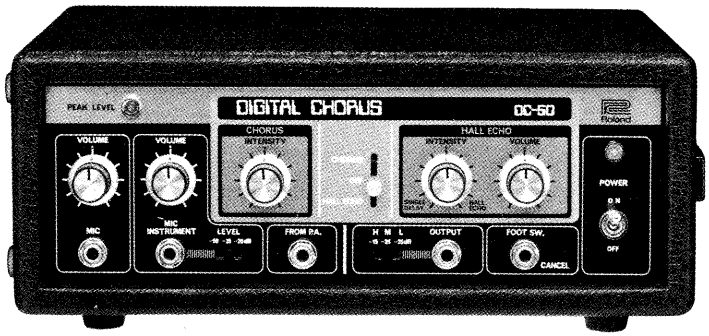
DIGITAL CHORUS

DC-50



DC-50

Roland

Printed in Japan

CONTENTS

First published December 1976

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1. SPECIFICATIONS

- INPUT
  - □MIC
    - Input Jack 1
    - Volume Control 1
    - Sensitivity / Impedance.....
      - −50dB (3.16mV) / 2.9kΩ (at 1kHz)
  - □MIC/INSTRUMENT
    - Input Jack 1
    - Volume Control 1
    - Input Level Changeover Switch, 3-Step 1
    - Sensitivity / Impedance.....
      - −50dB (3.16mV) / 2.9kΩ (at 1kHz)
      - −35dB (17.8mV) / 12kΩ (at 1kHz)
      - −20dB (100mV) / 68kΩ (at 1kHz)
  - □FROM P.A.
    - Input Jack 1
    - Sensitivity / Impedance.....
      - −26dB (50mV) / 39kΩ (at 1kHz)
- OUTPUT
  - Output Jack 1
  - Output Level Changeover Switch, 3-Step 1
  - Output Level / Impedance .....
    - H: −15dB (178mV) / 150Ω
    - M: −25dB (56.2mV) / 2.2kΩ
    - L: −35dB (17.8mV) / 870Ω
    - (at EFFECT − OFF, 10kΩ Load)
- S/N RATIO 55dB ("A" weighted)
- EFFECT □MODE SELECTOR (CHORUS / OFF, straight only / HALL ECHO)..... 1
  - □CHORUS
    - Intensity Control 1
    - Delay Time ..... 45 − 65mS
  - □HALL ECHO
    - Volume Control 1
    - Intensity Control 1
    - Delay Time ..... 102.4mS (113mS)*
- OTHERS
  - Foot Switch Jack for Effect 1
  - Peak Level Lamp (LED) 1
  - Power Switch 1
  - Power Pilot Lamp (LED)..... 1
- DIMENSIONS ..... 366(W) x 148(H) x 245(D)mm
- WEIGHT 4kg
- AC MAINS 100/117/200/220/230/240V, 50/60Hz
- POWER CONSUMPTION ..... 4W (except 117V), 6W (117V)
- FINISH ..... Vinyl Leather, Plywood
- ACCESSORY Connection Cord (2.5m)..... 1

** Figure in parenthesis indicates data for Serial No. 561950 and higher.*

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2. CIRCUIT DESCRIPTION

2-1. AGC (automatic gain control) CIRCUIT

D1, D2, Q3 and Q4 make up a detector for LED in photo-coupler PH1. When the output signal voltage from IC2 goes beyond a predetermined level (approximately 4Vp-p), Q4 conducts through the LED, and the resistance of CdS in feedback loop of IC2 reduces as the output increases, resulting in reduced gain of IC2.

Thus, the gain can be controlled within a predetermined level automatically.

2-2. LOW-PASS FILTER

After being regulated by IC2 in the AGC circuit, the input signal is fed to two stages of active low-pass filter.

The low-pass filter that comprises Q6 and Q7, functions to cut off higher frequency signal, which might otherwise produce dissonant beat frequency in combination with output from the clock generator.

2-3. BBD and LOW-PASS FILTER

BBD is a kind of delay circuit. It is driven by high frequency clock pulse generated by four transistors, Q20-Q23.

The frequency is 10KHz (9.1KHz)* for HALL ECHO.

For CHORUS, the frequency is 16KHz – 22KHz, modulated by a low frequency signal of 0.05Hz – 1Hz.

At HALL ECHO of DC-50, a delay time of 25.6msec (28msec)* is obtained by 512 stages of BBD, MN3001, a dual 512-stage bucket brigade device. A delay time of 102.4msec (113msec)* is achieved with a total of 2,048 stages.

Each BBD (512 stages) has two output terminals in order to enable cancelling clock pulse leakage.

The BBD output signal passes through one-transistor amplifier and one-transistor active low-pass filter, and then it is fed to the BBD of the next stage.

The output from the fourth BBD passes through one-transistor (Q15) amplifier and one-transistor (Q16) active low-pass filter. Further it passes through a one-transistor (Q17) active low-pass filter so that clock pulse cannot be heard.

2-4. FOOT SWITCH CIRCUIT FOR CANCEL

FET (Q18) is a gate circuit. When the cathode voltage of diode D3 is approximately +2V, the FET conducts to put the signal through.

When PCB terminal No. 10 is grounded through FOOT SWITCH, and the cathode voltage of diode D3, is approximately –4V, the FET non-conducts, interrupting the effect signal.

Thus, by inserting FOOT SWITCH into the cancel foot switch jack on the control panel, an operator can freely set the effect signal to on or off.

2-5. HALL ECHO VOLUME and INTENSITY CONTROL

The signal that passes the gate circuit of Q18 is fed to HALL ECHO VOLUME mounted on the control panel. By the volume control, an operator can regulate the volume of HALL ECHO. With effect switch set on HALL ECHO, the signal is also fed to INTENSITY CONTROL mounted on the control panel. Then the signal is amplified by an amplifier, consisting of one-transistor (Q8) and is fed back to input of first stage BBD.

When INTENSITY KNOB is set to minimum, a single delay tone of approximately 100msec (113msec)* is produced.

**Figure in parenthesis indicates data for Serial No. 561950 and higher.*

2-6. LOW FREQUENCY GENERATOR

The low frequency generator, using Dual-Op-Amp, (IC5) generates a triangular wave. This circuit is used only for chorus effect.

