

ELECTRONIC MUSICAL INSTRUMENT

ROLAND RHYTHM INSTRUMENT

*Rhythm 55*

# SERVICE NOTE

THE 5th EDITION

Printed in Japan.'75.Nov.



Roland Corporation

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## SECTION 1. SPECIFICATIONS

### 1. Summary

|                   |   |
|-------------------|---|
| Rhythm Selector   | 10 buttons<br>Waltz, Slow Rock, Ballad, Rock'n Roll, Beguine,<br>Cha-Cha, Mambo, Samba, Bossa-Nova, Rhumba.                       |
| 2 beat Variation  | Bass Drum, Bass and Snare Drum. Fox Trot 1.<br>Swing 1, March, Parade.  |
| 4 beat Variation  | Bass Drum, Bass and Snare Drum, Fox Trot 2,<br>Swing 2, Swing 3, Tango.   |
| Voices            | Bass Drum, Low Conga, High Conga, Cowbell,<br>Maracas, Rim Shot, Claves, Snare Drum, High-Hat,<br>Cymbal.                         |
| Features          | Up-Tempo Switch(double speed), Touch Start Switch.  |
| Controls          | Volume, Balance, Tempo, Up-Tempo, Power ON-OFF.   |
| Pilot Lamp        | (used as both Power and Tempo Pilot)  |
| Output Jack       | High Impedance : 220K , Low Impedance : 10K   |
| Foot Switch Jack  | (for start)   |
| Power Supply      | 100V, 117V or 220V, 230V, 240V (50/60Hz each)   |
| Power Consumption | 4.5VA   |
| Dimension         | 140mm(H) x 380mm(W) x 240mm(D)  |
| Weight            | 4 Kgs   |
| Construction      | Portable type<br>Designed to work with any amplified musical<br>instrument, portable music amplifier or public<br>address system. |
| Accessories       | Foot control Switch, Connection cord.   |

## SECTION 2. THEORY OF OPERATION

Roland Rhythm TR-55 consists of three elemental sections and a power supply. The first elemental section is Operation System for rhythm patterns. including a Master Oscillator, a Reset Circuit and a Tempo Lamp. The second elemental one is Rhythm Selector System which selects pulse patterns coming out of the Operation System. The third is Voice Generator System and the Audio Preamplifier. The following figure 1 shows the abovementioned :

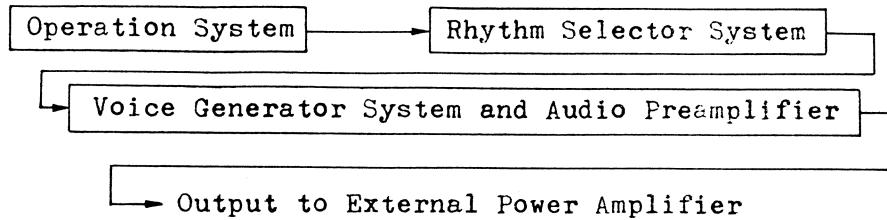


Fig. 1.

### 1. Operation System

The Master Oscillator is a multi-vibrator composed of two transistors. Tempo is controlled by adjusting bias voltage of the oscillator, which consists of two semifixed resistors and a potentiometer of series connection. One semifixed resistor is slowest tempo, and the other semifixed resistor is the fastest tempo. The another one potentiometer which is located on the control panel type is used by a player for adjusting a very delicate tempo. Divider is a 5-stage flip-flop counter set for dividing a beat cycle into  $1/32$  cycle of the Master Oscillator. (The first stage is composed of two transistors, and others are included in one chip of IC.)

As a  $3/4$  beat rhythm must be necessary, the second and third stage divide a beat cycle as the unit of 3 instead of 4 with feedback between the output of the third and second stage of the divider. The Tempo Lamp will light up to the first beat. But only for Slow Rock and Ballad rhythms, light will come on the first and third beat. The control of brightness is adjusted in advance on light-up time. For the Tempo Lamp, a light emitting diode is used. Output of divider are connected to the diode matrix which is taking pulse patterns. Various pulse patterns are used as a trigger of a Voice Generator.

### 2. Rhythm Selector

The selection of rhythm patterns is made up by a push button switch divided into two sections on the Control Panel and a Rotary Switch. Push buttons at the two sections are separated beat buttons for the variation section and a Jazz, Latin section. And the Rotary Switch for Variation works by pushing " 2 BEAT " or " 4 BEAT " button. The necessary pattern of the rhythm indicated by a buttons is connected with the Voice Generator. Buttons of Waltz, Slow Rock, Ballad provides for the circuit to feed back on the divider for making  $3/4$  beat.

3. Roland Rhythm TR-55 has 10 Voice Generators including Bass Drum, low Conga, High Conga, Rim Shot, Cow Bell, Claves, Snare Drum, Cymbal, High-Hat and Maracas. Each of Bass Drum, Low Conga, High Conga and low frequency Snare Drum oscillates by electrical input pulses given to each phase shift circuits of necessary frequency and index decayed oscillation.

Rim Shot, Cawbell and Claves are generated by shock exciting individual L-C circuits which oscillate at the proper frequency and decay exponentially. These low frequency voices are fed into the preamplifier.

A reverse biased transistor is used to generate white noise for the Cymbal, High-Hat, Maracas and high frequency Snare Drum. The output of noise transistor is fed through one stage of amplification.

The collector load of this amplifier is a potentiometer which permits adjustment of the output level these high frequency voices.

To generate the Cymbal, a transistor, normally biased on, is tuned off by the incoming signal from the pulse pattern generator; the rising collector voltage of this transistor forward biases a tuned amplifier so that the white noise, always applied to the base of this tuned amplifier, is amplified.

#### 4. Audio Output

The high frequency signals and the low frequency signals are both fed into a preamplifier, and its outputs are fed to the volume control mounted on the control panel and then to the Rhythm 55 output.

#### 5. Up-Tempo Switch

With Up-Tempo Switch set newly, a variation of tempo can be enjoyed. In this case, double trigger pulse is fed to the first stage flip-flop.

#### 6. Touch-start Chip (Touch-Plate)

Start and stop of the rhythm machine can be operated with slight finger's touch.

### SECTION 3. GENERAL NOTICE

1. Avoid playing near the fluorescent light, neon light, transformers etc., as they will create undesirable noises.
2. It is absolutely free from sound distortion, but it should be played within the capacity rating of the amplifier. It is always advisable

- to connect to amplifiers having ample output power.
- 3. Since it covers a very wide range of tones, the quality of tones may vary according to the types of amplifiers used. Use any amplifiers having high selective qualities.
  - 4. Avoid using "Roland Rhythm" in high temperature and humid places.  
Be careful not to let it accumulate dust.
  - 5. The voltage changer located in the chassis should not be turned.

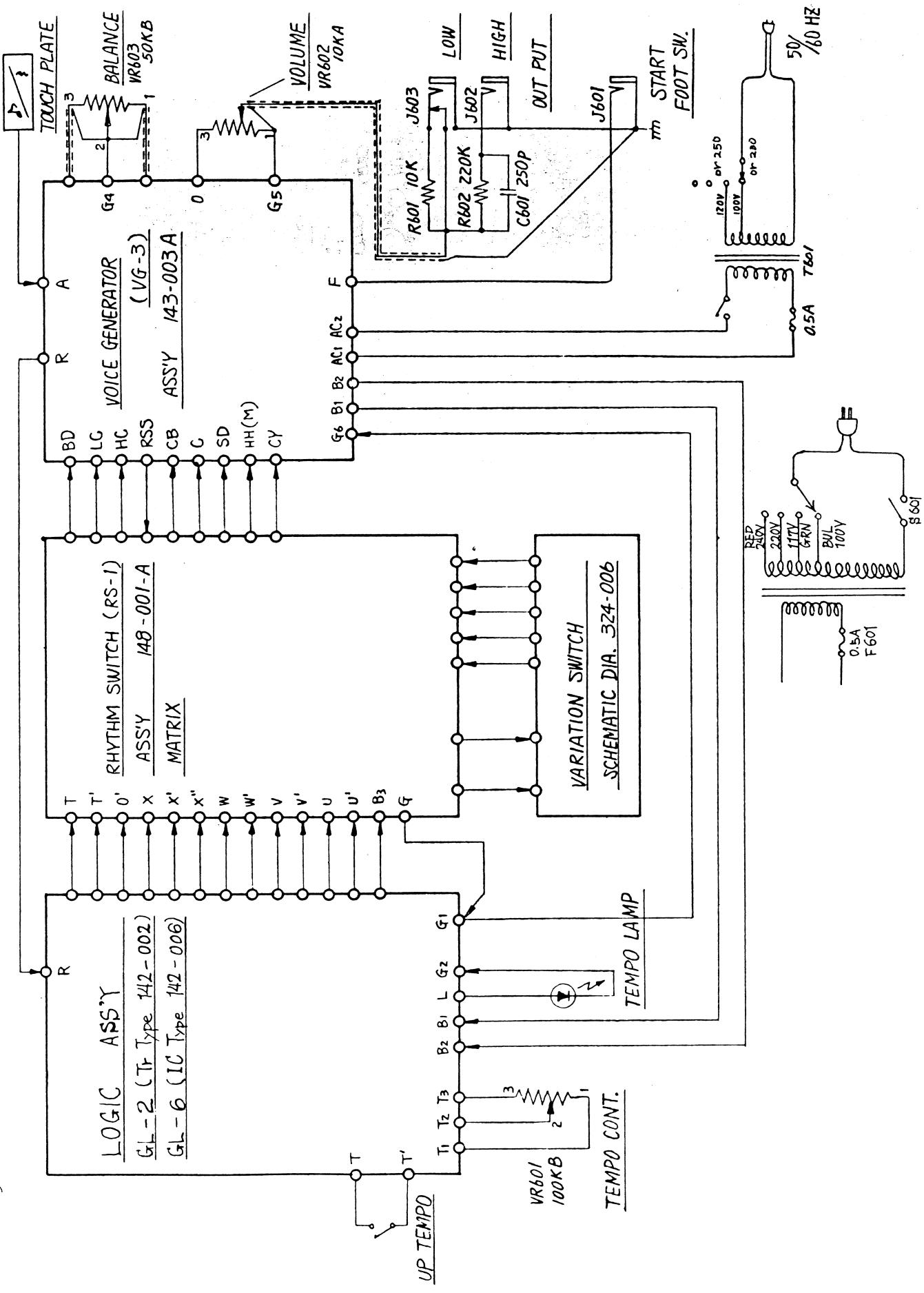
#### SECTION 4. DISASSEMBLING

To pull out the chassis, remove 4 screws on the bottom board, 2 screws on the front cabinet and 2 nuts inside of the cabinet.

NOTE : The manufacturer holds the right of changing any kind of component parts for improvement with or without previous notice.

SECTION 5. GENERAL BLOCK DIAGRAM

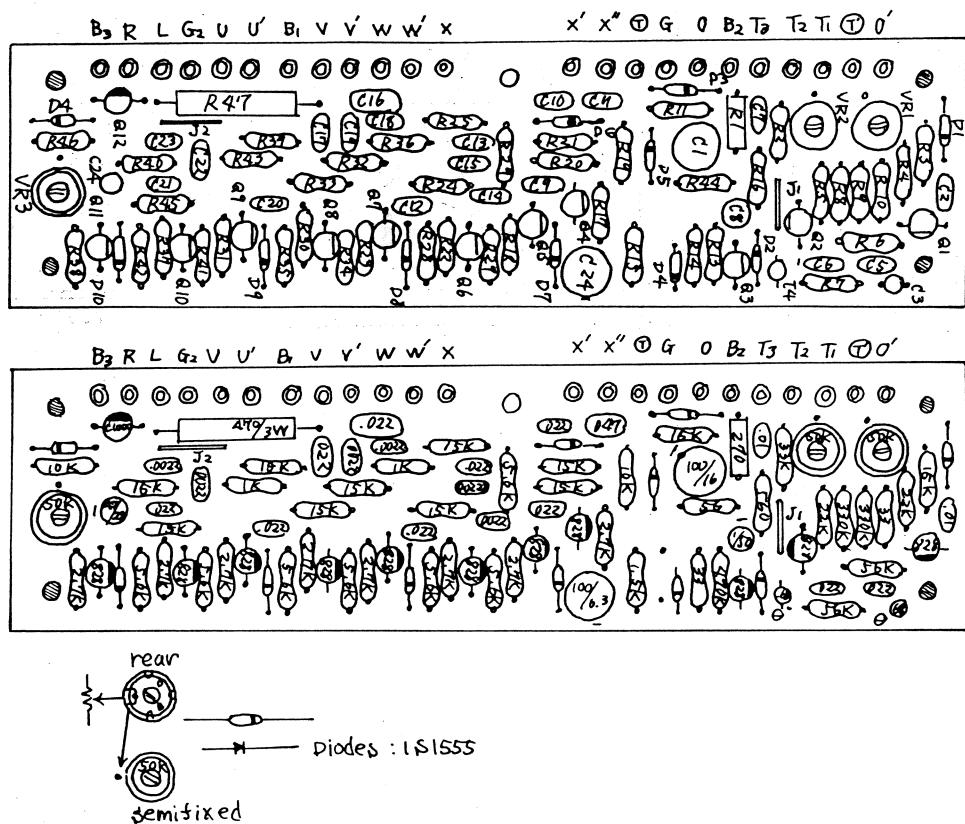
Fig. 2.



