YAMAHA

Solo Synthesizer

SY-1

SERVICE MANUAL

NIPPON GAKKI CO., LTD.
Hamamatsu, Japan
SINCE 1887

SY-1 Service Manual Contents

SY-1 SPECIFICATIONS

KEY BOARD 37 keys $c \sim c_3$ (3 octaves)
(Technical Keys) ($c_2 \sim c_5$)

PRESET TONE LEVERS

- Side I
  - Flute
  - Trombone
  - Trumpet
  - Saxophone
  - Oboe
  - Bow Violin
  - Piano
  - Harpsichord
  - Contrabass
  - Tuba
  - Bass Guitar
  - Funny
  - Trumute
  - Double
- Side II
  - Clarinet
  - Bassoon
  - French Horn
  - Bass Clannet
  - English Horn
  - Pizzicato Violin
  - Guitar
  - Hawaiian Guitar
  - Pizzicato Bass
  - Sousaphone
  - Wah Guitar
  - Pulsar
  - Growlpet
  - Reed
- Side I /Side II Selector

FILTER CONTROLS

- Preset/Control Selector
- Cutoff Frequency
- Resonance

ENVELOPE CONTROLS

- Preset/Control Selector
- Attack
- Sustain

VIBRATO CONTROLS

- Preset/Control Selector
- Speed
- Depth

TRANSPOSITION LEVERS

- One Octave Down
- Normal
- One Octave Up
- Two Octaves Up

TOUCH CONTROLS

- Vibrato Depth (On/Off)
- Wah-Wah (On/Off)
- Volume (On/Off)
- Sensitivity

ATTACK BEND CONTROLS

- Pitch (On/Off)
- Tone (On/Off)
- Intensity (Tone)
- Time (Tone)

PORTAMENTO CONTROLS

- On/Off Selector
- Time

PULSE WIDTH CONTROLS

- Preset/Control Selector
- Width

OTHER CONTROLS

- Tune
- Master Volume

OTHER FITTINGS

- Outputs
  - Expression Jack
  - Non-Expression Jack
  - Expression/Non-Expression Switch
  - Telephone Jack
- Power Switch
- Pilot Lamp
- Foot Controller
  - Jack
  - Volume
  - VCF
- Music Rest
- Height-Adjustable Rear Legs

CIRCUITRY

- Solid State
- Power Consumption: 20 Watts
- Power Source: AC, 50/60Hz

DIMENSIONS

Width:	78cm (30 ¾")
Depth:	28cm (11")
Height:	16.5cm(6 ½")

WEIGHT 12kg (26 lbs.)

FINISH American Walnut Grain

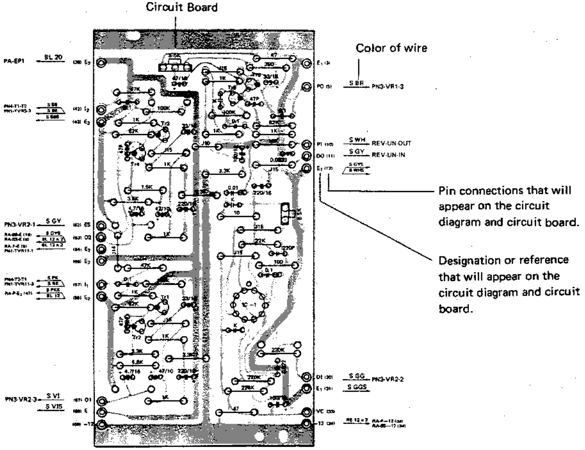
OPTIONAL ACCESSORIES

- Stand
- Foot Pedal
- Carrying Case

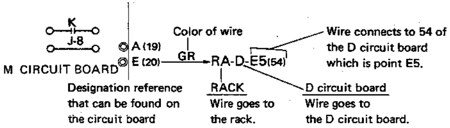
Coding Guide

WIRING FOR EXPLANATION PURPOSES.

DF CIRCUIT BOARD AND WIRING



This coding states that a green wire is connected to pin 20, which is point E of the M circuit board. The other end of the wire is connected to pin 54, which is point E5 of the D circuit board, physically located on the Rack.



NOTE: ABBREVIATIONS OF WIRE COLOR IN ELECTONE

BL	BLACK	BR	BROWN	RE	RED	OR	ORANGE
YE	YELLOW	GR	GREEN	BE	BLUE	VI	VIOLET
GY	GRAY	WH	WHITE	GG	GRASS GREEN	SB	SKY BLUE
PK	PINK	TR	TRANSPARENT	TP	TIN PLATED WIRE		

Technical Information

1. Basic Synthesizer Theory

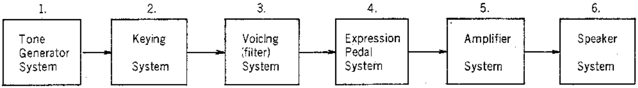
A "synthesizer" is an electronic instrument which utilizes changes in voltage to effect changes in tone color (waveforms), intervals (frequency) and volume (amplitude), permitting the player to freely create desired sounds.

First of all we must set forth certain basic terms which clarify how synthesizer principles compare to the basics of previous electronic musical instruments.

Previous electronic musical instruments created tone color in the following two ways, for the most part.

1) Composite Voicing (harmonic synthesis)
2) Format (filter) Voicing

The system is outlined in the following block diagram :



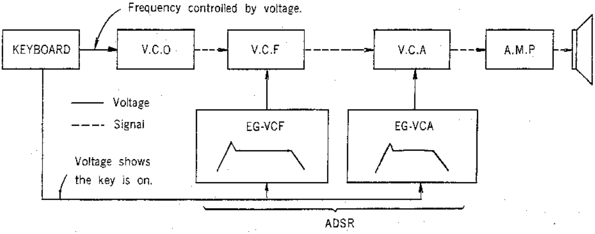
(1) The tone generator system produces all the signals (notes) used in the organ.

(2) The keying system controls the signals through electronic gates operated by the keys on the keyboards.

(3) The voicing system shapes the signals to represent various instruments or voices. The organist selects which voice he wants the signals to represent by operating tabs or tone levers on the control panel.

(4), (5), (6) These operate in the same way in the synthesizer system.

The diagram below illustrates the basic construction of the synthesizer system :

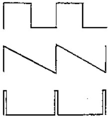


(1) VCO (Voltage-Controlled Oscillator)

The VCO is an oscillator which creates waveforms by using voltage to control oscillation frequency. In most cases the waveform is a complicated one, incorporating many short, sawtooth and pulse wave formations.

In addition to the voltage from the keyboard, other voltages can also be fed to the VCO, from other oscillators.

In the case of ultra-low frequency sine waves, a vibrato effct is created. On the other hand, the addition of square waveforms, depending upon the voltage, creates "poo-pi-poo-pi" and other types of sounds.



(2) VCF (Voltage-Controlled Filter)

This is a tone color circuit which adjusts the filter performance according to voltage.

The VCF changes the tone color (waveform) of voice signals sent from the VOC by adjusting the cut-off frequency and resonance according to changes in voltage.

Previous electronic organ tone color circuits worked by first using input signals in chords, with no other way to adjust except by using filters. In the synthesizer, voltage controls the operation of filters which can work wjth individual tones ; in this way a filter circuit which can decide the output wave with fixed harmonics regardless of key is created.

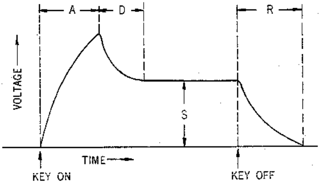
(3) VCA (Voltage-Controlled Amplifier)

This circuit used voltage to control the degree of amplification.

The voltage works here to adjust changes in the rise and attenuation of signals coming from the VCF, as well as affecting attack and sustain effects.

(4) ADSR (Attack, Delay, Sustain, Release)

The conventional ADSR circuit changes the envelope in the following way, feeding the envelope to the VCF and VCO to change tone color and volume. In the Yamaha system, however, this part is already reduced, making use of EG-VFC and EG-VCA circuits.



A : ATTACK TIME

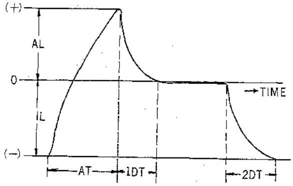
D : DELAY TIME

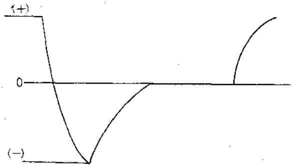
S : SUSTAIN

R : RELEAS

(5) EG-VCF (Envelope Generator VCF)

In the Yamaha synthesizer the ADSR is designed on the basis of the EG-VCF envelope, as the figure below illustrates.





This envelope exists to create tone color changes while assuring tone color stability throughout the interval that a key is held down (except for rising and falling). For this purpose, the key On condition is taken as 0 standard basis and the envelope revolves around this standard as its center.

The EG-VCF can change or adjust the following items within the envelope waveform :

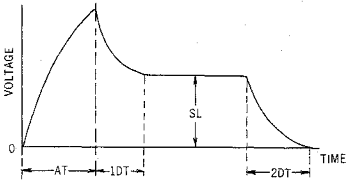
AL : Attack Level	IL : Initial Level
1DT : First Decay Time	2DT : Second Decay Time

Consequently, the VCF can also provide changes in tone color during voice signal rise and fall, according to changes in the EG-VCF envelope.

(6) EG-VCA (Envelope Generator VCF)

The EG-VCA can affect the following changes, as shown in the illustration below :

AT : Attack Time	1DT : First Decay Time
2DT : Second Decay Time	SL : Sustain Level



2. Yamaha Solo Synthesizer : Basic Theory

(1) Key Voltage Adjustment Circuit

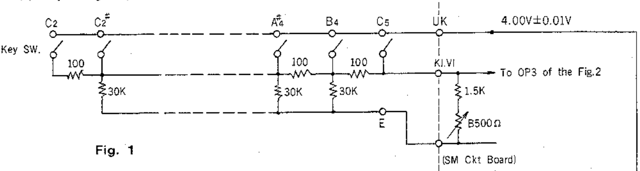
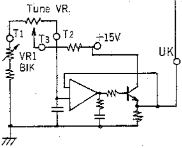


Fig. 1



NAME / Key No.	C	C#	D	D#	E	F	F#	G	G#	A	A#	B
2	0.50	0.532	0.563	0.597	0.632	0.669	0.709	0.751	0.795	0.842	0.892	0.945
3	1.00	1.064	1.127	1.193	1264	1.339	1.418	1.502	1.591	1.685	1.784	1.889
4	2.00	2.127	2.253	2.386	2.528	2.677	2.836	3.003	3.181	3.369	3.568	3.779
5	4.00											

Table 1 (Terminal : KI Digital Voltmeter Input Impedance : over 100KΩ)

The Yamaha solo synthesizer creates proportional frequencies through the varied voltages applied to a single voltage-controlled oscilator by each key.

The VCO, which is controlled by the input voltage, it is an oscillator which controls the relation between input voltage and output frequency.

The voltage at terminal KI in Fig. 1 is 4.00V at C5, 2.00V at C4, 1.00V at C3 and 0.50V at C2, so this ratio is clear. From OP1 in Fig.1 a standard +4.00V ±0.01V is supplied. At the same time, however, the input of OP1 is a tuning voltage input, and can be used for ±100 Cents changes. First adjust the UK terminal for +4.00V ±0.01V (use VR1B1K). Next, check at VRB500Ω on the SM circuit board that C4 is +2.00V±0.01V and that all other intervals are correct according to Table 1. At this time ability absolute accuracy and Input impedance of the D.C. volt meter should be less than 0.5%, with an input impedance of over 100KΩ. An error of 0.055% in the voltage will cause a pitch variation of 1 Cent. For example, 0.055% of 4.00V is 2.2mV.

When adjusting each key, connect the fixed resistor 1.8KΩ (allowable error: ±0.5%) between KI and E on each ckt board, then adjust for 4.00V—2.127V (C5— C#4) consulting Table 1. In actual organs, at lower intervals this voltage may well be on the low side.

(2) Key Voltage Buffer Amp and Keying Circuit

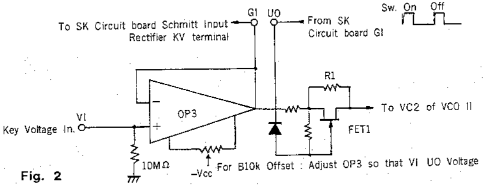


Fig. 2

Impedance is changed by OP3 to protect against drop in each key voltage, providing stable pitch voltage to VCO II.

The OP1 (operational amplifier) serves to feed the voltage of each key into non-inverting input.

DC voltage created by OP3 is fed to the SK circuit board Schmitt circuit and to FET I in Fig. 2. The SK circuit board creates the delay pulse required when the keyboard is switched on or off.

The above pulse is fed from SK circuit board GI terminal to FET 1 with a slight delay when the switch is turned on, in order to avoide key switch chattering. Keyboard voltage travels through FET 1 or R1 (when FET 1 is off).

(3) VCO II (Voltage Controlled Oscillator II Module)

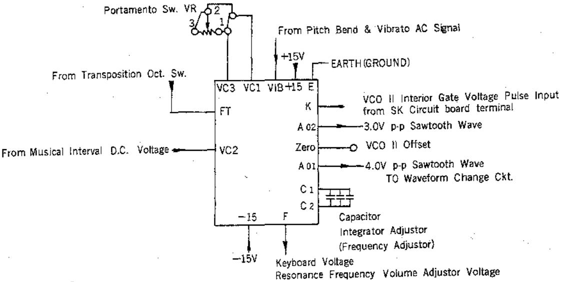


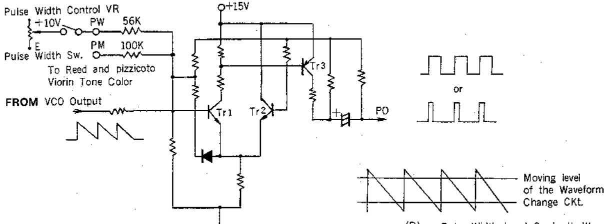
Fig. 3

Fig. 3 illustrates the VCO II module. The sawtooth wave frequency responding to input voltage is created in the VCO. Each terminal input and output is also noted. The modele adjustment method requires setting to transposition normal.

Check that the voltage at the UO terminal (Fig. 2) is the same for terminal VI when C4 is pressed ; also check that this voltage is being fed to VC2.

1. Check for the determined ±15V. (DC power supply voltage)
2. Check that a normal pulse is fed to terminal K when the key is pressed and released.
   There is an FET gate in VCO II ; the signal passes from SK circuit board K terminal to the VCO II K terminal.
3. A P–P 3.0±0.3V (1046Hz$^{+2\%}_{-1\%}$) sawtooth wave is created at A02 and A0 terminals. In this case, however, an oscilloscope frequency counter is required, then the tone can be checked and adjusted in the same way as an Electone. If the VC2 input voltage is not proper under ordinary conditions, adjust with an added capacitor.
   If further adjustment of the portamento is desired it can be accomplished by inserting a VR between VC3 and VC1 of the VRII section.

