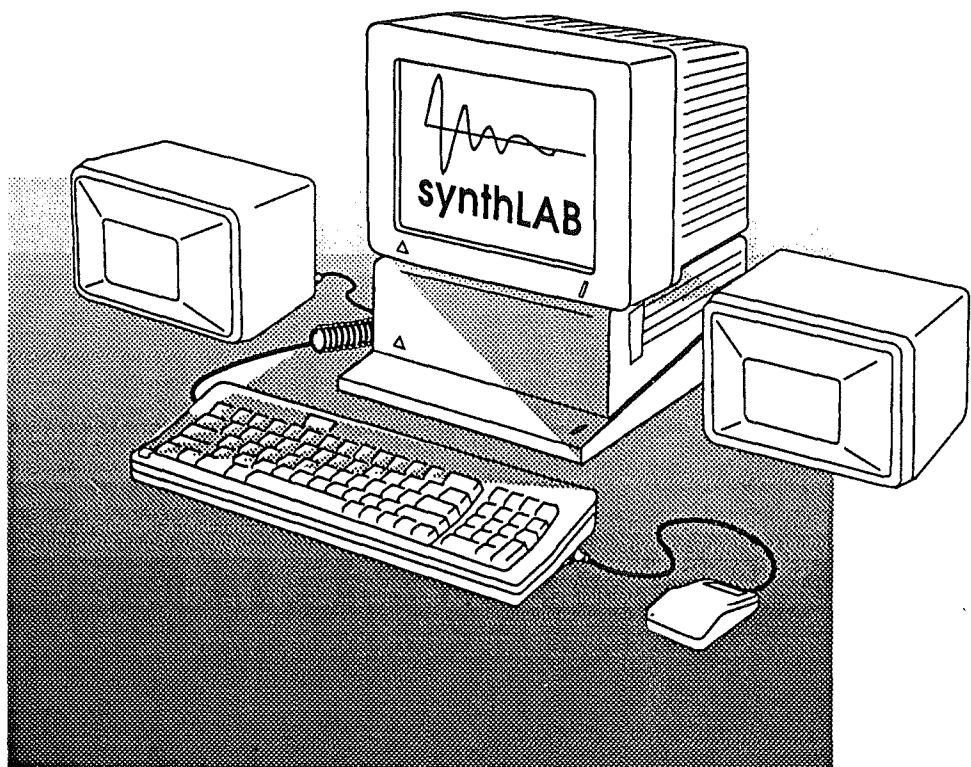


synthLAB™

User's Manual



by
Mark Cecys

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As the computer industry grows and matures, developers are under increasing pressure to continually create more complex and more sophisticated applications. At Apple Computer, we try to minimize this burden on developers by providing them with a wealth of OS routines called System Tools. Over the years, these Tools have grown and become very complex and sometimes unmanageable. For example, creating a new system Tool with a few vague notes written down by the engineer is no longer considered adequate support. We realize that you, as developers for the Apple GS, need additional support in dealing with the continually increasing complexity of your applications.

synthLAB is a support application for developers who are creating programs using MIDI Synth (system Tool035). And like MIDI Synth, it has three basic parts to it: a synthesizer, a sequencer and a MIDI driver. With synthLAB, you can create the instruments you'll need for your application, either by modifying existing ones, or by creating totally new and original ones. With the synthLAB sequencer, you can record your custom sequences used in your application. You can take advantage of MIDI Synth's multi-timbral feature by experimenting with different instrument combinations until you get the sound that you want. You no longer have to "hand-code" instruments and sequences into your source code without the benefit of hearing exactly what your creating. Using a tool like synthLAB, creating sound in your application should be easier and the result will certainly be more interesting to your users.

Since synthLAB itself is built around MIDI Synth, it makes for a great learning tool in understanding how MIDI Synth works. Most of synthLAB's parameters directly correspond to MIDI Synth parameters. If you're not quite sure how a certain parameter affects MIDI Synth, with synthLAB you can go and actually try it, playing with different values until it becomes clear. You can also learn and develop the techniques needed in creating your own quality instruments by examining and manipulating the existing instruments provided with synthLAB. Making interesting instruments is an art, and the best way to learn this is by actually trying it yourself. So, synthLAB is also a powerful educational tool for developers.

And finally, if you have any musical inclinations, take a break and have some fun. Connect a MIDI keyboard and record your favorite music, experiment with different arrangements of instruments. You'll surprise yourself on how creative you can be, given the right tools to express yourself. Unlike any other personal computer, your GS is a powerful music synthesizer.

synthLAB Quick-Start

After booting the synthLAB Program disk, double-click on the "synthLAB" icon to launch the program. Once loaded, you'll get the "player keyboard" title screen. If you don't hear any output sound or if you get an error message, see the topic "Getting Starting" later in this section. When you're through listening to the demo, press either the GS keyboard "return" key or click on the *arrow* button on the bottom right of the screen to exit. The screen now shows the Sequencer Page, with deck control buttons to the left and eight sets of track controls on the right of the screen.

If you want, you can load and play some of the sample sequences and instruments on the Sequences and Instruments disk. Pull down the File menu button and select the "Load Sequence..." item. Remove the synthLAB Program disk and insert the Sequences and Instruments disk. Click on the *Drive* button to list the sequences found on this disk. After double-clicking on your selection, the file dialog box goes away and synthLAB will load in the selected sequence with the appropriate instruments. When the arrow cursor returns, you're ready to play the sequence. You can either click on the deck *Play* button, or if you want to see the actual notes being played, select the "About synthLAB..." item from the "Δ" menu button. Either way will play the sequence for you.

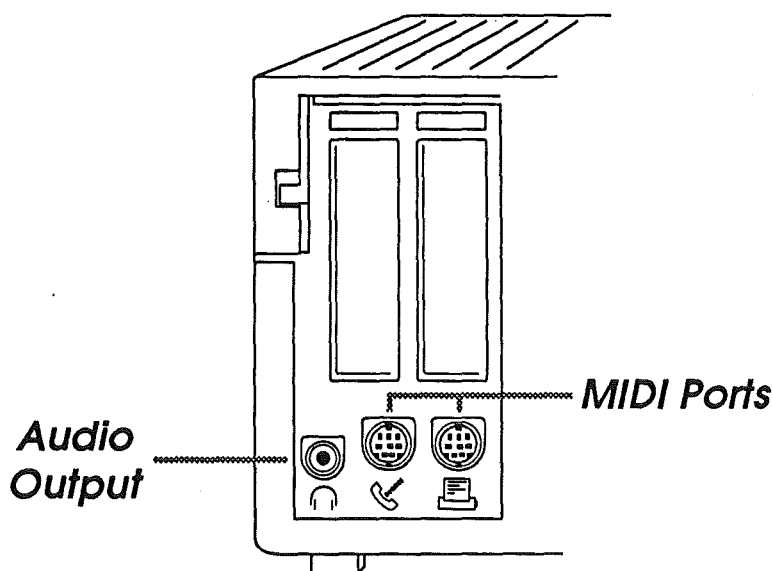
To get the full effect from synthLAB, try using a stereo interface card with the output going to an external amplifier/speaker system. You'll miss quite a lot if you only play synthLAB in "mono" through the low-quality internal speaker.

How to use this manual

This manual is a general reference guide for starting and navigating around synthLAB. By itself, it certainly is not complete, especially if you're going to create your own instruments. synthLAB's primary goal is to support and encourage developers working with MIDI Synth. Although in some ways it could be used as such, synthLAB is not a consumer product. The system architecture and many of the parameters and functions which synthLAB controls are described in the "MIDI Synth External ERS" and are not duplicated here. The "ERS" is very technically oriented, written primarily for programmers and developers. It is intended that you use this manual, synthLAB and the "ERS" together, referencing various sections in each until you get solid understanding of how things work. It is important that you read the "ERS", since this information is not covered here.

This manual and the "ERS" assumes that you have a good understanding of how MIDI works. Explaining and describing all the many aspects of MIDI is beyond the scope of this manual. There are many excellent books written about MIDI, which are available at your local music dealer if you need additional information.

Finally, there are some terms used in this manual that might cause some confusion. The term *keyboard* will always refer to an external MIDI keyboard (the musical kind). The keyboard that's part of your GS computer system that you type with, will be called the *GS keyboard*. Also, new names are given to some of the hardware ports on your GS. Since MIDI devices are connected to either the



Modem or Printer ports on the back of the GS, either one will be referred to as a *MIDI port*. The headphone jack, which usually goes to some sort of external amplifier (if you're the least bit serious about sound quality), is called the *audio output port*. If you're using a stereo interface card, then the audio output port is the stereo output connector on the card.

Getting Started

As usual, the first thing you should do is make a back-up copy of the synthLAB disk, then store the original away somewhere safe. If you're using a hard disk, just copy the "synthLAB" folder over to your hard disk.

Next, copy "Tool035" (MIDI Synth) over to your "Tools" folder, which is found inside your boot "System" folder. If your boot disk is already full and you don't have any more room available then leave MIDI Synth in the same folder with synthLAB. When it initially runs, synthLAB tries to load MIDI Synth from the system "Tools" folder. If it can't find it there, it then looks for it in its own folder. If you have a hard disk, this should not be a problem.

If you plan on using MIDI along with synthLAB, you'll need to install MIDI into your system with the new MIDI CDEV. Simply move the file from the synthLAB disk called "MIDI" over to the "CDev" folder on your boot disk (found inside the "System" folder). Before running synthLAB, run the Control Panel NDA from the Apple menu. Select the CDEV called "MIDI" and enter the correct information which describes your MIDI setup (see Appendix B). Return back to the Finder and launch synthLAB.

After synthLAB has loaded, you should hear music playing at the title screen. If synthLAB encountered an error while trying to start, you'll get an error message telling you what is wrong.

You'll get an error if AppleTalk is active. Due to the way interrupts work on the GS, you can't run MIDI and AppleTalk together (AppleTalk also eats up CPU time, which would degrade our performance). Go to the Control Panel and de-select AppleTalk. Reset, re-boot and try again.

Try to avoid using Inits and DA's which install themselves in the background (menu clocks, screen savers, etc.). Remember, nothing comes for free. These background programs continually steal valuable CPU time, making applications run slower. For 'real-time' programs like synthLAB, this is especially critical since they are competing for the same background interrupt time.

Requirements

- Apple IIGS system
- 1M of system memory or greater
- GS/OS 5.02 or greater
- One 3.5" drive
- "MIDI Synth External ERS" manual

Recommended

- External amplifier/speakers (home stereo, powered monitors, etc.)
- MIDI interface (Apple MIDI, *Audio Animator*, etc.)

- MIDI controller (external MIDI keyboard, MIDI guitar, wind controller, etc.)
- Stereo interface card (*Audio Animator*, etc)

Optional

- Reverb or Effects Processor
- MIDI synthesizer, sampler, etc.
- Hard disk

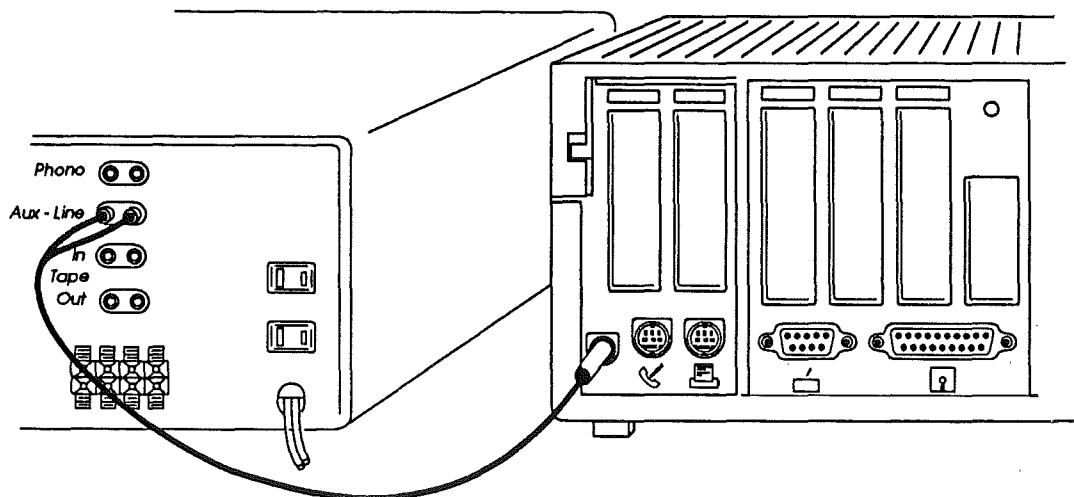
synthLAB will work on all GS models with a Rom version 01 or higher. Like most new applications these days, you'll need a minimum 1 meg of system ram. If your GS does not have 1 MB on the motherboard, you'll need a 1 meg. expansion card installed.

