

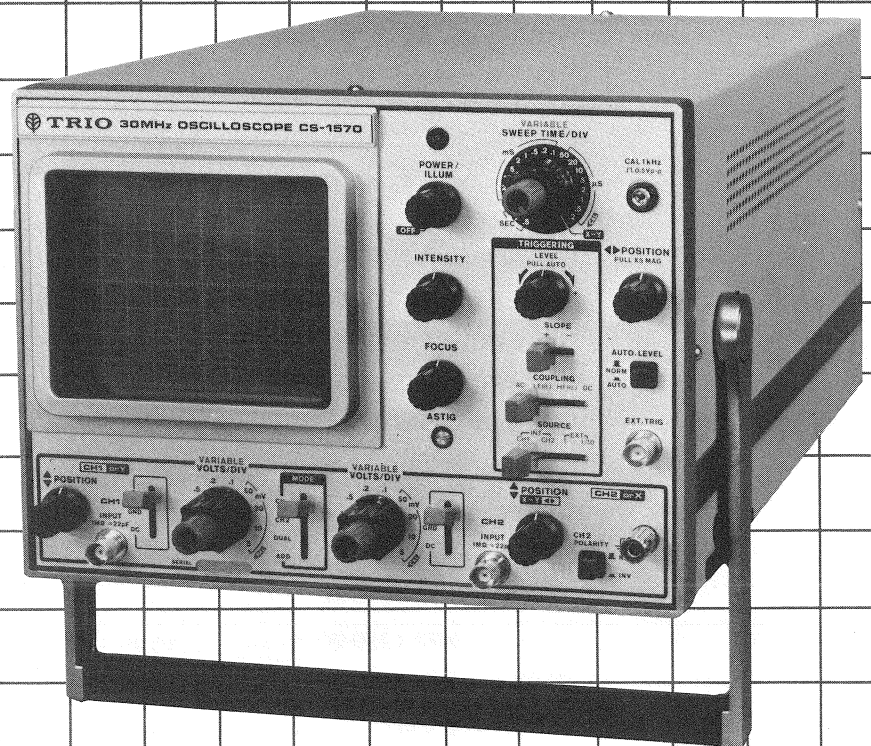


# TRIO

# SERVICE MANUAL

# CS-1570

OSCILLOSCOPE



# OUTLINES/CONTENTS

## OUTLINES

Offers a wide frequency range from DC to 30 MHz (−3 dB) and a high sensitivity of 5 mV/div (1 div = 1 cm).  
Automatically synchronized with a changing wave form due to automatic level synchronizing function.  
Sync input is automatically switched over to its channel when a single phenomenon is observed.  
Because of the adoption of the signal delay system, the rising part of a high-speed pulse can be exactly observed.  
The mesh type rear-stage accelerated CRT assures a sufficient luminance.  
The adoption of many IC's has raised reliability.  
The digital switch circuit is adopted and a large part of wiring is eliminated by rational design.  
In X-Y mode setting, CH1 and CH2 are directly displayed on the X and Y axis.  
CHOP and ALT are automatically selected by electronically interlocked SWEEP TIME/DIV switch.  
The bright line can be checked at no-signal time due to the auto-free-running function.  
Sync coupling comes in 4 types, AC, LF Rej, HF Rej, and DC. Stabilized synchronization is possible.  
Since power consumption is low (25W), heat generation is minimal and high stability is secured.

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# SPECIFICATIONS

## CATHODE RAY TUBE (CRT)

Type of Cathode Ray Tube H9155P31 (130mm)  
 Acceleration Voltage 4 kV  
 Effective Area 8 div x 10 div (1 div = 10 mm)

## VERTICAL AXIS (for both CH1 and CH2)

Sensitivity 5 mV/div~5 V/div  $\pm 3\%$   
 Precisely adjustable in all 10 ranges  
 Input Impedance  $1M\Omega \pm 2\%$ , 24pF  $\pm 3pF$   
 Frequency Response DC: DC~30MHz  
 (less than -3 dB)  
 AC: 5 Hz~30MHz  
 (less than -3 dB)  
 Rising Time Less than 11.7nsec.  
 Overshoot Less than 3%  
 (at 100 kHz square wave)  
 Cross-talk Less than -66 dB

## Operating Mode

CH1 Channel 1 only  
 CH2 Channel 2 only  
 DUAL 2-channel (CHOP and ALT are automatically selected by SWEEP TIME/DIV),  $0.2\mu s/div \sim 1.5ms/div$ : ALT  $1ms/div \sim 0.5s/div$ : 200 kHz

ADD CH1 + CH2

Polarity Reversal CH2 only  
 Maximum Input Voltage 600V p-p or 300 V  
 (DC + AC peak)

Signal Delay Time More than 12 nsec.  
 (delay time on CRT screen)  
 Maximum Amplitude without Distortion More than 4 div at 30 MHz,  
 More than 8 div below 10 MHz

## HORIZONTAL AXIS

Operating Mode X-Y mode is selected by SWEEP TIME/DIV

CH1 Y axis  
 CH2 X axis

Sensitivity Same as VERTICAL (CH2)  
 Input Impedance Same as VERTICAL (CH2)  
 Frequency Response DC: DC  $\sim 2$  MHz (-3 dB)  
 AC: 5 Hz  $\sim 2$  MHz (-3 dB)

## SWEEP CIRCUIT

Sweep System NORM Triggering sweep  
 AUTO Free-running sweep at no-signal time

Sweep Time  $0.2\mu s/div \sim 0.5s/div \pm 3\%$   
 1-2-5 step  
 Precisely adjustable in all 20 ranges

Magnifier 5 times  $\pm 5\%$   
 Linearity Less than 3%

## SYNCHRONIZATION

Sync Input INT CH1 and CH2 (automatically switched for single-trace)  
 EXT 1 and 1/10

Sync System NORM Manual sync level  
 AUTO LEVEL Automatic sync level  
 Sync Polarity Positive and negative  
 Sync Coupling AC, LF Rej, HF Rej, DC

## SYNC RANGE

Sync coupling	Sync frequency range (Hz)	Minimum sync voltage (amplitude)		
		INT	EXT1	EXT1/10
AC	10 ~ 30M 20 ~ 15M	1div 0.3div	0.5Vpp 0.1Vpp	5Vpp 1Vpp
LF. Rej	10K ~ 30M 20K ~ 15M	1div 0.3div	0.5Vpp 0.1Vpp	5Vpp 1Vpp
HF. Rej	10 ~ 300K 20 ~ 50K	1div 0.3div	0.5Vpp 0.1Vpp	5Vpp 1Vpp
DC	DC ~ 30M DC ~ 15M	1div 0.3div	0.5Vpp 0.1Vpp	5Vpp 1Vpp
PULL AUTO (PULL)	10 ~ 20M 20 ~ 15M	1div 0.3div	0.5Vpp 0.1Vpp	5Vpp 1Vpp
AUTO LEVEL (AUTO)	20 ~ 20M 40 ~ 15M	1div 0.8div	0.5Vpp 0.2Vpp	5Vpp 2Vpp

## CALIBRATION VOLTAGE

0.5V p-p  $\pm 1\%$  in positive polarity  
 Standard level 0 volt  
 1 kHz  $\pm 3\%$  Square wave

## LUMINANCE MODULATION

Input Voltage Bright at +5 Vp-p or more  
 Input Impedance 10 k $\Omega$   
 Frequency Range DC  $\sim 5$  MHz  
 Maximum Input Voltage 50 V

## POWER SOURCE

Power Supply Voltage AC 50/60 Hz  
 100/120/220/240V  $\pm 10\%$   
 Power Consumption 25W

## DIMENSIONS AND WEIGHT

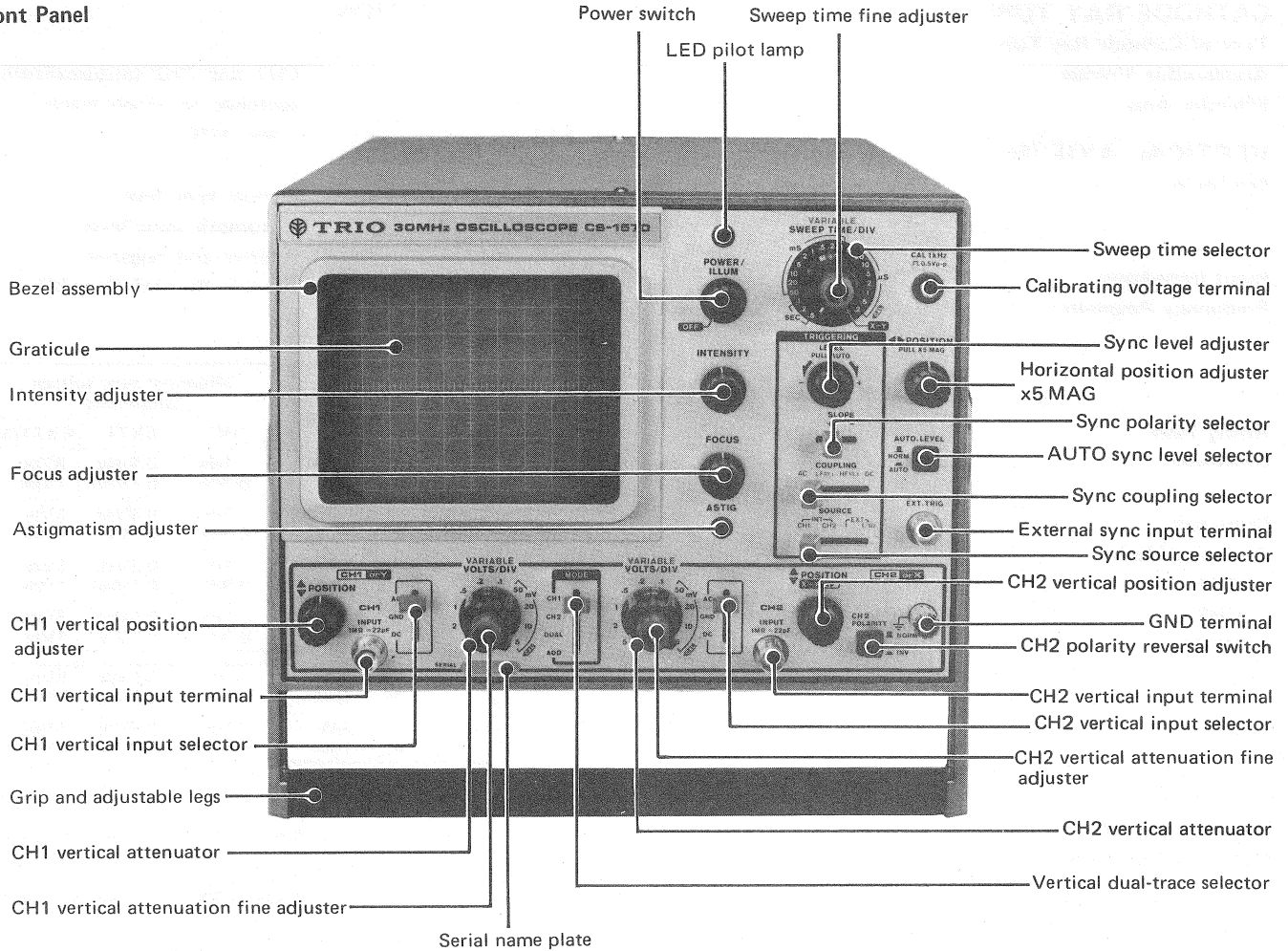
Width 260 mm (277 mm)  
 Height 190 mm (204 mm)  
 Depth 375 mm (440 mm)  
 Figures in ( ) show maximum sizes including projected parts  
 Weight 8.5 kg