## SECTION 6. LOGIC CIRCUIT

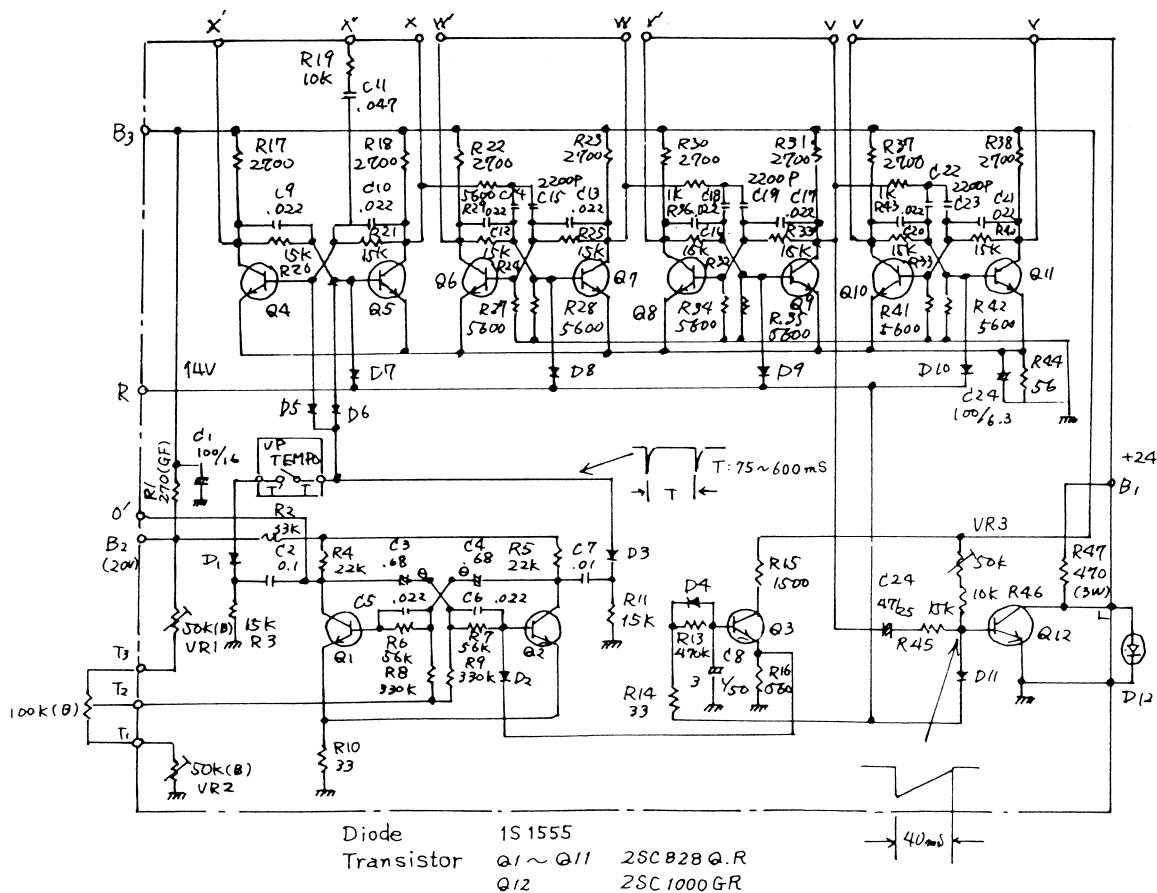
6-1 Logic Matrix Board Assembly Parts Layout (GL-2)  
(former type)

Fig. 3.

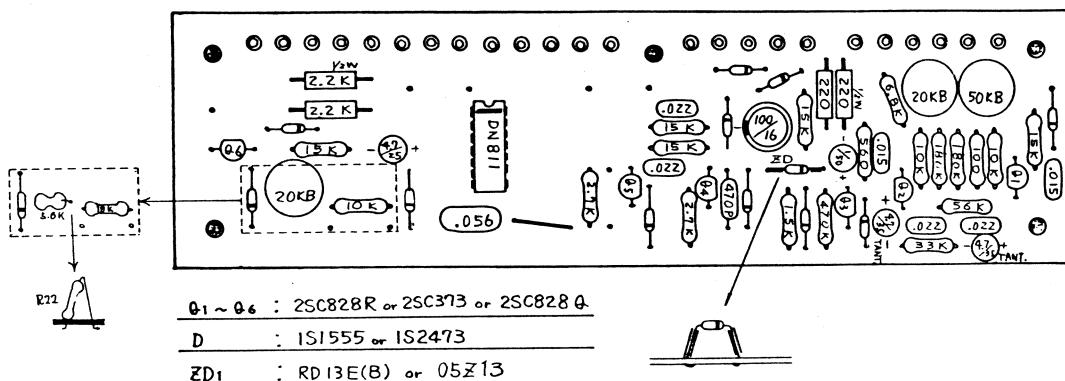
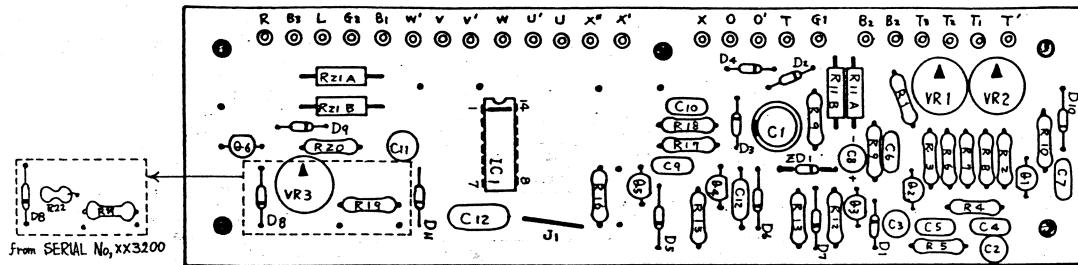


6-2 Logic Circuit Diagram (GL-2) (former type)

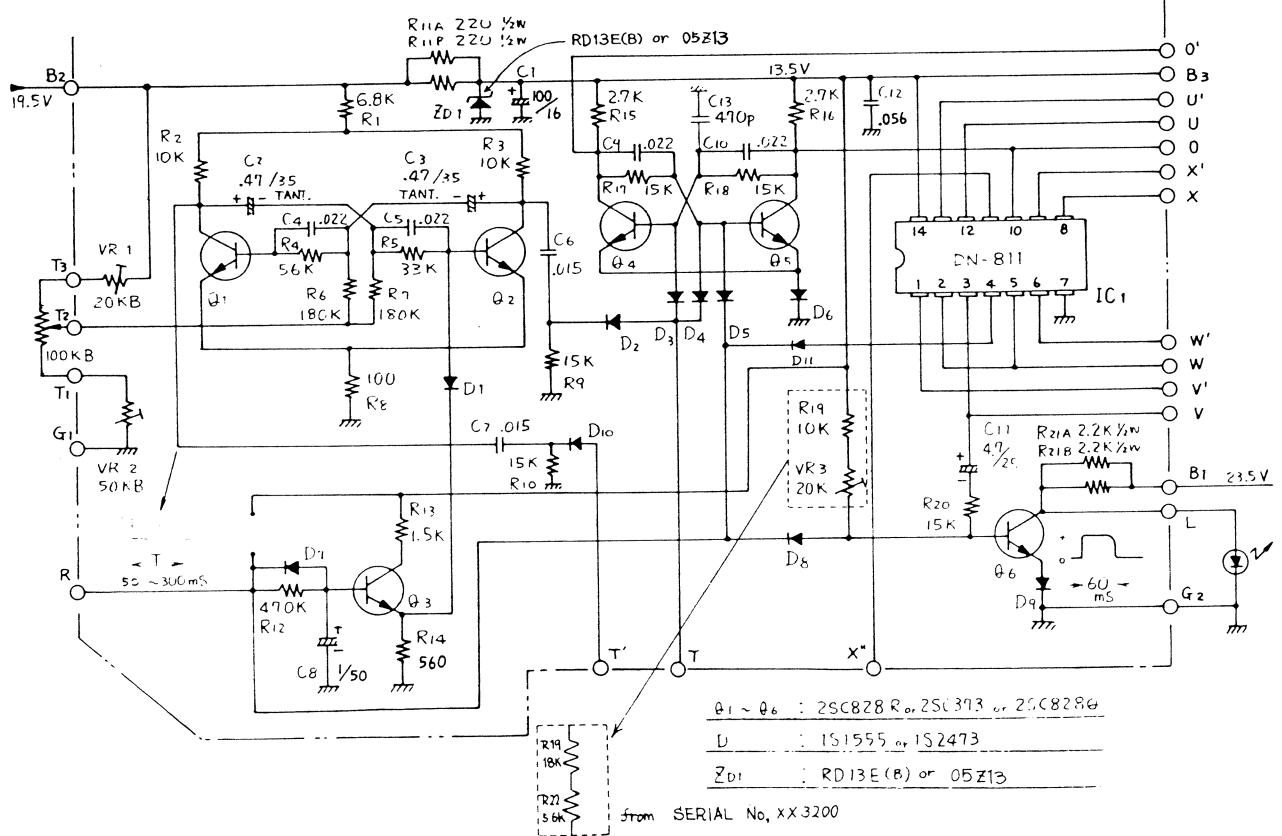
Fig. 4.



6-3. Logic Board Assembly Parts Layout (GL-6) Fig. 5.



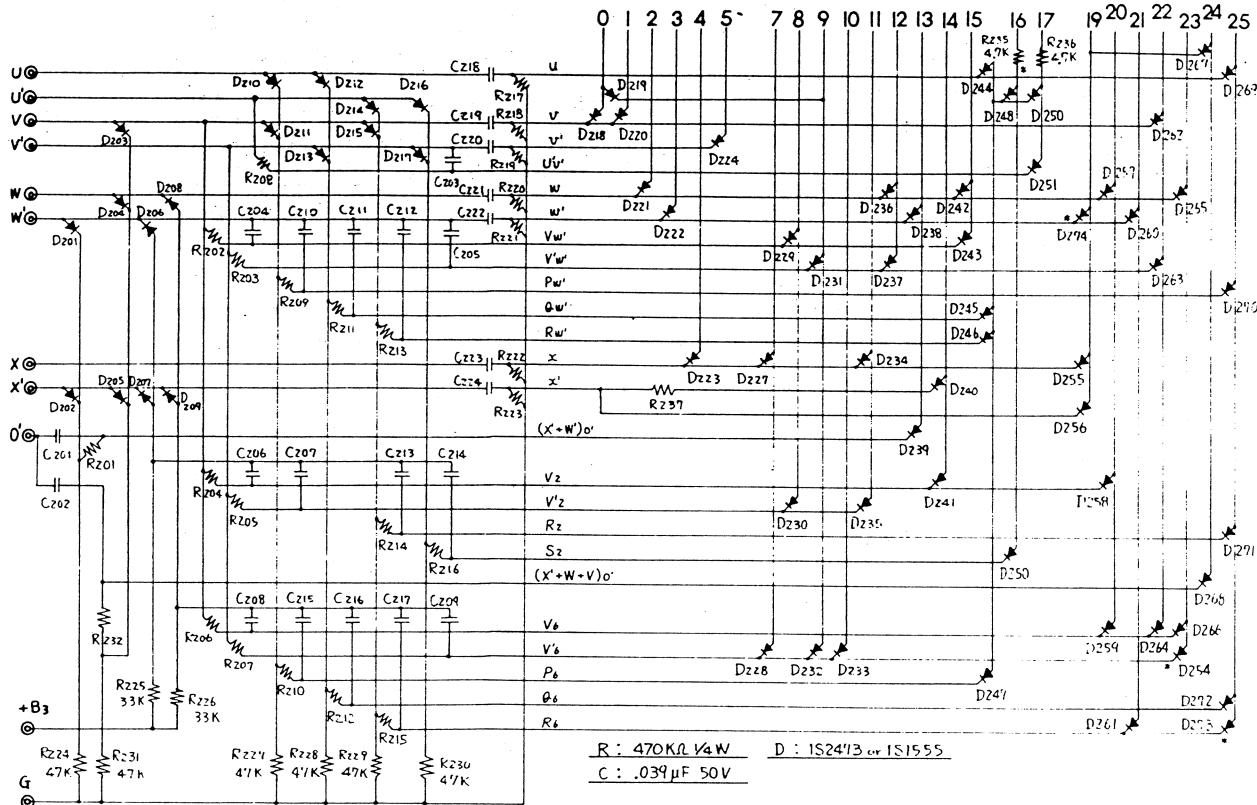
6-4. Logic Circuit Diagram (GL-6) Fig. 6.



