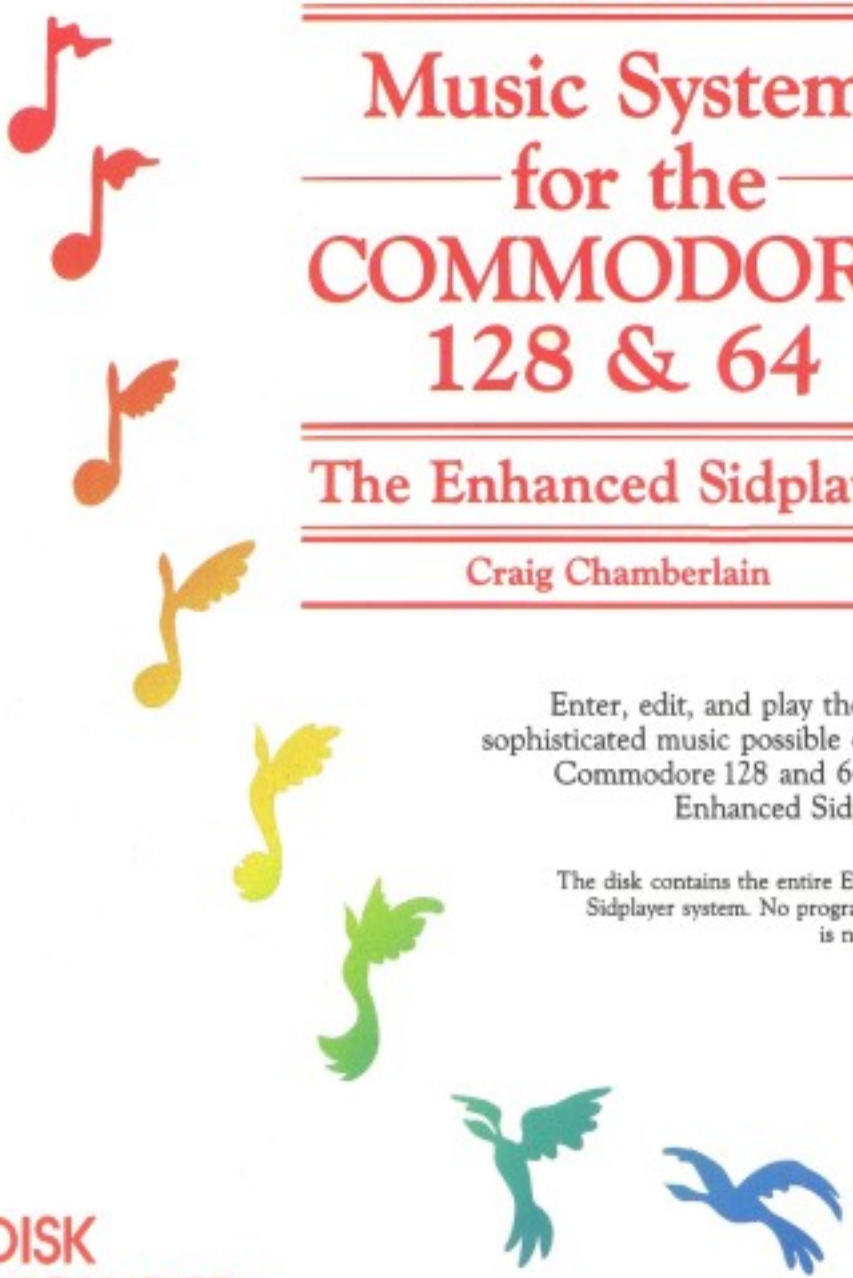
# COMPUTE!'s

# Music System for the COMMODORE 128 & 64

## The Enhanced Sidplayer

Craig Chamberlain



Enter, edit, and play the most sophisticated music possible on the Commodore 128 and 64 with Enhanced Sidplayer.

The disk contains the entire Enhanced Sidplayer system. No program entry is necessary.

**DISK INCLUDED**

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# Contents

# Foreword

### *Enhanced Sidplayer*

The *Enhanced Sidplayer* music system is an impressive upgrade to an already successful piece of software. Known for its flexibility and power, *Sidplayer* is *the* music program for the Commodore 64.

Now it's even better. With *Enhanced Sidplayer*'s Editor and Player, you can enter, edit, and play songs of almost any length and complexity.

### First, Some History

Jack Tramiel, the former president of Commodore, once said that the 64 was the "computer for the masses." The machine offered great features at a great price and introduced millions of people to computing. The 64 is still a strong seller.

*Sidplayer*—the original version—was in the spirit of Tramiel's philosophy. First published in *All About the Commodore 64, Volume Two* (COMPUTE! Books), *Sidplayer* was designed not just for people who knew a lot about music, but for *anyone* who had a Commodore 64.

Then Commodore did something interesting. In 1985 they took the Commodore 64, added numerous "wish list" improvements, and produced the Commodore 128. It's even better than the 64.

### Revised and Rewritten

Just as Commodore built the 128 from the foundation of the 64, so *Enhanced Sidplayer* was created from the original *Sidplayer*. The entire music system has been rewritten to run on the Commodore 128—*in Commodore 128 mode.* It's been extensively revised; suggestions were collected from users over more than a year's time.

The end result is a complete music system, one that's easier for beginners, but at the same time has more to offer advanced users.

**Tune In**

You'll be dazzled by the sophistication of *Enhanced Sidplayer.* You'll be pleased to see how simple it is to operate, even from the very beginning.

All the programs are included on the companion disk as a package. All are ready to run and use from the moment you put the disk in the drive.

Tune the orchestra of your mind with *Enhanced Sidplayer*—a powerful music system for the Commodore 128 and 64.

# Author's Note

A whole rest.

(That's what I'm going to take, having completed this project.)

(with apologies to Prof. Peter Schickele)

I must say that the most rewarding thing to me about *Sidplayer* is when people who think that they have no musical ability try the program anyway, and are pleasantly surprised to discover a talent they didn't know they had.

I hope you enjoy the *Enhanced Sidplayer* programs, and find the text to be helpful and clear.

Craig Chamberlain
September, 1986

# Acknowledgments

Thanks is given to those who made design suggestions, tested the programs, contributed demonstration songs, or otherwise helped in the project: Marte Brengle; Brian Copeland; Ken Fuller; Ruth Gordon, Ph. D.; Stan Halavy II; Ellen Kaufman; John Mackey; John Roache; Wayne Schmidt; Dave Schmoldt; Steve Sileo; Rick Sterling; Brian Szepatowski.

Special thanks is owed to Bob Huffman, who originated Singalong songs, and Joseph Grau and Kermit Woodall, who came up with and popularized the idea of putting pictures with songs.

Chapter 1

# Introduction to *Enhanced Sidplayer*

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# Introduction to *Enhanced Sidplayer*

Enhanced Sidplayer *is a complete music-playing and editing system for the Commodore 128 and 64 computers. Designed so that you can easily use the sound chip built into your computer,* Enhanced Sidplayer *lets you make impressive music on your personal computer.*

## Electronic Music

To fully appreciate the capabilities of *Enhanced Sidplayer,* it helps to have an understanding of how electronic music works.

When your ear hears a sound, it's actually detecting *vibrations.* The rate of vibration is called the *frequency* and determines the *pitch* of a sound. In a musical instrument, a metal string, reed, stretched membrane, or air in a tube is what vibrates, and the instrument's player usually has a method for changing the pitch.

Vibrations also have another characteristic, called *waveform.* The waveform determines the tone quality or *timbre* of a sound, and is what distinguishes the sound produced by one instrument, such as a flute, from the sound produced by another instrument, like a violin. Square, triangle, and sawtooth are common basic waveforms.

There's just one other essential characteristic—*volume.* As a string is plucked or air is blown, the volume changes over a short period of time. This pattern of changing volume levels is called an *envelope,* and is usually divided into four parts: the *attack, decay, sustain,* and *release.* During the first three parts, the volume rises to a peak level and then falls to a sustain level. When the note is released, the volume fades away to silence.

The frequency, waveform, and envelope are all essential parts of a note. A sequence of notes, in turn, creates music. Electronic music is merely a method of producing these qualities of sound by electronic means. A device which does this is called a *synthesizer*. Theoretically, it's possible for a synthesizer to imitate any musical instrument, or to produce sounds never heard before.

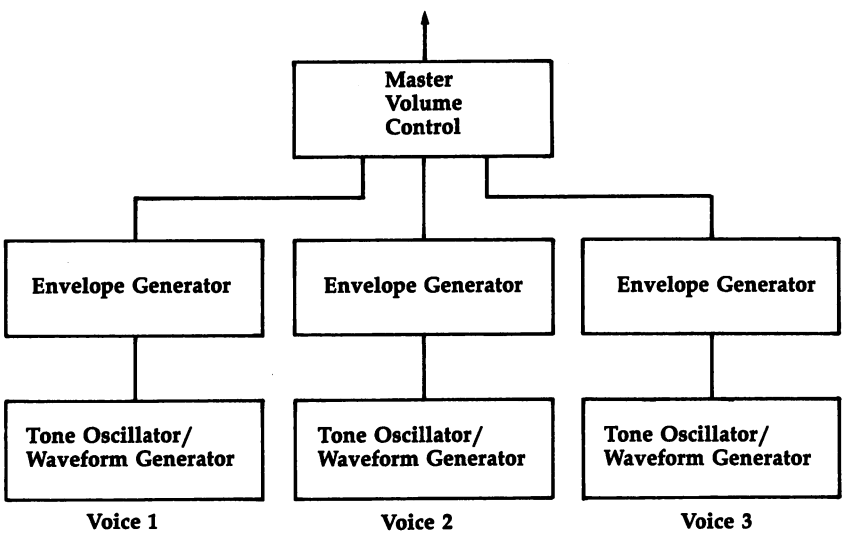
Although the actual process is much more complicated than described here, some individuals have made some incredible accomplishments in the field of electronic music. The first significant record of electronic music was "Switched-On Bach" by W. Carlos. Other notable names in electronic music are Tomita and Synergy.

## The SID Chip

The Sound Interface Device, usually referred to as the SID chip, is one of the custom chips inside the Commodore 64 and 128 computers. It's solely responsible for producing music and sound effects on the computer, and has many features for controlling sound.

The chip was designed by Bob Yannes, the system architect for the Commodore 64, and at the time (1981), it was considered a complete synthesizer on a chip.

**Figure 1-1. Producing Electronic Sounds**



The SID chip contains three tone oscillators. Each oscillator acts as one voice and can produce a tone in a range of eight octaves using one of four basic waveforms. The tone is passed through an envelope generator which regulates the volume of that voice. All three voices are then combined into one audio signal which is controlled by the master volume and sent to the television or monitor speaker. Figure 1-1 illustrates the basic process.

This is a simplified description of the actual design of the SID chip, but it does serve our purposes. Advanced features not mentioned include a filter and options for synchronization and ring modulation.

## The *Enhanced Sidplayer* Music System

*Enhanced Sidplayer* fully supports all of the features built into the SID chip. Up to three voices can be played at the same time, each with its own pitch, waveform, and envelope. *Enhanced Sidplayer* also supports the filter and all of the related filter controls, plus the synchronization and ring modulation options.

To further extend the power of the SID chip, there are additional features provided by software control, such as vibrato, portamento, transposing, automatic filtering, modulation effects, and more.

The most important thing, however, is not that *Enhanced Sidplayer* has all these features, but that it makes them easy to use. The music system includes a carefully designed editing program which lets you edit all three voices. Notes can be entered from keyboard or by joystick, and are played as they're entered for immediate feedback. Special commands are available to select things like waveform and envelope settings. The editing features and the special commands are fully explained in the following chapters.

Finally, all music created using *Enhanced Sidplayer* can be merged with your own BASIC programs. The music plays while the program runs. This opens up a wide range of possibilities, including animated screen displays that change in time with the music.

## Compatibility

To fit all these features into the Commodore 64, the versions of the playing and editing programs for the 64 use all of the computer's memory resources. This includes the RAM under the ROMs and under the I/O space. The programs also use extensive bank switching.

> **Important Note**
> It's a good idea to not use any fast-loading cartridges until you're familiar with the normal operation of the programs. The programs will definitely not work with the DOS Wedge, so if you've installed it, reboot the computer without it installed.

The programs should be compatible with most nonstandard drives used on Commodore 128 systems. If you have a fast-loading cartridge, however, you may want to remove it for now and try it later when you're more familiar with the programs. That way you'll be able to tell if the cartridge interferes with the normal operation of the programs.

Don't run the programs with the DOS Shell installed.

## The Player

A stand-alone player program and some demonstration songs have been provided so that you can hear just what *Enhanced Sidplayer* can do.

### Running the Player

To run the Player, either select it from the SID Menu program on the *Enhanced Sidplayer* disk, or load and run it manually.

To manually load the Player on a Commodore 128, make sure the computer is in 40-column mode, and then type:

```
RUN "SID PLAYER.128"
```

If you're using a Commodore 64, type in this instead:

```
LOAD "SID PLAYER.64",8
RUN
```

### Song Selection

When you run the Player, it lists the names of all the *Sidplayer* songs on the disk in three columns. *Sidplayer* songs are identi-

fied by a .MUS extension at the end of their filenames. The .MUS extension, however, isn't shown with the names on the screen.

Each of the three columns can display up to 17 songs, for a maximum of 51 songs on a single screen. If a disk contains more than 51 songs, the extra songs are listed on a second, or even third screen. If that's the case, just press the space bar to switch between the first and second screens.

After the songs are listed, an arrow cursor appears beside the song name at the top left. Use the cursor keys to move the arrow to any row and column position.

**Selecting songs individually.** To select a song, move the cursor to the name of the song and press F1 (function key 1, at the right side of the keyboard on the 64, and at the top right on the 128). The first demonstration song on the *Enhanced Sidplayer* disk is called COMMODORE, and should appear in the top left position. Just press F1 and the name COMMODORE is printed in reverse to show that it's been selected for playing.

Additional songs can be chosen simply by moving the cursor to the appropriate name and pressing F1. Remember that if there are more song names on a second screen, you can press the space bar to switch to that screen and select some of those songs.

The order in which songs are selected is significant. The Player program remembers the order in which you choose the songs, and later plays them in that order. Be sure to select the songs in the order you want them played.

To cancel a selection, move the cursor back to the song name and press F1 again. The reverse letters switch back to normal to confirm that the song is no longer selected.

**Selecting an entire disk.** One of the nicest features of the Player program is that you can set it to play all of the songs on the disk. Just press F3 to do this. The Player then selects every song not already selected.

The F3 feature doesn't change the playing order of the songs that were already selected. Thus, if you want to play all the songs on the disk, but want to hear certain songs first, you can select those songs with F1, then press F3 to select the remaining songs.

You may also cancel individual songs after using F3. This can be used if you want to hear all but one or two of the songs on the disk.

This feature will come in handy when you want to play all the songs on the disk, but two of the files are the left and right parts of a song for two computers. These files should be played simultaneously, not separately. Simply cancel the selections of the two files with F1 after you've pressed F3.

To cancel all selections and start over, press F4 (shifted F3). All of the song names are restored to normal characters to indicate that none are selected.

## Song Playing

Once you've made your selections, press F7 to start the playing. The program switches to the playing screen, loads the first song, prints its text lines, and starts playing.

If you selected the COMMODORE song, for instance, the program displays the text lines shown below and plays the music used by Commodore in their television commercials.

**TWO PART INVENTION #13 (A MINOR)**
**BY J.S. BACH**
**COURTESY CRAIG CHAMBERLAIN**

The screen shows a piano keyboard with keys that light up as the notes are played. Each voice uses a different color to highlight the keys.

When the song is done, the Player automatically loads the next song in the sequence and starts playing it. This continues until all of the selected songs have been played. The program then returns to the screen with the song names.

To stop a song before it's through and make the Player skip to the next song, press the space bar. The playing stops, and the next song in the sequence is loaded and played.

Press the F7 key to simply stop the playing—the program returns to the song name screen. The cursor should point to the song which was playing.

## Singalong Songs

Some *Sidplayer* songs also have accompanying words files. These are called *Singalong songs*. They display verses synchronized with the music.

The filename for a words file is the same as the filename for the corresponding music file, except that a .WDS extension is used instead of .MUS. The song TIMES.MUS on the *Enhanced Sidplayer* disk is a Singalong song because there's also a TIMES.WDS file.

When you select a song which has an accompanying words file, the Player automatically loads the words file after it loads the music file. Then, as the music plays, the words are displayed in the box at the bottom where the text lines are normally shown.

To view the text lines for a Singalong song, press the W key while the song is playing. The text lines then appear in place of the words. To return to the words display, just press the W key again.

### Songs with Pictures

Some songs have an accompanying picture file. The picture file is identified by a filename with a .PIC extension. As with a words file, the Player program automatically loads the picture file after it loads the music file. The picture is shown in place of the piano keyboard.

To see the text lines for a song when a picture is displayed, press the P key while the song is playing. The bottom part of the picture is replaced with the text-line box. Press the P key again to restore the full picture.

The song BLACKSHEEP.MUS on the *Enhanced Sidplayer* disk has an accompanying picture file called BLACKSHEEP.PIC. Choose BLACKSHEEP from the song-name screen to hear and see an example of a song accompanied by a picture.

### Filter Problems

One major problem with the SID chip is that there's a great variance in filtering effects from one computer to another. The same filter settings which sound fine on one computer may cause the sound to be almost inaudible on another. This variance is the greatest on older Commodore 64 computers. The filters on the Commodore 128 computers seem to be more consistent, though there are still problems.

If you notice that a voice seems to be missing when you're playing a song and you suspect that the voice is being passed through the filter, press the F key while the music is playing. This disables the filter and should let you hear the voice.

Instead of disabling the filter altogether, you may want to try pressing the cursor-up and -down keys while the song is playing. This changes an offset value that's added to the filter cutoff, and may compensate for some filtering problems.

To see what kind of filter you have, play the song FILTERDEMO on the *Enhanced Sidplayer* disk. This song plays one voice which is passed through the filter.

### Selecting Adjacent Songs

If you want to select several songs displayed next to each other—either in adjacent rows or columns—there's an easy way to select them. Press F2 on the first song, then move the cursor to the other names. Each song that the cursor lands on is selected. If a song was already selected, it's left alone.

F1 can still be used to cancel individual songs. After you've selected the desired songs, start the playing in the normal way.

This "drag" feature will stay on until you press any function key other than F1.

### Continuous Playing

The F8 key can also be used to start songs playing. Unlike using F7, however, pressing F8 plays songs continuously. After all the songs have been played, the Player recycles to the first and starts over. Play continues until the F7 key is pressed.

Another feature of the F8 key is that while F7 always makes the playing start at the beginning of the sequence, F8 can be used to make the playing continue at a song which was stopped. Say the fourth song in a sequence is being played when you press F7 (to stop the playing)—play can be restarted at that song by pressing F8 rather than F7.

### Changing Disks

When you want to hear songs on another disk, insert the new disk and press F5. A new listing of song names in three columns appears. The program is immediately ready for you to make your new selections.

If there are no *Sidplayer* songs on the disk, the program displays the message *NO MUSIC FILES ON DISK - INSERT ANOTHER DISK AND PRESS F5.* After you insert a new disk and press F5, the program searches for song names in the new directory and lists them in the columns.

### Quitting the Player

When you are done using the player, press the F6 key when you see the screen with the song names.

**Player Function-Key Summary**

F1 Select or cancel a song
F2 Select a song and turn on "drag" mode
F3 Select all remaining songs
F4 Cancel all song selections
F5 Get a new disk directory
F6 Quit the Player and return to BASIC
F7 Start playing songs in the order selected
F8 Start playing at current song with continuous playing

Nothing happens if you press the F7 or F8 keys when no songs have been selected.

## How to Use This Book

**Chapter 2** presents some basic concepts and terminology of music theory. The later chapters on the Editor should provide enough information so that you can skip this chapter, but if you have no prior experience in music you may feel more comfortable in reading it first.

**Chapters 3–6** introduce the Editor program and its four basic screens. Chapter 4 is probably the most important in terms of learning how to use the Editor.

**Chapter 7** walks you through a complete sample session of using the Editor. It shows you how to enter notes and commands to create a song, and how to play it back. If you're eager to use the Editor, skip ahead to this chapter right now. Be aware, however, that preceding chapters explain many useful and time-saving features.

**Chapters 8–15** introduce most of the commands supported by *Enhanced Sidplayer*, starting with the simplest commands for setting things like waveforms, to very advanced commands for things like modulation effects.

**Chapter 16** gives instructions on how to use two special utility programs. These programs help you add polyphonic and phrasing effects to your songs. These are advanced techniques which require some experience in using *Enhanced Sidplayer*.

**Chapter 17** tells how to create Singalong songs. You don't need to have mastered all the commands in order to use the Singalong feature. Once you can enter a song on *Enhanced Sidplayer,* you're ready to create a Singalong song.

**Chapter 18** shows how an *Enhanced Sidplayer* song can be merged with a BASIC program. The SID DEMO program is an example of this technique.

**Chapter 19** explains how to use various utility programs for managing *Enhanced Sidplayer* songs, including a convenient song-copying utility and a program to list songs on a printer.

The last chapter, **Chapter 20,** offers helpful information, including tips on the use of commands, how to create pictures for songs, and where to find more songs.

Each chapter starts with a brief overview—printed in italics—which tells you what's covered in the chapter, and gives you some reading-strategy suggestions. You can use this information to choose which chapters are the most important to you.

There's also a quick reference guide at the beginning of each chapter to help you find a particular section quickly. If you're already familiar with the earlier version of *Sidplayer,* you may wish to just skim these guides to see what's new.

No matter what your reading strategy is, be sure that you read Chapter 4, the one covering the Editing Screen. A lot of thought has been invested in the design of the Editor, and this chapter describes many features that make song entry easier and more fun.

Chapter 2

# Fundamentals of Music Theory

Notation
Pitch
Accidentals
Key Signatures
Durations
Dotted Notes
Measures
Tempo
Rests
Ties and Slurs
Dynamics
Multiple Voices

Chapter 2

# Fundamentals of Music Theory

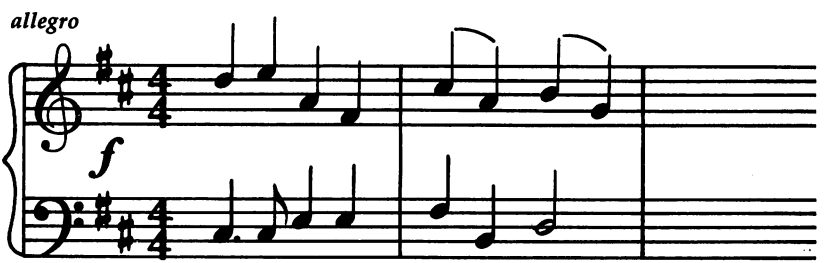
*This chapter presents fundamental concepts and terms to give you a basic understanding of music theory. After you've gone through this chapter, you should be able to read a simple piece of sheet music.*

*The Editor, however, is easy to use—so easy, in fact, that you don't really have to know how to read sheet music to enter a song. You may want to skip this chapter and come back to it later if you have questions.*

## Notation

To express music on paper, a special form of notation has been developed. This notation is capable of describing every facet of a piece of music, from generalities, such as the order in which to play the notes, to specifics, like the style in which individual notes are to be played. Figure 2-1 is an example of how music is commonly written.

**Figure 2-1. Grand Staff**




Each group of five horizontal lines is called a *staff.* At the left edge of each staff is a *clef symbol.* The clef symbol for the top staff indicates that the staff is a *treble staff.* The bottom staff uses a different clef symbol and is called a *bass staff.* Together, the two staves form a *grand staff,* which is used for displaying notes.

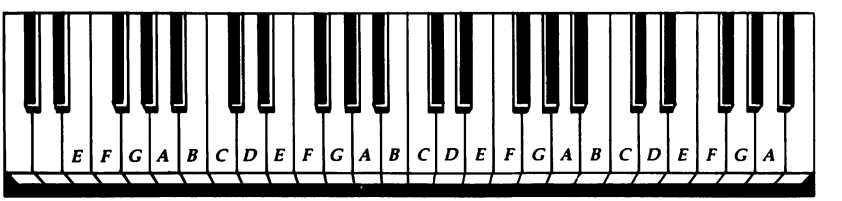
Different note characteristics are introduced one at a time below. As each characteristic is discussed, the method for expressing it in notation is also shown.

## Pitch

If you're entering a song from sheet music, most likely it will have been written for the piano. Let's start with that instrument to see how pitches work.

Look at the white keys on a piano—one of the keys is associated with a pitch that's called C. If you hit this key, the piano plays a C *pitch.* If you hit the white key immediately to the right of the C key, the piano will play a D pitch. This continues for pitches referred to as E, F, G, A, and B. (Notice that there's no H—after G, the sequence returns to A.) After the B pitch, the pitches repeat with C again.

**Figure 2-2. Piano Keyboard**




**Scale.** When you listen to the sequence of pitches in order, they form what's called a *scale.* The scale repeats with each C pitch, and repeats several times both above and below the original C.

**Octave.** Examine a single scale—from one C to the next—and you'll notice that it consists of eight pitches. Collectively, these pitches are called an *octave.* To distinguish this set of pitches from the next, the second set is said to occur one octave higher or lower than the first.

Just as the different pitches in an octave are labeled, so are the different octaves. Instead of using a letter, though, a number is used to identify an octave. The C pitch corresponding to the C key near the middle of the piano keyboard is called *middle C,* and begins *octave 4.*

Consisting of the pitches C to C, each octave is numbered relative to the octave containing middle C. The octave immediately above octave 4, for instance, is octave 5, since it starts

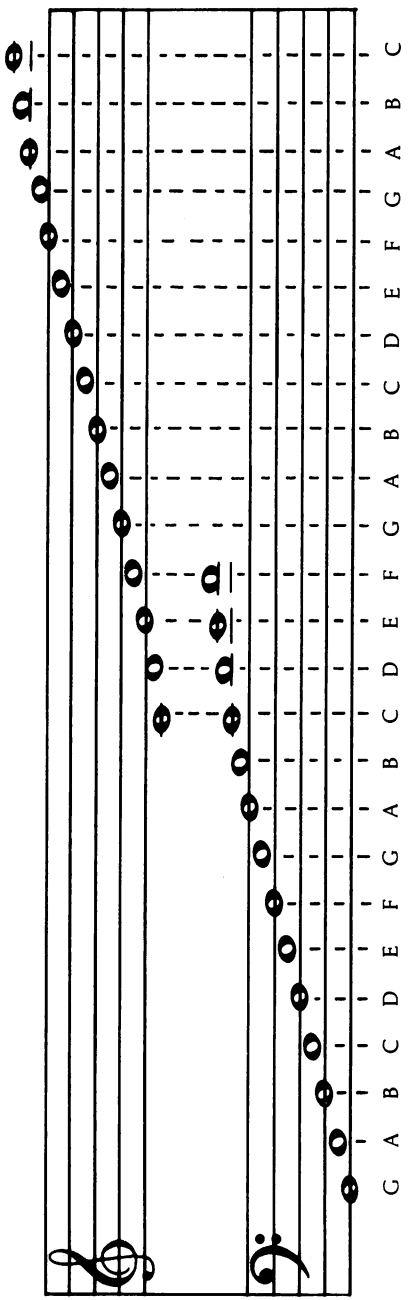



**Figure 2-3. Note Placement**

at the next higher C. The octaves which are of the most use musically are octaves 1–7.

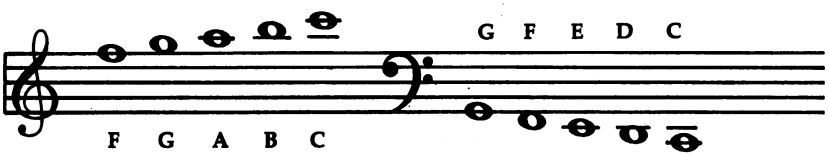
(Octaves are not numbered like this in standard music theory, but the practice is convenient for our purposes and is often used in this book.)

In music notation, the pitch value of a note is represented by its vertical position when drawn on a staff. The note C5 (pitch C in octave 5) is indicated by placing the note between the second and third lines of the treble staff. The next higher pitch, D5, is indicated by placing the note above the position for C5, except that this time the note is placed on the line. The positions for all notes alternate between being on a staff line or between staff lines. Figure 2-3 illustrates this placement.

One special case is middle C. The staff line for C4 is placed between the treble and bass staves. The separation of the two staves creates some space used for messages and special symbols which give additional information to the performer.

Another special situation is when a note is so high or low in pitch that it goes off the staff. In such instances, additional staff lines, called *leger lines,* are added. The pitch of notes drawn on leger lines is still determined in the normal way, by counting staff lines and seeing whether the note is placed on or between lines. Figure 2-4 shows some leger lines.

**Figure 2-4. Leger Lines**

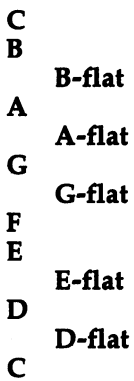



By using the grand staff and leger lines, eight octaves (octaves 1–7) can be displayed.

## Accidentals

Eight octaves, each containing seven different pitches, would seem to make a total of 56 pitches. Actually, there are some intermediate pitches between some of these notes. Called *accidentals,* they correspond to the black keys on a piano.

**Figure 2-5. Accidental Pitches**




A note is *sharp* if its pitch is a half step above its normal pitch. A note is *flat* if the pitch is a half step below the normal pitch. Notes that are not sharp or flat are said to be *natural.*

Two important observations should be made. First, every sharp note is equivalent to a flat note. C-sharp and D-flat both denote the same pitch. The difference lies in the viewpoint—whether the intermediate pitch is a half step above C or a half step below D.

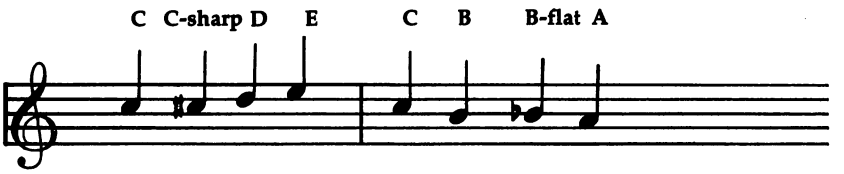
The other important point is that not all notes can have a corresponding sharp or flat value. There's no intermediate pitch between E and F, or between B and C. If someone talks about E-sharp, they're really talking about F, because the next step above E *is* F. Likewise, F-flat is the same thing as E. This works in a similar way for the notes B-sharp and C-flat. Note names like these are not used very often.

By convention, accidentals are usually expressed only in terms of sharps or flats, not in combinations of both. If you want to talk about the pitches G-sharp and E-flat, you would either talk about G-sharp and D-sharp, or A-flat and E-flat.

Thus far, the words *sharp* and *flat* have been used for accidental pitches. Another way to indicate that a note is sharp or flat is to use a special symbol. The symbol for a sharp note looks like a slanted pound sign ( ♯ ). The symbol for a flat note looks something like a lowercase letter *B* ( ♭ ). The natural symbol ( ♮ ) is normally not used in front of natural notes.

To show that a note on the grand staff is a sharp or flat note, the appropriate accidental symbol is placed just before the note, as shown in Figure 2-6.

**Figure 2-6. Accidental Symbols**




Including the accidentals, one octave consists of 12 different pitches. With eight octaves, the total is now 96 different pitches. Most songs use only the notes coming from this palette of 96 pitches.

## Key Signatures

In actual practice, a typical song won't use all 12 of the available pitches in a given octave. Usually just 8 of the 12 are used, so you're back to 8 pitches per octave. The selection of pitches used is determined by the *key* in which the music is written.

The topic of pitch was introduced by starting with a C scale. This is a sequence of pitches, starting on C, that continues for one octave. Let's examine the relationship of these notes to the 12 in the entire octave. If the distance between each of the 12 pitches is called a *half step*, the sequence of notes forming the C scale is determined by the following steps: whole, whole, half, whole, whole, whole, half—where a whole step equals two half steps. In the following, the ½ symbol shows where the half steps occur in the scale.

**C D E -½- F G A B -½- C**

Now apply that sequence of steps again, but this time start the scale at the note A.

**A B C ♯ -½- D E F ♯ G ♯ -½- A**

This scale contains three sharp notes, as opposed to the earlier scale which contained none. The sharp notes replaced their natural counterparts. This scale is said to be written in the *key of A*. A song written in the key of A will, for the most part, use only this set of pitches in each octave.

You can start a scale on any pitch, and for every starting note, there's a different combination of sharp or flat pitches

used. Here's another example, this time using flats.

**B ♭ C D -½- E ♭ F G A -½- B ♭**

This is the key of B-flat. The notes were determined by using the same sequence of half and whole steps, but beginning with the note B-flat. The key of B-flat contains two flat notes, B-flat and E-flat. The notes B-natural and E-natural will not normally be used by a song written in the key of B flat.

Here's a complete listing of all the major keys. The keys with less than five sharps or flats are the ones used most often.

**Table 2-1. Keys**

| Key | Notes | | | | | | | | Sharps/Flats |
|---|---|---|---|---|---|---|---|---|---|
| C | C | D | E | F | G | A | B | C | 0 |
| G | G | A | B | C | D | E | F♯ | G | 1♯ (F♯) |
| D | D | E | F♯ | G | A | B | C♯ | D | 2♯ (F♯, C♯) |
| A | A | B | C♯ | D | E | F♯ | G♯ | A | 3♯ (F♯, C♯, G♯) |
| E | E | F♯ | F♯ | A | B | C♯ | D♯ | E | 4♯ (F♯, C♯, G♯, D♯) |
| B | B | C♯ | D♯ | E | F♯ | G♯ | A♯ | B | 5♯ (F♯, C♯, G♯, D♯, A♯) |
| F♯ | F♯ | G♯ | A♯ | B | C♯ | D♯ | E♯ | F♯ | 6♯ (F♯, C♯, G♯, D♯, A♯, E♯) |
| C♯ | C♯ | D♯ | E♯ | F♯ | G♯ | A♯ | B♯ | C♯ | 7♯ (F♯, C♯, G♯, D♯, A♯, E♯, B♯) |
| F | F | G | A | B♭ | C | D | E | F | 1♭ (B♭) |
| B♭ | B♭ | C | D | E♭ | F | G | A | B♭ | 2♭ (B♭, E♭) |
| E♭ | E♭ | F | G | A♭ | B♭ | C | D | E♭ | 3♭ (B♭, E♭, A♭) |
| A♭ | A♭ | B♭ | C | D | E♭ | F | G | A♭ | 4♭ (B♭, E♭, A♭, D♭) |
| D♭ | D♭ | E♭ | F | G♭ | A♭ | B♭ | C | D♭ | 5♭ (B♭, E♭, A♭, D♭, G♭) |
| G♭ | G♭ | A♭ | B♭ | C♭ | D♭ | E♭ | F | G♭ | 6♭ (B♭, E♭, A♭, D♭, G♭, C♭) |
| C♭ | C♭ | D♭ | E♭ | F♭ | G♭ | A♭ | B♭ | C♭ | 7♭ (B♭, E♭, A♭, D♭, G♭, C♭, F♭) |

If you study Table 2-1 carefully, you'll notice some patterns. For example, each key that contains sharp notes contains F♯. The key of G has F♯ as its only sharp note. The key of D keeps the F♯, but adds C♯. Each successive key adds one more sharp note, while retaining all of the sharps from preceeding keys. This pattern works in the same way for keys containing flat notes, starting with the note B♭.

You can determine the key in which a piece of music is written by counting the number of sharp or flat symbols near the clef symbols on the grand staff. If no sharp or flat symbols appear there, the music is written in the key of C. If one sharp symbol is displayed, the piece is written in the key of G. Two sharp symbols mean that the key of D is to be used, and so on.

Likewise, one flat symbol indicates the key of F, two indicate the key of B-flat, on up to seven flat symbols, which indicate the key of C-flat.

Just as the number of sharp or flat symbols is important, so is their position. The sharp symbol for F♯ is always placed on the line that designates note F. Furthermore, when a sharp symbol is put next to the clef symbol, it has the effect of automatically placing a sharp symbol in front of every note on that line. A sharp symbol on line F means that all notes placed on the grand staff in F positions are to be played as F-sharps. Of course, the same is true when flats are used. A flat symbol placed near the clef on the line for B means that all B notes should be played as B-flats.

Sharp and flat symbols placed beside a clef symbol are called a *key signature*. The use of a key signature saves a lot of work when writing music, because it's no longer necessary to place a sharp or flat symbol before each sharp or flat note.

Figure 2-7 contains some examples of key signatures. Since all keys that contain sharps contain F♯, all of these keys have a sharp symbol at the F position. Each successive key adds a sharp symbol at a new position while retaining all the old ones.

Note, too, that a sharp or flat on one line affects not only the notes on that line, but the corresponding notes in the octaves above and below as well.

## Durations

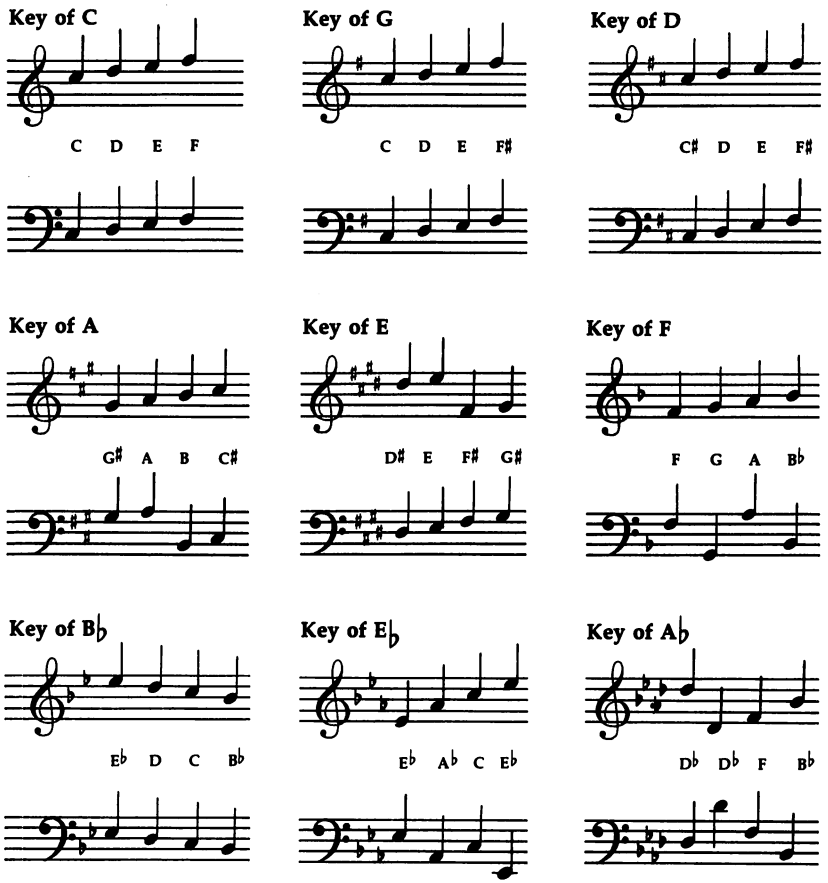
The vertical position of a note on the grand staff determines its pitch. The horizontal direction of the staff indicates time.

A sequence of notes is played—in order—from left to right, just as text is read. To play the notes at an even speed, one note is played every *beat*. By putting the pitches together in a pleasing order, you'll create a melody, the basis for a song.

Pitch, however, is only one major characteristic of a note. Another important quality of a note is its *duration*. In a song, notes are not always played at the rate of one note every beat. Sometimes a note may be played for two beats. Other times, two notes might be played within the span of one beat—in other words, each note is half a beat long. Thus, every note on the staff not only must show its pitch, but its duration as well.

The duration of a note is indicated by its symbol. The note most often used thus far in the book is formally called a

**Figure 2-7. Key Signatures**

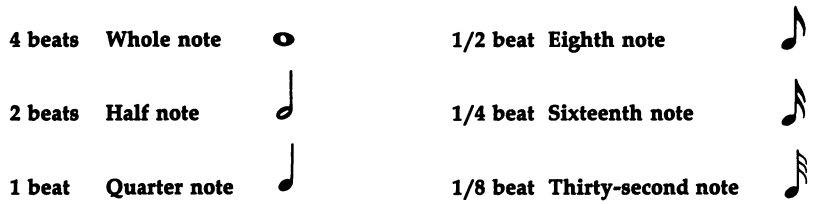



*quarter note*, and is drawn with a stem and a filled-in oval at the bottom. If we assume a quarter note plays for a duration of one beat, then twice that length, two beats, is indicated by a *half note*, which looks like a quarter note except that the oval is not filled in. Twice the length of a half note is a *whole note*, which plays for four beats and looks like a half note without a stem.

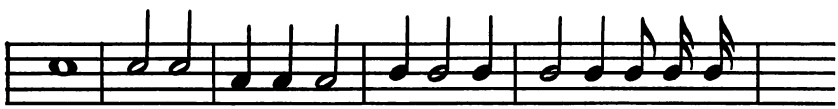
In the other direction, for durations less than one beat, the symbol for a quarter note is used with flags added at the top of the stem. An *eighth note* plays for half a beat and has one flag. A *sixteenth note* has two flags. Four sixteenth notes

are equal in duration to one quarter note. Thirty-second and sixty-fourth notes do exist, but they're not used very often. Figure 2-8 shows these notes—take a moment to look at their shapes.

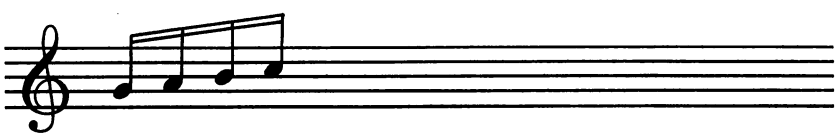
**Figure 2-8. Note Duration Symbols**



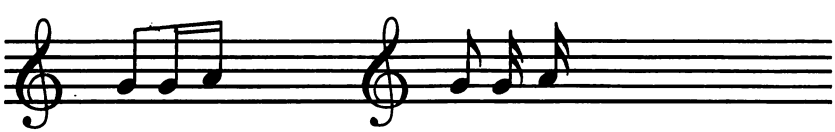

The following combinations (a combination is shown within the vertical bars) are all equivalent in duration to one whole note.