## ACCESSORIES

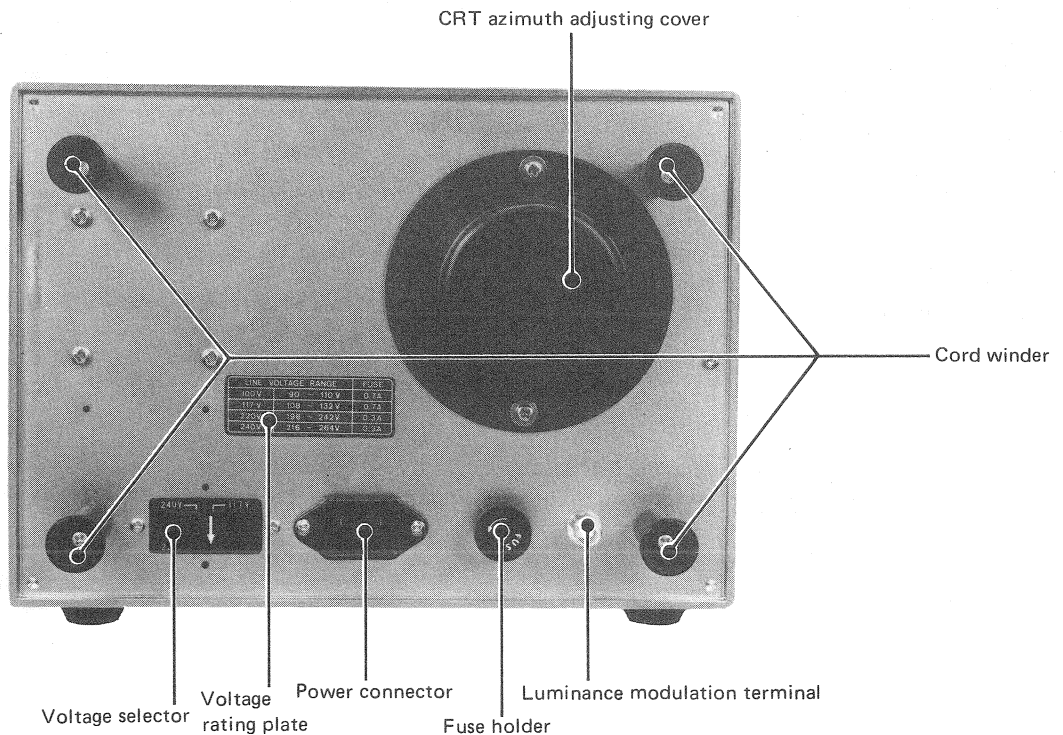
Probe PC-28 2 pcs.  
 Damping 1/10  
 Input impedance  $10M\Omega$   
 Input capacitance Less than 18pF  
 Instruction Manual 1 copy

# EXTERNAL VIEW AND NAME OF PARTS

## Front Panel



## Rear Panel



# CIRCUIT DESCRIPTIONS

Fig. 1 shows the block diagram of the oscilloscope. The circuit is shown in the circuit diagram given at the end of this manual.

## OUTLINES OF CIRCUITS

This oscilloscope is provided with two identical input attenuators and two vertical amplifiers. The input is attenuated to the required level, amplified at the pre-amplifier, and fed to the main vertical amplifier after proper switching.

Changeover between CH1 and CH2 pre-amplifiers is accomplished with MODE switch which actuates the mode control logic circuit. The input signal is finally fed to the output amplifier and the output is applied to the vertical deflection plate of CRT. The horizontal circuit generates saw-tooth wave forms synchronized by the triggering signal from the vertical circuit or the external source, which drive the horizontal amplifier while being applied to the horizontal deflection plate of CRT. During X-Y operation, the CH2 vertical input signal is amplified by the pre-amplifier and is applied as a horizontal signal to the horizontal amplifier.

All voltages together with high voltage for CRT are stabilized for reliable operation.

## VERTICAL AMPLIFIER

The pre-amplifiers for CH1 and CH2 are identical with each other in characteristics and functions.

The vertical input signal fed from the BNC input terminal is controlled by the AC-GND-DC switch and applied to the attenuator which consists of Q101, 102 (Q111, 112 for CH2) and IC101 (IC102). In this circuit the input signal is attenuated to the required level so that 10 types of vertical deflection sensitivity can be obtained. Q102 (Q112) is a dual FET which is very stable against temperature variations in DC balancing and is capable of receiving the input signal through high impedance. To obtain a good DC balance, the source circuit is provided with VR101 (VR106). IC101 (IC102) of the second attenuator performs selection for the 1-2-5 step. VR102 (VR107) is used for gain control (VARIABLE), while VR103 (VR108) is used for step attenuation and balancing.

The signal obtained from the attenuator enters the pre-amplifier which is composed of Q103~106 (Q113~116) and Q109, 110 (Q119~122). Q119~122 of the CH2 preamplifier compose part of the cascode amplifier. Simultaneously the polarity of CH2 is changed over.

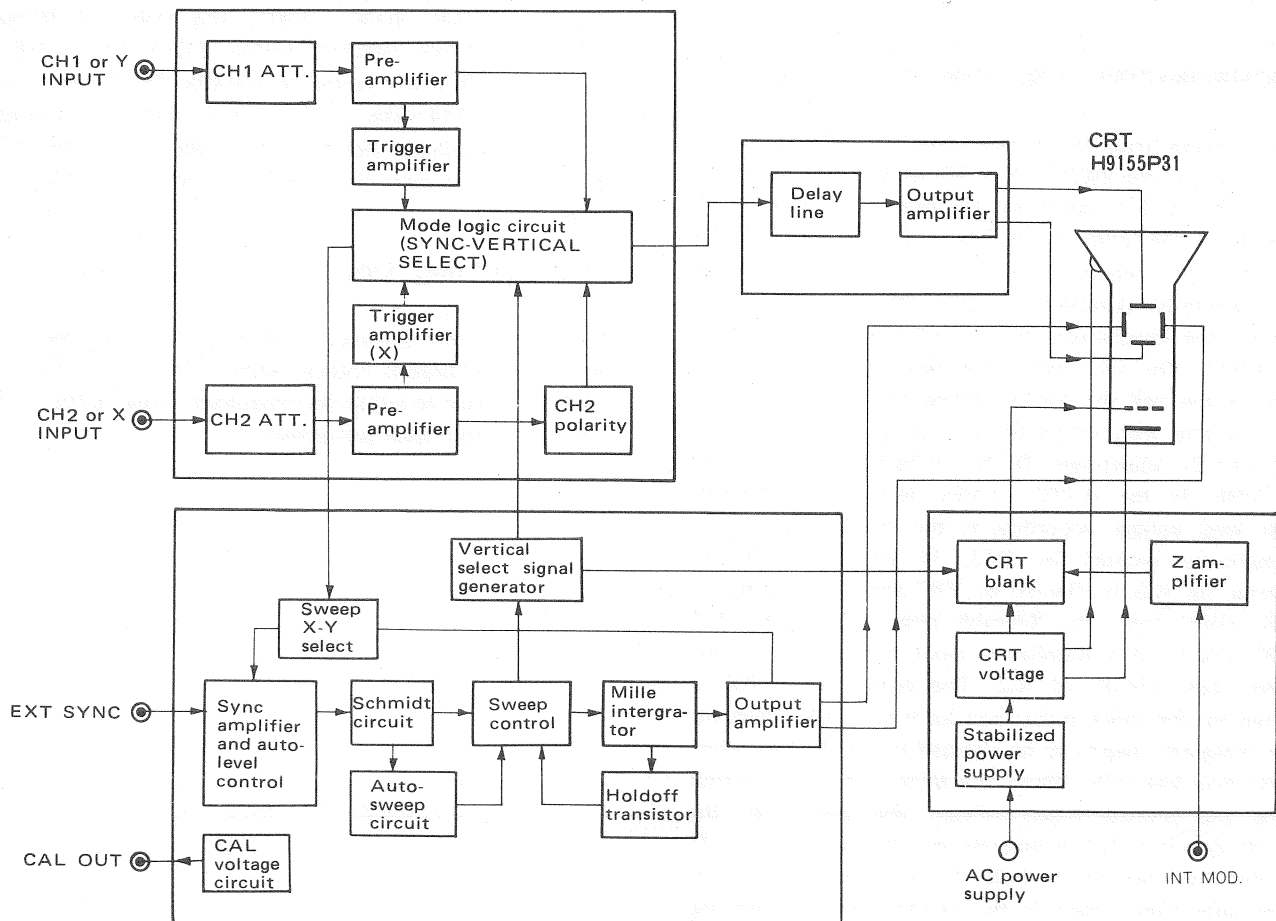


Fig. 1 Block Diagram for CS-1570

## CIRCUIT DESCRIPTIONS

The pre-amplifier adjusts vertical POSITION with VR104 (VR109). VR105 (VR112) is an adjuster for vertical POSITION centering. The variable resistor CH2 GAIN ADJ. VR110 connected to the emitter circuit of Q115, 116 of the CH2 pre-amplifier is used for gain balancing between channels. Part of the signal entering the pre-amplifier is fed to the trigger amplifier consisting of Q107, 108 (Q117, 118) and a synchronizing signal for the required mode is selected by IC103 and D116, 117, 121 of the sync select gate circuit in the mode logic. This signal is used as an internal synchronizing signal and sent to the sweep sync circuit. In X-Y operation the CH2 trigger amplifier acts as the X amplifier. Sensitivity of the X amplifier is calibrated by GAIN ADJ VR111. The signal obtained from the pre-amplifier is switched in the dual-trace mode by the vertical select gate D101~108 in the mode logic. This signal is further applied to the vertical output amplifier Q401~419 through the drive amplifier composed of Q123~126 and the delay line. VR401 connected to the emitter circuit of Q403, 404 simultaneously adjusts the gains of CH1 and CH2. The final-state output amplifier is composed of Q408~419. Q414~417 are used to improve the amplitude of the high-frequency component. The sufficiently amplified output from the final stage is directly fed to the vertical deflection plate of CRT.

