

Guitar Controller GS-500

Synthesizer GR-500

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CIRCUIT DESCRIPTION

FV CONVERTER

Input at (a) is a square wave sent from the FUNDAMENTAL circuit. The waveform at (d) is produced by delaying the signal. The output from A1 increases linearly according to the time constant of R1 and C1. It is grounded when S1 is closed by the signal of (d). The resulting waveform is (e).

SAMPLE and HOLD is activated by signal (g) at 50us before the (e) signal level becomes ground level. (d) is delayed by 50us compared with (a). The result is a direct current voltage of (f), which is a voltage that is proportional to T of the input signal.

It is then fed to LOG amp to obtain a voltage that is proportional to 1/T (frequency).

The voltage becomes -15V when the input from guitar diminishes. At this time, SAMPLe and HOLD is activated by the gate voltage (S3, S4).

SAMPLE AND HOLD

Because the frequency is somewhat unstable, the instant a string is picked, HOLD is activated by closing S3 after the frequency becomes stable by means of 7μs delaying. The frequency for HOLD corresponds to the initial part of picking a string. In order to follow vibrato or choking techniques, the voltage of Fig.5-(g) that duplicates (h) is produced through R2 by closing S4 with Gate signal.

If the guitar output frequency changes largely to cause an octave-equivalent voltage variation due to the change of harmonic content while S3 is open, the VOLT PROTECT circuit is activated to lock the primary voltage (the SAMPLe and HOLD is turned off.)

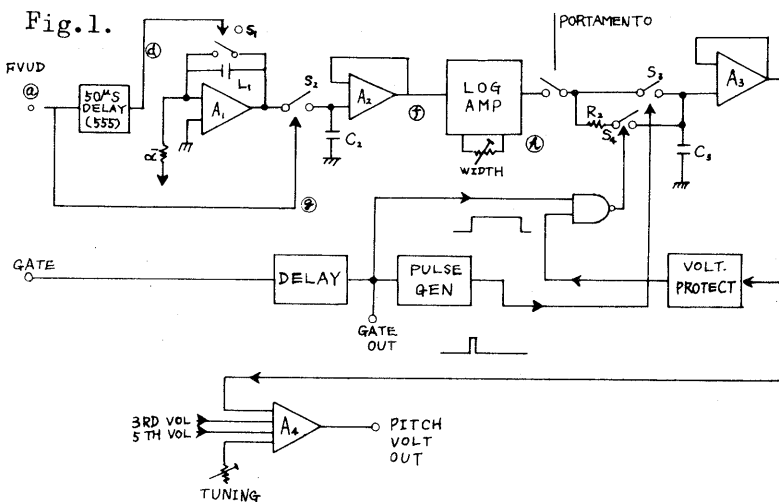


Fig.2.

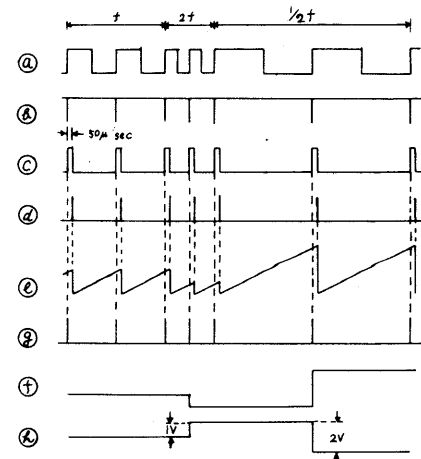


Fig.4.

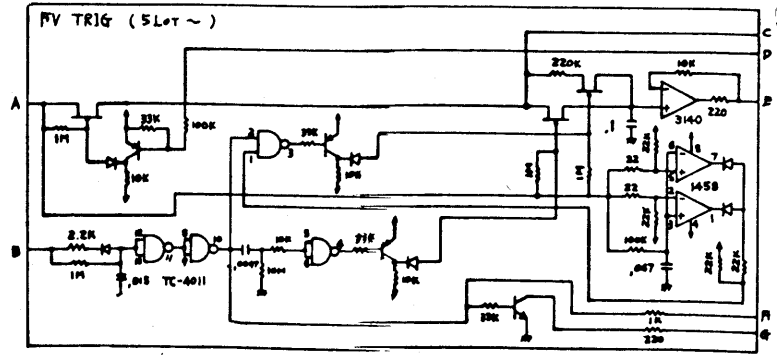


Fig.3.

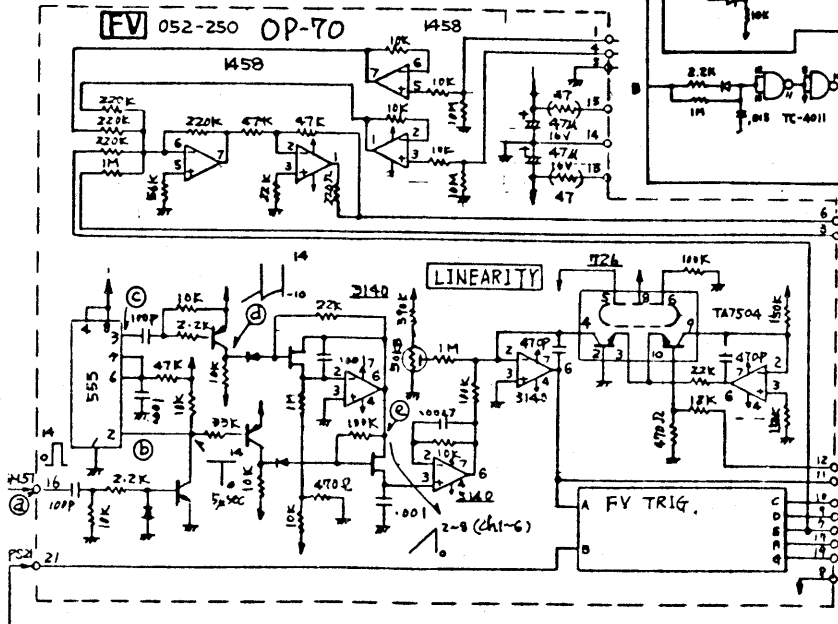
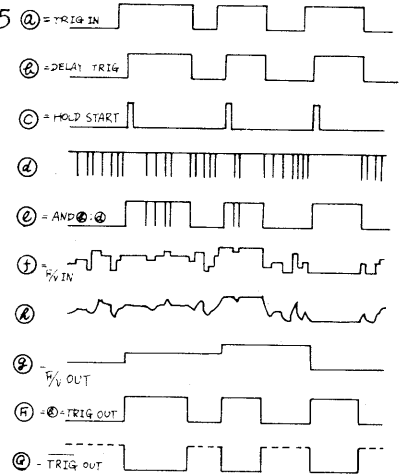


Fig.5



POLY ENSEMBLE ENVELOPE GENERATOR CIRCUIT

In the Envelope Generator of Poly Ensemble, Attack Time, Decay Time and Sustain Level for all six channels are controlled by three respective VR's.

The Attack Time varies depending on the Attack Osc frequency. As the frequency becomes higher, C1 is charged faster and vice versa.

The Decay Time varies depending on the Decay Osc frequency. As the frequency becomes higher, the time for C1 to discharge down to the Sustain level, becomes shorter, and vice versa.

The Release Time is preset to be minimum to match the release time of the actual guitar string vibrations.

The poly ensemble sounds are produced by chopping the envelope. The pulse width changes by the change in the bias on Trc according to the envelope output.

Fig.6.

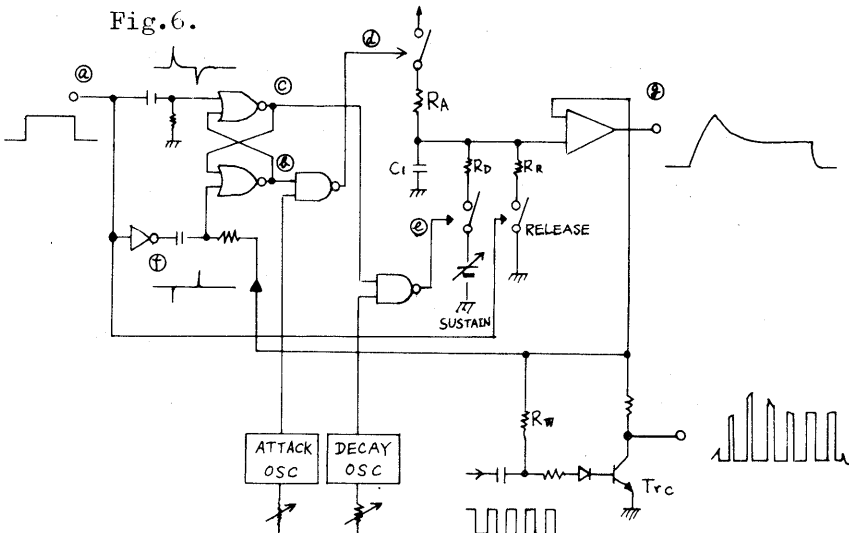


Fig.7.

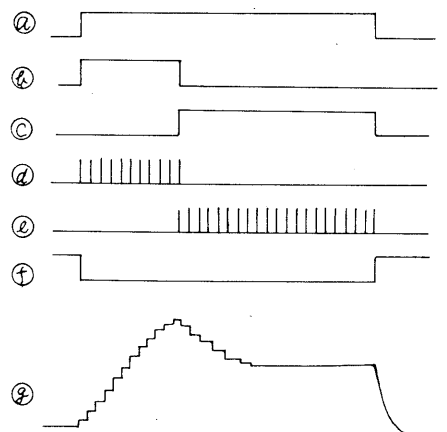
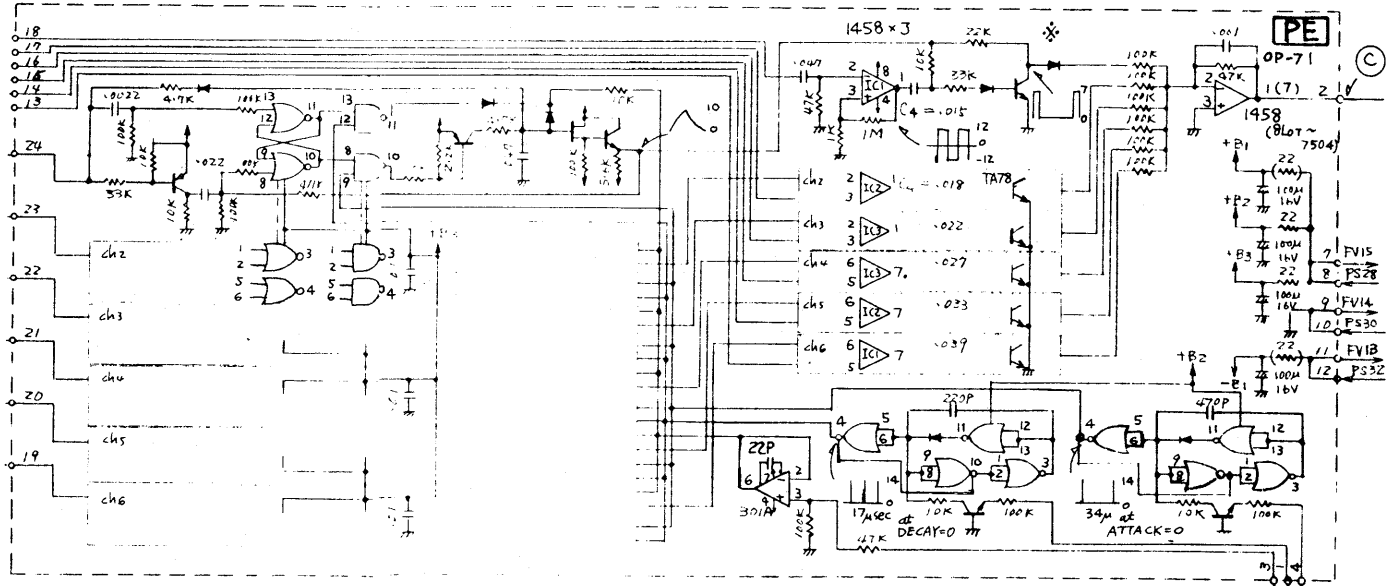


Fig.8.



WAVEFORM CONVERTER

The Pitch Voltage, after passing Antilog amp, charges C1 with a constant current. The C1 discharges by the rise-time pulses of the square wave from the FUNDAMENTAL GENERATOR, which generates a sawtooth wave. The sawtooth waves are fed to the converter to make pulse waves. The FUNDAMENTAL GENERATOR output is divided to 1/2 by the DIVIDER and processed in a similar circuit as above to produce the 16' pulse.

Fig.9. FROM F₁/4 CONVERTOR

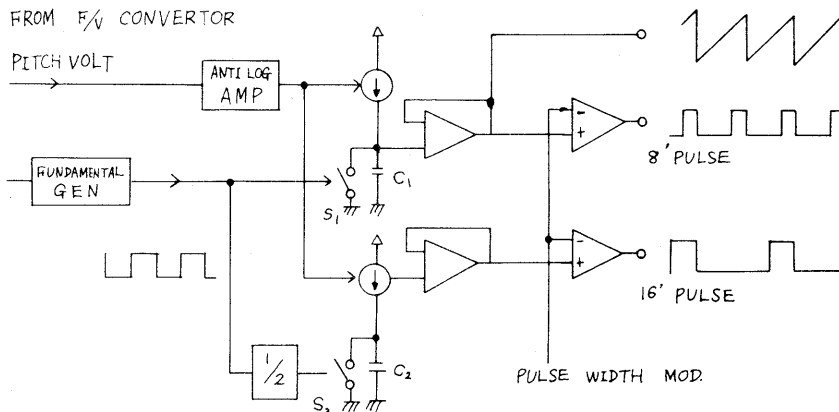
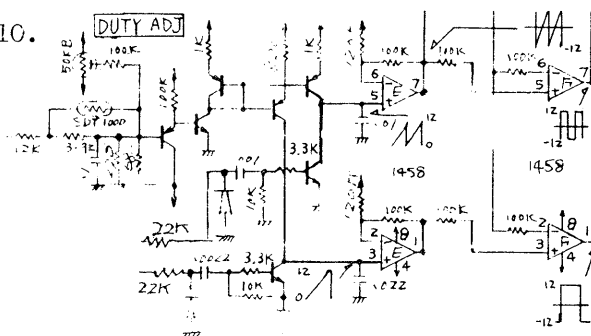
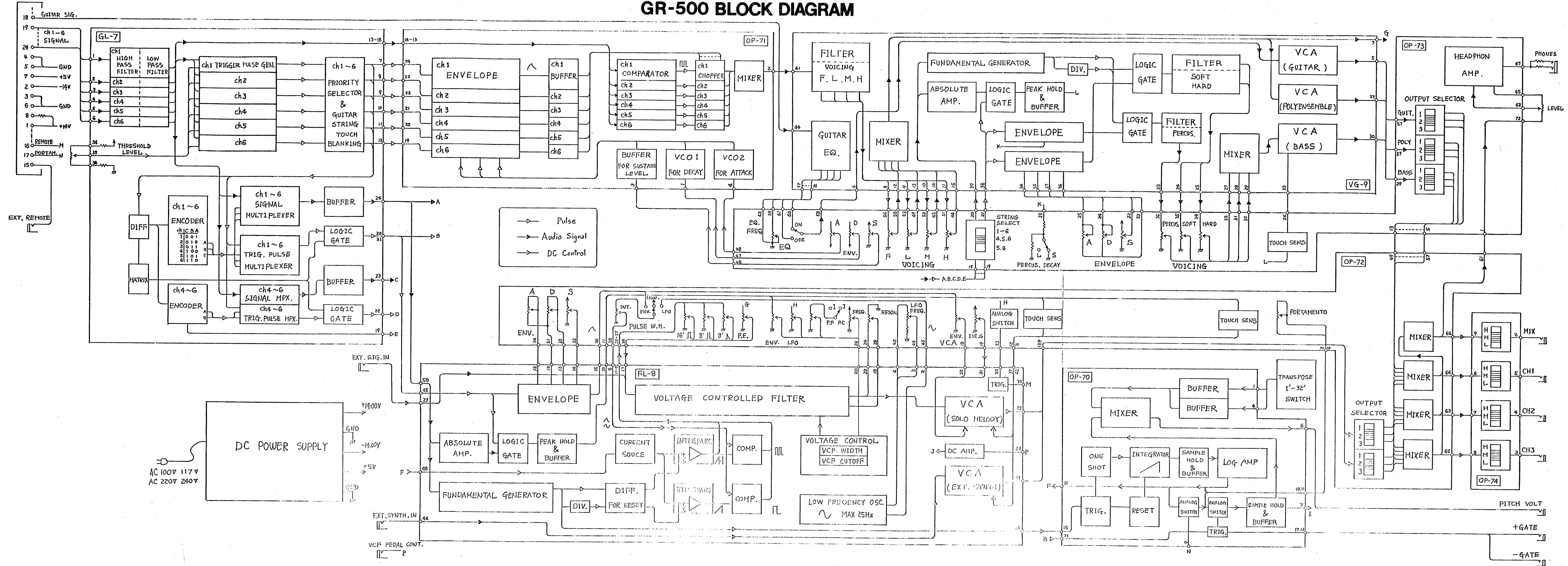