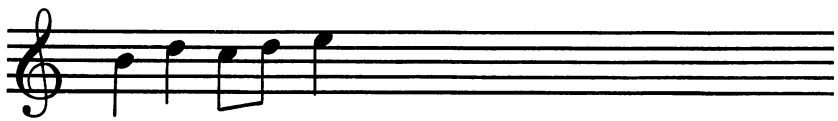
One convention in displaying durations less than one beat is to combine notes of equal duration in sets. Two eighth notes can be drawn by extending the flag from the first to the top of the stem of the second. This can also be done with sixteenth notes, except that two lines connect the tops of the stems, because sixteenth notes have two flags.



Notes of different durations can be combined. The notes shown on the left are the same as those shown on the right.



Notes can even be drawn upside down. This is done only when the notes would appear near the top of a staff. The oval portion of the note stays in the same place, so the pitch isn't affected. Duration is also not affected.

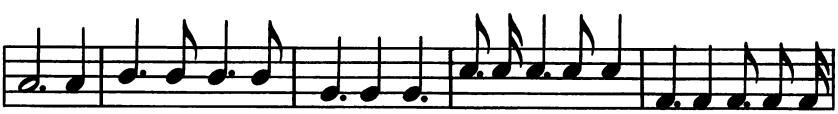


## Dotted Notes

With just a few different durations, it's possible to create a variety of different rhythms. But there are still some durations which cannot be expressed using only the notes you've seen so far. For example, how do you show that a note should be played for three beats? Situations like this require the use of *dotted notes.*

When a dot is placed after a note, it means that the note should be played for one and a half times the normal duration. A dotted half note, then, plays for three beats, since a half note is two beats, and half of that is one. A dotted whole note plays for six beats (whole note = four beats; half of that = two beats). And a dotted quarter note? It plays for one and a half beats.

Using the dot, here are some more note combinations which total four beats.



Notice that the dot always appears to the right of the note. If you see a dot placed above or below a note, it has a different meaning and doesn't affect the note's duration. These dot placements are explained in a later chapter.

## Measures

A song is just a long sequence of notes of different pitches and durations. To make it easier to deal with pitches, these notes are separated into groups called octaves. Likewise, to make it easier to work with a sequence of notes, the notes are often

divided into groups called *measures*. Each measure consists of the same number of beats, commonly four.

In sheet music, a measure is formed by placing a vertical line called a *bar* between each group of notes on the staff.


Measures are mainly used for organization and reference. It's much easier to refer to a note as being the second note in the twenty-third measure than it is to refer to the one hundred forty-seventh note.

Each measure must have the same total duration. Since this total duration is often four beats, or one whole note, you can see why the note for one beat is called a quarter note.

## Tempo

You've seen that the length of a note is expressed in beats, and that notes can be organized into groups called measures, which have the same number of beats. But just how long is a beat?

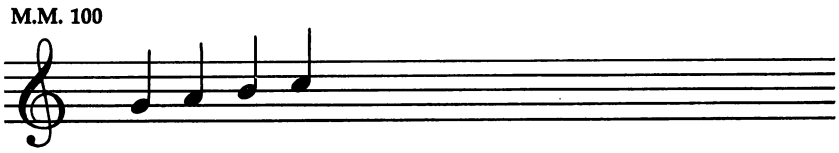
A beat is simply a unit of time. The shorter the amount of time for each beat, the faster they occur. If the amount of time for each is longer, fewer beats occur in the same length of time.

The rate at which the beats occur is called the *tempo*. The faster the tempo, the more quickly the notes are played. At a slower tempo, each beat lasts for a longer amount of time. Another way to look at it is to say that for a fixed amount of time—such as one minute—there are more beats at a fast tempo than there are at a slow tempo.

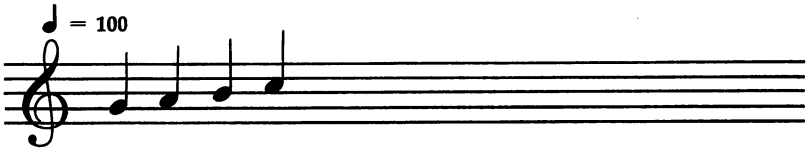
The relationships of quarter notes to half notes, whole notes, sixteenth notes, and so on still holds—a half note is always twice as long as a quarter note. Only the actual time lengths change.

The standard method of measuring a tempo is to specify the beats per minute. An average tempo is about 100 beats per minute. A tempo of 60 means that there's one beat every second, which is rather slow. A tempo of 150 is more than two beats every second, which is relatively fast.

The tempo is a very important part of a song. A beautiful melody can be ruined if it's played too fast or too slow. Therefore, sheet music usually indicates the proper tempo. At the top of the sheet music you should find the letters *M.M.*, followed by a number. This number indicates the beats per minute, and defines the tempo that should be used in playing the song.




Another way to show tempo is to replace the M.M. with a quarter note and an equal sign. The quarter note is used because it represents one beat.




(Using a number for the tempo is convenient because it can be used when setting a metronome.)

But there's another method of specifying the tempo—words like *adagio* or *allegro,* just two examples of the tempo indicators you can spot on sheet music. Here's a list of the most commonly used tempo terminology, in order from slowest to fastest.

| | |
|---|---|
| **lento** | Very slow |
| **grave** | Slow, solemn |
| **largo** | Broad |
| **adagio** | Leisurely |
| **andante** | Walking |
| **andantino** | A little faster walk |
| **moderato** | Moderate |
| **allegretto** | Rather fast |
| **allegro** | Fast |
| **vivace** | Lively |
| **presto** | Very fast |
| **prestissimo** | As fast as possible |

These values may be modified by one of the following words.

**molto** Very
**meno** Less
**piu** More

The tempo marking *moderato* indicates medium speed, which roughly corresponds to M.M. 100.

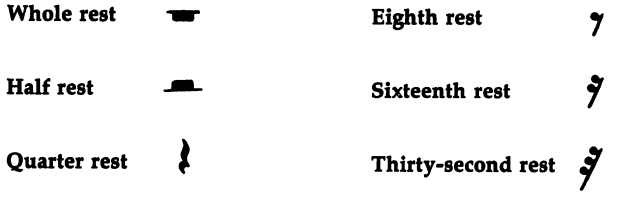
## Rests

Pitch and duration are the two most important parts of a note. There's something similar to a note, however, which has only duration and no pitch. It's called a *rest*. For the specified amount of time, no tone is produced.

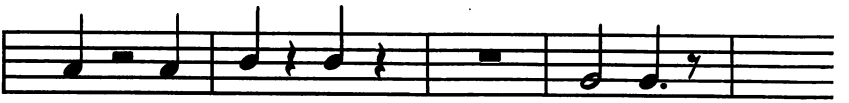
There's a different rest symbol for each duration. Because the idea of pitch doesn't apply, the vertical position of a rest doesn't matter, so it's usually placed in the middle of the staff.

A whole rest is drawn as a small block placed right below the second staff line. A half rest looks the same except that the block is placed on top of the third staff line. A quarter rest is a symbol which defies description. Eighth, sixteenth, and thirty-second rests are all drawn as slanted stems with the proper number of flags to the left of the stem. Figure 2-9 shows these rest symbols.

**Figure 2-9. Rest Symbols**

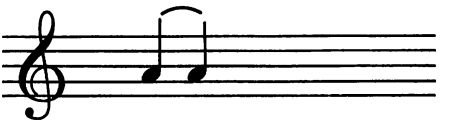



Here are some combinations of notes and rests. They've been divided into measures to show that each group has a total duration of four beats.



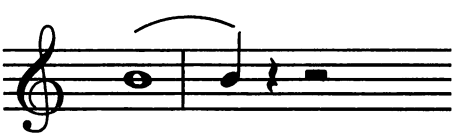
### Ties and Slurs

Another special symbol is called the *tie* symbol. Two notes are tied together when connected by a symbol that looks like a curved line or arc. The tie means that the two notes are to be played together as one long note, with no break in volume. Thus, two quarter notes tied together will play just like a half note.

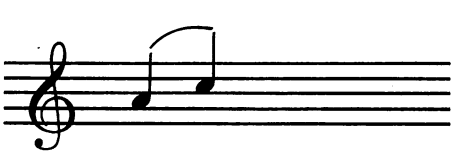


Ties are used because they can extend across one measure into another. In the following two sequences of notes, each sequence sounds the same when played, but the first cannot be divided into measures.

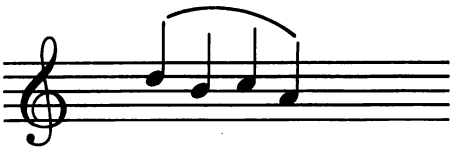
The next example shows how a tie can create a note five beats long.



Another application of the tie symbol is to connect notes of different pitches. In this use, the tie is called a *slur* and may be used within a measure as well as between measures. Playing two quarter notes slurred together is like playing a half note which changes pitch half way through playing.



Sometimes a tie symbol is used over a long stretch of notes. This creates a smooth, *legato* effect when the notes are played.



If the tie symbol occurs over several measures, it indicates phrasing and doesn't mean that the notes should be played in a legato style.

## Dynamics

Yet another major characteristic of a note is its *volume.* Some parts of a song can be emphasized if they're played loudly. Other parts may be subdued by being played quietly. The level of loudness or softness of a piece of music is referred to as *dynamics.*

Dynamics are indicated on sheet music by letters which appear between the two staves of the grand staff. These letters are listed below, in order from loudest to softest.

**fff** (fortississimo)
**ff** (fortissimo)
**f** (forte)
**mf** (mezzo forte)
**mp** (mezzo piano)
**p** (piano)
**pp** (pianissimo)
**ppp** (pianississimo)

These volume levels range from very very loud (fff) to very very soft (ppp). Extremes such as ffff or pppp are not often used.

The term *dynamics* refers to the general volume level of a song, and shouldn't be confused with the concept of an envelope, which describes the changes in volume as an individual note is played.

## Multiple Voices

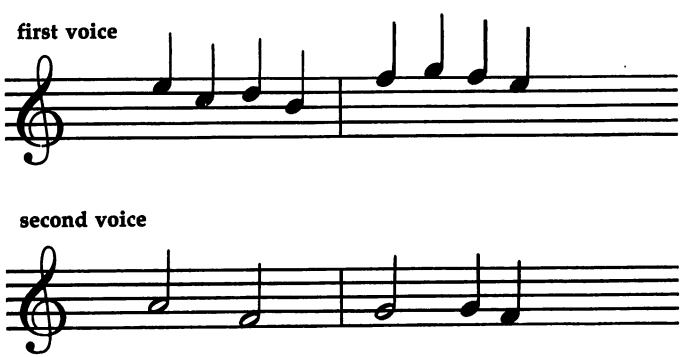
You've seen the essential characteristics of individual notes and how notes can be combined into groups called measures. The music can then be sung or played on an instrument. The next step is to have several voices or instruments playing at the same time.

A set of notes for one singer or one instrument is generally referred to as one *voice*. With two voices playing simultaneously, one voice can play a melody while the other plays a bass part to add more body to the song. If a third voice is added, it can be used for harmony or for percussion effects such as drums or cymbals.

Each voice is independent of the others, and can play its own notes of different pitches and durations. This presents a problem; there must be a way to synchronize the voices. They should start together and end together.

Fortunately, the concept of tempo and the use of measures solve this problem. Though the voices may be independent, they must share the same tempo. The tempo establishes a beat which all voices can follow. The notes in each voice are divided into measures. Then, even though the durations within a measure may differ for each voice, at least the voices will always be on the same measure at any given instant. Figure 2-10 illustrates this idea.

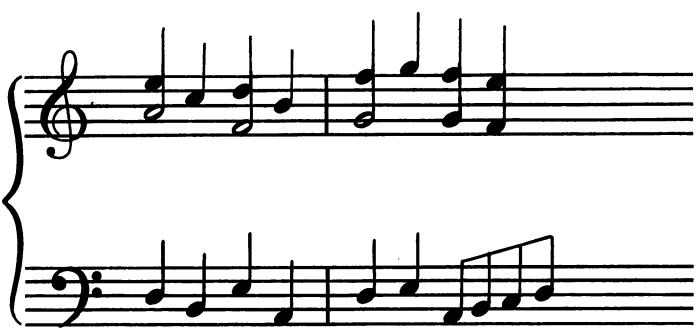
**Figure 2-10. Multiple Voices, Example 1**



The horizontal direction of the grand staff corresponds to time. Because multiple voices are synchronized according to tempo, it's possible to represent more than one voice on just one grand staff. Within each measure, the notes for all of the voices are drawn. It's a rather simple matter to determine which notes go with which voice.

Usually, the topmost notes are for the first voice, the notes below those for the next voice, and so on, with the bottom-most notes being for the last voice.

**Figure 2-11. Multiple Voices, Example 2**



# Chapter 3

# The *Enhanced Sidplayer* Editor

Chapter 3

# The *Enhanced Sidplayer* Editor

*The Editor is used to enter, edit, and play back as many as three voices of a song. The program's numerous features make editing as easy as possible.*

*This chapter introduces the Editor—including its four principal screens—and shows you how to use the Main Menu items.*

*The Main Menu is fairly self-explanatory, and since some of its features are explained in Chapter 7 ("A Sample Session"), you may want to skip this chapter for now.*

## Loading Instructions

To run the Editor, you may either select it from the SID Menu program on the *Enhanced Sidplayer* disk, or load and run it manually.

To manually load the Editor on the Commodore 128, make sure the computer is in 40-column mode, and then type:

```
RUN "SID EDITOR.128"
```

If you're using a Commodore 64, type in this instead:

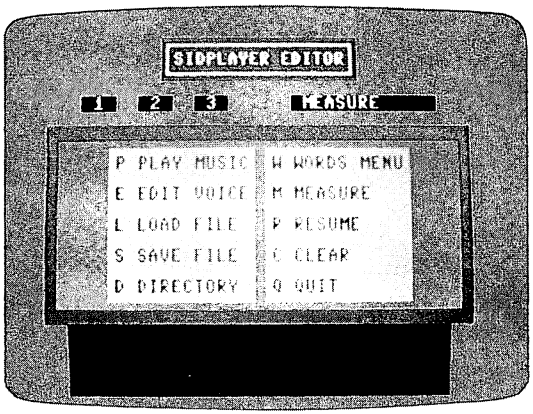
```
LOAD "SID EDITOR.64",8
RUN
```

SID EDITOR.128 and SID EDITOR.64 are both actually short boot files which display a title screen and then load the main Editor program. (EDITOR2 is the filename of the main program.)

After the program has been loaded and run, the Main Menu appears. It should look like the screen shown in Figure 3-1.

If you have trouble getting the Editor to run, see the section "Compatibility" in Chapter 1.

**Figure 3-1. The Main-Menu Screen**




## The Main Menu

As you can see from Figure 3-1, the Main Menu contains ten selections.

| | |
|---|---|
| **P PLAY MUSIC** | **W WORDS MENU** |
| **E EDIT VOICE** | **M MEASURE** |
| **L LOAD FILE** | **R RESUME** |
| **S SAVE FILE** | **C CLEAR** |
| **D DIRECTORY** | **Q QUIT** |

Above the menu are four dark boxes. The three on the left show voice numbers, and the one on the right contains the word MEASURE.

Below the menu is the text-line box. It's initially empty.

To select an item from the Main Menu, press the appropriate key.

**P Play the song currently in memory**
**E Change the current editing voice**
**L Load a music file from disk**
**S Save a music file to disk**
**D Display a directory of music files**
**W Switch to the Singalong Screen**
**M Play at a measure**
**R Resume playing if possible**
**C Clear the song in memory**
**Q Quit the Editor and return to BASIC**

These items are all explained in more detail later in this chapter.

## The Four Screens

Use the F1 and F3 function keys to switch to the other screens.

To switch from the Main Menu to the Editing Screen, press F3. The Editing Screen is where notes are entered and changed.

Press F3 again to switch to the Command Screen. This is the screen where various commands are entered for controlling things like tempo, volume, waveforms, and envelopes.

Press F3 once more to switch to the Display Screen. This screen displays the current values of all parameters for each voice. You can watch them change as the music plays.

Another press of the F3 key returns you to the Main Menu.

You can move to the screens in reverse order by pressing F1. The four screens are linked in a closed loop so that you're never more than two keypresses away from any other screen.

As you may have noticed, the Editor is packed with features. This brief tour of the screens may be rather intimidating. Rest assured that you can still enter songs without using all these features.

## Music-File Directory

Press the D key from the Main Menu to see a directory of music files on the disk currently in the drive. Like the Player program, the song filenames are listed without their .MUS extensions. This time, however, the block count for each file is also given, so the filenames are listed in only two columns.

If there are more filenames than will fit on one screen, the Editor displays the first screen, then waits for you to press the space bar to continue to the next. If you don't want to see any more of the screens, press the F1 key instead of the space bar to exit the directory early and return to the Main Menu.

On the last screen, the Editor prints the number of free blocks remaining on the disk, and waits for you to press the space bar or F1 key before returning to the Main Menu.

If there are no .MUS files on the disk, the Editor simply displays the message *NO MUSIC FILES ON DISK.*

### Brief Directory

To get a brief directory display, showing only the disk title and the free-block count, press SHIFT-D instead of D.

## Loading a Song

Press the L key to load a music file from disk. The Editor clears the song currently in memory, loads the new file, and prints the text lines in the box at the bottom of the Main-Menu Screen. The song is ready for you to edit or play.

### Loading Errors

If an error occurs during a load, an appropriate message appears above the menu. The Editor will wait for you to press any key to acknowledge the error. The song previously in memory is also cleared.

The exception to this is if the error is *DEVICE NOT PRESENT* or *FILE NOT FOUND*, in which case the previous song is *not* cleared.

> If you're running the Commodore 64 version of the Editor, another type of error may occur—the music file may be too large for the machine's memory. If this happens, the error message *FILE TOO LARGE* prints above the menu in either black or red. If it's displayed in black, the music file may have overwritten the words file currently in memory (if one had been loaded), so both the music and words will be cleared.
>
> If the error message is in red, it means that some system memory was overwritten by the load, and the Editor may not operate correctly. In this case the Editor returns to BASIC when you press a key to acknowledge the error, and you must load and run the Editor again.
>
> The EXTRACT.64 utility in Chapter 19 can be used to break some large files into smaller parts if you're having trouble loading large music files on the Commodore 64 version.

### Wildcard Caution

You may use the asterisk (*) wildcard in a filename for loading, but use it with caution. When the asterisk wildcard is used, the .MUS filename extender is ignored, and the first file on the disk matching the load filename is loaded. If a music file has an accompanying words or picture file, it's possible

that one of these files will be loaded instead. The Editor is sometimes able to detect when a nonmusic file has been loaded and will report the *NOT A MUSIC FILE* error message.

When the Editor cannot detect the error, it'll be apparent from the new text lines and the voices that something has gone wrong.

### Load with Merging

You can merge a new song with the one currently in memory by pressing Shift-L when you load a file. The song in memory is not cleared. This is an advanced application described in more detail in Chapter 19.

## Playing a Song

Once you've loaded a song, you can immediately play it. Press the P key and the screen switches to the same display—complete with piano keyboard—as you saw in the SID Player program. The music starts to play.

### Slow Playing

While the music is playing, you can press the CTRL or Commodore key to make the song play at one-third its current tempo. This is handy if you want to listen carefully to a certain passage in a song. The song can also be made to play slowly if you have a joystick plugged into port 2 and you push the joystick in any direction.

Note that the tempo is slowed only as long as you have the CTRL or Commodore key pressed down, or push on the joystick.

### Fast Forward

Press the left SHIFT key while a song is playing to increase the playing speed to three times the current tempo. This fast-forward playing is handy if you want to quickly skip over some of a song. If you have a joystick plugged into port 2, activate fast forward by pressing the joystick trigger.

### Voices On and Off

Press the 1, 2, and 3 keys while the music is playing to turn voices on or off. Press the RETURN key to turn all voices back on. You can also press SHIFT–RETURN (press both the SHIFT

and the RETURN key simultaneously) to turn only the current editing voice on, but you'll need to use the right SHIFT key to do this because the left SHIFT key is reserved for fast-forward playing.

When the song is finished, the Editor automatically returns to the Main-Menu Screen. To stop a song early and return to the Menu, press the space bar while the song is playing.

When you return to the Main Menu, you may notice that some of the voice numbers above the menu are not highlighted. This shows which voices had been turned off while the song played. You can also press the 1, 2, 3, RETURN, and SHIFT–RETURN keys on the Main Menu to turn voices on or off when the music isn't playing.

## Resume Playing

If you stop a song before it's done, playing can be resumed. Press the R key, and the Editor switches to the playing screen and continues where it left off.

The Resume feature is not available if a song has not yet been played, or if the song played all the way to the end, or if the song has been modified in any way since the playing was stopped.

## Playing at a Measure

Playing starts at the beginning of a song when you press the P key. If measure markers have been used in a song, you can start playing at a measure marker instead.

When you press the M key, the Editor places a cursor in the MEASURE box above the menu, and waits for you to enter a number from 0 to 999. Enter a number and press RETURN—the Editor starts playing at the first occurrence of a measure marker with that number. If there's no measure marker with that number in the song, the error message *MEASURE NOT FOUND* prints instead.

To play a song starting at a measure, the Editor rapidly and inaudibly plays the song up to that measure, so that all the settings for things like waveforms and envelopes will be correct at that point. That's why there may be a brief pause before the music starts. This pause is longer if the requested measure is deeper into the song.

If you press the M key and hit RETURN without typing a measure number, the previous measure number is used. If no measure number had been entered earlier, playing starts at the beginning of the song.

## Saving a Song

To save the current song to disk, press the S key. The Editor shows the number of disk blocks which will be used by the file, and asks if you want to change the song's text lines. If you want to add text lines to a song, or change the current text lines, press the Y key. Otherwise, press the N key to continue with the save operation. To cancel the save altogether, press any other key.

### Changing the Text Lines

If you decide to change the text lines, the Editor clears the current text lines (if there are any) and puts a cursor in the top left corner of the text-line box. You can then enter as many as five lines of up to 32 characters each.

Only the standard letters, digits, and punctuation characters can be entered. Other characters, such as shifted letters, are ignored. To enter a blank line, just press RETURN. After you've pressed RETURN on the fifth line, the Editor continues with the save.

The standard use of text lines is to give the full title of a song, identify the composer, and give credit to the person who entered the song.

Notice that the number of blocks required to store the music file on disk may change after new text lines have been entered.

The next prompt asks you for the filename to be used in saving the music file. The filename may be up to 12 characters long, and the characters may be the usual letters, digits, and some punctuation symbols. Don't type the .MUS filename extension, since the Editor automatically adds that to the filename.

If you want to cancel the save at this point, simply press RETURN without entering a filename.

The Editor writes the music file to disk when you press the RETURN key after entering a filename.

### Saving Errors

If an error, such as *DISK FULL*, occurs while the file is being saved, the Editor prints an appropriate error message and waits for you to acknowledge it by pressing any key. This may result in a partially saved file on your disk. You can distinguish a partially saved file because it will have a length of 0 blocks and an asterisk will appear beside its file type when you list the disk directory. *Never* scratch a partially saved file. Instead, remove it by validating the disk (128 owners can use the COLLECT statement; the equivalent for the Commodore 64 is OPEN 15,8,15,"V0":CLOSE 15).

### Scratch and Save

One error which gets special handling is the *FILE EXISTS* error. This error occurs when you try to save a file with a filename already on that disk.

When this happens, the Editor prints the *FILE EXISTS* error message, but also displays a prompt asking if you want to replace the existing file with the new one. If you do, press the Y key, and the Editor scratches the existing file and tries to save the file again. If you press any key other than Y, the save is canceled, and the existing file is not erased.

When the Editor scratches a file, it sends a Scratch command to the disk drive. *The SAVE@ method of saving and replacing a file is not used.*

### Streamlined Save

When you're busy working on a song, it's a good practice to periodically save your work. To make periodic saves easier, a streamlined save is available.

When you press SHIFT-S, the Editor bypasses the usual text-line change prompt, and prints the filename prompt with the previous filename already entered. You can then just press RETURN to save using that filename, or if you use version numbers, you can delete the old number and type the new one before pressing RETURN.

### Switching Devices

If you have more than one disk drive connected to your computer, and want to save (or load) songs from disks in either, you can easily specify the currently active drive by pressing SHIFT-8 or SHIFT-9. These key combinations select device

8 and device 9 (both of which indicate a disk drive), respectively.

Keying one of these combinations produces the message *DEVICE X SELECTED*, where X is 8 or 9. Hit any key to acknowledge the message.

Device 8 is the default setting.

## Clearing a Song

To clear the song currently in memory, press the C key. This is useful when you want to start entering a new song.

To insure that the current song isn't accidentally erased, you're asked to confirm the operation. Press the Y key at the prompt to clear the song—all the notes and commands in each voice are erased, as well as the text lines. Press the N key, or any key other than Y, to cancel the clear.

*Warning: Once a song has been cleared, it cannot be retrieved unless you've saved it to disk.*

## Changing the Editing Voice

A song may use up to three voices. The Editor can hold three voices in memory at once, but only one voice can be edited at a time.

When you first run the Editor, it's ready for you to edit voice 1. To edit a different voice, press the E key; then press the 1, 2, or 3 key for the voice you want to edit. The Editor automatically switches to the Editing Screen.

This item is explained in greater detail in the next chapter.

## The Singalong Screen

A Singalong song is a song which has both a music file and an accompanying words file (see Chapter 1 for more information on Singalong songs). The Singalong Screen lets you load a words file and play the song currently in memory so that the verses are displayed while the music plays.

Press the W key to switch to the Singalong Screen. The screen has its own menu, one that's similar to the Main Menu except that the menu items refer to .WDS files, not .MUS files. For example, the Directory item displays a directory of all files on the disk with .WDS extensions, not those with .MUS extensions.

See Chapter 17 for information on how to create Singalong songs and how to use the Singalong Screen.

## Quitting the Editor

When you're done using the Editor, press the Q key to return to BASIC. Leaving the Editor erases the song currently in memory, so you'll probably want to save your work first. As with the Clear menu item, there's a confirmation prompt before you can quit. Press the Y key to leave the Editor, or any other key to continue using the program.

The confirmation prompt for the Quit menu item has one extra feature. The Editor remembers whether you've saved the music file since it was last modified. If you press Q to quit the Editor and the file hasn't been saved since its last modification, the message *FILE NOT SAVED* appears along with the confirmation prompt.

Once you quit the Editor and return to BASIC, you can rerun the Editor by typing RUN.

Chapter 4

# The Editing Screen

Chapter 4

# The Editing Screen

*This chapter explains how to enter and edit notes on the Editing Screen. Its first half explains the basics of note entry and editing, while the second half describes various special features which streamline the editing process.*

*Some of the information given in the first half of this chapter is also presented in Chapter 7. You don't need to know about the special editing features described in the second half of the chapter to start entering songs, so you may want to skip that part for now. However, since most of your time using the* Enhanced Sidplayer *Editor is spent on the Editing Screen, this chapter is extremely valuable.*

## Basic Parts of the Editing Screen

Switch to the Editing Screen from the Main Menu by pressing the F3 key. The Editing Screen appears as shown in Figure 4-1. (The labels marked in Figure 4-1 are explained in detail below.)

If there's a song currently in memory, press the C key when you see the Main Menu to clear the song before switching to the Editing Screen. The following text assumes that the voice is starting out empty.

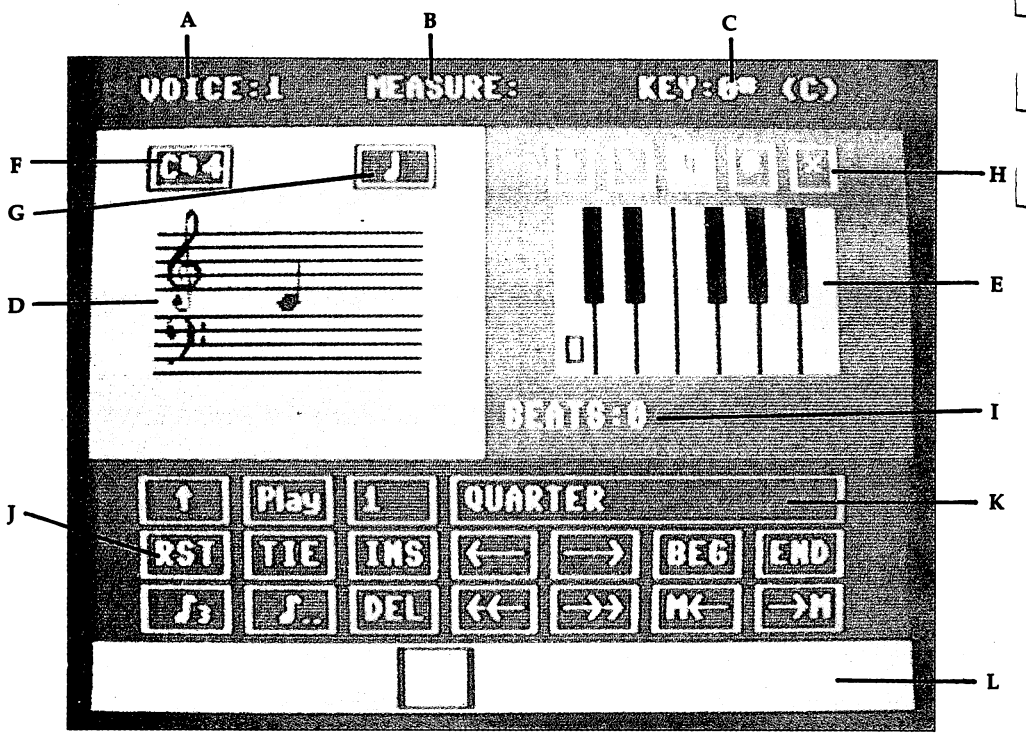
### Voice Number, Measure Number, and Key Signature

The Editing Screen displays a lot of information. The voice currently being edited appears at the top left **(A)**. A *1* should show here unless you've previously chosen the EDIT VOICE item on the Main Menu to edit a different voice.

The current measure number is displayed to the right of the voice number **(B)**. No number is displayed here until a measure marker is entered.

At the top right you'll see the current key signature **(C)**. The default key is the key of C, shown by the letter *C* within parentheses. The 0 followed by a sharp symbol ( ♯ ) indicates that this key has no sharps or flats.

**Figure 4-1. The Editing Screen**




## Grand Staff and Piano Keyboard

The next section of the Editing Screen shows a grand staff **(D)** and one octave of a piano keyboard **(E)**. The default current pitch is a middle C, so the quarter note on the staff is at the middle-C position, and the C key on the piano is marked.

## Pitch and Duration Boxes

Within the white grand staff area are boxes showing the current pitch and duration. The pitch box, at the top left of the staff **(F)**, shows a C natural in octave 4—middle C. The duration box on the right **(G)** displays a quarter note, the initial duration.

### Accidental Boxes

Above the piano keyboard on the right are five boxes containing accidental symbols **(H)**. From the left, these boxes contain

| | |
|---|---|
| **Double-flat symbol** | 𝄫 |
| **Flat symbol** | ♭ |
| **Natural symbol** | ♮ |
| **Sharp symbol** | ♯ |
| **Double-sharp symbol** | 𝄪 |

The box with the natural symbol—the middle box—should be highlighted. The boxes on the far left and far right which contain double-flat and double-sharp symbols can be ignored for the moment.

### Current Beats

Below the piano keyboard, the message BEATS with the number 0 is displayed **(I)**. This is the number of beats in the current measure. The number will change after some notes have been entered.

### Joystick Boxes

Below the grand staff and piano keyboard are a number of boxes containing different words and symbols **(J)**. These boxes are used for joystick note entry. Some of the boxes may also be highlighted at times to indicate that a feature such as a rest is currently in effect.

### Message Window

Within the joystick box area, the long box on the first level at the far right is used to display various messages **(K)**. It should initially display the current duration—QUARTER.

### Scroll Area

The bottom section of the screen—which is white—is where the notes appear when entered **(L)**.

## Note Entry

The general procedure is to press certain keys to select a pitch and duration, then press the RETURN key to enter the note.

## Pitch

Press the C, D, E, F, G, A, or B key to change the current pitch, or press a number key from 0 to 7 to change the current octave.

The quarter note on the grand staff moves, the corresponding key on the piano is marked, and the display in the pitch box changes to reflect the new pitch.

Take a moment now to enter a few notes. Just select a pitch and press the RETURN key. A note appears in the scroll area at the bottom of the screen, then immediately moves to the left in preparation for the next note to be entered. The note looks like a quarter note—the current duration—and has the pitch and octave number written above it.

If you press the RETURN key without changing the pitch, the note entered is of the same pitch as the previous note.

## Duration

Change the current duration by pressing one of the following keys:

**W** Whole note
**H** Half note
**Q** Quarter note
**8** Eighth note
**S** Sixteenth note
**T** Thirty-second note
**9** Sixty-fourth note

When you press a duration key, the displays in the duration box and message window change to reflect the new duration. However, the quarter note on the grand staff remains a quarter note even if a different duration is selected.

Now press the RETURN key. The note that appears in the scroll area is of the current pitch, but has the new duration.

To select a dotted duration, press the period (.) key after pressing the letter or digit key for the duration. (The sixty-fourth note duration cannot be dotted.) To cancel the dot, press the period key again. The dot is automatically canceled when the next duration key is pressed.

*For the present demonstration, don't enter any thirty-second or sixty-fourth notes, or any dotted sixteenth notes. Notes with these durations cannot be played in the default tempo and will cause an* ILLEGAL DURATION *playing error.*

### Playing from the Main Menu

Now that you've entered a few notes, you might like to hear your musical creation. Return to the Main Menu by pressing the F1 key, then press the P key to play the voice. Don't worry about the other voices—they should be empty. When the voice is through playing, the Editor returns to the Main Menu.

To continue editing, press the F3 key to switch to the Editing Screen. The notes you entered should be in the same position as before.

## Note Editing

The various keystrokes for editing are fairly logical and can be learned quickly. If you have experience in using a word processor, it will go even faster.

### Scrolling

You've already seen how entered notes scroll off to the left at the bottom of the screen. That means you can see only a few notes at a time (actually three). Reviewing notes that have disappeared, however, isn't difficult. Simply scroll them back into view with the two cursor keys.

Press the left cursor key (ignore the up and down arrow markings) and all the notes scroll to the right. The note which had previously scrolled off the screen reappears at the left edge, and the most recently entered note moves back into the box. If you keep the cursor key pressed down, it repeats and the notes scroll continuously.

As the notes scroll, the current pitch and duration are updated to reflect each note as it appears in the box. Scroll as far as you want. Scrolling stops when you reach the beginning of the voice.

Press the right cursor key to scroll in the opposite direction. Scrolling stops at the end of the voice.

### Fast Scrolling

To use really speedy scrolling, hold down either SHIFT key as you press the cursor keys.

### Replace

It's easy to correct mistakes. Using the cursor keys, scroll the notes until the one which needs to be changed appears in the box. Select the correct pitch and duration and press the RETURN key. The old note is replaced with the new one. Scroll to the end of the voice and continue entering notes.

### Insert

You can even insert a note anywhere in the song. Scroll until you reach the point where the note (or notes) should be inserted. The note framed by the box is the one which will be to the *right* of the inserted note. Next, press SHIFT–INST/DEL. The note in the box, and all notes to its right, shift to the right and create a blank space.

If necessary, insert several blanks. The only thing you can't do while blanks exist is scroll. You must fill in all the blanks or delete them to make the voice complete before you can scroll again. You can, however, press F1 to exit to the Main Menu. This deletes all extra blanks. You can then press F3 to return to the Editing Screen.

### Delete

To erase an extra note or blank, press the INST/DEL key (just press the key itself, not along with the SHIFT key). The note or blank currently in the box is deleted, and the notes or blanks to its right shift left to fill in the gap.

When deleting notes, remember that the INST/DEL key repeats if it's held down instead of just pressed once. Be careful that you don't delete necessary notes.

### Undelete

If you accidentally delete or replace a note, the deleted or replaced note can be retrieved. If you notice the mistake immediately, just hold down the Commodore key and press the U key—the deleted or replaced note is inserted into the voice. If you've entered more notes, though, you'll first have to scroll to the spot where the notes were deleted, since when you "undelete" a note or notes, they appear at the current position of the box.

Whenever a note is deleted or overwritten, it's stored in a special buffer which holds up to 128 notes. If you accidentally delete several notes, for instance, just hold down the Commo-

dore key and press the U key once for each deleted note.

Deleted notes are inserted in the opposite order in which they were deleted. This way, if several notes were deleted, they'll be in the correct order when you undelete them.

If you've replaced a note, and then decide you want the original note back, hold down the Commodore key and press U. The original note returns, framed by the box. The note which earlier replaced it, however, remains in the song. You'll have to delete it manually.

The undelete buffer is automatically emptied whenever you return to the Main Menu.

### Backspace

If you're entering notes and make a mistake, you can scroll to it, delete it, and then enter the correct note. One undesirable side effect, however, is that deleting the wrong note puts it into the undelete buffer.

A better way to correct the error is to use the backspace feature. Hold down the CTRL key and press the arrow key just above it. This deletes the note immediately to the left of the box, without placing it in the undelete buffer.

Since this is the only keystroke which acts on a note other than the one appearing in the box, it's also the only one that uses the CTRL key.

### Clear

Use the clear feature when you want to delete all the notes from the current note to the end of the voice.

Press SHIFT–CLR/HOME. Since an accidental clear can be disastrous, a confirmation prompt appears in the window below the piano keyboard. Press the Y key to erase the note currently in the box and all of the notes to its right, or press any other key to cancel the clear.

By scrolling to the beginning of the voice and using SHIFT–CLR/HOME, you can erase the entire voice.

Notes deleted by SHIFT–CLR/HOME are not remembered in the undelete buffer and cannot be undeleted.

### Moving to the Beginning or End of the Voice

When editing, you often need to move to the beginning or end of the voice. Maybe you want to move to the beginning to

erase the voice, or perhaps you have made some corrections and want to jump to the end to continue entering.

Simply use the function keys F2 and F4. Pressing F2 (SHIFT-F1) takes you to the beginning of the voice. Likewise, pressing F4 (SHIFT-F3) takes you to the end of the voice.

## Playing on the Editing Screen

It can be inconvenient to keep switching back to the Main Menu to play a voice. Fortunately, a voice can also be played on the Editing Screen.

### Start Playing

Scroll to the beginning of the voice and press the P key. The box marked *Play* is highlighted, the voice starts to play, and the notes at the bottom scroll so that the note playing always appears in the box. The grand staff, piano keyboard, and other displays are also updated as the notes scroll by.

### Slow and Fast Playing

While the voice is playing, you can press the Commodore or CTRL key for slow playing, or press the left SHIFT key for fast playing. Remember that slow and fast playing can also be done from the joystick by pushing the stick in any direction and by pressing the trigger, respectively.

### Scrolling On and Off

You can also press the P key while the voice is playing to turn off the scrolling. This is handy if you want to examine the notes at a particular point in the voice. Playing continues even though the scrolling has stopped. As long as the scrolling is turned off, the other displays (grandstaff, keyboard, and others) are not updated.

Scrolling continues when you press the P key again, framing the note currently being played.

### Stop Playing

When the playing stops, the notes automatically scroll back to their original position before the playing started. Normally the playing stops when the end of the voice is reached, but you can stop it at any time by pressing the space bar.

### Stopping at the Current Note

Another way to stop the playing is to press the F7 key. The voice not only stops playing, but the notes don't scroll back to their starting position. Instead, the note which was playing when the F7 key was pressed is shown in the box.

### Playing Errors

The playing may also stop automatically if a playing error occurs. A common playing error is *ILLEGAL DURATION*, which you may have seen if you tried to play thirty-second or sixty-fourth notes at tempos which don't support those durations. When a playing error occurs, the error message appears in red in the message window, and the note which caused the error shows in the box at the bottom. Press any key to acknowledge the error before you continue editing.

### Playing at a Position

When you start the playing on the Editing Screen, the playing actually begins at the current entering position. That's why you have to move to the beginning of the voice to hear it in its entirety. To begin playing at another position in a song, just move to that location before you press the P key.

As with the Measure playing feature on the Main Menu, there may be a short delay before the playing starts if the position is not near the beginning of the voice.

### Playing Without Scrolling

If you prefer that the notes don't scroll while they play, press SHIFT-P to start the voice playing.

## Other Note Features

### Accidentals

Figure 4-2 shows the three symbols called *accidentals*, which are often found in sheet music.

**Figure 4-2. Accidentals**

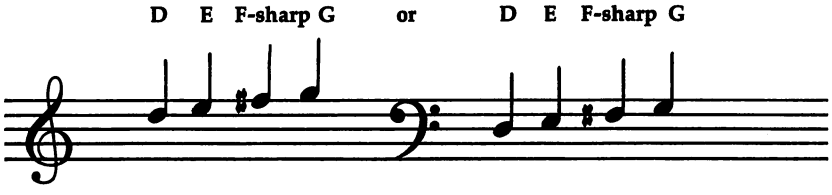
**sharp**

**flat**

**natural**

When you find one of these symbols placed before a note in the sheet music, it means that the pitch of the note should be slightly adjusted up or down. Say, for example, that you find an F note with a sharp in front of it, as in Figure 4-3.

**Figure 4-3. F-sharp**




This means that you should enter the note with the pitch F-sharp instead of just F (also called F-natural).

To do this on the Editing Screen, press the F key to select the F pitch, then press the plus (+) key to select the sharp *before* you press the RETURN key to enter the note.

A sharp slightly increases the pitch of a note. The pitch F-sharp is halfway between the pitches F and G.

A flat slightly decreases the pitch of a note. To enter a flat pitch, press the minus (−) key after you've selected the pitch, but before you press RETURN.

When you've entered a sharp or flat, notice that it's indicated in the pitch display above the grand staff, by the appropriate box highlighting above the keyboard, and by the correct symbol appearing in the scroll area between the pitch and octave characters.

To cancel a sharp or flat, press the English pound sign (£) key to select the natural pitch.