2-7. CHORUS INTENSITY

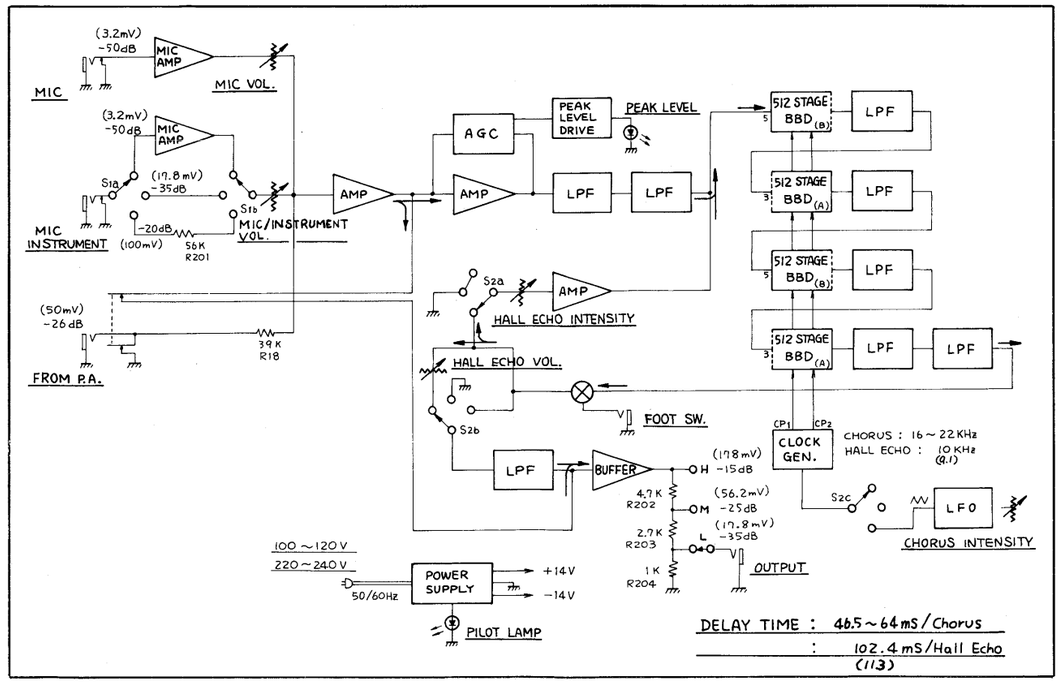
The triangular wave frequency is changed by INTENSITY KNOB mounted on the control panel. The frequency is approximately 0.05Hz – 1Hz. The lowest frequency is determined by R123 and the highest by R122.

At CHORUS, the clock generator frequency to drive BBD gate is approximately doubled by changing the bias voltage with R127. The base bias of the clock generator is modulated by the triangular wave and the frequency changes approximately 16KHz to 22KHz. The change in clock generator frequency causes change in delay time of BBD. Thus, the delayed signal and straight signal are mixed, producing a unique chorus sound.

2-8. OUTPUT IMPEDANCE

By virtue of the emitter follower method, the output impedance of DC-50 is very low. It is approximately 150Ω at H output terminal, approximately 2.2kΩ at M output terminal, and approximately 870Ω at L output terminal.

