Programmer's Guide to the Disney Sound Source

The Sound Source consists of two modules: the D/A Converter Module and the Speaker Box Module. The D/A Converter Module contains a custom IC containing circuits for a timing generator, 16-level FIFO, and D/A converter. The Speaker Box Module contains the speaker, amplifier, batteries, and voltage regulation. The two modules are connected with a 4-conductor cable.

The D/A IC timing generator transfers data from the FIFO to the D/A converter at a fixed rate of 7 kHz +/- 5%.

Power Control

As shown in diagram 1, the signal line SELECT from the D/A Module controls the power supply in the Speaker Box Module. If the SELECT line can source current (approx. 1 ma), the Speaker Box will turn on. When the speaker box is turned on, it will supply +5 volts back to the D/A Module. Pulsing the SELECT line low for brief periods (1 to 10 usec) to strobe the D/A chip will not affect the power control circuits.

When the Sound Source is turned on, you will hear a pop on the speaker. This is due to the power being applied to the amplifier in the Speaker Box.

The SELECT line is connected to pin 17 of the printer interface. Pin 17 is normally set low by the BIOS at power-on and reset, turning off the Sound Source.

The Sound Source user should return pin 17 low before returning to DOS.

Sending Data to the D/A Converter

Eight bit data sent to the D/A converter is loaded into a 16 level FIFO. Data is clocked from this FIFO at the fixed rate of 7 kHz +/- 5%. The rising edge of the pulse on Pin 17 from the printer interface is used to clock data into the FIFO. Note from diagram 1 that the SELECT and -INIT inputs to the D/A chip are isolated from pin 17 by an RC time constant.

8-bit unsigned data is converted to an analog voltage as follows:

255	Maximum voltage
⋮	
128	Mid level
⋮	
0	Minimum voltage

Checking FIFO Status

As shown in diagram 1, pin 16 provides current to the collector resistor of a transistor inverter. Pin 10 will be high when the FIFO within the D/A chip is full. Thus when pin 10 is low, more samples can be sent to the D/A chip.

Using Interrupts to Send Data to the Sound Source

To send data to the Sound Source under interrupt control, the program can "steal" the system timer interrupt and reset the rate to 582 Hz by changing the timer divider from its normal setting of 0 to a setting of 2048. This corresponds to about 12 samples of sound data per interrupt (at the rate of 7000 samples/second). The interrupt handler would need to acknowledge the timer interrupt 31 out of 32 times. The last time control would be passed to the normal BIOS interrupt handler to maintain the system time.

A good practice is to write the interrupt handler so that it always sends 8 samples without checking the status of the FIFO of the sound source, and it then sends up to 8 more while polling the status of the FIFO. This technique will prevent a "lock up" condition if the sound source is not connected or is otherwise not operational.

Example Routine

```
; Send up to 8 samples to Sound Source, checking status

PR_POWER_UP=          04H  ; code for power-up of Sound Source
PR_POWER_DOWN=        0CH  ; code for power-down of Sound Source
PR_STROBE=            0CH  ; code for strobe of Sound Source

        MOV     CX,8
        MOV     DX,PORT           ; address of printer data
        INC     DL                ; address of status port
SLOOP:
        IN      AL,DX             ; read status
        TEST    AL,40H            ; check pin 10
        JNZ     EXIT_SLOOP        ; jump if FIFO is full

        DEC     DL                ; points to data port
        LODSB                     ; get next sample
        OUT     DX,AL             ; send to FIFO
        ADD     DL,2              ; points to control port
        MOV     AL,PR_STROBE
        OUT     DX,AL
        PUSH    AX                ; delay a little
        POP     AX
        MOV     AL,PR_POWER_UP
        OUT     DX,AL
        PUSH    AX
        POP     AX
        PUSH    AX
        POP     AX
        DEC     DL                ; address of status again
        LOOP    SLOOP             ; up to 8 times . . .
```

Note for Tandy Computers with Special Adapter

Due to small differences in the printer interface on Tandy Computers that require a special adapter to operate with the Sound Source, the following changes to the above routine are necessary:

```
PR_POWER_UP=          04H  ; code for power-up of Sound Source
PR_POWER_DOWN=        0EH  ; code for power-down of Sound Source
PR_STROBE=            0EH  ; code for strobe of Sound Source
```