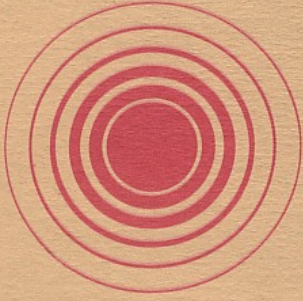


MODEL E60/L60



**LOWREY**<sup>®</sup>

SERVICE MANUAL

Debut

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## MODEL E60/L60

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## SPECIFICATIONS



## SPECIFICATIONS

### THE LOWREY DEBUT SPINET (Model E60/L60)

The Debut is a self-contained spinet organ with two 44-note keyboards and a 13-note pedal keyboard. This solid state organ (transistor and integrated circuit) includes a 25-watt amplifier and a 12-inch speaker.

#### UPPER KEYBOARD

Trombone 16	Flute 16
Clarinet 16	Flute 8
Cello 16	

#### LOWER KEYBOARD

Guitar	Piano
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#### Magic Genie Chords

Magic Genie Chord tab - enables Magic Genie Chord continues to play after key is released.  
 A2 Keyswitch - adds seventh to Magic Chord  
 A2 Key will not sound if pressed alone.  
 Minor Footswitch - changes major chord to a minor.  
 A2 Key and Minor Footswitch - changes major chord to a minor seventh.

Key Note	Provides This Chord
A1	A Major
A#1	A#/B <sub>b</sub> Major
B1	B Major
C1	C Major
C#1	C#/D <sub>b</sub> Major
D1	D Major
D#1	D#/E <sub>b</sub> Major
E1	E Major
F1	F Major
F#1	F#/G <sub>b</sub> Major
G1	G Major
G#1	G#/A <sub>b</sub> Major

#### Lower Keyboard Controls

Lower Volume Control  
 Genie Voices tab -  
     Normal = lower keyboard voices modulate with rhythm  
     +Organ = lower keyboard voices play without modulation

### BASS

String Bass 8 - adds sustain to pedal bass  
 Genie Bass 8 - enables keyboard bass, disables pedals  
 Bass Volume Control

### AUTOMATIC RHYTHM

Dixie	Samba	Rock 1
Country	Bosa Nova	Rock 2
Swing	Rhumba	Tango
Waltz	Cha-Cha	March

#### Rhythm Controls

Rhythm Volume Control  
 Rhythm Tempo Control

### EFFECTS

Sustain Length Control - adds sustain to upper keyboard  
 Vibrato tab

### GENERAL FEATURES

Photoelectric Expression Pedal  
 Glide Footswitch (left side of expression pedal)  
 Headphone Jack (accepts stereo or mono headphone)

### DIMENSIONS

Height — 34" (without music rack)  
 Width — 41.5"  
 Depth — 23.375"  
 Weight — 112 lbs.

## CIRCUIT DESCRIPTION

### SCHEMATIC 1

#### TONE GENERATOR

The tone generator consists of the Master Oscillator Q3, the Top Octave Synthesizer IC1, the IC Dividers IC2-9 and the Vibrato Oscillator Q1 and Q2. The Master Oscillator creates a high frequency signal which is applied to the Top Octave Synthesizer IC1. Here the signal is divided to create 13 specific octave frequencies which are applied to the IC Dividers where they are divided in half several times creating lower octave frequencies. These audio signals are then routed to various diode keying circuits.

#### Q1, Q2 VIBRATO OSCILLATOR

The Vibrato Oscillator develops a continual low frequency (6.3Hz) sine wave of sufficient amplitude to shift the frequency of the Master Oscillator high and low creating a vibrato effect. The oscillator output is applied to the master oscillator via the Vibrato tab.

#### Q3, IC3A, IC1, IC2 MASTER OSCILATOR, INVERTER AND TOP OCTAVE SYNTHESIZER

Q3 develops a continual high frequency (1MHz) signal which is inverted by IC3, frequency divided-by-two by IC2 and applied to the Top Octave Synthesizer IC1. Here the signal is divided simultaneously to produce thirteen specific audio frequency signals. These signals are connected to the Upper Keyboard Diode Keying circuits and also to the IC Dividers where the signals are divided several times to produce lower organ tones which are applied to the Upper and Lower Diode Keying circuits. The signal outputs are of a particular octave frequency and are shown boxed on Schematic 1. (The letter-number designation within these boxes refer to a specific octave frequency and should not be confused with a keyboard designation.)

#### IC2-9 FREQUENCY DIVIDERS

Audio signals from the TOS are applied to the IC Dividers where these signals are divided in half several times to create lower organ frequencies. A chart is provided on Schematic 1 giving the specific outputs of each divider. One section of IC2 is used to divide the Master Oscillator frequency by four and apply it to the Chord Function Generator. Another part of IC2 is used for the Pedal Divider.

### SCHEMATIC 2

#### UPPER DIODE KEYING, FLUTE,

#### REED/STRING QC

Audio signal from the Tone Generators (via the Upper Keyboard Diode Keying circuitry) is divided into groups of seven to eight notes each called Diode Keying groups. These groups are filtered individually by the upper keyboard Flute filters for each organ footage: 8 and 16. After filtering, the signal is collected and applied via the Flute tabs to the Flute Collector Amp IC3D where the signal is amplified before being applied to the Flute/String Output Preamp.

Audio signal from the Reed/String Collector lines is applied to Reed/String Collector Amps where the signal is amplified before being applied to voicing circuits where the various Reed/String voices are created. The Trombone and Clarinet voices are applied to the Output Preamp. The Cello and Lower Keyboard Reed/String voices are applied to the String Preamp.

#### Q4-Q15, IC3D FLUTE FILTERS, COLLECTOR AMP

The Flute Filters are low-pass filters. There are six filters for each Flute footage. Two are shown for each footage on Schematic 2. The filtered audio is then applied to 8 and 16 foot collector lines. Turning on a Flute tabswitch applies the Flute signal to the Flute Collector Amp IC3D. The upper and lower Flute signal is amplified and applied to the Flute/String Output Preamp.

#### IC4B&D REED/STRING COLLECTOR AMPS

Audio from the 8 and 16 foot Diode Keying Groups is combined through 4.7K resistors and routed to the 8 and 16 foot Reed/String Collector Amps IC4B&D. The outputs are mixed and applied to the Reed/String voicing circuits.

#### IC2A&B TROMBONE/CLARINET FILTER

Turning on the Trombone or Clarinet tabs removes ground from an audio path to the input of the Trombone/Clarinet Filter IC2A. The Clarinet voice is a 16-foot pitch. The Trombone voice is composed of 16- and 8-foot Reed/String signal. IC2A&B develops the tonal quality of the Trombone and Clarinet voices. The output of IC2B is applied to the output preamp.

## CIRCUIT DESCRIPTION

### IC3A STRING PREAMP

When the Cello tab is turned on, ground is removed from the Cello signal path and the signal is passed to the String Preamp IC3A. IC3A amplifies the Cello and Lower Keyboard R/S audio before it is applied to the Flute/String Output Preamp.

### IC3C FLUTE/STRING OUTPUT PREAMP

Audio signals from the Flute Collector Amp and the String Preamp are applied to IC3C where the signal is amplified before being applied to the Output Preamp.

### IC2D BASS FILTER

Audio signal from the Bass Frequency Divider is applied to the Bass Filter where it is voiced, amplified and filtered before being routed via the Bass Volume Control to the Output Preamp.

### IC2C OUTPUT PREAMP

Signals from the Flute/String Output Preamp, Rhythm Preamp, Bass Filter and Trombone/Clarinet Filter are amplified by IC2C before being applied to the Expression Pedal Photocell P1.

## SCHEMATIC 3

### LOWER REED/STRING QUALITY CONTROL

Lower keyboard audio signals are collected into a Diode Keying Group and applied to the Lower Reed/String Collector Amp. The Lower Reed/String signal is amplified and applied to the Lower Keyboard Modulator along with the Magic Chord R/S signal. The R/S signal is gated through the Lower Keyboard Modulator by pulses developed in the Rhythm Function Generator. The R/S signal is filtered and amplified before being routed through the lower Volume Control to the String Preamp.

### IC4A LOWER REED/STRING COLLECTOR AMP

Audio from the Lower Diode Keying Group is combined and routed to the Lower Reed/String Collector Amp. Here, the Lower Reed/String audio is amplified before being applied to the Lower Keyboard Modulator.

### IC1, Q1 LOWER KEYBOARD MODULATOR & EMITTER FOLLOWER

Audio signal from the Lower Keyboard R/S Collector Amp or the Chord Function Generator IC5 Pin 5 is applied to the input of Modulator IC1. Here the signal is amplified before being applied to the Emitter Follower Q1. Signal can only pass through the Modulator when a positive voltage is applied to Pin 5 from the Lower Keyboard Modulator Driver Q2. With no rhythm on, a steady positive voltage is applied to Pin 5 holding the Modulator on, allowing signal to pass through unmodulated. With a Rhythm Tabswitch on, positive voltage pulses are applied to Pin 5 from the Lower Keyboard Modulator Driver Q2, gating the signal through the Modulator at the speed (tempo) of the rhythm. With the Genie voices tab in the + Organ position a steady positive voltage will be applied to Pin 5 of IC1 allowing the signal to pass unmodulated. The signal is then applied to the Emitter Follower Q1 where it is transformed to a low impedance output signal before being applied to various voicing circuits and the Lower Keyboard Reed/String Preamp IC3B via the Lower Keyboard Tabswitches.

### Q3 PIANO FILTER

Audio signal from the Lower Keyboard Emitter Follower is applied to the Piano Filter where the signal is voiced before being applied to the Lower Keyboard Reed/String Preamp.

### IC3B LOWER KEYBOARD REED/STRING PREAMP

Turning on the Piano or Guitar tabs ungrounds an audio signal path which applies audio to IC3B. The signal is amplified then applied to the String Preamp.

## SCHEMATIC 4

### CHORD FUNCTION GENERATOR AND LOWER KEYBOARD DIODE KEYING

There are 44 Lower Keyboard Accompaniment keyswitches. Pressing an accompaniment key applies positive voltage to the anode of a Diode D2, allowing audio signal from the tone generators to pass to the Lower R/S Collector Amp IC4A. Turning on the Magic Genie Chord tabswitch disables the first twelve accompaniment keys (A1-G#1). With the Magic Chord tab on, the A2 accompaniment keyswitch becomes the 7th switch. Pressing the A2 keyswitch applies positive voltage to the 7th Enable IC1A which adds the 7th note to the Magic Genie Chord being played.

## CIRCUIT DESCRIPTION

### IC5 CHORD FUNCTION GENERATOR

The Chord Function Generator IC5 contains a keyboard scanning system, five programmable frequency generators and the required logic to provide four output features which are bass, chord, strum and arpeggio. **Note: Only the bass and chord features of the CFG are used.** The keyboard scanning system is capable of scanning 72 time points on a sequential basis. The scan matrix is partitioned in a 12 (X scan) by 6 (Y scan) array. Sequential pulses are outputted on the 12 'X' lines and a particular time point is active when one of the X lines is connected to one of the Y lines. The X scan outputs are normally high and go low when active. In the non-chord mode (Magic Genie Chord tab off) the bass feature is the only function that is enabled. In this mode of operation, bass signal is outputted from Pins 6 & 7 of the CFG. In the chord mode (Magic Genie Chord tab on) circuitry is enabled to add data bits. These bits correspond to the notes in the chord being played. For example, if a chord is being played there will be data bits at 3 of the 72 time points. If the A2 Key (which is the 7th switch) is pressed, a fourth data bit is added to the chord; pressing the minor footswitch shifts the data at one of the time points creating the minor of the chord being played. The minor and 7th of the chord reset with each new keydown. The strum, arpeggio and Boogie Woogie Bass functions of the CFG are not enabled and therefore not outputted from the CFG. The chord hold feature is latched in the on position. This enables the chord to continue to play after the Magic Chord key is released.

### CHORD FUNCTION MASTER OSCILLATOR

The oscillator input to the CFG is the Tone Generator Master Oscillator frequency divided by four. This 250KHz signal is applied to five programmable frequency generators via Pin 24 of the CFG IC5. The programmable generators are each capable of generating one of 12 frequencies, dependent on the address code provided them. These generators supply the audio signal for the bass in both the chord and non-chord mode of the CFG. The generators also supply the audio signal for the Magic Chords in the chord mode of the CFG. If the vibrato tab is on, the features that are outputted will have a vibrato effect.

### MAGIC GENIE CHORDS

There are 28 Lower Keyboard bass keyswitches. The first twelve of these are also Magic Chord keyswitches. Turning on the Magic Chord tabswitch performs four functions:

- 1) Pin 1 of IC2A is switched high. This electrically disconnects Pin 29 from Pin 21 of the CFG which places the CFG in the chord mode of operation.
- 2) The A1-G#1 DC keyswitches are disabled by removing the DC voltage from the A1-G#1 DC keying bus.
- 3) Positive voltage is applied to IC3D Pin 12 which electrically disconnects Pin 33 from Pin 20 of the CFG. This disables the A2 scan.
- 4) The A2 DC keyswitch is disabled. The A2 key now becomes the seventh switch. Pressing this key routes DC voltage to IC1A Pin 1 which adds the seventh component to the chord being played.

Pressing a Magic Chord keyswitch (A1-G#1) connects a Y scan line to an X scan line, causing data bits to appear at three CFG time points (four with seventh enabled). These data bits provide the address code for the programmable frequency generators, causing three (or four) audio frequencies that form a specific chord to be outputted at Pin 5 of the CFG. These audio signals are then applied to the Lower Keyboard Modulator.

**NOTE: In the Magic Chord mode of operation, only the highest chord being played will sound.**

### IC2A&C MAGIC CHORD ENABLE

When Pin 1 of IC2A is held low (Magic Chord tab off), IC2A appears as an inverter. Negative transitions of the CFG Pin 29 are inverted first by IC2A and then by IC2C and in effect connect the X scan output from Pin 29 to the Y scan line, Pin 21 of the CFG. Placing the Magic Chord tab in the on position ungrounds Pin 1 of IC2A which goes high. This locks Pin 3 low which holds IC2C Pin 10 high. The Y scan line does not feel the negative transition of the X scan line from Pin 29. This places the CFG in the Magic Chord Mode of operation.

### IC3C&D A2 SCAN DISABLE

When the Magic Chord tab is off, Pin 12 of IC3D is low. IC3D appears as an inverter. Negative transitions of the CFG Pin 33 are inverted first by IC3D and then by IC3C and in effect connect the X scan output from Pin 33 to the Y scan line, Pin 20 when the A2 key is pressed. Placing the Magic Chord tab to on applies positive voltage to IC3D Pin 12. This locks the output of IC3D low which holds Pin 10 of IC3C high. The Y scan line does not feel the negative transition of the X scan line from Pin 33. This disables the A2 scan.

## CIRCUIT DESCRIPTION

### 7TH & MINOR ENABLE

Normally, Pin 1 of IC1A is held low. IC1A appears as an inverter and its output at Pin 3 is the inverted input of the X scan line from Pin 26 of IC5. Negative transitions of the CFG Pin 26 are inverted first by IC1A and then by IC1D and in effect connect the X scan output from Pin 26 to the Y scan line, Pin 21 of the CFG. This is the condition of the CFG chip when the 7th component of the chord is not being played. To enable the 7th component to play the X & Y scan lines must be momentarily disconnected. This is accomplished by the following: Turning on the Magic Chord tabswitch connects the A2 accompaniment keyswitch to Pin 1 of IC1A. Pressing the A2 keyswitch at this time causes Pin 1 of IC1A to go high which in turn causes a low on Pin 3 and a high on Pin 11 of IC1D. With Pin 11 held high, the Y scan line from Pin 21 does not feel the negative transition of the X scan line from Pin 26. This deactivates the 7th time point and adds the 7th component to the chord being played.

The Minor Enable operates in the same manner, using the X scan output from Pin 27 of the CFG and Minor Enable IC1B&C. The minor is enabled by pressing the minor footswitch which is located to the right on the expression pedal. This applies a low to IC1C which is inverted and applied as a high to Pin 6 of IC1B. This holds Pin 4 of IC1B low and inhibits the negative transition of the X scan output from Pin 27 from reaching the Y scan line from Pin 21. This enables the minor function of the CFG.

### HIGH/LOW BASS

With the Magic Genie Chord tabswitch off, the only feature of the CFG chip that is outputted is the High/Low Bass. In this mode of operation, holding down two or more lower keyboard keyswitches (A1-C3) causes the following: audio signal corresponding to the highest note being played is outputted from Pin 6 of the CFG and audio signal corresponding to the lowest note being played is outputted from Pin 7 of the CFG. The High bass signal is routed to Pin 1 of the Genie Bass Select IC4A and the Low bass signal is routed to Pin 12 of IC4A. (See Genie Bass Keying.)

### ROOT/FIFTH BASS

With the Magic Genie Chord tabswitch on, the bass feature of the chip is in the Root/Fifth mode of operation. If a Magic Genie Chord (one-note chord) is held at this time, the audio signals at the bass root output (Pin 7) and bass 5th output (Pin 6) are the root and 5th components of the chord being played. The

5th bass signal is routed to Pin 1 of the Genie Bass Select IC4A and the Root Bass signal is routed to Pin 12 of IC4A. (See Genie Bass Keying.)

**NOTE: With the rhythm tabs turned off, only the Low/Root bass will be heard. [See Genie Bass Select.]**

### SCHEMATIC 5

#### PEDAL/GENIE BASS KEYING

The Bass notes can be keyed by the Bass Pedals (when the Genie String Bass tab is off) or by the Lower Keyboard when the Genie String Bass is on.

When a Bass pedal is pressed:

- 1) A pulse is developed across the .22 capacitor (connected to the C1 Pedal Switch through a 100 ohm resistor) causing the Pedal Cancel Trigger to operate.
- 2) A generator output Diode D7 is biased on, allowing tone generator signal to pass through Diodes D2, 15 and 16 to the base of the Pedal Collector Amp Q8.
- 3) A 10uf capacitor is charged, which holds Diode D7 on after the pedal has been released.
- 4) The Pedal Keyer conducts applying a positive voltage to the Pedal/Genie Keyer Emitter Follower causing the Emitter Follower to conduct which allows signal from the Pedal/Genie Divider to pass to the Bass Filter.

#### Q4 & Q5 PEDAL CANCEL TRIGGER

Pressing a pedal develops a pulse across the .22 capacitor connected through a 100 ohm resistor to the C1 Pedal Switch. This momentarily lowers the voltage on the base of Q4 turning it off. When Q4 turns off, it applies a positive voltage pulse to the base of Q5; this causes Q5 to turn on, momentarily grounding the Pedal Keying Line which discharges any previously charged 10uf pedal sustain capacitor. This turns off the signal path of the previously played pedal making sure that only the signal from the pedal being played enters the Pedal Divider. (If more than one signal at a time enters the Pedal Divider, rumble will occur.)

#### Q8, IC3B PEDAL COLLECTOR AMP, INVERTER

Audio signal from the Tone Generators is applied through Diodes D7, 2, 15 and 16 to the base of the Pedal Collector Amp each time a pedal is played. This signal is amplified and inverted before being applied to the Pedal/Genie Bass Enable IC4B.