### SYNCHRONIZING AND SWEEP CIRCUITS

The sync signal from the vertical amplifier (or X-axis input signal) is led to the SWEEP, X-Y SELECT circuit consisting of Q17~20. In X-Y operation the input signal for CH2 is positioned in the center of the CRT screen by X-POSITION ADJ VR12 and fed as the X-axis signal to the horizontal output amplifier composed of Q21~24. In trigger sweep operation the internal sync signal is adjusted for its DC level with VR11. The sync signal passing through the trigger source switch and the sync coupling circuit is received at FET Q12 and then enters the sync amplifier of IC5. For TRIG LEVEL adjustment, DC balancing for IC5 is adjusted with VR8. In the AUTO LEVEL setting, an optimum trigger level voltage according to the input wave form is automatically secured by D13, 14 and VR9. Output balancing for IC5 is effected by VR7 and the rectangular-shaped signal from the Schmidt circuit consisting of 2 NAND IC's 1c, d is supplied as clock pulses to the sweep control gate circuit of IC2. The output from IC2 is inverted by the clock pulses and turns Q7 OFF. Then the Miller integrator begins to be charged at a speed dependent on the time-base CR. When the Miller integrator output attains the predetermined voltage, the output of the hold-off circuit of IC3 is inverted and the sweep stops. At that time IC3 remains to hold this state until the sweep control gate circuit stays in the standby mode for waiting the next clock pulse. Q4~6 of the AUTO circuit are used to check if there is output from the Schmidt circuit of IC1.

The control signal is fed to the sweep control gate so that free running occurs at time of no signal. The amplitude of the saw-tooth output signal from the Miller integrator is adjusted by VR6 (WID) and VR15 (GAIN), and is fed to the horizontal output amplifier of Q21~24. In this amplifier, VR10 and VR202 are used to change the input DC level for the adjustment of DC balancing and horizontal position in each MAG setting.

In the horizontal output amplifier, subsidiary adjustment for ◀ ▶ POSITION VR202 is effected by VR13. VR14 is used to adjust the gain at the time of magnified sweep. The sufficiently amplified signal is then directly fed to the horizontal deflection plate of CRT.

### CRT CIRCUIT AND POWER CIRCUIT

The Q output from the sweep control gate circuit IC2 controls the vertical select signal generator of IC4 and the unblanking signal is fed to Q302~306, 313. The blanking signal amplified at Q303~305, 313 is DC-reproduced to high voltage by Q302 and Q306, 307, D304, 305 and is applied to the grid of CRT.

The CRT requires acceleration voltage of  $-1.3\text{kV}$  and high voltage of  $+2.7\text{kV}$ . These high voltages are generated by the DC-DC converter (Q301, T301) and stabilized through the feedback type regulator circuit (Q311, 312). Adjustment of  $-1.3\text{kV}$  is effected by VR303. The power circuit (Q307~310, 314~316, IC301) is fully stabilized. Voltages from the stabilized power circuit can be adjusted with VR304 and are very stable against power source fluctuations.

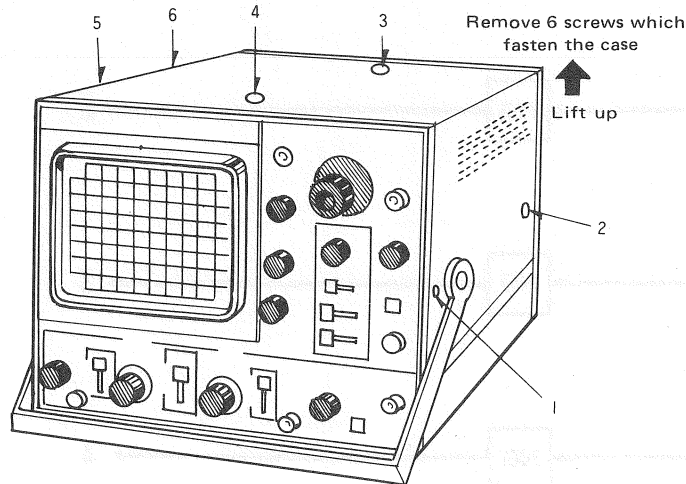
### CALIBRATING VOLTAGE

The output from the multivibrator of Q2, 3 is shaped to obtain the calibrating voltage output. The variable resistors VR2, 3 are used to adjust the frequency (pulse width). VR1 is for the output level adjustment.

# TROUBLESHOOTING

## REMOVING THE CASE (Refer to Fig. 2)

Remove the six screws from the top and side walls of the case. Then remove the four screws from the bottom plate.



(Note) A high voltage of about 3kV is applied to the CRT socket and the rear printed circuit board. The case should be removed after the oscilloscope has been de-energized completely. After the removal of the case, never touch the high-voltage section with fingers, screw driver, etc.

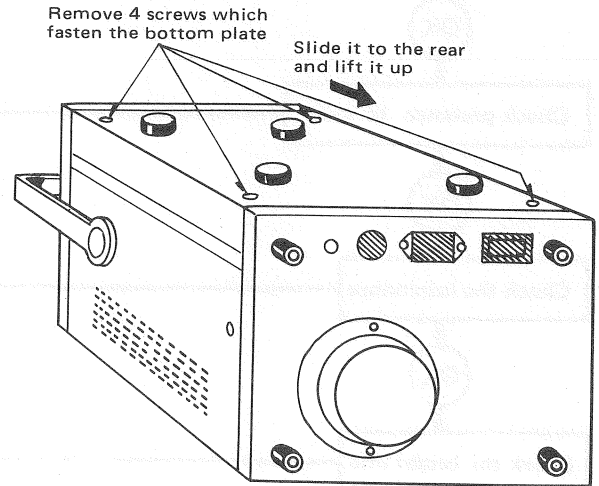


Fig. 2 Removing the Case

## REMOVING THE BEZEL (Refer to Fig. 3)

Since the bezel is mounted on the case through the four mold legs on its back, it can directly be removed without using any tool. However, the mold legs may be broken if unreasonable force is exerted on them carelessly. As shown in Fig. 3 (A), remove the two legs on the bottom side first. (They should be loosened so that the swelling part a of each leg's tip is unlocked as shown in Fig. 3 (B).) Then the remaining two legs on the top side can be dismantled. In dismantling these legs, only vertical force should be exerted always against the panel surface.

When mounting the bezel 1 on the case, as shown in Fig. 3 (C), get the two holes B and B' of the graticule 2 engaged with the two bosses A and A' of the bezel 1. Then get them engaged with the two holes C and C' of the filter 3.

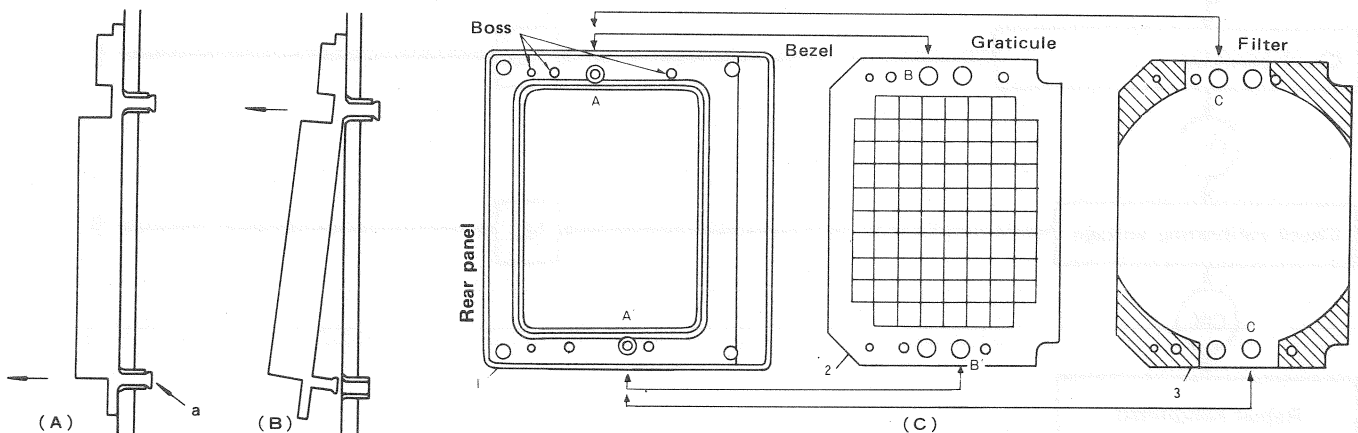


Fig. 3 Removing the Bezel

## AC VOLTAGE SELECTOR

The oscilloscope may be operated from 100V, 120V, 220V, 240V, putting the AC voltage selector in place of another.

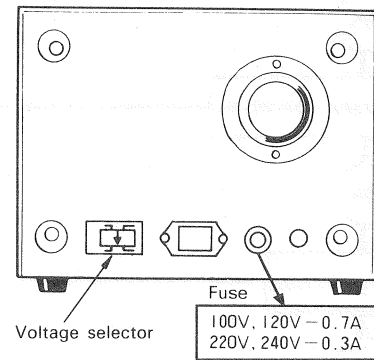
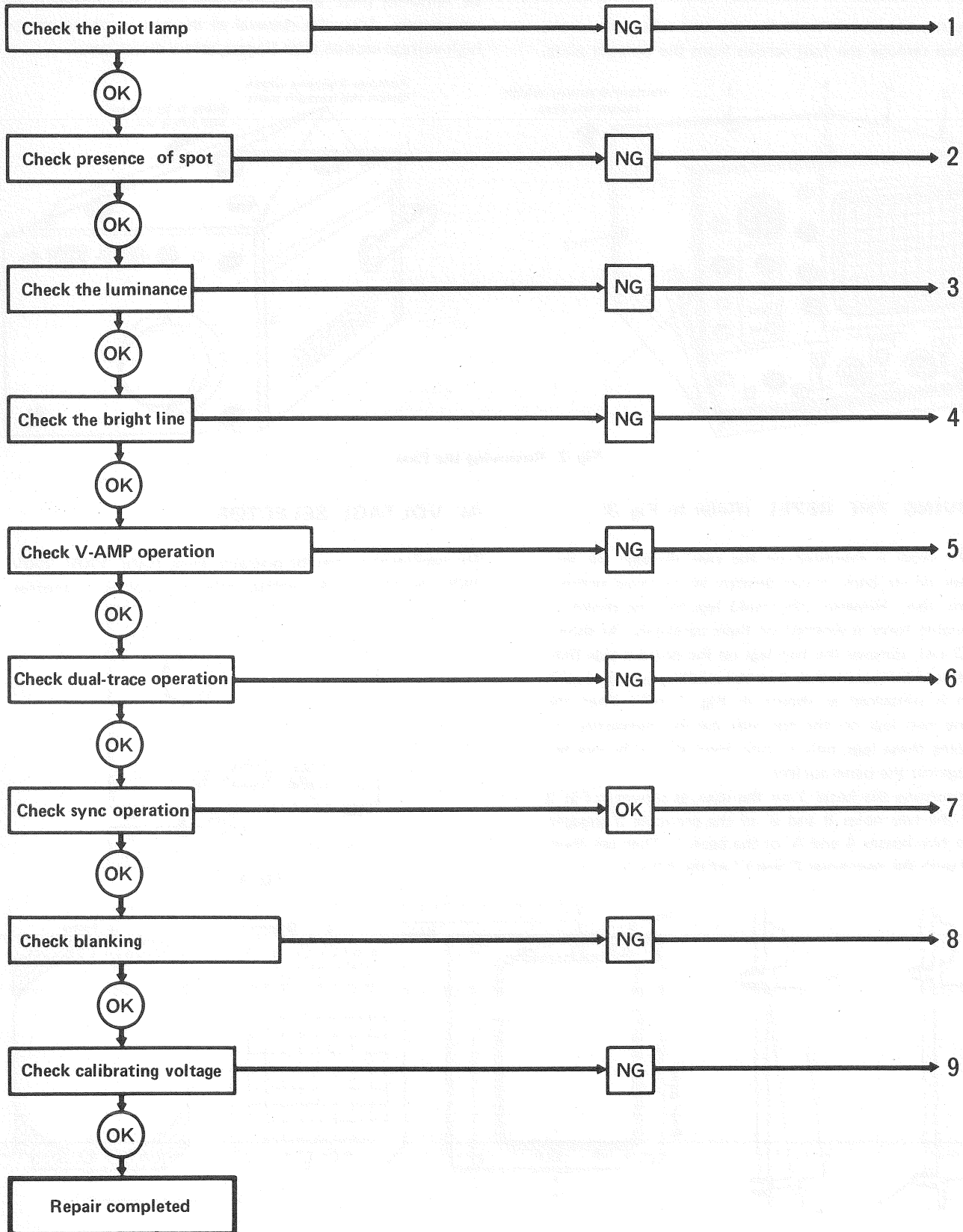