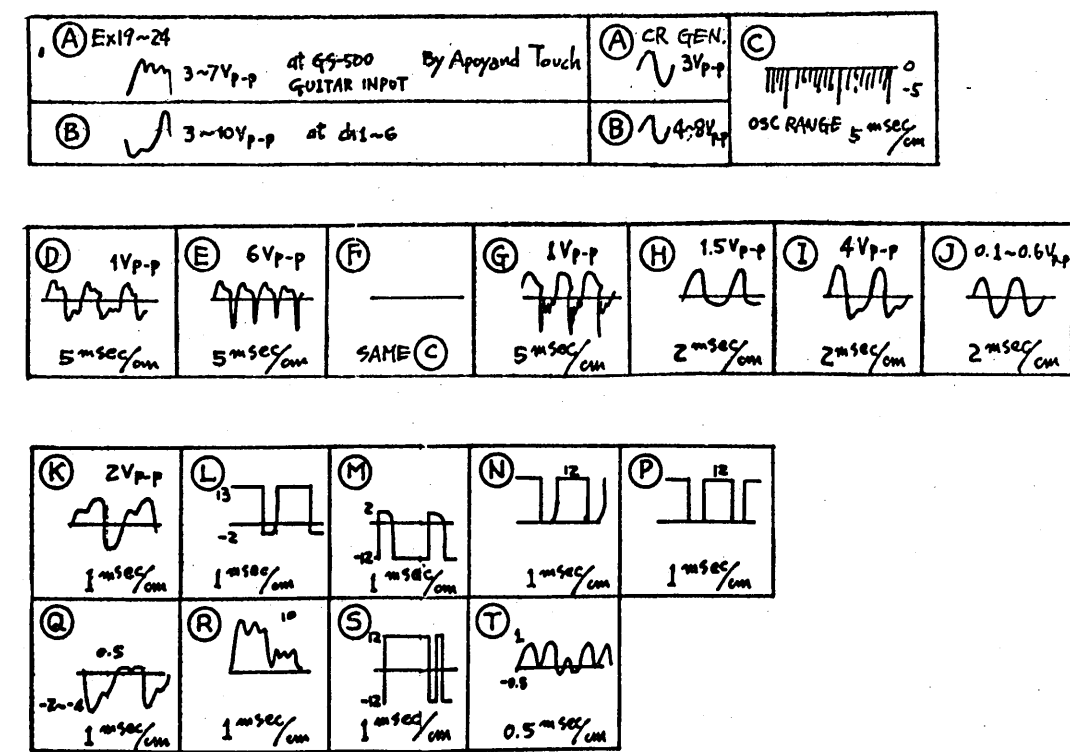
Fig.10.