(4) Waveform Change Circuit



(A)

(B) Pulse Width Input Sawtooth Wave

Use the VR connected to PW to change the motion point of the above input waveform.

Fig. 4

Fig. 4 illustrates the waveform change circuit which permits changes in the sawtooth waveform width by short waveform transformations. It would be best if the input waveform shown in part B of the figure was changed to the width of the Tr1 action point.

However, the duty cycle ratio can be changed according to changes in the voltage of the VR connected at PW between +10V and E.

This is called "pulse width." The ratio is 50%–90%. The VCO creates a sawtooth waveform, while this waveform change circuit creates a square waveform. In order to have a waveform appropriate for the tone color, these two forms are used separately.

(5) Auxiliary Gate Circuit (For preset double and reed tones)

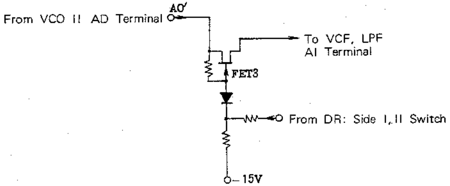


Fig. 5

When the transformed square wave and the sawtooth waveform which is VCO II output are used together, the FET 3 gate is controlled by the DR terminal; this is used for preset double and reed only.

(6) VCF: LPF, HPF (Voltage Control Filter: Low Pass, High Pass)

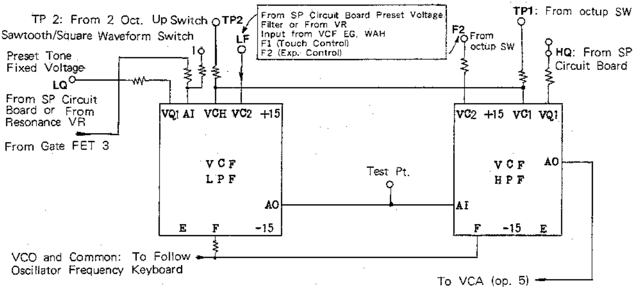


Fig. 6

Fig. 6 shows the connections between VCF: LPF and VCF: HPF. VCF is composed in the same way as VCO: of a molded circuit, so resistance to temperature fluctuations is outstanding. VCF: LPF can be thought of as a flute tone color-type waveform change filter. The various VC2 terminals of VCF feed voltage which is changeable according to touch and exp. controls, etc., providing cutoff frequency. The various fixed voltages from the preset tones and resonance VR are fed to VQ1. The resonance controls the out-off wave oscillation point by Z(ZETA): cutoff frequency resonance point of the lowpass filter. The VCF: HPF, like the VCF: LPF, is a voltage-controlled circuit which affects changes in filter characteristics. VC2 feeds in VCF EG, WAH (touch control) and Exp. control voltages. VC1, which also changes input frequency during octave up stages, feeds in varied voltage to change filter characteristics. VQ1 exists to vary filter cutoff points. AO output is fed into VCA.

(7) VCA (Voltage Control Amplifier)

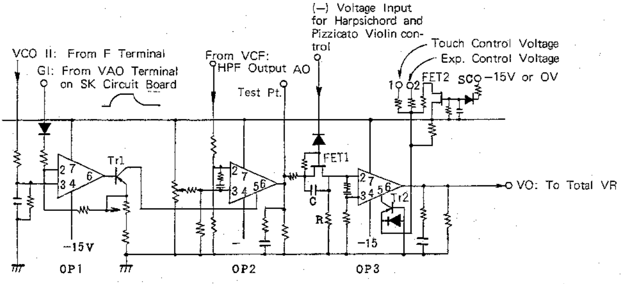


Fig. 7

The VCA circuit is illustrated in Fig. 7-1. VCF output is fed to OP2 as shown in Fig. 7. OP2 is a current control operation amplifier: its gain changes according to the current fed to terminal 5. The OP 1 input signal controls OP 2 via envelope voltage input from the SK circuit board VAO terminal. The OP 2 output which has been thus controlled either passes through the FET1 or (for harpsichord and pizzicato violin only) creates (–) voltage at the FET1 gate, thus passing through capacitor C only and working with the CR bypass filter to cut bass click noise. OP 3 is also a current control type OP amplifier. According to touch control and exp. control voltage inputs from 1 and 2 Tr2 emitter potential rises, causing current to flow between (5) and (E) in OP 3. The SC terminal can control via terminals 1 and 2 when they are used by feeding –15V to the FET2 gate and thus shutting the FET2 off. However, if terminals 1 and 2 are not used, the FET2 is normally on, thus supplying a fixed current to terminal 5 of OP 3 via the resistor. Thus a buffer amp input is provided via total VR. Output waveform is shown in Fig. 7-1.

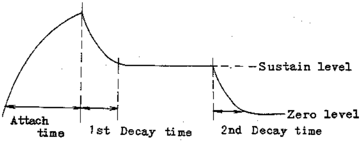


Fig. 7-1

(8) Output Amplifier and Click Noise Avoided Circuit

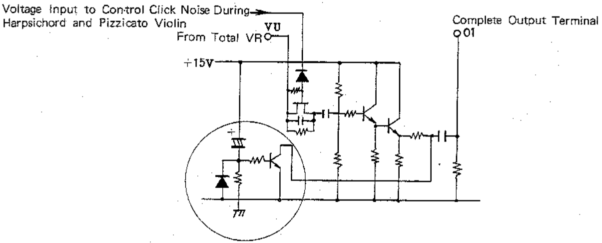


Fig. 8

Fig. 8 shows the output amplifier circuitry. When harpsichord or pizzicato violin signals mixed with the input signal, in order to control click noise (–) voltage is supplied, shutting off the FET. The signal passes through the capacitor and resistor, effectively cutting out click noise. Terminal 01 output impedance is approximately 600Ω, so 0dB output voltage is provided.

The circled circuit in Fig. 8 serves to avoid click noise when the power is switched on. At this time the transistor switches on to short all output signals; then the capacitor charges and the transistor swithes off for normal output signal.

(9) VCF EG (VCF Envelope Generator), VCA EG

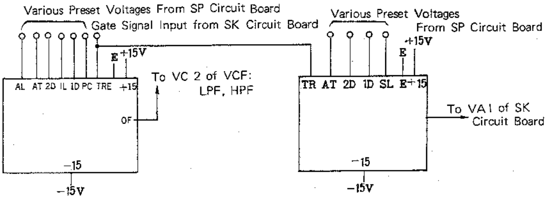


Fig. 9

Fig. 9 shows the VCF EG and VCA EG module circuits. When +10V is fed to the PC terminal, VCF EG takes 0 level as its center and rises to the + side, then lowers to create the output waveform at OF like that shown in Fig. 10–1. When −10V is fed to the PC terminal, a waveform converse to that shown in Fig. 10–1 appears as output at OF. Terminals AL, AT, 2D, IL, 1D and PC create voltage waveforms which match the tone color of the preset voltage inputs from the SP circuit board. These waveforms are fed to VC 2 of VCF, LPF and HPF as inputs, changing the filter sawtooth wave frequencies to create the various preset tone waveforms.

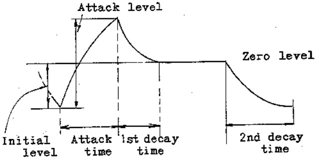


Fig. 10-1

(10) Oscillator Types

9–1. Vibrato Oscillator

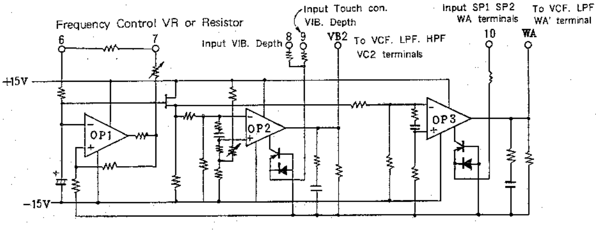
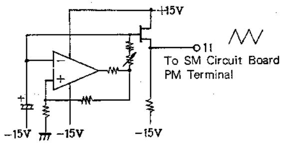


Fig. 11 illustrates the circuitry of the vibrato oscillator.

When the (−) terminal potential is less than the (+) terminal, current flows from C through the VR and resistor between 6 and 7. When the potential is higher in the (−) terminal, OP 1 output is reversed. (+) terminal potential becomes that of the (−) terminal and C discharges through the resistance between 7 and 6. When the (−) terminal potential drops lower than that of the (+) terminal, the original condition recurs. This back and forth motion in the (−) terminal creates a constant charge-discharge pattern in the capacitor, giving rise to a triangular waveform. Between 6 and 7 is a vibrato speed VR connected to SP of the SP circuit board. When the VR resistance is high, OP 1 frequency is low. By the action of the vibrato depth control voltage input at terminal 8 and the touch control vibrato depth voltage input at terminal 9, OP 2 gain is controlled. This signal is fed from the VB2 terminal to the various VC2 terminals of the VCF, LPF and HPF. Terminal 10 feeds the controlled signal from the WA terminals of the SP1 and SP2 circuit boards to VC2 on the VCF, LPF and HPF, thus acting as a control. This untouched signal is wah guitar vibrato.

9-2. Double, Reed Preset Tone Oscillator



This section works on the same principle as the vibrato oscillator: output impedance is lowered thanks to the FET. The vibrato effect is created by adding the signal from terminal 11 to the preset double and reed tones.

(11) Exp. In Buffer Amp, Touch Control Detector Buffer Amp

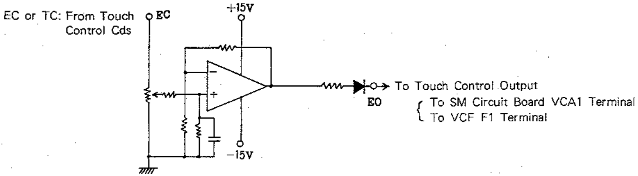
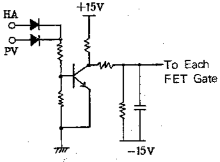


Fig. 13 illustrates the circuitry of the Exp. In control buffer amp and the touch control detector buffer amp. This amplifier serves to make the control voltage optional, and also to keep output impedance low. Input and output signals are unified, and (+) voltage appears at the output.

(12) Harpsichord and Pizzicato Violin Click Prevention Voltage Switching Unit



(+) input is fed from HA and PV in Fig. 14, switching the Transistor on and reducing output resistance to −15V. When the voltage becomes negative a slight delay can be created by the capacitor, cancelling click noise in the PST switch.

(13) Voltage Generator for Various Gate Pulse Circuits, Tone Bend and Pitch Bend Circuits

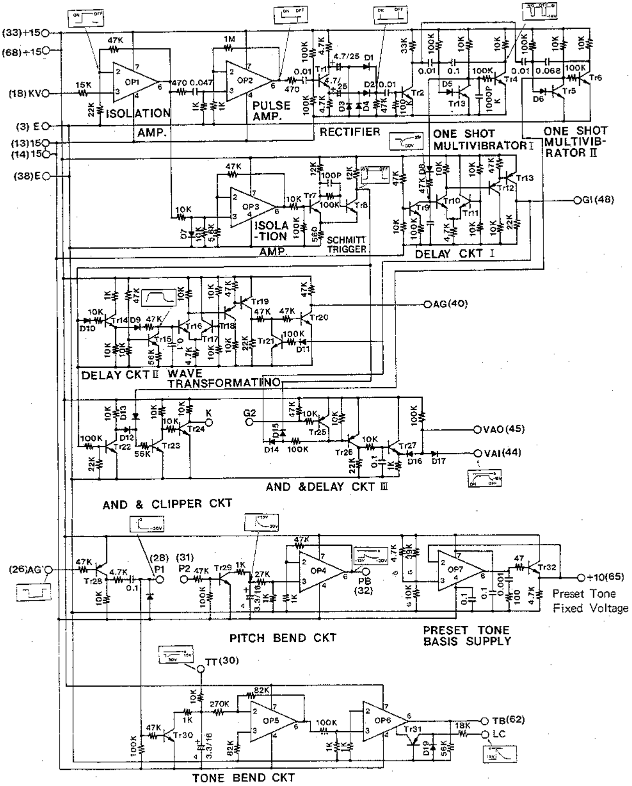


Fig. 15 shows the circuitry for the tone color basic oscillator which functions for the various gate pulse circuits, pitch bend and tone bend circuits and SP1 & SP2 circuit boards. Fig. 16 shows the pulse waveforms for the various terminals.

Keyboard voltage is fed to terminal KV. OP1 works as a transformation amp to differentiate between these outputs. It contains a rectifier circuit which changes the positive/negative pulses of the Tr1 output which passes through buffer amp OP2 into positive-only, then feeds them as input to one-shot multivibrator I and II. One-shot multivibrator 1 uses the Tr10, Tr11 delay circuit to feed delay pulses from terminal GI.

At the same time, the Schmitt trigger creates pulses like that shown in the figure by feeding the pulses created by Tr7 and Tr8, then delayed by Tr16 and Tr17, from terminal AG. The AG signal is fed to AG', and it passes to the pitch bend circuit P2. It then passes from the PB terminal as input to the VCOII VB1 terminal. The waveform created by the Schmitt trigger circuit and the one-shot multivibrator of Tr5 and Tr6 passes from terminal K and is used to create the pulse shown in the figure, driving the gate circuit in the VCO II.

In order to feed the waveform created by VCA EG to VCA as input from terminal VA I, output is fed from VAO. However, when the key is first pressed turning the switch on, Tr27 is off, so the signal from VA I passes to VA 0.

When another key is pressed Tr27 goes on momentarily and the signal does not pass from VA I to VA 0. Previous control voltage to VCA is cancelled. Thus an integral circuit, composed of a 10KΩ resistor and 0.1μF capacitor, is formed to prevent click noise when a key is first pressed.

TB is a special output terminal for tone bend, fed by VCF LPF. The LC terminal is controlled by the attack bend intensity VR, thus controlling the TB output voltage.

OP7 is a basic voltage amplifier, supplying +10.6V to the SP1 and SP2 circuit boards. Therefore +10.6V is fed from the +10 terminal.

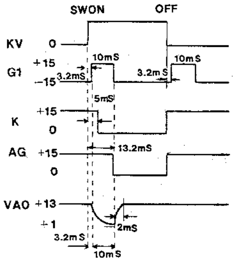


Fig. 6 Output Waveform at Each Terminal

3. Concerning Modules

In order to create temporal changes in pitch, waveform and volume these modules work by control from very small amounts of voltage.

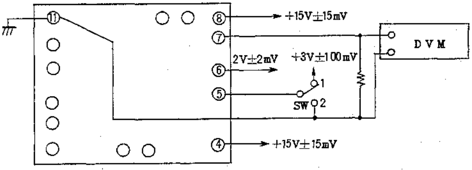
Modules are made up of C. R, Tr and IC, etc. component parts, and in order to assure high reliability a composite resin filler is used. In distinguishing good and faulty modules there is a basic method to be used, described on the following pages.

(1) VCO II (NE-10200) Voltage Controlled Oscillator

The oscillator frequency (f), which is the tone source, is compared to control voltage (E).