## SECTION 7. MATRIX CIRCUIT

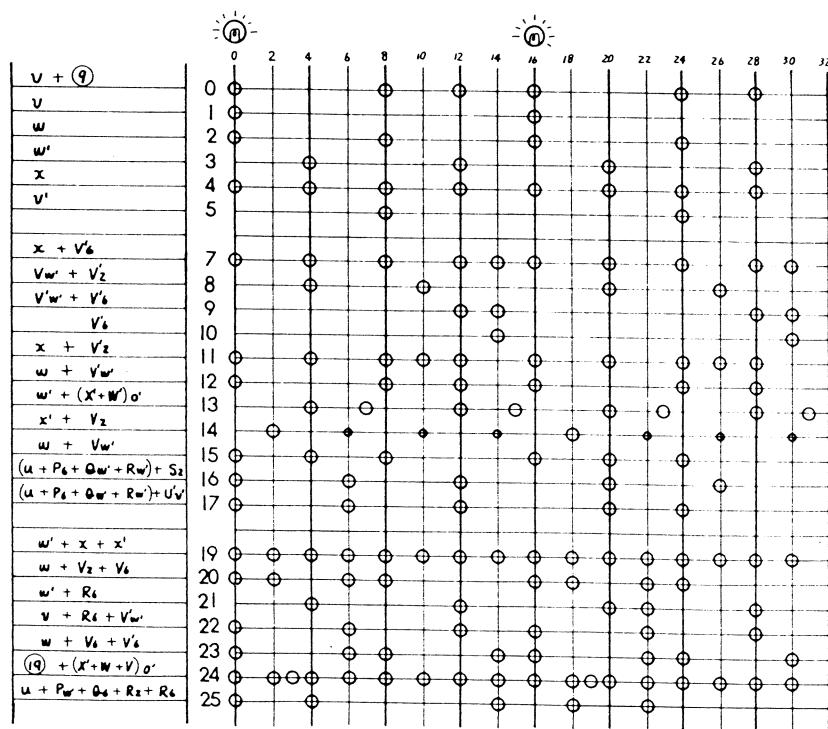
### 7-1. Circuit Diagram

Fig. 7.



## 7-2. Logic Output Timing Chart

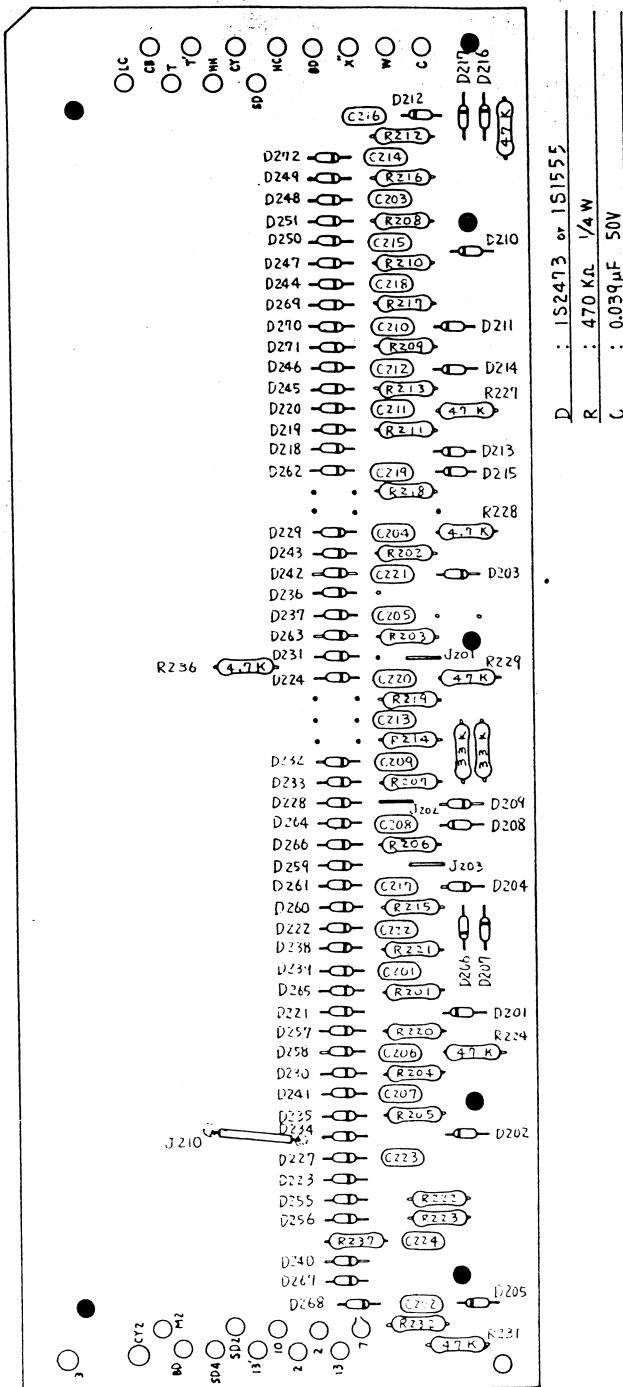
Fig. 8.



## SECTION 8. RHYTHM SWITCH ASSEMBLY

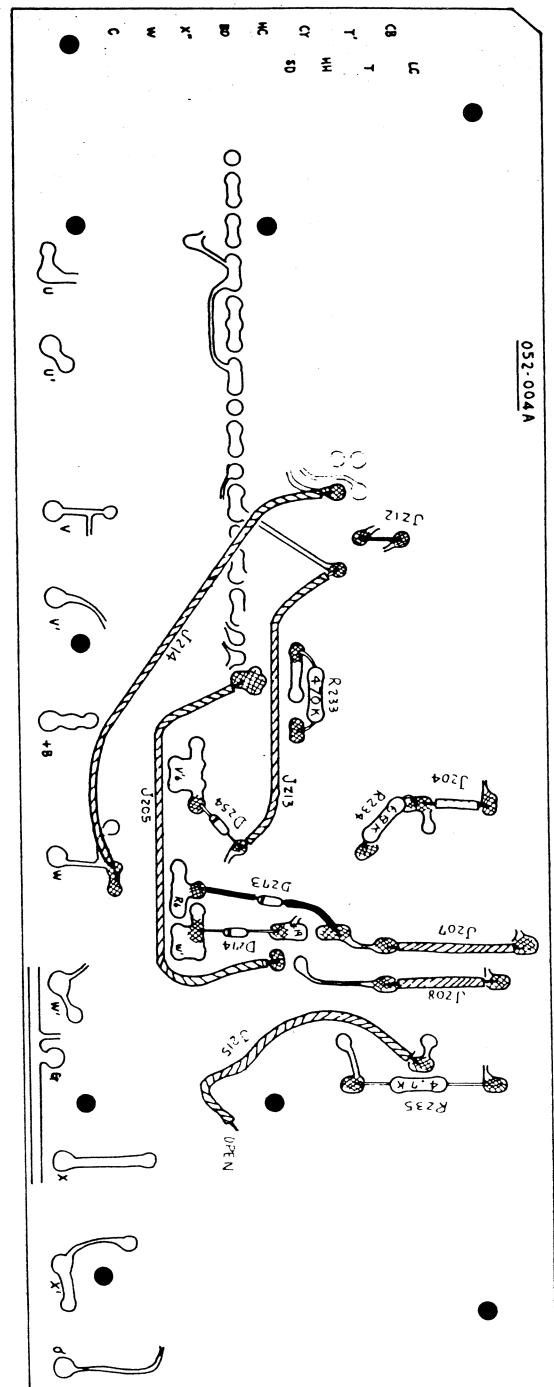
### 8-1. Rhythm Switch Assembly Parts Layout (RS-1)

Fig. 9.



## 8-2. Rear Side Parts Layout

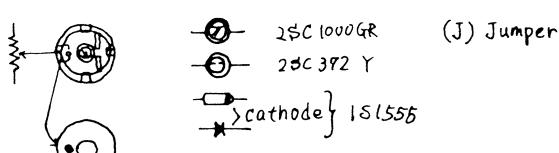
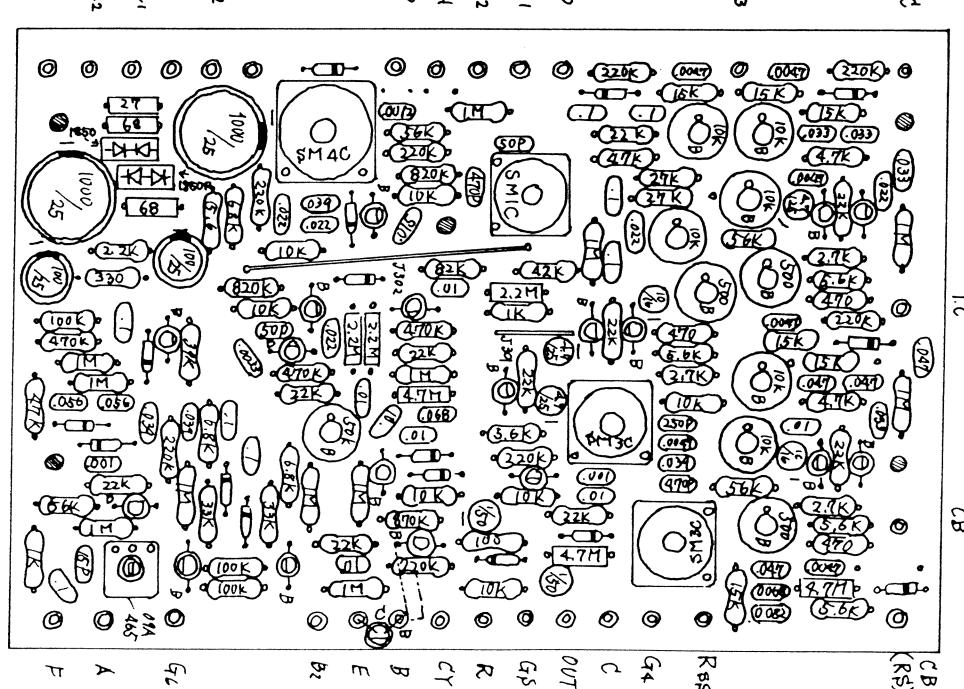
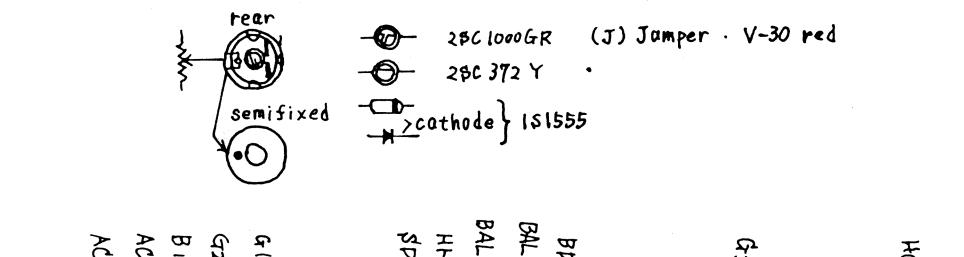
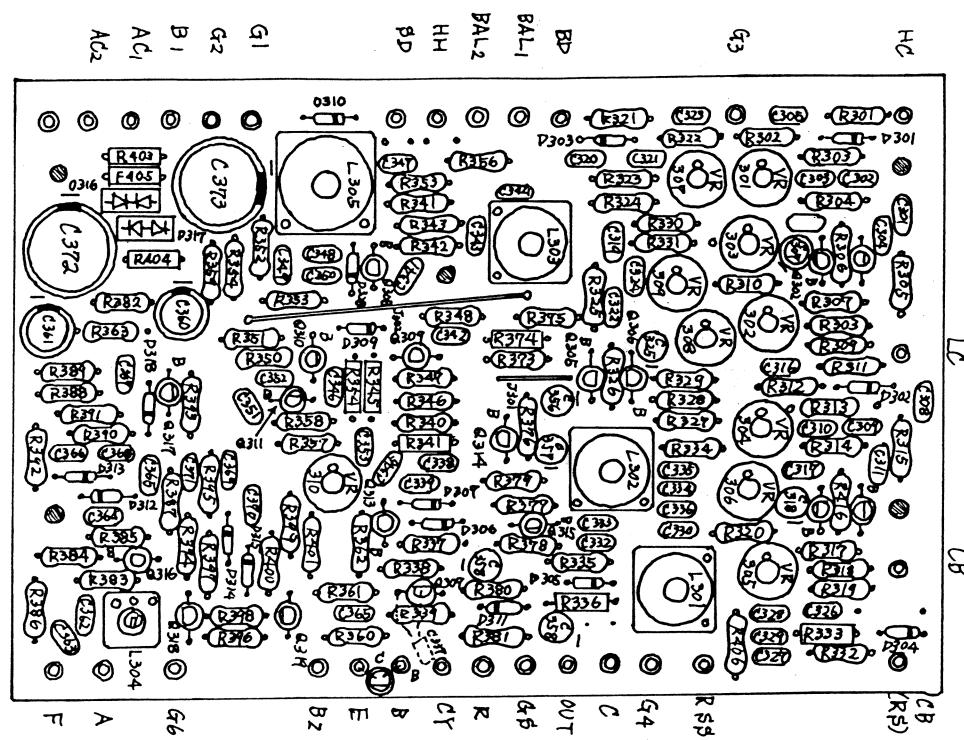
Fig. 10.



