MANUAL NO. 993-043227-001
PRICE $15.00

TECHNICAL SERVICE MANUAL for

moog SONIC V SONIC VI

SONIC VI

Norlin

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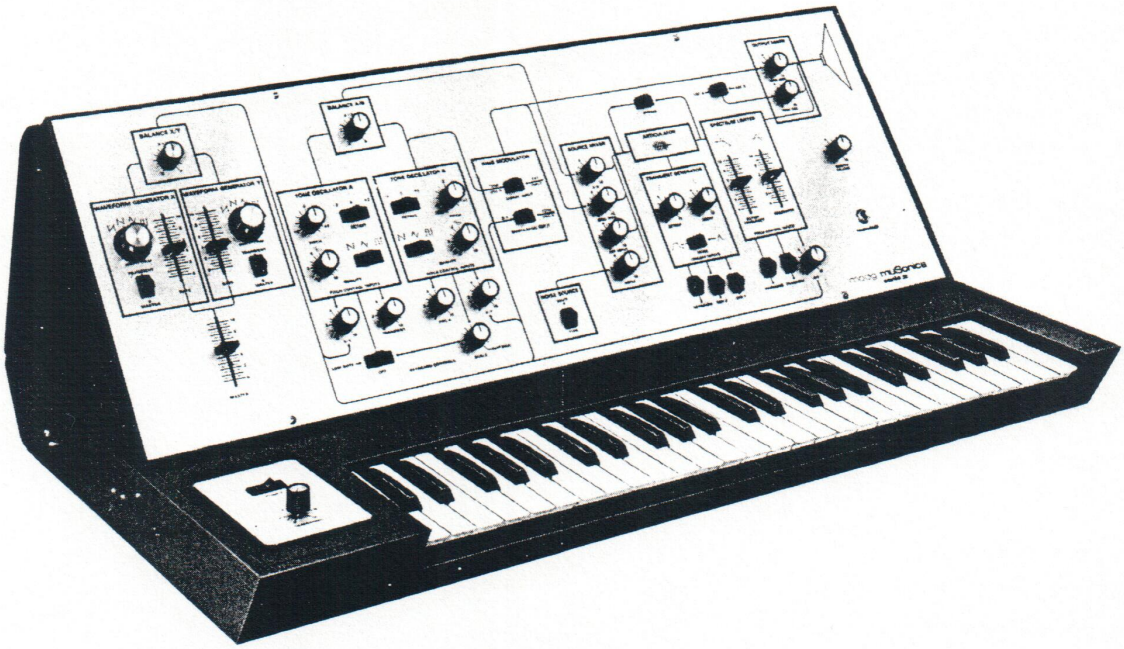
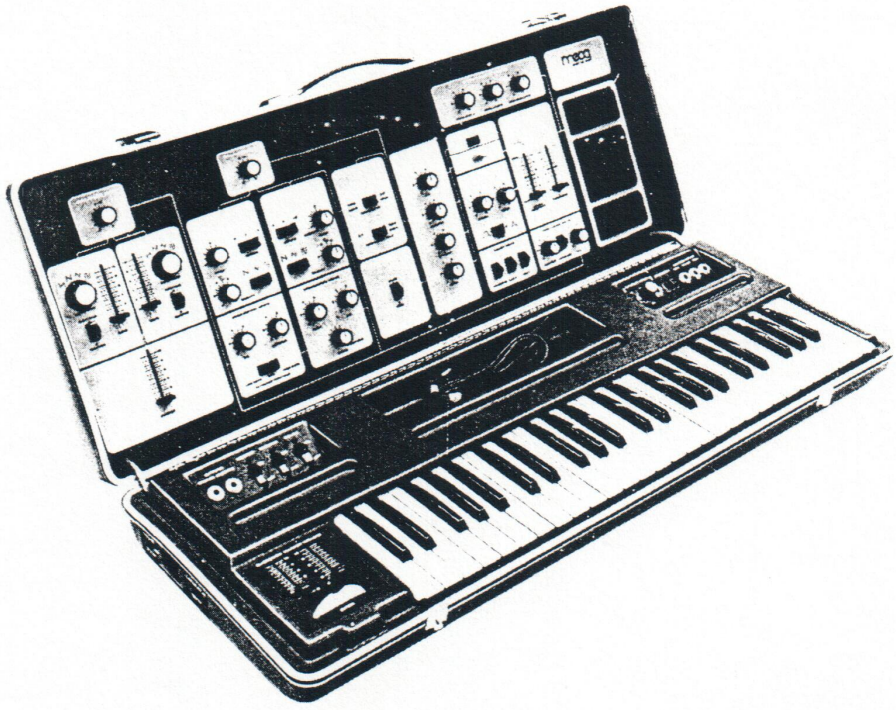


SONIC V



SONIC VI

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SECTION 1
INTRODUCTION AND PRECAUTIONARY MEASURES

1.1 INTRODUCTION

This manual provides servicing and parts information for the Sonic VI Synthesizer, manufactured by Norlin Music, Inc., 2500 Walden Avenue, Buffalo, New York 14225.

The manual is divided into nine Sections. Section 1 provides an introduction and precautionary measures which must be followed or damage to equipment or injury to personnel may result; Section 2 gives a circuit description of printed circuit boards and an overall simplified system block diagram; Section 3 contains a troubleshooting guide which isolates trouble to a specific part; Section 4 gives a step-by-step procedure for disassembly of the main subassemblies; Section 5, internal and external adjustment procedures; Section 6, keyboard maintenance; Section 7, replacement parts list; Section 8, modification for Sonic VI assemblies for Serial No's 1265 to 1300; and Section 9, operating controls, schematic diagrams, and printed circuit board component location diagrams.

1.2 PRECAUTIONARY MEASURES

There are potential shock hazards in the Sonic VI, as in any line operated electrical instrument. All lethal or hazardous voltages are confined to the area around the power input panel. Always unplug the instrument while servicing the lower portion, or replacing the fuse.

If a fuse blows, replace it only with the proper value as indicated on the label near the fuse holder. If the fuse continues to blow, it is an indication that a definite electrical problem has developed. Never replace with a larger fuse; this may result in further internal damage. Ascertain that the line voltage selector switch is in the proper position.

DO NOT make adjustments at random. Many adjustments are critical and should be made in accordance with the procedures outlined herein.

SECTION 2
CIRCUIT DESCRIPTION

2.1 GENERAL

This Section consists of a circuit description of the Oscillation Printed Circuit Board No. 1, Signal Processing Printed Circuit Board No. 2 and the Pitch Bender Printed Circuit Board No. 3. Refer to Figure 2-1 for simplified block diagram and refer to Section 9 for Sonic VI Main Frame schematic diagram and Printed Circuit Board schematic diagrams.

2.2 OSCILLATOR PRINTED CIRCUIT BOARD NO. 1 (Refer to Figures 9-2 and 9-3)

This assembly contains two regulated power supplies, two tone oscillators, and two modulating oscillators. In addition, controls for pitch, waveform selection, and modulation are located on this printed circuit board.

2.2.1 REGULATED POWER SUPPLIES

The regulated power supplies provide the plus and minus 15 volts required by all other circuits. These power supplies utilize standard voltage regulator integrated circuits in conjunction with series pass power transistors for high current handling capability. These power supplies employ current limiting and are short-circuit proof.

2.2.2 TONE OSCILLATORS

The two tone oscillators are completely independent, non-synchronous, and use identical circuits. Each oscillator is a dual slope integrator which produces a triangle wave having a frequency exponentially proportional to the control voltage. Linear control voltages are converted to exponential currents by a grounded base transistor configuration. These transistors are part of a heated chip which is operated at a constant elevated temperature to increase thermal stability. The exponential current is then converted to an exponential voltage which is used to voltage control the pitch of the tone oscillators. The basic triangle wave is then processed to produce sawtooth and square waveforms.

2.2.3 MODULATING OSCILLATORS

The X-Y modulating oscillators are also dual slope integrators with some component values changed to reduce their frequency. Each oscillator produces four waveforms. The selected waveform outputs of X and Y can be mixed to produce complex modulating signals. Oscillator rates are controlled independently with the individual rate controls and jointly via a MASTER RATE control.

2.3 SIGNAL PROCESSING PRINTED CIRCUIT BOARD NO. 2 (Refer to Figures 9-4 thru 9-7)

This assembly contains a voltage controlled amplifier, filter, articulator, contour generator, keyboard circuit, ring modulator, noise generator, two mixers, and an output power amplifier. In addition, operating controls for these circuits are located on this circuit board.

2.3.1 VOLTAGE CONTROLLED AMPLIFIER

The voltage controlled amplifier utilizes a programmable gain integrated circuit amplifier, which receives its control current from the VOLUME control and the EXTERNAL VOLUME CONTROL input jack.

2.3.2 FILTER

The filter is a voltage controlled low pass type which employs the Moog patented transistor ladder network. It is capable of regeneration (oscillation) over a wide frequency range. The filter scale factor is adjustable to enable the filter to track the key board. Earlier versions use a diode matrices in place of the transistor ladder.

2.3.3 ARTICULATOR

The articulator uses the same type programmable gain integrated circuit amplifier as the voltage controlled amplifier and receives its control voltage from the contour generator.

2.3.4 CONTOUR GENERATOR

The contour generator employs a dual gate latch to switch from the attack state to the decay state. Attack time is controlled by varying a resistance in the charge path of a timing capacitor. When the timing capacitor reaches a pre-determined potential, a comparator resets the dual gate latch to begin the decay cycle. The decay time is controlled by varying a resistance in the discharge path of the timing capacitor.

2.3.5 KEYBOARD CIRCUIT

The keyboard current source provides a precise dc voltage across the keyboard resistance string. In addition to this dc level, an ac signal at approximately 8kHz is superimposed upon the fixed current in the resistance string. This ac signal generates gate and trigger voltages by amplifying the 8kHz and rectifying it to obtain a dc switching voltage. This dc voltage drives a voltage comparator which generates gate and trigger one. A second trigger is produced when two or more keys are depressed, shorting out a portion of the keyboard resistance. This condition causes a voltage change at the output of the keyboard current source, since the keyboard resistance is in the feedback circuit. This change is applied to a comparator which produces the second trigger.

When a key is depressed, a point on the keyboard resistor string contacts the keyboard buss which is connected to a holding capacitor and the keyboard amplifier. The holding capacitor is charged to a level equal to that of the keyboard buss. When the key is released, this capacitor holds the voltage

level to which it was last charged, acting as a sample/hold circuit. To reduce charge "bleed-off", a high input impedance FET operational amplifier is used. The output of this FET circuit is the pitch 1 control voltage which is applied to the GLISSANDO control and varies the charge time of the glissando capacitor. A voltage follower provides a low impedance for driving the filter and oscillator pitch control inputs. The pitch 2 control voltage is the difference between pitch 1 and keyboard low end voltages.

2.3.6 RING MODULATOR

The ring modulator uses a balanced modulator chip which accepts two ac signals, and in conjunction with an output summing amplifier, supplies an output which is the sum and difference frequencies of the two original signals.

