alphaPlus™

Operating system
for the alphaSyntauri® digital synthesizer

Syntauri

alphaPlus™ Tutorial Manual

3506 Waverley Street
Palo Alto, California 94306, USA
(415) 494-1017

Written by: Philip Casella

alphaPlus Tutorial

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Chapter 1
About the Manual

Welcome to this introduction to the alphaPlus™ operating system, used with the alphaSyntauri™ synthesizer.

Written in **tutorial**, hands-on format, this manual will take you step by step through the basic use of the system. It will also provide some important background information along the way, concentrating on the fundamentals -- enough to get most people started in musical synthesis.

We are sticking to the basics because we want to focus on using the instrument -- that is, creating and modifying musical sounds. Once you know how to use the system, you can get more information from texts on musical synthesis theory (some are cited in the bibliography).

As you go through the tutorial, you may tempted to depart from the path we're taking and experiment on your own. Well, **please do.** You'll be learning about each feature, then trying it out on the system. It's up to you whether you spend fifteen minutes or two days trying each feature before you come back to learn about the next.

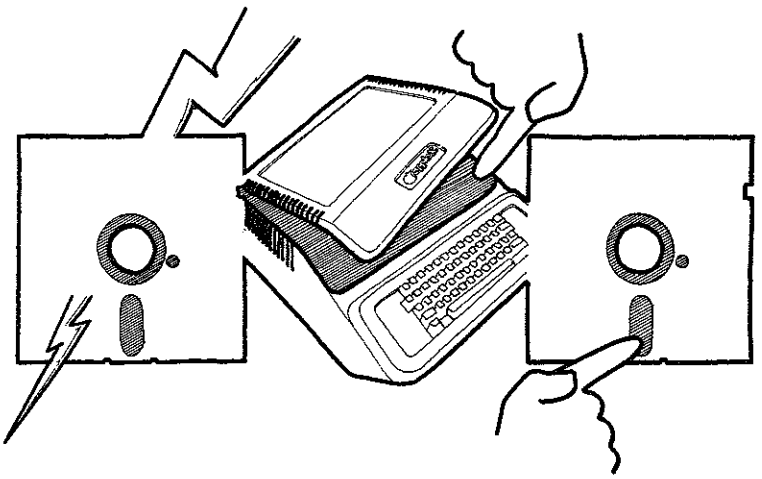
And don't worry about making mistakes. Once you get the system set up and running (by **carefully** reading and following the setup instructions in Appendix A), there is nothing you can do (short of physical abuse) that will damage anything. The worst that can happen is that you will accidentally erase one of the system diskettes, and of course you will have taken our advice (coming up) to **make at least one backup copy** of every diskette that can be copied.

You will do that, won't you? We'll discuss this further in Appendix A, **Setup & Initialization.**

A Few Cautions

We said earlier that there was nothing you could do to damage the system, short of physical abuse. Well, take note that the term "physical abuse" isn't restricted to kicking, mauling, and dowsing with liquid. Other things you should avoid are:

- Fooling around with internal Apple components while the computer is on.
- Touching diskettes anywhere not protected by the casing.
- Neglecting diskettes -- leaving them out in the sun or dust, or near a power amp, TV, or other source of electromagnetic radiation.



A Few Conventions

We've adopted a few special ways to help make reading and using this manual easier. For one thing, when we want you to press a certain key on the Apple keyboard, we'll enclose its label in these brackets: < >.

So if we say "Type <B>" -- it means "Press the key labeled 'B'," or "Type the letter 'B'." Usually a statement like that will be followed by "and press <RETURN>," since that's how you let the computer know you've typed something.

One exception to this is when you press <CTRL> (the key labeled "CTRL", right?) and another key at the same time. In the alpha-Syntauri system, the computer senses these double keystrokes immediately, and you won't have to press <RETURN>.

You'll be using <CTRL> often, and always together with another key. We indicate this by enclosing CTRL and the other key symbol in the same set of brackets. So "Press <CTRL-P>" means "Hold down <CTRL> and press <P>."

Got it?

And one more thing: you'll be setting this book aside frequently to use the system. To help you find your place when you come back, we'll insert a row of asterisks, like this:

* * * * *

...unless there's already an illustration there, or you're at the bottom of a page or the end of a topic.

Onward and Upward

If your Apple computer and alphaSyntauri synthesizer are set up and ready to go, then continue with this tutorial. If not, turn to Appendix A, **Setup & Initialization.** When you've completed the procedures described there, continue with Chapter 2.

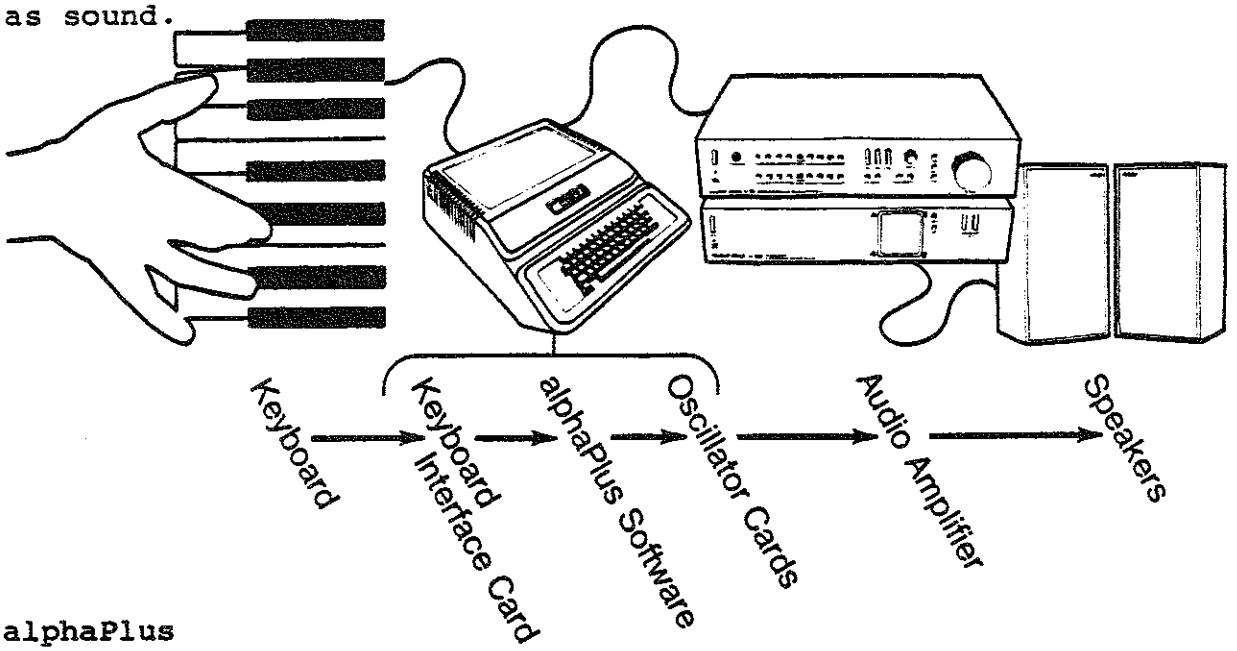
Chapter 2
About the System

The purpose of this section is to give you a general understanding of how the alphaSyntauri synthesizer and the alphaPlus operating system work, their features and how you can use them, and what kind of results you can expect.

The alphaSyntauri Synthesizer

The alphaSyntauri synthesizer **hardware** consists of a piano-like keyboard and two "oscillator boards" connected to an Apple II computer. Also connected to the system is some kind of amplifier -- like your stereo system.

When you start up the alphaSyntauri instrument, the operating system **software** (alphaPlus) will be inside your Apple, waiting for you to strike a key on the alpha keyboard. This will send a signal to the Apple, which alphaPlus will grab, interpret according to instructions we've programmed (which you can modify), and send through the oscillator cards to the amplifier...where it comes out as sound.



alphaPlus

The operating system supplies the magic. Using alphaPlus, you control the qualities of the sound produced when you play the alphaSyntauri keyboard. You can make it sound like a piano or an organ, a woodwind or a brass, a violin or an instrument not yet heard on earth.

Chapter 2: About the System

What You'll Learn

In the pages that follow, you'll work with the three basic elements of sound -- pitch, loudness, and timbre -- and learn how you can use alphaPlus to shape them to please your ear. You'll also learn about vibrato and special effects, recording and playing back (without a tape recorder), echo and transposition, creating and saving waveforms and envelopes, and other features.

There is really no end to the possibilities. Sound is so simple to the ear, and yet so rich and complex in its construction that you can always extend, but never exhaust, the potential for new textures and effects.

Of course, you don't have to devote a lifetime to expanding your grasp of the subtleties of music. In fact, you can be playing a wide range of synthesized instruments within minutes of turning the alphaSyntauri system on, using built-in sounds!

Depending on your background in musical synthesis, you may be able to get the information you need from the quick-reference card that comes with this manual after reading only a few more pages of this tutorial; but we recommend that you finish it. It won't take long, and you'll get a strong foundation for setting and reaching your musical goals.

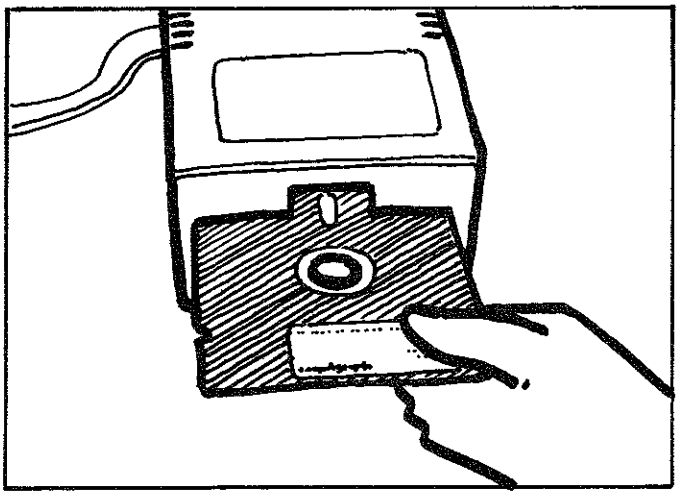
Chapter 3
Starting Up

At this point your alphaSyntauri synthesizer should be completely set up and ready to go. If it isn't, or if you're not sure, turn to Appendix A for a description of the setup and initialization procedures.

Getting the System Running

If, once you're set up, things don't seem to be turning out the way we say they should in this next section, we've got an appendix for that, too: Appendix B, **Troubleshooting.** If you have a problem getting started, check there first.

Still with us? Okay. The first step is to open the disk drive door and insert the alphaPlus diskette (or the backup...you did make a backup*, didn't you?) into the disk drive. If you have more than one drive, insert the diskette into Drive 1. The label on the diskette should be facing up, and the elliptical slot in the casing should be inserted first, as in the illustration below.



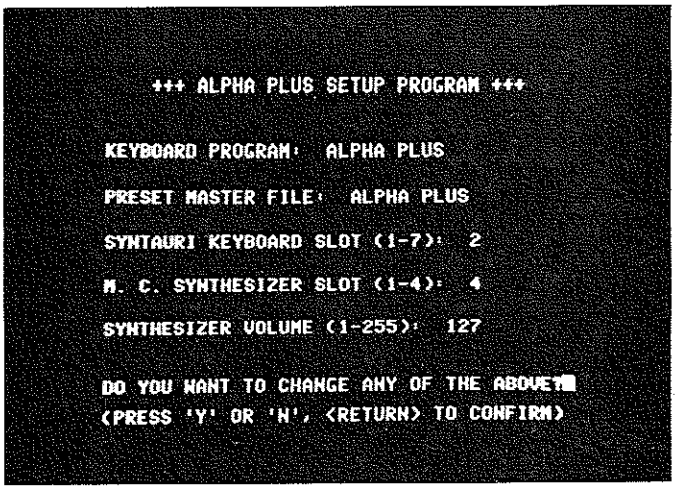
When the diskette is completely inside, close the disk drive door. Turn your amplifier on, but keep the volume very low.

*See Appendix C and Apple DOS manual for disk duplication procedures, using COPY or COPYA on DOS System Master diskette.

Next, turn on the monitor and the Apple (the Apple's off/on switch is on the back of the unit, on the left).

Immediately, the disk drive's red **IN USE** light should come on, and the drive may make a few strange noises. If you watch your monitor, you will see periodic messages telling you what's going on.

The first time you "boot" the system (that's what you're doing now), you have to supply some information about how your computer is set up. When the IN USE light on the disk drive goes out, you should see this on the screen:



If the system was already set up when you got to it, you may not see the screen in the above illustration. If that's the case, skip to **Ready to Play,** a few paragraphs down.

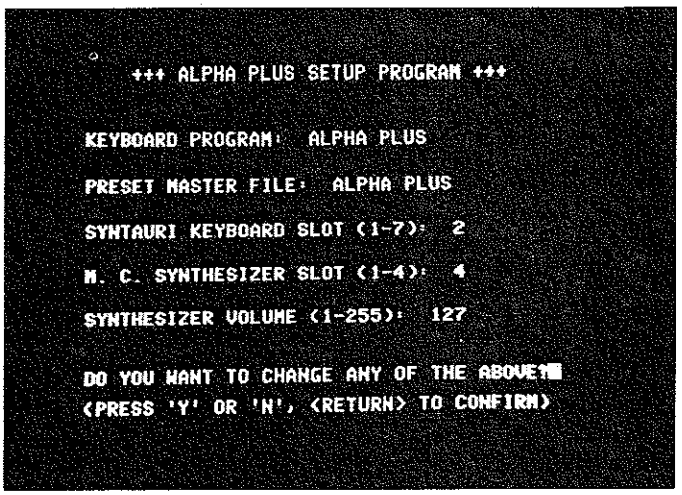
If you aren't the person who set up the system, and you see this screen anyway, assume (for now) that the necessary information has already been supplied. Type <N> (for NO) and press <RETURN>. Then skip down to **Ready to Play.**

If you personally set up the system according to the directions in Appendix A, then you probably followed our advice and wrote down the slot numbers into which you inserted the system cards. Get this information now. If you don't have it, you'll have to remove the top cover from the Apple, **being especially careful not to disturb any of the internals while the Apple is on,** and note which cards are in which slots. (The slot numbers -- Ø through 7 -- are behind the slots. Or just count from left to right.)

* * * * *

If the slot numbers are the same as presented on the screen, fine. Type <N> and press <RETURN>. Skip down to **Ready to Play.**

If the slot numbers -- any of them -- are different, then type <Y> and press <RETURN>. The cursor (the small white rectangle on the screen) will move to the first item. Press <RETURN> to skip this one, and again to skip the next one.



The third item asks which slot the Syntauri keyboard interface is in. This is the rectangular printed circuit board that says **Syntauri** on it, installed upright inside the Apple. It has a long cable running to the keyboard. Type in the number of the slot holding this card, and press <RETURN>. (The slot numbers, from Ø-7, are printed in back of each slot.)

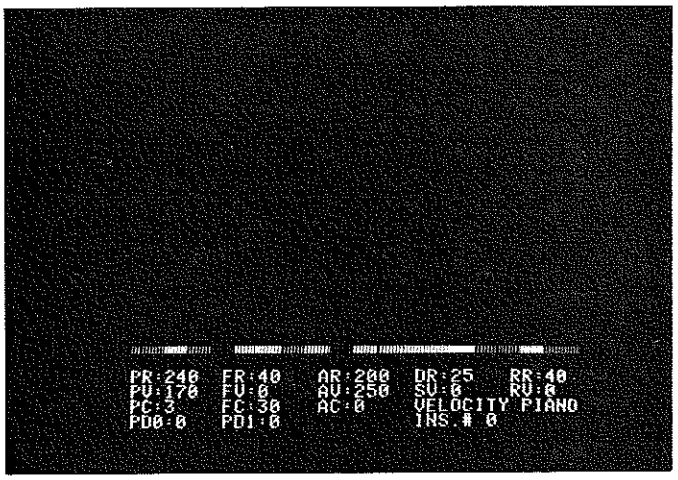
(This card, and the ones mentioned in the next paragraph, are illustrated in Appendix A.)

The fourth question wants a slot number for the Mountain Computer MusicSystem cards. There are two of them, interconnected: type in the number of the slot the card on the **left** is in (the one with the phone plug attachment). Press <RETURN>.

Press <RETURN> again to skip the last item, type <N> in response to the question at the bottom, and press <RETURN> one last time.

Ready to Play

When the **IN USE** light goes out, you'll see this on the screen:



(If you don't, go to Appendix B, **Troubleshooting**. Otherwise, keep reading.)

Now it's safe to turn up the volume on your amplifier. You're ready to play. Try it: play a few notes or chords on the alpha keyboard -- or more than a few, if you like. And take a look at the screen while you're playing.

* * * * *

When you have the system running, you will probably want to "kill" the setup program so that you don't have to reassure the Apple about all the cards being in the right slots every time you boot up. To do this, first type <CTRL-K> (hold down the key labeled CTRL (for Control) and press the K key, remember?). Don't press <RETURN>.