## CIRCUIT DESCRIPTION

### IC4B PEDAL/GENIE BASS ENABLE

When the Genie String Bass tab is off, Pin 8 of IC4B is high and Pin 6 is low. This enables the Pedal audio signal at Pin 9 to pass through the internal AND and NOR gate and be outputted at Pin 4. Turning on the Genie String Bass tab applies Pin 6 high and grounds Pin 8. This will allow Genie Bass signal outputted from IC4A Pin 3 to pass through IC4B and be outputted at IC4B Pin 4. Audio signal outputted from IC4B Pin 4 is applied to the Pedal/Genie Divider.

### IC2 PEDAL/GENIE DIVIDER

Part of IC2 is used as the Pedal/Genie Divider. Audio signal is applied to the divider where it is divided in half. The output signal from the Pedal/Genie Divider is combined with the divider input frequency and passes to the Bass filter when the Pedal/Genie Keyer Emitter Follower Q6 conducts and turns on D9 and D7.

### Q7 PEDAL KEYER

Playing a bass pedal applies a positive voltage through a Diode D1 simultaneously to the Emitter and base of the Pedal Keyer Q7. This causes Q7 to conduct applying a positive voltage to the base of Pedal/Genie Keyer Emitter Follower Q6 when the Genie String Bass tab is off.

### Q6 PEDAL/GENIE KEYER EMITTER FOLLOWER

Positive voltage from the Pedal Keyer Q7 or the Genie Bass Keyer IC2D is applied to the base of Pedal/Genie Keyer Emitter Follower Q6. This causes Q6 to conduct applying a positive voltage to the anodes of D9 and D7, allowing signal from the input and output of the Pedal/Genie Divider to pass to the Bass Filter. The positive voltage applied to the base of Q6 also charges a .22uf capacitor which discharges through two resistors and D11 to ground on pedal release. If either the Pedal String Bass or Genie String Bass tab is on, ground is removed from D11. The capacitor now discharges onto the base of Q6 holding it on after the pedal is released. The signal from the Pedal/Genie Divider momentarily continues to pass to the Base Filter and gives a sustain effect to the Bass.

**NOTE:** The Genie String Bass will have a sustain effect only when the signal is gated by pulses from the Genie Bass Keyer when a rhythm is playing.

### IC4A GENIE BASS SELECT

The Genie Bass Select IC4A has as its inputs at Pins 1 and 12 the High/Fifth Bass and the Low/Root Bass from Pins 6 and 7 of the CFG IC5. With all rhythms off, Pin 13 of IC4A is held positive and Pin 2 is held low. This enables only the Low/Root Bass signal to be outputted from IC4A. Turning on a rhythm tab causes the inputs at Pins 2 and 13 to alternately switch high and low. The audio output at Pin 3 of IC4A will now be an alternating high low signal. When the Genie String Bass tab is pressed, Pin 6 of IC4 switches high. This enables the Genie Bass signal to pass to the Pedal/Genie Divider IC2 where the signal is divided in half. When the Pedal/Genie Keyer Emitter Follower Q6 conducts, D7 and 9 turn on passing the audio to the Bass Filter.

### IC2B&D GENIE BASS KEYER, GENIE BASS ENABLE

With the rhythm switches off, Pin 5 of IC2B is held high. This locks the output Pin 4 in a low state. Pin 13 of IC2D has a DC voltage applied to it. This holds Pin 11 low which is applied through the Genie String Bass switch to the Genie/Pedal Keyer Emitter Follower keeping it off. When a lower keyboard key is pressed, the normally high output at IC4A Pin 3 alternates high and low at the frequency of the bass signal. Diode D8 and the .1uf capacitor at Pin 13 of IC4B are used as a half wave rectifier. When audio is present at Pin 3 of IC4A, it is rectified and appears as a low at Pin 13 of IC2D. Because Pin 12 is low (due to the rhythm switches being off), Pin 11 now goes positive which causes Q6 to conduct. This applies a positive voltage to the anodes of D9 and D7, allowing the Genie Bass signal to pass to the Bass Filter.

Placing a rhythm switch on, applies a low from Inverter IC6C Pin 3 to Pin 5 of IC2B. At this time, Pin 6 of IC2B is also low. Pin 4 now goes positive which disables IC2D, locking Pin 11 low. Positive keying pulses from the Rhythm Function Generator IC7 Pin 19 are applied to IC2B Pin 6. Because Pin 5 is low, the positive pulse is inverted and outputted at Pin 4 as a low. If audio is being outputted from IC4A Pin 3, then IC2D Pin 13 will be low. This will result in a high being outputted from IC2D Pin 11 and will turn on Q6. The high on Pin 11 is fed back to IC2B Pin 6 through a .022uf capacitor as a positive pulse lengthening the keyer pulse.

## CIRCUIT DESCRIPTION

### SCHEMATIC 6

#### RHYTHM

##### IC6C&D CLOCK MULTIVIBRATOR

The Clock Multivibrator oscillates at a speed which is controllable from approximately 3.3 to 44Hz. The rectangular wave output is applied to the clock input of the Rhythm Function Generator (RFG) IC7.

##### IC7 RHYTHM FUNCTION GENERATOR

The Rhythm Function Generator (RFG) IC7 is the source of all Rhythm, Auto Bass and Lower Keyboard Modulator timing pulses. Pressing a Rhythm tabswitch applies a positive voltage to the RFG. This enables the logic sequence for the rhythm chosen. The Rhythm Select switch performs three functions:

- 1) It determines the Rhythm pattern that will be heard with a particular Rhythm by selecting the track that the logic sequence will follow.
- 2) It reduces the Clock Multivibrator speed for the Track A patterns by placing a .033uf capacitor in parallel with the .1uf feedback capacitor.
- 3) It provides a ground path for the capacitors located at the bases of the Brush and Cymbal Keyers to determine the Brush and Cymbal length.

The outputs of the RFG are positive pulses which are applied to the Instrumentation, Bass and Lower Keyboard Modulator circuits. The Track A patterns 1 through 3 are triplet rhythms (24 time points). Pattern A4 is a 3/4 rhythm (18 time points). All other rhythms are in 4/4 time (32 time points).

##### IC10 RHYTHM PATTERN ENABLES

To enable a rhythm pattern, positive voltage is applied via the Rhythm tabs to the Rhythm Function Generator. In the Track A or B position of the Rhythm Select switch, positive voltage is applied to inputs of IC10A and IC10B. The output (Pin 3) of IC10A will be high on Tracks B and C. Pressing the Rhythm 4 tab routes positive voltage to Pin 18 of IC7 on Track A and to Pin 17 on Tracks B and C. Pin 4 of IC10B will be high on Track C and low on Tracks A or B. In the Track C position, positive voltage is routed via the Rhythm 1 tab to IC7 Pin 11 and via the Rhythm 2 tab to IC7 Pin 12. On Tracks A or B the low output of IC10B is inverted by IC10D and applied to IC7 Pin 12 when the Rhythm 1 tab is pressed and to Pin 15 when the Rhythm 2 tab is pressed.

##### INSTRUMENTATION

The Instrumentation circuits produce the instrument voices for the rhythm. The generator circuits are tied together at their output and applied to the rhythm preamp where the voices are amplified and sent via the rhythm volume control to the output preamp.

##### IC8 and 10 RHYTHM GENERATORS

The Rhythm Generators are tuned resonant circuits. Positive pulses from the Rhythm Function Generator cause the circuits to generate short bursts of audio oscillation with diminishing amplitudes. The outputs of the Rhythm Generators are combined and applied to the Rhythm Preamp IC8A.

##### IC11 NOISE GENERATOR

The Noise Generator produces a random noise signal which is applied through Diode D38 to the cathodes of Diodes D42, 43 and 44. When either the Snare, Brush or Cymbal Keyer circuits operate, this signal is passed through D42, 43 or 44 to the Snare, Brush or Cymbal Voicing circuits.

##### Q15, 16, 17 SNARE KEYSER, SNARE VOICING

Positive pulses from Pin 5 of IC7 are applied to the Low Drum generator causing it to oscillate producing the Low Drum voice. This audio signal is routed to the Rhythm Preamp IC8A. Pin 5 also applies a positive pulse to the base of Q15, Snare Keyer, turning it on. This causes positive voltage to turn on Diode D42 which allows noise signal to pass to the Snare Voicing circuit Q16 and Q17 where it is voiced for proper tonality. The voiced noise signal at the output of Q17 combines with the Low Drum signal, creating the Snare Drum voice.

##### Q12, 13, 14 BRUSH KEYSER, BRUSH VOICING

Positive pulses from Pin 22 of IC7 are applied to the base of Q12, Brush Keyer, turning it on. This applies positive voltage to Diode D43 which now conducts allowing noise signal to pass to the Brush Voicing circuit. Here the signal is voiced for proper Brush tonality then applied to the Rhythm Preamp IC8A. With each positive pulse applied to Q12, a .22uf capacitor is charged. The length of the Brush tone is regulated by varying the discharge time of this capacitor. Depending on the position of the Rhythm Select switch, pressing a Rhythm tab connects a resistor to ground from the on contact of the Rhythm switch to the Brush Keying line at IC7 Pin 22. The value of this resistor regulates the discharge rate of the .22uf capacitor, thereby regulating the length of the Brush tone.

## CIRCUIT DESCRIPTION

### Q9, 10, 11 CYMBAL KEYER, CYMBAL VOICING

Positive pulses from Pin 21 of IC7 are applied to the base of Q9, Cymbal Keyer, turning it on. This applies positive voltage to Diode D44 which now conducts allowing noise signal to pass to the Cymbal Voicing circuit. Here the signal is voiced for proper Cymbal tonality then applied to the Rhythm Preamp IC8A. With each positive pulse applied to Q9, a .27uf capacitor is charged. The length of the Cymbal tone is regulated by varying the discharge time of this capacitor. Depending on the position of the Rhythm Select switch, pressing a Rhythm tab connects a resistor ground from the on contact of the Rhythm switch to the Cymbal Keying line at IC7 Pin 21. The value of this resistor regulates the discharge rate of the .27uf capacitor, thereby regulating the length of the Cymbal tone.

### IC6B LOW BASS ENABLE

With the Rhythm switches off, Pin 25 of IC7 is low. This low is applied to IC4A Pin 2 disabling the high bass and to IC6B Low Bass Enable. The low applied to IC6B is inverted to a high and applied to IC4A Pin 13. This enables only the low bass to play. (See Schematic 5.) When a rhythm is playing, Pin 25 of IC7 alternates high and low. When Pin 25 is positive the high bass signal will be outputted from IC4A.

Positive pulses are outputted from IC7 Pin 19. These pulses trigger the Genie Bass Enable Keyer circuit and gate the high-low bass signal to the Bass Filter. (See Schematic 5.) Refer to the Rhythm Patterns Diagram for the high-low pattern for specific rhythms.

### IC6A INVERTER

With the rhythm tabs off, the input to IC6A is low. This applies a high output to the Genie Bass Enable IC2B which locks its output low. Turning on any rhythm tab routes a positive voltage to the input of IC6A. The output of IC6A applies a low to IC2B enabling keying pulses from IC7 Pin 19 to reach the Genie Bass Keyer IC2D. (See Schematic 5.)

### Q2 LOWER KEYBOARD MODULATOR DRIVER

When the Genie Voices Normal/+ Organ tab is in the Normal (Off) position, positive voltage pulses from Pin 23 of IC7 are applied to the base of Lower Keyboard Modulator Driver Q2, causing it to turn on. When Q2 turns on it applies a positive voltage pulse to IC1 Pin 5 gating the Lower Keyboard

Reed/String signal through IC1 in a pattern determined by the rhythm selected. Pin 24 of IC7 is normally low. In this condition the lower keyboard audio has a staccato sound. For certain rhythm time points, Pin 24 goes positive, removing the discharge path for the .22uf capacitor at the base of Q2. This gives a sustain to the modulated audio. If no rhythm tabs are pressed, a steady positive voltage is applied from Inverter IC6A through D26 to the base of Q2. This holds IC1 on and allows the Lower Keyboard Reed/String signal to pass unmodulated.

In the +Organ position, the Genie Voices tab routes a steady positive voltage to Q2. This applies positive voltage to IC1 which allows the Lower Keyboard Reed/String signal to pass unmodulated.

## SCHEMATIC 7

### POWER SUPPLY & AMPLIFIER

#### POWER SUPPLY

AC line source voltage is converted into positive and negative DC supply voltages using Transformer T1 and Rectifier Diodes D1-6. Zener Diodes Z1 and Z2 regulate the voltage applied to Q8 and Q7, negative and positive regulators. Some of the voltage divider circuits are located on various boards throughout the organ. These circuits are shown enclosed in dotted lines with a note for their location. A 1-amp, Slo-Blo fuse is employed in the primary circuit of the power supply to prevent component damage in the event of a short circuit. Diodes D1 and D2 convert AC voltage to 55 Volts DC for the Power Amplifier.

#### AMPLIFIER

The function of the preamp is to boost the signal voltages to a point where they can be used by the Driver and Phase Splitter circuits. The Differential Preamp senses the signal at the output of the amplifier and controls it by regulating the signal input at the preamp. The Driver inverts the audio voltage and applies it to the Phase Splitter. The output transistors convert the audio voltages from the Phase Splitter into high-current, low-voltage output signal that is connected via the headphone jack to the speakers.

## ADJUSTMENTS

### BOARD C Schematic 1

#### VR1 VIBRATO SPEED ADJUSTMENT

Vibrato speed may be adjusted by using a small screwdriver. Proper speed is between 6-7 Hertz. The Vibrato Oscillator will not oscillate if adjustment is extreme.

#### L2 TUNING COIL ADJUSTMENT

This adjustment is carefully set at the factory. Should tuning be necessary, it is suggested a tuning fork for a certain note be used (C for example). By holding down a key (C for example), adjust the tuning coil with a non-metallic screwdriver until no roll or beat is heard between the organ note and fork tone. When this note is properly tuned, the TOS tuning is automatically locked in.

### BOARD B Schematic 3

#### VR2 LOWER KEYBOARD MODULATOR THUMP ADJUSTMENT

The Modulator length is factory-set by component values. The purpose of the Lower Keyboard Modulator Thump Adjustment is to eliminate any DC transient (thump) that may occur when playing the Lower Keyboard Reed/String voices. To adjust, turn on any rhythm and an accompaniment tabswitch (Piano, Guitar), set rhythm volume at minimum and expression shoe at maximum. Turn adjustment until minimum thump is heard. If thump level cannot be reduced satisfactorily by adjustment, then replace Modulator IC.

### VR1 CHORD LEVEL ADJUSTMENT

With the Magic Chord tab off, hold a 3-note left-hand chord; switch the Magic Chord tab on and hold the same chord, but as a Genie one-note chord. Adjust VR1 until the volume level of the chord is the same with the Magic Chord tab on or off.

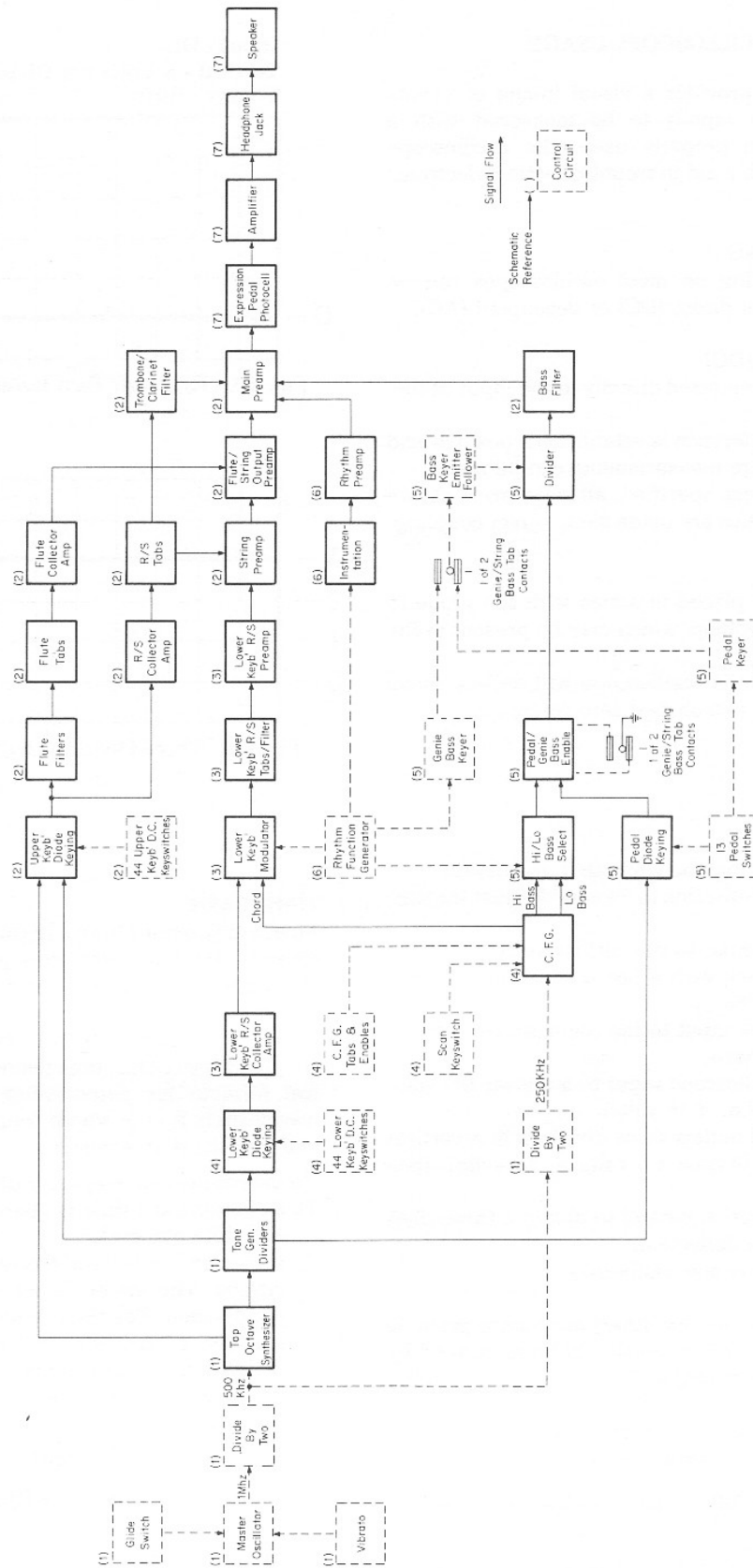
### BOARD E Schematic 7

#### AMPLIFIER BIAS ADJUSTMENT

[To be performed after replacement of amplifier components.]