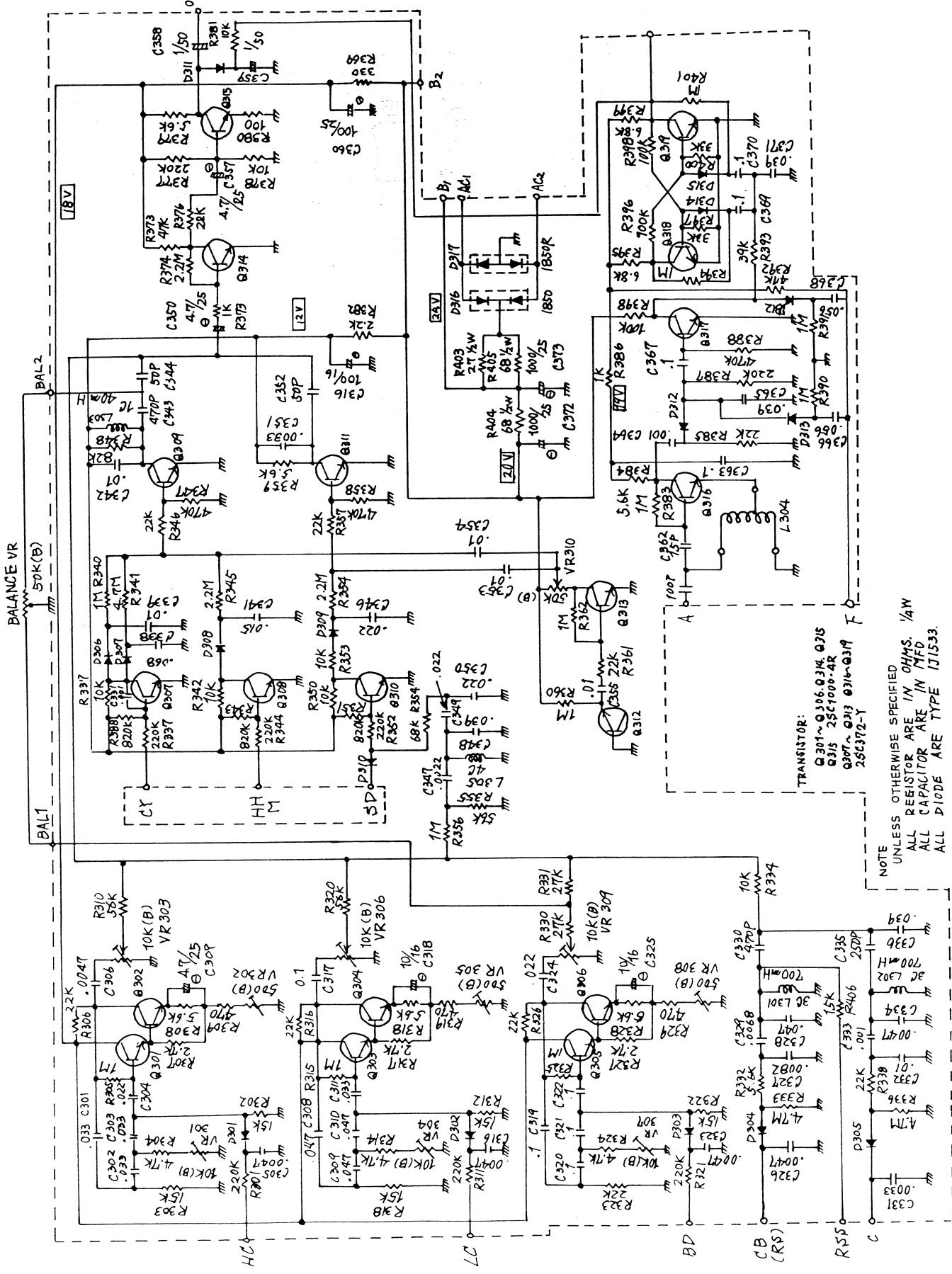
SECTION 9. VOICE GENERATOR AND POWER SUPPLY CIRCUIT

9-1 Voice Generator Board (VG-3)

Fig. 11.

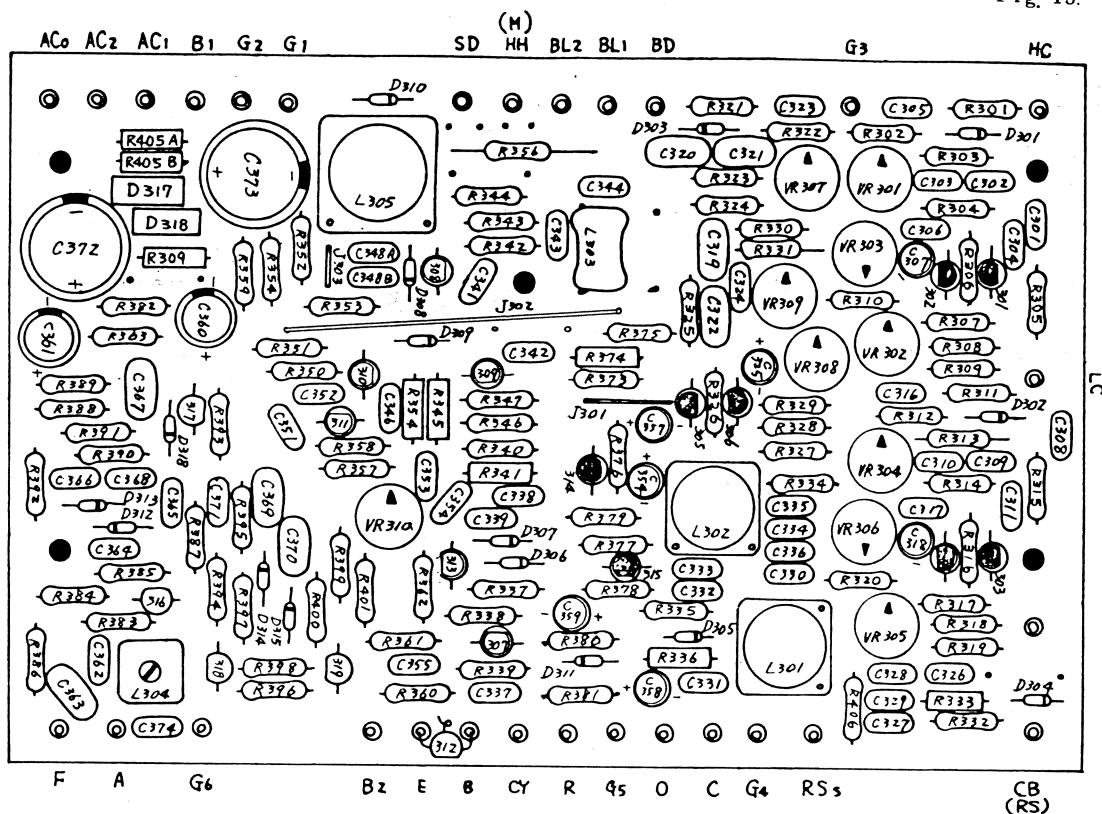


9--2 Voice Generator Circuit (VG-3)

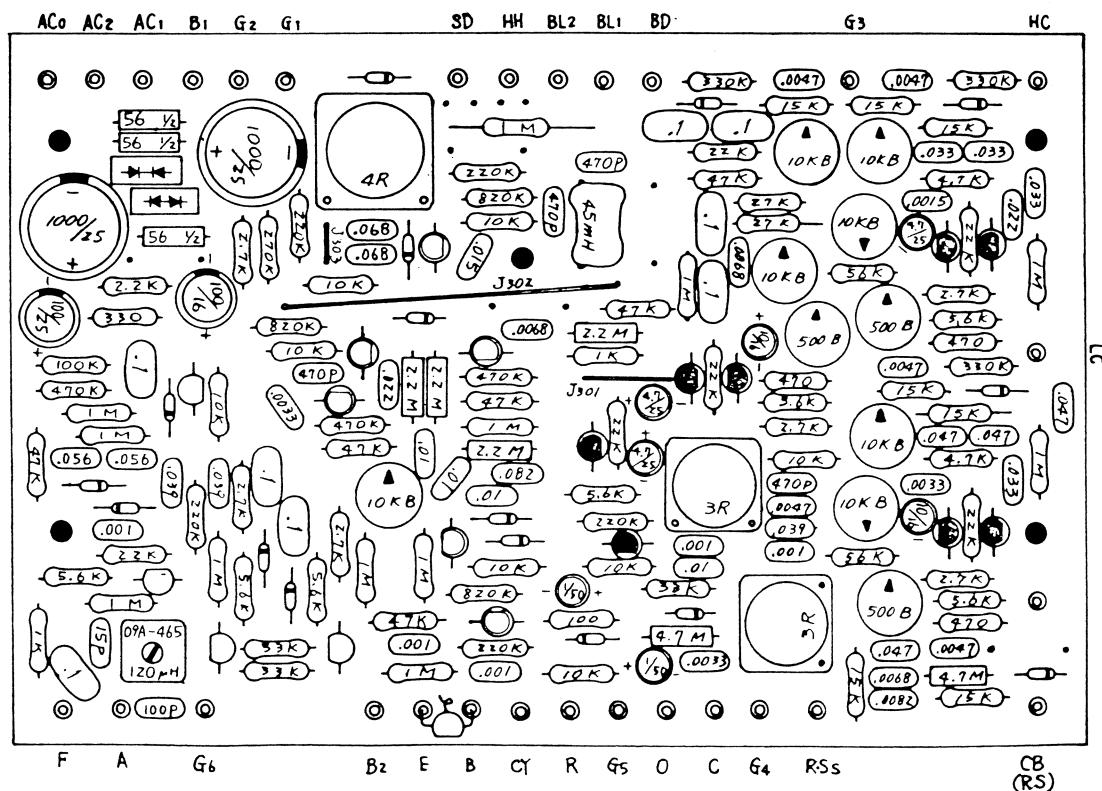


### 9-3. Voice Generator and Power Supply Board Assembly Parts Layout (VG-3)

Fig. 13.



