

# ACP APPLE MUSIC MACHINE

The ACP APPLE MUSIC MACHINE uses three of the new and versatile AY3-8912 PROGRAMMABLE SOUND GENERATORS. Each PSG has three D/A converters for a total of 9 channels of sound at one time. The MUSIC MACHINE can be used to play music with AUTO PLAY or COMPOSE programs. You can use the MUSIC MACHINE to produce sound effects for games or other programs you write.

If this is a kit refer to Fig.1 for the placement of parts and the parts list. After all components have been placed on the board check for any solder bridges. Make sure pin 1 of all IC's match Fig.1.

Turn your APPLE off. Insert the MUSIC MACHINE in slot #5 (all software is written for slot #5). Plug the audio cables into your stereo. Turn your APPLE and stereo on. Load and run the AUTO PLAY program. This will play a number of songs on the disc and then stop. The COMPOSE program is used to enter songs of your own from sheet-music.

To use the MUSIC MACHINE for sound effects in your own programs the first thing to do is read the complete PSG DATA MANUAL.

All data from the APPLE is sent to the three PSG's through the A & B PORTS of the 6522 VIA. With the MUSIC MACHINE in slot #5 the address of 6522 registers are --

C0D0--B Port, input or output

C0D1--A Port, input or output

C0D2--Data Direction Register for the B Port

C0D3--Data Direction Register for the A Port

On power up or after reset the A & B Ports of the 6522 are input ports. To change them to output ports 1's are put in the 8 bits of both data direction registers.

Example: A9 FF  
8D D2 C0  
8D D3 C0

The A Port is connected to the data lines of all three PSG's. The B Port is used to enable one of the PSG's at a time and to control the PSG function. The low order of the B Port (C0D0) sets the PSG FUNCTION.

0=INACTIVE  
1=READ FROM PSG  
2=WRITE TO PSG

The high order of the B Port enables one of the PSG's.

0=IC-4  
1=IC-3  
2=IC-2

To write into one of the 16 registers of one of the three PSG's the following sequence must be used.

Example: Put FF (hex) in register 0 of IC-4

A9 00 -----Load the register number (in hex)  
8D D1 C0 -----in the A Port (C0D1)

A9 03 -----Load the PSG function (3=LATCH ADDRESS) and the enable  
8D D0 C0 -----for IC-4 (0) in the B Port

A9 00 -----Load the PSG function (Z=INACTIVE) and the enable  
8D D0 C0 -----for IC-4 (0) in the B Port

Register 0 of IC-4 has now been addressed and is ready for data.

A9 FF -----Load the data (in hex)  
8D D1 C0 -----in the A Port (C0D1)

A9 02 -----Load the PSG function (2=WRITE TO PSG) and the enable  
8D D0 C0 -----for IC-4 (0) in the B Port (C0D0)