2.3.7 NOISE GENERATOR

The noise generator utilizes a reverse biased emitter base transistor junction as its source. This signal is amplified and filtered to yield both white and pink noise outputs.

2.3.8 OUTPUT AMPLIFIER

The output power amplifier is an integrated circuit which runs on the unregulated plus voltage. It powers the internal speaker and the headphone jack. The MONITOR output is taken ahead of the power amplifier for better signal-to-noise ratio.

2.4 PITCH BENDER PRINTED CIRCUIT BOARD NO. 3

This assembly contains the master VOLUME control, the GLISSANDO control, the pitch bender amplifier and the input rectifier diodes. The pitch bender amplifier has diode desensitizer circuits which provide a dead band when the pitch bender is in the spring return center position. Later versions of this circuit eliminate the pitch bender amplifier and add a second series string desensitizer diode to each side to decrease the susceptibility to mechanical variations in the spring return. (Refer to Figures 9-8 and 9-9.)

SECTION 3
TROUBLE ANALYSIS GUIDE

SYMPTOM	PROBABLE CAUSE
GENERAL MALFUNCTIONS (Refer to Figures 9-1 thru 9-10)	
A. No sound and POWER indicator light off.	1. Blown fuse F1. 2. Defective power transformer T1. 3. Defective rectifier diodes CR3-CR6. 4. Defective POWER switch S3. 5. Open line cord.
B. No sound, POWER indicator light on.	1. Loss of plus or minus power supply voltage (Board No. 1). 2. VOLTAGE SELECTOR S4 in wrong position.

SYMPTOM	PROBABLE CAUSE
GENERAL MALFUNCTIONS (Refer to Figures 9-1 thru 9-10) (Continued)	
C. Excessive hum and constant modulation of all signals.	1. Defective rectifier diode CR3-CR6 (Board No. 3). 2. Open filter capacitor (under Board No. 3). 3. Defective voltage regulator (Board No. 1). 4. Broken ground wire.
D. Pitch Bender inoperative.	1. Defective IC1 (Board No. 3). 2. Open Pitch Bender control R7.
E. Pitch Bender works in one direction only.	1. Defective diode CR1, CR2, CR7 or CR8 (Board No. 3). 2. Defective IC1 (Board No. 3).
F. Both Oscillators radically off pitch.	1. Output of Pitch Bender is not at zero volts. 2. Defective IC24 (Board No. 1).
G. Noisy or double triggering.	1. Dirty Keyboard contacts. 2. Keyboard contacts out of adjustment (See Section 5).
H. Keyboard functions backward.	1. Short from Keyboard resistor string to grounded metal frame. 2. Defective Keyboard current source (Board No. 2).
I. GLISSANDO control inoperative.	1. Defective control R1. 2. Open GLISSANDO capacitor (Board No. 2).
J. VOLUME control inoperative.	1. Defective control R2. 2. Defective Voltage Controlled Amplifier (Board No. 2).
K. No output at speaker (PHONES jack OK).	1. Defective speaker. 2. Defective SPEAKER switch S1.
L. No EXTERNAL INPUT (J5).	1. Defective EXTERNAL INPUT level control R12. 2. Trouble in external preamplifier (Board No. 2).
M. Inoperative CONTROL INPUT.	1. Defective jack J5. 2. Broken harness wire.

SYMPTOM	PROBABLE CAUSE
OSCILLATOR BOARD NO. 1 MALFUNCTIONS (Refer to Figures 9-2 and 9-3)	
A. MASTER RATE control has no affect on OSCILLATOR "X" or "Y".	1. Defective MASTER RATE control R1. 2. Defective MASTER RATE amplifier IC1.
B. OSCILLATOR "X" dead.	1. Defective Q1, IC2, IC3, or CR1.
C. No OSCILLATOR "X" sawtooth output.	1. Defective IC5.
D. No OSCILLATOR "X" square wave output.	1. Defective IC4.
E. OSCILLATOR "X" triangle is non-symmetrical.	1. X Low maladjusted R13. 2. Defective Q1.
F. OSCILLATOR "Y" dead.	1. Defective Q2, IC6, IC7 or CR2.
G. No OSCILLATOR "Y" sawtooth output.	1. Defective IC9.
H. No OSCILLATOR "Y" square wave output.	1. Defective IC8.
I. OSCILLATOR "Y" triangle is non-symmetrical.	1. Y Low maladjusted R28. 2. Defective Q2.
J. TONE OSCILLATOR "A" dead.	1. Defective Q9, CR8, Q3, IC14, IC15, IC16, Q4 or IC25.
K. No TONE OSCILLATOR "A" pitch control from any source.	1. Defective IC12, IC13, or IC24.
L. No TONE OSCILLATOR "A" square wave output.	1. Defective IC16.
M. No TONE OSCILLATOR "A" sawtooth output.	1. Defective Q4 or IC17.
N. OSCILLATOR "A" and "B" running low frequency.	1. Defective IC24. 2. Maladjustment of Chip Temp R135.
O. TONE OSCILLATOR "B" dead.	1. Defective Q12, CR10, Q10, IC20, IC21, IC22, Q11 or IC26.
P. No TONE OSCILLATOR "B" pitch control from any source.	1. Defective IC18, IC19, or IC24.

SYMPTOM	PROBABLE CAUSE
OSCILLATOR BOARD NO. 1 MALFUNCTIONS (Refer to Figures 9-2 and 9-3) (Continued)	
Q. No TONE OSCILLATOR "B" square wave output.	1. Defective IC22.
R. No TONE OSCILLATOR "B" sawtooth output.	1. Defective Q11 or IC23.
S. Plus 15 volt supply too high.	1. Defective IC10 or Q5. 2. Maladjustment of +ADJ R38.
T. Plus 15 volt supply too low.	1. Defective IC10. 2. Short on +15 volt line. 3. Maladjustment of +ADJ R38.
U. Minus 15 volt supply too high.	1. Defective IC11, Q6 or Q7. 2. Maladjustment of –ADJ R43.
V. Minus 15 volt supply too low.	1. Defective IC11, Q6, Q7, Q8, CR11. 2. Short on –15 volt line. 3. Maladjustment of –ADJ R43.

SYMPTOM	PROBABLE CAUSE
SIGNAL PROCESSING BOARD NO. 2 MALFUNCTIONS (Refer to Figures 9-4 thru 9-7)	
A. No output at speaker or PHONES jack. (MONITOR output OK).	1. Defective IC28.
B. No Output at speaker PHONES OR MONITOR jack.	1. Defective IC21, Q3, Q4 or Q16.
C. VOLUME Control and EXT VOLUME CONTROL input inoperative.	1. Defective Q3, Q4 or IC21.
D. ARTICULATOR does not function (BYPASS OK).	1. No Input from Contour Generator.
E. ARTICULATOR does not function (BYPASS dead).	1. Defective IC14 or Q2.
F. Contour Generator inoperative.	1. No trigger from keyboard circuit. 2. Defective IC23, Q5, Q6, Q7, IC24, IC25, CR7.
G. Keyboard will not trigger the Contour Generator.	1. Defective IC4, CR3, CR4, IC5, or IC1.
H. Keyboard will not produce second trigger.	1. Defective IC3, CR1.
I. Keyboard produces no pitch change.	1. Defective Q1, IC6, IC2 or IC26.
J. Keyboard will not produce second note.	1. Defective IC7 or IC2.
K. First and second note do not track.	1. OSCILLATOR "A" and/or "B" not properly tuned. 2. Maladjustment of KB trimpot R8.
L. FILTER will not regenerate (ARTICULATOR switch in BYPASS).	1. Defective Q14, IC29, or Q8 thru Q13. 2. Maladjustment of Regen trimpot R171.
M. FILTER will not pass any signal.	1. Defective IC27, Q14, IC29 or Q15. 2. Maladjustment of Pitch trimpot R160.
N. FILTER range from subaudio to above audio within span of 2 or 3 numbers on panel.	1. R177 open.

SYMPTOM	PROBABLE CAUSE
SIGNAL PROCESSING BOARD NO. 2 MALFUNCTIONS (Refer to Figures 9-4 thru 9-7) (Continued)	
O. FILTER will not track Keyboard when regenerating.	1. Maladjustment of filter Scale trimpot R179.
P. RING MODULATOR dead.	1. Defective IC9 or IC8.
Q RING MODULATOR has bleed through (original signal getting through).	1. Maladjustment of Signal Balance trimpot R39. 2. Maladjustment of Mod Balance trimpot R43.
R. No NOISE (WHITE or PINK).	1. Defective Q17, IC11 or IC12.
S. NOISE level low.	1. Defective Q17. 2. Maladjustment of Noise trimpot R55.
T. EXTERNAL INPUT dead.	1. Defective IC10.
U. No GLIDE.	1. Open C43.
V. GLIDE always present.	1. Defective IC26. 2. GLISSANDO Control.
W. Frequency drifts after key is released.	1. Leaky FET Q1. 2. Contamination of Keyboard buss circuitry. 3. Leaky capacitor C11.

SECTION 4
REMOVAL PROCEDURE

NOTE
Refer to Figure 4-1 for the following sub-assembly locations.

4.1 CONTROL PANEL

a) Remove ten screws, five at top and five at bottom of front panel.

b) Hold hand in front of panel and slowly close the cover.

c) Control panel will drop out of upper cover.

d) Unplug cable harness from printed circuit boards.

4.2 LOWER TRAY COVER

a) Unplug the unit.

b) Remove screw in the power cord storage we

c) Remove seven screws around the perimeter of the lower tray cover.

d) Remove knobs from VOLUME and GLISSANDO controls.

e) Lift lower tray cover off.

4.3 LOWER TRAY ASSEMBLY

a) Remove lower tray cover (paragraph 4.2).

b) Remove nine mounting screws on bottom of carrying case.

c) Lift entire tray assembly out.

4.4 OSCILLATOR PRINTED CIRCUIT BOARD NO. 1

a) Remove control panel (paragraph 4.1).

b) Remove all knobs associated with Board No. 1. "X" and "Y" WAVEFORM selector knobs are held on with setscrews.

c) Unplug the cable harness.

d) Remove 12 spring retainer clips.

e) Lift Board No. 1 off guide pins.