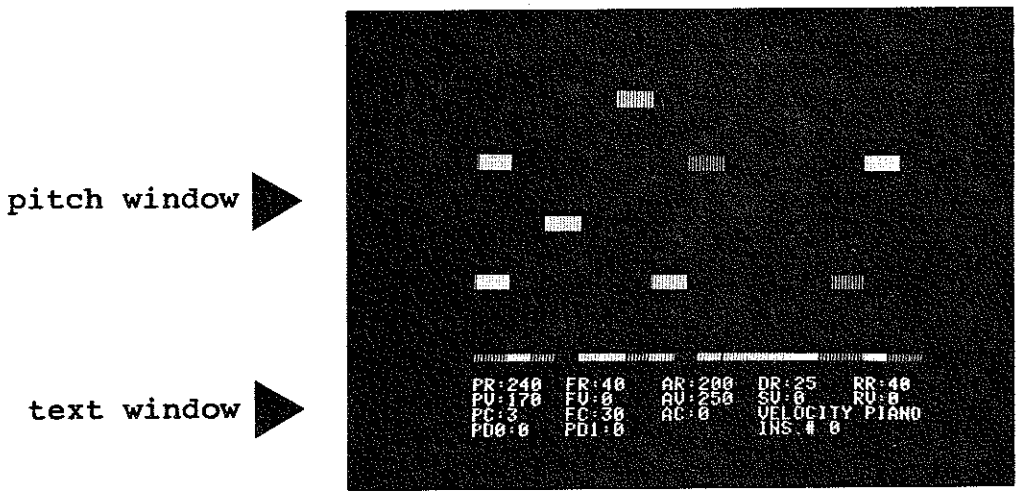
INCLUDE SETUP ON POWER UP (Y/N)?

We have to answer the question on the screen. Type <N>, for No, and press <RETURN>. That's all there is to it. You can restore the setup program at any time with another <CTRL-K>, followed by <Y>.

* * * * *

Why would you want to restore the setup program, you ask? Because you may someday want to put the cards in different slots; if you do, you'll have to tell alphaPlus about it.

You probably noticed (hard not to) the visual display on the screen while you played the alpha. The top part of the display is called the **pitch window.** Each note in the 12-tone octave is represented by a small rectangle of a different color (for which, obviously, you need a color display). The vertical position of the rectangle corresponds to the octave played, and the horizontal position corresponds to the specific tone within the octave.



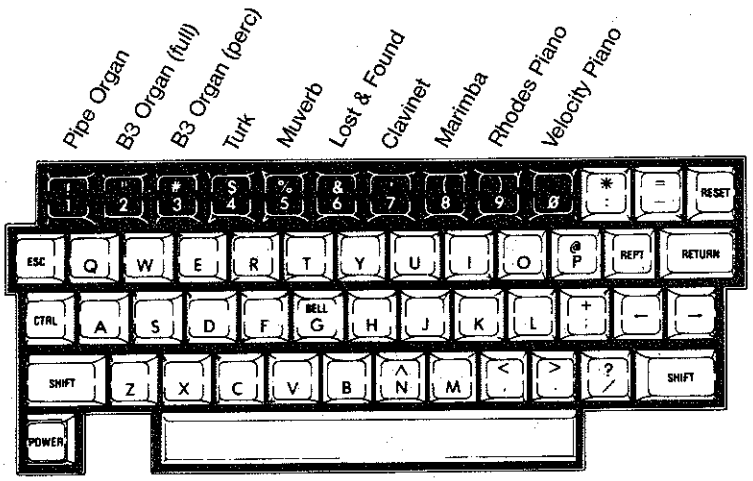
Whenever you see this on the screen, the alpha keyboard is active, or ready to play; this is called **live mode.** There's not much more to say about this, except that you can tell a lot about how you're playing by watching the display: we give you a visual perspective in addition to the audio!

The bottom part of the screen, with all the numbers, is called the **text window.**

If you look in the lower right corner of the text window, you'll find the name and number of the instrument you've been playing. The number corresponds to one of the ten number keys in the top row of the Apple keyboard.

In fact, you have ten instruments at your immediate disposal, and you can "call up" any one of them simply by pressing one of those ten keys -- Ø through 9. Try it, and take a few minutes (or hours) to play around with the various instruments. Note that instrument zero -- the Velocity Piano -- makes use of the Velocity Sensing feature: it sounds louder if you strike the keys faster.

These ten instruments make up a preset master, which is loaded into the Apple automatically when you boot the system.



Later on you'll also learn how to define your own instruments and compile them into preset masters.

The letter and number pairs in the text window (like AR:2Ø0) are called **parameters,** meaning values that determine the characteristics of something. Here, the values determine many characteristics of the sound produced by each instrument. For example, AR:2Ø0 indicates that the **attack rate** for that instrument is set to 2Ø0.

If you don't know what an attack rate is, or why you should care, don't worry. We'll get to it in Chapter 5.

In the meantime, let's consider something more concrete -- like the pedals. The **sustain pedal** is plugged into the right-hand jack on the back of the alpha keyboard. For many instruments, this pedal will prolong the note played after the key is released. Why not for all the instruments? You'll understand that after we discuss the text window parameters.

The pedal plugged into the left-hand jack controls the **portamento.** Pressing this pedal sweeps the pitch rapidly from one note to the next as you play.

Try these pedals out with the ten instruments in the preset master.

You also have another preset master of ten instruments on your alphaPlus diskette, and even more preset masters on the diskette labeled **Preset Masters** (naturally), which comes with your alpha-Syntauri system.

To get at a preset master, you have to **load** it from the diskette. Try it: press <CTRL-P>, and you'll see this:

LOAD PRESET MASTER: ALPHA PLUS

ALPHA PLUS is the name of the current preset master. To load the other preset master from the alphaPlus diskette, you have to type its name over the name supplied by the system (i.e., ALPHA PLUS) and press <RETURN>.

The name of the other preset master on this diskette is INSTR. Type that name now, just that way -- <INSTR > -- and press <RETURN>. In a few moments, ten new sounds will be available from the same ten number keys.

* * * * *

If you're wondering what else is on the diskette, do this: type <?>.

* * * * *

This is the diskette **catalog**, and it lists all the files on the diskette in the drive. Press any key to move the list along, until you return to live mode. We'll discuss other file types later in the tutorial. For now, play with the ten instruments in the preset master INSTR for a while, and when you come back we'll try out some more system features.

Chapter 4
Record/Playback

We're going to move through this topic fairly quickly, so that you can try out the procedures on the system without spending a lot of time reading. Don't worry about memorizing at this point: the main thing is that you know what features are available. The quick-reference chart will help you with the details.

Record/Playback Overview

One of the most exciting and versatile features of the alphaSyntauri synthesizer is the Record/Playback feature. With alphaPlus, you can record (in the computer's memory) up to 2000 notes, and save them as a **notes file** on diskette.

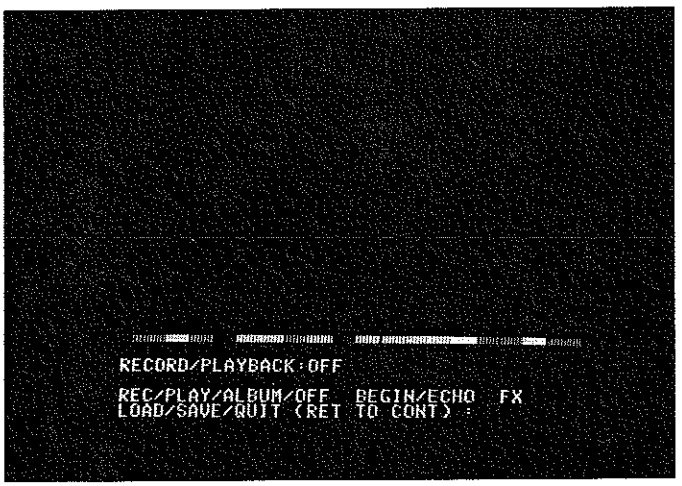
You can play back the recording slower or faster, or in a different key, or through different instruments. You can stop the playback at any time and start recording again from that point. And the **Echo** feature will let you set a recording to "loop" (play over and over again) for repeating bass lines and background textures.

In addition, you can link your notes files in an "album," to hear them play back in sequence, automatically.

How do you do all this? Easy.

Record

First, press <spacebar> to get into the Record/Playback mode.



This menu gives you access to a number of interesting features. Most of them control recording and playing back notes files.

Now type <R> for Record, <RETURN>, and <B> for Begin, <RETURN>.

* * * * *

The alpha keyboard is now set to record: the instrument name on the screen is in inverse video (black letters on a white field).

The recording won't begin until you press a key or a footpedal. From that point, every note, pedal effect, and pause will be recorded. Before you start, we ought to tell you how to stop the recording: just press <spacebar>. This will return you to the Record/Playback menu, and we'll take it from there.

For now, play a few notes "for the record" (don't worry, they're easy to erase).

Playback

Presumably, you've recorded a short piece and pressed <spacebar> to halt the recording. Now you'd like to play it back. (If not, type <O> and <RETURN> to turn off the Record mode.) The Record/Playback menu should be on the screen. Type <P> and press <RETURN>.

PLAYSPEED 5Ø% TO 2ØØ%:

How fast do you want to hear it? Type a number between 5Ø and 2ØØ (**don't** enter the % sign) and get ready to press <RETURN>, but first we ought to tell you that --

- You can change the tempo during playback with the arrow keys: <-- to slow down, --> to speed up. The speed will change by 5% each time you press one of these keys.
- You can still use the alpha keyboard during playback, and the pedals are live as well.

Now press <RETURN> for a playback.

Want to hear it again? Maybe with a different instrument? First type <I>, then pick your instrument with one of the number keys, then <spacebar>, <P>...the same routine.

Continue Recording a Pre-recorded Piece

If you wanted to continue recording from any point, you would just press <spacebar> at that point, then <R>, <RETURN>. Once again, recording won't start until you use the alpha keyboard or one of the pedals. Try it. (Note: if you want to start over from the beginning, just type <B>, for Begin, and press <RETURN>.)

Save a Recorded Notes File

To save your recording on diskette as a notes file, you would go to the Record/Playback menu (<spacebar>), type <S> (for Save), and <RETURN>. The system now asks you for the filename.

```
RECORDING LENGTH = xx NOTES
SAVE NOTES:
```

Type any name you like (but it must be no more than 14 characters long; and don't use commas) and press <RETURN>. Your notes file will be saved for posterity.

Normally you should use a spare diskette for saving recordings, not the alphaPlus operating system diskette. This will give you more room for storage, and help keep things organized. See Chapter 9 for hints on organizing your diskettes. (Initializing new diskettes is covered in Appendix A and the Apple DOS Manual.)

Retrieving a Notes File

To load the notes file from diskette, press <spacebar> to get to the command menu, type <L> (for Load), <RETURN>, and enter the name of the file after the prompt shown below. (Enter means type something and press <RETURN>.

```
LOAD NOTES:
```

Once you've retrieved the notes file from diskette, you can play it as if you had just recorded it: <P>, <RETURN>, and enter the playback speed.

Any notes file can be played back on any instrument, although the number of the original instrument is "remembered" when you load

it. If you play it back in a different preset master, it will play in the instrument with the same number as the one it was recorded with.

If you're not sure of the name of a notes file you want, you can look at the diskette **catalog** (a listing of all the files on the diskette) by pressing <?> while the text window is on the screen, or <?>, <RETURN> from the record/playback menu. Notes files are all those with the prefix NOTES:. There are some demonstration notes files on the alphaPlus diskette. If you wish, try loading them and playing them back.

The Echo Feature

Entering <E> from the command screen turns on the Echo feature, and displays an inverse "E" in the text window.

Once on, Echo will stay on until you enter <E> again, but it won't have any effect unless you are recording or playing back.

When you record with Echo on, then hit <spacebar>, the piece you recorded will be played back over and over again, until you hit <spacebar>, <0> (for Off), and <RETURN>. The timing for hitting the spacebar is crucial, however; you'll probably have to experiment for a while to get the hang of it. Also, make sure you let up on the key for the last note before hitting the spacebar -- otherwise, that note may not play properly.

You can play back any piece, whether it was recorded with Echo or not, in this "continuous loop" fashion by playing back with Echo.

Metronome

alphaPlus has a built-in metronome to help you achieve perfect timing while recording, or for practice. The metronome clicks the speaker inside the Apple, displays a moving rectangular bar on the screen, and sends a signal pulse to the cassette output port at the rear of the Apple, which allows it to be further amplified.

You turn the metronome on, and set its rate, by typing <CTRL-Z) and entering the number of beats per minute. You turn off the metronome by entering zero (<Ø>).

Once on, the metronome will sound continuously during live mode and recording, but <u>not</u> during playback.

Create an Album

You can create an "album" by specifying two or more notes files to be played back automatically, in sequence. (If you want to try this, there are some notes files on the demo disk; they're easy to find, since they all have the prefix NOTES:.) Here, as with the FX mod, you type only the part of the name after the colon.

As with an LP record, all notes files in an album must be on the same diskette.

To create an album, press <spacebar> and <Q> (for Quit). This is how you will normally exit the synthesizer. When you do, you will be given a chance to save any notes file you may have recorded, and the preset master, in case you've made any changes to it.

If you don't want to save any notes files or the preset master, just press <RETURN> to skip these "SAVE" options.

After you quit the system, you'll see the right bracket prompt (or >) that indicates you are in BASIC, within the Apple's operating system. With the alphaPlus diskette in the drive, type <RUN ALBUM>. The disk drive will start up, and you'll be asked to name the album you're about to create. (Hint: Naming the album after the preset master the notes files were recorded with makes it easier to play back with the same instruments.)

After you name the album you'll see this:

ALBUM NAME:(as you typed it)
NOTES FILE 1:

At this point, make sure the diskette containing all the notes files you intend to include in the album is in the drive. Enter the names of the notes files you want to hear, in the order you want them. When you're done, hit <RETURN> an extra time.

When you see the right bracket prompt again, make sure the alphaPlus diskette is in the drive and type <RUN ALPHA PLUS> to get back to the synthesizer.

Play an Album

All the notes files you specified for an album must be together on the same diskette for you to play back the album. To play it back, put that diskette in the drive, press <spacebar>, <A>, <RETURN>, and enter of the name of the album.

- **To skip to the next notes file:** press <spacebar>.
- **To abort the album sequence and return to live mode:** press <ESC>.

Recess

We've covered a lot of ground in this chapter. You've learned about many basic features of the alphaPlus operating system; and there are more to come! We still haven't looked closely at the parameters for instrument definition, and we haven't begun to consider waveforms.

For now, we suggest you take a break and use the features you've learned about in new combinations. Make some music for a while, and when you come back we'll start getting to the heart of the system: envelopes and waves.

CHAPTER 5
INSTRUMENT OVERVIEW

This is a short chapter, but an important one. It has some background information you'll need for the rest of the tutorial, so in spite of the fact that it's "all read and no play," please finish it before continuing.

For this chapter, you don't have to be at the alphaSyntauri synthesizer. You can read it in bed or on a picnic. So make yourself comfortable and dig in.

Getting Started with Synthesis

By now you should have a practical understanding of what we mean by the term "instrument": it's one of ten different "types" of musical sound in a preset master, and you can choose among them by pressing one of the ten number keys while in the live mode.

We've hinted that there's more to an instrument, and the details may seem a bit mysterious to you. We've purposely put off getting into the details until you had a chance to play around with the synthesizer. Now you're ready to get deeper into musical synthesis.

We created those ten instruments (and others on the diskette) using alphaPlus. We created them, fine-tuned them, and gave them names suggestive of the sound quality they produce. The main point is this: what we did, you can do (with practice).

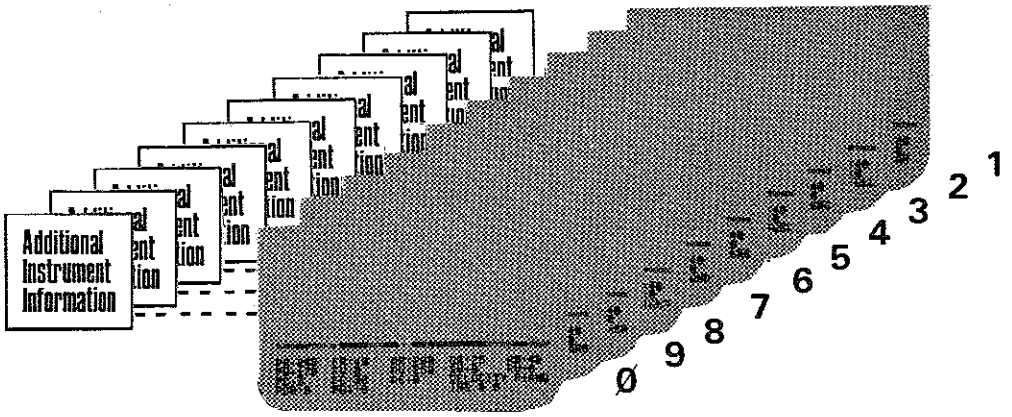
We've designed alphaPlus to make it as easy as possible for you to experiment, to try things out and hear the results immediately. And the tutorial will make it easier, guiding you through the most important steps.

What's in an Instrument?

