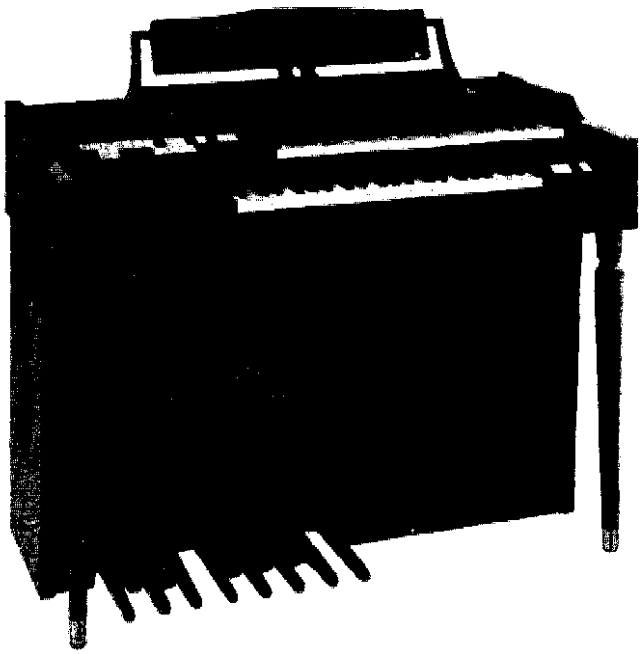
SERVICE MANUAL

MODELS TLO-1/TLOR-1

Hall Electronic Service
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LOWREY Holiday Deluxe MODEL



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SERVICE MANUAL

MODELS TLO-1/TLOR-1

TABLE OF CONTENTS

SERVICE INFORMATION

Specifications 2
Circuit Description 3
A.O.C. Keying Chart 8
Bass Pedal Troubleshooting Guide 9
Block Diagram 10

SCHEMATICS

Drawing No. 1 Tone Generators, Repeat, Vibrato & U.M. Diode Keying 11
Drawing No. 2 Automatic Orchestra (Wiring Diagram) 12
Drawing No. 3 Upper/Lower Manual, Keyswitches and Tabswitches 13
Drawing No. 4 Bass Pedals, Filters, Doublers, Preamps & Rhythm Keyswitches 14
Drawing No. 5 Power Supply, Amplifier, Reverb & Wow Wow 15
Drawing No. 6 Rhythm 16

DIODE CHARTS

Upper Manual Diode Keying Circuit Board 17
A.O.C., Coupler Sustain Control & Rhythm Circuit Board 18

PHOTOGRAPHS

SERVICE ACCESS AND CIRCUIT LOCATION

Front View 19
Rear View (Back Removed) 20
Front View (Tab Switch Assembly Raised) 21
Front View (Upper Manual Raised) 22

PRINTED CIRCUIT BOARDS, CHASSIS AND ASSEMBLIES

Vibrato Board 23
Tone Generator Board 23
Quality Control Board 24
Bass Pedal Board 25
Reverb Board 26
Rhythm Board 27
Repeat Chassis 28
Amplifier/Power Supply Chassis 29
Bass Pedal Assembly (Cover Removed) 30
Wow Wow/Expression Pedal Assembly 30

PARTS

Parts Information 31
Parts List 32

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SPECIFICATIONS

A completely transistorized self-contained home spinet organ with two 44-note keyboards and 13-note pedal keyboard. One 35-watt high-fidelity amplifier. Three ultra high-fidelity speakers: one extra heavy-duty 12-inch low-range speaker; one 8-inch Main speaker; one 8-inch Leslie speaker. Earphone jack for playing in privacy. Dimensions: 35″ high x 44½″ wide x 22½″ deep. Available in Transitional Mahogany, Walnut, and Fruitwood (Cherry); Early American Fruitwood (Cherry); Italian Provincial Walnut; French Provincial Fruitwood (Cherry); and Danish Modern Walnut.

CONTROL TABS

General

Solo Reed/String
Reed String 4′ ..... Coupler
Solo 4′
Solo 2⅔′
Brilliance ..... Normal—Full
Pedal ..... Soft—Medium
Pedal ..... Full
Pedal Sustain ..... Off—On
Accompaniment ..... Soft—Full
Solo 8′
Sustain ..... Medium
Sustain ..... Long
Vibrato ..... Slow—Fast
Vibrato ..... Light—Heavy
Vibrato ..... Off—On
Repeat ..... Off—On
Repeat ..... Slow—Fast
Upper to Lower 16′-8′-4′ ..... Off—On
Manual Attack ..... Normal—Slow
AOC
Leslie Trem. ..... Off—On
Organ ..... Main—Leslie
Main Chorus ..... Off—On
Add Main to Leslie
WOW WOW

Reverberating Rhythm (Model TLO-1R Only)

Reverb
Bass Drum
Snare Drum
Brush Cymbal
Crash Cymbal
Tom Tom
Bongo
Block
Clave
Tom Tom, Bongo, Block—Unified or Divided

SPECIAL CONTROLS

Expression Pedal
On-Off Switch with Pilot Light
Glide Switch (on Exp. Ped.)
Brush Accent Switch (TLO-1R only)
Rhythm Volume Control (TLO-1R only)
Rhythm Push Buttons (TLO-1R only)
Wow Wow Organ Volume Control

VOICES

UPPER KEYBOARD

Trombone 16′
Clarinet 16′
Trumpet 8′
Oboe 8′
Kinura 8′
Cello 16′
String 8′
Flute 16′
Flute 8′
Flute 4′
Twelfth 2⅔′

LOWER KEYBOARD

Melodia 8′
Diapason 8′
Viola 8′
Cornet 8′

PEDAL KEYBOARD

Bass Guitar
Pedal 8′-16′-4′

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CIRCUIT DESCRIPTION

VIBRATO

(Refer to Drawing No. 1)

Q1 VIBRATO OSCILLATOR

Develops a continual low frequency, high impedance sine wave of sufficient amplitude to drive the Vibrato Emitter Follower Q2.

Q2 VIBRATO EMITTER FOLLOWER

Converts the high impedance sine wave from the Vibrator Oscillator Q1 to a low impedance alternating current. This alternating current alternately shifts the frequency of the twelve Master Oscillators Q3.

TONE GENERATORS

(Refer to Drawing No. 1)

Q3 MASTER OSCILLATOR

Develops a continual audio frequency signal, the output of which is connected to the Buffer Q3A and 1st Divider Q4-Q5. Twelve such Master Oscillators are used to determine proper musical pitch for the entire organ.

Q3A BUFFER

The Buffer acts as an isolation stage between the Master Oscillator Q3 and the diode keying and keyswitches.* This prevents any change in Master Oscillator frequency due to change in circuit load.

Q4-Q5 1ST DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the Master Oscillator Q3. The output of the 1st Divider is connected to the diode keying and keyswitches.* The 1st Divider output signal is also used to drive the 2nd Divider Q6-Q7.

Q6-Q7 2ND DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the 1st Divider Q4-Q5. The output of the 2nd Divider is connected to the diode keying, bass keying and keyswitches.* The 2nd Divider output signal is also used to drive the 3rd Divider Q8-Q9. On tone generators D# and E, TLOR-1 only, the output of the 2nd Divider is used for the rhythm (See Rhythm).

Q8-Q9 3RD DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the 2nd Divider Q6-Q7. The output of the 3rd Divider is connected to the diode keying, bass keying and keyswitches.* On generators F through C the 3rd Divider output signal is also used to drive the 4th Divider Q10-Q11.

Q10-Q11 4TH DIVIDER

Produces a continual audio frequency signal of exactly half the frequency of the 3rd Divider Q8-Q9. The output of the 4th Divider is only connected to the diode keying, bass keying and keyswitches.*

*Tone generator outputs are mixed for proper waveshaping in Non-Sustain Networks prior to being connected to the Upper/Lower Manual Audio Keyswitches.

REPEAT

(Refer to Drawing No. 1)

Q12-Q13 REPEAT MULTIVIBRATOR

When the Repeat tabswitch is "on," this circuit alternately produces negative pulses at the collector of each transistor. When the Repeat tabswitch is turned "off," B+ is removed from the multivibrator circuit and ground is applied to the base element of Pulse Shapers Nos. 1 and 2. Either the alternate negative pulses from the Repeat Multivibrator or the ground is applied to the Pulse Shapers (Q14 and Q15).

Q14-Q15 PULSE SHAPER NO. 1 and 2

Negative pulses from the Repeat Multivibrator (Q12-Q13) causes the Pulse Shapers to alternately produce positive voltage pulses. When the Repeat tab is "off" the Pulse Shapers produce a constant positive voltage. The positive pulses or constant positive voltage is directly connected to the Pulse Drivers Nos. 1 and 2 (Q16 and Q17).

Q16-Q17 PULSE DRIVER NO. 1 and 2
Q18-Q19 PULSE KEYER NO. 1 and 2

These circuits function together to produce either a constant positive high current keying voltage or an alternate positive keying pulse. The keying voltage, or pulses, are applied to the Upper Manual D.C. keyswitches, coupler and A.O.C. Intelligence "on" busses via the A.O.C., Attack and Coupler (Upper to Lower) tabswitches.

UPPER/LOWER MANUAL

(Refer to Drawing No. 3)

Q20 UPPER MANUAL 4′ & 8′ REED/STRING COLLECTOR PREAMP

Audio signal from the 4′ & 8′ Upper Manual diode keying groups is combined and amplified. The output of this preamp is connected to the Trombone, Trumpet, Oboe, Kinura, Cello and String tabswitches.

Q21 UPPER MANUAL 16′ REED/STRING COLLECTOR PREAMP

Audio signal from the Upper Manual 16′ diode keying groups is combined and amplified. The output of the preamp is connected to the Trombone, Clarinet and Cello tabswitches.

Q22 LOWER MANUAL 8′ REED/STRING COLLECTOR PREAMP

Audio signal from the Lower Manual 8′ Audio Keyswitch groups is combined and amplified at this preamp. The output of the preamp is connected to the Cornet and Viola tabswitches.

BASS PEDALS

(Refer to Drawing No. 4)

Q34-Q35 PEDAL CANCEL TRIGGER

Depressing any Bass Pedal Switch creates a pulse which

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causes this circuit to produce a bigger pulse thus triggering (turns on momentarily) the Pedal Cancel Transistor Q36.

Q36 PEDAL CANCEL TRANSISTOR

This transistor momentarily conducts when there is a pulse from the Pedal Cancel Trigger Q34-Q35. When the Pedal Cancel Transistor conducts, any positive voltage in a pedal sustain capacitor is conducted through the pedal cancel line, and Diode D11 to −8 volts and thus neutralized. The −8 volts from the Pedal Cancel transistor is also applied as a pulse to the Guitar Bass Keyer Q37 and on TLOR-1 to the Rhythm. (See Rhythm.)

Q37 GUITAR BASS KEYER

The negative pulse from the Pedal Cancel Transistor Q36 triggers the Guitar Bass Keyer which then produces a strong positive pulse. This strong pulse is used to key (momentarily). Diodes D18-D19 which allow the output signal from the 1st Pedal Divider Q40-Q41 to pass through on to the base pedal tabswitches.

Q38 & Q39 PEDAL KEYER & PEDAL KEYER EMITTER FOLLOWER

Depressing a bass pedal switch applies a positive voltage to these two circuits. They, in turn, apply a strong keying voltage to Diodes D20-23 and on TLOR-1 the Rhythm. (See Rhythm.) Diodes D20-23 are in series with the output signal from the Pedal Dividers Q40-43 and the Bass Pedal tabswitches. When the Pedal Sustain or Guitar Bass tabswitch is turned on, a 15 mfd. capacitor keeps Diodes D20-23 keyed for a short length of time after the pedal is released.

Q40-Q41 1ST PEDAL DIVIDER

Depressing a bass pedal keys a Diode D12, allowing the signal from a tone generator to pass to the pedal collector line and on to the 1st Pedal Divider. The 1st Pedal Divider produces a signal of exactly half the frequency of the input signal from the tone generator. The output of the 1st Pedal Divider connects to Diodes D18-D19-D20-D21, the 2nd Pedal Divider and the Pedal tabswitches.

Q42-Q43 2ND PEDAL DIVIDER

The 2nd Pedal Divider produces a signal of exactly half the frequency of the input signal from the 1st Pedal Divider Q40-Q41. The output of the 2nd Pedal Divider connects to Diodes D22-D23 and on to the Pedal tabswitches.

FILTERS & PREAMPS

(Refer to Drawing No. 4)

Q23 150 CYCLE FILTER
Q24 212 CYCLE FILTER
Q25 300 CYCLE FILTER
Q26 425 CYCLE FILTER
Q27 600 CYCLE FILTER
Q28 850 CYCLE FILTER
Q29 1200 CYCLE FILTER
Q30 1700 CYCLE FILTER

Audio signals from most of the Upper/Lower Manual and Pedal tabswitches are filtered to produce the various organ voices. The combined output from the 212 cycle through 1700 cycle Filters connects to the Photocell Limiter P1 and on to the Main Preamp Q33. The output from the 150 cycle Filter connects to both the Wow Wow Bass Preamp Q44 and the Main Preamp Q33.

Q31 STRING PREAMP

Audio signal from the String, Cello, Clarinet and Viola tabswitches as well as Rhythm on TLOR-1, are connected to and amplified by this Preamp. The amplified output signal from the String Preamp is connected to the Main Preamp Q33.

Q32 DOUBLER PREAMP

Audio signal from the Kinura tabswitch and the Doubler Coils L2 & L3 is connected to and amplified by this preamp. The output of the Doubler Preamp connects to the Main Preamp Q33.

Q33 MAIN PREAMP

All audio signals from the entire organ, except the Wow Wow output in the 150 cycle filter, are connected together at and amplified by the Main Preamp. The output of the Main Preamp is connected to either the Expression Pedal Photocell P2 and Wow Wow Preamp Q45, or on Model TLOR-1, the Reverb Driver Q52.

P-1 PHOTOCELL LIMITER

The louder the organ is played the more A.C. voltage there is coupled from the speaker to the Limiter Photocell lamp. When the A.C. voltage is high enough, the lamp lights causing the photocell P1 to conduct, which lowers the gain of the output signal from the String Preamp, Doubler Preamp and the 212 through 1700 cycle Filters. The Limiter prevents distortion and protects the speakers from overload.

REVERB TLOR-1

(Refer to Drawing No. 5)

Q52 REVERB DRIVER

The audio output signal from the Main Preamp Q33 is amplified and connected to the Reverb Spring Unit where the Reverb effect is produced.

Q51 REVERB PREAMP NO. 1

Reverberating audio signal from the Reverb Spring Unit is amplified for the first time. The output signal is then sent on to Reverb Preamp No. 2.

Q53 REVERB PREAMP NO. 2

Further amplification of the Reverb signal is accomplished, plus, the Reverb signal is controlled at the output of this circuit. With the Reverb tabswitch off, all Reverb signal is grounded.

Q54 MIXER

Both Reverberating audio signal from Reverb Preamp No. 2 (Q53) and normal audio signal from Main Preamp Q33 are combined and amplified at this circuit. The output signal from the Mixer circuit is connected to the Expresson Pedal Photocell P2 and Wow Wow Preamp Q45.

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WOW WOW/EXPRESSION PEDAL

(Refer to Drawing No. 5)

Q44 BASS PREAMP

Audio signal from the 150 cycle Filter is connected to and amplified by this preamp. The output from the Bass Preamp connects to the Voltage Amp. Q47 **only** when the Wow Wow tabswitch is "on".

Q45 WOW WOW PREAMP

Audio signal from the Main Preamp Q45 or Reverb Mixer Q54 (TLOR-1) is applied to both the Expression Pedal Photocell P2 and the Wow Wow Preamp. The Wow Wow Preamp is a variable tuned circuit that amplifies only the audio signals near the frequency at which it is tuned. The frequency range of the Wow Wow Preamp is adjusted by the Wow Wow control VR5, the range is approximately 300 to 1700 cycles. The Wow Wow output signal is connected to the Wow Wow tabswitch. The Wow Wow signal connects to the Voltage Amp. Q47 **only** when the Wow Wow tabswitch is "on".

Q46 WOW WOW EMITTER FOLLOWER

This circuit determines the frequency to which the Wow Wow Preamp is tuned by electrically changing the effective value of the .012 mfd. capacitor attached to the emitter of this transistor.

P2 EXPRESSION PEDAL PHOTOCELL

Organ volume is controlled by more or less illumination of Photocell P2. Depressing the Expression Pedal moves a light bulb closer to Photocell P2 thus increasing organ volume. The R. C. network connected across Photocell P2 provides Bass boost at low volume levels. The Audio signal from Photocell P2 is connected to the Wow Wow tabswitch. When the Wow Wow tabswitch is "off" the Audio signal connects to the Voltage Amp Q47.

AMPLIFIER

(Refer to Drawing 5)

Q47 VOLTAGE AMP

Amplifies the audio signal from the Wow Wow tabswitch to an audio signal strong enough to drive the Driver circuit Q48. Feedback from the Output circuit Q49 and Q50 is also connected to the Voltage Amp.

Q48 DRIVER

Operating in conjunction with the Driver Transformer T2, the Driver circuit produces a high current signal necessay to drive the Output circuit Q49 and Q50.

Q49-Q50 OUTPUT

The high current audio signal from the Driver Q48 and Driver Transformer T2 is amplified to a high current power output signal. This amplified audio output signal is connected to the Voltage Amp. Q47 (feedback), headphone jack, speakers and Leslie tabswitches.

POWER SUPPLY

(Refer to Drawing No. 5)

Positive and negative D.C. supply voltages are produced using Transformer T1, Diodes D24 & 29/D25 & 28 and D26 & 27 plus several resistors and filter capacitors. These D.C. voltages are supplied to the various circuits of the organ. (Refer to the Plug & Socket Charts for specific voltage wiring.) Zener Diode Z2 is used as a voltage regulator on rhythm models only. The Internal Leslie motors are connected across the primary of the power transformer T1 (ahead of the 1 Amp main power fuse) in series with a 5 Amp Slo-Blo fuse.

A 2 Amp fuse is also included in the D.C. supply circuit connected to Repeat. This is done to prevent serious component damage in the event of a short circuit.

RHYTHM

(Refer to Drawing No. 6)

Q55-Q56 SNAREDRUM ROLL MULTIVIBRATOR

Depressing the Snaredrum push button or any of the first 27 Lower Manual keys starts the Snaredrum Multivibrator by applying B+ to Q56. When the Multivibrator is running it produces strong positive voltage pulses (approximately 15 per second) that are used to activate the Noise Amp. Q74 and the Tom Tom pulse amplifier Q57. The simultaneous keying of the Tom Tom and noise circuits produces the Snaredrum sound. Further voicing of the Snaredrum noise is accomplished by the combination Crash Cymbal and Snaredrum Gate Q71.

Q57 TOM TOM PULSE AMP.

Depressing the Tom Tom push button or activating the Snaredrum as per above applies a positive voltage pulse to the Tom Tom Pulse Amp. The positive pulse is then amplified and inverted to a strong negative voltage pulse which is applied to the input of the Tom Tom Gen. Q62.