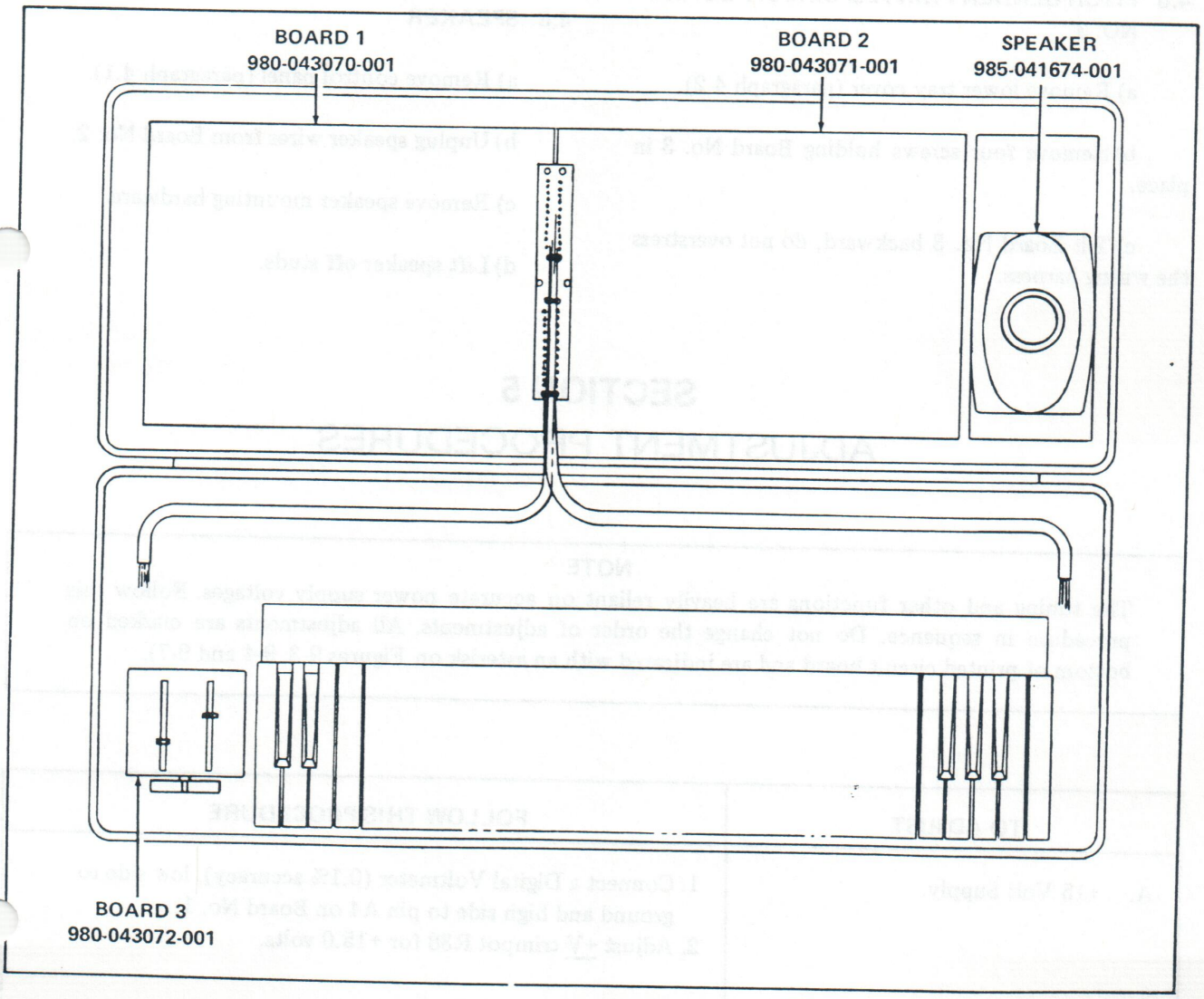


FIGURE 4-1. SUBASSEMBLY LOCATIONS DIAGRAM

4.5 SIGNAL PROCESSING PRINTED CIRCUIT BOARD NO. 2

a) Remove control panel (paragraph 4.1).

b) Remove all knobs associated with Board No. 2.

c) Unplug the cable harness and the speaker wires.

d) Remove 10 spring retainer clips.

e) Lift Board No. 2 off guide pins.

4.6 PITCH BENDER PRINTED CIRCUIT BOARD NO. 3

a) Remove lower tray cover (paragraph 4.2).

b) Remove four screws holding Board No. 3 in place.

c) Tilt Board No. 3 backward, do not overstress the wiring harness.

4.7 KEYBOARD

a) Remove lower tray cover (paragraph 4.2).

b) Remove lower tray assembly (paragraph 4.3).

c) Remove six keyboard mounting screws.

d) Unsolder one wire at left end of keyboard.

e) Unsolder two wires at right end of keyboard.

4.8 SPEAKER

a) Remove control panel (paragraph 4.1).

b) Unplug speaker wires from Board No. 2.

c) Remove speaker mounting hardware.

d) Lift speaker off studs.

SECTION 5
ADJUSTMENT PROCEDURES

NOTE

The tuning and other functions are heavily reliant on accurate power supply voltages. Follow this procedure in sequence. Do not change the order of adjustments. All adjustments are marked on bottom of printed circuit board and are indicated with an asterisk on Figures 9-3, 9-4 and 9-7).

TO ADJUST	FOLLOW THIS PROCEDURE
A. +15 Volt Supply.	1. Connect a Digital Voltmeter (0.1% accuracy), low side to ground and high side to pin A4 on Board No. 1. 2. Adjust +V trimpot R38 for +15.0 volts.

TO ADJUST	FOLLOW THIS PROCEDURE
B. −15 Volt Supply.	1. Connect a Digital Voltmeter (0.1% accuracy), low side to ground and high side to pin A5 on Board No. 1. 2. Adjust −V trimpot R43 for −15.0 volts.
C. OSCILLATOR "A" Symmetry.	1. Connect a VTVM, with a center zero scale, to pin 2 of IC15. 2. Set OSCILLATOR "A" for low frequency (approximately 100 Hz.) 3. Adjust S−A trimpot R74 for zero volts dc.
D. OSCILLATOR "B" Symmetry.	1. Connect a VTVM, with a center zero scale, to pin 2 of IC21. 2. Set OSCILLATOR "B" for low frequency (approximately 100 Hz.) 3. Adjust S−B trimpot R117 for zero volts dc.
E. Keyboard Circuit.	1. Connect a Digital Voltmeter low side to "keyboard buss" (pin D1) high side to "KB1" (pin D5). On Sonic V, connect to shielded cable from keyboard located between connectors C and D.) 2. Alternately depress low and high "C". 3. Adjust FET balance trimpot R23 so that voltage level is the same for low and high "C". Disconnect Voltmeter. 4. Set OSCILLATOR "B" PITCH control to CONCERT (fully counterclockwise in click). 5. Set OCTAVE switches to 0. 6. Set WAVEFORM switches to sawtooth. 7. Turn PITCH CONTROL INPUTS (X/Y, CONTOUR, and OSCILLATOR "A") off (fully counterclockwise in click). 8. Set SCALE control to DIATONIC (fully clockwise). 9. Turn OSCILLATOR "A" and "B" OUTPUT MIXER controls on so that both oscillators can be heard. 10. Set KEYBOARD switch to the HIGH NOTE position (right). 11. Connect an Oscilloscope to the MONITOR jack to observe output. 12. Depress and hold high "C". 13. Tune OSCILLATOR "A" using the PITCH control, to the same frequency that OSCILLATOR "B" is producing (zero beat). 14. Switch the KEYBOARD switch to LOW NOTE (left). 15. Still holding high "C" depressed, adjust KB trimpot R8 (Board No. 2) so that OSCILLATOR "A" and "B" zero beat. 16. Switch back to HIGH NOTE and check that OSCILLATORS "A" and "B" are still zero beating. If not, repeat steps 10 thru 15.

TO ADJUST	FOLLOW THIS PROCEDURE
F. Pitch Bender.	1. Connect a Digital Voltmeter low side to ground, high side to the Pitch Bender output. This output is available in the lower tray at pin 5 of Board No. 3 or behind the control panel on pin B6 or B8. 2. If the output voltage is less than 50 mv, no adjustment is required. If the output voltage is in excess of 50 mv, proceed to step 3. 3. Loosen the setscrew in the Pitch Bender Wheel. 4. Rotate the control shaft until the output voltage is zero. 5. Tighten the setscrew and check to see that the output is still less than 50 mv when the wheel is centered.
G. OSCILLATOR "B" Tuning. NOTE: It is suggested that contact cleaner be used prior to adjusting trimpots in order to expedite tuning.	1. Turn KEYBOARD switch OFF (center). 2. Turn OSCILLATOR "A" OUTPUT MIXER control off (listen to "B" only). 3. Depress and hold middle "C". Adjust C–B R105 for 261.6 Hz. (Use a frequency counter or zero beat with a "C" tuning fork). 4. Turn OSCILLATOR "A" OUTPUT MIXER control on. Adjust level so that both oscillators can be heard. 5. With middle "C" still depressed, tune OSCILLATOR "A" via the PITCH control to zero beat with OSCILLATOR "B". (OSCILLATOR "A" now tuned to 261.6 Hz.) 6. Depress and hold high "C." (OSCILLATOR "B" will increase in frequency by two octaves, OSCILLATOR "A" will remain at middle "C.") 7. Adjust HI–B R104 for zero beats two octaves above middle "C". The frequency of high "C" is 1046.4 Hz. (Beat note can easily be seen on Oscilloscope). 8. Depress and hold low "C." 9. Adjust LO–B R108 for zero beats two octaves below middle "C" (65.4 Hz). **NOTE** These three tuning adjustments are interactive. It may be necessary to repeat steps 5 thru 9 until no further improvement is attainable.
H. Chip Temperature.	1. If unable to obtain proper scale and/or pitch with the above procedure, it may be necessary to make a very slight change of the Chip Temperature trimpot R135. This acts as a course scale adjustment and normally requires change only when the heated chip (IC24) is replaced. Changing the setting of this will affect both OSCILLATORS "A" and "B" and make it necessary to re-tune both.

TO ADJUST	FOLLOW THIS PROCEDURE
I. OSCILLATOR "A" Tuning. **NOTE:** It is suggested that contact cleaner be used prior to adjusting trimpots in order to expedite tuning.	1. Now that OSCILLATOR "B" is tuned, it will be used as a reference to simplify the tuning of OSCILLATOR "A". 2. Adjust OUTPUT MIXER controls so that both OSCILLATORS can be heard. 3. Set SCALE control to DIATONIC (fully clockwise). 4. Set KEYBOARD swith to HIGH NOTE. 5. Set OSCILLATOR "A" and "B" OCTAVE switches to 0. 6. Set OSCILLATOR "B" PITCH control to CONCERT (fully counterclockwise in click). 7. Set OSCILLATOR "A" PITCH control to 0. 8. Depress middle "C" and adjust C–A trimpot R62 for zero beat with OSCILLATOR "B" (261.6 Hz). 9. Depress high "C" and adjust HI–A trimpot R61 for zero beats (1046.4 Hz). 10. Depress low "C" and adjust LO–A trimpot R65 for zero beats (65.4 Hz). **NOTE** These three tuning adjustments are interactive. It may be necessary to repeat steps 8 thru 10 until no further improvement is attainable.
J. OSCILLATOR "X" Symmetry.	1. Use OSCILLATOR "X" triangle at minimum rate to modulate OSCILLATOR "A". 2. While listening to OSCILLATOR "A", adjust X–LO trimpot R13 so that the pitch rise and fall times are equal.
K. OSCILLATOR "Y" Symmetry.	1. Use OSCILLATOR "Y" triangle at minimum rate to modulate OSCILLATOR "A". 2. While listening to OSCILLATOR "A" adjust Y–LO trimpot R28 so that the pitch rise and fall times are equal.
L. RING MODULATOR	1. Turn on RING MODULATOR at the OUTPUT MIXER (all other signals off). 2. Set the SIGNAL INPUT switch to TONE OSC "B". 3. Set the MODULATING INPUT switch to mid-position (between positions) so that no modulating signal is present. 4. Adjust Mod Balance trimpot R43 for minimum output. 5. Set the MODULATING INPUT switch to TONE OSC "A". 6. Set the SIGNAL INPUT switch to EXT INPUT (do not apply an external signal). 7. Adjust Sig Bal trimpot R39 for minimum output. 8. Turn off RING MODULATOR at the OUTPUT MIXER.

