ON TARGET
Gottlieb
TECHNICAL NEWSLETTER VOLUME 2, ISSUE 6 JUNE 1981

SOUND/SPEECH BOARD

General Description

The System 80 sound system has been redesigned and is now capable of producing synthesized speech. As a result, the original System 80 Sound Board has been replaced by a new Sound/Speech board. The Sound/Speech Board was first used in our "MARS, god of war" game, and it will continue to be used in all our future products.

NOTE: The System 80 Sound Board will still be made available by our distributors.

The component which provides the new board with its speech capability is the Votrax SC-01 Speech Synthesizer. The SC-01 is a 21-pin integrated circuit which, when used with its support circuitry, will phonetically synthesize continuous speech with unlimited vocabulary.

WARNING: The Sound Board and the Sound/Speech Board are not interchangeable. Installing either of these two boards into a game for which it was not designed will severely damage that board. The two boards are illustrated in Figure 1. Please note the differences.

(Continued on page 2)

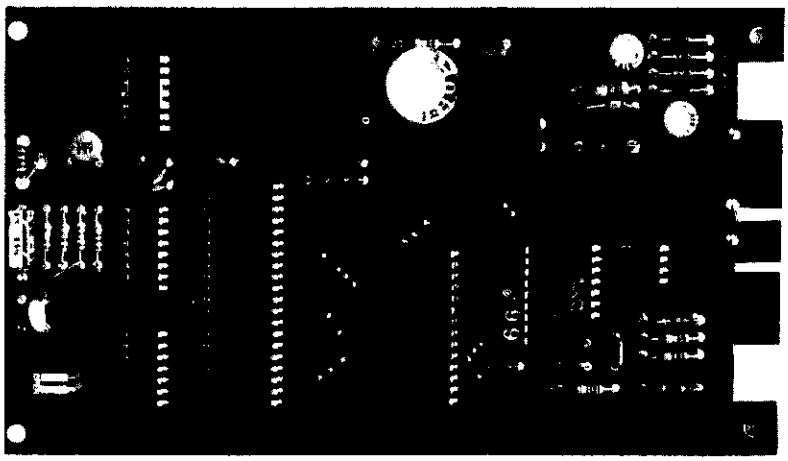


Figure 1A. Sound Board

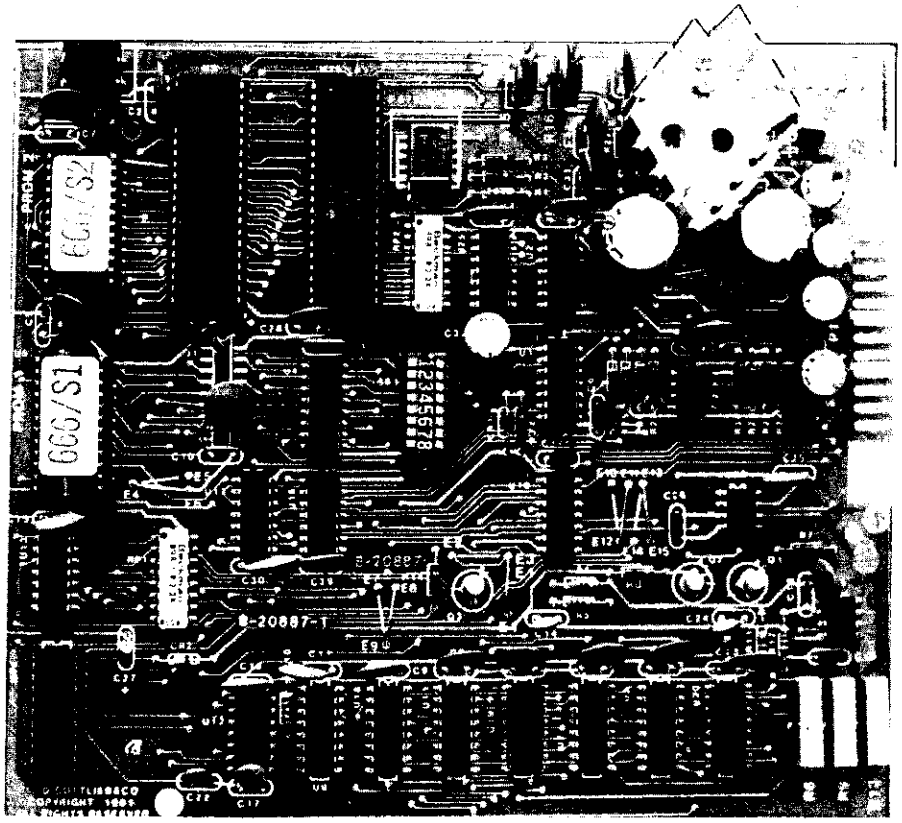


Figure 1B. Sound/Speech Board

SOUND/SPEECH BOARD

(Continued from page 1)

CAUTION: Mounted on the Sound/Speech Board are five potentiometers which are used for calibration. Under no circumstances should their settings be altered, other than when performing the recommended calibration procedure.

The Sound/Speech Board receives its information at its binary sound inputs S1, S2, S4, S8 and S16 (S32 is not used). It will then sequentially select the proper combination of the 64 individual phonemes stored in the SC-01. The binary sound information originates in the Control Board, is then sent to and inverted by the Driver Board and from there it travels directly to the Sound/Speech Board.