Q62 TOM TOM GENERATOR

A low frequency oscillator that produces an audio signal of diminishing amplitude when excited by a negative voltage pulse from the Tom Tom Pulse Amp. Q57. Any one of the three Group pulse Amps Q58, Q59 or Q60 will also key the Tom Tom Gen. depending on the setting of the United Divided tabswitch. The output of the Tom Tom Gen. is connected to the Rhythm Preamp Q70.

Q58 GROUP NO. 1 PULSE AMP.

Depressing any of the first ten Lower Manual keys applies a positive voltage pulse to the input of the Group No. 1 Pulse Amp. This positive voltage pulse is then amplified and inverted to a strong negative voltage pulse suitable for keying the Tom Tom, Bongo and Block Gen's as well as the Brush Cymbal Trigger Q68-Q69. The output of the Group No. 1 Pulse Amp. may be used to trigger the Tom Tom, Bongo or Block Gen's either singularly or in combination depending on the settings of the Unified Divided, Tom Tom, Bongo or Block tabswitches.

Q59 GROUP NO. 2 PULSE AMP.

Depressing any of the six Lower Manual keys between G1 and C2 applies a positive voltage pulse to the input of the Group No. 2 Pulse Amp. This positive voltage pulse is then amplified and inverted to a strong negative voltage pulse suitable for keying the Tom Tom, Bongo and Block Gen's. The output of the Group No. 2 Pulse Amp. may be used to trigger the Tom Tom, Bongo

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or Block Gen's either singularly or in combination depending on the settings of the Unified Divided, Tom Tom, Bongo or Block tabswitches.

Q60 GROUP NO. 3 PULSE AMP.

Depressing any of the eleven Lower Manual keys between C#2 and B3 applies a positive voltage pulse to the input of the Group No. 3 Pulse Amp. This positive voltage pulse is then amplified and inverted to a strong negative voltage pulse suitable for keying the Tom Tom, Bongo and Block Gen's. The output of the Group No. 3 Pulse Amp. may be used to trigger the Tom Tom, Bongo or Block Gen's either singularly or in combination depending on the settings of the Unified Divided, Tom Tom, Bogo or Bock tabswitches.

Q63 BONGO GENERATOR

A low frequency oscillator that produces an audio signal of diminishing amplitude when excited by a negative voltage pulse from the Bongo push button or any one of the three Group pulse Amps Q58, Q59 or Q60. The setting of the Unified Divided tabswitch and the Rhythm Keyswitch depressed, determines which Pulse Amp will key the Bongo Generator. The output of the Bongo Generator is connected to the Rhythm Preamp Q70.

Q64 BLOCKS GENERATOR

A low frequency oscillator that produces an audio signal of diminishing amplitude when excited by a negative voltage pulse from the Blocks push button or any one of the three Group pulse Amps Q58, Q59 or Q60. The setting of the Unified Divided tabswitch and the Rhythm Keyswitch depressed, determines which Pulse Amp will key the Block Generator. The output of the Block Generator is connected to the Rhythm Preamp Q70.

Q65 BASS DRUM GENERATOR

A low frequency oscillator that produces an audio signal of diminishing amplitude when excited by a negative pulse from the Pedal Cancel Transistor Q24 or the Bass Drum push button. The output of the Bass Drum Generator is connected to the Rhythm Preamp Q70.

Q66 CRASH CYMBAL TRIGGER

A negative voltage pulse from the Pedal Cancel Transister Q24 keys this circuit which then produces a positive voltage pulse that is used to key the Noise Amp. Q74 and Clave Trigger Q67.

Q67 CLAVE TRIGGER

A positive voltage pulse from the Crash Cymbal Trigger keys the Clave Trigger which then produces a negative voltage pulse. The negative voltage pulse excites the Clave Generator (mainly coil L8 & capacitors) into momentary oscillation. The Clave Generator output signal is connected to the Rhythm Preamp Q70.

Q68-Q69 BRUSH CYMBAL TRIGGER

A negative voltage pulse from either the Pedal Cancel Transistor Q24 or the Group No. 1, 2 or 3 Pulse Amps keys the Brush Cymbal trigger, which, then produces a strong positive voltage output pulse. This positive voltage pulse is used to key the Noise Amp. Q74. When the Brush Accent switch is in Medium or Long position, additional capacitors are charged thus allowing the brush sound to sustain longer.

Q61 SHIMMER GENERATOR

The B+ keying voltage from the Bass Pedal Keyer Q21 is changed to a 18 cycle pulsating B+ keying voltage by the Shimmer Generator. This pulsating B+ voltage then keys the Noise Amp. Q74. A combined signal from the D# and E tone generators results in approximately an 18 cycle AC modulation signal that controls the Shimmer Generator.

Q73 NOISE GENERATOR

A B+ voltage applied to the emitter of this transistor causes the internal base emitter junction to produce random noise signal (Zener break down). The output of the Noise Generator is connected to the Noise Amp. Q74.

Q74 NOISE AMP

This circuit is normally not operating in fact it acts as a blocking circuit between the Noise Generator Q73 and the Gate Circuits Q71-Q72. Two things happen to the Noise Amp. circuit when it is keyed by either a positive voltage or positive voltage pulse:

1. It amplifies the noise signal from the Noise Generator Q73. (A positive voltage applied to the base of the Noise Amp. biases it "on.")

2. The amplified noise signal is allowed to pass onto the appropriate Gate Circuit Q71 or Q72.

The above two functions are controlled by four pairs of diodes that are connected in the following order:

1. **D44 & D48 BRUSH SHIMMER**
2. **D45 & D49 BRUSH CYMBAL**
3. **D46 & D51 SNAREDRUM NOISE**
4. **D48 & D50 CRASH CYMBAL**

Q71-Q72 BRUSH/CRASH & SNAREDRUM GATES

These two circuits voice the noise signal from the Noise Amp Q74. Gate Q71 is slightly different from Gate Q72 in that as the noise signal decays the voicing changes. The voiced noise output signal from Gates Q71 & Q72 is connected to the Rhythm Preamp Q70.

Q70 RHYTHM PREAMP

Audio signals from all the Rhythm voice circuits are combined at and amplified by this Preamp. The output of this preamp is connected through the Rhythm volume control to the String Preamp Q31.

ADJUSTMENTS

VR-1 VIBRATO SLOW SPEED ADUSTMENT

Vibrato slow speed may be adjusted using a small Phillips screwdriver. Proper speed is between 5-6 Hertz with the Vibrato speed tabswitch in the Slow position. Always adjust vibrato slow speed before adjusting fast speed. The Vibrato Oscillator will not oscillate if adjustment is extreme.

VR-2 VIBRATO FAST SPEED ADJUSTMENT

Vibrato fast speed may be adjusted using a small Phillips screwdriver. Proper speed is between 6-7 Hertz

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with the Vibrato speed tabswitch in the Fast position. Always adjust vibrato slow speed before adjusting fast speed. The Vibrato Oscillator will not oscillate if adjustment is extreme.

VR3 REPEAT SPEED ADJUSTMENT

Repeat speed may be adjusted using a small regular screwdriver. Proper speed is between 7 and 8 beats per second with the Repeat tabswitch in the Fast position. A comparison may be made by ear between Repeat and Vibrato for an approximate setting. Take into consideration customer preference.

VR6-VR7 BIAS ADJUSTMENT

This adjustment is carefully set at the Factory! Readjustment should only be necessary when Output transistors are replaced. Refer to the Lowrey Repair Procedures Manual for complete Amplifier circuit repair and adjustment procedures.

L1 TUNING ADJUSTMENT

This adjustment is carefully set at the factory. Should tuning be necessary, refer to the Lowrey Repair Procedures Manual.

L2-L3 DOUBLER COIL ADJUSTMENT

This adjustment is carefully set at the factory! Readjustment should only be necessary when Doubler circuit components are replaced. Refer to the Lowrey Repair Procedures Manual for complete Doubler Circuit Repair and Adjustment procedures.

VR10 SNAREDRUM ADJUSTMENT TLOR-1

The roll or beat of the snaredrum may be adjusted using a small regular screwdriver. Proper speed is approximately 15 beats per second. Take into consideration customer preference.

VR11 TOM TOM ADJUSTMENT TLOR-1

The Tom Tom adjustment affects the "length" of the Tom Tom tone. Adjusting the Tom Tom length is similar to adjusting the head of an actual Tom Tom drum. Repeatedly depress the Tom Tom push button while turning the Tom Tom adjustment with a small regular screwdriver. Too little Tom Tom length will cause the Tom Tom to sound dead too much and the Tom Tom will sound continuously.

VR-12 BONGO ADJUSTMENT TLOR-1

The Bongo adjustment affects the "length" of the Bongo tone. Adjusting the Bongo length is similar to adjusting the head of an actual Bongo drum. Repeatedly depress the Bongo push button while turning the Bongo adjustment with a small regular screwdriver. Too little Bongo length will cause the Bongo to sound dead too much and the Bongo will sound continuously.

VR13 BLOCK ADJUSTMENT TLOR-1

The Block adjustment affects the "length" of the Block tone. Repeatedly depress the Block push button while turning the Block adjustment with a small regular screwdriver. Too little Block length will cause the Block to sound dead too much and the Block will sound continuously.

VR14 BASS DRUM ADJUSTMENT TLOR-1

Th Bass Drum adjustment affects the "length" of the Bass Drum tone. Adjusting the Bass Drum length is similar to adjusting the head of an actual Bass Drum. Repeatedly depress the Bass Drum push button while turning the Bass Drum adjustment with a small regular screwdriver. Too little Bass Drum length will cause the Bass Drum to sound dead too much and the Bass Drum will sound continuously.

VR8 REVERB ADJUSTMENT TLOR-1

The amount of reverberation may be adjusted using a small regular screwdriver. Set the reverberation to an amount that is pleasing but not overpowering. Acoustically dead rooms may require slightly more reverberation than normal. Too much Reverb may cause a ringing or oscillation when certain notes are played.

IMPORTANT

(TLOR-1)

A constant Hum or noise will occur when the Reverb tab is "on" if the Reverb locking cardboard is not removed after shipment.

AUTOMATIC ORCHESTRA

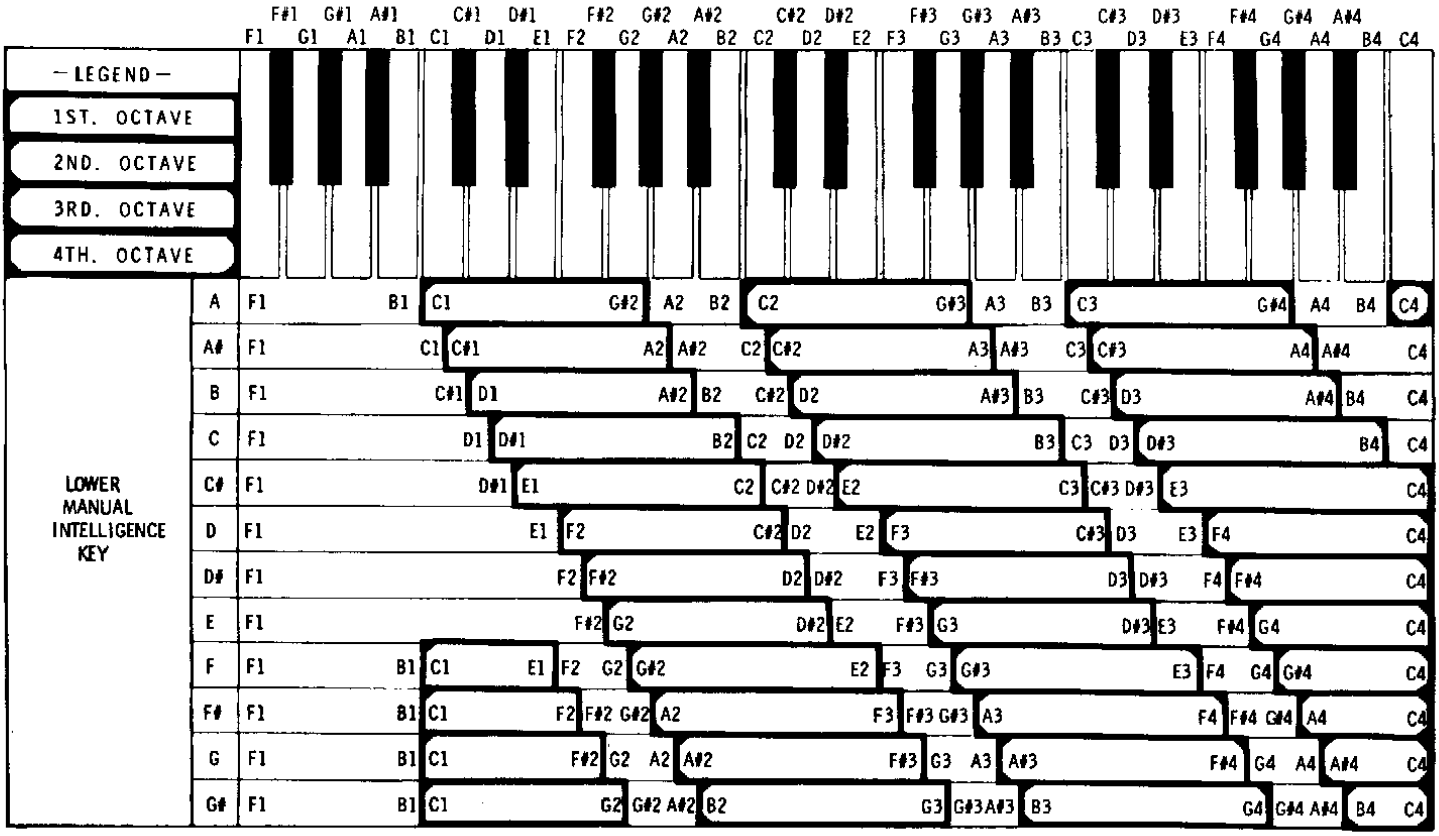
(Refer to Drawing No. 2)

Automatic Orchestra (A.O.C. consists of two switching circuits—A.O.C. Keyswitches and Intelligence keyswitches. In addition, 41 isolation diodes are used to prevent cross-keying when chords are played on the Upper Manual with Sustain. Listed below is an example of what happens when a C Major chord is held on the Lower Manual and the C4 Upper Manual key is depressed.

1. With the A.O.C. tabswitch "on", hold a C Major chord (C, E and G) on the Lower Manual. This applies B+ keying voltage from the Intelligence keyswitches to all of the C,E and G A.O.C. keyswitch on busses via isolation diodes.
2. Upon depressing the Upper Manual C4 key
   (a) The C4 Upper Manual D.C. keyswitch, as well as the nine A.O.C. keyswitches, make contact with their respective on busses.
   (b) The C4 key switch contact receives B+ keying voltage from its on buss and thus keys the C4 note.
   (c) Two of the nine (E3 and G4) A.O.C. keyswitches contact on busses that have B+ keying voltage applied to them from the Intelligence keyswitches. This B+ keying voltage is applied to the off busses of the E3 and G4 Upper Manual D.C. keyswitches, thus keying E3 and G4 along with C4.

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A.O.C. KEYING CHART



A.O.C. CHECKOUT PROCEDURE

1. Depress these two tabs only: Upper Manual Flute 8′ and A.O.C.
2. Depress one key (A1 for example) in the Lower Manual A.O.C. Intelligence section (A1 through C3).
3. Play each of the keys from C1 through C4 on the Upper Manual. On certain keys, a note—in addition to the normal Upper Manual note—should be heard. This additional note will be, for example, an "A" note if an "A" key is depressed in the Lower Manual Intelligence section. The additional "A" note will be **within** the octave, but "**below**" that Upper Manual key being depressed. Refer to the A.O.C. Keying Chart to determine which notes sound as different Intelligence and Upper Manual keys are depressed.
4. Repeat the above procedure for the remaining notes of the Lower Manual A.O.C. Intelligence section.

IMPORTANT

For A.O.C. to function properly, the A.O.C. (and Arpeggio) tabswitches must make proper on contact and the Upper Manual D.C. keyswitches must make proper off contact.

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BASS PEDAL TROUBLESHOOTING GUIDE

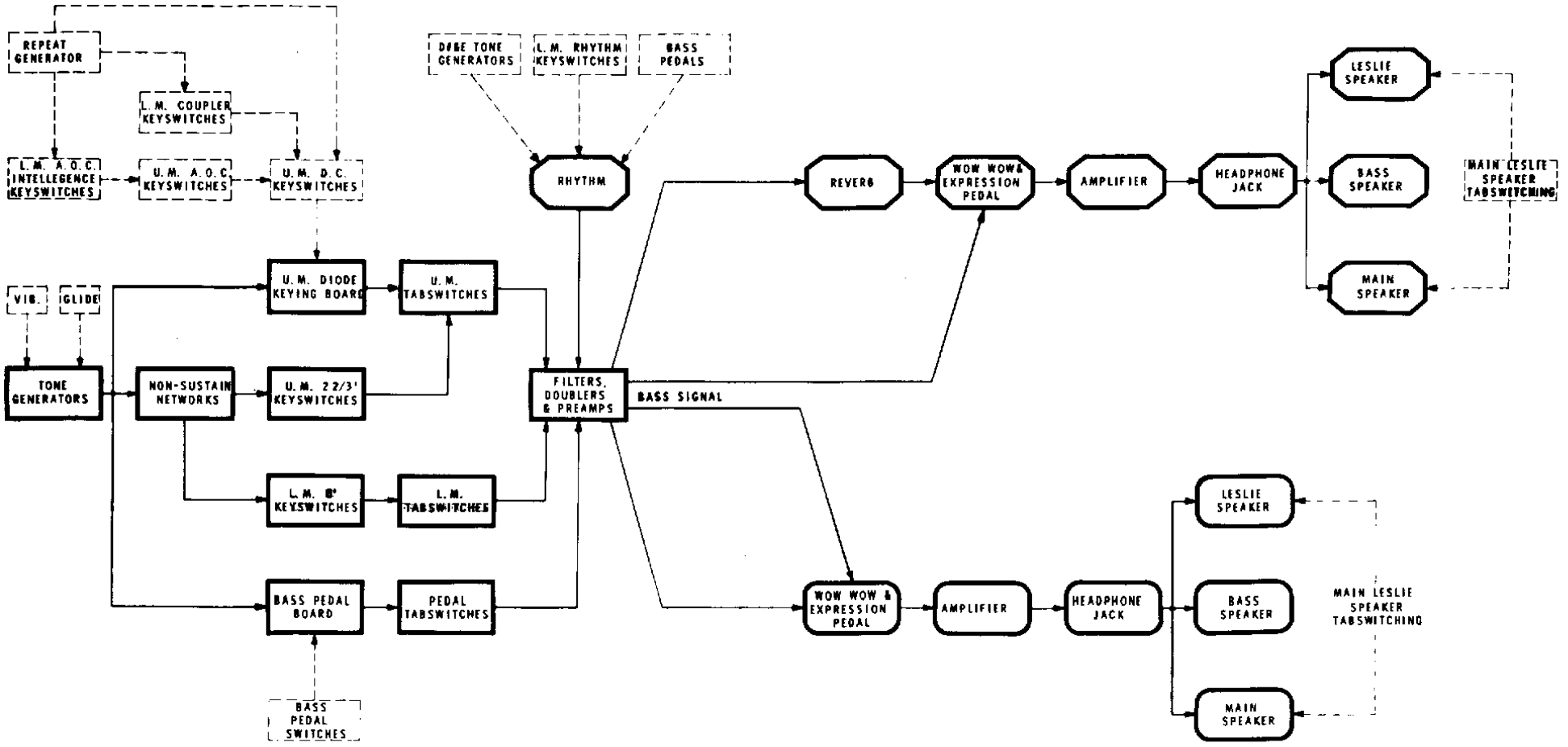
		TRANSISTOR		DIODE	
		OPEN	SHORTED	OPEN	SHORTED
1.	One "dead" pedal.			D12*	
2.	All pedals rumble.	Q35	Q35		
3.	All pedals rumble except one.				D12 D13#
4.	All pedals rumble, but if any one is held it will clear after about 30 seconds.			D11	
5.	All pedals play except one, which when depressed, causes all other pedals to rumble for about 30 seconds.		D13*		
6.	No pedals.	Q35, 38 Q39	Q34 Q36	D14	
7.	No pedals on 8′ only			D20 D21	
8.	No pedals on 16′ only.	Q42 Q43	Q42 Q43	D22 D23	D22
9.	No pedals, but a thump or a click may be heard as a pedal is depressed.	Q40 Q41	Q40 Q41	D15 D16	D15 D16
10.	Pedal sustain always "on".			D17	
11.	Pedals continue to play for about 15 seconds after a pedal is released.		Q38 Q39		D20
12.	No Bass Guitar harmonic.	Q37		D18 D19	
13.	Bass Harmonic remains on for about 15 seconds after pedal is released.		Q37		D18
14.	Bass Guitar plays double—as pedal is depressed and released.				D11

#Diode will be located in circuit of normal playing pedal. *Diode will be located in circuit of non-playing pedal.