TO ADJUST	FOLLOW THIS PROCEDURE
M. NOISE.	1. Connect a Decibel Meter to the PHONES jack. This is a stereo jack. If a monaural plug is used, plug it in half way only to prevent shorting. 2. Set the ARTICULATOR switch to BYPASS. 3. Set filter CUTOFF FREQUENCY control to 10 (up). 4. Set filter RESONANCE control to 0 (down). 5. Turn on NOISE at the SOURCE MIXER (fully clockwise). All other signals off. 6. Set MASTER VOLUME control to maximum. 7. Set NOISE SOURCE switch to WHITE. 8. Adjust Noise Level trimpot R55 for +10 db.
N. Voltage Controlled Amplifier Balance.	1. Turn off all OUTPUT and SOURCE MIXER controls. 2. Connect a jumper from pin C15 to pin C3. 3. Set MASTER VOLUME control to maximum. 4. Set OSCILLATOR "A" waveform switch to square wave. 5. Adjust VCA Bal trimpot R138 for minimum level at speaker. (Adjust "ART" trimpot on Sonic V). 6. Remove jumper.
O. ARTICULATOR BALANCE.	1. Turn off all OUTPUT and SOURCE MIXER controls. 2. Set ARTICULATOR switch to the left position. 3. Turn GEN X trigger switch on (below contour generator). 4. Set WAVEFORM GENERATOR X for full speed (RATE and MASTER RATE controls at maximum). 5. Set ATTACK and DECAY at 0 (minimum). 6. Set MASTER VOLUME control to 10 (maximum). 7. Adjust Artic trimpot R74 for minimum output at speaker. (Adjust "CR" trimpot on Sonic V).
P. FILTER.	1. Turn all signal sources off. 2. Set ARTICULATOR to BYPASS. 3. Set CUTOFF FREQUENCY control to 5. 4. Set RESONANCE control to 10. 5. Turn KEYBOARD CONTROL INPUT to filter on. 6. Depress middle "C". 7. If filter is not regenerating (oscillating), adjust Regen trimpot R171 clockwise until regeneration occurs. 8. Alternately, depress middle and high "C" while adjusting Scale trimpot R179 for a two octave change (use Frequency Counter if necessary). 9. After Scale is set, turn off KEYBOARD CONTROL INPUT. 10. Check that CUTOFF FREQUENCY control is still at 5. 11. Adjust Pitch trimpot R160 so the filter is producing 1000 ± 20 Hz.

SECTION 6
KEYBOARD MAINTENANCE

Occasionally, it will become necessary to clean and adjust the keyboard. The contacts, although gold plated, may become dirty, contaminated, or corroded. When contacts become poor, noises and erratic sounds may be generated while playing the instrument.

To gain access to the keyboard, remove the lower tray and lower tray cover (refer to Section 4). An opening in the base plate will allow cleaning and adjusting to be performed without dismounting the keyboard. Avoid touching the "Buss Bar" and the "Contact Wires" with the fingers since hand oils and perspiration will cause corrosion. Under normal conditions, any dirt can be removed by wiping the buss bar with a cotton swab soaked in a ethyl alcohol solution in the area of the problem key(s).

CAUTION
Do NOT use abrasives or abrasive tools, since this will destroy the gold plating.

Sometimes, it is necessary to adjust the contact wires for more or less tension. If the contacts are positioned too close to the buss bar, a condition known as "contact bounce" will occur. This results in double triggering. If the contacts are positioned too far from the buss bar, a poor or undependable contact will be made. This has two disadvantages, one being the generation of erratic pitch changes; the other is excessive key travel before contact occurs.

To clean the keys, use a soft cloth moistened with a mild soap solution. Scratches may be removed with a plastic or automotive polishing compound. Waxing the keys is not recommended.

CAUTION
Never allow cleaning agents to run down between the keys. Avoid harsh solvents, since the keys are made of plastic and may be dissolved.

SECTION 7
REPLACEMENT PARTS LIST

7.1 ORDERING

The following list specifies parts available from Norlin Music, Buffalo, New York 14225, (716) 681-7242. Please specify the part name, model, serial number, part description and part number when ordering. Order unlisted parts by description.

REPLACEMENT PARTS LIST

NORLIN PART NO.	MOOG PART NO.	DESCRIPTION
	SUBASSEMBLIES	
980-043070-001	93-119	Oscillator Printed Circuit Board No. 1
980-043071-001	93-120	Signal Processor Printed Circuit Board No. 2
980-043072-001	93-127	Pitch Bend Printed Circuit Board No. 3

REPLACEMENT PARTS LIST

NORLIN PART NO.	MOOG PART NO.	DESCRIPTION
		SUBASSEMBLIES (Continued)
979-043073-001	93-008	Keyboard Assembly
985-041674-001	58-003	Speaker
978-043075-001	99-107	Carrying Case
959-043091-001	97-229	Wheel, Pitch Bender
997-043076-001	93-003	Front Panel Assembly (Less Boards)
970-043089-001	95-027	Bottom Panel
970-043090-001	95-028	Chassis, Pitch Bender
		POWER SUPPLY
954-041647-001	43-159	Transformer, Power
957-041794-001	74-011	Power Cord
910-041739-001	55-342	Receptacle, Power
906-041621-001	57-004	Fuseholder
		HARDWARE
915-041916-002	53-003	Knob, Skirted, 1-1/4 Inch Diameter
915-043083-001	53-023	Knob, Slide, Potentiometer
915-043084-001	53-024	Knob, Black Glamor Cap, Small
915-043085-001	53-025	Knob, Black Glamor Cap, Large
915-040921-001	53-026	Knob, Black, Push On
		SWITCHES
960-043079-001	51-053	Switch, Rotary, 2 Pole, 4 Position
960-043080-001	51-505	Switch, Slide, DPDT
960-043081-001	51-506	Switch, Slide, DPTT
960-041303-001	51-508	Switch, Slide, DPDT, Line Voltage Selector
960-041755-001	51-202	Switch, Rocker, DPDT
960-043078-001	51-510	Switch, Rocker, Illuminated
		JACKS AND SOCKET
910-041306-001	54-105	Jack, Phone, Non-Shorting
910-041306-002	54-106	Jack, Phone, Shorting
910-041306-004	54-107	Jack, Phone, 2 Circuit
910-041707-006	55-007	Socket, 6 Pin, Cinch Jones
		DIODES
919-042019-004	61-112	Diode, 1N4004
919-041074-001	61-201	Diode, 1N34A
919-041075-001	61-211	Diode, 1N4148
919-043082-001	61-212	Diode, 1N4738

REPLACEMENT PARTS LIST

NORLIN PART NO.	MOOG PART NO.	DESCRIPTION
		TRANSISTORS
991-043083-001	62-407	Transistor, 2N3055
991-041051-001	62-415	Transistor, 2N3904
991-041052-001	62-416	Transistor, 2N3906
991-041054-001	62-533	Transistor, 2N3954 (E400)
991-041055-001	62-534	Transistor, NF510 (E112)
991-041126-001	65-006	Transistor, Selected, TIS97
		INTEGRATED CIRCUITS
991-043217-001	63-002	Integrated Circuit, MC1316D (For Older Sonic VI Versions Only)
991-041089-001	63-003	Integrated Circuit, CA3080
991-041115-001	63-004	Integrated Circuit, 748
991-041117-001	63-006	Integrated Circuit, 796
991-043218-001	63-008	Integrated Circuit, Diode Array CA3039, TO-5 (For Older Sonic VI Versions Only)
991-043219-001	63-009	Integrated Circuit, 723, Regulator, DIP
991-043220-001	63-011	Integrated Circuit, 914, TO-5
991-041082-001	63-012	Integrated Circuit, 726
991-041101-001	63-741	Integrated Circuit, 741
991-041104-001	63-879	Integrated Circuit, SG3821N
991-041119-001	65-009	Integrated Circuit, Selected, 741 (A) (Red Dot)
991-041119-002	65-010	Integrated Circuit, Selected, 741 (B) (Green Dot)
		POTENTIOMETERS
925-040699-001	28-028	Potentiometer, Rotary, 10K Ohms, Pitch Bender
925-043092-001	28-059	Potentiometer, Rotary, 10K Ohms, Linear
925-043093-001	28-060	Potentiometer, Rotary, 10K Ohms, Linear W/Switch
925-043094-001	28-060-1	Potentiometer, Rotary, 10K Ohms, Linear W/Switch
925-043095-001	28-061	Potentiometer, Rotary, 50K Ohms, Linear W/Switch
925-043096-001	28-062	Potentiometer, Rotary, 50K Ohms, Audio
925-043097-001	28-063	Potentiometer, Rotary, 100K Ohms, Linear W/Switch
925-043098-001	28-064	Potentiometer, Rotary, 1 Meg Ohm, Audio
925-040265-002	28-065	Potentiometer, Rotary, 100K Ohm, Audio
925-043100-001	28-066	Potentiometer, Rotary, 100K Ohms, Linear
925-043105-001	28-401	Potentiometer, 10K Ohms, Slide, Linear
925-040271-001	28-402	Potentiometer, 100K Ohms, Slide, Linear
925-043106-001	28-403	Potentiometer, 100K Ohms, Slide, Audio
925-043107-001	28-404	Potentiometer, 500K Ohms, Slide, Audio
925-043108-001	28-405	Potentiometer, 50K Ohms, Slide, Audio

