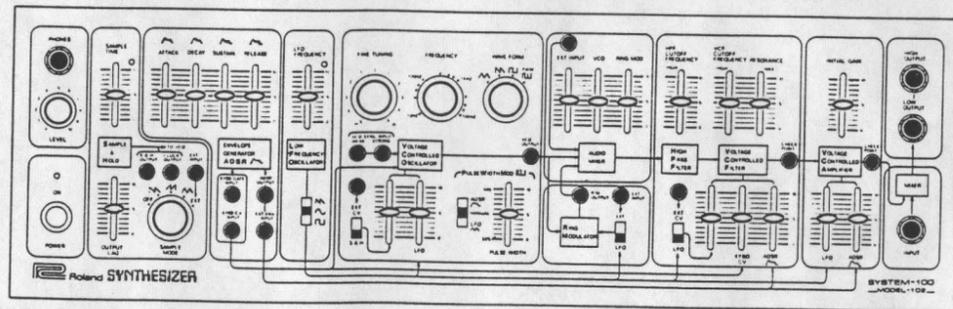
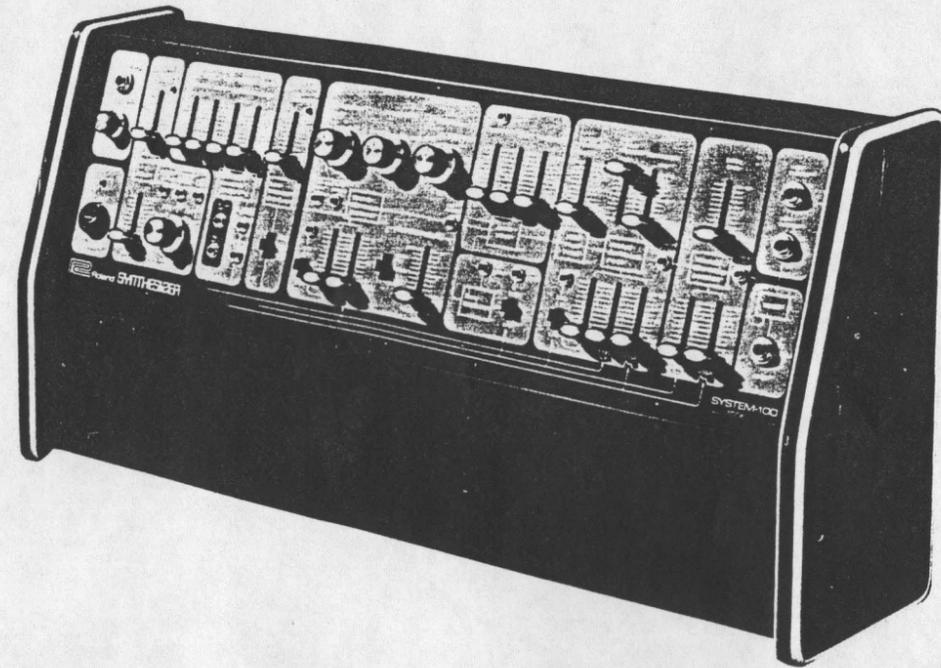


# Service Manual Roland System 100 Expander 102

My copy is missing the page for the parts-layout for the VCF-VCA-Board. I inserted in this file the page from the Modul 101 here. The board is identically, but the parts for the noise are not installed.

This file is a scan from papercopies from the original service manual. Never pay for a copy of this file!  
It should be available for free.

# PANEL DIAGRAM



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## MODEL-102

### 1. VCO (Voltage Controlled Oscillator)

Frequency Range: 3 Hz — 40 KHz  
VCO Output: 10 Vp-p  
VCO Sync. Input: Strong and Weak

#### CONTROLS

Waveforms: Triangular, Sawtooth, Square, Pulse (Pulse Width Controlled)  
Frequency: 10 Hz — 10 KHz (at A2 key) continuously variable  
Fine Tuning: 1 oct.  
Pulse Width: 5% — 50% (Manual, ADSR, LFO)  
Ext. CV or S/H: 1V/oct.  
LFO

### 2. RING MODULATOR

Ext. Input: 10Vp-p  
Ring Modulator Output: 10Vp-p

### 3. AUDIO MIXER

Ext. Input Impedance: more than 50K $\Omega$

#### CONTROLS

VCO, Ring Modulator, Ext. Input

### 4. HIGH PASS FILTER

HPF Cutoff Frequency: 10 Hz — 10 KHz

### 5. VCF (Voltage Controlled Filter)

Cutoff Frequency Range: 20 Hz — 100 KHz

#### CONTROLS

VCF Cutoff Frequency: 20 Hz — 20 KHz  
Resonance: 0 — self oscillation  
LFO/Ext. CV: 1V/oct.  
KYBD CV  
ADSR

### 6. VCA (Voltage Controlled Amplifier)

#### CONTROLS

Initial Gain  
LFO  
ADSR

### 7. ENVELOPE GENERATOR (ADSR)

KYBD Gate Input: +14 from MODEL 101  
KYBD CV Input: 1V/oct. from MODEL 101  
ADSR Output: +6V (contour peak)  
Env. Input: +6V (contour peak)

#### CONTROLS

Attack Time: 0.4 msec — 3 sec.  
Decay Time: 0.8 msec — 6 sec.  
Sustain Level: 0 — 100% (contour peak)  
Release Time: 0.8 msec — 6 sec.

### 8. LFO (Low Frequency Oscillator)

Wave Form: Sawtooth, Sine, Square

#### CONTROL

LFO Frequency: 0.15 Hz, —25 Hz

### 9. SAMPLE AND HOLD

Ext. Input: 10Vp.p  
S/H Output:  
Clock Output:  $\pm$  14.V

#### CONTROLS

Sample Mode: OFF, Sawtooth, Reverse Sawtooth, Triangular, Ext. Input  
Sample Time: 0.6 Hz — 125 Hz  
Output Lag: 0 — 2 sec.

### 10. OUTPUT MIXER

Input: 6Vp-p max.  
Input Impedance: 50K ohm

### 11. AUDIO SIGNAL OUTPUT

High Output: 3Vp-p with 1K-ohm output impedance.  
Low Output: 0.3Vp-p with 1K-ohm output impedance.

### 12. HEADPHONE OUTPUT

0.3V max. into standard 8-ohm stereo headphones.

### 13. DIMENSIONS AND WEIGHT

Overall Size: 610 mm wide, 155 mm deep, 305 mm high.  
Net Weight: 7.5 Kg

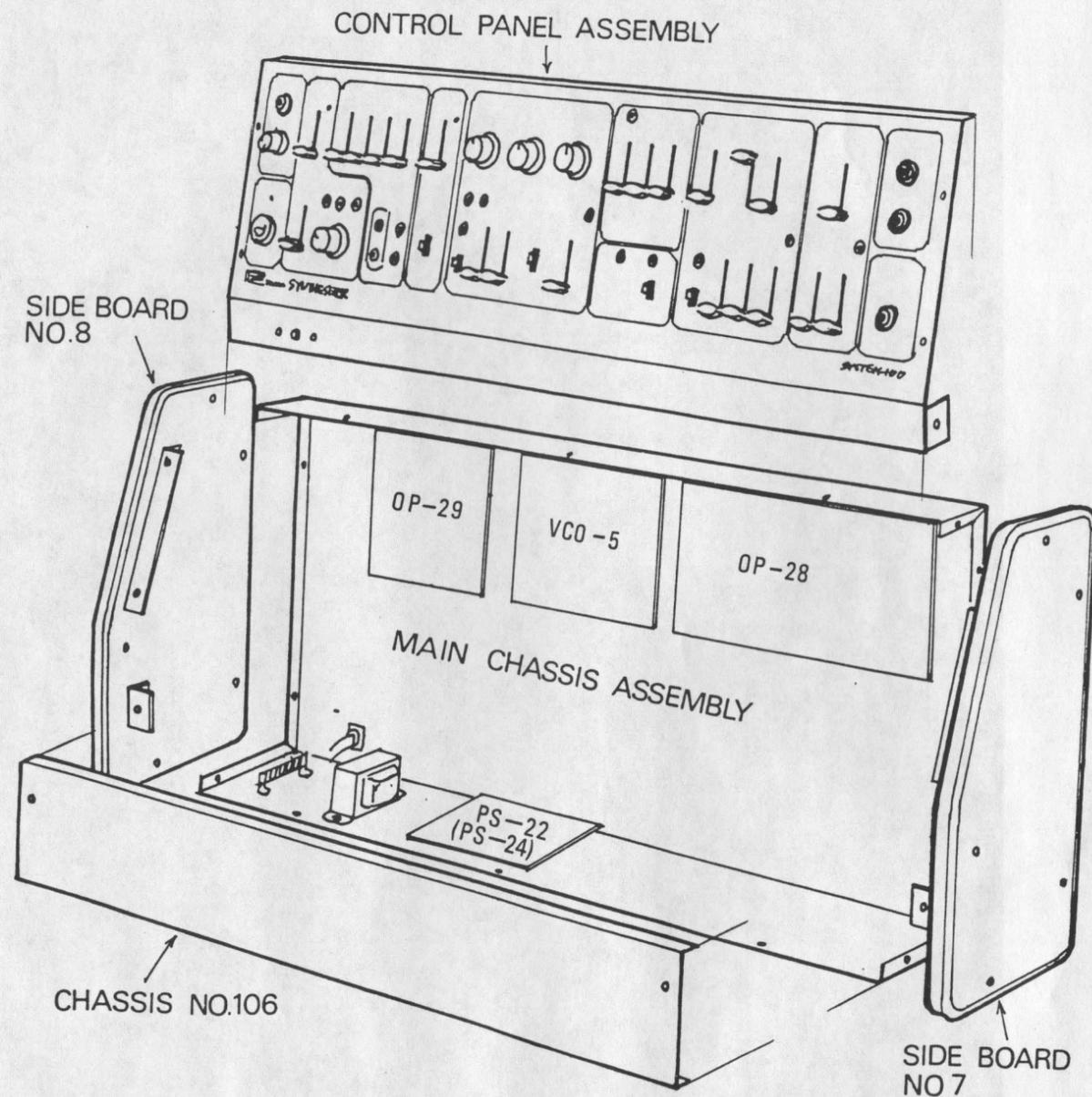
### 14. POWER REQUIREMENTS

100 — 120V 50 — 60 Hz  
220 — 250V 50 — 60 Hz

### 15. POWER CONSUMPTION

10W max.

### GENERAL LAYOUT



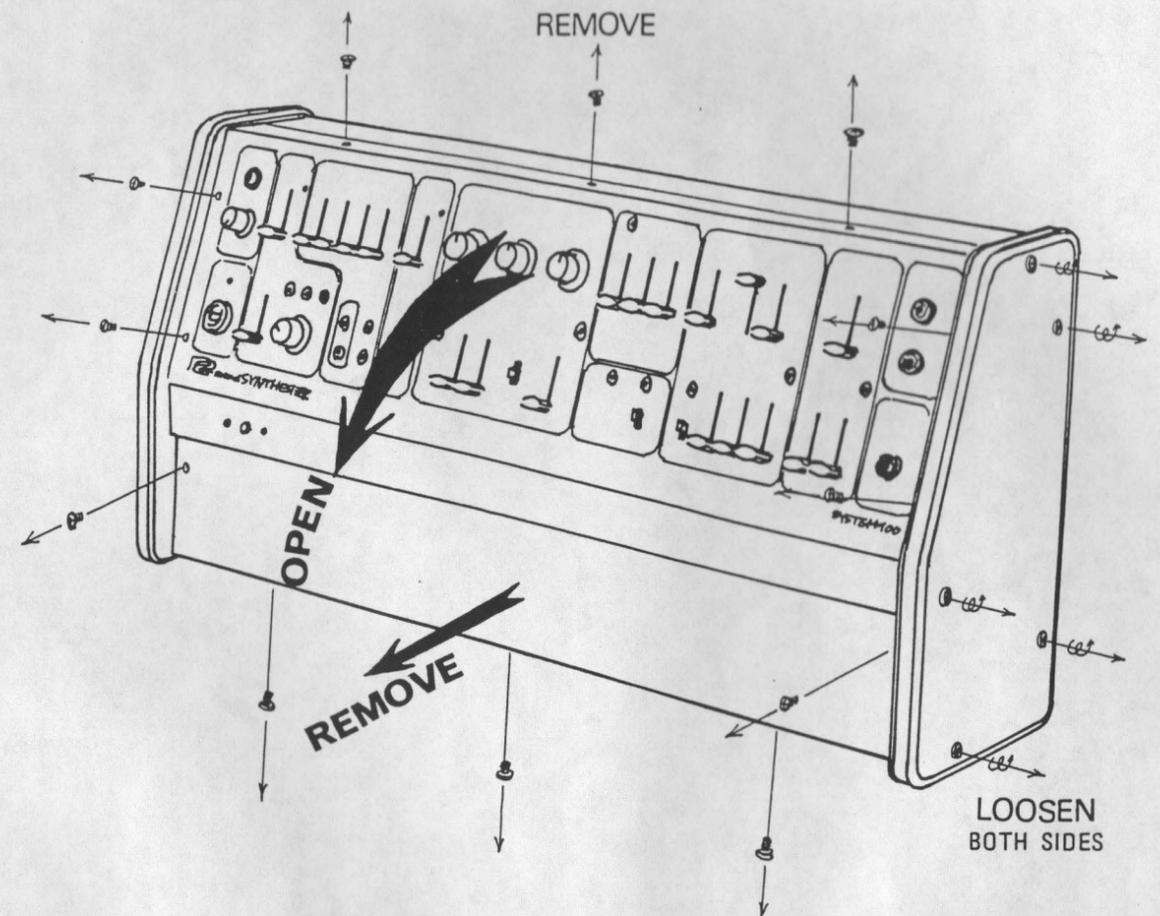
### DISASSEMBLY

System-100, Model-102 can be disassembled in the following steps when necessary for checking and readjustment. The power cord must be disconnected from the power source before proceeding with disassembly.

