SOUND/SPEECH BOARD MODIFICATIONS

INTRODUCTION

Several circuits on the Sound/Speech Board have been modified to improve the board's sound/speech capabilities. These circuits and the details concerning each of their respective modifications are as follows:

 Audio Amplifier Circuit (Figure 1)

Purpose: To provide higher volume levels for sound and speech.

Components Eliminated:

- A. R17-1.8 Megohm Resistor
- B. R19-150 Kilohm Resistor
- C. R20-1.8 Megohm Resistor
- D. C34-0.1 Microfarad Capacitor
- E. C35-470 Microfarad, 35 Volt Capacitor
- F. C43-0.1 Microfarad Capacitor

Components Replaced:

- A. C31 and C32 were 0.1 microfarads; are now 0.05 microfarads.
- B. R18 and R21 were 1.8 megohms; are now 100 kilohms.
- C. R22 was 150 kilohms; is now 2.0 kilohms.
- D. C37 was 0.1 microfarads; is now 4.7 microfarads, 25 volts, tantalum.

Figure One contains the modified schematic.
Please note the changes.

2. U14 Strobe Circuit (Figure 2)

Purpose: To eliminate this circuit as a possible source of speech distortion by providing greater signal stabilization over a wider range of ambient temperatures.

Circuit Description: The strobe signal is taken from Pin 6 of U2 and sent

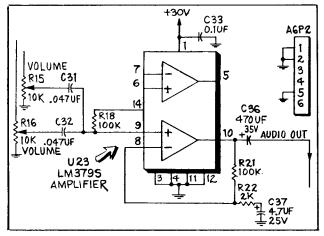
to U25. U25 will invert the signal and then reinvert it back into its original state (for time delay purposes). The strobe signal will then be buffered by U12 and sent directly to the speech synthesizer, U14.

The non-maskable interrupt is taken from Pin 3 of U3, inverted in U25 and buffered in U12.

Traces Deleted: (Fig. 4) In the modified version, the trace has been cut between U12-10 and U12-13.

NOTE: Figure Two contains the modified schematic. Please note the changes.

This modification has been done through the use of jumper wires. Refer to the following chart and Fig. 4 for points of origin and termination.





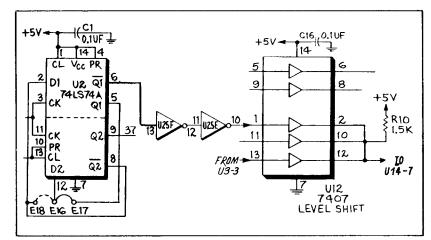


FIGURE 2

SOUND/SPEECH BOARD MODIFICATIONS

(continued from page 1)

JUMPER CHART

From:	To:
U12-10 U12-2 U2-6 U25-12 U25-10 U3-3 U25-8	U12-12 U12-12 U25-13 U25-11 U12-1 U25-9 U12-13

3. Voice Clock Circuit (Figure 3)

Purpose: To eliminate possible distortion in the pitch of the speeches by increasing the stabilization of the circuit over a wider range of ambient temperatures.

Components Replaced:

- A. R7 was 10 megohm; is now 10 kilohm, 5%, 1/4 watt.
- B. R9 was 2 megohm; is now a
 2.2 kilohm fixed resistor, 5%, 1/4 watt.

Traces deleted: From U21-3 to ground.

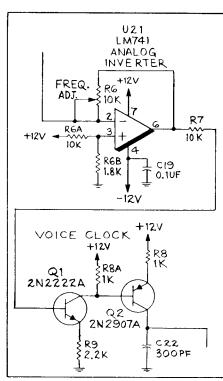
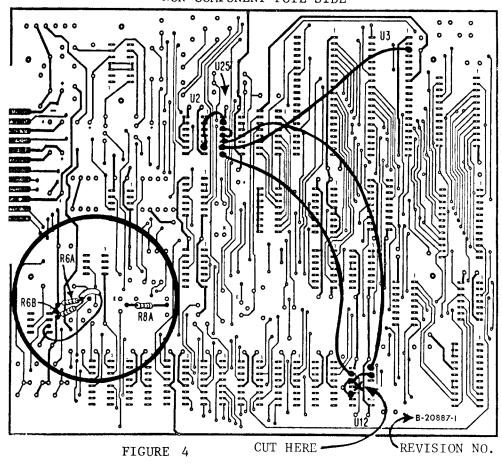


FIGURE 3

NON-COMPONENT FOIL SIDE



Components Removed: C18.

Components Added: (Fig. 4)

- A. R6A: 10K ohm, 5%, 1/4 watt.
- B. R6B: 1.8K ohm, 5%,
 1/4 watt.
- C. R8A: 1K ohm, 5%,
 1/4 watt.

NOTE: Figure three contains the modified schematic. Please note the changes.

Board Identification:

NOTE: For the following, refer to Figure 4.

The boards containing the U14 strobe circuit and the voice clock modifications will have the jumper wires and resistors R6A, R6B and R8A mounted on the non-component side of the boards. These boards will have the number B-20887-1 printed on their non-component side.