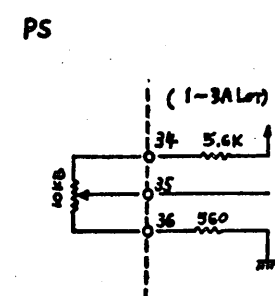
GR-500 BLOCK DIAGRAM



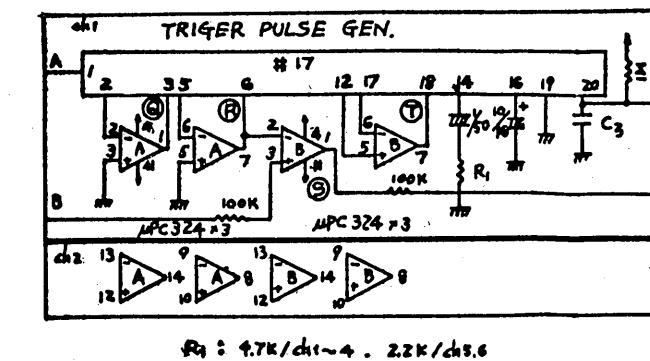
WAVEFORM CHARTS



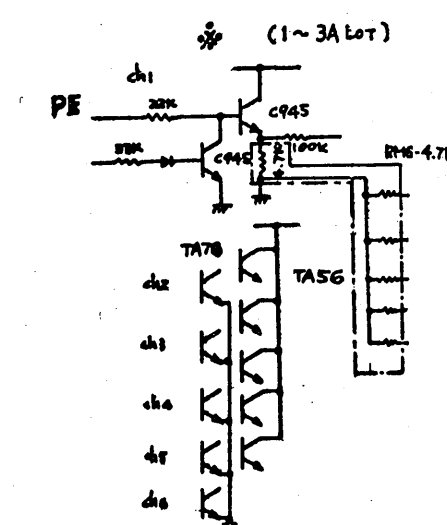
GL-7



GL-7

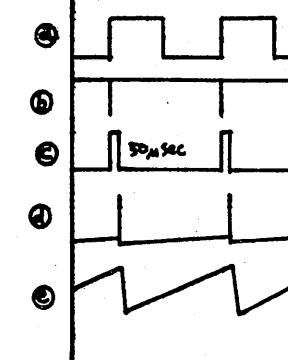


OP-70



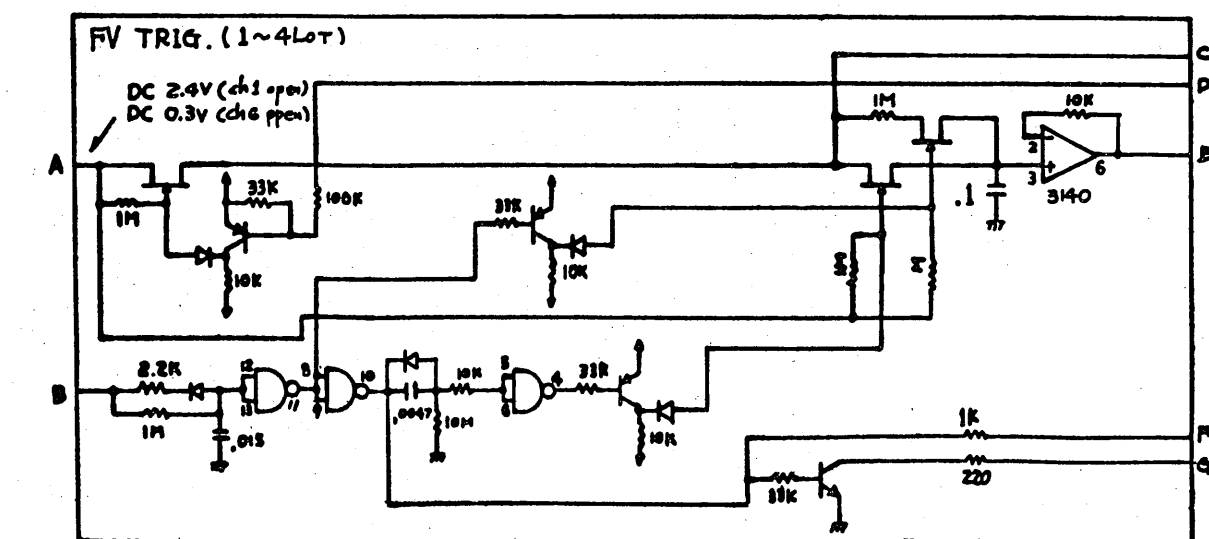
CHANGES OF CIRCUIT

FV TIMING CHART

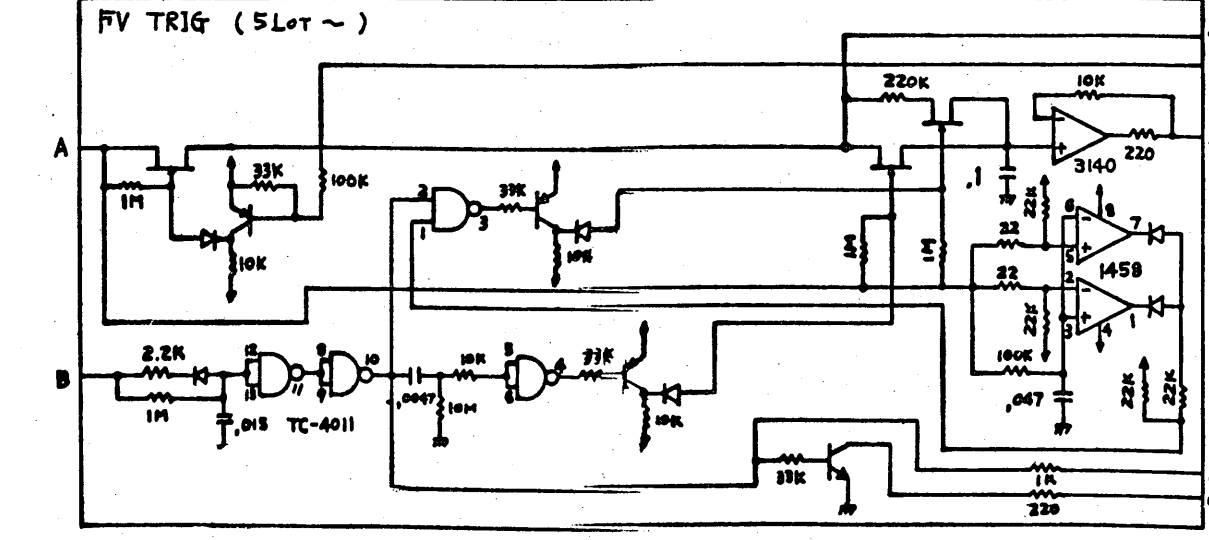


OP-70

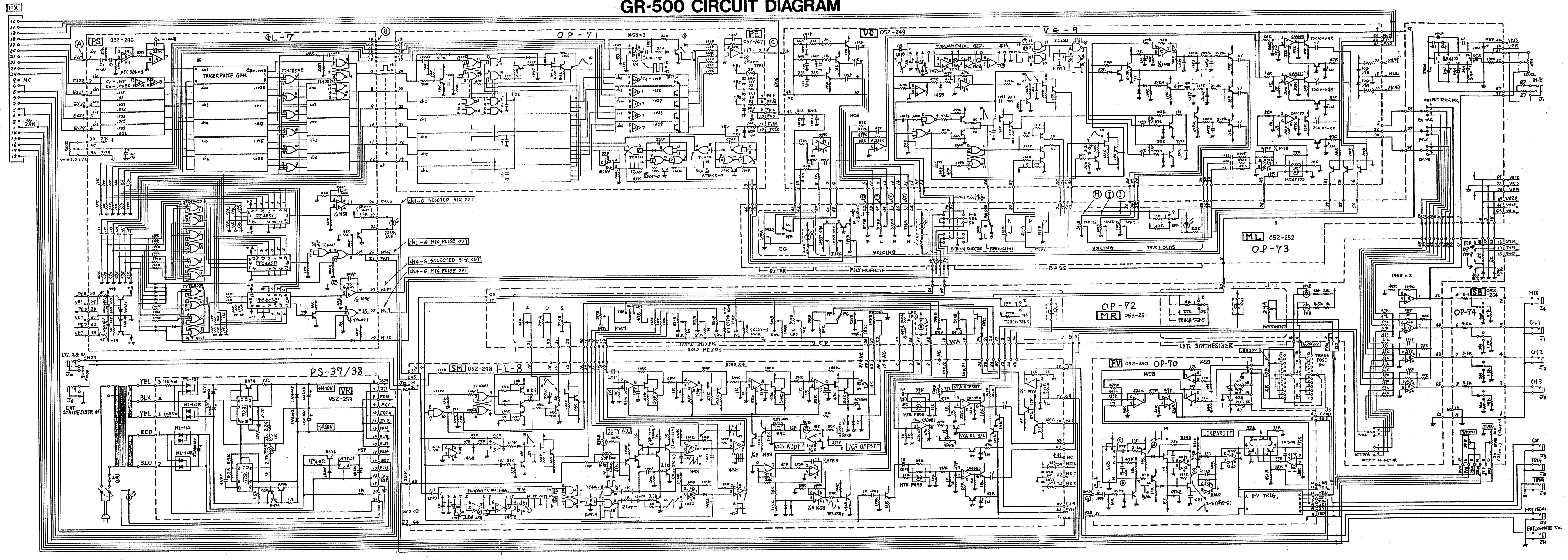
CHANGES OF CIRCUIT



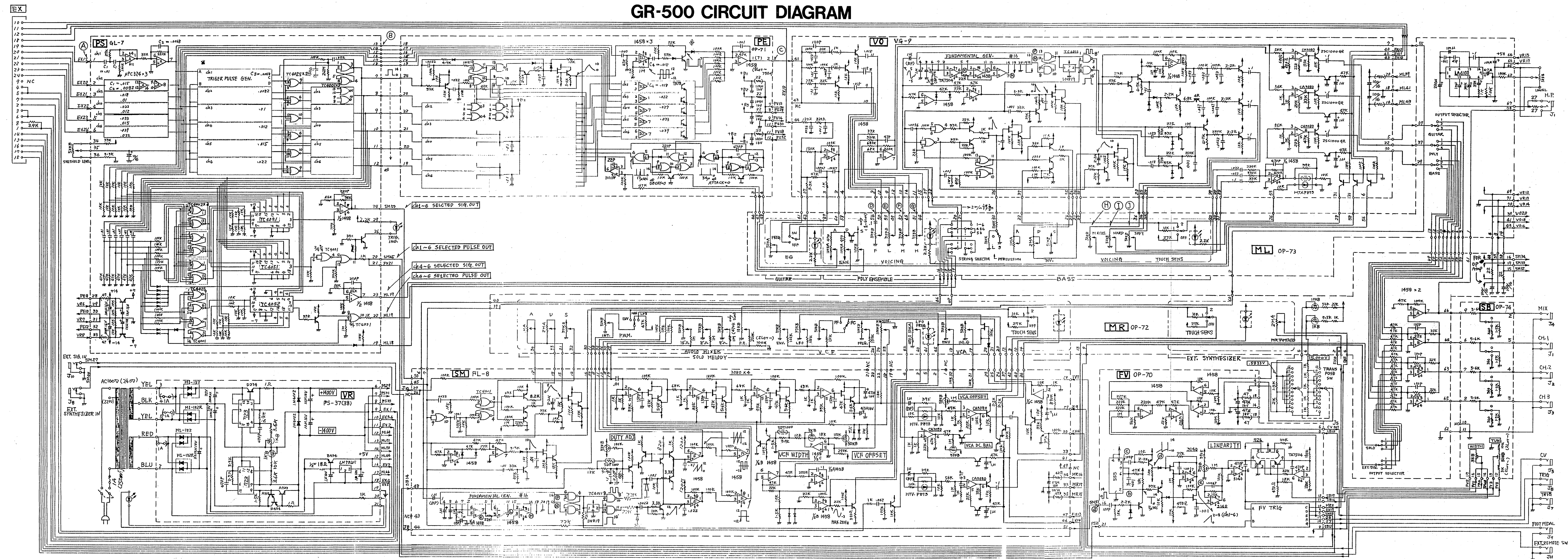
OP-70



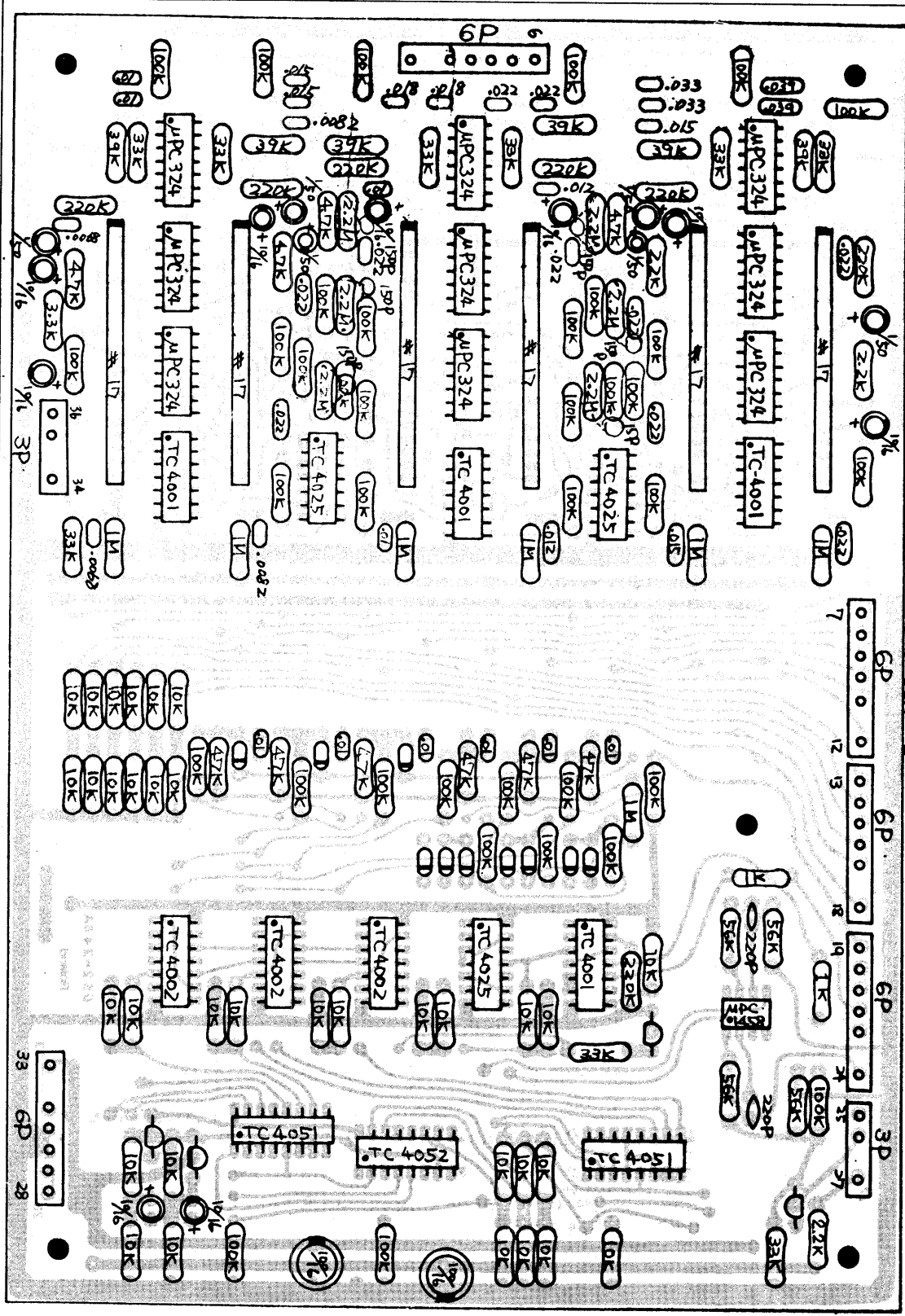
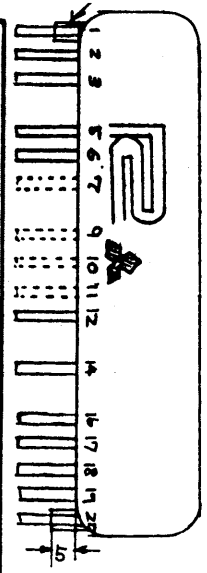
GR-500 CIRCUIT DIAGRAM



GR-500 CIRCUIT DIAGRAM



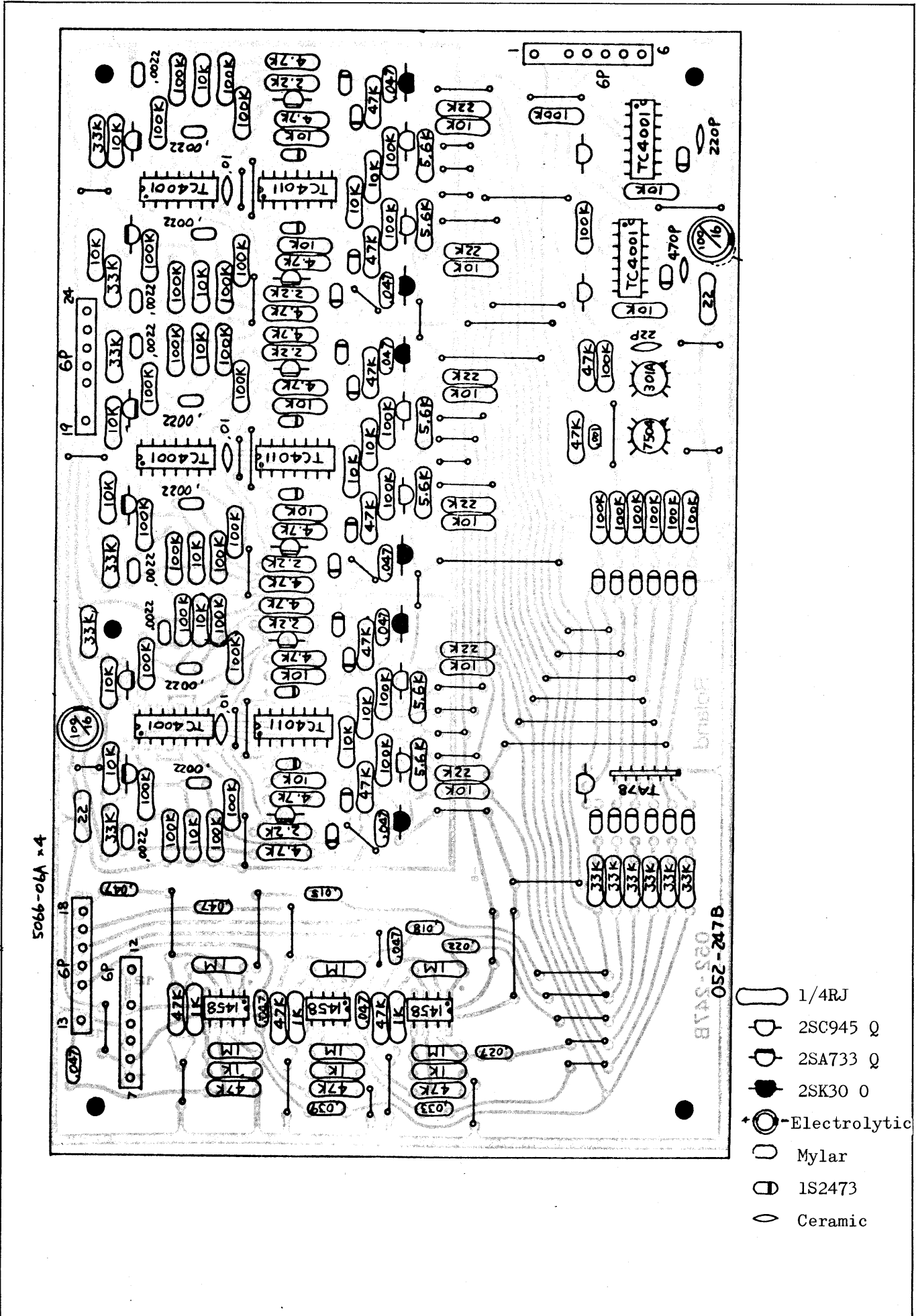
PACK NO.17



- | | | |
|--|----------------|----------------|
| | 1/4RJ | 4051 - TC4051P |
| | 1S2473 | 4052 - TC4052P |
| | 2SC945 Q | 4001 - TC4001P |
| | 2SA733 Q | 4002 - TC4002P |
| | + Electrolytic | 4025 - TC4025P |
| | Mylar | 324 - uPC-324 |
| | Ceramic | |

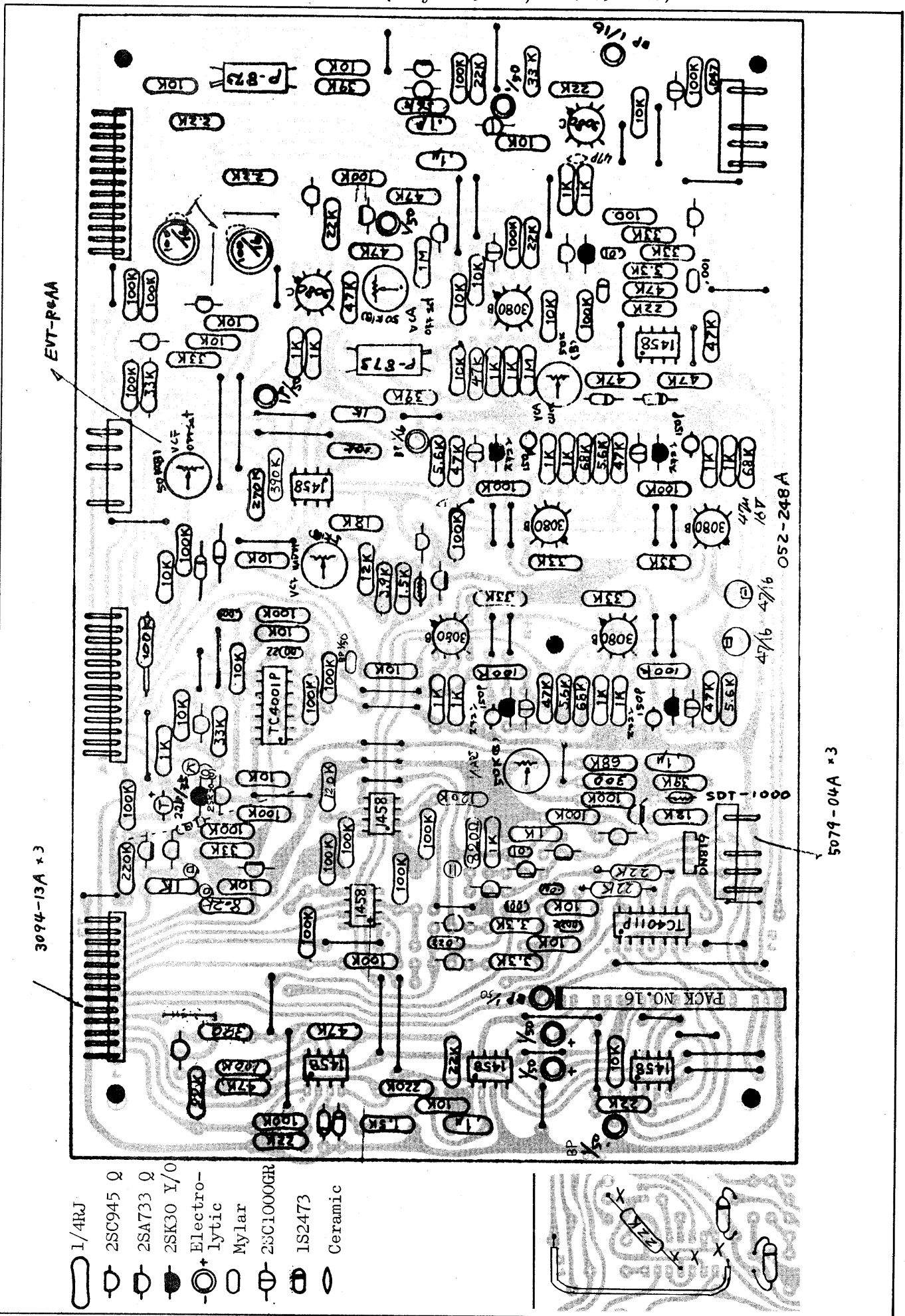
(PATTERN ON THE TOP SIDE OMITTED)

OP-71 (Assy: 149-071; PCB: 052-247)

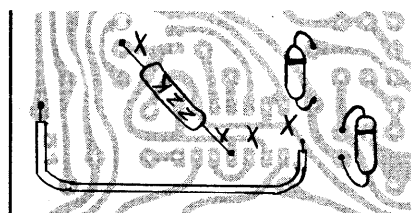


- 1/4RJ
- 2SC945 Q
- 2SA733 Q
- 2SK30 O
- Electrolytic
- Mylar
- 1S2473
- Ceramic