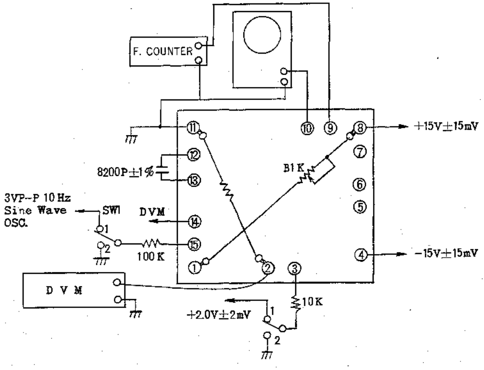
f=KE (K : fixed value)

1. Sample Hold FET Test



During switch 2 the digital voltmeter should indicate 2V±30mV.
During switch 1 the digital voltmeter should indicate 0V±2mV.

2. Oscillator Frequency Adjustment



2–1. Zero Adjustment

Connect as shown in the figure, and set both switch 1 and 2 to condition 2. Adjust the exterior VR B1K so that the DVM indicates ±1mV. Then disconnect the DVM and set switch 2 to condition 1. Then, when the DVM is connected to terminal 14 the reading should be within the limits of $2V\pm^{0.8V}_{3mV}$

2–2. Oscillator Frequency

Use an oscilliscope to check that a sawtooth waveform of approximately 4V p–p is present at the output. Frequency counter reading should be 1060±200Hz.

2–3. Output Waveform and Offset Voltage Adjustment

Adjust VR1 so that the oscilloscope shows a 4V±100mV sawtooth waveform. If a sliced waveform appears at the output at this time, adjust VR2 to the proper value.

Adjust VR2 so that DC offset voltage is ±100mV.

2–4. Vibrato

When switch 1 is set to condition 1 vibrato should appear on the oscilloscope waveform.

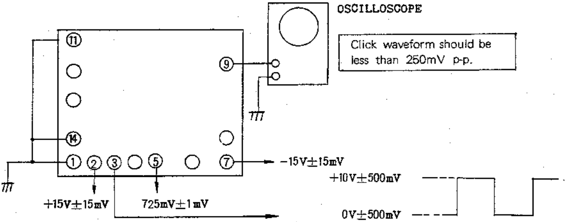
2–5. Output Waveform for Audio.

Connect the oscilloscope to (10) and check that the waveform is 3V±0.6V p–p.

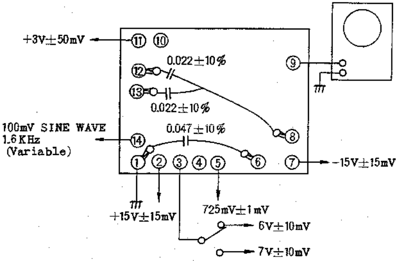
(2) VCF–LPF (NE–10400)

VCF: Voltage Controlled Filter

LPF: Low Pass Filter



Rise and fall of the 100Hz short waveform should be less than 1m sec.



OSCILLOSCOPE

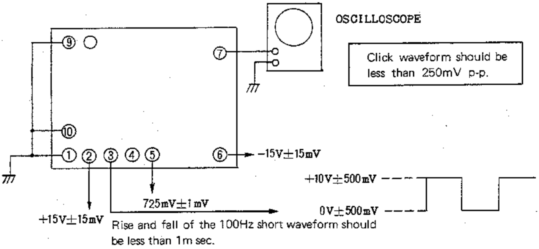
Connect an adjustable frequency oscillator to terminal 14 and look for the frequency which provides peak sine wave form on the oscilloscope. Then set for the following conditions.

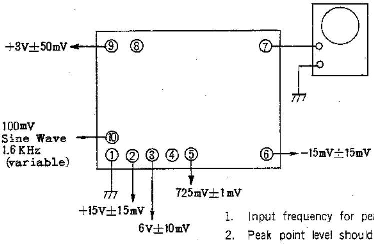
1. Input frequency for peak sine wave should be 1.3KHz–2.0KHz.
2. Peak point level should be between 290mV and 430mV

(3) VCF–HPF (NE–10500)

VCF : Voltage Controlled Filter

HPF : High Pass Filter





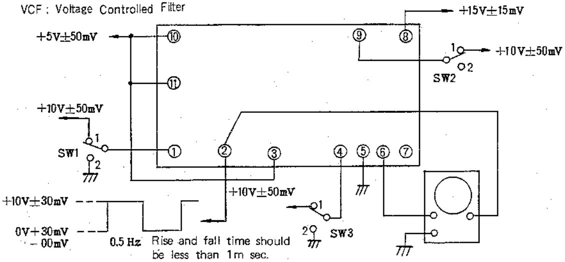
Connect an adjustable frequency oscillator to terminal 14 and look for the frequency which provides peak sine wave form on the oscilloscope. Then set for the following conditions:

1. Input frequency for peak sine wave should be 1.3KHz–2.0KHz.
2. Peak point level should be between 290mV and 430mV

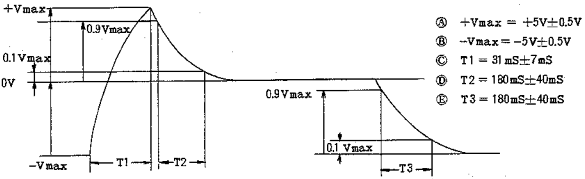
(4) EG–VCF (NE–10800)

EG : Envelope Generator

VCF : Voltage Controlled Filter



1. The following waveform whould appear on the oscilloscope when switches 1, 2 and 3 are set to condition 1.

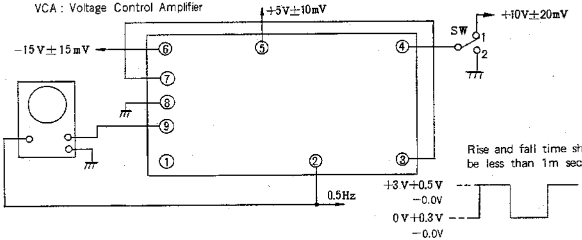


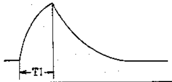
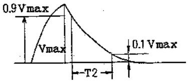
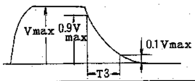
2. When switch 3 only is set to condition 2 the above waveform should be reversed (with GND as center).
3. When all three switches are in condition 2 the click waveform on the oscilloscope should be less than 50mV p−p.

(5) EG−VCA (NE−10900)

EG : Envelope Generator

VCA : Voltage Control Amplifier

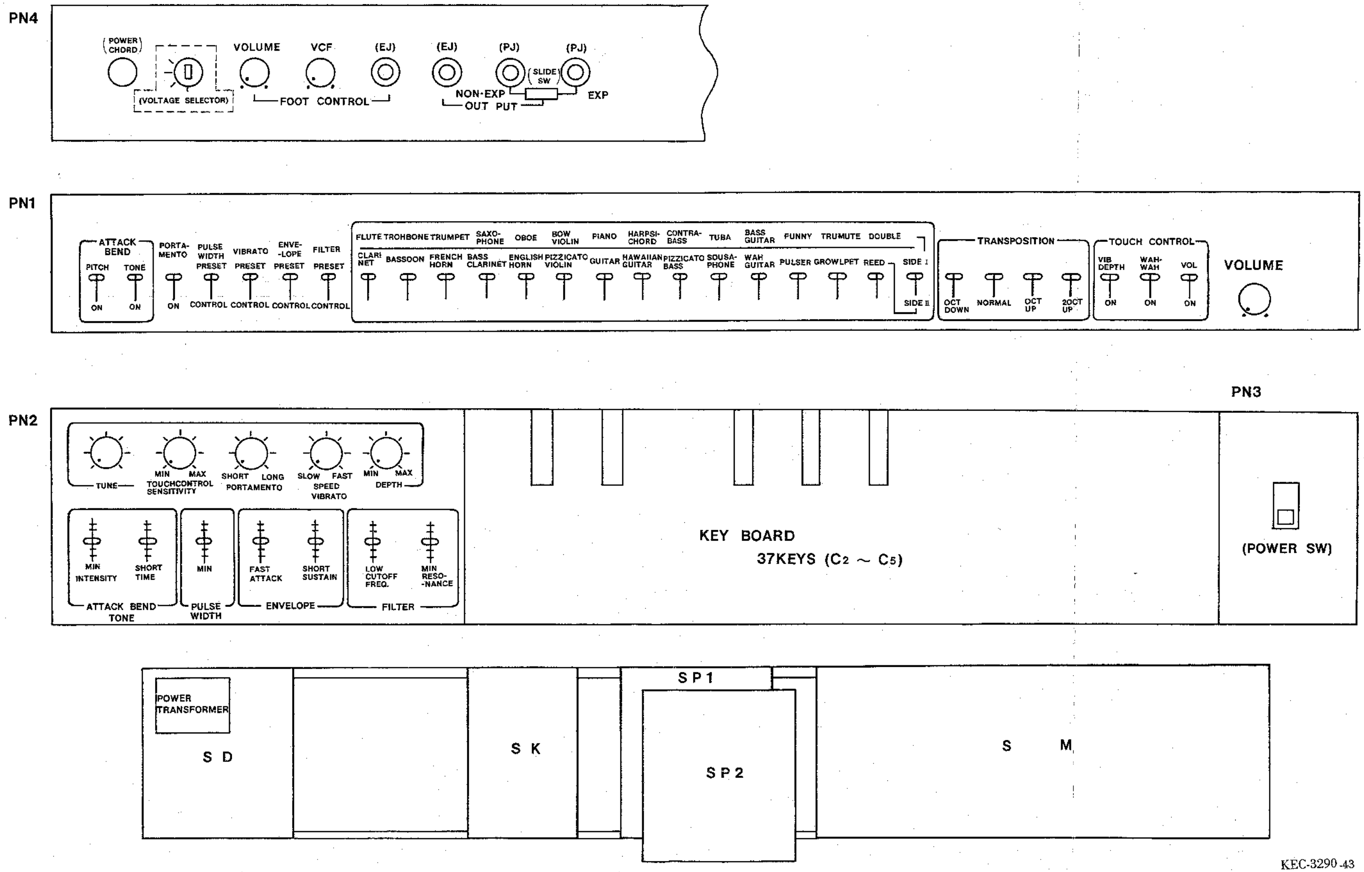


CHECK POINT	SW POSITION	WAVE	REMARKS
ATTACK TIME	2		T1 = 31mS±7mS
FIRST DECAY TIME	2		T2 = 180mS±40mS
SECOND DECAY TIME	1		T3 = 180mS±40mS

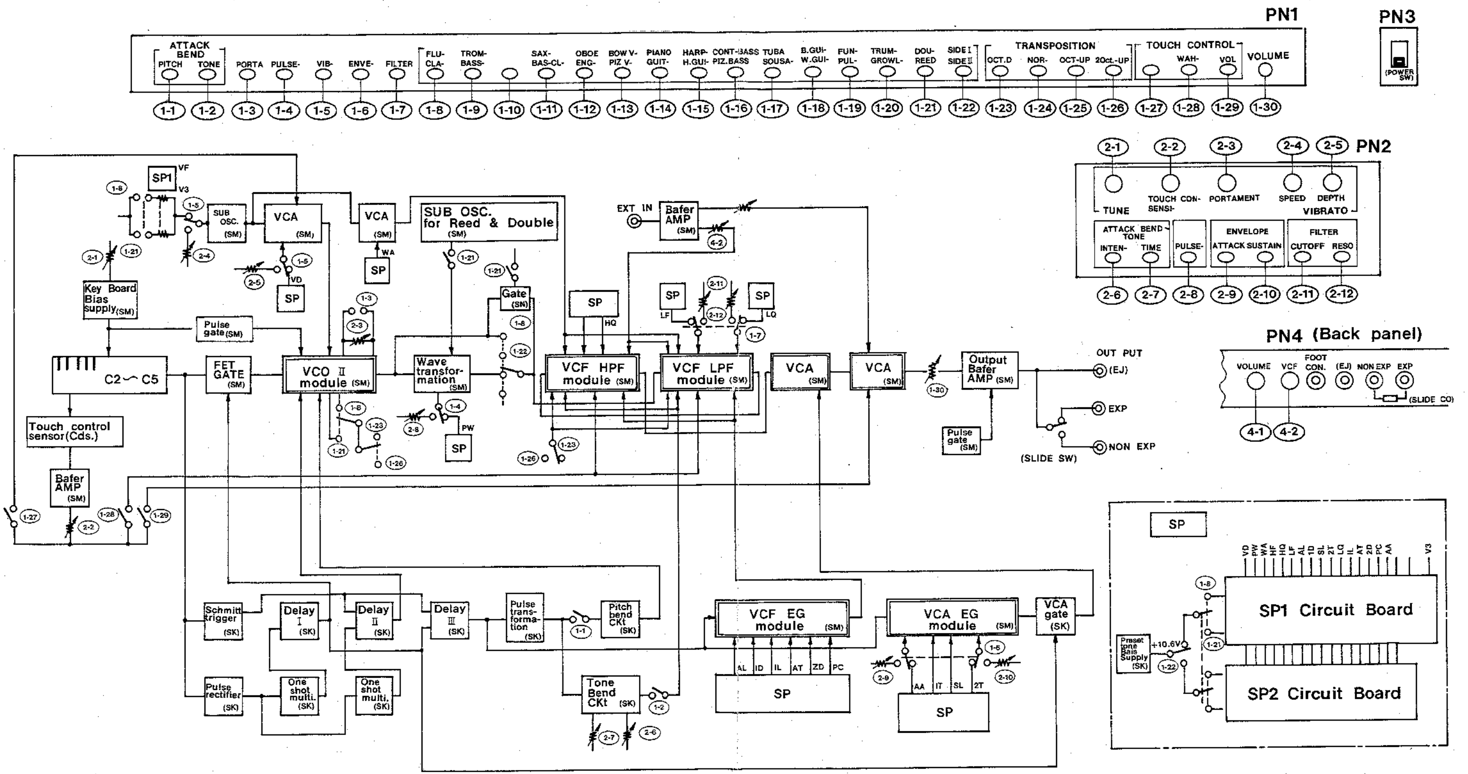
(Note) Vmax = 10.0V±0.5V

Assembly Layout, Top view & Back view

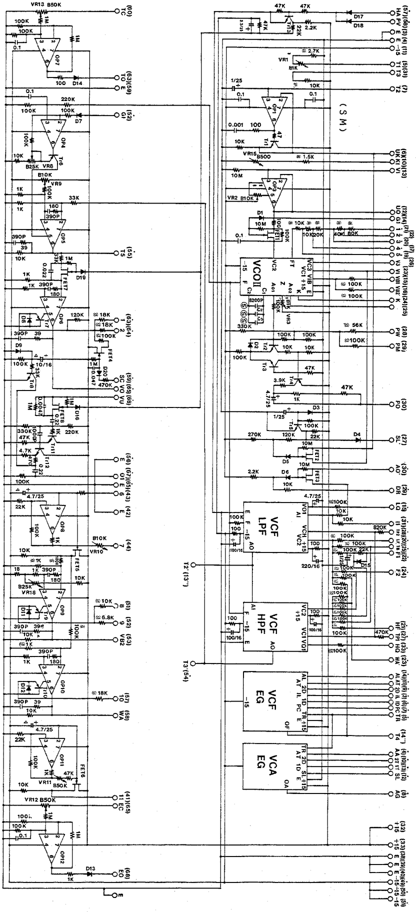
The voltage selector is attached only General, South Africa and Europe models.