NOTE: A phoneme is one of a set of the smallest units of speech. Phonemes are the building blocks of speech.

The SC-01 will also add pitch (inflection) and frequency (duration) to each of the phonemes that it generates.

Once the output signals from the SC-01 have been amplified, they will be distributed by the two speakers mounted in the bottom of the cabinet.

SC-01 Pin Layout and Signal Description:

PO-PS (Phoneme 6-Bit Selection Code): The input data is received by these 6 pins. The latching is controlled by the strobe signal (CSTB).

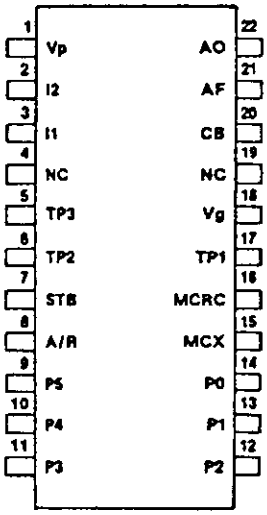


Figure 2

STB (Strobe): Latching occurs on the rising edge at the strobe signal.

I1-I2 (Inflection Level Setting): Instantaneously sets the pitch level of the phonemes.

A/R (Acknowledge/Request): Acknowledges receipt of the phoneme data (the signal pulses from high to low in one master clock cycle following the active edge of the STB signal. It will also indicate the timing out of the previous phoneme concurrent with the request for new phoneme data (signal pulses from low to high).

NC: No connection.

TPX: No connection.

MCRC (Master Clock Resistor-Capacitor): Determines the internal master clock frequency. This input must be connected to MCX when using the internal clock.

NOTE: Varying the clock frequency will vary the voice and sound effects. As the clock frequency decreases, so will the audio frequency while the phoneme timing lengthens.

MCX (Master Clock External): Will allow control by an external clock signal.

AO (Audio Output): Supplies analog signals to the audio output device.

AF (Audio Feedback): Used with Class A or B transistor audio amplifiers for added stability.