Remove the 5 screws on the lower front chassis.

Remove the 7 front panel screws and also loosen the 10 side board screws. The panel can be opened by pulling the top of the panel.

Use a string through the screw holes to keep the frnt panel from falling too far forward.



## DESCRIPTION of PCB(Printed Circuit Board) ASSEMBLY

Since the circuits of the Model 102 are similar to or the same as the Model 101 circuits, refer to the Model 101 section of this manual (pp. 7, 8) for circuit descriptions not given below.

### 1. VCO BOARD ASSEMBLY (VCO-5)

#### 1-1. SAMPLE and HOLD

This circuit takes the periodic samples of voltage levels from the LFO waveforms or external source to produce different patterns of up and down voltage steps.

### 2. VCF VCA BOARD ASSEMBLY (OP-28)

### 3. RING BOARD ASSEMBLY (OP-29)

#### 3-1. RING MOD is a device which makes use of the double balanced modulation by an IC.

The RING MODULATOR is a balanced multiplier which suppresses the two input frequencies but passes both the sum and difference frequencies of the inputs.

#### 3-2. The CLOCK OSC determines the sample timing of the Sample and Hold circuit.

#### 3-3. The LAG is a variable RC time constant for rounding off the sharp edges of the Sample and Hold output waveform.

#### 3-4. The INVERTER is used to invert the LFO waveform for use in the Sample and Hold circuit.

#### 3-5. The VCO SYNC function uses an external pulse (usually the square wave output of the Model 101 VCO SYNC OUT jack) to synchronize the Model 102 VCO to an external source.

### 4. POWER SUPPLY BOARD ASSEMBLY (PS-22, PS-24)

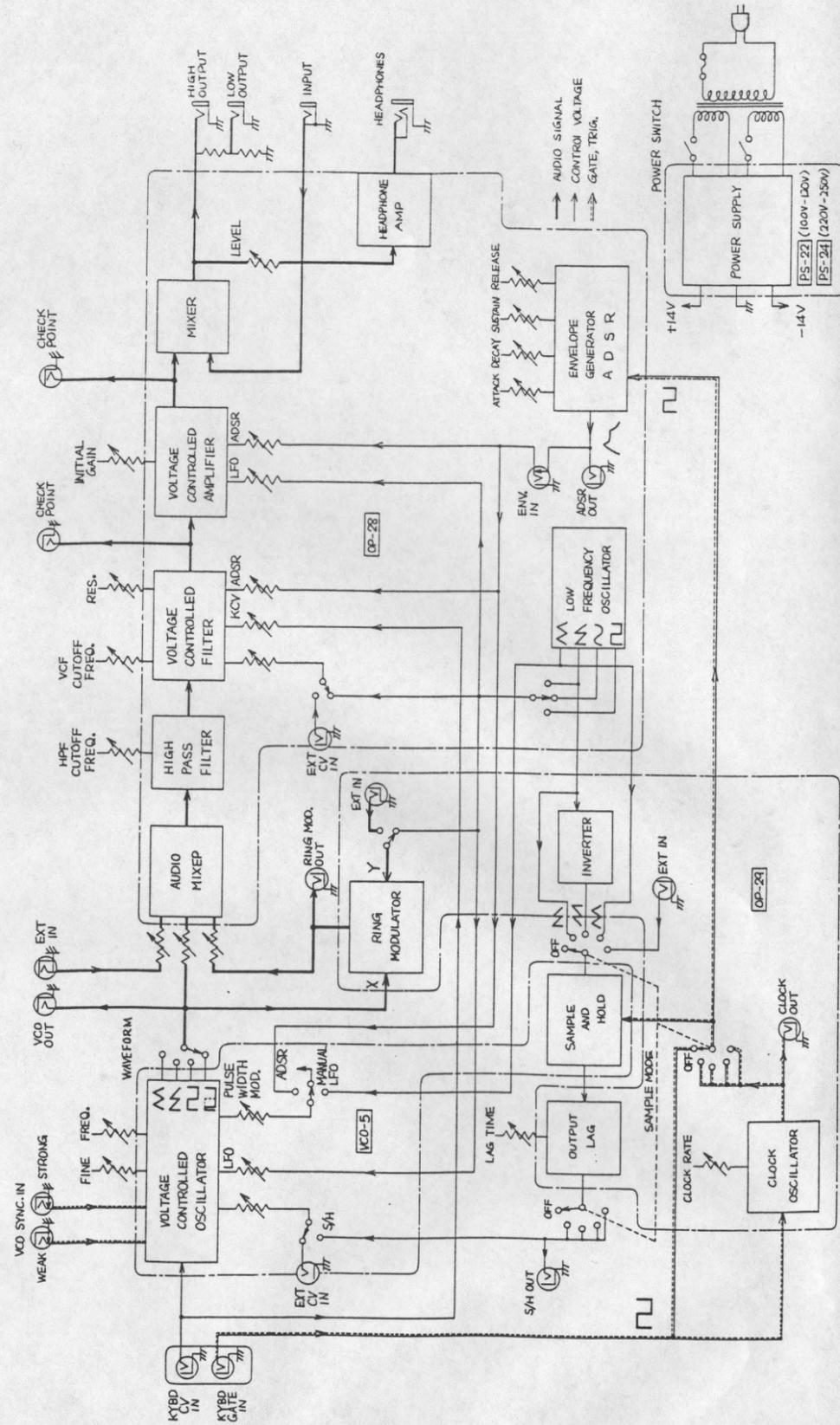
This assembly is a voltage regulator circuit which provides constant voltages of +14V and -14V.

Note: The PS-22 board is for 100V - 120V, while the PS-24 board is for 220V - 250V.

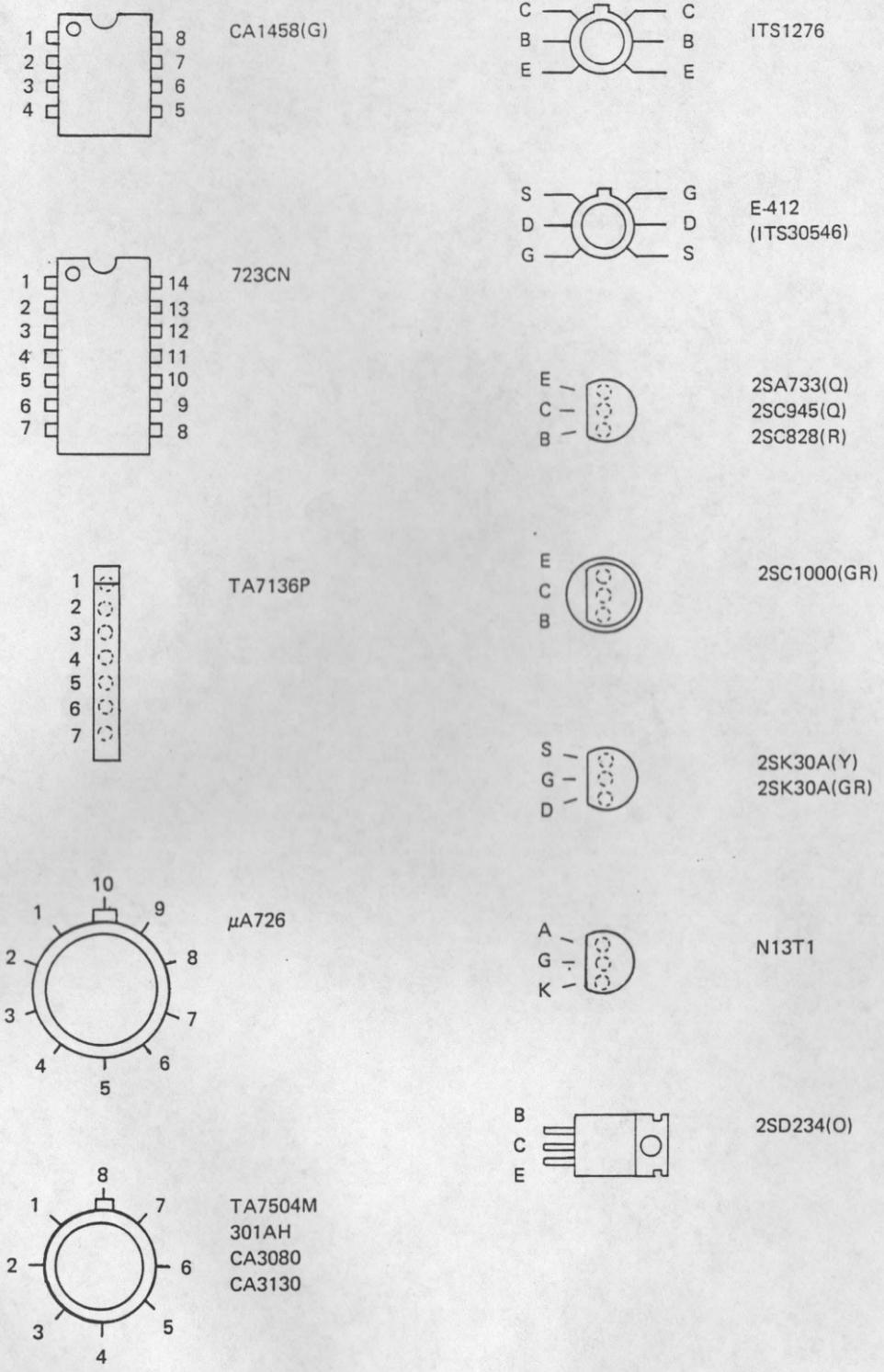
Fuse 0.5A, Fuse Holder TF-758, of Label No. 69, are used on PS-24 alone.

For PS-22, use a jumper wire on the Fuse Holder.