- 1) Unplug organ, remove back and expose the component side of the Power Supply/Amplifier chassis.
- 2) Remove the 3-amp fuse located on the Amplifier Board.
- 3) Connect a milliammeter to the fuse posts (positive lead to +55 volts, negative lead to collector of Q10).
- 5) Turn on power and allow Power Supply to stabilize.
- 6) Current should read between 20 and 30 mA.
- 7) If adjustment is necessary, turn off power and remove the factory-tailored resistor.
- 8) Connect a variable resistor (decade box, potentiometer, resistor substitution box, etc.) to the wire wrap pins. The initial value should be approximately 10K ohms.
- 9) Turn on power and allow power supply to stabilize.
- 10) Adjust variable resistor for a current reading of 25mA.
- 11) Turn off power and solder proper resistor to wire wrap pins.
- 12) Turn on power and recheck current.
- 13) Turn off power, remove milliammeter leads, insert fuse.

# AUDIO SIGNAL FLOW BLOCK DIAGRAM



## TEST EQUIPMENT

### OSCILLOSCOPE USAGE

An oscilloscope provides a visual image of events which occur too rapidly to be measured with a voltmeter. When properly used, the oscilloscope becomes a valuable aid in troubleshooting electronic organs.

#### INPUT COUPLING

The input coupling on most oscilloscopes can be switched between direct (DC) or decoupled (AC).

##### Direct Coupling [DC]

1. The probe is connected directly to the input of the oscilloscope.
2. Once a zero reference is established, positive and negative voltage measurements can be made.
3. Unless otherwise specified, all waveforms shown on the schematics are made using direct coupling.

##### Decoupled [AC]

1. A capacitor is placed in series with the probe to block any DC voltage which may be present in the AC signal.
2. The image on the oscilloscope will deflect above and below the established zero reference.

### CALIBRATION

Any oscilloscope may be calibrated as follows:

1. Set vertical deflection to 5 volts/division (or similar range).
2. Ground the input to the oscilloscope.
3. Align the trace with a horizontal graticule (see Fig. 6A).
4. Unground the input to the oscilloscope, trace should not move.
5. Connect oscilloscope input to a known DC voltage source (i.e. +15 volts).
6. Trace should deflect three divisions in a vertical direction [3 division x 5 volts = 15 volts]. (See Fig. 6B.)
7. Adjust calibration control to obtain a three division (15 volt) deflection.
8. Oscilloscope is now calibrated.

**NOTE:** If a ten-to-one (or other) attenuator probe is used, the vertical deflection should be multiplied by ten (or other). For example: With a ten-to-one probe, the vertical deflection would have to be set to .5 volts per division to obtain a three division deflection when measuring a 15 volt source.

$$.5V \times 3 \text{ Div.} = 1.5V \quad 1.5V \times 10 \text{ atten.} = 15V$$

Input - DC  
Vertical - 5 Volts per Division  
Trigger - Auto

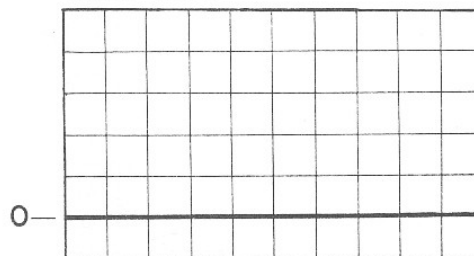


Fig. 6A - Establish Zero Reference

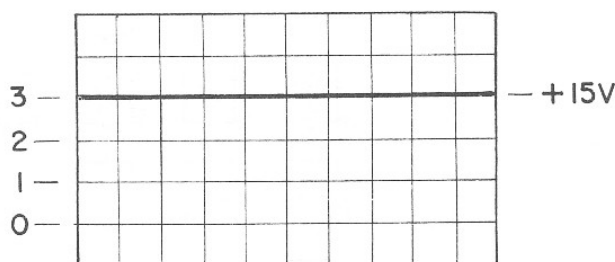


Fig. 6B - Three Division Deflection

### TIME BASE

Most oscilloscopes have a horizontal time base which controls the movement (sweep) of the trace across the screen from a few seconds to several microseconds.

Frequency and time are inverse functions. As frequency increases, time decreases. The mathematical formula for determining the frequency of a waveform is  $F = \frac{1}{t}$  where frequency (F) is in cycles and time (t) is in seconds.

To determine the frequency of a waveform:

- 1) Determine the time it takes for the waveform to complete one cycle.
- 2) In Figure 7, a cycle of the waveform takes five divisions. The sweep is set for 200 microseconds per division. The time required for a single cycle is  $200\mu S \times 5$  divisions or 1000 microseconds = 1 millisecond = .001 second.
- 3) Using the formula  $F = \frac{1}{t}$ , the frequency of the waveform is:

$$F = \frac{1}{.001}$$

$$F = 1000\text{Hz}$$

## TEST EQUIPMENT

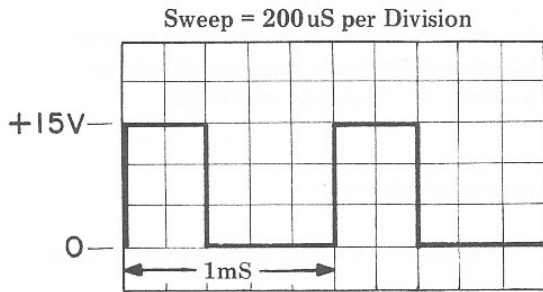


Fig. 7 - Determining Frequency

When observing a waveform, at least two cycles (repetitions) should be observed. This ensures that all of the event (i.e. serial data) is observed. Figure 8A shows a waveform observed with a 20 millisecond per division sweep. When the sweep is decreased to 100 milliseconds per division, two complete serial data cycles can be seen (see Fig. 8B). The sweep may now be increased to display the best image of the event.

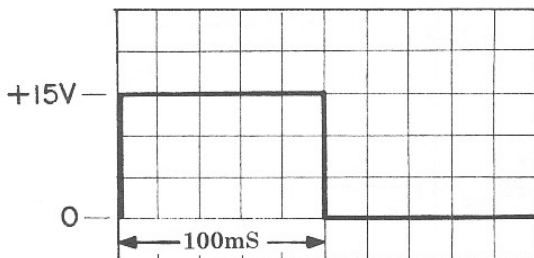


Fig. 8A - Serial data observed with 20mS per Division sweep

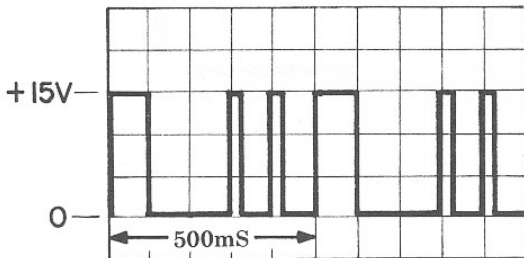


Fig. 8B - Serial data observed with 100mS per Division sweep

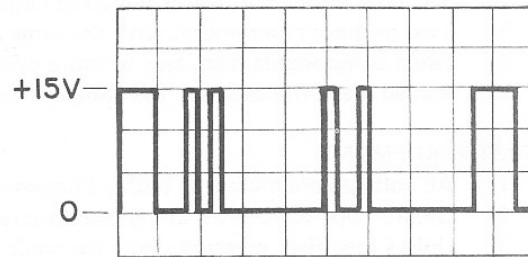


Fig. 9A - Internally Triggered Data

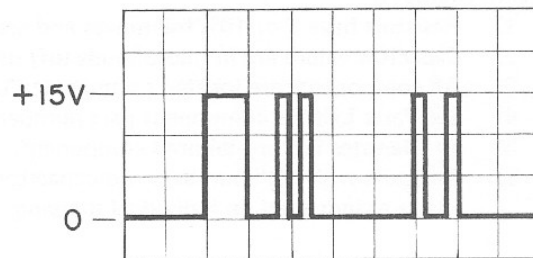


Fig. 9B - Externally Triggered Data

### TRIGGERING

Some oscilloscopes have triggered sweep. There are two common types of triggered sweep. Internal triggering relies on the positive or negative going edge of the waveform to start the sweep. The trigger level is controlled by a potentiometer which will cause the sweep to start at the selected voltage level. External triggering is most useful for observing events which occur in a specific relationship to time. Serial data from the Chord Function Generator or Flute Encoder would be an example. Figure 9A shows data being triggered internally. As data bits are added or subtracted from the serial data stream, the image on the oscilloscope will shift dependent on the first data bit (farthest left) used for triggering. The pattern in Figure 9B is externally triggered using the positive edge of the T1 time frame. As data bits are added or subtracted, they will always appear in the same position with respect to the triggering source.

## IMPORTANT INFORMATION

### SCHEMATIC DRAWINGS, PRINTED WIRING BOARDS

- 1) The numbering on each printed wiring board begins with Q1, IC1 and D1.
- 2) Board locations are clearly shown in large letters.
- 3) Two or more components with the same reference number may be drawn on the same schematic.
- 4) When components from two or more printed wiring boards are drawn on the same schematic, shaded areas will separate the components and their location will be clearly identified.

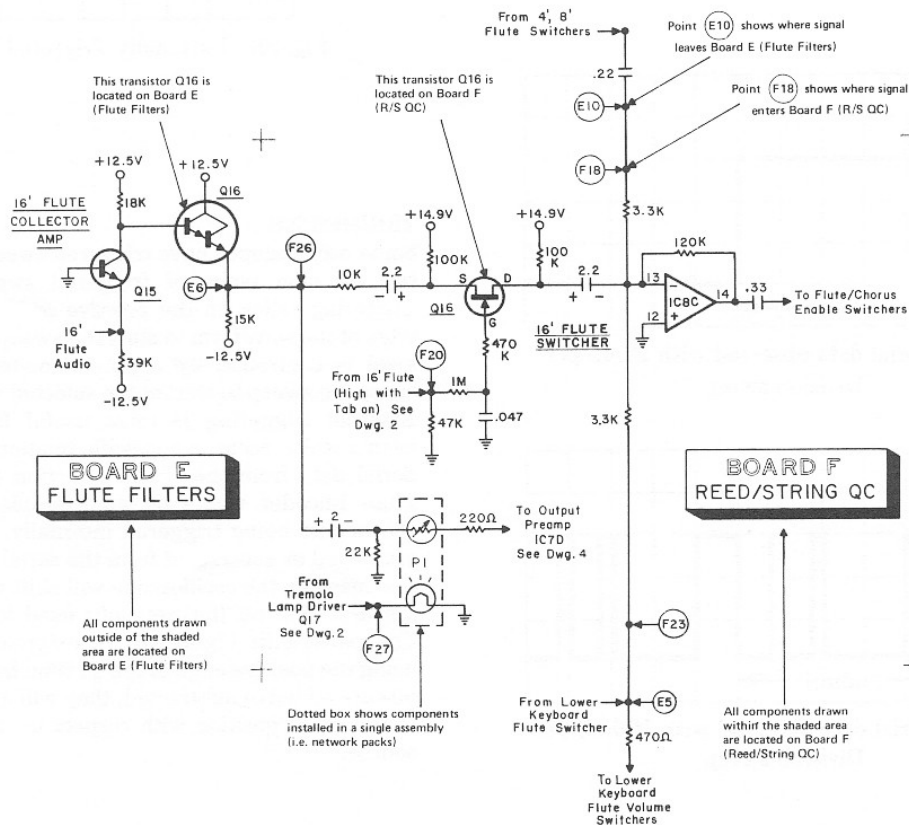
### TEST EQUIPMENT

- 1) All voltages are measured with a Simpson 260 VOM to ground reference.
- 2) Oscilloscope waveforms are approximations.
- 3) Unless specified, measurements are made with keyswitches, tabswitches and pushbutton switches in the "off" position and controls at minimum.

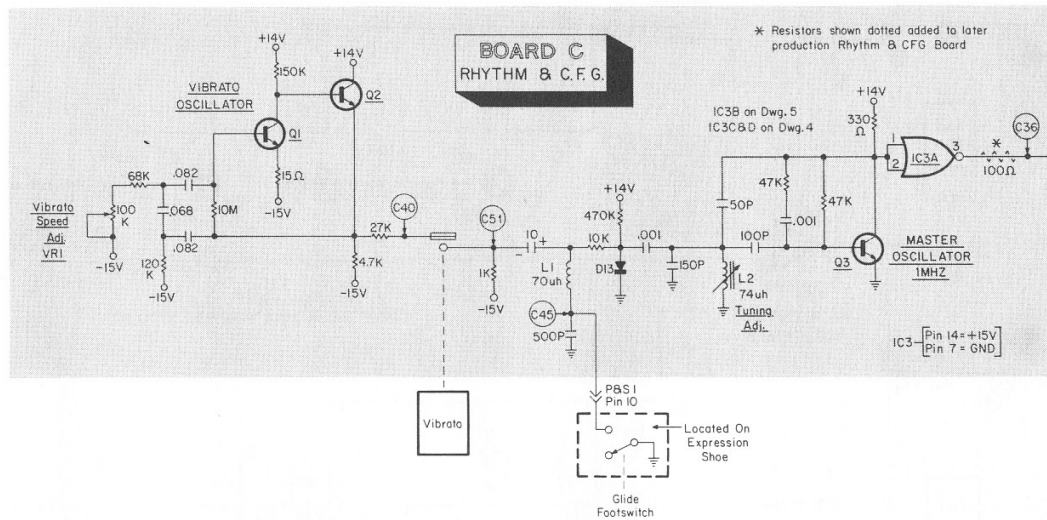
NOTE: Actual voltages and waveshapes will vary depending on the accuracy of your test equipment, loading, component tolerances, power supply voltages and other variables.

### COMPONENTS

- 1) Resistors have 5 or 10% tolerances and are rated at 1/4 or 1/2 watt unless otherwise specified.
- 2) Capacitor values are in microfarads (uf) unless otherwise specified.
- 3) All components are located on indicated boards unless specified.
- 4) See Parts List for component part numbers.
- 5) ✚ Denotes factory-tailored component.
- 6) Resistors with "R" numbers and capacitors with "C" numbers are located in networks or listed in charts as indicated on individual drawings.

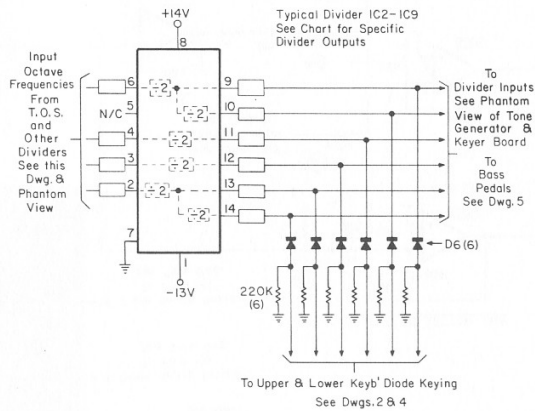
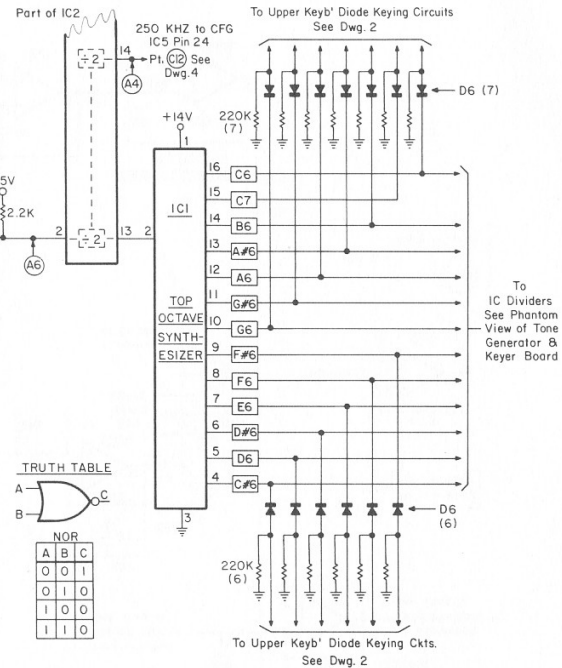






IC DIVIDER FREQUENCY OUTPUTS

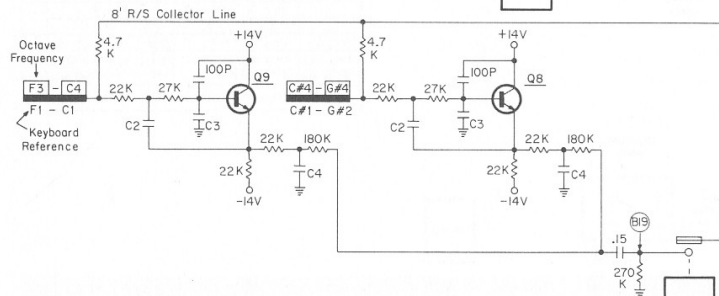
Note	1st Octave Frequency		1st Divider Oct. Freq.		2nd Divider Oct. Freq.		3rd Divider Oct. Freq.		4th Divider Oct. Freq.	
	IC	PIN	IC	PIN	IC	PIN	IC	PIN	IC	PIN
C	C6	8	C5	9	C4	10	C3	11		
C#	C#6	4	C#5	12	C#4	13	C#3	14		
D	D6	5	D5	12	D4	13	D3	14		
D#	D#6	3	D#5	13	D#4	14	D#3	12		
E	E6	7	E5	11	E4	9	E3	10		
F	F6	8	F5	12	F4	13	F3	14	F2	9
F#	F#6	9	F#5	4	F#4	10	F#3	11	F#2	12
G	G6	10	G5	9	G4	10	G3	13	G2	14
G#	G#6	11	G#5	11	G#4	12	G#3	13	G#2	14
A	A6	12	A5	9	A4	11	A3	12	A2	14
A#	A#6	13	A#5	7	A#4	10	A#3	13	A#2	14
B	B6	14	B5	7	B4	12	B3	13	B2	14



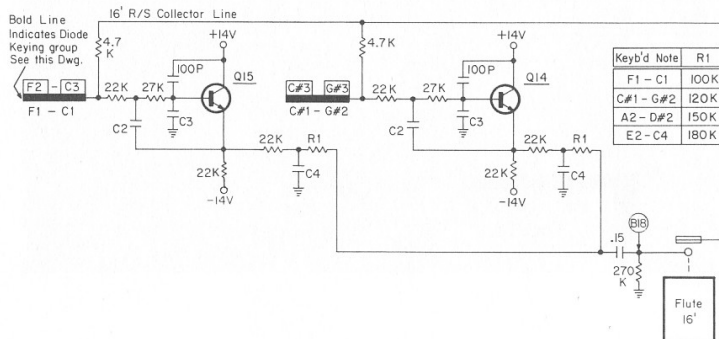
**BOARD A  
TONE GEN. & KEYS**

UPPER KEYB' FLUTE FILTER CHART						
Footage	Keyb' Note	Octave Freq.	Filter	C2	C3	C4
8'	F1 - C1	F3 - C4	Q9	.1	.0047	.082
	C#1 - G#2	C#4 - G#4	Q8	.068	.0022	.056
	A2 - D#2	A4 - D#4	Q7	.039	.0022	.033
	E2 - A#3	E5 - A#5	Q6	.027	.0015	.022
	B3 - F4	B5 - F6	Q5	.022	.001	.015
	F#4 - C4	F#6 - C7	Q4	.012	.560P	.01
16'	F1 - C1	F2 - C3	Q15	.18	.01	.15
	C#1 - G#2	C#3 - G#3	Q14	.15	.0047	.1
	A2 - D#2	A3 - D#4	Q13	.082	.0039	.056
	E2 - A#3	E4 - A#4	Q12	.047	.0027	.039
	B3 - F4	B4 - F5	Q11	.039	.0022	.022
	F#4 - C4	F#5 - C6	Q10	.027	.0012	.022