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BLOCK DIAGRAM

TLO-1/TLOR-1

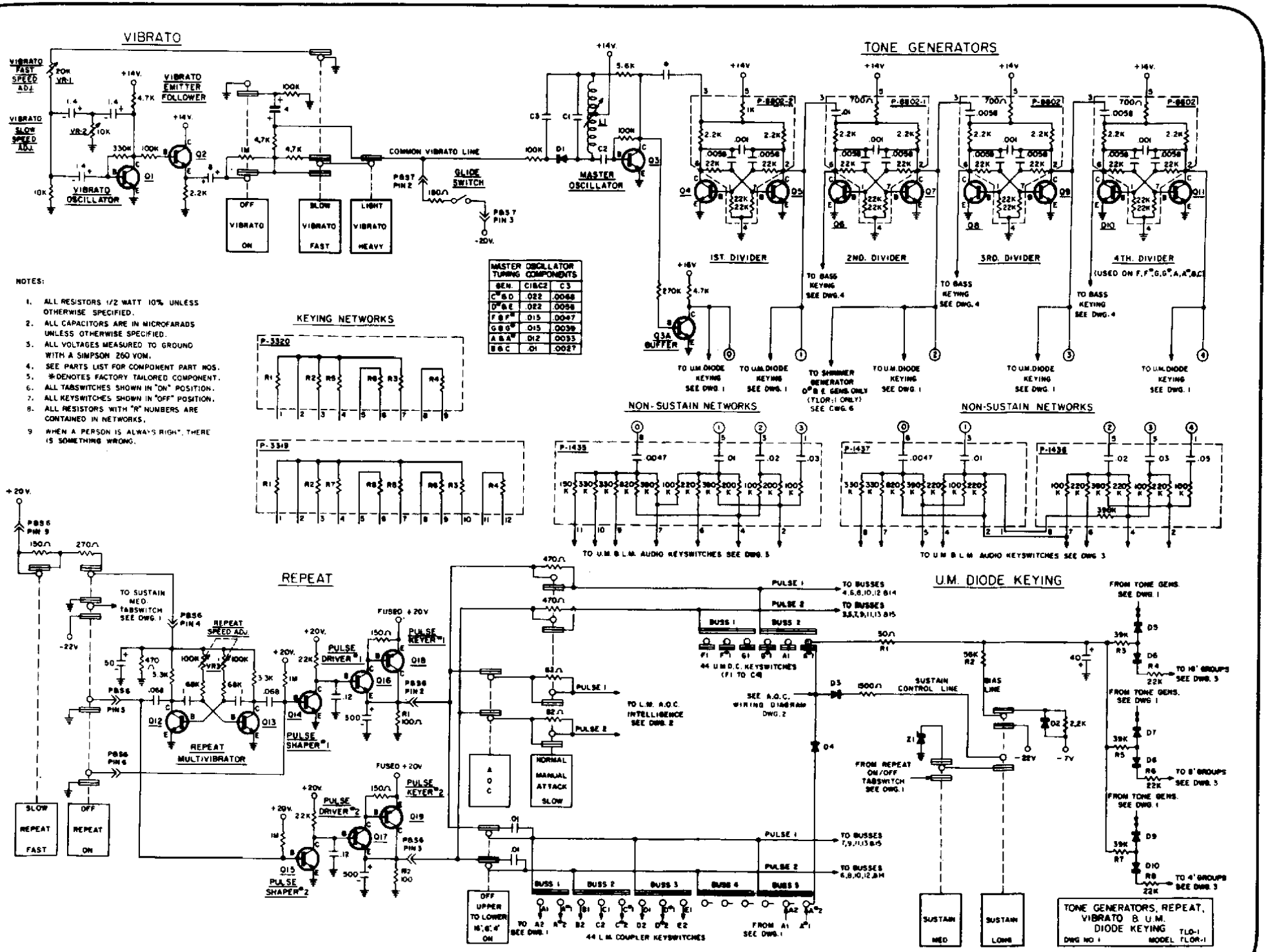


LEGEND

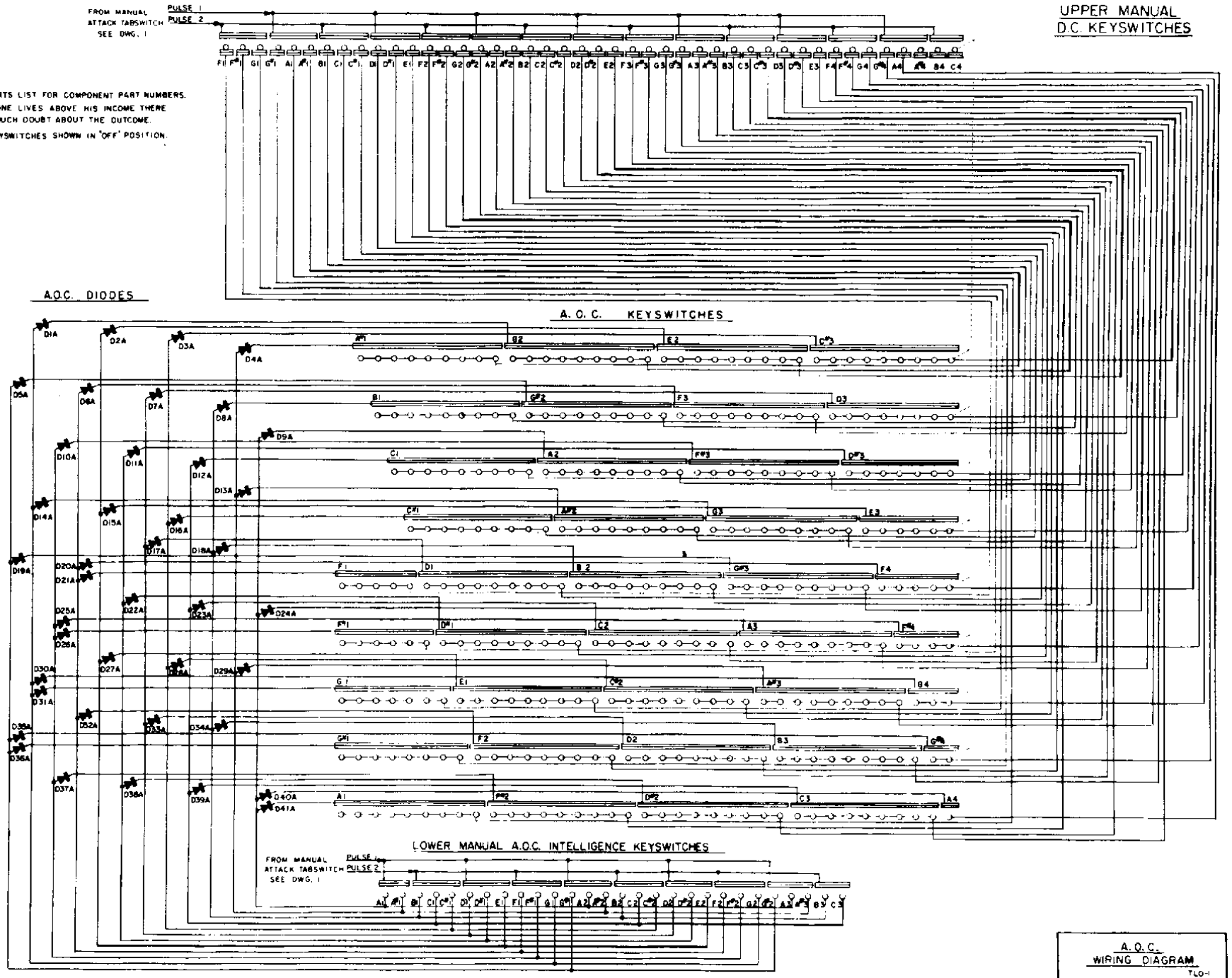
SIGNAL FLOW →

TLO-1 or TLOR-1 | TLO-1 | TLOR-1 | CONTROL CIRCUITS

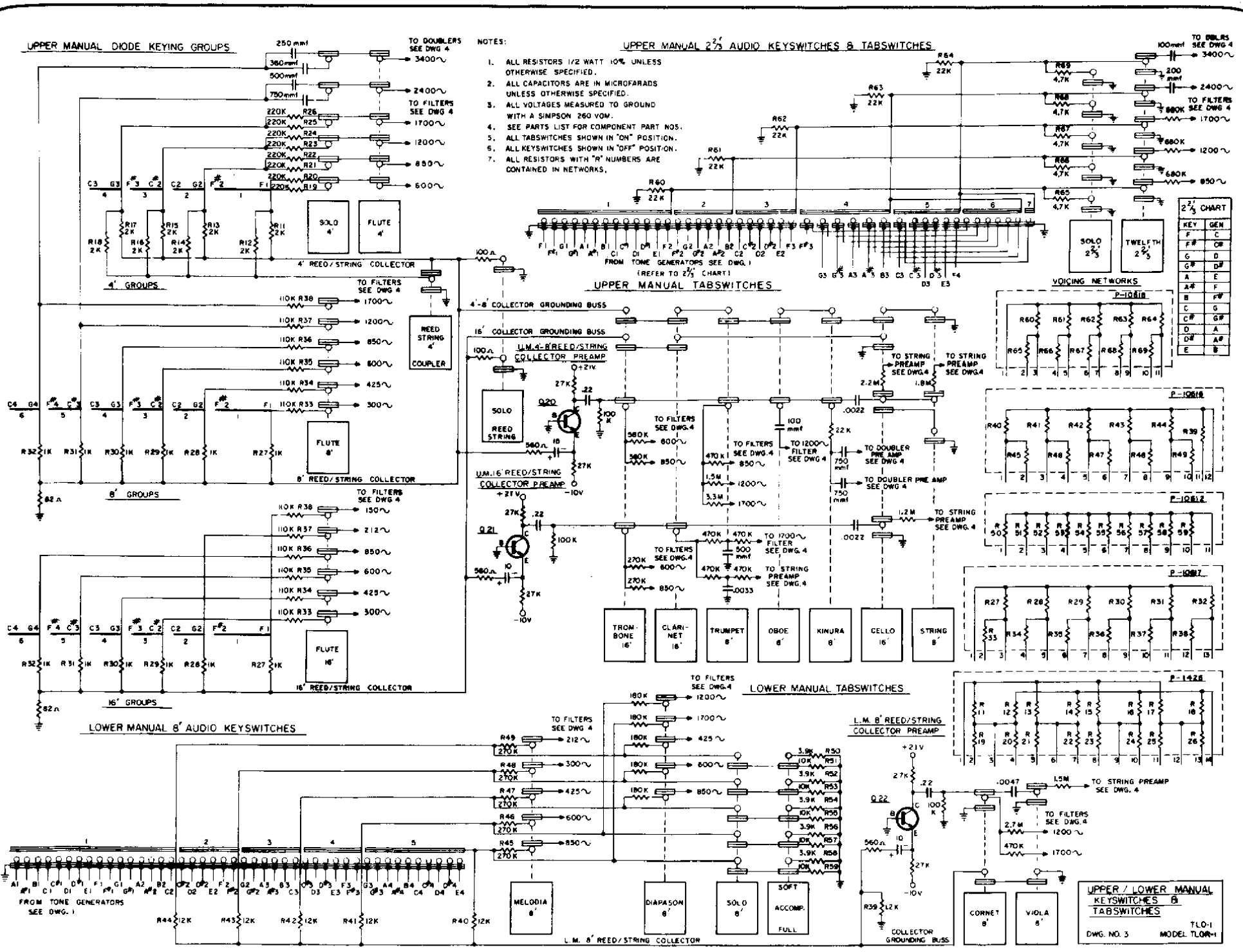
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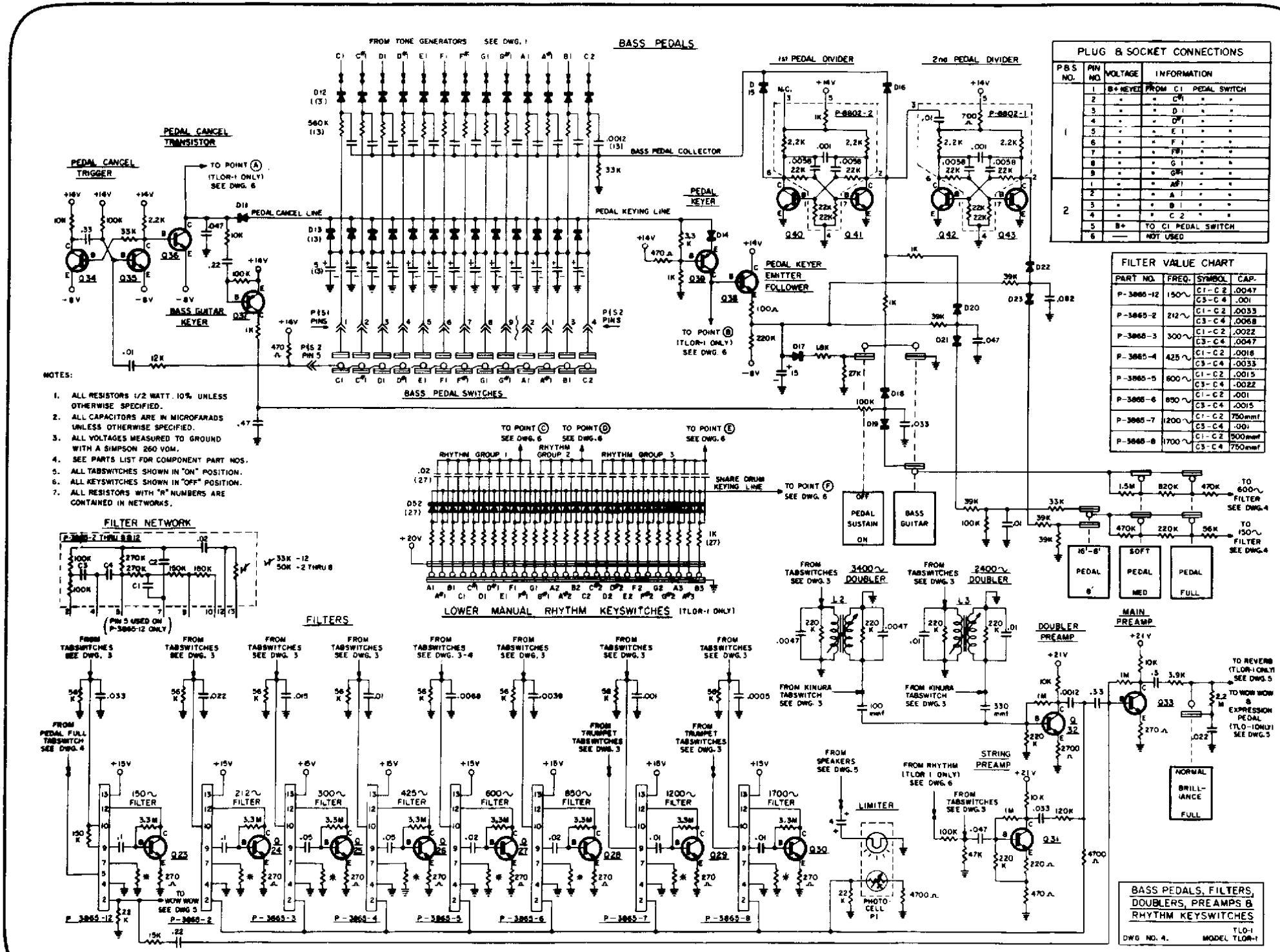
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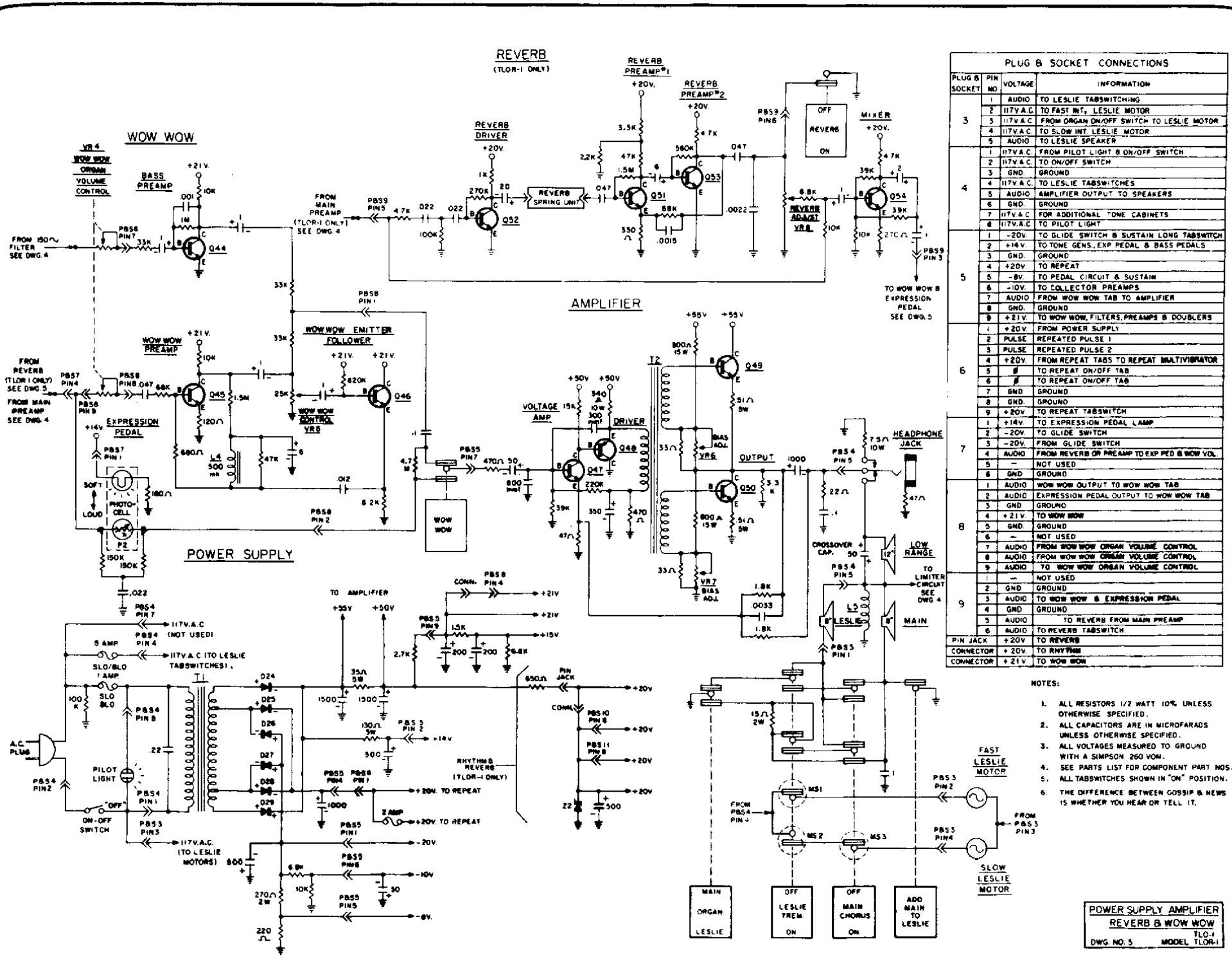