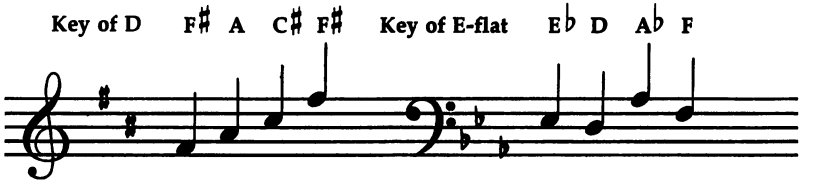
## Key Signature

Sometimes when you look at a piece of sheet music you'll see one or more sharp or flat symbols at the left edge of the staff next to the clef symbol. Figure 4-4 shows some examples.

These symbols form the key signature. The number of sharps or flats in the key signature determines the key in which the music is written. As shown in Figure 4-4, the key of D has two sharps and the key of E-flat has three flats.

The presence of a sharp or flat in a key signature means that all notes at that position on the staff should be treated as if they had a sharp or flat symbol in front of them. For in-

**Figure 4-4. Key Signatures**




stance, a sharp appearing at the position for F in a key signature means that all F notes—in all octaves—should be entered as F-sharps.

Don't worry—you don't have to remember which notes should include a sharp or flat symbol. The Editor has a feature to help. All you have to do is tell the Editor how many sharps or flats are in the key signature, and the program automatically selects the appropriate pitches for you.

Look at the top level of the the screen, at the right. This displays the key signature. The number indicates how many sharps or flats are in the current key, and the letter gives the name of the key. The default key is C, which has no sharps or flats.

Let's say that you're entering a voice from sheet music and the key signature on the sheet music shows two sharp symbols, one at the position for F, the other at C. Press the Commodore and plus (+) keys twice. This adds two sharps to the default key of C to give you two sharps, which is the key of D. Now when you press the letter keys to select a pitch, the pitches F and C are automatically sharped.

To select a key with more sharps, press Commodore-+ as necessary. To reduce the number of sharps, or to select a key with flats, press the Commodore and minus (−) key. Keep pressing until the desired number of sharps or flats is displayed.

To set the key signature back to the key of C (no sharps or flats) from any other key, press the Commodore and pound (£) keys.

If the key signature has been set and you encounter an accidental symbol in front of a note, that accidental overrides the accidental set by the key signature, so you'll have to use the plus, minus, or pound key to change the pitch for that particular note.

## Rest

A voice doesn't have to constantly play notes. It can also be silent for a designated amount of time. A rest tells a voice how long it should be silent.

Different rest symbols are used for different durations, as shown in Figure 4-5. Since there's no pitch associated with a rest, rest symbols are always drawn in the middle of the staff.

**Figure 4-5. Rests**


To select a rest, press the R key. The note name in the main level changes to read *(R)*, and the box marked RST below the grand staff is highlighted. Any note entered from this point is a rest.

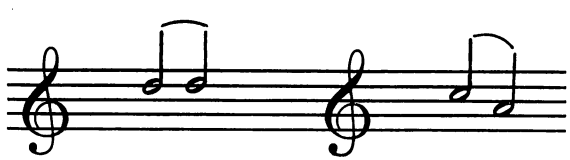
The Editor doesn't display the duration symbols for rests. Rests of different durations can be selected by pressing the duration keys—such as W for whole rest and Q for a quarter rest—but the Editor still displays the duration symbols for normal notes.

The rest stays in effect until canceled, which is done by pressing the R key again. The rest is also automatically canceled whenever you press one of the keys for a pitch, including the octave number and accidental keys.

## Tie/Slur

Two notes are tied or slurred when they're connected by a symbol which looks like an arc. When the symbol joins two notes of the same pitch, it's called a *tie*. If the two notes have different pitches, the symbol is called a *slur*. Notes that are tied or slurred are played with no break between the notes.

**Figure 4-6. Ties and Slurs**



A tie or slur is selected by pressing the slash (/) key. The box below the grand staff containing the word TIE becomes highlighted. The next note entered is followed by a curved symbol indicating a tie or slur.

Unlike the rest, the tie or slur is automatically canceled after a note is entered. To cancel it without entering a note, press the slash key a second time.

Rests cannot be tied, so the rest is automatically canceled whenever a tie or slur is selected. Likewise, pressing the R key to select a rest cancels the tie or slur.

### Entering Notes Without Scrolling

Instead of the RETURN key, you may also press SHIFT–RETURN to enter a note. By pressing the latter combination, however, the notes don't scroll to the next position once a note is entered.

This can be a useful feature when you want to modify a sequence of notes. For example, maybe you entered several notes as quarter notes, but they should have been eighth notes. To change the duration of each note, you could scroll to that note, specify the correct duration, and then press RETURN. If you do, though, the Editor scrolls to the next note, keeping the previous note's pitch, not the pitch of the note currently in the box.

By pressing SHIFT–RETURN and then the cursor key to scroll right, the current pitch is updated to reflect the next note, and you'll be all set to specify the new duration and replace the next note.

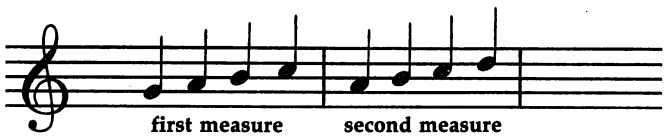
## Measures

### Entering Measure Markers

In music, notes are organized into groups called *measures.* Measures help the performer keep in time with the other players, and are convenient when trying to locate a particular note in a song.

The Editor supports a rather flexible measure structure. To designate the beginning of a measure in a voice, you must place a measure marker at that position. Press the F7 key to see what a measure marker looks like. The characters *MS#* appear in the scroll window at the bottom, with the number *1*

**Figure 4-7. Measures**




below them. The current measure-number display at the top should now also display the number 1.

A measure marker is actually one of the commands which can be entered from the Command Screen. Because the MS# command is used so frequently, the F7 key provides a convenient way to enter the command without going to the Command Screen.

If you scroll to the left of the MS#1 command just entered, you'll notice that the current measure number turns blank. When you scroll to the right again, so that you're on the marker or to the right of it, the current measure number displays a 1 again.

Enter a few more measure markers separated by notes to see how the measure numbering works. Basically, whenever you press the F7 key, the Editor takes the current measure number, adds one to it, and enters an MS# command with that number. The system works best if you enter the measure markers sequentially. If you enter a marker between two other markers, the marker is a duplicate of the measure marker to its right.

Later in this chapter you'll find a method of inserting a measure marker and correcting all the following measure numbers. This can come in handy if you forget to enter a measure marker while entering notes.

Measures in sheet music are usually not numbered, so you'll have to number them yourself. Though it takes some time, it's well worth it while you're editing.

## Moving to the Previous or Next Measure

Just as pressing the F2 or F4 key takes you to the beginning or end of the voice, pressing F6 (SHIFT-F5) or F8 (SHIFT-F7) instantly takes you to the previous or next measure marker, respectively.

### Search for a Measure

The Editor can also search for a specific measure marker and move to that point in the voice.

Press the F5 key to search for a measure. A prompt appears in the message window, and the Editor waits for you to enter the desired measure number. After you enter the number and press RETURN, the Editor searches the voice from the beginning until it finds the first occurrence of the requested measure, and moves to that position. If there's no such measure marker in the voice, the Editor prints the message *MS#x NOT FOUND.*

### Search from Current Position

The F5 search usually starts at the beginning of the voice. If, for some reason, the same measure number has been used more than once in a voice, only the first occurrence of that measure number will be found.

To start a search from the current position, press SHIFT–RETURN instead of RETURN when you enter the measure number. This enables you to find later occurrences of a measure number.

If you hit the F5 key accidentally and don't notice the measure-number prompt, the joystick and keyboard may seem locked up, or inoperable. To recover, just press the RETURN key at the measure-number prompt without typing a number. This cancels the measure search.

### Current Beats in Measure

Move to the beginning of the voice and press SHIFT–CLR/HOME to erase the entire voice. The current measure number display should be blank, and the current number of beats displayed under the piano keyboard should be 0.

Press the F7 key to enter an MS#1 command, then enter four quarter notes. The number of beats should increment by one as each quarter note is entered. Enter an MS#2 command followed by a few more notes, possibly of different durations. Do this a few times until you have several measures.

Now when you press F6 or F8 to move to the previous or next measure, you can quickly see how many beats are in each measure. Usually each measure should contain the same number of beats, so this is an easy way of detecting when you've missed a note in a measure.

There's a limit to the number of beats the Editor can keep track of. The Editor stops counting beats when the total reaches 16, which would be four full measures. When this happens, the beats display is blanked.

### Measure Numbers While Playing

While a voice plays, the current-beats display remains blank, but the measure-number display shows the number of the current measure. However, when a song uses repeats or phrases, the displayed measure number may not always be accurate. The number shown will be the number of the MS# command most recently encountered in playing, which may not always be the same as the measure number corresponding to the current position.

Measure markers have no effect on how a voice is played, and are used strictly for editing purposes. The use of measure markers is optional, but recommended, especially in longer songs. Be sure to see the automatic measure-numbering mode in the "Advanced Modes and Features" section later in this chapter.

## Function-Key Summary

Before we move on to joystick note entry, let's review the uses of the various function keys.

**F1** Switch to Main Menu
**F2** Move to beginning of voice
**F3** Switch to Command Screen
**F4** Move to end of voice
**F5** Search for measure marker
**F6** Move to previous measure
**F7** Enter next measure marker
**F8** Move to next measure

In the back of the book you'll find a special cutout which can be placed around the function keys.

## Joystick Note Entry

The joystick can also be used for note entry and editing. Plug a joystick into port 2 and you're ready.

### Pitch

To change the current pitch, push the joystick up or down—the next pitch in the current key is selected. You can run through the full eight octaves this way.

### Duration

To change the current duration, push the joystick left or right. Notice that the dotted durations are included in the range. For the moment, ignore the durations marked *ABSOLUTE SET* and *UTILITY*.

### Entering Notes

Press and release the joystick button to enter a note. This is the same as pressing the RETURN key.

### Accidentals

Changing the current accidental is done a little differently. Press the joystick button and hold it down while you push the stick to the left or right. The yellow frame which normally appears around the pitch or duration display shifts to the accidental boxes above the piano keyboard. Release the button and move to the different accidental boxes by pushing the stick left or right. To select an accidental, move to the appropriate box and press the button. The accidental is selected, the yellow frame returns to the grand staff area, and you can continue normal joystick note entry.

### Rests, Ties, and Blanks

Rests, ties, and other editing features displayed below the grand staff and keyboard can also be selected with the joystick. To move to this area, hold down the joystick button while you pull the stick down, then release the button. The yellow frame appears on the box with the letters RST. Move to other boxes by pushing the joystick in one of the four cardinal directions (up, down, left, or right).

To select a rest, make sure you're on the box marked RST and press the button. This is the same as pressing the R key. The box highlights, and the yellow frame returns to the grand staff area.

Select a tie by moving to the TIE box and pressing the button.

To insert a blank, move to the box marked INS and press the button. This time, however, the yellow frame remains in case you want to insert more than one blank. To return to the grand staff area and continue editing, move to the box in the upper left corner of this area (it shows an up arrow) and press the joystick button.

### Delete

One or more notes can be deleted by moving to the DEL box and pressing the joystick button.

### Scrolling

To scroll left or right, move to one of the boxes with the left or right arrows (they're beneath the message window) and press the button. Hold the button down to scroll continuously.

Move to the boxes with the double arrows for fast scrolling.

The boxes marked BEG and END let you move to the beginning or end of the voice. Pressing the joystick button when one of these is selected is the same as pressing F2 or F4.

### Measures

The boxes which show an arrow and the letter *M* move you to the previous or next measure. This is just like pressing F6 or F8.

### Play

Playing can be started from the joystick by moving to the box marked *Play* and pressing the button. (The box to the right, which displays a number, is explained in the section on editing multiple voices.)

The two remaining boxes (at the lower left) are used for selecting triple and double dot durations. These features are explained in Chapter 14.

## Keyboard Note Entry

There's an alternate way to select pitches and durations from the keyboard. You may find this method easier, especially if you're not a touch typist.

The four keys I, J, K, and M work like the joystick. Pressing the I and M keys is just like moving the stick up or down. The next higher or lower pitch in the current key is selected.

The J and K keys select different durations, as when the joystick is pushed left or right. Again, you can ignore the ABSOLUTE SET and UTILITY durations for the present time.

## Editing Different Voices

Thus far, editing on only one voice has been discussed. Notes for additional voices can be entered and edited too, but only one voice can be edited at a time.

Go to the Main Menu and press the E key for EDIT VOICE. The message *WHICH VOICE? (1,2,3)* appears. Enter a number from 1 to 3 to change the current editing voice. The Editor automatically switches to the Editing Screen and displays the new voice.

While you're editing one voice, the Editor remembers the contents of the other voices, including the current position on each voice. If you choose the EDIT VOICE item on the Main Menu to return to the first voice, you'll return to the same position as when you left that voice, even if you've entered and scrolled notes on other voices.

An easy way to see how multiple voice editing works is to load one of the sample songs with three voices and look at the individual voices of the song.

When you're playing a voice on the Editing Screen and you stop by pressing the F7 key, the editing position changes to show the note that was playing at that moment. Playing from the Main Menu can also be stopped by pressing F7, but in this case the positions on all three voices change to show the notes which were playing at the time the key was pressed.

The positions on all three voices are also changed if a playing error occurs while playing from the Main Menu.

When playing from the Editing Screen, the Editor defaults to playing only the voice currently being edited. However, it's possible to play all three voices at the same time. Press the 1, 2, and 3 keys while the music is playing to turn the voices on and off. The numbers for the voices which are on are shown in the box to the right of the one marked *Play*. Press RETURN to turn on all the voices. Press SHIFT–RETURN to turn off all of the voices except the current editing voice. Notice that the displays on the screen are those for the current editing voice only, even when one or two other voices are playing.

The voices can also be turned on and off when the music isn't playing by pressing SHIFT-1, SHIFT-2, and SHIFT-3. You can also do this by using the joystick to move to the box with the voice numbers and pressing the button.

Finally, if you're playing on the Editing Screen and an error occurs on a voice other than the one being edited, the number of the voice is displayed with the error message.

This concludes the description of basic note entry and editing. The remainder of this chapter explains how to use various advanced features which make editing easier, including cut and paste, an automatic insert mode, and an automatic measure-numbering mode. You don't have to use these features to enter a song, however, so you may prefer to read the rest of this chapter after you're more familiar with the Editor.

## Cut and Paste

The cut-and-paste feature lets you delete a long sequence of notes from a voice, or move or copy a sequence of notes to another place in the voice. The basic procedure is to *cut* the notes from the voice and then optionally *paste* them into the voice at one or more places. The cut-and-paste feature can also be used to move notes from one voice to another, or even from one song to another.

### Mark

To cut a sequence of notes from a voice, you must specify where you want the cut to start and stop. To mark the position where a cut should start, scroll the notes until the first note to be cut appears in the box, then press Commodore-M. The box disappears and the note is displayed in reverse. *MARK SET* appears in the message window.

As you scroll left or right to the position where you want the cut to end, the notes between the marked position and the current position are also displayed in reverse. The reverse printing indicates which notes are going to be cut.

While you're marking the notes to be cut, you cannot enter any new notes, or insert or delete notes.

### Cut

Once you've reached the position where you want the cut to end, and the last note to be cut is the final note displayed in

reverse, press Commodore-C. The notes which were in reverse are removed from the voice and transferred to a special cut-and-paste buffer. The message window tells you how many notes were cut (measure markers and other commands are counted as notes), and the box in the scrolling area reappears. The voice contracts to close the gap created by the cut notes, and you can continue editing.

### Paste

If you want to insert the cut notes into another place in the voice, just move to that position and press Commodore-P to paste them down. The note in the box, and all notes to its right, shift to the right to make room for the new notes. The notes in the cut-and-paste buffer are copied into the voice starting at the position in the box.

If you don't scroll to another position, and instead press Commodore-P immediately after you press Commodore-C, the notes are pasted right back into the position from which they were cut. The voice is thus restored to its original state. It will be as if the notes had never been cut, except that now you have a copy of these notes in the cut-and-paste buffer.

### Moving and Copying

The cut-and-paste buffer is not cleared after a paste, so you can paste the same notes at more than one place in the voice if you want. For example, if you just want to move a sequence of notes from one place to another, you'd cut them from one place and paste them at another, as described above. But if you want to make a copy of the notes and insert that copy somewhere in the voice, leaving the notes in their original position, you should press Commodore-P right after you press Commodore-C to restore the notes in their original position, then move to the other position and paste the notes *again* to insert the copy.

The notes in the cut-and-paste buffer are preserved when you change the current editing voice, so you can use cut and paste to move or copy notes from one voice to another. The buffer is preserved even if you load a new song, so you can move notes to another song as well.

### Kill the Cut-and-Paste Buffer

When you're finished pasting the notes into place, you may wish to empty the cut-and-paste buffer as a precaution against accidentally pressing Commodore-P and pasting notes at unintended places. To kill, or erase, the buffer, press Commodore-E. The buffer is emptied, and pressing Commodore-P no longer pastes notes into the voice.

### Size Restriction

On the Commodore 128 version of the Editor, the cut-and-paste buffer will hold 12,733 notes, which is equivalent to 101 disk blocks. You'll probably never exceed the capacity of the cut-and-paste buffer on the Commodore 128 Editor.

The cut-and-paste buffer on the Commodore 64 version, however, will hold 2048 notes, which is equivalent to 16 disk blocks. The smaller buffer size may be a problem in situations where you're pasting very long sequences of notes, such as when you're moving a complete voice from one song to another.

To indicate that the limit's been reached, only as many notes as will fit in the cut-and-paste buffer will print in reverse. Thus, if you're marking notes to be cut, and they stop printing in reverse, it means that not all of the notes from the marked position to the current position can fit in the buffer. Only those displayed in reverse will fit.

There's no limit on the size of a cut, so you can still cut the notes at that position and they'll all be removed, but only the first 2048 notes will be remembered in the buffer. *The notes which are cut and not remembered in the cut-and-paste buffer cannot be retrieved.*

### Changing or Clearing the Mark

Once you've pressed Commodore-M to start marking notes for a cut, you can change the position of the mark by pressing Commodore-M again. To cancel the marking altogether, press Commodore-M at the same position where it was pressed last. The message *MARK CLEARED* prints in the message window, and the box reappears. A mark is also cleared when you switch to the Main Menu.

## Adjusting Measure Markers

You may run into situations where you want to change the numbers on a sequence of measure markers. Perhaps you forgot to enter a measure marker. It's easy enough to go back and insert the missing measure marker, but then all the markers to its right will be off by one. Fortunately, there's an editing feature that will let you increment or decrement the numbers on a range of measure markers.

### Increment Measure-Marker Numbers

To increment measure-marker numbers, press Commodore-I. The Editor starts at the note or command in the box and adds one to every measure-marker number it finds, working to the right, until it comes to the end of the voice. The message *INCREMENTED* appears in the message window.

### Decrement Measure-Marker Numbers

Press Commodore-D to decrement measure markers. This works just like Commodore-I, except that one is subtracted from each measure-marker number. The message *DECREMENT* appears in the message window.

### Entering a Measure Marker with a Specific Number

You don't have to number the measures consecutively. Instead of using F7, you can go to the Command Screen and enter an MS# command with any number from 0 to 999. This is handy if you don't want to use a measure marker at every measure, and just want to insert a marker at the beginning of each page of sheet music. See the next chapter for information on how to enter the MS# command directly.

### Limiting the Increment or Decrement Range

To restrict the range of measure markers which are incremented or decremented, place an MS#0 or MS#999 command at the place where you want the increment or decrement to stop. The incrementing or decrementing will stop as soon as the first MS#0 or MS#999 is encountered.

## Special Modes and Features

There's quite an assortment of special modes and features which you can select to customize the Editor to suit your own preferences.

All the modes and features described below are selected by holding down the SHIFT key and pressing another key. In each case, the first time you press the keys, the setting is not changed—only the current value of that setting is displayed in the message window. To change the setting, press the keys *again*, without pressing any other keys in-between.

### Key Repeat

Normally the cursor and the INST/DEL keys are the only ones which repeat after you hold them down for a bit. To make all the keys repeat when you're on the Editing Screen, press SHIFT-R twice. Remember that the first time you press SHIFT-R, the Editor only tells you what the current value is, which should be *KEY REPEAT OFF.* SHIFT-R must be pressed a second time to change the value.

The key-repeat feature is especially handy when you want to use F6 or F8 to zip through measures, or if you use the I, J, K, and M keys to select pitches and durations.

Be careful when you're using the backspace feature or when you're pasting notes into a voice and key repeating is turned on—you may delete or paste more notes than intended.

### Staff Type

The grand staff is suitable for most note entry, but sometimes the sheet music may not show a grand staff made up of treble and bass staves, and instead show only one staff with one clef symbol. If you then enter notes on leger lines, the other staff on the screen can make it harder to count these lines. For situations like this, you can change the displayed staff from a grand staff to a single treble staff or bass staff.

Press SHIFT-S as necessary to change the staff type. The first time that you press SHIFT-S, the Editor displays the name of the current staff in the message window (it should read *GRAND STAFF*). To change to the treble staff, press SHIFT-S again. Press it once more to select the bass staff.

There are actually six different staves available. The other three (alto, tenor, and soprano) are described in Chapter 14.

The staff type can also be changed while a song is playing. Press the S key (don't press SHIFT) while the song is playing to switch to the next staff.

For your editing convenience, the staff type can be set differently on each voice.

### Autoinsert Mode

Use SHIFT-I to turn on the auto-insert mode. With it on, any note you enter shifts the note in the box, and all notes to its right, one position to the right before the new note is entered. If you're going to insert several notes or commands, this mode can save you from constantly pressing SHIFT–INST/DEL.

### Time Signature

On a piece of sheet music, the *time signature* is displayed to the right of the clef and key-signature symbols. It's displayed as a fraction, such as 4/4 or 3/4. The top number indicates the number of beats in one measure, and the bottom number, the number of beats in a whole note.

A whole note usually lasts for four beats, so the bottom number is normally 4, but in some time signatures the bottom number may be 2, 8, or even 16. If it's 8, for instance, a whole note plays for eight beats, so each eighth note is one beat (instead of each quarter note being one beat).

If you're entering notes from sheet music which has a number other than 4 on the bottom of the fraction, the display for the current number of beats will not be accurate. To tell the Editor the number of beats for a whole note, press SHIFT-W. The current time signature will be displayed. Keep pressing SHIFT-W until the number on the bottom of the fraction matches the one in the sheet music. The top number doesn't matter for now. Once the number of beats for a whole note has been set, the current-beats display should be correct.

The calculation of the number of beats in the current measure can be disabled completely by selecting the number 0 on the bottom of the fraction. If you prefer not to use measure markers at all, you may increase the speed of some Editor functions slightly by turning the calculation off.

### Automatic Measure Numbering

One very helpful editing feature is the automatic measure-numbering mode. When this mode is turned on, the Editor

monitors the number of beats in the current measure. After you enter a note that completes a measure, the Editor automatically enters the next measure marker, just as if you had pressed the F7 key.

To turn on the automatic measure-numbering mode, press SHIFT-B. This displays the same time signature as was displayed for SHIFT-W, except that now you can change the *top* number of the fraction. Keep pressing SHIFT-B until the number matches the one shown in the sheet music. *Remember that this number specifies the number of beats per measure.* The Editor needs to know this number to be able to detect when a measure is full and a new measure marker should be entered.

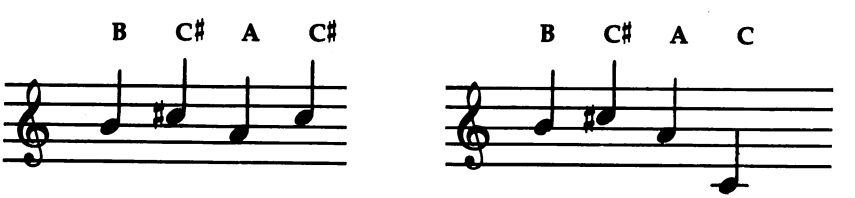
So that notes are not overwritten by measure markers when you're editing in the middle of a voice, the automatic measure numbering occurs only when you are adding notes to the end of the voice. The feature also doesn't work when the current number of beats has exceeded the Editor's limit and the beats display is blank.

To turn the automatic measure numbering off, press SHIFT-B until the top number is 0.

## Measure Mode

In sheet music, if an accidental symbol is placed before an individual note in a measure, that accidental should be applied to all succeeding notes of that pitch in that measure. In the first example shown in Figure 4-8, the fourth note is C-sharp, even though there's no sharp symbol preceding it, since the previous C in that measure was sharped. The second figure shows that this doesn't hold for notes of the same pitch, but in a different octave.

**Figure 4-8. Assuming Accidentals**



Another feature having to do with measures is the measure mode. When this mode is turned on, the Editor remembers when you've entered a sharp or flat note. The next time you select the same pitch in *that* measure, the previous accidental is automatically placed. All accidentals remembered in this way are forgotten by the Editor when the next measure marker is entered, or when you return to the Main Menu.

Use SHIFT-M to turn the measure mode on or off. As always, the message window shows when the mode is on or off.

The measure mode has one shortcoming—it doesn't keep track of octave numbers when it remembers accidentals. If a measure contains notes in different octaves, you may have to be careful when selecting a pitch that was entered with an accidental symbol in a different octave.

This mode is most useful when you number measures regularly.

### Search Direction

The F5 search always starts at the beginning of the voice or at the current position, and proceeds to the right until it comes to the requested measure marker or the end of the voice. You can make the search start at the end of the voice or the current position, and work to the left until the measure marker or beginning of the voice is reached.

Use SHIFT-D to set the current direction for searching. The message window shows when the direction is set for the left or the right.

The search direction also affects the incrementing and decrementing of measure numbers. When the search direction is set to left, measure marker numbers are incremented or decremented to the left of the current position.

### Octave Mode

When you press a key to select a pitch, the Editor chooses the one nearest in pitch to that note. If the nearest pitch is in a different octave, the octave number will be changed, too. If you don't want the Editor to change the octave number, just select the pitch in the current octave and turn the octave mode off with SHIFT-O.

### Tie Mode

After a note is entered with a tie, the Editor automatically turns off the tie mode. If you want to change this default, turn the tie mode on with SHIFT-slash (/). The tie stays on after you enter a tied note.

The process, then, is to turn on the tie mode with SHIFT-slash, press the slash key to set a tie, and select a note. All following notes continue to be tied.

Turn off the tie by pressing the slash key.

### Ding and Click

The Editor plays the current pitch whenever you press a key which changes the current pitch, octave, or accidental, or when you scroll. To disable this feature, press SHIFT-G. You should now hear a clicking sound when you change pitch, octave, or accidental, or scroll through the voice. The only time you'll hear the current pitch is when you press Return to enter the note. Press SHIFT-G again to turn the "ding" sound back on.

If you want to disable the clicking sound, too, press SHIFT-C. Now no sound is generated when you change parameters or scroll.

### Update Mode

When you scroll, the current pitch, duration, and other parameters are updated to reflect the note that appears in the box. To disable this updating, press SHIFT-Q. You'll still hear the pitches and clicks as you scroll, but the values displayed on the screen won't change. This may be useful if you want to insert a particular note at different places in a voice without the parameters being lost when you scroll to that position.

### Smooth Scrolling Speed

If you'd like scrolling to be faster or slower, you can change its step value. Change the step by pressing SHIFT-Z. The larger the step, the faster the scrolling.

To turn off the smooth scrolling altogether, and have the notes scroll at the same speed as fast scrolling, use a step value of 0.

### Joystick Speed

The speed of the joystick can also be adjusted. Press SHIFT-J to change the delay value used for the joystick. Larger delay values slow joystick movement.

### Free Memory

To see how much room is left in memory, press SHIFT-F. The number of notes or commands which can still be entered is displayed in the message window.

### Saving Your Custom Settings

See Chapter 20 for information on how to modify your copy of the Editor so that your preferred values for these various settings can be the default values whenever you load and run the program.

## Help Screen

To help you remember the keystrokes available on the Editing Screen, a help screen is available. Press the HELP key on the Commodore 128 or SHIFT-H on the Commodore 64 to see the help screen.

As an added guide, here's a list of the Editing Screen's keystrokes.

| Keystroke | Function |
|---|---|
| C,D,E,F,G,A,B | Select pitch |
| R | Select rest |
| – | Select flat |
| £ | Select natural |
| + | Select sharp |
| SHIFT-minus | Select double flat (available on limited pitches) |
| SHIFT-plus | Select double sharp (available on limited pitches) |
| W,H,Q,8,S,T,9 | Select duration |
| SHIFT-period | Select double dot |
| SHIFT-T | Select triplet |
| U | Select utility duration |
| SHIFT-U | Select utility duration—voice |
| SHIFT-A | Select absolute set pitch |
| I,J,K,M | Duplicate joystick directions |
| RETURN | Enter a note with current values |
| SHIFT–RETURN | Enter a note without scrolling position |
| CRSR up/down | Slow scrolling to the left |
| CRSR left/right | Slow scrolling to the right |
| SHIFT–CRSR up/down | Fast scrolling to the left |
| SHIFT–CRSR left/right | Fast scrolling to the right |
| F1 | Return to Main Menu |
| F2 | Move to beginning of voice |
| F3 | Move to Command Screen |
| F4 | Move to end of voice |
| F5 | Search for measure marker |
| F6 | Move to previous measure marker |
| F7 | Insert next measure marker |
| F8 | Move to next measure marker |
| INST/DEL | Create a blank space for note insertion |
| SHIFT–INST/DEL | Delete the current note or blank space |
| Commodore-U | Undelete |
| CTRL-← | Delete the note/command to the left of the scroll box |
| Commodore-£ | Change to key of C |
| Commodore-minus | Add a flat to the key signature |
| Commodore-plus | Add a sharp to the key signature |
| SHIFT-B | Set number of beats per measure |
| SHIFT-C | Toggle clicks on/off |
| SHIFT-D | Toggle direction left/right |
| SHIFT-F | Display free memory |

| Keystroke | Function |
|---|---|
| SHIFT-G | Toggle ding on/off |
| SHIFT-I | Toggle autoinsert mode on/off |
| SHIFT-J | Set joystick delay speed |
| SHIFT-M | Toggle measure mode on/off |
| SHIFT-O | Toggle octave mode on/off |
| SHIFT-Q | Toggle update mode on/off |
| SHIFT-R | Toggle repeat key on/off |
| SHIFT-S | Change to next staff |
| SHIFT-W | Set number of beats per whole note |
| SHIFT-Z | Change scroll step rate |
| SHIFT-/ | Toggle tie mode on/off |
| Commodore-M | Mark the beginning of a cut |
| Commodore-C | Cut all notes from mark to current position |
| Commodore-P | Paste notes in cut-and-paste buffer at current position |
| Commodore-E | Empty the cut-and-paste buffer |
| Commodore-I | Increment measure number |
| Commodore-D | Decrement measure number |
| P | Start playing at current position |

(While playing)

| | |
|---|---|
| 1,2,3,RETURN,SHIFT–RETURN | Select or deselect voices to be audible |
| Commodore, CTRL | Slow playing |
| Left SHIFT | Fast-forward playing |
| P | Toggle scrolling on/off |
| S | Change staff |
| Space bar | Stop playing |
| F7 | Stop playing and move to position of note played when stopped |
| SHIFT-1,-2,-3 | Select/deselect voices when not playing |

Chapter 5

# The Command Screen

Chapter 5

# The Command Screen

*In addition to notes, the Editor lets you enter commands to control such things as tempo, volume, waveform, and envelope. Since the Editor supports a variety of commands, and since the Editing Screen is already crowded with features, a separate Command Screen is available. This chapter introduces the Command Screen and explains how to enter commands to set the tempo, volume, and measure number.*

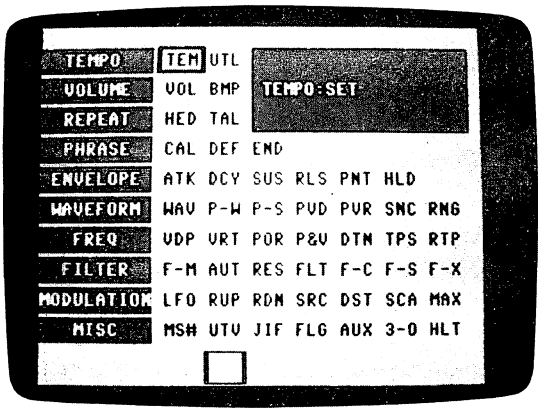
*Much of the information in this chapter is also presented—in abbreviated form—in Chapter 7. There, you can follow the sample session to get a basic idea of how the Command Screen works and how to set the tempo and volume. However, there are some very important restrictions in setting the tempo which are only explained here. You may have trouble keeping the voices synchronized if the suggested cautions aren't followed. This chapter also describes more time-saving features. Read this chapter before you start entering longer songs.*

## Command Selection and Entry

The commands are organized in rows with headings like TEMPO and WAVEFORM. Each command has its own three-letter abbreviation. A small box—called the *command box*—is displayed around one of the commands and can be moved to the other commands by pressing the I, J, K, and M keys or by pushing the joystick. If the command box is moved off the end of one row or column, it wraps around to the other side.

The window in the upper right corner of the screen displays the full name of the current command. This display changes as the command box moves from one command to another.

**Figure 5-1. The Command Screen**




To enter a command, move the command box to that command and press the RETURN key or the joystick button. The window then shows the number range for the selected command. All commands require that a number be entered from the keyboard.

Once a number is typed and the RETURN key is pressed, the command is actually entered. The command name and the number then appear in the box at the bottom, where the notes are usually entered, and the command and the previous notes scroll to the left. You can then enter another command or press F1 to return to the Editing Screen.

If you accidentally select the wrong command, press RETURN without typing a number. The command isn't entered, and you can choose another command.

As on the Editing Screen, if you press SHIFT–RETURN to enter the command number, the command is entered, but the notes do not scroll.

## Command-Screen Editing

Commands can be scrolled, replaced, inserted, deleted, and so on, just like notes. Most of the editing keys which work on the Editing Screen also work on the Command Screen. This includes INST, DEL, undelete, backspace, and the cut-and-

paste keys. Clear, however, is not supported on the Command Screen. The function keys also work the same except for F5 and F7, which are discussed later in this chapter.

Of course, you can press the F1 function key to return to the Editing Screen at any time, whether a command has been entered or not.

The various special modes and features for the Editing Screen cannot be selected on the Command Screen. Though they may affect the Command Screen, such as the key-repeat mode or the scrolling speed, they can't be selected from the Command Screen. If you want to access one or more of these special features, return to the Editing Screen.

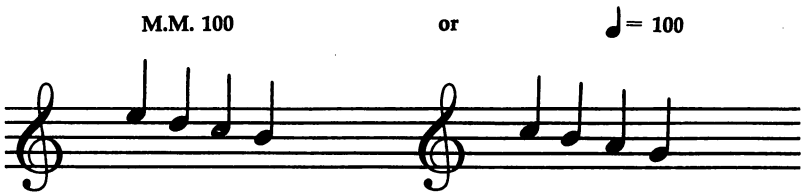
The Command Screen does have two special modes (update mode and set search direction) which are explained near the end of this chapter.

The next three sections introduce three very useful and simple commands. Other commands are explained in later chapters.

## Tempo

The *tempo* determines how quickly the notes are played, and is normally specified at the beginning of a song by one of two methods, both shown in Figure 5-2.

**Figure 5-2. Set Tempo**




### The TEM Command

The TEM command, used to set the tempo, is usually placed at the beginning of voice 1. The number part of the command is the desired tempo value. In the preceding example, this number was 100.

## Tempo Restrictions

There are some restrictions regarding which tempo values can be used. The TEM command supports only a limited number of tempo values, and of those, some don't allow certain durations. Not all tempo values support sixteenth notes, thirty-second notes, sixty-fourth notes, or dotted whole notes. Table 5-1 shows all of the available tempo values and their restrictions.

**Table 5-1. Tempo Values and Restrictions**

| Tempo | Restrictions |
|---|---|
| 1800 | No sixteenth or thirty-second notes |
| 900 | No thirty-second notes |
| 600 | No sixteenth or thirty-second notes |
| 450 | None |
| 360 | No sixteenth or thirty-second notes |
| 300 | No thirty-second notes |
| 257 | No sixteenth or thirty-second notes |
| 225 | None |
| 200 | No sixteenth or thirty-second notes |
| 180 | No thirty-second notes |
| 163 | No sixteenth or thirty-second notes |
| 150 | None |
| 138 | No sixteenth or thirty-second notes |
| 128 | No thirty-second notes |
| 120 | No sixteenth or thirty-second notes |
| 112 | None |
| 105 | No sixteenth or thirty-second notes |
| 100 | No thirty-second notes |
| 94 | No sixteenth or thirty-second notes |
| 90 | None |
| 85 | No sixteenth or thirty-second notes |
| 81 | No thirty-second notes |
| 78 | No sixteenth or thirty-second notes |
| 75 | None |
| 72 | No sixteenth or thirty-second notes |
| 69 | No thirty-second notes |
| 66 | No sixteenth or thirty-second notes |
| 64 | None |
| 62 | No sixteenth or thirty-second notes |
| 60 | No thirty-second notes |
| 58 | No sixteenth or thirty-second notes |
| 56 | None |

Those tempos which don't support a sixteenth note also don't support a dotted eighth note. Likewise, those tempos

which don't support thirty-second notes don't support dotted sixteenth notes.

The restrictions on sixty-fourth notes aren't shown in the chart. Only four tempos—225, 112, 75 and 56—support sixty-fourth notes.

Tempo values 81 and below don't support dotted whole notes, but this is not a major problem. A dotted whole note can be simulated by tying a half note to the whole note.

When you type the number for the TEM command, the Editor chooses the closest available tempo value. For example, if you enter 160, the command TEM 163 is actually entered, since tempo 160 is not available.

In most cases, it doesn't matter if the exact tempo is not available. There's practically no difference between M.M. 160 and M.M. 163. The only complication would be if the song used sixteenth or thirty-second notes, which are not supported in M.M. 163. If that was the case, the tempo value 150 would have to be used instead.

If you try to play durations like sixteenth notes in a tempo that doesn't support them, the playing stops with an *ILLEGAL DURATION* playing error. If this happens, press any key to acknowledge the error, then change the tempo to one which does support the duration in question.

The *DURATION OVERFLOW* playing error occurs if you try to play a whole note at the tempo M.M. 81 or lower.

### Getting Around Tempo Restrictions

For those situations when the limited tempo choices or restrictions on note durations are a problem, use the JIF command. This is an advanced command which lets you play any duration at any tempo, even fractional tempos. The JIF command is explained in Chapter 15.

### Tempo Specifications and Default Tempo

Sometimes a word like *adagio* or *allegro* is used in place of an M.M. value. In these situations, you have to choose the appropriate tempo value based on the information given in Chapter 2.

If the sheet music doesn't specify any tempo, use whichever tempo sounds best to you. If you don't enter a TEM command, the default tempo, M.M. 100, is used.

### Tempo and Multiple Voices

The tempo controls the rate at which the beats occur. All three voices follow the same beats so that they stay synchronized. Therefore, when a TEM command is set on one voice, it affects all three voices. When a song uses more than one voice, you don't have to put a TEM command on each voice. Put the command on voice 1, and that tempo becomes active on the other voices, too. *Don't put the command on a later voice, or the voices may not stay synchronized.*

### Changing the Tempo

You've got to take some care when you use the TEM command to change the tempo in the middle of a song. *The change must be made at a point in the song where all three voices are starting new notes.* This usually happens at the beginning of a measure, but may happen within a measure. Also make sure you place the TEM command on voice 1.

If you don't follow these guidelines, and the tempo changes when a voice is in the middle of a note, or on a voice other than voice 1, the voices won't stay synchronized.

## Volume

Like the tempo, the general volume level of a song is also usually indicated at the beginning of a song. Volume is specified by the letters *p* for *piano* (soft) and *f* for *forte* (loud).

### The VOL Command

The master volume of the SID chip ranges from 0 to 15, with 15 being the loudest and 0 being off. This volume level is set by the VOL command.

### Suggested Volume Levels

The following chart shows the suggested volume levels for various dynamics markings.

| Dynamic | Level | Dynamic | Level |
|---|---|---|---|
| fff | 12 | mp | 7 |
| ff | 11 | p | 5 |
| f | 10 | pp | 4 |
| mf | 8 | ppp | 3 |

### Volume-Level Caution

It's strongly recommended that you *not* use volume levels above 12, even though the master volume can go to 15. The highest volume levels can overpower some television and monitor speakers and distort the sound.

### Default Volume

If the sheet music doesn't specify a volume, don't enter a VOL command. The default volume level of 8 (mf) will be used.

### Volume and Multiple Voices

As its name implies, the master volume controls the overall volume of all three voices. Therefore, you only need to use the VOL command on one voice. It doesn't matter on which voice the VOL command is used, but it's most often used on voice 1. If the VOL command is used on different voices at the same point in the music, the VOL command on the highest numbered voice prevails.

## Measure Markers

The F7 key on the Editing Screen is one way to enter a measure marker, but it works best when the measure markers are numbered and entered sequentially. When F7 is pressed on the Editing Screen, the Editor takes the current measure number, adds 1, and inserts an MS# command with that number.

### The MS# Command

To enter an MS# command with any number from 0 to 999, select the MS# command from the Command Screen and follow the standard procedure of typing a number and pressing RETURN. This is useful when you're using measure markers infrequently, such as at the top of each page of the sheet music, or when you want to enter an MS#0 or MS#999 command to limit the range for a measure-number increment or decrement.

## Search for a Command

For those occasions when you want to see if you've used a particular command somewhere in a voice, a command-search feature is available on the Command Screen.

Searching can be done in two ways. You can either search for a command with a specified value, or search for the next occurrence of that command with any value.