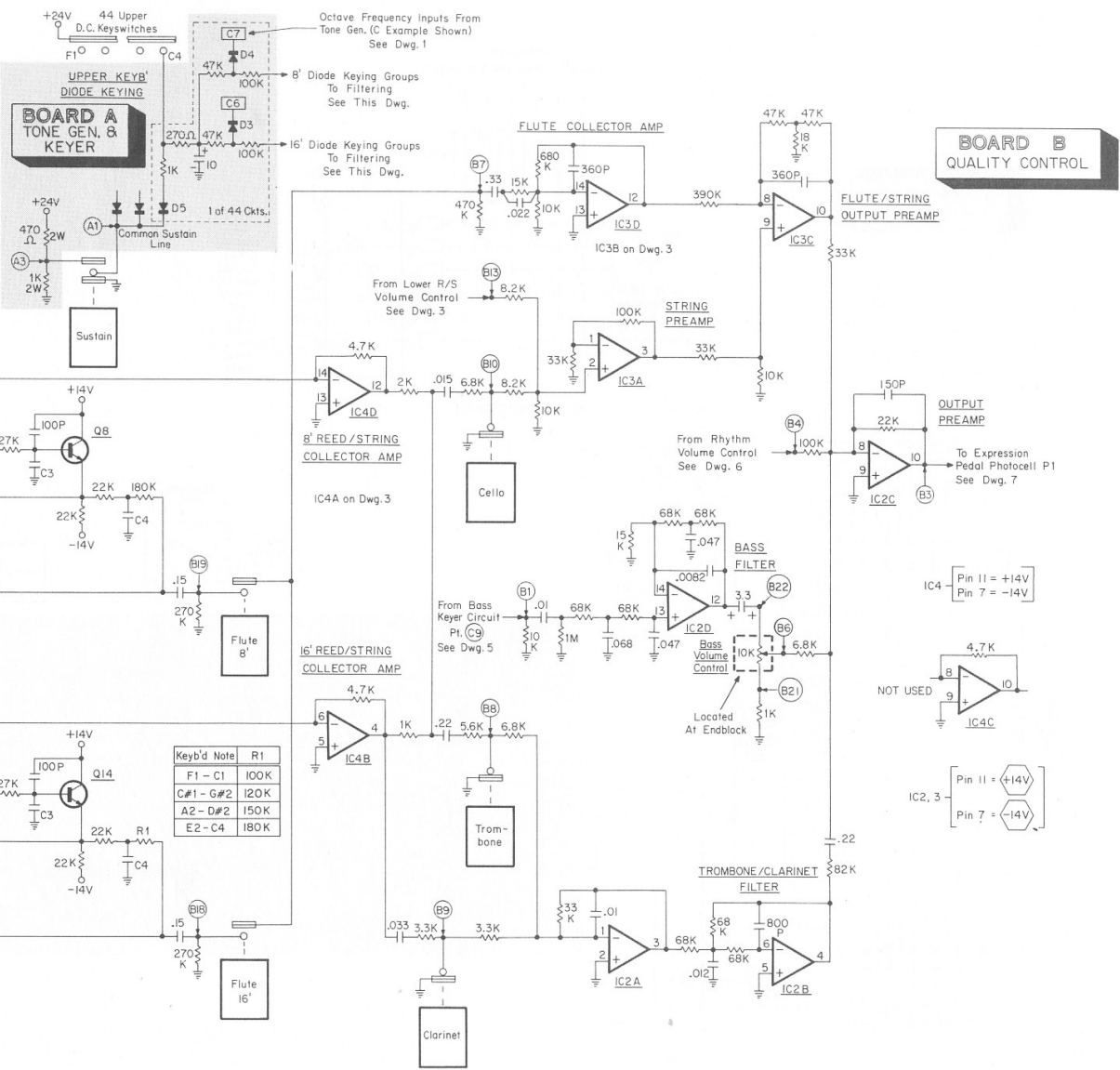
8' FLUTE FILTERS & DIODE KEYING GROUPS  
(Two of Six Typical Filters Shown)



16' FLUTE FILTERS & DIODE KEYING GROUPS  
(Two of Six Typical Filters Shown)



Keyb'd Note	R1
F1 - C1	100K
C#1 - G#2	120K
A2 - D#2	150K
E2 - C4	180K

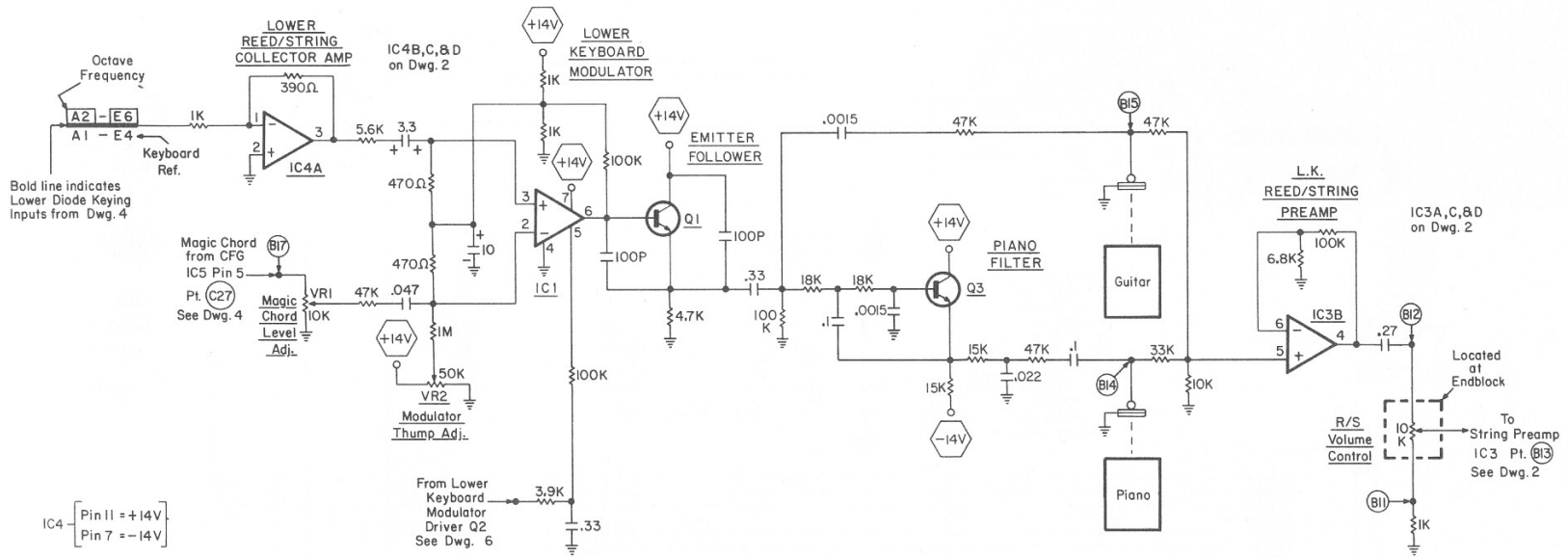


**BOARD B**  
QUALITY CONTROL

IC4 [Pin 11 = +14V  
Pin 7 = -14V]

NOT USED

IC2, 3 [Pin 11 = +14V  
Pin 7 = -14V]

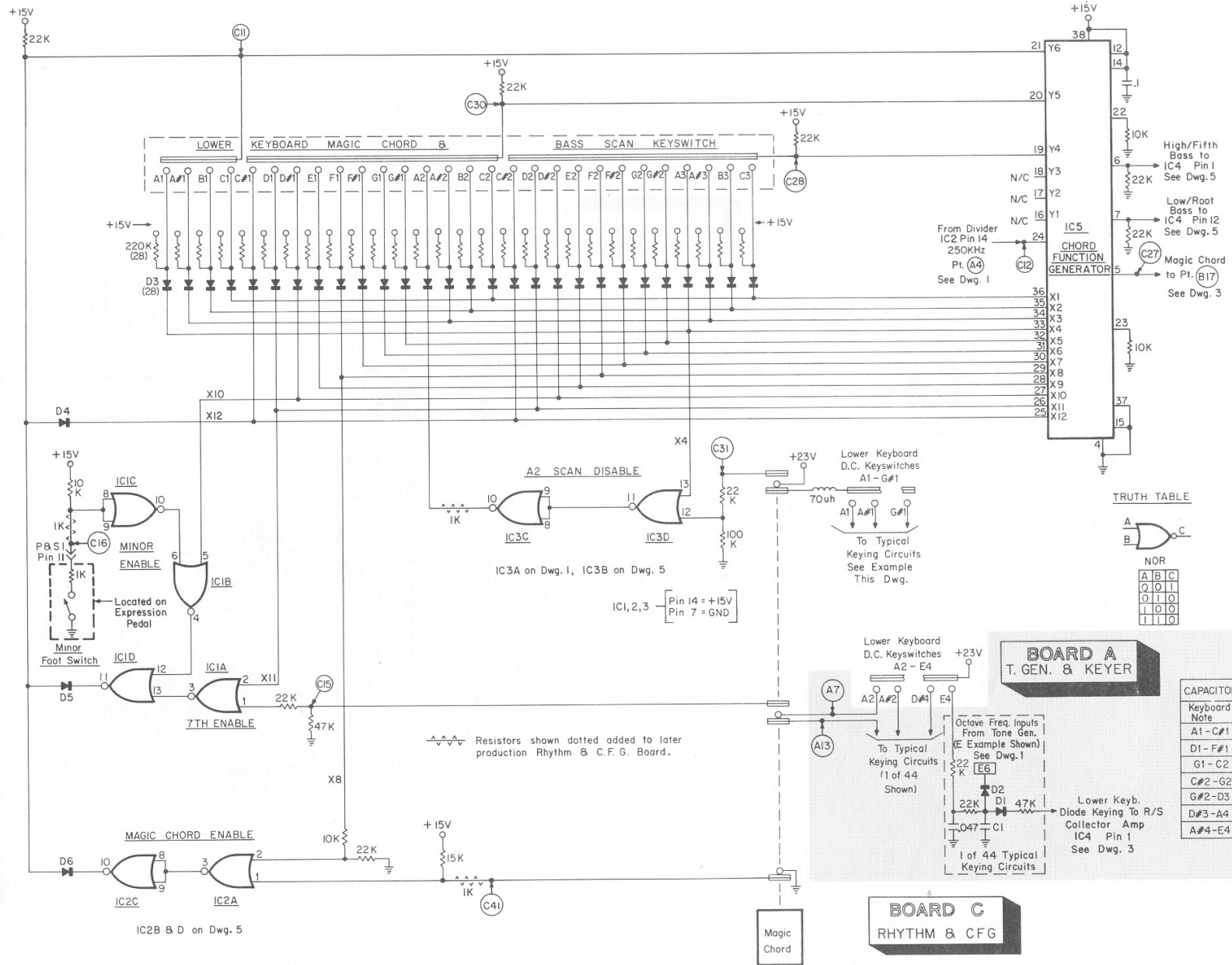


IC4 - [ Pin 11 = +14V  
Pin 7 = -14V ]

IC3 - [ Pin 11 = +14V  
Pin 7 = -14V ]

**BOARD B**  
QUALITY CONTROL

17



TRUTH TABLE

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

NOR

CAPACITOR	SELECT
Keyboard Note	C1
A1 - C#1	.068
D1 - F#1	.047
G1 - C2	.033
C#2 - G2	.022
G#2 - D3	.01
D#3 - A4	.0068
A#4 - E4	.0033

Resistors shown dotted added to later production Rhythm & C.F.G. Board.

IC2B & D on Dwg. 5

IC3A on Dwg. 1, IC3B on Dwg. 5

IC1, 2, 3 [Pin 14 - +15V  
Pin 7 - GND]

BOARD C  
RHYTHM & CFG

BOARD A  
T. GEN. & KEYER

Lower Keyb. Diode Keying To R/S  
Collector Amp  
IC4 Pin 1  
See Dwg. 3

From Divider  
IC2 Pin 14  
250KHz  
Pt. (A4)  
See Dwg. 1

High/Fifth Bass to IC4 Pin 1  
See Dwg. 5

Low/Root Bass to IC4 Pin 12  
See Dwg. 5

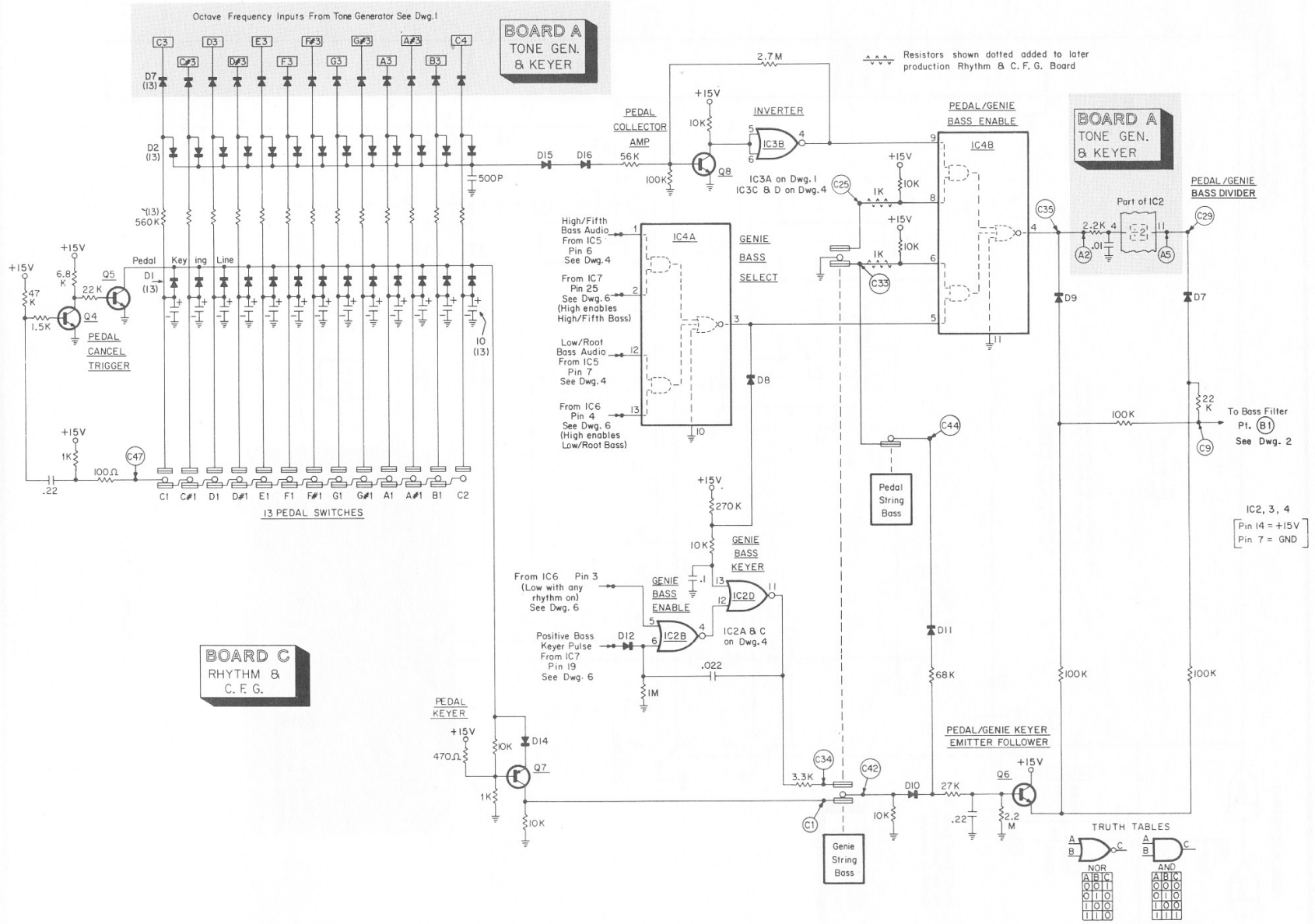
Magic Chord to Pt. (B17)  
See Dwg. 3

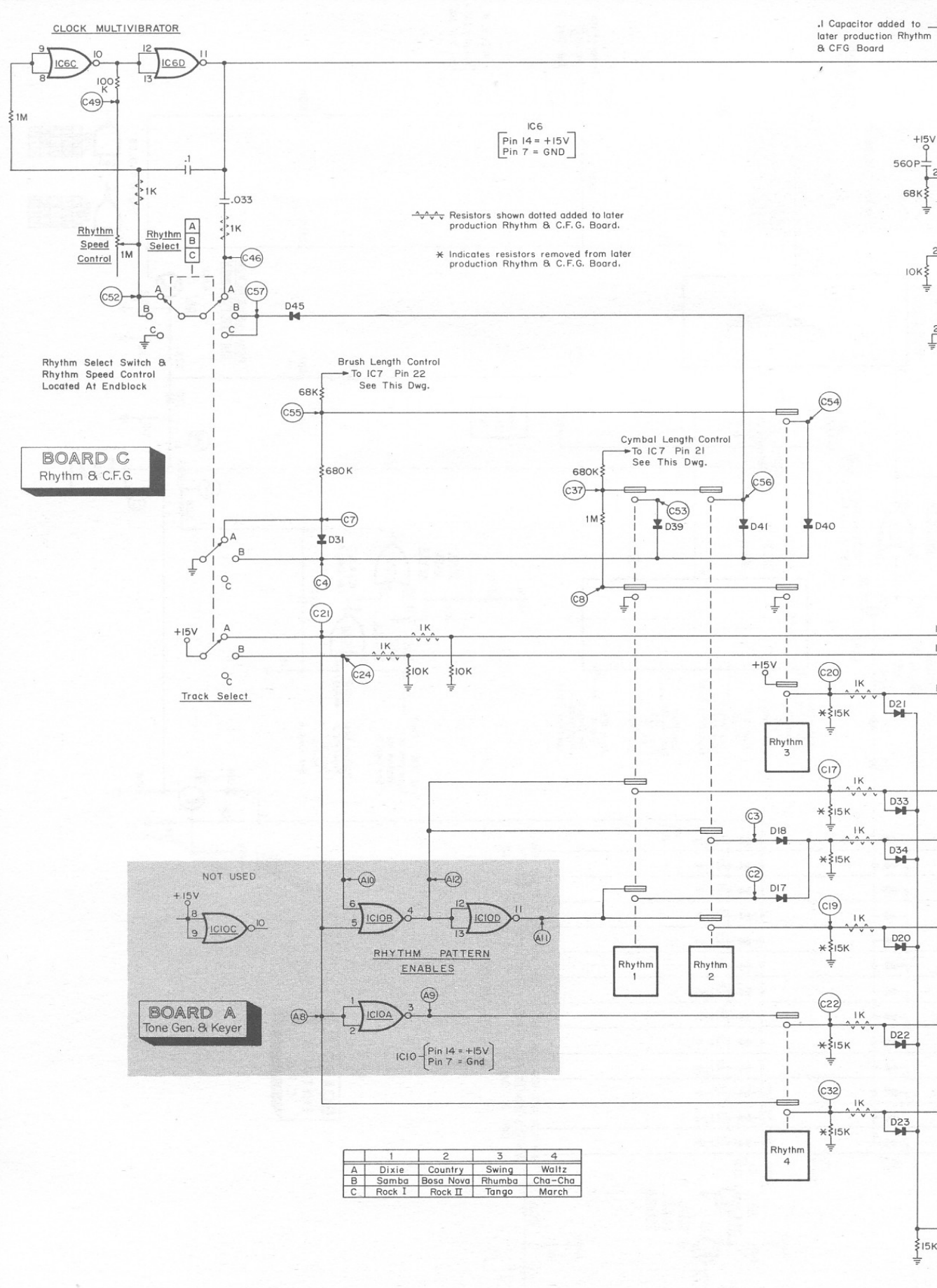
Lower Keyboard D.C. Keyswitches  
A1 - G#1  
To Typical Keying Circuits  
See Example This Dwg.