# GENERAL BLOCK DIAGRAM

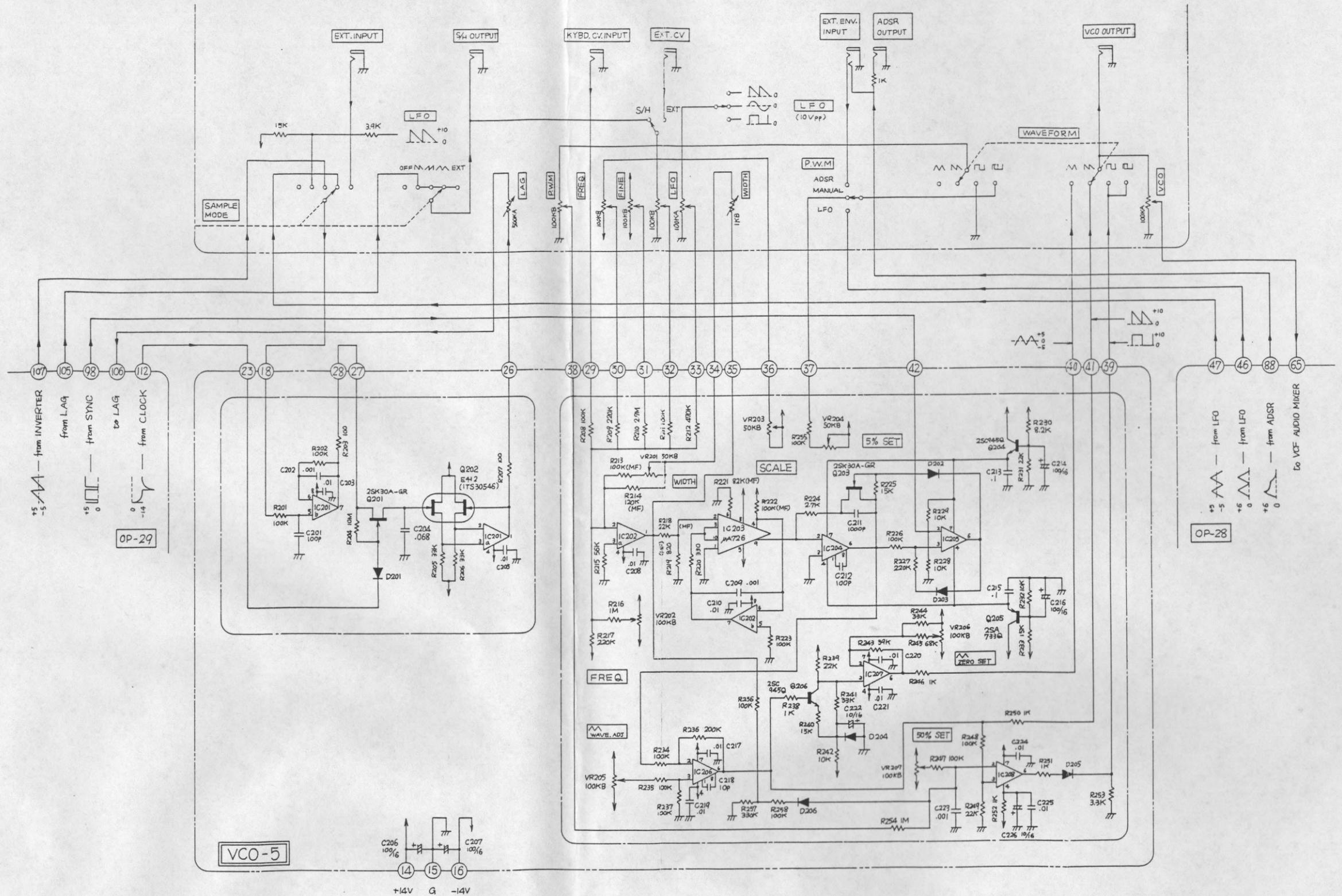


# SEMICONDUCTOR ELECTRODES (TOP VIEW)



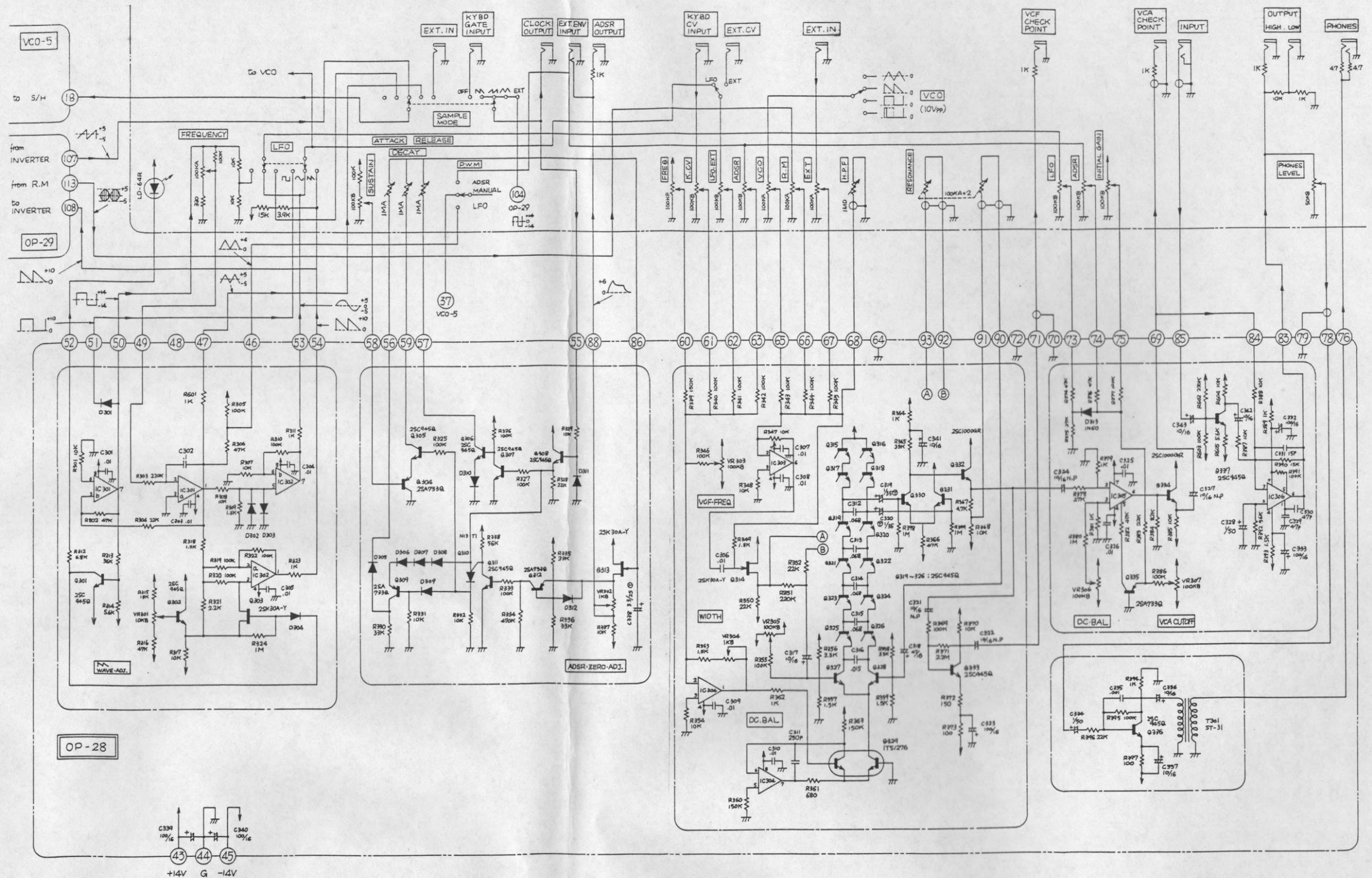


# VCO-5 VCO BOARD CIRCUIT DIAGRAM



- NOTES: IC201, 202 ..... CA1458G  
 IC204, 205 ..... CA3130  
 IC206, 208 ..... 301AH  
 IC207 ..... TA7504M  
 (MF): Metal Oxide Film Resistor.  
 ALL DIODES ARE 1S2473

# OP-28 VCF·VCA BOARD CIRCUIT DIAGRAM



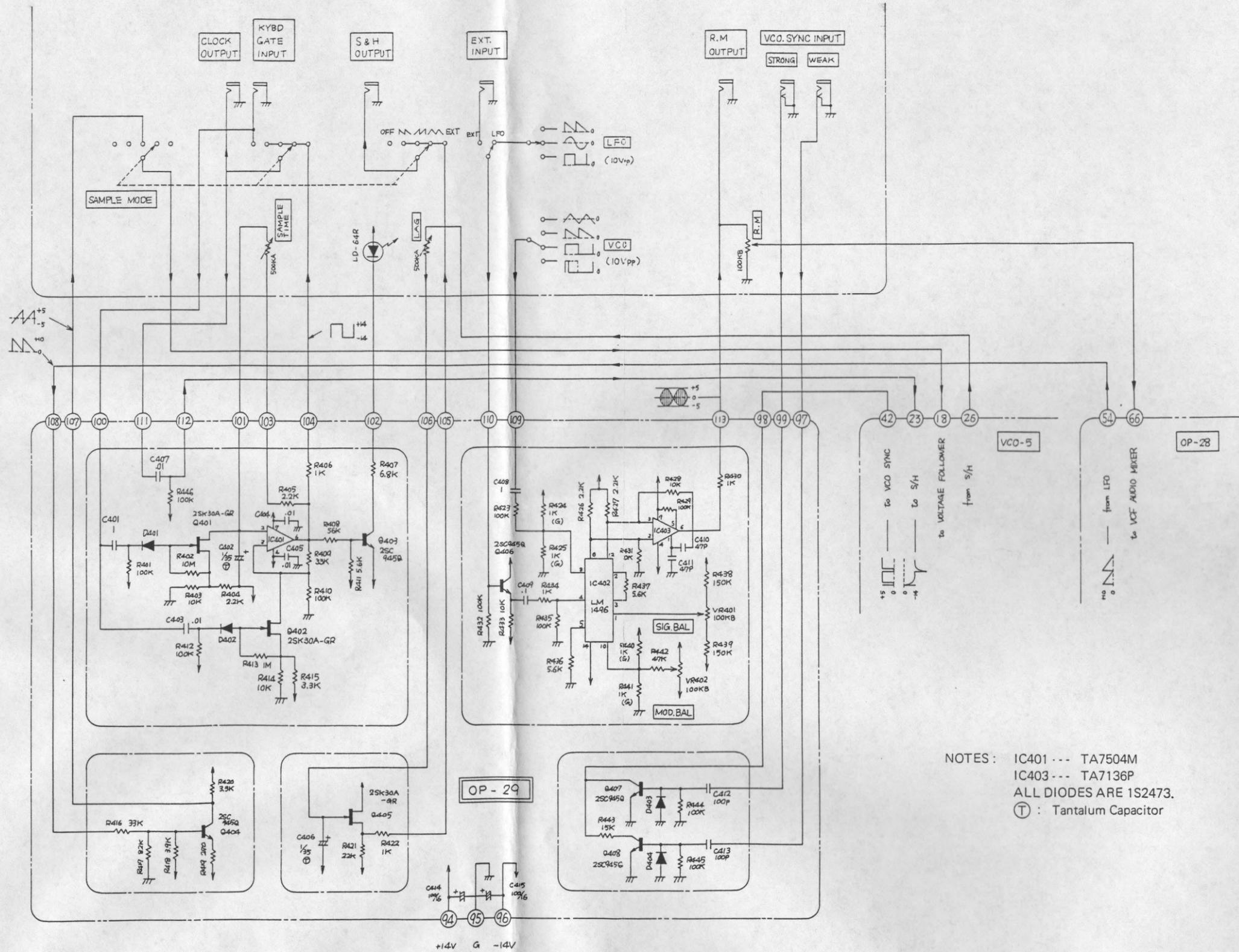
- NOTES: Q315-318 ..... 2SC945Q (SELECTED VCF)  
 Q327, 328, 330, 331 ..... 2SC1000GR (SELECTED hfe)  
 IC301, 302, 304 ..... CA1458G  
 IC303 ..... TA7504M  
 IC305 ..... CA3080 (SELECTED C)  
 IC306 ..... TA7136P