We don't know why anyone would have a GS with a monochrome monitor, but if you do, it won't be pretty.

If you're using an older version of GS/OS, then see your dealer for an upgrade to the latest version.

Audio Output

Unless you're the type who enjoys listening to music through a cheap 25-cent speaker, hook the GS audio output to an external audio system. Any home stereo or powered monitor speaker will do. If you're using a home stereo system, you'll need a *1/8" stereo mini plug to phono (RCA) plug* adapter cable to connect your GS to your amplifier. The *mini* plug goes to the audio output (headphone) jack on the back of your GS or your stereo interface card, while the two *phono* ends go to the *line* or *Aux* inputs usually on the back of your stereo amplifier (Even though the plugs are called *phono*, do NOT plug them into the *phono* input on your amplifier, you could damage your speakers if you do).



There are several things you can do to improve the overall quality of sound coming from

your GS. First, try turning the *treble* control on your amplifier down a bit to filter out the "hiss" if you have a noisy GS or a noisy stereo interface.

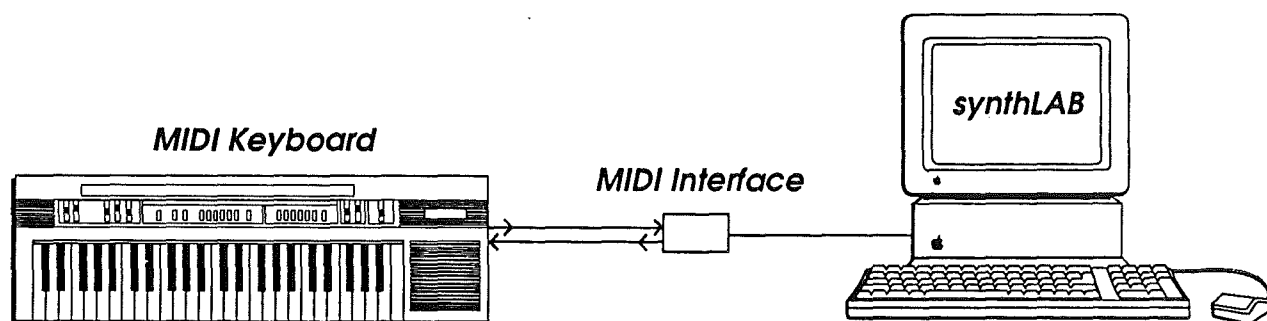
Second, both synthLAB and MIDI Synth are designed to be most effective when played in stereo. By being able to assign each Generator (1/2 of an Instrument) to either stereo channel, many interesting stereo effects can be created. If you have a stereo interface card, see the owner's manual for installation instructions.

The author's personal recommendation is Applied Engineering's *Audio Animator*. Not only does this card produce very good quality stereo output, but it has a built-in MIDI interface, an excellent stereo digitizer and a convenient external control box for all your connections and level controls. This audio system includes useful software for digitizing and editing your own sounds, and for recording and playing MIDI sequences.

Finally, if you have a reverb unit or a special effects box, try using it on your GS. You'll be surprised that by adding a small amount of reverb will suddenly make your GS sound like a \$1,000 professional synthesizer (they all have reverb built-in these days).

Connecting a MIDI Device to synthLAB

If you happen to have one, hook an external MIDI keyboard up to your GS. Whether you're creating instruments and sequences, or if you just want to play your GS as a synthesizer, you'll get the most out of synthLAB if you control it thru MIDI.

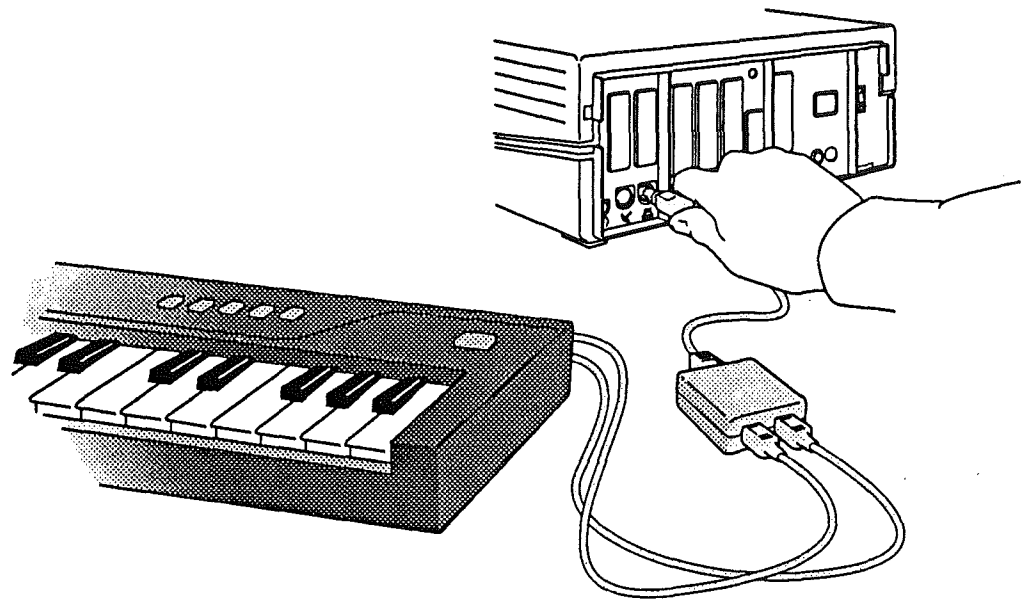


Since synthLAB is both a synthesizer and a sequencer, you can do many useful things with your GS connected to a MIDI keyboard. As mentioned above, you can simply play your GS as a synthesizer. Play notes on the keyboard, and your GS will track them by playing selected instruments. It will even respond to note velocity, pitch-bend and your volume and sustain pedals. Next, you can record your performances into an eight-track sequencer, recording each track separately using different instruments. You can save these sequences on disk, building your own personal library. Finally, you can have synthLAB play your MIDI keyboard. If you run out of instruments or voices with synthLAB, you can assign any tracks to output their MIDI data out to your keyboard.

When creating instruments, the keyboard gives you more control in defining the various parameters. You can quickly test your instrument over the complete note and velocity range. Many instruments sound different when they interact with other voices, so you can play chords or octaves and hear this effect. If the instrument is multi-sampled (different waves for note zones), you can make sure that the transitions between WaveLists are seamless and that each multi-sample is balanced correctly with the others.

Since MIDI signals are electrically different from signals that computers use, you'll need to connect your keyboard through an special MIDI interface. Any 1mhz external type of interface (Apple MIDI for example) or an internal card interface (like Applied Engineering's *Audio Animator*) will work. For example, when using the Apple MIDI interface, you simply plug the MIDI cables into one end of the interface which connects to your MIDI keyboard, then plug the other end into a MIDI port on your GS (Modem or Printer, see diagram below).

Once you start synthLAB, you'll need to enable the MIDI port. Pull the "Setup" menu down and select the "MIDI..." item. Then from the dialog box, click on the *MIDI In Enable* button to enable it (it's the icon with the arrow pointing into the computer). Press a few notes on the keyboard, and you should hear your GS play them. Notice that the "MIDI In" display on the top right corner of the screen lights up for every MIDI message received.



Connecting an Apple MIDI interface

Limitations

When writing any application, you must limit the scope in which you intend to cover, in order to maintain a realistic schedule. Because of this, all applications have their limitations, and do not have all the features necessary to meet all user's needs. Just as it's important to know what an application does, it's also just as important to know what an application will not do.

- synthLAB is intended to be an instrument editor. It works on banks of 16 instruments at a time. It does not have any “librarian” features enabling you to move instruments between banks. This would certainly be useful.

- synthLAB is not a waveform editor. The waves must be created and edited elsewhere. We at Apple will provide wave files for you to use, but it would be nice if you could sample and edit your own.

- The sequencer in synthLAB is very limited and lacks many of the editing features found in more advanced types of sequencers.

- Since synthLAB does not use QuickDraw to draw all images on the video screen, there are times when it does not know anything about “foreign” windows. Therefore, it can't support NDA's.

Developers should note that these are limitations of only synthLAB and not the System Tool, MIDI Synth. A professional style sequencer can very well be written around MIDI Synth. The custom interface was the author's personal preference: MIDI Synth was designed to work well with the standard GS Desktop (Windows, Menus, Controls, etc.).

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synthLAB has three basic parts to it: a synthesizer, a sequencer and a MIDI driver. Everything synthLAB does relates to one of these three parts. Since synthLAB's main purpose is to create instruments for MIDI Synth, it obviously has controls to manipulate all the parameters defined in an Instrument Record. To play an instrument, we need the synthesizer, so synthLAB has controls for that too. And finally, there are controls for the sequencer and the MIDI driver.

File Types

When you use a word processor, you typically load in your text file, manipulate the file by adding and editing words and sentences to the file, and when you're done, you save this file back to disk. The word processor creates and manipulates text files. synthLAB is, in many ways, like a word processor. But instead of working on text files, synthLAB works on instrument files and sequence files.

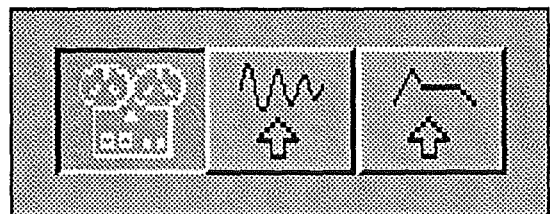
An *instrument file* is a collection of instruments grouped together in what is called an instrument *bank*. Each bank has 16 instruments and each instrument is actually an Instrument Record defining how the sound is built. In other words, a bank is simply a group of 16 Instrument Records. The instruments in a bank are all related to one another in that they all share the same *wave file*. This file contains the actual waveforms used in producing the output sound. synthLAB does not manipulate the wave file in any way, it only loads it into DOC ram after you load an instrument file. Once an instrument file is loaded, synthLAB can now edit and/or play any one of these 16 instruments.

A *sequence file* is the data output created by the sequencer. A Sequence File can contain only one sequence.

Navigating synthLAB

Since all of synthLAB's features can't fit onto a single screen, the various functions have been divided up and placed into either separate video screens or grouped inside the menu buttons at the top of the screen. The three main video screens are called *pages*, and you can access any one of them them by pressing one of the three page buttons.

The left button selects the *Sequencer* page. You use this page whenever you wish to control sequence record or playback. The middle button selects the *WaveList Edit* page, which has controls to change the WaveList Record parameters. The button on the right, the *Envelope Edit* page, selects the controls used to edit Envelope Record parameters. These last two pages are used to define Instrument Records (see "MIDI Synth ERS").