Fig. 4

# TROUBLESHOOTING

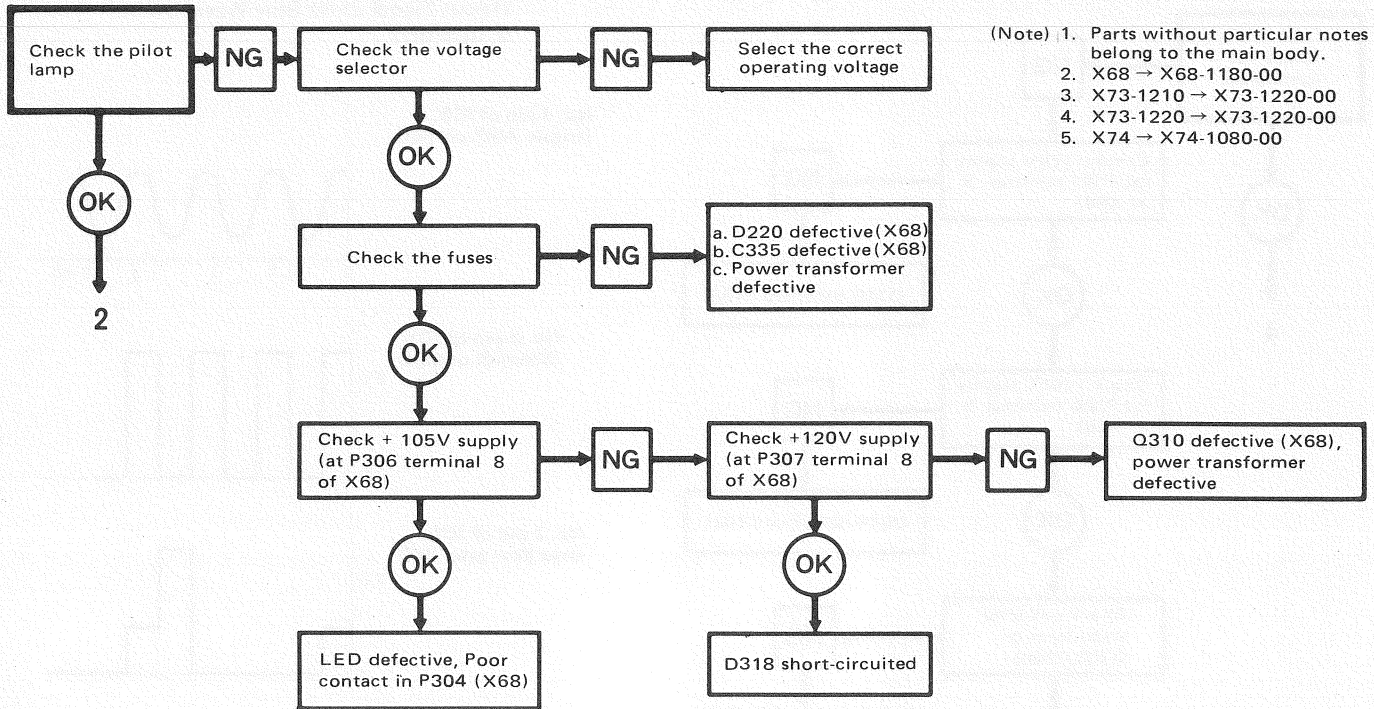
## TROUBLESHOOTING





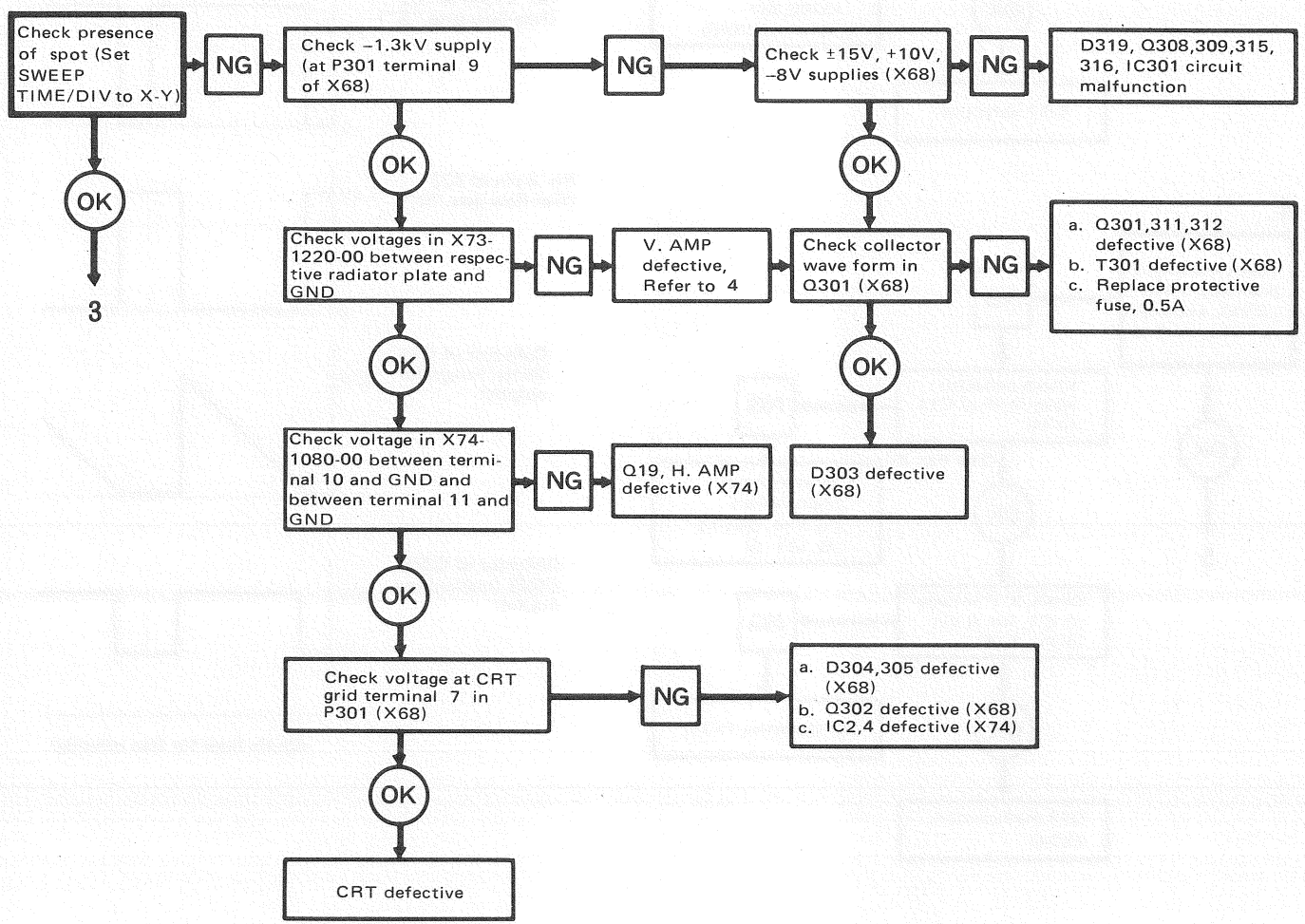
# TROUBLESHOOTING

1.



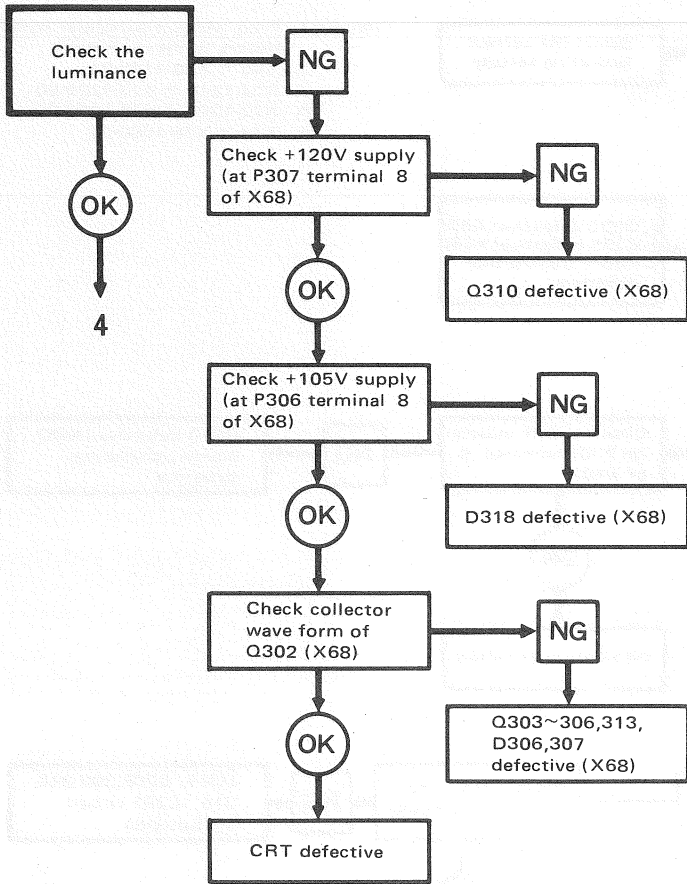
(Note) 1. Parts without particular notes belong to the main body.  
 2. X68 → X68-1180-00  
 3. X73-1210 → X73-1220-00  
 4. X73-1220 → X73-1220-00  
 5. X74 → X74-1080-00

2.



# TROUBLESHOOTING

3.