The purpose of this chapter is to give you an idea of the components of an instrument and how alphaPlus organizes them. You'll learn more about the elements of sound, and how to use alphaPlus to control them, in the next two chapters.

Instruments are collected in **preset masters**, in groups of ten. A preset master contains:

- ten instrument names,
- the parameter values displayed in the text window for each instrument, and
- instructions to the system about where to look on the diskette for information that further defines each of the ten instruments.



It's much better to save instruments on a diskette in preset masters than individually. If they're not collected in a preset master, you have to type in additional information on the Apple keyboard each time you load an individual instrument.

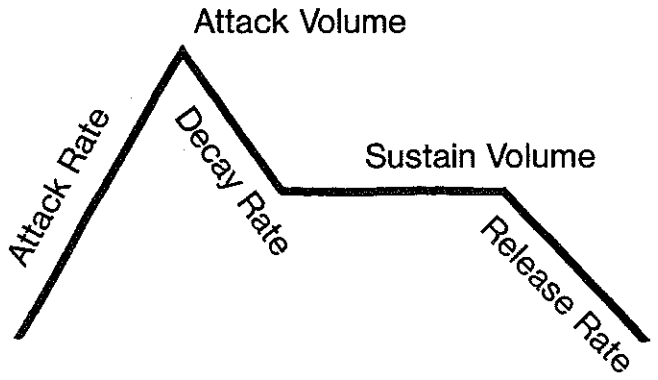
On the other hand, when the instruments are saved in a preset master, all the information is there, and you can bring them in from the diskette ten at a time.

If you don't have ten different instruments to save, you can always duplicate an entire preset master, under a different name, and replace instruments within it, one at a time. (See Chapter 9 for hints on naming files.)

Envelopes Explained

Most of the parameters in the text window have to do with the envelopes for the instrument. Each instrument has two channels -- primary and percussion -- and two envelopes, one for each channel.

An envelope is a representation of the loudness history of a tone, in terms of **attack**, **decay**, **sustain**, and **release**. A picture will make this clearer:



The envelope describes how quickly the tone reaches maximum loudness, how loud it can get, and how quickly it fades out. A tone's envelope is one of the main factors determining what that tone will sound like.

Every time you strike a key on the alpha keyboard, it takes a certain finite time for the tone played to reach its maximum loudness. How long depends on the **attack rate**.

The maximum volume is itself another important parameter, called the **attack volume**.

How fast does the tone diminish? This depends on the **decay rate**.

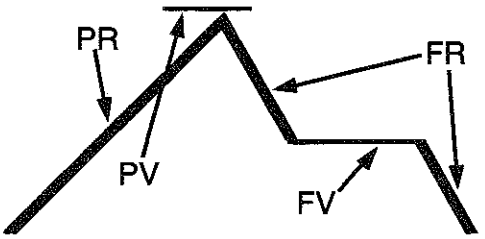
Does the tone decay to a certain loudness and then persist until the key is released? If so, that loudness is determined by the **sustain volume** parameter.

How fast does the tone's loudness fall off when the key is released? That depends on the **release rate**.

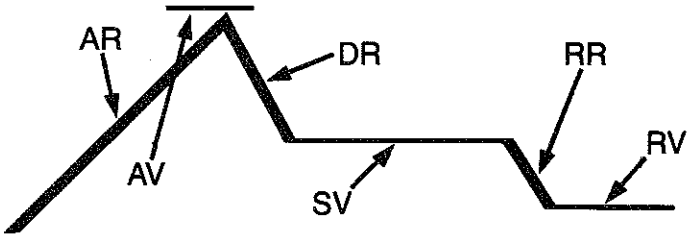
Occasionally you may want an instrument to produce tones that retain a certain loudness indefinitely, long after the key is released. This is the **release volume**.

That's what it takes to define a single envelope. The six terms we used above apply to only one of alphaSyntauri's two audio channels: the **primary** channel. The envelope for the **percussion** chan-

nel has only four of these parameters, and with slightly different names -- just to enable you to distinguish them on the screen. The table below shows how they correspond.



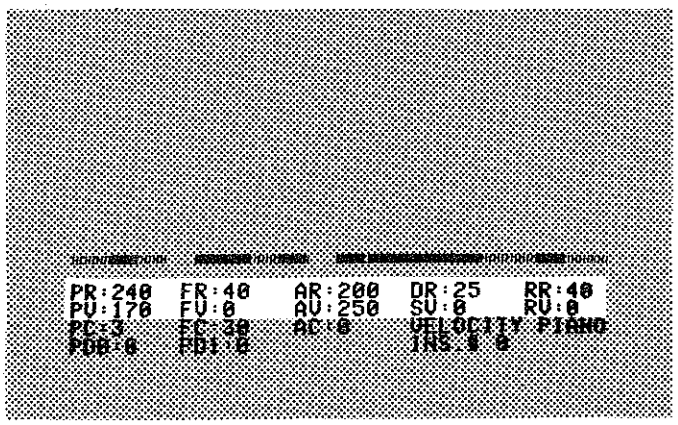
percussion channel



primary channel

Primary Channel	Percussion Channel
AR: Attack Rate	PR: Percussion Rate
AV: Attack Volume	PV: Percussion Volume
DR: Decay Rate	FR: Fall Rate
SV: Sustain Volume	FV: Fall Volume
RR: Release Rate	same as FR
RV: Release Volume	None

Now compare the parameters in the text window with the list above:



For the most part, the envelope parameters for the primary and percussion channels are the same. The difference is that the percussion channel uses the fall rate for its release rate, and has no release volume parameter. We'll show you how to change the envelope parameters, and the other text window parameters, in the next chapter.

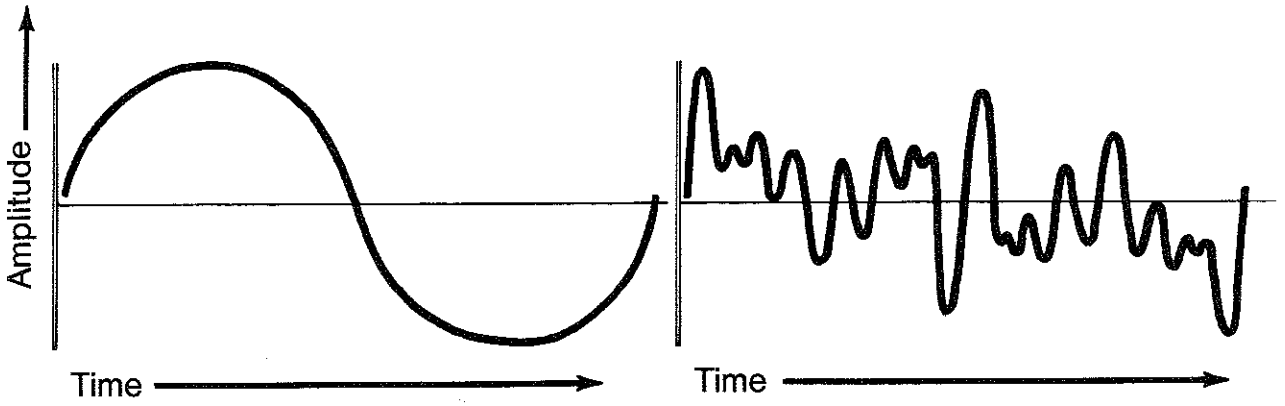
Waves Explained

Waveforms are the other main factor that determines what a tone will sound like.

A wave is a purely mathematical representation of sound. Nonetheless, it is a technically accurate one, especially useful in musical synthesis.

As you may know, what your ear and brain perceive as sound is actually the rapidly alternating compression and expansion of air (or water, if you're skin-diving) caused by a vibrating object.

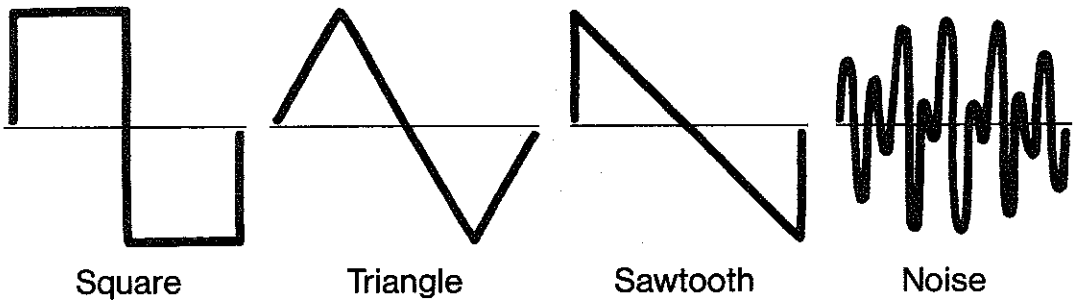
The back-and-forth motion of any vibrating object -- for example, the cone of a speaker -- can be described in terms of a wave on a graph: the vertical axis represents the two extremes of the object's motion, which for any particular object determine the loudness of the tone produced; and the horizontal axis represents time.



For this vibration to be perceived as sound, the motion must be very rapid: the lowest tone the human ear can hear results from a vibration of around 20 cycles per second (or **Hertz, Hz** for short). This is called the **frequency** of the wave.

So a tuning fork that sounds a concert A-440 is actually vibrating at a rate of 440 times a second.

The **sine wave** (pictured above) is a basic type of sound: it depicts a single vibrating motion. There are several other types of waves that are common enough to have standard names, for example:



These waves represent various combinations of sine waves. You'll learn how they're formed later on.

It probably won't surprise you to learn that each instrument uses two waves -- primary and percussion, one for each channel. However, you can use the same wave for both channels.

With alphaPlus, you can build your own waves and save them on diskette as **waveform tables.** You can then assign them to different instruments in a preset master, or "mix and match," trying out different waveforms with different envelopes.

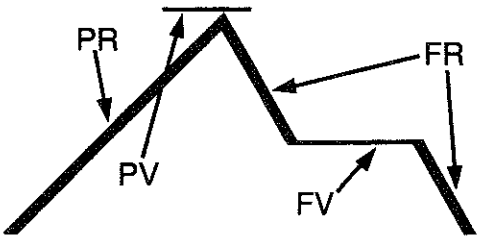
We've provided two programs for wave-building in alphaPlus. You'll find that it's easy to create a waveform and combine it with different envelopes. What's not so easy is to figure out ahead of time what waves you should use to create a specific sound. We'll give you some guidelines to start out with, but it's mainly a matter of experimentation until you can develop an "ear" for it.

Back to the Keyboard!

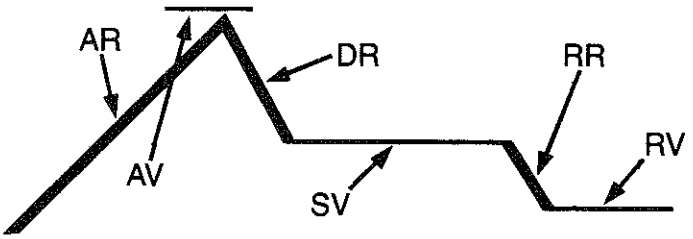
That's about as much of an introduction as we need. The next step is for you to try out what we've been talking about on the system, and hear the results of your experiments for yourself.

Chapter 6
Envelopes in Depth

We've described a tone's envelope as the loudness history of that tone. Let's repeat a few illustrations from the previous chapter, just to keep them fresh in your mind:

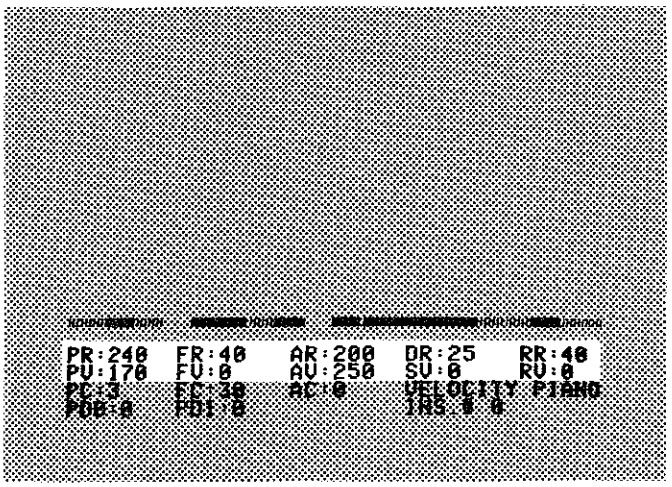


percussion channel



primary channel

Primary Channel	Percussion Channel
AR: Attack Rate	PR: Percussion Rate
AV: Attack Volume	PV: Percussion Volume
DR: Decay Rate	FR: Fall Rate
SV: Sustain Volume	FV: Fall Volume
RR: Release Rate	Same as FR
RV: Release Volume	None



That last illustration should be especially familiar to you: it's the text window, which is on the screen whenever you're using an instrument on the alphaSyntauri. At this point, it would be a good idea to boot up the system, because we're going to be working with the parameters in the text window.

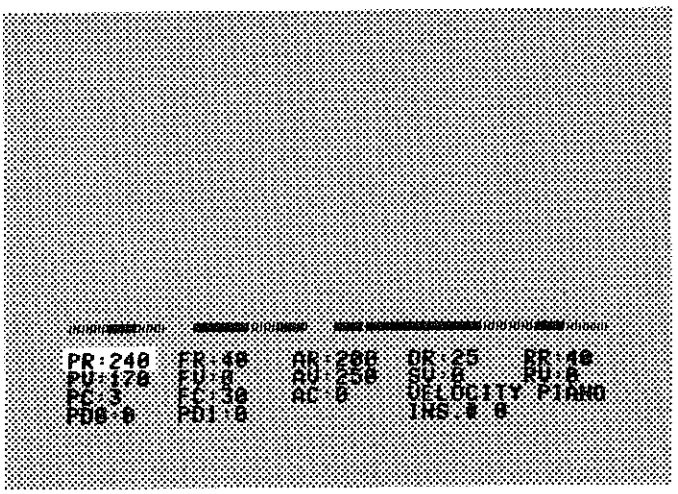
The parameters in the top two rows are the ones that determine the primary and percussion envelopes. The first order of business is to learn how to make changes to these parameters.

Getting Around the Text Window

In order to change any of the parameters, it's obvious that you have to take two steps: (1) single out a parameter, and (2) enter a new value.

The second step's easy: the envelope parameters can be any value between Ø and 255, and you enter the number from the Apple keyboard. You know that, normally, pressing a number key causes a new instrument to come to the screen. How do you indicate that you want to change a parameter, rather than an instrument?

That's the first step. You select a parameter to change by typing one or more letters that identify that parameter on the screen. This is easier to demonstrate than explain, so do this: press <P> and look at the screen.



The value after PR: (the first parameter in the first row) should now appear in "inverse" -- black letters on a white field. Let's call the inverse rectangle over the value the "cursor." The cursor indicates which value will change if you next press a number key.

Instead of a number, press <F>. The cursor will move to the value for FR:. Now press <V>, and watch the results.

For the first two rows, the rule is: Press the first initial of any parameter in the top row to put the cursor there, then press <V> to move to the value just below it.

From there, pressing <C> will get you to the corresponding value in the third row, which has three parameters: PC (percussion control), FC (frequency control), and AC (attack control).

> **Percussion control** lets you select primary channel only, or both primary and percussion, as well as whether or not to have velocity sensing (speed of keypress determines loudness and attack rate.)
>
> **Frequency control** lets you adjust the pitch of the keyboard in quarter-tones. Normal is FC:54, which puts middle C right where you'd expect it. You use this parameter for tuning (each unit of change is a quarter-tone) and transposition.
>
> **Attack control** gives you effects like tremolo and flutter (if AC:1) by repeating the attack/decay cycle when you hold a note, rather than proceeding normally to the sustain and release segments of the envelope.

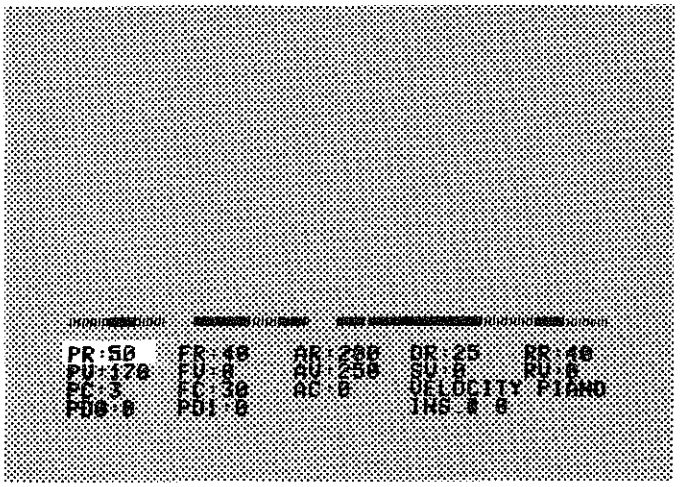
We won't go into these controls in detail here. You can find more information about them in Chapter 8.

There's one more wrinkle to getting around the text window: getting **out** of it so that you can go back to choosing instruments again. That's easy: just press <I>. When you do that, the cursor will disappear, and any number you press will pick one of the ten instruments in the preset master. Try it now: press <I>.