Block Diagram

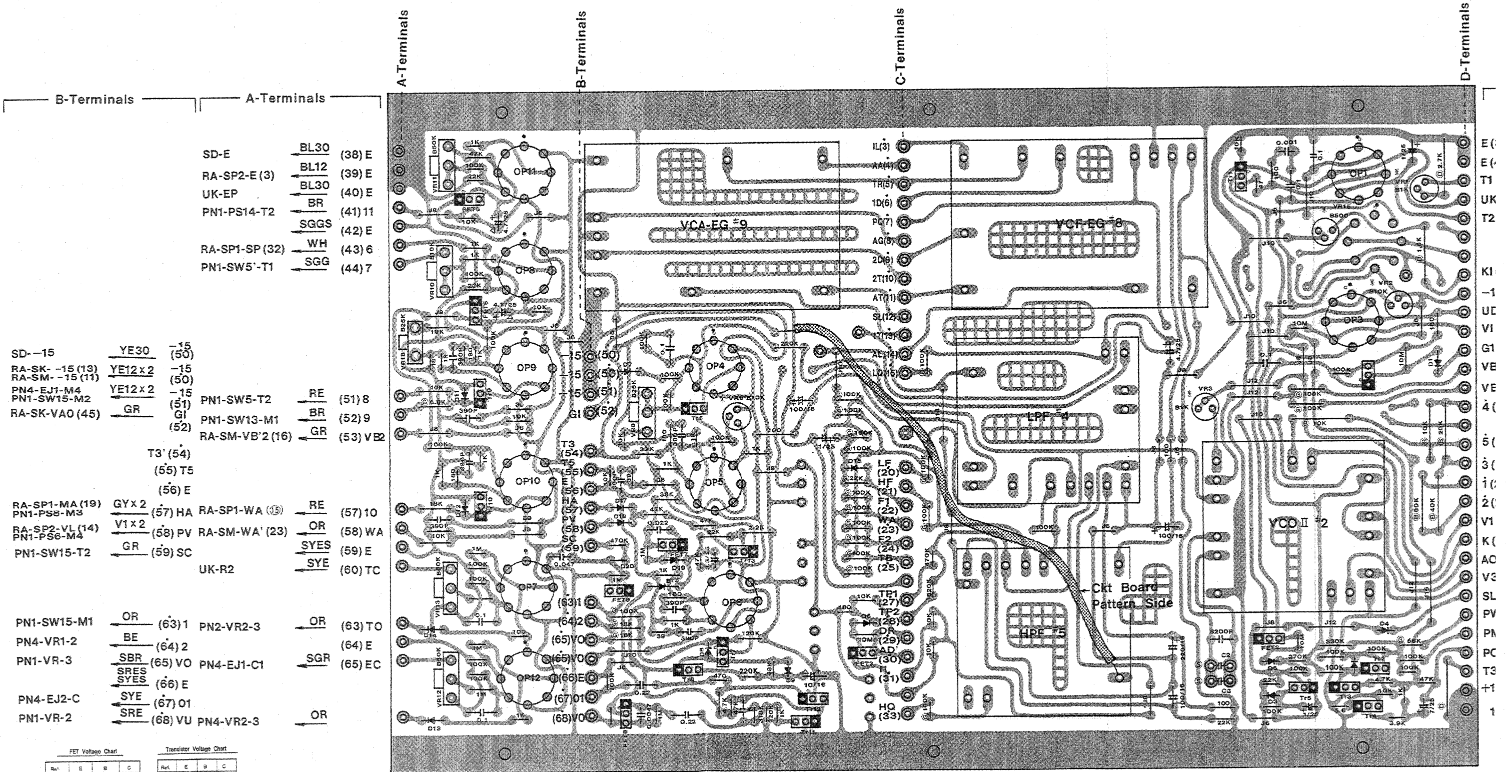


SM Circuit Diagram



Note)
Marked ⓑ : Metal Film Resistor ±0.1%
Marked ⓒ : Metal Film Resistor ±0.5%
Marked ⓖ : Carbon Resistor ±2.0%
Marked ✱ : Cermet Type Variable Resistor 3321H.
Transistor Tr1~3, 5, 8, 11~13 : 2SC458(B)(C)
Tr4, 6, 7, 9, 10 : 2SA561(Y)
FET1~8 : 2SK30A(Y)
Operational AMP OP5, 6, 9, 10 : CA3080
Others : MA741HC
Marked ⊿ : Tantalum or Solid AL Capacitor
Marked ⓢ : Polystyrene Film Capacitor.
Diode : 1S1555

SM Circuit Board & Wiring



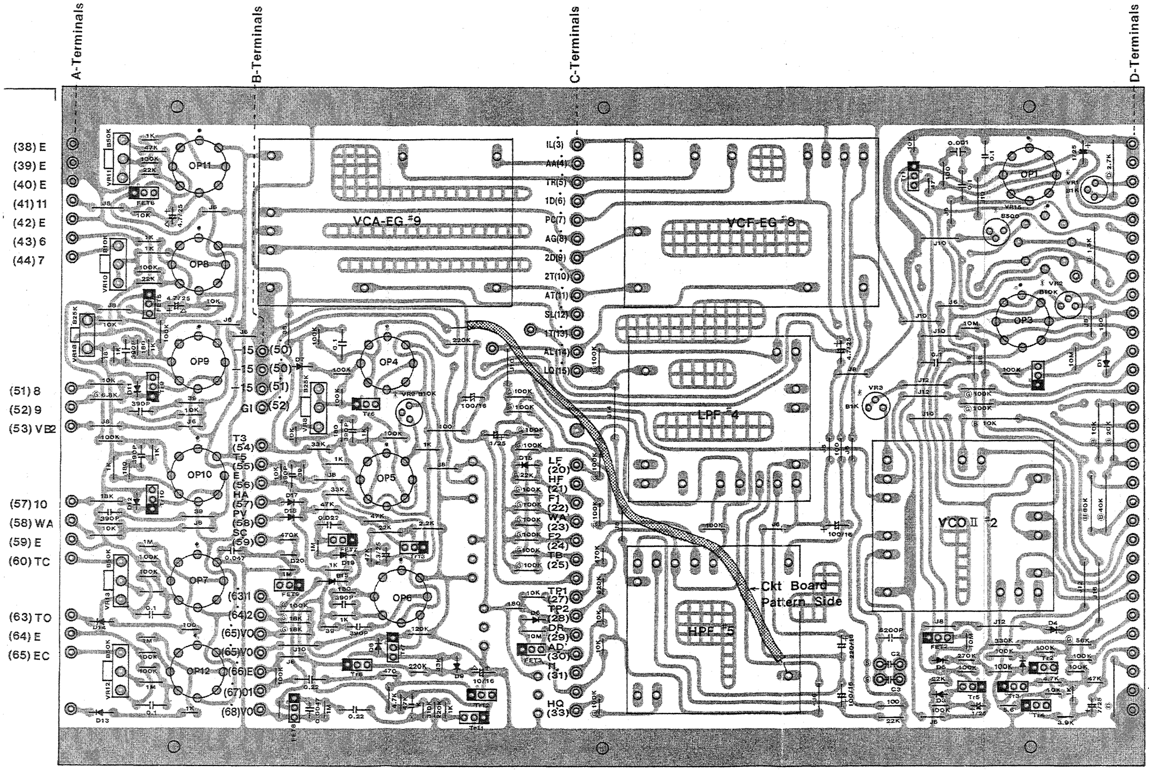
FET Voltage Chart

Ref.		E	B	C
FET	1	0	0	9.2
	2	0	4.2	−2
	3	0	0	−4.6
	5	15	0.5 (7 HZ)	0.5
	6	15	0.5 (7 HZ)	0.5
	7	0	0	0
	8	0	0	0

Transistor Voltage Chart

Ref.		E	B	C
Tr	1	4.6	5.7	16
	2	−0.6	−0.1	15.5
	3	−0.6	−0.1	15.5
	4	16	15	3.2
	5	0.6	0	0.6
	6	0.5	11	−14.5
	7	0.6	0	0.5
	8	0	0	7.4
	9	0.5	0	−15
	10	0	0	−15
	11	8	7.5	15.5
	12	7.4	8.0	16
	13	0	0	15

SM Circuit Board & Wiring



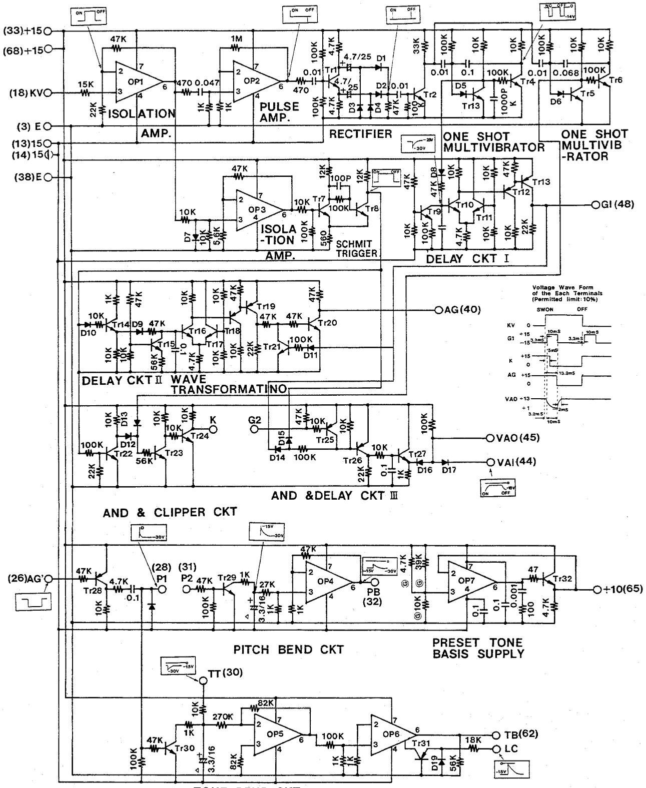
D-Terminals

E (3)	BL30	SD-E
E (4)	BL12 x 2	PN1-PS14-T5 UK-E
T1 (5)	BR	PN2-VR1-1
UK (6)	GR12	UK-C5-M
T2 (7)	RE	PN2-VR1-2
KI (10)	BE SBE	RA-SM-VI (13) UK-C5-T
−15 (11)	YE12	RA-SM- 15 (50)
UD (12)	BR	RA-SK-KV (18)
VI (13)	BE	RA-SM-KI (10)
G1 (14)	OR	RA-SK-GI (48)
VB1 (15)	YE	RA-SK-PB (32)
VB2' (16)	GR	RA-SM-VB2 (53)
4̇ (17)	RE	PN1-SM12-M2
5̇ (19)	BR	PN1-SW12-M1
3̇ (20)	OR	PN1-SW11-M2
1̇ (21)	GR	PN1-SW9-M2
2̇ (22)	YE	PN1-SW10-M2
V1 (23)	GR x 2	PN1-SW3-B PN2-VR3-2
K (24)	VI	RA-SK-4 (41)
AO (25)	BR x 2	RA-SM-AO (30) PN1-SW4-B1
V3 (26)	BE x 2	PN1-SW3-T PN2-VR3-1
SL' (27)	GY x 2	RA-SM-2T (10) PN1-SW6-T2
PW (28)	BE	PN1-SW4-T2
PM (29)	VI	PN1-PS14-M2
PO (30)	RE	PN1-PS4-M1
T3 (31)	OR	PN2-VR1-3
+15 (32)	BR30	SD-+15
15 (33)	BR12 x 2	PN-SW12-T3 RA-SK- 15 (33)

C-Terminals

IL (3̇)	YE	RA-SP1-IL ⑥
AA (4̇)	GR	PN1-SW6-T1
TR (5̇)	BE	RA-SK-AG' (26)
1D (6̇)	VI	RA-SP1-1D ⑩
PC (7̇)	GY	RA-SP1-PC ⑬
AG (8̇)	WH	RA-SK-VAI (44)
2D (9̇)	GG	RA-SP1-2D ④
2T (1̇0)	RY	RA-SM-SL' (27)
AT (1̇1)	WH	RA-SP1-AT ⑤
SL (1̇2)	GG	RA-SP1-SL ⑨
1T (1̇3)	SB	RA-SP1-IT ①
AL (1̇4)	PK	RA-SP1-AL ⑪
LQ (1̇5)	RE	PN1-SW7-T2
LF (2̇0)	SB	PN1-SW7-T1
HF (2̇1)	BR	RA-SP1-HF
F1 (2̇2)	RE	PN1-SW14-M ⑭
WA' (2̇3)	OR	RA-SM-WA (58)
F2 (2̇4)	YE	PN1-VR2-2
TB (2̇5)	OR	PW1-SW2-M
TP1 (2̇7)	YE	PN1-SW12-M3
TP2 (2̇8)	VI	PN1-SW11-M3
DR (2̇9)	BE	PN1-SW8-T3
AD' (3̇0)	BR	RA-SM-AO (25)
I1 (3̇1)	YE	PN1-PS14-T1
HQ (3̇3	GR	RA-SP1-HQ ⑬

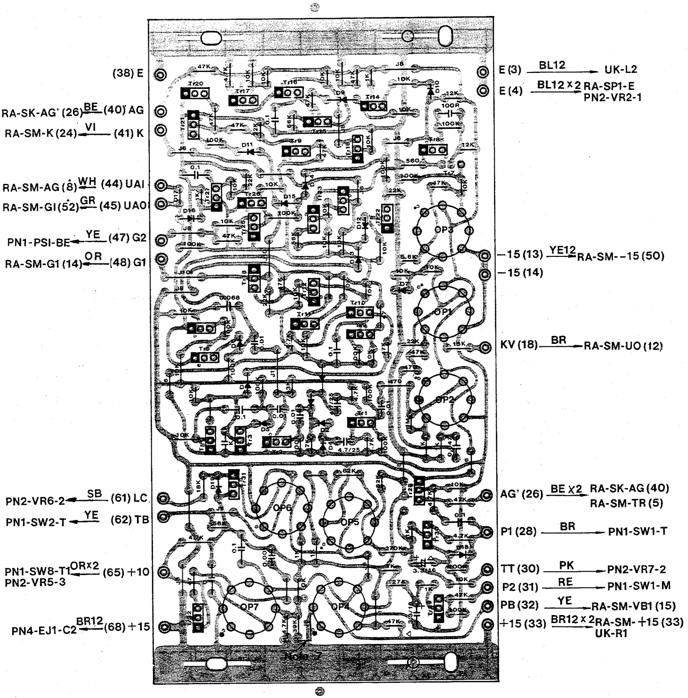
SK Circuit Diagrom



Note) Transistor Tr15, 6, 23, 24 : 2SC752(0)(Y)
Tr12, 13, 18, 19, 25, 26, 31 : 2SA561(Y)
Other Transistors : 2SC1537
Diode D1~D22 : 1S1555