To change from SERIAL No.252200  
R377(220K): replaced by 180K  
R379(5.6K): replaced by 4.7K



 : 2SC1000-GR

 : 2SC828-R or 2SC828-O or 2SC372-X

- 2SC372-Y

• LS2473 or LS1E55

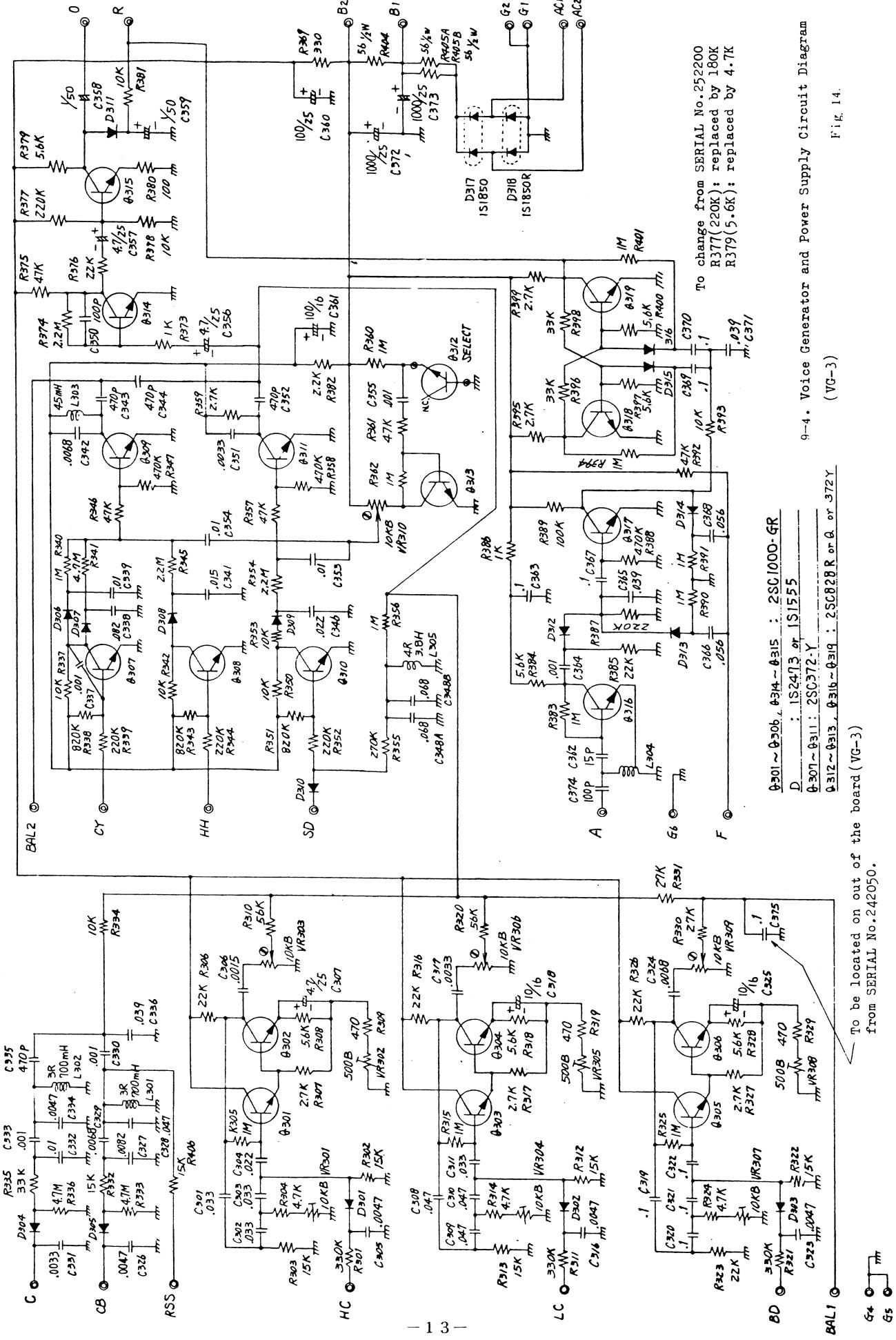
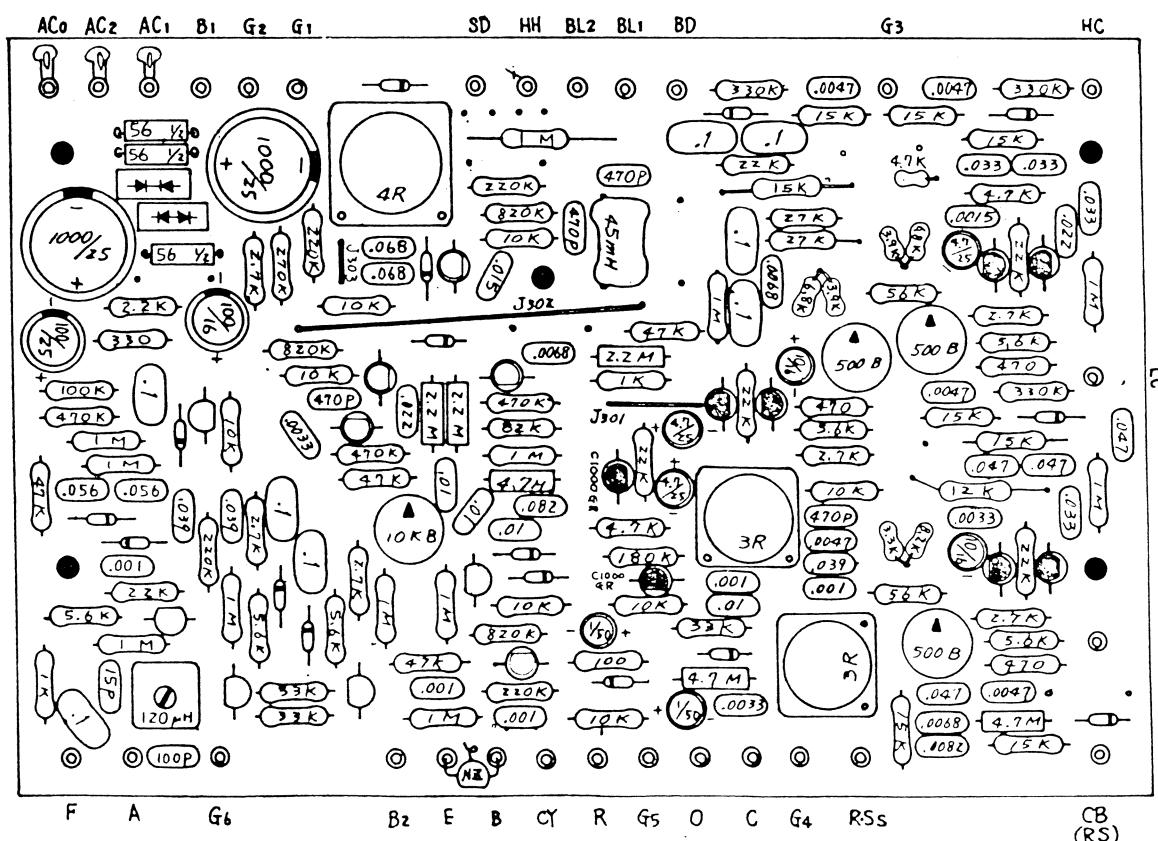
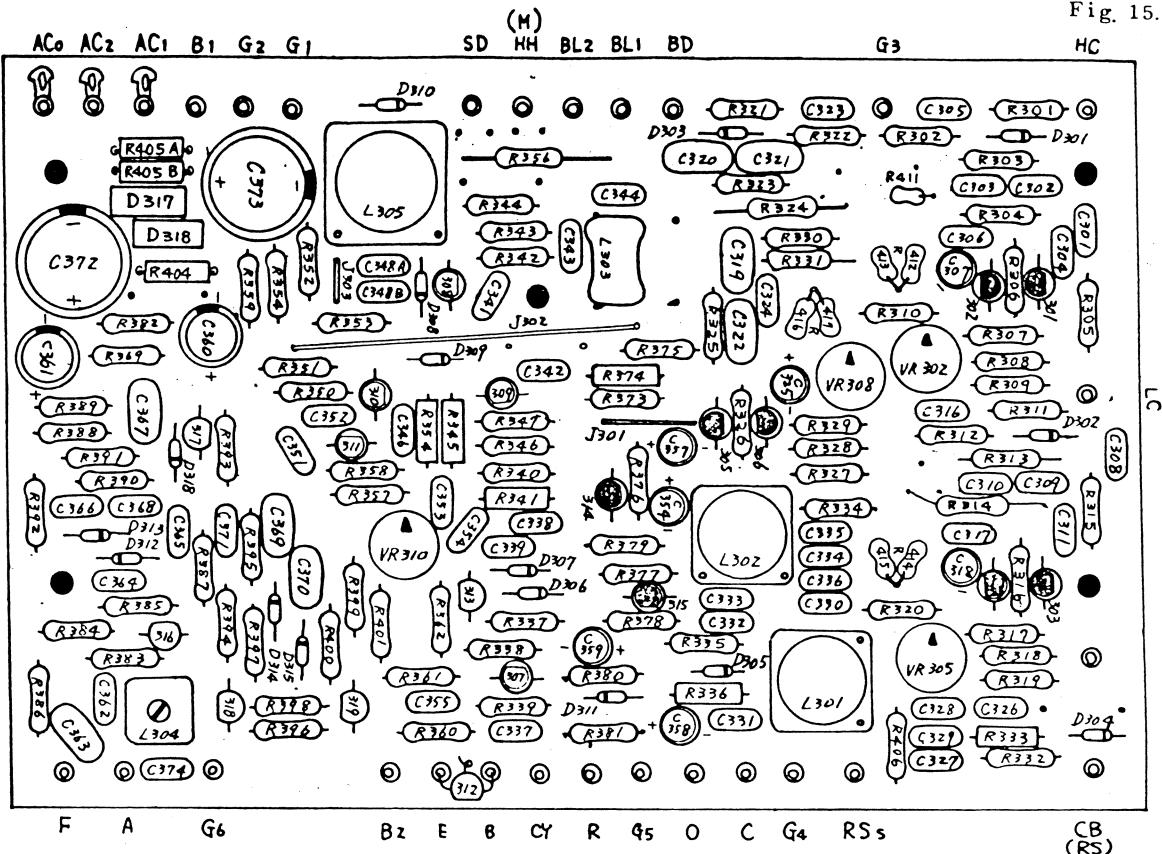


Fig. 14.

9-4. Voice Generator and Power Supply Circuit Diagram  
 To be located on or out of the board (VG-3)  
 from SERIAL No. 242050.

## 9-5 Voice Generator and Power Supply Board Assembly Parts Layout (VG-3)

Fig. 15.