Octave Freq. Inputs From Tone Gen. (E Example Shown)  
See Dwg. 1

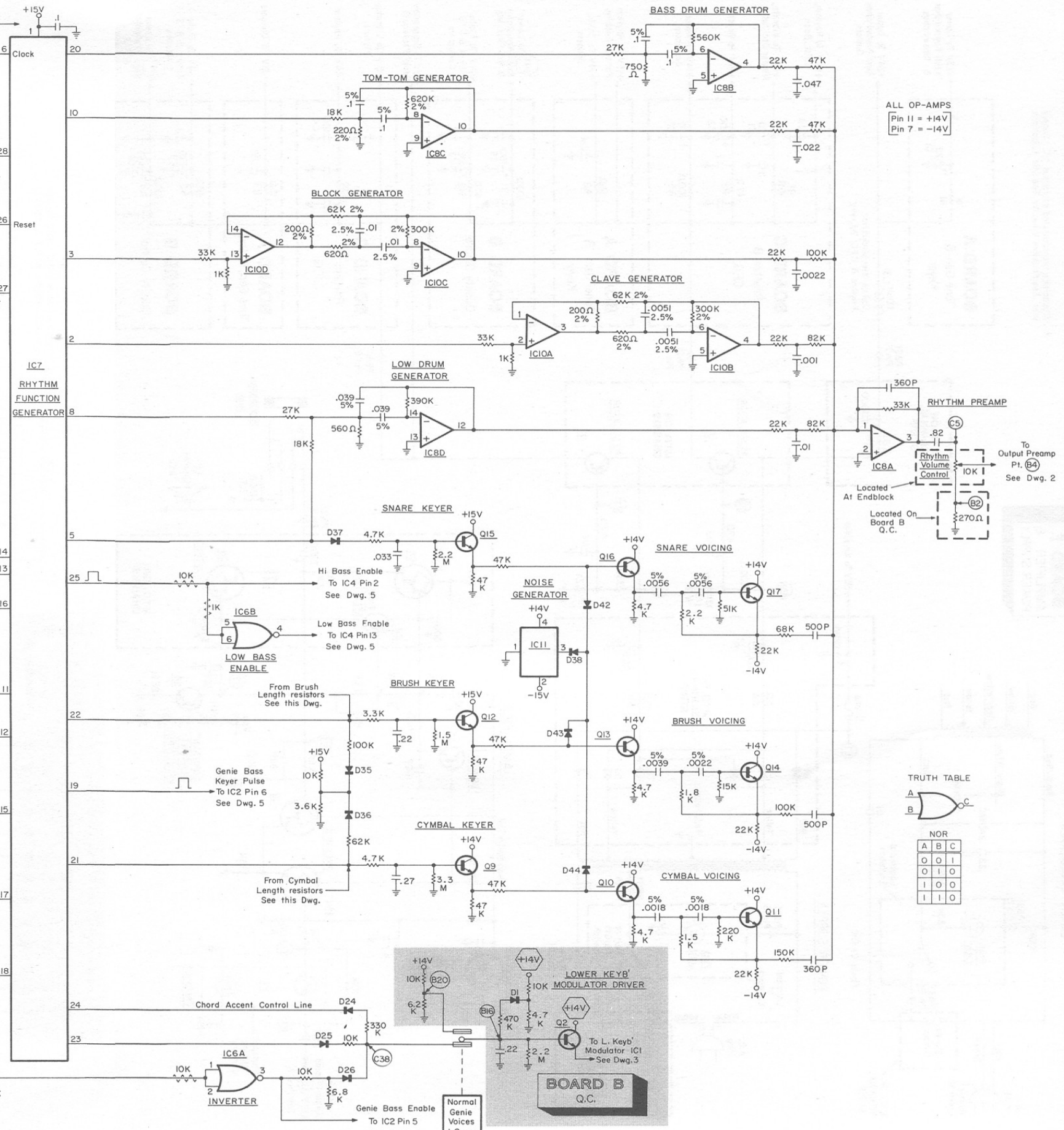
To Typical Keying Circuits  
1 of 44 Shown

Magic Chord





	1	2	3	4
A	Dixie	Country	Swing	Waltz
B	Samba	Basa Nava	Rhumba	Cha-Cha
C	Rock I	Rock II	Tango	March



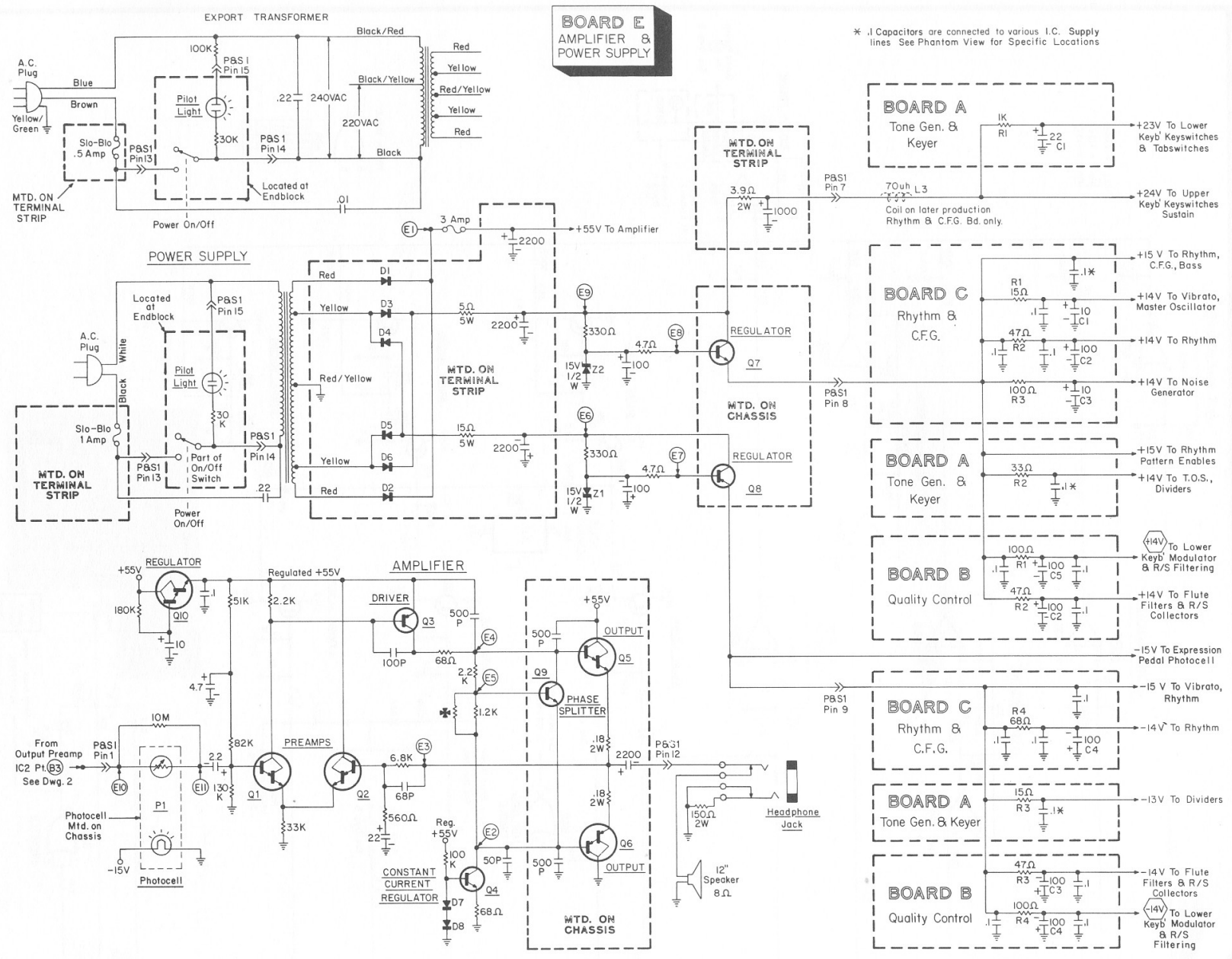
**TRUTH TABLE**

A NOR B

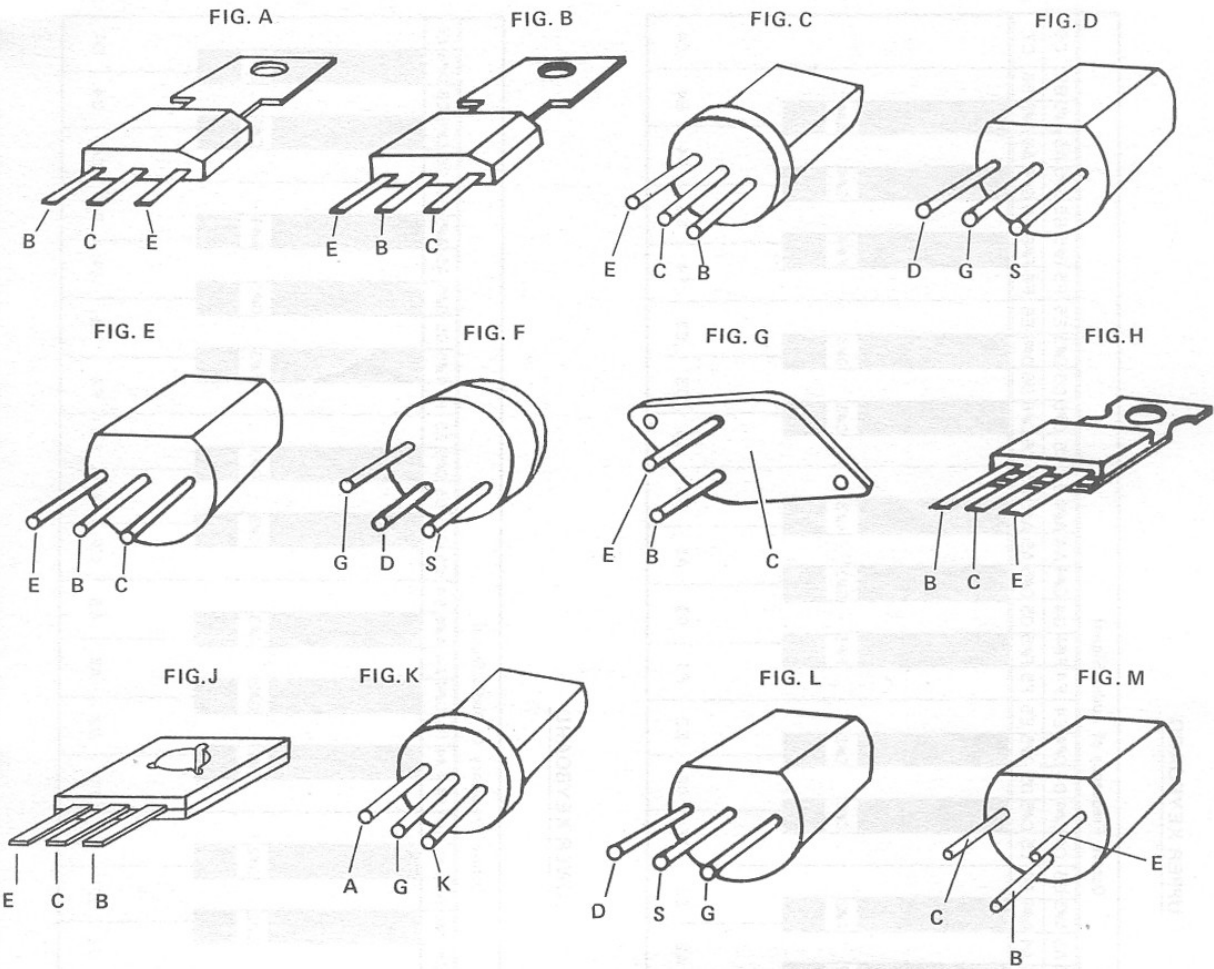
A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

**BOARD E**  
AMPLIFIER & POWER SUPPLY

\* .1 Capacitors are connected to various I.C. Supply lines See Phantom View for Specific Locations



## TRANSISTOR BASING DIAGRAM

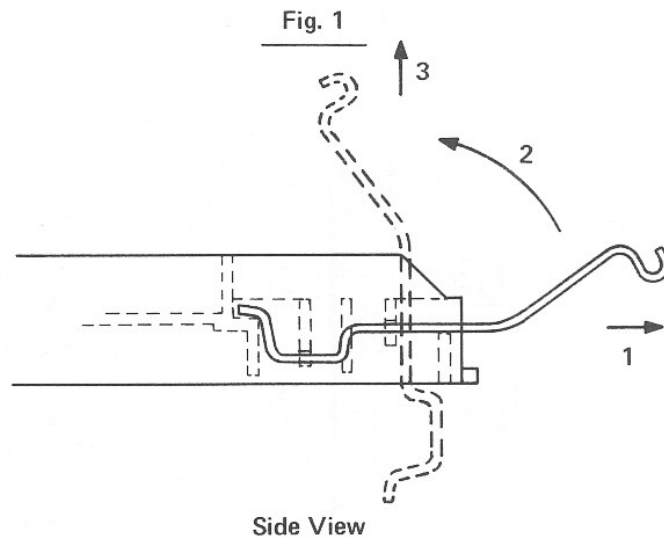


PART NUMBER	FIGURE	PART NUMBER	FIGURE	PART NUMBER	FIGURE	PART NUMBER	FIGURE
992-001192	G	991-012328	F	991-016727	C	992-024185	G
991-002232	C	991-012396	F	991-016788	C	991-024184	C
991-002271	G	991-012686	F	992-017169	G	991-025535	E or M
991-002298	C	992-013170	A	991-017456	F	991-026039	G
991-002356	C	991-013543	C	991-018238	C	991-026040	G
991-002873	C	991-013544	C	991-018047	E	991-026028	G
991-002888	C	991-013599	C	991-018237	B	991-026054	C
992-003139	G	991-015000	A	991-018493	E	991-026617	C
991-003304	C	991-015001	A	992-020432	G	991-026315	C
991-008393	C	991-015062	A	991-020425	H	991-028269	L
991-008394	C	991-015063	A	991-020426	H	991-028691	C
992-008890	G	991-015316	K	992-022201	G		
991-010098	C	991-015587	C	991-021451	J		
991-010462	C	991-015614	C	991-021450	J		
991-011576	D	991-015663	C	992-022773	G		
991-011706	D	991-016274	C	991-022774	L		



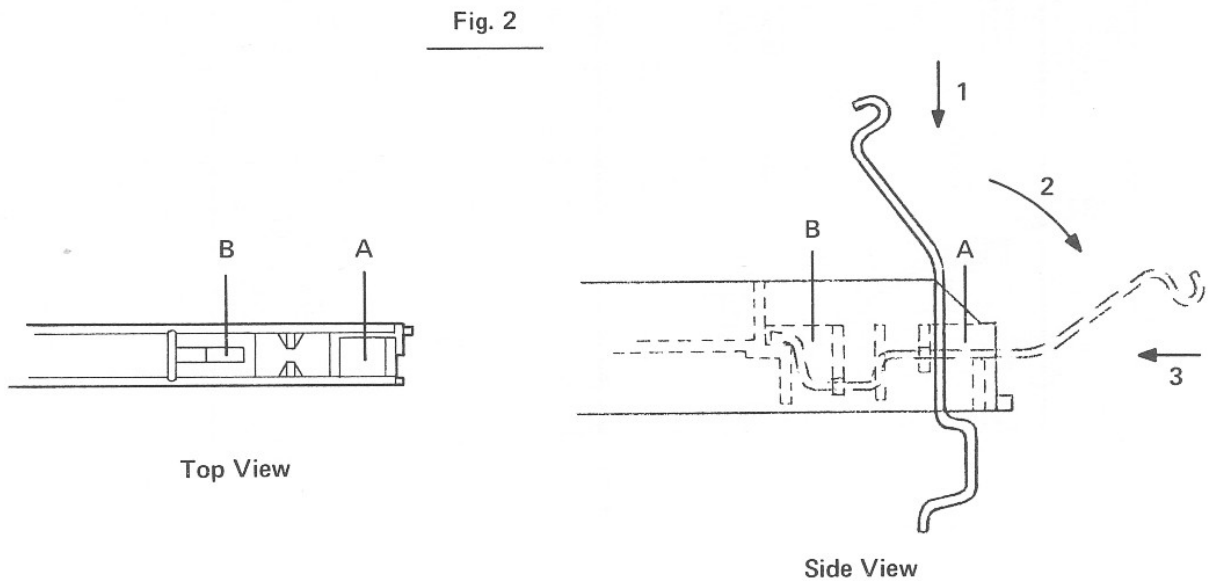


## KEYSWITCH ACTUATOR REPLACEMENT



To remove wire actuator

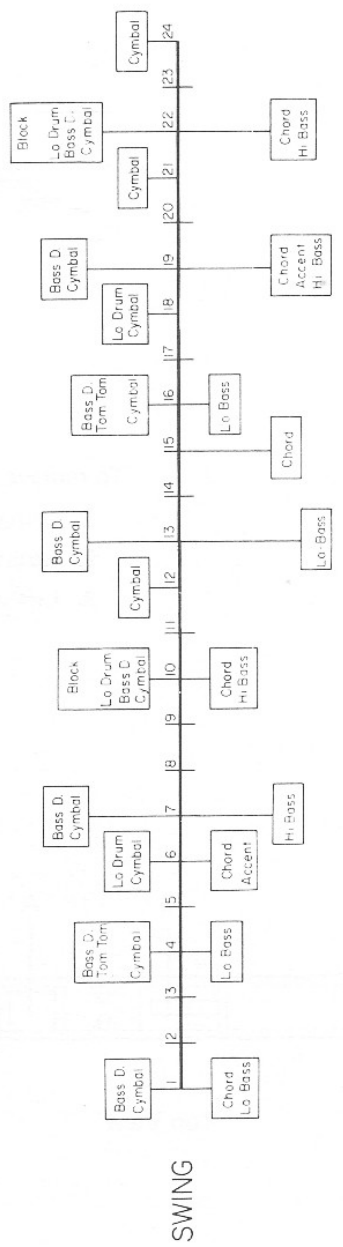
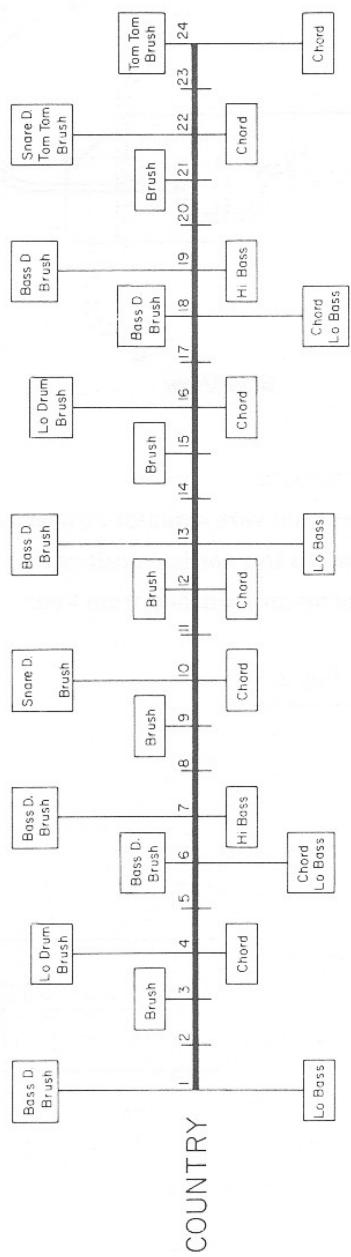
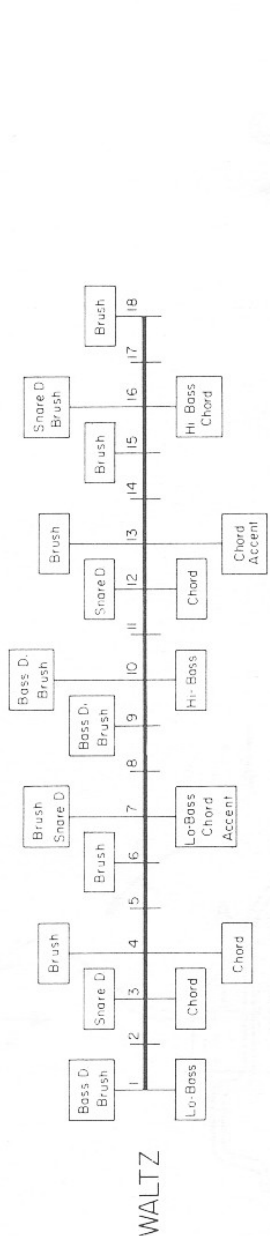
1. Using pliers, pull wire actuator outward until it stops.
2. Rotate upward to a vertical position.
3. Lift wire actuator vertically from key.