Changing Parameters

The next step is changing the values in the text window. If you've gotten out of the text window (if the cursor is gone), type <1> to select instrument #1 (Pipe Organ). Then get back into the text window by pressing <P>, to make the cursor appear at the PR: parameter.

Any number you type now will appear in the cursor. Press <5Ø> and look at the screen.



So far, you haven't actually changed the parameter. If you play a few notes, you'll notice that the sound hasn't changed. And if you press <ESC>, the original PR value will reappear. Try it.

* * * * *

Now type <5Ø> again, and press <RETURN>. The cursor hasn't moved, but the change has taken effect. If you play a few notes, you should hear the difference.

If you press more numbers, they'll appear in the cursor. However, you won't be able to make the number in the cursor greater than 255. Try it, pressing <ESC> to get "unstuck" when the number reaches 255.

* * * * *

As soon as there are three digits in the cursor, alphaPlus checks the value to make sure it's less than 255. If it is, you can change the value. Once the total reaches or exceeds 255, you are "stuck" with 255 until you--

- press <ESC>,
- move the cursor to another parameter and back, or
- press <I> (which will eliminate the cursor and let you select instruments) and then <P> again.

One more thing: while the cursor is on a particular value, you can use the left and right arrow keys to decrease and increase (respectively) that value by 1 for each press. Combined with the use of the <REPT> key, this is handy for making small changes to

the values. But note that **these changes take effect immediately, with no requirement to press <RETURN>.**

Experiment with this feature now, if you like.

* * * * *

We've covered the **rules** for making changes to the text window. The use of shortened commands enables you to make changes with as few keystrokes as possible. After some practice, you'll appreciate that. Until then, **be sure to check the screen before pressing <RETURN>.** Of course, you can always reverse any changes you make, but you'll save yourself some trouble by looking before you leap.

Once you've changed some envelope values, what then? Well, you can save the **preset** (a collective name for all the values in the text window) on diskette with the **<CTRL-S>** command, and load any preset on a diskette into an instrument with **<CTRL-L>.** In this case, what you're doing is combining a preset with primary and percussion channel waveforms.

We'll be using these commands, and others, in hands-on exercises in this tutorial.

Changing Envelopes: An Exercise

For this exercise, the ALPHA PLUS preset master should be in the computer. (If you've booted the system normally, and not loaded a different preset master, it will be.)

Press <I> to get back to live mode, and then press <2> to call up the "B3 ORGAN FULL" instrument.

* * * * *

We'll use the B3 ORGAN FULL waveform, but not its envelope. The envelope we want to use for this exercise is part of the preset called "ORGAN." It's on the system diskette. To load the preset

into the B3 ORGAN FULL instrument, first press <CTRL-L>. This is the command you use to load a **preset** (text window values -- envelope and control parameters) from the diskette. Then type in <ORGAN> over the name of the existing preset.

LOAD PRESET: ORGANGAN FULL

(No, that's not a typo -- that's what it looks like when you type "ORGAN" over "B3 ORGAN FULL.")

Press <RETURN> and the preset named ORGAN will be loaded from the diskette. Play a few notes, if you like.

Linear vs. Exponential Envelopes

For the envelope in this exercise we're using the **linear** mode, rather than the **exponential**. What's the difference?

The parameter values for linear and exponential envelopes might be the same. The difference is that the rates in an exponential envelope are interpreted somewhat differently. It takes the same time to get to peak volume, but the progression is exponential rather than linear (see the illustration below).

So what? Well, exponential and linear interpretations give rise to different sounds. In general, exponential envelopes are better for keyboards and percussion instruments, linear for brass and strings. However, most instrument sounds can be created using linear envelopes; the same isn't true for exponential envelopes.

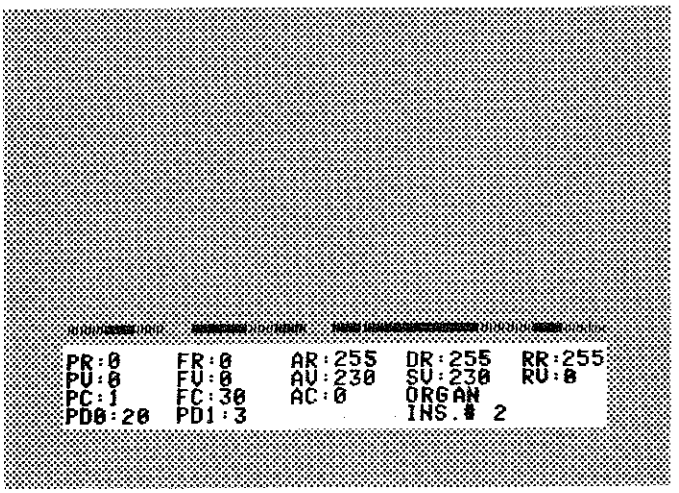
You can, if you like, use the same envelope in both modes. To change an instrument's envelope from linear to exponential, or vice-versa, just press <CTRL-A>. You'll see this on the screen:

```
CURRENT ENVELOPE: LINEAR
WISH TO CHANGE THIS (Y/N)?
```

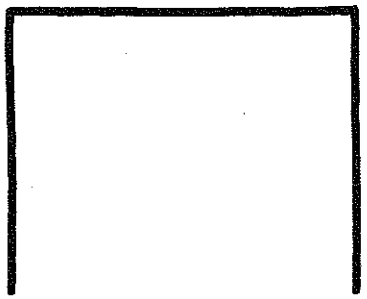
Of course, if you're currently using an exponential envelope, it will say EXPONENTIAL rather than LINEAR. To change this setting, just type <Y> and press <RETURN>. To leave it as is, just press <RETURN>. (To minimize keystrokes, we've designed the system so that you can usually answer in the negative, or skip an option, just by pressing RETURN. In this case, you don't have to type <N>.)

What Does an Organ Sound Look Like?

These parameters should be in the text window:



The primary channel parameters define an envelope that looks like this:



Organ

This is a representation of the primary envelope for the instrument now active in the synthesizer. To make things simpler, we want to hear **only** the primary envelope, so we've set all the percussion envelope parameter values to Ø. With stereo output, this means one channel only.

Play a few notes to familiarize yourself with the sound. Notice that the attack is virtually instantaneous: the tone reaches full volume almost immediately after the key is struck. The volume stays at that level until you release the key, then falls off as quickly as it began. Do you see how this is reflected in the shape of the envelope? Look at the numeric values we used to achieve this effect.

The attack rate is 255 -- the fastest rate possible.

The attack volume is 23Ø, but this isn't especially significant here, since the instrument would sound the same with a lower value -- only quieter. What is significant is that the sustain volume is also 23Ø. In other words, the note reaches peak volume and stays there until the key is released.

Since the attack volume and the sustain volume are the same, the decay rate is unimportant. Why? Because the decay rate determines how fast the tone goes from attack volume to sustain volume.

When the key is released, the release rate takes over. This value is 255, the same as the attack rate.

This discussion should help you relate the shape of the envelope to the sound that this instrument makes. The next step is to change the envelope to achieve a specific effect.

Step 1: From Organ to Piano

Compared to an organ, what does a piano sound like? Well, the attack rate is about the same -- very fast. But the notes start losing volume right away. When you release the key, the sound drops off faster, but not so abruptly as an organ.

So what parameters should we change to make our organ envelope sound more like a piano?

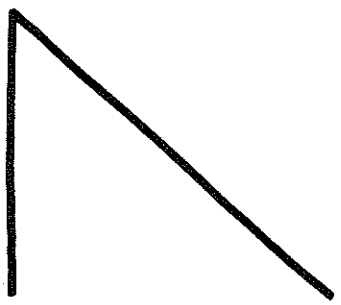
To do that, we need to change the **decay rate**, the **sustain volume**, and the **release rate**.

The piano envelope is on the diskette as PIANO, and you can load it in with <CTRL-L> if you like. But you'll probably find it more interesting to change the values manually, one by one, and test the sound after each change.

If you decide to do this, here are the parameters that you need to change:

Decay Rate (DR:)	from 255 to 25
Sustain Volume (SV:)	from 230 to Ø
Release Rate (RR:)	from 255 to 60

And here's the envelope that you've created with these changes:



Piano

As you can see, the attack is the same: virtually instantaneous; but the volume starts falling off (decaying) at once. Play a few notes and hear the effect.

* * * * *

This doesn't sound exactly like a piano, mainly because we're still using the same wave as for the organ. But it should be close enough to give you the idea.

Step 2: From Piano to Clarinet

This is a bigger jump. Think about it: how does a clarinet envelope differ from a piano envelope?

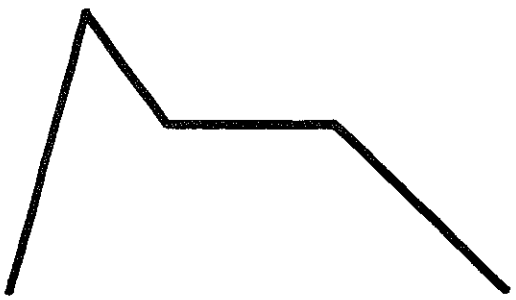
The main change is that the attack is slower with a clarinet. Wind instruments tend to build relatively slowly to peak volume. They also have more sustain.

Except for the attack rate and the sustain volume, the parameters don't change very much. Here are the numbers:

Attack Rate:	From 255 to 80
Attack Volume:	From 230 to 240
Decay Rate:	From 25 to 40
Sustain Volume:	From 0 to 200
Release Rate:	From 60 to 80

Once again, you can type these changes in directly, or load the envelope named CLARINET from the diskette.

Here is the graphic representation of the envelope:



Clarinet

This envelope has all four elements: attack, decay, sustain, and release. The attack is more gradual than an organ or piano; and the decay rate/sustain volume combination make it distinctively non-percussive.

But something's missing. Again, the problem is the waveform. While an organ waveform might sound all right for a piano, it just won't do for a clarinet.

Some Practice with Waves

To hear what a difference a wave makes, load the wave named SQUARE from the diskette. To do this, type <CTRL-W>, then type <SQUARE> over the name (supplied by the system) of the current wave:

PRIMARY.....LOAD WAVE:SQUARE

Press <RETURN>, and the system will prompt you to load a wave for the percussion channel. Since we're not using this channel, just press <RETURN> again.

Play a few notes. Hear the difference? In the next chapter, we'll show you how to create waves of your own; for now, let's try a few others.

Clarinet to Flute

To get a flute-like sound, use <CTRL-W> to load the wave named SINE. (Once again, for the primary channel only.)

* * * * *

Of course, coaxing any particular sound out of a synthesizer is partly a matter of keyboard technique: you must mimic the playing style of the instrument. In any case, you'll be able to hear the potential for a flute in this sound.

Flute to Violin

You can get an approximate violin sound out of the current envelope by loading in the wave named SAWTOOTH. Do this now, just as you did for SQUARE and SINE.

With a little practice, you'll be able to predict the effects of changes to an instrument's envelope. You can even draw the envelope you want on paper and plug in the values that will create it.

In comparison, the shape of a wave tells you almost nothing about how it will sound. There are a few standard waveforms, like the sine wave, the square wave, the triangle wave, and the sawtooth wave; and you can learn to recognize the characteristic sound of each.

However, most waveforms that you'll use for instruments are built up of several (usually from two to sixteen) other basic waves, and the resulting graphic representation of the waveform is not a good indicator of its sound. The best way to develop your ability to achieve the wave effect you want is with lots of practice.

And while you're working on developing your ear for waves, you're bound to happen on some sounds that you like. You can apply them to existing envelopes, or envelopes you define yourself, to create some interesting instruments.

The examples in this chapter used the envelope for the primary channel only. Far more interesting sounds are possible when you use both envelopes (and waveforms) and play them against each other, combining greatly different sounds. This opens up a whole new range of possibilities that we haven't touched on here.

If it seems that there are just too many possibilities, don't despair! You can proceed at your own pace, perfecting your control, and bringing together different elements in new ways when you want to experiment.

The alphaPlus operating system has features to make practice and experimentation as easy and instructive as possible. Envelopes? The numbers are right on the screen, easy to change and to save as a group. Waves? You can see the waveform taking shape as you build it, and hear the effect at the same time.

Chapter 9 considers the different file types you'll be using with the alphaSyntauri instrument, and how to manipulate them.

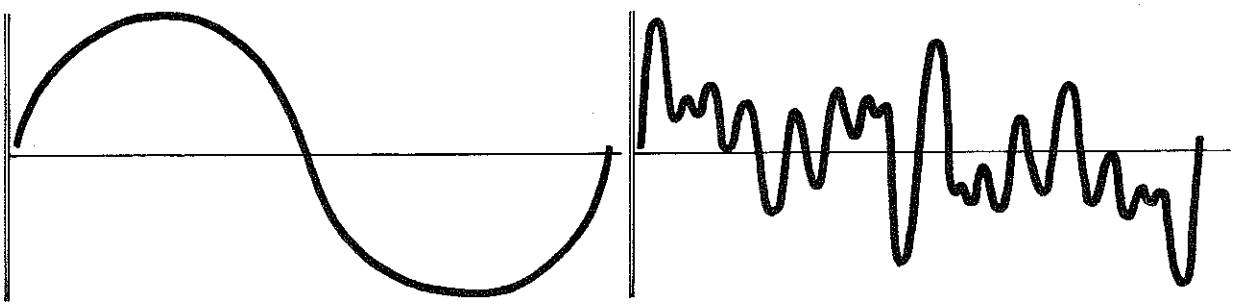
In the next chapter, we'll cover using the features of alphaPlus that let you create and manipulate waveforms.

Chapter 7
Waves in Depth

Envelopes, as you know by now, describe the "loudness history" of a tone, in terms of attack, decay, sustain, and release. But that's only part of the story. There is another factor that makes a piano sound the way it does, or a flute, a human voice, fingernails on a blackboard -- any sound at all, musical or not. That factor is the composite waveform of the sound.

We have already described a wave as a mathematical representation of the back-and-forth movement of any vibrating object. Most musical sounds are made up of many waves. These waves can be expressed as a single "composite" wave that is the combination, point for point, of all the individual waves.

As it turns out, the only "single" wave that exists is a sine wave. Here's an example, along with the composite waveform of a pipe organ:



Sine Organ

A sine wave by itself, as you will soon hear, sounds pleasant, but a bit too sweet and simple for extended listening.

The pipe organ waveform is made up of dozens of individual waves of different frequencies and amplitudes (loudnesses). The wave itself has a perceivable frequency (pitch), that of the **fundamental harmonic**. The fundamental usually has the lowest frequency and the highest amplitude.

Where do these other waves come in? They are called **overtones**, or harmonics, and the specific overtones produced by a given musical instrument determine, in large part, its **timbre** (pronounced tam'-ber -- the distinctive quality of a sound, the overall effect of that sound's waveform and envelope).

In a musical instrument, harmonics are tones with frequencies that are integral multiples of the fundamental frequency. That is, if the fundamental (the **first harmonic**) has a frequency of 100 Hz (cycles per second) the second harmonic will have a frequency of 200 Hz, the third a frequency of 300 Hz, then 400, 500, 600, etc.

The fundamental and its harmonic overtones make up the **harmonic series**. If you compute the pitches that overtones in the harmonic series have, the musical intervals (between the fundamental and each harmonic) work out as follows:

Harmonic	Frequency (Example, in Hertz)	Musical Interval
First (FUNDAMENTAL)	100	(Unison)
Second	200	Octave
Third	300	Fifth
Fourth	400	Octave
Fifth	500	Major third
Sixth	600	Fifth
Seventh	700	Minor seventh
Eighth	800	Octave
Ninth	900	Major second
Tenth	1000	Major third
Eleventh	1100	Diminished fifth
Twelfth	1200	Fifth
Thirteenth	1300	Major seventh
Fourteenth	1400	Minor seventh
Fifteenth	1500	Major seventh
Sixteenth	1600	Octave

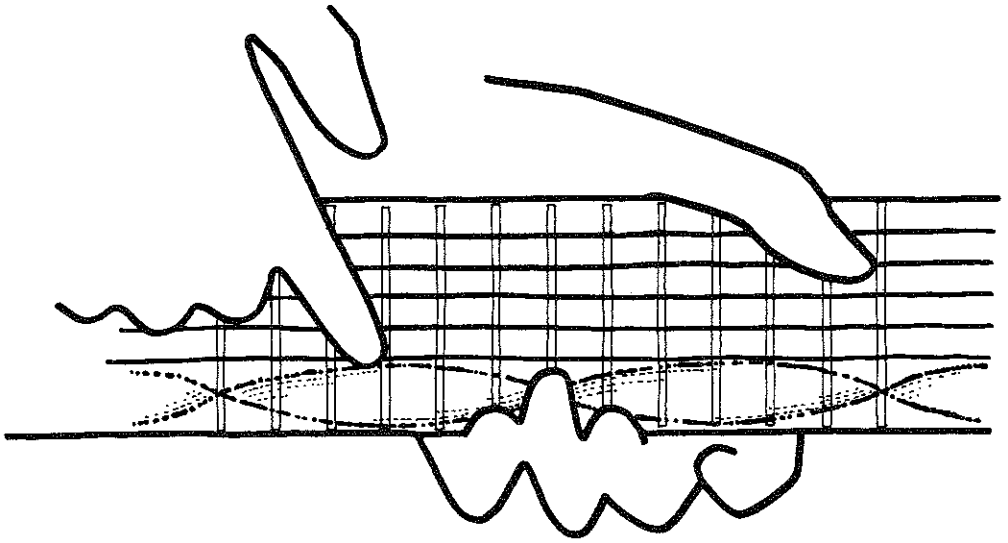
...and so on, to beyond the range of human hearing.