PLUG & SOCKET CONNECTIONS			
P&S NO.	PIN NO.	VOLTAGE	INFORMATION
1	1	B+ KEYED	FROM C1 PEDAL SWITCH
	2	"	" C#1 " "
	3	"	" D 1 " "
	4	"	" D#1 " "
	5	"	" E 1 " "
	6	"	" F 1 " "
	7	"	" F#1 " "
	8	"	" G 1 " "
	9	"	" G#1 " "
2	1	"	" A#1 " "
	2	"	" A 1 " "
	3	"	" B 1 " "
	4	"	" C 2 " "
	5	B+	TO C1 PEDAL SWITCH
	6	—	NOT USED

FILTER VALUE CHART			
PART NO.	FREQ.	SYMBOL	CAP.
P-3865-12	150~	C1-C2	.0047
		C3-C4	.001
P-3865-2	212~	C1-C2	.0033
		C3-C4	.0068
P-3865-3	300~	C1-C2	.0022
		C3-C4	.0047
P-3865-4	425~	C1-C2	.0018
		C3-C4	.0033
P-3865-5	600~	C1-C2	.0015
		C3-C4	.0022
P-3865-6	850~	C1-C2	.001
		C3-C4	.0015
P-3865-7	1200~	C1-C2	750mmf
		C3-C4	.001
P-3865-8	1700~	C1-C2	500mmf
		C3-C4	750mmf

BASS PEDALS, FILTERS, DOUBLERS, PREAMPS & RHYTHM KEYSWITCHES
TLO-1
DWG NO. 4. MODEL TLOR-1

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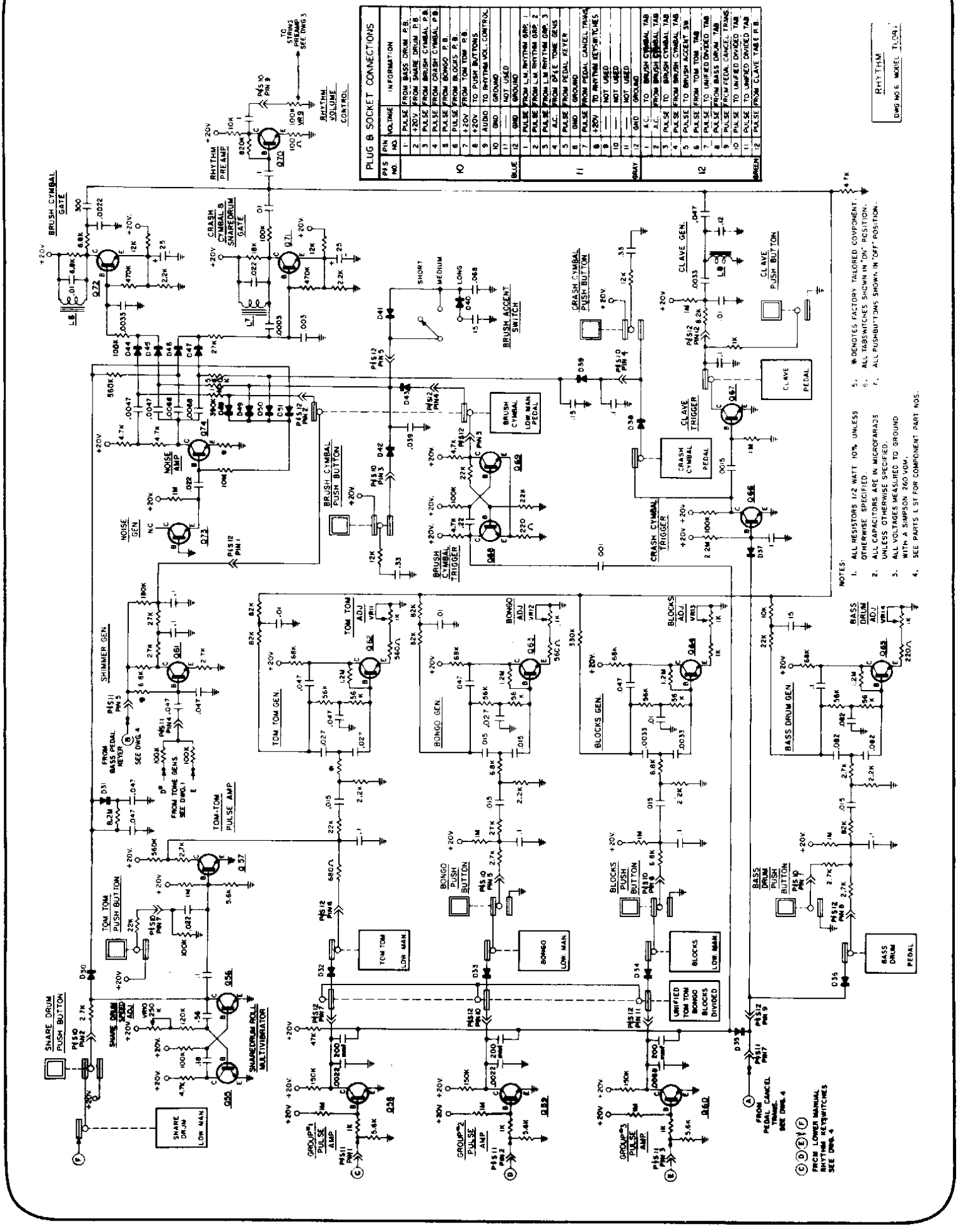
PLUG & SOCKET CONNECTIONS

PLUG & SOCKET	PIN NO	VOLTAGE	INFORMATION
3	1	AUDIO	TO LESLIE TABSWITCHING
	2	117V.A.C.	TO FAST INT. LESLIE MOTOR
	3	117V.A.C.	FROM ORGAN ON/OFF SWITCH TO LESLIE MOTOR
	4	117V.A.C.	TO SLOW INT. LESLIE MOTOR
	5	AUDIO	TO LESLIE SPEAKER
4	1	117V.A.C.	FROM PILOT LIGHT & ON/OFF SWITCH
	2	117V.A.C.	TO ON/OFF SWITCH
	3	GND.	GROUND
	4	117V.A.C.	TO LESLIE TABSWITCHES
	5	AUDIO	AMPLIFIER OUTPUT TO SPEAKERS
	6	GND.	GROUND
	7	117V.A.C.	FOR ADDITIONAL TONE CABINETS
	8	117V.A.C.	TO PILOT LIGHT
5	1	-20V.	TO GLIDE SWITCH & SUSTAIN LONG TABSWITCH
	2	+14V.	TO TONE GENS., EXP PEDAL & BASS PEDALS
	3	GND.	GROUND
	4	+20V.	TO REPEAT
	5	-8V.	TO PEDAL CIRCUIT & SUSTAIN
	6	-10V.	TO COLLECTOR PREAMPS
	7	AUDIO	FROM WOW WOW TAB TO AMPLIFIER
	8	GND.	GROUND
	9	+21V.	TO WOW WOW, FILTERS, PREAMPS & DOUBLERS
6	1	+20V.	FROM POWER SUPPLY
	2	PULSE	REPEATED PULSE 1
	3	PULSE	REPEATED PULSE 2
	4	+20V.	FROM REPEAT TABS TO REPEAT MULTIVIBRATOR
	5	∅	TO REPEAT ON/OFF TAB
	6	∅	TO REPEAT ON/OFF TAB
	7	GND	GROUND
	8	GND.	GROUND
	9	+20V.	TO REPEAT TABSWITCH
7	1	+14V.	TO EXPRESSION PEDAL LAMP
	2	-20V.	TO GLIDE SWITCH
	3	-20V.	FROM GLIDE SWITCH
	4	AUDIO	FROM REVERB OR PREAMP TO EXP PED & WOW VOL
	5	—	NOT USED
	6	GND	GROUND
8	1	AUDIO	WOW WOW OUTPUT TO WOW WOW TAB
	2	AUDIO	EXPRESSION PEDAL OUTPUT TO WOW WOW TAB
	3	GND	GROUND
	4	+21V.	TO WOW WOW
	5	GND.	GROUND
	6	—	NOT USED
	7	AUDIO	FROM WOW WOW ORGAN VOLUME CONTROL
	8	AUDIO	FROM WOW WOW ORGAN VOLUME CONTROL
	9	AUDIO	TO WOW WOW ORGAN VOLUME CONTROL
9	1	—	NOT USED
	2	GND	GROUND
	3	AUDIO	TO WOW WOW & EXPRESSION PEDAL
	4	GND	GROUND
	5	AUDIO	TO REVERB FROM MAIN PREAMP
	6	AUDIO	TO REVERB TABSWITCH
PIN JACK		+20V	TO REVERB
CONNECTOR		+20V.	TO RHYTHM
CONNECTOR		+21V.	TO WOW WOW

NOTES:

1. ALL RESISTORS 1/2 WATT 10% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES MEASURED TO GROUND WITH A SIMPSON 260 VOM.
4. SEE PARTS LIST FOR COMPONENT PART NOS.
5. ALL TABSWITCHES SHOWN IN "ON" POSITION.
6. THE DIFFERENCE BETWEEN GOSSIP & NEWS IS WHETHER YOU HEAR OR TELL IT.

POWER SUPPLY AMPLIFIER
REVERB & WOW WOW
TLO-I
DWG. NO. 5 MODEL TLOR-I

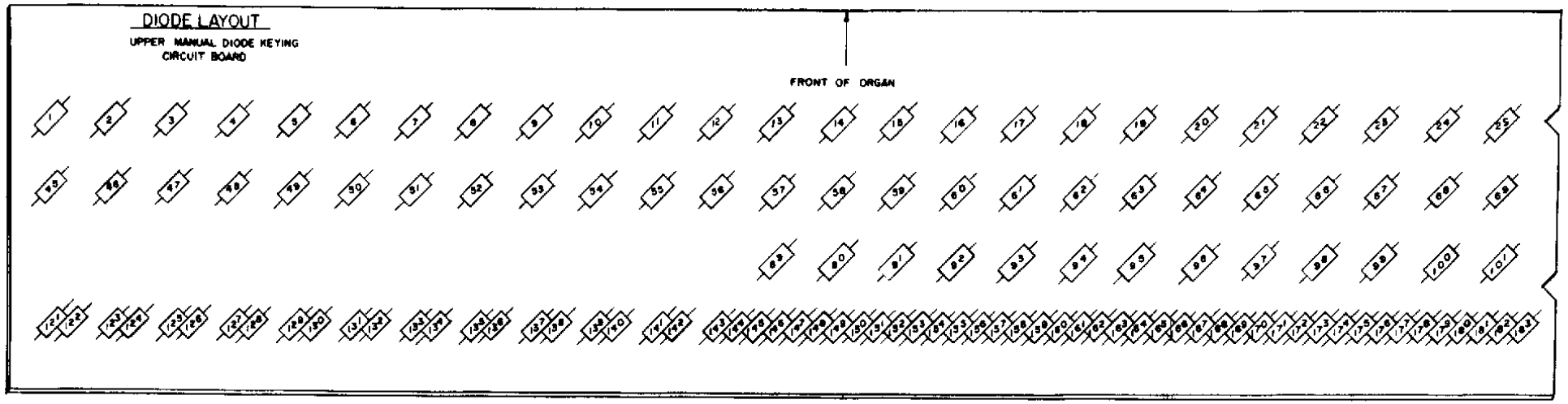


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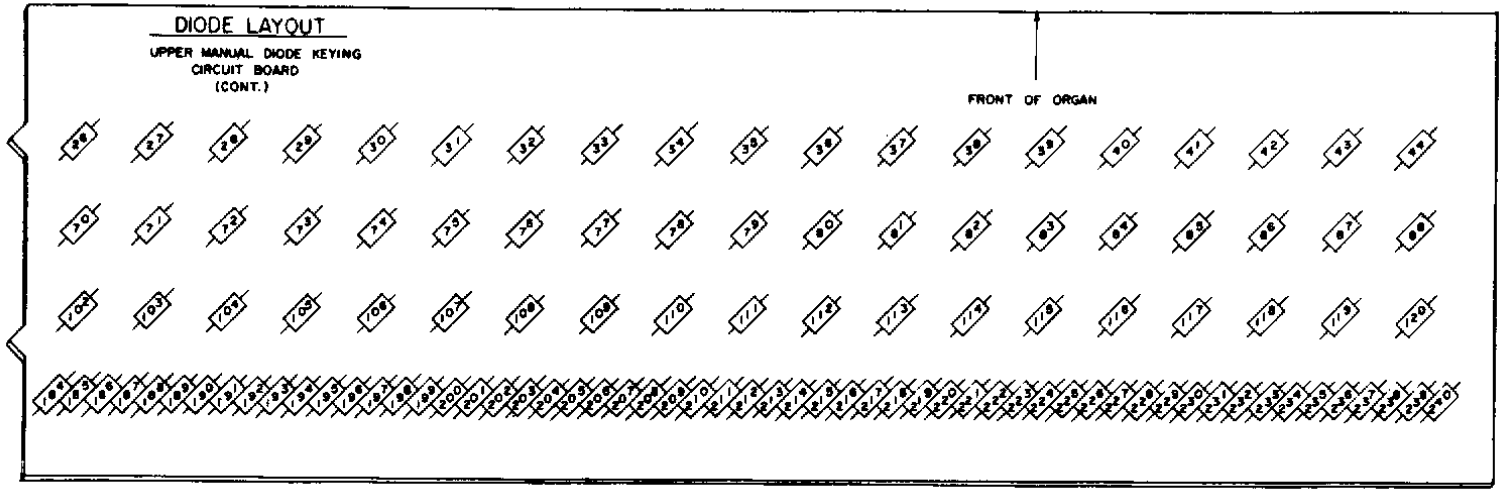
DIODE LAYOUT

UPPER MANUAL DIODE KEYING CIRCUIT BOARD



DIODE LAYOUT

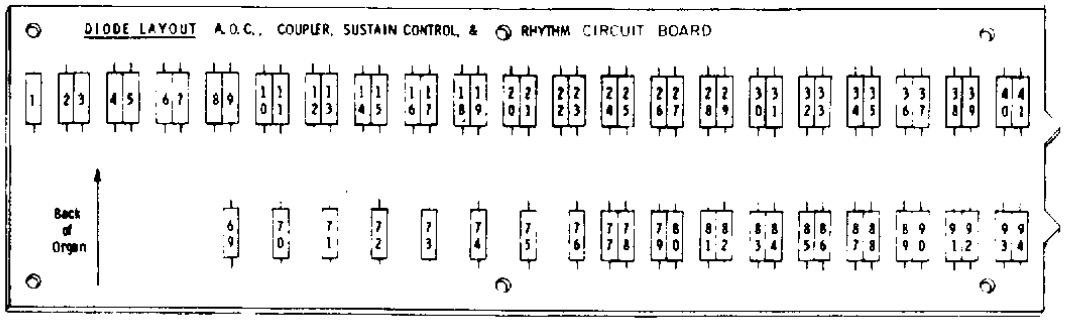
UPPER MANUAL DIODE KEYING CIRCUIT BOARD (CONT.)