4.

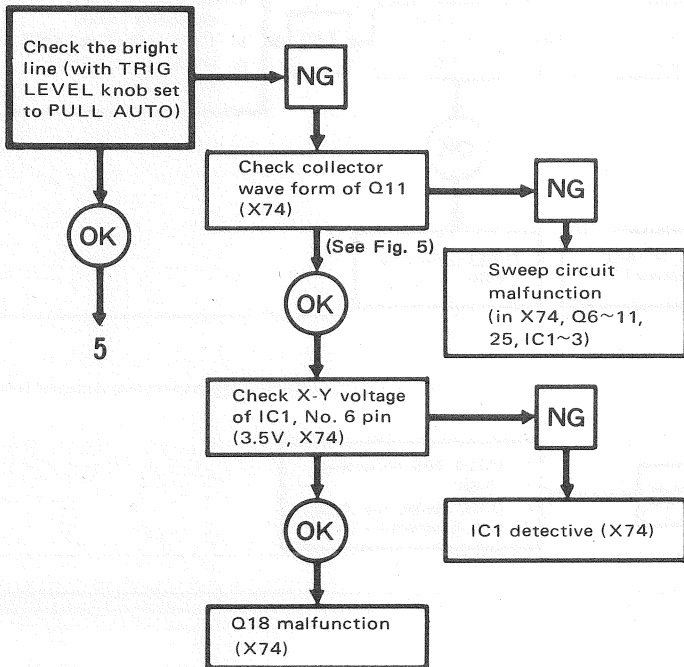
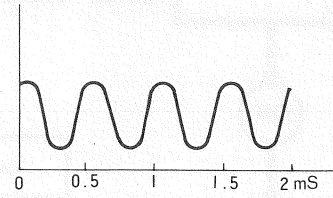
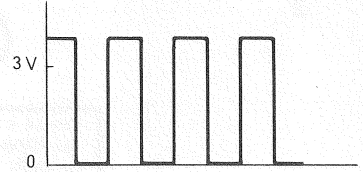


Fig. 5 Wave Form in SWEEP Circuit (X74-1080-00)  
(Input Signal 2kHz Sine Wave, SWEEP TIME  
0.1mS/div)

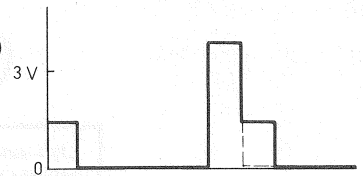
No. 6 pin of IC5  
(trigger AMP output)



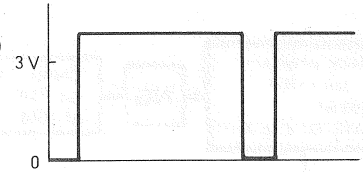
No. 8 pin of IC1  
(Schmidt output)



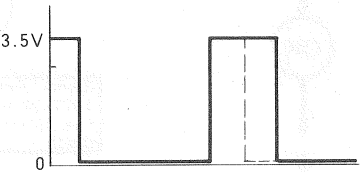
No. 2 pin of IC2  
(free-flow gate "R")



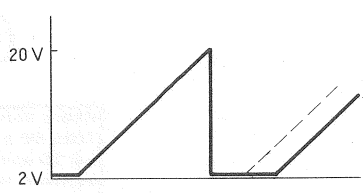
No. 13 pin of IC2  
(free-flow gate "S")



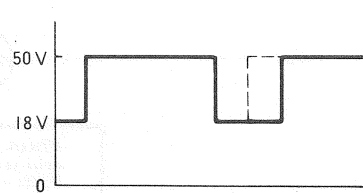
No. 8 pin of IC2  
(free-flow gate "Q")



Collector of Q11  
(Miller integrator output)



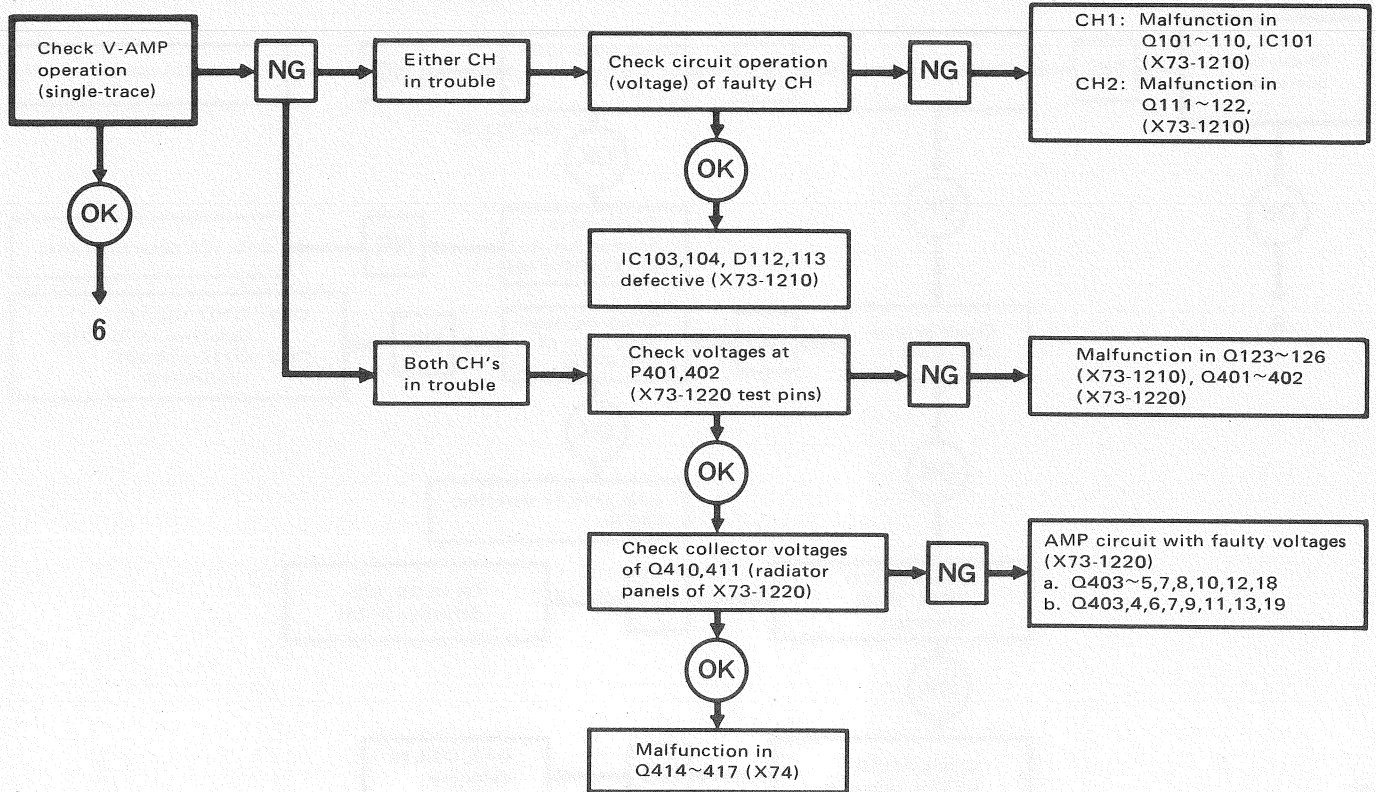
Collector of Q305  
(X68) (unblanking output)



(Chain lines for free running)

# TROUBLESHOOTING

5.



6.

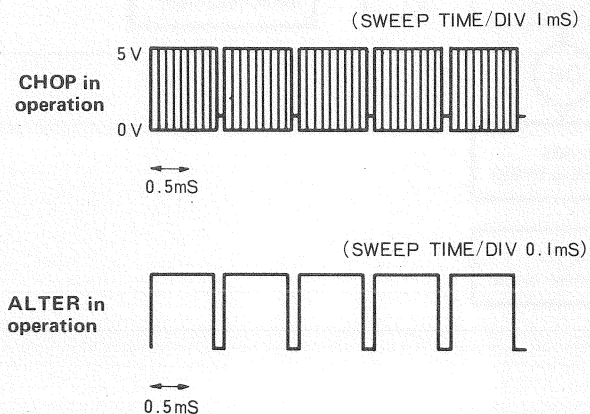
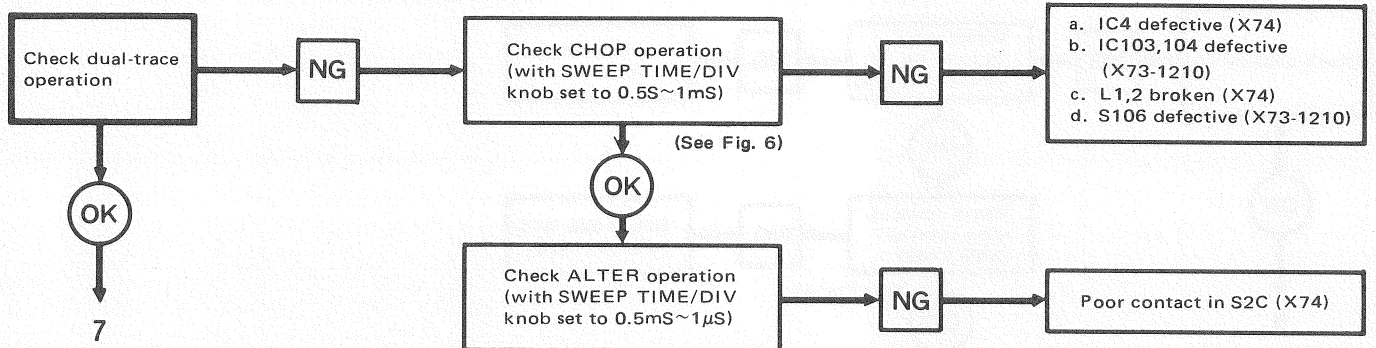
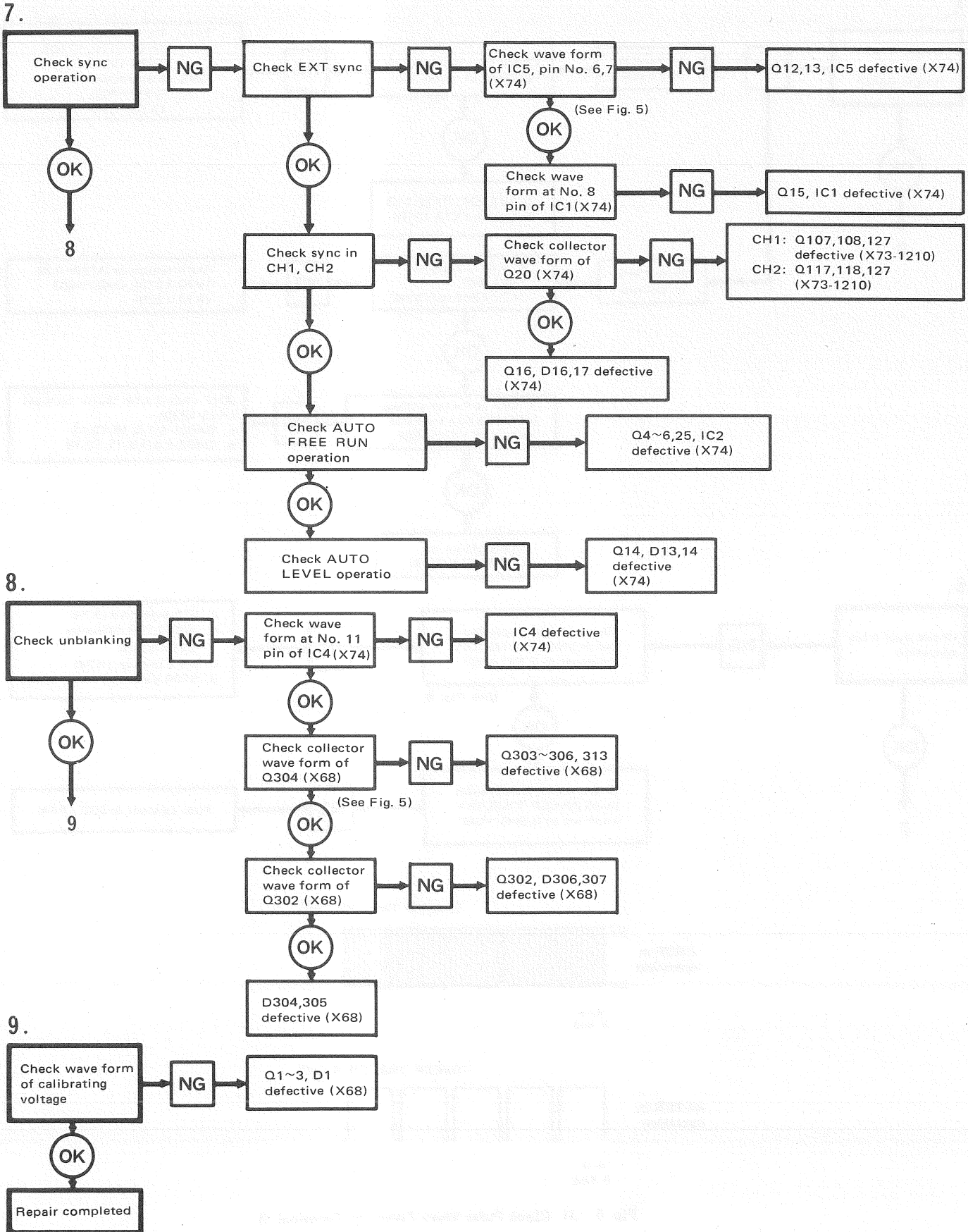