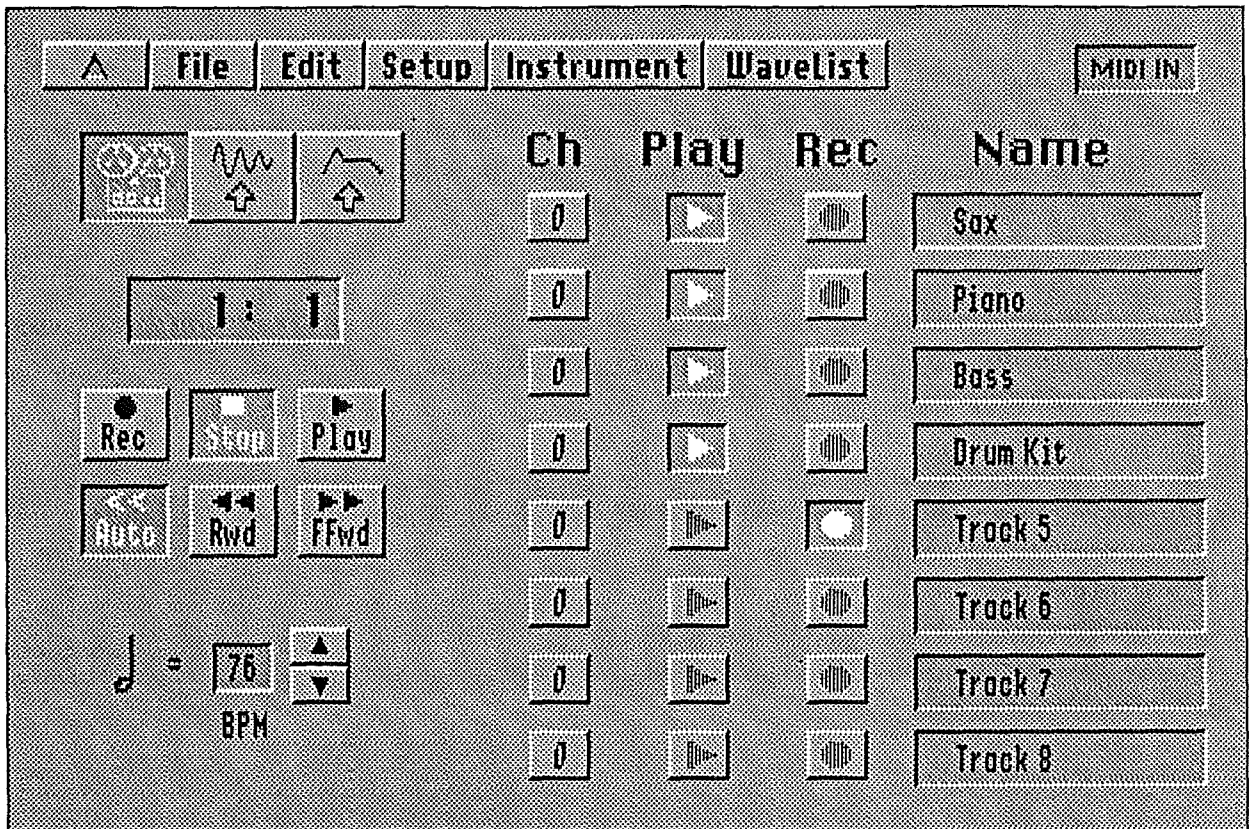
Page Buttons

The *menu buttons* have functions which are common for all three pages. Things like file I/O, program setup and instrument selection, are all initiated from these buttons.

The Sequencer Page



The Sequencer page can be grouped into three main areas. On the left are the *deck controls*. They behave like controls on a typical tape recorder. In the lower left corner is the *tempo control*, which sets the speed or playback rate of the sequence. And finally, the right half of the page has the *track controls*. These are eight duplicate sets of controls, one set for each of the eight tracks used by the sequencer.

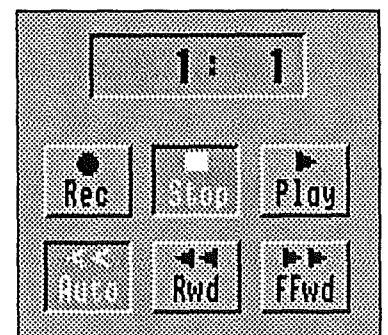


The Deck Controls

If you're familiar with how to control a tape recorder, then you should find these controls very straightforward. Play, Stop, Rec, Fast-Forward, Rewind and Auto-Rewind all work the same as their tape deck counterparts. They control the basic sequencer functions. Above the deck control buttons is the position counter, which shows you where you are in the sequence.

Play

To play a sequence from memory, press the Play button. It starts at the current location as displayed by the counter. The sequencer will automatically stop when it reaches the end.



Deck Controls

Record

Pressing this button will start recording MIDI messages received at the MIDI port. In other words, if you have a keyboard connected to the MIDI port and MIDI is enabled (see "MIDI Setup"), then synthLAB will start recording everything you play. At the same time it can also play-back selected tracks while you record. Like the play function, recording starts at the position indicated by the counter.

Stop

Will immediately halt a play or record process.

Fast-Forward

If you want to advance the the counter forward, then press and hold this button until you reach the desired position. If you hold this button down while a sequence is playing, then the tempo will double and stay at that speed until you release the button.

Rewind

This button will advance the position counter backward. Double-clicking this button will reset the counter to the beginning of the sequence (1:1).

Auto-Rewind

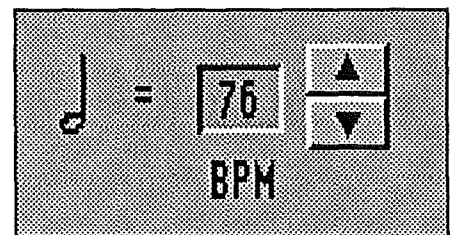
When this button is on, anytime the sequence stops it will automatically rewind to the beginning of the sequence. Otherwise, if it's off, then it remains at the current location.

Counter Display

The counter shows you the where you are positioned in the sequence. It displays the position in measures and beats. You can't directly edit the value, you move it forward or backward by using the deck buttons.

Tempo Control

This control sets the speed in which the sequencer plays. It sets this speed in units of half-note beats per minute. If you are used to working with quarter-note beats, then the quarter-note BPM value is twice the half-note value displayed. For example, when the tempo display shows 60, this is equivalent to 120 quarter-note beats per measure.



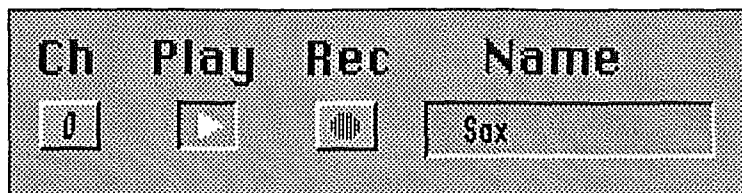
Tempo Control

Track Controls

The synthLAB sequencer is in many ways like an eight-track tape recorder. And like a multi-track tape deck, you can record one track of music at a time, using different instruments or combinations on each separate track. Then during play-back, you can select any or all of the tracks you wish to hear. You can play-back selected tracks at the same time that you are recording on another track. You can even over-dub any track until it sounds right.

But unlike a tape recorder, you are recording only MIDI messages, and not the actual sound being heard. When the sequencer plays, it sends these MIDI messages over to the synthesizer, which then reproduces the instruments you recorded in the first place. The advantage over a tape recorder is that you have the flexibility to experiment and re-orchestrate your sequence even after you're done recording.

The track controls consist of eight duplicate sets of controls, one set for each track. Track number one is the top set, while the bottom most set is track eight. There are four controls for each track. You can give each track a name, select one track for recording, enable any or all tracks for play-back and finally, you can force any track to play a selected instrument.



Track Controls

Track Name

This control lets you reference the track by an entered name. You can put any type of notes or labels in here, which you may find useful. After clicking on the control, you'll get a line-edit type of dialog box. Type the name you want and click the "Done" button to exit. Up to 15 characters can be entered.

Track Record

Before you start recording, you have to tell the sequencer which one of the eight tracks it must record on. This button selects the record track. Note that synthLAB allows you to select only one track for this at a time. If you change the record track by pressing a new button, synthLAB will automatically turn the previous selected button off. Pressing a track record button while it's already on will turn it off, leaving no tracks selected for record.

Recording on a track that already has information on it will overwrite the previous data with new data.

Track Play

During a play or record process, individual tracks can be turned on or off for play-back by pressing these buttons. Unlike the track record buttons, any number or combinations of tracks can be selected for play-back. Clicking on a selected button will turn it off.

Track Channel

With this control, you can force all MIDI messages in the track to play a specific instrument. Since the sequencer always plays in "multi" mode (see the "ERS"), the channel part of the MIDI message specifies which one of the 16 instruments to play. This control makes all messages in the track to have one specified channel number, and thus one specified instrument. Channel one plays instrument number one, channel two plays instrument number two and so on. A channel number of zero will leave the message alone, letting it play whatever channel or instrument was originally recorded.

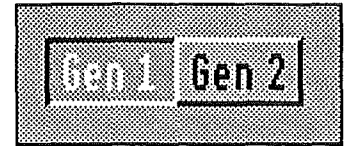
The reason you have to specify channel number is that it also affects the MIDI data that gets sent out the MIDI port, if it's enabled. All MIDI data sent out from the track will now be on the entered channel.

When you click on the button, you'll get a dialog box with a control that lets you change the channel number. Press the up or down arrow keys to set it to the value you want, then exit.

Editing Instrument Records



The WaveList Edit and Envelope Edit pages are used to edit Instrument Records, which define the instruments used by MIDI Synth (see "MIDI Synth ERS" for details on Instrument Records). Remember, each Instrument Record has two Generators (Gen 1 and Gen 2), and each Generator has one Envelope Record and eight WaveList Records (WaveList 1-8). If you look at the two Edit pages, you'll notice that they both have Generator select buttons (Gen 1, Gen 2). You use this to select which one of the two Generators you wish to work on. In the Envelope Edit page, it selects one of the two Envelope Records, while in the WaveList Edit page, this selects which of the two sets of eight WaveList Records you want. You use the WaveList menu button to further select which specific WaveList to edit while in the WaveList Edit page.



Gen Select Buttons

Since each synthLAB instrument bank has 16 instruments, you first have to select which instrument you want to edit. The Instrument menu button lets you make this selection. Pull it down and select the instrument. Next, you select a Generator by clicking one of the Generator select buttons. Finally, if you are editing a WaveList parameter, you need to select a WaveList from the WaveList menu button.

Before editing a WaveList, check the *Top Key* parameters to make sure that you have the correct WaveList selected for the desired note range. This is the most common mistake that users make when editing WaveLists.

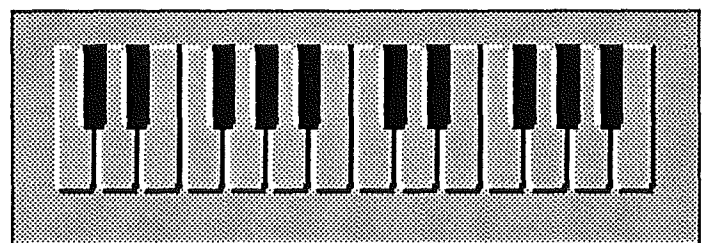
To get to any specific Instrument Record parameter, you need to:

1. *Select the correct instrument from the Instrument menu.*
2. *Select one of the two Generators with the Gen buttons.*
3. *If it's a WaveList parameter, then select the correct WaveList number from the WaveList menu.*

Because there is so much data to edit, this probably sounds confusing at first. Once you start working with it, this organization will start to make some sense to you.

Screen Keyboard

The two-octave screen keyboard will play whatever instrument is currently selected for edit (from the *Instrument* menu button). Clicking on the keys will play them. You can change the keyboard



Screen Keyboard

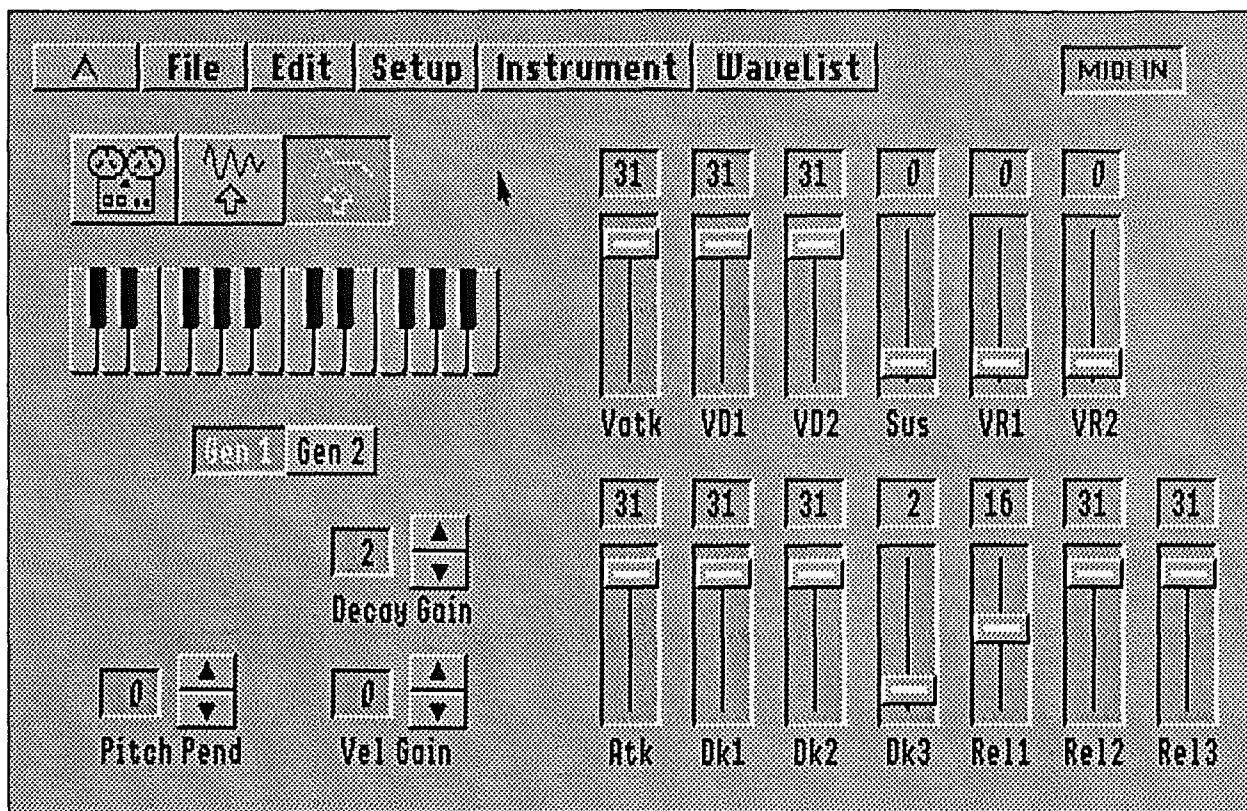
range and volume from the *System Setup* menu item found under the *Setup* menu button on the top of the screen (see "Setup Menu").