The point is that most musical instruments achieve their characteristic timbre by producing a waveform made up of overtones from the harmonic series. And yet it is the fundamental frequency that is perceived as the pitch of the note.

In fact, even when the fundamental is missing (a condition you can create with alphaPlus), your ear will somehow "compute" it, if enough overtones are present, so that the fundamental pitch will be the one you hear.

Where do overtones come from? From sympathetic vibrations that are set in motion by the fundamental. No doubt you've had the experience of "feeling" bass tones, rather than simply hearing them. The sound waves coming from any vibrating object will alalways tend to induce a similar **resonance** in anything they encounter.

Resonance is the result of sympathetic vibrations that occur in the wood or strings of a violin or piano, or in the metal of a trumpet. You can hear them directly by resting your finger lightly on the midpoint of a guitar string, then plucking the string sharply with a fingernail of the other hand. Here's an illustration of what happens:



In this case, the fundamental is dampened by your finger, but each half of the string vibrates at the rate of the second harmonic -- one octave above the fundamental.

But even without your finger there, the string would not simply vibrate at the frequency of the fundamental; if it did, a simple sine wave would suffice to describe its motion. No, it would vibrate in a very complicated way, in halves, thirds, fourths, and so on. That is part of what makes a guitar sound like a guitar.

Hearing Is Believing

Let's try out some of these ideas by loading a program from the alphaPlus diskette called **Quickwave.**

To load Quickwave, first boot alphaPlus. Once in live mode, press <CTRL-X>. When you do this, you'll be asked:

LOAD QUICKWAVE (Y/N)?

Type <Y> and press <RETURN>. You will be given a chance to save any notes files you may have created. (Quickwave is loaded into part of the same space in memory that notes files use, partly erasing any such file. Of course, if you use a different diskette for saving notes files, make sure the alphaPlus diskette is in the disk drive before you call up Quickwave.)

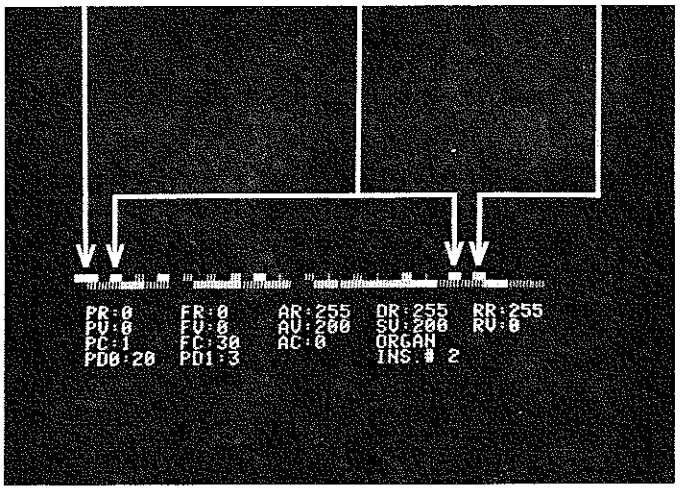
After you respond by typing in a notes file name and pressing <RETURN> (or just pressing <RETURN> if you don't want to save a notes file), you'll be running Quickwave.

Using Quickwave

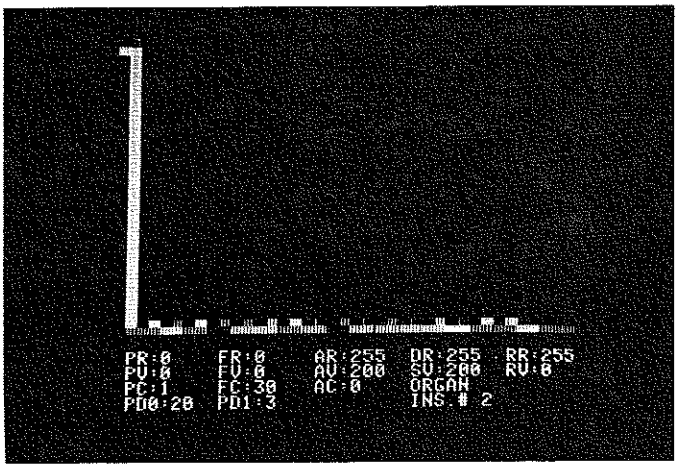
There should be a row of small colored boxes above the text window, as in the illustration below. The leftmost box, which is pink, is the cursor. This is similar to the cursor you used to enter envelope values in the pitch window. Its purpose is to let you select harmonics -- represented by the other 16 boxes.

The box just to the right of the cursor's present position represents a harmonic at the frequency of the fundamental. The other boxes, as labeled, represent the next 15 tones in the harmonic series, and an auxiliary wave (which we'll explain soon) at the same frequency as the fundamental.

fundamental harmonics auxiliary



Right now, each harmonic has an amplitude of Ø, which you can increase by positioning the cursor to the left of a harmonic (a box) and pressing a number between 1 and 9. The box becomes a column. Its height, and thus its amplitude, depend on the number you press. The cursor moves to the next box to the right.



As soon as you press a number, the **primary** and **percussion** waves of the instrument you're in will be replaced by the tone represented by the column. With Quickwave you can build a wave up from the available harmonics (and the auxiliary wave), and hear it as you build it. The entire keyboard is active, as it is during live play, and the envelope used is the one for the instrument you were in when you pressed <CTRL-X>.

Note that Quickwave won't **analyze** a waveform for you: you can't get a representation (in columns of various heights) of an existing wave. If you want to find out the amplitudes of the various harmonics that make up a given waveform, there is a program on the alphaPlus diskette called ANALYZER that will do just that. This program is described later in this section.

What you **can** do with Quickwave is assemble different harmonics of a waveform at different amplitudes. Furthermore, you can add in another waveform at the pitch of the fundamental using the auxiliary wave.

Now let's take Quickwave for a test drive.

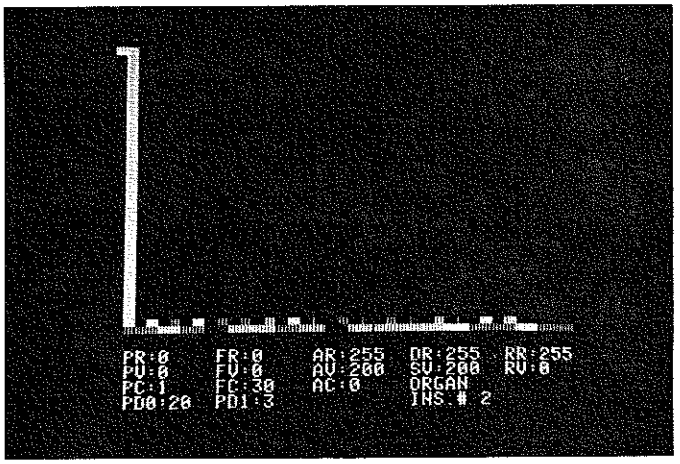
Moving the Cursor

Press <K> several times, and watch the cursor move to the right. When you reach the edge of the screen it will appear again at the left.

Got that? You can also move the cursor to the left by pressing <J>. Using these two keys, move the cursor back to its original position -- to the left of the first harmonic.

* * * * *

Now press <9>, and watch the box to the right of the cursor.



You have just created a wave: you've set the fundamental to a relative amplitude of 9. If you don't believe it, play a few notes on the alpha keyboard.

* * * * *

That's a sine wave, since there are no overtones. Sounds nice, but not very interesting.

The cursor is now resting to the left of the second harmonic. From the table presented earlier, we can determine that it is an octave of the fundamental. Prove it: hold down a key on the alpha keyboard and press <5>.

* * * * *

Did you hear the octave chime in? If you keep playing, the fundaental and the overtone will start to sound like one note. Add

another overtone: press <3> to assign a relative amplitude of three to the third harmonic.

* * * * *

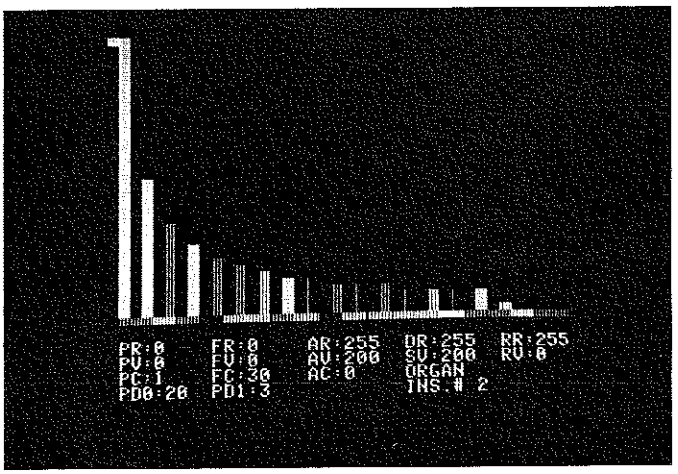
Whether you know it or not, you're building a **sawtooth** wave, which is made up of all the harmonics. Each harmonic has a certain set amplitude: the second is 1/2 the fundamental, the third is 1/3 the fundamental, the fourth 1/4, the fifth 1/5, and so on.

Actually, the second harmonic should have an amplitude of 4.5 (1/2 x 9 -- the fundamental), and not 5. Here's how you accomplish this: move the cursor to the left until it's at the top of the column for the second harmonic (the one set at 5), and press the left arrow key twice.

* * * * *

The column moved down slightly. To be precise, it moved down 1/4 of a unit for each press of the left arrow key. Since you pressed that key twice, it went down 1/2, and is now set at 4 1/2.

You can also increase any column value by 1/4 by pressing the right arrow key. The use of the arrow keys gives each harmonic 36 different units of amplitude.



The third harmonic is already correct, at 3 (1/3 x 9). With what you know now, you should have no trouble setting the fourth harmonic to 2 1/4 (1/4 x 9). Try it.

If you like, you can continue to build the sawtooth wave; or you can experiment with Quickwave, setting different harmonics to different values and playing a few notes to hear the results. If you create a waveform that you decide you want to **save as a WAVE: file**, here's how you do that:

1. Press <CTRL-E>
2. You'll see this on the screen:

   PRIMARY.....SAVE WAVE:SAWTOOTH

   The name supplied by the system is that of the wave used in the primary channel of the instrument before you entered Quickwave. Choose a new name for your wave and type it in over the name supplied.
3. Press <RETURN>
4. You'll see this on the screen:

   PERCUSSION.....SAVE WAVE:B3 ORGAN FULL

   Again, this is the name of the percussion wave used before Quickwave. Just press <RETURN>
5. Press <CTRL-X> to get back to Quickwave.

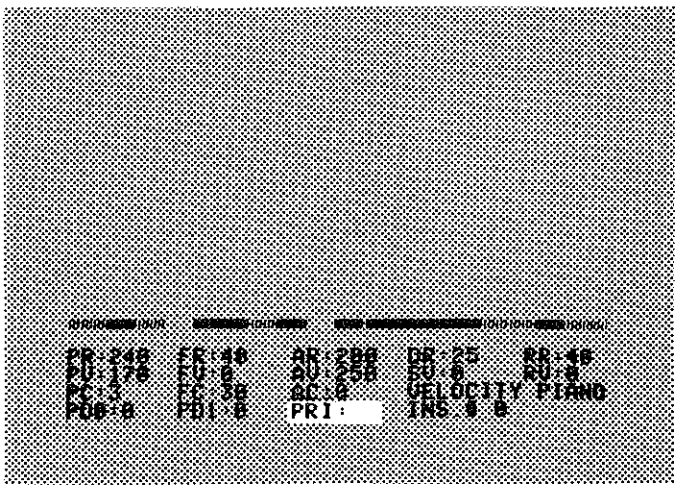
This procedure will save any wave currently in the primary channel (or the percussion channel, if you type in a name before you press <RETURN>) on diskette as a WAVE: file. You can load this wave into any instrument with the <CTRL-W> command.

More About Quickwave

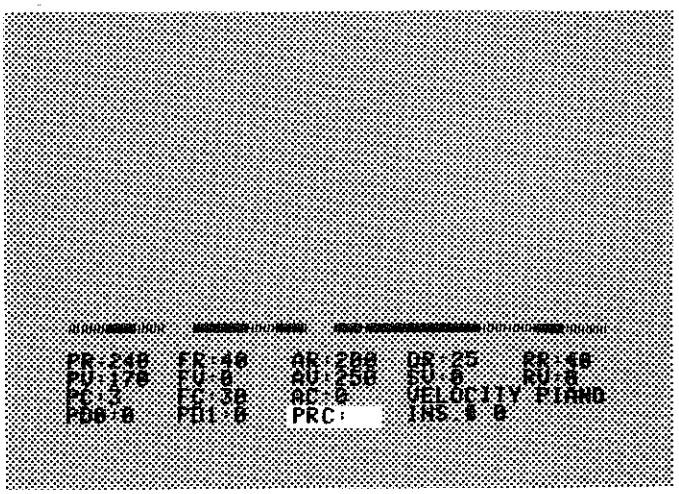
As you know, the alphaSyntauri synthesizer uses two separate channels: primary and percussion. Each channel has its own wave (although they may be identical). When, in Quickwave, you first pressed a number to assign an amplitude to one of the harmonics, that tone replaced the primary and percussion waves of the instrument you were in.

1. Quickwave on Separate Channels

However, with Quickwave you can work on either of the channels separately, leaving the other wave intact, by using the slash key (</>). Try it now.



The letters "PRI" stand for primary, telling you that any changes you make to the columns now will affect only the primary channel. Now press </> again.



Now any changes will affect only the percussion channel. From now on, pressing </> will toggle you back and forth between the two channels.

2. Quickwave on Both Channels

To get back to working on both channels, you would press <CTRL-X>. After you do this, any changes you make will affect both channels unless you press </> again. In fact, if you used Quickwave to

build up two separate waves, then pressed <CTRL-X>, making any change before pressing </> would make both waves the same.

There's a lot to this, but it will all come naturally when you've worked with Quickwave for a while. Check the reference section for a summary of Quickwave features.

Using Other Waves with Quickwave

The **base wave** -- that is, the waveform normally used to build the fundamental and harmonics in Quickwave -- is a sine wave. The sine wave is a basic building-block of more complex waves.

To add a little variety, the wave used as the **auxiliary** is one from the alphaPlus diskette called **NOISE.** (Soon we'll show you several ways to make use of both the base and the auxiliary wave.)

However, you're not restricted to using the sine wave. In fact, you can use any wave that exists as a WAVE: file on any diskette (just make sure the diskette containing that wave is in the disk drive!).

The following three exercises demonstrate this, and other uses for Quickwave. (If you decide not to try the exercises just now, you should at least read through them. To get back to live mode, just press any key that doesn't have a specific Quickwave function -- like <RETURN>. Quickwave will still be in memory, and will come up instantly when you press <CTRL-X>. In fact, unless you exit alphaPlus or record a notes file, Quickwave will still remember all the changes you made, to every instrument!)

Sine vs. Square

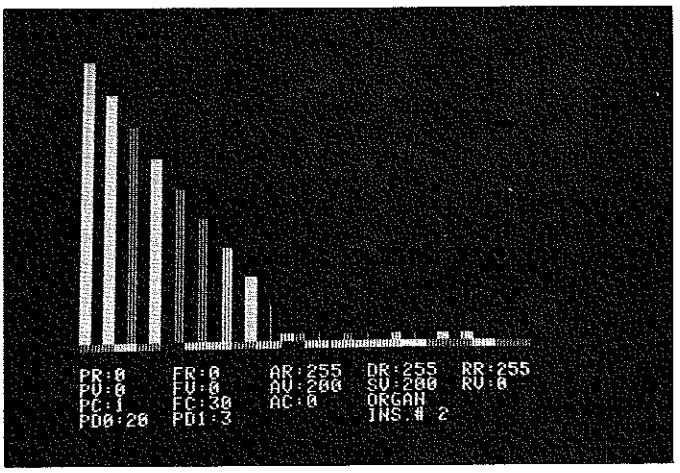
First, set all the harmonics to zero (press <Ø> repeatedly until all the columns are boxes.)

* * * * *

Remember, the base wave is presently a sine wave. Set the first 9 harmonics to the following values:

Harmonic:	1	2	3	4	5	6	7	8	9
Value:	9	8	7	6	5	4	3	2	1

When you're done, the screen should look like this:



Play a few notes to get an idea of the sound produced by this waveform.

* * * * *

Now press <CTRL-Q>. You'll see this on the screen:

LOAD HARMONIC BASE WAVE:SINE

Type in the wave name <SQUARE> and press <RETURN>.

* * * * *

You are then asked to supply the name of a new waveform for the auxiliary (in place of NOISE). Since we're not using the auxiliary wave here, just press <RETURN>.