REPLACEMENT PARTS LIST

NORLIN PART NO.	MOOG PART NO.	DESCRIPTION
		TRIMPOTS
925-043101-001	28-119	Trimpot, 1K Ohms, Carbon
925-043102-001	28-121	Trimpot, 10K Ohms, Carbon
925-040281-001	28-301	Trimpot, 1K Ohms, Cermet
925-040281-002	28-302	Trimpot, 2K Ohms, Cermet
925-040281-003	28-303	Trimpot, 100K Ohms, Cermet
925-040281-004	28-304	Trimpot, 500K Ohms, Cermet
925-040281-005	28-305	Trimpot, 10K Ohms, Cermet
925-043099-001	28-306	Trimpot, 200K Ohms, Cermet
925-043103-001	28-309	Trimpot, 20K Ohms, Cermet
925-043104-001	28-310	Trimpot, 200K Ohms, Cermet
		MATCHED RESISTOR SETS
923-043084-001	65-013	Matched Resistor Set, 20K/10K
923-043085-001	65-014	Matched Resistor Set, 20K/20K
923-043086-001	65-015	Matched Resistor Set, 60.4K/30.1K/20K
923-043087-001	65-016	Set of Matched 100 Ohm Resistors
923-043088-001	65-028	Matched Resistors, 20K/100K/100K/150K
853-421001-031	25-023	Resistor, 1K Ohms, ±1%, 1/4 W, Met, Film
853-423321-031	25-031	Resistor, 3.32K Ohms, ±1%, 1/4 W, Met, Film
853-421502-031	25-037	Resistor, 15K Ohms, ±1%, 1/4 W, Met, Film
853-421003-031	25-044	Resistor, 100K Ohms, ±1%, 1/4 W, Met, Film
853-423013-031	25-048	Resistor, 301K Ohms, ±1%, 1/4 W, Met, Film
853-421002-031	25-062	Resistor, 10K Ohms, ±1%, 1/4 W, Met, Film
853-423010-031	25-069	Resistor, 30.01K Ohms, ±1%, 1/4 W, Met, Film
853-421212-031	25-070	Resistor, 12.1K Ohms, ±1%, 1/4 W, Met, Film
853-424991-031	25-072	Resistor, 4.99K Ohms, ±1%, 1/4 W, Met, Film
853-423570-031	25-085	Resistor, 357 Ohms, ±1%, 1/4 W, Met, Film
853-421151-031	25-086	Resistor, 1.15K Ohms, ±1%, 1/4 W, Met, Film
853-425491-031	25-089	Resistor, 5.49K Ohms, ±1%, 1/4 W, Met, Film
853-426651-031	25-090	Resistor, 6.65K Ohms, ±1%, 1/4 W, Met, Film
853-421872-031	25-091	Resistor, 18.7 Ohms, ±1%, 1/4 W, Met, Film
853-421912-031	25-092	Resistor, 19.1K Ohms, ±1%, 1/4 W, Met, Film
		RESISTORS
853-422002-031	25-093	Resistor, 20K Ohms, ±1%, 1/4 W, Met, Film
853-423012-031	25-094	Resistor, 30.1K Ohms, ±1% 1/4 W, Met, Film
853-426042-031	25-075	Resistor, 60.4K Ohms, ±1%, 1/4 W, Met, Film
924-040183-001	26-202	Resistor, 1K Ohms, Temp, Comp
		AMPLIFIER AND CAPACITOR
991-043221-001	63-743	Amplifier, Power, Audio
945-043077-001	37-028	Capacitor, 240 uf, Electrolytic

SECTION 8
MODIFICATIONS

> **NOTE**
> These modifications are for instruments with Serial Numbers 1265 to 1300.

8.1 OSCILLATOR PRINTED CIRCUIT BOARD NO. 1

To increase the input sensitivity of the oscillator "External Control Input" from 5.0 volts per octave 1.0 volt per octave:

a) Change resistors R58 and R100 from 100K ± 1% to 20K ± 1% metal film.

To prevent occasional "No-Start" condition, caused by latch-up of the positive regulator:

a) Add diode CR12 (1N4148) from the plus 15 volt line to ground. Install diode "Piggy Back" on capacitor C4.

8.2 SIGNAL PROCESSING PRINTED CIRCUIT BOARD NO. 2

To convert filter "External Control Input" to 1.0 volt per octave:

a) Change resistor R157 from 43K ± 5% to 60.4K ± 1%.

8.3 PITCH BENDER PRINTED CIRCUIT BOARD NO. 3

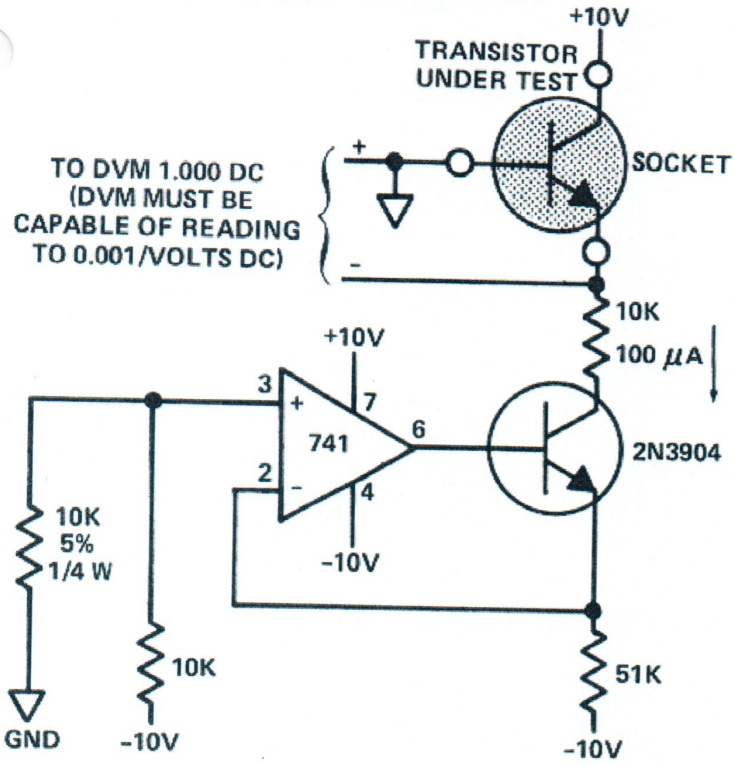
To increase the output swing of the Pitch Bender:

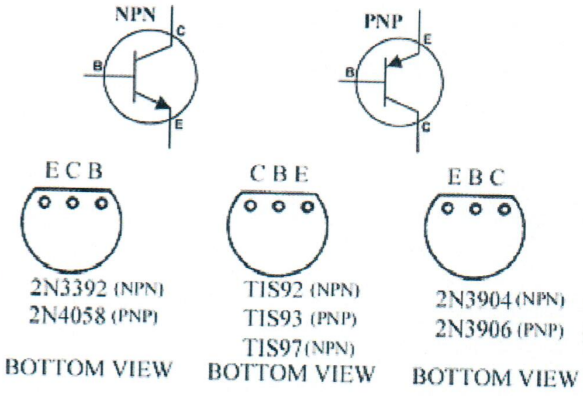
a) Change resistor R6 from 100K ± 5% to 43K ± 5% carbon.

SECTION 9
OPERATING CONTROLS, SCHEMATICS AND PRINTED CIRCUIT BOARDS ADJUSTMENTS AND PARTS LOCATION DIAGRAMS

Correct

NPN TRANSISTORS 2N3904, 2N3392 (ETC.)



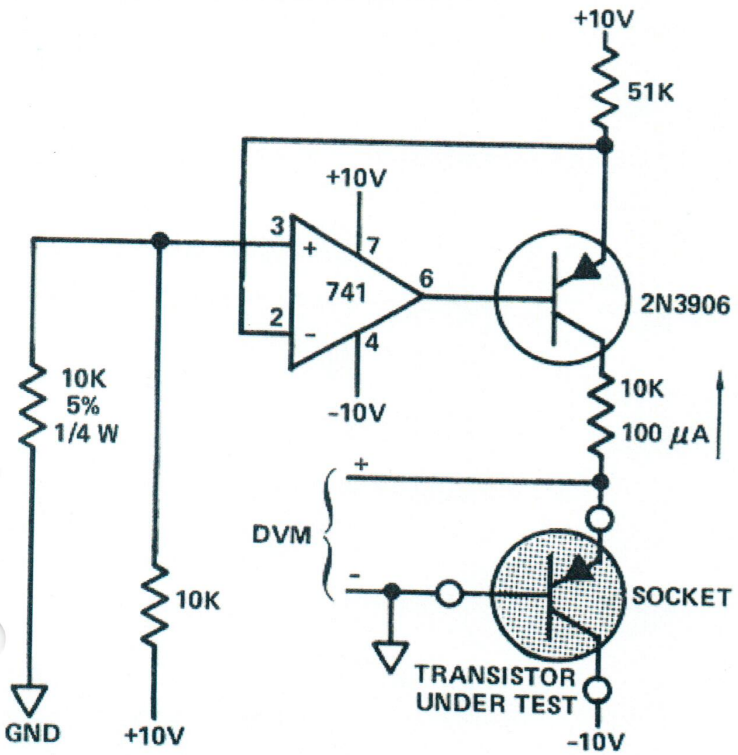


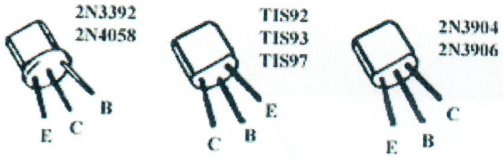
MATCHING PROCEDURE

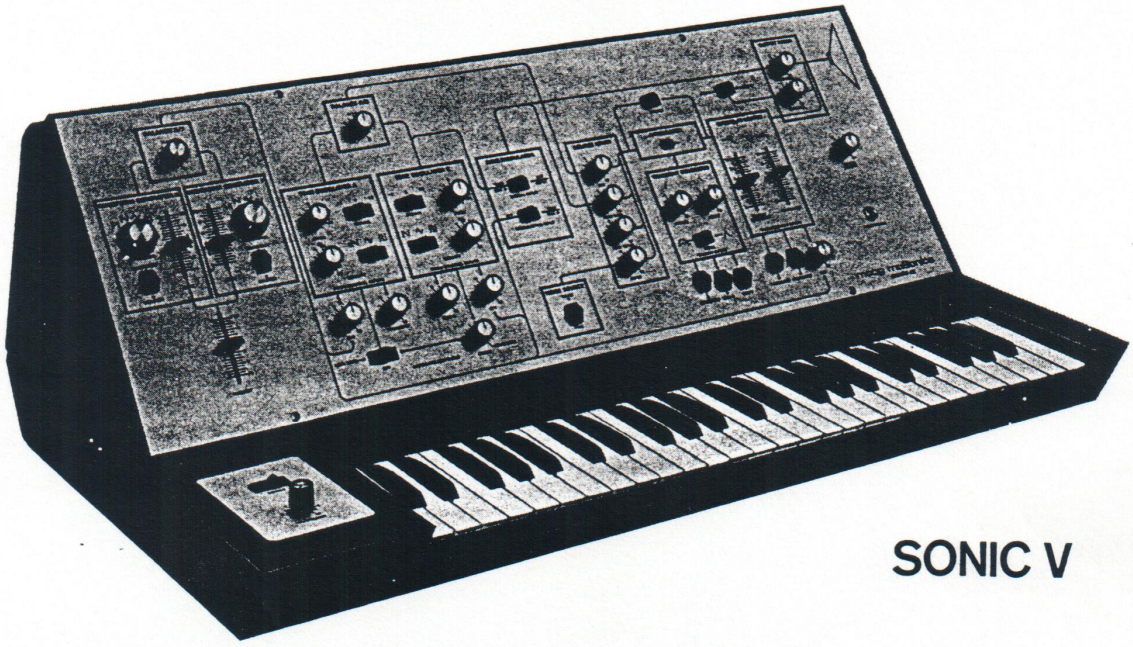
1. SETUP ± 10V SUPPLIES TO ±10.00 V OR ±15.00 V.
2. TAKE TRANSISTORS (APPROXIMATELY 20) AND PLACE THEM IN STYROFOAM TO STABILIZE AT ROOM TEMPERATURE.
3. PLACE TRANSISTORS INTO SOCKET, ONE AT A TIME, AND MEASURE BASE TO EMITTER VOLTAGE. DO NOT USE YOUR FINGERS. USE GLOVES OR PLIERS WITH INSULATING JAWS. YOUR FINGER HEAT WILL CAUSE THE READINGS TO VARY.
4. MARK DOWN THE V_{be} FROM THE DVM AND FIND TWO TRANSISTORS THAT THE V_{be} MATCHES to ±2 MV.
5. EXAMPLE:

TRANSISTOR 1 = 0.600
TRANSISTOR 2 = 0.598
0.002

PNP TRANSISTORS 2N3906, (ETC.)