If you click on the keyboard while you're recording a track, synthLAB will record those notes.

Envelope Edit Page



This page lets you edit Envelope Records (see "MIDI Synth ERS" for information on Instrument Records). There are two independent envelopes for each instrument, one for Gen 1 and another one for Gen 2. The sliders found on the right set the envelope parameters, while the buttons on the bottom left control the remaining parameters found in an Envelope Record.



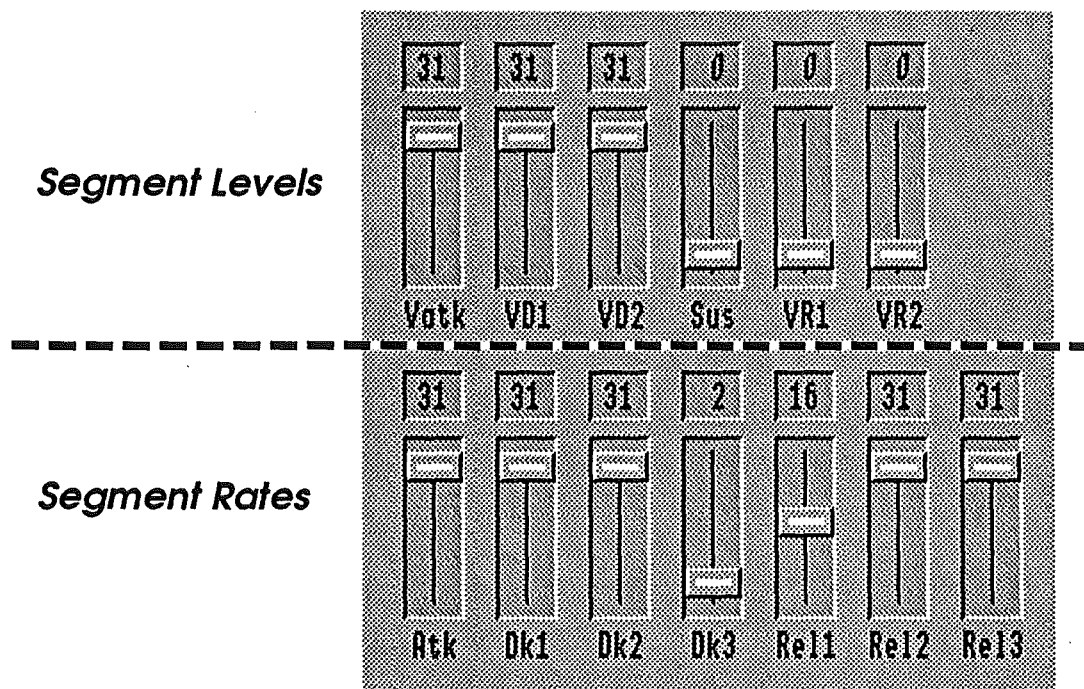
Envelope Sliders

These sliders let you edit the eight envelope segments. The top six sliders set the **level** values while the bottom seven sliders set the **rates**.

Here's a brief summary of the envelope (see "Instrument Records" in the "ERS" for details):

1. Start ramping from zero at *Atk* rate to *Vatk* level.
2. Ramp at *Dk1* rate to *VD1* level.
3. Ramp at *Dk2* rate to *VD2* level.
4. Ramp at *Dk3* rate to *Sus* level.
5. Hold at *Sus* level until "Note Off".
6. Ramp at *Rel1* rate to *VR1* level.
7. Ramp at *Rel2* rate to *VR2* level.
8. Ramp at *Rel3* rate to a zero level.

If any level is set to zero, then the envelope ends at that point. The level sliders display 1/4th the real value. In other words, a level slider value of 25 sets a value of 100 into the Envelope Record.



Velocity Gain

This sets the envelope's sensitivity to MIDI velocity data (see "Instrument Records" in the "ERS" for details). Note that the Gen 1 control affects the entire instrument; both the Gen 1 envelope and the Gen 2 envelope.

Decay Gain

Increases the the Decay rates for higher pitched notes (see "Instrument Records" in the "ERS" for details).

Pitch Bend

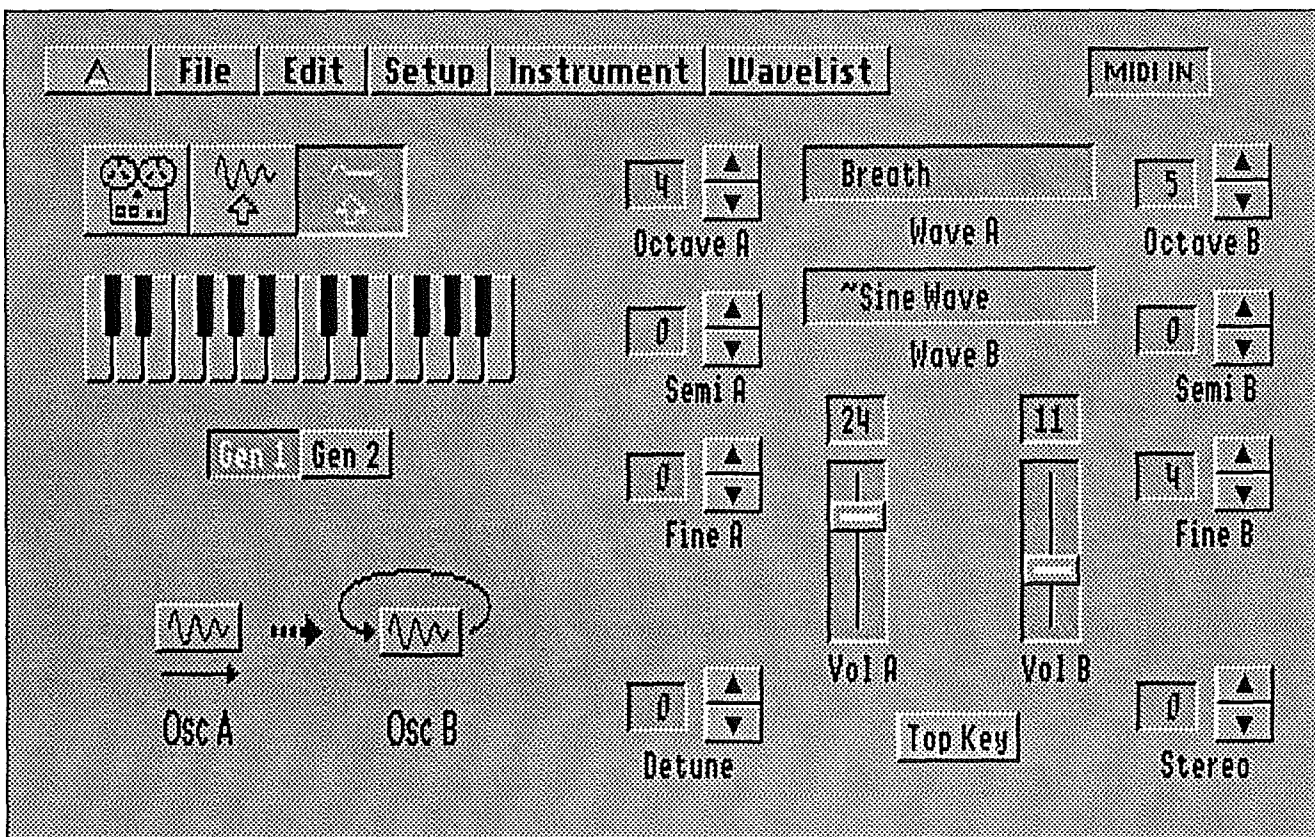
This sets the instrument's sensitivity to MIDI pitch bend data (see "Instrument Records" in the "ERS" for details). Like Velocity Gain, the Gen 1 control affects the entire instrument; both the Gen 1 envelope and the Gen 2 envelope.

WaveList Edit Page



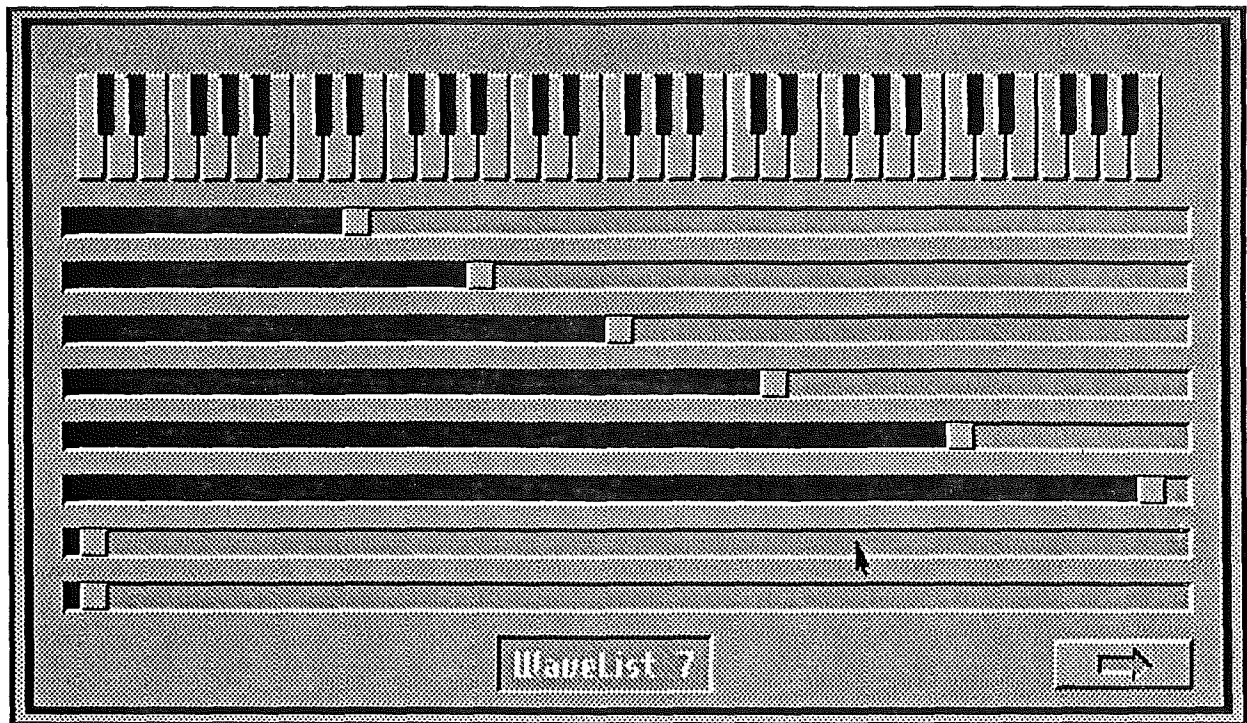
This page lets you edit WaveList Records (see "MIDI Synth ERS" for information on WaveList Records). There are 16 WaveLists for each instrument, eight for Gen 1 and another eight for Gen 2. Make sure that you have the correct WaveList selected from the WaveList menu button whenever you are editing in this page.

Keep in mind that there are four oscillators for each instrument, two for Gen 1 and two for Gen 2. The two oscillators (Osc A and Osc B) in each generator are independently controlled. Each oscillator can have its tuning (*Octave*, *Semi* and *Fine*), volume, wave and configuration set from this page.