Ⓣ : Tantalum Capacitor  
 ALL DIODES ARE 1S2473  
 UNLESS OTHERWISE SPECIFIED



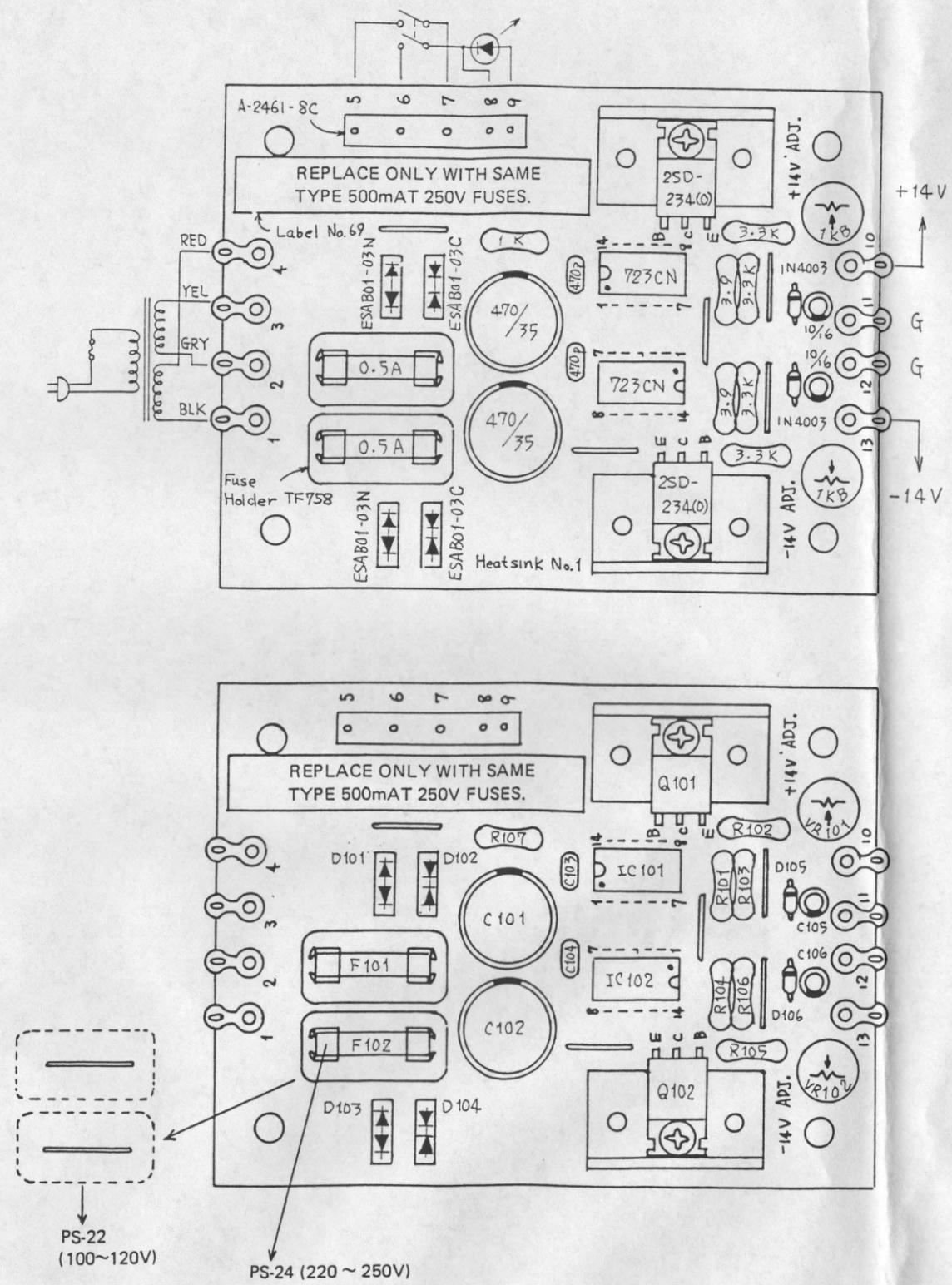


# OP-29 RING BOARD CIRCUIT DIAGRAM

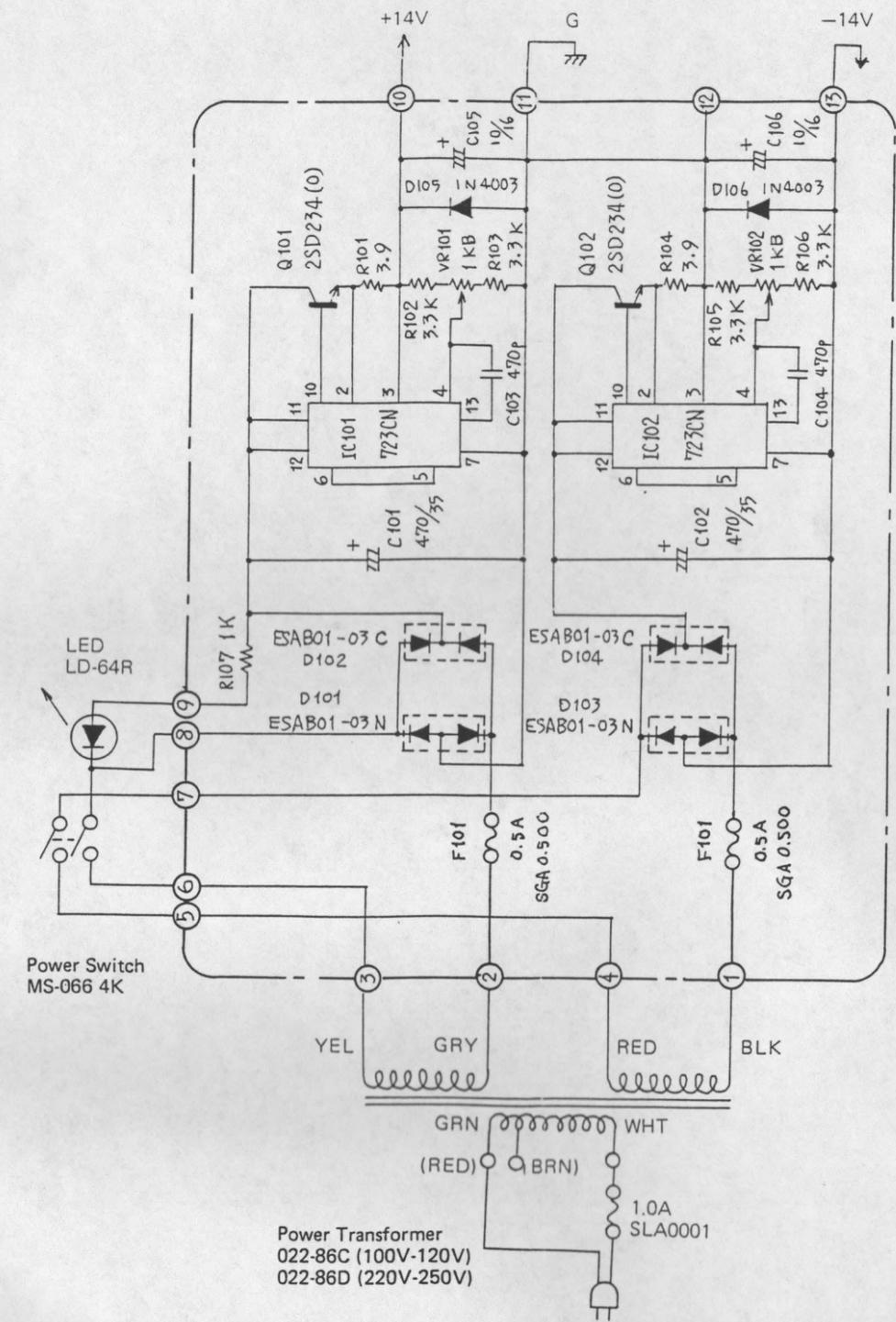


NOTES: IC401 --- TA7504M  
 IC403 --- TA7136P  
 ALL DIODES ARE 1S2473.  
 (T) : Tantalum Capacitor

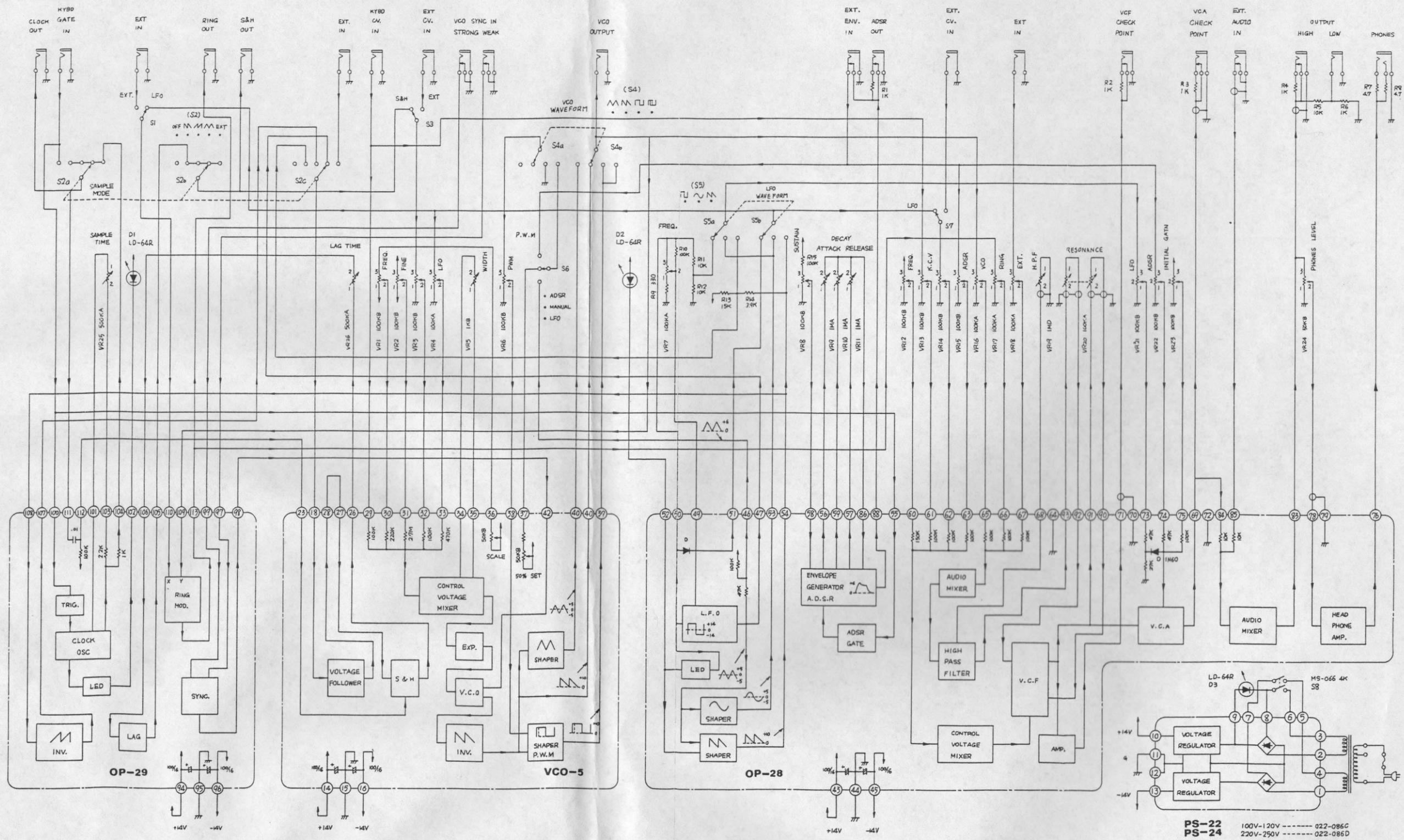
# PS-22 PS-24 Power Supply Board Assy Parts Layout



# Circuit Diagram



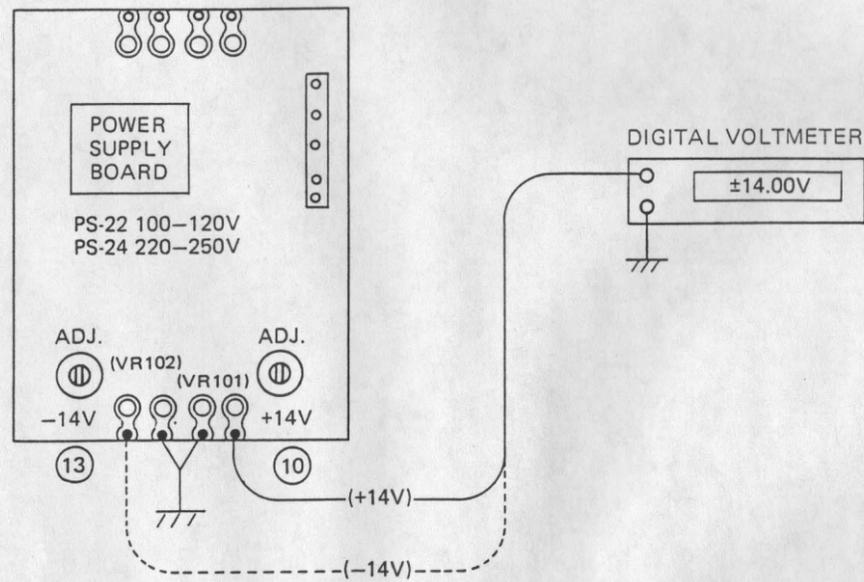
# WIRING DIAGRAM



# SYSTEM 100, MODEL 102 ADJUSTMENT PROCEDURES

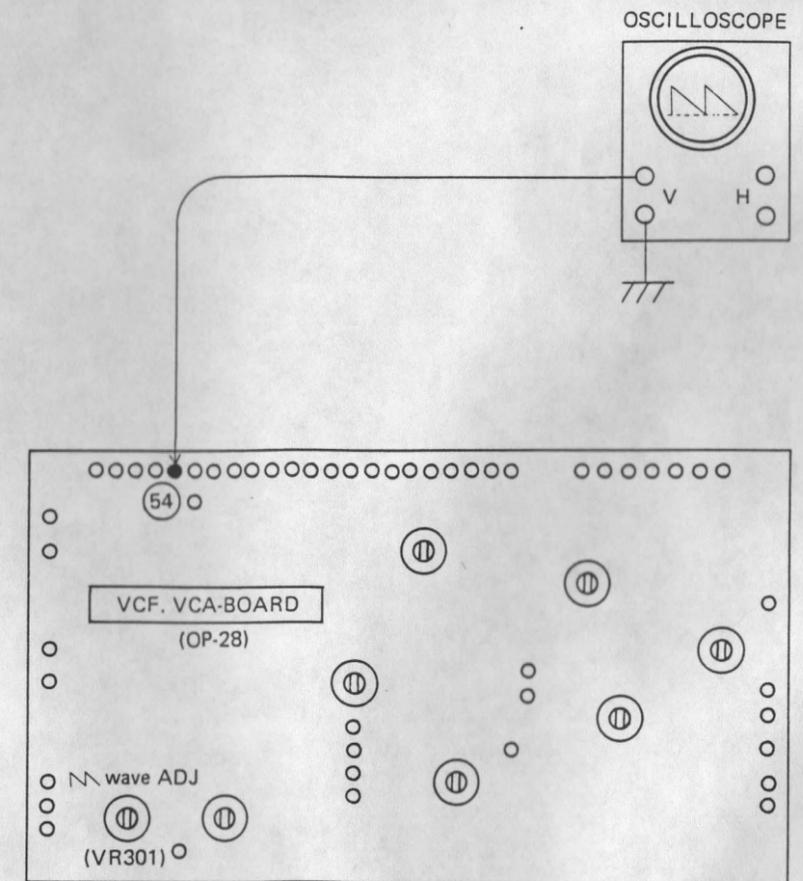
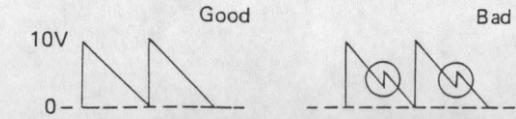
## 1. Power supply Voltage Adjustment:

- a) Connect 2 Digital Voltmeter to Terminal "10" of the Power Circuit Board (PS-22, PS-24), and adjust VR101 (+14V ADJ.) for +14V
- b) Adjust VR102 (-14V ADJ.) for -14V at Terminal "13".
- c) Tolerance:  $14V \pm 100 \text{ mV}$ .
- d) Digital Voltmeter should have:
  - Resolution voltage . . . . . down to DC 10 mV or more
  - Input Impedance . . . . . 1 Mohm or more



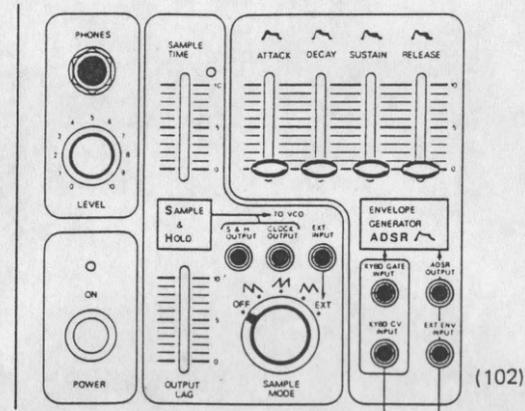
## LFO Waveform Adjustment:

- a) Connect the Oscilloscope to Terminal "54" of the VCF-VCA Board (OP-28), and adjust VR301 (N wave ADJ.) for a Sawtooth wave.