Operational Amplifier OP1~5, 7 : MA741HC
Operational Amplifier OP6 : CA3080
K : Ceramic Capacitor 1000pH ±10%
Marked △ : Solid AL Capacitor
Marked Ⓖ of the Resistor : ±2%

SK Circuit Board & Wiring

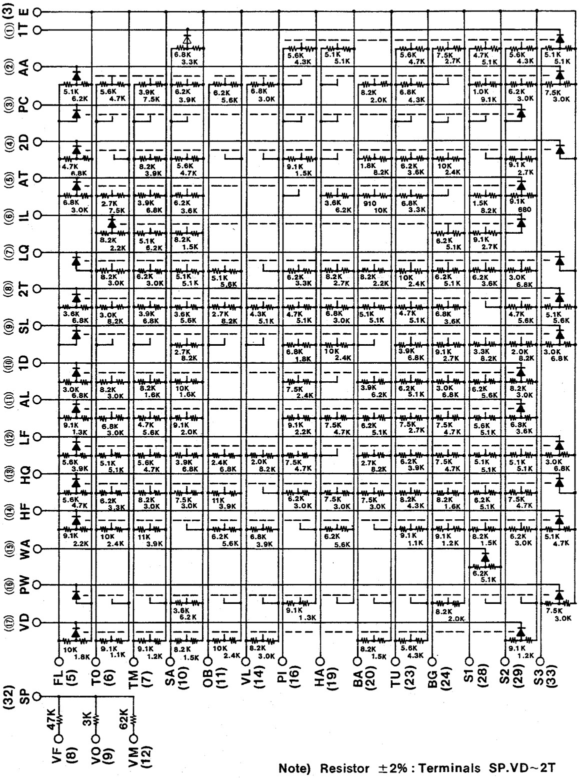


Transistor Voltage Chart

Ref.	E	B	C	Ref.	E	B	C
Tr 1	− 1.8	− 0.8	1.7	Tr 17	7.2	8	15
2	−15	−14.5	14	18	15	14.5	0
3	−15	−14.5	−15	19	15	14.5	0
4	−15	−14.5	15	20	0	0	14.5
5	0	0.7	0.2	21	0	0	0
6	0	0.15	15	22	0	0	13
7	1.2	0	13.5	23	0	0.5	0.1
8	1.2	1.6	1.2	24	0	0.1	15
9	−11	− 9.5	−10	25	15	14.5	14.5
10	− 0.2	−10	15	26	14.5	15	15
11	− 0.2	0.	15	27	14	14.3	15
12	15	14.5	−15	28	14.5	15	−15
13	15	14.5	− 9.2	29	−15	−14.5	0
14	0.2	0.4	15	30	−15	−14.5	0
15	2.2	3.2	2.2	31	0	0	0
16	7	4.2	15	32	12	13	15

Note)
1. TRANSISTORS Tr5, 6, 23, 24 : 2SC752(O)(Y)
   Tr12, 13, 18, 19, 25, 26, 28, 31, : 2SA561(Y)
   Others : 2SC1537
2. Diode : 1S2473
3. K : Ceramic Capacitor 1000pF
4. Marked △ : Solid AL Capacitor or Tantalum Capacitor
5. OP1～5, 7 : μA741HC OP6 : CA3080
6. Marked Ⓖ : Resistor ±2%
7. Bend the jumper wire.

SP1 Circuit Diagram



Note) Resistor ±2% : Terminals SP.VD~2T
Resistor ±5% : Terminals LQ~1T
Marked - - - : Attach the diode 1S2473VE

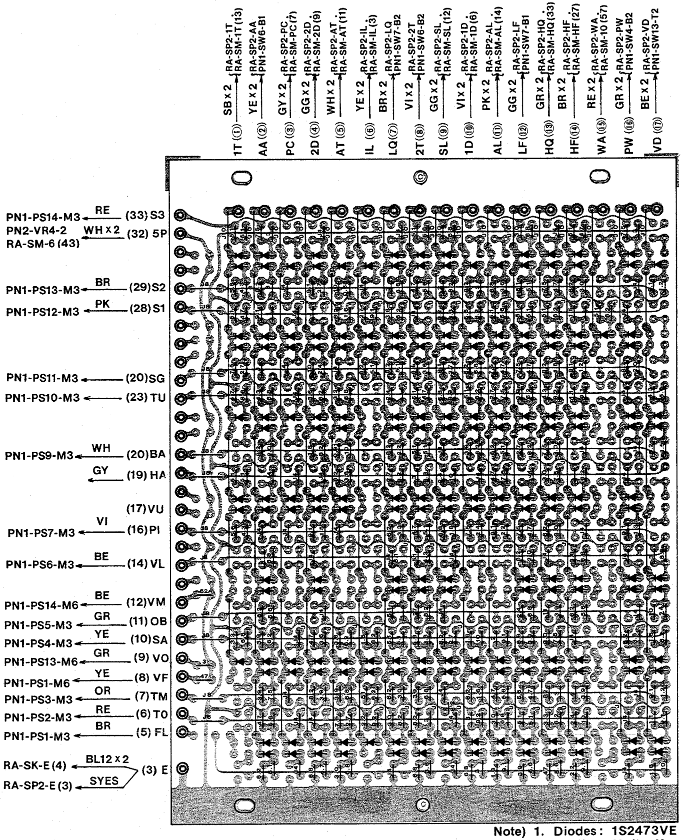
SP1 Terminal Voltage Table

Output / Input	1T	AA	PC	2D	AT	IL	LQ	2T	SL	1D	AL	LF	HQ	HF	WA	PW	VD
FL	0	5.21	10.06	5.66	2.70	0	0	6.28	10,06	6.69	0.87	3.63	4.24	1.66	0	0	1.16
TO	0	4.25	10.05	0	7.11	1.79	2.35	7.08	10.06	2.32	2.61	4.30	3.25	1.59	0	0	0.71
TM	0	6.28	10.02	2.86	6.06	5.15	2.99	6.08	10.06	1.26	5.12	4.05	2.37	2.27	0	0	0.80
SA	2.94	3.53	10.01	4.20	3.33	1.17	4.70	5.79	7.27	1.01	1.42	5.80	5.80	0	0	6.06	1.19
OB	0	4.45	0	0	0	0	5.05	7.36	10.14	0	0	6.90	2.22	4.45	0	0	1.57
VL	0	2.73	0	0	0	0	0	5.18	10.15	0	0	7.63	0	3.36	0	0	2.34
PI	4.05	10.07	10.09	1.07	10.09	0	3.15	4.70	1.82	2.04	1.70	3.45	3.00	0	0	0.97	0
HA	4.70	10.11	10.12	10.12	6.10	0	2.12	2.73	1.57	10.12	3.51	10.12	2.50	4.36	0	0	0
BA	0	1.57	0	8.06	7.11	0	1.70	4.67	10.06	5.87	4.17	7.00	2.49	0	0	0	1.20
TU	4.25	3.63	10.05	3.32	2.87	0	1.56	4.87	6.05	4.16	2.31	3.66	3.03	0.66	0	0	4.01
BG	2.27	10.08	10.08	1.61	10.08	4.19	4.24	3.11	1.92	6.71	3.45	4.25	1.27	0.84	0	1.51	0
S1	4.87	8.74	10.06	0	8.25	1.92	3.38	0	6.87	4.39	4.43	4.43	4.13	1.22	3.75	0	0
S2	4.02	2.92	10.03	1.93	0.39	10.18	6.68	5.13	7.84	2.32	3.11	4.43	3.60	2.88	0	0	0.79
S3	6.31	2.53	0	0	0	0	0	4.99	6.77	0	0	6.90	0	4.51	0	2.54	0

(1T–LQ) ±10% (2T–VD) ±5%

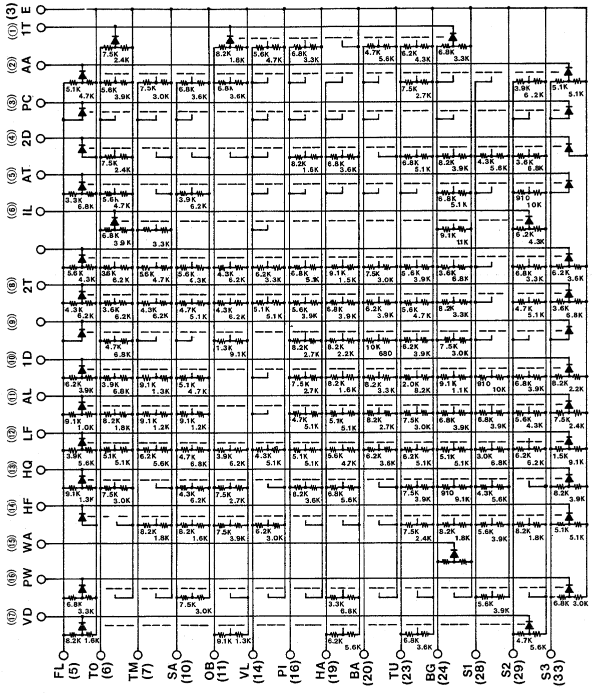
unit (V)

SP1 Circuit Board & Wiring



Note) 1. Diodes: 1S2473VE
2. Resistor Unit: KΩ
3. J: Jumper Wire

SP2 Circuit Diagram



Note) Resistors :
VD~2T ± 2%
LQ~1T ± 5%
marked---: Attach the diode 1S2473VE

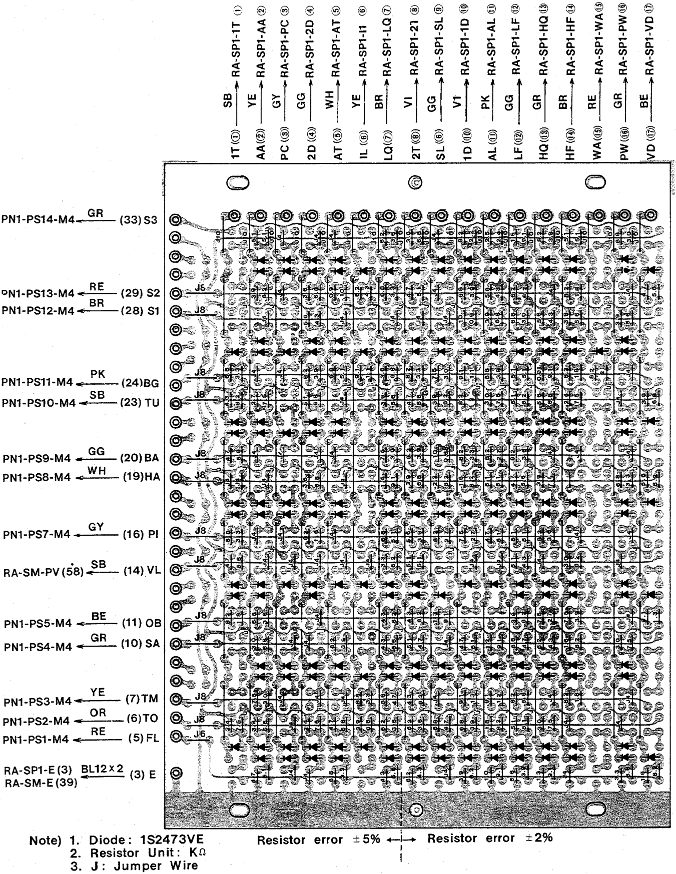
SP2 Terminal Voltage Tabie

Out put / In put	1T	AA	PC	2D	AT	IL	LQ	2T	SL	1D	AL	LE	HQ	HF	WA	PW	VD
FL	0	4.53	10.13	0	6.58	0	4.03	5.66	10.14	3.53	0.65	5.62	0.89	0	0	2.88	1.27
TO	2.07	3.80	10.2	2.03	4.31	3.25	6.10	6.10	5.70	6.01	1.38	4.78	2.43	0	0	0	0
TM	0	2.55	10.16	0	0	2.75	4.27	5.68	10.17	0.91	0.82	4.41	0	1.47	0	0	0
SA	0	2.76	10.13	0	5.89	0	4.07	4.94	10.13	4.48	0.81	5.64	5.68	1.27	0	2.52	0
OB	1.38	3.19	0	0	0	0	5.69	5.70	8.76	0	0	5.81	2.38	3.04	0	0	0.91
VL	4.35	10.21	10.21	10.17	10.21	10.21	3.12	4.77	0	10.2	10.2	5.10	0	2.96	0	0	0
PI	43.00	10.18	10.18	1.31	10.18	0	4.00	3.82	2.15	2.32	4.96	4.75	2.72	0	0	0	0
HA	0	10.13	10.15	3.13	10.15	0	1.08	3.33	1.78	1.28	4.73	4.27	3.09	0	0	6.55	4.45
BA	5.13	10.19	10.20	0	10.19	0	2.54	3.58	0.42	2.54	2.14	3.38	0	0	0	0	0
TU	3.77	2.33	0	3.96	10.11	0	3.82	4.27	3.51	7.91	2.53	4.21	4.20	2.11	0	0	3.10
BG	2.97	10.15	10.15	2.90	3.94	0.74	6.32	2.54	2.53	0.73	3.33	4.72	9.12	1.48	1.62	0	0
S1	0	10.21	0	5.43	10.20	0	10.19	10.18	10.19	9.23	3.34	6.78	5.44	3.03	0	3.84	0
S2	0	5.93	10.13	6.37	9.19	3.79	2.95	4.94	10.12	3.30	4.03	4.70	0	1.46	0	0	5.13
S3	0	4.74	10.17	0	10.16	0	3.39	6.34	10.16	1.81	2.09	8.54	2.91	4.75	0	2.71	0

±10% (1T – LQ) ±5% (2T – VD)

unit (V)

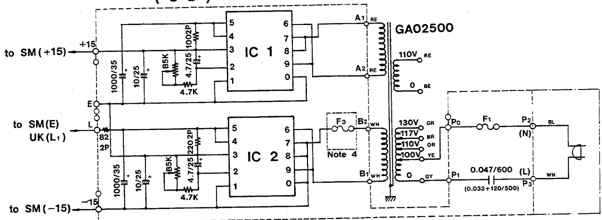
SP2 Circuit Board & Wiring



Note) 1. Diode: 1S2473VE
2. Resistor Unit: KΩ
3. J: Jumper Wire

Power Supply Circuit Diagram

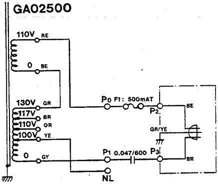
(S D)



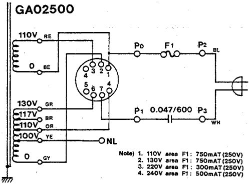
HIGH PRECISION
D.C. (±15V) SUPPLY

Note)
1. IC1. IC2: IC Voltage Regulator STK– 502
2. Fuse: F1 750mAT (250V)
3. Variable Resistor: B5KΩ Cermet type (3321H)
4. Morked [dotted box]: Canada, USA & North Europe models are shorted in the dotted line and other models attached the Fuse F3 (750mAT).