The boards containing just the three resistors R6A, R6B and R8A mounted on the non-component side, will have the number B-20887-2 printed on their non-component side. The jumper wires will have been replaced by traces.

The boards having the number B-20887-3 printed on the non-component side will have neither the jumper wires nor the three resistors mounted on the non-component side. These boards will have the resistors mounted on the component side and traces replacing the jumper wires.

The part number will be the same for all three boards, MA-147, with B-20887-3 eventually replacing the first two. Each of the three boards is interchangeable.

TEST PROCEDURE

SOUND/SPEECH BOARD

REQUIREMENTS:

- 1) Oscilloscope (Single Channel)
- 2) Test Fixture
- 3) Sound/Speech Test Proms

Prom 1 Checksum = \$E011 Prom 2 Checksum = \$DD83

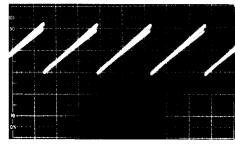
PROCEDURE:

- 1) Insure that test fixture power switch is off.
- 2) Connect sound/speech board (UUT) to test fixture cable.
- 3) Install test proms in their proper sockets.
- 4) Set all dip switches on.
- 5) Set test fixture power switch on.
- 6) Set oscilloscope as follows:

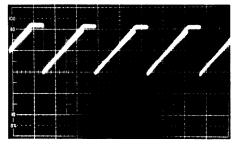
Vertical: 5 Volts/Div. DC Coupled

Horizontal: 2 MS/Div Internal Trigger H Freq Rej

7) Monitor U22-6 for signal shown in Fig. 5A. Adjust R13 so that signal does not flatten out at the top as shown in Fig. 5B.



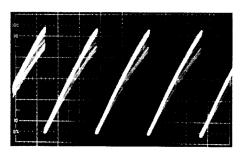
U21, PIN 6 U22, PIN 6 VERT. = 5 VOLTS/DIV HORZ. = 2 mSEC/DIV



U21, PIN 6 U22, PIN 6 VERT. = 5 VOLTS/DIV HORZ. = 2 mSEC/DIV

FIGURE 5B

8) Monitor U21-6 for a sawtooth signal similar to the one shown in Fig. 5A. Adjust R6 so that this signal amplitude is between 3 and 5 volts peak to peak.



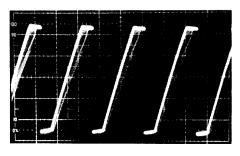
EDGE CONNECTOR, PIN 7 VERT. = 5 VOLTS/DIV HORZ. = 2 mSEC/DIV

FIGURE 6A

9) Monitor Pin 7 on the edge connector for signal shown in Fig. 6A. Adjust R15 so that signal does not flatten out at the top and bottom as shown in Fig. 6B.

A slight flattening at the bottom is permissible.

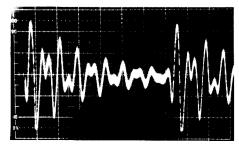
10) Press the test switch.



EDGE CONNECTOR, PIN 7 VERT. = 5 VOLTS/DIV HORZ. = 2 mSEC/DIV

FIGURE 6B

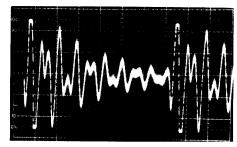
11) Monitor Pin 7 on the edge connector for signal shown in Fig. 7A. Adjust R6 so that signal is 6.8 divisions between the two large peaks.



EDGE CONNECTOR, PIN 7 VERT. = 5 VOLTS/DIV HORZ. = 2 mSEC/DIV

FIGURE 7A

12) Adjust R16 so that signal does not flatten out at the top or bottom as shown in Fig. 7B.



EDGE CONNECTOR, PIN 7 VERT. = 5 VOLTS/DIV HORZ. = 2 mSEC/DIV

TEST PROCEDURE

SOUND/SPEECH BOARD

(Continued from page 3)

- 13) Press the test switch.
- 14) Press switch 1. Verify that "One" is spoken. Press switch 2. Verify that "Two" is spoken. Press switch 3. Verify that "Three" is spoken. Press switch 4. Verify that "Four" is spoken. Press switch 5. Verify that "Five" is spoken. Press switch 6. Verify that "Six" is spoken.
- 15) Press the switch.
- 16) Toggle dip switches 1,3-7 off then on again. Verify that the UUT correctly identifies each switch when toggled.
- 17) Press the test switch.
- 18) The UUT will perform its own ram and prom tests. If any memory

- components are faulty, it will be identified.
- 19) If there are no memory problems, the UUT will repeatedly say "Please listen to be sure I am speaking correctly". Listen to the sentence a few times to insure that the SCO1 will ennunciate a string of words in the correct manner.
- 20) Hold down the test switch. The UUT will announce "Test Complete".
- 21) If you wish to go back to the top of the test, press the test switch at this time. Otherwise set the test fixture power switch to the off position.
- 22) Disconnect the test fixture cable.

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FLASHBACH

BOWLING CHAMP, in February 1949, was the first Gottlieb game to have "percussion bumpers," known today as pop bumpers. That term was used for the next two or three games. A few months later, in October, a game called BASKETBALL introduced the industry's first cup-type bumper switches, replacing the unreliable carbon-ring contactors.

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