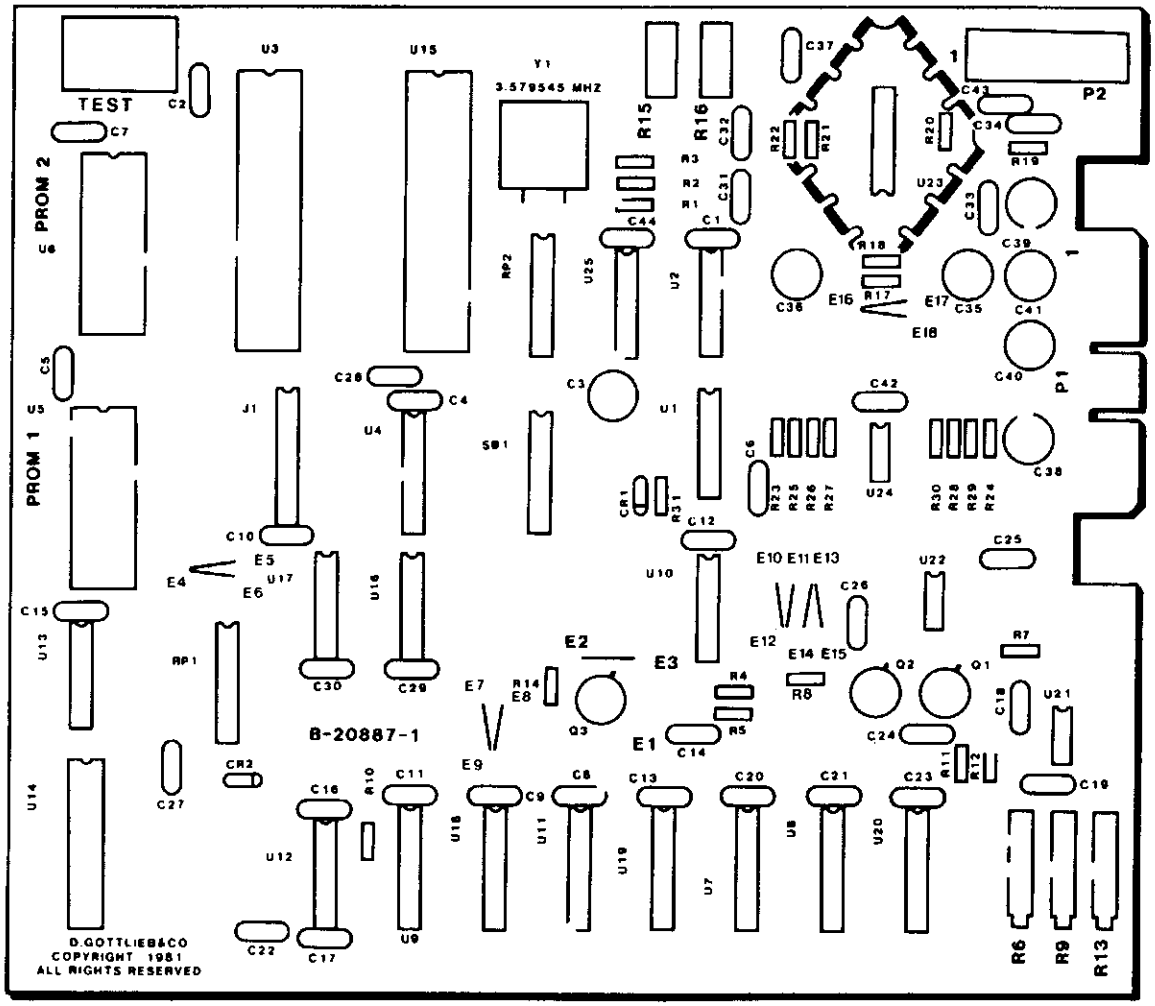
CB (Class B): Current source for Class B transistor audio amplifiers.

Bench Tester Modification Kit: The bench tester that is currently in use was not originally designed to calibrate or test the Sound/Speech Board. However, a modification kit is now available which will give it these capabilities. The kit is easily installed and can be ordered from any authorized Gottlieb distributor.

Component Identification: Listed below are common functions performed by IC's on both the Sound and Sound/Speech Boards. Also listed below are the part numbers for these IC's. Please note that while their functions are essentially identical, their part numbers are not. Under no circumstances are they to be considered as being interchangeable.