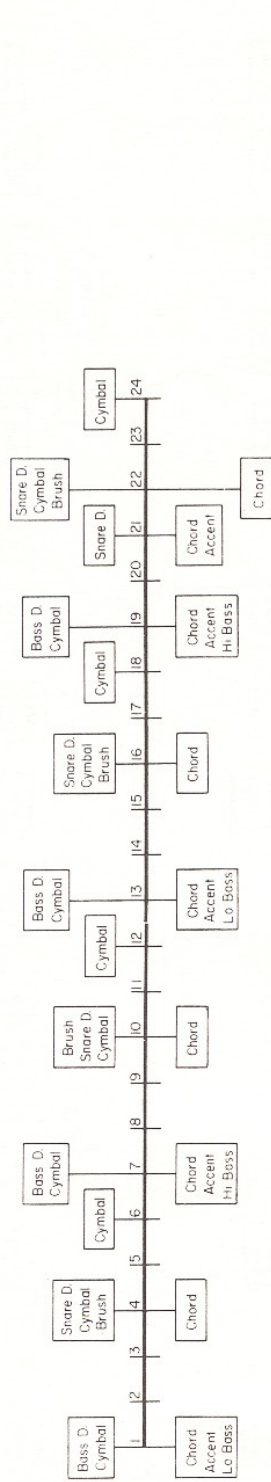
To replace wire actuator

1. Holding hooked end, insert wire actuator vertically into opening A.
2. Rotate downward so that straight end positions into Slot B.
3. Using pliers, push wire actuator inward until it stops.

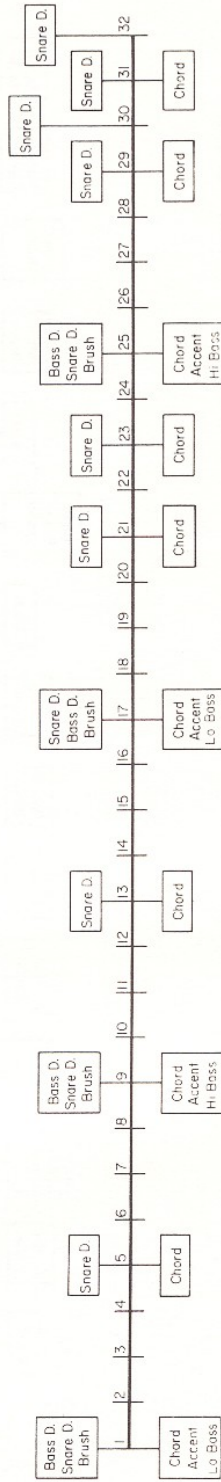
# RHYTHM PATTERN CHARTS



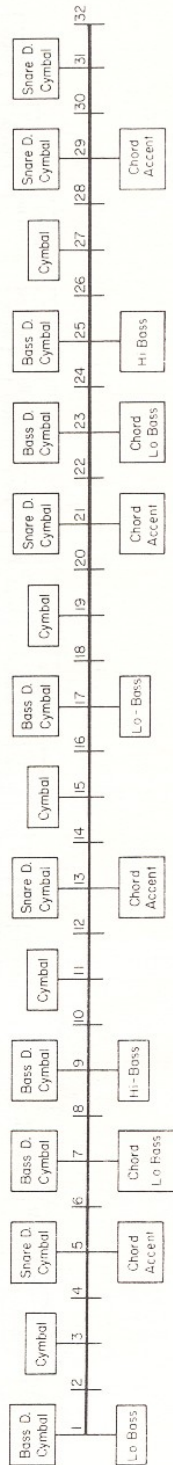
# RHYTHM PATTERN CHARTS



DIXIE



MARCH



ROCK I

# RHYTHM PATTERN CHARTS

**RHUMBA**

A 32-measure rhythm chart for Rhumba. The chart is divided into four 8-measure segments. The first segment (measures 1-8) includes Bass D. Tom, Tom, Clove, Brush, Lo Drum, and Lo Bass. The second segment (measures 9-16) includes Bass D., Clove, Brush, Lo Drum, and Chord. The third segment (measures 17-24) includes Bass D., Tom, Tom, Brush, Lo Drum, and Hi Bass. The fourth segment (measures 25-32) includes Bass D., Clove, Brush, Lo Drum, Chord, and Hi Bass.

**SAMBA**

A 32-measure rhythm chart for Samba. The chart is divided into four 8-measure segments. The first segment (measures 1-8) includes Bass D., Snare D., Brush, Chord, and Lo Bass. The second segment (measures 9-16) includes Bass D., Tom, Tom, Brush, Lo Drum, and Chord. The third segment (measures 17-24) includes Bass D., Snare D., Brush, Chord, and Lo Bass. The fourth segment (measures 25-32) includes Bass D., Tom, Tom, Brush, Lo Drum, Chord, and Hi Bass.

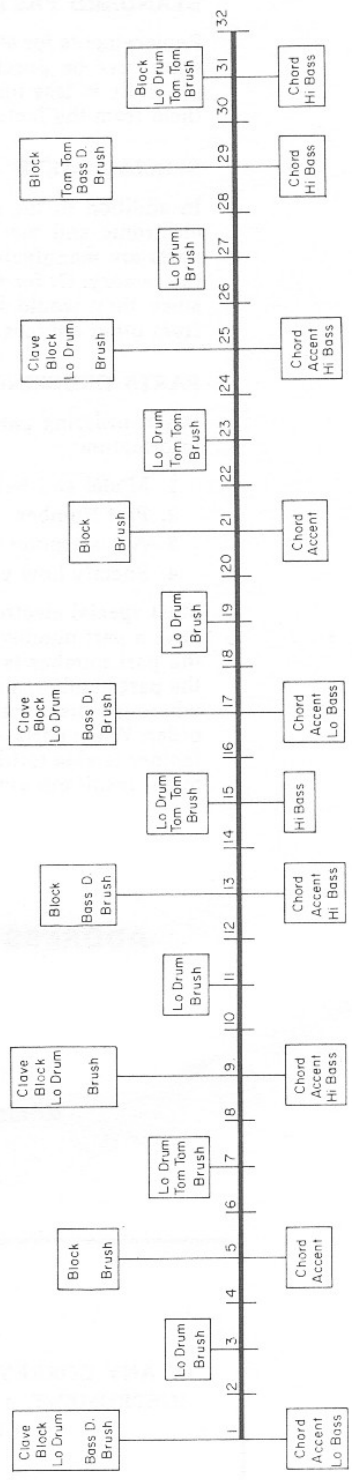
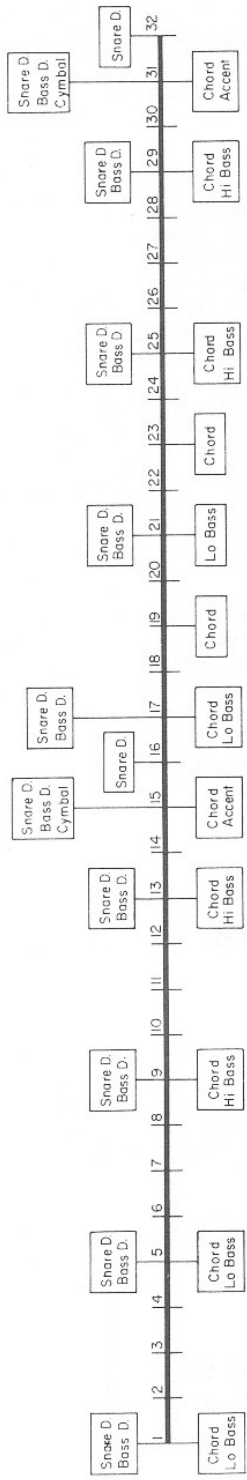
**BOSSA NOVA**

A 32-measure rhythm chart for Bossa Nova. The chart is divided into four 8-measure segments. The first segment (measures 1-8) includes Bass D., Blocks, Brush, Chord, and Lo Bass. The second segment (measures 9-16) includes Bass D., Blocks, Brush, Chord, and Hi Bass. The third segment (measures 17-24) includes Bass D., Blocks, Brush, Chord, and Lo Bass. The fourth segment (measures 25-32) includes Bass D., Blocks, Brush, Chord, and Hi Bass.

**ROCK II**

A 32-measure rhythm chart for Rock II. The chart is divided into four 8-measure segments. The first segment (measures 1-8) includes Bass D., Snare D., Brush, Chord, and Lo Bass. The second segment (measures 9-16) includes Bass D., Snare D., Brush, Chord, and Lo Bass. The third segment (measures 17-24) includes Bass D., Snare D., Brush, Chord, and Lo Bass. The fourth segment (measures 25-32) includes Bass D., Snare D., Brush, Chord, and Hi Bass.

# RHYTHM PATTERN CHARTS



## **PARTS INFORMATION**

### **STANDARD PARTS**

Replacements for all standard electronic parts and hardware may be purchased directly from local suppliers generally in less time than would be required to obtain them from the factory.

### **SPECIAL PARTS**

In addition to the standard replacement parts, special electronic and mechanical parts are also used. These parts are manufactured by and to the specifications of the factory. Order these parts directly from the factory since they would be difficult or impossible to obtain from other sources.

### **PARTS ORDERING INFORMATION**

When ordering parts be sure to include the following information:

1. Model and Serial Number
2. Part Number
3. A description of the part
4. Specify how you want the part shipped.

Most special electronic parts and mechanical parts will have a part number stamped on them. In the event that the part number is missing, or you are unable to read the part number, a complete description of the part and where it is used will allow the factory to fill your parts order. When parts are ordered in the proper manner the factory is able to fill your orders promptly—delays that might result are avoided.

### **ADDRESS PARTS ORDERS TO:**

**LOWREY SERVICE PARTS DEPARTMENT**  
1300 Naperville Drive  
Romeoville, Illinois 60441

### **IMPORTANT**

**IN ANY CORRESPONDENCE CONCERNING THIS  
INSTRUMENT ALWAYS INCLUDE MODEL AND  
SERIAL NUMBERS**

## PARTS LIST

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### THE PARTS LIST CONTAINS THE FOLLOWING INFORMATION:

1. Name of Part
2. Value, Tolerance and Code (When Important)
3. Brief description
4. Where the part is found (assembly, printed circuit board, etc.)
5. Schematic Reference Number
6. PART NUMBER — USE IT!

This parts list includes all standard stock replacement parts. No attempt has been made to include every nut, bolt and screw. If the necessity for a non-listed part arises, please write describing the parts location and function as well as model and serial number of the unit.



## PARTS LIST

### BOARD A

#### Tone Generator & Keyer

Capacitors	Electrolytic 25V	
C1	22 uf . . . . .	945-026783-005
	10 uf . . . . .	945-026783-010
Diodes	All . . . . .	919-024769
Integrated Circuits		
IC1	Top Octave Synthesizer. . .	991-027326
IC2-9	6-Stage Divider. .	991-025539-002
IC10	Quad NOR . . . . .	991-026025
Resistors	WW 10% 2W	
	470 Ohm . . . . .	924-010471-471
	1000 Ohm . . . . .	924-010471-102
Sockets	14-Pin. . . . .	906-018905
	16-Pin. . . . .	906-018905-001

### BOARD B

#### Quality Control

Capacitors	Electrolytic	
C1-4	100 uf 16V. . . . .	945-026783-006
	10 uf 16V. . . . .	945-026783-004
	3.3 uf 16V . . . . .	945-028285-001
Diodes		
D1	. . . . .	919-024769
Integrated Circuits		
IC1	Op-Amp . . . . .	991-021444-001
IC2-4	Quad Op-Amp . .	991-022794
Potentiometers		
VR1	10K 20% Chord Level Adjust. .	925-004349-003
VR2	50K 20% Thump Adjustment . .	925-004349-007
Sockets	8-Pin. . . . .	906-021448
	14-Pin . . . . .	906-018905
Transistors		
All	. . . . .	991-026315

### BOARD C

#### Rhythm-CFG

Capacitors	Electrolytic 16V	
C1	10 uf . . . . .	945-026783-004
C2	100 uf . . . . .	945-026783-006
C3	10 uf . . . . .	945-026783-004
C4	100 uf . . . . .	945-026783-006
Coils		
L1	70 uh . . . . .	956-018877
L2	Oscillator . . . . .	952-018874-003
L3	70 uh . . . . .	956-018877

### BOARD C (Continued)

#### Rhythm-CFG

Diodes		
D13	Glide. . . . .	919-024117
D42-44	. . . . .	919-010873
All others	. . . . .	919-024769
Integrated Circuits		
IC1-3	Quad NOR . . . . .	991-026025-002
IC4	AND/OR Invert .	991-026613
IC5	CFG. . . . .	991-026003-002
IC6	Quad NOR. . . . .	991-026025-002
IC7	RFG. . . . .	991-026389
IC8, 10	Quad Op-Amp . .	991-022794
IC11	Noise Generator .	991-024108
Potentiometer		
VR1	100K 20% Vibrato Speed Adjust. .	925-004349-010

#### Sockets

8-Pin. . . . .	906-021448
14-Pin. . . . .	906-018905
28-Pin. . . . .	906-018905-003
40-Pin. . . . .	906-022727

#### Transistors

Q1	Vibrato Oscillator	991-013544
Q3	Master Oscillator	991-025535
Q7	Pedal Keyer . . . .	991-010098
All others	. . . . .	991-026315

### BOARD E

#### Amplifier/Power Supply

Capacitors	Electrolytic	
	4.7 uf 63V . . . . .	945-026783-018
	2.2 uf 63V . . . . .	945-026783-017
	10 uf 100V. . . . .	945-026783-020
	22 uf 63V. . . . .	945-026783-019
	100 uf 16V. . . . .	945-026783-006
Clip	Fuse . . . . .	976-026063
Diodes		
Z1, 2	Zener 15V . . . . .	919-026799-068
D7, 8	. . . . .	919-024769
Fuse	Fast-Blo 3-amp. .	939-001197-003
Transistors		
Q1, 2	Darlington . . . . .	991-026617
Q3	PNP Driver . . . . .	991-015614
Q4	Current Regulator	991-013544
Q10	Darlington . . . . .	991-026617

## PARTS LIST

### BASS PEDAL ASSEMBLY

Assemblies	Long Pedal . . . . .	997-006405
	Short Pedal . . . . .	997-006406
	Pedal Switch. . . . .	997-028815
Caps	Black Pedal. . . . .	915-003863
	Dark Brown Pedal	915-003856
Springs	Compression. . . . .	975-005811
	Contact . . . . .	917-009155

### BENCH ASSEMBLY

Bench	Walnut E60 . . . . .	978-027305
	Walnut L60 . . . . .	978-029237

### CONSOLE ASSEMBLY

Endblocks	Lower Left Hand	966-026774
	Lower Right Hand	966-026775
	Upper Right Hand	966-026776
Back	. . . . .	972-026793-001
Post	Circuit Board Mtg.	964-027337-002
Speaker	12-inch, 8-ohm. .	985-028295

### POWER SUPPLY/EXPRESSION PEDAL ASSEMBLY

Arm	Actuator. . . . .	967-026076
Assemblies	Control Arm. . . . .	997-026151
	Glide Switch. . . . .	997-027607
	Pedal & Mat . . . . .	997-023127
Bulb		
P1	GE1819 . . . . .	939-003190
Capacitors	Electrolytic	
	2200 uf 63V. . . . .	945-026797-004
	2200 uf 25V. . . . .	945-026797-002
	1000 uf 25V. . . . .	945-026797-001
Cord	Power. . . . .	989-008717
Diffuser	White . . . . .	922-015938-001
Diodes		
D1-6	. . . . .	919-021084
Fuse	1-amp Slo-Blo	
	Pigtail . . . . .	939-001120-002
Mat	Expression Pedal	959-022953
	Glide Switch. . . . .	959-009208-003
	Glide Switch. . . . .	959-009208-004
Photocell		
P1	Expression Pedal	948-029970