3. BLOCK DIAGRAM



4. PC BOARD

TOP VIEW

Q1, Q2, Q6 – Q8
2SC1222 E or 2SC1681 BL or 2SC1222 F

Q3, Q4, Q22, Q23, Q25
2SC536 F or 2SC828 R

Q5
2SA733 P

Q9 – Q17, Q19
2SC900 F or 2SC1000 GR

Q20, Q21
2SA493 GR or 2SA564A R

or 2SA826 R or Q

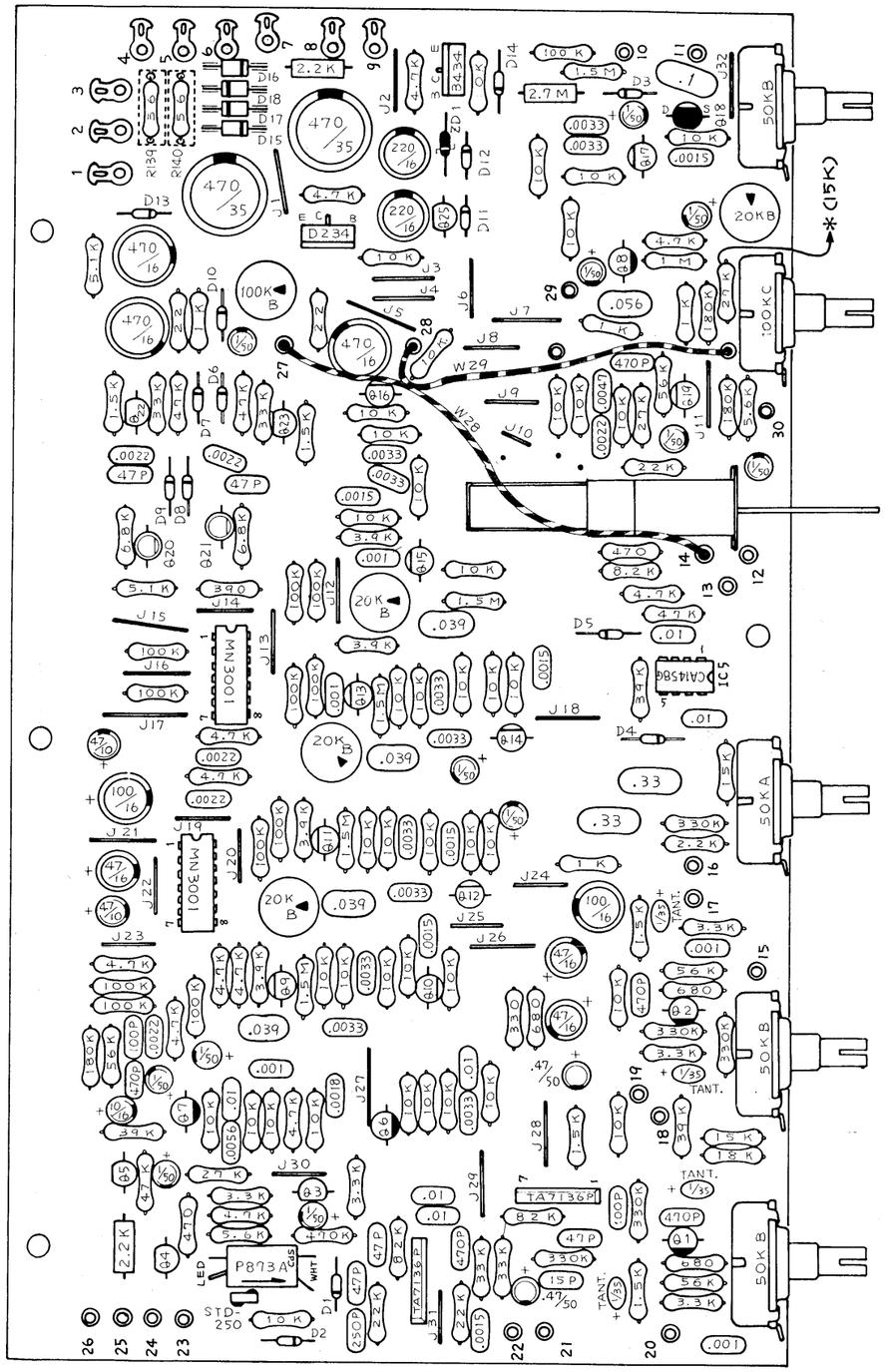
D1 – D14
1S2473 or 1S1555

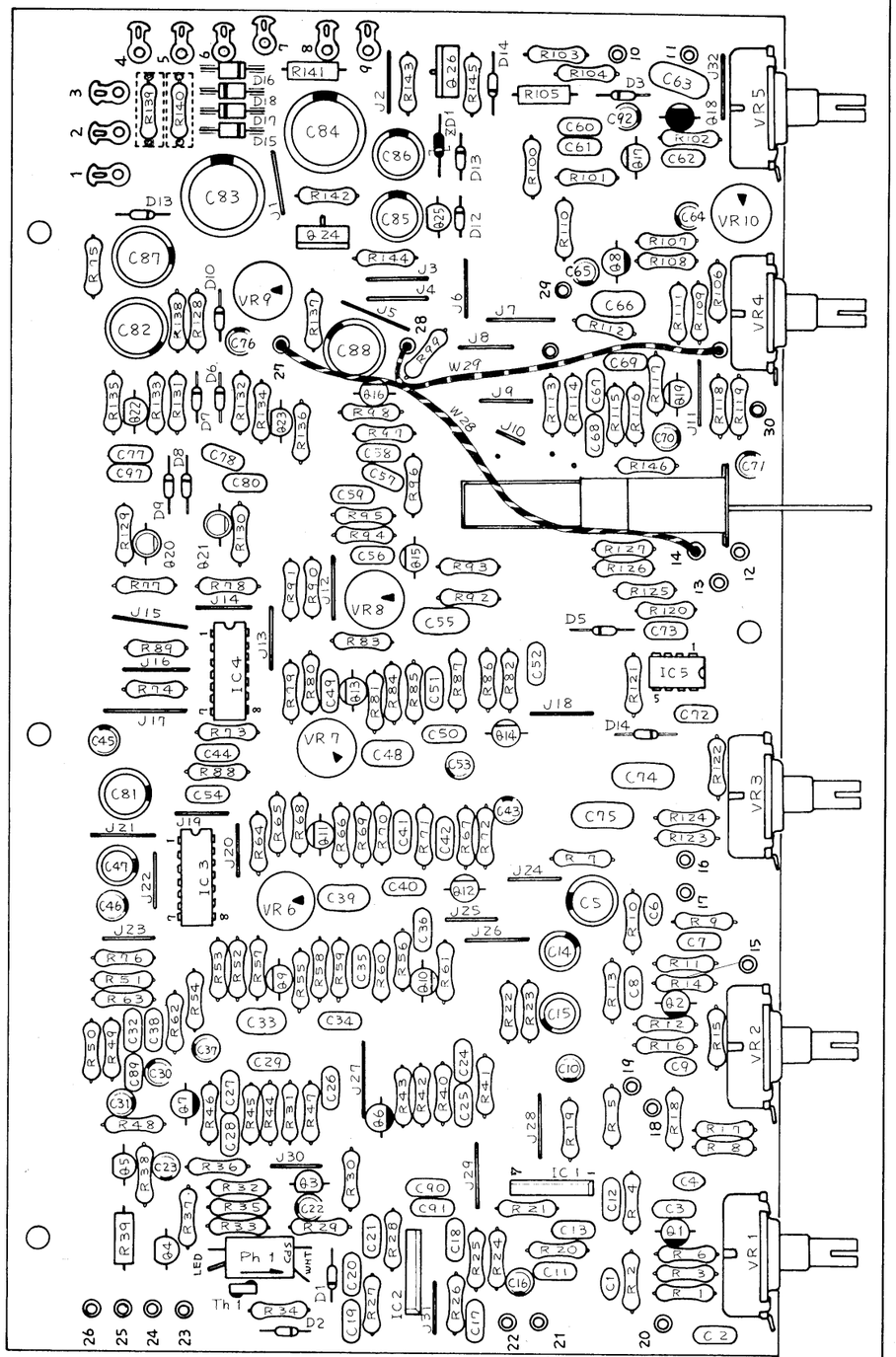
D15 – D18
1N4003 or 10D-1 or S1B0-1-02

ZD1
05Z15A or 02Z15A (1S2121A)

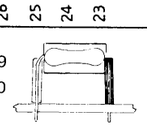
Q18 (FET)
2SK44 D or 2SK30A Y

IC5
μPC1458C or CA1458G

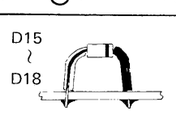




NOTE: R139 and R140 function like ordinary fuse. If the resistor is burnt, locate the cause and take proper action. Then replace it with resistor of the equal rating.