FUNCTION	SOUND BOARD	SOUND/SPEECH BOARD
CPU	U1-R6503	U3 - R6502
ROM/RAM/IO	U2-R6530C:R3016-11	U/5 - 6532-18
PROM	U4-HM7643-5	U5/U6 - 2716
TIMER/CLOCK	U8-NE555P	3.579545MHZ crystal with a 7404 Hex Inverter clocking a 74LS74

SOUND/SPEECH BOARD (A6) COMPONENT LOCATION



SOUND/SPEECH BOARD (A6) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
C1, C2, C4-C13, C15, C16, C18-C21, C23, C25, C26, C28-C34, C37, C42, C43, C44	Capacitor, .1 UF 25V, CMD	
C3, C38-C41	Capacitor, 47 MF, 50V	
C14, C24	Capacitor, 100 PF, 250V, 20%	
C17	Capacitor, .002 MF, CMD	
C22	Capacitor, 300 PF, CMD	
C27	Capacitor, 1 UF, 50V, TNT	
C35, C36	Capacitor, 470 MF, 35V	
CR1	Diode	1N4148
CR2	Diode, Zener	1N5225B
Q1, Q3	Transistor, NPN	2N2222A
Q2	Transistor, PNP	2N2907A
R1, R4, R5, R11, R12	Resistor, 5.6K ohm, 1/4W	
R2, R3	Resistor, 2K ohm, 1/4W, 5%	
R6, R13	Potentiometer, 10K, Bourns	3006-103
R7	Resistor, 10M ohm, 1/4W, 5%	
R8, R14	Resistor, 1K ohm, 1/4W, 5%	
R9	Potentiometer, 2M, Bourns	3006P-2 05
R10	Resistor, 1.5K ohm, 1/4W, 5%	
R15, R16	Potentiometer, 10K, CTS	X201R
R17, R18, R20, R21	Resistor, 1.8M ohm, 1/4W	
R19, R22	Resistor, 150K ohm, 1/4W, 5%	
R23-R30	Resistor, 10K ohm, 1/4W	
R31	Resistor, 3.3K ohm, 1/4W, 5%	
RP1, RP2	Resistor, Dip	4116R-002-222
SB1	Dip Switch	1008-692
SW1	Moment Pushbutton Switch	
U1	IC, Trigger	7414
U2	IC	SN74LS74N
U3	CPU	R6502-13
U4	IC	SN74LS138N
U5, U6	E Prom	2716
U7-U9, U11, U18	IC	SN74L75
U10	IC	SN74LS02N
U12	IC	SN7407N
U13	IC, Inverter	SN74LS05N
U14	Voice Chip	SC01
U15	RRIOT	R6532-18
U16	IC	SN74LS04N
U17	IC	SN74LS30N
U19, U20	Converter, PMI	1408A-6P
U21, U22	IC	LM741CP
U23	IC	LM379S
U24	IC, Dual Comparitor	LM193
U25	Inverter	7404
Y1	Crystal, 3.579545 MHZ	
	Socket 22 Pin Dip	
	Socket 24 Pin (2)	640361-3
	Socket 40 Pin (2)	640379-3

Gottlieb

VOLCANO

MARS

If a game using the new Sound/Speech Board (MARS, god of war and later games) is slammed, the background sound on the game will remain on if Switch #25 on the control board is in the Off position. Game Adjustment Switch #25 on the control board MUST BE IN THE ON POSITION to prevent this.

Notice

The Pinball/Video Service Hotlines are now the same. Call 800-323-9121, in Illinois 800-942-1620 from 8:00 a.m. to 4:30 p.m. CST for any Gottlieb pinball or video game assistance.

FLASHBACK

In December 1955, EASY ACES appeared as the first Gottlieb game having metal legs. The previous game, the last to have wooden legs, was FRONTIERSMAN.

A few years later, in August 1957, during the production run of WORLD CHAMP, metal front doors were introduced and have been used ever since. As a result, only the early WORLD CHAMP games have wooden front doors.

MAILING LIST: Get ON TARGET every month by sending your name and mailing address to:

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