Australia model

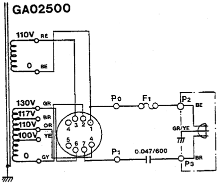


General model

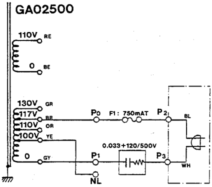


Note)
1. 110V area F1: 750mAT (250V)
2. 130V area F1: 750mAT (250V)
3. 220V area F1: 300mAT (250V)
4. 240V area F1: 500mAT (250V)

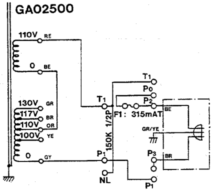
South Africa & Europe models



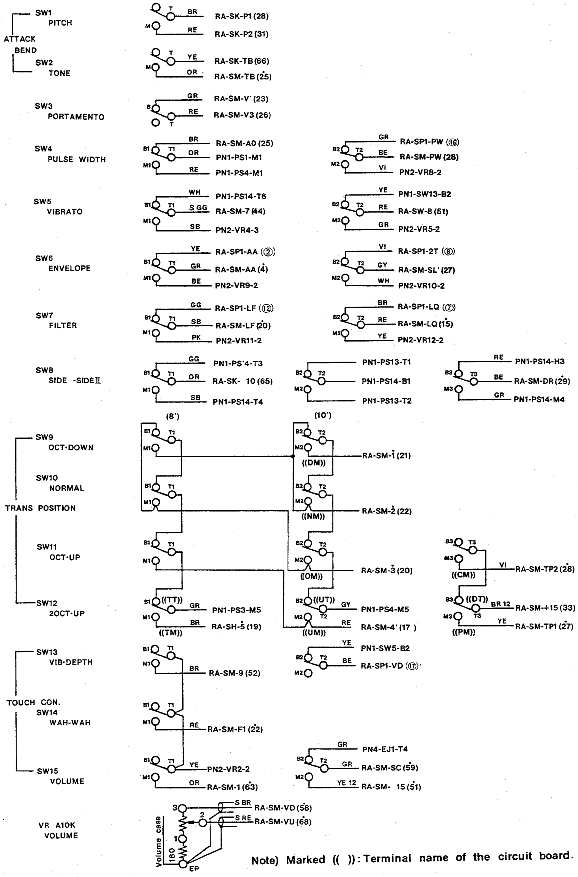
USA & Canada models



North Europe models

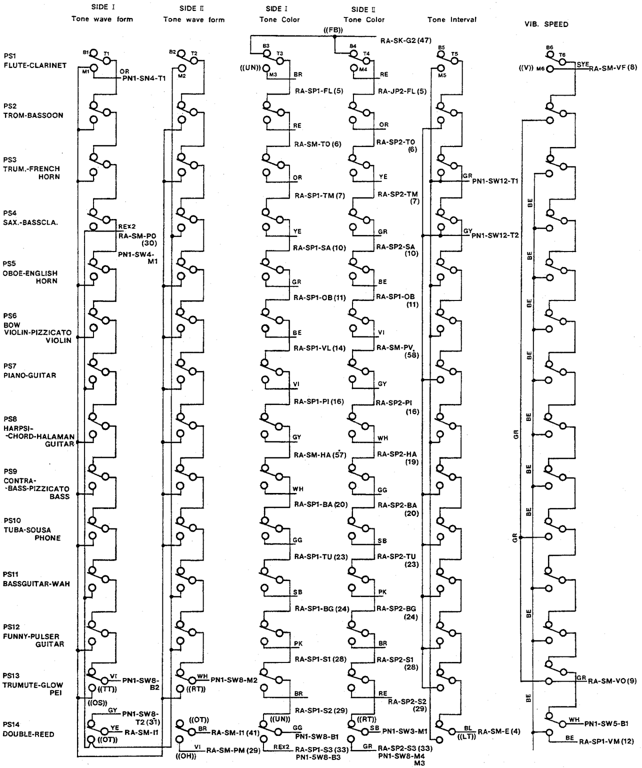


Panel 1 Circuit Diagram (1)



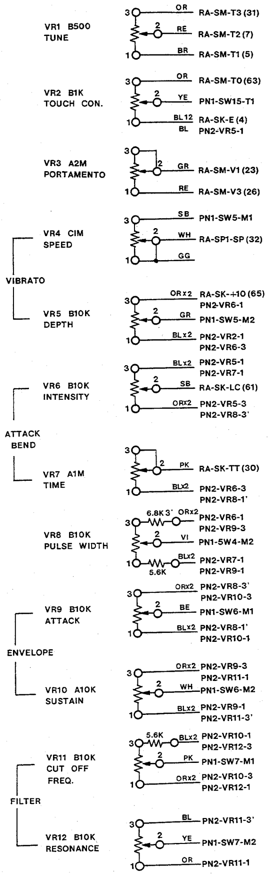
Note) Marked (( )): Terminal name of the circuit board.

Panel 1 Circuit Diagram (2)

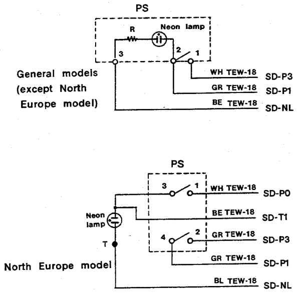


Note) marked (( )): Terminal names of the SS circuit board.

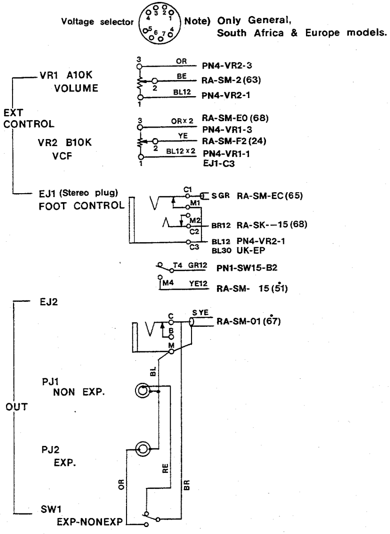
Panel 2 . 3 & 4 Circuit Diagram



KEC-3300-43



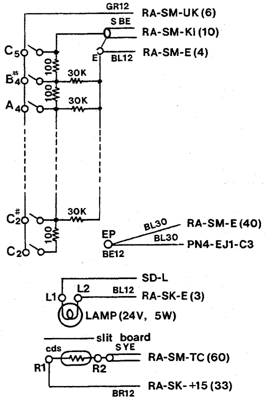
KEC-3301-43



KEC-3302-43

Manual Key board switch Circuit Diagram

MK



NAME / Key No.	C	C#	D	D#	E	F	F#	G	G#	A	A#	B
2	0.50	0.532	0.563	0.597	0.632	0.669	0.709	0.751	0.795	0.842	0.892	0.945
3	1.00	1.064	1.127	1.193	1264	1.339	1.418	1.502	1.591	1.685	1.784	1.889
4	2.00	2.127	2.253	2.386	2.528	2.677	2.836	3.003	3.181	3.369	3.568	3.779
5	4.00											

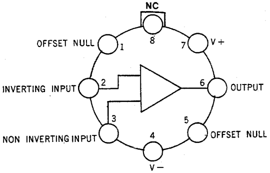
Note) Resistor: All Metal Film resistors ±0.5%

New Parts Specification

1. LG00016 MA741HC (FAIRCHILD)

CONNECTION DIAGRAMS
(TOP VIEW)

8 LEAD METAL CAN



NOTE: PIN 4 CONNECTED TO CASE

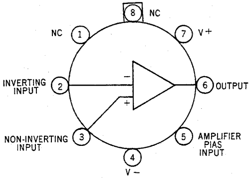
ORDER PART NOS. U5B7741312
U5B7741393

Absolute Maximum Ratings

a. Supply Voltage ±18V
b. Internal Power Dissipation 500mW
c. Differential Input Voltage ±30V
d. DC Input Voltage ±15V
e. Operating Temperature Range 0℃ to + 70℃

2. LG00036 CA3080 (RCA)

TOP VIEW



NOTE: PIN 8 IS INDICATED BY THE CASE INDEX TAB
9203-17660

Absolute Maximum Rating

a. Supply Voltage ±18V
b. Device Dissipation 125mW
c. Differential Input Voltage ±5V
d. DC Input Voltage ±18V
e. Perating Tcmperature Range 0℃ to + 70℃

SY-1 (S/# 1001 ~)

(1) Absolute Maximum Ratings

Parameter	Symbol	Conditions	Max Ratings	Units
Average output current	Io max.		1.0	A
Pulse output current	Iop max.	Pulse Width 6msec	3.0	A
Diode surge current	Isurge		30	A
Diode average rectification current	Iob max.		0.5	A
Input max. DC voltage	Vbc max.	Voltage control part	34	V
Input max. AC voltage	V_{AC} max.	Rectificated part	30	V
IC Bass Operating Temperature	Tc		85	℃
Storage Temperature Range	Tstg		−30 ~ +100	℃

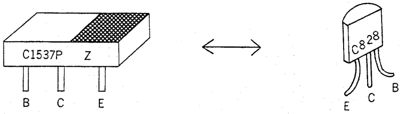
(2) Operating Characteristics (Temperature=25℃)

Parameter	Symbol	Conditions	Min	Nomal	Max.	Units
Output voltage	Vo	V_{DC}=22V, Io=1.0A	17.7	18.0	18.3	V
Output impedance	Ro	V_{DC}=22V, Io 0.1~1.0A		15		m
Stability coefficient	S	V_{DC}=22~30V Io=1.0A		0.8		mV/V_{DC}
Temperature coefficient	$^{\alpha}T$	Tc −10℃ ~ +85℃ V_{DC} 22V, Io=1.0A	−3	±1.0	+3	mV/℃
Ripple voltage	Vrp	Cin=1000μF V_{DC}=22V, Io=0.3A			1.5	mVrms

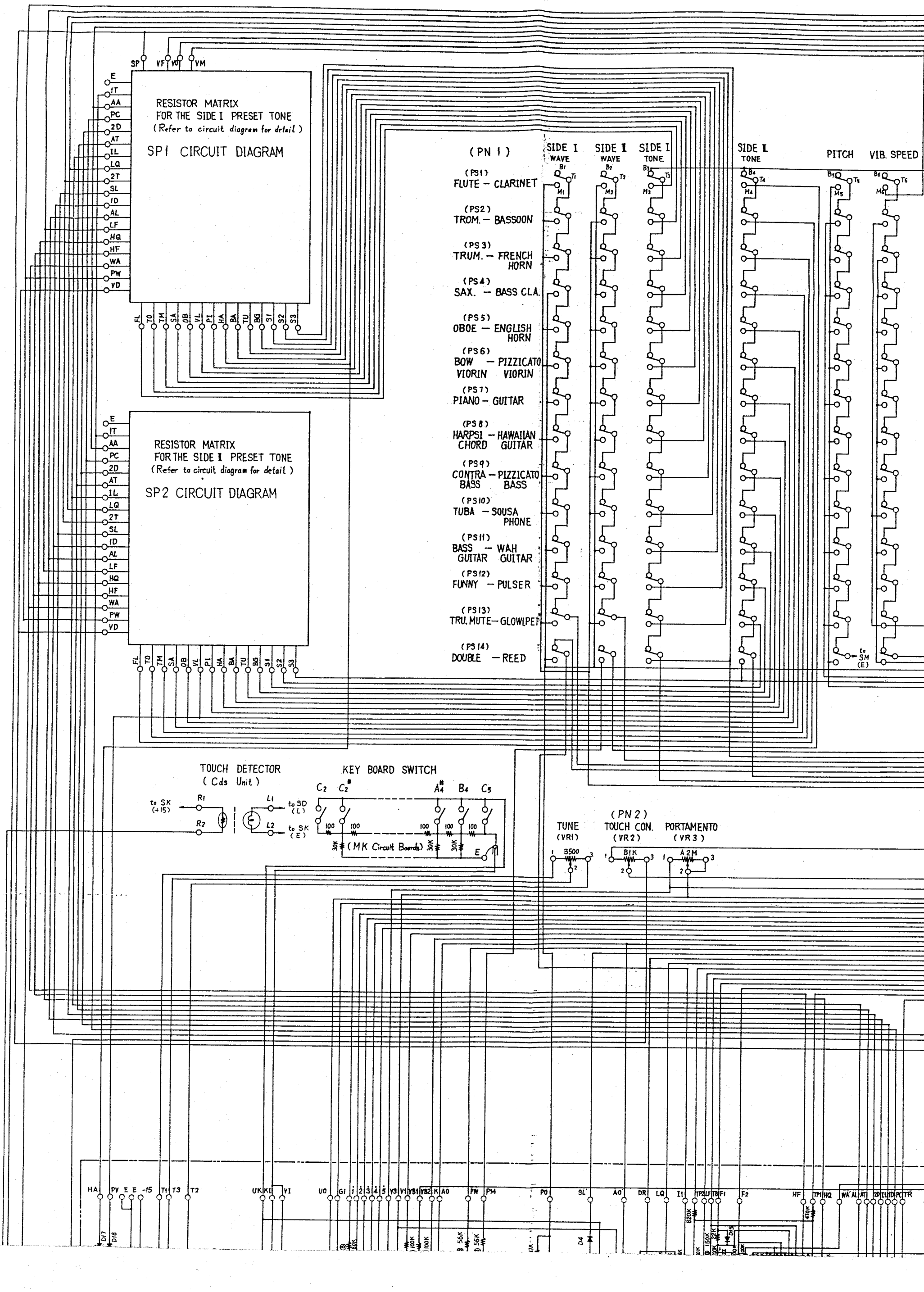
(3) Transistor

ic15370 2SC1537p

Please use 2SC828 of the Substitutive transistor.