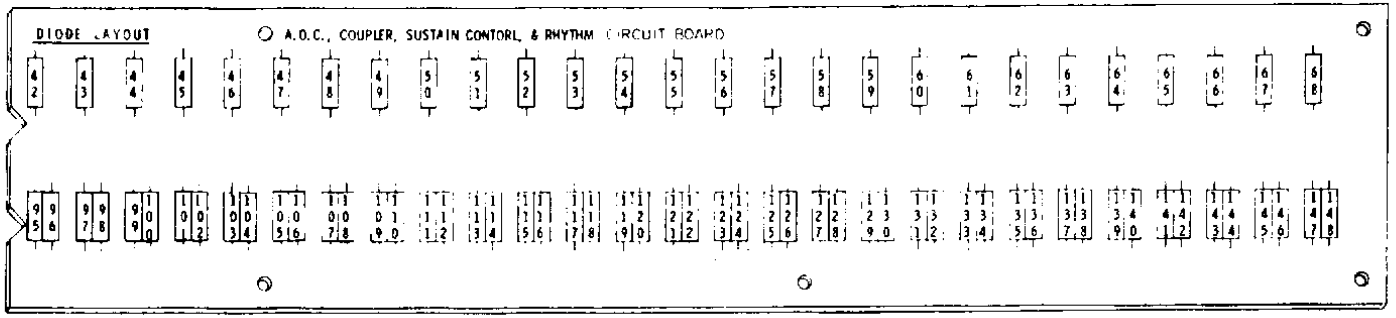


DIODE CHART

KEY	16'	8'	4'
F 1	120 & 240	88 & 239	44 & 204
F# 1	119 & 237	87 & 236	43 & 201
G 1	118 & 234	86 & 233	42 & 198
G# 1	117 & 231	85 & 230	41 & 195
A 1	116 & 228	84 & 227	40 & 192
A# 1	115 & 225	83 & 224	39 & 189
B 1	114 & 222	82 & 221	38 & 186
C 1	113 & 219	81 & 218	37 & 183
C# 1	112 & 216	80 & 215	36 & 180
D 1	111 & 213	79 & 212	35 & 177
D# 1	110 & 210	78 & 209	34 & 174
E 1	109 & 207	77 & 206	33 & 171
F 2	108 & 236	76 & 203	32 & 168
F# 2	107 & 255	75 & 200	31 & 165
G 2	106 & 232	74 & 197	30 & 162
G# 2	105 & 229	73 & 194	29 & 159
A 2	104 & 226	72 & 191	28 & 156
A# 2	103 & 223	71 & 188	27 & 153
B 2	102 & 220	70 & 185	26 & 150
C 2	101 & 217	69 & 182	25 & 147
C# 2	100 & 214	68 & 179	24 & 144
D 2	99 & 211	67 & 176	23 & 142
D# 2	98 & 208	66 & 173	22 & 140
E 2	97 & 205	65 & 170	21 & 138
F 3	96 & 202	64 & 167	20 & 136
F# 3	95 & 199	63 & 164	19 & 134
G 3	94 & 196	62 & 161	18 & 132
G# 3	93 & 193	61 & 158	17 & 130
A 3	92 & 190	60 & 155	16 & 128
A# 3	91 & 187	59 & 152	15 & 126
B 3	90 & 184	58 & 149	14 & 124
C 3	89 & 181	57 & 146	13 & 122
C# 3	56 & 178	12 & 143	12 & 143
D 3	55 & 175	11 & 141	11 & 141
D# 3	54 & 172	10 & 139	10 & 139
E 3	53 & 169	9 & 137	9 & 137
F 4	52 & 166	8 & 135	8 & 135
F# 4	51 & 163	7 & 133	7 & 133
G 4	50 & 160	6 & 131	6 & 131
G# 4	49 & 157	5 & 129	5 & 129
A 4	48 & 154	4 & 127	4 & 127
A# 4	47 & 151	3 & 125	3 & 125
B 4	46 & 148	2 & 123	2 & 123
C 4	45 & 145	1 & 121	1 & 121

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SUSTAIN	
U. M. KEY	DIODE
F1	78
F#1	80
G1	82
G#1	84
A1	86
A#1	88
B1	90
C1	92
C#1	94
D1	96
D#1	98
E1	100
F2	102
F#2	104
G2	106
G#2	108
A2	110
A#2	112
B2	114
C2	116
C#2	118
D2	120
D#2	122
E2	124
F3	126
F#3	128
G3	130
G#3	132
A3	134
A#3	136
B3	138
C3	140
C#3	142
D3	144
D#3	146
E3	148
F4	69
F#4	70
G4	71
G#4	72
A4	73
A#4	74
B4	75
C4	76

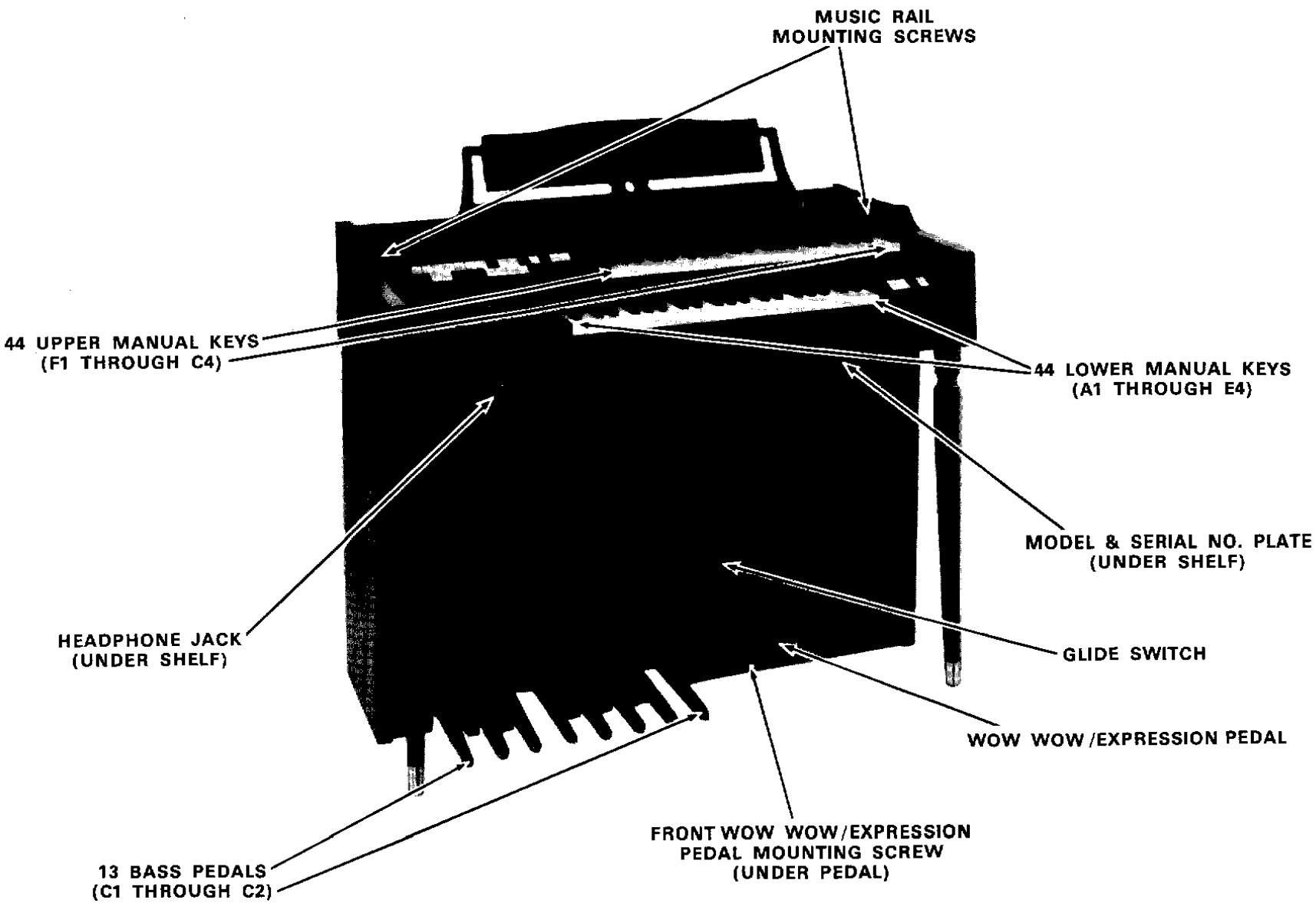
A. O. C.		
INTELLIGENCE NOTE	U. M. KEY	DIODE
F	F (1, 2, 3, 4)	1
		2
		3
		4
F#	F# (1, 2, 3, 4)	5
		6
		7
		8
G	G (1, 2, 3, 4)	9
		10
		11
		12
G#	G# (1, 2, 3, 4)	13
		14
		15
		16
A	A (1, 2, 3, 4)	17
		18
		19
		20
A#	A# (1, 2, 3, 4)	21
		22
		23
		24
B	B (1, 2, 3, 4)	25
		26
		27
C	C (1, 2, 3, 4)	28
		29
		30
C	C# (1, 2, 3, 4)	31
		32
		33
D	D (1, 2, 3, 4)	34
		35
		36
D#	D# (1, 2, 3, 4)	37
		38
		39
E	E (1, 2, 3, 4)	40
		41

COUPLER	
U. M. KEY	DIODE
F1	77
F#1	79
G1	81
G#1	83
A1 & A2	85
A#1&A#2	87
B1&B2	89
C1&C2	91
C#1&C#2	93
D1&D2	95
D#1&D#2	97
E1&E2	99
F2	101
F#2	103
G2	105
G#2	107
A3	109
A#3	111
B3	113
C3	115
C#3	117
D3	119
D#3	121
E3	123
F3	125
F#3	127
G3	129
G#3	131
A4	133
A#4	135
B4	137
C4	139
C#4	141
D4	143
D#4	145
E4	147

RHYTHM		
RHYTHM GROUP	U. M. KEY	DIODE
1	A1	42
	A#1	43
	B1	44
	C1	45
	C#1	46
	D1	47
	D#1	48
	E1	49
	F1	50
	F#1	51
2	G1	52
	G#1	53
	A2	54
	A#2	55
	B2	56
	C2	57
3	C#2	58
	D2	59
	D#2	60
	E2	61
	F2	62
	F#2	63
	G2	64
	G#2	65
	A3	66
	A#3	67
	B3	68

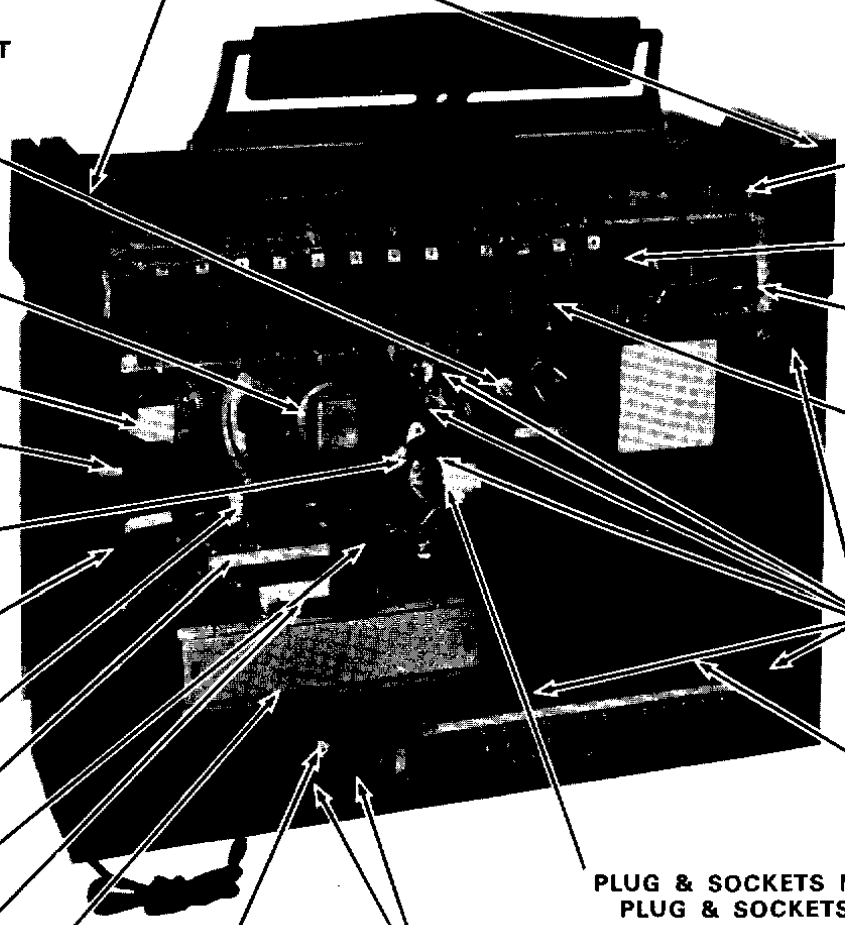
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FRONT VIEW



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REAR VIEW
(Back Removed)

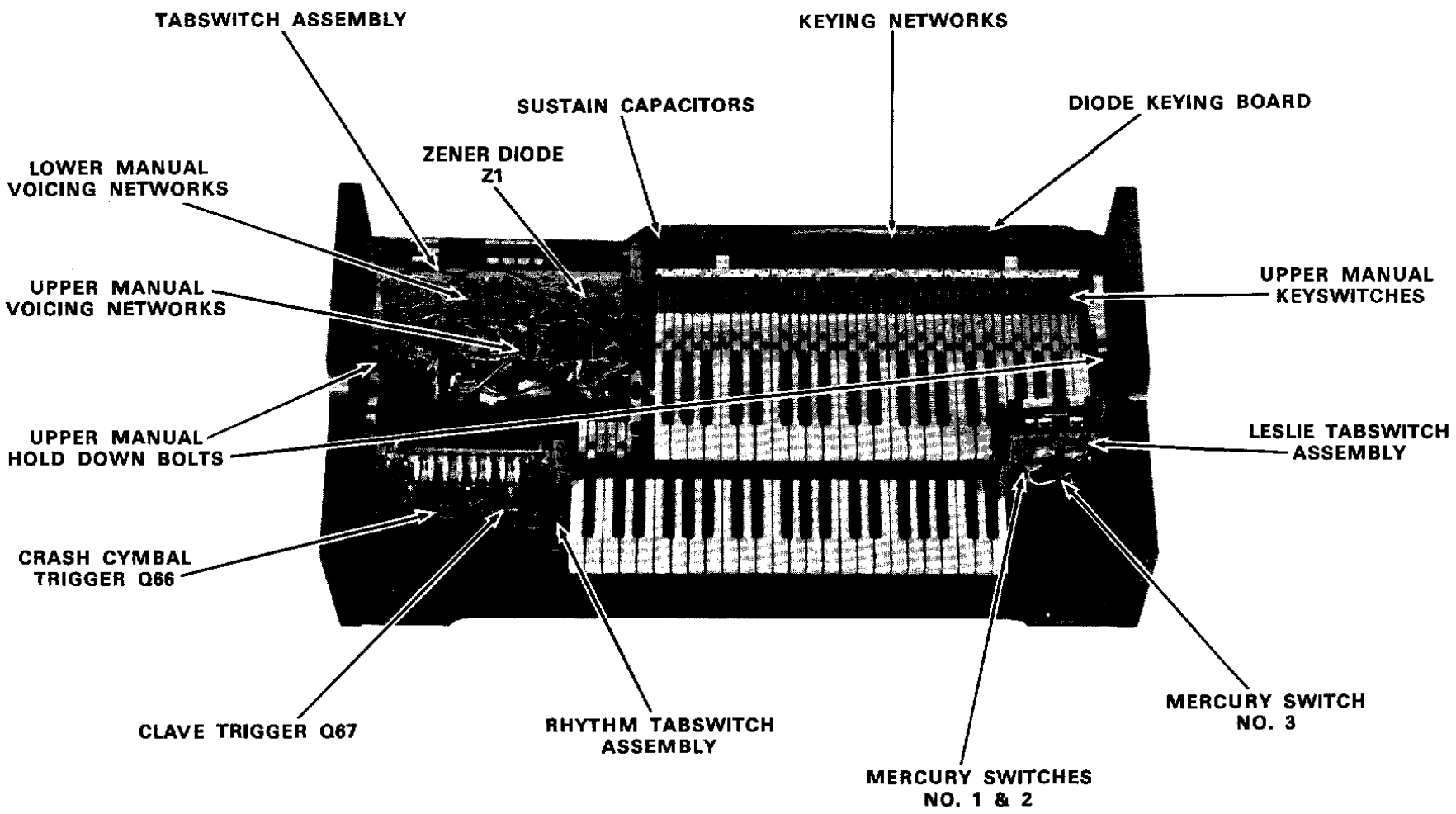


TOP MOUNTING SCREWS
LESLIE BELT ADJUSTMENT
12" LOW RANGE SPEAKER
8" MAIN SPEAKER
AMPLIFIER/POWER SUPPLY
PLUG & SOCKETS NO. 10, 11 & 12 TLOR-1
RHYTHM & REVERB PIN JACK
PLUG & SOCKET NO. 6
REPEAT CHASSIS
RHYTHM BOARD
REVERB BOARD
REVERB SPRING UNIT
WOW WOW BOARD
REAR WOW WOW / EXPRESSION PEDAL MOUNTING SCREWS
PLUG & SOCKETS NO. 1, 2, 7, 8 & 9 TLOR-1
PLUG & SOCKETS NO. 1, 2, 7 & 8 TLO-1
BASS PEDAL SWITCHES
LESLIE MOUNTING BOLTS
TONE GENERATOR BOARDS (12)
BASS PEDAL BOARD
VIBRATO BOARD
QUALITY CONTROL BOARD

Note:
To remove organ top remove the two top mounting screws and slide top back.

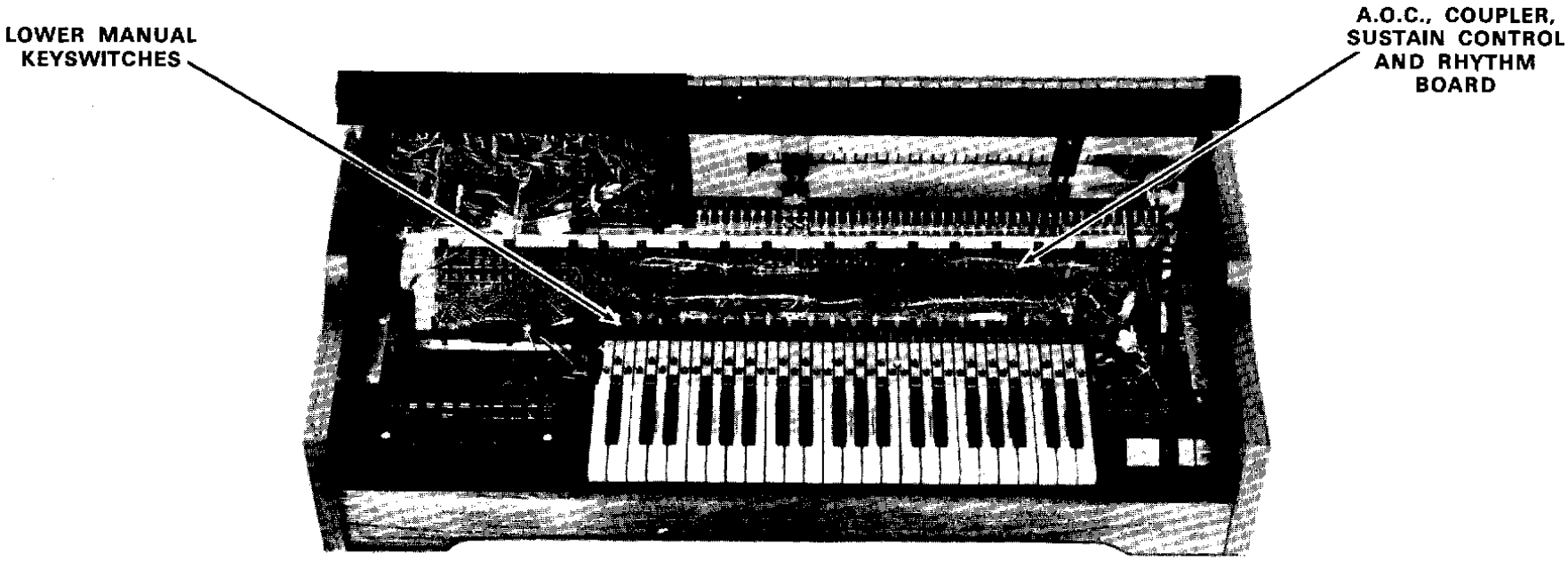
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FRONT VIEW
(Tabswitch Assemblies Raised)



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FRONT VIEW
(Upper Manual Raised)