SONIC V

SONIC V and SONIC VI

Another Quality Product from Norlin

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2500 Walden Avenue, Buffalo, New York 14225

NORLIN MUSIC
7373 N. Cicero Avenue, Lincolnwood, Illinois 60646

NORLIN MUSIC INSTRUMENTS LIMITED
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NORLIN MUSIC LIMITED
114 Charing Cross Road, London, England

NORLIN MUSIC SERVICES B. V.
Waalhaven, Z. Z. 48, Rotterdam, Holland

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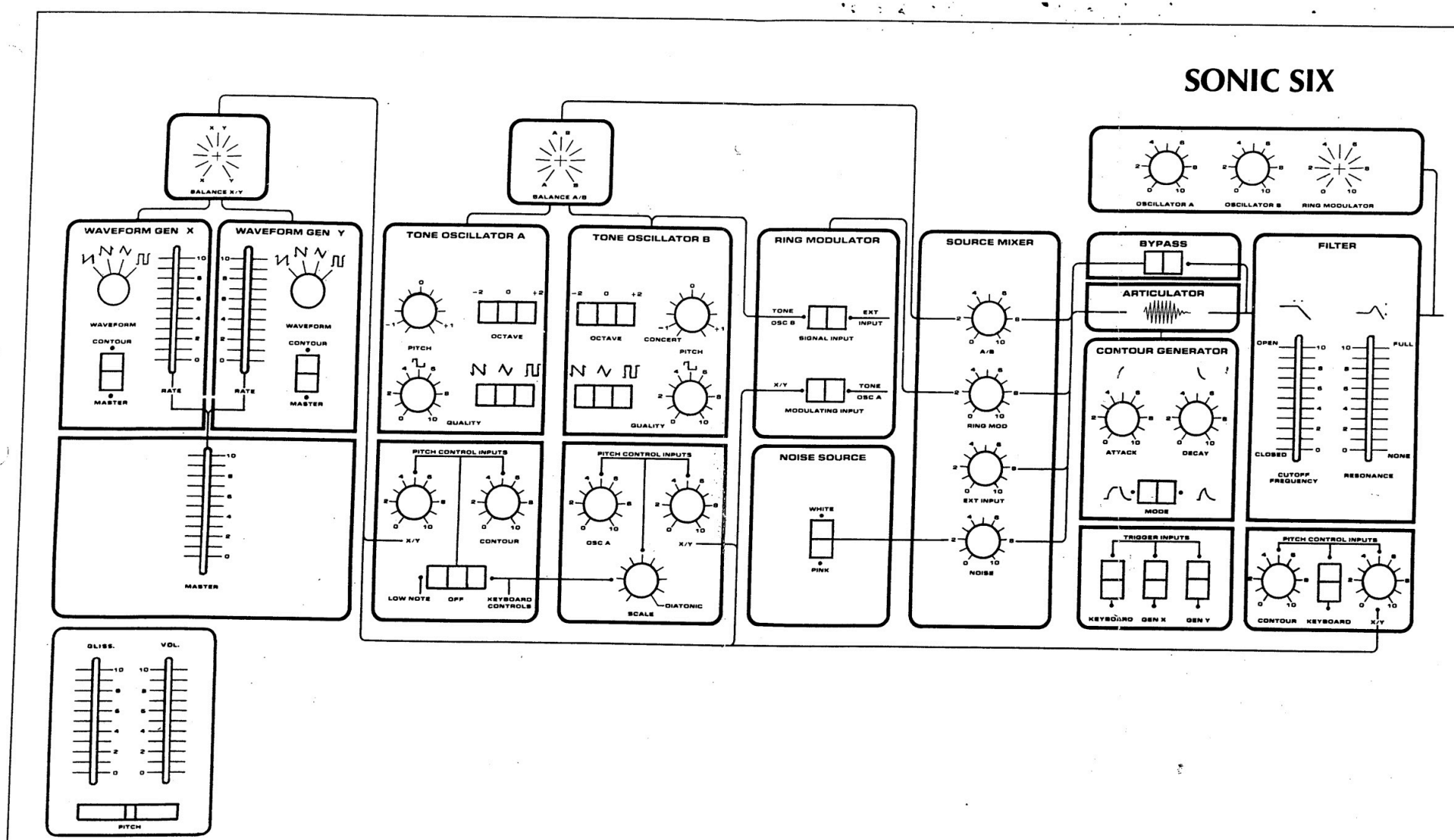