Fig. 6 J1 Clock Pulse Wave Forms at Terminal 5

# TROUBLESHOOTING





# ADJUSTMENTS

## ADJUSTMENTS

The following points have been already adjusted. However, observe the following notes before making re-adjustments:

1. Calibrating the power source voltage.
2. For adjustment, use a well-insulated flat-blade screw-driver.
3. For optimum adjustment, turn the power on and warm up the oscilloscope sufficiently before starting.
4. All adjustments should follow the following order. If this order is reversed or only a partial adjustment is attempted, this may influence the other part of the circuit.
5. Accurate measuring instruments should be employed.
6. Prior to adjustments, set VARIABLE to CAL position.

## POWER AND CRT CIRCUIT ADJUSTMENTS

### (1) Adjustment of low-voltage power supply

Check voltage at No. 8 pin of P306 and adjust VR304 for a reading of  $+107V \pm 1\%$ . Then check voltages at pin Nos. 2, 3, 4, 5 of P306 and pin No. 1 of P304, and confirm that these voltages are  $-8V$ ,  $+5V$ ,  $+15V$ ,  $+10V$ , and  $+120V$  respectively.

### (2) Adjustment of high-voltage power supply

Check voltage at pin No. 9 of P301 (CRT cathode voltage) and adjust VR303 for a reading of  $-1.3kV \pm 1\%$ .

### (3) Adjustment of luminance

Adjust VR302 so that the bright line disappears when the INTENSITY volume control index is at left in horizontal position. Adjust TC301 so that the luminance of the sweep start point is identical with that of other part. (SWEEP TIME/DIV is set to  $0.2\mu S/div.$ ) Then adjust the spot with FOCUS and ASTIG.

### (4) Adjustment of CRT bright line angle

Loosen the two cover mounting screws for angle adjustment on the rear panel. Turn the cover and make the bright line coincide with the level line on the graticule.

### (5) Adjustment for pattern distortion

Give a full stretch of CAL voltage wave form on the CRT screen until vertical bright line appears every 1 div on the horizontal graduations. Adjust VR301 so that this vertical bright line is always straight in any position within the effective area of CRT. Adjust the spot again with FOCUS and ASTIG.

## CH1 VERTICAL AXIS CIRCUIT ADJUSTMENTS

Before starting adjustments, set the following knobs as instructed:

MODE	CH1
VOLTS/DIV	5mV/div

### (6) CRT centering

Short-circuit the test terminals P401 and P402 of the vertical final-stage amplifier (Fig. 7) and adjust VR402 so that the bright line is positioned in the center of CRT.

### (7) VARIABLE ATT DC BAL adjustment

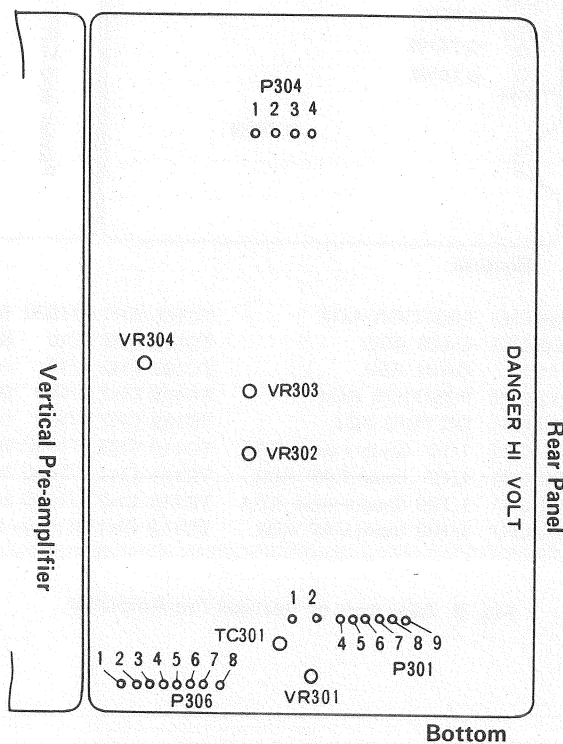
Adjust VR101 so that the bright line does not move up and down even when VARIABLE is turned.

### (8) STEP ATT DC BAL adjustment

Adjust VR103 so that the bright line does not move up and down even when VOLTS/DIV is turned.

### (9) POSITION adjustment

Adjust VR105 so that the bright line can be positioned in the center when the knob POSITION is set to the mechanical center.



VR301	Pattern distortion ADJ.
VR302	INTENSITY ADJ.
VR303	$-1.9kV$ ADJ.
VR304	$+107V$ ADJ.
TC301	Blanking pulse ADJ.