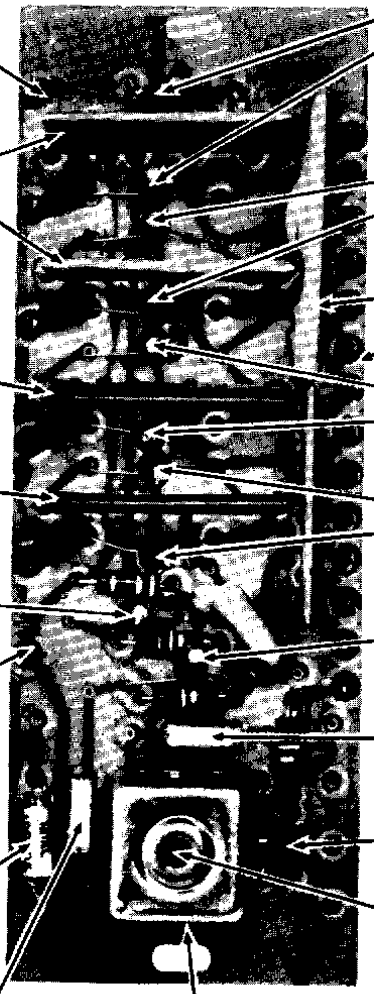


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VIBRATO BOARD

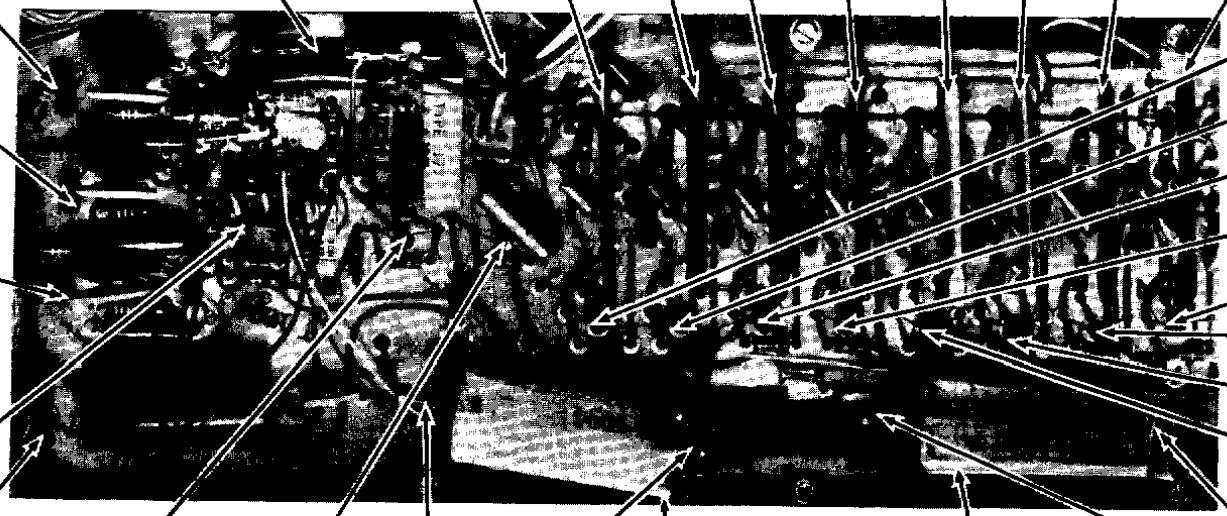


TONE GENERATOR BOARD



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QUALITY CONTROL BOARD



GROUND TERMINAL

FILTER NETWORKS

P-3865-7 P-3865-5 P-3865-3

P-3865-8 P-3865-6 P-3865-4 P-3865-2

P-3865-12

L.M. 8' REED/STRING COLLECTOR PREAMP Q22

LIMITER PHOTOCELL P1

U.M. 16' REED/STRING COLLECTOR PREAMP Q21

U.M. 4'-8' REED/STRING COLLECTOR PREAMP Q20

DOUBLER PREAMP Q32

+21V TERMINAL

STRING PREAMP Q31

MAIN PREAMP Q33

DOUBLER COIL ADJUSTMENT

3400 ~ DOUBLER COIL

2400 ~ DOUBLER COIL

1700 ~ FILTER Q30

1200 ~ FILTER Q29

850 ~ FILTER Q28

600 ~ FILTER Q27

150 ~ FILTER Q23

212 ~ FILTER Q24

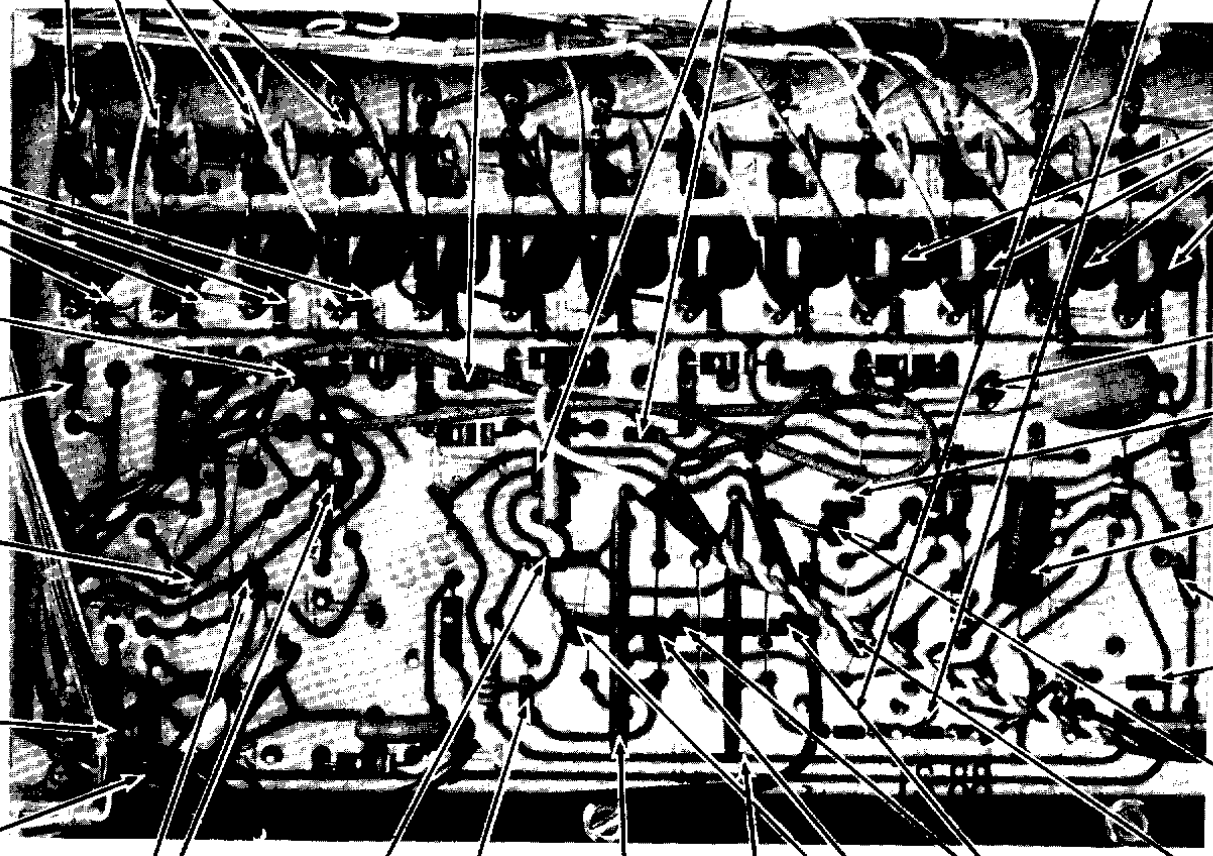
300 ~ FILTER Q25

425 ~ FILTER Q26

DOUBLER COIL ADJUSTMENT

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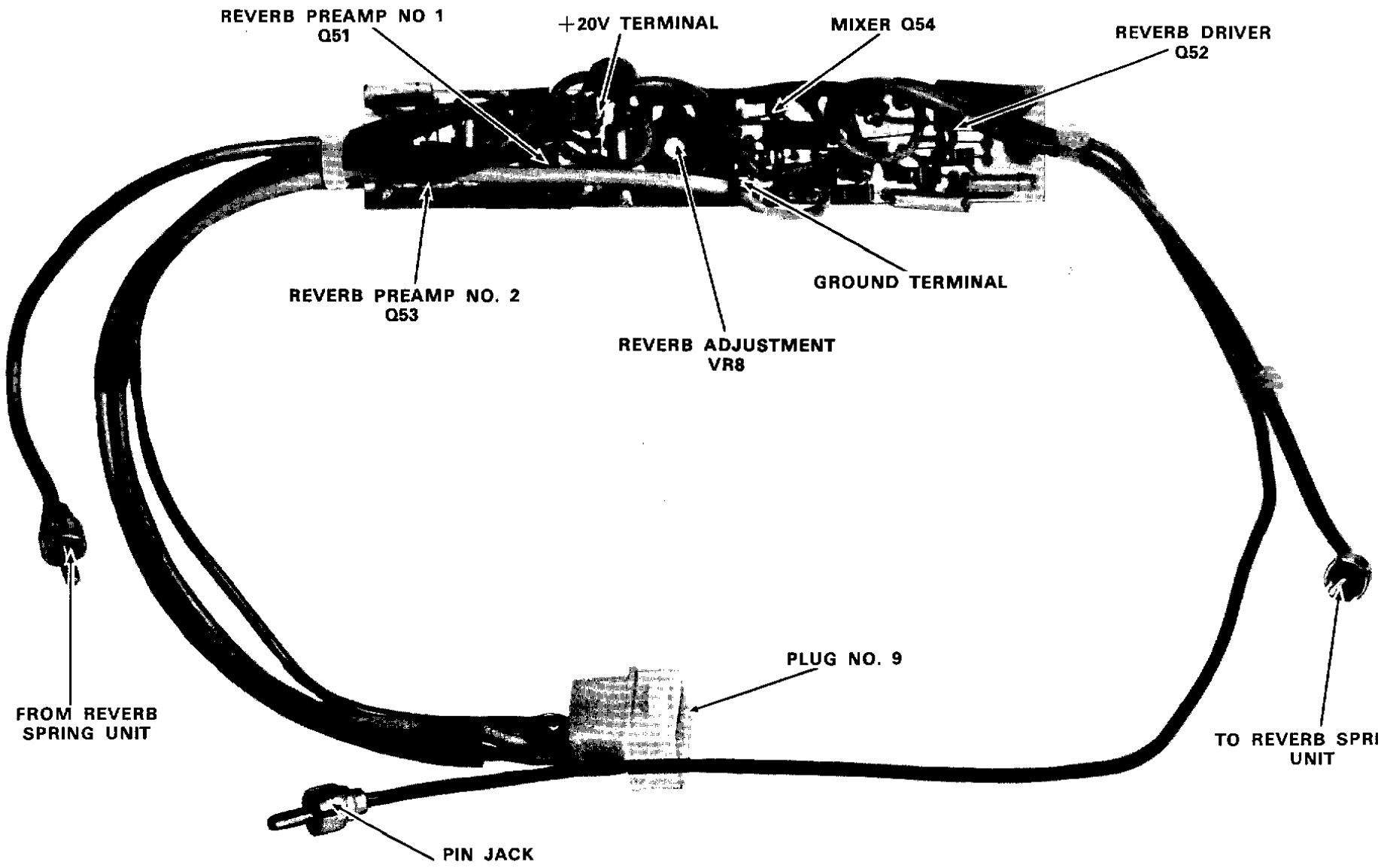
BASS PEDAL BOARD



DIODES D12 (13)
DIODE D17
DIODES D20-D21
D22-D23
PEDAL SUSTAIN CAPACITORS 5 mfd. (13)
DIODES D13 (13)
GUITAR BASS KEYER Q37
-8V TERMINAL
DIODE D14
DIODE D11
PEDAL SUSTAIN CAPACITOR 15 mfd.
PEDAL CANCEL TRANSISTOR Q36
DIODES D18-D19
+14V TERMINAL
PEDAL KEYER Q39
GROUND TERMINAL
2ND PEDAL DIVIDER TRANSISTORS Q42-Q43
PEDAL KEYER EMITTER FOLLOWER Q38
1ST PEDAL DIVIDER NETWORK P-8802-2
1ST PEDAL DIVIDER TRANSISTORS Q40-Q41
PEDAL CANCEL TRIGGER Q34-Q35
DIODE D16
DIODE D15
2ND PEDAL DIVIDER NETWORK P-8802-1

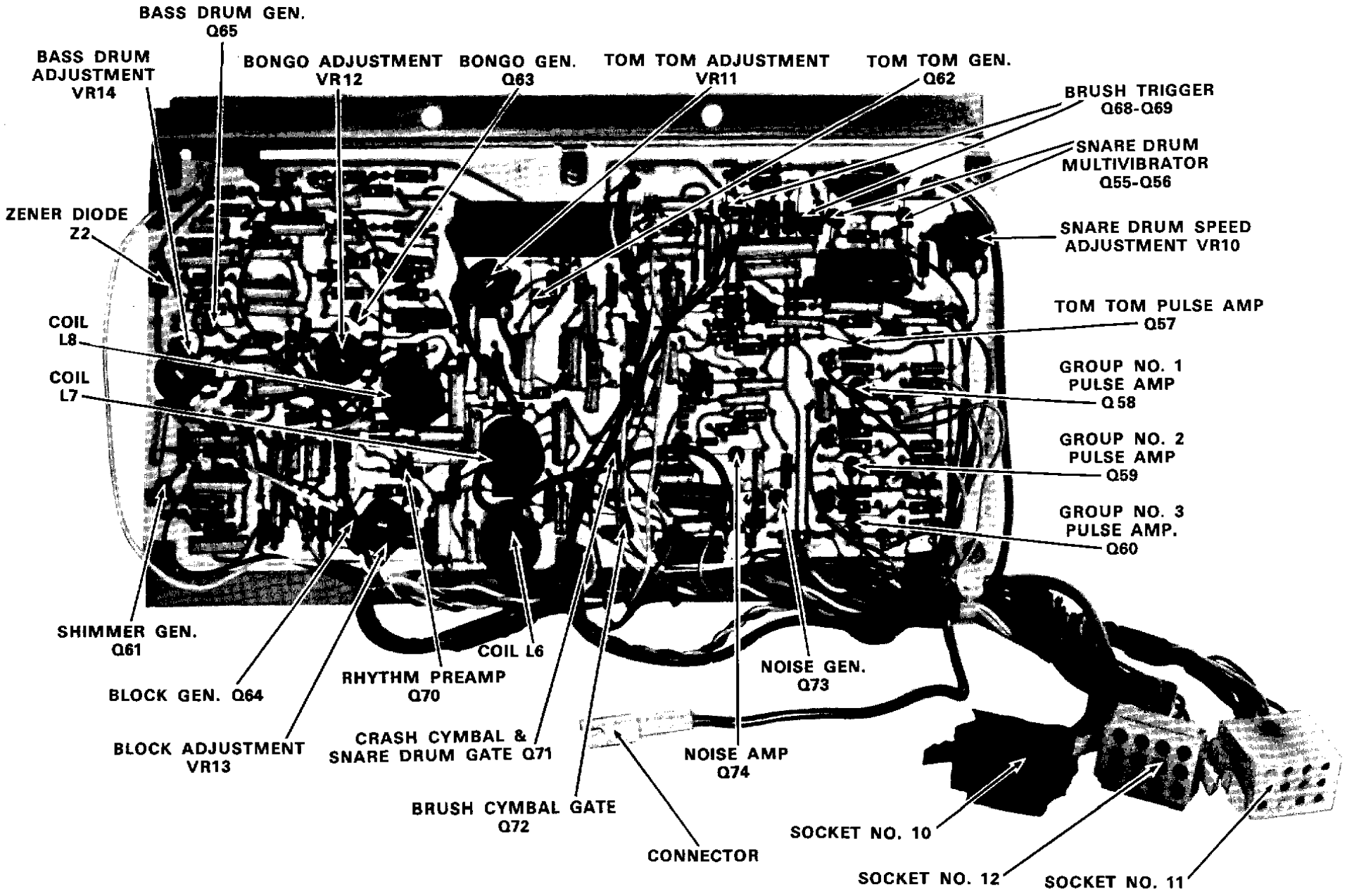
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REVERB BOARD