R139
R140



D15
~
D18

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5. CIRCUIT DIAGRAM

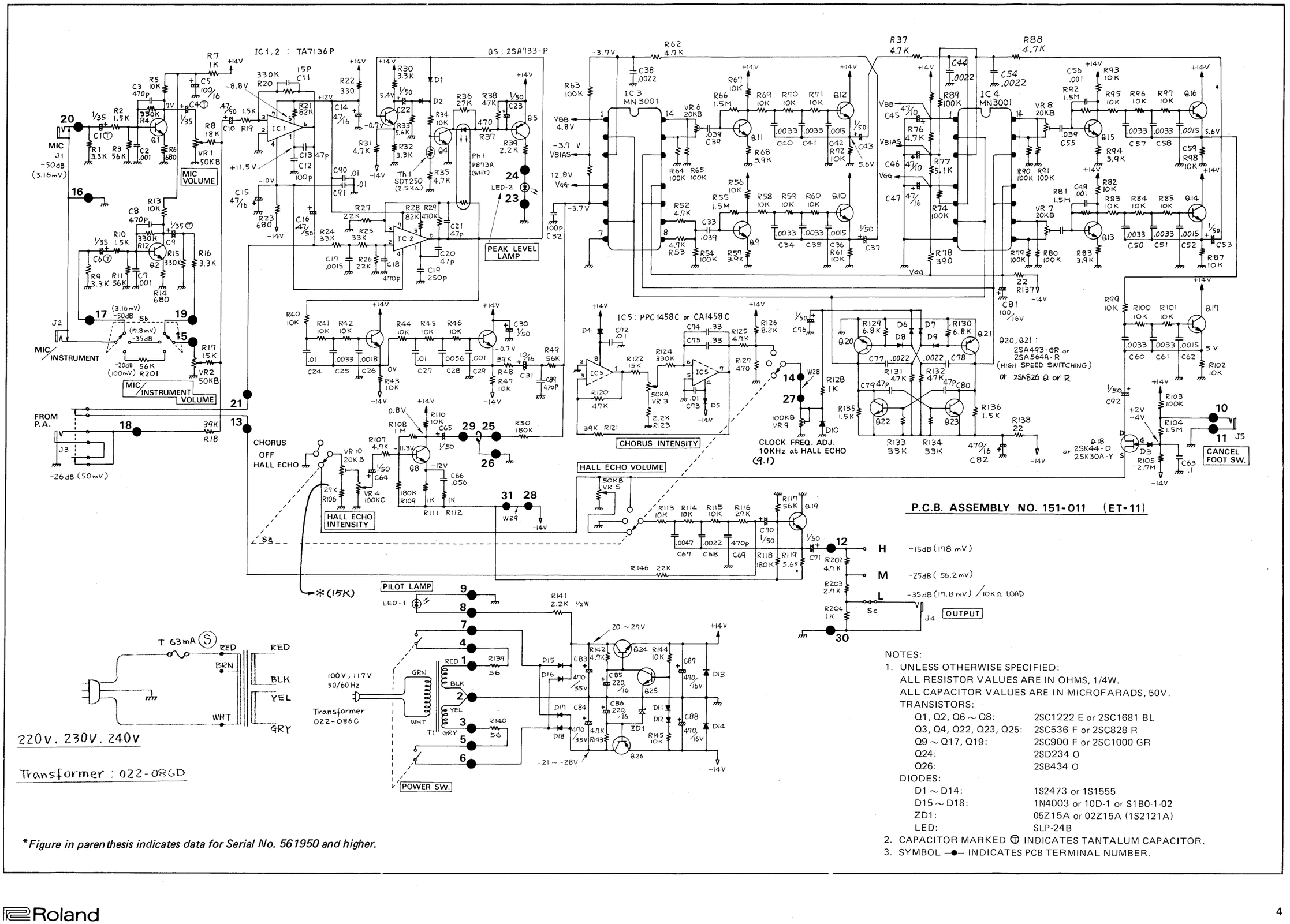


Figure in parenthesis indicates data for Serial No. 561950 and higher.

P.C.B. ASSEMBLY NO. 151-011 (ET-11)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, 1/4W.
   ALL CAPACITOR VALUES ARE IN MICROFARADS, 50V.
   TRANSISTORS:

Q1, Q2, Q6 ~ Q8:	2SC1222 E or 2SC1681 BL
Q3, Q4, Q22, Q23, Q25:	2SC536 F or 2SC828 R
Q9 ~ Q17, Q19:	2SC900 F or 2SC1000 GR
Q24:	2SD234 O
Q26:	2SB434 O

   DIODES:

D1 ~ D14:	1S2473 or 1S1555
D15 ~ D18:	1N4003 or 10D-1 or S1B0-1-02
ZD1:	05Z15A or 02Z15A (1S2121A)
LED:	SLP-24B

2. CAPACITOR MARKED Ⓣ INDICATES TANTALUM CAPACITOR.
3. SYMBOL —●— INDICATES PCB TERMINAL NUMBER.

6. ADJUSTMENT AND CHECKING

6-1. ADJUSTING CLOCK GENERATOR FREQUENCY

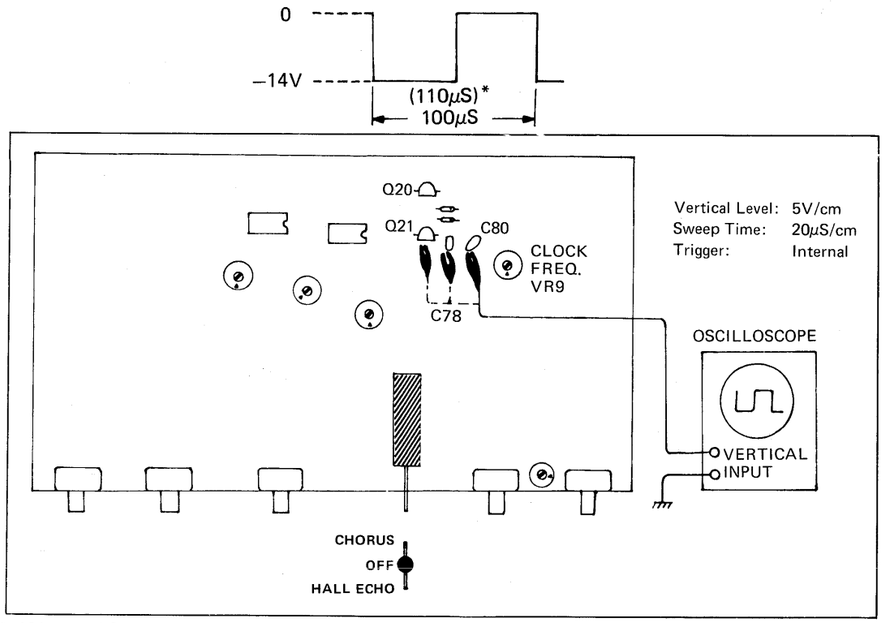
a. Set mode switch to OFF position.

b. Connect an oscilloscope to one of the leads of C80 (or C78), the same point with collector of Q21 (clock generator).

Adjust trimmer potentiometer VR9 so that the clock generator frequency is 10KHz or 100μS (9.1KHz or 110μS)*.

If the clock generator frequency is lower than 10KHz (9.1KHz)*, the delay time will become longer. If so, however, bigger noise can be generated in the BBD, and at the same time, higher frequency component of the signal will be attenuated. Therefore, such setting is unfavorable.

If the clock generator frequency is higher than 10KHz (9.1KHz)*, the delay time will become shorter. Also, the higher frequency component of the signal is emphasized, making the possibility of howling trouble greater, when using microphone. This is unfavorable, too.



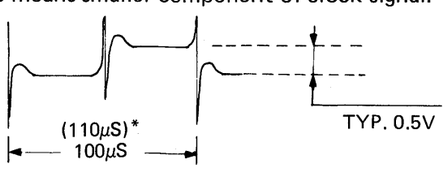
6-2. ELIMINATING CLOCK PULSE LEAKAGE FROM BBD OUTPUT

(Adjusting BBD Balance)

6-2-1. Checking First BBD Output

a. Set mode switch to OFF position.

b. Connect an oscilloscope to base of Transistor Q9 that amplifies the first output of BBD (IC3, Pins 8 and 9). Voltage wave of clock component as shown below will appear. Smaller amplitude of the rectangular wave means smaller component of clock signal.