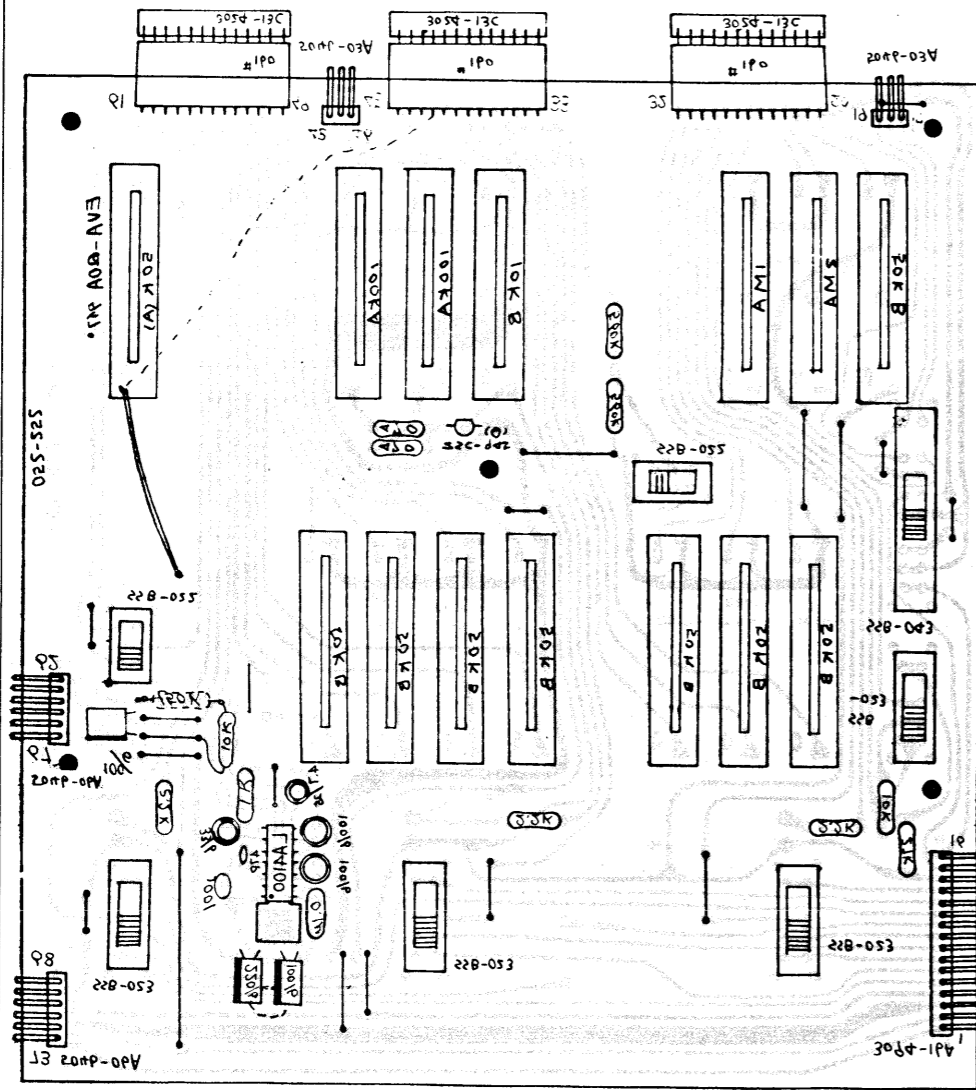
FL-8 (Assy: 145-008; PCB: 052-248)



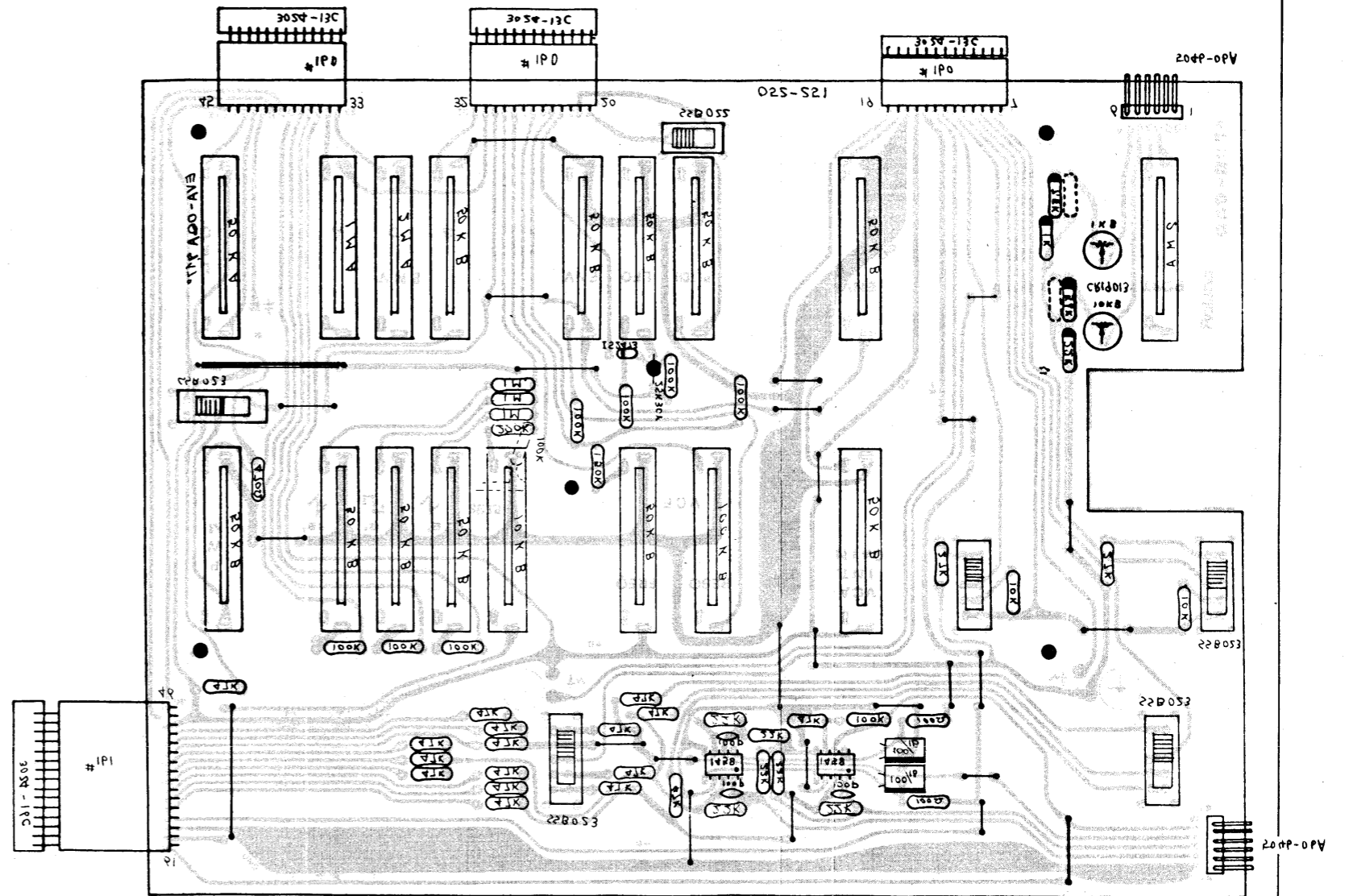
- 1/4RJ
- 2SC945 Q
- 2SA733 Q
- 2SK30 Y/O
- Electrolytic
- Mylar
- 2SC1000GR
- IS2473
- Ceramic



OP-73 (Assy: 149-073; PCB: 052-252)



OP-72 (Assy: 149-072; PCB: 052-251)

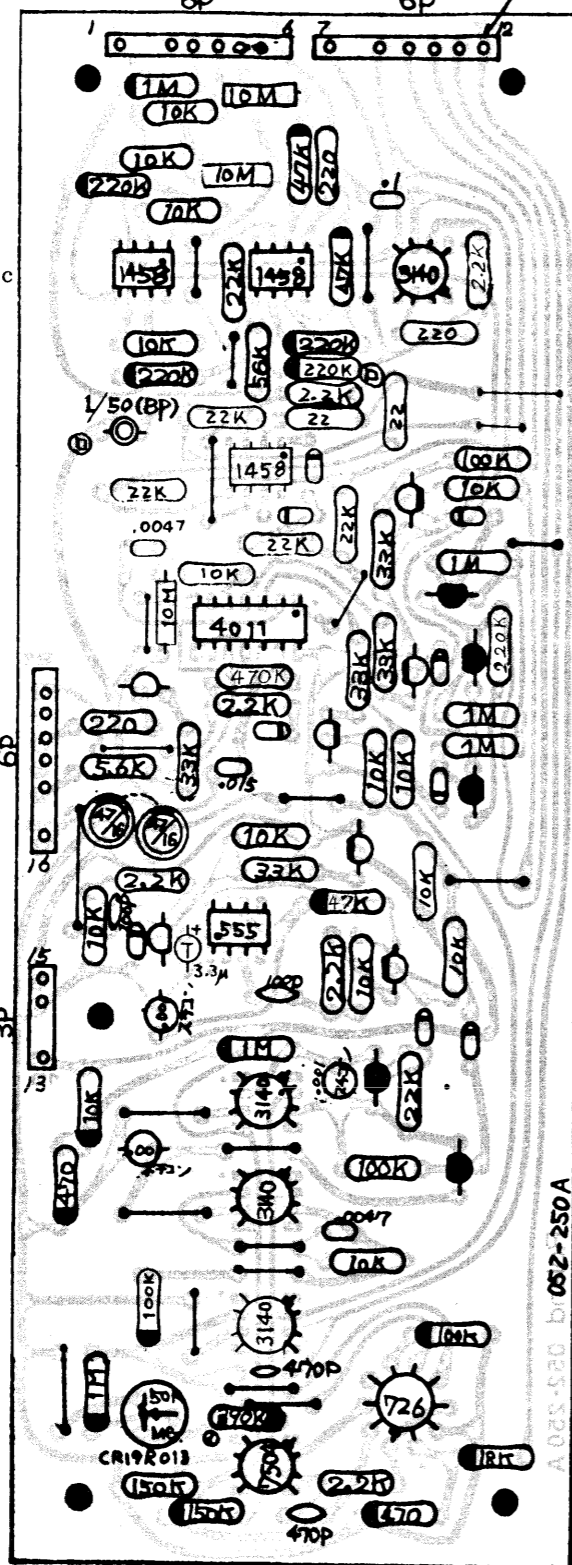


- 1/4RJ
- CRE 1/4 FX
- 2SK30 Y
- Electrolytic

OP-70 (Assy: 149-070; PCE: 052-250)

5066-06A x3

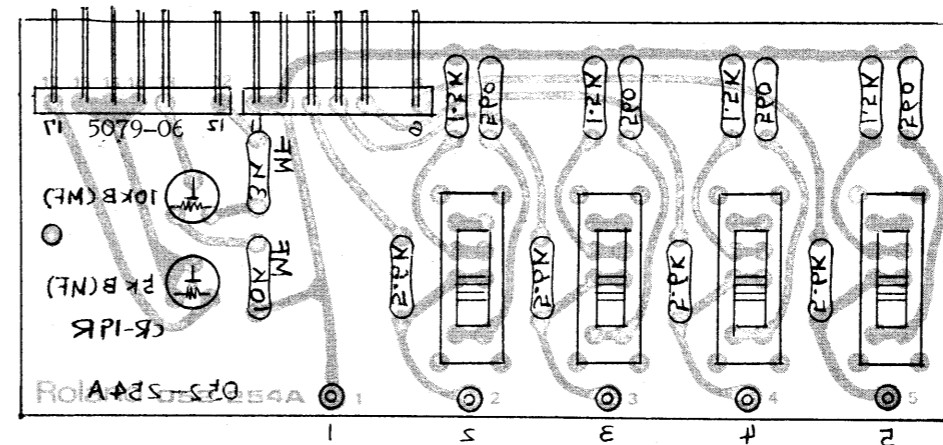
- 1/4RJ
- 12GK
- 2SC945 Q
- 2SA733 Q
- 2SK30A GR
- Electrolytic
- Mylar
- Ceramic
- 1S2473
- Tantalum
- CRB 1/4FX



5066-03A

052-250A

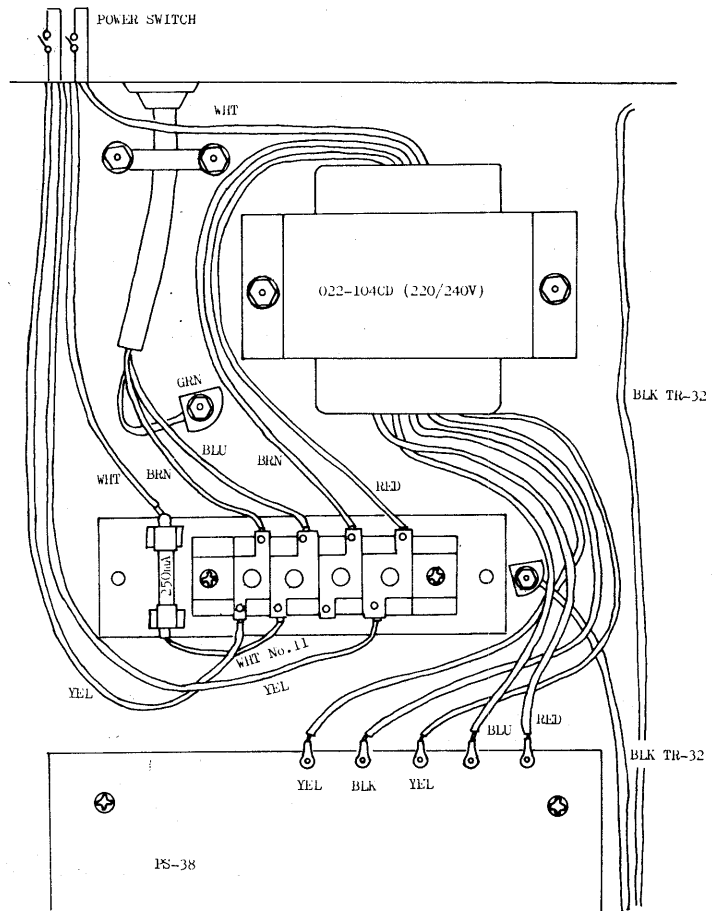
OP-74 (Assy: 149-074; PCB: 052-254)



**FOR PRODUCTS WITH
POWER TRANSFORMER 022-104B(-C/D)**

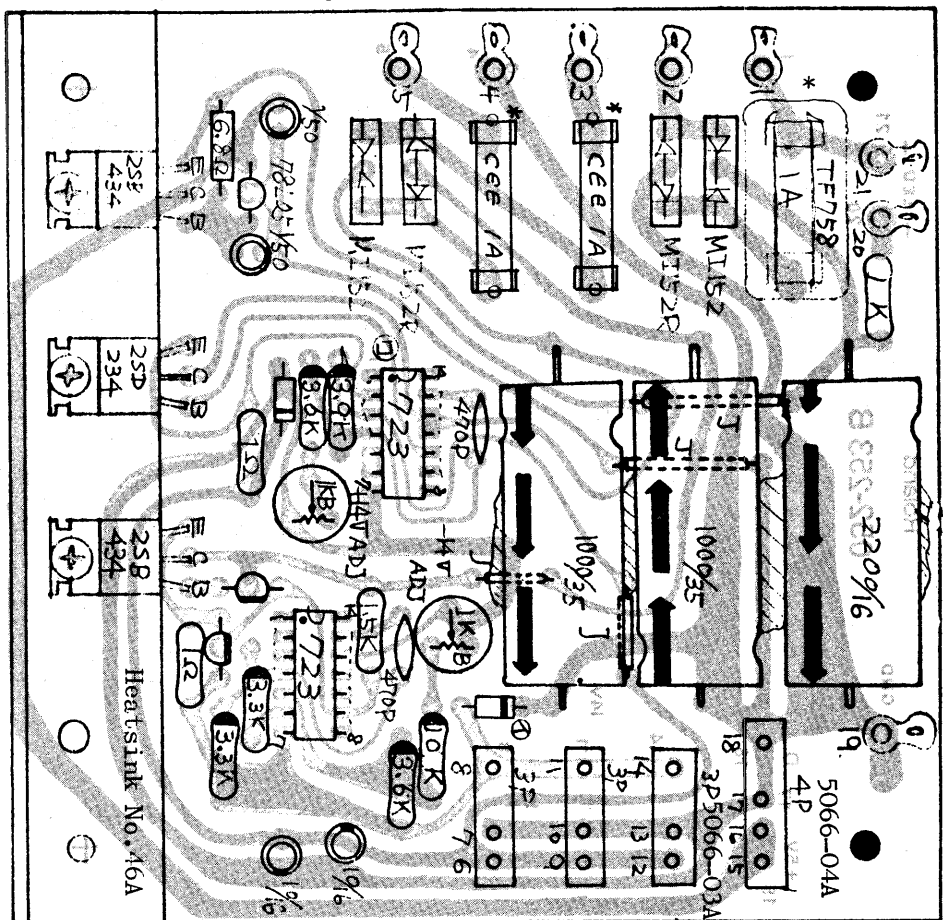
Two 10 ohm resistors are mounted in the place of fuses marked * on the PCB below. The fuses are placed on the terminal block apart from the PCB.