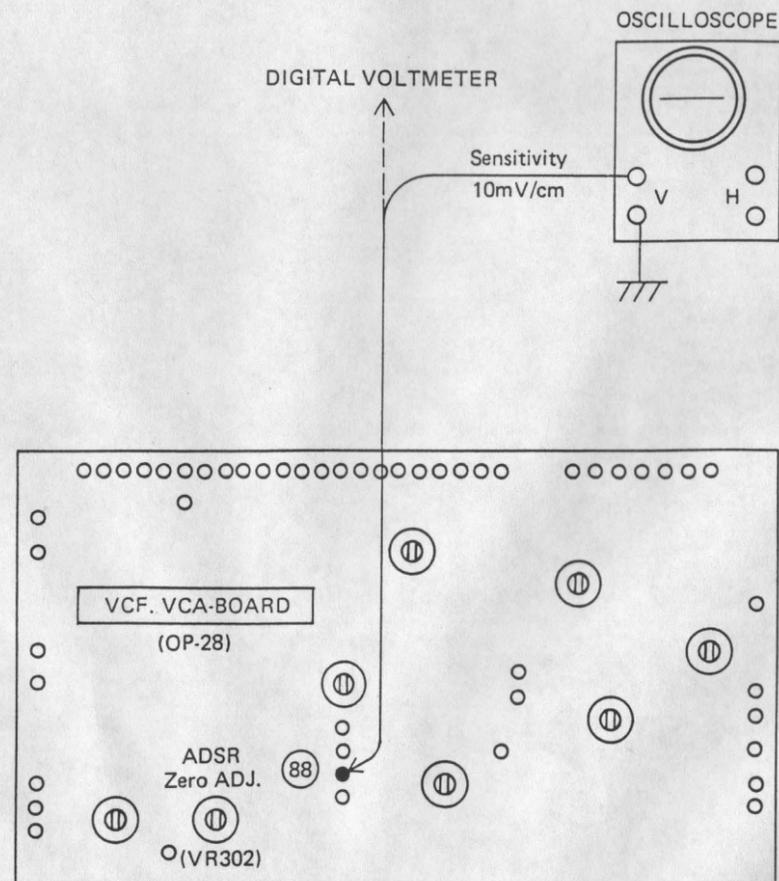


**ADSR Zero Adjustment:**

a) Set the controls of the Control Panel as illustrated below:

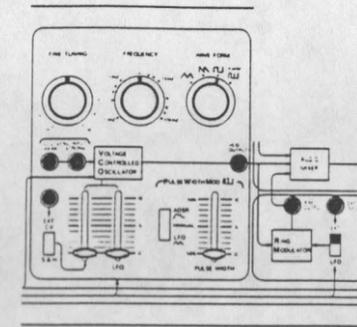


b) Connect an Oscilloscope or Digital Voltmeter to Terminal "88" or the ADSR OUTPUT JACK and adjust VR302 (ADSR Zero ADJ.) for 0V.



**RING MOD Adjustment:**

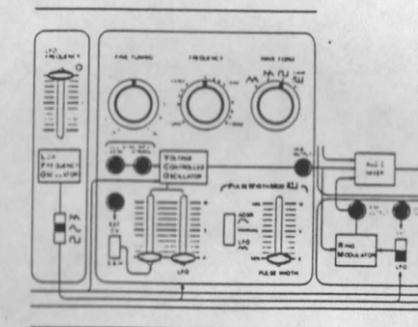
a) Set the controls of the control panel as illustrated below:



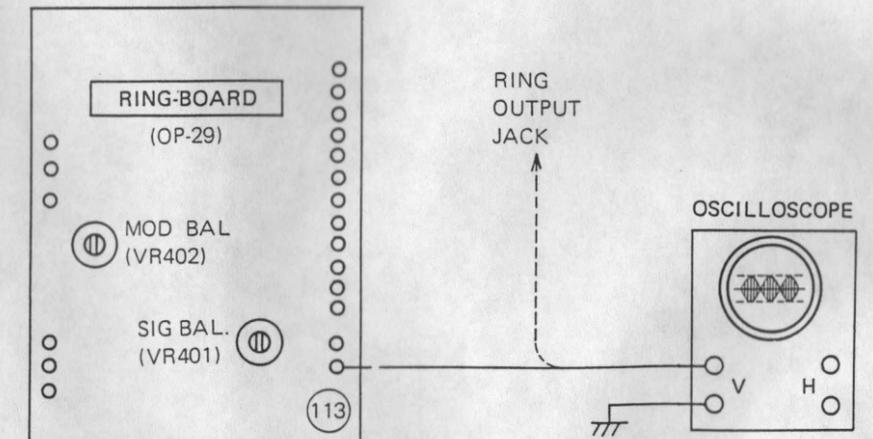
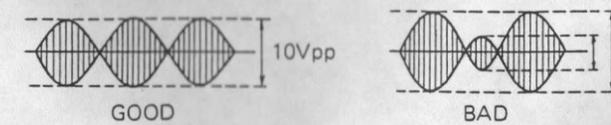
b) Connect the Oscilloscope to terminal "113" or the RING OUTPUT jack and adjust VR-401 (SIG BAL) for minimum output.

c) Allowable voltage limit;..... under 100 mV

d) Reset the controls as illustrated below:



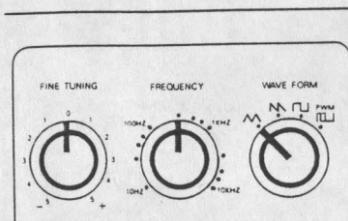
e) Adjust VR-402 (MOD BAL) for uniform waveform and amplitude.



### VCO ADJUSTMENT

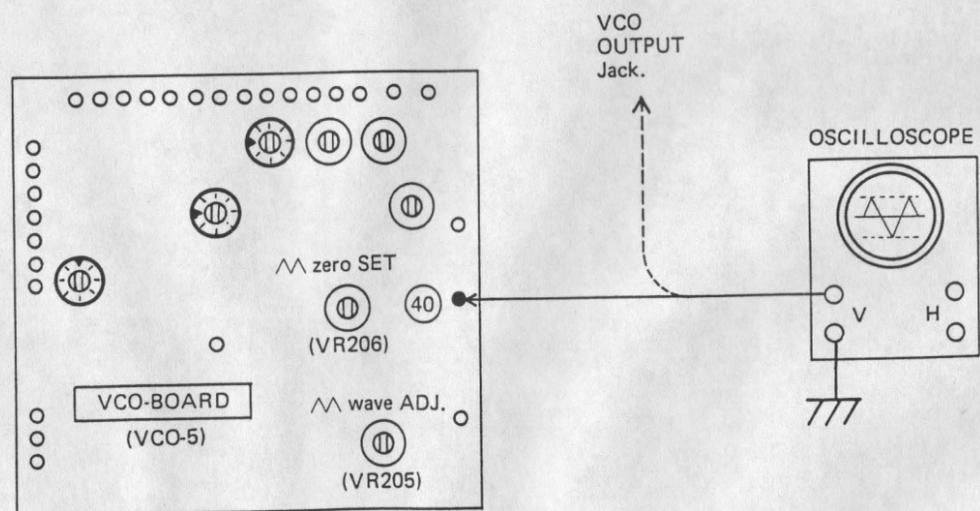
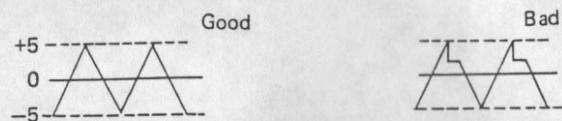
#### 1. Triangular ( $\Delta$ ) Wave Form Adjustment:

a) Set the Control Panel as shown below.



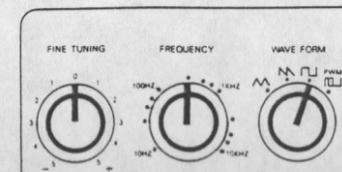
b) Connect the Oscilloscope to Terminal "40" or the VCO OUTPUT JACK, and adjust VR205 (  $\Delta$  WAVE ADJ.) for the triangular waveform.

c) Then, adjust VR206 (  $\Delta$  ZERO SET) so as to balance this output waveform on 0V.



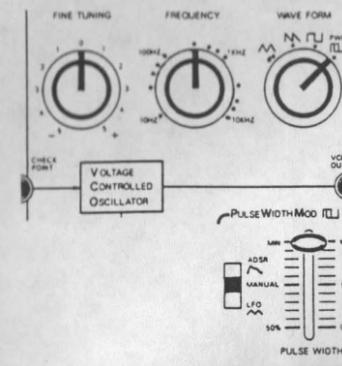
#### 2. Square ( $\square$ ) Wave Adjustment:

a) Set the Control Panel as shown below.



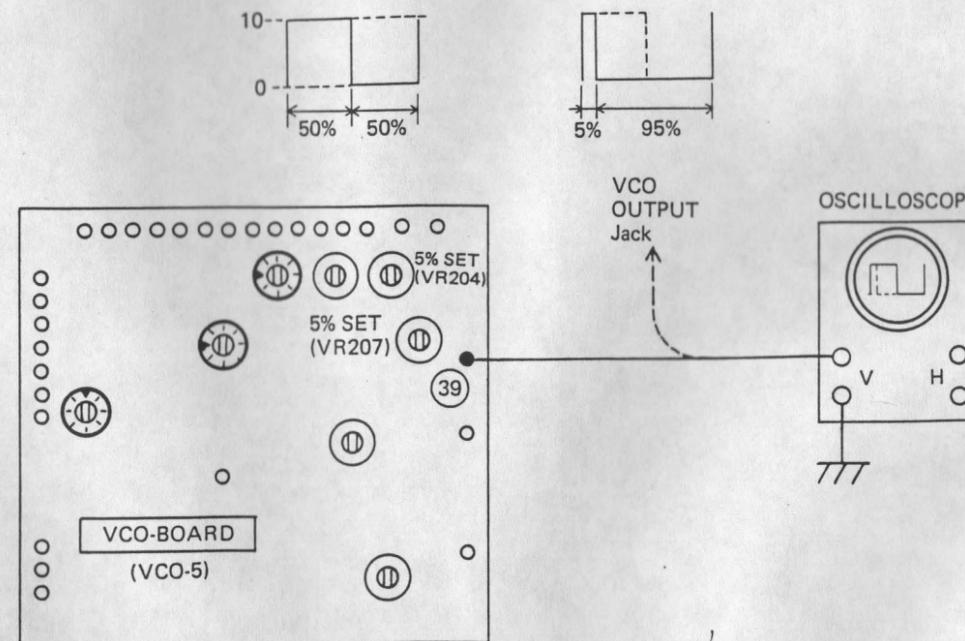
b) Connect the Oscilloscope to Terminal "39" or the VCO OUTPUT JACK on the VCO Board (VCO-5), and adjust VR207 (  $\square$  50% SET) for a 50% - 50% square wave.

c) Re-set the Control Panel as shown below.



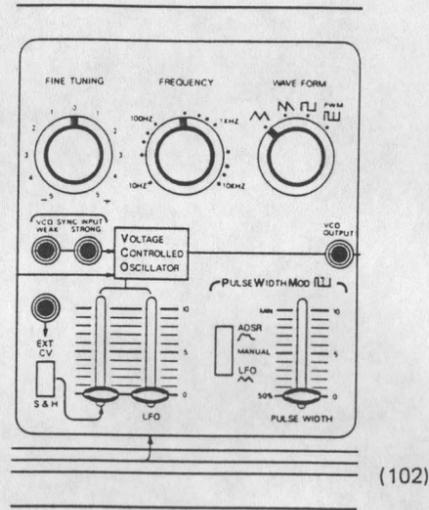
d) With the same connection as in b) above, adjust VR204 (  $\square$  5% SET) for a 5% - 95% square wave.

e) Check that the wave form does not disappear when the front panel FREQUENCY control is turned from 10 Hz to 10 KHz.

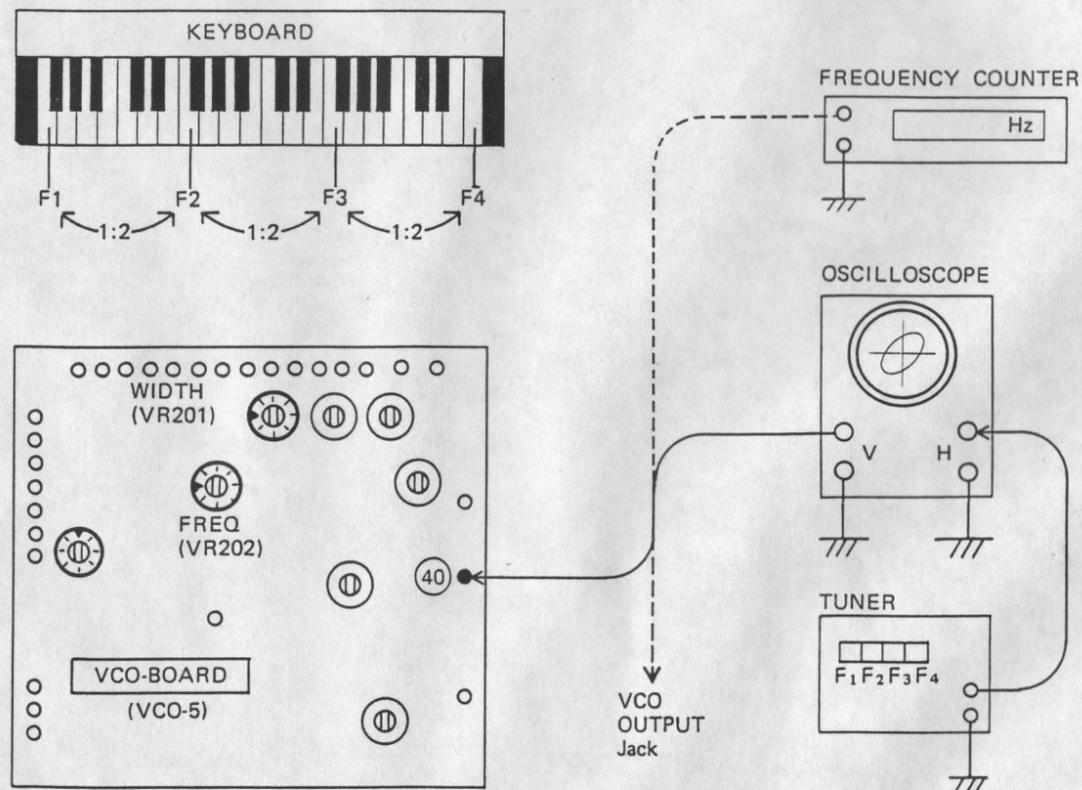


3. VCO WIDTH Adjustment:

a) Set the Control Panel as shown below.