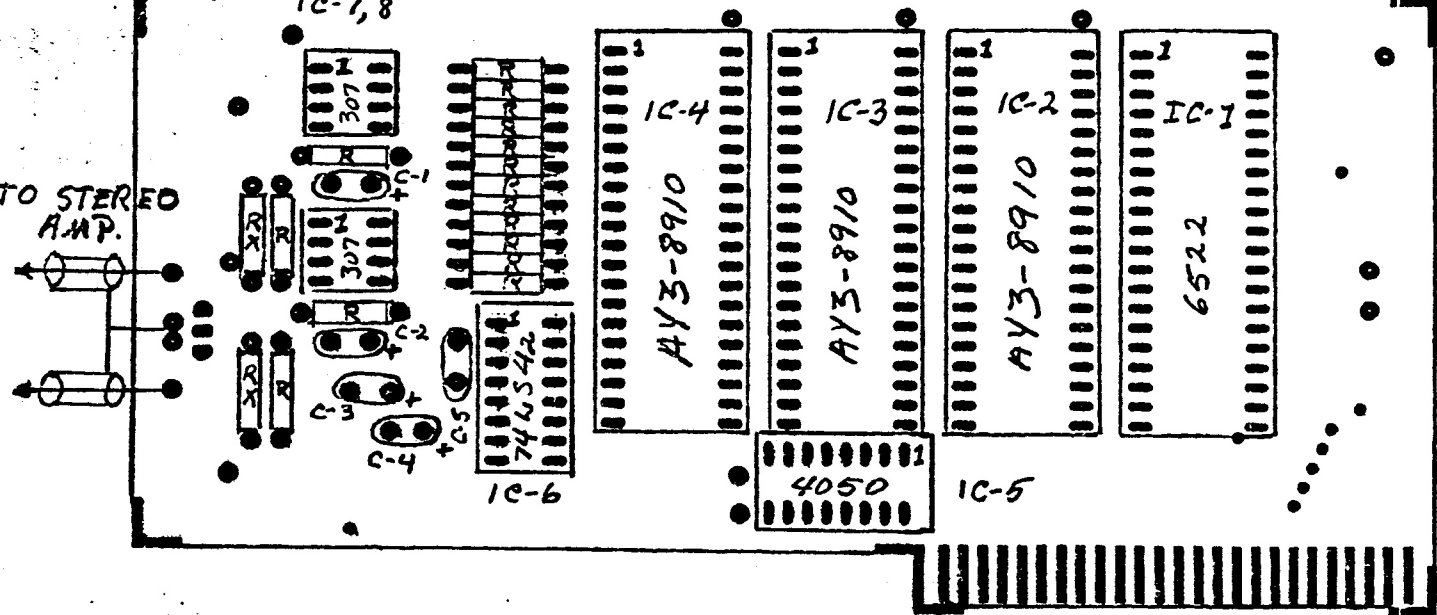
A9 00 -----Load the PSG function (Z=INACTIVE) and the enable  
8D D0 C0 -----for IC-4 (0) in the B Port

The 1.023 MHz. APPLE system clock is used for the PSG's clock. To find the right value for the three 12-bit tone period channels A, B, or C divide  $1023000$  by the frequency you desire and convert the result to hexadecimal. Use the high 12-bits for the value.

Example: To find the value for note C (octive 4), 261.624 Hz.  
 $1023000/261.624 = 3910.1917 = 0F46$  (hex). Use 0F4 for the value.  
Put F4 in the 8-bit Fine Tune and 0 in the 4-bit Coarse Tune.

Load and run this program. It will produce the above C note until you hit reset.

0800-	A9 FF	LDA	#\$FF	0823-	20 37 08	JSR	\$0837
0802-	8D D2 C0	STA	\$C0D2	0826-	4C 26 08	JMP	\$0826
0805-	8D D3 C0	STA	\$C0D3	0829-	8D D1 C0	STA	\$C0D1
0808-	A9 00	LDA	#\$00	082C-	A9 03	LDA	##03
080A-	20 29 08	JSR	\$0829	082E-	8D D0 C0	STA	\$C0D0
080D-	A9 F4	LDA	##F4	0831-	A9 00	LDA	##00
080F-	20 37 08	JSR	\$0837	0833-	8D D0 C0	STA	\$C0D0
0812-	A9 07	LDA	##07	0836-	60	RTS	
0814-	20 29 08	JSR	\$0829	0837-	8D D1 C0	STA	\$C0D1
0817-	A9 3E	LDA	##3E	083A-	A9 02	LDA	##02
0819-	20 37 08	JSR	\$0837	083C-	8D D0 C0	STA	\$C0D0
081C-	A9 08	LDA	##08	083F-	A9 00	LDA	##00
081E-	20 29 08	JSR	\$0829	0841-	8D D0 C0	STA	\$C0D0
0821-	A9 0F	LDA	##0F	0844-	60	RTS	



PART LIST

- R (16) 10K Ohms 1/4 Watt Resistor
  - Rx (2) (optional) Use only if less output to your stereo is necessary  
     10k Ohms will cut output 1/2  
     20k Ohms will cut output 1/3
  - C-1, C-2, C-3, C-4 10mf 35v Tantalum cap (Observe polarity)
  - C-5 .1mf disc cap
  - IC-1 6522 VIA
  - IC-2, IC-3, IC-4 AY3-8910 PSG
  - IC-5 4050 (CMOS)
  - IC-6 74LS42
  - IC-7, IC-8 LM307
  - Audio Cable (2) RCA Type
- Use sockets for all IC's