FIGURE 9-1. OPERATING CONTROLS, INSIDE COVER

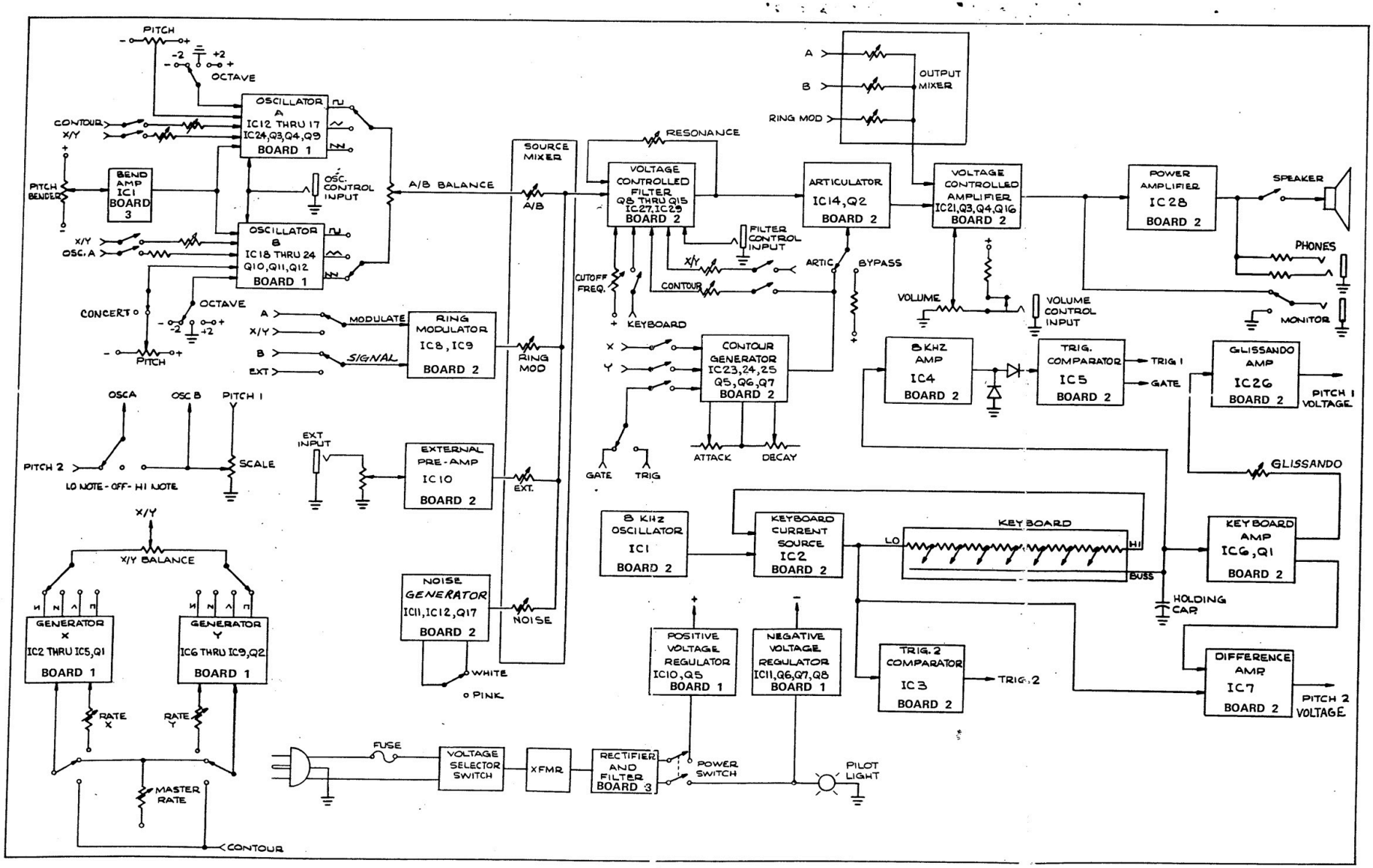


FIGURE 2-1. SIMPLIFIED BLOCK DIAGRAM

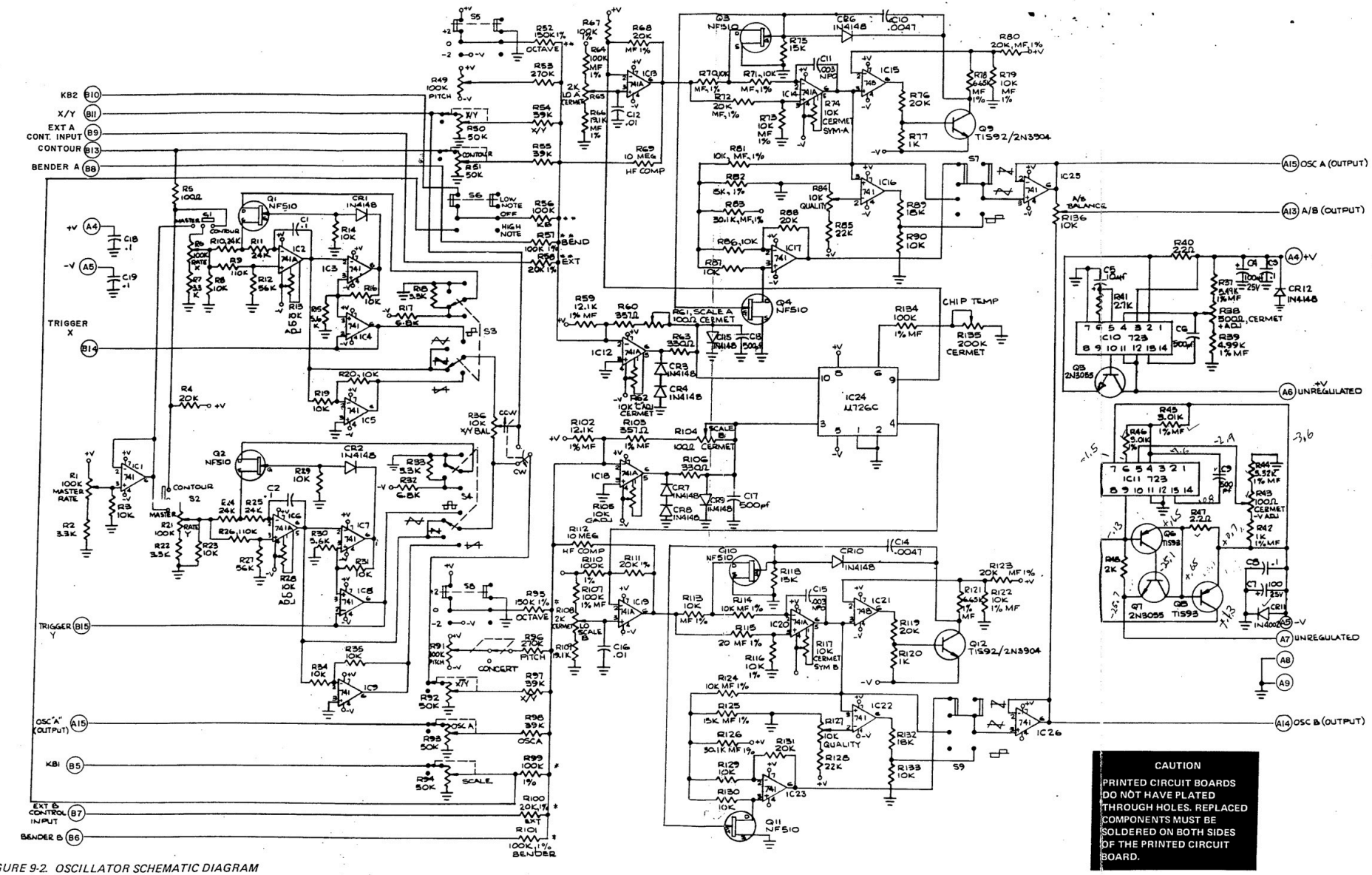


FIGURE 9-2. OSCILLATOR SCHEMATIC DIAGRAM

NOTE:

SPRAY ALL OSCILLATOR CONTROLS WITH CONTACT CLEANER BEFORE TUNING OSCILLATORS.

CAUTION
PRINTED CIRCUIT BOARDS DO NOT HAVE PLATED THROUGH HOLES. REPLACED COMPONENTS MUST BE SOLDERED ON BOTH SIDES OF THE PRINTED CIRCUIT BOARD.

THESE ADJUSTMENTS MAY BE MADE ON TOP OR BOTTOM OF PRINTED CIRCUIT BOARD ASSEMBLY.

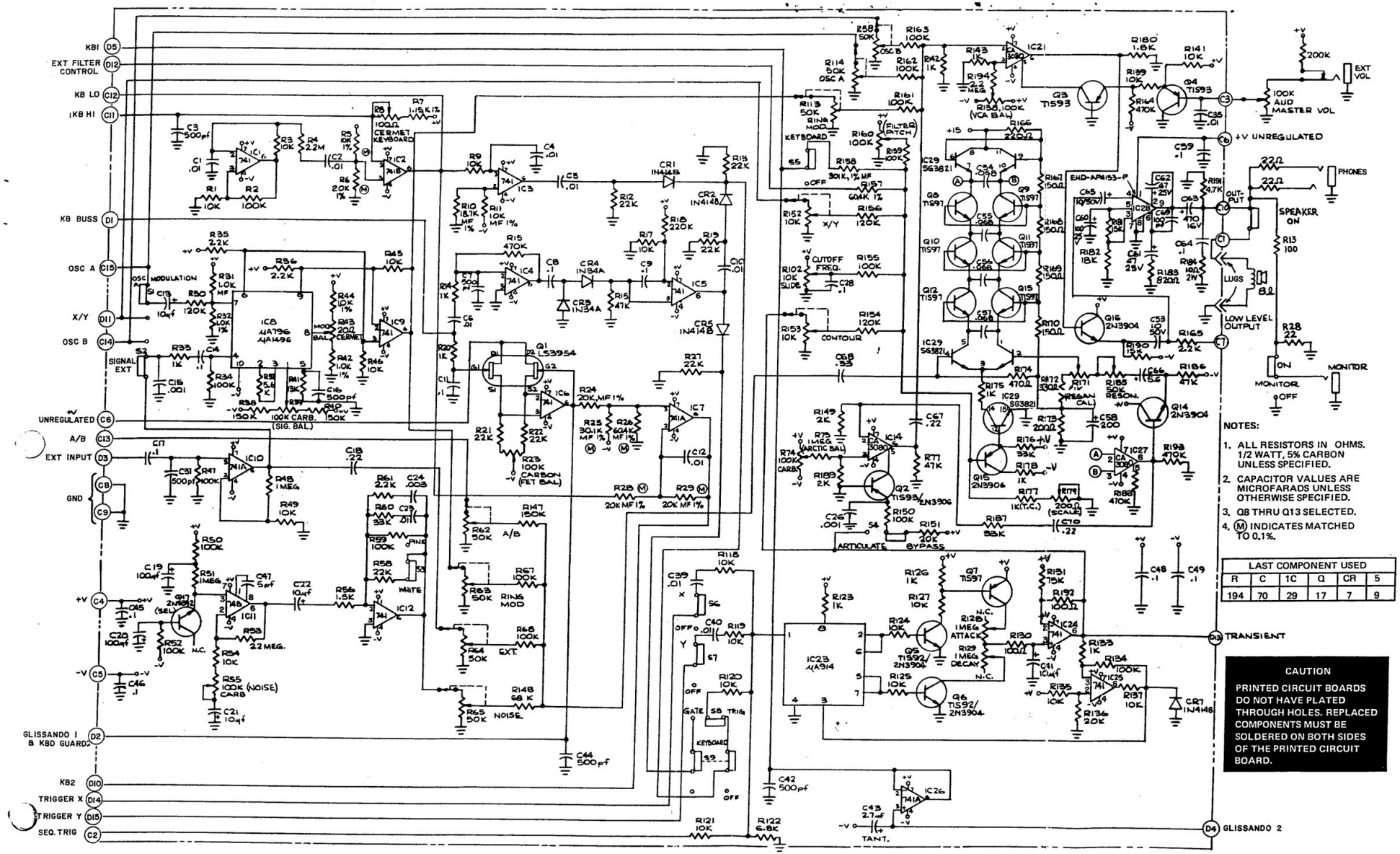
TOP VIEW

SUGGESTED LOCATION FOR PROBE GROUND

BOTTOM VIEW

SUGGESTED LOCATION FOR PROBE GROUND

FIGURE 9-3. OSCILLATOR PRINTED CIRCUIT BOARD ASSEMBLY (BOARD NO. 1)



NOTES:

1. ALL RESISTORS IN OHMS. 1/2 WATT, 5% CARBON UNLESS SPECIFIED.
2. CAPACITOR VALUES ARE MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. Q8 THRU Q13 SELECTED.
4. (M) INDICATES MATCHED TO 0.1%.

LAST COMPONENT USED					
R	C	IC	Q	CR	S
194	70	29	17	7	9

CAUTION

PRINTED CIRCUIT BOARDS DO NOT HAVE PLATED THROUGH HOLES. REPLACED COMPONENTS MUST BE SOLDERED ON BOTH SIDES OF THE PRINTED CIRCUIT BOARD.