 : 2SC1000GR or 2SC900F

 : 2SC536F or 2SC828R or 2SC3724

-Q : 2SC372Y

- : 1S2473 or 1S1555

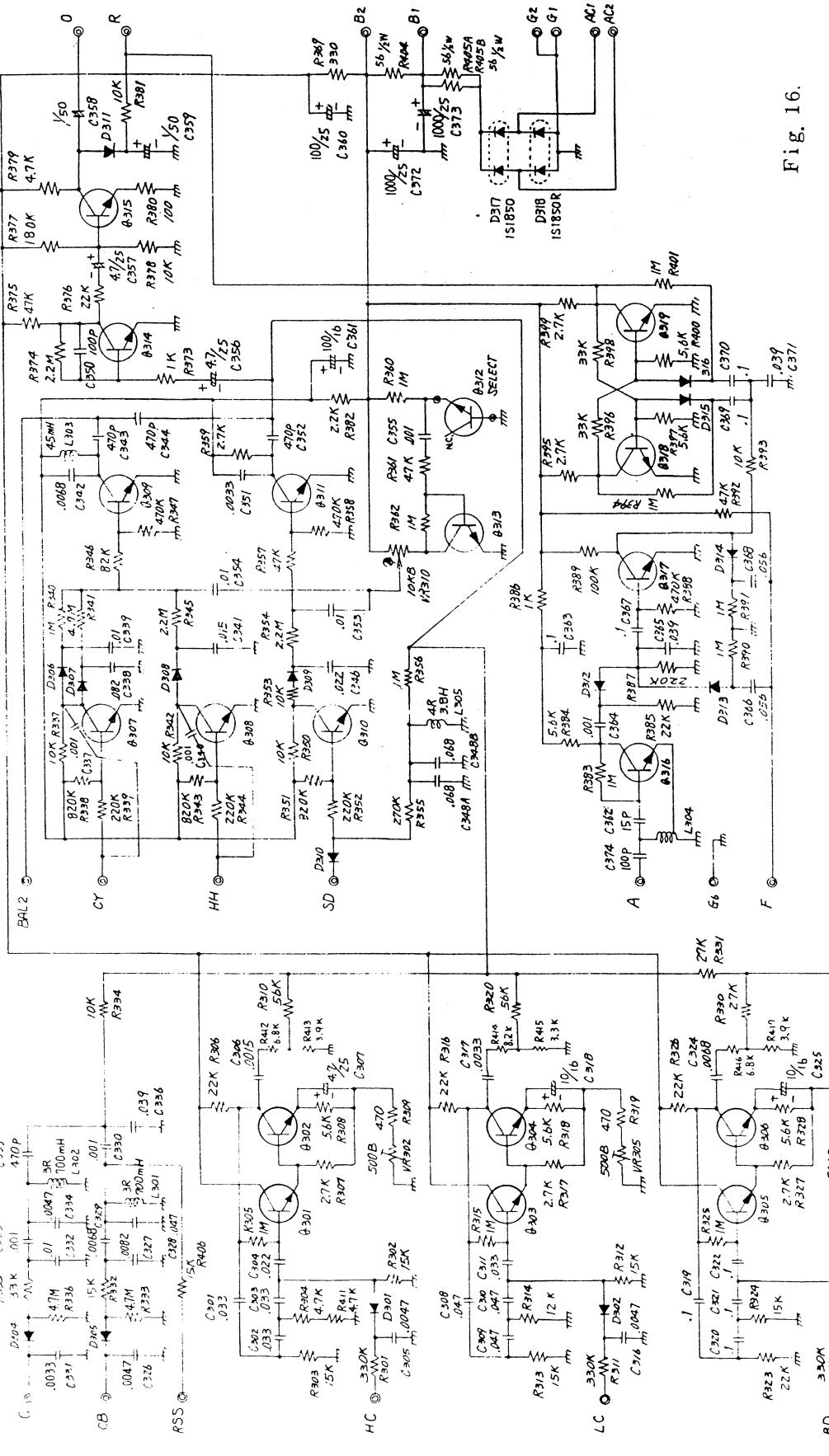


Fig. 16.

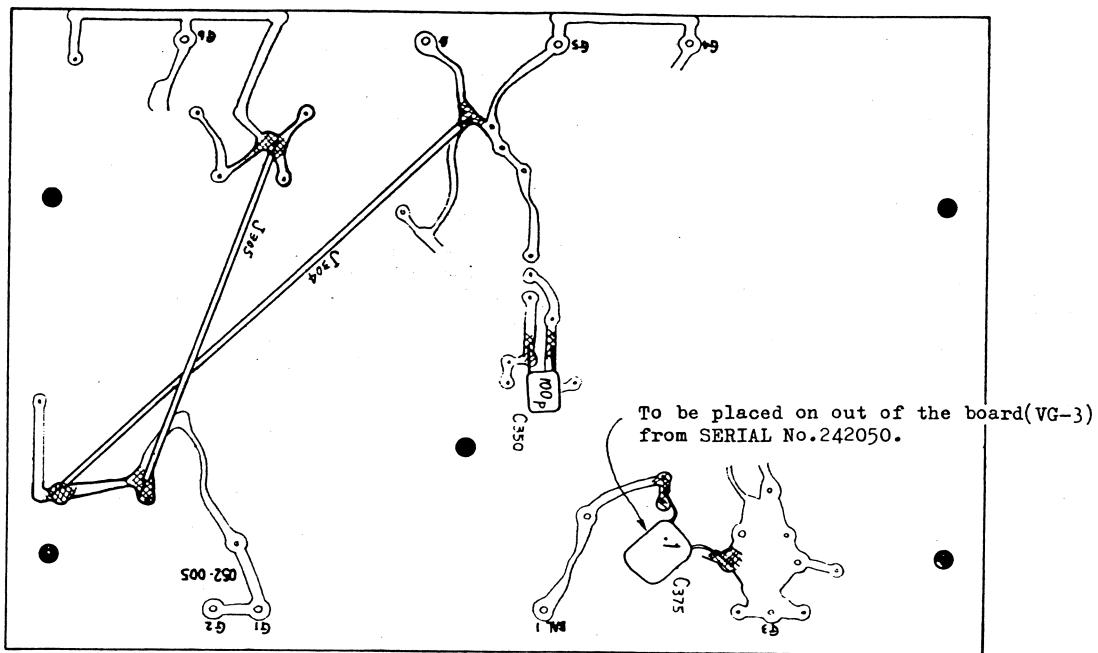
9-6 Voice Generator and Power Supply Board

Assembly Parts Layout (VG-3)

|                  |                                 |                        |
|------------------|---------------------------------|------------------------|
| G*               | Q301 ~ 306                      | : 2SC1000GR or 2SC900F |
| G5               | Q307 ~ 311                      | : 2SC372Y              |
| Q312             |                                 | : 2SC828R (N2)         |
| Q313, Q316 ~ 319 | : 2SC536F or 2SC372Y or 2SC828R |                        |
| Q314, 315        |                                 | : 2SC1000GR            |
| D                |                                 | : 1S2413 or 1S1555     |

9-7. Rear side view of VG-3 Board

Fig. 17.



## SECTION 10. RHYTHM PATTERN

### 10-1. Relation between Rotary Switch and Rhythm Selector

Fig. 18.

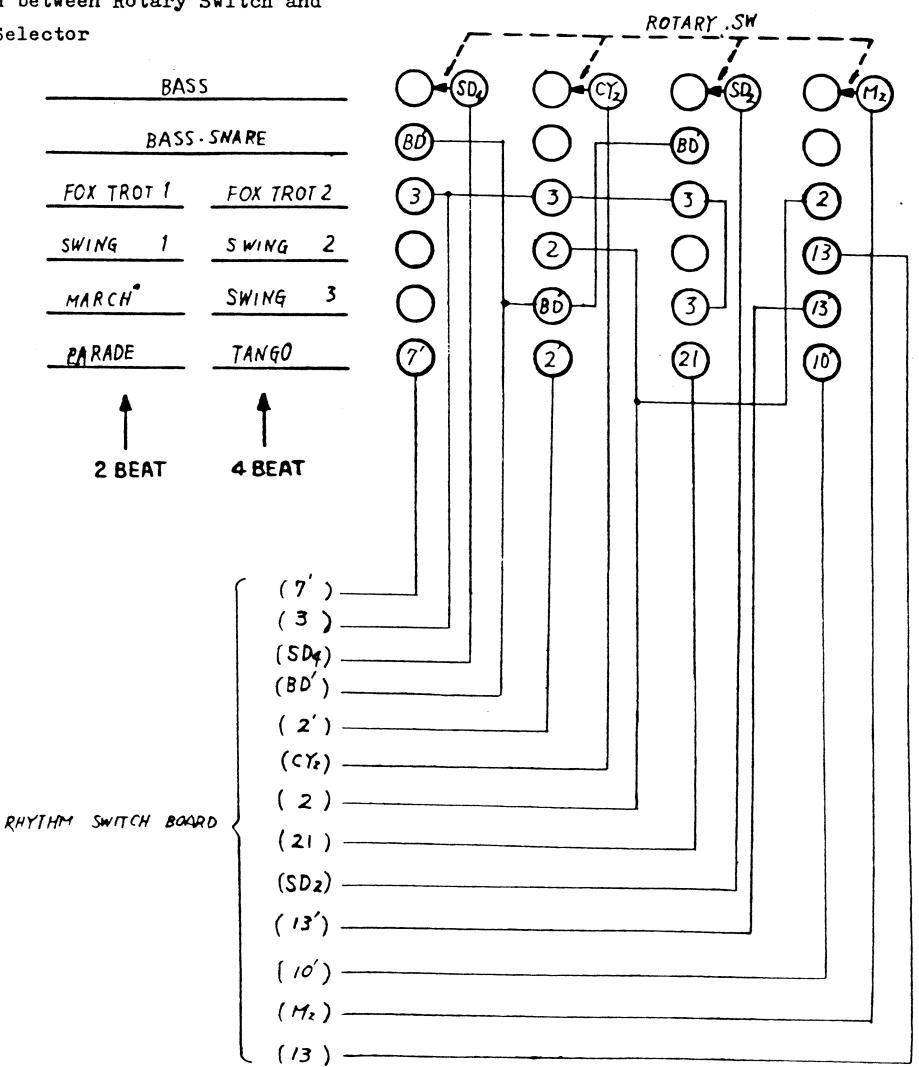


Fig. 19.

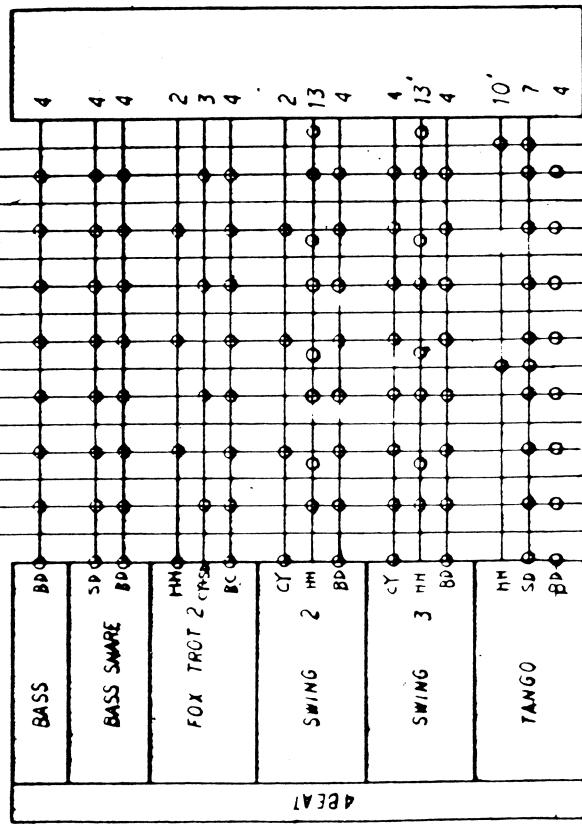
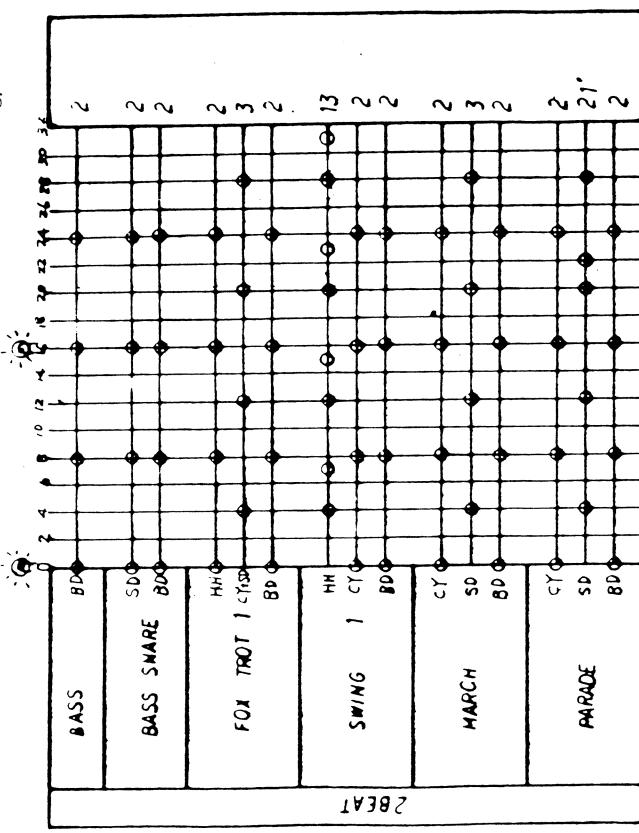
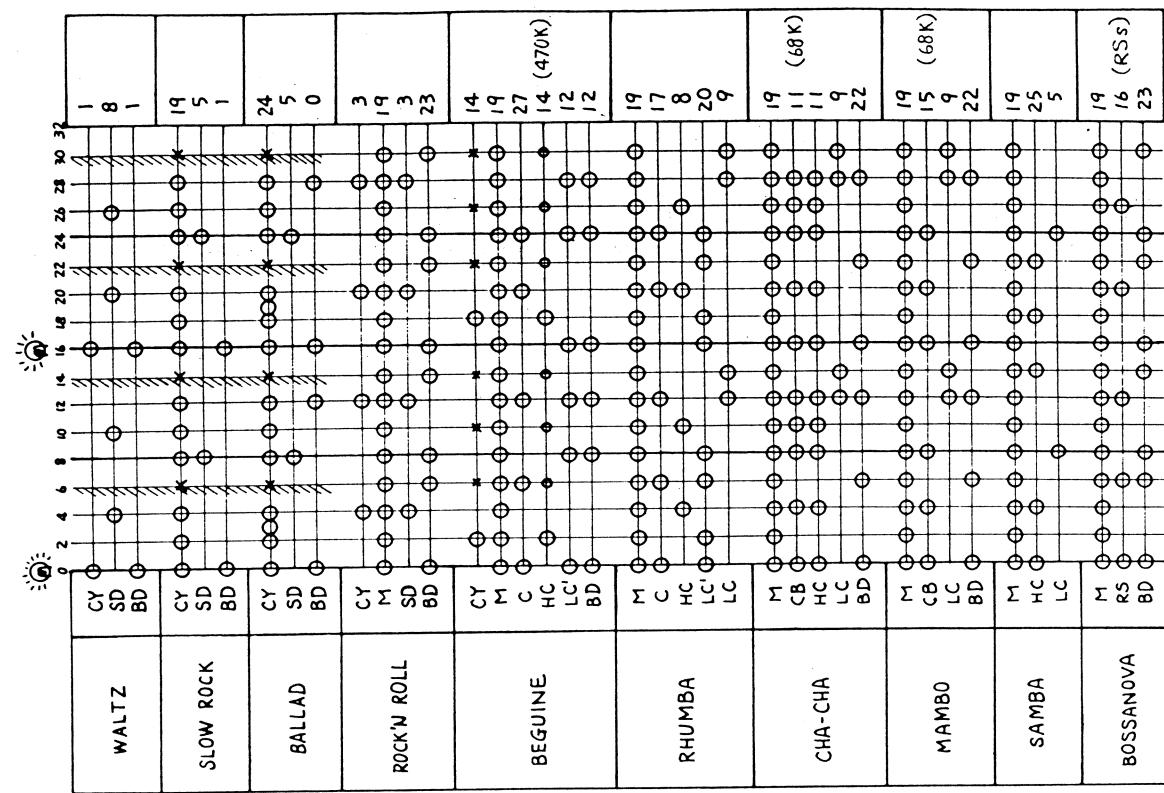