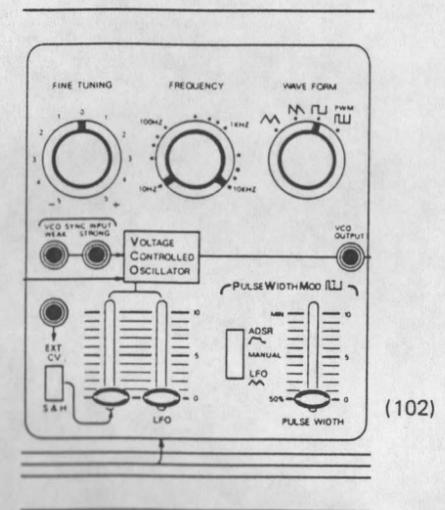


- b) Connect the Oscilloscope or Frequency Counter to Terminal "40" or the VCO OUTPUT JACK, and adjust VR201 (WIDTH) so that the frequency generations on Keys F1, F2, F3, and F4, become all octave relations with each other.
- c) When tuned with a Tuner, use VR202 (FREQ.) for adjustment of the frequency of Key F1.

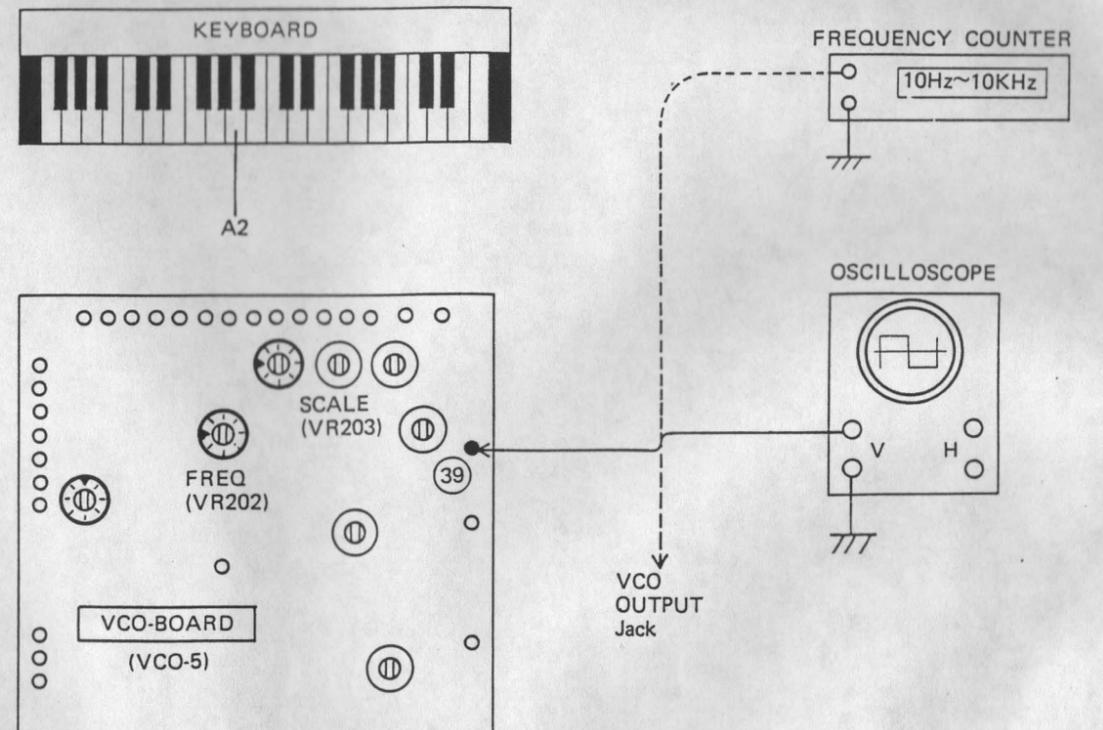


4. VCO FREQ. Adjustment:

a) Set the Control Panel as shown below.



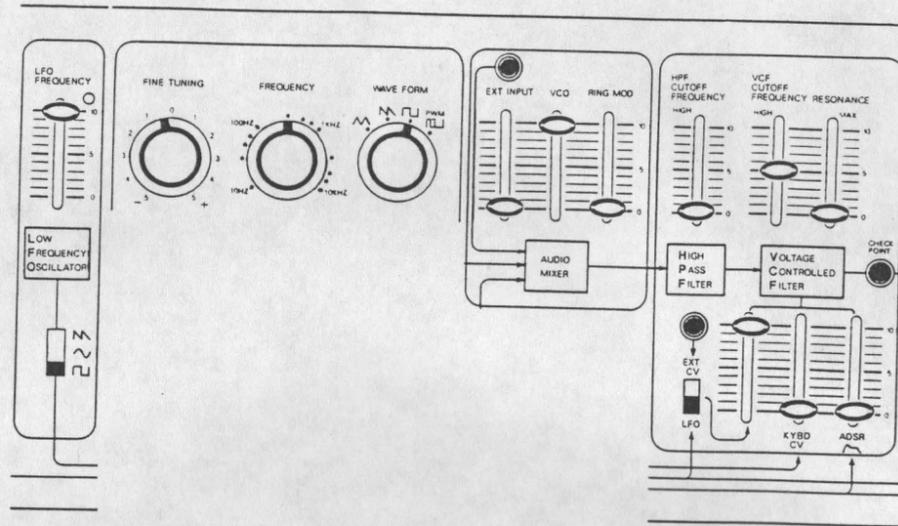
- b) Connect the Oscilloscope or Frequency Counter to Terminal "39" or the VCO OUTPUT JACK. With the front panel FREQUENCY control set at "10Hz", adjust VR202 (FREQ) so that the A2 key on the keyboard produces 10Hz (100ms).
- c) In the same manner, adjust VR203 (SCALE) so as to have 10 KHz (100 μs) when the FREQUENCY control is at "10 KHz".
- d) Repeat the above b) and c) until the frequency output matches the "10 Hz" and "10 KHz" indications)



## VCF ADJUSTMENT

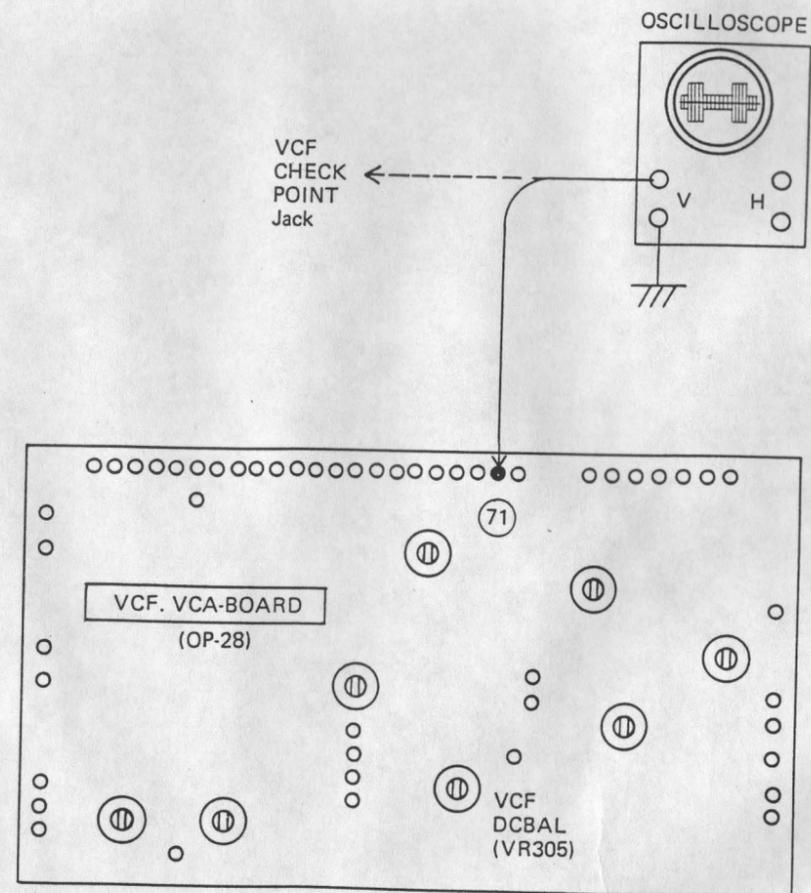
### 1. VCF DC BAL Adjustment:

a) Set the Control Panel as shown below.



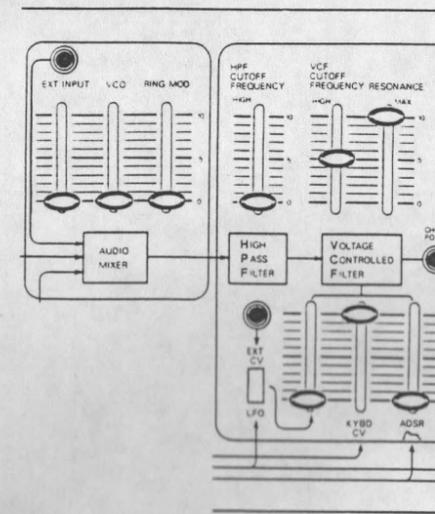
b) Connect the Oscilloscope to Terminal "71" or the VCF CHECK POINT JACK on the VCF VCA Board, and adjust VR305 (VCF DC BAL) so the output waveform is symmetrical.

c) Check that waveform remains balanced when the CUTOFF-FREQ. control is moved between 10 and 0.



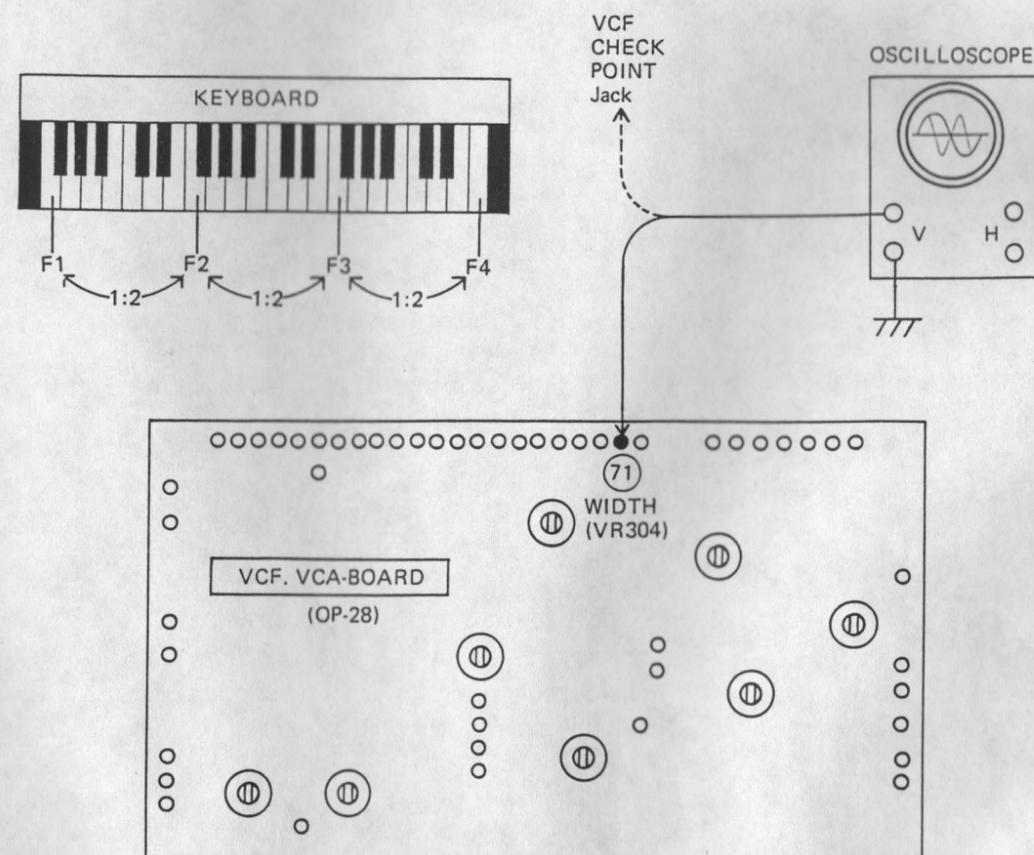
### 2. VCF WIDTH Adjustment:

a) Set the Control Panel as shown below.



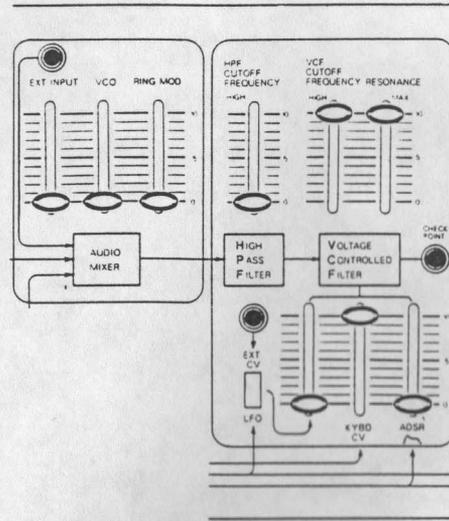
b) Connect the Oscilloscope to Terminal "71" or the VCF CHECK POINT JACK, and adjust VR304 (WIDTH) so that the frequency generations of Keys F1, F2, F3, and F4, are all in octave relationships with each other.

d) Check that such octave relations remain the same when the front panel CUTOFF FREQ. control is moved between 10 and 0.