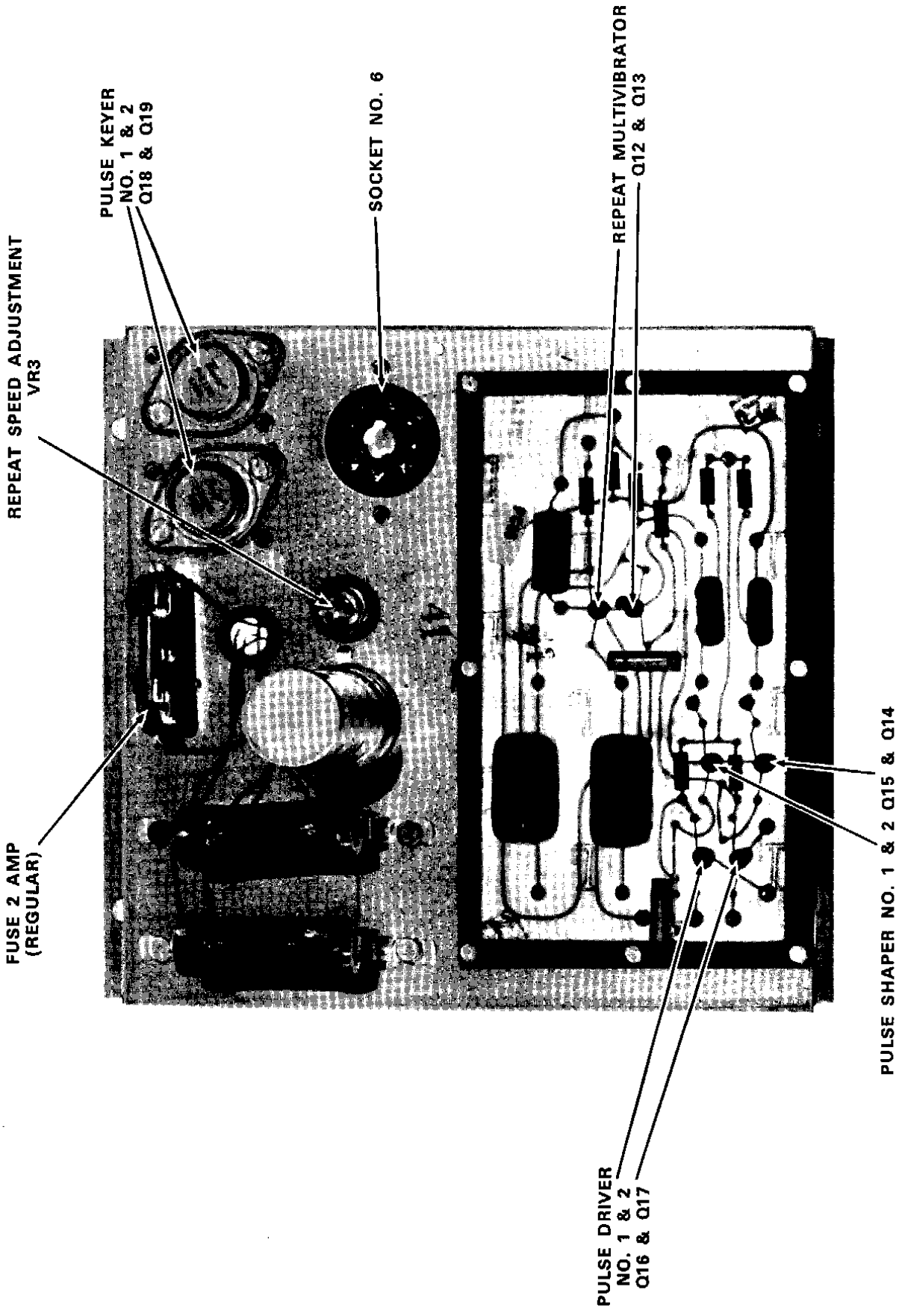


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RHYTHM BOARD



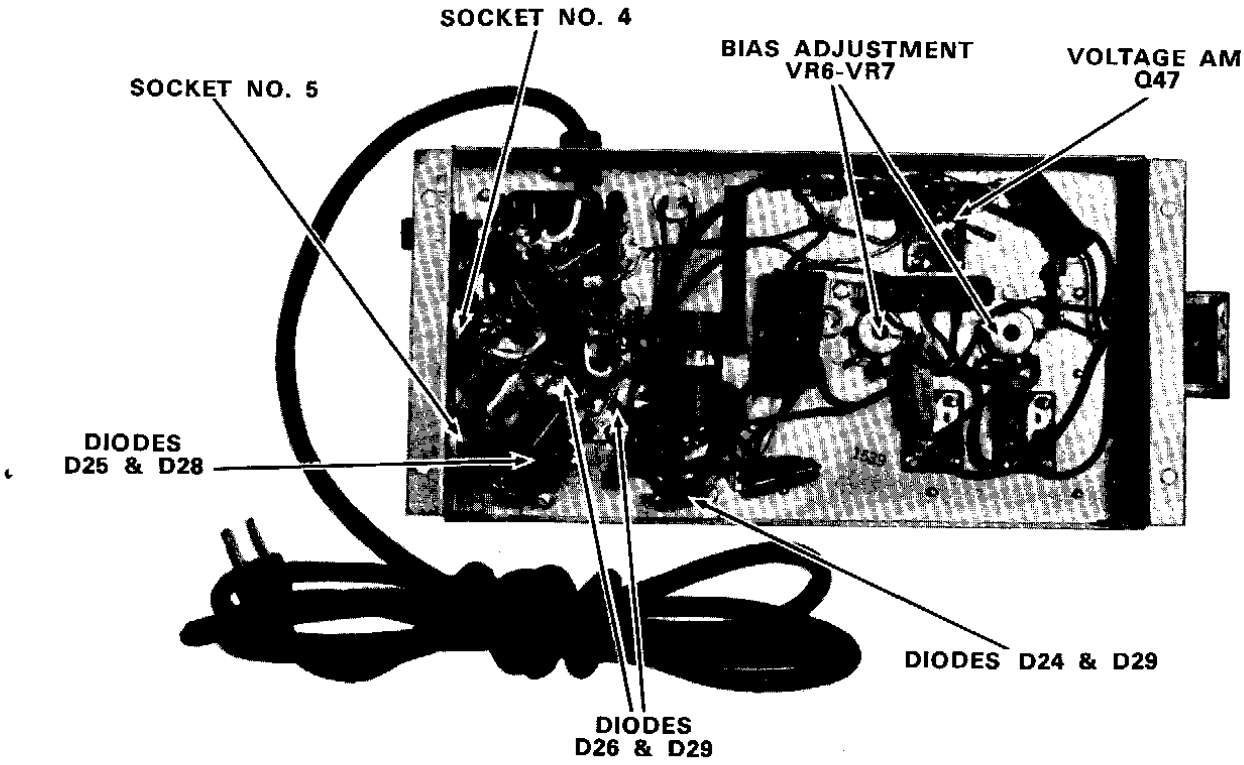
REPEAT CHASSIS

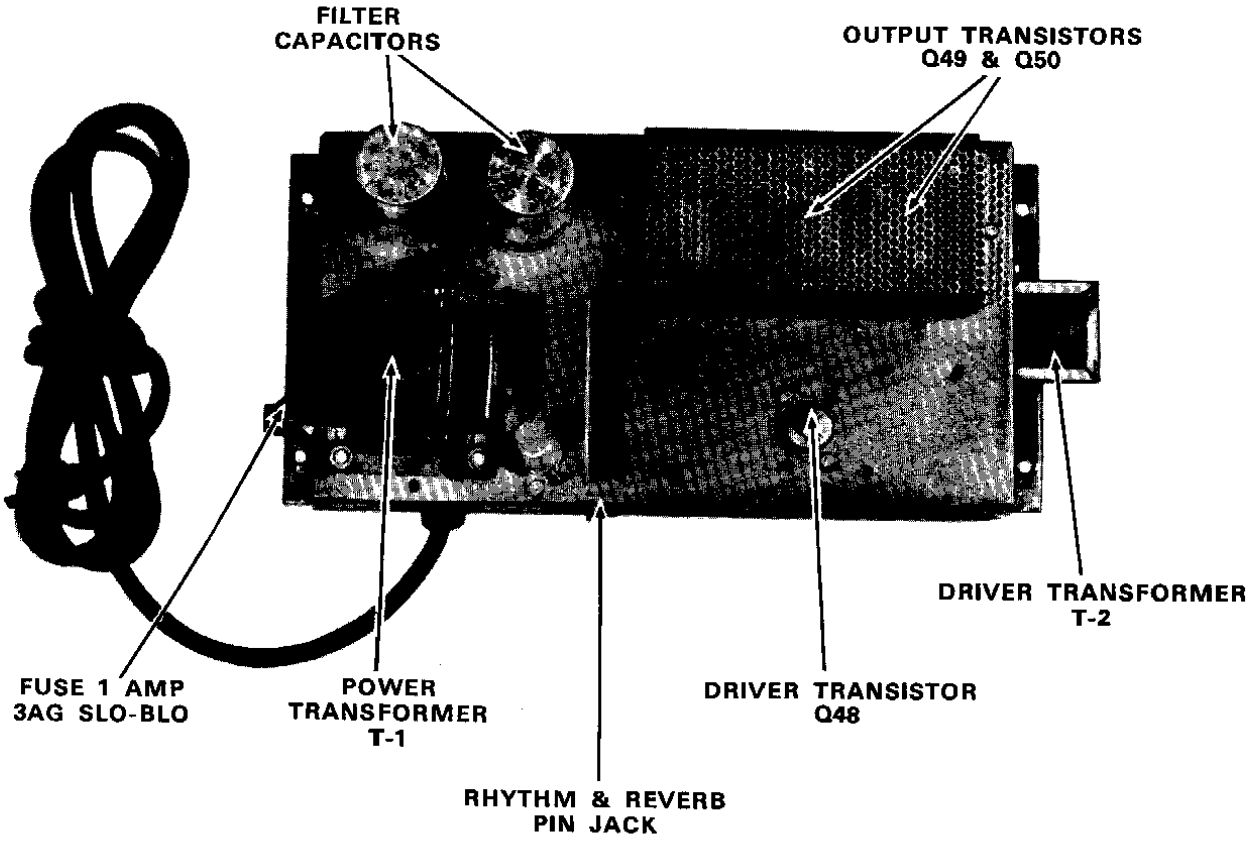


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AMPLIFIER/POWER SUPPLY CHASSIS

(Top and Bottom View)

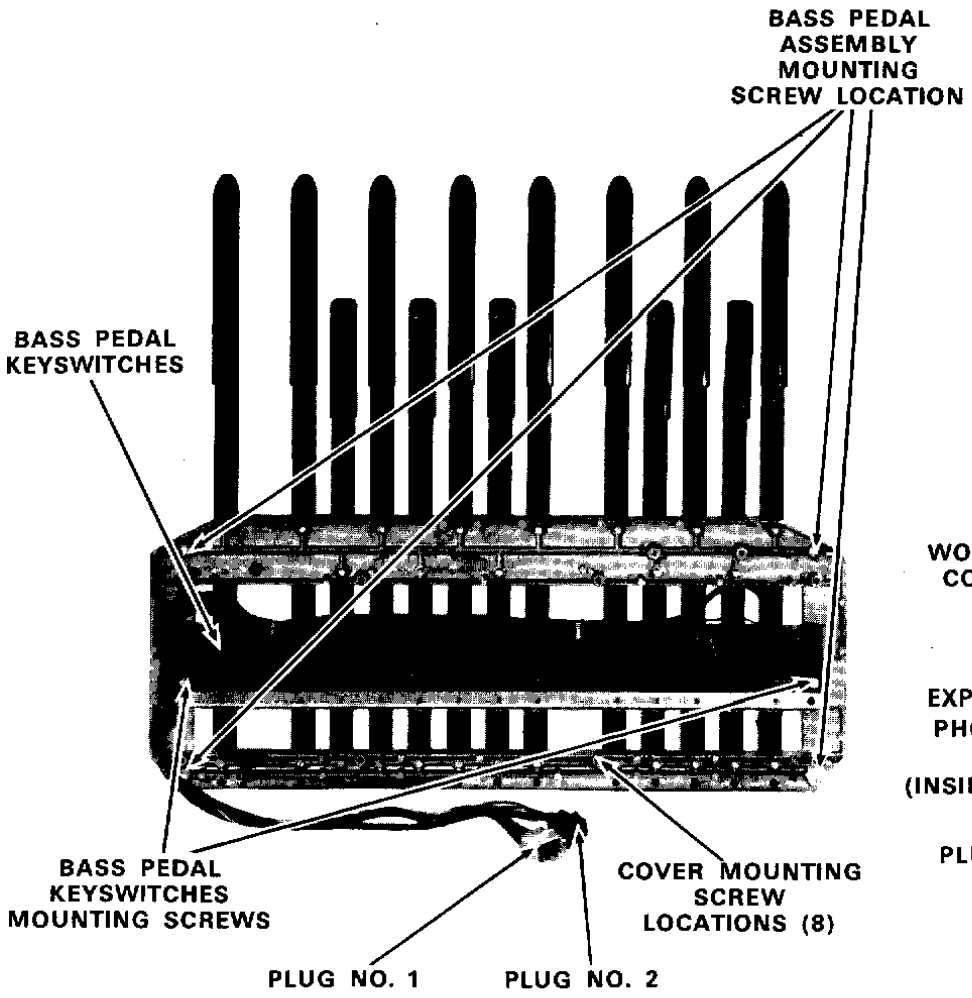




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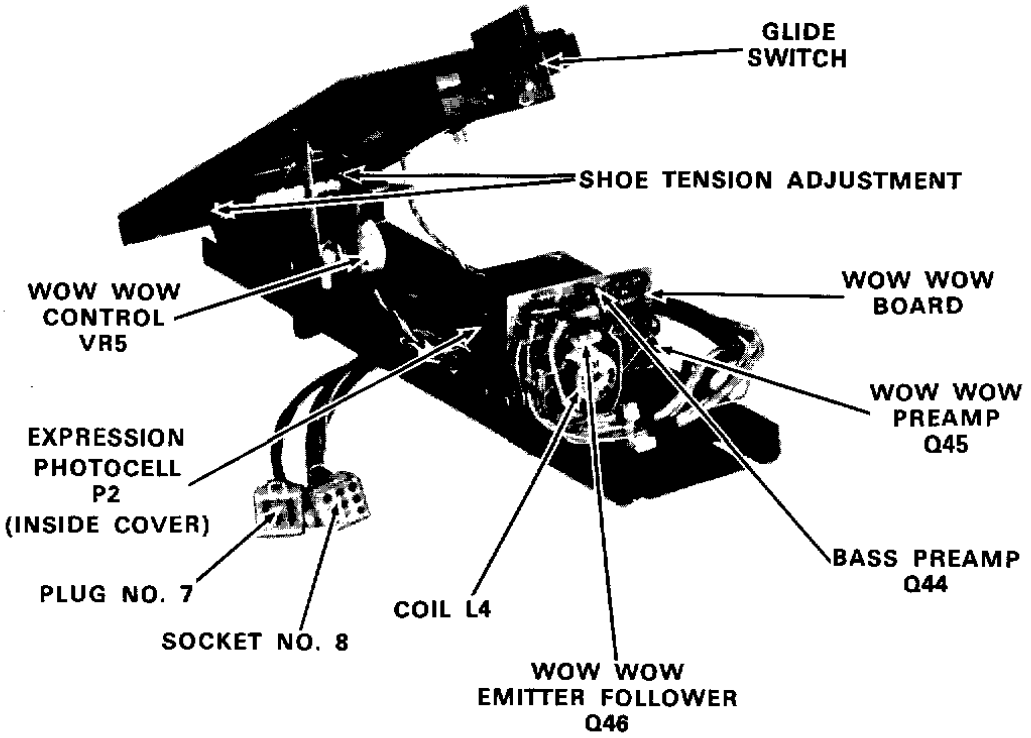
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BASS PEDAL ASSEMBLY
(Cover Removed)



To Remove Bass Pedal Assembly:
1. Remove the complete leslie assembly.
2. Remove the four bass pedal assembly mounting screws.
3. Tilt organ back slightly and pull the assembly out the rear of the organ.

WOW WOW/EXPRESSION PEDAL ASSEMBLY



To Remove Wow Wow/Expression Pedal:
1. Loosen the two rear mounting screws.
2. Remove the one front mounting screw.

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:

C.M.I. SERVICE DEPT.
7373 No. Cicero Ave.
Chicago, Illinois 60646

IMPORTANT

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

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PARTS LIST

TABLE OF CONTENTS

	Page
AMPLIFIER/POWER SUPPLY CHASSIS ASSEMBLY	32
BASS PEDAL ASSEMBLY	33
BASS PEDAL CIRCUIT BOARD	33
BENCH ASSEMBLY	33
CONSOLE ASSEMBLY	34
LESLIE ASSEMBLY	34
LOWER MANUAL KEYSWITCH ASSEMBLY	34
LOWER MANUAL TABSWITCH ASSEMBLY	34
MANUAL ASSEMBLY	35
QUALITY CONTROL CIRCUIT BOARD	35
REPEAT CHASSIS	36
REVERB ASSEMBLY TLOR-1	36
RHYTHM CIRCUIT BOARD TLOR-1	36
RHYTHM TABSWITCH ASSEMBLY TLOR-1	37
TONE GENERATOR CIRCUIT BOARD	37
VIBRATO CIRCUIT BOARD	38
UPPER MANUAL TABSWITCH ASSEMBLY	38
UPPER MANUAL KEYSWITCH ASSEMBLY	39
UPPER MANUAL DIODE KEYING BOARD	39
WOW WOW/EXPRESSION PEDAL ASSEMBLY	39

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 and 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 part's location and function as well as model and serial number of the unit.

PARTS LIST

Part	Description	Schematic Reference	Part Number
AMPLIFIER/POWER SUPPLY CHASSIS ASSEMBLY			
Assembly	Amplifier/Power Supply (Complete TLOR-1)		997-010566
Assembly	Amplifier/Power Supply (Complete TLO-1)		997-004734
Capacitor	Ceramic .0033 UF 500V		947-002630-332
Capacitor	Ceramic 300 UUF 500V		947-002630-301
Capacitor	Ceramic 800 UUF 500V		947-002630-801
Capacitor	Electrolytic 1500-1500 UF 75V		945-003193
Capacitor	Electrolytic 1000-500 UF 25V-15V		945-008893
Capacitor	Electrolytic 350 UF 15V		945-008895-42
Capacitor	Electrolytic 50 UF 20V		945-008895-12
Capacitor	Electrolytic 1000 UF 40V		945-003861-1
Capacitor	Electrolytic 500 UF 25V		945-009638-1
Capacitor	Mylar .1 UF 100V		946-005872-53
Capacitor	Mylar .22 UF 400V		946-003003-224

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PARTS LIST

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Cord	Power		989-008717
Diode	Rectifier	D25-D28	919-010829
Diode	Rectifier	D24, D29	919-010829-1
Fuse	1 Amp Slo-Blo		939-013304-2
Fuse	5 Amp Slo-Blo (Pigtail)		939-001120
Holder	Fuse		906-006303
Insulator	For Power Transistors		908-008882
Potentiometer	Phono		906-006104
Jack	60 Ohm (Bias Adj.)	VR6, VR7	925-008863-3
Resistor	W.W. 650 Ohm 10W		924-006811-61
Resistor	130 Ohm 25W		925-008867-1
Resistor	WW 800-800 Ohm		924-006811-56
Resistor	WW 340 Ohm 10W		924-006811-60
Resistor	WW 35 Ohm 5W		924-006811
Resistor	WW .51 Ohm 5W		924-008896
Resistor	270 Ohm 2W		851-652271
Transformer	Power	T1	954-001448
Transformer	Driver	T2	955-008860-1
Transistor	Voltage Amplifier	Q47	991-008393
Transistor	Driver	Q48	992-008890
Transistor	Power Output	Q49, Q50	992-003139

BASS PEDAL ASSEMBLY

Assembly	Pedal Frame Complete with pedal caps		997-006404
Assembly	Pedal Switch Complete		997-003228
Cap	Pedal (Maroon)		915-003856
Cap	Pedal (Black)		915-003863
Contact	Pedal Switch		917-009155
Screw	Top Pedal Cap		903-006829
Screw	Bottom Black Pedal Cap		806-045132-5
Screw	Bottom Maroon Pedal Cap		806-0055132-4
Spring	Compression		975-005811

BASS PEDAL CIRCUIT BOARD

Assembly	Bass Pedal Board Complete		996-010569
Capacitor	Ceramic .0012 UF 100V		947-002336-122
Capacitor	Electrolytic 3 UF 50V		945-008895-6
Capacitor	Electrolytic 5 UF 25V NP		945-010433-1
Capacitor	Electrolytic 15 UF 20V		945-008895-10
Capacitor	Mylar .033 UF 50V		946-002155-333
Capacitor	Mylar .047 UF 50V		946-002155-473
Capacitor	Mylar .33 UF 50V		946-002155-334
Capacitor	Mylar .22 UF 50V		946-002155-224
Capacitor	Mylar .01 UF 50V		946-002155-103
Capacitor	Mylar .082 UF 50V		946-002155-823
Capacitor	Mylar .47 UF 50V		946-002155-474
Diode	Keying	D11-D23	919-004799
Network	Divider		949-008802-1
Network	Divider		949-008802-2
Transistor	Trigger Cancel, Keyer	Q34, Q35, Q38	991-008393
Transistor	Cancel	Q36	991-002232
Transistor	Divider	Q40-Q43	991-008394
Transistor	Keying (PNP)	Q37, Q39	991-010098

BENCH ASSEMBLY

Bench	Mahogany		978-001141-6
Bench	Walnut		978-001141-7
Bench	Fruitwood		978-001141-8