### Search for Command with Value

To search for the first occurrence of a particular command with a specified value, move the command box to that command and press the F5 key. The number-range prompt appears in the window, just as if you'd pressed the RETURN key. The only difference is that the prompt reads *SEARCH:*, not *ENTER:*. Type the appropriate number and press RETURN. The Editor starts at the beginning of the voice and searches for the specified command. When the first occurrence of the command is found, the notes scroll so that the command is in the box at the bottom of the screen. If the specified command isn't found in the voice, the notes are not scrolled and the message *COMMAND NOT FOUND* prints in the window.

### Search from Current Position

As with the F5 measure search on the Editing Screen, the command search on the Command Screen can be made to start its search at the current position rather than at the beginning of the voice. Simply press SHIFT–RETURN when you enter the command number instead of RETURN.

### Searching to the Left

You can specify the search direction on the Command Screen with SHIFT-D, in the same manner as on the Editing Screen. If the direction has been set for searching to the left, the command search starts at the end of the voice or at the current position, and works to the left until the specified command or the beginning of the voice is reached.

### Search for Next Occurrence of Command

To move to the next occurrence of a particular command with any value, place the command box on the desired command and press F7. The Editor searches the voice starting from the current position and stops at the next occurrence of the specified command. Notes are scrolled to that position. If no more commands of that type are found before the end of the voice is reached, the Editor scrolls to the end of the voice. This is

very similar to using the F8 key, except that the Editor scrolls to the next command of the indicated type, not the next MS# command.

If the direction set by SHIFT-D is to the left, F7 works more like F6 and moves to the previous occurrence of the command, or to the beginning of the voice.

### Examples

Here are some simple examples to help illustrate how command searching works. Assume that the following notes and commands have been entered on the current voice, and that the SHIFT-D direction has been set to the right.

| TEM | VOL | C 4 | VOL | D 4 | VOL | E 4 | TEM | VOL | F 4 |
|---|---|---|---|---|---|---|---|---|---|
| 120 | 6 | Q | 7 | Q | 5 | Q | 112 | 7 | Q |

With the box at the bottom of the screen in any location in the voice, move the command box to the TEM command, press F5, type the number 112, and press RETURN. The Editor scrolls the notes to show the TEM 112 command in the scroll-area box.

If you then move the command box to the VOL command, press F5, enter the number 7, and press RETURN, the Editor scrolls to the *first* VOL 7 command—the one between the C and D quarter notes.

Next, press F7 and the Editor moves the scroll-area box to the VOL 5 command, which is the next VOL command in the voice.

Finally, move the command box back to the TEM command, press F5, type the number 120, and press SHIFT–RETURN. The Editor doesn't scroll the notes, but instead prints the message *COMMAND NOT FOUND*. There were no TEM 120 commands starting from the position of the VOL 5 command and working to the right.

The results would be different for both F5 and F7 if the search direction was set to the left.

## Update Mode

The Command Screen supports its own kind of update mode, which is usually off. When this mode is turned on and a command scrolls into the box at the bottom of the screen, the command box automatically moves to that command. This can be quite handy when you want to change the values of one or

more commands. As soon as you scroll to the command you want to change, the command box is already in position. You can just press RETURN to select the command and enter the new value. This feature can also be helpful when used in conjunction with SHIFT–RETURN to enter a command number, but not scroll the notes.

Use SHIFT-Q to turn the Command Screen update mode on or off. Note that this mode has nothing to do with the update mode on the Editing Screen, even though the same key is used.

## Help Screen

Press the HELP key on the Commodore 128 or SHIFT-H on the Commodore 64 to see a help screen for the Command Screen. The help screen shows the tempos that are supported by the TEM command, and the jiffy durations of notes in each tempo. Jiffy durations are explained in Chapter 9, when the envelope release point is introduced.

The help screen is actually two screens. After you've seen the first, press any key to go on to the second. Press any key again to return to the Command Screen.

# Chapter 6

# The Display Screen

Chapter 6

# The Display Screen

*This chapter describes how to use the Display Screen. This screen lets you see the values of all commands while a song plays.*

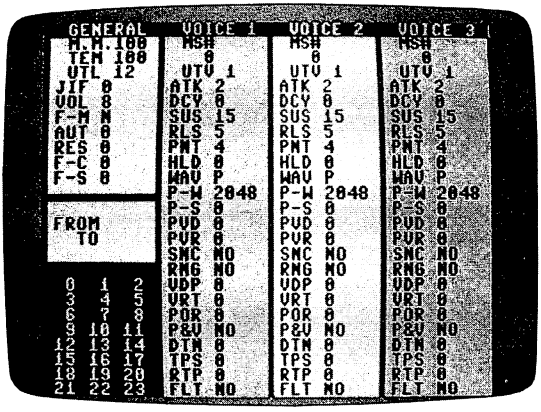
*The Display Screen can be very helpful when you're first learning how to use the* Enhanced Sidplayer's *commands. The screen is easy to use and understand, so make sure you read this chapter.*

## Basic Parts of the Display Screen

The Display Screen consists of four columns and appears as shown in Figure 6-1.

On the left, the General column displays values which apply to all three voices. Below the General column are two boxes used for displaying measure and phrase numbers. The other three columns are Voice columns. Each Voice column corresponds to one of the three voices, and is color coded to match the color of that voice's piano key on the playing screen.

**Figure 6-1. The Display Screen**



### General Column

The tempo and master volume must be the same for all three voices, so these values are shown in the General column. And since there's only one filter which can be used by any of the three voices, the current filter settings are also displayed here.

The first number shown is labeled *M.M.* and is usually identical to the value labeled *TEM.*

The other numbers in the column indicate the current values for the tempo (TEM), utility duration (UTL), jiffy length (JIF), volume (VOL), and filter (F-M to 3-O). If no song has been played yet, the default values appear.

### Measure Box

The gray box at the bottom of the General column is used when you want to play the music starting at one measure and ending at another. Initially, there are no measure numbers displayed here, so playing will start at the beginning of the song and continue to the end.

### Phrase Box

The black area below the measure box displays all the phrase numbers. These numbers are highlighted when the respective phrases are defined. The color of the highlighting indicates which voice contains the phrase definition.

### Voice Columns

The first number shown in each voice column is the number of the last MS# command encountered when the voice was played.

The line below the MS# number has two roles. It displays the current-note pitch and duration when the voice is playing; then, once playing stops, it displays the number of jiffies that were left to play. For example, if you stop the playing and the number 4 shows, it means that you stopped the playing four jiffies from the end of the current note. This feature helps you detect when the voices are off by one or more jiffies.

The remaining entries in the column display the current values for the various commands. For instance, the number after the command name P-W (pulse width) shows the value of the last P-W command processed by *Enhanced Sidplayer.*

When no song has been played, default values are shown.

### Alternate Displays

There are a few command values not displayed on the Display Screen. These include the modulation settings and the values of the most recent FLG and AUX commands. To see the modulation settings, press SHIFT-F. The filter values in the General column and the bottom three commands in each Voice column are replaced with the modulation commands. Press SHIFT-F again to return to the previous display.

To see the most recent FLG and AUX command values, press SHIFT-U. The UTL and UTV displays change to show FLG and AUX values. When no FLG or AUX commands have been processed yet, the number 0 is displayed. Press SHIFT-U again to see the utility-duration numbers again.

## Playing on the Display Screen

### Start Playing

To start the playing on the Display Screen, press the P key.

While the song plays, you can press the 1, 2, and 3 keys to select and deselect the voices. The column heading for each voice appears highlighted to indicate when it is playing.

Use RETURN to turn on all the voices, or right SHIFT–RETURN to turn off all but the current editing voice.

The fast-forward and slow-playing features are also available on the Display Screen. Press the Commodore or CTRL keys to fast-forward, and the Commodore or CTRL keys for slow-play.

### Automatic Replay

A special feature of the Display Screen is that when a song ends, it automatically starts over.

### Stop Playing

Press the space bar to stop the playing. If you now change screens to either the Editing or Command Screen, you'll see that the editing position is at the beginning of the voice displayed.

You can also stop play by pressing F7. When you do this, the current editing position on each voice is set to point at the note which was playing when F7 was pressed.

### Resume Playing

To resume the playing, press the R key. This feature is not available if the song has not yet played or if the playing had stopped because of an error such as *ILLEGAL DURATION.*

### Play from Measure to Measure

To start the playing at a particular measure, rather than at the beginning of the song, press the F5 key when the song is not playing. A cursor appears after the word *FROM* in the Measure Box. Type the starting measure number and press RETURN. Playing will now begin at this measure the next time you press the P key.

You can also specify the stopping point. Press F7 when the song is not playing and enter a number after the word *TO* in the measure box.

To cancel either feature and start or stop at the beginning or end of the sound, press F5 or F7; then press RETURN without entering a number.

### Playing Errors

Whenever the playing stops with an error, the Editor switches to the Main Menu to display the message.

### Demonstration

To see just how lively the Display Screen can get, play the song called FRUMSKINDER on the *Enhanced Sidplayer* disk and watch it on the Display Screen.

# Chapter 7

# A Sample Session

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Clear the Voices
Tempo
Volume
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Chapter 7

# A Sample Session

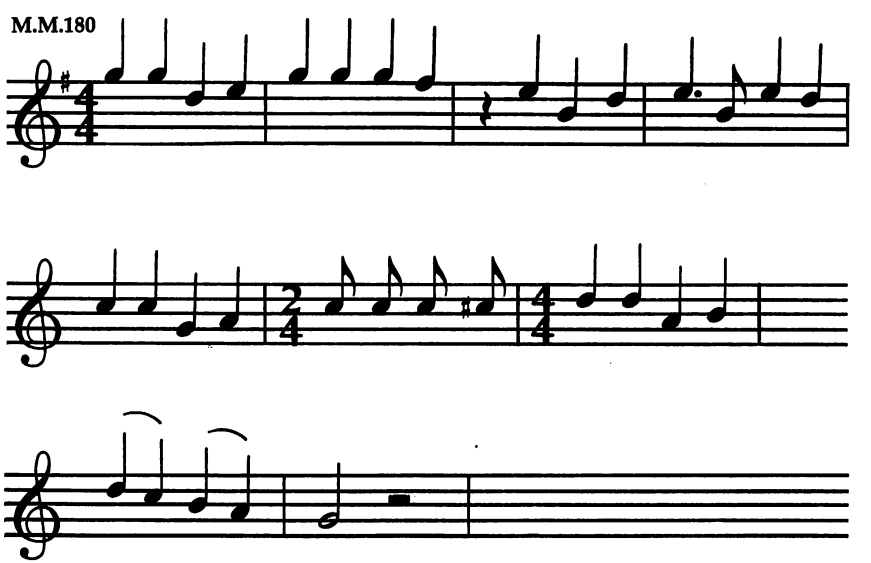
*Here's a step-by-step example demonstrating how to enter a short song. This sample session covers basic note entry and some editing features, and also gets you started on the use of commands.*

*This chapter gives you some immediate hands-on experience with* Enhanced Sidplayer *and offers a taste of what it's like to enter a song. It does not, however, replace any of the preceding chapters. Chapters 3–6 contain valuable information that makes song entry easier and faster. So, although you can use this sample session as a way to learn the basic operation of the Editor, read the earlier chapters before you start entering longer songs.*

## The Sheet Music

Let's use a simple blues rhythm for the demonstration.

**Figure 7-1. The Blues**



As you look at Figure 7-1, you'll notice that the song is written in 4/4 time, the key signature shows one sharp, and most of the notes are quarter notes. There are some variations, however. There's a quarter rest, a dotted note, a brief time signature change to 2/4 time (the notes are eighth notes in that measure and one of them has an accidental), and some later notes are tied. The song ends with a half note.

## Clear the Voices

Begin by selecting the CLEAR item from the Main Menu to erase all three voices. The Editor either asks you to confirm that you want to clear the current song, or does nothing if the voices are already empty.

## Tempo

The sheet music shows that the tempo is M.M. 180. Press F1 or F3 as necessary to go to the Command Screen and use the I, J, K, and M keys or the joystick plugged into port 2 to move the command box to the TEM command. Press RETURN or the joystick button and enter the number 180 at the prompt. Notice that a TEM 180 command appears in the box at the bottom of the screen, then scrolls to the left one position.

## Volume

Since no volume level is specified on the sheet music, don't set the volume with a VOL command. When the voice is played, the default level of 8 will be used.

You're through entering commands. The next step is to enter the song's notes, so press F1 to switch to the Editing Screen.

## Key Signature

One thing you need to do before entering any notes is to set the key signature. The song is written in the key of G (the key signature shows one sharp). Press Commodore-+ once to select the key of G. The key-signature display at the top right corner of the screen changes to show the key of G with one sharp.

## Time Signature

For convenience, let's turn on the automatic measure-numbering mode. When you press SHIFT-W, a time signature appears in the message window. The bottom number should be 4, but the top number will be 0. Keep pressing SHIFT-W until the top number changes to a 4.

## Measure

You're ready to enter the notes in the first measure, so press F7 to enter the first measure marker. The Editor knows that the numbering should start at 1.

## Note Entry

Enter the notes for the first measure. The first four notes are quarter notes with the pitches G5, G5, D5, and E5. Press the Q key to select the quarter-note duration, and press the G and 5 keys to select the pitch G5. Of course, if the duration is already set at a quarter note (as it should be if you're starting fresh, since it's the default), you don't have to press the Q key. The same is true for the pitch and octave.

To enter the first note, press the RETURN key. The note appears in the box in the scroll area and then shifts to the left. The next note is also a G5, so you don't have to change any duration or pitch parameters. Just press the RETURN key again to enter the second note.

The remaining two notes are D5 and E5. Press the D and E keys as appropriate before entering these two notes.

After the E5 is entered, the Editor automatically enters the MS#2 command to mark the beginning of the next measure. Continue by entering the next four notes. Notice that because of the current key, the F-sharp, not F-natural, is automatically selected for the last note of this second measure. The Editor automatically enters the third measure marker.

Measure 3 begins with a quarter rest. Press the R key to select a rest instead of a pitch, then press RETURN to enter it. The rest stays on until you press the E key to set the pitch for the E5 note.

Measure 4 starts with a dotted quarter note. Press the period (.) key to select the dot, then enter the note. Press the 8 key to select the eighth-note duration for the next note. The

remaining two notes are quarter notes, so press Q to select a quarter-note duration before entering them. Continue by entering the notes for the fifth measure.

Things get interesting at measure 6. The notes are eighth notes, not quarter notes, so change the duration again. The last of these eighth notes has a sharp symbol in front of it, changing the pitch for that note from C-natural to C-sharp; so, press the plus (+) key to select the sharp before you enter that note.

Also notice that this measure plays for only two beats instead of the usual four beats, as indicated by the time signature change to 2/4 time. Since the Editor is still using 4/4 time, it won't automatically enter the next measure marker after the last quarter note. If the time signature was going to stay at 2/4, it would be worthwhile to use SHIFT-W to set the time signature to 2/4 so that the automatic measure numbering would work correctly. However, since the change lasts for only one measure, press the F7 key to manually enter the measure marker 7, and continue by entering that measure's notes. Remember to set the duration back to a quarter note.

Notes D5 and B4 in measure 8 are followed by ties, so press the slash (/) key to select the tie mode before you enter those two notes.

The last measure, number 9, is easy since it contains only a half note and a half rest. Once they've been entered, the voice is ready to be played.

## Editing

If you make a mistake and enter a wrong note, just use the cursor keys to scroll back to the note and enter the correct note instead. Remember that the cursor-up/-down key scrolls left and the cursor-left/-right key scrolls right. If you miss a note or enter an extra one, use the INST/DEL key as necessary to create space for another note or delete the unwanted note.

Other useful editing keys are the SHIFTed function keys. Press F2 or F4 to move to the beginning or the end of the voice, respectively. Press F6 or F8 to move to the previous or next measure.

## Playing

Press F2 to move to the beginning of the voice, then press P to begin playing. You can stop the playing at any time by pressing the space bar.

## Debugging

Sometimes you won't detect a mistake until the voice is played. The Editor can find some mistakes, like the use of a sixteenth note in a tempo which doesn't support sixteenth notes, but it cannot find others, like wrong pitches. If you hear a bad note while the voice is playing, press the F7 key. The playing stops and the note which was playing at that moment is displayed in the box.

A couple of other debugging features are fast forward and slow playing. Press the left SHIFT key while the voice plays to move rapidly past a part, or press the Commodore or CTRL key to slow the playing down.

If you want to hear only part of a voice, you don't have to start at the beginning of the voice and fast forward to that spot. Just scroll to the note where you want the playing to begin and press the P key. The playing starts at that position.

## Fun with Commands

At this time you might try changing the value of the TEM command or inserting some new commands. For example, try the WAV command with the values 1, 2, 4, and 0. When WAV is set to 4 for pulse wave, set different pulse widths from 200 to 2048 by entering a P-W command. Or experiment with the POR command set at different values starting at 400. The WAV and P-W commands can be entered at any place in the voice, even at several places. For best results, enter the POR command somewhere after the first note.

## The Display Screen

To see the waveform and other parameters change as the music plays, switch to the Display Screen and press the P key to start the playing. The various settings change as the commands are encountered in the music.

## Save

If you want to save the file, switch to the Main Menu and select the SAVE FILE item. Type Y at the first prompt and enter your own text lines. The standard practice is to give the full title of the song and the composer's name, followed by a credit for the person who entered the song. Press RETURN on any extra lines.

After the text lines are entered, specify a filename for saving the song. The save begins when you press the RETURN key. You may want to select the DIRECTORY item when the save is done to check that your song is really there.

## Load

If you want to insure that you have entered the notes correctly, you can compare your file with the one on the *Enhanced Sidplayer* disk. The file BLUES.MUS on the *Enhanced Sidplayer* disk contains the voice in this sample session on Voice 1. Voices 2 and 3 are an extra bass line and percussion line which you may also want to look at.

# Chapter 8

# Waveforms

Chapter 8

# Waveforms

*This chapter introduces the three basic commands for controlling the waveform of a voice.*

*The commands are very simple—simple enough to learn just through experimentation. If you skim this chapter, however, make sure you read the cautions on narrow pulse widths and pulse-width-sweeping wraparound.*

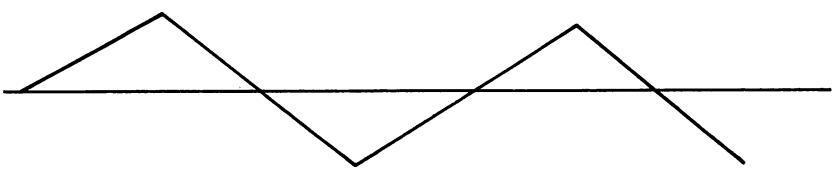
## Types of Waveforms

The *timbre* of a sound is what distinguishes a middle C played on a saxophone from a middle C played on a cello. The main thing that controls a sound's timbre is the type of vibration which produces the sound. There are a few basic types of vibrations or *waveforms.* These types are named according to their shape when viewed with an oscilloscope.

### Triangle

*Triangle* waves (Figure 8-1) produce soft, mellow tones. The flute is an example of an instrument which produces triangle waves.

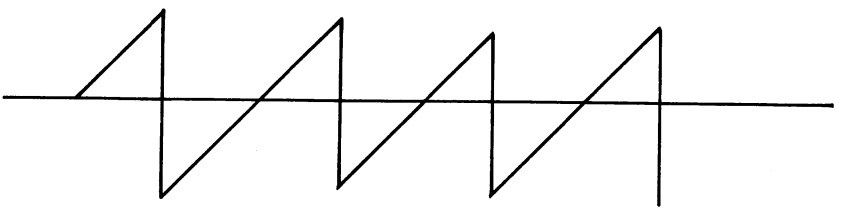
**Figure 8-1. Triangle Wave**



### Sawtooth

A *sawtooth* waveform (Figure 8-2) produces a bright, buzzy tone. Brass instruments create waves that are basically sawtooth waves. (This wave is also called a *ramp* waveform.)

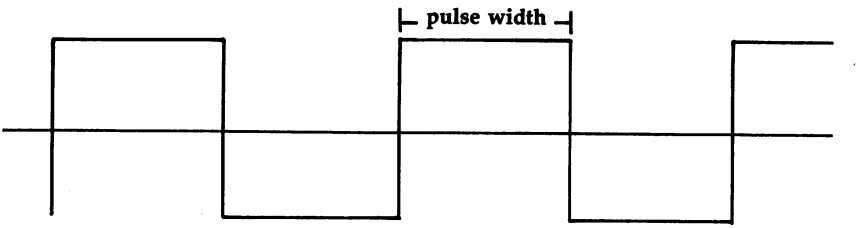
**Figure 8-2. Sawtooth Wave**



## Pulse

Figure 8-3 illustrates a *square* wave. This waveform sounds rich and hollow, and is produced by the clarinet, among other instruments.

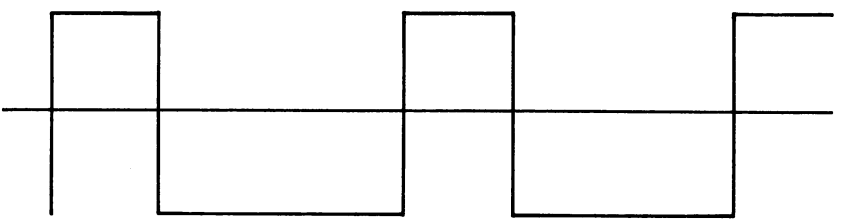
**Figure 8-3. Square Wave**




The *pulse* wave alternates between high and low states. The amount of time during one cycle that the wave is high is called the *width* or *duty cycle* of the wave. *Square waves* have a pulse width of 50 percent.

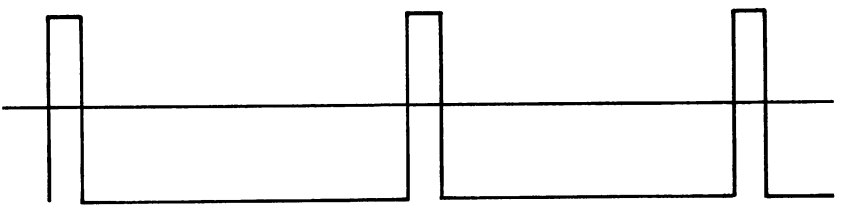
When the width is reduced, the wave becomes more *rectangular.* The waveform shown in Figure 8-4 might be produced by an oboe or bassoon.

**Figure 8-4. Rectangular Wave**



Pulse waves with a very narrow pulse width (Figure 8-5) sound thin and reedy.

**Figure 8-5. Narrow Pulse Width**

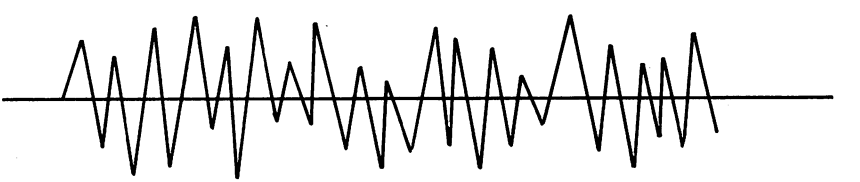


Pulse waves with widths greater than 50 percent sound just like pulse waves with widths less than 50 percent. For instance, a pulse wave with a 40 percent width sounds the same as a pulse wave with a 60 percent pulse width.

### Noise

The noise waveform shown in Figure 8-6 has no definite shape—it's completely random. It's called *noise* because it's the waveform associated with *white noise,* the sound you hear when a television station goes off the air. The noise waveform is useful for producing percussion effects, such as snare drums.

**Figure 8-6. Noise Waveform**



## Limits of the SID Chip Waveforms

The waveforms introduced here are the basic types, and are the only ones supported by the SID chip. Actual instruments produce more complicated waveforms which may not conform exactly to any one of these basic types. For this reason, the SID chip cannot truly reproduce the sound of real instruments. In most cases, the best it can do is create a close approximation of the desired sound.

## Setting the Waveform

The Command Screen in the Editor includes a row of commands which pertain to waveforms. Three of these commands are introduced in this chapter.

### The WAV Command

The first command, labeled WAV, specifies the waveform for a voice. When you press the RETURN key to select the WAV command, the window in the upper right corner shows you the number which represents each waveform.

| Number | Character | Waveform |
|---|---|---|
| 0 | N | Noise |
| 1 | T | Triangle |
| 2 | S | Sawtooth |
| 4 | P | Pulse |

Enter a number and press RETURN. The command which appears in the box at the bottom of the screen shows the letter instead of the number of the waveform selected.

Each of the three voices can have its own waveform.

## Setting the Pulse Width

### The P-W Command

If you choose the pulse waveform, you may also want to use the P-W command to set the pulse width. The numeric range for this command is from 0 to 4095, with 2048 being a perfect square wave (50 percent width). Values smaller or larger than 2048 produce rectangular waves. Try playing a voice using different P-W values to hear the effects of the various pulse widths.

Just as each voice has its own waveform, each voice also has its own pulse width. Changing the pulse width for one voice does not affect the others.

The pulse width has no effect on the triangle, sawtooth, and noise waveforms.

### Caution About Narrow Pulse Widths

As you approach the limits of 0 or 4095, the waves become so narrow that the volume begins to decrease. The pulse wave is inaudible when the pulse width is set to 0 or 4095. In most cases, only width values from 100 to 4000 are used.

### Pulse-Width Sweeping

An advanced feature of *Sidplayer* is that it can change the pulse width during a note. This is called *sweeping* the pulse width. When sweeping is turned on, the pulse width starts at the value specified in the last P-W command, but increases or decreases for the duration of the note. The width is then reset back to the specified value at the beginning of the next note.

The effect is to add a sense of motion to the sound. A typical way to use sweeping is to set the pulse width at 2048 and have it increase slowly, so that the sweeping is barely noticeable. Another technique is to set the pulse width lower, perhaps at 400, and have it increase rather quickly. You'll hear the sound go from a rectangular wave to a square wave as the width reaches 2048, then back to a rectangular wave as the width continues to increase.

### The P-S Command

The P-S command controls pulse-width sweeping. Values from 1 to 127 turn on the sweeping and determine the sweep rate. The specified value is the amount added to the pulse width each jiffy (every 1/60 second), so the larger the value, the faster the width increases. Values from −1 to −127 do the same thing, except that they cause the width to decrease. Try 10 for starters.

To turn off the pulse-width sweeping, enter the P-S command with the number 0.

### Pulse-Width Sweeping and Tied Notes

If one note is tied to another, the pulse width is not reset when the second note starts playing. The sweeping just continues with no break.

### Caution About Pulse-Width-Sweeping Wraparound

If the pulse width is allowed to sweep past 4095, it wraps around to 0 and continues sweeping. The same thing happens if the width decreases and sweeps past 0.

When the width wraps around, the SID chip makes a popping noise. The noise is quite noticeable and usually detracts from a song, so wraparound should be avoided. Wraparound is most likely to happen when a fast sweep rate is used, when long notes are played, or when several notes are

tied together. In most cases wraparound can be avoided by using a smaller sweep rate or by setting the pulse width lower so that the sweeping occurs over a longer distance.

### Resetting the Pulse Width

When you turn the sweeping off with the command P-S 0, the pulse width isn't reset to the specified value at the beginning of the next note. If you want the pulse width reset, use the P-W command to set the width again.

## Default Waveform Settings

Here's a list of the default waveform settings.

```
WAV  P
P-W  2048
P-S  0
```

This creates a square wave with no sweeping. This type of waveform is used if none of the waveform commands are placed at the beginning of a voice.

The default settings were chosen for their neutrality, not because they produce an especially pleasant timbre. Explore the effects of different waveform settings. Remember that each voice can have its own waveform, pulse-width, and sweep-rate settings, and that the settings can be changed at any point in a song.

## Demonstrations

For an example of the various waveforms and sweeping effects, load and play the song WAVEFORMDEMO on the *Enhanced Sidplayer* disk. The song is a familiar melody played ten times, with different waveform settings each time. You may want to play the song from the Display Screen to see the changes as they occur.

**1. WAV P P-W 2048 P-S 0**
The default settings for a square wave with no sweeping are used the first time the melody is played.

**2. WAV T**
The second time through, the triangle waveform is used. Notice that it's much softer and quieter than the square wave. The waveform controls the timbre of a sound, but one side ef-

fect is that it also has a slight effect on the volume. In general, the square wave is the loudest waveform, the triangle wave is the quietest.

**3. WAV S**
The sawtooth waveform is used the third time.

**4. WAV N**
The noise waveform is used the fourth time the melody is played. You can tell that the different pitches of the notes produce different kinds of sounds, but the sounds have no discernable pitch.

**5. WAV P P-W 2048 P-S 0**
The melody is played again with the default settings. The following examples keep the pulse wave and change only the pulse width and the sweep rate.

**6. WAV P P-W 1600 P-S 0**
This time the pulse width is changed to give a somewhat more rectangular pulse wave. The tone should be slightly different from the previous play.

**7. WAV P P-W 800 P-S 0**
The tone should sound very different at a width of 800.

**8. WAV P P-W 200 P-S 0**
This gives a very narrow pulse wave.

**9. WAV P P-W 2048 P-S 10**
This time, the width is back to the square-wave setting, but a light sweeping is used.

**10. WAV P P-W 2048 P-S 50**
The wave should sound raspier with the larger sweep rate. The sweep rate is in fact too large. You can hear the sweeping wrap around and produce a popping noise when the half notes are played.

To close the chapter, listen to two more demonstration songs. These are complete songs which use a variety of waveform settings.

The first, called TSONATA 6-3, uses the triangle, sawtooth, pulse, and noise waveform settings. The second song, FUGUE NO. 7, uses only the pulse wave, but with different pulse widths and lots of pulse-width sweeping.

# Chapter 9

# Envelopes

Chapter 9

# Envelopes

*This chapter defines an envelope and shows you how to use the six commands which control the envelope of each voice.*

*The envelope is a very important part of a voice, and is one of the harder concepts to master. You may run into difficulties if you use envelope commands without understanding how they work. If the envelope isn't set correctly, some notes may not be audible when they're played. Take the time to read this chapter carefully, especially the section on the release point.*

## The Envelope of a Note

Though the term *dynamics* refers to the general volume of a song as set by the VOL command, it doesn't describe the changes in volume which occur while an individual note plays. These changes in volume over the course of a note are referred to as the *envelope* of that note.

Although it may not be immediately obvious that the volume of a note must change over a note's duration, there is a reason why it's necessary. If the volume of each note did not change, there'd be no way to tell any difference between a quarter note and four sixteenth notes played one after another. To hear the sixteenth notes as separate, distinct notes, there must be a break in volume between each. It turns out that this change in volume between notes can get rather complicated, and can have a significant effect on the music.

## The Four Parts of the Envelope

The practice that's been used in the field of electronic music for many years will work equally well here—let's break the envelope of a note into four stages.

### Attack

When a note first starts playing, the volume must increase from no volume to the peak volume established by the master volume level. The speed at which the volume rises is called the *attack rate.*

### Decay

The volume then diminishes slightly until it reaches an intermediate volume level called the *sustain level.* The rate at which the volume falls from the peak level to the sustain level is called the *decay rate.*

### Sustain

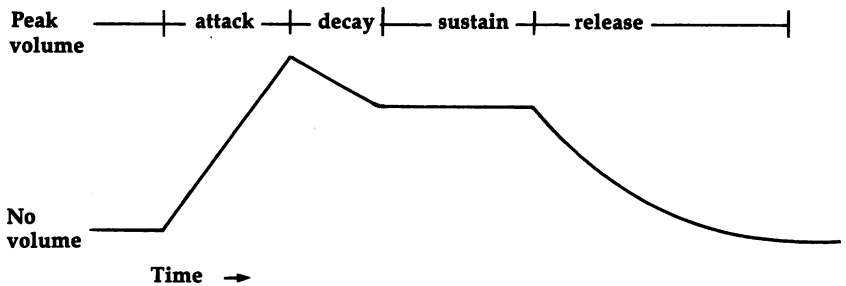
The volume stays at the *sustain level* for most of the duration of the note.

### Release

Toward the end of the note, the volume begins to fade away at a speed called the *release rate.*

A good way to understand the four stages of the envelope is to graph them as shown (Figure 9-1).

**Figure 9-1. ADSR Envelope**




The graph's horizontal axis represents time and the vertical axis represents volume. Over the span of one note, the volume rises, falls to an intermediate level, stays at that level for a while, and then fades away to silence.

This standard envelope is sometimes also called an *ADSR envelope,* because of the Attack, Decay, Sustain, and Release sequence.

## Types of Envelopes

Not all instruments play notes with the same ADSR values. Each instrument has its own characteristic envelope. In electronic music, the ability to control the envelope of a voice lets you more closely approximate a particular instrument.

There are two basic types of envelopes. One type is used for sustaining instruments, which include organs, wind instruments, and string instruments played with a bow.

The other type of envelope is for nonsustaining instruments—string instruments which are plucked and percussion instruments such as drums.

### Sustaining Envelopes

For an example of a sustaining envelope, let's consider a person playing a violin. At the beginning of a note, the player has to dig in with the bow to make the string start vibrating. This is the attack.

Once the string has started to vibrate and is producing a tone, the player doesn't have to apply quite so much pressure to the string to keep it vibrating, so the volume is reduced a bit. This is the decay part of the envelope.

As the player continues to bow, a constant volume level is maintained. This is the sustain part of the envelope.

At the end of the note, the player stops the bow, but the string continues to vibrate for a moment until the sound fades away completely. The instant when the player stops the bow is called the *release,* and the rate at which the volume fades away is the release rate.

The whole process works similarly for a wind instrument, such as a flute. The player has to blow with a little extra force to start the air vibrating, and then eases off slightly. The air continues to vibrate for a moment after the release, when the player stops blowing.

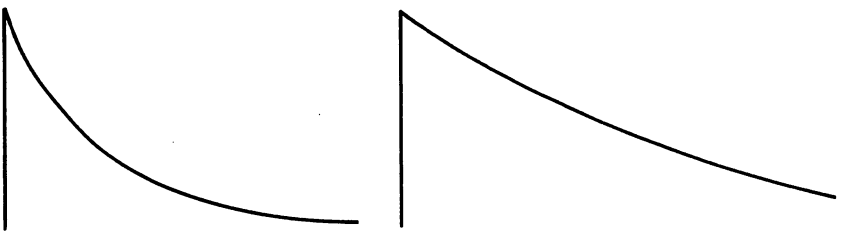
### Nonsustaining Envelopes

Nonsustaining instruments have completely different envelopes. The most important characteristic of these instruments is that they are struck. The instrument is hit or plucked once for each note. No continual force is applied, as when a bow is drawn or air blown, so the volume is not sustained.

Most percussion instruments have nonsustaining envelopes. These instruments include drums, bells, and others like woodblocks. They usually have very fast attack rates. The decay rate varies from one instrument to another. The sound of a snare drum decays rather quickly, but the sound of a gong takes a long time to decay. Since there's no sustain, there's no sustain part of the envelope. Thus it's called an *ADR envelope.*

The two graphs in Figure 9-2 illustrate nonsustaining envelopes.

**Figure 9-2. ADR Envelope**



**Snare drum envelope** **Gong envelope**

## Setting the Envelope

The Command Screen has six commands which are used to configure the envelope.

### The ATK Command

Use the ATK command to set the attack rate of a voice. The command lets you choose one of 16 attack rates, numbered from 0 to 15. At rate 0 the attack takes just a fraction of a second, while at rate 15 the attack takes about eight seconds.

### The DCY Command

The DCY command sets the decay rate. Again, its rates are numbered from 0 to 15, with 0 being the fastest. However, the rates are a little slower. The decay takes 24 seconds at rate 15.

### The SUS Command

Set the sustain level with the SUS command. If it's set to 0, the volume decays to no volume. If the level is set to 15, the volume doesn't decay at all, and stays at the peak volume set

by the VOL command. Values between 0 and 15 correspond to evenly spaced volume levels between no volume and peak volume.

*When you're using a nonsustaining envelope, the sustain level must be set to 0.*

### The RLS Command

The RLS command sets the release rate. The rates, numbered from 0 to 15, are the same as those for the DCY command.

When you use a nonsustaining envelope, the release is the same thing as the decay, so the release rate is usually set to the same value as the decay rate.

### Default Envelope Settings

These are the default values for the envelope.

**ATK 2**
**DCY 0**
**SUS 15**
**RLS 5**

This configuration produces an envelope suitable for an organ. As with the waveform default settings, these values were chosen because they're good starting points for creating new envelopes, not because they define an especially pleasing envelope.

### Changing the Envelope

You can change the envelope at any point in a song. For example, a voice may briefly switch to a nonsustaining envelope to play one part, then switch back to a sustaining envelope and continue.

### Envelopes on Multiple Voices

Though each voice can have its own envelope, it's recommended that all three voices have a similar attack rate. Otherwise, the voices may not seem to be playing together.

## The Release Point

The *release point* is the point in a note's duration when the volume begins to drop from the sustain level to silence. *Enhanced Sidplayer* lets you control when the release should

occur, but to understand how to use this feature, it's necessary to know how the program handles durations.

## Explanation of Jiffies

*Enhanced Sidplayer* deals with note durations in terms of time units called *jiffies*. One jiffy lasts about 1/60 second. Table 9-1 shows the jiffy length of each note duration in each tempo. This chart is the same as the one displayed on the help screen for the Command Screen.

**Table 9-1. Tempo**

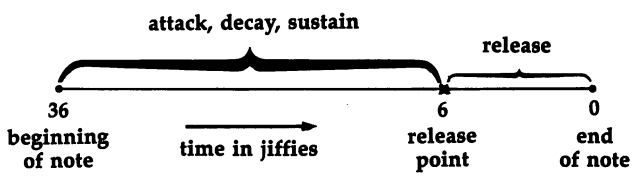
| M.M. | W | H | Q | E | S | 32 | 64 |
|---|---|---|---|---|---|---|---|
| 1800 | 8 | 4 | 2 | 1 | — | — | — |
| 900 | 16 | 8 | 4 | 2 | 1 | — | — |
| 600 | 24 | 12 | 6 | 3 | — | — | — |
| 450 | 32 | 16 | 8 | 4 | 2 | 1 | — |
| 360 | 40 | 20 | 10 | 5 | — | — | — |
| 300 | 48 | 24 | 12 | 6 | 3 | — | — |
| 257 | 56 | 28 | 14 | 7 | — | — | — |
| 225 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 200 | 72 | 36 | 18 | 9 | — | — | — |
| 180 | 80 | 40 | 20 | 10 | 5 | — | — |
| 163 | 88 | 44 | 22 | 11 | — | — | — |
| 150 | 96 | 48 | 24 | 12 | 6 | 3 | — |
| 138 | 104 | 52 | 26 | 13 | — | — | — |
| 128 | 112 | 56 | 28 | 14 | 7 | — | — |
| 120 | 120 | 60 | 30 | 15 | — | — | — |
| 112 | 128 | 64 | 32 | 16 | 8 | 4 | 2 |
| 105 | 136 | 68 | 34 | 17 | — | — | — |
| 100 | 144 | 72 | 36 | 18 | 9 | — | — |
| 94 | 152 | 76 | 38 | 19 | — | — | — |
| 90 | 160 | 80 | 40 | 20 | 10 | 5 | — |
| 85 | 168 | 84 | 42 | 21 | — | — | — |
| 81 | 176 | 88 | 44 | 22 | 11 | — | — |
| 78 | 184 | 92 | 46 | 23 | — | — | — |
| 75 | 192 | 96 | 48 | 24 | 12 | 6 | 3 |
| 72 | 200 | 100 | 50 | 25 | — | — | — |
| 69 | 208 | 104 | 52 | 26 | 13 | — | — |
| 66 | 216 | 108 | 54 | 27 | — | — | — |
| 64 | 224 | 112 | 56 | 28 | 14 | 7 | — |
| 62 | 232 | 116 | 58 | 29 | — | — | — |
| 60 | 240 | 120 | 60 | 30 | 15 | — | — |
| 58 | 248 | 124 | 62 | 31 | — | — | — |
| 56 | 256 | 128 | 64 | 32 | 16 | 8 | 4 |

The number of jiffies for a whole note is different for each tempo. This number is repeatedly cut in half to give durations like a half note, a quarter note, and so on. After a certain point, some numbers cannot be evenly divided by two, which is why some tempos don't support sixteenth, thirty-second, or sixty-fourth notes.

## The PNT Command

The PNT command sets the release point, and specifies how many jiffies from the end of a note the release should begin. Let's say that the release point is set at 6 and the current tempo is M.M. 100. As you can see by looking at Table 9-1, a quarter note in this tempo is 36 jiffies long. It takes 30 jiffies for the volume to go through the attack, decay, and sustain stages of the envelope. Then the voice is released, and, during the remaining six jiffies, the volume falls from the sustain level to no volume. Figure 9-3 shows this process.

**Figure 9-3. Release Point**




The default value for the release point, and thus the PNT command, is 4.

## Legato Style

To play notes in a smooth, connected manner known as *legato* style, use a small release point such as 1 or 2. Since the release is so near the end of each note, the volume doesn't have a chance to fade to silence before the next note starts. This creates the flowing, continuous effect of legato style.

If you set the release point to 0, the notes are never released. It will sound as though a tie had been placed on each note.

### Caution About Large Release-Point Values

Even though the range of the PNT command is from 0 to 255, usually only very small values are used. Values like 3, 4, and 5 work best. Set the release point too high and notes of short duration won't be heard. For instance, in tempo M.M. 100, an eighth note is 18 jiffies long. If the release point is set at 20 jiffies, the eighth note is released as soon as it starts playing. The volume never has a chance to rise, and the note won't be heard.

For best results, always make sure that the release point is *less* than the duration of the shortest note which will be played. If necessary, set the release point to one value for the first part of a song, change it to a smaller value when shorter notes play, and then reset it back to the first value.

### Release Point for Nonsustaining Envelopes

*If you're using a nonsustaining envelope, the release point must be set to 1.*

## The Hold Time

To solve the problem with inaudible notes when the release point is too large, *Enhanced Sidplayer* supports another feature called the *hold time.* This is the amount of time, starting at the beginning of a note, during which the release point is ignored and the envelope is allowed to go through its attack, decay, and sustain stages. Like the release point, the hold time is specified in jiffies. Unlike the release point, however, the hold time's jiffies are counted from the beginning of the note instead of the end.