Top Key

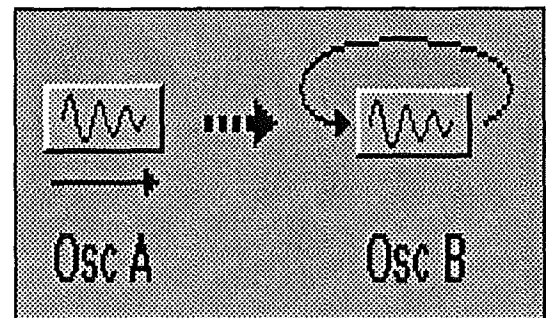
Each one of the eight WaveLists can be made active to play in only a specific range of notes. This allows you to create "multi-sampled" instruments with a different wavesample for each WaveList (see WaveList Records in the "ERS" for details). Clicking the Top Key button will display a dialog box with eight horizontal sliders, one for each WaveList. Remember that the Top Keys are prioritized in order from WaveList 1 to WaveList 8. This means that WaveList 2 starts from where WaveList 1 ended, WaveList 3 starts from where WaveList 2 ended, and so on.



Top Key Dialog Box

Oscillator Configuration

The two oscillators in each generator can be set to any one of six different modes or *configurations* (see WaveList Records in the “ERS” for details). This is a very powerful feature of MIDI Synth since it gives you great flexibility in controlling how the two oscillators interact with each other. Clicking on the control will step to the next configuration (Type 0 thru Type 5).

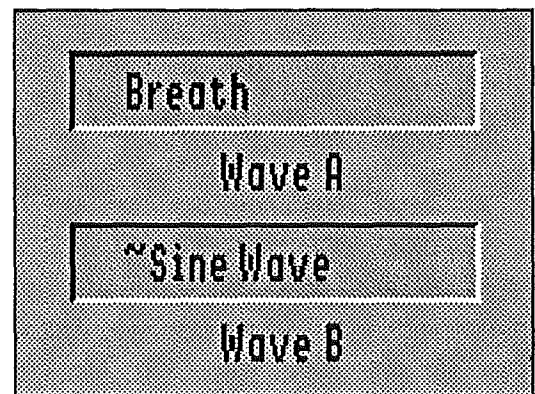


Type 3 Configuration

Wave Select

Holding down the mouse button on either of the two *Wave Select* controls (Wave A and Wave B) will produce a pop-up menu of available waves from the current Wave File.

The convention used by synthLAB to notate the difference between wave types is to start ‘loop’ type wave names with the character “~”. For example, if you had two waves titled “Piano” and “~Piano”, the wave “Piano” would be a sampled recording of a piano attack



Wave Select Controls

while the wave “~Piano” would be a single-cycle wave of the piano’s sustain and release. The “Piano” wave should be played with a ‘one-shot’ configuration and the “~Piano” wave should be played with a ‘loop’ type configuration. In this example, you may want to use Configuration *Mode 3* with Osc A playing the sampled “Piano” attack and Osc B playing the single-cycle “~Piano” wave.

Oscillator Tuning

There are several important reasons why you need to independently tune each individual oscillator. Since sampled waves are dependent on the input and output sampling rate and on the pitch of the original source, they most probably are not going to play back at the correct pitch. If you’re using multi-sampled sounds, they’ll need to be tuned to the correct octave. So the most obvious use is to tune the waves to the correct pitch.

Many effects can be created by altering the tuning ratio between different oscillators. If you fine tune two “loop” mode oscillators with a slight difference in pitch, you get an interesting effect of “movement” while the two oscillators slowly beat against each other. When you tune the two oscillators further apart in pitch, the sound’s “texture” increases giving a richer and thicker sound. If you slightly detune two oscillators playing the same sampled sound, you get the familiar “phasing” effect.

There are three tuning controls for each oscillator. The Octave control is centered around a normalized value of 3. This means that single-cycle waves will produce the correct pitch (middle A is 440 hz) when The Octave is set to 3, and both Semi and Fine are set to zero. The Semi control increases the pitch by semi-tone increments and the Fine control increases the pitch by fractions of a semi-tone.

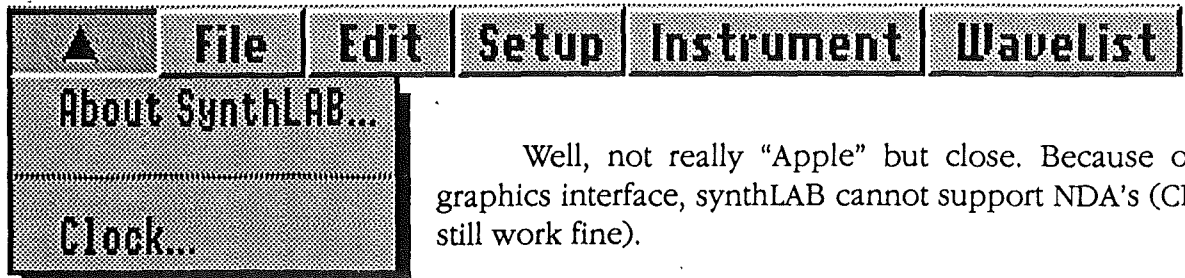
Oscillator Volume

These sliders let you set each oscillator’s output level. If you want to turn an oscillator off, set the *Volume* to zero. Like the Envelope sliders, these sliders display 1/4th the real value set in the Instrument Record.

There are a couple of points you should keep in mind when you’re making instruments. Since sampled waves usually have a recorded envelope in them, their output volume will sound lower than single-cycle waves. So if you’re mixing the two types, you’ll usually need to play single-cycle waves at a lower level to get the correct balance.

There’s a slight amount of cross-talk between Osc A and Osc B. If you’re not using one of the oscillators (zero volume), make sure that you select a wave for the unused oscillator that has very little high harmonic content (like a sine wave). Also, tune the unused oscillator to a low frequency. Even though the volume is set to zero, you may still be able to hear the oscillator if its selected wave is very bright or at a high pitch.

“Δ” Menu

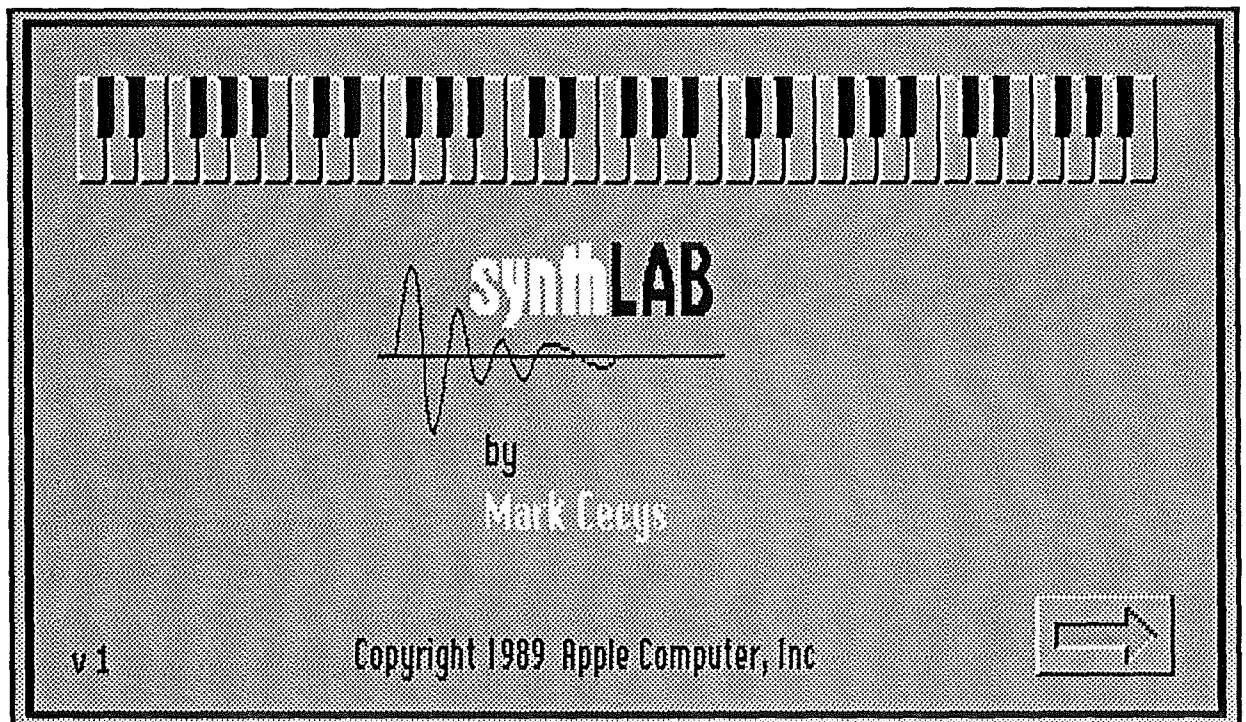


Well, not really “Apple” but close. Because of its graphics interface, synthLAB cannot support NDA’s (CDA’s still work fine).

This interface is a result of the author’s personal choice, and does not reflect on MIDI Synth’s compatibility with the “Mac desktop” interface. MIDI Synth is optimized for speed, so it works well with any desktop/non-desktop interface.

About SynthLAB..

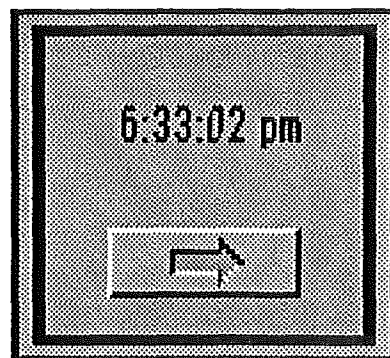
Selecting this item brings up the “player keyboard” dialog box. The “keyboard” will play whatever sequence is currently in memory. The displayed number on the lower left side of the dialog box shows the program version number.



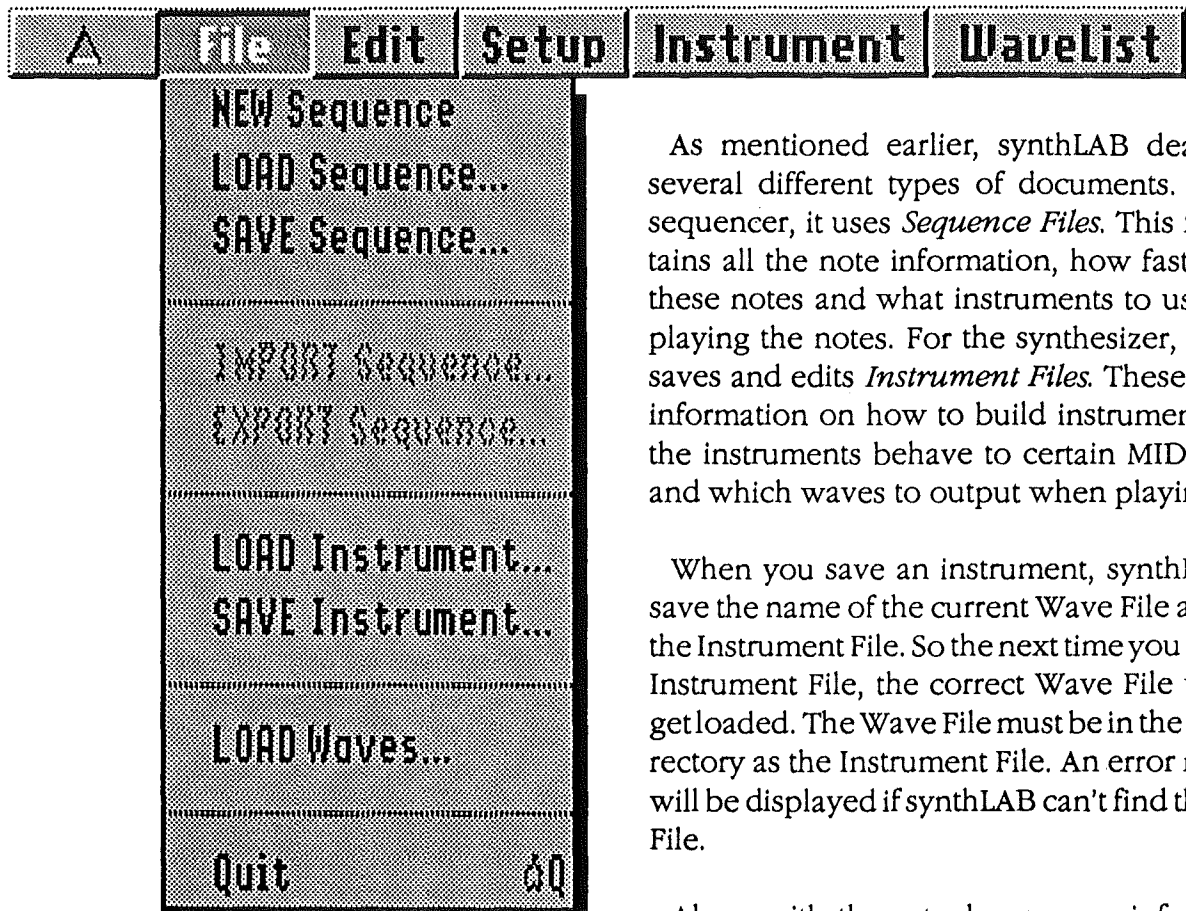
About synthLAB... Dialog Box

Clock...