### POWER SUPPLY/EXPRESSION PEDAL ASSEMBLY (Continued)

Resistors	WW 10%	
	3.9 Ohm 2W. . . . .	924-010471-039
	5 Ohm 5W. . . . .	924-008896-046
	15 Ohm 5W . . . . .	924-008896-001
	.18 Ohm 2W. . . . .	924-008896-021
Shield	Light. . . . .	922-026077
Sockets	Transistor TO-3 . .	906-026058-001
	Transistor TO-66	906-027308
Springs	Compression. . . . .	975-011747-001
	Contact. . . . .	917-029542
	Glide Switch. . . . .	975-022949
Transformers		
T1	Power 120V. . . . .	954-028613-001
T1	Power Export. . . . .	954-028613-002
Transistors		
Q5	Power Output . . . . .	992-026039-002
Q6	Power Output . . . . .	992-026040-002
Q7	Regulator. . . . .	992-022201
Q8	Power Regulator. . .	992-022773
Q9	Phase Splitter . . . .	991-026315-001
<b>UPPER LEFT ENDBLOCK ASSEMBLY</b>		
Endblock	Upper Left Hand	966-027428
Guide	Slider . . . . .	976-005170
Jack	Headphone. . . . .	910-013556-008
Knob	Slideswitch. . . . .	915-027352
Potentiometers		
	10K Lower Volume	925-027317-001
	10K Bass Volume	925-027317-001
	1M Rhythm Speed	925-027317-002
	10K Rhythm	
	Volume . . . . .	925-027317-001
Pusher	Short . . . . .	964-001903-003
	Medium . . . . .	964-024548
Resistor	WW 10% 2W	
	150 Ohm . . . . .	924-010471-151
Springs	Contact . . . . .	917-005166-001
	Toggle . . . . .	975-002338-001
Switches	Power On/Off. . . . .	960-028213
	Rhythm Select. . . . .	960-027322-001
	Power On/Off	
	Export . . . . .	960-028213-001

## PARTS LIST

### UPPER LEFT ENDBLOCK ASSEMBLY (Continued)

Tabs	Cello 16 . . . . .	915-009876-243
	Clarinet 16 . . . . .	915-009876-234
	Flute 8 . . . . .	915-009876-219
	Flute 16 . . . . .	915-009876-218
	Genie String Bass	915-009876-410
	Genie Voices	
	Normal+Organ	915-009876-297
	Guitar . . . . .	915-009876-324
	Magic Genie Chords	915-009876-409
	Pedal String Bass .	915-009876-407
	Piano . . . . .	915-009876-282
	Rhythm 1 . . . . .	915-009876-401
	Rhythm 2 . . . . .	915-009876-402
	Rhythm 3 . . . . .	915-009876-403
	Rhythm 4 . . . . .	915-009876-404
	Sustain . . . . .	915-009876-314
	Trombone 16 . . .	915-009876-233
	Vibrato . . . . .	915-009876-290

### UPPER, LOWER KEYSWITCH ASSEMBLY

Actuators	Wire . . . . .	976-026764
	Plastic . . . . .	964-026765
Coil	70 uh . . . . .	956-018877
Keys	Black . . . . .	964-024757
	A . . . . .	964-028228-001
	B . . . . .	964-028228-002
	C . . . . .	964-028228-003
	D . . . . .	964-028228-004
	E . . . . .	964-028228-005
	F . . . . .	964-028228-006
	G . . . . .	964-028228-007
	A1 Lower Key- board . . . . .	964-028228-008
	C4 Upper Key- board . . . . .	964-028228-009
Spring	Contact . . . . .	917-022999
	Pulldown . . . . .	975-027466

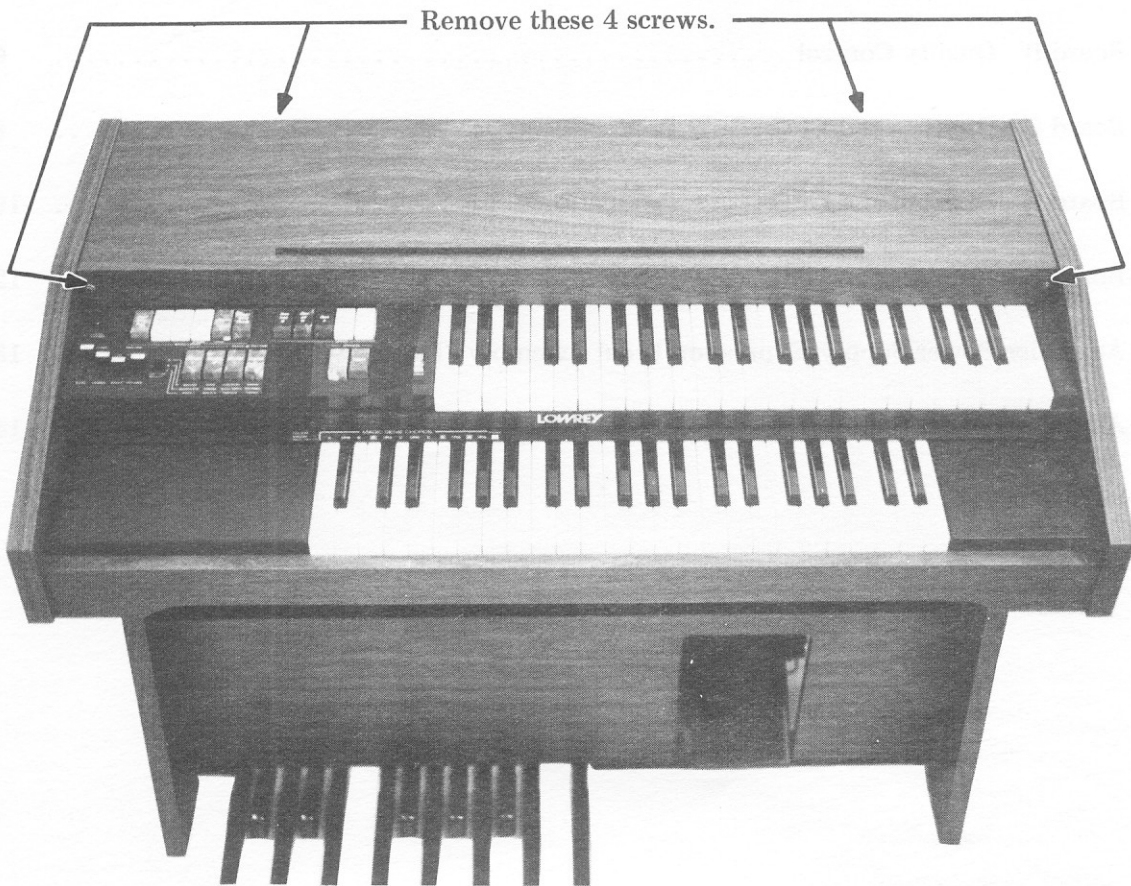
NOTE: Keys are supplied without wire actuators. Insert wire actuator from original key into replacement key. If new actuators are needed, they should be ordered separately.

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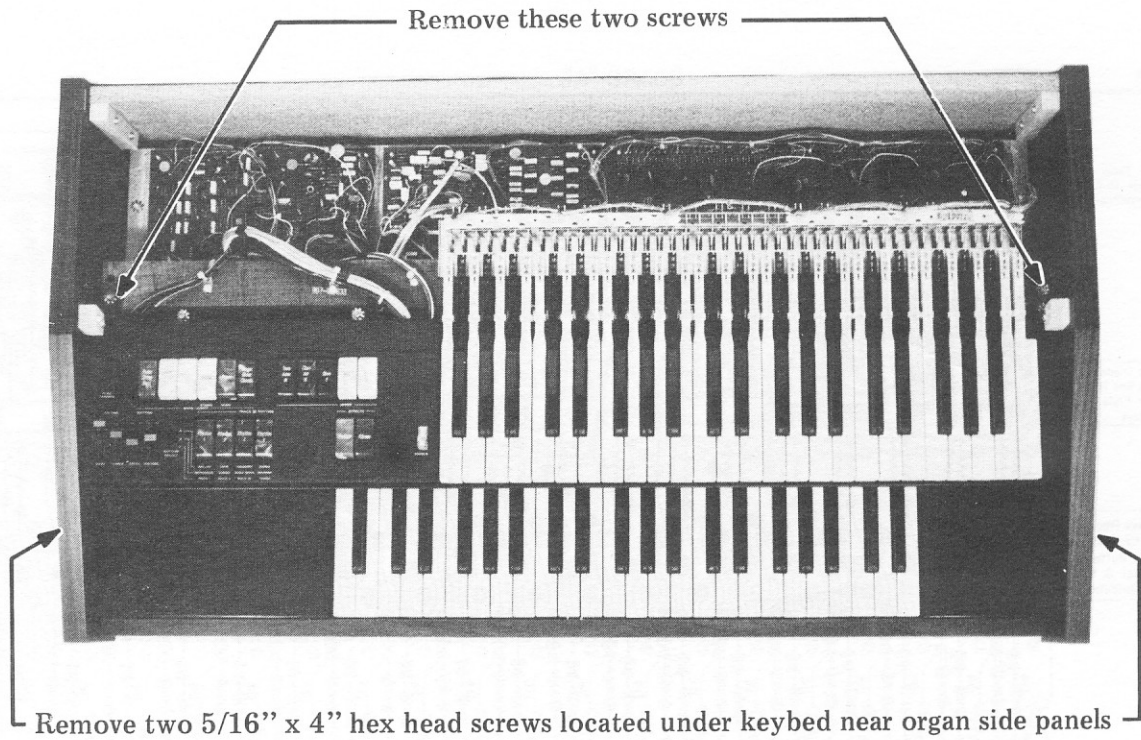
## DISASSEMBLY & BOARD LOCATION