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PARTS LIST

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Bench	Ebony		978-001141-10
Bench	Walnut Italian Prov.		978-001141-11
Bench	Early American		978-001138
Bench	French Provincial		978-001139

CONSOLE ASSEMBLY

Back	Mahogany		972-002843-11
Back	Lt. Natural		972-002843-12
Back	Brown		972-002843-13
Back	Black		972-002843-14
Capacitor	50 UF Crossover		945-008719
Coil	Crossover	L5	956-008721
Jack	Headphone		910-008068
Leslie	Tremolo Unit		984-009211
Resistor	WW 7.5 Ohm 10W		924-007349-1
Speaker	8" PM		985-003185-1
Speaker	12" PM		985-006823-3
Switch	AC Off-On		960-004346

LESLIE ASSEMBLY

Assembly	Tremolo Unit Complete		984-010670
Assembly	Slow & Fast Motors with Brackets		984-060715
Belt			984-011700
Bushing	Black rubber		984-014233
Drum	Styrene		984-060608
Pulley	Slow Speed		984-014076
Motor	Fast Speed		984-060269
Motor	Motor		984-051607
Shaft	Assembly (Shaft & Pulley)		984-060616
Speaker	8" 8 ohm		984-017202

LOWER MANUAL KEYSWITCH ASSEMBLY

Actuator	Keyswitch		964-002495
Capacitor	Ceramic .02 UF 500V (TLOR-1)		947-010672-203
Contact	Spring		917-003133
Diode	(On Coupler Board)	D3, 4, 52, D1A-41A	919-004799
Spring	Pull Down		975-007085

LOWER MANUAL TABSWITCH ASSEMBLY

Capacitor	Ceramic .1 UF 25V		947-005396-5
Capacitor	Ceramic .01 UF 500V		947-002631-103
Contact	Tabswitch		917-005166-1
Guide	Slider		976-005170
Pusher	Medium		964-001901
Potentiometer	Dual Wow Wow	VR4	925-010833
Resistor	WW 15 ohm 2W		924-009385
Spring	Toggle		975-002338-1
Switch	Mercury	MS1-MS3	960-005399
Tab	Leslie Tremolo Off-On		915-007136-84
Tab	Main Chorus Off-On		915-007136-141
Tab	Organ Main-Leslie		915-005773-73
Tab	AOC		915-010605
Tab	Add Main to Leslie		915-007136-85
Tab	Wow Wow		915-005773-142
Tab	Repeat Slow-Fast		915-007136-114
Tab	Repeat Off-On		915-007136-115
Tab	Upper to Lower 16' 8' 4'		915-007136-111
Tab	Manual Attack Normal-Slow		915-007136-79

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PARTS LIST

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
MANUAL ASSEMBLY			
Bumper	Rubber		916-006282
Endblock	Lower Left (TLOR-1)		966-003160-4
Endblock	Upper Left		966-010495
Endblock	Lower Left		966-006001
Endblock	Upper Right		966-009857
Endblock	Lower Right		966-010610
Felt	Up-Stop		914-009451-1
Keyboard	Complete Lower Manual 44 Note		997-005918
Keyboard	Complete Upper Manual 44 Note		997-005915
Knob	Brush Accent		915-004300-3
Knob	Rhythm Volume		915-004300-4
Knob	Wow Wow		915-004300-13
Rail	Lower Keyboard Up Stop		997-005993
Rail	Up Stop Rail Screws		810-045032-4
Rail	Upper Keyboard Up-Stop		966-006268-1
Screw	Endblock SM 8 x 1¼ oval		816-050533-20
Screw	Endblock SM 8 - 1¾ oval		816-050533-28
QUALITY CONTROL CIRCUIT BOARD			
Assembly	Quality Control Board Complete		996-010567
Capacitor	Ceramic .01 UF 25V		947-002335-103
Capacitor	Ceramic .02 UF 25V		947-002335-203
Capacitor	Ceramic .1 UF 25V		947-002335-104
Capacitor	Ceramic .05 UF 25V		947-002335-503
Capacitor	Ceramic .22 UF 25V		947-002335-224
Capacitor	Ceramic .0012 UF 100V		947-002336-122
Capacitor	Ceramic .001 UF 100V		947-002336-102
Capacitor	Ceramic .0033 UF 100V		947-002336-332
Capacitor	Electrolytic 4 UF 35V		945-008895-16
Capacitor	Electrolytic 10 UF 20V		945-008895-9
Capacitor	Electrolytic 15 UF 20V		945-008895-10
Capacitor	Electrolytic 50 UF 20V		945-008895-12
Capacitor	Electrolytic 200-200 UF 35V		945-001451
Capacitor	Mylar .033 UF 100V		946-005872-46
Capacitor	Mylar .047 100V		946-005872-48
Capacitor	Mylar .0039 UF 50V		946-010437-392
Capacitor	Mylar .01 UF 50V		946-002155-103
Capacitor	Mylar .015 UF 50V		946-002155-153
Capacitor	Mylar .033 UF 50V		946-002155-333
Capacitor	Mylar .022 UF 50V		946-002155-223
Capacitor	Mylar .3 UF 100V		946-005872-68
Capacitor	Mylar .0022 UF 50V		946-002155-222
Capacitor	Mylar .0033 UF 50V		946-002155-332
Capacitor	Mylar .0082 UF 50V		946-010437-822
Capacitor	Mylar .0047 UF 50V		946-002155-472
Capacitor	Mylar .0068 UF 50V		946-002155-682
Coil	Doubler	L2, L3	953-006121
Network	212 Cycle Filter		949-003865-2
Network	300 Cycle Filter		949-003865-3
Network	425 Cycle Filter		949-003865-4
Network	600 Cycle Filter		949-003865-5
Network	850 Cycle Filter		949-003865-6
Network	1200 Cycle Filter		949-003865-7
Network	1700 Cycle Filter		949-003865-8
Network	150 Cycle Filter		949-003865-12
Photocell	Limiter	P1	948-001859
Transistor	Filter & Preamps	Q20-Q33	991-002298

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PARTS LIST

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
REPEAT CHASSIS			
Capacitor	Electrolytic 500-500 UF 25V		945-001193
Capacitor	Electrolytic 50 UF 20V		945-008895-12
Capacitor	Mylar .068 UF 100V		946-005872-50
Capacitor	Mylar 1 UF 50V		946-002155-105
Capacitor	Mylar .12 UF 50V		946-002155-124
Insulator	Transistor		908-002346
Potentiometer	Dual Repeat Speed Adj.	VR3	925-001191
Resistor	WW 100 ohm 10W		924-006811-32
Transistor	Pulse Keyer	Q18, Q19	992-001192
Transistor	Multivibrator, Shaper	Q12-Q15	991-008393
Transistor	Driver	Q16, Q17	991-002356
REVERB ASSEMBLY TLOR-1			
Assembly	Reverb Spring Unit & Circuit Board Complete		997-003460
Assembly	Reverb Spring Unit		984-003365
Assembly	Reverb Circuit Board		996-003459
Capacitor	Mylar .0015 UF 10% 50V		946-002155-152
Capacitor	Mylar .022 UF 10% 50V		946-002155-223
Capacitor	Mylar .047 UF 10% 50V		946-002155-476
Capacitor	Ceramic .0022 UF 10% 500V		947-002630-222
Capacitor	Electrolytic 1 UF 20V		945-008895-11
Capacitor	Electrolytic 2 UF 20V		945-008895-32
Capacitor	Electrolytic 6 UF 20V		945-008895-7
Capacitor	Electrolytic 20 UF 25V		945-008895-30
Potentiometer	Reverb (Adj.)	VR8	925-003306-2
Transistor	Preamp #2, Mixer, Driver	Q53, Q54, Q52	991-008393
Transistor	Preamp #1	Q51	991-002298
RHYTHM CIRCUIT BOARD TLOR-1			
Assembly	Rhythm Circuit Board Compete		997-004505
Capacitor	Mylar .1 UF 10% 50V		946-002155-104
Capacitor	Mylar .12 UF 10% 50V		946-002155-124
Capacitor	Mylar .15 UF 10% 50V		946-002155-154
Capacitor	Mylar .18 UF 10% 50V		946-002155-184
Capacitor	Mylar .22 UF 10% 50V		946-002155-224
Capacitor	Mylar .56 UF 10% 50V		946-002155-564
Capacitor	Mylar .01 UF 10% 50V		946-002155-103
Capacitor	Mylar .015 UF 10% 50V		946-002155-153
Capacitor	Mylar .022 UF 10% 50V		946-002155-223
Capacitor	Mylar .027 UF 10% 50V		946-002155-273
Capacitor	Mylar .033 UF 10% 50V		946-002155-333
Capacitor	Mylar .039 UF 10% 50V		946-002155-393
Capacitor	Mylar .047 UF 10% 50V		946-002155-473
Capacitor	Mylar .082 UF 10% 50V		946-002155-823
Capacitor	Mylar .001 UF 10% 50V		946-002155-102
Capacitor	Mylar .0022 UF 10% 50V		946-002155-222
Capacitor	Mylar .0033 UF 10% 50V		946-002155-332
Capacitor	Mylar .0047 UF 10% 50V		946-002155-472
Capacitor	Mylar .0068 UF 10% 50V		946-002155-682
Capacitor	Ceramic 200 UUF 10% 500V		947-002630-201
Capacitor	Ceramic 300 UUF 10% 500V		947-002630-301
Capacitor	Electrolytic 25 UF 15V		945-008895-29
Capacitor	Electrolytic 500 UF 25V		945-008895-19
Coil		L6-8	952-003308
Diode	Keying	D30, 31, 35, 39, 42-51	919-004799
Diode	Zener	Z2	919-003309

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PARTS LIST

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Potentiometer	250K Snaredrum (Adj.)	VR10	925-003306
Potentiometer	1K Tom Tom, Bongo, Block, Bass Drum (Adj.)	VR11-14	925-003306-1
Transistor	Noise Amp	Q74	991-002356
Transistor	Noise Gen	Q73	991-003304
Transistor	Amp. Gate, Trigger, Gen, Multi	Q55-65, 68-72	991-008393

RHYTHM TABSWITCH ASSEMBLY TLOR-1

Capacitor	Mylar .15 UF 10% 50V		946-002343-154
Capacitor	Mylar .33 UF 10% 50V		946-002343-334
Capacitor	Mylar .068 UF 10% 50V		946-002343-683
Capacitor	Ceramic .1 UF 25V		947-005496-5
Capacitor	Ceramic .0015 UF 10% 500V		947-002630-152
Diode	Keying	D32-34, 36-38, 40-41	919-004799
Guide	Pusher		976-005170
Pusher	Medium		964-001901
Potentiometer	Rhythm Volume	VR9	925-003170-2
Contact	Tabswitch		917-005166-1
Spring	Toggle		975-002338-1
Contact	Push Button		917-003134
Spring	Push Button Compression		975-008286
Switch	3 Position Brush Accent		960-004097-1
Tab	Reverb Off-On		915-005773-100
Tab	Bass Drum		915-005773-90
Tab	Snaredrum Lower Manual		915-005773-91
Tab	Brush Cymbal Lower Manual Pedal		915-005773-92
Tab	Crash Cymbal Pedal		915-005773-93
Tab	Tom-Tom Lower Manual		915-005773-94
Tab	Bongo Lower Manual		915-005773-95
Tab	Block Lower Manual		915-005773-96
Tab	Tom Tom Bongo Blocks		915-005773-97
Tab	Cave Pedal		915-005773-105
Transistor	Crash Cymbal	Q66	991-002356
Transistor	Clave Trigger	Q67	911-008393
Pushbutton	Gray Plastic		915-003329
Knob	Brush Accent		915-004300-3
Knob	Rhythm Volume		915-004300-4

TONE GENERATOR CIRCUIT BOARD

Assembly	Generator Board F		996-001621-F
Assembly	Generator Board F#		996-001621-F#
Assembly	Generator Board G		996-001622-G
Assembly	Generator Board G#		996-001622-G#
Assembly	Generator Board A		996-001623-A
Assembly	Generator Board A#		996-001623-A#
Assembly	Generator Board B		996-001624-B
Assembly	Generator Board C		996-001624-C
Assembly	Generator Board C#		996-001625-C#
Assembly	Generator Board D		996-001625-D
Assembly	Generator Board D#		996-001626-D#
Assembly	Generator Board E		996-001626-E
Capacitor	Mylar .015 UF 50V		946-002155-153
Capacitor	Mylar .033 UF 50V		946-002155-333
Capacitor	Mylar .0047 UF 50V		946-002155-472
Capacitor	Mylar .022 UF 50V		946-002155-223
Capacitor	Mylar .0039 UF 50V		946-002155-392

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PARTS LIST

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Capacitor	Mylar .0033 UF 50V		946-002155-332
Capacitor	Mylar .012 UF 50V		946-002155-123
Capacitor	Mylar .0027 UF 50V		946-002155-272
Capacitor	Mylar .01 UF 50V		946-002155-103
Capacitor	Mylar .0068 UF 50V		946-002155-682
Capacitor	Mylar .0056 UF 50V		946-002155-562
Capacitor	Polystyrene .015 UF 50V		946-003385-153
Capacitor	Polystyene .012 UF 50V		946-003385-123
Capacitor	Polystyrene .01 UF 50V		946-003385-103
Capacitor	Polystyrene .022 UF 50V		946-003385-223
Coil	Master Oscillator C#-F#	L1	952-009978-3
Coil	Master Oscillator G-C	L1	952-009978-2
Diode	Vibrato	D1	919-004799
Network	Divider		949-008802
Network	Divider		949-008802-1
Network	Divider		949-008802-2
Network	Output		949-001435
Transistor	Master Oscillator, Buffer	Q3, Q3A	991-008393
Transistor	Divider	Q4-Q11	991-008394

VIBRATO CIRCUIT BOARD

Assembly	Vibrato Board Complete		996-001627
Capacitor	Electrolytic 1.4 UF 15V		945-008895-4
Capacitor	Electrolytic 8 UF 35V		945-008895-14
Potentiometer	Vibrato Fast Speed (Adj.)	VR1	925-004349
Potentiometer	Vibrato Slow Speed (Adj.)	VR2	925-008894
Transistor	Oscillator, Emitter Follower	Q1-Q2	991-008393

UPPER MANUAL TABSWITCH ASSEMBLY

Capacitor	Ceramic 100 UUF 500V		947-002630-101
Capacitor	Ceramic 200 UUF 500V		947-002630-201
Capacitor	Ceramic 250 UUF 500V		947-002630-251
Capacitor	Ceramic .0033 UF 500V		947-002630-332
Capacitor	Ceramic .0022 UF 500V		947-002630-222
Capacitor	Ceramic 360 UUF 500V		947-002630-361
Capacitor	Ceramic 500 UUF 500V		947-002630-501
Capacitor	Ceramic 750 UUF 500V		947-002630-751
Capacitor	Ceramic .0047 UF 500V		947-002630-472
Capacitor	Ceramic .1 UF 500V		947-002631-103
Capacitor	Eectroytic 4 UF 35V		945-008895-16
Capacitor	Mylar .022 UF 100V		946-005872-58
Contact	Tabswitch		917-005166-1
Diode		D2	919-004799
Diode	Zener	Z1	919-001445
Guide	Slider		976-005170
Network	Voicing		949-010612
Network	Voicing		949-010616
Network	Voicing		949-010617
Network	Voicing		949-001426
Network	Voicing		949-010618
Pusher	Medium		964-001901
Spring	Toggle		975-002338-1
Tab	Solo Reed String		915-007136-118
Tab	Cello 16		915-007136-121
Tab	Trombone 16		915-007136-119
Tab	Clarinet 16		915-007136-120
Tab	String 8		915-005773-13
Tab	Trumpet 8		915-005773-10

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PARTS LIST

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Tab	Oboe 8		915-005773-11
Tab	Kinura 8'		915-007136-126
Tab	Flute 16		915-007136-122
Tab	Reed String 4' coupler		915-007136-144
Tab	Flute 8		915-005773-7
Tab	Solo 4		915-005773-62
Tab	Flute 4		915-005773-14
Tab	Solo 2-2/3		915-007136-123
Tab	Twelfth 2-2/3		915-007136-068
Tab	Brilliance Norm-Full		915-007136-96
Tab	Pedal 8 16-8		915-005773-65
Tab	Pedal Soft-Med		915-005773-34
Tab	Pedal Full		915-005773-24
Tab	Pedal Sust Off-On		915-005773-43
Tab	Accomp Soft-Full		915-005773-67
Tab	Solo 8		915-005773-47
Tab	Melodia 8		915-005773-25
Tab	Diapason 8		915-005773-66
Tab	Viola 8		915-005773-38
Tab	Coronet 8		915-005773-27
Tab	Bass Guitar		915-007136-143
Tab	Sustain Medium		915-007136-116
Tab	Sustain Long		915-007136-117
Tab	Vibrato Slow-Fast		915-005773-44
Tab	Vibrato Light-Heavy		915-005773-45
Tab	Vibrato Off-On		915-005773-46

UPPER MANUAL KEYSWITCH ASSEMBLY

Actuator	Keyswitch		964-009461
Contact	Spring (A.O.C.)		917-009220
Contact	Spring (Audio and DC)		917-003134
Spring	Pull Down		975-007085

UPPER MANUAL DIODE KEYING BOARD

Capacitor	40 UF 20V Sustain		945-001173
Diode	Keying	D5-D10	919-004799
Network	Firing		949-003319
Network	Firing		949-003320

WOW WOW/EXPRESSION PEDAL ASSEMBLY

Arm	For Wow Wow Potentiometer		995-009738
Arm	Bulb Actuator		962-003181
Assembly	Wow Wow/Expression Pedal		997-004729
Assembly	Glide Switch Complete		997-001328
Assembly	Wow Wow Circuit Board Complete		996-010551
Bearing	Nylon Pivot		997-005023
Bulb	GE-1819		939-003190
Capacitor	Eectrolytic 1 UF 20V		945-008895-11
Capacitor	Electrolytic 6 UF 20V		945-008895-7
Capacitor	Mylar .001 UF 50V		946-002155-102
Capacitor	Mylar .012 UF 50V		946-002155-123
Capacitor	Mylar .022 UF 50V		946-002155-223
Capacitor	Mylar .047 UF 50V		946-002155-473

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PARTS LIST

PART	DESCRIPTION	SCHEMATIC REFERENCE	PART NUMBER
Coil	500 MH	L4	952-010092-2
Mat	Expression Shoe		959-006337-4
Mat	Glide Switch		959-009208-1
Photocell		P2	948-009998
Potentiometer	Wow Wow	VR5	925-088800-1
Rod	Pivot		974-007325
Socket	Bulb		906-003183
Spring	Expression Shoe Tension		975-007294
Spring	Bulb Arm Actuator Tension		975-003197
Screw	Sems 10-32 x 3/8 HH (Pivot Rod Ends)		813-065422-6
Switch	Glide		960-006340
Spring	Glide Switch		975-009205
Transistor	Bass Preamp	Q44	991-002298
Transistor	Wow Wow Preamp, Emitter Follower	Q45, Q46	991-002356

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