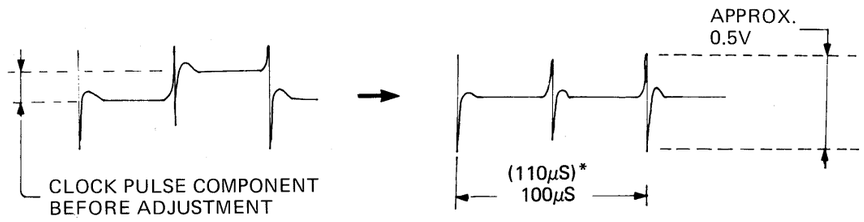
Mixing two outputs from BBD enables elimination of the clock component. For more precise adjustment, change the value of R52 or R53.

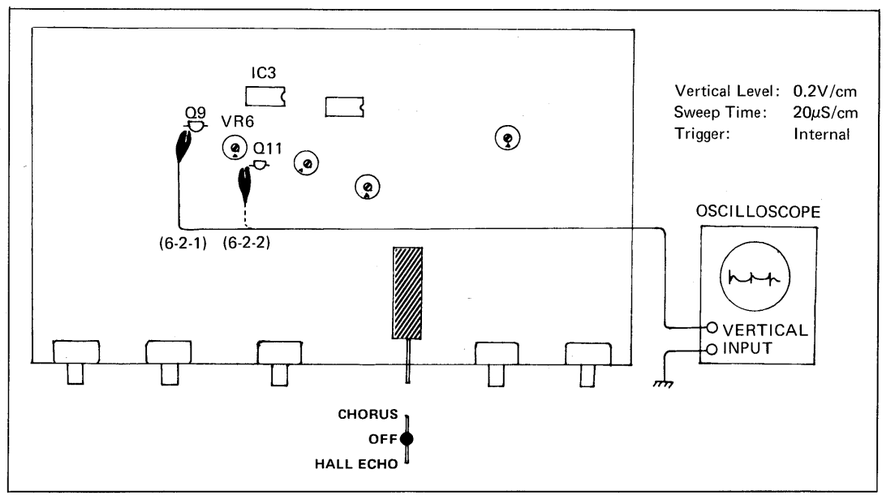
Figure in parenthesis indicates data for Serial No. 561950 and higher.

6-2-2. Adjusting Second BBD Output

a. Set mode switch to OFF position.

b. Connect an oscilloscope to base of Transistor Q11 that amplifies the second output of BBD (IC3, Pins 13 and 14). Adjust trimmer potentiometer VR6 so that the clock component is minimized.





6-2-3. Adjusting Third BBD Output

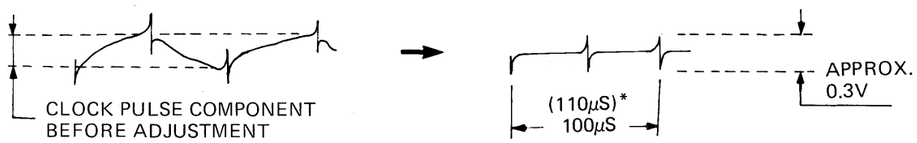
a. Set mode switch to OFF position.

b. Connect an oscilloscope to base of Transistor Q13 that amplifies the third output of BBD (IC4, Pins 8 and 9). Adjust trimmer potentiometer VR7 so that the clock component is minimized.

6-2-4. Adjusting Fourth BBD Output

a. Set mode switch to OFF position.

b. Connect an oscilloscope to base of Transistor Q15 that amplifies the fourth output of BBD (IC4, Pins 13 and 14). Adjust trimmer potentiometer VR8 so that clock component is minimized.



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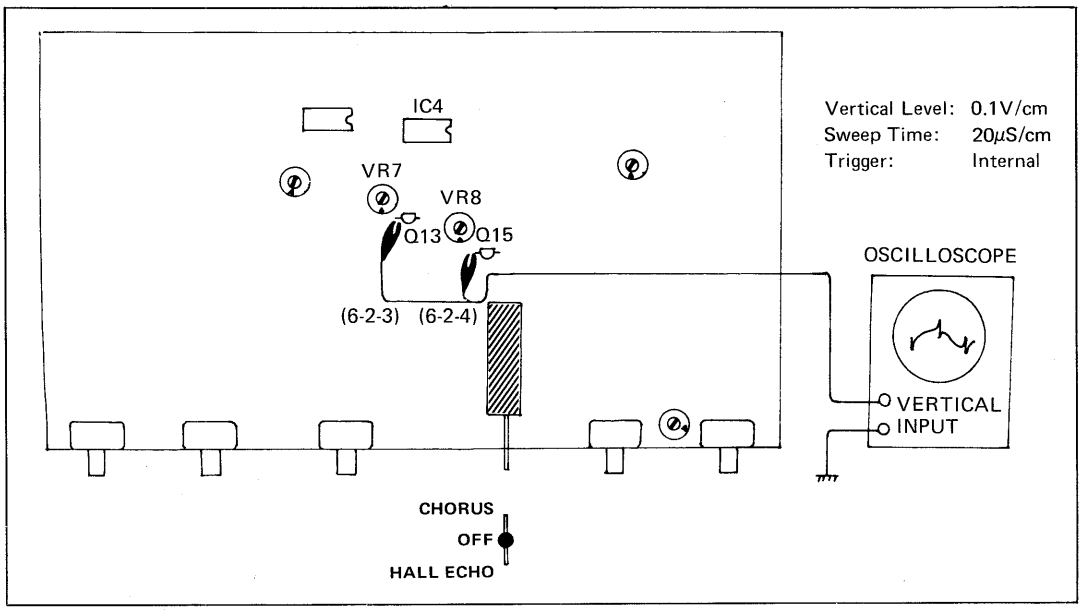
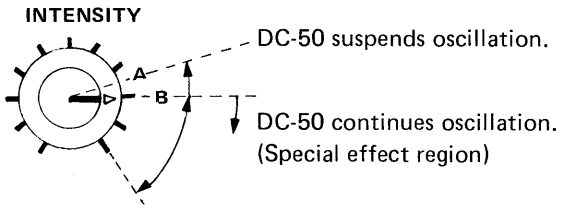
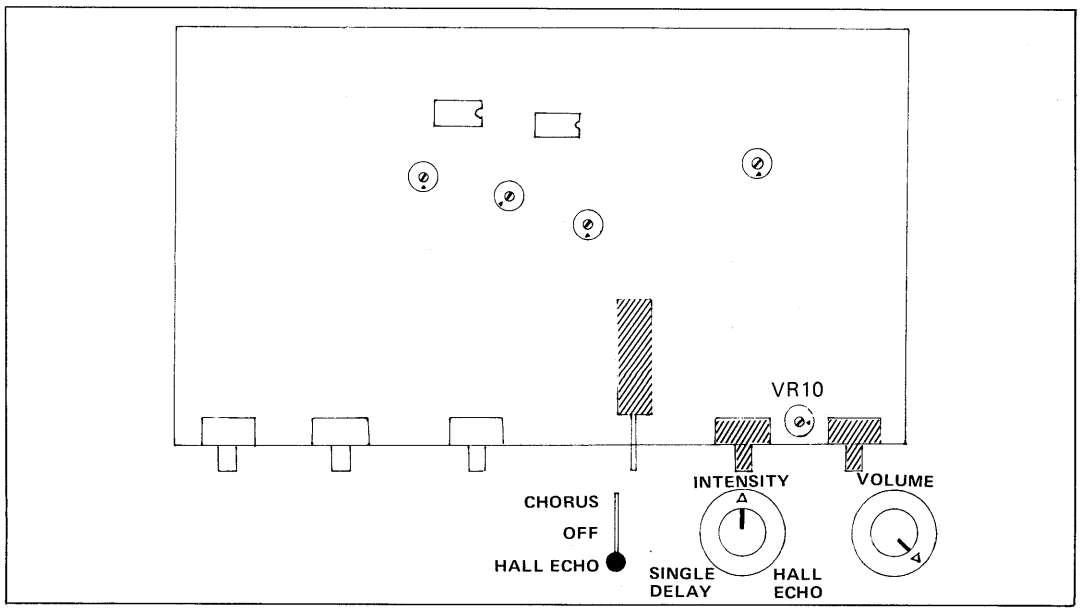