Because 022-104C secondary voltage is a little lower than that of 022-104B, remove the resistors and connect with jumpers, when replacing 022-104B by 022-104C.



PS-38 (220/240V) (Assy: 146-038; PCB: 052-253)

- 1/4CRB FX
- 1/4RJ
- 12GK
- 2SA733 Q
- Electrolytic
- Ceramic
- Diode 1N4003

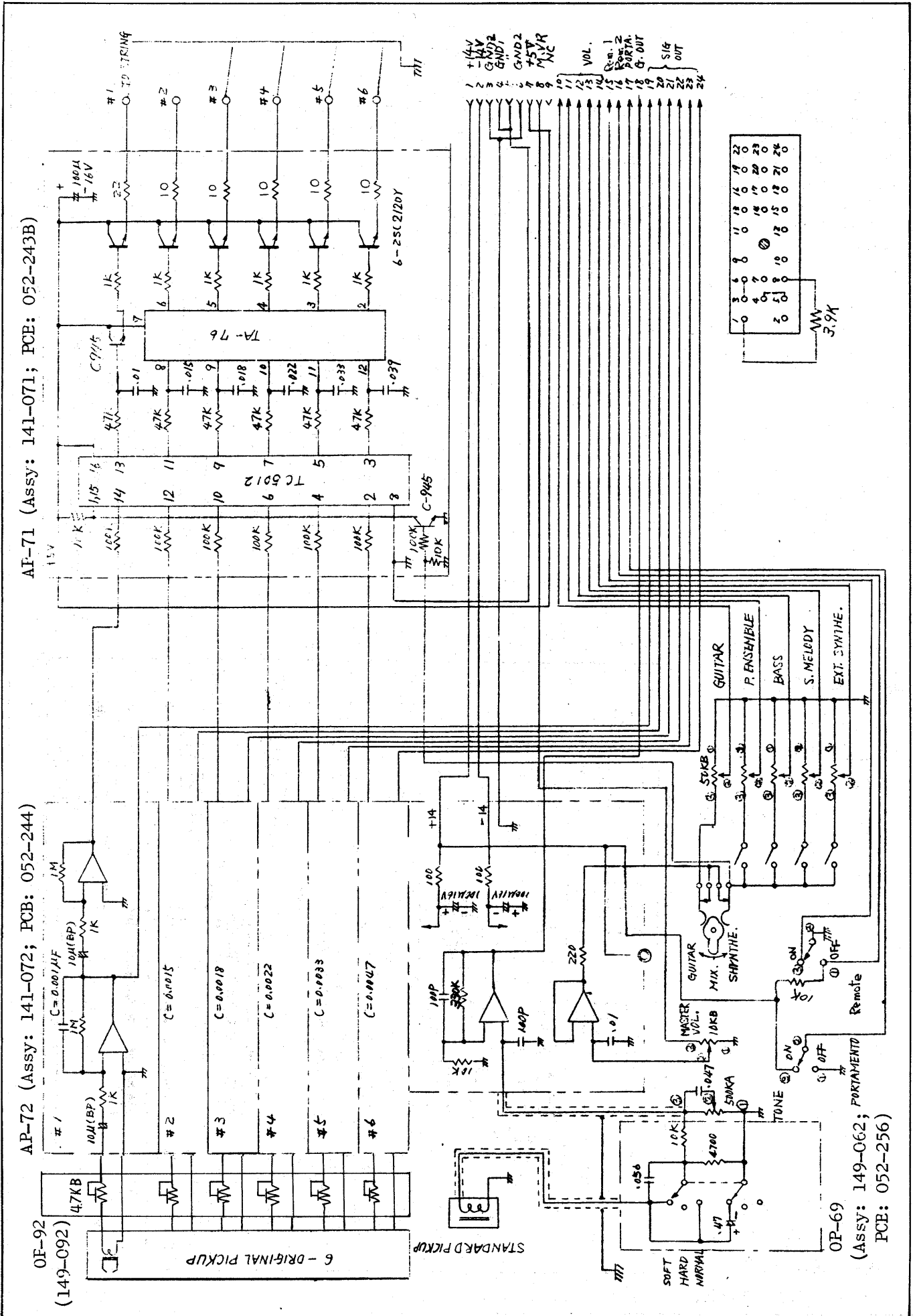


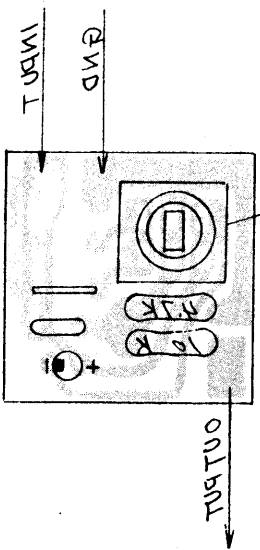
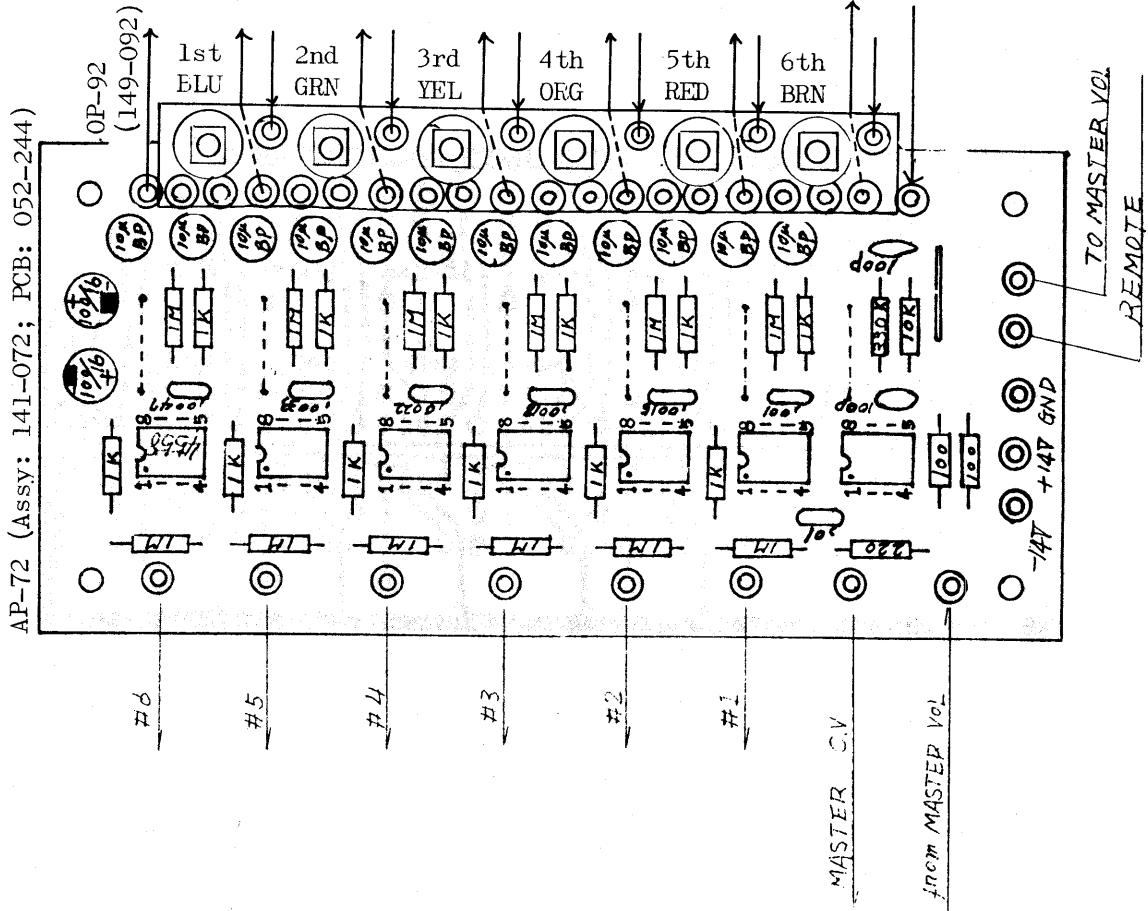
PS-37 (100/120V)

(Assy: 146-037)

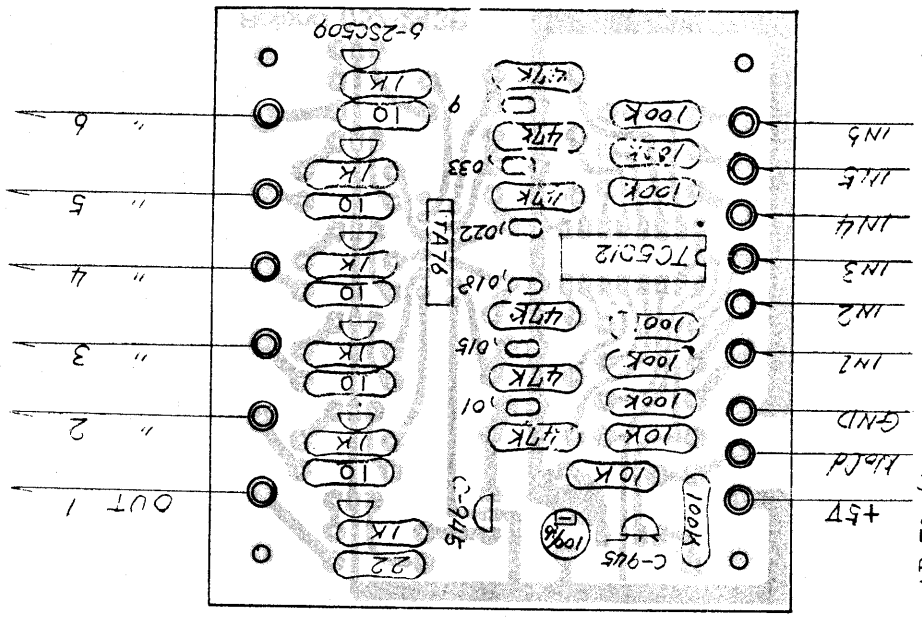
PCE: 052-253)

*1A fuse on TF758 fuse holder Jumper on PS-37





OF-69 (Assy: 149-062; PCB: 052-256)



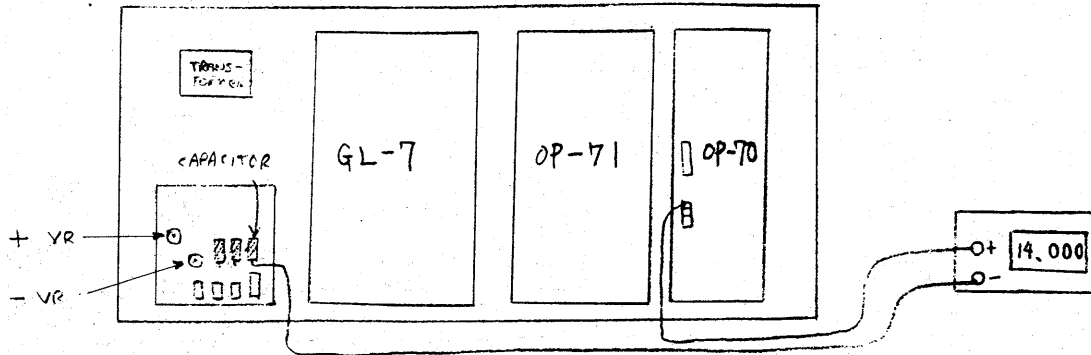
AP-71 (Assy: 141-071; PCB: 052-243B)

ADJUSTMENT

SECTION 1. POWER SUPPLY CALIBRATION

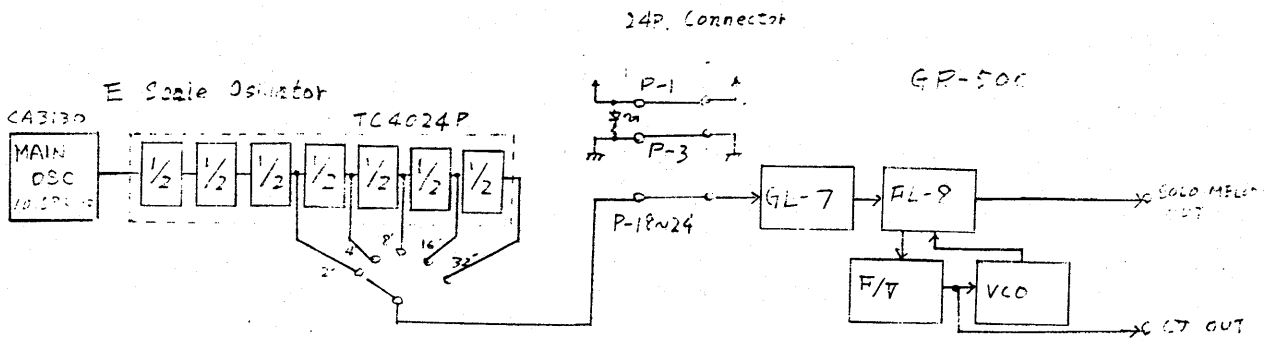
Adjust the "+" VR for +14.000V (+5mV) at Pin 15.