Even if you can't use your favorite NDA's, you still have your clock. This impressive "synthLAB NDA" alone is well worth the price you paid for synthLAB.



Clock



As mentioned earlier, synthLAB deals with several different types of documents. For the sequencer, it uses *Sequence Files*. This file contains all the note information, how fast to play these notes and what instruments to use when playing the notes. For the synthesizer, it loads, saves and edits *Instrument Files*. These contain information on how to build instruments, how the instruments behave to certain MIDI events and which waves to output when playing.

When you save an instrument, synthLAB will save the name of the current Wave File as part of the Instrument File. So the next time you load this Instrument File, the correct Wave File will also get loaded. The Wave File must be in the same directory as the Instrument File. An error message will be displayed if synthLAB can't find the Wave File.

Along with the actual sequence information, Sequence Files also contain the name of the Instrument File used when the Sequence File was saved. When loading the Sequence File, synthLAB will search the same directory for the Instrument File (along with its Wave File). It's important to understand that synthLAB does not save the Instrument File when it saves a Sequence File, it only saves the name of the current Instrument File as part of the Sequence File. If you changed some instruments and plan on saving them under a new file name, make sure to save the new Instrument File first, before saving the sequence. This way the Sequence File will have the name of your new Instrument File, since the sequence will be saved after you gave the Instrument File a new name. Otherwise synthLAB will still load the old instruments in whenever that sequence gets loaded.

As you can see, synthLAB expects Sequence, Instrument and Wave Files to all be in the same directory. Loading a Sequence File will automatically cause an Instrument File to be loaded, which in turn will automatically cause a Wave File to be loaded. If these files are not in the same directory, you'll have to load them in manually. For example, If your Instrument and Wave Files are in a different directory from your sequences, after loading in a sequence, you'll get an error message telling you that synthLAB couldn't find the appropriate Instrument File. This message is useful since it gives you the name of the Instrument File that goes with the sequence. At this point, you'll have to select the "Load Instrument..." item from the "File" menu and find the correct Instrument File.

New Sequence

Selecting this item will set the sequencer to default values. This is used if you're making a new sequence from scratch. Be careful with this selection because it will erase any sequence currently recorded in memory.

All eight tracks will be given default names ("Track 1" - "Track 8") and track channels will be set to 'thru' (0) mode. Track 1 will be set to both record and play with the counter reset to the first beat (1:1). Finally, all 16 instrument volumes (see "Volumes..." in the menu "Setup" section) will be set to maximum values.

New Sequence does not affect the tempo value, metronome, count-off, key start, beat value, beats per measure and the sequencer clock source. Nor does it affect the instruments in any way.

Load Sequence...

After selecting this item, select a Sequence File from the displayed dialog box. The appropriate instruments and waves will also automatically be loaded along with the sequence. Remember, synthLAB expects the Instrument and Wave Files used by the sequence to be in the same directory as the sequence. If they're not, you'll get an error message telling you what file synthLAB couldn't find.

All the information that was saved (see "Save Sequence...") with the sequence will be restored when the Sequence File is loaded. Loading a sequence will over-write any current sequence you may have in memory. So be sure to save your old sequence before loading in a new one.

synthLAB can't handle sequences which are larger than 128k bytes in size. If you're loading sequences made by synthLAB, this should not be a problem. If you're importing sequences from other programs, make sure that they are less than this amount.

Save Sequence...

This item brings up the standard dialog box for saving files. Type in the name of your Sequence File at the bottom and click on the Save button. If you want synthLAB to automatically load your instruments in the next time you load this sequence, make sure that you save the sequence in the same directory where the Instrument and Wave Files are located. synthLAB will save the current Instrument File name along with the sequence, and tries to load these instruments whenever the sequence is loaded.

Besides saving all the note and MIDI information in your sequence, all track names, track channel, track play, track record, instrument volumes, beat value, beats per measure and the tempo value will also be saved with the sequence (see section "Sequence File Format").

Import/Export Sequence

These two items are not currently implemented. They may be implemented in a future version of synthLAB.

Load Instrument...

After selecting this item, select an Instrument File from the displayed dialog box. The appropriate Wave File will also automatically be loaded along with the instruments. Remember, synthLAB expects the Wave File to be in the same directory where the Instrument File is located. If it's not, you'll get an error message telling you the Wave File name synthLAB couldn't find.

Save Instrument...

This item brings up a dialog box for saving Instrument Files. Type in the name of your Instrument File at the bottom and click on the Save button. If you want synthLAB to automatically load the Wave File in the next time you load these instruments, make sure that you save the Instrument File in the same directory where the Wave File is located. synthLAB will save the current Wave File name along with the instruments (see section "Instrument File Format"), and tries to load this Wave File whenever the instruments are loaded.

Load Waves...

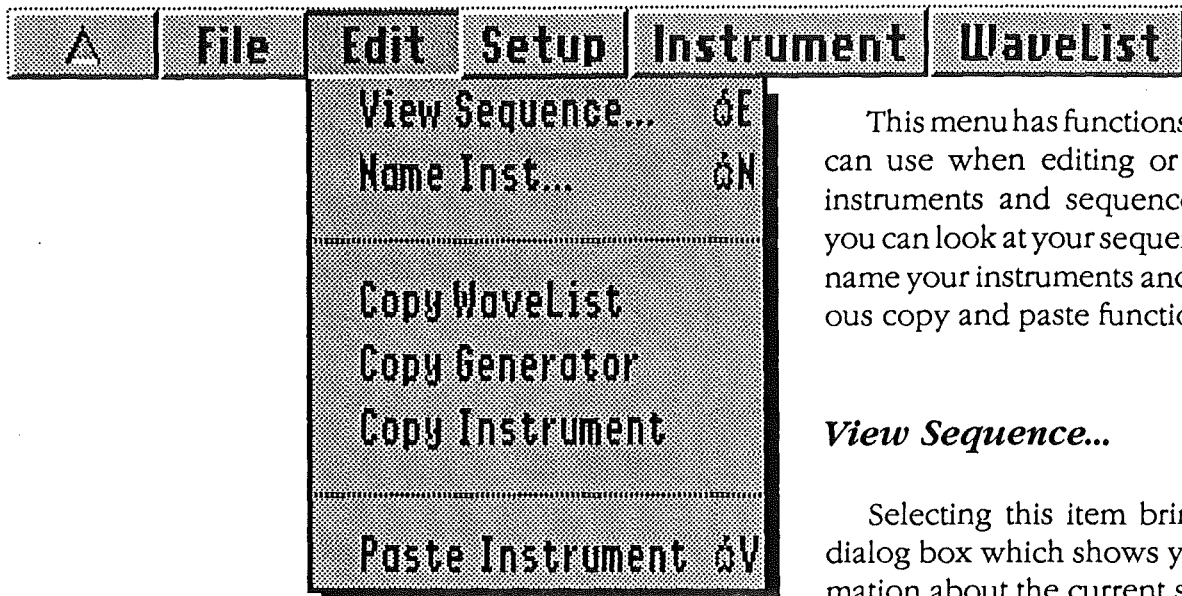
This item can be used to load Wave Files located in different directories from their Instrument Files. If synthLAB can't find the Wave File when loading instruments, it will display an error message telling you the name of the Wave File needed. You can then select this menu item and load the correct Wave File from its directory.

If you load a new Wave File that is different from the one that was used when the instruments were created, you'll need to redo most of the instrument controls to work with the new waves. In other words you'll have to build the instruments from scratch.

Quit

Selecting this item will terminate synthLAB and return program control back to the launching application (usually the Finder). Before selecting this, make sure that you saved any changed sequence and instruments. If you don't, they'll be gone forever.

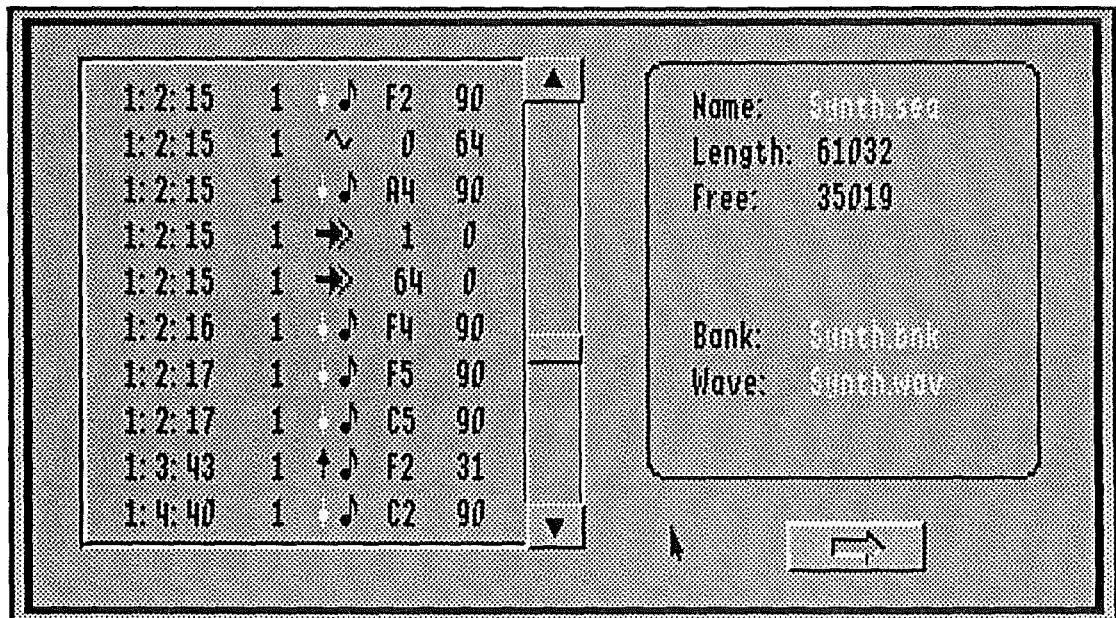
Edit Menu










This menu has functions that you can use when editing or creating instruments and sequences. Here, you can look at your sequence data, name your instruments and do various copy and paste functions.

View Sequence...

Selecting this item brings up a dialog box which shows you information about the current sequence in memory. On the right side you'll see the name of the sequence (actually the name of the last loaded or saved sequence), its length in bytes and the number of bytes available in the seq buffer. Below this is the name of the current Instrument File (Bank) and the name of the current Wave File (Wave).



On the left side is a list control which shows you each individual seq item in your sequence (the scroll thumb does not function in the current version). The left-most value displayed in the seq item is the time-stamp shown in *measure: beat: remainder ticks* format. Remember that beats are based on a value of 96 ticks in a quarter note. So when displaying any seq item that does not fall on a beat, the remainder field will show the number of ticks past the last beat. If the beat is a quarter note, then the remainder will have a value between 0 and 95. An eighth note beat will have

	Note Off - \$8x
	Note On - \$9x
	Poly After-Touch - \$Ax
	Control Change - \$Bx
	Program Change - \$Cx
	Mono After-Touch - \$Dx
	Pitch Wheel- \$Ex

MIDI Status Messages

remainders between 0 and 47, and so on.

Displayed to the right of the time-stamp, is the channel number. If you're playing the synthesizer, then this is also the instrument number.

Finally, the remaining three fields on the right show the MIDI message and data bytes. The MIDI message status field is represented by any one of the symbols shown in the chart. Since only valid data bytes are shown, you may see one, two or no data bytes following the message status.

Name Inst...

This item lets you modify the name of the instrument which is currently selected for editing (selected from the Instrument menu). Up to 15 characters can be entered as an instrument name.

Copy WaveList

Copy Generator

Copy Instrument

Selecting any one of these items will copy the specified parameters into an internal clipboard. This is used to duplicate the contents of a WaveList, Generator or Instrument. Once the parameters have been copied into the clipboard, you can then select another WaveList, Generator or Instrument, and paste those parameters into the new location.

A "Copy WaveList" selection will only copy the 16 parameters of the selected WaveList. Copying a Generator will copy one Envelope and eight WaveLists. Finally, when you copy an Instrument, all parameters from both Generators (both Envelopes and all 16 WaveLists), including the instrument name, will be placed into the clipboard. The original parameters will not be affected in any way by this.