6-3. ADJUSTING HALL ECHO INTENSITY

a. Set mode switch to HALL ECHO position.
Set HALL ECHO INTENSITY KNOB to center position.
Set HALL ECHO VOLUME to maximum.

b. Connect an amplifier to the output and adjust the intensity while listening to the sound. When INTENSITY KNOB is set to maximum position, DC-50 starts to oscillate. This is due to excess feedback to the delay circuit.
Adjust trimmer potentiometer VR10 so that DC-50 suspends oscillation with INTENSITY KNOB at Point A and it continues to oscillate with KNOB at Point B. Portion from B to the maximum position of KNOB is used for obtaining special effect sound.



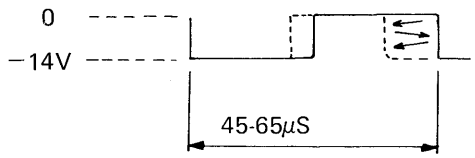


6-4. CHECKING CHORUS INTENSITY

6-4-1. Checking Clock Generator

a. Set mode switch to CHORUS position.

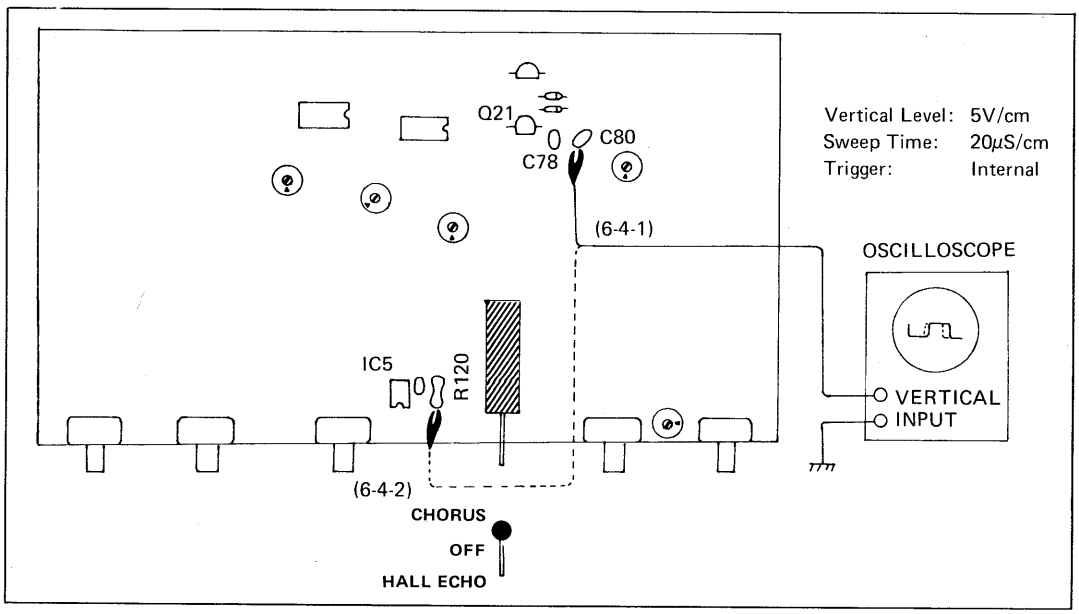
b. As in case of adjusting clock generator frequency (item 1), connect an oscilloscope to one of the leads of C80 (or C78), the same point as collector of Q21 (clock generator).
If the clock generator frequency swings between 15.4KHz (65μS) and 22KHz (45μS), the clock generator is correctly working.
If the clock generator frequency is fixed as in case of HALL ECHO or OFF setting, the low frequency oscillator is inoperative.
Check it according to the following paragraph.



6-4-2. Checking Frequency of Low Frequency Oscillator

a. There is no restriction on setting.

b. Connect an oscilloscope to one of the leads of resistor, R120, the same point as Pin 1 of IC5, of the Low Frequency Oscillator circuit.
If the period of the rectangular wave that appears is as described below, the low frequency oscillator is correctly working.
With CHORUS INTENSITY KNOB at Min ..... approx. 20 sec.
With CHORUS INTENSITY KNOB at Max ..... approx. 1 sec.