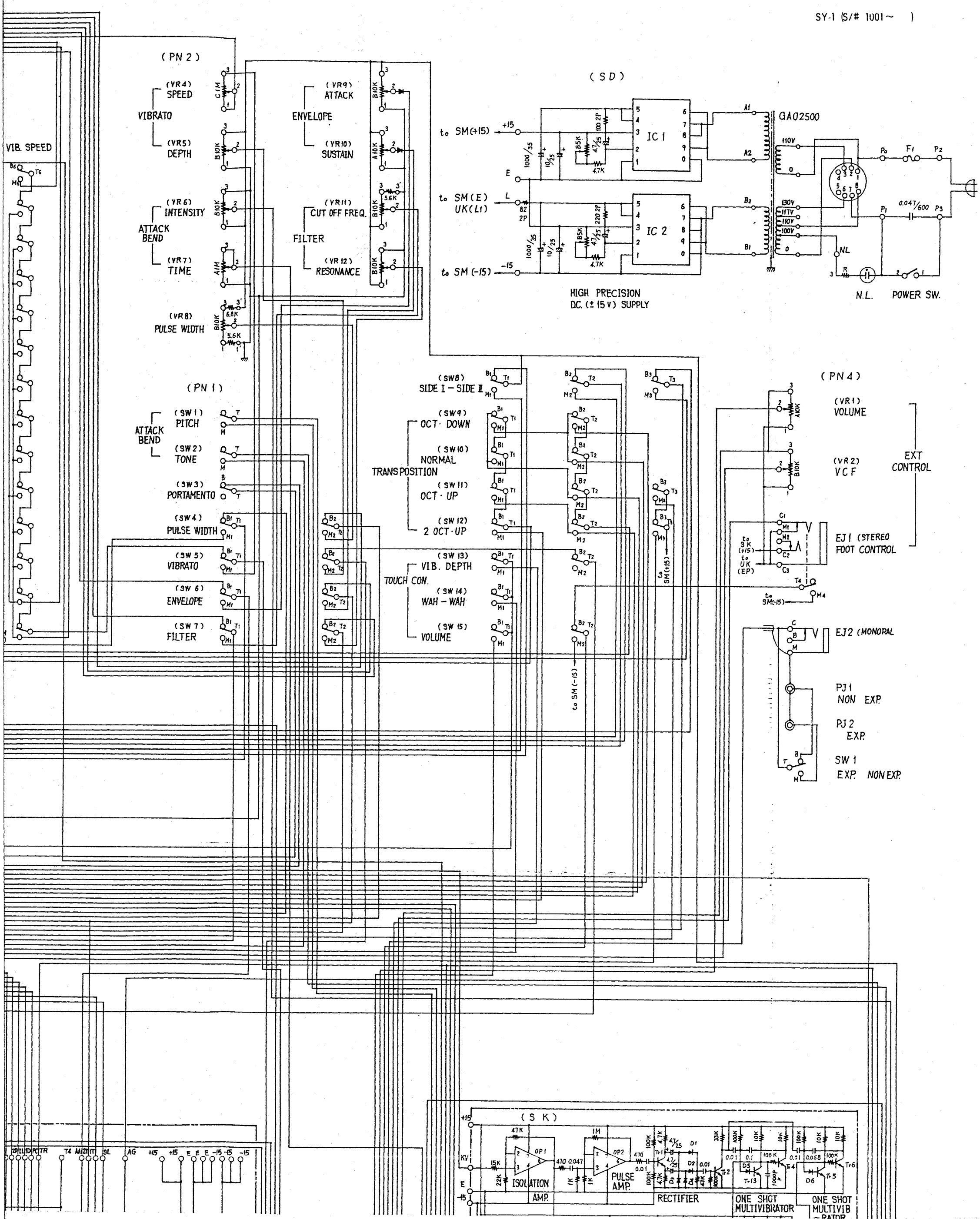


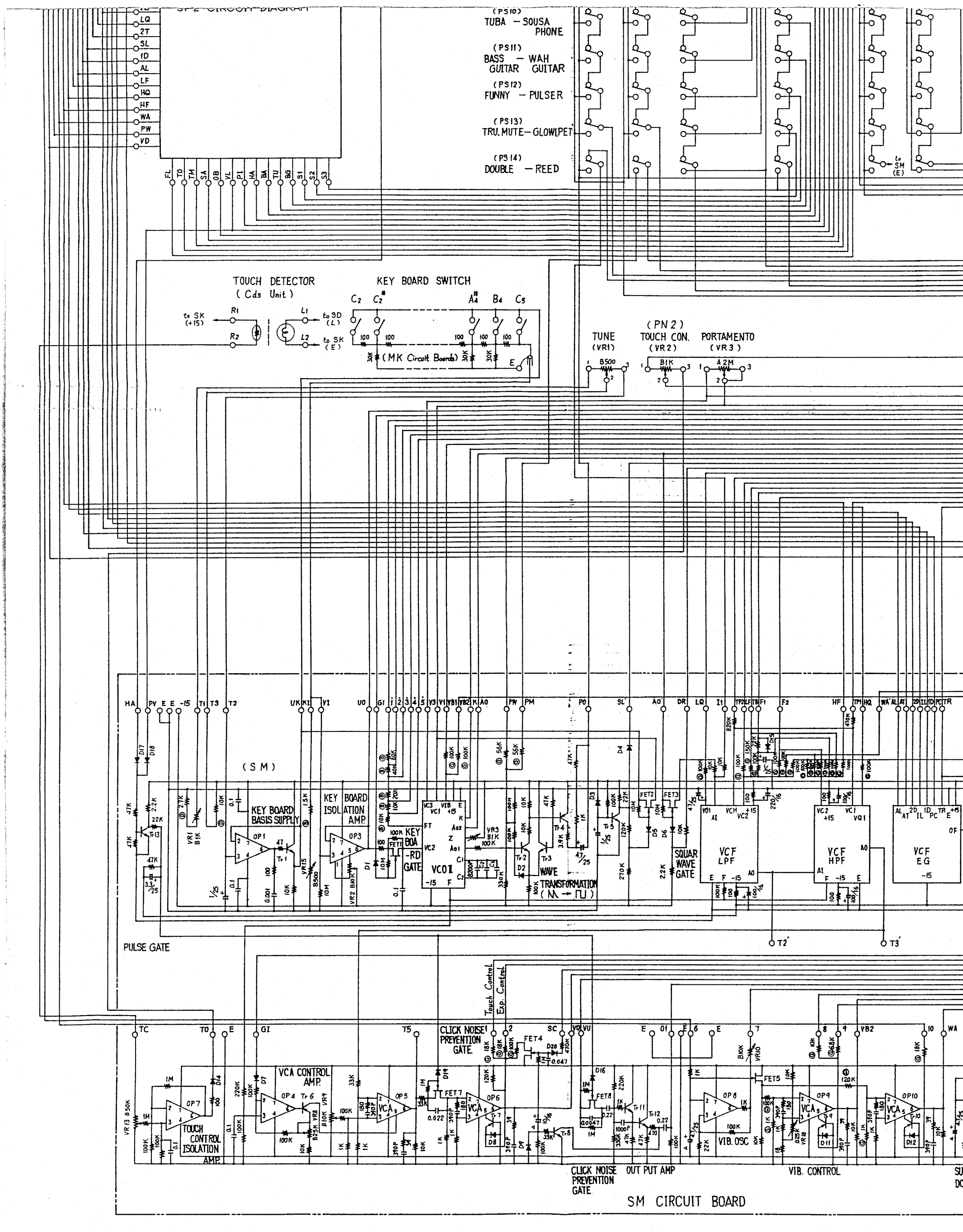
SY-1 Overall Schem

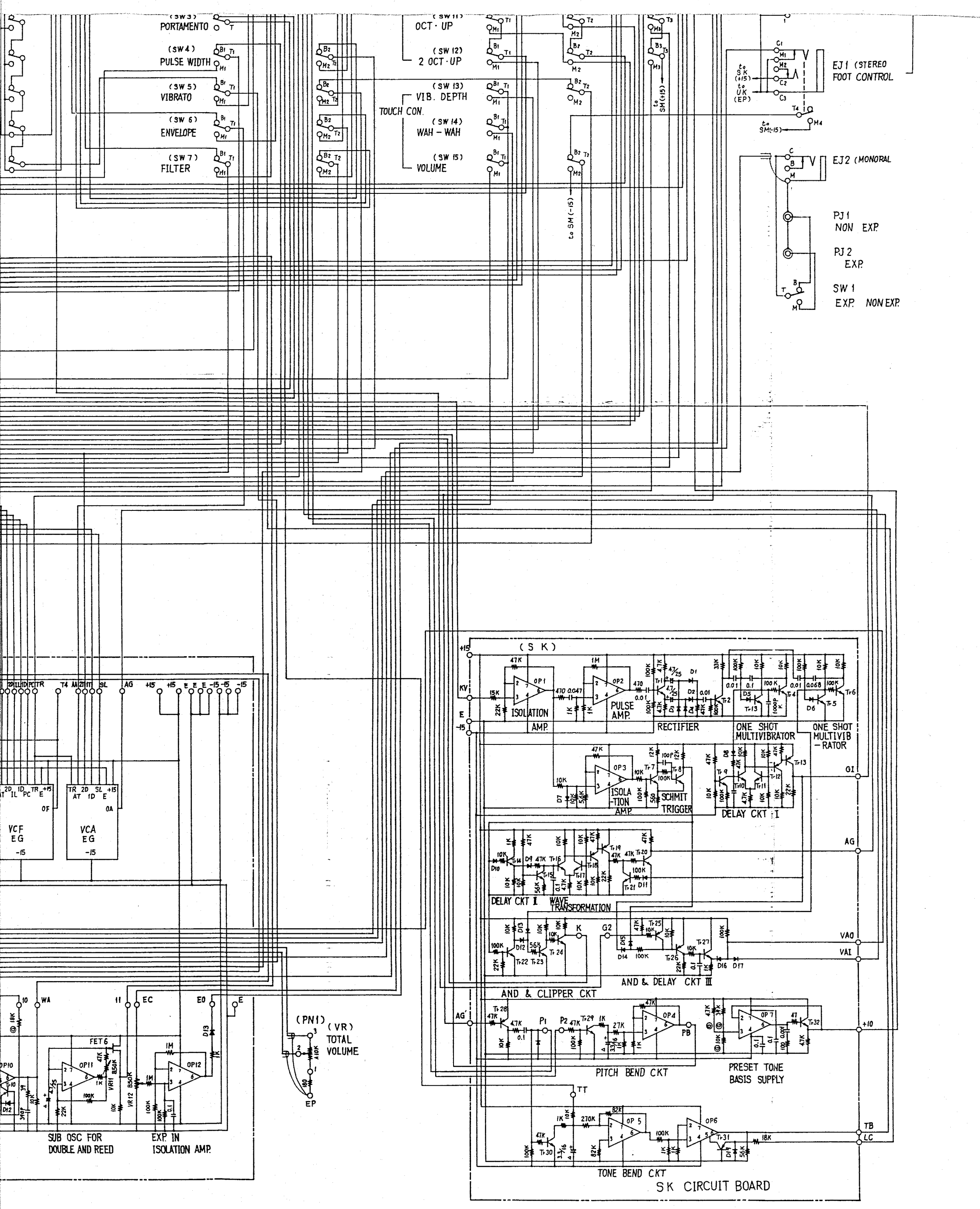


ll Schematic Diagram

SY-1 (S/# 1001~)



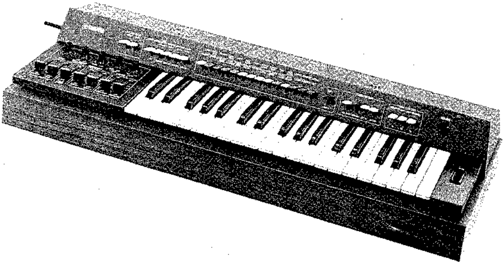

(PS10) TUBA — SOUSA PHONE
(PS11) BASS GUITAR — WAH GUITAR
(PS12) FUNNY — PULSER
(PS13) TRU. MUTE — GLOWLPET
(PS14) DOUBLE — REED
TOUCH DETECTOR (Cds Unit)
KEY BOARD SWITCH
(MK Circuit Boards)
(PN2)
TUNE (VR1)
TOUCH CON. (VR2)
PORTAMENTO (VR3)
(SM)
KEY BOARD BASIS SUPPLY
KEY ISOLATION AMP.
KEY BOARD GATE
VCO II
WAVE TRANSFORMATION
SQUAR WAVE GATE
VCF LPF
VCF HPF
VCF EG
PULSE GATE
CLICK NOISE PREVENTION GATE
VCA CONTROL AMP.
TOUCH CONTROL ISOLATION AMP.
Touch Control
Exp. Control
OUT PUT AMP
VIB. OSC
VIB. CONTROL
SM CIRCUIT BOARD


(SW3) PORTAMENTO
(SW4) PULSE WIDTH
(SW5) VIBRATO
(SW6) ENVELOPE
(SW7) FILTER
(SW11) OCT·UP
(SW12) 2 OCT·UP
(SW13) VIB. DEPTH
TOUCH CON.
(SW14) WAH-WAH
(SW15) VOLUME
to SM(+15)
to SM(-15)
to SK (+15)
to UK (EP)
EJ1 (STEREO FOOT CONTROL
EJ2 (MONORAL
PJ1 NON EXP.
PJ2 EXP.
SW1 EXP. NON EXP.
VCF EG
VCA EG
(S K)
ISOLATION AMP.
PULSE AMP.
RECTIFIER
ONE SHOT MULTIVIBRATOR
ONE SHOT MULTIVIB-RATOR
ISOLA-TION AMP.
SCHMIT TRIGGER
DELAY CKT I
DELAY CKT II
WAVE TRANSFORMATION
AND & CLIPPER CKT
AND & DELAY CKT III
PITCH BEND CKT
PRESET TONE BASIS SUPPLY
TONE BEND CKT
SK CIRCUIT BOARD
SUB OSC FOR DOUBLE AND REED
EXP. IN ISOLATION AMP.
(PN1) (VR) TOTAL VOLUME

YAMAHA SOLO SYNTHESIZER

SY－1

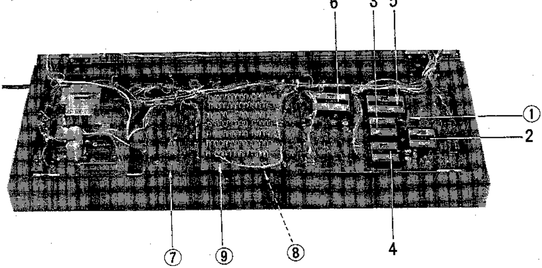
Parts List



CONTENTS

1. Circuit Board, Power Sppply Unit and Component Parts

(シート，電源ユニット及びその部品)