* * * * *

The normal text and pitch windows will show on the screen. Press <CTRL-X> and the Quickwave screen will return with the same harmonics at the same amplitudes. You've loaded in a new base wave (SQUARE, to replace SINE), but the waveform won't be recalculated until you make an amplitude number entry. Since we want all the amplitude values to stay the same, move the cursor back to the first harmonic (using <J>) and type <9>. This won't change the value, but it will recalculate the waveform using the SQUARE wave rather than SINE.

The fundamental and all the overtones that you set are now harmonics of the waveform SQUARE rather than of SINE.

Again, play a few notes. Do you hear the difference in sound? The tones are comparatively hollow.

Harmonic Augmentation

Press <I> and <2> to get to the B3 ORGAN FULL instrument.

* * * * *

For this exercise, you'll be using the B3 ORGAN FULL waveform with Quickwave. However, since this waveform is not presently on the diskette as a WAVE: file, but only within the ALPHA PLUS preset, you must first save B3 ORGAN FULL as a WAVE: file.

To do this, first press <CTRL-E>.

PRIMARY.....SAVE WAVE:B3 ORGAN FULL

(NOTE: If you haven't restarted alphaPlus since you did the envelope experiments in Chapter 6, the wave name shown here will be ORGAN; if that's the case, press <RETURN> and apply the instructions in the next paragraph to the B3 ORGAN FULL waveform in the percussion channel.)

Now hold down the right arrow and REPT keys together until the cursor moves to the right of the words B3 ORGAN FULL. (You are in effect "retyping" these words.) Then press <RETURN>.

* * * * *

The next screen will offer you the chance to save the percussion channel waveform. This is the same, B3 ORGAN FULL, so there is no need to save it again. Press <RETURN>.

* * * * *

Now press <CTRL-X> to get back into Quickwave. Set all the amplitudes to zero by pressing <Ø> repeatedly until all the columns are boxes.

The next step is to load SINE as the base wave, and B3 ORGAN FULL as the auxiliary wave. Press <CTRL-Q>.

LOAD HARMONIC BASE WAVE:SINE

(NOTE: If you haven't restarted alphaPlus since Chapter 6, the wave name here may be SQUARE; if so, just type in SINE and press <RETURN>.)

"Retype" the wave name SINE with the right arrow and REPT keys, and press <RETURN>.

LOAD HARMONIC AUX WAVE:SINE

Now type in B3 ORGAN FULL as the auxiliary waveform, and press <RETURN>.

* * * * *

SINE is now the base wave, and B3 ORGAN FULL the auxiliary. As it happens, SINE is the wave that was originally used to create B3 ORGAN FULL. In this exercise, you'll be modifying the B3 ORGAN FULL wave by increasing one of the harmonics of SINE.

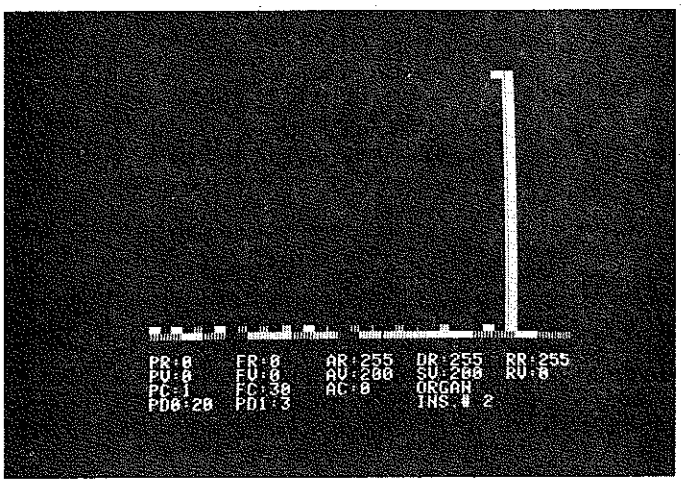
The illustration below shows the harmonic makeup of B3 ORGAN FULL. Note that the harmonics specified are those of the SINE wave. Together, these harmonics, at the amplitudes shown, compose the waveform B3 ORGAN FULL:

B3 ORGAN FULL Harmonic	(using SINE harmonics) Amplitude (relative)	
1st	17.2	
2nd	17.2	
3rd	17.3	
4th	17.2	
6th	17.2	(include illus of
8th	17.3	B3 ORGAN FULL waveform)
10th	17.2	
12th	17.2	
16th	17.3	

The amplitude for each harmonic was set when the waveform was first created. You can use Quickwave to augment (but not to di-

minish) any of the harmonics, or to add others. You've already got the two waveforms (SINE and B3 ORGAN FULL) in the system as the base and auxiliary waves, so we'll proceed from there.

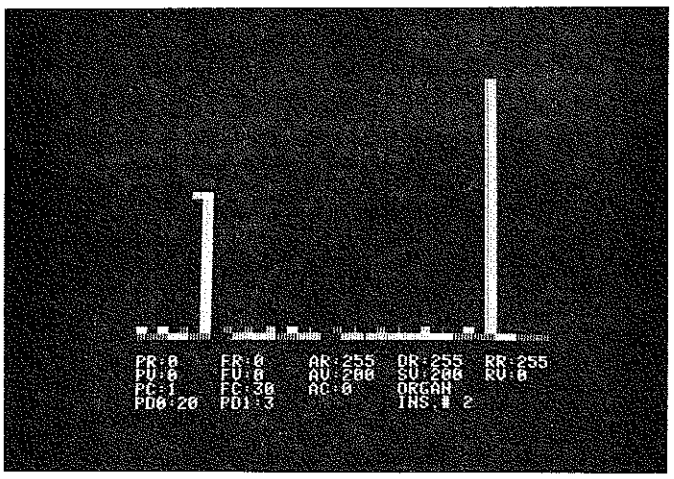
Use <K> to move the cursor to the last box on the right (the auxiliary waveform indicator) and press <9>.



Play a few notes. They should sound identical to the B3 ORGAN FULL instrument, since you're using the same envelope and the same wave.

* * * * *

Now move the cursor to the fourth box from the left -- the fourth harmonic of the base wave, SINE -- and hit the right arrow key repeatedly to increase the amplitude. Play a few notes after every few times you hit this key, and keep going until the column reaches the top of the screen.



Every time you press the right arrow key, you are increasing the fourth harmonic, using a sine wave. The list above shows you the relative amplitude of this harmonic in the original waveform B3 ORGAN FULL. That relative amplitude increases by 2.7 percent (1/36th) with each press of the right arrow key.

Listen for the effect that increasing this harmonic has on the sound of the instrument. If you like, try modifying other harmonics.

Square and Triangle Together

In this exercise, you'll combine one waveform with a harmonic made up of another. This is similar to the previous exercise, except that last time the harmonic (a sine wave) was already a component of the waveform (B3 ORGAN FULL). This time, the two waveforms will be unrelated (as much as any two musical sound waves can ever be).

When you combine the waveform with the unrelated harmonic and play the keyboard, every note will be in effect two notes. In synthesizer terms, this is like having two oscillators set a certain interval apart.

First, set all the harmonics on the Quickwave screen to zero by pressing <Ø> repeatedly, until all the columns are boxes.

* * * * *

Now use <CTRL-Q> to load SQUARE as the base waveform, and TRIANGLE as the auxiliary waveform.

* * * * *

Set the auxiliary waveform, TRIANGLE, to an amplitude of <9>, and play a few notes. (Remember, the auxiliary wave is always at the fundamental frequency.)

* * * * *

Set the cursor at the third harmonic of the base waveform. As you play the keyboard, use the right arrow key to increase this harmonic. You'll hear the new tone gradually getting louder. This tone is an octave plus a fifth above the fundamental (TRIANGLE), so that every note you play in effect gives you two tones.

Now increase the third harmonic to <9>. Try this same experiment with other harmonics, in combination or singly (that is, setting each one back to zero before you go on to the next).

* * * * *

We hope that these exercises give you an interest in exploring further into the capabilities of Quickwave. Any time you create a waveform that interests you, you can save it on a diskette (using <CTRL-E>. (Note: In Chapter 9 we recommend that you segregate your files, saving all waves on a separate diskette. Read that chapter before doing any serious development work.)

You can also build a waveform using Quickwave, save it, then press <CTRL-Q> and reload it into Quickwave. The entire waveform will become the fundamental (base wave), with all Quickwave amplitudes set to zero.

You can also load that waveform (or any waveform built up from that waveform) into any instrument, using <CTRL-W>.

The possibilities are limitless, and we encourage you to experiment with them.

Another Wave-Building Program

Quickwave is your introduction to wave-building, and you'll probably find it useful in the future for trying out different harmonic combinations on the keyboard. However, there's another program called **WAVE**, which gives you much more precise control over harmonics and amplitudes.

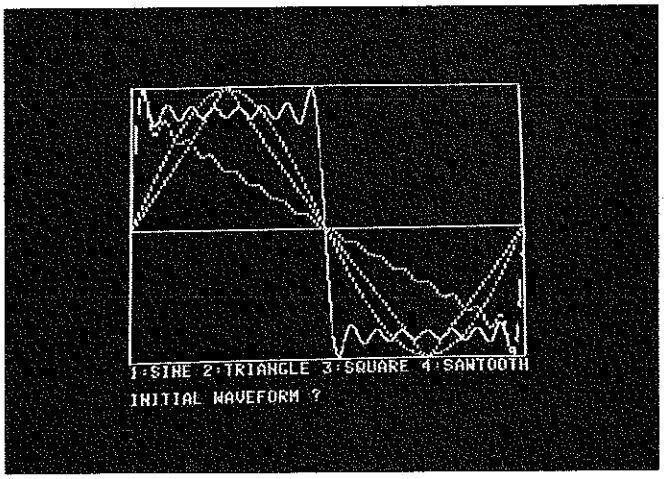
A primary difference between Quickwave and **WAVE** is that you don't immediately hear your results on the alpha keyboard. You must first save the waveform to diskette, reload alphaPlus, and then load your new waveform. We've made this process as smooth as possible for you.

Instead of hearing the tone from the keyboard, you hear it as a 132-Hz **reference tone** that WAVE provides as you build sounds. As you get some experience with WAVE, you'll find this tone very informative.

The advantage of WAVE is that it is terrific for precise wave-building. You'll see what we mean as we go along.

To run WAVE, just press <CTRL-C>. (You can run this program from BASIC -- that is, without first booting alphaPlus -- by typing <RUN WAVE> and pressing <RETURN>.)

In a moment you'll see four waves built on the screen, one at a time, and hear each one as it's finished.



When this demonstration ends, you'll be presented with the question "INITIAL WAVEFORM ?"

WAVE is asking you to specify which of the four waves you want to start with in building a new composite waveform. Your choices are:

1 -- SINE
2 -- TRIANGLE
3 -- SQUARE
4 -- SAWTOOTH

Another possibility: You can use as your "initial" wave any waveform that exists as a WAVE: file on diskette. (For example, B3 ORGAN FULL.)

Building a Sawtooth with WAVE

In this exercise, you'll be able to direct and observe the gradual creation of a sawtooth waveform out of pure sine waves.

You may remember from a few pages back that a sawtooth wave can be made out of successive harmonics of a sine wave with amplitudes (relative to the fundamental) of 1/2, 1/3, 1/4, 1/5, and so on. We can express this progression of amplitudes as 1/N, where N equals the number of the harmonic (in the harmonic series).

(In contrast, a square wave consists of odd harmonics only, with relative amplitudes of 1/N; and a triangle wave consists of odd harmonics only, with relative amplitudes of $1/N^2$, which works out to relative amplitudes of 1 (fundamental), 1/9, 1/25, 1/49.... You can see that, with Quickwave's resolution limit of 36 different amplitudes, you would be unable to assign an amplitude small enough to be 1/49 of the fundamental. Not so with WAVE.)

Back to the screen. To the question "INITIAL WAVEFORM?", answer <1> and press <RETURN>.

```
INITIAL WAVEFORM ? 1
HARMONIC ?
```

Since a sawtooth includes all harmonics, let's start with the first: answer <1>, and press <RETURN>.

```
HARMONIC ? 1
AMPLITUDE?
```

You could put in virtually any number here (including decimals), since all other entries will be gauged in relation to this one; but just to keep things simple, fill in <100> and press <RETURN>.

```
HARMONIC ? 1
AMPLITUDE? 100
```

The screen will clear, and a sine wave will be drawn in. As you supply information about successive harmonics, this wave will be redrawn again and again, each time modified by addition of the latest wave.

Your task now is to fill in the rest of the numbers for the sawtooth, out to the 16th harmonic. You could probably figure out the relative amplitudes yourself, but just to save you the trouble...

Wave	Harmonic	Amplitude
1	2	50
1	3	33.3
1	4	25
1	5	20
1	6	16.7
1	7	14.3
1	8	12.5
1	9	11.1
1	10	10
1	11	9.1
1	12	8.3
1	13	7.7
1	14	7.1
1	15	6.7
1	16	6.3

When the question "WAVEFORM?" comes up after you enter the 16th harmonic, answer <Ø> -- to quit. Save the waveform under the name SAW, and when WAVE asks you if you would like to do another waveform, answer <Y> to do the next exercise, or <N> to take a break, and press <RETURN>. (Note: If you type <N>, WAVE will attempt to restart the alphaPlus operating system. If this is what you want, make sure the alphaPlus diskette is in the drive. If not, open the disk drive door and press <CTRL-RESET> to stop the drive.)

* * * * *

A few points before we go on to the next exercise. First of all, there's no special significance to the first amplitude entry of 1ØØ. We could just as easily have made it 1ØØØ, or 1Ø. The important point is that all amplitude entries are relative. We used 1ØØ to make it easier to calculate succeeding entries, according to the ratio 1/N.

We only went out to the 16th harmonic, although we could have entered a harmonic number as large as 255. Actually, in a series of diminishing amplitudes like this, 16 harmonics are usually enough to define the sound. But a more compelling reason for stopping at 16 is a phenomenon called **foldover**, or **aliasing**.

Briefly, foldover is a type of audio distortion caused by the presence in a waveform of harmonics tones too high for the system to reproduce. The alphaSyntauri system is capable of producing sounds as high as 16,ØØØ Hz. Harmonics higher in the series, when played in the keyboard's upper registers, can cause aliasing.

One more point: we can also enter **negative** harmonics, by preceding the amplitude entry with a minus sign (-). If there is only one wave of a specific harmonic, it doesn't matter whether the amplitude is positive or negative.

Furthermore, you can partially or completely cancel out the effect of any harmonic by entering a wave of the same type, and the same harmonic, with the opposite amplitude. For example, if you enter a sine wave at the 5th harmonic with an amplitude of 5Ø, then change your mind, you can negate the effect of that harmonic by entering a sine wave at the 5th harmonic with an amplitude of -5Ø.

Wave Stew

The purpose of this exercise is to take you quickly through the procedures for (1) combining the different waveforms in the WAVE program, and (2) bringing in waves from WAVE: files on the diskette.

Let's start with the wave you created and saved in the previous exercise: SAW. (If you didn't go through the previous exercise, you can use the wave SAWTOOTH, which is already on the alphaPlus diskette.)

The question "INITIAL WAVEFORM" should be on the screen. In response, type <SAW> (or <SAWTOOTH>, as noted above). Of course, you could simply enter <4>, and use the sawtooth wave provided with the program, but then you wouldn't get the chance to call up the wave you just created. Specify the first harmonic and an amplitude of <1ØØ>.

* * * * *

The sawtooth wave is drawn on the screen, and its sound comes from the speakers.

Now, one at a time, add each of the other three waves in the program: SINE, SQUARE, and TRIANGLE (<1>, <2>, and <3>). For each, specify the first harmonic and an amplitude of <1ØØ>.

In this exercise, you called a waveform from diskette, saw the changes to the developing waveform, and heard its sound as each new waveform was added.

WAVE is a separate program from the rest of the alphaPlus operating system. Therefore, as noted above, to get back to live mode, make sure the alphaPlus diskette is in the drive when you answer <N> to the question "ANOTHER WAVEFORM?"

Analyzing Waveforms

We mentioned earlier that there is a program called ANALYZER on the alphaPlus diskette that will let you find out what harmonics, at what amplitude, constitute any waveform (as long as it's saved as a WAVE: file on diskette).

You run ANALYZER from BASIC -- that is, outside of alphaPlus. With the alphaPlus diskette in the drive, type <RUN ANALYZER> and press <RETURN>. When you are prompted, supply the name of a waveform file and press <RETURN> again (if the file is on another diskette, be sure to insert that diskette in the drive before you press <RETURN>).

The waveform will be located on the diskette and drawn on the screen. Then the first 20 harmonics will be displayed on the bottom four lines of the display. Finally, the representation of the waveform will disappear and you'll be able to see all 20 harmonics, with their relative amplitudes.

By now you've had some experience with the basic capabilities of WAVE and Quickwave, and have learned to make use of both programs. You can make waveforms, save them to diskette, and combine them with different envelopes. The rest is a matter of practice, creating and comparing waveforms and envelopes.