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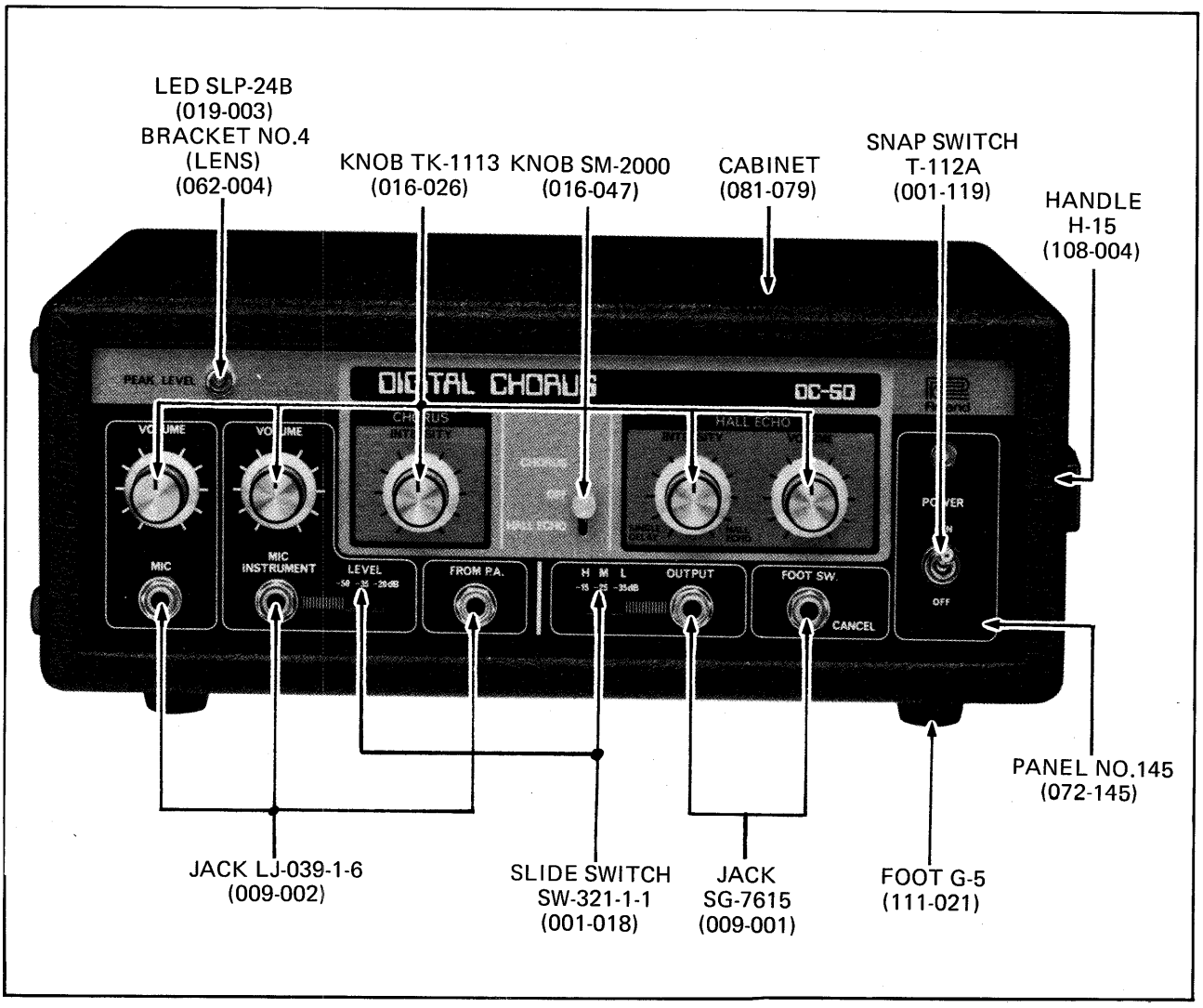
7. PARTS LIST

PART NO.	PART AND DESCRIPTION
151-011	Effect Board Assembly, ET-11
052-187	PC Board (less parts)
020-022	IC, MN3001
020-027	IC, TA7136P
020-062	IC, μPC1458C can be substituted by:
020-061	FET, 2SK44 D 2SK30A Y
017-009	Transistor, 2SA493 GR 2SA564A R
017-097	or 2SA826 R or Q (From Serial No. 643950)
017-010	Transistor, 2SD234 O 2SD234 Q or F
017-021	Transistor, 2SC900 F 2SC1222 E, 2SC1681 BL
017-022	Transistor, 2SB434 O
017-024	Transistor, 2SA733 P
017-037	Transistor, 2SC536 F 2SC828 R, 2SC945 P
017-038	Transistor, 2SC1222 E
018-014	Diode, 1S2473 1S1555
018-022	Diode, 1N4003 1N4004
018-024	Zener Diode, 05Z15A
018-025	Thermistor, SDT-250
019-010	Photo-Coupler, P873-G35-380 (White)
019-003	LED, SLP-24B
001-082	Lever Switch, SLT-143N
030-284	Potentiometer, V24L5PH1N 15KC15B50K (EVCSOAK15)
030-294	Potentiometer, V24L5PH1N 15KC15A50K (EVCSOAK15)
030-304	Potentiometer, V24L5PH1N 15KC15C100K (EVCSOAK15)
028-005	Trimmer Potentiometer, EVL-R4XA00 20KB (SR19R)
028-007	Trimmer Potentiometer, EVL-R4XA00 100KB (SR19R)
044-130	Resistor, 2.2KΩ, 1/2W, ±10%, Carbon Solid
044-167	Resistor, 2.7MΩ, 1/2W, ±10%, Carbon Solid
032-070	Capacitor, 0.47μF, 50V, Electrolytic
032-071	Capacitor, 1μF, 50V, Electrolytic
032-033	Capacitor, 10μF, 16V, Electrolytic
032-022	Capacitor, 47μF, 10V, Electrolytic
032-036	Capacitor, 47μF, 16V, Electrolytic
032-037	Capacitor, 100μF, 16V, Electrolytic
032-038	Capacitor, 220μF, 16V, Electrolytic
032-040	Capacitor, 470μF, 16V, Electrolytic
032-068	Capacitor, 470μF, 35V, Electrolytic
032-099	Capacitor, 1μF, 35V, ±10%, Tantalum
035-007	Capacitor, 0.0015μF, 50V, ±10%, Mylar
035-008	Capacitor, 0.0018μF, 50V, ±10%, Mylar
035-011	Capacitor, 0.0033μF, 50V, ±10%, Mylar

*Carbon film resistors of 1/4W, ±5% rating are omitted.

PART NO.	PART AND DESCRIPTION
035-012	Capacitor, 0.0047μF, 50V, ±10%, Mylar
035-013	Capacitor, 0.0056μF, 50V, ±10%, Mylar
035-016	Capacitor, 0.01μF, 50V, ±10%, Mylar
035-023	Capacitor, 0.039μF, 50V, ±10%, Mylar
035-025	Capacitor, 0.056μF, 50V, ±10%, Mylar
035-028	Capacitor, 0.1μF, 50V, ±10%, Mylar
035-034	Capacitor, 0.33μF, 50V, ±10%, Mylar
037-002	Capacitor, 15pF, 50V, ±10%, Ceramic
037-005	Capacitor, 47pF, 50V, ±10%, Ceramic
037-006	Capacitor, 100pF, 50V, ±10%, Ceramic
037-007	Capacitor, 250pF, 50V, ±10%, Ceramic
037-008	Capacitor, 470pF, 50V, ±10%, Ceramic
037-009	Capacitor, 1,000pF, 50V, ±10%, Ceramic
037-010	Capacitor, 2,200pF, 50V, ±10%, Ceramic