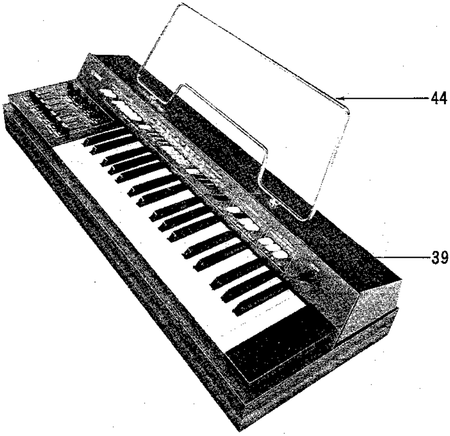


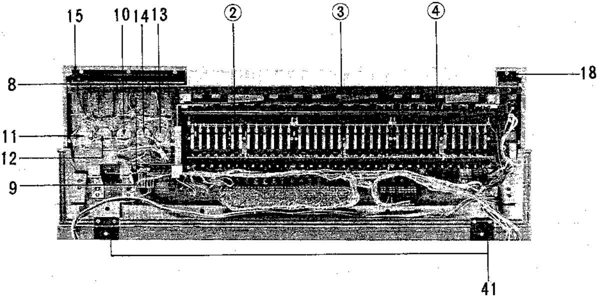
Ref. No.	Part No.	Description		Remarks	Common Models	
①	NA 02965	SM Circuit Board #16893	S M シ ー ト			
	FP 14633	Tantalum capacitor 25V 3.3μF	タンタルコンデンサ			
	FP 14647	—do.— 25V 4.7μF	〃			
	HB 16610	Carbon resistor 1KΩ 1/4P ±2%	絶縁型炭素被膜抵抗			
	HB 16668	—do.— 6.8KΩ —do.—	〃			
	HB 16710	—do.— 10KΩ —do.—	〃			
	HB 16718	—do.— 18KΩ —do.—	〃			
	HB 16756	—do.— 56KΩ —do.—	〃			
	HB 16782	—do.— 82KΩ —do.—	〃			
	HB 16810	—do.— 100KΩ —do.—	〃			
	HU 38627	Metal film resistor 2.7KΩ 1/4P ±0.5%	金 属 被 膜 抵 抗			
	HU 38710	—do.— 10KΩ —do.—	〃			
	HU 19710	—do.— 10KΩ 1/4P ±0.1%	〃			
	HU 19720	—do.— 20KΩ —do.—	〃			
	HU 19740	—do.— 40KΩ —do.—	〃			
	HU 19780	—do.— 80KΩ —do.—	〃			
	HI 20999	Solid resistor EPC—14 10MΩ ±10%	ソ リ ッ ド 抵 抗			
	HT 14019	Valiable resistor B50KΩ (18K3—1)	可 変 抵 抗 器			
	HT 14021	—do.— B25KΩ (—do.—)	〃			
	HT 14027	—do.— B50KΩ (—do.—)	〃			
	HT 56004	Cermet type trimmer potentiometer B1KΩ (3321H)	多回転式可変抵抗器			
	HT 56007	—do.— B10KΩ(—do.—)	〃			
	iA 05612	Transistor 2SC561(Y)	トランジスター			
	iC 04588	—do.— 2SC458(B) or (C)	〃			
	iE 00001	FET(field effect transistor) 2SK30A(Y)	F E T			
	iF 00007	Diode 1S2473 VE				

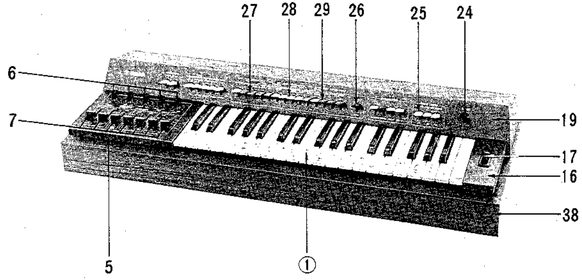
Ref. No.	Part No.	Description		Remarks	Common Models	
	iG 00016	Integrated circuit iA741HC	I C			
	iG 00036	—do.— CA3080	〃			
2	NE 10200	Module VCO II #2	モジュール			
3	NE 10400	—do.— VCF-LPF #4	〃			
4	NE 10500	—do.— VCF-HPF #5	〃			
5	NE 10800	—do.— VCF-EG #8	〃			
6	NE 10900	—do.— VCA-EG #9	〃			
⑦	NA 02966	SK circuit board #16902	S K シート	NA03050-54 1-42		
	FN 13633	Solid aluminum capacitor 16V 3.3μF	固体アルミ電解コンデンサ			
	HB 16647	Carbon resistor 4.7KΩ 1/4P ±2%	絶縁型炭素被膜抵抗			
	HB 16739	—do.— 39KΩ —do.—	〃			
	HB 16710	—do.— 10KΩ —do.—	〃			
	iA 04952	Transistor 2SA495 (Y)	トランジスター			
	iA 05612	—do.— 2SA561 (Y)	〃			
	iC 15370	—do.— 2SC1537 (P)(Q)(R)	〃			
	iC 07523	—do.— 2SC752 (O)(Y)	〃			
	iF 00006	Diode IS2473VA	ダイオード			
	iF 00007	—do.— IS2473VE	〃			
	iG 00016	Integrated circuit iA741HC	I C			
	iG 00036	—do.— CA3080	〃			
⑧	NA 02967	SP1 circuit board #16910	SP1 シート			
⑨	NA 02968	SP2 —do.— #16910	SP2 シート			
	HB 16591	Carbon resistor 910Ω 1/4P ±2%	絶縁型炭素被膜抵抗			
	HB 16611	—do.— 1.1KΩ —do.—	〃			
	HB 16612	—do.— 1.2KΩ —do.—	〃			
	HB 16613	—do.— 1.3KΩ —do.—	〃			
	HB 16615	—do.— 1.5KΩ —do.—	〃			
	HB 16616	—do.— 1.6KΩ —do.—	〃			
	HB 16618	—do.— 1.8KΩ —do.—	〃			
	HB 16620	—do.— 2 KΩ —do.—	〃			
	HB 16622	—do.— 2.2KΩ —do.—	〃			
	HB 16624	—do.— 2.4KΩ —do.—	〃			
	HB 16627	—do.— 2.7KΩ —do.—	〃			
	HB 16630	—do.— 3 KΩ —do.—	〃			
	HB 16633	—do.— 3.3KΩ —do.—	〃			
	HB 16636	—do.— 3.6KΩ —do.—	〃			
	HB 16639	—do.— 3.9KΩ —do.—	〃			
	HB 16643	—do.— 4.3KΩ —do.—	〃			
	HB 16647	—do.— 4.7KΩ —do.—	〃			
	HB 16651	—do.— 5.1KΩ —do.—	〃			
	HB 16656	—do.— 5.6KΩ —do.—	〃			
	HB 16662	—do.— 6.2KΩ —do.—	〃			
	HB 16668	—do.— 6.8KΩ —do.—	〃			
	HB 16675	—do.— 7.5KΩ —do.—	〃			
	HB 16682	—do.— 8.2KΩ —do.—	〃			

Ref. No.	Part No.	Description		Remarks	Common Models
	HB 16691	Carbon resistor 9.1KΩ 1/4P ±2%	絶縁型炭素被膜抵抗		
	HB 16710	—do.— 10KΩ —do.—	〃		
	HB 16711	—do.— 11KΩ —do.—	〃		
	HB 16747	—do.— 47KΩ —do.—	〃		
	HB 16762	—do.— 62KΩ —do.—	〃		
	iF 00007	Diode 1S2473VE	ダイオード		
	NA 02976	MK1 circuit board #16951, molded NB03421(Key switch)	MK1シート		
	NA 02977	MK2 —do.— #16962, molded NB03422(—do.—)	MK2シート		
	NA 02978	MK3 —do.— #16962, molded NB03423(—do.—)	MK3シート		
	HU 18510	Metal film resistor 100Ω 1/4P ±0.5%	金属被膜抵抗		
	HU 18615	—do.— 1.5KΩ —do.—	〃		
	HU 18730	—do.— 30KΩ —do.—	〃		
	HT 56003	Cermet type trimmer potentiometer B500Ω(3321H)	多回転式可変抵抗器		
⑩	NB 03416	Power supply unit #03416	電源ユニット	General model (110V, 130V areas)	
	NB 03417	—do.— #03417	〃	General model (220V, 240V areas)	
	NB 03418	—do.— #03418	〃	US & Canadian models	
	NB 03427	—do.— #03427	〃	European model	
	NB 03428	—do.— #03428	〃	Australian model	
11	GA 02500	Power transformer #02540	電源トランス		
12	iG 00046	Integrated circuit STK—502	IC電圧レギュレーター		
⑬	NA 02988	SD circuit board #16923	SDシート	US & Canadian models	
	NA 02989	—do.— —do.— —do.—	〃	European model	
	NA 02990	—do.— —do.— —do.—	〃	General model (220V, 240V areas)	
	NA 03024	—do.— —do.— —do.—	〃	General model (110V, 130V areas)	
14	HT 56007	Cermet type trimmer potentiometer B10KΩ(3321H)	多回転式可変抵抗器		
	HL 32510	Metal oxide resistor 100Ω 2W	酸化金属被膜抵抗		
	HL 42522	—do.— 220Ω 2W	〃		
	HL 32482	—do.— 82Ω 2W	〃		
	HU 38647	Metal film resistor 4.7KΩ 1/4p ±0.5%	金属被膜抵抗		
	LB 20047	Fuse holder #20047 (SMKH—N1150)	ヒューズホルダー	European model	
	LB 20057	Fuse holder pin (SN—5053)	ヒューズホルダーピン	except European models	
	KB 00065	Miniature fuse 250V 315mA	ミニチュアヒューズ	European model	
	KB 00122	Lead type fuse 250V 750mA	リード付ヒューズ	US & Canadian models	
	KB 00031	Fuse 250V 500mA	ヒューズ	General model	
	KB 00032	—do.— 250V 750mA	〃	—do.—	
	FZ 00011	Spark killer 0.033μF+120Ω/500V	スパークキラー	US & Canadian models	
	FQ 02447	Oil capacitor 600V 0.047μF	オイルコンデンサー	General model	

2. Panels, Cabinet and Component Parts
(パネル及び外装関係部品)



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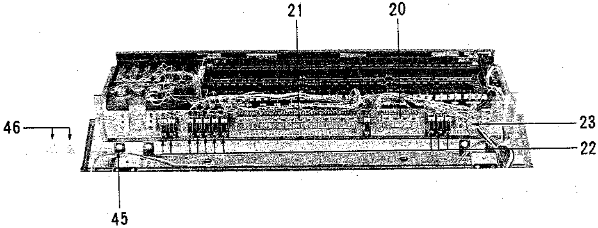
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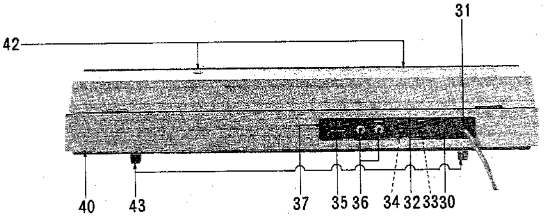
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Ref. No.	Part No.	Description		Remarks	Common Models	
①	NB 03400	Keyboard assembly	鍵盤アッセンブリー			
	CB 01117	White Key C, F	白 鍵			
	CB 01118	—do.— D	〃			
	CB 01119	—do.— E, B	〃			
	CB 01120	—do.— G	〃			
	CB 01121	—do.— A	〃			
	CB 01122	—do.— C′	〃			
	CB 01123	Black Key	黒 鍵			
	AA 01567	Key spring , white key	キースプリング			
	AA 01568	—do.— , black key	〃			
	AA 03279	Keyboard spacer (U)	口 金 U			
	AA 03250	Spring	引 張 バ ネ			
	CB 01584	Dust cover	ダ ス ト カ バ ー			
②	NB 03421	Switch assembly, 13K	スイッチアッセンブリー			
③	NB 03422	—do.— , 12K	〃			
④	NB 03423	—do.— , 12K	〃			
		Component parts of endblock (left)				
5	30108500045510	Endblock (left)	拍 子 木 (左)			
6	CB 00495	Knob #00495	ツ マ ミ			
7	CB 06619	—do.— #06619	〃			
	AA 01779	Volum fixing metal	V R 板			
8	HQ 30015	Slide variable resistor B10KΩ	スライドボリューム			
9	HQ 30018	—do.— A10KΩ	〃			
10	HR 20016	Variable resistor A2MΩ	可 変 抵 抗 器			
11	HR 20015	—do.— B500Ω	〃			
12	HR 20007	—do.— B1KΩ	〃			
13	HR 20010	—do.— B10KΩ	〃			
14	HR 20017	—do.— C1MΩ	〃			
	LA 00002	Lug terminal 2P 1L	小 型 ラ グ 板			
	iF 00004	Diode 1S1555	ダ イ オ ー ド			
15	AA 03297	Metal cover	拍子木カバー			
		Component parts of endblock (right) (except Swedish & Norwegian models)				
16	30108500045530	Endblock (right)	拍 子 木 (右)			
17	KA 10007	See-sow switch (power SW)	パワースイッチ			
18	AA 03298	Metal cover	拍子木カバー			

Ref. No.	Part No.	Description		Remarks	Common Models	
		Component parts of endblock (right) (European model)				
	30108500034511	Endblock (right)	拍 子 木 (右)			
	KA 10012	See-sow switch (power switch)	パワースイッチ	Swedish & Norwegian models		
	BB 00236	Switch clamper	スイッチ止メ軸			
	AA 03298	Metal cover	拍子木カバー			
	CB 00166	Pilot lens	赤 玉			
	CB 00777	Lamp holder	ランプホルダー			
	JB 00018	Neon lamp	ネ オ ン 管			
	LA 00004	Lug terminal 3P 1L	ラ グ 板			
		Component parts of panel assembly				
19	30108500034510	Panel	パ ネ ル			
20	KA 70054	4 multi lever switch	4連ピアノスイッチ			
21	KA 70055	14 −do.−	14連ピアノスイッチ			
22	KA 20020	Lever switch	レバースイッチ			
23	HR 20002	Variable resistor A10K(RV24YN 27KQ)	可 変 抵 抗 器			
	NA 02983	SS1 circuit board for KA70055	SS1 シ ー ト			
	NA 02984	SS2 −do.− for KA70054	SS2 シ ー ト			
24	CB 00495	Knob	ツ マ ミ			
25	CB 02494	−do.− , white	〃			
26	CB 02495	−do.− , black	〃			
27	CB 02496	−do.− , red	〃			
28	CB 02497	−do.− , yellow	〃			
29	CB 02498	−do.− , green	〃			
	AA 03512	Lever switch fixing metal	スイッチ板			
		Component parts of back panel NB03409				
30	AA 03302	Back panel	バックパネル			
	AA 03300	Volum fixing metal	V R 板			
	LB 20025	Voltage selector	電 圧 切 替 器			
31	CB 00441	Cord stopper	コードストッパー			
32	CB 01913	Knob	ツ マ ミ			
33	HR 20002	Variable resistor A10KΩ(RV24YN 27KQ)	可 変 抵 抗 器			
34	HR 20010	−do.− B10KΩ(−do.−)	〃			
35	KA 40000	Slide switch SL−13	スライドスイッチ			
36	LB 40010	Phone jack	イヤホーンジャック			
37	LB 20019	Pin jack , 2P	ピンジャック			
38	30108500015000	Cabinet	本 体			

Ref. No.	Part No.	Description		Remarks	Common Models	
39	30108500021290	Top cover	屋根			
40	30108500024010	Bottom cover	床板			
41	AA 01614	Hinge #01614	蝶番			
42	AA 03289	Bush for music rest	譜面板ブッシュ			
43	AA 03290	Adjustable bolt	調節ボルト			
	AA 01547	Nut for leg	脚用ナット			
44	AA 03292	Music rest	譜面板			
45	AA 03326	Angle metal	アングル			
	CB 02487	Music rest supporter	譜面板押え			
	CB 02544	Vinyl band for panel supporter	サポート			
46	EU 05020	Wing bolt 5×20	蝶ボルト			