### TOP REMOVAL

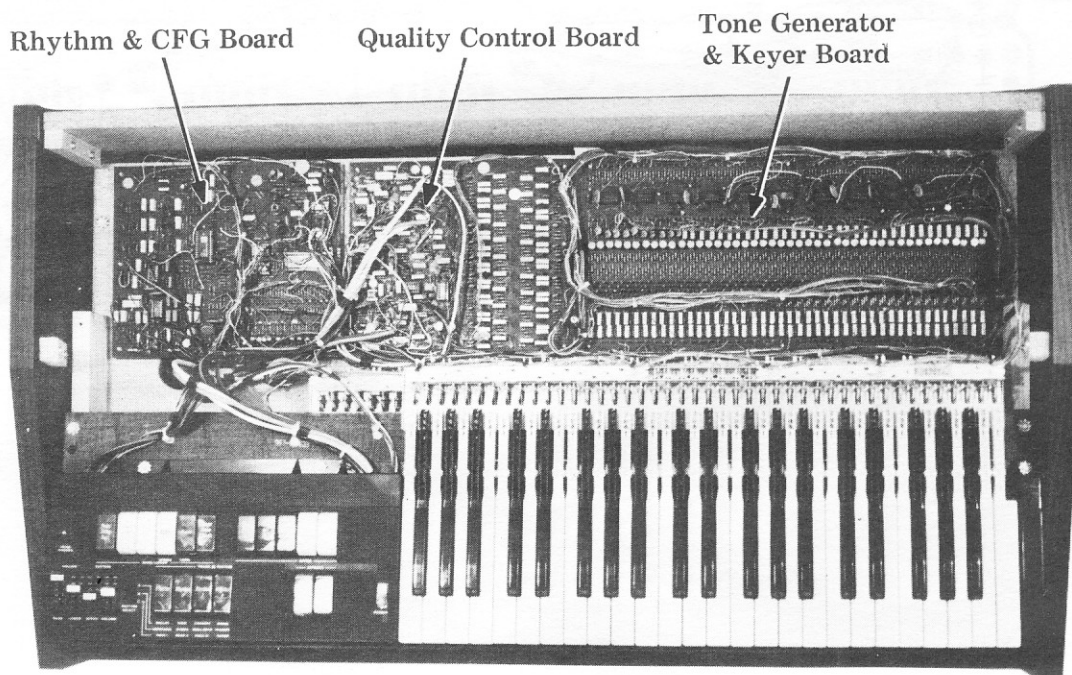


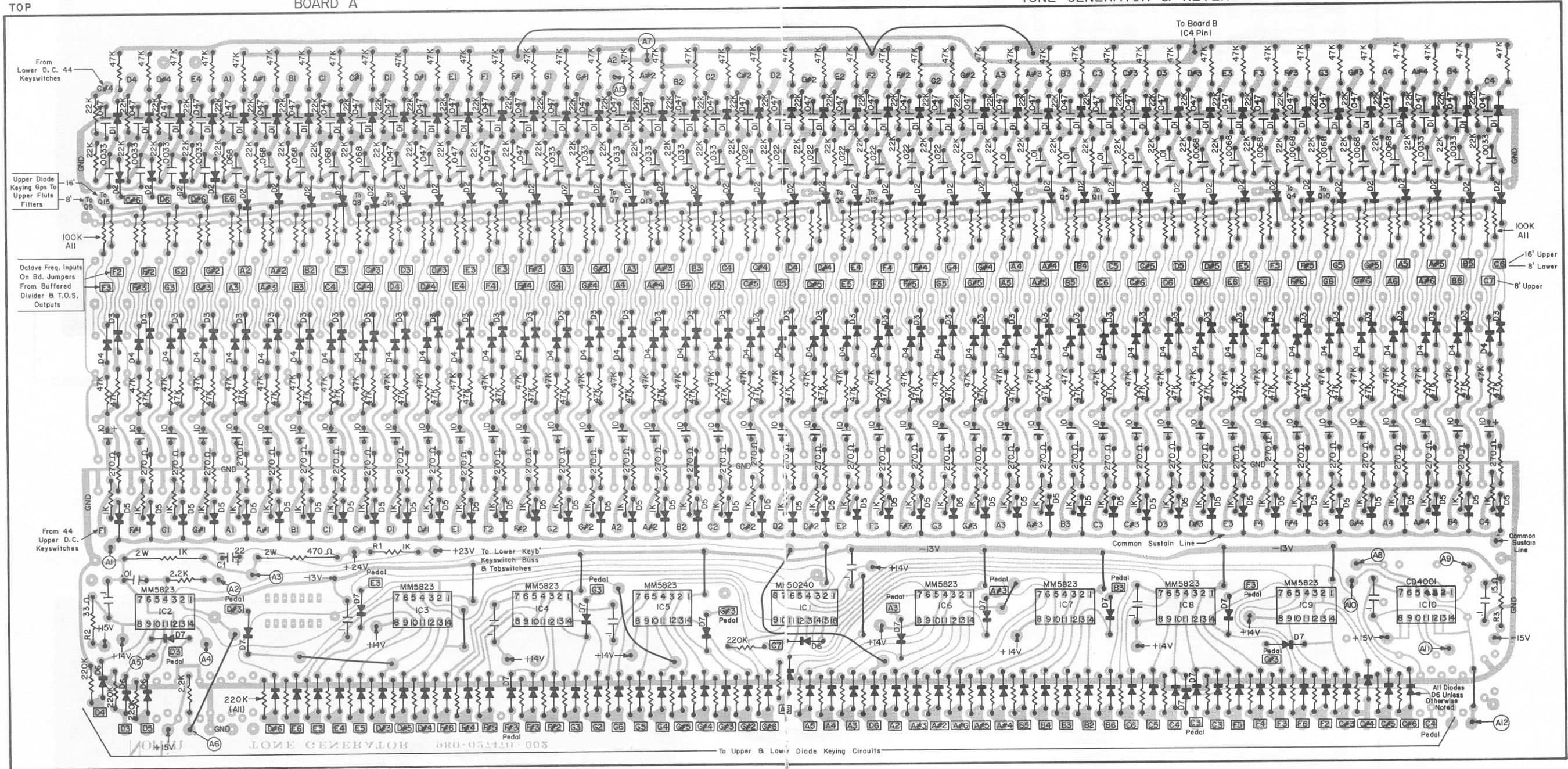
## DISASSEMBLY & BOARD LOCATION

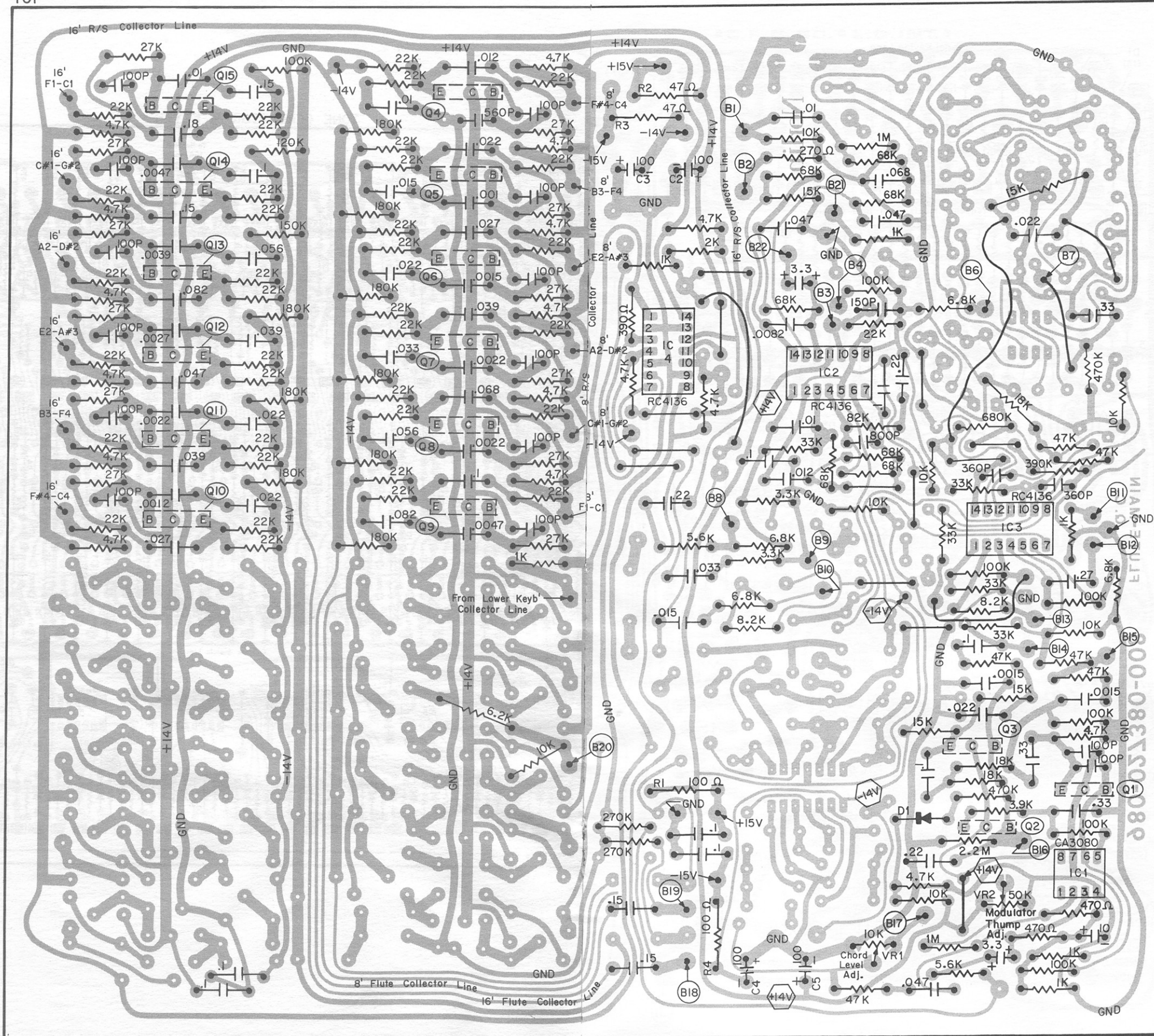
### TO SLIDE UPPER KEYBOARD FORWARD



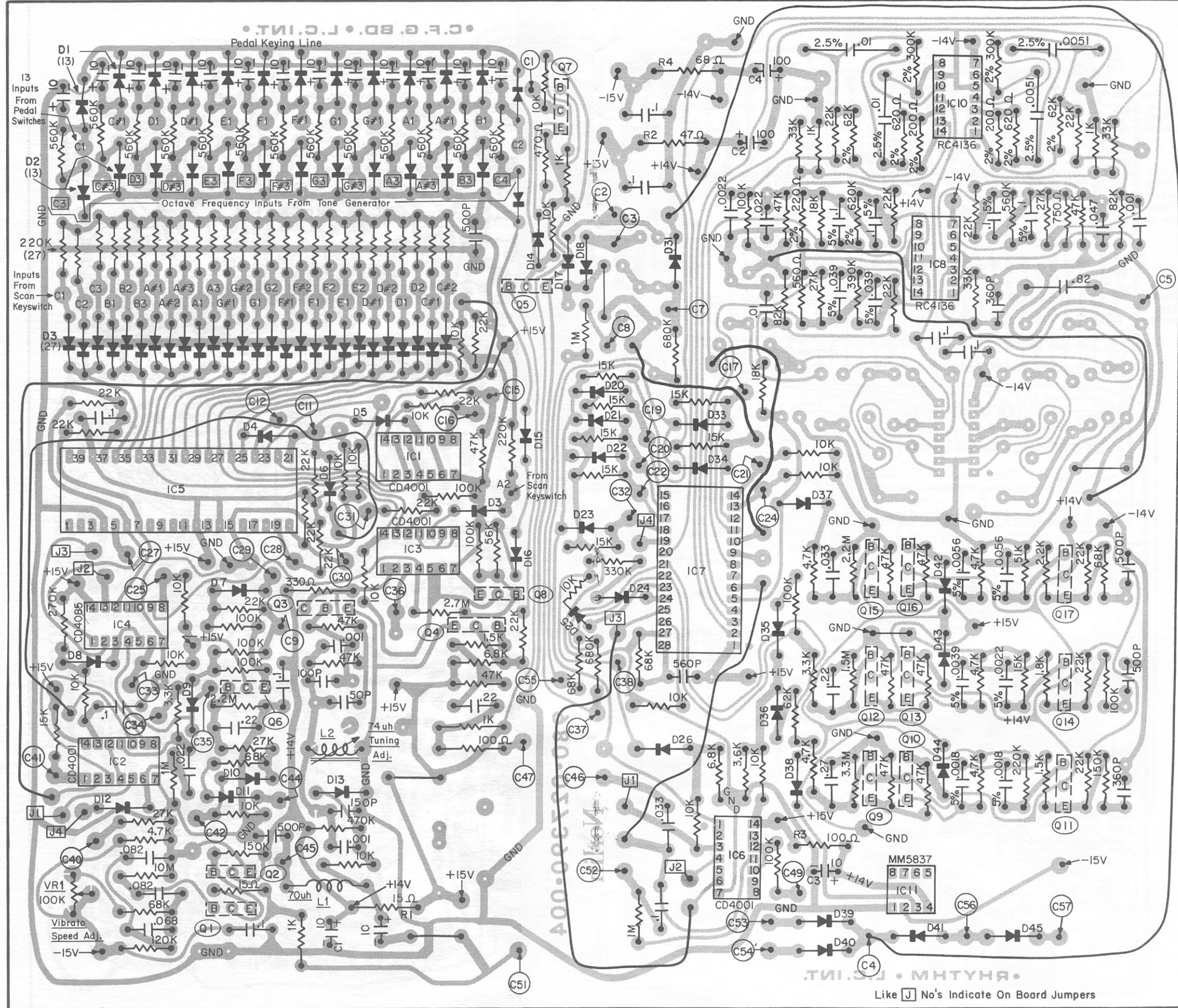
Slide Keyboard forward to gain access to Printed Circuit Boards

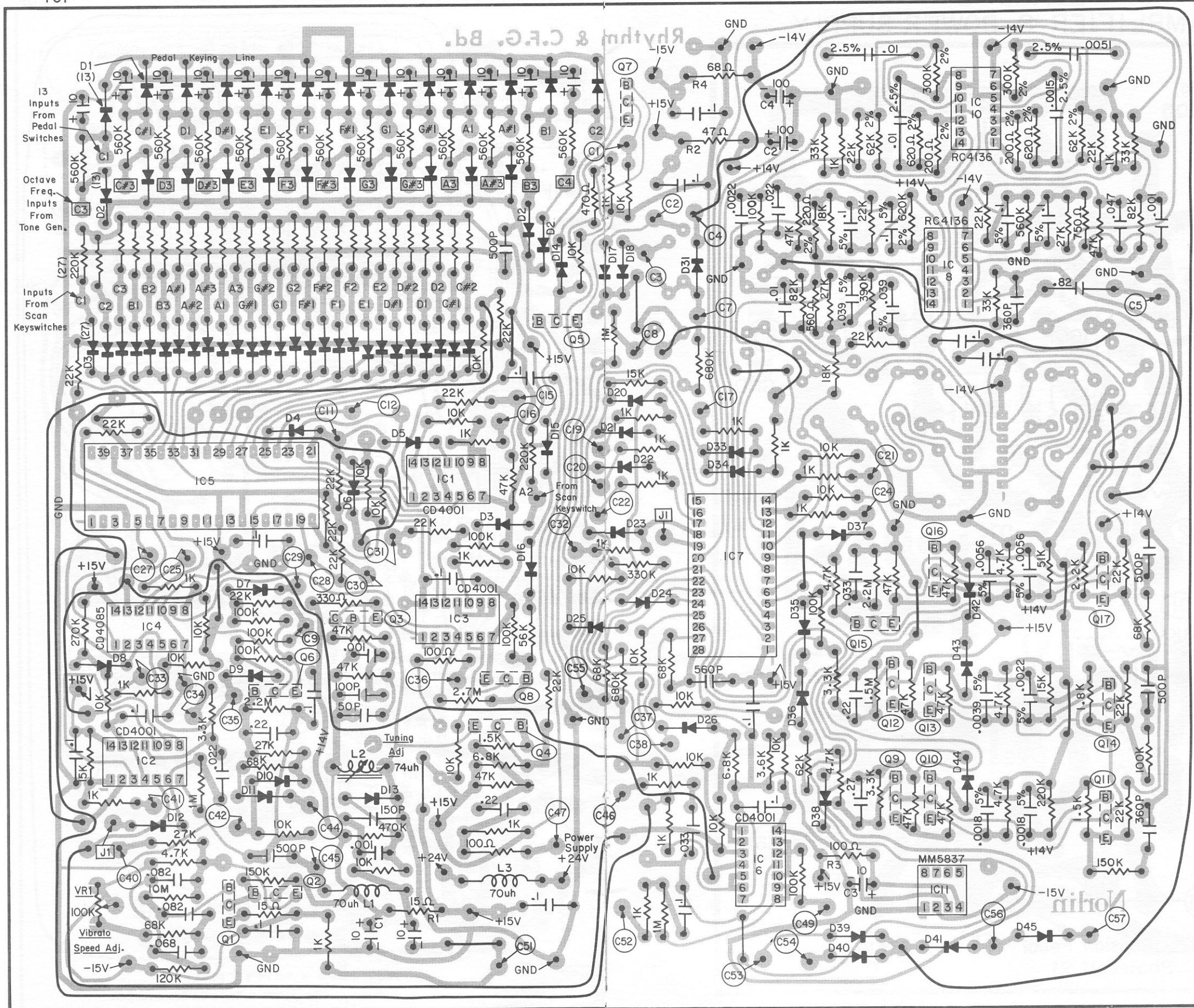




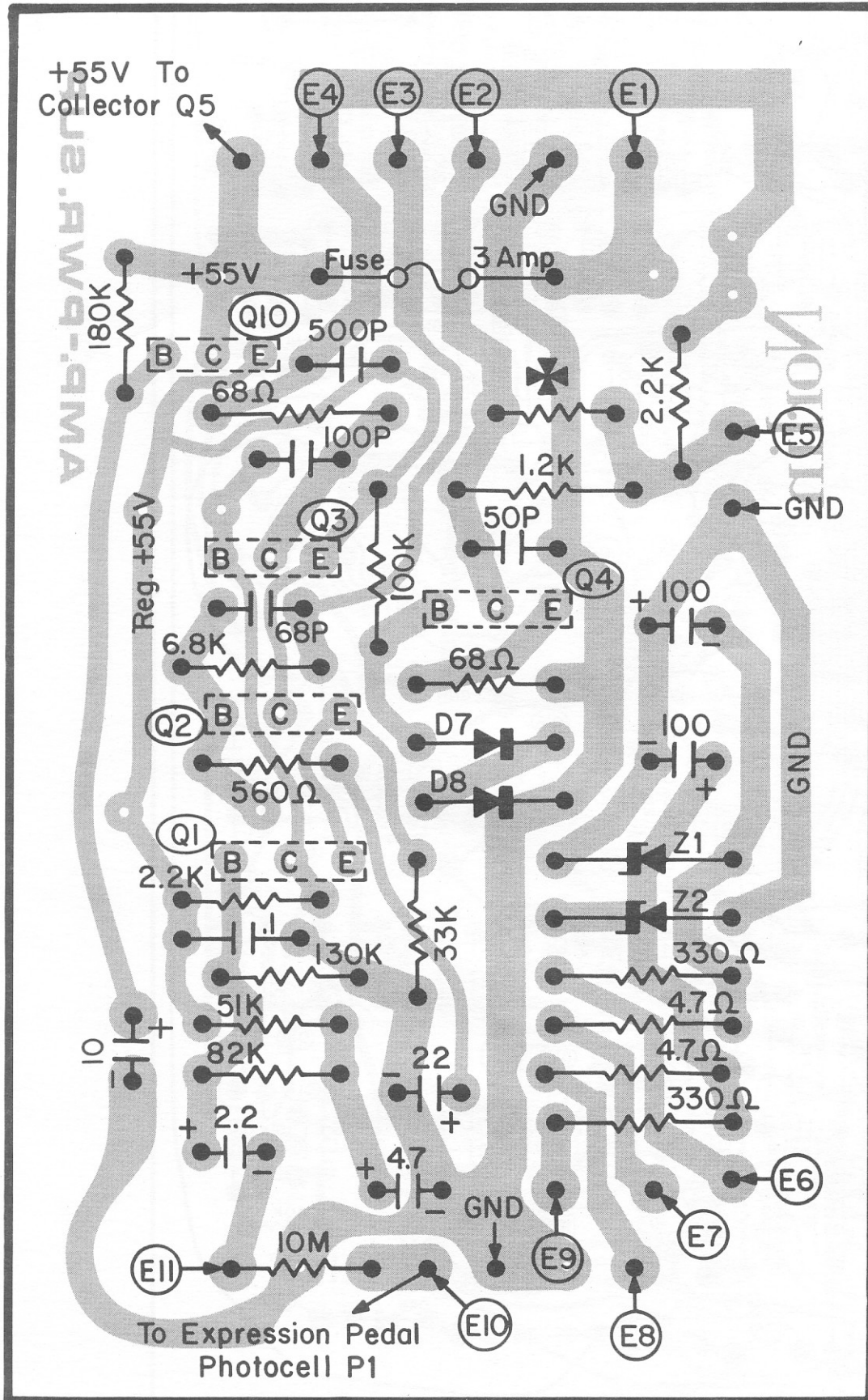




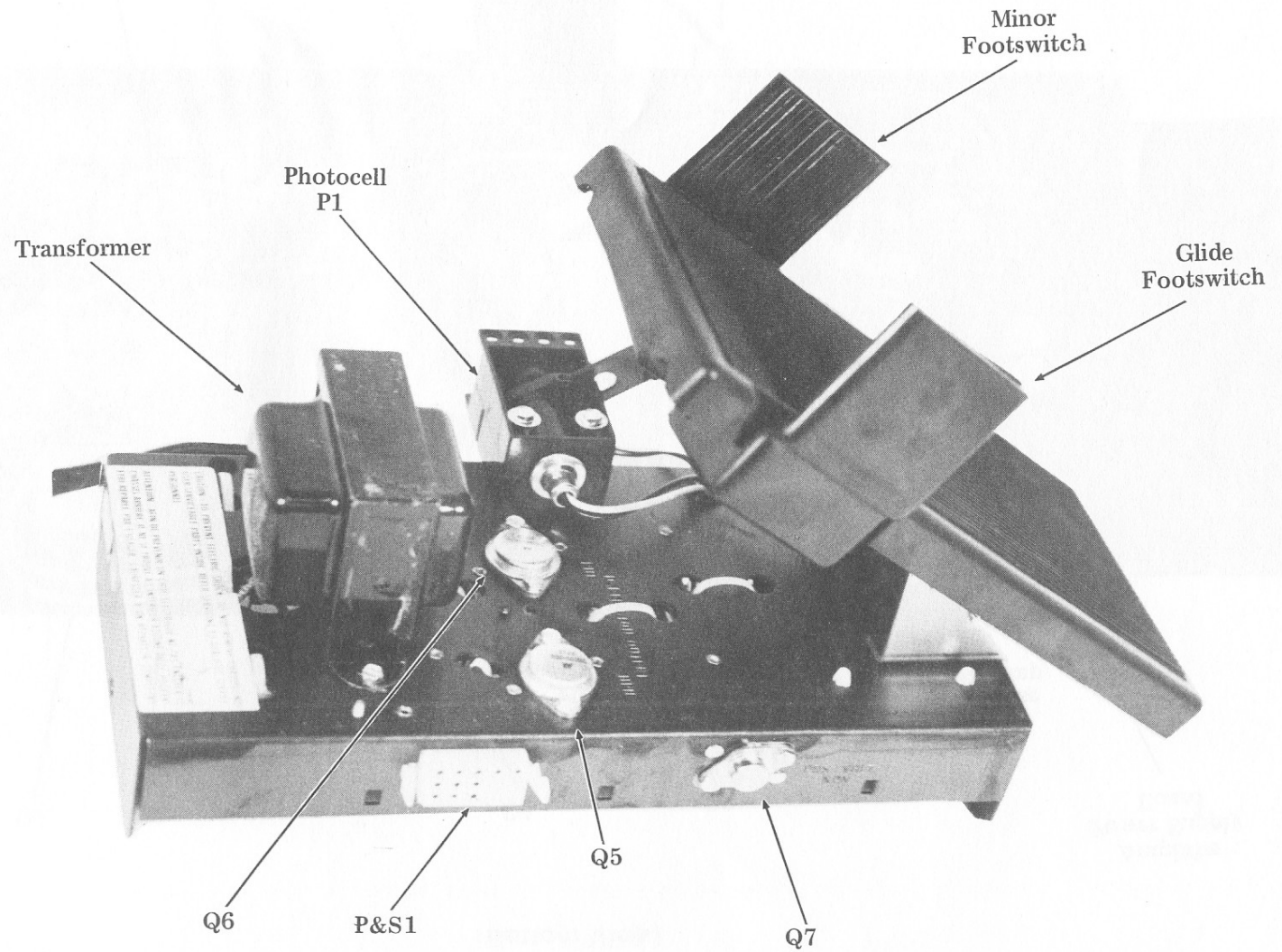




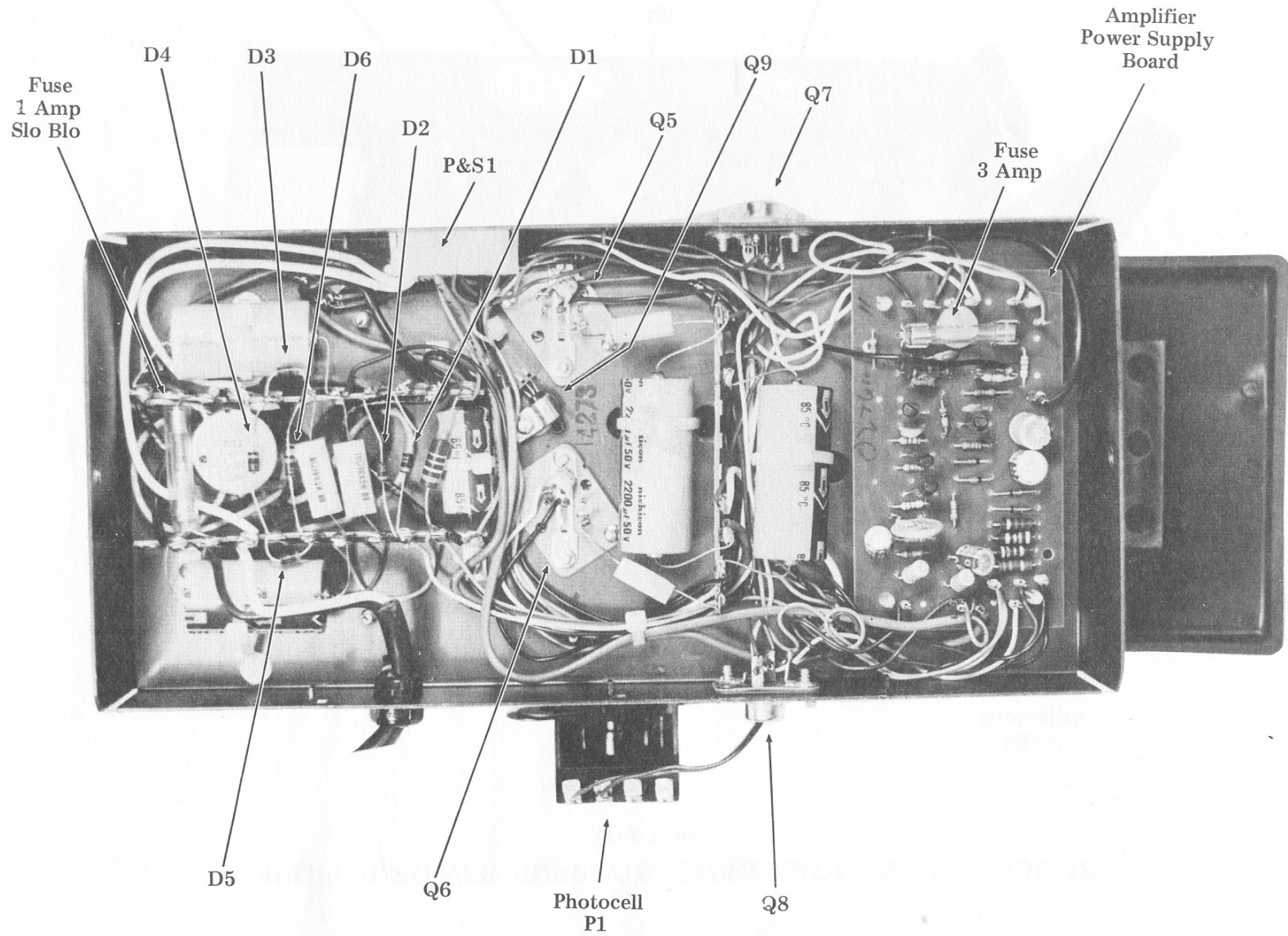
# BOARD "E" AMPLIFIER & POWER SUPPLY



# AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY (Top View)



# AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY (Bottom View)



998-030332

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