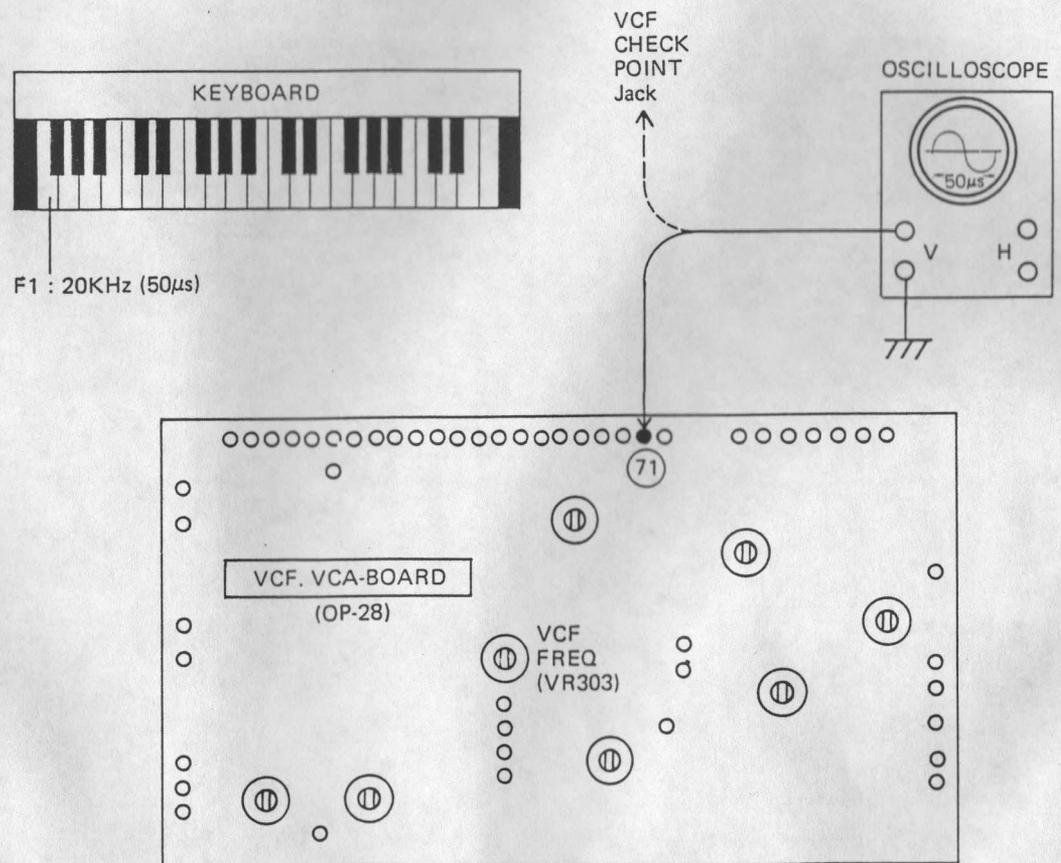
### 3. VCF FREQ. Adjustment:

a) Set the Control Panel as shown below.



b) Connect the Oscilloscope to Terminal "71" or the VCF CHECK POINT JACK on the VCF-VCA Board (OP-28), and adjust VR303 (VCF-FREQ.) so the frequency produced by Key F1 is 20 KHz (50  $\mu$ s)

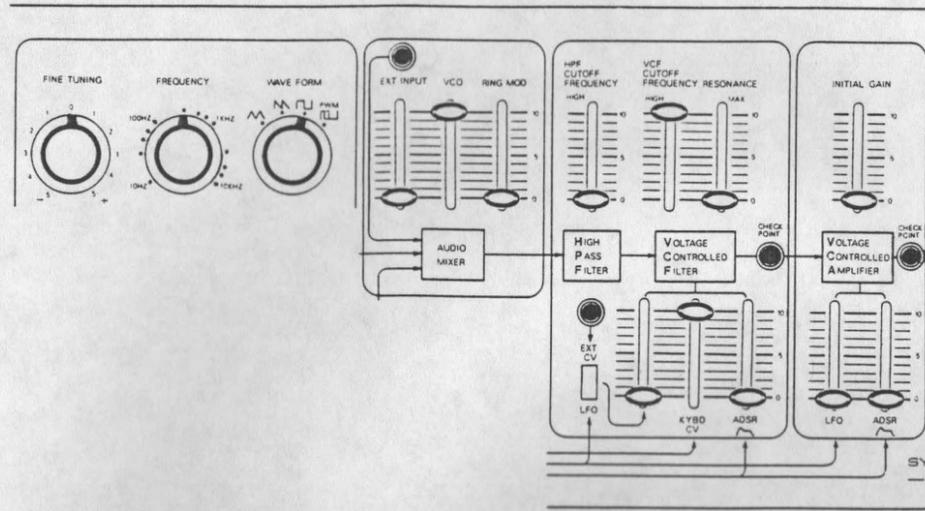
c) Adjustment as above may sometimes disturb the VCF WIDTH Adjustment as done in (2) above. Repeat, therefore, both adjustments of (2) and (3) until both WIDTH and FREQ. are correct.



## VCA ADJUSTMENT

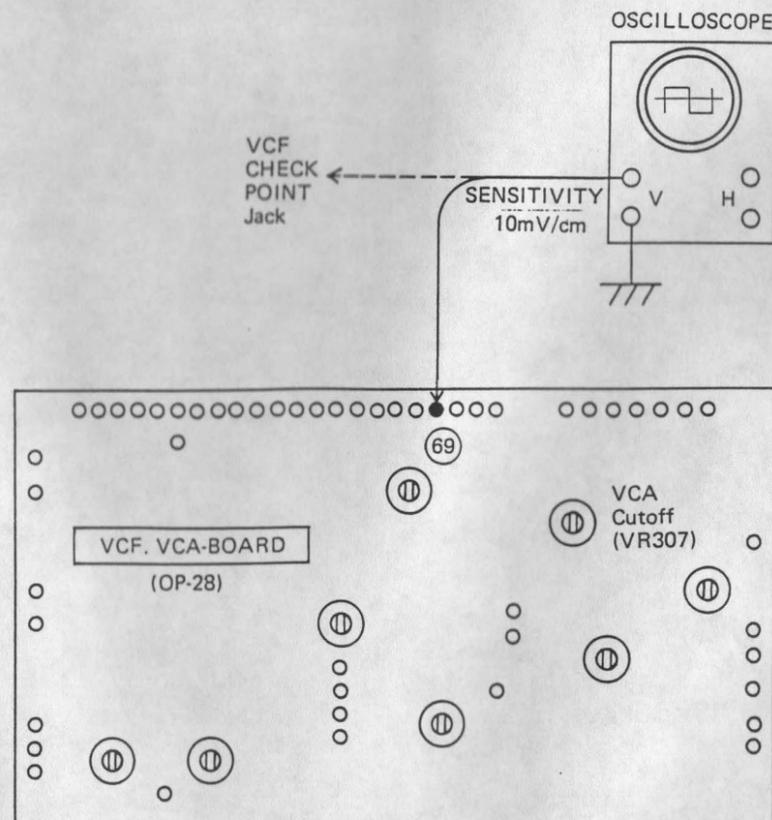
### 1. VCA CUTOFF Adjustment:

a) Set the Control Panel as shown below.



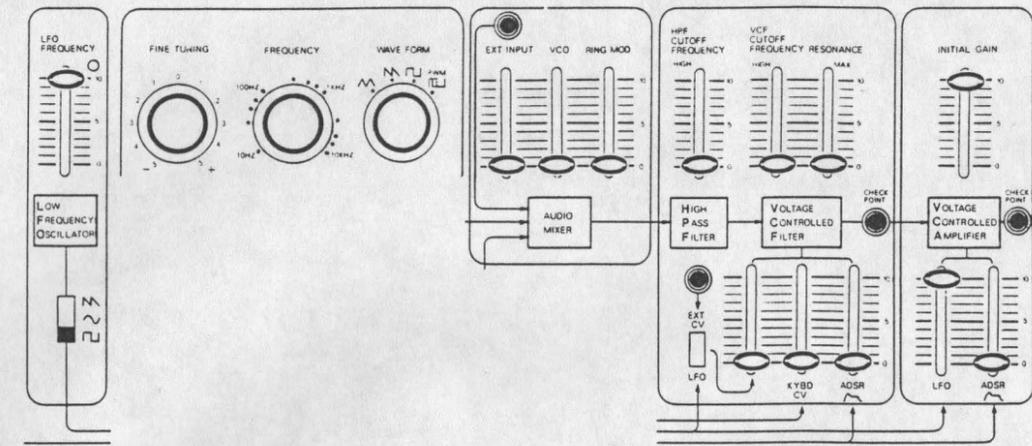
b) Connect the Oscilloscope to Terminal "69" or the VCA CHECK POINT JACK on the VCF VCA Board (OP-28), and set VR307 (VCA CUTOFF) at the point where the output wave form just disappears.

c) Check that, when the INITIAL GAIN on the Control Panel is moved to "10", the output voltage is within 2 - 3 Vp-p.

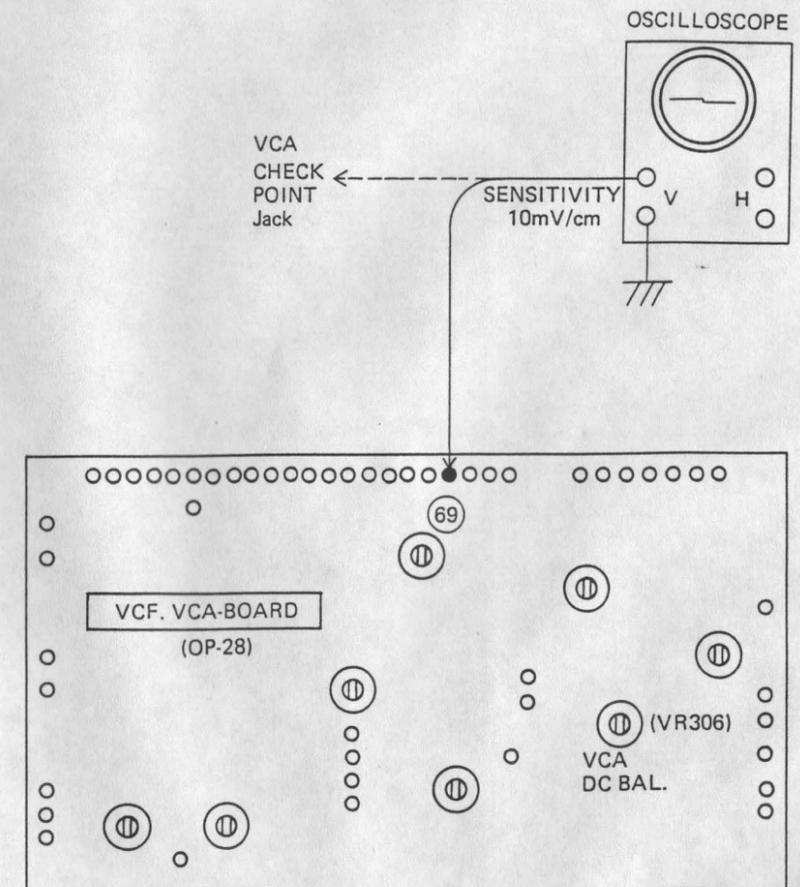


### 2. VCA DC BAL Adjustment:

a) Set the Control Panel as shown below.



b) Connect the Oscilloscope to Terminal "69" or VCA CHECK POINT JACK on the VCF VCA Board (OP-28), and adjust VR306 (VCA DC BAL) for minimum "click" at the output.