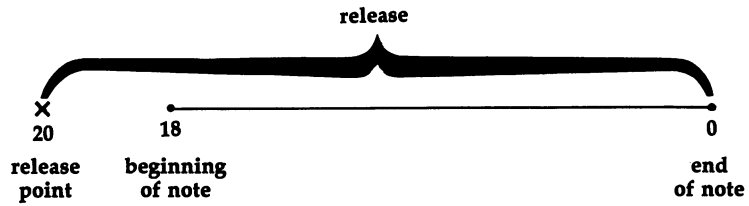
### The HLD Command

Use the HLD command to set the hold time. The command accepts values from 0 to 255. The default value is 0, which means that there's no hold time and the release point is always used to determine when each note should release. With any other number, the release of each note is held until the specified number of jiffies have passed.

Here's an example. Assume that the tempo is M.M. 100 and the release point has been set to 20. An eighth note played with these settings would be inaudible because an

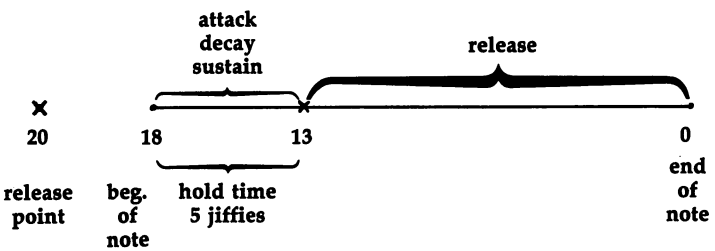
eighth note at M.M. 100 is only 18 jiffies long and the note would start to release immediately. Figure 9-4 is a good illustration of what happens.

**Figure 9-4. Inaudible**




To prevent this from happening, a hold time could be used. Let's say that the hold time has been set to five jiffies by the command HLD 5. Now when the eighth note is played, the release point is ignored for the first five jiffies while the envelope goes through the attack, decay, and sustain stages. Once the five jiffies have passed, the note starts to release because there are 13 jiffies remaining in the duration of the note. That's less than the release point of 20.

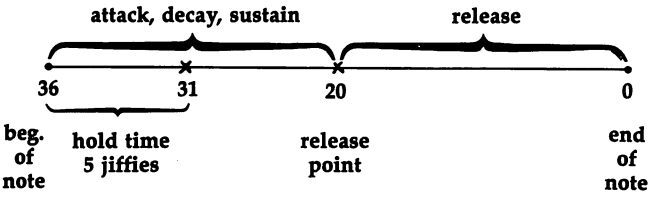
**Figure 9-5. Hold Time**




The hold time of five won't have any effect on a note with a longer duration, such as a quarter note.

Assume that the release point is still set at 20. A quarter note in M.M. 100 is 36 jiffies long, which means that its attack, decay, and sustain sequence lasts for the first 16 jiffies before its release (the last 20 jiffies). Since the quarter note doesn't release during the first 16 jiffies anyway, holding a release during the first five jiffies has no effect.

**Figure 9-6. Hold Time Wasted**




When a hold time is used, short notes are sometimes played as if they were tied together. Consider the case when the hold time has been set to five jiffies and the note being played is only four jiffies. The note is sustained for all four jiffies and is never released before the next note starts. The note is effectively tied to the next one.

### Staccato Style

A dot placed above or below a note in sheet music means that the note should be played in a quick, light, choppy manner. This is known as *staccato* style, and is the opposite of legato style.

One way to produce this effect with *Enhanced Sidplayer* is to set the release point at 255 and then use a small hold time—such as five jiffies. With these settings, all notes of different durations attack, decay, and sustain for five jiffies, then release for the remainder of their duration.

An alternate method of playing in a staccato manner is to use a nonsustaining envelope.

## Demonstrations

Three demonstration songs are provided on the *Enhanced Sidplayer* disk. The first is intended only to illustrate particular effects with envelopes, while the second is a complete song which emphasizes envelope changes. The third song demonstrates envelope changes combined with waveform changes.

The first song, called ENVELOPEDEMO on your *Enhanced Sidplayer* disk, plays a well-known melody ten times, each time with different envelope settings.

**1. ATK 0 DCY 0 SUS 15 RLS 5 PNT 4 HLD 0**

The melody is played the first time with the default settings for the six envelope commands. Notice that in this envelope

there's no decay, since the sustain level is set at maximum. Each note sustains at the peak volume level, which is the master volume set by the VOL command.

**2. ATK 2 DCY 7 SUS 8 RLS 5 PNT 4 HLD 0**
In this envelope, the sustain level has been set to half the peak level, so the volume decays and sustains at half of the volume set by the VOL command. The *bite* at the beginning of each note is quite noticeable. The decay is fairly fast but, could be made slower with a larger value for the DCY command.

**3. ATK 2 DCY 8 SUS 0 RLS 8 PNT 1 HLD 0**
This is a nonsustaining envelope, as you can tell from the sustain level of 0. As soon as the volume hits the peak level, it drops to silence. Notice that the release point has been set to 1, as it should be for all nonsustaining envelopes.

**4. ATK 9 DCY 0 SUS 0 RLS 0 PNT 1 HLD 0**
This is an example of a backwards envelope. The sound builds slowly and fades away quickly.

**5. ATK 2 DCY 0 SUS 15 RLS 5 PNT 4 HLD 0**
The default settings are played again.

The remaining examples change only the release point and hold time.

**6. ATK 2 DCY 0 SUS 15 RLS 5 PNT 1 HLD 0**
This envelope gives a smooth, legato feeling to the notes because the release point is so small. The notes release only during the last jiffy of each note and they never get a chance to fade completely to silence.

**7. ATK 2 DCY 0 SUS 15 RLS 5 PNT 12 HLD 0**
This gives a somewhat staccatto feel to the voice.

**8. ATK 2 DCY 0 SUS 15 RLS 5 PNT 16 HLD 0**
Here the release point is set too large. The eighth notes don't play consistently, and only the longer durations are heard each time.

**9. ATK 2 DCY 0 SUS 15 RLS 5 PNT 16 HLD 5**
The problem of the inaudible eighth notes has been corrected by using a hold time of five. The eighth notes are allowed to sustain for the first five jiffies before they're released.

**10. ATK 2 DCY 0 SUS 15 RLS 5 PNT 255 HLD 5**
This is an example of the staccato style. Each note sustains for five jiffies and then releases.

The second demonstration song—VIOL–AMINOR—is a complete song which uses a variety of envelope changes.

The third demonstration is ORGAN SONATA. This song doesn't use a lot of waveform and envelope changes, but it makes an important point. The song plays once with the default waveform and envelope settings, then repeats twice with slightly different settings each time. The repeats sound much more interesting than the first time through. This shows how just a few simple waveform or envelope commands can make a big difference in a song.

# Chapter 10

# Repetition

Chapter 10

# Repetition

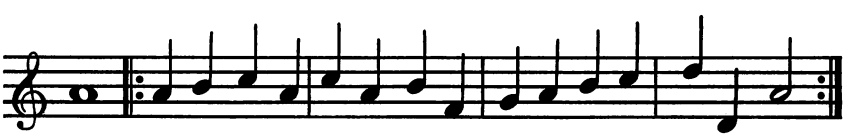
*As you listen to a song, you'll sometimes hear that a group of measures is played more than once. Repetition occurs often in music, especially in contemporary songs. This chapter introduces five commands which can be very useful when you want to repeat measures.*

*Two of the commands, for simple repeats, are easy to learn and use. The other three commands are for phrases, which are more complicated, but also much more powerful. Using phrases can save you a lot of time in entering a song. Additionally, phrases must be used with some of the advanced commands described in the next chapter. Since repeats and phrases are used so often, make sure you read this chapter.*

## Repeats

The simplest form of repetition is when a group of measures repeats immediately after it plays. Special symbols are used in sheet music to indicate that a sequence of measures repeats, saving having to write notes twice. The symbol which marks the beginning of a repeat consists of two vertical lines followed by two dots (Figure 10-1). The end of a repeat is marked by a symbol that looks almost the same, except the dots come before the double lines instead of after them.

**Figure 10-1. Repeats**



When the music plays and the first repeat symbol is reached, the playing continues as usual. Upon reaching the end of the repeat, however, the song doesn't continue to the

next measure; instead, playing jumps back to the measure which had the beginning repeat symbol and continues from that point. When playing comes to the end repeat mark the second time, it's ignored and playing continues with the next measure.

Normally, a sequence of measures repeats only once. There are, however, cases where measures may repeat several times, such as in a bass line.

### The HED Command

*Enhanced Sidplayer* has two commands to support repeats. The beginning of a repeat should be marked by the command HED, which stands for *repeat head.* The number for this command determines how many times the sequence of notes is to be play. In a standard repeat, the notes are repeated once, meaning that the sequence is played a total of two times. Thus, you'd normally enter the number 2 before pressing RETURN and continuing.

### The TAL Command

At the end of the repeat, enter the TAL command (*repeat tail*). There's no data value for this command, but since the Editor requires that you enter a number and press RETURN, just type any number from 0 to 9.

When the voice plays, the sequence of notes between the HED and TAL commands plays the designated number of times.

### The Repeat Count

The number entered for the HED command must fall in the range 0–255. In most cases this number will be 2, but you may find a use for a repeat count greater than that.

One application you might find a use for is repeating a note several times. (The HED and TAL commands don't have to be used solely with measures; they can be used as easily with single notes.) To make a note repeat 16 times, for instance, just put it between the commands HED 16 and TAL.

A repeat count of 1 means that the sequence should be played only once, which would seem to make the repeat structure unnecessary. A value of 1 is useful when you're first entering a song. If you keep playing a song to listen for bad notes at the end, you don't want to wait for repeats earlier in

the song, so use 1 at first (remember to change it to the correct value before you save the final version of the song).

Using 0 with the HED command makes the notes repeat forever. This may be useful in some game applications, but should not be used in normal music.

### Caution About Nested Repeats

Repeats cannot be nested. Whenever you use a HED command, it must be followed by a TAL command before another HED command can be used. It's okay for a voice to contain several repeats; you just can't have a repeat within a repeat. Each voice can have its own repeat, however, so each voice can repeat independently of the others.

When repeats are used properly, there should be one repeat end for every repeat beginning. If a voice is playing and a TAL command is encountered with no previous HED command, playing repeats forever back to the most recent HED command. If no HED command has been used on that voice, playing repeats forever back to the beginning of the voice.

## Phrases

Occasionally you'll find that a repeat has a first and a second ending, as shown in Figure 10-2. This means that one set of notes should be played at the end of the sequence the first time through, and a different set should be played the second time. The simple repeat structure of the HED and TAL commands cannot handle this kind of repeat. You must use *phrases.*

**Figure 10-2. First and Second Ending**


If a repeat is a loop, a phrase is like a BASIC subroutine. A phrase allows the same sequence of notes to be played at different places in the music. The first time the sequence of notes is played, special commands make *Enhanced Sidplayer* remember the beginning and end of the sequence. This is called *defining the phrase.*

Later in the music when the notes must be played again, playing can be made to jump back to the beginning of the phrase by using a single command. This is known as *calling the phrase.* When the end of the phrase is reached, playing continues with the notes immediately after the command which called the phrase.

It's important to understand that there are some differences between *Sidplayer* phrases and BASIC subroutines. In BASIC, a subroutine is usually put at the end of a program. Every time the subroutine has to be executed, it's called by the GOSUB statement. With *Sidplayer,* however, the notes and commands forming the phrase are placed in the song at the first instance where the phrase must be played. After the phrase has been played once, and thus is defined, it can be played again by using the phrase call.

### The DEF Command

To define a phrase, enter the DEF command. This command needs a number in the range 0–23. For now, just enter the command with the number 0, then enter the notes which form the phrase.

### The END Command

After the last note in the phrase, enter the command END. Like TAL, END has no data value, so enter it by typing 0–9 and pressing RETURN.

When playing reaches the END command, the notes have played once, the definition is complete, and the phrase is ready for calling.

### The CAL Command

To call the phrase, just enter the CAL command with the number 0. This one command takes the place of all the notes in the phrase.

### Example

Here's an example which demonstrates how phrase calling works.

Begin by entering the command DEF 0, followed by the notes up to, but not including, the first ending you see in Figure 10-2 (that means you'll enter the first six notes). Now enter the END command. The next two notes, those for the first

ending, come next. At this point, playing is supposed to return to the beginning to repeat. Instead of entering all those notes again, just enter the command CAL 0. Finally, enter the two notes for the second ending.

When the voice plays, the six-note phrase plays the first time. The DEF and END commands have no effect. The two notes for the first ending then play. The command CAL 0 sends playing back to the first note after the command DEF 0, to play the defined six-note phrase again. When the END command is reached, playing continues with the first note after the CAL 0 command.

### Calling a Phrase Several Times

A phrase can be called more than once. A phrase is still defined after it's been called, so it can be called as many times as necessary.

### Multiple Phrases

Phrases have many uses besides handling repeats with different endings. In fact, phrases are so useful that quite often one is not enough. Fortunately, *Enhanced Sidplayer* can remember up to 24 independent phrases. When you enter the DEF command, the number from 0 to 23 identifies which phrase is being defined. That particular phrase can later be called by using the same phrase number with the CAL command.

If, while a song plays, a CAL command tries to call a phrase which hasn't been defined earlier in the music, the Editor stops with error *UNDEFINED PHRASE CALL.*

### Calling a Phrase in Another Voice

The 24 phrases are shared among the three voices. For example, even though phrase 7 may be defined on voice 1, it can also be called on voices 2 or 3. This means that playing can temporarily jump to another voice.

### Nested Phrase Calls

It's possible for one phrase to call another. Phrase calls can be nested to a limit of five levels on each voice. If you try to exceed this limit, the Editor stops the playing with the *STACK OVERFLOW* error.

It's even possible to define one phrase inside another. Be aware that a phrase definition counts as one nesting level.

The only thing a phrase definition cannot do is call itself. If the definition of a phrase directly or indirectly contains a call to itself, an infinite loop results. Playing eventually stops with the *STACK OVERFLOW* error.

The *STACK UNDERFLOW* error also occurs if DEF and END commands are not properly matched and playing reaches an END command with no previous DEF command.

Remember that repeats should not be nested. If a repeat calls a phrase, and that phrase contains a repeat, you have, in effect, created nested repeats. As mentioned earlier, *Enhanced Sidplayer* forever repeats back to the second HED command when playing reaches the second TAL. If the HED command is in a different voice, the playing stops with the *REPEAT HEAD* error.

### Redefining Phrases

Phrases can be redefined at any time in a song. If a phrase is no longer needed, its number can be used in the DEF command of a new phrase. This lets you use more than 24 phrases during the course of a song.

## Other Kinds of Repetition

### Da Capo

Repeats are not the only kind of repetition. Other forms include *da capo* and *dal segno.* Da capo is indicated on sheet music by the letters *D.C.* and means that the playing should jump back to the beginning of the music and continue from there, this time ignoring all repeats. The playing may be stopped before the end of the song by the use of the word *fine.*

### Dal Segno

Dal segno, identified by the letters *D.S.*, means that playing should jump to the measure marked by a special sign, which looks like a slash with dots to either side, passing through a fancy letter *S* (see Figure 10-3). Playing continues from this point and stops at either the end of the song or at a *fine,* whichever comes first.

### Coda

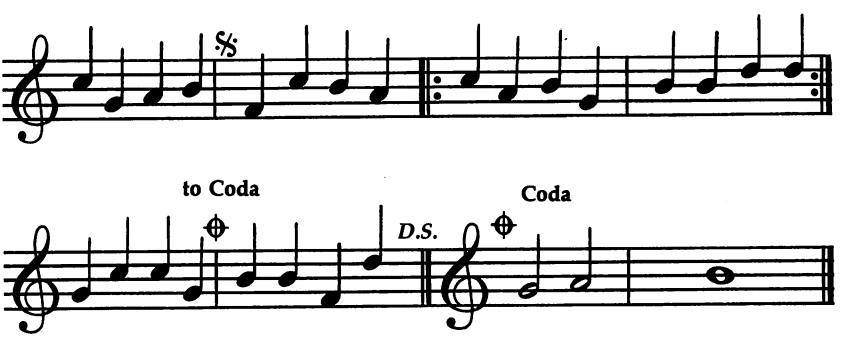
There's one other symbol often encountered when da capo or dal segno has been used. After playing has jumped back to

the beginning of the voice or to a particular measure, you may encounter the message *To Coda,* followed by a coda symbol. This symbol looks like a letter *O* with a cross passing through it (see Figure 10-3) and means that the playing is going to jump to another place again. This time, though, instead of jumping back, playing skips ahead. At the end of the sheet music you should find some measures labeled as *Coda,* with the coda symbol shown again. Playing jumps to the first of these measures and continues to the end of the song.

### Example

Through the clever use of phrase calling, *Enhanced Sidplayer* can handle these advanced forms of repetition. The example shown in Figure 10-3, although condensed and not necessarily typical, uses repeats, dal segno, and a coda.

**Figure 10-3. Repeats, D.S., and Coda**




Here's the order in which these measures would be played:

- The first two measures are played (the sign is ignored).
- The next two measures are played and then repeated.
- The following two measures are played (the coda symbol is ignored).
- At the D.S., playing goes back to the measure which had the sign (the second measure) and continues from there.
- This time, the measures in the repeat are played only once.
- When playing reaches the coda symbol, it jumps to the coda (the last two measures), then ends.

There are several ways in which repeats and phrases could be used to play these measures. Here's one:

1. Since the first measure is played only once, enter the notes in the measure without defining a phrase.
2. The second measure is played twice, but at two different times. A phrase is needed. Places the notes for the second measure between DEF 0 and END commands to define them as phrase 0.
3. The next two measures are repeated, but they're also played a third time later on. One solution is to use a HED 2 and a TAL command, and between those commands define phrase 1 with the notes in the two measures. The order would thus be *HED 2, DEF 1, notes for the two measures, END, TAL.* This way the measures repeat the first time, but can be played just once later on by calling phrase 1. The fact that phrase 1 gets defined each time through the repeat loop doesn't matter.
4. The fifth measure gets played at two different times in the song, so it should also be defined in a phrase. Assuming its phrase number is 2, the order would be *DEF 2, notes for fifth measure, END.*
5. The next measure is played only once, so just enter the notes for that measure.
6. At this point the playing is supposed to jump back to the second measure. That can be done with the command CAL 0.
7. Since repeats are ignored after a D.S. has been indicated, measures 3 and 4 must be played only once. That can be done with the command CAL 1.
8. The fifth measure also needs to be played just once. Use the command CAL 2.
9. Enter the notes for the coda, and you are all set.

The final sequence of commands and notes is

**Notes for measure 1**
**DEF 0 Notes for measure 2 END**
**HED 2 DEF 1 Notes for measures 3 and 4 END TAL**
**DEF 2 Notes for measure 5 END**
**Notes for measure 6**
**CAL 0**
**CAL 1**
**CAL 2**
**Notes for measures 7 and 8**

An alternate method would be to place a CAL 1 command where TAL appeared instead of using HED and TAL. Measures 3 and 4 would then play a second time.

Of course, when only a few notes are to be repeated, it's much easier to just reenter the notes. Phrase calls were used in the example only to demonstrate how phrase calling could be done in music where longer sequences of measures are repeated.

## Other Uses of Phrases

Phrases let you play the same notes at different points in a song, but the notes don't have to be played the same way each time. If you put the notes in a phrase, you can play the phrase, change the waveform and envelope settings, play the phrase again by calling the phrase, change the settings again, and so on. This technique was used in the waveform and envelope demonstration songs.

### Phrases and Commands

Phrases are also handy if you need to frequently alternate between two or more voice settings. A phrase can consist of only commands, with no notes. The first time you set the waveform and envelope for a voice, enclose the commands in a phrase definition. Later in the song, if settings have changed, and you want to return to the original settings, just call the phrase.

### The Clobber Error

Don't define several phrases at the beginning of a song before any notes are played. It may result in a *CLOBBER* error. The *CLOBBER* error occurs when the amount of time taken by *Enhanced Sidplayer* to process a sequence of commands exceeds one jiffy. If you get this error, it means that there are too many commands in a row, with no notes in between.

A phrase shouldn't be defined until the first time it's needed. Once the phrase has been played and defined, it can then be called for all later instances.

### Advanced Applications

You'll find other applications of phrases in the next chapter when the advanced techniques of detuning, sync mode, and ring modulation are introduced. When these techniques are used, it's necessary to have two voices playing the same notes simultaneously. Phrases come in very handy in these situations.

Chapter 11

# Frequency and Waveform Effects

Chapter 11

# Frequency and Waveform Effects

*This chapter introduces a variety of different commands which help you create even more interesting sounds with the SID chip. Some of the commands let you change the pitch of a note while it plays, and others make the SID chip produce more complicated waveforms to give you a whole new range of timbres.*

*The commands are easy to use, and you can have a lot of fun experimenting with them. The TPS command is especially useful and has many applications. If you'd like to find out how some simple commands can really liven up a song, don't miss this chapter.*

## Portamento

### Frequency Numbers

To make the SID chip produce a pitch, a *frequency number* has to be stored in the chip's frequency registers. The frequency numbers for all eight octaves can be found in the Appendix. Every time a new note is played, *Enhanced Sidplayer* examines the pitch of the note and stores the corresponding frequency number in the SID chip frequency registers for the specified voice.

The frequency numbers are rather large. Middle C's number, for example, is 4291. There's also a big difference between frequency numbers for each half step. The frequency number for the C-sharp above middle C is 4547, quite a jump from 4291.

The numbers between 4291 and 4547 make the SID chip produce pitches between C and C-sharp. Normally, these pitches are never played. If *Enhanced Sidplayer* plays a C followed by a C-sharp, the frequency number changes immediately from 4291 to 4547. But if the frequency number were to run through all the intermediate values before reaching 4547,

the pitch would make a smooth transition from the C to the C-sharp. The pitch would *glide* from the one note to the other.

The effect is called *glissando,* or *portamento* in synthesizer jargon. Gliding can be done between any two pitches, and can go up or down. The trombone is one instrument which does this naturally.

## The POR Command

*Enhanced Sidplayer* supports a portamento option for each voice. To turn on the portamento feature, enter the POR command with a number greater than zero. As each note plays, the pitch glides up or down from the previous note until it reaches the pitch of the new note. To turn off the portamento feature, use the command POR 0.

The POR command number specifies the value to be added to the current frequency number each jiffy, thus effectively controlling the glide rate. The larger the number, the larger the step from the old frequency number to the new one, so the faster the pitch glides from one note to the next.

An important characteristic of the rate number is that larger numbers must be used for higher pitches. If you examine the frequency numbers in the Appendix, you'll notice that the difference between the numbers increases as the pitch increases. To be precise, the difference doubles with each octave.

To get the same glide effect in each octave, the rate should be doubled or halved as necessary. For example, if the glide rate is 100 when playing notes in octave 4, use a glide rate of 200 for notes in octave 5 or a rate of 50 for notes in octave 3 to get the same effect.

Sometimes it may take a bit of experimentation to find the right POR command value for a particular glide. If the value is too large, the pitch immediately jumps from the old pitch to the new one when the new note starts playing. As you try smaller and smaller values, you should begin to notice that the pitch glides from the pitch of the old note to that of the new one, and then stays at that new pitch for the remainder of the new note's duration.

If the value for the POR command is too small, the pitch may not reach the pitch of the new note by the time that note is through playing. When that happens, *Enhanced Sidplayer* forces the pitch to jump to that of the new note. The gliding then starts from that pitch when the next note starts playing.

To illustrate this, consider the following example. You want to glide from a C4 eighth note to a G4 quarter note. If the POR value is too large, the pitch will jump to G4 as soon as that note begins to play. The effect is the same as if the portamento feature wasn't turned on. If the value for the POR command is smaller, the pitch will start to glide from C4 to G4 as soon as the G4 quarter note starts playing. When the pitch reaches G4, it will stay there until the G4 quarter note is through. If the glide rate is too small, the pitch will start to glide from C4 to G4, but the G4 quarter note will end before the glide is complete. In that case, the pitch will jump to G4. If the note following the G4 is an E4 half note, the pitch will then start to glide from G4 to E4 as soon as the E4 half note is played.

Usually, gliding is done only a few times in a song. When used continuously, the result can sometimes be rather comical, as in the song ALBUMLEAF on the *Enhanced Sidplayer* disk.

## Vibrato

The effect of *vibrato* is to make the pitch waver slightly. The pitch repeatedly increases and then decreases by a small amount as each note plays. When done properly, the slight but steady fluctuation in pitch is barely noticeable, but makes a tone sound more natural and alive.

### The VDP Command

*Enhanced Sidplayer* supports a simple form of vibrato for each voice. Two commands are needed to control the vibrato. The first, VDP, sets the vibrato depth. The number for this command ranges from 0 to 127. The number is the value added to the frequency each jiffy, so the larger the number, the wider the range of the frequency variation and the more pronounced the vibrato effect. The most commonly used values are 1–50. Like the glide rate, the vibrato depth number should be doubled for each higher octave and halved for each lower octave.

### The VRT Command

The VRT command specifies the vibrato rate, or how quickly the tone alternates between increasing and decreasing pitches. The number ranges from 0 to 127 (0 represents 256). The number determines how many jiffies the vibrato continues

before changing direction. Smaller rate numbers produce faster vibrato rates. The values 1–4 are used most often.

There are no default vibrato settings, so the first time you want to turn vibrato on, both commands should be entered.

To turn vibrato off, use the command VDP 0. You don't have to do anything to the rate when you turn vibrato off. To turn vibrato back on, enter the VDP command again. Unless a new rate is specified with another VRT command, the previous rate remains in effect.

The song K.C.O. on the *Enhanced Sidplayer* disk is a brief, but pleasant, example of how vibrato can add a nice touch to a song.

## Pulse-Width Vibrato

The VDP and VRT commands produce a vibrato effect by rapidly changing the pitch of a voice. Another type of vibrato is created by rapidly changing the pulse of the pulse waveform. *Enhanced Sidplayer* can do this through its PVD and PVR commands.

### The PVD Command

Enter this command—pulse vibrato depth—with a number in the range 1–127 to turn on pulse-width vibrato and set its depth. As with the VDP command, larger values give a more pronounced vibrato effect. Unlike the VDP, however, the number for the PVD command doesn't have to change for notes in different octaves—frequency numbers are not involved.

### The PVR Command

Use the PVR command to set the pulse-width vibrato rate. The number can range from 0 to 127 (0 means 256).

Both the PVD and PVR commands should be entered the first time pulse-width vibrato is turned on. To turn the vibrato off, enter the command PVD 0.

Pulse-width vibrato has no effect when a waveform other than the pulse wave is used.

## Detuning

*Detuning* is done by adding a constant number, specified by the DTN command, to the frequency number of each note played.

Detuning a single voice isn't very useful. All it does is make the voice play slightly out of tune. When used with two voices, however, where both play the same notes, but one is slightly detuned, the result is a chorus effect. This is used in the COMMODORE demonstration song found on the disk and has some interesting applications.

### The DTN Command

The DTN command detunes a voice. Enter the command with a number from 1 to 2047 to make the voice a little sharp. The larger the value, the more the voice is detuned. Values around 50 work best when you're playing pitches near middle C. Enter a number from −1 to −2048 to make the voice flat. For most applications, the direction makes no difference.

As with the glide rate and vibrato depth, larger values must be used for higher pitches to get the same detuning effect.

To turn the detuning off, enter the command with 0.

What's the easiest way to make two voices play the exact same notes? The answer is to use phrases. A phrase defined on voice 1 can be called simultaneously on voice 2 or 3. You don't have to wait for playing to reach the END command before calling the phrase—the phrase is actually defined as soon as *Enhanced Sidplayer* has processed the DEF command.

This means that you can define the phrase on voice 1 and at the same time call it on voice 2 after setting the detune value.

**Voice 1: DEF 0 Play notes END**
**Voice 2: DTN 50 CAL 0**

Either voice can be detuned. The DTN command can be put either before the DEF 0 or before the CAL 0. Just make sure that the DTN command is not included in the phrase definition. You don't want both voices to be detuned.

This also works for other combinations of voices, but only when the phrase is defined on the voice with the smaller number. A phrase defined on voice 1 can be called simultaneously on voice 2 or 3. A voice defined on voice 2 can be called only on voice 3. But a phrase defined on voice 3 can't be called at the same time by voices 1 or 2.

The only drawback to detuning is that it takes two voices, so only one voice is left free. The effect can sometimes be

worth it, though. The song PIPERS on the *Enhanced Sidplayer* disk uses detuning to create a very realistic bagpipe sound.

## Transposing

Detuning works by adjusting the pitch of each note so that it's slightly sharp or flat. Transposing also changes the pitch of each note, but in quite a different manner.

When a voice is transposed, the pitch of each note is shifted up or down a designated number of half steps. For example, if a voice is transposed up one half step, all notes entered as C play as C-sharps, all C-sharps as D, every D as D-sharp, and so on. If the voice is transposed down one half step, D notes play as C-sharps, C-sharps as C-naturals, C-naturals as B-naturals, and so on. You can trace these transmutations with Table 11-1.

**Table 11-1. Transposing**

C
B
A♯/B♭
A
G♯/A♭
G
F♯/G♭
F
E
D♯/E♭
D
C♯/D♭
C

Transposing can be done by more than a half step. In a voice transposed up by 7 half steps, for example, a note entered as C plays as G. Since there are 12 half steps in an octave, transposing up or down by that number makes a voice play an octave higher or lower.

### The TPS Command

The TPS command specifies the number of half steps a voice should be transposed. Enter this command with a number from 1 to 95 to transpose a voice up by the designated number of half steps. Enter a number from −1 to −95 to transpose the voice down. Using 0 turns the transposing off.

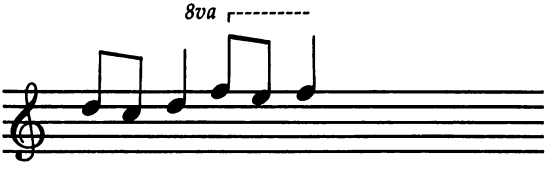
Transposing applies to all notes equally, so unlike some of the previously discussed commands, the value doesn't need to be changed for higher or lower pitches.

Make sure that you don't transpose a voice out of the SID chip's range. The highest pitch the SID chip can produce is B7. If a note is transposed so that its pitch would be in octave 8, *Enhanced Sidplayer* still plays the pitch in octave 7.

If you're not sure if a voice is being transposed out of range, watch the voice when you play it from the Main Menu. The piano keys won't be highlighted for those notes which would be in octave 8 (even though the notes are still played in octave 7).

There are many useful applications for the TPS command. For instance, you may sometimes see a dashed line appearing above or below a sequence of notes.

**Figure 11-1. Octave Offset**




The dashed line, along with the message *8va* or *8vaba,* means that the notes should be played one octave higher or lower than written. This is done because writing the notes with the correct pitches would require too many leger lines, and the notes would be difficult to read.

The easiest way to handle an octave offset is to enter the notes as written, then insert a TPS 12 or TPS −12 command at the beginning of the offset.

An interesting effect is created by having two voices play the same note, while one of the voices is transposed up one or two octaves. This produces a rich, warm tone. The effect was used in the COMMODORE demonstration song.

Another possibility is to use transposing with detuning. While one voice plays a series of notes, the other plays the same notes, but is detuned and transposed up one or two octaves. The songs CALLIOPE and BISTRO on the *Enhanced Sidplayer* disk use this technique to emulate a calliope and an accordion.

## Synchronization

You've already read that a rich, warm tone is created when two voices play the same notes and the second voice is transposed up by 12 or 24 half steps. But if you try this technique with the second voice transposed up by other numbers of half steps—like 6, 11, or 13—the resulting tone sounds absolutely awful.

The reason that the pleasant tone is produced only when the second voice is transposed up an octave or two is because the voices become *synchronized.* Remember that the frequency of a note is doubled when it's played an octave higher. When two voices play the same notes, one an octave higher, the direct relationship between the frequencies causes the tones to be synchronized.

The tone produced by two synchronized voices sounds rich and warm because it contains more *harmonics* than usual. The second voice augments the harmonics of the first. This method of adding harmonics to a tone is called *additive synthesis.*

Synchronization occurs naturally at intervals of 12 half steps, but it can be made to occur at any half-step interval if the synchronization mode of the SID chip is turned on. The advantage to using the synchronization mode is that different half-step intervals produce different harmonic patterns. The synchronization mode, therefore, lets you produce many new types of tones.

### The SNC Command

The SNC command controls the synchronization mode. Unlike the previous commands which have supported a number range, SNC takes only the values 0 and 1 to turn the mode off or on. Enter the command with the number 1 (YES) to turn the synchronization mode on.

A specific procedure must be followed to synchronize two voices. Let's say you want to synchronize voices 1 and 2. First, define voice 1 to be a phrase. On voice 2, enter the SNC YES and the TPS commands. Choose any number of half steps, such as eight. Then call the phrase which was defined on voice 1.

```
Voice 1:  DEF          Play Notes  END
Voice 2:  SNC YES      TPS         CAL
```

Play the two voices several times, each time transposing voice 2 by a different number of half steps, to hear the various types of tones that can be created. Each waveform produces different effects when synchronized, so you might also try changing the waveform.

Both voices should have the same envelope, but they don't have to have the same waveform. For instance, you might use a square wave on voice 1 and a triangle wave on voice 2.

To synchronize voices 1 and 3, use this procedure:

```
Voice 1: SNC YES   TPS   DEF   Play Notes  END
Voice 3: CAL
```

And use this procedure to synchronize voices 2 and 3:

```
Voice 2: DEF         Play Notes  END
Voice 3: SNC YES     TPS         CAL
```

It's important that you use *only* these procedures. Synchronization won't work correctly if the SNC or TPS commands are used on the wrong voice. Also, only positive transposition values should be used. Negative values don't seem to be very useful.

When you want to stop using the synchronization mode and return to normal playing, enter the SNC command with the value 0 (NO) to turn the mode off. Do this on the voice which earlier turned the synchronization mode on. You'll probably also want to enter a TPS 0 command to cancel the transposing.

To hear a variety of synchronization-mode effects using different transposition values and different waveform combinations, play the song SYNCMODEDEMO on the *Enhanced Sidplayer* disk. The song plays a popular theme ten times, each time with different values for TPS or WAV.

**1. Voice 2: TPS 6**

The two voices play the same notes each time. They're played the first time with voice 2 transposed up six half steps, but without the synchronization mode turned on. The result doesn't sound very pleasant because synchronization doesn't occur naturally at an interval of six half steps.

**2. Voice 2: SNC YES**

The synchronization mode is now turned on, and the voices synchronize to produce one tone which should sound a little different from any you've heard before.

**3. Voice 1: WAV T**
**Voice 2: WAV T**
Both voices now switch to the triangle waveform, with all other settings kept the same. Notice how the triangle waveform actually sounds more like a sawtooth waveform when the synchronization mode is used.

**4. Voice 2: TPS 14**
The tone changes a little when a different half-step interval is used.

**5. Voice 2: TPS 18**
Another half-step interval yields another type of tone. Each interval gives a slightly different tone.

**6. Voice 2: TPS 30**
Sometimes very large half-step intervals can give interesting sounds.

**7. Voice 1: WAV T**
**Voice 2: WAV P**
Here a different combination of waveforms is used, with the same half-step interval, to get yet another timbre.

**8. Voice 1: WAV S**
**Voice 2: WAV S TPS 19**
Both the waveform and interval are changed for a different effect.

**9. Voice 1: WAV T**
**Voice 2: WAV P**
An earlier waveform combination is used with the interval of 19 half steps.

**10. Voice 1: WAV P**
**Voice 2: WAV T**
The waveforms on the two voices are simply switched, but notice what an impact the switch has on the voice.

The song TPI14 uses different half-step intervals and waveforms to demonstrate how synchronization effects could be used in a complete song.

## Ring Modulation

A ring modulator takes two frequencies and produces two new frequencies in their place. The new frequencies are the sum

and difference of the originals. For example, if a ring modulator is given the frequencies 200 and 300 Hz, it produces the frequencies 100 and 500 Hz, but not 200 or 300 Hz.

The two frequencies produced by ring modulation are interpreted by your ear as a single pitch. Interestingly enough, however, the frequency corresponding to that pitch is not either of the two produced by the ring modulation. It's much like an optical illusion—the pitch that you hear doesn't really exist. The illusion isn't always perfect. Sometimes it can be hard to discern the pitch of a ring-modulated tone, or the tone may sound slightly out of tune.

Ring-modulated tones are useful for creating percussion effects. Bells; chimes; steel drums; and various instruments made of metal, wood, or glass can be approximated.

To use ring modulation, a definite procedure must be followed. Two voices must play the same sequence of notes, just as when you're using the synchronization mode. With ring modulation, however, the best results are obtained only when voices 1 and 3 are used.

Voice 1 supplies the waveform and envelope of the ring-modulated tone, plus one of the two frequencies needed for the ring-modulation process. The first thing voice 1 should do is select the triangle waveform. This waveform must be used in order for ring modulation to work.

Since ring-modulated tones are used mainly for percussion effects, a nonsustaining envelope should be selected.

### The RNG Command

Enter the RNG command with the value 1 for YES to turn ring modulation on. Voice 1 is now ready to start playing notes. These notes should be put in a phrase definition so that they can be called by voice 3.

### The 3-O Command

Voice 3 just supplies the second frequency needed for ring modulation, so its waveform and envelope don't have to be set. In fact, it's best to turn off the output from this voice completely, by using the 3-O (3 OFF) command. Enter this command with 1 for YES at the beginning of voice 3. The frequencies of notes played by voice 3 are still used in the ring-modulation process, but the output itself isn't heard. Voice 3 can now call the phrase defined in voice 1.

Here's an example sequence of commands which could be entered to use ring modulation.

```
Voice 1          Voice 3
WAV T            3-O YES
ATK 0            CAL
DCY 9
SUS 0
RLS 9
PNT 1
RNG YES
DEF
Play Notes
END
```

As with synchronization, different tone types can be produced by using the TPS command. With ring modulation, however, transposing one voice can cause the resulting pitch to be out of tune by a few half steps, so it's often necessary to also transpose the other voice to bring the pitch back in tune.

For instance, assume you want to use ring modulation with a half-step interval of six half steps. If you put a TPS 6 command on voice 3, the notes will play with ring modulation, but the pitch of the notes will be flat by four half steps.

**Table 11-2. Transposition Values**

| Half-step Interval | V1 TPS | V3 TPS | Highest Note |
|---|---|---|---|
| −20 | 7 | −13 | E7 |
| −19 | 7 | −12 | E7 |
| −18 | 7 | −11 | E7 |
| −17 | — | — | |
| −16 | 6 | −10 | F7 |
| −15 | 6 | −9 | F7 |
| −14 | 6 | −8 | F7 |
| −13 | — | — | |
| −12 | 0 | −12 | B7 |
| −11 | — | — | |
| −10 | 2 | −8 | A7 |
| −9 | 4 | −5 | G7 |
| −8 | 2 | −6 | A7 |
| −7 | 7 | 0 | E7 |
| −6 | 10 | 4 | C♯ |
| −5 | 0 | −5 | B7 |
| −4 | 2 | −2 | A7 |
| −3 | — | — | |

| Half-step Interval | V1 TPS | V3 TPS | Highest Note |
|---|---|---|---|
| −2 | — | — | |
| −1 | — | — | |
| 0 | 0 | 0 | B7 |
| 1 | −1 | 0 | B7 |
| 2 | — | — | |
| 3 | — | — | |
| 4 | 0 | 4 | G7 |
| 5 | −5 | 0 | B7 |
| 6 | 4 | 10 | C♯ |
| 7 | 0 | 7 | E7 |
| 8 | — | — | |
| 9 | −5 | 4 | G7 |
| 10 | 4 | 14 | A6 |
| 11 | — | — | |
| 12 | 0 | 12 | B6 |
| 13 | — | — | |
| 14 | −4 | 10 | C♯ |
| 15 | −5 | 10 | C♯ |
| 16 | 0 | 16 | G6 |
| 17 | −5 | 12 | B6 |
| 18 | 1 | 19 | E6 |
| 19 | 0 | 19 | E6 |
| 20 | — | — | |
| 21 | — | — | |
| 22 | −2 | 20 | E♭ |
| 23 | 4 | 27 | G♯ |
| 24 | 0 | 24 | B5 |
| 25 | — | — | |
| 26 | 0 | 26 | A5 |
| 27 | 1 | 28 | G5 |
| 28 | 0 | 28 | G5 |
| 29 | — | — | |
| 30 | −5 | 25 | B♭ |
| 31 | 0 | 31 | E5 |
| 32 | −5 | 27 | G♯ |
| 33 | 1 | 34 | C♯ |
| 34 | 0 | 34 | C♯ |
| 35 | 0 | 35 | C5 |
| 36 | 0 | 36 | B4 |
| 37 | 0 | 37 | B♭ |
| 38 | 0 | 38 | A4 |
| 39 | 0 | 39 | G♯ |
| 40 | 0 | 40 | G4 |

To remedy the situation, you have to transpose both voices up by four half steps. The end result is that you'll have a TPS 4 command on voice 1 and a TPS 10 command on voice 3.

Table 11-2 is a chart ordered by increasing half-step intervals. For each interval, the appropriate transposition values for voices 1 and 3 are given.

The transposition values for some of these intervals are close approximations and don't produce a distinct pitch, which is why they're best used for percussion effects. Those intervals for which no satisfactory transposition values could be found have been marked with a dash.

When the transposition value for a voice is 0, no TPS command has to be entered for that voice.

The rightmost column shows the highest note which can be played using the given transposition values. For example, when the half-step interval of 9 is used, only notes up to G7 should be used. Notes above G7 will be transposed out of range, and won't play properly.

You can transpose the tone up or down one or more octaves by adding a multiple of 12 half steps to each transposition value. Let's say that you're using the 26 half-step interval, in which the transposition values are 0 and 26. Adding −12 half steps gives the transposition values −12 and 14.

Be aware that the effect of ring modulation may vary from one octave to another. Notes played in one octave may sound quite different when played with the same half-step interval in a different octave.

To turn ring modulation off, enter the command RNG NO on voice 1. Enter the command 3-O NO on voice 3 to reenable the output of that voice. The command TPS 0 should be entered on those voices that were being transposed.