8. PANEL PARTS



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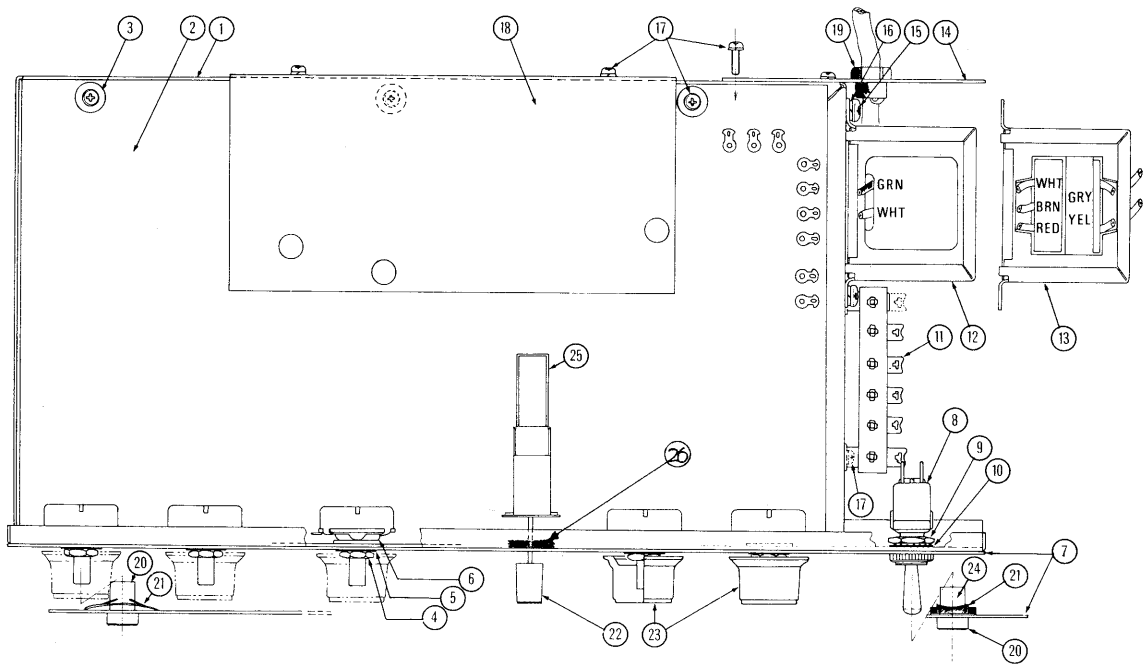
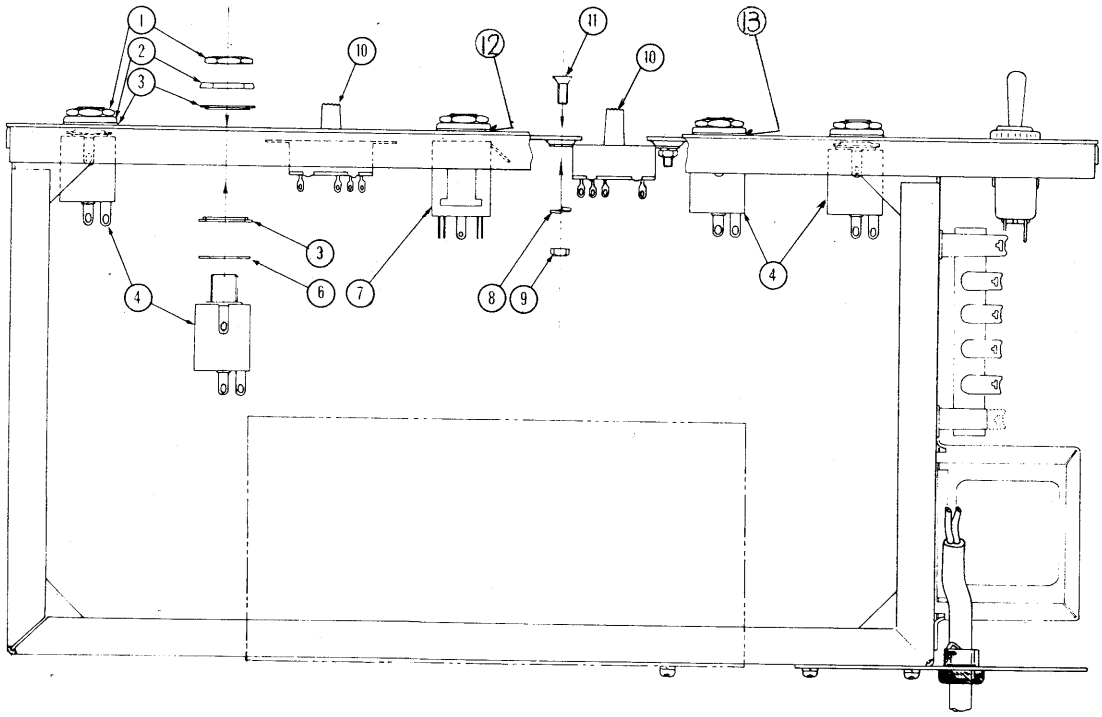
9. CHASSIS ASSEMBLY



NO.	PART NO.	PART AND DESCRIPTION	NO. USED
1	061-139	Chassis No.139	
2	151-011	Effect Board Assembly, ET-11	
3		Flat Washer, M3 x 8 x 0.8, Fe	3
4		Potentiometer Nut, included in Potentiometer	5
5		Flat Washer, included in Potentiometer	5
6	121-001	Potentiometer Washer	
7	072-145	Panel No.145	
8	001-119	Snap Switch, T-112A	
9		Nut, included in T-112A	
10		Washer, included in T-112A	
11	042-004	Terminal Strip, 2L4P	
12	022-086C	Power Transformer, 100/117V	
13	022-086D	Power Transformer, 200/220/230/240V	
14	064-117	Holder No.117	
15		Binding Head Screw, 4 x 8, Fe	2
16		Spring Washer, M4, Fe	2
17		Pan Head Screw, 3 x 8, SEMS, Fe	10
18	061-140	Chassis No.140	
19	047-019	Line Cord Strain Relief, R-5	
20	062-004	Bracket No.4 (Lens)	
21	121-007	Spring Nut No.7, M8P Type	
22	016-047	Knob No.47, SM-2000	
23	016-026	Knob, TK-1113	
24	068-001	Padding No.1	2
25	001-082	Lever Switch SLT-143N	
26	065-066	Cover	



NO.	PART NO.	PART AND DESCRIPTION	
1		Jack Nut, included in Jack	5
2	121-005	Jack Washer No.5	5
3	068-005	Insulating Bushing No.5	8
4	009-001	Jack, SG-7615 No.5	4
5			
6		Flat Washer, included in Jack	5
7	009-002	Jack No.2, LJ-039-1-6	1
8		Spring Washer, M3	4
9		Nut, M3	4
10	001-018	Slide Switch, SW-321-1-1	2
11		Flat Head Screw, 3 x 6	4
12	121-019	Insulating Bushing, Green	1
13	121-018	Insulating Bushing, Red	1
	042-032	Terminal Strip, TT-501 D-1 2P (220/240V)	1
	012-018	Fuse Holder, XN-1153 (220/240V)	1
	008-054	Fuse, CEE 63mAT (220/240V)	1