Fig. 7 Adjusters of Power and CRT Circuits and Test Points

# ADJUSTMENTS

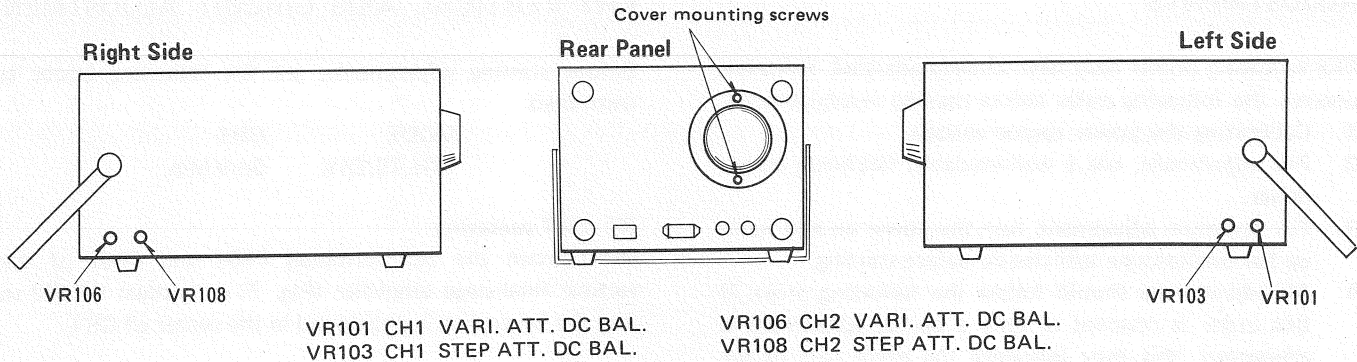


Fig. 8 Adjusters on Case Sides and Rear Panel

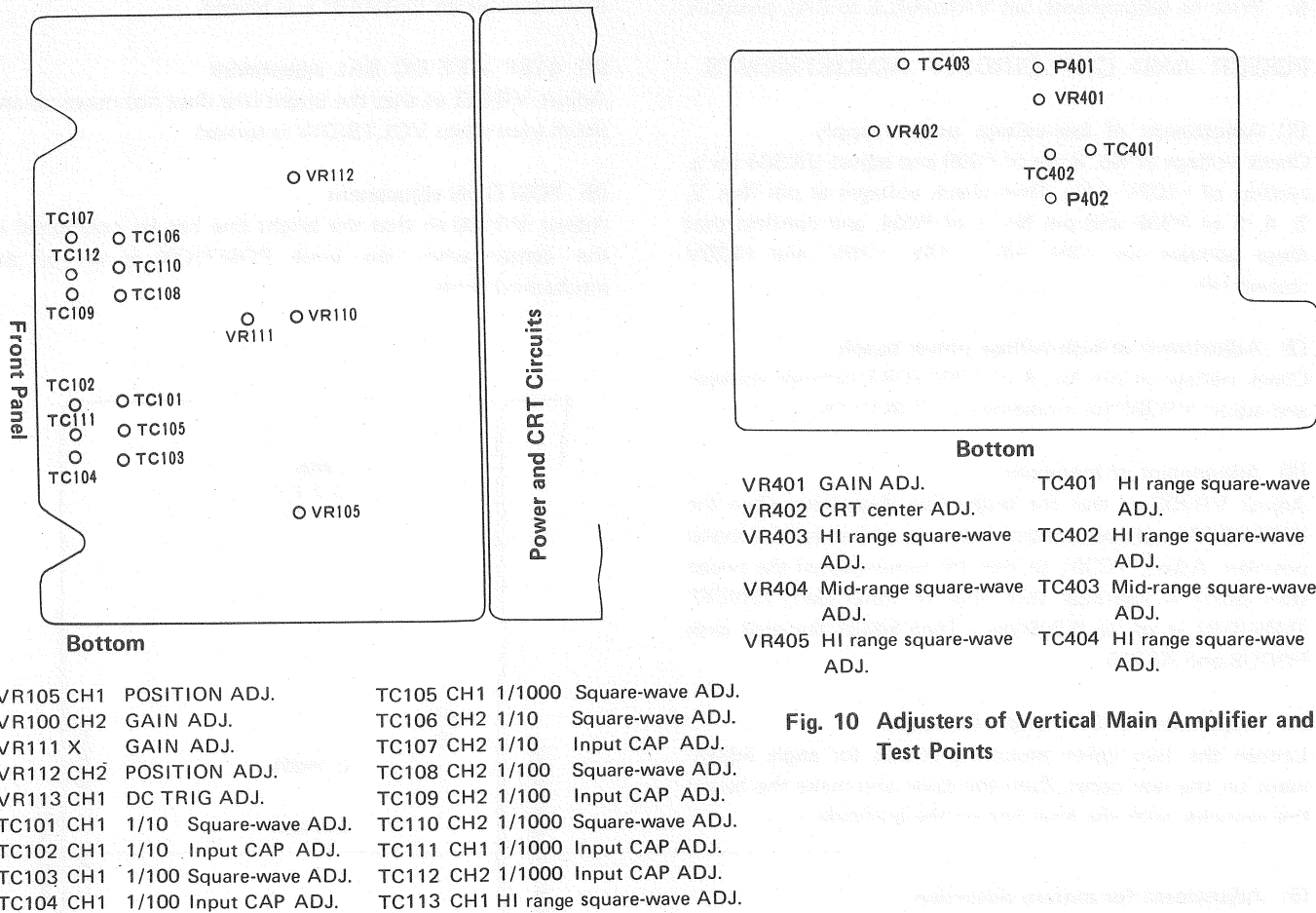


Fig. 9 Adjusters of Vertical Pre-Amplifier

Fig. 10 Adjusters of Vertical Main Amplifier and Test Points

## (10) Sensitivity adjustment

Apply adjusted 1kHz 30mVpp signal and adjust VR401 to obtain a 6-div deflection.

## (11) HI range adjustment with square waves

Apply an ideal 100kHz square-wave signal with a rising time of more than 5nS and adjust TC401, TC402, TC403, TC404, VR403, and VR404 of the vertical final-stage amplifier (Fig. 7) until a high-quality wave form can be obtained on CRT.



# ADJUSTMENTS

## CH2 VERTICAL AXIS CIRCUIT ADJUSTMENTS

Before starting adjustments, set the following knobs as instructed:

MODE CH2  
VOLTS/DIV 5mV/div

### (12) VARIABLE ATT DC BAL adjustment

Adjust VR106 so that the bright line does not move up and down even when VARIABLE is turned.

### (13) STEP ATT DC BAL adjustment

Adjust VR108 so that the bright line does not move up and down even when VOLTS/DIV is turned.

### (14) POSITION adjustment

Adjust VR112 so that the bright line can be positioned in the center when the knob POSITION is set to the mechanical center.

### (15) Sensitivity adjustment

Apply adjusted 1kHz 30mVpp signal and adjust VR110 to obtain a 6-div deflection.

## VERTICAL ATTENUATOR ADJUSTMENTS

The following adjustments are performed while a high-quality 1kHz square-wave is applied to the vertical input terminal:

(16) Set VOLTS/DIV to 50mV/div and adjust TC101 (TC106 for CH2) to obtain a high-quality wave form on CRT.

(17) For respective ranges of 0.5V/div and 5V/div, adjust TC103 and TC105 (TC108 and TC110 for CH2) in this order.

## INPUT CAPACITANCE ADJUSTMENTS

The following adjustments require the 10:1 attenuator probe. A 1kHz square wave is applied, VOLTS/DIV is set to 5mV/div, and the probe's trimmer is adjusted to obtain a high-quality wave form on CRT.

(18) Set VOLTS/DIV to 50mV/div and adjust TC102 (TC107 for CH2) so that a high-quality wave form can be obtained on CRT.

(19) For respective ranges of 0.5V/div and 5V/div, adjust TC104 and TC111 (TC109 and TC112 for CH2) in this order.

## HORIZONTAL AXIS CIRCUIT ADJUSTMENTS

Before starting adjustments, set the following knobs as instructed:

SWEEP TIME/DIV 1ms/div  
VERTICAL INPUT 1kHz marker signal

### (20) SWEEP TIME adjustment

Adjust VR15 so that 1 wave length corresponds to 1 div on the CRT screen.

### (21) BRIGHT LINE LENGTH adjustment

Set input to GND and adjust VR6 so that the bright line settles in 10.5 div  $\pm 0.2$  div.

### (22) HIGH-SPEED SWEEP TIME adjustment

- Set SWEEP TIME/DIV to 1 $\mu$ S/div and adjust TC1 so that the 1MHz marker signal coincides with the scale.
- Set SWEEP TIME/DIV to 0.5 $\mu$ S/div and adjust TC2 so that the 2MHz marker signal coincides with the scale.
- Set SWEEP TIME/DIV to 0.2 $\mu$ S/div and adjust VR5 so that the 5MHz marker signal coincides with the scale.

### (23) SWEEP MAG adjustment

Adjust VR14 so that sweep time becomes 1/5 (10-cycle wave form in 2 peaks) when PULLx5 MAG knob is pulled.

### (24) MAG CENTER adjustment

With the knob PULLx5 MAG pulled, adjust VR10 so that the wave form is magnified to the right and left from its center. (Repeat (23) and (24) two or three times reciprocally.)

### (25) ◀ ▶ POSITION adjustment

Adjust VR13 so that the starting point of the bright line is positioned at the left end of the effective CRT scale when the knob ◀ ▶ POSITION is set to its mechanical center.

### (26) X-AXIS SENSITIVITY adjustment

Set SWEEP TIME/DIV to X-Y and apply the adjusted 1kHz 50mVpp signal to the X axis (CH2). Adjust VR210 so that a deflection of 10div appears on the horizontal axis when VOLTS/DIV is set to 5mV/div.

### (27) X POSITION adjustment

Set SWEEP TIME/DIV to X-Y and X-axis (CH2) input to GND. Adjust VR12 until the bright spot settles in the center of CRT.

# ADJUSTMENTS

## SYNC CIRCUIT ADJUSTMENTS

Before starting adjustments, set the following knobs as instructed:

AUTO LEVEL	NOR
COUPLING	AC
SOURCE	INT
VERTICAL INPUT	Apply 1 kHz sine wave and set it in the center of CRT.

### (28) SLOPE adjustment

Short-circuit the test terminals 14 and 15 of the sync circuit and adjust VR7 until voltage at test terminal 13 remains unchanged even when SLOPE is switched over. Then release the short-circuit condition and adjust VR16 until the starting point of the wave form does not move up and down even when SLOPE is moved.

### (29) DC SYNC adjustment

Open-circuit the test terminals 14 and 15 and adjust TRIG LEVEL knob until the trigger level does not move even when SLOPE is moved. Then adjust VR11 so that the trigger level does not move even when COUPLING is set to DC. Make adjustments for CH1 by adjusting VR113 of the vertical pre-amplifier (Fig. 6).

### (30) AUTO LEVEL adjustment

Set AUTO LEVEL to AUTO and adjust VR9 so that a synchronized condition can be obtained even when the amplitude is less than 0.5 div.

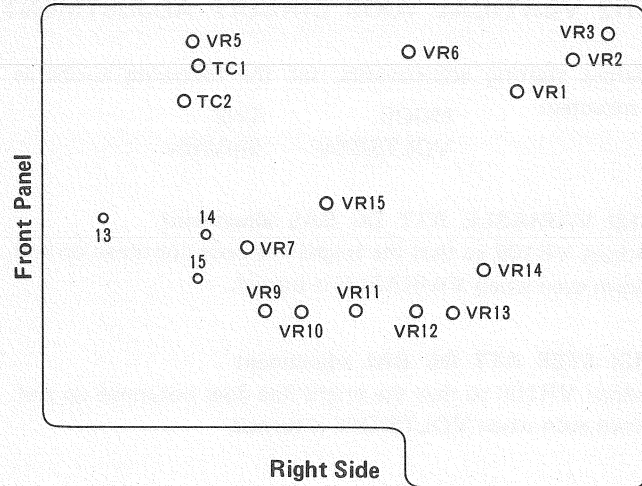
## CALIBRATING VOLTAGE ADJUSTMENT

### (31) FREQUENCY adjustment

Checking the wave form of CAL, adjust VR3 so that the LOW level time attains  $0.5\text{mS} \pm 3\%$ . Similarly adjust VR2 until the HIGH level time attains  $0.5\text{mS} \pm 3\%$ .

### (32) VOLTAGE adjustment

Adjust VR1 to obtain  $0.5\text{Vpp}$ .