You might be wondering just what ring-modulated tones sound like by now, so play the song RINGMODDEMO on the *Enhanced Sidplayer* disk. The song plays a clock chime ten times, each time with a different combination of transposition values for the two voices.

**1. Voice 1: RNG YES TPS 0**
**Voice 2: 3-O YES TPS 0**

The first time the notes play, ring modulation is turned on, but no transposing is done. This gives a new timbre, but it's not the typical ring-modulation type of sound. Note that voice 1

also has the triangle waveform and nonsustaining envelope, even though those commands aren't shown above.

**2. Voice 3: TPS 6**
As soon as voice 3 is transposed up by six half steps, you hear the glassy, bell-type sound characteristic of ring-modulated tones. But the notes are out of tune; they're flat by four half steps.

**3. Voice 1: TPS 4**
**Voice 3: TPS 10**
Now that both voices have been transposed up by four half steps, the notes are played in tune.

**4. Voice 1: TPS 4**
**Voice 3: TPS 14**
Here the notes are played with an interval of ten half steps for a different ring-modulation effect.

**5. Voice 1: TPS −5**
**Voice 3: TPS 10**
The interval of 15 half steps gives another effect.

**6. Voice 1: TPS −2**
**Voice 3: TPS 20**
The ring-modulation effect is again different for an interval of 22 half steps.

**7. Voice 1: TPS −12**
**Voice 3: TPS −5**
This is the ring-modulation effect for an interval of seven half steps. Both voices have been additionally transposed down one octave.

**8. Voice 1: TPS 0**
**Voice 3: TPS 7**
The same interval is kept, but the notes are played one octave higher than last time. Notice how the ring-modulation effect is significantly different in the higher octave.

**9. Voice 1: TPS 12**
**Voice 3: TPS 19**
The notes are played again with the same interval, but at an octave higher.

**10. Voice 3: 3-O NO**
The same interval and octave are used, but this time voice 3 is given the same waveform and envelope as voice 1. Voice 3 output is no longer turned off. If you listen carefully, you may notice that the tone is a little more full-bodied.

# Chapter 12

# The Filter

Chapter 12

# The Filter

*The filter lets you alter the harmonic content of a voice to get many new timbres. This chapter explains how the filter works and introduces several commands for controlling the filter.*

*The SID chip's filter would be very promising if there wasn't such a great variance in filtering effects from one computer to another. See the caution on varying filter effects for more information about the problems with the SID chip filter. If you find that the filter in your computer doesn't work well, or if you don't like the idea of your songs possibly sounding different on other computers, you may want to skip this chapter.*

## Harmonics

When an oscillator generates a tone, it produces not only the requested pitch, but some *harmonics* as well. Harmonics are frequencies which are related to the main pitch. The first harmonic, also called the *fundamental frequency,* is the frequency of the main pitch. The second harmonic has a frequency twice that of the fundamental frequency, the third harmonic has a frequency three times that of the fundamental frequency, and so on.

Because the volume of the fundamental frequency is always greater than the volume of the other harmonics, the main pitch detected by your ear is that of the fundamental frequency. The harmonics, however, give the tone its *timbre.*

## The Purpose of the Filter

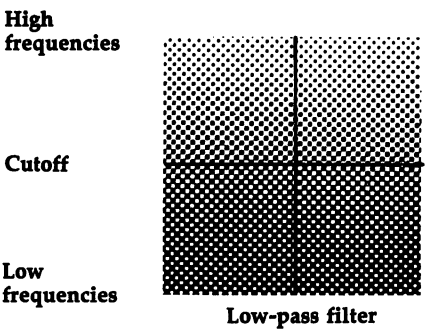
Since each instrument has its own characteristic timbre, the ability to control the harmonic content of a voice can be helpful in emulating a particular instrument. That's where the filter comes in. The filter is used to remove selected frequencies from a tone. This technique is known as *subtractive synthesis,* and lets you duplicate a whole new variety of instruments.

The SID chip's filter has three main control parameters which must be set before the filter can be used. These parameters are the *mode,* the *cutoff frequency,* and the *resonance.*

## Filter Mode

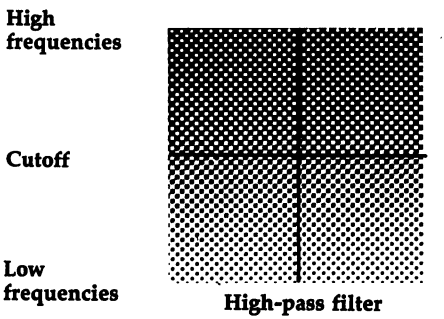
The filter mode determines which types of frequencies are removed from a tone. The most commonly used mode is the *low-pass mode,* which allows only the frequencies below a certain frequency, called the *cutoff frequency,* to pass through the filter. Any frequencies above the cutoff are *attenuated* (greatly reduced in volume) so that they're seemingly removed from the tone. Figure 12-1 illustrates the frequencies allowed to pass through a filter set to low-pass mode.

**Figure 12-1. Low-Pass Filter Mode**




The low-pass filter mode produces full-bodied tones. The opposite of the low-pass mode is the *high-pass mode,* where frequencies below the cutoff are suppressed while frequencies above the cutoff are permitted to pass through unaltered (Figure 12-2).

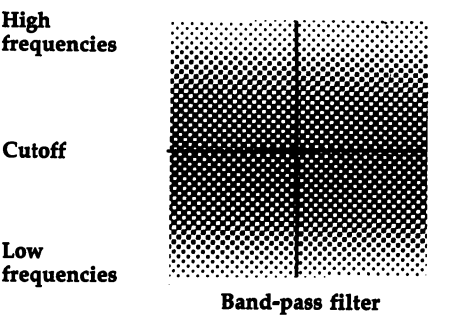
**Figure 12-2. High-Pass Filter Mode**




The high-pass mode causes tones to sound tinny or buzzy.

One other filter mode, the *band-pass mode,* allows only the frequencies near the cutoff to pass through. All others are attenuated (Figure 12-3).

**Figure 12-3. Band-Pass Filter Mode**




The band-pass mode produces thin, open tones.

## The F-M Command

Use the F-M command to set the filter mode. This command works similarly to the WAV command. When you press the RETURN key to select the F-M command on the Command Screen, the window displays a number for each filter mode.

**1 L Low-pass**
**2 B Band-pass**
**4 H High-pass**

Type the number of the desired mode and press RETURN to enter the command. The filter-mode letter is displayed as part of the command.

You can even select combinations of filter modes. Just add the appropriate numbers together. For example, choosing 5 sets the filter for both low- and high-pass modes. This combination is also called the *band-reject* or *notch* mode.

## Filter Cutoff

The cutoff frequency of the filter acts as a dividing line. In low-pass mode, for instance, frequencies above the cutoff are attenuated while frequencies below the cutoff are allowed to pass through unaltered. But consider what happens when the pitches of notes in a song fall right around the cutoff frequency. Notes having pitches below the cutoff are played correctly, but notes with pitches above the cutoff aren't heard.

What is needed is a way to set the cutoff higher or lower. The ideal setting is to place the cutoff right above the highest note to be played. That way, all the fundamental frequencies fall below the cutoff so that all the notes will be heard. Most of the harmonics will be above the cutoff, however, so they'll be removed from the tone.

### The F-C Command

The F-C command is used to set the filter cutoff. The range of this command is 0–255, with 0 being the lowest and 255 being the highest. The standard practice is to start with a value between 0 and 255, play the voice, and then move the cutoff up or down as needed.

## Resonance

The effect of *resonance* is to produce a sharper tone by emphasizing, or *peaking*, the frequencies in the tone right around the cutoff. Actually, the resonance control of the SID chip is not very effective. Its main effect, in fact, is on the volume of the voice being passed through the filter.

### The RES Command

Use the RES command to set the level of resonance. The number for this command ranges from 0 (no resonance) to 15 (maximum resonance). In most cases, 15 is best, but sometimes you may want to use a smaller value to produce a muted effect.

## Passing a Voice Through the Filter

### The FLT Command

Once you've configured the filter by using the F-M, F-C, and RES commands, use the FLT command with the value 1 (for YES) to indicate that the voice should be passed through the filter.

Here's an example showing how you might use the filter. Start with the following commands:

```
F-M L
F-C 255
RES 15
FLT YES
```

Next, enter a few notes—a simple scale is sufficient. When you play the voice, it should play normally. In low-pass mode with the filter cutoff set at the maximum value, all frequencies are passed through the filter.

Lower the cutoff by reducing the number for the F-C command; then play the voice again. Do this a few times, each time reducing the F-C command number by about 20 or so. The effects of filtering should gradually become more noticeable.

To stop the filtering, enter the FLT command with the number 0 to indicate that you don't want the voice to be passed through the filter. You don't have to change the mode, cutoff, or resonance settings.

```
FLT NO
```

If you want to pass the voice through the filter later in the song, enter the FLT command with the number 1. The earlier filter settings will still be in effect, but can be changed if necessary.

### Autofilter Mode

Trying to find a proper setting for the filter cutoff can be inconvenient and time consuming. As an alternative to the F-C command, the *Enhanced Sidplayer* offers a special feature called the *autofilter mode.* When the autofilter mode is turned on, the filter cutoff is automatically set according to the pitch of each note. Since the cutoff is calculated for each note, all notes, high and low, will produce pretty much the same filtering effect.

### The AUT Command

To turn on the autofilter mode, select the command AUT and enter 1. Do this instead of entering the F-C command.

```
F-M B
AUT 1
RES 15
FLT YES
```

You may also specify that an offset should be added to the cutoff. When you enter the number for the AUT command, choose any number from 1 through 127 or −1 through −127. Different offset values give different filtering effects. Turn off the autofilter mode with the command AUT 0.

If you're using the autofilter feature, it's important that you turn it off whenever you stop passing the voice through the filter. Otherwise, *Enhanced Sidplayer* continues to do the autofilter calculations needlessly. To turn off the autofilter feature enter:

```
FLT NO
AUT 0
```

## Filter-Cutoff Sweeping

Just as pulse-width sweeping changes the pulse width during a note, filter sweeping lets you increase or decrease the cutoff frequency while a note plays.

### The F-S Command

Use the F-S command to turn on filter sweeping. The number entered with this command controls the sweep rate and direction, and ranges from −127 through 127. Values from 1 through 127 make the cutoff sweep upward; the larger the

number, the faster the sweep. Values from −1 through −127 sweep downward. A value of 0 turns off the sweeping.

In most cases, the best results are obtained by using small numbers for the sweep rate, such as values 1–10. If the cutoff sweeps too far, it wraps around like pulse width. The effect is not desirable.

Be sure to turn off the filter sweeping when you stop passing the voice through the filter.

```
FLT NO
F-S 0
```

Or, if you're using the autofilter mode:

```
FLT NO
AUT 0
F-S 0
```

## Restrictions in Using the Filter

While the SID chip has three oscillators, and can therefore play three voices, it has only one filter. There's not a separate filter for each voice. Figure 12-4 should help you understand the arrangement. The illustration is the same as Figure 1-1, except that it's been modified to include the filter.

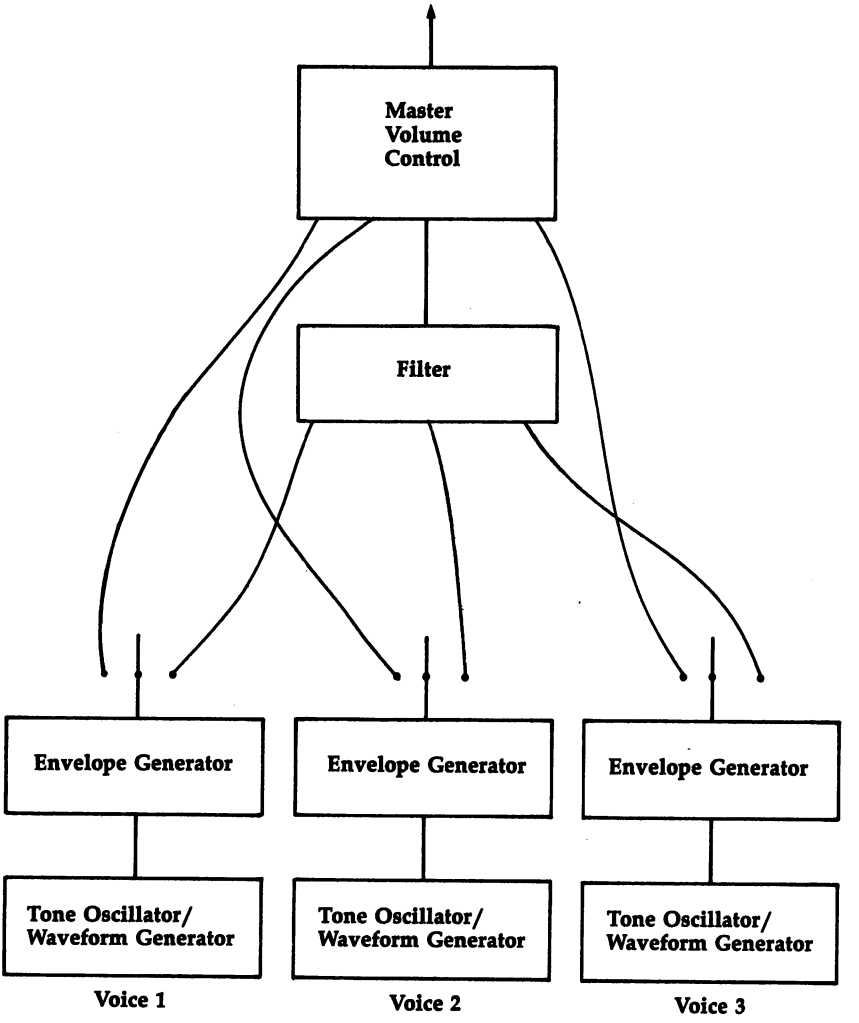
### Caution on Filtering More Than One Voice

As shown by Figure 12-4, any voice can be passed through the filter, but only one should be routed through the filter at a time. Passing two or three voices through the filter at the same time can overpower it, making it produce an unpleasant buzz.

### Caution on Varying Filter Effects

The biggest drawback to using the filter is that there's extreme variance in filtering effects from one computer to another. Although the problem is not as great on Commodore 128 computers, the same filter settings can produce completely different results on different Commodore 64 computers. On some 64s, especially older ones, a voice can be almost inaudible when it's passed through the filter, no matter what settings are in effect. If you have one of the earliest versions of the Commodore 64, you may not be able to use the filter.

**Figure 12-4. Filtering Through the SID Chip**




## Demonstrations

To hear an example of various filter settings, play the song FILTERDEMO on the *Enhanced Sidplayer* disk. The song plays a scale ten times, each time with different filter settings. Of course, if you don't hear anything when you play the song, it may be that the filter in your computer doesn't work correctly.

**1. F-M NO AUT 0 RES 0 FLT NO**
The first time through, a simple C scale is played with no filtering.

**2. F-M L AUT 30 RES 15 FLT YES**
This gives a low-pass filter with the filter cutoff set automatically and with full resonance. The cutoff is set a little high.

**3. F-M L AUT 1 RES 15 FLT YES**
The filter cutoff is set a little lower, and the effect of the filter should become more noticeable.

**4. F-M L AUT 30 RES 15 FLT YES**
The filtering effect should now be very noticeable with the cutoff set a little lower.

**5. F-M H AUT 40 RES 15 FLT YES**
The tone should be much quieter and very tinny and buzzy now that the filter is set to high-pass mode.

**6. F-M H AUT −40 RES 15 FLT YES**
The tone should be a bit louder now that the cutoff is set lower.

**7. F-M B AUT 1 RES 15 FLT YES**
As you can hear, band-pass mode doesn't sound that much different from high-pass mode.

**8. WAV S F-M L AUT 1 RES 15 FLT YES**
The tone should sound brassy when the waveform is changed to sawtooth.

**9. WAV S F-M L AUT 1 RES 0 FLT YES**
The tone should be somewhat muted when the resonance is set to 0.

**10. WAV S F-M L AUT 1 RES 15 F-S 10 FLT YES**
With filter-cutoff sweeping turned on, you should hear a change in the filtering effect as each note is played.

Three more brief demonstration songs have been provided on the disk. BRASS is a theme played by a trumpet, a trombone, and then a tuba. The songs KOTO and SITAR emulate those instruments.

# Chapter 13

# Modulation

Chapter 13

# Modulation

*This chapter explains how to use the seven modulation commands. These commands provide complex ways to control the frequency and pulse width of a voice or the filter cutoff.*

*These are the most advanced commands supported by* Enhanced Sidplayer. *It's probably best to wait until you've mastered most of the other commands before using those found here.*

## OSC3 and ENV3 Modulation

### The OSC3 Register

The SID chip has two registers which report special information about voice 3. The first is called the *OSC3 register,* which reports information about the waveform and pitch on voice 3.

The number in this register always ranges from 0 to 255 and changes over time according to voice 3's waveform and pitch.

- Triangle wave—the value in OSC3 starts at 0, goes through all the numbers up to 255, runs back down to 0, then repeats.
- Sawtooth wave—the value in the register goes from 0 to 255, immediately jumps back to 0, and starts again.
- Pulse wave—the number in OSC3 alternates between 0 and 255. No other values are used.
- Noise—the OSC3 register contains random numbers between 0 and 255.

The rate at which the number changes depends on the pitch of voice 3. The higher the pitch, the faster the value changes.

### The ENV3 Register

The *ENV3 register* reports information about voice 3's envelope. This value also starts at 0, increases to 255, and then heads back down to 0. It does so according to the current

phase of the envelope. The number increases during the attack phase, reaches 255 when the envelope reaches peak volume, then decreases when the envelope sustains and eventually releases.

The rate at which the number changes depends on the attack, decay, and release rates on voice 3, and has nothing to do with the waveform or pitch.

### Basic Modulation Scheme

The information reported by the OSC3 and ENV3 registers is interesting, but not very useful by itself.

But consider what would happen if the number reported by one of the registers was added each jiffy to a voice's frequency value. The frequency of that voice would change in some very unusual ways.

If voice 3 was set for a triangle wave and the OSC3 number was added to voice 1's frequency each jiffy, for instance, the result would be a vibrato effect on voice 1. If voice 3 was set to sawtooth, the vibrato would go in only one direction. With voice 3 set for pulse, voice 1's frequency would alternate between two values. And with voice 3 set for the noise waveform, voice 1's frequency would jump to different values. These effects would happen throughout the duration of each note, and would happen at different speeds depending on voice 3's pitch.

A rather different effect would be heard if the number from ENV3 was added each jiffy. The pitch of each note would rise and fall along with the volume.

These would certainly be interesting effects, but there's nothing limiting them to frequency. The value from OSC3 or ENV3 could be added to the pulse width or filter cutoff each jiffy for different effects.

This method of having one voice affect another is called *modulation* and is supported by *Enhanced Sidplayer.* The basic procedure is to specify a source and destination for the modulation, then just let the modulation continue while notes are played.

### The SRC Command

The SRC command specifies whether the modulation number should come from the OSC3 or ENV3 register. *The command should be entered on the voice that's to be modulated.*

| SRC Number | Source |
|---|---|
| 0 | Software-generated waveform |
| 1 | OSC3 register |
| 2 | ENV3 register |

Use 0 to select a different source called the *software-generated waveform,* explained later in this chapter.

## The DST Command

The DST command specifies the destination for the modulation and is the command that actually turns the modulation on. The values 1, 2, and 3 correspond to the frequency, pulse width, and filter cutoff. A DST command with the value 0 turns modulation off. *Enter this command on the voice that's to be modulated.*

| DST Number | Destination |
|---|---|
| 0 | Modulation off |
| 1 | Frequency |
| 2 | Pulse width |
| 3 | Filter cutoff |

If you put the command on voice 1, for example, then the frequency or pulse width of voice 1 will be modulated. If you put the command on voice 3, the voice will modulate itself.

Remember that there's only one filter shared among the three voices, so if you're modulating two or more voices, only one should modulate the filter cutoff. (Because of the limits of the filter, only one voice should be filtered at a time anyway.)

## The SCA Command

The numbers from the OSC3 and ENV3 registers are always in the range 0–255. This range may seem large, but it's actually rather small when you consider the size of the frequency numbers in the higher octaves or the range of pulse-width numbers.

Adding a number between 0 and 255 to the frequency or pulse width may not have much of a noticeable effect. To solve this problem, the modulation number from OSC3 or ENV3 can be scaled to different sizes by the SCA command. This command doubles or halves the modulation number a specified number of times.

| SCA Number | Scale |
|---|---|
| 7 | 128 |
| 6 | 64 |
| 5 | 32 |
| 4 | 16 |
| 3 | 8 |
| 2 | 4 |
| 1 | 2 |
| 0 | 1 |
| −1 | 1/2 |
| −2 | 1/4 |
| −3 | 1/8 |
| −4 | 1/16 |
| −5 | 1/32 |
| −6 | 1/64 |
| −7 | 1/128 |

You probably won't want to use scale values 6 and 7 for frequency modulation, since they'll make the modulation number too large. Scale values above 3 would probably be too large for pulse-width modulation, and values above 2 too large for filter-cutoff modulation.

### The 3-O Command

When voice 3 is used to modulate another voice, the output from voice 3 itself is usually not desired. To make voice 3 inaudible, use the 3-O command with the value 1. This lets the oscillator for voice 3 continue to operate, but prevents the output from reaching the master volume control. To reenable the output of voice 3, enter the 3-O command with the value 0.

## Software-Generated Waveform Modulation

There's one significant drawback to OSC3 and ENV3 modulation. Since voice 3 is used to modulate another voice, in most cases it cannot play a third voice at the same time. This leaves only two voices for playing music.

One way to get around this restriction would be to use a simulated modulation number instead of the actual number from OSC3 or ENV3. That would make the modulation independent of voice 3 so that voice 3 would be available for playing music.

*Enhanced Sidplayer* supports a simulated modulation number. To do this, it simulates a waveform and produces a value which behaves very much like the OSC3 number. Special commands have to be used to set the type of waveform and its rate of change.

### The LFO Command

The LFO command specifies the basic type of waveform that's to be simulated. Enter the command with 0 to select a triangle-type wave, or 1 for a pulse wave. For your purposes, consider the sawtooth waveform to be a type of triangle wave.

### The RUP and RDN Commands

The rate of change for the simulated waveform is set by the RUP and RDN commands. The meanings of the *rate up* and *rate down* values set by these commands depend on the type of waveform being generated.

When a triangle type of waveform is being generated, the two commands specify the number added to the modulation number each jiffy. The rate number can be from 0 to 31 in each direction. For example, if the rate up has been set to 5 and the rate down has been set to 6 (by the commands RUP 5 and RDN 6), the modulation number increases by 5 each jiffy until it reaches 255, then decreases by 6 each jiffy until it reaches 0. This cycle repeats continuously.

When the two rate values are the same, the result is a true triangle waveform. The commands RUP 7 and RDN 7 give a triangle waveform, and the commands RUP 20 and RDN 20 give a faster triangle waveform. Making the rate numbers different has the effect of pushing the top of the triangle wave to the left or right so that one side of the wave is steeper than the other.

A rate value of 0 means that the modulation number won't rise or fall in that direction. For instance, if the rate up is set to 10 and the rate down is set to 0, the modulation number increases by 10 each jiffy until it reaches 255, then jumps back to 0 and starts increasing again. This gives a sawtooth waveform. By making the rate up 0 and the rate down a number greater than 0, you can get a backwards sawtooth wave. Setting both rates to 0 freezes the waveform so that the modulation number doesn't change.

Remember that you never actually hear the software-generated waveform. The waveform simply acts as another source for the modulation number.

The rate-up and -down values take a different meaning when the waveform has been set to the pulse wave by the LFO command.

The pulse wave makes the modulation number alternate between 0 and 255, and the rate numbers specify the number of jiffies the modulation number stays at each value. The rate up corresponds to the time that the modulation number is at 255, and the rate down corresponds to the time that the number is at 0. If the rate up is 2 and the rate down is 3, for example, the modulation number will be 255 for two jiffies and 0 for the next three jiffies. It will then be 255 again for two jiffies, and so on.

When pulse-wave modulation is used, a rate value of 0 is interpreted to mean 32 jiffies.

### The MAX Command

Since the modulation number from the software-generated waveform is always in the range 0–255, it's often necessary to make the number larger with the SCA command. However, because scaling simply multiplies the modulation number by a multiple of two, the selection of values is small. For better resolution, the maximum value can be reduced from 255 to any other number by the MAX command. If you use the command MAX 100, for instance, the modulation number rises to 100 and then falls to 0 if the triangle wave is generated, or alternates between 0 and 100 if a pulse wave is generated.

To get the desired resolution, first use the SCA command to set the basic range that you want; then use the MAX command to fine-tune the range.

### Using the Software-Generated Waveform

To use the software-generated waveform for modulation, follow the same procedure as with OSC3 and ENV3 modulation. The only difference is that you enter 0 at the SRC command to use the simulated modulation number. The destination can still be the frequency, pulse width, or filter cutoff as set by DST.

There's only one limitation to the software-generated waveform—*Enhanced Sidplayer* doesn't generate a separate software-generated waveform for each voice, but creates only one.

If two voices are using the software-generated waveform as a source, the modulation number will be the same for each. The destination and scale can be different for each voice, but the waveform type, rate, and maximum value will be the same.

# Chapter 14

# Advanced Music Theory

Chapter 14

# Advanced Music Theory

*This chapter explains several more elements of notation which are commonly found in sheet music.*

*Since this chapter is a potpourri of different notation elements, you can freely pick and choose which parts you want to read. However, it's a good idea to be aware of what's covered here, if only to know where to turn when you notice these elements in sheet music.*

## Tempo Changes

There are two kinds of tempo changes. In the first, the tempo changes abruptly, perhaps from a slow to a fast speed. This is most often found at the beginning of a movement or major part of a piece of music.

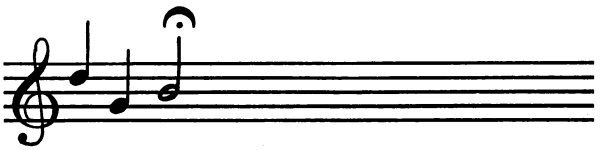
In the second type of tempo change, the tempo increases or decreases gradually. This type of change is marked by the words *accelerando* and *ritardando*, which mean that the tempo should start getting faster or slower, respectively. For instance, if the tempo is currently M.M. 100 and you see *ritard*, you might change the tempo to M.M. 94, then change it to M.M. 90 a few notes later.

As mentioned in Chapter 5, change the tempo only at a point in the music where all three voices are starting new notes. If you don't, the voices won't stay synchronized.

You may also want to take a look at the JIF command described in Chapter 15. JIF can make a voice *ritard* without changing the tempo, so that you can avoid the restrictions associated with the TEM command.

The symbol used to change the tempo briefly is the *fermata*—it looks like a narrow semicircle with a dot below it (Figure 14-1). A fermata can be placed over a particular note or rest to extend its duration. This is sometimes referred to as a *hold*.

**Figure 14-1. Fermata**



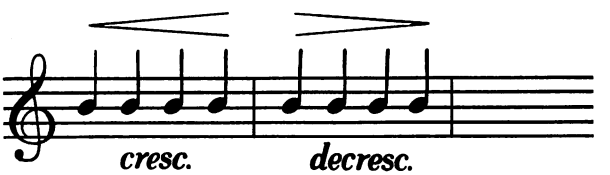
The easiest way to handle a fermata is to enter the corresponding note with a longer duration than written. If there are several notes under the fermata, all should be played with the longer duration.

## Dynamics

Volume changes are the most common type of change in music. As with the tempo, the dynamics can change immediately or gradually. Immediate changes are noted in the normal way, with letter combinations such as *p* or *fff*. Gradual changes are marked by the words *crescendo* and *decrescendo*, which indicate that the volume should gradually increase or decrease, respectively.

Gradual volume changes can also be denoted by symbols placed above notes, as in Figure 14-2.

**Figure 14-2. Crescendo and Decrescendo**




### The BMP Command

Use the VOL command for abrupt volume changes, when the master volume is to be changed by more than one level. For gradual changes, however, you may prefer to use the BMP command. This command is used to bump the master volume up or down one level.

When you press the RETURN key after selecting BMP from the Command Screen, the window indicates that entering 0 bumps the volume up one level and entering 1 bumps

the volume down one level. After you press the RETURN key, the command is shown with the name BMP and the characters *UP* or *DN*.

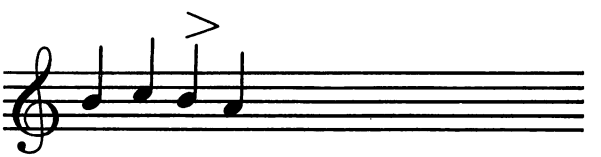
To produce the effect of a crescendo or decrescendo, bump the volume up or down every few measures. BMP is also useful in repeat loops at the end of a song, where the volume has to fade out.

A BMP UP command doesn't change the master volume if the volume is at 15, the highest level. Likewise, a BMP DN command has no effect when the volume was previously set at 0.

Remember that the SID chip doesn't support a separate volume level for each voice. The master volume level affects all three voices, even when it's set on only one. You only need to use VOL and BMP commands on one voice. In fact, if you put BMP commands on two voices at the same point in the music, the volume is bumped by two levels, not one.

There's also a symbol to change the volume of a single note. An *accent mark* looks like a greater-than sign (>). When placed above a note, as illustrated by Figure 14-3, it means that the note should be played just a little louder than the others.

**Figure 14-3. Accent Mark**



Since there's no volume control for individual voices, accents are hard to simulate. You might set the sustain level a little higher, or sustain the note a little longer by using a smaller release point. Insert these changes before the note to be accented. After the note, reset the sustain level or release point to the previous value.

## Key Changes

Clef symbols are usually drawn only at the beginning of a piece of music. They are followed by sharp or flat signs which indicate the key in which the music is to be played. These symbols specify the key signature.

A piece of music doesn't have to use just one key for an entire song. If a key signature appears somewhere in the middle of the sheet music, it's indicating a change of key. Any previous sharps or flats are canceled—only the sharps or flats specified by the new key signature are to be used. When you see this in sheet music that you're entering, use the Commodore-plus and Commodore-minus keys on the Editing Screen to change the current key signature until you've set the correct number of sharps or flats.

Sometimes you'll see natural signs in a key signature when there's a key change. These natural signs just remind you that the sharps and flats of the previous key no longer apply.

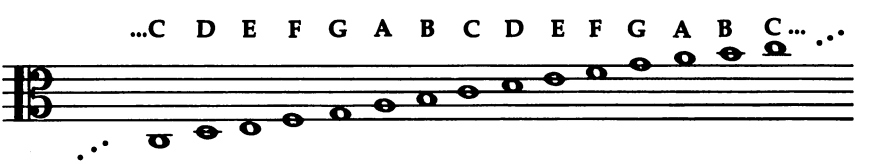
Key changes aren't as common as tempo or volume changes, so they can be easy to miss when reading sheet music. It's a good idea to look over the sheet music before entering notes so that you'll be ready for any key change.

## Staff Changes

Sometimes when music is written using treble and bass staves, the bass staff may change to a treble staff. The change is marked by a clef symbol in the music. When this happens, be careful that you enter the notes according to their position in the treble staff.

Another kind of staff is the *alto* staff. This staff uses a different clef symbol (Figure 14-4). Notice that the alto staff positions for pitches are different from both the treble and bass staves.

**Figure 14-4. Alto Staff**




The alto staff is used in sheet music for the viola and for the alto voice in vocal music. If you come across the alto staff, use the SHIFT-S feature on the Editing Screen to change the grand staff to the alto staff. This can be a big help in entering the notes if you're not accustomed to reading the alto staff.

Two other types of staves used even less frequently are the *tenor* and *soprano* staves. Both use the same clef symbol as the alto staff, but it's moved to a different position. The staff positions for pitches are changed correspondingly. The Editing Screen supports both these staves.

## Time Signatures

The time signature was introduced briefly in Chapter 4, but now let's look at it in greater detail.

At the beginning of sheet music, right after the key signature, you'll often find a fraction such as 4/4. The top number shows the number of beats per measure, and the bottom number indicates the number of beats per whole note. Together, these two numbers define the *time signature.*

Until now, you've used only *4/4 time,* in which each measure contains four beats and a whole note is four beats long.

**4 (number of beats per measure)**

**4 (number of beats per whole note)**

When using different time signatures, there may be more or less than four beats in every measure, and a whole note may not always be four beats long.

One of the more common alternate time signatures is 3/4 time. This is just like 4/4 time, except that there are only three beats in every measure. Waltzes are always written in 3/4 time.

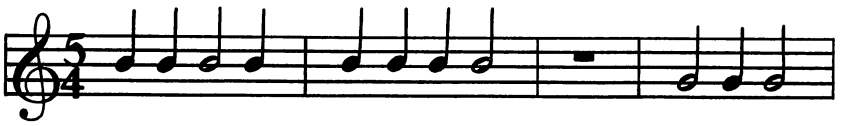
Another common time signature is 2/4 time. Once in a great while you may encounter an irregular time, like 5/4 or 7/4.

Changing the number of beats in a measure doesn't affect *Enhanced Sidplayer.* As long as you follow the sheet music, there should be no problem. The important thing is that each measure has the same number of beats. If you're using the automatic measure-numbering feature, remember to use SHIFT-B on the Editing Screen to set the correct number of beats per measure.

A common practice in time signatures other than 4/4 is to use the whole rest symbol as a *measure rest* symbol to indicate a full measure of rest. For example, if a song is written in 5/4 time and you see a whole rest, the sheet music *isn't* wrong. It means that the rest should last for five beats.

The five-beat rest in Figure 14-5 would be entered as a whole rest and a quarter rest. In other time signatures, a measure rest may last for a different number of beats.

**Figure 14-5. Measure Rest**



When the bottom number in the time signature is 4, a whole note plays for four beats, so one-fourth of that duration—a quarter note—plays for only one beat. If the bottom number is 2, however, a whole note plays for two beats, a half note is one beat, and the quarter note plays for just half a beat. When the number on the bottom is 8, a quarter note plays for two beats, and the note for one beat is now an eighth note.

Usually the bottom number in the time signature is 4, and the tempo is specified as an M.M. number or as a number following a quarter note and equal sign. When the bottom number is 2, the half note gets one beat instead of the quarter note, and the tempo is specified by an M.M. number or by a half note and equal sign. Whichever method indicates the tempo, the value entered for the TEM command should be twice the value shown after the M.M. or equal sign when the bottom number in the time signature is 2. This is necessary to make *Sidplayer* play the song at the correct speed.

If the number on the bottom of the time-signature fraction is 8, the eighth note gets one beat, and the number you enter for the TEM command should be half of the number shown after the M.M. or the eighth note and equal sign.

There's an alternate way to show a time signature without using numbers. A time of 4/4 can be indicated by a letter *C* that appears where the time signature belongs. The *C* stands for *common time.* If the *C* has a vertical line passing through it, it indicates 2/2 time, also known as *cut time.*

One last word about time signatures—they can change while a song is playing. Such changes are indicated by double bars followed by a new fraction or symbol.

## Partial Measures

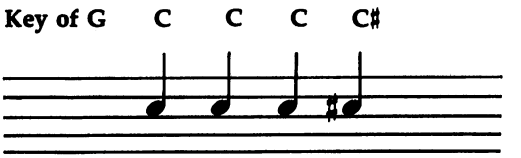
Only a first or last measure may have less than the full number of beats. An example is when the first note in a song starts on a fourth beat. Rather than drawing the preceding rests, a partial measure is used.

## Accidentals Revisited

In any octave there are 12 different pitches, including naturals, sharps, and flats. For the most part, a song uses 7 of these pitches, as specified by the current key. Once in a while, a song may play a note with a pitch not in the key. The BLUES piece from Chapter 7 is written in the key of G, meaning that only one note is sharp (F-sharp), but the melody line had to play a C-sharp at one instance.

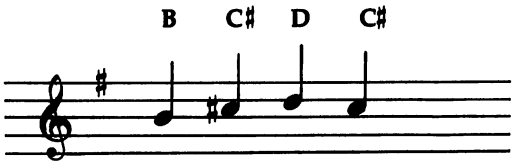
Special exceptions like this are handled by placing an accidental sign immediately before the note that's to be sharp or flat, as shown in Figure 14-6. This accidental overrides the current key signature for that particular pitch.

**Figure 14-6. Accidentals**



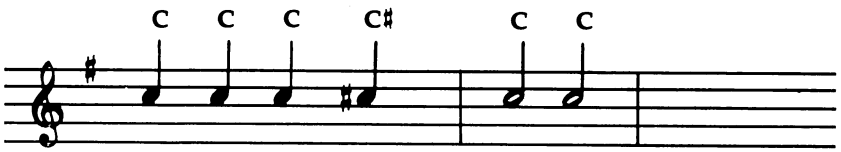

Furthermore, the effect of the accidental sign holds true for all following notes of the same pitch. A sharp sign placed in front of a C affects not only *that* C note, but any other C notes in the same octave which may follow (Figure 14-7).

**Figure 14-7. Following Notes**



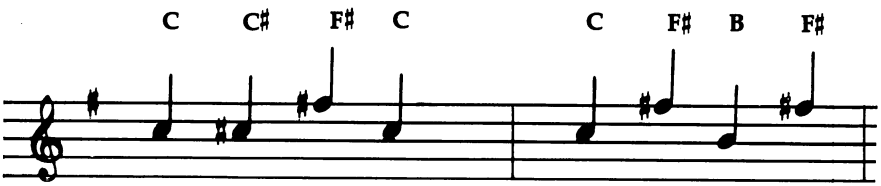
The changed accidental isn't permanent—in fact, it's canceled at the next measure (Figure 14-8).

**Figure 14-8. Canceled**



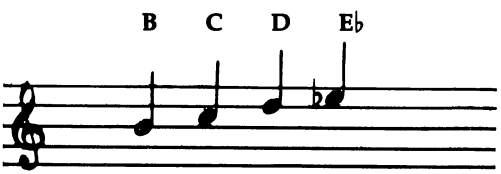

An accidental sign used like this affects only the designated pitch in that octave. All other natural and accidental pitches remain the same (Figure 14-9).

**Figure 14-9. Leaves Others Alone**




All these examples used sharp notes. A flat symbol can also be used in a measure to change a specific pitch from natural to flat (Figure 14-10).

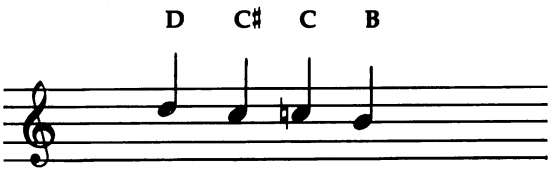
**Figure 14-10. Flats, Too**




You've seen how to change a natural pitch into a sharp or flat. What about the other direction—removing a sharp or flat from a pitch to make it natural?

All it takes is a natural sign. Placed in front of a note, it cancels the sharp or flat for all following notes of that pitch within the current measure (Figure 14-11).

**Figure 14-11. Naturals**

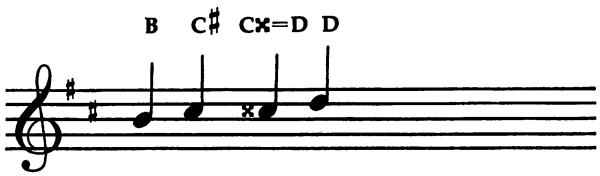



A common mistake is to forget that an accidental on one note also affects later notes of that pitch in the same measure. So that you don't have to remember when an accidental has been used earlier in a measure, measure mode can be enabled on the Editing Screen. When this mode is turned on, the Editor automatically remembers the accidentals for each pitch until you begin entering the next measure. See Chapter 4 for more details on the measure mode.

## Double Sharps and Flats

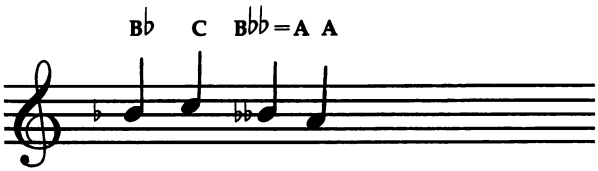
Although they're not often used, it's possible to have double sharps or double flats. Increasing a natural by one half step changes it into a sharp. If you do the same thing to a note which is already sharp, the pitch is increased another half step. The symbol to indicate a double sharp looks something like an X and is shown in Figure 14-12.

**Figure 14-12. Double Sharp**




Two flat signs are used to indicate a double flat (Figure 14-13).

**Figure 14-13. Double Flat**



The double sharp and double flat signs, along with the sharp, natural, and flat signs, give a total of five different accidental signs.

The Editor supports the most frequently used double sharps and double flats. The pitches F, C, G, and D can be entered with a double sharp, and the pitches B, E, and A can be entered with a double flat. Press SHIFT-plus or SHIFT-minus to select a double sharp or double flat, respectively.

If you come across a note with a double sharp or flat that's not directly supported by the Editor, you'll have to calculate an equivalent pitch. For example, if you encounter a D-double-flat, you should enter a C-natural, because the pitch two half steps below D is C.

## Double Dots

A dot placed after a note means that the duration of the note should be increased by one half. Adding a second dot means that the duration should be increased an additional amount equal to half the value of the first dot. Thus, a double-dotted half note is equal in duration to a half note plus a quarter note plus an eighth note. Double dots can be used on other note durations as well.

Double-dotted notes are supported by *Enhanced Sidplayer.* To select a double-dotted duration, first choose the duration without the dot by pressing the appropriate duration key; then press SHIFT-D. If you're using the joystick, select the duration by pushing the stick left or right; then move to the joystick boxes and press the trigger on the one with the double-dotted note. Once the double-dot has been selected, you can enter the note just like any other.

## Triplets

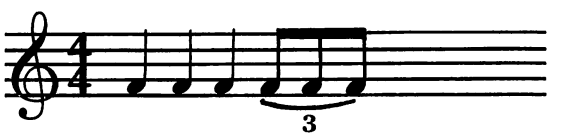
All durations, from whole note to sixty-fourth note, are based on the number two. These durations allow notes to be played for one, two, or four beats; half a beat; and so on. This system works very well except that it's difficult to handle durations based on the number three. To play a note for three beats, a dotted half note can be used. But how do you play a note for one-third of a beat? Using dots won't help there. Instead, you need to use a new kind of duration called a *triplet.*

A triplet consists of three notes played for the amount of time normally allotted to two notes. An eighth triplet is equal in duration to two eighth notes. Because two eighth notes form one beat, each of the three notes in an eighth triplet is one-third of a beat long.

