Another Voice for the VIC

Normally, your VIC has 4 musical voices . . . three music registers and a white noise register . . . but by connecting a small amplifier and speaker to the USER PORT, and doing a little programming, you can get *another* musical voice.

The user port on the VIC is very similar to the user port on the PET. This makes it easy to adapt some of the PET's music methods to the VIC.

Background—Adding Sound to Older PET/CBM's

Before Commodore introduced the CBM 8032 with a build-in speaker, most PET/CBM users had to develop their own means of getting their computers to squeek, hum, whistle, and sing. They came up with the idea of using the shift register of the 6522 connected to the user port to send square waves through an external amplifier/speaker combination. The shift register could be programmed through BASIC, giving a wide variety of squeals, pops, sirens, etc.

Theory

Most music is made up of square waves of different amplitudes and frequencies. One of the functions of the 6522 chip is to generate square waves through the CB2 line. If we connect the CB2 line to a speaker, we will be able to hear the square waves generated by the VIC.

NOTE: Connecting a speaker directly to CB2 may damage your VIC and void your warranty. You must connect the speaker through an *amplifier* to protect the VIC.

Parts Needed

1. Small battery powered speaker/amplifier
2. User Port Connector (12 position, 24 contact edge connector with .145"spacing
3. Wire

Connecting The External Speaker to Your VIC

Bb	=251	(B below first C) B	=124
C	=237	(first C) C1	=117
C#	=224	C1#	=111
D	=211	D1	=104
D#	=199	D1#	= 99
E	=188	E1	= 93
F	=177	F1	= 88
F#	=167	F1#	= 83
G	=157	G1	= 78
G#	=149	G1#	= 73
A	=140	A1	= 69
A#	=132		

1. Wire the GROUND of the amplifier to the GROUND of the USER PORT (pin N).
2. Wire the SIGNAL of the amplifier to the CB2 output of the USER PORT (pin M).

You are now ready to add your other voice through a BASIC program.

BASIC program steps:

1. Set the 6522 shift register to free running mode by typing:
   POKE 37147,16

2. Set the shift rate by typing:
   POKE 37144,C   where C is an integer from 0 to 255
                          C is the note to be played.

3. Load the shift register by typing:
   POKE37146,D   where D = 15, 51, or 85 for a square
                          wave. This step sets the octave for the
                          note.

This step must be done last, since as soon as it is set, the VIC starts generating the square waves.

The frequency of the square wave can be found by the following formula:

$$\text{FREQUENCY} = \frac{500000 \text{ Hz}}{(C+2)(D1)}$$

Where D1=8 when D=15
D1=4 when D=51
D1=2 when D=85

When you're in this mode, the VIC will *not read or write to cassette*. To restore normal operations, you must type:
   POKE 37147,0

The following short program demonstrates music using this method. By hitting a letter a note will be played.

```
10 PRINT " MUSIC USING CB2."
11 REM A TO G IS ONE OCTAVE, SHIFT A TO G IS
   ANOTHER
15 PRINT "HIT + TO GO UP AN OCTAVE"
17 PRINT:PRINT "USE ! TO EXIT."
20 POKE3747,16:DIMA(14):FORI=1TO14:
   READA(I):NEXT
40 GETA$IFA$=""""THEN40
42 IFA$="!" THEN POKE37147,0:END:REM
   RESET 6522
45 ifa$="+" THEN SF=SF-(SF<2):GOTO40
50 ifa$="+" THEN SF=SF-(SF>0):GOTO40
60 A=ASC(A$)-64+(ASC(A$)>192)*121:IF A>14
   OR A<1 THEN 40
70 POKE 37144,A(A)
80 POKE37146,-(SF=0)*15-(SF=1)*51-(SF=2)*85
90 GOTO40
100 DATA 124,117,104,93,88,78,69
110 DATA 251,237,211,188,177,157,140
```

One use for this procedure is to connect an external amplifier and speakers to your VIC to provide improved sound quality . . . or perhaps to use your VIC as a music synthesizer, with the proper program. This is only one of several hobbyist-type projects we will be describing in the VIC section of this magazine. Watch future issues for more hobby-related computer projects. ■

— *Andy Finkel*