Fig. 20.



## SECTION 11. ADJUSTMENT

### 1. Adjustment of tempo speed by using oscilloscope

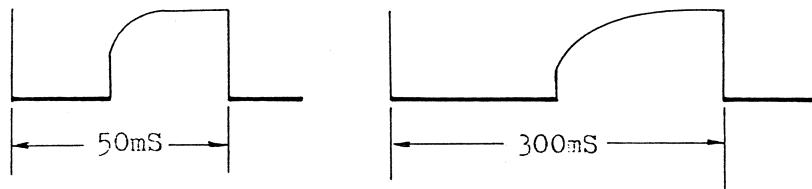
\* Rating

At oscillation period of Master Oscillator(Q1, Q2)

50mS(Quick) - 300mS(SLOW)

- a) Clockwise turning to the end of Tempo control(Quick), adjust semifixed resistor VR1 so that duration of one cycle of master oscillator shows 50mS.
- b) Then, counterclockwise turning to the end of Tempo control(Slow), adjust semifixed resistor VR2 so that duration of one cycle of master oscillator shows 300mS.

Fig. 21.



These forms are the collector voltage wave forms of the master oscillator.

Seeing the wave form on the collectors of Q1 or Q2, and check the wave forms whether they are as Figure B undesirable wave form including unsaturated territory. The wave form like Fig.C including wide unsaturated territory is to be wrong. In case that hfe of the transistor Q1 or Q2 is small, or a time constant of R7.C2 or R6.C3 is small, the wave form-Fig.C will appear.

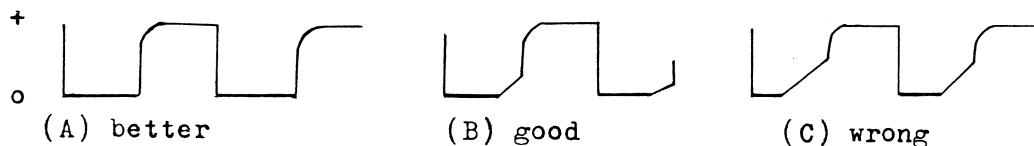


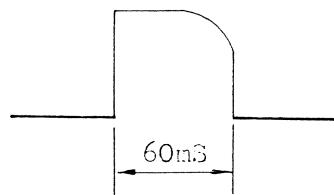
Fig. 22.

Note : Be sure to use a Probe(10 : 1) to seeing the wave form on the collector.

### 2. Adjustment of Tempo Lamp

See wave form at the collector of the transistor Q6 by the oscilloscope, and adjust semifixed resistor VR3 so that duration of cut-off of the lamp driver Q6 shows 60mS.

Fig. 23.



### 3. Circuit of Touch Start Switch

#### 3-1. Checking of Oscillation Frequency

Connect the oscilloscope with collector of Q316, and check the oscillation frequency is over 1700KHz( $0.59\mu\text{S}$ ). If the oscillation frequency is below 1700KHz, turn the core of L304 so as to make the frequency over 1700KHz.

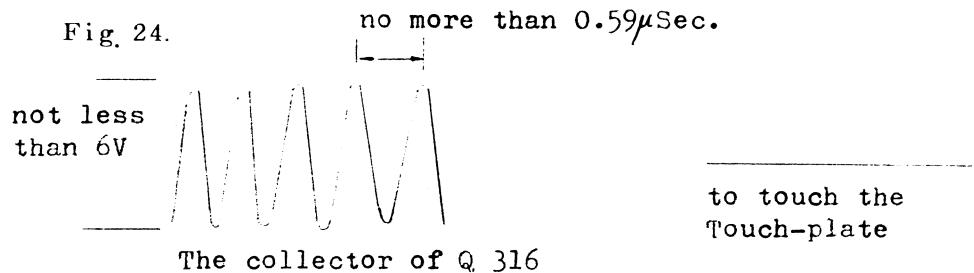
#### 3-2. Checking of oscillation voltage

Connect the oscilloscope of frequency zone over 2MHz with the collector of Q316, and check that the oscillation voltage is over 6V(p-p).

#### 3-3. Checking of oscillation stop

Connect the oscilloscope with the collector of Q316, touch the touch-plate slightly with hand, and check that the touch wave form disappears.

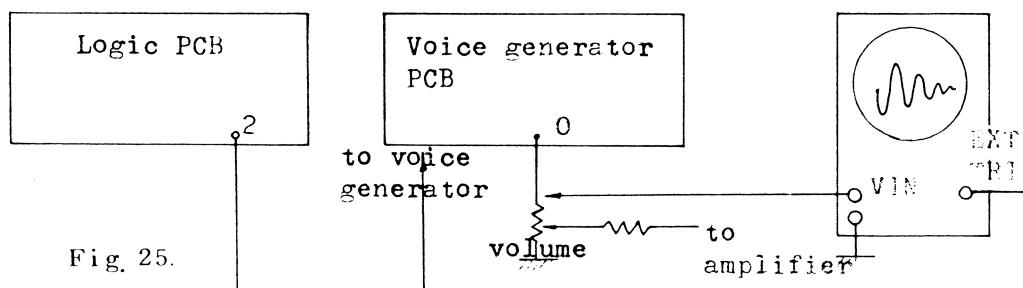
Fig. 24.



The collector of Q 316

### 4. Voice Generator

#### 4-1. Adjustment by measuring wave form on the oscilloscope



Logic output terminal "2" (pulse track No.2, negative pulse) is a standard trigger pulse. The period of a standard trigger pulse is generally 0.6sec. Measure voltage of output terminal "0" on the Voice generator PCB, and connect jack output(low out) with an amplifier. In case of listening to sound at the same time, connecting an amplifier, take down the volume position not to be due to output terminal. The position of Balance control knob is to be in center.

#### 4-2. Adjustment of the noise section(Cy, M,(High-Hat), Sd)

Set the Balance control knob to maximum of clockwise turn.

#### 4-2-1. Adjustment of Maracas

Connect a trigger pulse with terminal "M" on Voice Generator PCB. and adjust semifixed resistor VR310 so that the level of output voltage may reach 1.5V. Check decay time within regular value.

#### 4-2-2. Adjustment of Cymbal

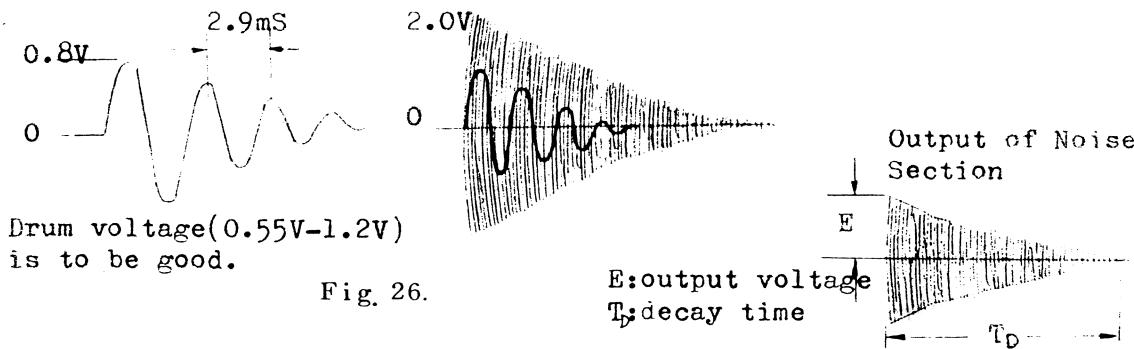
Connect a trigger pulse with terminal "Cy" on the PCB, and check decay time and output voltage within regular value.

(output adjustment of Cymbal is in the same way as Maracas)

#### 4-2-3. Adjustment of Snare Drum

Connect a trigger pulse with terminal "SD" on the PCB, and check decay time and output voltage within regular value.

(Output adjustment of high frequency of Snare Drum is in the same way as Maracas.)



#### 4-3. Adjustment of the Drum section (BD, LC, HC, CB, RS, C)

Set the balance control knob to maximum of counterclockwise.

##### 4-3-1. Adjustment of the Bass Drum

###### a) Adjustment of frequency

Connect a trigger pulse with terminal "BD" on the PCB. and adjust semifixed resistor VR307 so as to make the frequency as 60Hz. 60Hz is nearly 16.7mS.

###### b) Adjustment of Decay time

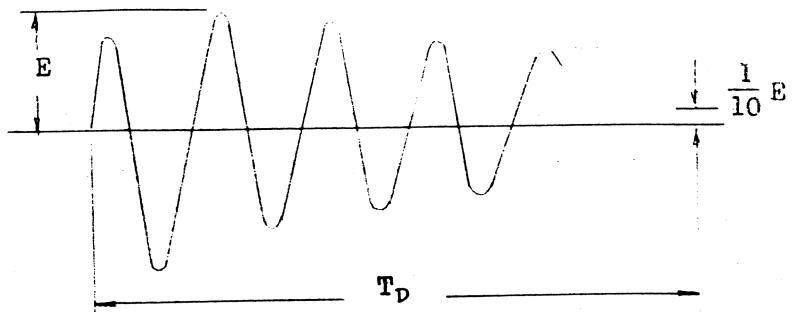
Adjust the semifixed resistor VR308 so as to get the Decay time( $T_D$ ) as 120mS.

###### c) Adjustment of the output voltage

Adjust the semifixed resistor VR309 so as to get the output voltage (E) as 2.5V

Repeat adjustment so that the conditions a), b) and c) may be satisfied simultaneously.

Fig. 27.



#### 4-3-2. Adjustment of Low Conga

##### a) Adjustment of frequency

Connect a trigger pulse with terminal "LC" on the PCB, and adjust the semifixed resistor VR304 so as to make the frequency as 147Hz. 147Hz is nearly 6.8mS.