There's a lot to the alphaSyntauri synthesizer, and you won't become an expert overnight. However, you'll find learning about it an enjoyable experience, since you can create your own instruments with what you know now. As your skills develop, you'll be able to modify instruments to meet your tastes and needs, and to create others to match the sounds that you can imagine.

Going Full Circle

Remember, waveforms and envelopes are not independent of each other. Becoming an expert in one or the other is not enough: you have to learn to use them together.

It only takes a few keystrokes to bring in a different preset from the diskette to try with the current waveform, and vice-versa. Keep trying out new combinations, and listen for the differences. Soon you'll find that you can predict what the effect of a new combination will be, and your experimentation will become less and less haphazard.

Finally, Chapter 9, **About Files**, has some useful advice that will help you keep your growing collection of sounds organized.

Chapter 8
A Few More Features

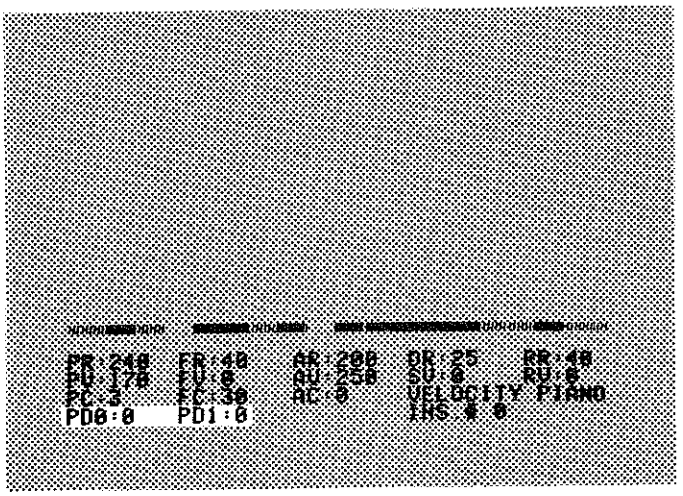
By now you've read about most of the features of alphaplus, and practiced many of them. You may feel that you can get any further information you need from the quick-reference chart. If so, you can skip this chapter, which will move quickly through the few alphaPlus features we haven't covered, or covered only briefly.

Of course, if you later find you need a bit more explanation, you can always come back to the Tutorial.

Vibrato (CTRL-V)

Vibrato, as you may know, is a musical effect caused by slight and rapid variations in pitch. With alphaPlus, you can change the waveform used for these frequency shifts, as well as the **rate** and extent (or **depth**) of the variations.

While in live mode, look at the text window parameters. In the lower left are shown the current values for vibrato rate and depth, as PDØ: and PD1:, respectively.



PDØ determines how **fast** the frequency will shift, and PD1 determines how **far**.

The **vibrato waveform** is the waveform used for the rapid frequency shifts. This is normally a sine wave, but you can substitute any waveform contained in a WAVE: file on diskette. (The next time you load the preset master, the SINE wave will again be used as the vibrato waveform.)

To change waveform, rate, and depth, type <CTRL-V>. You'll see this on the screen:

VIBRATO.....LOAD WAVE:SINE

Just type in the name of any WAVE: file on the diskette (remember, <?> lets you see the diskette catalog) and press <RETURN>. Of course, you can leave the current wave in place by pressing <RETURN> without typing in a name.

Next you'll have an opportunity to type in specific values for vibrato rate and depth.

ENTER VIBRATO RATE: 2Ø

ENTER VIBRATO DEPTH: 3

Type in a new number (and press <RETURN>), or just press <RETURN> to accept the current value.

Changing Vibrato Rate and Depth with the Paddles

You can change vibrato rate and depth much more dynamically by using the Apple game paddles.

When alphaPlus is first started, it doesn't matter where the game paddles are set -- the PDØ and PD1 values on the screen don't correspond to the paddle settings. They are part of the instrument definition included in the preset master ALPHA PLUS. (Before you change them, you may want to note what they start out as so you can get the original sound back without reloading the preset master (using <CTRL-P>).)

To make these parameters take on the values of the paddle settings, thereby changing the vibrato rate and depth, just press <B>. Then rotate one of the paddles and press <B> again, and take a look at the corresponding PD value on the screen. (If you're not sure which paddle is Ø and which is 1, this is a good way to find out; then label them for future reference.)

Repeat this with the other paddle. Try various values for rate and depth, and play some notes to get an idea of what changing these values does to the sound. If the vibrato effect intrigues

you, try different rates and depths for different instruments. Remember, however, to note the original values. (If worse comes to worst, you can get either of the preset masters back by using <CTRL-P> and typing its name: either INSTR or ALPHA PLUS.)

For a really bizarre effect, try setting both the rate and the depth of vibrato very high -- say 175 or so -- for a particular instrument, then press the portamento pedal, together with <REPT> and one of the arrow keys.

FX Mods

Here's another way to get some interesting special effects. Try this: type <CTRL-F>.

EXEC 'FX' MOD:

The system wants to know which FX mod (effects modification) you want. Any file on the catalog that begins with the prefix MOD: is an FX mod. Look for one with the name **MOD:TS**. If you don't see it on one part of the list, touch any key on the Apple keyboard to move the list up another screenful.

To load the mod, type the last part of the name of that mod -- in the case of **MOD:TS**, you would type just the letters **TS**. Then press <RETURN>.

Using the paddles, you can go further and change the FX mod characteristics. Normally the paddles control vibrato, but when an FX mod is in effect, they are programmed to affect the FX mod characteristics. Instead of pressing <B>, as you did for vibrato, you use the button or switch on one or the other of the paddles to make the change take effect.

Finally, to turn off the FX mod, press <CTRL-F>, <RETURN>, <O>, <RETURN>.

The other FX mods available on the alphaPlus diskette are:

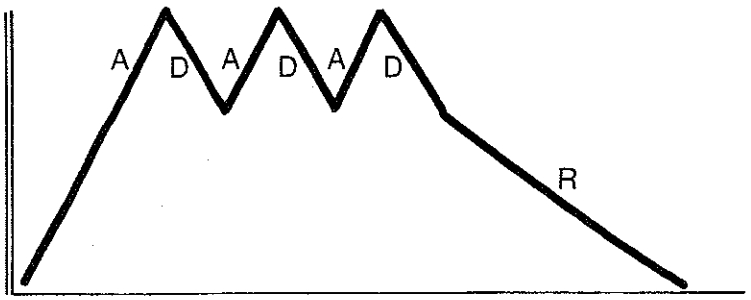
AM	amplitude modulation
CH	chorus effect
PB	pitch bend
PS	pitch scan

Back to the Text Window

There are three text window parameters that we discussed, briefly, in Chapter 6: attack control (AC), frequency control (FC), and percussion control (PC). You change these values just as you change envelope values: move the text window cursor to the value after the initials (see Chapter 6 for directions on moving the text window cursor), type in the new value, and press <RETURN>.

Attack Control

This parameter can only take a value of zero or one. When AC = 1, the attack/decay cycle of the primary envelope is repeated as long as a note is held:



You can use this to achieve a tremolo effect, as well as other more striking effects.

Frequency Control

This parameter does just what it says: you can use it to change the alpha keyboard frequency. This means that the pitch of every note will change.

The FC value may be set anywhere from Ø-255. Every unit of change increases or decreases the keyboard pitch by one quarter-tone.

Here are some significant values:

FC = 3Ø	Middle C
FC = 6	Down one octave (24 quarter-tones)
FC = 54	Up one octave (from Middle C)

Try this: type <FC> to get the cursor to the FC value, then use the arrow keys (with or without REPT) to glide from one value to another as you play the alpha keyboard.

The FC: parameter is very useful for transposing from one key to another.

Percussion Control

The value in this parameter determines whether the percussion channel is on or off, and whether or not velocity sensing is in effect. (Velocity sensing means that how fast you press down the alpha keys determines how loud the note will be, and how abrupt the attack.) This feature is only available with the five-octave alphaSyntauri keyboard.

Velocity sensing affects only the primary channel. The specific envelope and waveform in the percussion channel will greatly affect the overall sound and sensitivity.

The PC: parameter may be set from Ø-3:

PC	Percussion Channel	Velocity Sensing
Ø	OFF	OFF
1	ON	OFF
2	OFF	ON
3	ON	ON

Touch Sensitivity (CTRL-T)

Touch sensitivity is a feature related to velocity sensing. The value may vary from Ø-7, with zero being the most sensitive, seven the least.

This value determines for what range of play (slow to fast key-presses) the attack rate and the attack volume increase. With touch sensitivity set to zero (and velocity sensing ON), the attack is faster and louder, depending on speed of keypress, across the entire range of play.

Set touch sensitivity to seven, and the attack gets faster and louder only for the fastest keypresses.

Pressing <CTRL-T> momentarily exits alphaPlus, first giving you a chance to save notes files (if you recorded any) and the preset master (in case you made some changes to it).

You can then change the current touch sensitivity value, or leave it as is. In either case, you are then shown the velocity rates and limits now in effect, in the form of two three-column tables.

Tuning Offset (CTRL-O)

Most instruments are not evenly tuned: a certain "detuning" is necessary to achieve the best effect.

The alphaSyntauri keyboard may be detuned in units of 1/32 of a tone. To do this, just press <CTRL-O> and enter the detuning value you want to hear.

You can enter any value from Ø-255. An offset of 1 or 2 will make for a richer, fuller sound. You can also have an offset of a tonic interval, like a fourth (8Ø), a fifth (112) or an octave (192). This will make each note sound like a chord.

A changed offset value can only be saved as part of a preset master. Practice with different values for different instruments to get the specific effect you want.

Changing Scales or Intervals per Octave

The alphaSyntauri keyboard is normally set, according to the standards of Western music, at 12 tones per octave. Also, it is equal-tempered. You can change this with <CTRL-N>. (Note that this will reload the default preset master, ALPHA PLUS, from the alphaPlus oper- ating system diskette.)

After you press <CTRL-N>, you can choose between equal and international tuning, and enter the number of intervals per octave (anywhere from 1-32), if you like.

That covers the features available in alphaPlus. For a quick reminder of the features and commands in alphaPlus, use the quick-reference chart that came with this package.

Don't stop reading yet, though: The next chapter has some information that will be invaluable to you when you start accumulating a lot of files of your own. Please read it before you do any serious development on the alphaSyntauri.

Chapter 9
About Files

You've been through it all, now -- or almost. We've taken you through the most important features of alphaPlus, and have touched on many others.

This chapter is about the **file structure** of alphaPlus. You've seen these files on your video display, heard them through your amplifier, used them as synthesizer features.

Now you will see them as files, learn how they are organized, and become better able to use them for your own purposes.

A file is a related body of information, stored on a diskette, and loaded into the computer's random access memory (RAM). Files have to be stored on diskettes because RAM is erased when the computer is turned off; also, RAM space is limited, and some files overwrite others when they're loaded from the diskette.

Many files on the alphaPlus system diskette are program files containing the instructions that make the computer do what it does. You don't have to be concerned about these, because you won't be doing anything with them except loading them.

We're more concerned here with files you'll be creating and modifying. These are:

- Preset Master files
- Waveform files
- Preset (envelope) files
- Notes files
- Album files

Another file type that you should learn to recognize is the FX mod file.

Preset Master Files

We've had a lot to say about preset master files, since that's where you'll be storing instruments you create. As we've discussed, the preset master groups together all the information you need for a complete description of ten instruments. (You could load several individual files, in sequence, to make up an instrument,

but you would still have to specify parameters like the vibrato rate and depth.)

There are two preset masters on the alphaPlus system diskette: **PRESET MASTER:ALPHA PLUS** and **PRESET MASTER:INSTR.**

PRESET MASTER: is a prefix that the system will attach whenever you save a preset master. You don't type in those words when you load or save a preset master -- they're just there to identify them in the diskette catalog.

Each preset master file has associated with it a **Wave Master** file, from which it takes the waveforms for the ten primary and percussion waves, and an **LFO master** file, from which it takes the vibrato and offset values.

To save a preset master: <CTRL-R>, (name), <RETURN>.

To load a preset master: <CTRL-P>, (name), <RETURN>.

Wave and LFO masters are saved and loaded automatically by alphaPlus.

Included with the alphaSyntauri software is a diskette of various preset masters. The instruments are listed in Appendix D.

Waveform Files

Five waveform files come on the alphaPlus diskette:

- WAVE:NOISE
- WAVE:SAWTOOTH
- WAVE:SINE
- WAVE:SQUARE
- WAVE:TRIANGLE

Again, note the prefix **WAVE:**. Any file on the diskette that begins with the prefix "WAVE:" is a waveform file (but not WAVE.B -- that's a period, not a colon). Remember, you shouldn't type in these prefixes. When you load a waveform file, the computer system knows what to look for.

A waveform file is just what it says: a waveform, which you can load into any channel of any instrument.

You create waveform files with Quickwave (<CTRL-X> or WAVE <CTRL-C>.

To save a waveform file: <CTRL-E>, (name), <RETURN>. (from any instrument)

To load a waveform file: <CTRL-W>, (name), <RETURN>. (into any instrument)

Preset (Envelope) Files

A Preset file contains the envelope values for both the primary and percussion channels, as well as the three control values: percussion control (PC), frequency control (FC), and attack control (AC).

These parameters are presented in the text window when an instrument is selected. You create a new envelope by altering these values.

To save a preset file: <CTRL-S>, (name), <RETURN>.

To load a preset file: <CTRL-L>, (name), <RETURN>.

Notes Files

Notes files are pieces you have recorded on the alpha keyboard. You create notes files by setting the synthesizer to record and playing the alpha keyboard. A notes file can contain up to 2000 notes.

You play back a notes file by loading it (or creating it from the keyboard) and setting the synthesizer to play back. You can set the notes file to repeat indefinitely with the Echo feature.

To save a notes file (from record/playback command menu): <S>, <RETURN>, (name), <RETURN>.

To load a notes file (from record/playback command menu): <L>, <RETURN>, (name), <RETURN>.

Album Files

Album files contain a list of notes file names. When you play an album file, it automatically calls the notes files, in sequence -- as long as they are on the same diskette.

During album playback you may advance to the next notes file in sequence by pressing <spacebar>.

To create and save an album file:

- From record/playback command menu: <Q>, <RETURN>, <RUN ALBUM>, (name of album), <RETURN>, (name of each notes file followed by <RETURN>).
- From BASIC: <RUN ALBUM>, (name of album), <RETURN>, (name of each notes file followed by <RETURN>).

To load and save an album file: (from record/playback command menu) <A>, <RETURN>, (name of album), <RETURN>.

FX Mod Files

FX Mod files are those files on the diskette with the prefix MOD:. You load existing FX Mod files to "post-process" your sounds. You will find the details about how each FX Mod affects the sound in the reference portions of this manual.

To load an FX Mod (from record/playback menu): <F>, (name of FX Mod), <RETURN>.

To turn off an FX Mod (from record/playback menu): <F>, <O>, <RETURN>.

Staying Organized

Within a few weeks, there's a good chance that you'll have files coming out your ears. There are three important steps you can take to assure that you'll know where things are and what you had in mind when you created them.

1. Keep notes.

Every time you create a file, make a note of the date, and of your intended use for the file. If it's a waveform file: what envelope did you try it with that sounded good? A notes file: is it a bass refrain for some other melody?

You know how you work, and how you use the sounds you make. We suggest only that you document them. Nothing is quite so unhelpful as a nondescript name on a catalog of a file you created weeks ago and can't remember why.

2. Name your files carefully

Develop a system to organize your files that makes sense. For instance, use associations or the same names to clarify which envelope goes with which wave.

```
Example:  PRESET:B3          (envelope)

          WAVE:B3 PRI
          WAVE:B3 PERC       (waveforms)
```

Do the same with the names of instruments in a preset master, adding cues to characterize each instrument for you. (Remember the fourteen-character limit on names, however!)

3. Segregrate your files!

Take it from us -- keep your waveforms on a waveform diskette, your presets on a preset diskette, and your preset masters on a preset master diskette. This may not seem necessary at first, but as you progress and these files multiply, you'll find that it's an incredible relief to **know** where a particular file is, and not to have to search through seven diskettes' worth of catalogs (especially in the middle of a performance!)

You'll probably be doing most of your diskette "housekeeping" from outside the alphaPlus operating system -- that is, from Apple's DOS (disk operating system). Set some time aside to go through your Apple DOS manual to learn about the commands available, and how to use them.

For convenience, we've provided a command (CTRL-D) that will let you exercise any DOS command from within alphaPlus. For example, to erase a file without exiting alphaPlus, you could just type <CTRL-D>, <DELETE (filename)>, <RETURN>.

That's about it. Oh, one more piece of advice: **back up your files!** Well, no, not every one, but those special ones that you'd really hate to lose...

The test is: is it worth the price of a diskette? If so, back it up and store it someplace safe. The best way to back up an entire diskette is with the COPYA (from Applesoft BASIC) or COPY (from Integer BASIC) program on the Apple DOS diskette. To back up selected files, use FID (also on the Apple DOS diskette).

Appendix C covers the use of these programs for this purpose. You can learn more about them from the Apple DOS Manual.