Adjust the "-" VR for -14.000V (+5mV) at Pin 13.



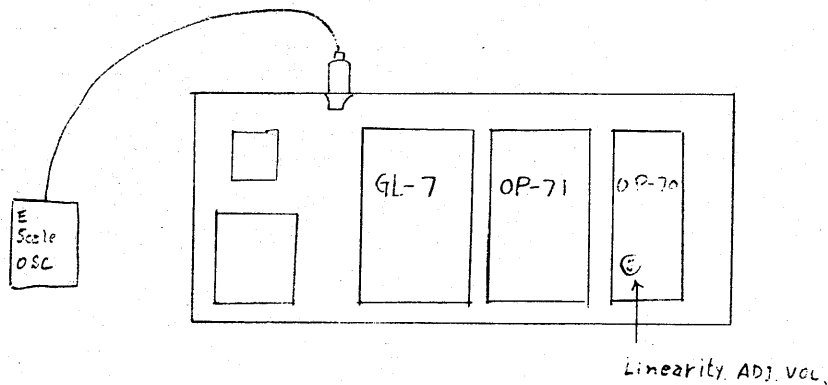
SECTION 2. FV CONVERTER

Test equipment: Digital Voltmeter

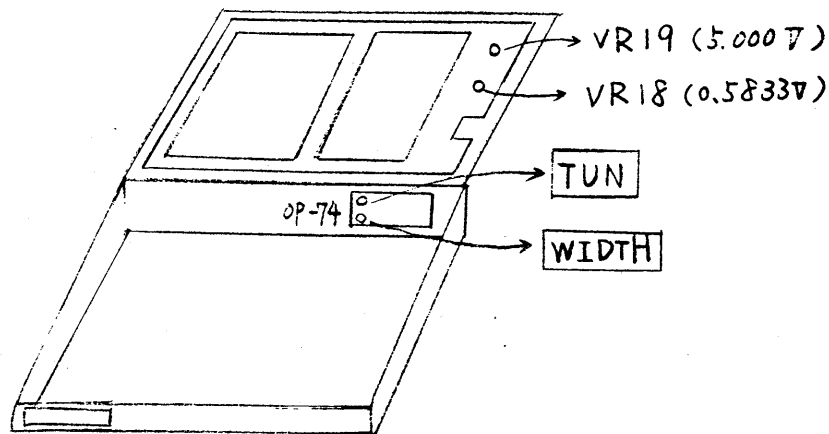


If the GS-500 Guitar Controller is tuned correctly (open sixth string = 82.4Hz), it can be used in place of the "E" Oscillator.

Connect the "E" Oscillator as shown:



Connect the digital voltmeter to the PITCH VOLT OUTPUT jack on the rear panel.



TRANSCOPE CALIBRATION

1. Set the "E" Oscillator at 8' (329.6Hz) (or pick the first open string on the GS-500) and set the TRANSCOPE switch at 32'-F and note the voltage. Call this "x".

Set the TRANSCOPE switch at 1'-F and adjust VR-19 for $x + 5.000V$.

2. Verify the 1V/1 Oct relation of the other "F" positions of the TRANSCOPE switch. The maximum permissible deviation is $\pm 1.5mV$.
3. Set the "E" Oscillation at 8' (329.6Hz) and the TRANSCOPE switch at 16'-F and confirm that the reading is $x + 1.000V$ ($\pm 1.5mV$).

Set the TRANSCOPE switch at 16'-5 and adjust VR-18 for $x + 1.000 + 0.583V$.

Set the TRANSCOPE switch at 16'-3 and verify that the reading is $x + 1.000 + 0.333V$ ($\pm 1.5mV$).

FV (FREQUENCY-TO-VOLTAGE) CONVERTER CALIBRATION

1. Set the TRANSCOPE switch at 8'-F and the "E" Oscillator at 32' (82.4Hz) (or pick the open sixth string).

Adjust the TUNING VR for 0.333V on the digital voltmeter.

2. Set the "E" Oscillator at 16' (164.8Hz) (TRANSCOPE at 8'-F). Adjust the WIDTH VR for 1.333V.
3. Repeat Steps 1 and 2 above until the readings are correct to within $\pm 1.5mV$.
4. Set the "E" Oscillator at 2' (1318.5Hz) and adjust the LINEARITY VR for 4.333V.
5. Repeat Steps 1 through 4 above until all values are within $\pm 1.5mV$.
6. As a final check, make sure that all settings of the "E" Oscillator produce correct voltages ($\pm 1.5mV$).

SECTION 3. SOLO MELODY SECTION

Test equipment: Oscilloscope

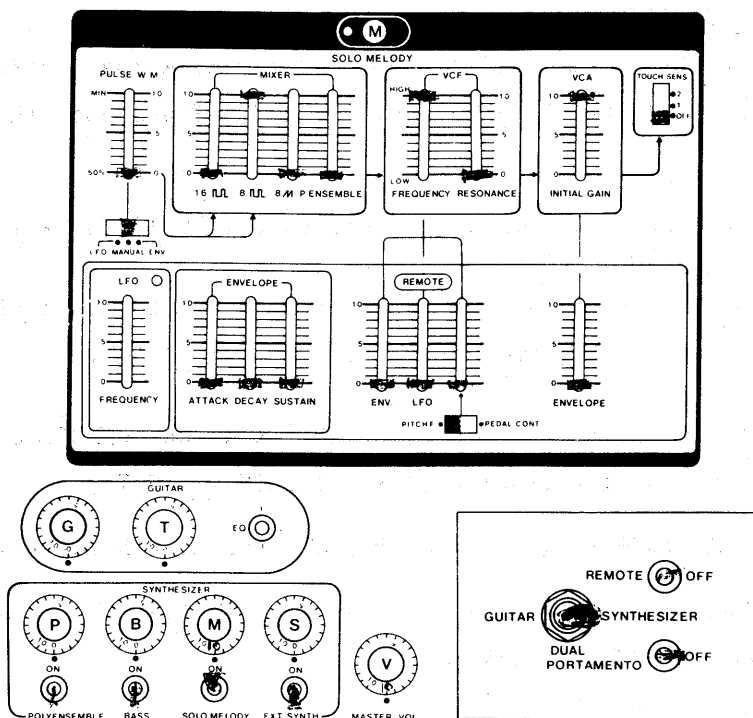
Connect the Oscilloscope to the MIX OUTPUT jack on the rear panel and set the output level switch at "H".

Connect an amplifier and speaker (or headphones) to the PHONES jack on the front panel.

Connect the GS-500 Guitar Controller to the GR-500 Guitar Synthesizer.

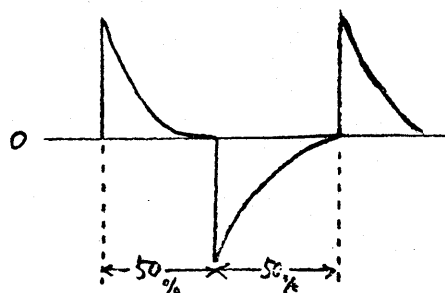
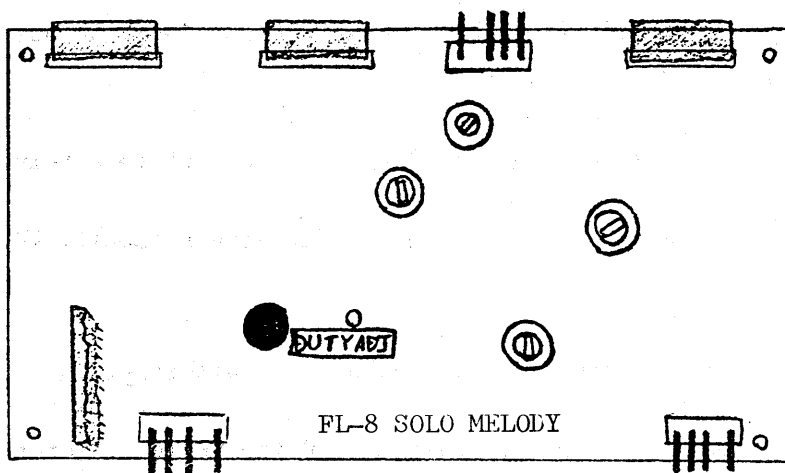
PWM CALIBRATION

1. Set the controls as shown:

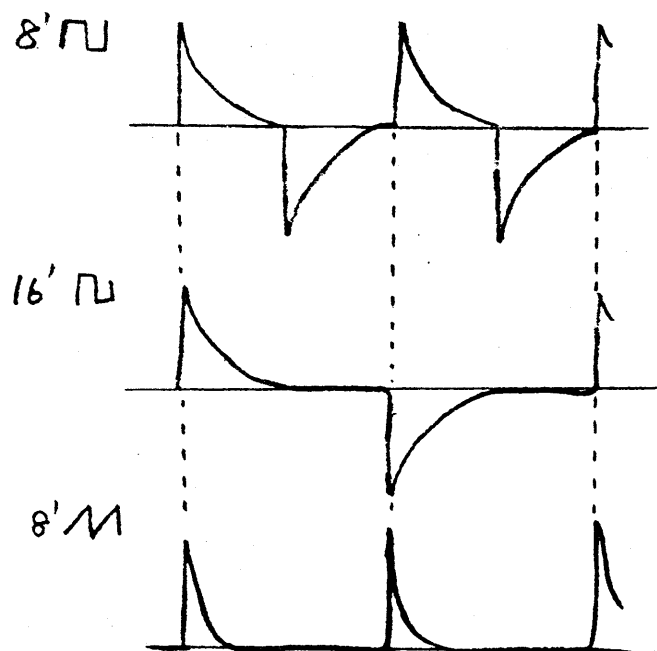


Set the THRESHOLD control at about 8 or 9.

2. Pick the open 3rd string and adjust the DUTY CYCLE ADJ VR for a 50% duty cycle.

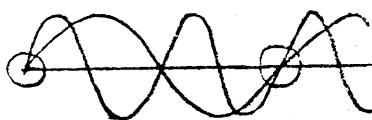
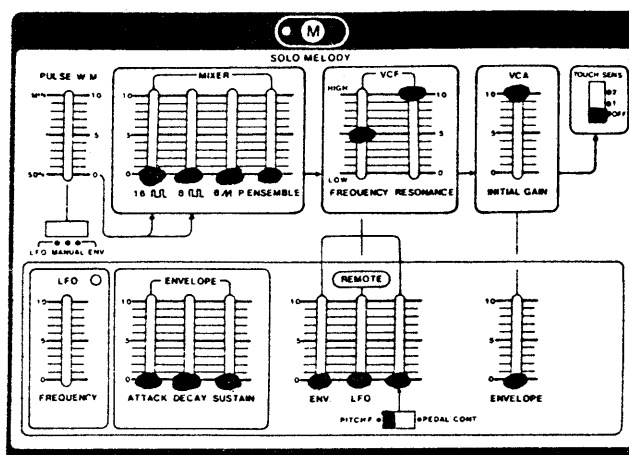


3. Check the 16' \square and 8' \sphericalangle waves; ideally they should have a 50% ($\pm 10\%$) duty cycle.



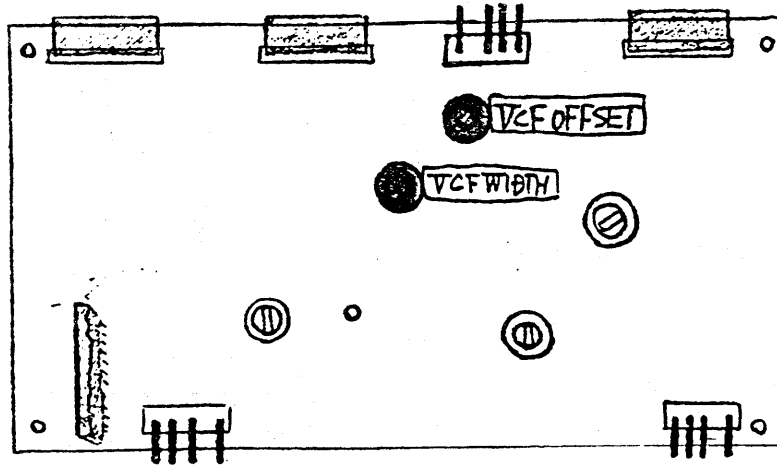
VCF CALIBRATION

1. Set the controls as shown:



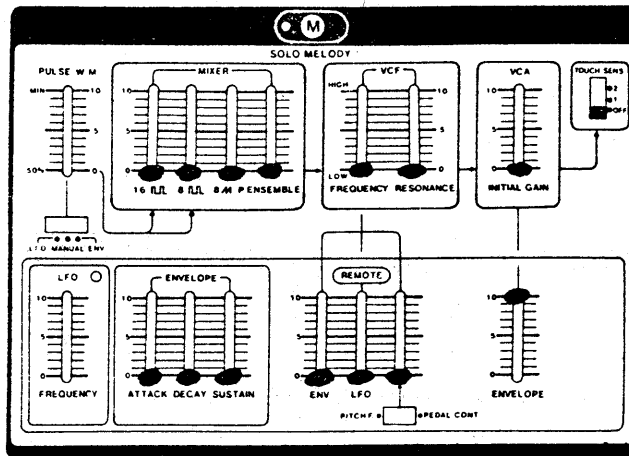
- With the controls set as shown, adjust the VCF OFFSET VR for 1kHz (using the Oscilloscope connected to the MIX OUTPUT jack as before).
- Set the PITCH F control at "10". Adjust the VCF WIDTH VR so that the frequency produced by the 12th fret of the third string is twice the frequency of the open third string.
- Verify that the first and sixth strings have these same relations between the 12th fret and open string.

- Verify that the calibration in 1 above is still correct. If not, repeat the above steps.

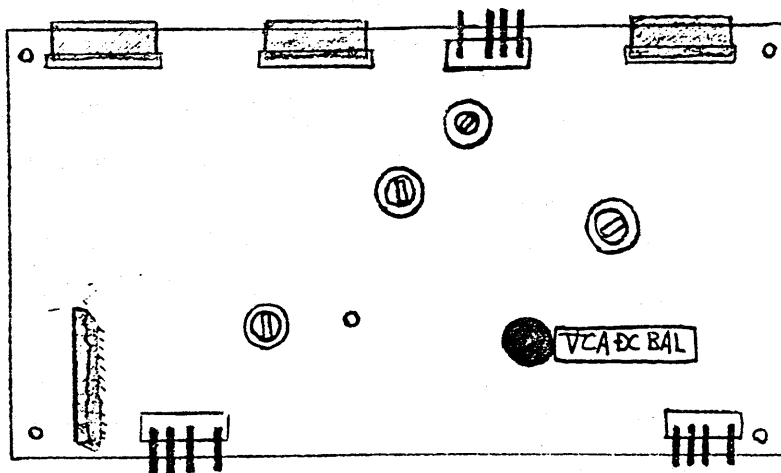
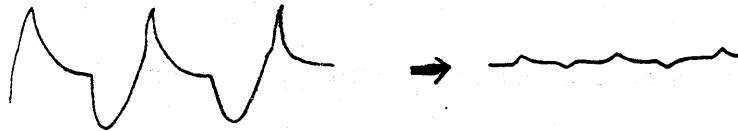


VCA CALIBRATION

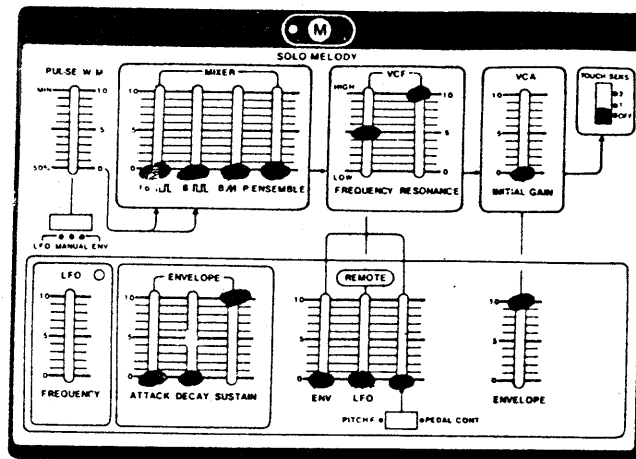
- Set the controls as shown:



- Pick one of the strings for a staccato tone burst and adjust the VCA DC BAL VR for minimum click noise.