### SYSTEM-100 MODEL-102 PARTS LIST

#### VCO-5 VCO Board Assembly (152-005)

052-134C Printed Circuit Board No. 134C				
020-025	IC	CA3130		
020-024	IC	301AH		
020-052	IC	CA1458G		
020-010	IC	TA7504M		
020-032	IC	$\mu$ A726		
017-013	Transistor	2SC945 (Q)		
017-012	Transistor	2SA733 (Q)		
017-016	FET	2SK30A (GR)		
017-036	FET	E412 (17S30546)		
018-014	Diode	1S2473		
028-006	Trimmer Potentiometer	50K $\Omega$ (B)	EVL-R4XA0054B	
028-007	Trimmer Potentiometer	100K $\Omega$ (B)	EVL-R4XA0015B	
029-108	Trimmer Potentiometer	50K $\Omega$ (B)	PNB-04C3A-503H	
029-109	Trimmer Potentiometer	100K $\Omega$ (B)	PNB-04C3A-104H	
044-025	Resistor	100 $\Omega$	1/4W $\pm$ 5%	
044-031	Resistor	330 $\Omega$	1/4W $\pm$ 5%	
044-037	Resistor	1K $\Omega$	1/4W $\pm$ 5%	
044-041	Resistor	2.7K $\Omega$	1/4W $\pm$ 5%	
044-042	Resistor	3.3K $\Omega$	1/4W $\pm$ 5%	
044-047	Resistor	8.2K $\Omega$	1/4W $\pm$ 5%	
044-048	Resistor	10K $\Omega$	1/4W $\pm$ 5%	
044-050	Resistor	15K $\Omega$	1/4W $\pm$ 5%	
044-052	Resistor	22K $\Omega$	1/4W $\pm$ 5%	
044-054	Resistor	33K $\Omega$	1/4W $\pm$ 5%	
044-055	Resistor	39K $\Omega$	1/4W $\pm$ 5%	
044-057	Resistor	56K $\Omega$	1/4W $\pm$ 5%	
044-058	Resistor	68K $\Omega$	1/4W $\pm$ 5%	
044-060	Resistor	100K $\Omega$	1/4W $\pm$ 5%	
044-082	Resistor	200K $\Omega$	1/4W $\pm$ 5%	
044-064	Resistor	220K $\Omega$	1/4W $\pm$ 5%	
044-066	Resistor	330K $\Omega$	1/4W $\pm$ 5%	
044-068	Resistor	470K $\Omega$	1/4W $\pm$ 5%	
044-072	Resistor	1M $\Omega$	1/4W $\pm$ 5%	
044-167	Resistor	2.7M $\Omega$	1/2W $\pm$ 10%	
044-599	Resistor	10M $\Omega$	1/2W $\pm$ 10%	
044-829	Resistor	820 $\Omega$	CRB-1/4FX $\pm$ 10%	
044-840	Resistor	22K $\Omega$	CRB-1/4FX $\pm$ 10%	
044-845	Resistor	82K $\Omega$	CRB-1/4FX $\pm$ 10%	
044-846	Resistor	100K $\Omega$	CRB-1/4FX $\pm$ 10%	
044-847	Resistor	120K $\Omega$	CRB-1/4FX $\pm$ 10%	
037-001	Capacitor	10pF	50V $\pm$ 10%	Ceramic
037-006	Capacitor	100pF	50V $\pm$ 10%	Ceramic
035-005	Capacitor	0.001 $\mu$ F	50V $\pm$ 10%	Mylar
035-016	Capacitor	0.01 $\mu$ F	50V $\pm$ 10%	Mylar
035-026	Capacitor	0.068 $\mu$ F	50V $\pm$ 10%	Mylar
035-028	Capacitor	0.1 $\mu$ F	50V $\pm$ 10%	Mylar
035-137	Capacitor	1000pF	100V $\pm$ 10%	Polystyrene
032-033	Capacitor	10 $\mu$ F	16V $\pm$	Electrolytic
032-037	Capacitor	100 $\mu$ F	16V $\pm$	Electrolytic

#### OP-28 VCF-VCA Board Assembly (149-028)

05 052-135A Printed Circuit Board No. 135A				
020-052	IC	CA1458G		
020-015	IC	CA3080		Selected VCA
020-010	IC	TA7504M		
020-027	IC	TA7136P		
020-021	IC	ITS1276		
017-013	Transistor	2SC945 (Q)		
017-047	Transistor	2SC945 (Q)		Selected VCF
017-003	Transistor	2SC1000 (GR)		
017-048	Transistor	2SC1000 (GR)		Selected hfe
017-012	Transistor	2SA733 (Q)		
017-014	FET	2SK30A (Y)		
017-018	PUT	N13T1		
018-014	Diode	1S2473		
018-027	Diode	1N60		
022-077	Output Transformer	ST-31		
028-002	Trimmer Potentiometer	1K $\Omega$ (B)	EVL-R4XA0013B	
028-004	Trimmer Potentiometer	10K $\Omega$ (B)	EVL-R4XA0014B	
028-007	Trimmer Potentiometer	100K $\Omega$ (B)	EVL-R4XA0015B	
044-025	Resistor	100 $\Omega$	1/4W $\pm$ 5%	
044-027	Resistor	150 $\Omega$	1/4W $\pm$ 5%	
044-035	Resistor	680 $\Omega$	1/4W $\pm$ 5%	
044-037	Resistor	1K $\Omega$	1/4W $\pm$ 5%	
044-038	Resistor	1.5K $\Omega$	1/4W $\pm$ 5%	
044-039	Resistor	1.8K $\Omega$	1/4W $\pm$ 5%	
044-040	Resistor	2.2K $\Omega$	1/4W $\pm$ 5%	
044-042	Resistor	3.3K $\Omega$	1/4W $\pm$ 5%	
044-044	Resistor	4.7K $\Omega$	1/4W $\pm$ 5%	
044-045	Resistor	5.6K $\Omega$	1/4W $\pm$ 5%	
044-046	Resistor	6.8K $\Omega$	1/4W $\pm$ 5%	
044-048	Resistor	10K $\Omega$	1/4W $\pm$ 5%	
044-050	Resistor	15K $\Omega$	1/4W $\pm$ 5%	
044-052	Resistor	22K $\Omega$	1/4W $\pm$ 5%	
044-053	Resistor	27K $\Omega$	1/4W $\pm$ 5%	
044-054	Resistor	33K $\Omega$	1/4W $\pm$ 5%	
044-056	Resistor	47K $\Omega$	1/4W $\pm$ 5%	
044-057	Resistor	56K $\Omega$	1/4W $\pm$ 5%	
044-059	Resistor	82K $\Omega$	1/4W $\pm$ 5%	
044-060	Resistor	100K $\Omega$	1/4W $\pm$ 5%	
044-062	Resistor	150K $\Omega$	1/4W $\pm$ 5%	
044-064	Resistor	220K $\Omega$	1/4W $\pm$ 5%	
044-065	Resistor	270K $\Omega$	1/4W $\pm$ 5%	
044-068	Resistor	470K $\Omega$	1/4W $\pm$ 5%	
044-072	Resistor	1M $\Omega$	1/4W $\pm$ 5%	
044-166	Resistor	2.2M $\Omega$	1/2W $\pm$ 10%	
037-002	Capacitor	15pF	50V $\pm$ 10%	Ceramic
037-005	Capacitor	47pF	50V $\pm$ 10%	Ceramic
037-007	Capacitor	250pF	50V $\pm$ 10%	Mylar
035-001	Capacitor	0.001 $\mu$ F	50V $\pm$ 10%	Mylar
035-016	Capacitor	0.01 $\mu$ F	50V $\pm$ 10%	Mylar
035-018	Capacitor	0.015 $\mu$ F	50V $\pm$ 10%	Mylar
035-026	Capacitor	0.068 $\mu$ F	50V $\pm$ 10%	Mylar
035-028	Capacitor	0.1 $\mu$ F	50V $\pm$ 10%	Mylar

032-099	Capacitor	1 $\mu$ F	35V	$\pm 40\%$	Tantalum
032-107	Capacitor	3.3 $\mu$ F	25V	$\pm 10\%$	Tantalum
032-071	Capacitor	1 $\mu$ F	50V		Electrolytic
032-033	Capacitor	10 $\mu$ F	16V		Electrolytic
032-036	Capacitor	47 $\mu$ F	16V		Electrolytic
032-037	Capacitor	10 $\mu$ F	16V		Non Polarized

OP-29 Ring Board Assembly (149-029)

052-136A	Printed Circuit Board No. 136A				
020-026	IC	LM1496			
020-010	IC	TA7504M			
020-027	IC	TA7136P			
017-013	Transistor	2SC945 (Q)			
017-014	FET	2SK30A (GR)			
018-014	Diode	1S2473			
028-007	Trimmer Potentiometer	100K $\Omega$ (B)	EVL-R4XA0015B		
044-030	Resistor	270 $\Omega$	1/4W	$\pm 5\%$	
044-037	Resistor	1K $\Omega$	1/4W	$\pm 5\%$	
044-040	Resistor	2.2K $\Omega$	1/4W	$\pm 5\%$	
044-042	Resistor	3.3K $\Omega$	1/4W	$\pm 5\%$	
044-043	Resistor	3.9K $\Omega$	1/4W	$\pm 5\%$	
044-045	Resistor	5.6K $\Omega$	1/4W	$\pm 5\%$	
044-046	Resistor	6.8K $\Omega$	1/4W	$\pm 5\%$	
044-048	Resistor	10K $\Omega$	1/4W	$\pm 5\%$	
044-049	Resistor	15K $\Omega$	1/4W	$\pm 5\%$	
044-052	Resistor	22K $\Omega$	1/4W	$\pm 5\%$	
044-054	Resistor	33K $\Omega$	1/4W	$\pm 5\%$	
044-056	Resistor	47K $\Omega$	1/4W	$\pm 5\%$	
044-057	Resistor	56K $\Omega$	1/4W	$\pm 5\%$	
044-059	Resistor	82K $\Omega$	1/4W	$\pm 5\%$	
044-060	Resistor	100K $\Omega$	1/4W	$\pm 5\%$	
044-062	Resistor	150K $\Omega$	1/4W	$\pm 5\%$	
044-072	Resistor	1M $\Omega$	1/4W	$\pm 5\%$	
044-737	Resistor	1K $\Omega$	1/4W	$\pm 2\%$	
044-599	Resistor	10M $\Omega$	1/2W	$\pm 10\%$	
037-005	Capacitor	47pF	50V	$\pm 10\%$	Ceramic
037-006	Capacitor	100pF	50V	$\pm 10\%$	Ceramic
035-016	Capacitor	0.01 $\mu$ F	50V	$\pm 10\%$	Mylar
035-028	Capacitor	0.1 $\mu$ F	50V	$\pm 10\%$	Mylar
032-099	Capacitor	1 $\mu$ F	35V	$\pm 10\%$	Tantalum

PS-22 Power Supply Board Assembly (146-022) 100V-120V

PS-24 Power Supply Board Assembly (146-024) 220V-250V

052-133B	Printed Circuit Board No. 133B				
048-001	Heatsink	No.1			
020-031	IC	723CN			
017-010	Transistor	2SD234 (O)			
018-028	Diode	ESA-B01-03C			
018-029	Diode	ESA-B01-03N			
018-022	Diode	1N4003			

028-002	Trimmer Potentiometer		1K $\Omega$ (B)		EVL-R4XA0013B
044-008	Resistor	3.9 $\Omega$	1/4W	$\pm 5\%$	
044-037	Resistor	1K $\Omega$	1/4W	$\pm 5\%$	
044-042	Resistor	3.3K $\Omega$	1/4W	$\pm 5\%$	
037-008	Capacitor	470pF	50V	$\pm 10\%$	Ceramic
032-033	Capacitor	10 $\mu$ F	16V	$\pm 10\%$	Electrolytic
032-068	Capacitor	470 $\mu$ F	35V		Electrolytic
010-038	Wafer Terminal	A-2461-8C			

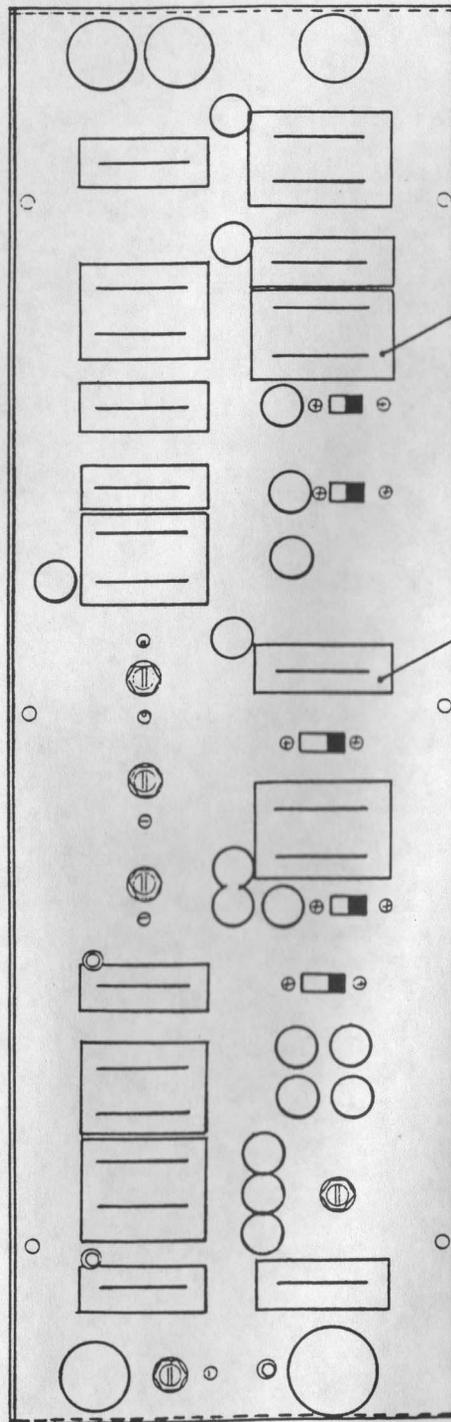
PS-24 Only

012-003	Fuse Holder	TF-758			
008-024	Fuse (Midget)	0.5A	SGA 0.500		
076-069	Label No.69				

Control Panel Assembly

010-010	Housing Receptacle		A-2139-8		
042-015	Pin Terminal		2578T		
044-009	Resistor	4.7 $\Omega$	1/4W	$\pm 5\%$	
044-031	Resistor	330 $\Omega$	1/4W	$\pm 5\%$	
044-037	Resistor	1K $\Omega$	1/4W	$\pm 5\%$	
044-043	Resistor	3.9K $\Omega$	1/4W	$\pm 5\%$	
044-048	Resistor	10K $\Omega$	1/4W	$\pm 5\%$	
044-050	Resistor	15K $\Omega$	1/4W	$\pm 5\%$	
044-060	Resistor	100K $\Omega$	1/4W	$\pm 5\%$	





Cover No. 67  
(065-067)

Cover No. 66  
(065-066)