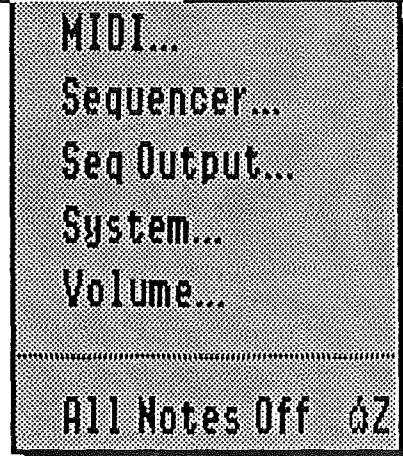
Paste

Once a Copy function has been completed, you can use this item to place the contents of the clipboard into some other location. If the clipboard is empty, this item will be disabled. Whenever the clipboard has something in it, this item will show you what type of parameters that are in there. For example, if you copied a WaveList, the Paste item will read "Paste WaveList". Selecting the Paste item will over-write the original parameters, so use this carefully.

Setup Menu



Whenever you start synthLAB, many of the program variables are set to their default values. Other program variables get set whenever you load a sequence. The Setup menu allows you to change these variables and to tailor the program environment to your specific needs.



MIDI..

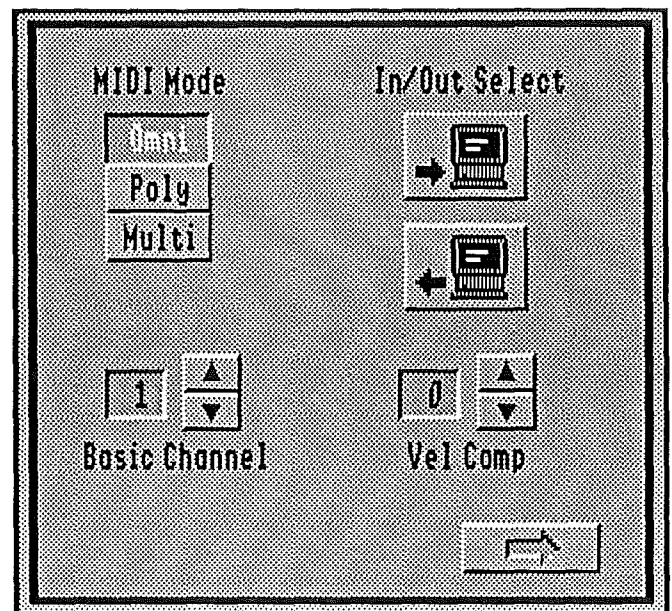
synthLAB always starts with MIDI disabled. If you have a MIDI interface connected to your GS, then you must first enable and configure the MIDI port from here, before synthLAB can respond to your MIDI keyboard.

A dialog box is displayed with controls for the various MIDI parameters. You can select the MIDI mode, enable MIDI input or output, enter the Basic Channel number and set the velocity compensation value (see the "ERS" for details on MIDI parameters).

The top button of the "In/Out Select" enables or disables the *MIDI In* function (note that in the icon, the arrow points IN to the computer, indicating the direction of MIDI data). When *MIDI in* is enabled you'll see the MIDI IN display (top right corner of the screen) become active. This display will light-up whenever a MIDI message is received at the MIDI port.

The lower button enables or disables the *MIDI Out* function. If you're not using this function, then make sure it is off (button is 'out').

If there's a problem with your MIDI setup, you'll get an error dialog instead of the setup dialog. See Appendix B for configuring MIDI correctly into your system.

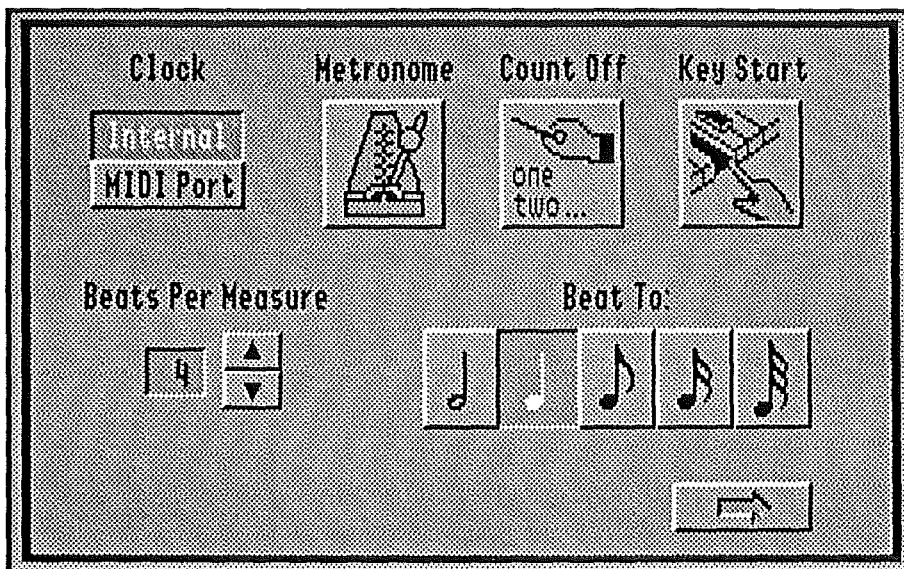


MIDI Setup Dialog

Sequencer...

Selecting this item displays a dialog box that has controls which affect the sequencer operation. The bottom two controls specify the values for measures and beats. The counter display, metronome and tempo control are all affected by these.

The Metronome will cause an audible woodblock tick to sound on every beat whenever you play or record with the sequencer. When Count Off is enabled, the sequencer counts off one measure before starting to play or record. You can force the sequencer to wait until it receives a MIDI note off message thru the MIDI port before it starts playing or recording by enabling the Key Start control.



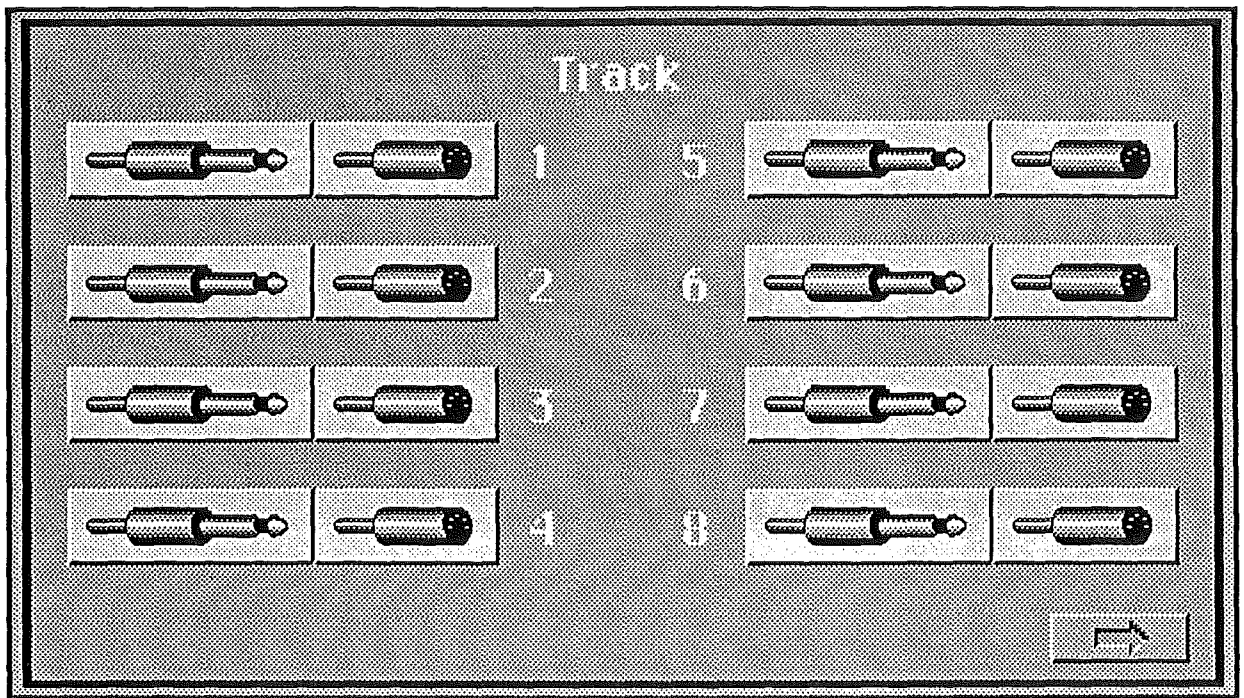
Sequencer Setup Dialog

Normally you use the Internal clock to advance the sequencer timer. This means that whenever you start the sequencer, it starts to increment its timer based on the current tempo value. If you need to synchronize the sequencer to an external MIDI device (like a drum machine or another sequencer), you can slave synthLAB thru MIDI by selecting the MIDI Port clock. Note that synthLAB can only receive MIDI timing clocks, it does not send them. This means that synthLAB can be slave device and not a master.

Seq Output...

With synthLAB (and MIDI Synth), you can specify where to send the output from each track whenever the sequencer is playing. You can have the sequencer for example, play only the synthesizer on tracks 1,2 and 5, while playing only a MIDI device on track 4, and have it play both the synthesizer and the MIDI device on track 3. This sequencer output configuration is mapped from the dialog box which is displayed whenever this menu item is selected.

Think of the sequencer as a box with eight audio jacks which can connect to the synthesizer and eight MIDI ports which can connect to your external MIDI device, one set for each track. This dialog box has two controls for each track. The left button with the "audio plug" icon connects the



Sequencer Output Dialog

sequencer track to the synthesizer, while the "MIDI plug" button connects the track to the MIDI port.

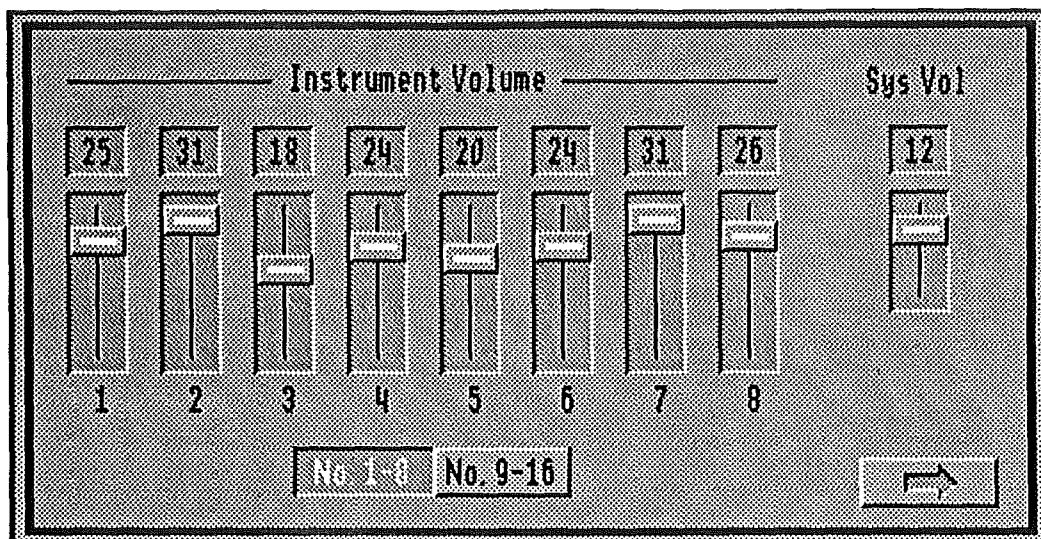
If you're using MIDI output, make sure that the *MIDI Out* button in the MIDI Setup dialog is on. This button acts as a master control, enabling or disabling MIDI out globally on all tracks.

System...

This item lets you adjust the pitch and volume of the screen keyboard found on the WaveList and Envelope pages.

Volume...

The volume level of each one of the 16 instruments can be adjusted independently from this dialog box. These controls are intended to be used with the sequencer to balance instrument levels when playing many instruments together. These settings are saved in the Sequence File, and are



Volume Setup Dialog

restored whenever you load a sequence.

The System Volume control sets the overall output level for the headphone jack on the back of your GS. It will have no effect on the volume if you're using a stereo interface card (you'll have to use the volume control on your stereo amplifier).

All Notes Off

This is the equivalent of the "panic" button found on some synthesizers used to kill any hung notes (notes that never got an off message). Selecting this item will send a 'note off' message to all voices active in the synthesizer.