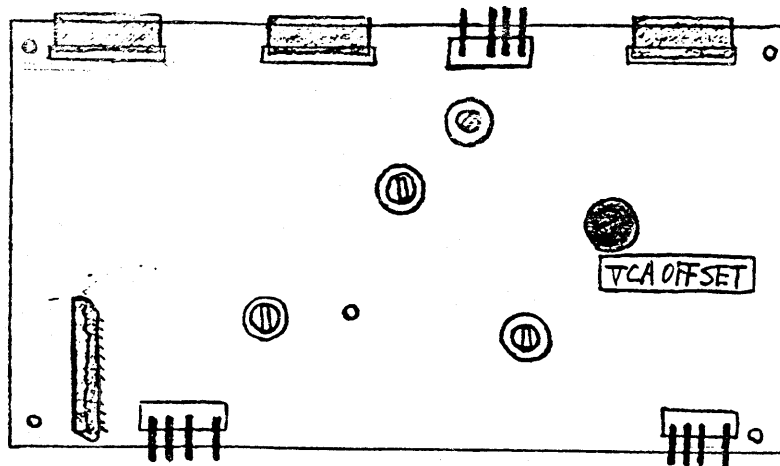
3. Set the controls as shown:



4. Set the Oscilloscope for maximum vertical gain.

Set the VCA OFFSET VR so that the VCF oscillations passed by the VCA are minimum.

5. Verify that the VCF oscillations appear at the output when the VCA INITIAL GAIN control is raised to about "2".



SOLO MELODY
FL-8

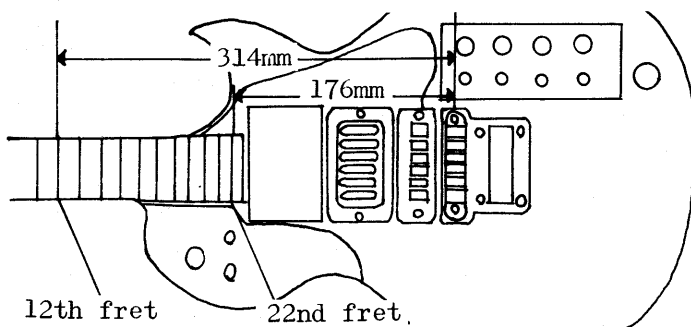
ADJUSTING GUITAR CONTROLLER

1. ADJUSTMENT AS A GUITAR

Tuning of each string should be made from time to time during adjustment at A=440Hz.

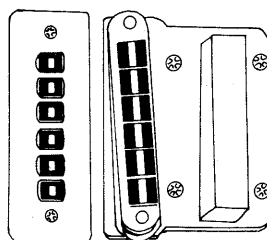
1) OCTAVE ADJUSTMENT

Adjust the first saddle of the bridge so that it is 314mm from the 12th fret (176mm from the 22nd fret).



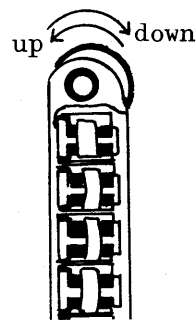
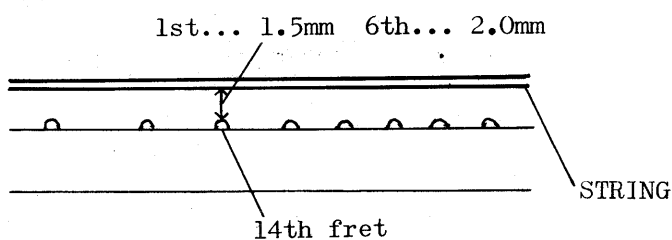
Adjust the 2nd to 6th saddles so that they are aligned straight.

Try the sound of open and 12th fret held, to make sure the sounds are in octave relation.



2) STRING HEIGHT

Adjust the bridge so that the clearance between the string and the 14th fret is approximately 1.5mm for the 1st string and 2.0mm for the 2nd string.

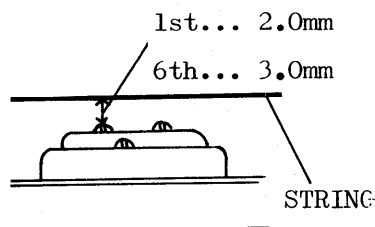
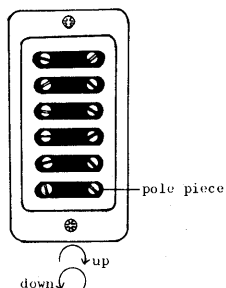


(use long-nose pliers)

3) PICKUP HEIGHT

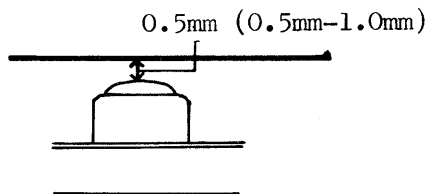
a. Humbucking Pickup

The most suitable position of the pole pieces may differ depending on the player's taste and also on type of the string used. As a standard, adjust the clearance between the pole piece and the string to be 2.0mm for the 1st string and 3.0mm for the 6th string.



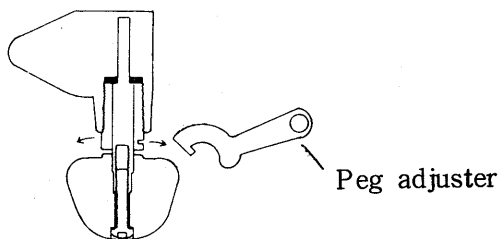
b. Divided Pickup

Adjust the minimum clearance from the string to the divided pickup to be 0.5mm. The clearance must be equal for all six strings.



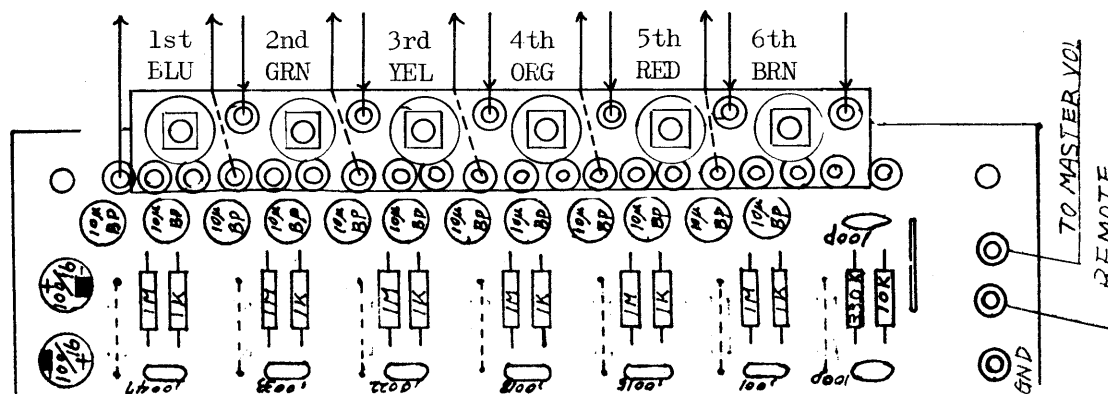
4) TORQUE OF PEG

Adjust the torque using the peg torque adjuster supplied.

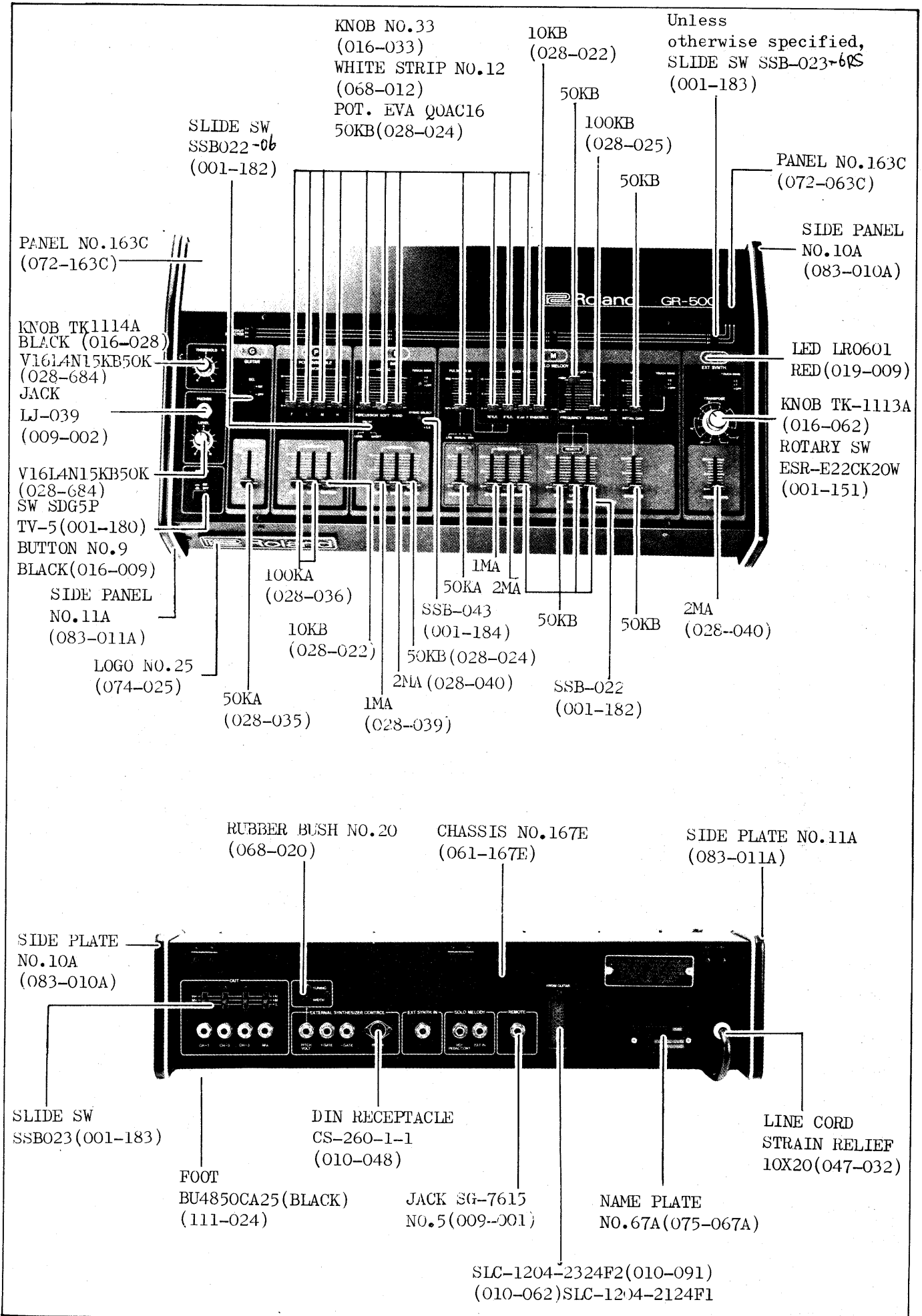


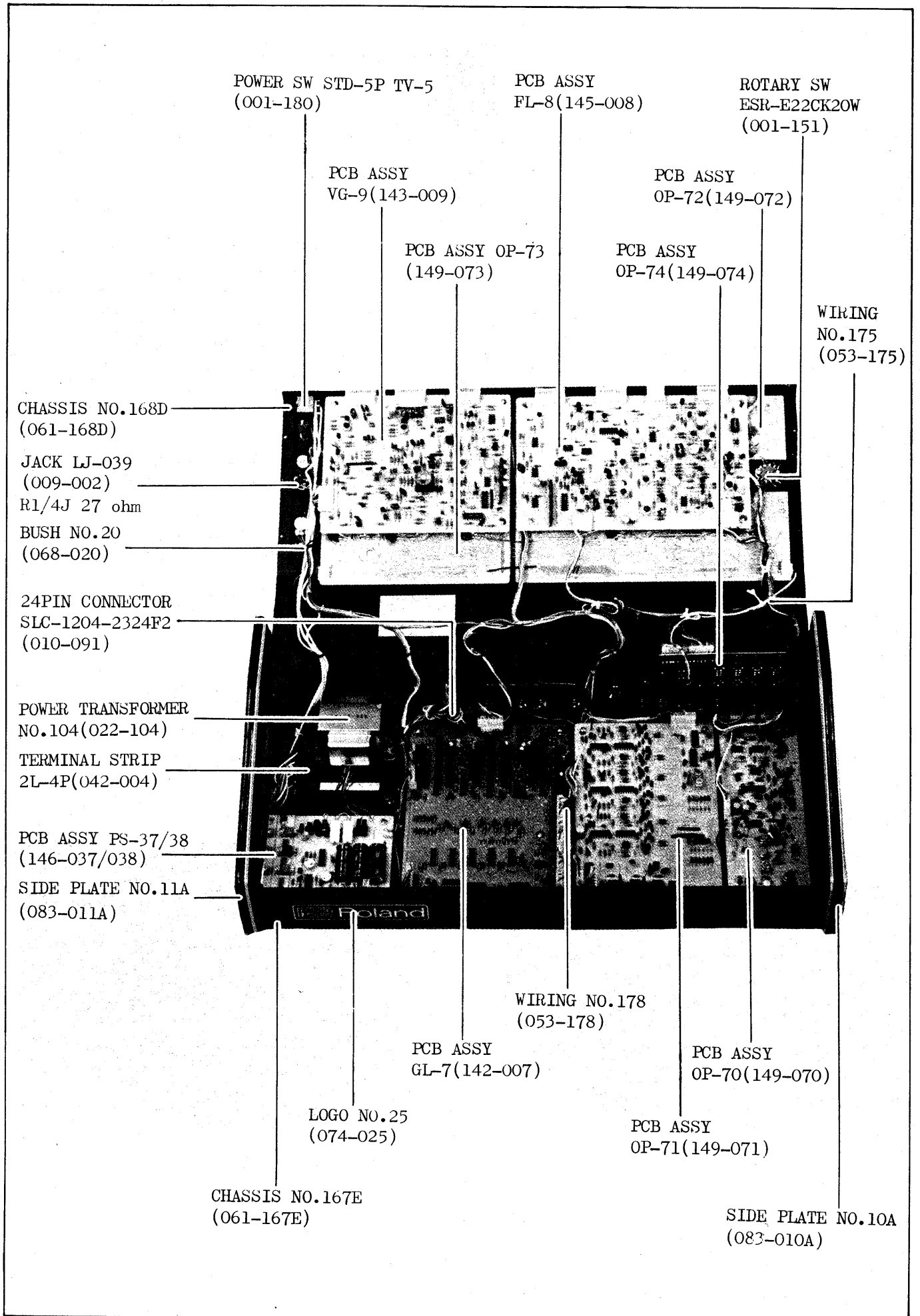
2. ADJUSTING THRESHOLD

The threshold for each string can be adjusted by the trimmer pots (0P-92, 149-092) on AP-72 (141-072)



- 1) Turn all trimmer pots fully clockwise. At this position, the resistance is zero and the sensitivity is the maximum.
- 2) Set GR-500 Guitar Synthesizer Threshold control at "0". While producing guitar section sound (as monitor) and Bass or Solo Melody section sound, pluck each string with an equal intensity: only weakly at the beginning and then gradually stronger; to find out the string with the minimum sensitivity to trigger. (The 5th or 6th string is usually the minimum sensitivity string.)
- 3) Turn counterclockwise the trimmer pots to lower the sensitivity gradually to that of the minimum sensitivity string as mentioned above.
- 4) Consulting the effect of touch sens and others, check to see that the sensitivity of all six strings is equal.