Appendix A
Setup & Initialization

Since you've found this manual, you've obviously started unpacking your alphaSyntauri digital synthesizer. If you haven't finished, do so now. When you're done, you should have the following items:

- alphaSyntauri music keyboard, 4- or 5-octave
- Cable (music keyboard to interface card)
- Keyboard interface card to the Apple II computer
- Mountain Computer MusicSystem™ , software, & manual
- Two footswitches
- alphaSyntauri diskettes (as per packing list)

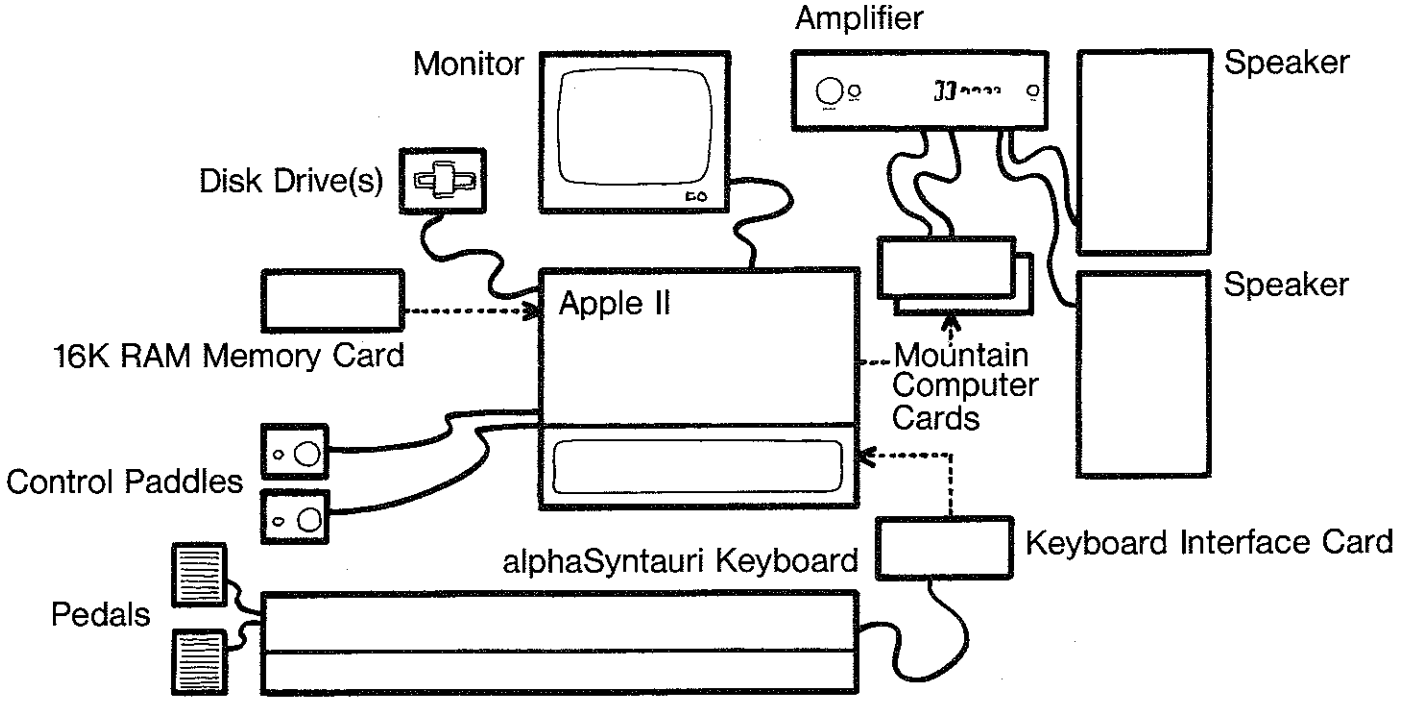
Contact your dealer if any parts are missing.

In addition, there are certain things you must provide:

- Apple II computer, 48K RAM, DOS 3.3 operating system
- RAM card (16K or greater)
- Apple disk controller and at least one disk drive
- Apple game paddles
- Video monitor or TV w/RF modulator
- Audio amplifier and speakers
- At least 1Ø blank diskettes (recommended)

Putting It Together

This diagram shows the interrelationships of the system components, properly assembled.



Your Apple system may already be assembled and working. If not, turn first to the Applesoft Tutorial and the DOS Manual for instructions on getting that system going.

****

Back already? Okay -- as things stand now, you should have your disk controller card plugged into slot 6 inside the Apple, and the disk drive cable should be plugged into the upper set of pins on the controller card. The language card or 16K RAM board should be plugged into slot Ø.

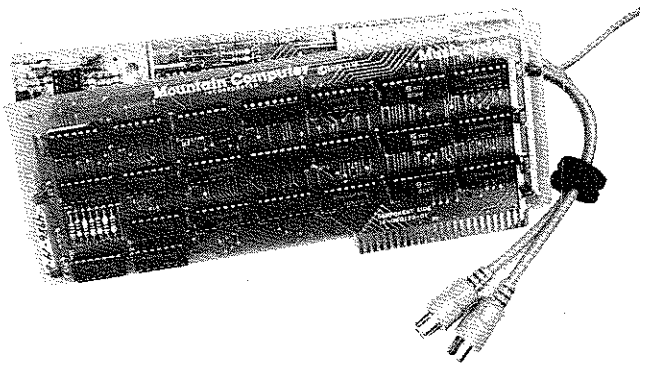
Furthermore, the paddles should be plugged into the back of the Apple, as well as your video monitor or TV and RF modulator.

We'll take it from here.

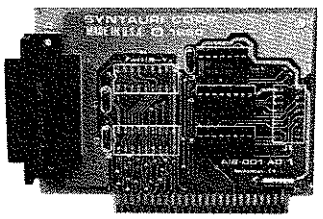
The Apple should, of course, be **turned off** during installation. This is vital!

Step 1: The Cards

The "cards" are the flat, rectangular printed circuit boards that fit into the slots in the back of your Apple. Here are the cards that help make up the alphaSyntauri synthesizer:



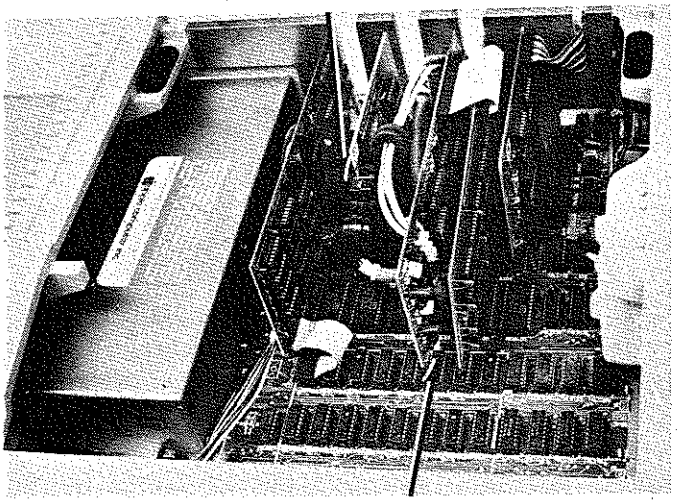
Mountain Computer Cards



Keyboard Interface Card

We suggest putting the keyboard interface card in slot 2, and the Mountain Computer cards in slots 4 and 5

slot 2



slots 4 and 5

These cards can go into any of the slots in the back of the Apple, with these restrictions:

- The Mountain Computer cards must be installed in adjacent slots (obviously, since they're attached to each other).
- The leftmost Mountain Computer card (the one with the audio jacks) must be installed in slot 1, 2, 3, or 4. This means, of course, that the rightmost MC card must be in slot 2, 3, 4, or 5. (Note that the slots are numbered from Ø to 7. The number is printed just behind each slot.)

The keyboard interface card can go in any unoccupied slot.

Install these cards now, and make a note of where you put them, because you'll have to supply the information to the computer later.

Step 2: The Cords

Now to connect the separate system components.

First, the alphaSyntauri keyboard: connect it to the keyboard interface card by means of the six-foot long cable.

Next, the footswitches: plug these into the back of the music keyboard.

Place the footswitches under the keyboard. The one plugged into the left jack should be on the left. (Portamento is the left jack, sustain the right.)

Finally, the amplifier: connect one end of the grey stereo audio cable (supplied in the MusicSystem box) to the RCA plugs that extend from the Mountain Computer cards. With your audio system OFF, plug the other end of this cable into the AUX or TAPE inputs of your amplifier. Do **NOT** use the MIC or PHONO inputs: this could harm your amplifier.

That's It

If you've connected everything according to the preceding directions, your alphaSyntauri synthesizer is ready to go. But before you turn things on, see Chapter 2 of the alphaPlus Tutorial and do it right.

Appendix B
Troubleshooting

What Went Wrong?

Well, if you're reading this, you're just plain curious, or for some reason the system didn't start up as it should have. There are several possible reasons -- and solutions -- for this.

1. **Something isn't plugged in.**
   SOLUTION: Check everything -- computer, monitor, and amplifier.

2. **The amplifier isn't on, or the volume isn't high enough.**
   SOLUTION: Again, check everything. For example, is the amplifier set to the right mode for the jack you plugged the interface cable into? Speaking of which...

3. **The keyboard cable isn't connected properly.**
   SOLUTION: Check both ends. There should be no perceptible "wiggle" at either one (be careful when you check this! Turn off the Apple beforehand, and be gentle when you handle the cards.).

4. **One or more of the cards in the back of the Apple is not inserted properly.**
   SOLUTION: Turn **off** the Apple, remove the back cover, and gently but firmly press down on each of the cards. Rock them back and forth **very slightly** to seat them in their slots. Then go through the steps for turning on the system again.

5. **One or more of the cards is not in the right slot, or not in the slot you told the system it was in.**
   SOLUTION: Read through Appendix A again, checking the slot positions carefully. Note the few restrictions on which cards can go in which slots. Then boot the system again, double-checking the slot numbers with the positions of the cards.

6. **You used a backup diskette that was defective.**
   SOLUTION: Make another backup, and try again with the original. If that works, check the new backup and make sure this one works too.

7. **Something's wrong with your hardware.**
SOLUTION: Try to isolate the problem. Try your Apple with other software. Try out the Mountain Computer software to check the Mountain Computer boards. Is the inside of the Apple getting too hot? (We recommend installing a fan.)

Appendix C
Backup Procedures

All diskettes and files should be backed up! (This means copied onto an extra diskette that is kept locked away, in a safe place.) Some diskettes provided with the system can't be copied. You can purchase backups from Syntauri Corporation.

Diskettes

First, of course, you'll need a supply of blank diskettes. Normally you have to **initialize** diskettes, which prepares them for holding your data. However, the Apple system master programs COPYA and COPY initialize diskettes as well as copy the entire contents of other diskettes unto them.

To use COPY (or COPYA):

1. Put the DOS system master diskette in the drive and turn on your Apple.
2. Most likely, the Applesoft BASIC prompt -- -- will be on the screen. Type <RUN COPYA>, and press <RETURN>. If you are in Integer BASIC (that is, if the angle-bracket prompt -- > -- is on the screen), just type <RUN COPY>.

Once the program -- either one -- is running, you have to supply the copy program with some information. How you answer will depend on whether you have one disk drive or two. You should see this on the screen:

```
ORIGINAL SLOT:    DEFAULT = 6
```

Your disk controller card should be in slot 6, so just press <RETURN> to accept this one.

When you see this:

DRIVE: DEFAULT = 1

Press <RETURN> again. Do the same for --

DUPLICATE SLOT: DEFAULT = 6

since the card in slot 6 accommodates two drives.

If you have two drives, press <RETURN> to accept --

DRIVE: DEFAULT = 2

BUT if you have only one drive, you will have to use that drive for both the original diskette and the duplicate, so type <1> and press <RETURN>.

Next you'll see the message --

-- PRESS 'RETURN' KEY TO BEGIN COPY --

but **before you do that**, remove the system master from drive 1 and replace it with the diskette you want to copy. If you have two drives, put a blank (or expendable) diskette in drive 2. If not, the program will prompt you to remove the original from drive 1 and replace it with the copy. This will happen several times.

When you have the original in drive 1 (and the blank in drive 2, if there is one), press <RETURN>. Those of you with two drives will find the process automatic from here; those with only one will have to make the switch, when prompted, several times.

When the copy is made, the screen will say --

DO YOU WISH TO MAKE ANOTHER COPY?

If you do, just type <Y> and press <RETURN> to go through the same procedure with another original (and another blank) diskette. If not, just press <RETURN>.

Files (and Initializing Diskettes)

At some point you'll probably want to copy a single file onto another diskette, either to back it up or to transfer it. You can do this directly from alphaPlus, by loading the file and then saving it on another diskette (the original, of course, remains on the diskette you loaded it from).

However, you may find it more convenient to use a program on the Apple DOS system master called FID (short for FIle Developer).

COPY and COPYA will copy an entire diskette, but any information that was already on the diskette you copy to is lost. FID lets you move files one at a time, keeping the destination diskette intact.

If you are copying files to a brand-new diskette with FID, you must first **initialize** the diskette.

When you initialize a diskette, the computer puts certain information on it to prepare it for holding files. You may have noticed that many diskettes have a program on them called HELLO. That is, by tradition, the name of the program that the computer puts on the diskette while initializing it.

You initialize a diskette from either Integer or Applesoft BASIC, after booting up with a DOS diskette (such as the DOS system master). Insert the diskette to be initialized in the drive and type the following (press <RETURN> after each line):

```
NEW
1Ø REM HELLO
INIT HELLO
```

The first line erases any existing program in Apple's memory; the second is a one-line program that doesn't really do anything except allow the diskette to be initialized (any program would do); and the third is a command to initialize the diskette with this program, and call it HELLO. (You could type <INTI> anything here, if you wanted to break with tradition.)

After you press <RETURN> the third time, the disk will make a few strange noises and spend the next few moments initializing. When

it stops, the diskette is initialized, and can be used to store files.

To use FID, insert the DOS system master and type <BRUN FID>. When the program is loaded, you'll see a menu that offers several choices, of which COPY FILES is the first.

If you choose COPY FILES, you will need to specify source and destination drives, just as you did with COPY. The main difference is that you have to specify the files you want to copy. You can do this by naming them (one at a time -- boring), or just type <=> for the filename. When the program asks you if you want prompting, answer <Y> (and press <RETURN>).

The program will then display the name of every file on the diskette, waiting for you to specify <Y> (for yes, copy it) or <N> (for no, skip this one). Every time you type <Y>, the file will be copied, and the program will prompt you to switch diskettes if you have only one disk drive.

Be sure to check the Apple DOS Manual for other uses of FID, and for more information about files and the use of the disk operating system.

GLOSSARY

Computer Terms

Boot: To start up the system by inserting a diskette (in this case, the alphaPlus system master) in the disk drive and turning on the computer.

Cursor: A symbol on the display screen that indicates the position where the next computer keyboard action will have an effect. In alphaPlus, a cursor is used to indicate which (1) text window parameter or (2) Quickwave harmonic will be changed by the next keystroke.

Diskette: A small square piece of magnetic material (5 1/4" in the Apple system) encased in heavy paper and used to store various kinds of information so that it can be read by the computer.

Drive: Peripheral device used to store information on the diskette, and retrieve it as needed.

Enter: To press a computer keyboard key and (usually) press RETURN to make it official for the computer. Some keystrokes do not require you to press RETURN, most notably those that involve pressing the CTRL (Control) key at the same time as another key.

File: An organized body of information stored on a diskette. alphaPlus uses notes files, waveform files, and others (see Chapter 8 of the Tutorial).

Inverse: Refers to characters presented on the display screen as black on a white background (white on black is normal).

Load: To bring a program file in from diskette and start it running in the computer.

Program: A set of instructions to the computer, usually stored on diskette until needed. A computer needs a program of one sort or another in order to do anything at all. Some programs run other programs, like alphaPlus, which runs Quickwave and other programs.

Retrieve: To bring information into the computer's memory from a diskette.

Syntauri/Synthesis Terms

Envelope: The "loudness history" of a tone, expressed in terms of attack, decay, sustain, and release. Graphically, a curve portraying the changing loudness of a tone from start ("attack") to finish ("release").

Exponential: Refers to envelopes whose loudness increases slowly at first, then much faster. Such envelopes are most appropriate for strings, brass instruments, and the like. See also **linear**.

Harmonic: A tone produced by sympathetic vibrations caused by another tone, called the fundamental. The frequency of a harmonic is always an integer multiple of that of the fundamental.

Instrument: In alphaPlus, a combination of specifications for various sonic elements that enable the alphaSyntauri to produce a certain sound. An instrument includes specifications for waveform(s), envelope(s), vibrato, and tuning offset (slight detuning).

Linear: Refers to envelopes that increase to maximum loudness at a steady rate. Such envelopes are most appropriate for pianos, organs, and the like. See also **exponential**.

Preset Master: In alphaPlus, a collection of specifications for ten instruments, stored on a diskette and loaded into the computer as a block.

System Master: The diskette that comes with the alphaSyntauri and includes the alphaPlus operating system.

Waveform: A representation of any sound in terms of the frequencies of its harmonics.