Appendix A

synthLAB File Formats

Instrument File Format



File Type: \$D6

Aux Type: \$0001

Instrument File - \$1600 bytes

\$0000	Instrument Header
\$0400	Instr #1 Def Record
\$0520	Instr #2 Def Record
•	
•	
\$14E0	Instr #16 Def Record

Instrument Header - \$400 bytes

\$000	Long	File Type: "INST"
\$004	Word	Version: \$0100
\$006	Word	Header Size (\$400)
\$008	Str[16]	Owner application name*
\$018	Str[16]	Wave File name
\$028	Byte	Master Semi-tone tuning*
\$029	Byte	Master Fine tuning*
\$02A	Byte	Reserved
\$02B	Byte	Master Volume (0-15)*
\$02C	Byte	Number of instruments (1-16)*
\$02D	Word	Reserved
\$030	Bytes[512]	Wave Ref Block
\$230	Bytes[208]	Free
\$300	Str[16]	Instrument #1 name
\$310	Str[16]	Instrument #2 name
•		
•		
\$3F0	Str[16]	Instrument #16 name

* not used by synthLAB

Instrument Def Record - \$120 bytes

\$0000	Envelope Record	
\$0010	WaveList Record 1	
\$0020	WaveList Record 2	
.		
.		
\$0080	WaveList Record 8	Generator 1
\$0090	Envelope Record	
\$00A0	WaveList Record 1	
\$00B0	WaveList Record 2	
.		
.		
\$0110	WaveList Record 8	Generator 2

Envelope Record - \$10 bytes

\$00	Byte	Attack level
\$01	Byte	Attack rate
\$02	Byte	Decay 1 level
\$03	Byte	Decay 1 rate
\$04	Byte	Decay 2 level
\$05	Byte	Decay 2 rate
\$06	Byte	Sustain level
\$07	Byte	Decay 3 rate
\$08	Byte	Release 1 level
\$09	Byte	Release 1 rate
\$0A	Byte	Release 2 level
\$0B	Byte	Release 2 rate
\$0C	Byte	Release 3 rate
\$0D	Byte	Decay Gain
\$0E	Byte	Velocity Gain**
\$0F	Byte	Pitch Bend**

WaveList Record - \$10 bytes

\$00	Byte	Top Key**
\$01	Byte	Configuration
\$02	Byte	Channel
\$03	Byte	Detune
\$04	Byte	Wave Address A
\$05	Byte	Wave Size A
\$06	Byte	Volume A
\$07	Byte	Octave Tuning A
\$08	Byte	Semi-tone Tuning A
\$09	Byte	Fine Tuning A
\$0A	Byte	Wave Address B
\$0B	Byte	Wave Size B
\$0C	Byte	Volume B
\$0D	Byte	Octave Tuning B
\$0E	Byte	Semi-tone Tuning B
\$0F	Byte	Fine Tuning B

** Generator 1 value used for both Generators

Wave Ref Block - \$200 bytes

\$000	Instr #1 Wave Ref
\$020	Instr #2 Wave Ref
.	.
.	.
\$1E0	Instr #16 Wave Ref

Wave Ref - \$20 bytes

\$00	Byte	WaveList 1 wave number	Osc A	Generator 1		
\$01	Byte	WaveList 2 wave number				
.	.	.				
.	.	.				
\$07	Byte	WaveList 8 wave number				
\$08	Byte	WaveList 1 wave number			Osc B	Generator 2
\$09	Byte	WaveList 2 wave number				
.	.	.				
.	.	.				
\$0F	Byte	WaveList 8 wave number				
\$10	Byte	WaveList 1 wave number	Osc A	Generator 1		
\$11	Byte	WaveList 2 wave number				
.	.	.				
.	.	.				
\$17	Byte	WaveList 8 wave number				
\$18	Byte	WaveList 1 wave number			Osc B	Generator 2
\$19	Byte	WaveList 2 wave number				
.	.	.				
.	.	.				
\$1F	Byte	WaveList 8 wave number				

wave number = \$00-\$3F (see Wave File format)

Wave File Format



File Type: \$D8

Aux Type: \$0004

Wave File - \$10900 bytes

\$0000	Wave Header Record
\$0100	Wave Def Record #1
\$0120	Wave Def Record #2
	•
	•
\$08E0	Wave Def Record #64
\$0900	PCM Data

Wave Header Record - \$100 bytes

\$00	Long	File Type: "WAVE"
\$04	Word	Version: \$0100
\$06	Word	Offset to Wave data
\$08	Str[16]	Owner application name*
\$18	Word	Number of valid Wave Defs
\$1A	Bytes[230]	Free*

Wave Def Record - \$20 bytes

\$00	Str[16]	Wave name
\$10	Word	DOC Address
\$12	Byte	Set to zero
\$13	Byte	Size
\$14	Byte	Volume*
\$15	Byte	Octave Tuning*
\$16	Byte	Semi-tone Tuning*
\$17	Byte	Fine Tuning*
\$18	Bytes[8]	Free*

* not used by synthLAB

PCM Data - \$10000 bytes

64k image of DOC ram.

Must not contain samples with a value of zero.

* Wave sizes

```
s256      equ 0
s512      equ 1
s1K       equ 2
s2K       equ 3
s4K       equ 4
s8K       equ 5
s16K      equ 6
s32K      equ 7
```

WHeader

```
DC.B 'WAVE'      ; file type
DC.W $0100      ; version = 1.00
DC.W 2048+256   ; offset to wave data (256 bytes for header,
;                                     2k bytes for Wave Defs)
DC.B 'SynthLAB'; owner (your application name)
DS.B 8          ; filler (owner field is 16 bytes)
DC.W 1          ; # of valid Wave Defs
DS.B 230       ; free (your app can use this)
```

WaveStr1

```
str 'Flute'     ; name
DS.B 16-(*-WaveStr1); filler (Wave Name field is 16 bytes)
DC.W $2000      ; DOC ram address
DC.B 0         ; reserved, set to zero
DC.B s4K       ; size, 4k bytes
DC.B 0         ; vol- not used
DC.B 0         ; oct- not used
DC.B 0         ; semi- not used
DC.B 0         ; fine- not used
DS.B 8         ; your app can put additional info here
```

**MPW IIGS Example of Wave File
(Header and Wave Def)**

Sequence File Format



File Type: \$D5

Aux Type: \$0001

Sequence Header

\$000	Long	File Type: "MSEQ"
\$004	Word	Version: \$0100
\$006	Word	Offset to Seq Data
\$008	Str[16]	Owner application name
\$018	Str[16]	Instrument #1 File name
\$028	Str[16]	Track #1 name
\$038	Str[16]	Track #2 name
.	.	.
.	.	.
\$118	Str[16]	Track #16 name

Sequence Initialization

\$128	Word[16]	Channel Volumes
\$148	Word[16]	Track Channels
\$168	Word[16]	Track Play
\$188	Word	Record Track
\$18A	Word	Tempo
\$18C	Word	Beats per Measure
\$18E	Word	Beat Value
\$190	Word	Ticks per Beat
\$192	Word[16]	Track Output Map
\$1B2	Word[16]	Reserved

Seq Data

Image of MIDI Synth Sequence.
Must not exceed 128k length.
Must terminate with EOS (\$FFFF).

```

HeadStart
  DC.B 'MSEQ'      ; file type
  DC.W $0100      ; version = 1.00
  DC.W HeadEnd-HeadStart ; index to seq data (header size)
  str 'SynthLAB' ; owner
  DS.B 8          ; filler (owner field is 16 bytes)
  str 'Synth.bnk'; instrument
  DS.B 7,0        ; filler (instrument field is 16 bytes)
  str 'the Demo'
  DS.B 8,0        ; filler (track name field is 16 bytes)
  str 'Track 2'
  DS.B 9,0
  .
  .              ; insert names for Tracks #3 - #15
  .
  str 'Track 16'
  DCB.B 8,0

```

* Seq Initialization

```

  DCB.W 16,127    ; Channel volumes = $7F
  DCB.W 16,-1     ; Track channels = 'Thru' mode

  DC.W -1,0,0,0,0,0,0,0,0
  DC.W 0,0,0,0,0,0,0,0,0; play Track #1 only

  DC.W 2          ; Record on Track #2
  DC.W 60         ; tempo
  DC.W 4          ; beats/measure
  DC.W 1          ; beat to: (quarter note)
;               ; This is used to hilite the "Beat To:" buttons
;               ; in the Seq Setup dialog.
;               ; Not needed to play a seq with MIDI Synth.
;               ; 0= half note 1= quarter 2 = 1/8th, etc.
  DC.W 96         ; ticks/beat = quarter note

  DCB.W 16,0     ; Output map
  DCB.W 16,0     ; reserved
HeadEnd

```

**MPW IIGS Seq File Example
(Header and Initialization)**

Appendix B

The MIDI CDEV

The MIDI CDEV was created to encourage developers to specify MIDI in a uniform manner inside their applications. Whenever a user runs a MIDI program for the first time, the user usually has to input information about their specific MIDI setup through some sort of dialog box. When they run another MIDI program, they must give that program the exact same information all over again. The problem occurs when the user changes their MIDI setup. Now they must enter this new setup into all their MIDI programs, one by one. Another problem is that the user might not remember exactly what their setup is a year later when they buy a new MIDI program.

With the MIDI CDEV, the user enters their specific MIDI setup only once through the NDA Control Panel. The MIDI CDEV creates a setup file (*Midi.Setup*) inside the "Drivers" folder which contains information about the user's MIDI connection. From there, all MIDI applications can use the *Midi.Setup* file to configure themselves.

Installing the MIDI CDEV

1. Copy the file called "MIDI" from the synthLAB disk to the "CDevs" folder, which is found inside the "System" folder on your boot disk. You have now added a new selection to the NDA Control Panel called *MIDI*.

2. From the Finder, select the "Control Panel" NDA from the Apple Menu. Scroll down the selection list until you find the icon called *MIDI* (shown in Fig. 1 on the left side). With your mouse, click on it to select it.

3. Once MIDI is selected, you'll get the setup options, shown in Fig. 1 on the right. The options on the top select where the MIDI interface is connected to your GS. The list on the bottom lets you select the appropriate MIDI Driver file.

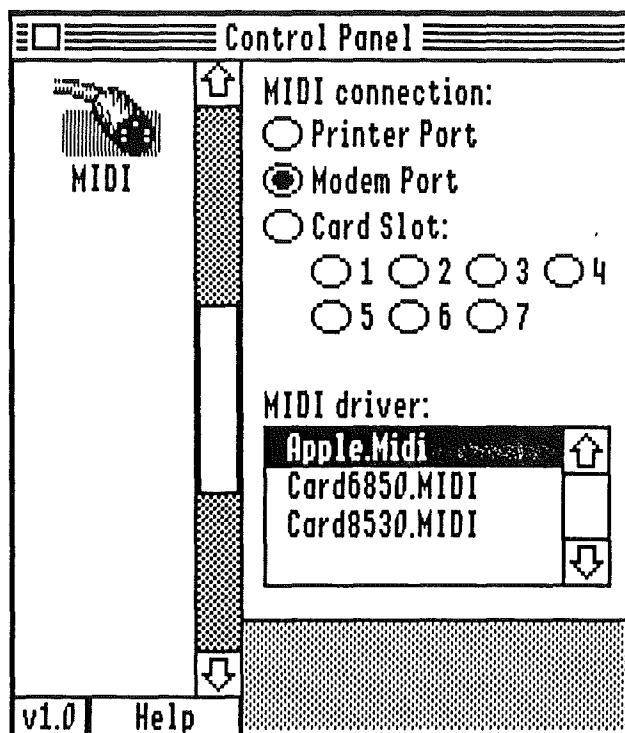


Fig. 1 - MIDI CDEV

MIDI connection

If you're using an external type of MIDI interface (*Apple MIDI*) that connects to a serial port on the back of your GS, then only select either the Printer or Modem ports. If you are using an internal card as a MIDI interface, such as the Applied Engineering *Audio Animator*, then select the "Card slot" button and one of the seven slot numbers.

MIDI Driver

The MIDI CDEV scans your "Drivers" folder and displays all of the MIDI type of driver files it finds there. From this list, you must select the appropriate driver for your interface. If there are no drivers shown in the list then consult your MIDI interface manual for instructions.

Midi.Setup File Format

WORD	External/Internal (0,1)
WORD	Slot number (1-7)
Str[32]	MIDI Driver file name Pascal string. (Not a pathname, file name only. Assumes path of */System/Drivers/)