##### b) Adjustment of Decay time

Adjust the semifixed resistor VR305 so as to get the Decay time( $T_D$ ) as 120mS.

##### c) Adjustment of the output voltage

Adjust the semifixed resistor VR306 so as to get the output voltage (E) as 3V.

Repeat adjustment so that the condition a), b) and c) may be satisfied simultaneously.

#### 4-3-3. Adjustment of High Conga

##### a) Adjustment of frequency

Connect a trigger pulse with terminal "HC" on the PCB, and adjust the semifixed resistor VR301 so as to make the frequency as 220Hz. 220Hz is nearly 4.55mS.

##### b) Adjustment of Decay time

Adjust the semifixed resistor VR302 so as to get the Decay time( $T_D$ ) as 90mS.

##### c) Adjustment of the output voltage

Adjust the semifixed resistor VR303 so as to get the output voltage (E) as 2.0V.

Repeat adjustment so that the condition a), b) and c) may be satisfied simultaneously.

#### 4-3-4. Adjustment of Cow Bell

##### a) Adjustment of frequency

Connect a trigger pulse with terminal CB(RS) on the PCB, and ~~adjust~~ capacitor C328 so as to make the frequency as 787Hz.

787Hz is nearly 1.27mS.

##### b) Adjustment of Decay time

Territory of Decay time (25 - 50mS) is to be good.

c) Adjustment of the output voltage

Territory of output voltage (3.0 - 5.0V) is to be good.

Otherwise, adjust the capacitor C327, C329 or C330 by adding capacitors parallelly connected.

In case that a capacitor or value is changed, check frequency and decay time again.

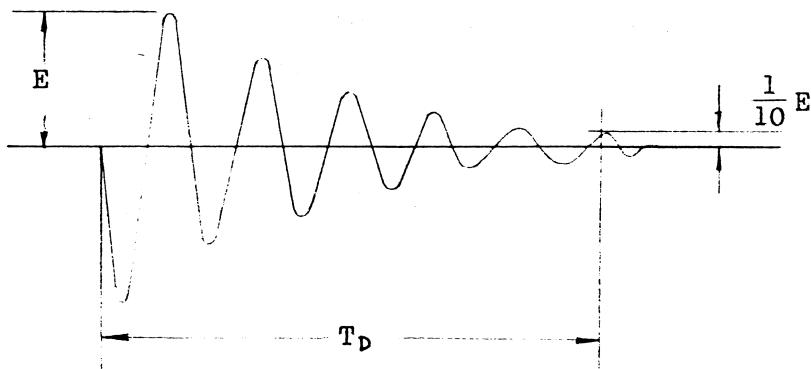


Fig. 28.

4-3-5. Adjustment of Rim Shot

The circuit of Rim Shot is the same as Cow Bell's, but in this case the L-C circuit is shunted with a resistor R406.

4-3-6. Adjustment of Claves

a) Adjustment of frequency

Connect a trigger pulse with terminal "C" on the PCB, and adjust the capacitor C334 so as to make the frequency as 2350Hz.

2350Hz is nearly 0.42mS.

b) Adjustment of Decay time

Territory of Decay time (15 - 25mS) is to be good.

c) Adjustment of the output voltage

Territory of output voltage (0.6 - 1.5V) is to be good.

Otherwise, adjust the capacitor C332, C333 or C335 by adding capacitors parallelly connected.

In case that a capacitor or value is changed, check frequency and decay time again.

STANDARD OUTPUT OF PERCUSSION INSTRUMENTS

| VOICE     | AMPLITUDE [V] |      |      | FREQUENCY [ms]<br>(Hz) |                |                | DECAY TIME [ms] |      |      |
|-----------|---------------|------|------|------------------------|----------------|----------------|-----------------|------|------|
|           | MIN.          | TYP. | MAX. | MIN.                   | TYP.           | MAX.           | MIN.            | TYP. | MAX. |
| BD        | 2.0           | 2.5  | 3.0  | 20<br>(50)             | 16.7<br>(60)   | 14.3<br>70     | 90              | 120  | 150  |
| LC        | 2.5           | 3.0  | 3.5  | 7.2<br>(139)           | 6.8<br>(147)   | 6.4<br>(156)   | 80              | 120  | 150  |
| HC        | 1.5           | 2.0  | 2.5  | 4.8<br>(208)           | 4.5<br>(220)   | 4.2<br>(233)   | 60              | 90   | 120  |
| C B       | 3.0           | 4.0  | 5.0  | 1.45<br>(690)          | 1.27<br>(787)  | 1.1<br>(910)   | 25              | 35   | 50   |
| (RS)      | —             | 3.3  | —    | —                      | —              | —              | 2.5             | 4    | 6.5  |
| C         | 0.6           | 1.0  | 1.5  | 0.48<br>(2100)         | 0.43<br>(2350) | 0.38<br>(2600) | 15              | 20   | 25   |
| SD        | 1.5           | 2.0  | 2.5  | —                      | —              | —              | 60              | 80   | 110  |
| HH<br>(M) | 1.0           | 1.5  | 2.0  | —                      | —              | —              | 45              | 60   | 75   |
| CY        | 1.0           | 1.5  | 2.0  | —                      | —              | —              | 250             | 350  | 450  |

TRIGGER PULSE : TRACK #2

## SECTION 12. PARTS LIST

## MODEL TR-55 PARTS LIST

Be sure to list part names as well as numbers to avoid mistakes  
when ordering replacements.

## CABINET ASSEMBLY (Complete)

## CHASSIS ASSEMBLY

|            |                                |   |
|------------|--------------------------------|---|
| 072-016    | Panel                          | No.16   |
| 072-019    | "                              | No.19 (Rear Panel)                                |
| 016-024    | Knob                           | No.24 TK-175 (Large)                              |
| 016-025    | "                              | No.25 TK-1122 (Small)                             |
| 001-003    | Rotary Switch                  | ESR-E246R15B                                      |
|            | Potentiometer                  | 50K(B) EVC-BOAS15 (Balance)                       |
|            | "                              | 10K(A) " (Volume)                                 |
|            | "                              | 100K(B) " (Tempo)                                 |
| 019-002    | Light Emitting Diode           | TLR-103   |
| 001-011    | Power Switch                   | SQ-142 or SJ-1574                                 |
| 001-002    | Voltage Selector Switch        | XW-103-1-10                                       |
| 022-019B-C | Power Transformer              | PT19B-C (0-100V-120V)<br>or PT19B-D (0-230V-250V) |
| 022-019B-D | "                              | SG-7615 No.5                                      |
| 009-001    | Jack                           |   |
| 008-013    | Wired-in Fuse                  | 0.5A  |
| 053-021    | Power Supply Cord              | No.21 SVT.2                                       |
| 042-004    | Terminal Strip                 | 2L-4P   |
| 062-002    | Bracket                        | No.2  |
| 047-019    | Cord Bushing                   | R5  |
| 074-014    | Badge                          | No.14   |
| 001-025    | Push Button Switch             | 10FS-52U-66                                       |
| 001-026    | "                              | 2FS-12U-18  |
| 001-027    | "                              | 1FS-2U-11   |
| 142-006    | LOGIC BOARD ASSEMBLY           | GL-6(IC Type)                                     |
| 142-002    | "                              | GL-2(Tr Type)                                     |
| 148-001    | RHYTHM SWITCH BOARD ASSEMBLY   | RS-1  |
| 143-003    | VOICE GENERATOR BOARD ASSEMBLY | VG-3  |

## \*SEMICONDUCTORS

|         |                         |                          |
|---------|-------------------------|--------------------------|
|         | IC                      | DN-811                   |
|         | Silicon Transistor      |                          |
|         | "                       | 2SC828-R or Q or 2SC-373 |
| 017-003 | "                       | 2SC828-R (White Noise)   |
| 017-004 | "                       | 2SC1000-GR               |
|         | Silicon Diode           | 2SC372-Y                 |
| 018-003 | "                       | 1S2473 or 1S1555         |
| 018-004 | "                       | 1S1850                   |
|         | Voltage Regulator Diode | 1S1850R                  |
|         |                         | RD13E-B or 05Z13         |

## \*RESISTORS

|                      |              |         |
|----------------------|--------------|---------|
| Semifixed Resistor   | 500ohm       | EVL-R4X |
| "                    | 10Kohm       | "       |
| "                    | 20Kohm       | "       |
| "                    | 50Kohm       | "       |
| Carbon Film Resistor | 100ohm 1/4 R |         |
| "                    | 330ohm       | "       |
| "                    | 470ohm       | "       |
| "                    | 560ohm       | "       |
| "                    | 1 Kohm       | "       |
| "                    | 1.5Kohm      | "       |
| "                    | 2.2Kohm      | "       |
| "                    | 2.7Kohm      | "       |

## MODEL TR-55 PARTS LIST

|         |       |                  |
|---------|-------|------------------|
| 022-030 | Choke | 45 mH            |
|         | Coil  | 0.7H 3R or SM-3C |
|         | "     | 3.8H 4R or SM-4C |

## \*BUTTONS

|         |      |        |
|---------|------|--------|
| 016-004 | No.4 | Ivory  |
| 016-005 | No.5 | Maroon |
| 015-006 | No.6 | Green  |
| 016-007 | No.7 | Yellow |
| 016-008 | No.8 | Gray   |

## MODEL TPI-05 PART LIST

|                       |         |         |
|-----------------------|---------|---------|
| Carbon Film Resistor  | 4.7Kohm | 1/4 R   |
| "                     | 5.6Kohm | "       |
| "                     | 6.8Kohm | "       |
| "                     | 10 Kohm | "       |
| "                     | 15 Kohm | "       |
| "                     | 22 Kohm | "       |
| "                     | 33 Kohm | "       |
| "                     | 47 Kohm | "       |
| "                     | 56 Kohm | "       |
| "                     | 68 Kohm | "       |
| "                     | 82 Kohm | "       |
| "                     | 100Kohm | "       |
| "                     | 180Kohm | "       |
| "                     | 220Kohm | "       |
| "                     | 270Kohm | "       |
| "                     | 330Kohm | "       |
| "                     | 470Kohm | "       |
| "                     | 820Kohm | "       |
| "                     | 1 Mohm  | "       |
| Carbon Solid Resistor | 56 ohm  | ERC12GK |
| "                     | 220 ohm | "       |
| "                     | 2.2Kohm | "       |
| "                     | 2.2Kohm | "       |
| "                     | 4.7Mohm | "       |

## \*CAPACITORS

|         |                        |                     |       |
|---------|------------------------|---------------------|-------|
|         | Plastic Film Capacitor | 470pf <sub>d</sub>  | 50V   |
| 035-001 | "                      | .001 mfd            | "     |
| 035-005 | "                      | .0015mfd            | "     |
| 035-007 | "                      | .0022mfd            | "     |
| 035-008 | "                      | .0033mfd            | "     |
| 035-011 | "                      | .0047mfd            | "     |
| 035-012 | "                      | .0068mfd            | "     |
| 035-014 | "                      | .0082mfd            | "     |
| 035-015 | "                      | .01 mfd             | "     |
|         | "                      | .015 mfd            | "     |
|         | "                      | .022 mfd            | "     |
|         | "                      | .033 mfd            | "     |
|         | "                      | .039 mfd            | "     |
|         | "                      | .047 mfd            | "     |
|         | "                      | .056 mfd            | "     |
|         | "                      | .068 mfd            | "     |
|         | "                      | .082 mfd            | "     |
|         | "                      | .1 mfd              | "     |
|         | Ceramic Capacitor      | 15 pf <sub>d</sub>  | 50V   |
| 037-002 | "                      | 100 pf <sub>d</sub> | "     |
| 037-006 | "                      | 450 pf <sub>d</sub> | "     |
| 037-017 | "                      | 470 pf <sub>d</sub> | "     |
| 037-020 | Electrolytic Capacitor | 1 mfd               | 50V   |
|         | "                      | 4.7 mfd             | 25V   |
|         | "                      | 10 mfd              | 16V   |
|         | "                      | 100 mfd             | "     |
|         | "                      | 100 mfd             | 25V   |
|         | "                      | 1000mfd             | "     |
|         | Tantalum Capacitor     | .47 mfd             | 35V K |

## \*COILS

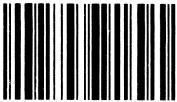
osc coil

09A-465



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