A sixteenth triplet means that the amount of time used for two sixteenth notes, or one eighth note, is to be divided into three equal parts. Each of the three notes in the triplet plays for that duration. Triplets based on other durations, such as quarter notes, are also possible.

Triplets are always written with a number 3 above or below them, as shown in Figure 14-14.

**Figure 14-14. Triplets**




To enter a triplet duration in the Editor, select the duration by pressing the appropriate duration key; then change it into a triplet by pressing SHIFT-T. With the joystick, select the duration and press the trigger on the joystick box which displays the note with the subscript 3. The note can now be entered and played like any other.

Normally, when triplets occur in music, they occur in groups of three. The beats display on the Editing Screen will show the correct number of beats when the three notes of a triplet have been entered, but it won't be able to calculate the total number of beats when there are less than three triplet notes. In that case, the message $+T$ is printed after the number of beats to indicate that there's at least one triplet note which isn't being counted in the beat total.

Because of the way *Enhanced Sidplayer* handles durations, many tempos don't support triplets. In M.M. 112, for example, a whole note plays for 128 jiffies. The number 128 is not evenly divisible by 3, so triplets cannot be played in this tempo. Table 14-1 shows which tempos support triplet durations. For those that do support triplets, the jiffy durations of triplet notes are also shown.

**Table 14-1. Tempo Chart—Triplets**

| M.M. | H | Q | E | S | 32 | 64 |
|---|---|---|---|---|---|---|
| 1800 | — | — | — | — | — | — |
| 900 | — | — | — | — | — | — |
| 600 | 8 | 4 | 2 | 0 | — | — |
| 450 | — | — | — | — | — | — |
| 360 | — | — | — | — | — | — |
| 300 | 16 | 8 | 4 | 2 | 0 | — |
| 257 | — | — | — | — | — | — |
| 225 | — | — | — | — | — | — |
| 200 | 24 | 12 | 6 | 3 | — | — |
| 180 | — | — | — | — | — | — |
| 163 | — | — | — | — | — | — |
| 150 | 32 | 16 | 8 | 4 | 2 | 1 |
| 138 | — | — | — | — | — | — |
| 128 | — | — | — | — | — | — |
| 120 | 40 | 20 | 10 | 5 | — | — |
| 112 | — | — | — | — | — | — |
| 105 | — | — | — | — | — | — |
| 100 | 48 | 24 | 12 | 6 | 3 | — |
| 94 | — | — | — | — | — | — |
| 90 | — | — | — | — | — | — |
| 85 | 56 | 28 | 14 | 7 | — | — |
| 80 | — | — | — | — | — | — |
| 78 | — | — | — | — | — | — |
| 75 | 64 | 32 | 16 | 8 | 4 | 2 |
| 72 | — | — | — | — | — | — |
| 69 | — | — | — | — | — | — |
| 66 | 72 | 36 | 18 | 9 | — | — |
| 64 | — | — | — | — | — | — |
| 62 | — | — | — | — | — | — |
| 60 | 80 | 40 | 20 | 10 | 5 | — |
| 58 | — | — | — | — | — | — |
| 56 | — | — | — | — | — | — |

The Editor supports half-note through sixty-fourth-note triplets. Every tempo which supports triplets supports them down to sixteenth-note triplets, but only some of the tempos support thirty-second- and sixty-fourth-note triplets. If you try to play a triplet in a tempo which doesn't support it, the playing stops with the *ILLEGAL DURATION* error.

See the JIF command introduced in Chapter 15 for a way to get around these restrictions.

## Other Uncommon Durations

Once in a while you may even see *pentuplets* (five notes), *septuplets* (seven notes), or other strange durations. To support these less common durations, *Sidplayer* has a *utility duration* which can be set to last any desired amount of time. If you want to play an eighth pentuplet, for example, all you have to do is set the utility duration to play the appropriate number of jiffies, then enter the notes of the pentuplet using the duration marked *UTILITY*.

### The UTL Command

Use the UTL command to set the utility duration. The range of this command is 1–256 jiffies, with 0 representing 256 (in other words, setting UTL to 0 specifies 256 jiffies, the highest allowed). To calculate the number of jiffies for a particular duration, refer to Table 9-1 (Chapter 9). This tempo chart is also shown in the help screen for the Command Screen. If you want an eighth pentuplet, for instance, find the jiffy length for a quarter note in the current tempo and divide that number by five. Enter the result for the UTL command. Of course, if the jiffy length doesn't divide evenly, you'll have to use a different tempo.

Once the utility duration has been set by the UTL command on one voice, it counts as a duration just like a quarter note, half note, and so on, and can be used for entering notes and rests on all three voices.

To select the utility duration, press the U key or push the joystick left or right until you come to the duration marked *UTILITY*. Be careful not to select the one labeled *UTILITY–VOICE*.

The length of the utility duration remains in effect until changed by the UTL command. To play notes with a utility duration of a different length, simply set the new jiffy length with another UTL command in front of those notes. Since the calculation of the utility duration depends on the current tempo, you may have to do this when the tempo changes.

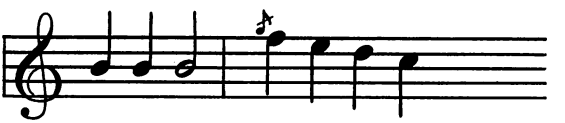
If you're using utility-duration notes with different durations on two or more voices, remember that a UTL command on one voice may affect the utility-duration notes on another. Chapter 15 shows how this problem can be avoided by using the alternate utility duration.

The default value of the utility duration is 12 jiffies.

## Grace Notes

If you see a note written considerably smaller than all others, it's a *grace note* (Figure 14-15). A grace note is played very quickly, just long enough to be heard.

**Figure 14-15. Grace Note**



To enter a grace note, enter the preceding note with a slightly shorter duration; then enter the grace note with the remaining duration. Usually, the utility duration must be used to do this.

In Figure 14-15, the grace note is preceded by a half note. Let's say that the current tempo is M.M. 100, in which case a half note plays for 72 jiffies. The grace note could be entered by setting the utility duration to 68 jiffies and entering the half note using the utility duration, then setting the utility duration to 4 jiffies and entering the grace note. The total duration of the two notes (68 + 4 jiffies) will be correct.

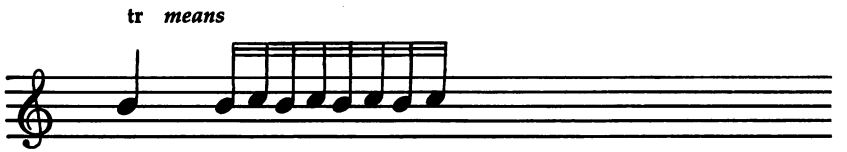
There's no definite rule about how many jiffies should be used for a grace note. Use whatever sounds best. The grace note in the example could have been played for 6 jiffies, in which case the previous note would have played for 66 jiffies.

Also remember that with short durations (such as four jiffies), the release point must be set lower or the note may have to be tied to the next one.

## Trills

The letters *tr* above a note indicate a *trill* (Figure 14-16). This means that the note should be played with the pitch rapidly alternating between the designated pitch and the next higher pitch in the current key.

**Figure 14-16. Trill**




Repeat loops can be useful in entering trills. To enter the trill shown in the example, a pair of thirty-second notes, in the pitches F and G, could be entered between a HED and TAL. The loop would be repeated four times.

Chapter 15

# Advanced Commands and Techniques

Chapter 15

# Advanced Commands and Techniques

*This chapter presents a few remaining commands and explores some new uses for the commands previously introduced.*

*The commands and techniques given here require some experience in using* Sidplayer. *The JIF command, however, is very useful and not that difficult to use, so you may want to read about it now, even if you save the other sections for later.*

## Tempo

The length of a note is measured by *Enhanced Sidplayer* in units of *jiffies*, where a jiffy is 1/60 second. Every note that *Enhanced Sidplayer* plays must have a length of one or more jiffies. To play a note at a certain tempo, the program calculates the length in time that the note would take, then calculates the number of jiffies in that amount of time.

When the duration of a note doesn't correspond to an exact number of jiffies and a fraction of a jiffy would have to be used, the note cannot be played at that tempo.

As it works out, this scheme lets you play notes in a variety of tempos, but there are restrictions on which tempos and which durations can be used. Sometimes these restrictions can be very inconvenient, especially when you want to play triplets.

To get around this problem, you need to change the length of a jiffy. By making a jiffy last more or less than 1/60 second, you can play any duration at any tempo.

### The JIF Command

The JIF command is used to set the length of a jiffy while a song is playing. The command takes a number from −200 to

757. The default value is 0, which means that a jiffy lasts for the normal 1/60 second. Larger (positive) values make the jiffy longer, and thus slow the tempo. Negative values shorten the jiffy to less than 1/60 second, and, in effect, speed up the tempo. To get an idea of how the JIF command values change the tempo, take a look at Table 15-1.

**Table 15-1. JIF Value Effect**

| JIF Value | Result |
|---|---|
| −200 | Four times the tempo |
| −177 | Three times the tempo |
| −133 | Twice the tempo |
| 0 | No change in the tempo |
| 266 | One-half the tempo |
| 533 | One-third the tempo |
| 757 | Almost one-fourth the tempo |

When you use the JIF command to change the tempo, you can find out the effective tempo by playing the song on the Display Screen. The number displayed after the command name TEM shows the tempo set by the last TEM command. Above the name TEM are the letters *M.M.* and a number. When no JIF command is used, the number displayed after M.M. is the same as the TEM number. However, when JIF *is* used to change the length of the jiffy, the number after M.M. shows the actual tempo at which the notes are playing.

## Playing at Any Tempo

To play notes at a tempo which isn't supported by *Enhanced Sidplayer,* first use the TEM command to set it to the nearest supported tempo that's *faster* than the desired tempo. Next, enter a JIF command with the value greater than 0 which slows the tempo down to the desired level.

Suppose you want to play at tempo 160. According to the tempo chart given in the help screen for the Command Screen, tempo 160 isn't supported. (A portion of the chart is shown here for your convenience.)

| M.M. | W | H | Q | E | S | 32 | 64 |
|---|---|---|---|---|---|---|---|
| 180 | 80 | 40 | 20 | 10 | 5 | — | — |
| 163 | 88 | 44 | 22 | 11 | — | — | — |
| 150 | 96 | 48 | 24 | 12 | 6 | 3 | — |

The first supported tempo faster than 160 is tempo 163, so you'd enter the command TEM 163. After that, you'll need to experiment with different values for the JIF command until you find one that slows down the tempo just slightly. In this example, the command JIF 4 slows down the tempo from 163 to 160.

### Playing Any Duration at Any Tempo

Some tempos won't support certain notes (see Table 5-1). Using JIF, however, you can play notes which aren't normally supported by a given tempo. Follow the same basic procedure as listed above, but instead of choosing the first faster tempo, choose the next faster tempo which supports the desired durations.

For instance, tempo 163 doesn't support sixteenth notes. The next faster tempo that does support sixteenth notes is tempo 180, so you'd use TEM 180, then slow the tempo down to 163 with JIF. To play sixteenth notes at tempo 160, you'd still use tempo 180, but with a slightly larger value for the JIF command to slow the tempo down to 160 instead of 163.

### Caution About Negative JIF Values

Though you can use negative JIF values to speed up the tempo, keep the following in mind.

Negative JIF values shorten the length of the jiffy. *Enhanced Sidplayer* must process all notes and commands within one jiffy, or a *CLOBBER* error occurs and playing stops. A shorter jiffy means there's less time for *Enhanced Sidplayer* to process everything, and the chance of the CLOBBER error happening increases. There's no problem, however, if you make the jiffy last longer than 1/60 second. That's why you should always choose a higher tempo, then use JIF to slow the tempo down instead of choosing a slower tempo and using a negative JIF value to speed it up.

### Other Applications

The JIF command is very handy when you want to ritard at the end of a song. All you have to do is use larger and larger JIF values to slow down the tempo. It doesn't matter if you change the value when one of the voices is in the middle of a note.

Another application is to play at a tempo less than 56, which is the lowest tempo supported by the TEM command. With JIF, the lowest tempo you can play at is tempo 14.

Changing the jiffy length also changes the sweep, portamento, vibrato, and modulation rates. Using the JIF command to double the tempo, for instance, also doubles the vibrato rate. This can be especially useful when you need faster modulation rates. Just remember that you may get CLOBBER errors whenever you use JIF to increase the tempo.

You shouldn't have too many problems when you double the tempo, but you may get some CLOBBER errors if you triple the tempo, especially at places where there are several commands grouped together. It's doubtful that you'll be able to play at four times the tempo without getting CLOBBER errors.

### Fractional Tempos

In many cases, two or more different values for the JIF command will seem to give the same tempo. What's happening is that you're getting fractional tempos. For example, at tempo 100 the commands JIF 1, JIF 2, and JIF 3 all show as M.M. 99 on the Display Screen, but the tempos are probably something like 99.7, 99.4, and 99.1.

## Utility Duration

Once the utility duration has been set, utility-duration notes on all three voices use that same duration. This makes sense—any other duration, such as quarter note, is the same on each voice. Sometimes it's convenient to have independent utility durations for each voice. For those occasions, an alternate utility duration is available.

### The UTV Command

Use the UTV command to set the utility duration for a particular voice. As with the UTL command, the duration must be specified in terms of jiffies. The default duration is one jiffy.

To play notes using the utility duration for a voice from the Editing Screen, press SHIFT-U on the keyboard or push the joystick left or right to select the duration labeled *UTILITY-VOICE*; then enter the notes. The notes will be played using the duration set by the most recent UTV command on that

voice. If you then use a UTV command and utility-voice duration notes on a second voice, they'll have no effect on the utility-voice durations of the first voice.

Utility durations for each voice are also independent from the utility duration set by the UTL command. This means that on any voice, you actually have two utility durations available at any time—the utility duration for that particular voice (UTV) and the utility duration common to all three voices (UTL).

One thing to remember is that when one voice calls a phrase defined in another voice, any notes with utility-voice durations in the phrase are played using the utility-voice duration for the voice which called the phrase, not the voice where the phrase was defined.

Here's an example. Let's say that the utility-voice duration has been set to four jiffies on voice 1 and nine jiffies on voice 2. If voice 2 calls a phrase which includes utility-voice durations, and which is defined in voice 1, voice 2 will play the utility-voice durations for nine jiffies, not four.

In such situations you may want to place a UTV command at the beginning of the phrase to make sure that the notes are played for the correct duration.

### Playing Illegal Durations Without Changing the Jiffy

When you want to play notes in a tempo which doesn't support them, you *can* use the JIF command. Remember, however, that a side effect is a changing of the sweep, portamento, vibrato, and modulation rates.

Another way to play the notes is to use utility durations. Say, for instance, that you want to play an eighth triplet at tempo 128. This tempo doesn't support eighth-note triplets because the duration for a quarter note, 28 jiffies, cannot be evenly divided by three. But if you enter the three notes of the triplet using utility durations, with the utility duration set to 9 for the first two notes and 10 for the third note, they'll play for the correct total amount of time. You'll hardly notice that one note is longer than the others.

### Echo Effects

When two voices play the same notes with detuning, a very short utility-duration rest placed at the beginning of one of the voices creates an echo effect.

## Volume

A popping noise sounds when the VOL command changes the master volume by large amounts. Some people feel that the popping detracts from a song, and try to minimize it in their songs.

To reduce the popping noise, try using smaller volume-level changes and different positions for the volume changes. The sustain levels of the voices can also be adjusted to control the overall volume.

## Waveforms

### The Noise Waveform

Of the four basic waveforms supported by the SID chip, the one most overlooked is the noise waveform. Although this waveform doesn't have a definite pitch quality, its character does change as the pitch changes. High pitches produce a hissing sound, while low pitches produce more of a rumble.

An interesting way to use the noise waveform is to play white-noise notes with different pitches to create a repeating percussion line. The sequence of notes should use short durations and can repeat every one or two measures. With just a little effort, you can create a fancy rhythm that adds a nice touch to a song.

The character of the noise waveform can be altered significantly by passing it through the filter. Try this with the filter set for the high-pass mode.

### Waveform Combinations

One way to create new types of sounds is to use two waveforms at the same time on the same voice. Unfortunately, the tones produced by combined waveforms are always very quiet, and only the combination of triangle and pulse waves is loud enough to be of much use.

To select the triangle and pulse wave combination, enter the WAV command with the number 5 (1 for triangle, plus 4 for pulse). At the higher pitches, this waveform sounds much like the pulse wave with the pulse width set to about 200. It begins to sound louder and more distinctive at lower pitches.

When a voice plays with the triangle and pulse wave combination, the pulse width acts as a volume control. Lower

pulse-width settings make the tone louder. The pulse width should be set below 2048 to make the waveform audible. One technique to consider is to use pulse-width sweeping to make a tone fade away to silence.

The combination of sawtooth and pulse waves is much quieter, but is useful occasionally. Again, the pulse width must be set low.

## Envelope

### Controlling the Volume of a Voice

One of the SID chip's major drawbacks is that there's not a volume control for each voice. To some extent, the sustain level can be used as a voice volume control. Select sustain levels less than 15 to make a voice a little quieter. You may also want to adjust the decay rate so that the volume doesn't drop from the peak to the sustain level too rapidly.

Another technique is to experiment with the attack rate and hold time so that each note is released *before* the attack phase is complete (before the volume hits the peak level).

For this to work, the release rate must be set at 255, and the hold time must be adjusted so that each note is held for just the right amount of time. The technique usually works best with ATK values 5–10 and HLD values 3–5. The DCY and SUS settings make no difference because the envelope never reaches those phases. The RLS value should be set so that each note fades to complete silence before the next note begins.

You'll have to experiment to find the best values in a particular situation.

Here's an example setting adjusted to work at tempo 100:

```
ATK 9 RLS 10 PNT 255 HLD 3
```

## Portamento

When the portamento feature is turned on, the pitch glides from that of the previous note to the pitch of the new note as soon as the latter starts playing. For instance, if a C note is followed by a G and portamento is on, when the G begins playing, the pitch starts at C and ends at G.

### The Absolute Set Pitch Command

The Absolute Set Pitch command can be used to change the starting pitch of a glide. In the example above, a command to absolutely set the pitch at E could have been placed between the C and G notes. Then, when the G was played, the pitch would have glided from E to G instead of from C to G.

Unlike other commands, the Absolute Set Pitch command is entered from the Editing Screen. To absolutely set the pitch, select the name, accidental, and octave of the pitch as usual, but press SHIFT-A or push the joystick left or right to select the duration marked *ABSOLUTE SET* before you enter the command. An *A* appears in the duration box above the staff. On the scrolling area at the bottom of the screen, the command appears as a note with the letter *A* in place of the duration.

Although this command is entered like a note, it's still a command since it has no duration. The command is entered like a note because the Editing Screen offers a convenient method for specifying a pitch.

### Pitch Bending Effects

One application of this command is to create *pitch bending* effects. Use the following procedure to bend the pitch of a note:

- Turn on portamento with the POR command
- Use the Absolute Set Pitch command to set the pitch one half step below or above the pitch of the note
- Play the note
- Turn portamento off with the command POR 0

When the note plays, its pitch doesn't start at the pitch of the note, but at one half step away; then it glides to the pitch of the note. A sort of pitch bend effect is created.

### Playing Pitches While Fading

Another application of the Absolute Set Pitch command has nothing to do with portamento. If the release rate is set to be very slow, you can make a voice play different pitches while fading out.

To do this, play a note followed by several rests. Place an Absolute Set Pitch command in front of each rest. The slow release rate makes the volume continue to fade during the

rests, and the Absolute Set Pitch command makes the pitch change during the fade.

### A Glide of Any Length

If you ever need to have a really long glide and there's no note duration long enough, remember that you can always use a utility-duration note.

## Vibrato

### Changing the Vibrato Depth During a Note

An advanced vibrato technique is to change the depth of the vibrato during a note.

Let's say that a voice is playing a whole note. Break the whole note into four quarter notes. Enter the first quarter note with a tie and follow it with a VDP command to set the vibrato depth. Do this again for the next two quarter notes, each time using a larger depth value. Enter the last quarter note without a tie.

When played, the tied quarter notes will sound like a whole note, and the different VDP commands will make the vibrato effect deepen gradually. The result is a more natural vibrato effect.

Remember to reset the vibrato depth for the next note.

### The P & V Command

Normally, when portamento and vibrato are used at the same time, the vibrato doesn't start until after the glide is complete. To let both portamento and vibrato occur at the same time, enter the P & V command with the value 1 (YES). To turn this feature off again, enter the command with the value 0 (NO).

## Detuning

*Enhanced Sidplayer* can play a note using any frequency, including frequencies between the normal half steps. Just choose a note with a pitch near the desired frequency and use the DTN command to set a frequency offset value. Refer to the Appendix to find the frequency number for each pitch.

As an example, let's say you want to play a note with the frequency 500 Hz. Use the following formula to calculate the corresponding frequency number:

**frequency number = frequency/0.06097**

The frequency number for 500 Hz is 500/0.06097, or 8201 (actually 8200.75, but it's been rounded to the nearest whole number). The pitch with the closest frequency is B4, which has the frequency number 8101. Therefore, to play a note at 500 Hz, all you have to do is enter the command DTN 100 followed by the note B4.

One application of this technique is to play quarter tones, which are a rather advanced concept in music theory and beyond the scope of this book.

## Transposing

The TPS command sets the transposition interval. Initially, the interval is zero half steps, and each note is played at the pitch specified when it was first entered. When the interval is something other than the default, the pitch of each note is transposed up or down the specified number of half steps before it's played. If you set the interval to seven half steps with the command TPS 7, each note plays at a pitch seven half steps above the pitch specified by the note itself. If you then enter the command TPS −8, the following notes are played eight half steps below their specified pitch.

### The RTP Command

The RTP command also lets you transpose notes, but it works a little differently. Instead of setting the transposition interval, it changes the interval by a specified number of half steps. The allowed RTP command values range from −47 to 47. This is called *relative transposing*. If the interval was set to 12 half steps by TPS 12, the command RTP 1 changes it to 13 half steps. Another RTP 1 command changes it to 14 half steps.

To cancel the effects of relative transposing and set the transposition interval back to the value set by the last TPS command, enter RTP 0. In the preceding example, RTP 0 would reset the interval to 12 half steps.

The TPS command automatically cancels the effects of relative transposing. If the interval was 12 half steps and then

changed to 11 half steps by RTP −1, the command TPS 7 would set the interval to 7 half steps.

Relative transposing is useful in those situations where you want to repeatedly change the transposition interval. The command is often used with repeats and phrases. However, when you need to transpose notes and either the TPS command or RTP command will suffice, it's best to use only TPS.

### Playing in Octave −1

It's possible, using the TPS command, to play notes in a ninth octave. If you play notes in octave 0 after entering the command TPS −12, the notes actually play in octave −1.

It's very hard to discern the pitch of notes in octave 0, and even harder to hear pitches in octave −1, so this technique is probably useful only for creating special effects. One thing to try is to play in octave −1 with the triangle and pulse waveform combination.

Remember that this technique won't work with notes above octave 7. If a note is transposed into octave 8 or higher, it's still played in octave 7.

### Playing Music for Different Instruments

The TPS command can be used to play music written, for instance, for B-flat instruments. The technique is to put a TPS command at the beginning of the voice to shift it into the correct key.

Consult someone knowledgeable in music theory for help in determining the number of half steps to use in transposing a voice to play music written for a particular instrument.

### Transposing and Detuning

When two voices play the same notes transposed one or two octaves apart, the resulting tone can be changed slightly by detuning one of the voices.

## Synchronization

### Synchronization with Portamento

When two voices are synchronized by the synchronization mode, a rather unusual effect can be created by using portamento on the voice which adds the harmonics. One technique

is to enter an Absolute Set Pitch command before each note. The command should set the pitch an arbitrary number of half steps below the pitch of the following note, so that the pitch glides up when the note plays.

### Changing the Transposition Interval

Normally, the transposition interval stays at one value while notes are played with the synchronization mode on. Something you can try is to change the interval by a half step every few notes. Each half-step interval gives a slightly different tone from the previous interval, so the change is gradual. The later notes, though, will sound very different from those at the beginning.

To use this, you must put a TPS or RTP command at various places on the voice which adds the harmonics. A phrase call cannot be used. Enter the notes for the one voice, copy them to the second, and then insert TPS commands with incrementing values (or RTP 1 commands) on the voice which would normally be transposed.

### Nonstandard Synchronization-Mode Configurations

The previous suggestions on how to use the synchronization mode—with phrase calls and transposing—were provided to show you how to get the true synchronization-mode effect.

Some people have gotten interesting results by using different configurations. For example, you may try turning on synchronization mode when the voice which adds the harmonics plays the same note the entire time.

## Ring Modulation

### Ring Modulation with Portamento

Using portamento with ring modulation creates some very weird effects.

### Ring Modulation with Voice 3 On

Some interesting effects can be obtained by using ring modulation without turning off voice 3 with the 3-O command. For the best effect, you may need to make its envelope similar to that used on voice 1.

### Synchronization and Ring Modulation

When ring modulation and synchronization mode are used together, a whole new range of timbres is available. To use both modes simultaneously, follow this procedure.

```
Voice 1: WAV T  SNC YES  RNG YES  TPS  DEF  Play Notes  END
Voice 3: 3-O YES     CAL
```

The triangle waveform is still required, but any interval of transposition can be used. Each interval gives a slightly different timbre. The pitches always stay in tune, so the TPS command needs to be used only on voice 1. As with synchronization, however, negative values aren't very useful.

For a demonstration of synchronization mode, ring modulation, and synchronization mode plus ring-modulation effects, play the song PRELUDE NO.2 on the *Enhanced Sidplayer* disk.

## Filter

### The F-X Command

The SID chip is designed to accept an external audio signal which can be mixed with the output from the three voices before being sent to the master volume control. Another option is to route the external audio signal through the SID chip's filter. This option is controlled by the F-X command. F-X works just like FLT except that it controls whether the external audio signal is passed through the filter instead of through one of the voices. Since there's not much advantage to passing an external audio signal through the SID chip, and the filter has its own problems anyway, this feature is seldom used.

By a quirk of the SID chip, however, there *is* a good reason to use the F-X command. In addition to generating tones for music, the SID chip also picks up a lot of the "noise" from the electronic circuitry inside the computer. When the F-X feature is turned on, even when no external audio signal is present, a lot of the background noise is reduced and the voices play with cleaner tones and less hiss. For this reason, the default value of the F-X command is 1, so that the feature is on.

### Popping Noise

The SID chip makes a popping noise whenever the FLT command turns filtering on or off. There's no way around this, but once in a while it can be useful for percussion effects.

### Filtered Ring-Modulation Tones

Table 11-2, in Chapter 11, listed the half-step intervals which work best. Only a few of the intervals give very pleasant or useful sounds. Too often, the sound produced by one interval includes an undesirable high-pitched tone.

If you pass the ring-modulated tone through the filter, however, with the filter mode set to low-pass, the squeal can be eliminated. Most of the intervals listed in the chart then become useful. Of course, this technique cannot be used if the filter in your computer doesn't work well.

## Miscellaneous

### The AUX Command

The AUX command is provided to allow for possible future expansion of *Enhanced Sidplayer.* The command accepts a data value from 0 to 255.

### Changing the Piano-Key Color

At the moment, the only use of the AUX command is to change the colors of the piano keys on the playing screen. Each voice is represented by its own key color. The default values are given below.

| Voice | Color |
|---|---|
| 1 | 2 (red) |
| 2 | 7 (yellow) |
| 3 | 14 (light blue) |

To change the piano-key color associated with a voice, enter the AUX command on that voice with a value from 0 through 15. The values correspond to the 16 standard colors of the VIC chip.

| AUX Value | Color |
|---|---|
| 0 | black |
| 1 | white |
| 2 | red |
| 3 | cyan |
| 4 | purple |
| 5 | green |
| 6 | blue |
| 7 | yellow |
| 8 | orange |
| 9 | brown |
| 10 | light red |
| 11 | dark gray |
| 12 | medium gray |
| 13 | light green |
| 14 | light blue |
| 15 | light gray |

To maintain upward compatibility with any future versions of *Sidplayer,* don't use the AUX command with a value greater than 15.

## Phonetics

Certain combinations of frequencies are associated with different vowel sounds, as demonstrated in the song called OLDMAC on the *Enhanced Sidplayer* disk.

## Musical Sculptures

If you have an appreciation for the bizarre, we dare you to play the song Y.O., also found on the disk.

## More Than Three Voices

The most serious limitation of the SID chip is that it supports only three voices. Many classical music pieces can be played with three voices, but most of today's songs need at least four.

### Choosing Which Notes to Cut

Sometimes when a song has to play four notes, one can be eliminated without significantly affecting the music. When a note in the bass staff is also played a few octaves higher in the treble staff, the treble staff note can usually be cut. If the treble staff contains notes which don't seem part of the melody,

try deleting them. When it's not obvious which note should be dropped, a friend who has a good understanding of music theory may be able to help.

Contemporary sheet music is often written with two treble staves and one bass staff. The top treble staff usually has just the notes for the melody, and the other treble staff has the melody notes, plus extra notes for harmony and chords. If you enter the top treble staff and the bass staff, you'll get the basic part of the song and still have one voice free for the harmony or for percussion effects.

A good rule of thumb for cutting notes is to keep the top and bottom notes and delete one of the notes in between.

### Alternating Effects on One Voice

A clever technique is to have one voice play both a bass part and percussion part. Bass notes can be played on each down beat, and percussion effects, such as snare-drum strikes, can be played on the up beat. An easy way to do this is to define a phrase just for the percussion note. The phrase should select a nonsustaining envelope with the noise waveform, play a note, then reset the envelope and waveform. To enter the voice, just enter bass notes separated by phrase calls.

### Playing a Song on Two Computers

There's no way to make a SID chip play more than three voices. But why use just one SID chip? By using two Commodore 64 or 128 computers, each running *Enhanced Sidplayer,* you can play up to *six* voices.

The only complication with using two or more computers is getting them to start playing at the same time. Therefore, the Editor and Player programs have been designed to make it easy to synchronize several computers. After a song has loaded, the program won't begin playing the song until the joystick button is released.

To start two computers at the same time, load the appropriate song on each computer, keep the joystick buttons pressed, press P from the Main Menu on the Editor or F8 on the Player to start the playing, and release both buttons simultaneously. For best results, have the same person release both joysticks.

You may also get good results by not using the joystick and pressing the appropriate keys simultaneously, although you may have to do it a few times to get the songs started together. One way to practice is to play the same song on both computers. This will also let you verify that both computers are playing at the same speed, and will let you adjust the volume levels so that they're balanced.

One helpful technique is to put timing beeps at the beginning of a song for two computers. If the timing beeps match on the two computers, you know that they were started together.

Using two or more computers opens up many exciting possibilities, including the production of stereo music. For an example of a song which plays six voices on two computers, play the DAWN RIVER-L and DAWN RIVER-R songs on the *Enhanced Sidplayer* disk.

Chapter 16

# Polyphony and Utility-Duration Phrasing

Chapter 16

# Polyphony and Utility-Duration Phrasing

*This chapter explains how to use the POLYCON and UTLDUR programs to convert a song so that it plays with polyphony or special phrasing effects.*

*These effects are advanced techniques which definitely require an understanding of how* Enhanced Sidplayer *works. The polyphony effect is relatively easy to use and requires two voices. Utility-duration phrasing can be done on one voice, but the technique is more complicated and takes a bit of time to use. You may wish to play the demonstration songs POLYDEMO and UTLDURDEMO now to hear what the effects sound like, but it would be a good idea to use the POLYCON and UTLDUR programs only after you have a fair amount of experience in using the program.*

## The Polyphony Effect

The *polyphony effect* occurs when one sequence of notes is played alternately on two voices. Voice 1 plays the first note, voice 2 plays the second note, voice 1 plays the third note, and so on. This allows each new note to start playing while the previous note is still fading away for a pleasant, continuous sound.

To hear the effect, play the song POLYDEMO on the *Enhanced Sidplayer* disk. The song plays a scale up and down on one voice, then plays it again using two voices with polyphony. This is repeated a few times at faster tempos. Watch the colors of the piano keys on the playing screen to see how the voices alternate in polyphony playing.

## The POLYCON Program

The POLYCON program converts a song so that the notes in one voice are played with the polyphony effect. To do this, it copies the notes in the one voice to a second voice that's not being used, then changes every other note to a rest. Notes 1, 3, 5, and so on in the one voice are changed to rests, and notes 2, 4, 6, and so on in the other voice are changed to rests.

To convert a song, load and run the POLYCON program. Enter the name of the song to be converted and wait for the song to load.

The *source voice* is the one which contains the notes that are to be played with the polyphony effect. When prompted for the source voice, enter the number of the voice which has these notes.

You can convert the entire voice, or only the notes in a specified range of measures. If you want to do the latter, enter the measure number where the conversion should start, or just press RETURN if you want the conversion to start at the beginning of the voice.

Next, enter the measure number where the conversion should end. The conversion stops at the *beginning* of this measure. For example, if you specify that the conversion should stop at measure 50, the notes up to measure 50 are converted, but those in measure 50 itself are not. Press RETURN without entering a number if you want the conversion to continue to the end of the voice.

If you don't convert the whole voice and enter a number for the beginning or ending measure, or both, the voice must contain measure markers with the same numbers. The POLYCON program searches the voice for these corresponding measure markers. If the measure markers are missing, the program stops with an error.

The program asks you to specify which voices are to be used to produce the polyphony effect. Press the Y or N key to specify Yes or No on each voice. The polyphony effect requires that two voices be used. The source voice can be one of these, so be sure to press Y for the source voice.

The second voice should be one that's not in use—not playing any notes—while the polyphony notes are being played. If you're converting an entire voice, this second voice must be empty. If you're only converting a range of measures,

the second voice should be playing only rests during those measures. Decide which voice will be the second voice; then type Y for that voice number. Type N for the remaining voice.

If the conversion is being done on a range of measures, there must be corresponding measure markers in the second voice as well as in the source voice. If the program can't find the starting and ending measure markers in the second voice, it stops with an error.

As part of the conversion process, any notes, rests, or commands between the measure markers in the second voice are deleted and replaced with the polyphony notes.

After you've responded with Y or N for each voice, the program performs the conversion and asks whether you want to convert another part of the song. Type Y to repeat the above procedure, possibly using a different source voice.

When you've finished and don't want to convert any more notes, type N at the last prompt. Enter a filename and wait for the program to save the converted song.

The polyphony effect can also be done using three voices. Just type Y for each voice when prompted. Be sure that the two nonsource voices aren't playing any notes during those measures when the polyphony effect is desired, since the notes are deleted by the program and replaced with the polyphony notes.

You may need to go back to the Editor and add slower release rates to the polyphony voices. The volume must continue to fade after each note is played in order for the polyphony effect to be noticeable.

The polyphony effect sounds nice when used with any notes, but it's especially pleasing when used with quickly played notes.

You may also want to try polyphony with detuning. Have two voices play the alternating notes and the third voice play all the notes with detuning turned on. To do this, enter the notes for the source voice and make sure that the corresponding parts on the other two voices are empty. When you run the POLYCON program, specify that the source voice should *not* be a polyphony voice, but that the other two voices should be. Place a DTN command on the source voice and adjust the release rates on the other two voices if necessary. The result should be a pleasant type of sound that you can't get any other way.

Be careful with phrase calls when polyphony is used. Remember that the POLYCON utility converts only the notes between the specified measure markers. If there's a phrase call within that range of measures and the phrase is defined elsewhere in the voice, the phrase won't play in the polyphony manner. In general, it's best to avoid phrase definitions and calls in parts of a song where polyphony is used.

Remember that once a part of a song has been converted, there's no easy way to undo the conversion. It may be a good idea to keep a copy of the song without the polyphony effect.

## Utility-Duration Phrasing

The computer is just a machine; it has machinelike precision and no imagination—and that's reflected in how it plays. At a given tempo with constant settings, each quarter note is played for exactly the same amount of time and in exactly the same way as every other quarter note.

In a live performance, a person playing an instrument may not play notes so precisely. The performer may stretch some notes to play a little longer and shorten others. This is called *phrasing* and gives the music a more natural, less rigid feeling.

Although it takes a bit of work, there is a way to add phrasing effects to an *Enhanced Sidplayer* song. The basic procedure consists of three steps. First, each note is changed into a utility-duration note of the same pitch, with its own UTL or UTV command in front of it. The durations of the various notes are then adjusted so that they're played in the way a live performer might play them. The final step saves memory: Any utility-duration notes with unmodified durations are changed back to regular notes.

### The UTLDUR Program

The first step is to get the notes into the form of UTL or UTV commands followed by utility-duration notes. Since it would be exceedingly difficult to enter the notes this way in the first place, the UTLDUR program can be used to convert the notes of any song into this form.

Load and run the UTLDUR program. Enter the name of the song to be converted at the prompt for the filename.

The following prompt asks whether you want to expand, contract, or save the song. To convert notes into utility-duration notes, choose the expand option by pressing the 1 key.

At the next prompt, enter the number of the voice which contains the notes you want to convert.

As with the POLYCON utility, either an entire voice or just part of one may be converted. Enter the number of the measure at which the conversion should start, or press RETURN to start the conversion at the beginning of the voice. If a measure number is specified, the voice must contain a measure marker with that number.

Enter the number of the measure where the conversion should end, or press RETURN to convert to the end of the voice. If a measure is specified, the voice must contain a corresponding measure marker.

The last prompt asks which type of utility duration should be used. You can use either utility durations set by the UTL command or utility-voice durations set by the UTV command. After you press the 1 or 2 key to make your selection, the program converts the notes and returns to the prompt asking whether you want to expand, contract, or save the song. You can then convert another part of the song, perhaps on a different voice, or save the song and move on to the second step in the procedure.

The conversion process is pretty straightforward, but there's one additional requirement. You must place a TEM command at the beginning of each sequence of notes that's converted. The UTLDUR program has to know the tempo at which the notes are played in order to calculate the values for the UTL or UTV commands. If no tempo is specified, M.M. 100 is assumed.

Here's an example to show how the conversion works. Let's say that the following notes are to be converted:

```
TEM  C 4  E 4  F 4  G 4  72  Q  E  E  H
```

At M.M. 72, a whole note plays for 200 jiffies, so after conversion to utility durations, the notes would look like this:

```
TEM  UTL  C 4  UTL  E 4  UTL  F 4  UTL  G 4
 72   50   U    25   U    25   U   100   U
```

These notes play exactly the same as before, except now they're utility-duration notes, and small adjustments to their durations can easily be made.

Once the song has been converted, load it into the Editor and start adjusting the durations. Be very careful that whatever is added to one duration is removed from one or more other durations. Continuing the above example, if 4 jiffies are added to the first note, making it 54 jiffies long, 4 jiffies need to be removed from other notes. The 100-jiffy note could be changed to play for 96 jiffies, or the two 25-jiffy notes could be changed to 23 jiffy notes. Many other solutions are also possible. *The important thing is that the total duration of all the notes must not change, or the voices won't stay synchronized.*

If you suspect that you're off by one or more jiffies, you can always use the jiffy-count feature on the Display Screen to determine where the voices stop being synchronized. Play the voices; then stop the playing at a certain point, and see whether the number of remaining jiffies on the voice with the utility durations agrees with the number of remaining jiffies on the other voices. If not, the voices are unsynchronized at that point.

When you have the song sounding the way you want, run the UTLDUR program again and convert the same parts of the song as before, but this time choose the option to contract the song instead of expand it. The program finds any utility-duration notes with jiffy durations corresponding to the durations in the current tempo and changes them into normal notes. The UTL or UTV command for each of these notes is deleted in the process, so contraction can reduce the size of a converted song.

This procedure can take a bit of effort, depending on how fancy you want to get, but the results can be worth it.

There are two sample songs on the *Enhanced Sidplayer* disk which you can load and play to hear examples of the polyphony effect and utility-duration phrasing. SIDBURNER is an example of the former, and CLAIR DLUNE is a sample of the latter.

# Chapter 17

# Singalong Songs

Chapter 17

# Singalong Songs

*This chapter explains how to use the Singalong Screen and how to create Singalong songs.*

*Once you've entered a few songs, you should be ready to create a Singalong song. You don't need to know how to use any advanced commands or techniques.*

Singalong songs are a whole new way to enjoy *Enhanced Sidplayer* songs. A Singalong song consists of a *Sidplayer* music file (with a .MUS filename extension) and a words file with the same basic filename (except that its extension is .WDS). When you play a Singalong song, the words are displayed as verses which change in time with the music. This feature is great for many different kinds of songs, including holiday, religious, popular, and comedy songs.

## The Singalong Screen

The Singalong Screen is used to load words files and play Singalong songs. To switch to the Singalong Screen, press the W key from the Main Menu.

### Load a Words File

To load a words file, press the L key on the Singalong Screen and enter the filename at the prompt. Don't include the .WDS extension in what you type. If the file is on the disk, it's loaded and the full title of the song is printed at the top of the screen.

The words file is not loaded automatically when the corresponding music file is loaded, so it must be loaded separately. To load a Singalong song, you have to load the music file from the Main Menu, then load the words file from the Singalong Screen.

There's a shortcut to save you from having to type the same filename twice. When you press SHIFT-L on the Singalong Screen, the Editor attempts to load a words file with the same name as the most recently loaded or saved music

file. If you load the music file for a Singalong song from the Main Menu, just switch to the Singalong Screen and press SHIFT-L to load the corresponding words file.

### Play a Singalong Song

To play a Singalong song, press the P key. The music starts to play, and the verses begin printing.

The verses for the song are printed on two lines. The current verse line prints in light blue, and the next verse line, two lines below that, appears in dark blue. This lets you read ahead one line.

While a song is playing, you can use the fast-forward and slow-playing features, but you cannot turn the voices on or off. All three voices are played whenever you play a song on the Singalong Screen.

Press the space bar if you want to stop a song before it's finished.