POWER SW STD-5P TV-5
(001-180)

PCB ASSY
FL-8(145-008)

ROTARY SW
ESR-E22CK20W
(001-151)

PCB ASSY
VG-9(143-009)

PCB ASSY
OP-72(149-072)

PCB ASSY OP-73
(149-073)

PCB ASSY
OP-74(149-074)

WIRING
NO.175
(053-175)

CHASSIS NO.168D
(061-168D)

JACK LJ-039
(009-002)

R1/4J 27 ohm

BUSH NO.20
(068-020)

24PIN CONNECTOR
SLC-1204-2324F2
(010-091)

POWER TRANSFORMER
NO.104(022-104)

TERMINAL STRIP
2L-4P(042-004)

PCB ASSY PS-37/38
(146-037/038)

SIDE PLATE NO.11A
(083-011A)

WIRING NO.178
(053-178)

PCB ASSY
GL-7(142-007)

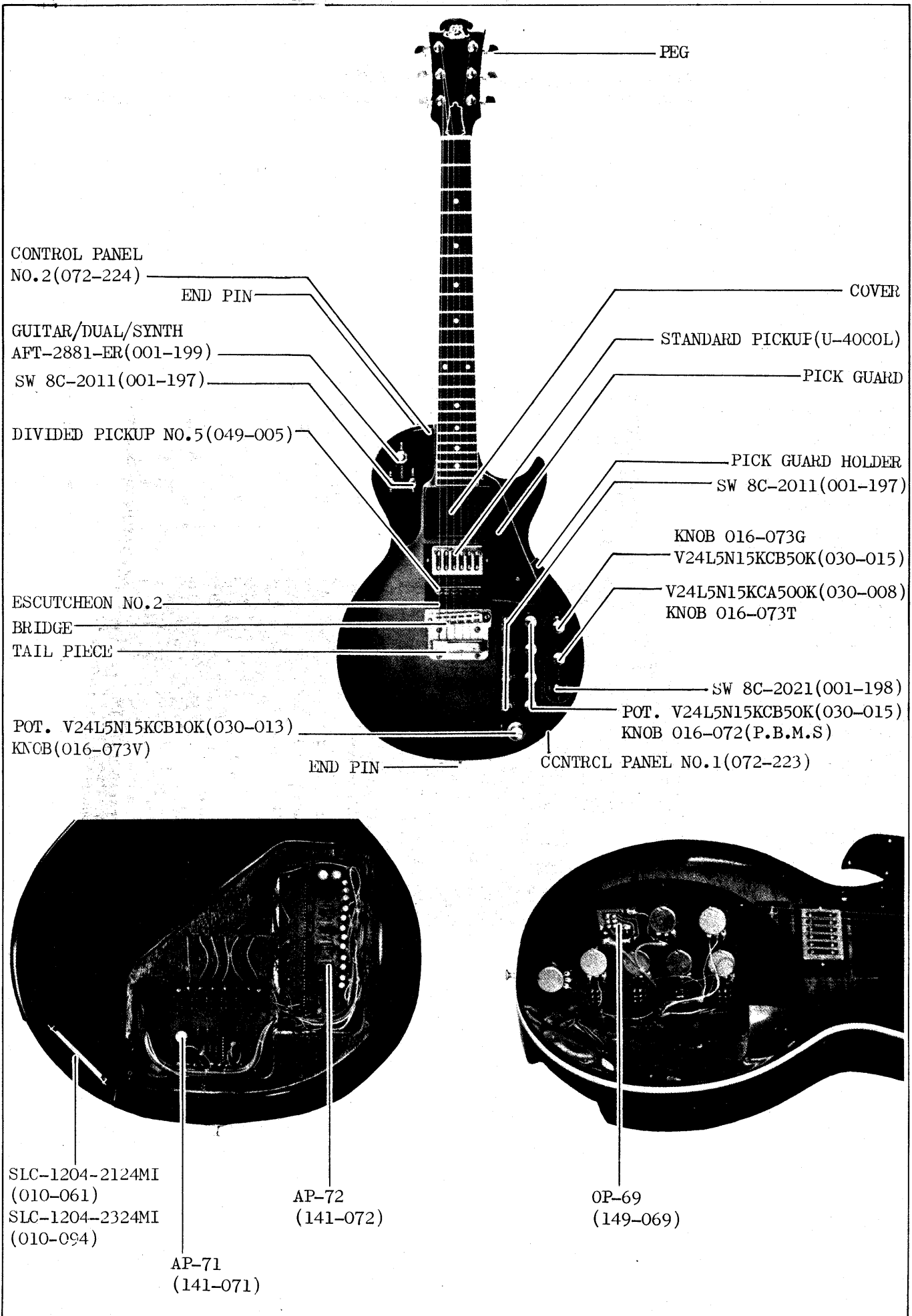
PCB ASSY
OP-70(149-070)

LOGO NO.25
(074-025)

PCB ASSY
OP-71(149-071)

CHASSIS NO.167E
(061-167E)

SIDE PLATE NO.10A
(083-010A)



PARTS LIST

PART NO.	PART AND DESCRIPTION	PART NO.	PART AND DESCRIPTION
061-168E	Chassis	008-041	Fuse MGP-0001 1A, 100/120V prim.
072-163B	Panel (Up to 671299)	008-060	Fuse CEE-250mA, 220/240V prim.
072-163C	Panel (671300 and higher)	008-066	Fuse CEE-1.0A, 220/240V sec.
083-010A	Side Panel No.10A, right	012-018	Fuse Holder XN-1153, 220/240V
083-011A	Side Panel No.11A, left	012-003	Fuse Holder TF-758, PS-38 only
130-183A	Carton	047-032	Line Cord Strain Relief 10 X 20
074-025	Badge No.25, Roland logo	047-023	Cord Clamp 1702B
111-024	Foot BU4850, CA-25 black	042-036	Terminal Block TT-501, 220/240V
120-001	Nut No.1, spacer 3x10mm	022-034	Coil 4R 3.8H
120-009	Nut No.9, 3x13mm	048-046A	Heat Sink No.46A
009-001	Jack No.1, SG-7615		Potentiometer
009-002	Jack No.9, LJ-039-1-1, stereo	028-684	V16L4N15K B50K K-15 50KB
010-048	Receptacle, CS260-1-1, DIN	028-022	EVAQOAC16 B14 10KB, slide
010-062	Receptacle, SLC-1204-2124F1, 24pin (up to 650799) 2324F2	028-035	EVAQOAC16 A54 50KA, slide
010-091	Receptacle, SLC-1204-2343F2, 24pin (650800 and higher)	028-024	EVAQOAC16 B54 50KB, slide
010-063	Connector, SLC-1204-1224M1 (C-24B)	028-025	EVAQOAC16 B15 100KB, slide
010-064	Connector, SLC-1204-1224F1 (C-24B) (C-24B, up to 650799)	028-039	EVAQOAC16 A16 1MA, slide
010-092	Connector, SLC-1204-1324M (C-24C)	028-040	EVAQOAC16 A26 2MA, slide
010-093	Connector, SLC-1204-1324F (C-24C) (C-24C, 650800 and higher)	028-036	EVAQOAC16 A15 100KA, slide
149-074A	OP-74A Assy	028-001	EVT-R4AA00 B52 500-ohm, trimmer
149-070A	OP-70A Assy	028-002	EVT-R4AA00 B13 1KB, trimmer
149-071B	OP-71B Assy	028-006	EVT-R4AA00 B54 50KB, trimmer
149-072A	OP-72A Assy	030-489	CR-19R, 1KB, trimmer
149-073A	OP-73A Assy	030-495	CR-19R, 10KB, trimmer
142-007A	GL-7A Assy	030-499	CR-19R, 50KB, trimmer
145-008A	FL-8A Assy	030-493	CR-19R, 5KB, trimmer
143-009B	VG-9B Assy		IC
146-037B	PS-37 Assy (100/120V)	020-031	723
146-038B	PS-38 Assy (220/240V)	020-089	LM-78L05, 100mA
052-254A	OP-74A PCB less parts	020-090	TC-4051P
052-250A	OP-70A PCB less parts	020-091	TC-4052P
052-247B	OP-71B PCB less parts	020-051	TC-4001P
052-251A	OP-72A PCB less parts	020-092	TC-4002P
052-252A	OP-73A PCB less parts	020-093	TC-4025P
052-246A	GL-7A PCB less parts	020-062	uPC-1458C
052-248A	FL-8A PCB less parts	020-069	uPC-324C
052-249B	VG-9B PCB less parts	020-040	TC-4011P
052-253B	PS-37/38 PCB less parts	020-024	301A
016-062	Knob TK-1113A, black	020-076	RM6-4.7K, resistor network
016-028	Knob TK-1114A, black	020-039	DN-819
016-009	Button No.9 for power switch	020-015	CA-3080
016-033	Knob No.33 for slide pot	020-010	TA-7504M
068-012	Strip No.12 for Knob No.33	020-035	NE-555V (MC1455)
001-180	Switch SDG-5P TV-5, power	020-032	uA-726
001-151	Switch ESR-E22CK20W, rotary	020-065	CA-3140T
001-182	Switch SSB-022, slide	020-094	LA-4100
001-183	Switch SSB-023, slide	140-017	Pack No.17, EHM-426W07
001-184	Switch SSB-043, slide	140-016	Pack No.16, EHM-429W08
022-104CN	Power Transformer, 100V		Transistor
022-104CC	Power Transformer, 117V	017-022	2SB434 Y
022-104CD	Power Transformer, 220/240V When replacing 104B by 104C, remove two 10 ohm resistors on PS-37/38.	017-010	2SD234 0
		017-012	2SA733 Q
		017-013	2SC945 Q
		017-003	2SC1000 GR
		017-014	2SK30A Y FET
		017-016	2SK30A GR FET
		017-093	TA-78, transistor array

PART NO.	PART AND DESCRIPTION	PART NO.	PART AND DESCRIPTION
	Diode		GS-500
018-014	1S2473	141-072	AP-72 assy
018-015	SDT-1000, thermistor	141-071	AP-71 assy
018-018	1N4003	149-069	OP-69 assy
018-062	M1-152	149-092	OP-92 assy
018-063	M1-152R		
019-009	LR-0601, LED	052-244	AP-72 PCB less parts
019-011	P873A-G35-380RE, photo-coupler	052-243B	AP-71 PCB less parts
		052-256	OP-69 PCB less parts
010-084	Housing 5065-03, 3.96mm pitch	052-361	OP-92 PCB less parts
010-085	Housing 5065-04, 3.96mm pitch		
010-086	Housing 5065-06, 3.96mm pitch		Potentiometer
010-090	Receptacle 2578T for 010-084-6	030-015	V24L5N15KB50K
010-087	Housing 5051-03, 2.5mm pitch	030-013	V24L5N15KB10K
010-088	Housing 5051-06, 2.5mm pitch	030-008	V24L5N15KA500K
010-089	Receptacle 2759 for 010-087-8	030-463	SR-19R 4.7K, trimmer
053-161	Flat Cable No.161, 16 p.		
053-160	Flat Cable No.160, 13 p.	049-005	Divided Pickup No.5
	Capacitors		Standard Pickup U-4000L
032-071	ECEA50V1 50V 1u, electrolytic	010-061	Receptacle SLC1204-2124M1, C-24B (serial no. up to 650799)
032-033	ECEA16V10 16V 10u, electrolytic	010-094	Receptacle SLC1204-2324M1, C-24C (serial no. 650800 and higher)
032-037	ECEA16V100 16V 100u, electrolytic		010-061 and -094 are not interchangeable.
032-036	ECEA16V47 16V 47u, electrolytic	016-072	Knob 72(P/B/M/S), small w/graduated skirt and letter
032-046	ECEA25V4R7 25V 4.7u, electrolytic	016-073	Knob 73(V/T/G), large w/graduated skirt and letter
032-007	ECEA6V33 6V 33u, electrolytic		Switch
032-009	ECEA6V100 6V 100u, electrolytic	001-197	8C-2011 miniature toggle, 2P
032-010	ECEA6V220 6V 220u, electrolytic	001-198	8C-2021 miniature toggle, 3P
032-033	ECEB35V1000 35V 1000u, axial leads	001-199	AFT-2881-ER toggle, 3P
032-042	ECEB16V2200 16V 2200u, axial leads		Semiconductor
032-190	ECEA50N1 50V 1u, bi-polar	020-074	IC TC-5012P
032-214	35V 2.2u, tantalum	020-064	IC uPC-4558
035-156	ECQ-S1151 150p, polystyrene (axial leads)	017-086	Transistor array, TA-76
035-137	125V 0.001u, (polystyrene, radial leads)	017-013	Transistor 2SC945 Q
		017-085	Transistor 2SC2120 Y
			Capacitor
		032-095	35V 0.47u, tantalum
		032-037	ECEA16V100 16V 100u electrolytic
		032-191	ECEA16N10 16V 10u bi-polar
		072-223	Control Panel, large
		072-224	Control Panel, small
			Tail Piece
			End Pin
			Cover Hold Magnet
			Escutcheon No.2
			Bridge
			Pick Guard
			Holder, Pick guard

PARTS ORDERING INFORMATION

Name of part number of some of the parts is changed from those printed on previously issued parts list. When ordering replacement parts, be sure to follow the description on the present issue.

When ordering parts, be sure to include the following information:

1. Model and Serial Number
2. Part Number
3. A Description of the Part

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