FIGURE 9-5. SIGNAL PROCESSING SCHEMATIC DIAGRAM - SERIAL NO'S 1265 AND UP

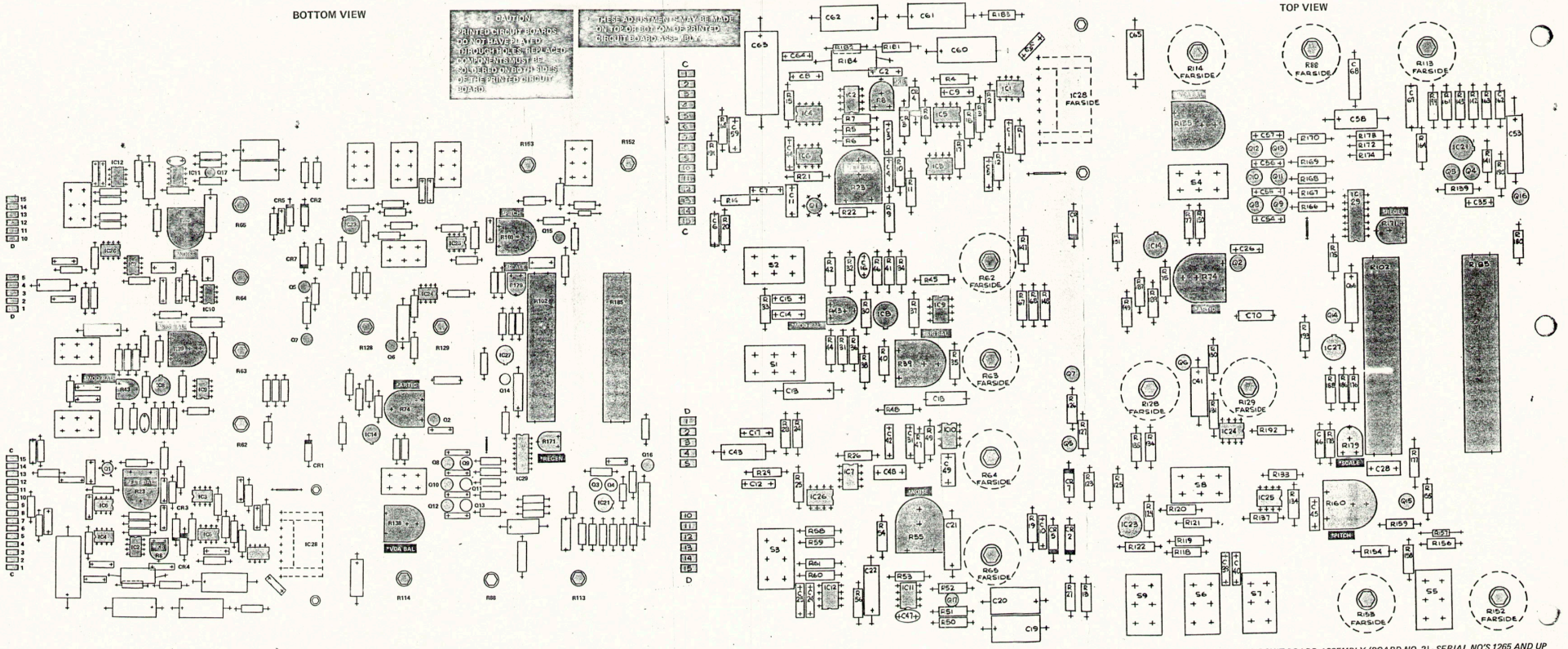


FIGURE 9-4. SIGNAL PROCESSING PRINTED CIRCUIT BOARD ASSEMBLY (BOARD NO. 2) - SERIAL NO'S 1265 AND UP

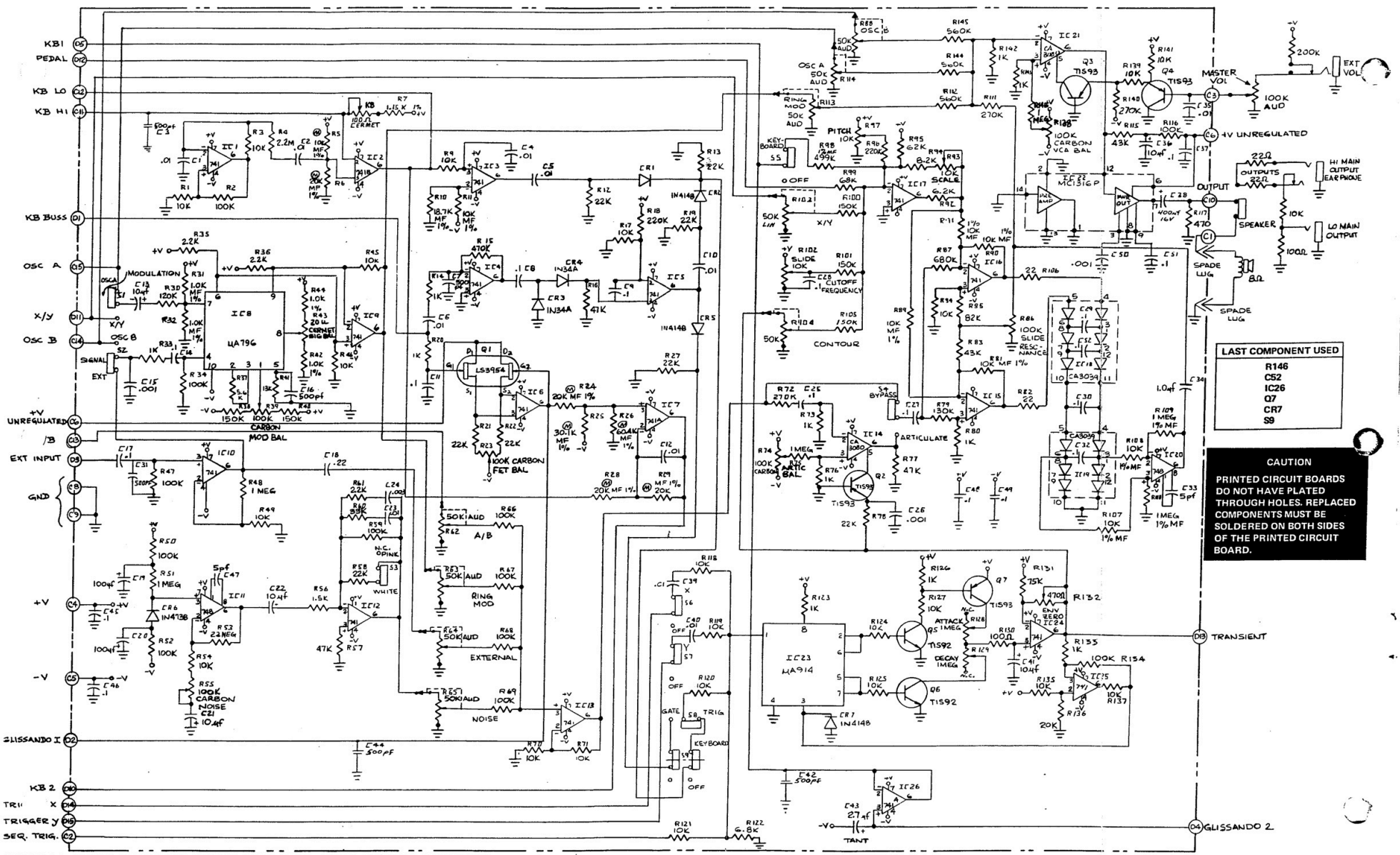


FIGURE 9-6. SIGNAL PROCESSING SCHEMATIC DIAGRAM - SERIAL NO'S 1264 AND BELOW

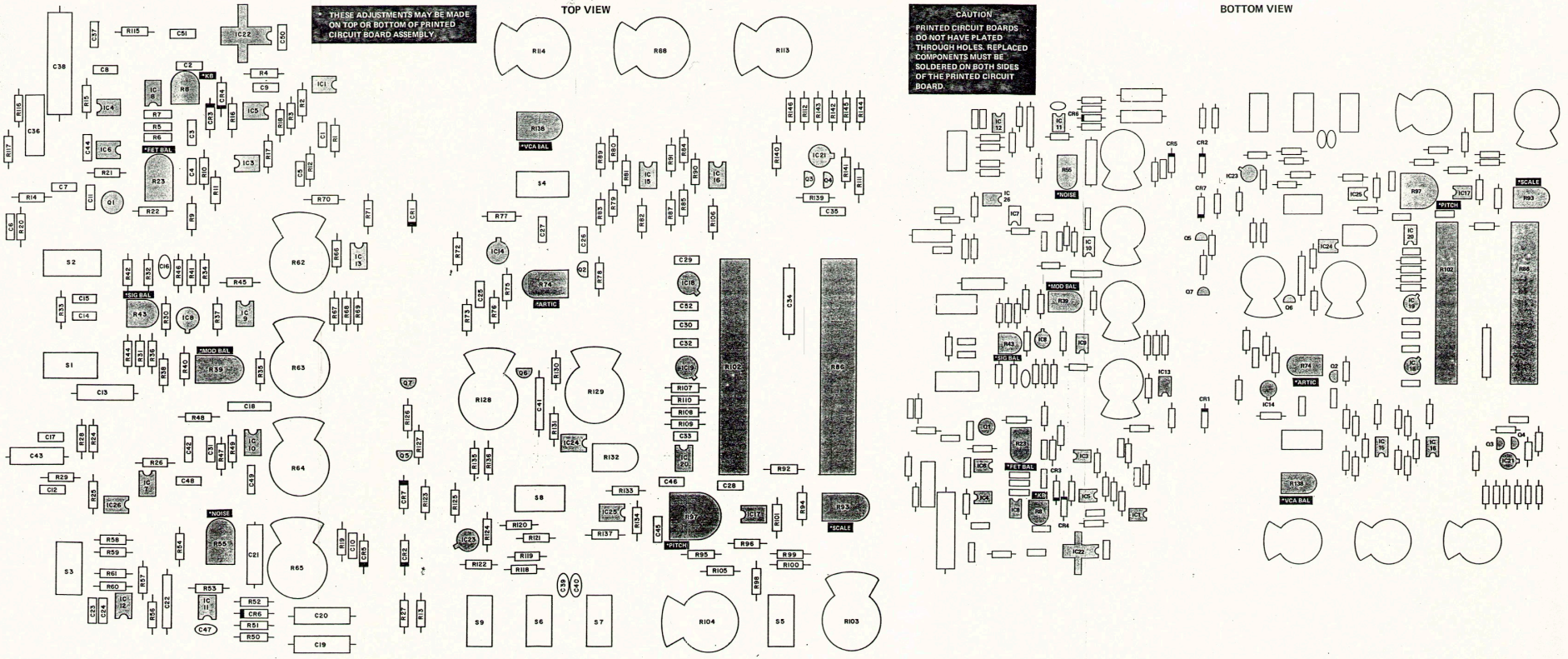


FIGURE 9-7. SIGNAL PROCESSING CIRCUIT BOARD ASSEMBLY (BOARD NO. 2) - SERIAL NO'S 1264 AND BELOW

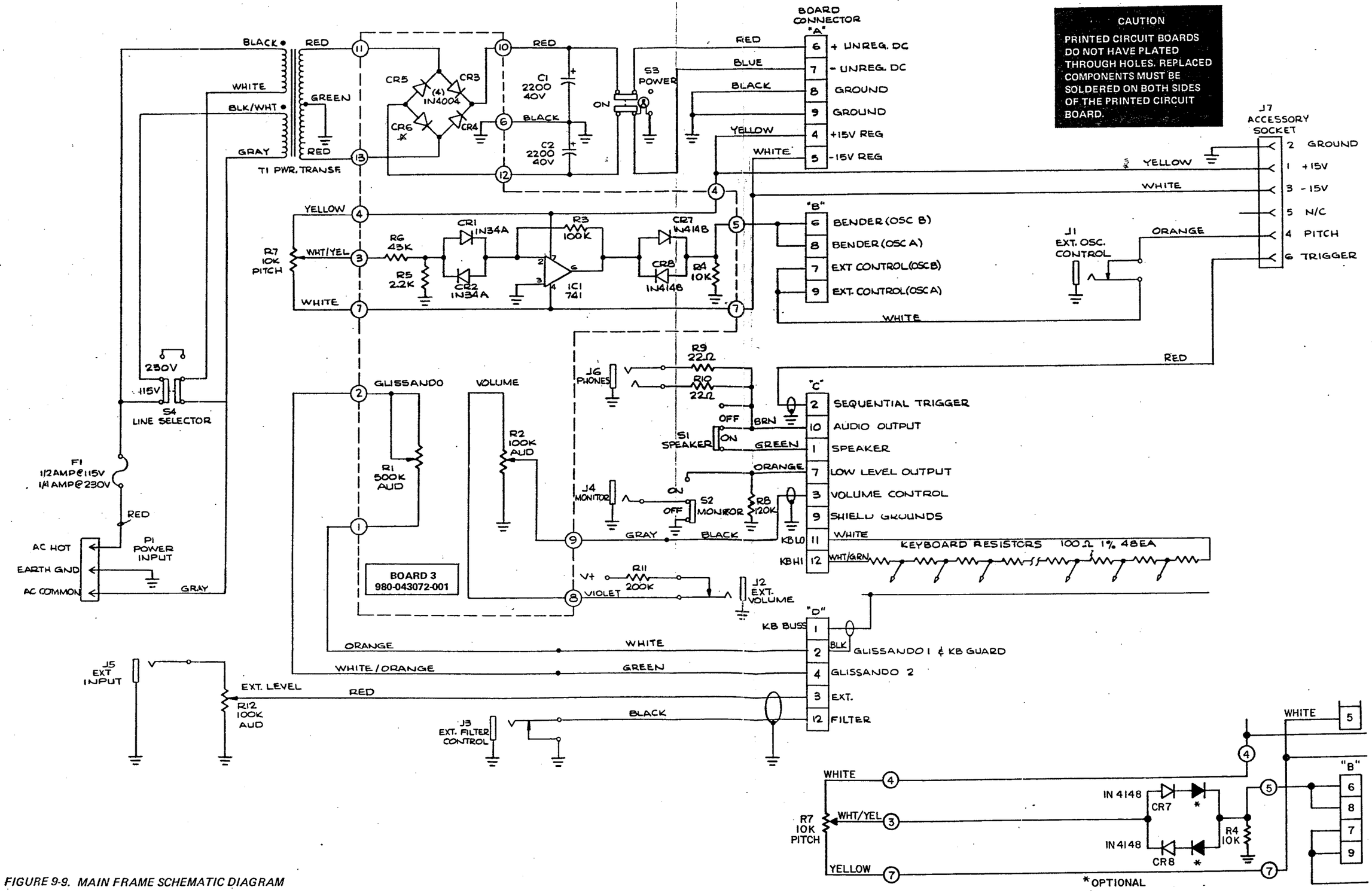


FIGURE 9-9. MAIN FRAME SCHEMATIC DIAGRAM