### Save a Words File

To save the current words file to disk, press the S key and specify a filename. This feature is useful when you want to copy a words file from one disk to another.

### Directory of Words Files

To view all the words files on a disk, press the D key. The Editor lists the .WDS files on the disk, along with their block sizes. The number of remaining free blocks on the disk also appears.

### Clear the Words File

On the Commodore 64 version of the Editor, a words file uses up some of the song memory. To erase the current words file and free up the memory, press the C key.

### Return to the Main Menu

Press either the M key or the F1 key to switch back to the Main Menu.

## How to Create a Singalong Song

To create a Singalong song, you must use a word processor to enter the verse lines in a text file, run a conversion program to convert that text file into a .WDS file, and then embed special *flag commands* at the appropriate places in the music to signal where the verse lines change.

### Entering the Words

The first step is to create the text file containing the verse lines. Two different types of word processors are supported: *SpeedScript*, which creates PRG files, and *EasyScript* and other compatible word processors, which create SEQ files.

Enter the verse lines of the song with a carriage return at the end of each line. Both uppercase and lowercase letters may be used.

Make sure that each line contains no more than 38 characters—that's the maximum number of characters which can print on a Singalong Screen verse line. And if the song plays a lead-in before the verses start, a blank line at the beginning of the file may be necessary. Save the text file when you're done.

### Converting the Words to a .WDS File

Now run either the SS/WDS conversion program if you used *SpeedScript* or the ES/WDS conversion program if you used *EasyScript* or a compatible word processor. (Both conversion programs are included on the *Enhanced Sidplayer* disk.) Each program first asks for the name of the text file. Enter the filename and wait for the file to load.

Next, the conversion program asks for the title of the song. This is the full title displayed at the top of the Singalong Screen. It may be up to 36 characters long. The conversion program won't let you type characters not allowed in the title.

The program then asks for the filename of the words file you want to produce. Don't add the .WDS extension yourself—the program does this automatically. This filename should be identical to the corresponding .MUS file and may be up to 12 characters long. If you used the same name for the text file, just press RETURN and the conversion program adds the .WDS extension to that name.

The program begins the conversion process by scratching an earlier version of the .WDS file if it exists. The screen then

changes to the colors used on the Singalong Screen, and the text lines are printed to the screen as they're converted.

If a line has more than 38 characters, an error message prints, the incomplete .WDS file is scratched, and the program ends.

### The FLG Command

After the conversion is finished and the .WDS file has been completely written, use the Editor to enter the notes of the song. When you're through entering and editing the notes and commands in the song, insert a FLG 1 command at each location where the next verse line is to print. The command accepts any value from 0 to 255, but you should use only 1 for verse line changes.

The FLG commands need to be added to only one voice. Be sure that there's at least one note between each FLG command. Save the music file when you're done.

It's a good idea to play the song with the .WDS file at least once to check that the verse lines match up properly. Often a FLG command is missed or inserted at the wrong place. It usually takes a few trials to match the verses perfectly.

### Color and Reverse Printing in Verse Lines

One final touch to a Singalong song is to add color or reverse printing. When the Singalong Screen prints each verse line, it always resets the cursor color to light blue or dark blue as appropriate. To change the color for the rest of the line, just insert the appropriate character code in that line. Table 17-1 lists the proper character codes.

If you're using *SpeedScript*, the character codes can't be entered directly, so a slightly different scheme is used. When you want to enter a color or reverse lettering code, first press the pound-sign key (£) while holding down the CTRL key. *SpeedScript* then prompts you to press a format key. Press the appropriate letter key as shown in Table 17-1.

**Table 17-1. Singalong/*SpeedScript* Color Codes**

| Character Code | *SpeedScript* Key | Effect |
|---|---|---|
| 144 | K | Black |
| 5 | W | White |
| 28 | R | Red |
| 159 | C | Cyan |
| 156 | P | Purple |
| 30 | G | Green |
| 31 | B | Blue |
| 158 | Y | Yellow |
| 129 | O | Orange |
| 149 | N | Brown |
| 150 | r | Light Red |
| 151 | d | Dark Gray |
| 152 | m | Medium Gray |
| 153 | g | Light Green |
| 154 | b | Light Blue |
| 155 | l | Light Gray |
| 18 | V | Reverse On |
| 146 | v | Reverse Off |

Even though these control codes don't increase the printed length of a verse line, each is counted as one character by the conversion program. A conversion program may therefore show a line-too-long error (more than 38 characters) when in fact the number of printed characters doesn't exceed 38. To solve this problem, change the assignment of the variable LL in line 120 of the conversion program from 38 to a larger value, such as 48. Be extra careful, then, that the number of letters and other printable characters in each verse line doesn't exceed 38.

Chapter 18

# Merging *Enhanced Sidplayer* with BASIC Programs

Chapter 18

# Merging *Enhanced Sidplayer* with BASIC Programs

*This chapter explains how to merge an* Enhanced Sidplayer *song with a BASIC program so that the music plays while the program runs.*

*If you don't plan to merge songs with programs, skip this chapter. If you know a little BASIC, however, it can be fun to experiment with adding music to a program. The procedure is straightforward and works with any song. Just be careful to use the SYS calls in the correct order.*

## Interrupt-Driven Playing

Run the BASIC PLAYER.128 or BASIC PLAYER.64 program on the *Enhanced Sidplayer* disk, and while it's playing the COMMODORE song, press the RUN/STOP key.

The music continues to play even though the program has stopped. Now type LIST. Again, the music continues to play normally as the program lists on the screen. Enter a few more statements—POKE statements to change the screen colors, for instance—and then type the CONT command to make the program resume execution.

*Enhanced Sidplayer* has been designed so that it can play while BASIC executes statements, commands, or even an entire program. Every 1/60 second, BASIC processing is temporarily set aside and *Enhanced Sidplayer* is allowed to process the music. When the music processing is done, BASIC resumes. Since this happens 60 times a second, the continual interruption to BASIC is too fast to be noticeable. BASIC and *Enhanced Sidplayer* seem to be running simultaneously.

Although this technique causes BASIC processing to run a little slower than normal, it does make it easy to add music to game, adventure, or educational programs.

## Load and Play Procedure

To demonstrate how to merge *Enhanced Sidplayer* with a BASIC program, let's begin with the BASIC PLAYER program. It contains only the statements necessary to load and play one song and can be readily merged with another BASIC program.

Both versions of the program are listed here for your convenience. What follows describes how the statements in the simplified player program work to load and play a song.

**BASIC PLAYER.64**

```
100 PRINT CHR$(147):PRINT " SIDPLAYER BASIC PLAYER
    "
105 PRINT " BY CRAIG CHAMBERLAIN":PRINT
120 DN=8:SA=780:SX=781:SY=782:SP=783
130 PRINT " TUNING INSTRUMENTS...":PRINT:GOSUB 570
    00:REM LOAD SIDPLAYER ML
200 F$="COMMODORE":LA=PEEK(49)+256*PEEK(50)+1000:G
    OSUB 57500:REM LOAD SONG
210 SYS HK:REM HOOK (INSTALL)
220 POKE SX,LO:POKE SY,HI:SYS PL:REM SET FOR PLAYI
    NG
230 K=PEEK(SX)+256*PEEK(SY):REM GET ADDRESS OF TEX
    T LINES
240 IF PEEK(K) THEN PRINT CHR$(PEEK(K));:K=K+1:GOT
    O 240:REM PRINT UNTIL CHR$(0)
250 POKE SS,7:REM START PLAYING MUSIC
260 IF PEEK(SS)AND7 GOTO 260:REM STILL PLAYING
270 SYS HU:REM HUSH
280 SYS DP:REM DROP (REMOVE)
290 END
57000 POKE SA,1:POKE SX,DN:POKE SY,1:SYS 65466:F$=
    "SID.OBJ.64":GOSUB 59000
57010 POKE SA,0:SYS 65493:IF PEEK(SP)AND1 GOTO 591
    00
57020 SS=49152:FL=49153:HK=49615:PL=49664:HU=49897
    :DP=49935:RETURN
57500 POKE SA,1:POKE SX,DN:POKE SY,0:SYS 65466:F$=
    F$+".MUS":GOSUB 59000
57510 HI=INT(LA/256):LO=LA-256*HI
57520 POKE SA,0:POKE SX,LO:POKE SY,HI:SYS 65493:IF
     PEEK(SP)AND1 GOTO 59100
57530 LA=PEEK(SX)+256*PEEK(SY):RETURN
59000 FOR K=1 TO LEN(F$):POKE 584+K,ASC(MID$(F$,K)
    ):NEXT
59010 POKE SA,LEN(F$):POKE SX,73:POKE SY,2:SYS 654
    69:RETURN
```

```
59100 P=PEEK(SA):PRINT " ERROR: ";:IF P=4 THEN PRI
   NT "FILE NOT FOUND":END
59110 IF P=5 THEN PRINT "DEVICE NOT PRESENT":END
59120 PRINT ST:END
```

**BASIC PLAYER.128**

```
100 PRINT CHR$(147):PRINT " SIDPLAYER BASIC PLAYER
   "
105 PRINT " BY CRAIG CHAMBERLAIN":PRINT
120 DN=8
130 PRINT " TUNING INSTRUMENTS...":PRINT:GOSUB 570
   00:REM LOAD SIDPLAYER ML
200 F$="COMMODORE":LA=PEEK(51)+256*PEEK(52)+1000:G
   OSUB 57500:REM LOAD SONG
210 SYS HK:REM HOOK (INSTALL)
220 SYS PL,0,LO,HI:REM SET FOR PLAYING
230 RREG ,SX,SY:K=SX+256*SY:REM GET ADDRESS OF TEX
   T LINES
235 BANK 1
240 IF PEEK(K) THEN PRINT CHR$(PEEK(K));:K=K+1:GOT
   O 240:REM PRINT UNTIL CHR$(0)
245 BANK 15
250 POKE SS,7:REM START PLAYING MUSIC
260 IF PEEK(SS)AND7 GOTO 260:REM STILL PLAYING
270 SYS HU:REM HUSH
280 SYS DP:REM DROP (REMOVE)
290 END
57000 BLOAD "SID.OBJ.128",U(DN),B0:BANK 0:SYS 1961
   8:BANK 15
57010 SS=4864:FL=4865:HK=5327:PL=5395:HU=5644:DP=5
   682:RETURN
57500 BLOAD (F$+".MUS"),U(DN),B1,P(LA)
57510 HI=INT(LA/256):LO=LA-256*HI:LA=PEEK(174)+256
   *PEEK(175):RETURN
```

When adding these lines to your own program, those lines above line 57000 can be renumbered to begin at any place in the program. *The lines starting at 57000, however, must not be moved.*

The program begins with some assignments in preparation for using the SYS statement in BASIC 2.0. These assignments are not necessary in BASIC 7.0 (on the Commodore 128).

**SA=780:SX=781:SY=782:SP=783**

The program then loads the *Sidplayer* machine language file into memory by calling the subroutine at line 57000.

```
GOSUB 57000
```

This subroutine loads the SID.OBJ file and also assigns the variables SS, FL, HK, PL, HU, and DP. These six variables are used later in the program.

Before the song can be loaded into memory, the filename and the load address must be set. Assign the name of the music file to the variable F$. *Do not include the .MUS extension as part of the filename.*

```
F$="COMMODORE"
```

Now calculate the load address, the location in memory where the music file is stored. The load address is the address of the end of the BASIC variable storage, plus a 1000-byte safety margin. Note that on the Commodore 128, the music file is stored in RAM bank 1.

In BASIC 7.0 (on the Commodore 128) use this assignment:

```
LA=PEEK(51)+256*PEEK(52)+1000
```

But use this in BASIC 2.0 (on the Commodore 64):

```
LA=PEEK(49)+256*PEEK(50)+1000
```

Call the subroutine at 57500 to load the song:

```
GOSUB 57500
```

Besides loading the requested music file, the subroutine at 57500 also assigns the variables LO and HI to be the low and high bytes of the load address. These variables are used later in the program.

At this point, everything has been loaded into memory, but a bit more preparation must be made before playing can begin.

The first thing the BASIC program must do is call the *Enhanced Sidplayer* HOOK routine with the statement SYS HK. This installs *Sidplayer* as part of the normal interrupt processing done every 1/60 second:

```
SYS HK
```

The PLAY routine must be called to tell *Enhanced Sidplayer* where the song begins in memory, and to set all the default values, such as tempo and volume.

In BASIC 7.0 (Commodore 128), use this SYS call:

**SYS PL,0,LO,HI**

In BASIC 2.0 (Commodore 64), use this instead:

**POKE SX,LO:POKE SY,HI:SYS PL**

The PLAY routine also returns the address of the text lines. This address can be determined by using the RREG function in BASIC 7.0 or by PEEKing locations SX and SY in BASIC 2.0.

It's not necessary to print the text lines to play the song, so the next program lines are optional. If you want to print the text lines, the program should start printing characters at the returned address and stop when it reaches a CHR$(0). On the Commodore 128, remember that it's necessary to PEEK in Bank 1.

The song is now ready to start. This statement makes the playing begin:

**POKE SS,7**

Location SS is the *Enhanced Sidplayer* status value. The last three bits of this location control voice processing.

| Voice Bit | SS Value | POKE |
|---|---|---|
| 1 | 0 | 1 |
| 2 | 1 | 2 |
| 3 | 2 | 4 |

When a bit is set, the corresponding voice plays. Playing for that voice stops when the bit is cleared. An individual voice can be played by POKEing location SS with the value 1, 2, or 4. To play all three voices, POKE SS with 1 + 2 + 4, or 7.

Playing continues as long as the three bits are set. Playing can be stopped at any time by POKEing SS with 0. The bits are automatically cleared by *Enhanced Sidplayer* when it reaches the end of the song or if an error occurs.

The player program simply loops until the three bits in SS are cleared when the end of the song is reached. Anything can be done during this time. The program could draw pictures on the screen, change the colors, or move sprites.

Once a song is finished, call the HUSH routine to silence the three voices and to reset the hardware timer interrupt rate.

**SYS HU**

A song can be replayed if you like. Just call the PLAY routine and set the three status bits again.

In BASIC 7.0 (Commodore 128), use

**SYS PL,0,LO,HI:SYS PL:REM REPLAY**

And in BASIC 2.0 (Commodore 64), use

**POKE SX,LO:POKE SY,HI:SYS PL:POKE SS,7:REM REPLAY**

When playing is through, call the DROP routine to remove *Enhanced Sidplayer* from the interrupt processing:

**SYS DP**

The DROP routine undoes everything done by HOOK and restores the interrupt processing to normal.

Be careful as you use the HOOK and DROP routines. Don't call HOOK if *Enhanced Sidplayer* is already installed. Don't call DROP if *Enhanced Sidplayer* has been removed or has not yet been installed.

The correct order is HOOK, PLAY, HUSH, and DROP. Calling these routines in the wrong order can cause the computer to crash.

While a song plays, BASIC is free to execute any statements and do any processing you want. The only restrictions concern using string variables and tape or disk Input/Output (I/O). If string variables are assigned often, the program should periodically call the free-memory function, as in K=FRE(0), to reorganize free memory. Otherwise, the string data may interfere with the free memory used for storing the song.

The processing done every 1/60 second is handled differently when the computer is communicating with the Datassette or disk drive. Therefore, tape or disk files should not be accessed while a song is playing.

## Synchronizing to the Music

Sometimes it would be handy if a BASIC program could determine which part of a song *Enhanced Sidplayer* is currently playing. Such information would be helpful in synchronizing screen displays and music. What's needed is a method of communication between *Enhanced Sidplayer* and the BASIC program.

## The FLG Command

For communication from *Enhanced Sidplayer* to the BASIC program, the FLG command is available. This command was briefly introduced in Chapter 17, where it was used to synchronize verse changes with music.

The FLG command is entered in the Editor with a number from 0 to 255. When playing reaches the command, *Sidplayer* POKEs the number into location FL, the flag location. The BASIC program can monitor this location to watch for specific values and change the screen accordingly.

Several FLG commands may be used in a song. The general procedure is to wait for the value in the flag location to change, update the screen, wait for the next value, and so on. To detect a change in the flag location, a few different methods can be used.

The first is to wait for a specific value to be POKEd into the flag location.

```
400 IF PEEK(FL)<>2 GOTO 400
```

This method requires a direct correspondence between the flag values in the music and the values being checked in the program. Usually, the flag commands will use incrementing numbers, so the BASIC program would first watch for the value 1, then for the value 2, and so on.

Another method is to disregard the value in the flag location and just wait for it to change. This can be done in two ways:

```
400 P=PEEK(FL)
410 IF PEEK(FL)=P GOTO 410
```

or

```
400 POKE FL,0
410 IF PEEK(FL)=0 GOTO 410
```

The advantage to this method is that you don't have to remember the exact flag values used in the music.

One other method is to use the WAIT statement:

```
400 WAIT FL,1:REM WAIT FOR ODD NUMBER
```

or

```
400 WAIT FL,1,1:REM WAIT FOR EVEN NUMBER
```

The advantage of using the WAIT statement is that you don't have to use an entire program line. Other statements can be placed after the WAIT statement. The only drawback is that the flag values must alternate between even and odd numbers.

### Demonstration

For a demonstration of how the FLG command can trigger screen changes in a BASIC program while a song is playing, run the program called SID DEMO.128 or SID DEMO.64 on the *Enhanced Sidplayer* disk. The program loads the SID.OBJ and SCIPIO.MUS files, then displays colorful screen graphics while the music plays.

### The HLT Command

When you use the FLG command, the BASIC program waits until *Enhanced Sidplayer* reaches a certain point in the music. An alternative is to stop the playing and wait until the program is ready for the music to continue. This is possible with the HLT command, which halts playing on a particular voice. When processed, this command clears the corresponding status bit in location SS. To make the playing continue, the BASIC program can simply set the status bit again.

This isn't the same as making the voice inaudible. All processing on a voice is stopped when the corresponding status bit is cleared.

## Multiple Songs

Once a song is finished, it's a simple matter to load and play another. Assign the name of the new song to F$, recalculate the load address and assign it to LA, and call the subroutine at 57500. To play the song, follow the standard HOOK, PLAY, HUSH, and DROP procedure.

Another possibility is to hold more than one song in memory at the same time. The only limit to the number of songs stored this way is the amount of available free memory.

When the subroutine at 57500 loads a song, it changes the value of LA to the address of the first free byte after the song, which is the address where the next song should be loaded. This makes it easy to load one song after another.

Load the first song in the usual way.

In BASIC 7.0 (Commodore 128), enter

```
F$="SONG1":LA=PEEK(51)+256*PEEK(52)+1000:GOSUB 57500
```

In BASIC 2.0 (Commodore 64), use

```
F$="SONG1":LA=PEEK(49)+256*PEEK(50)+1000:GOSUB 57500
```

Remember the values of LO and HI for later use.

```
L1=LO:H1=HI
```

To load the second song, assign the new filename to F$, but don't change the value of LA. Call the subroutine at 57500 and remember the new values of LO and HI.

```
F$="SONG2":GOSUB 57500:L2=LO:H2=HI
```

Repeat this procedure as many times as necessary.

To play one of the songs, just use the appropriate saved values for LO and HI when the PLAY routine is called.

From BASIC 7.0 (Commodore 128):

```
400 SYS HK:REM INSTALL SIDPLAYER
410 SYS PL,0,L1,H1:REM START SONG1
420 IF PEEK(SS)AND7 GOTO 420:REM WAIT UNTIL SONG1
    ENDS
430 SYS PL,0,L2,H2:REM PLAY SONG2
440 IF PEEK(SS)AND7 GOTO 440:REM WAIT UNTIL SONG2
    ENDS
450 SYS HU:REM HUSH
460 SYS DP:REM REMOVE SIDPLAYER
```

And from BASIC 2.0 (Commodore 64):

```
400 SYS HK:REM INSTALL SIDPLAYER
410 POKE SX,L1:POKE SY,H1:SYS PL:POKE SS,7:REM START
    SONG1
420 IF PEEK(SS)AND7 GOTO 420:REM WAIT UNTIL SONG1
    ENDS
430 POKE SX,L2:POKE SY,H2:SYS PL:POKE SS,7:REM PLAY
    SONG2
440 IF PEEK(SS)AND7 GOTO 440:REM WAIT UNTIL SONG2
    ENDS
450 SYS HU:REM HUSH
460 SYS DP:REM REMOVE SIDPLAYER
```

## Compatibility

The Commodore 128 version of *Enhanced Sidplayer* is stored under the BASIC ROM and also uses some memory in the program-application area (addresses 4864–7167). The Commodore 64 version uses RAM at 49152–53247. *Enhanced Sidplayer* shouldn't be used with any utilities which reside in the same memory locations.

*Enhanced Sidplayer* also uses some zero-page locations, but their values are preserved so there should be no conflicts with zero-page memory.

# Chapter 19

# Utility Programs

Chapter 19

# Utility Programs

*This chapter offers instructions on how to run the various utility programs included on the* Enhanced Sidplayer *disk.*

*Each utility is independent of the others and has its own instructions, so if you just want to use one particular utility, you need not read the entire chapter.*

## *Enhanced Sidplayer* File Copier

The SID COPIER utility can be used to copy several *Enhanced Sidplayer* music, words, and picture files at once.

To run the utility, select it from the SID MENU program, or load and run the utility manually.

If you have a Commodore 128, type in the following to load the copying utility:

```
DLOAD "SID COPIER.128"
```

Type in this to load the Commodore 64 version:

```
LOAD "SID COPIER.64",8
```

The program prompts you to insert the disk with the files to be copied, then asks you which types of files you want to copy.

You can choose to copy just music files; music and words files; or music, words, and picture files by pressing the 1, 2, or 3 key, respectively. Hitting RETURN picks the default setting (all three kinds of files). The program reads the disk directory to find all the specified types of files which are on the disk.

Next, the program asks for the name of the first file you want to copy. If you want to copy a music file and its accompanying words or picture files, just enter the name of the song and all related files are also selected. Of course, if you chose not to copy words or picture files, they won't be selected even if they're on the disk.

After the files are selected, the program prints the number of free blocks remaining in the copy buffer and prompts you for the next song name.

You can see which files have been selected up to this point by pressing RETURN at the song-name prompt. The selected files are shown with a hyphen (-) in front of their disk block size. If the listing goes by too fast, freeze and unfreeze it by pressing the space bar.

Once you've selected all the files you want to copy, enter the command BEGIN at the song-name prompt. The program then reads all the files from the disk, prompts you to insert the destination disk and press any key, and then writes all the designated files.

If the program finds a file which already exists on the destination disk, it asks whether the file should be replaced. Press the Y key to scratch the existing file and write the new one, or press the N key to skip the copying of that file. If you do the latter, the existing file is left alone.

Note: To select a single music, words, or picture file without including all its related files, just add the appropriate extension (.MUS, .WDS., or .PIC) to the filename.

Filename wildcards may not be used when you're specifying files to copy.

## Merging Songs

### SHIFT-L Merges

There's an easy way to merge two songs. Normally, when you load a song from the Main Menu of the Editor, the current song is cleared and replaced by the song loaded. However, if you press SHIFT-L and then enter a filename to load, the song currently in memory isn't erased. Instead, the newly loaded song is merged with the existing one.

Each voice in the song being loaded is placed at the current editing position of each voice of the song currently in memory. To append a song to the end of the current song, for instance, move to the end of each voice on the Editing Screen, change to the Main Menu, and press SHIFT-L.

The Commodore 64 version of the Editor has a limited amount of memory available for editing a song. The merge facility lets you create an extra-long song by editing it in sections, then merging the sections together.

### MERGE.64

The MERGE.64 utility combines two or more music files into one larger file. This combined music file can then be played by the Player.

The program first asks for a file to load. After you've entered the filename and the song is loaded, the program asks for the name of the file to be appended to the first file. When you enter the filename, the program reads each voice in the file and adds it to the *end* of each voice in the first song. Note that MERGE.64 cannot insert a song in the middle of a another song.

The program then asks for the name of another file to be appended. You can append as many files as you like.

Press RETURN alone to end the appending process. The program asks for one more filename to use for saving the composite file.

## Extract a Part of a Song

Use the cut-and-paste feature on each voice to extract a sequence of measures from a song by cutting all notes before and after the measures you want to extract.

If you're using the Commodore 64 version of the Editor and you want to extract a group of measures from a song that's too large to load into the Editor, use the EXTRACT.64 utility. This utility loads a music file, asks for starting and ending measure numbers, extracts the measures in the specified range, and saves them as a new file. This is very useful when you want to break a large music file into smaller parts.

After you've specified the name of the file to load, EXTRACT.64 asks for a starting measure number. To begin the extraction at the start of the file, press RETURN. You also must enter the ending measure number. Here, however, the number indicates that the extraction is to stop when it reaches that measure marker number. In other words, if you want to extract measures 26 through 50 inclusive, enter 51. Press RETURN if you want the extraction to go to the end of the voice.

The program searches for the starting measure marker in each voice. If the measure marker isn't found in a voice, you'll see an error message, and the program will stop.

An error message is also displayed if the program searches for the ending marker, but doesn't find it before reaching the end of the voice.

Finally, the program asks for the filename of the new music file to be saved.

Chapter 20

# Hints, Tips, and Suggestions

Chapter 20

# Hints, Tips, and Suggestions

*This chapter offers a variety of suggestions about how to make a song sound better, and shortcuts to make song entry easier. You'll also find information on how to create picture files, how to hook up your computer to a stereo, and where to submit or find more songs.*

*There are many valuable tips in this chapter. They can improve the quality of your songs and save you some time, so be sure to read this chapter.*

## Suggestions and Shortcuts

The following is a list of common problems to avoid and shortcuts to try when you're entering and editing a song. The list is organized by command for your convenience.

### TEM

Remember that the tempo should be changed only when all three voices are starting new notes. Otherwise, the voices will not stay synchronized. To change the tempo in the middle of a note, use the JIF command.

### VOL

**1.** It is strongly recommended that you not use volumes above level 12, except when you're using the triangle waveform. If you use volume levels above 12, especially with the pulse wave, the song may overpower the speaker on some television and monitor speakers, distorting the sound. Don't assume that everyone has their computer hooked up to a stereo.

**2.** You need to use the VOL command on only one voice. The master volume sets the volume for all three voices. If a VOL command is used on more than one voice at the same time, the VOL on the highest-numbered voice is the one which

takes precedence. The VOL and BMP commands are usually used only on voice 1.

### BMP

1. Use BMP in only one voice. If two voices use a BMP command at the same time, the volume is bumped by two levels, not one.

2. BMP can be used to fade out a song when the last measure or two are repeated, but it should not be used to fade out the last note, since this creates a noticeable "stepping" effect in the volume as it changes. A better way to fade out a note is to use a long release (a large RLS value).

### HED and TAL

1. Repeat loops *cannot* be nested. Be especially careful of this when you have a repeat loop that contains a phrase call, which in turn contains a repeat loop.

2. If at all possible, avoid using HED 0 for endless repetition. You can't play several songs on the SID PLAYER program when one of the songs does not end.

### DEF

Though it may be convenient to place several phrase definitions at the beginning of each voice to set up waveforms and envelopes for use later, it's not a good practice. When *Enhanced Sidplayer* has to process several commands before the first note, the chance of getting a CLOBBER error is increased. Remember that this error occurs when too many commands are placed between notes and they can't all be processed in one jiffy (1/60 second). The intended use of a phrase is for it to be defined as it's played the first time, then called when it needs to be played again.

### ATK

It's not always desirable to use a value of 0 for the ATK command. When all three voices have an attack rate of 0, and all three voices start playing new notes at the same time, sometimes the SID chip will not gate (start playing) the notes together; one note will start to sound before the others. The phenomenon is sporadic, but doesn't occur with slower attack rates. Use ATK 1 to solve the problem.

**DCY**

To minimize the biting effect of the volume falling from the attack peak to a much lower sustain level, a slower decay rate can be used.

**SUS**

If one voice is playing a melody and other voices are supporting it by playing harmony, it's a good idea to set the SUS level for the harmony voices at least one level lower than that of the melody voice. If the SUS levels are equal, the harmony voices can overpower the melody. Setting the harmony voices' SUS levels lower makes the melody voice stand out.

**RLS**

As with the ATK command, it's good practice to avoid using 0 with the RLS command. That release rate sometimes cuts off voices unevenly. It's more noticeable when the song is played on a stereo than it is when a television or monitor speaker is used. Values 1–15 are recommended for a more pleasant effect.

**PNT**

1. Remember that the release point must be less than the duration of the note being played. If it's not, the note won't play properly. If you set the release point larger and must play some shorter notes, you may want to use the HLD command to guarantee that the notes play correctly.

2. If a voice contains alternating notes and rests of the same duration—such as a quarter note, quarter rest, quarter note, quarter rest sequence in a bass line—a shortcut can be used. The technique is to combine the notes and rests into notes of equivalent total duration, then set the release point to make the release start where the rest would normally begin. For example, let's say that the above quarter notes and quarter rests were played in tempo 100, so that each note and rest was 36 jiffies long. The release point is set at 4. Instead of entering quarter note and quarter rest pairs, you could enter half notes and set the release point at 40 (36 jiffies for the quarter rest and 4 jiffies for the normal release point of the quarter note).

### WAV

1. For some reason, pitches played using the pulse wave in octaves 0 and 1, and some of octave 2, sound out of tune. It may be best to avoid using the pulse waveform when playing notes in the lower octaves.

2. Don't put a WAV command immediately before a rest. The release of a preceding note may continue into a rest, and a waveform change before the rest may clip the end of the note. Instead, put the WAV command before the next note to be played.

### P-W

Don't use the pulse wave with a pulse width less than 100 unless sweeping is also being used. Notes played with a width much less than 100 are inaudible.

### P-S

Pulse-width sweeping works by adding the pulse sweep value to the pulse width once each jiffy. The only problem with this is that with larger sweep rates, the pulse width can exceed 4095, in which case it wraps around and returns to 0. This causes a very noticeable popping noise. To avoid the wrap-around, you can use a slower sweep rate or set the pulse width lower (or higher if you're sweeping backwards). If you want to keep the same pulse width and sweep rate, consider using pulse-width vibrato with a very slow rate. You'll still get a sweeping effect, but it will change directions periodically so that the pulse width doesn't wrap around.

### VDP and VRT

Be aware that vibrato processing is done only for the duration of a note, and is not done when a rest is being played. When a note with a slow release rate is followed by a rest, the voice may continue to fade during the first part of the rest. If vibrato is used on the note, it's sometimes noticeable that the vibrato suddenly stops as the note fades. To prevent this, you can delete the rest, add its duration to the preceding note, and set the release point higher for that note (as discussed above under PNT).

### TPS

The SID chip cannot play pitches beyond octave 7, even when the TPS command is used. If you try to play a note above B7, the note will play with the same pitch, but in octave 7. An E transposed to octave 8 plays as an E in octave 7. To determine if a voice is being transposed out of range, watch the voice on the playing screen (as seen from both the Player and the Main Menu of the Editor) and see if the key disappears off the right edge of the piano-keyboard display.

### FLT

Passing two or three voices through the filter at the same time can overpower the filter on many SID chips and distort the voices. Only one voice should use the filter at a time.

### Miscellaneous

**1.** Never let two voices using the same waveform play notes of the exact same pitch at the very same time. When this happens, a phenomenon known as *destructive harmonic interference* can occur which can cause the two voices to cancel each other out (it in no way damages your computer). Both voices then become inaudible. The effect happens randomly and isn't always noticeable. The only time that two voices should simultaneously play the exact same pitches in the same octave with the same waveform is when the voices are being detuned.

**2.** If two notes of the same pitch are tied together, it's good practice to put the shorter note first. This is because a note tied to another note does not release. If the longer note is put first, the release cannot begin until the shorter note starts playing, and in some cases the release would normally begin sooner. This is especially true when larger release points are used. Putting the shorter note before the longer note insures that the release will begin at the appropriate place.

**3.** When a grace note is played, remember that its duration should come out of the duration for the *preceding* note. This way, the note following the grace note, instead of the grace note itself, begins right on the beat as it should. It may be necessary to use utility durations for both the grace note and the note preceding it.

**4.** The Editor and Player programs end the playing of a song when the last duration is complete, even if some of the voices are not finished releasing. To let each voice fade and finish completely, it's a nice touch to put a rest after the last note in each voice.

**5.** Whenever possible, try not to use the default waveform and envelope. The default settings were chosen because they give a simple, neutral waveform and envelope which can be modified easily. Playing all three voices with the default square wave and organ-type envelope, however, can make any song, even a very good one, sound bland.

**6.** Don't overlook the subtle, but significant, effects that different envelope settings can have on a song. Envelopes seem to be one of the most ignored aspects of songs.

## How to Customize the Editor

It's possible to change the default settings of the various Editor parameters to suit your own needs. Doing so can save time if you find yourself altering the settings each time you load and run the Editor.

The features which can be customized are listed below, along with their related keystrokes and default values.

| Feature | Keystrokes | Default |
|---|---|---|
| Autoinsert mode | SHIFT-I | Off |
| Automatic measure numbering | SHIFT-B | 0 |
| Click | SHIFT-C | On |
| Command Screen update mode | SHIFT-Q | Off |
| Ding | SHIFT-G | On |
| Disk drive device number | SHIFT-8 or SHIFT-9 | 8 |
| Editing Screen update mode | SHIFT-Q | On |
| Joystick speed | SHIFT-J | 6 |
| Key-repeat mode | SHIFT-R | Off |
| Measure mode | SHIFT-M | Off |
| Octave mode | SHIFT-O | On |
| Scroll step | SHIFT-Z | 3 |
| Staff type on each voice | SHIFT-S | Grand Staff |
| Tie mode | SHIFT-/ | Off |
| Time signature | SHIFT-W | 4 |

To update the Editor so that it will load and run with your preferred values, just set the values the way you want them, choose the QUIT item from the Main Menu, and replace the EDITOR2 file on the disk with the one in memory.

On the Commodore 128, use these commands to replace the file on the disk with your new changed version:

**SCRATCH "EDITOR2.128"**

Enter *Y* at the *ARE YOU SURE?* prompt. Then type

**DSAVE "EDITOR2.128"**

Use these commands to do the same thing for the Commodore 64 version:

```
OPEN 1,8,15,"S0:EDITOR2.64":CLOSE 1
SAVE "EDITOR2.64",8
```

Be sure to do this on a *copy* of the *Enhanced Sidplayer* disk. Don't try this on the disk that comes with the book. You don't want to risk erasing your original copy of the *Enhanced Sidplayer.*

## *Enhanced Sidplayer* on Your Stereo

You're only getting part of the effect when you play a song if your computer isn't connected to a stereo. Playing songs through a stereo gives you fuller bass lines and triangle waveforms, and reveals things you never knew were there.

If you're not using the monitor output of the Commodore 128 or 64, all you have to do is obtain the kind of monitor cord which splits into one or more video lines and one audio line. Plug the cord into the monitor output of the computer and connect the audio line to the auxiliary input of your stereo.

You may also want to get a *Y patchcord* to split the signal so that you can hear it through both the left and right speakers.

If you're using a 1702 or 1902 Commodore monitor, or another monitor where the monitor cord splits into separate video and audio lines, disconnect the audio line from the monitor and connect it to your stereo. You may need to purchase a phono plug extension cord to do this. You may also want to use a Y patchcord here so that you can send the audio to both the monitor and the stereo.

The situation is a bit more complicated if you're using a Commodore 1902A monitor. Since the monitor cord doesn't split into separate lines, but feeds directly into the monitor, you'll have to construct your own patchcord. The patchcord

should plug into the monitor output of the computer and split into a plug for the 1902 monitor and an audio line for your stereo.

## How to Create Picture Files

It's very easy to add a picture to an *Enhanced Sidplayer* song. Just rename the picture file with the same filename as the music file, but with a .PIC filename extension. This works with files in both the *Doodle* and *KoalaPad* formats.

*Doodle*-format picture files are identified by the characters DD, which start the filename. They can easily be renamed. Use one of the following lines.

In BASIC 7.0 (Commodore 128), use this:

```
RENAME "doodlefilename" TO "songname.PIC"
```

In BASIC 2.0 (Commodore 64), use this:

```
OPEN 1,8,15,"R0:songname.PIC=doodlefilename":CLOSE 1
```

Renaming a *KoalaPad*-format file is a little trickier. These files have a CHR$(129) as their first character. Use one of the following lines to rename a *KoalaPad* file.

In BASIC 7.0 (Commodore 128):

```
RENAME CHR$(129)+"koalafilename" TO "songname.PIC"
```

In BASIC 2.0 (Commodore 64):

```
OPEN 1,8,15,"R0:songname.PIC="+CHR$(129)+"koalafilename"
:CLOSE 1
```

## Where to Find Sheet Music

Most music stores carry sheet music for contemporary songs and some classical selections. Sheet music for the piano is best suited to *Enhanced Sidplayer* music entry.

If you want to do arranging from larger scores, check at a local university's music library or at public libraries in large cities.

## Original Compositions

You may also want to try your hand at original compositions. The song called HORROR on the *Enhanced Sidplayer* disk is an original composition that tells a story. HORROR, however, is

too large to play on the 64 version of the *Enhanced Sidplayer* Editor. Instead, load and play the song on the 64 Player.

## Where to Submit or Find More *Enhanced Sidplayer* Songs

*Enhanced Sidplayer* songs can be found on most of the major telecommunications services, including CompuServe, Delphi, GEnie, PlayNET, and QuantumLink. Over 1000 songs are available for downloading.

The author subscribes to the Delphi and PlayNET services. Check the Micro Artists Network (MANIAC) SIG on Delphi in the Groups and SIGS area, or send Delphi mail to the username CRAIGCH. On PlayNET, send mail to the username CRAIG C5.

Appendix

# Frequency Values

Appendix

# Frequency Values

| Musical Note Pitch | Octave | Frequency Value |
|---|---|---|
| C | 0 | 268 |
| C♯ (D♭) | 0 | 284 |
| D | 0 | 301 |
| E♯ (D♭) | 0 | 318 |
| E | 0 | 337 |
| F | 0 | 358 |
| F♯ (G♭) | 0 | 379 |
| G | 0 | 401 |
| A♭ (G♯) | 0 | 425 |
| A | 0 | 451 |
| B♭ (A♯) | 0 | 477 |
| B | 0 | 506 |
| C | 1 | 536 |
| C♯ (D♭) | 1 | 568 |
| D | 1 | 602 |
| E♭ (D♯) | 1 | 637 |
| E | 1 | 675 |
| F | 1 | 716 |
| F♯ (G♭) | 1 | 758 |
| G | 1 | 803 |
| A♭ (G♯) | 1 | 851 |
| A | 1 | 902 |
| B♭ (A♯) | 1 | 955 |
| B | 1 | 1012 |
| C | 2 | 1072 |
| C♯ (D♭) | 2 | 1136 |
| D | 2 | 1204 |
| E♭ (D♯) | 2 | 1275 |
| E | 2 | 1351 |
| F | 2 | 1432 |
| F♯ (G♭) | 2 | 1517 |
| G | 2 | 1607 |
| A♭ (G♯) | 2 | 1703 |
| A | 2 | 1804 |
| B♭ (A♯) | 2 | 1911 |
| B | 2 | 2025 |
| C | 3 | 2145 |
| C♯ (D♭) | 3 | 2273 |

| Musical Note Pitch | Octave | Frequency Value |
|---|---|---|
| D | 3 | 2408 |
| E♭ (D♯) | 3 | 2551 |
| E | 3 | 2703 |
| F | 3 | 2864 |
| F♯ (G♭) | 3 | 3034 |
| G | 3 | 3215 |
| A♭ (G♯) | 3 | 3406 |
| A | 3 | 3608 |
| B♭ (A♯) | 3 | 3823 |
| B | 3 | 4050 |
| C | 4 | 4291 |
| C♯ (D♭) | 4 | 4547 |
| D | 4 | 4817 |
| E♭ (D♯) | 4 | 5103 |
| E | 4 | 5407 |
| F | 4 | 5728 |
| F♯ (G♭) | 4 | 6069 |
| G | 4 | 6430 |
| A♭ (G♯) | 4 | 6812 |
| A | 4 | 7217 |
| B♭ (A♯) | 4 | 7647 |
| B | 4 | 8101 |
| C | 5 | 8583 |
| C♯ (D♭) | 5 | 9094 |
| D | 5 | 9634 |
| E♭ (D♯) | 5 | 10207 |
| E | 5 | 10814 |
| F | 5 | 11457 |
| F♯ (G♭) | 5 | 12139 |
| G | 5 | 12860 |
| A♭ (G♯) | 5 | 13625 |
| A | 5 | 14435 |
| B♭ (A♯) | 5 | 15294 |
| B | 5 | 16203 |
| C | 6 | 17167 |
| C♯ (D♭) | 6 | 18188 |
| D | 6 | 19269 |
| E♭ (D♯) | 6 | 20415 |
| E | 6 | 21629 |
| F | 6 | 22915 |
| F♯ (G♭) | 6 | 24278 |
| G | 6 | 25721 |
| A♭ (G♯) | 6 | 27251 |
| A | 6 | 28871 |

## *Frequency Values*

| Musical Note Pitch | Octave | Frequency Value |
|---|---|---|
| B♭ (A♯) | 6 | 30588 |
| B | 6 | 32407 |
| C | 7 | 34334 |
| C♯ (D♭) | 7 | 36376 |
| D | 7 | 38539 |
| E♭ (D♯) | 7 | 40830 |
| E | 7 | 43258 |
| F | 7 | 45830 |
| F♯ (G♭) | 7 | 48556 |
| G | 7 | 51443 |
| A♭ (G♯) | 7 | 54502 |
| A | 7 | 57743 |
| B♭ (A♯) | 7 | 61176 |
| B | 7 | 64814 |

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Back side: 64 version
Turn system on, and insert disk in drive. Type LOAD"*",8 and press Return. Type RUN and press Return.



742DBSK

# Enhanced Sidplayer

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- Easy editing—just like using a musical word processor.
- Fast operation—the complete system is written in machine language to run at top speed.
- Powerful functions—from merging music with BASIC programs to putting music and pictures together in a synchronized format.
- Countless features—like automatic measure numbering, 24 redefinable music phrases, and much more.

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