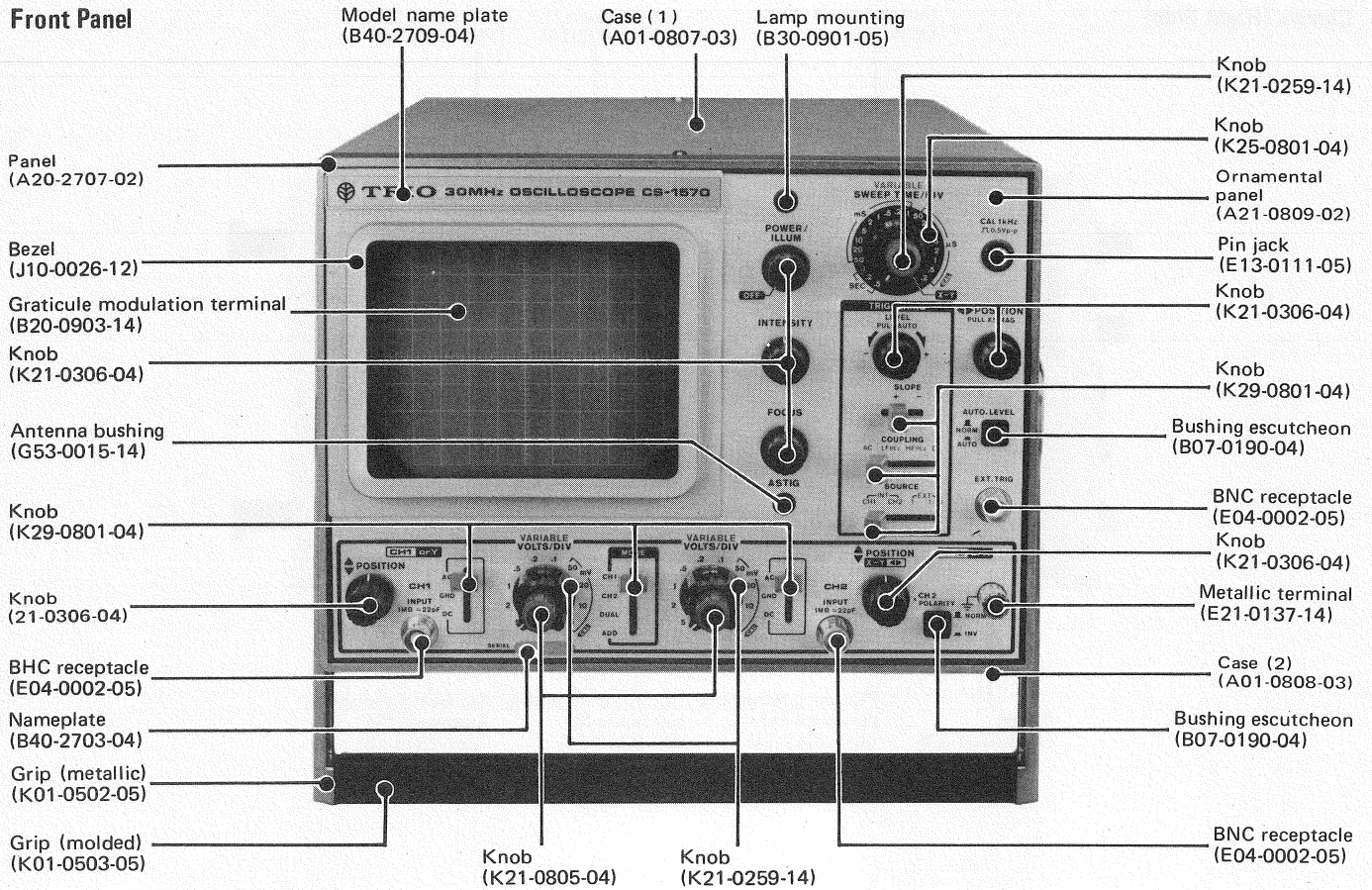


- VR1 CAL. calibrating voltage ADJ.
- VR2 CAL. frequency ADJ.
- VR3 CAL. frequency ADJ.
- VR5  $0.2\mu\text{s}$  ADJ.
- VR6 WIDTH ADJ.
- VR7 SLOPE BAL. (1)
- VR9 AUTO LEVEL ADJ.
- VR10 MAG CENTER ADJ.
- VR11 DC TRIG. ADJ.
- VR12 X POSITION ADJ.
- VR13 ◀ ▶ POSITION ADJ.
- VR14 MAG GAIN ADJ.
- VR15 SWEEP TIME ADJ.
- VR16 SLOPE BAL. (2)
- TC1  $1\mu\text{s}$  ADJ.
- TC2  $0.5\mu\text{s}$  ADJ.

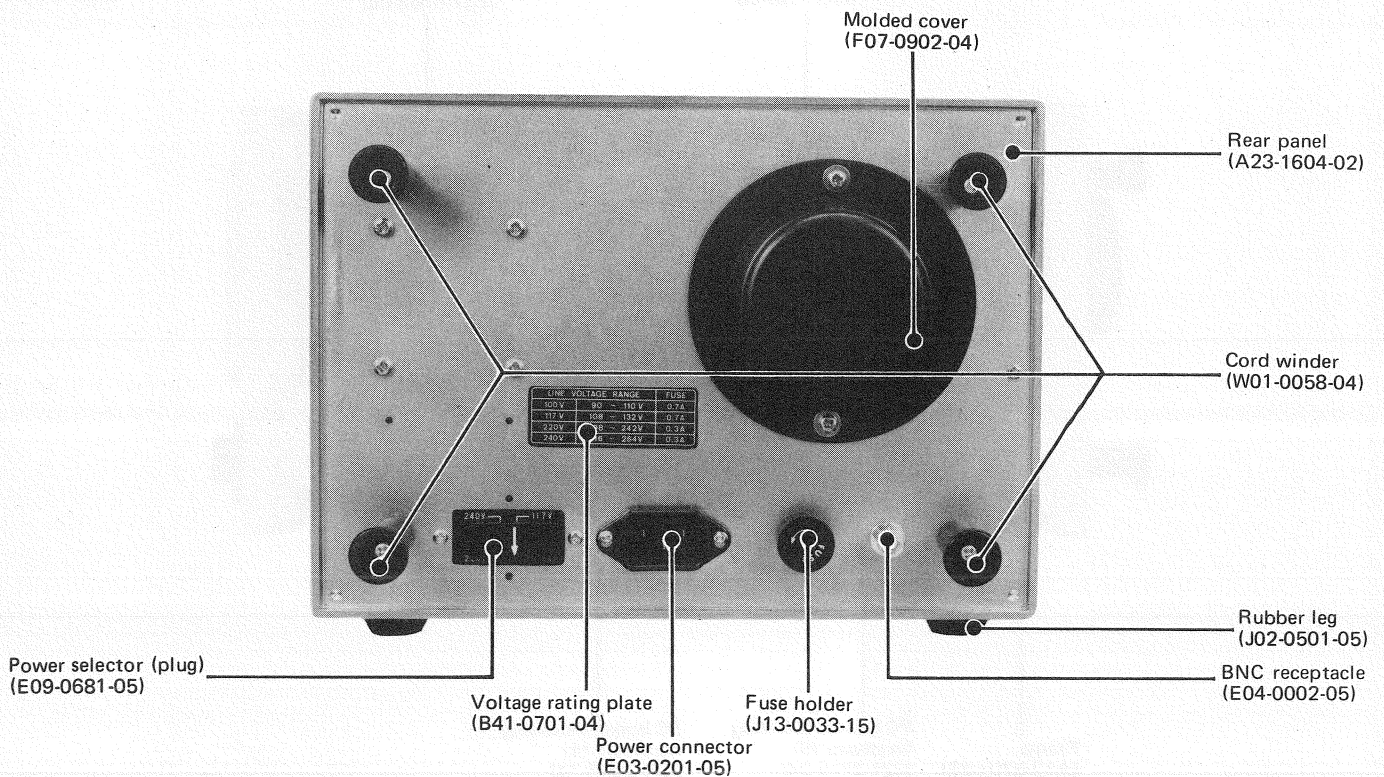
Fig. 11 Adjusters and Test Points of Horizontal and Sync Circuits and Calibrating Voltage

# PARTS ALIGNMENT

## Front Panel



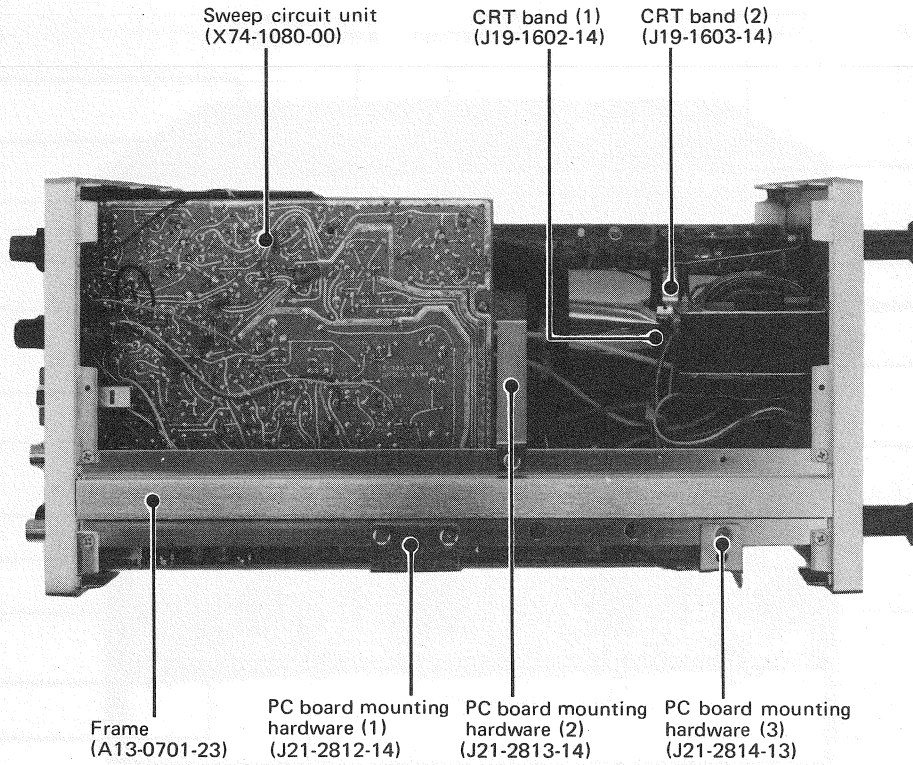
## Rear Panel



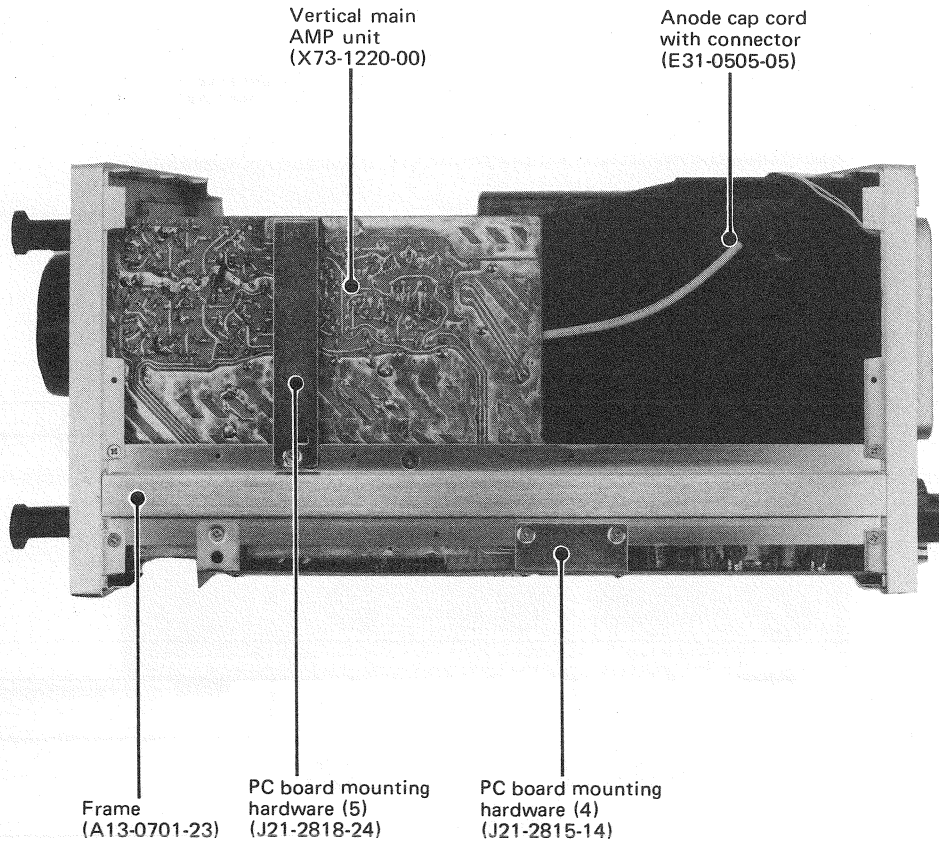


# PARTS ALIGNMENT

## Chassis (Right Side)

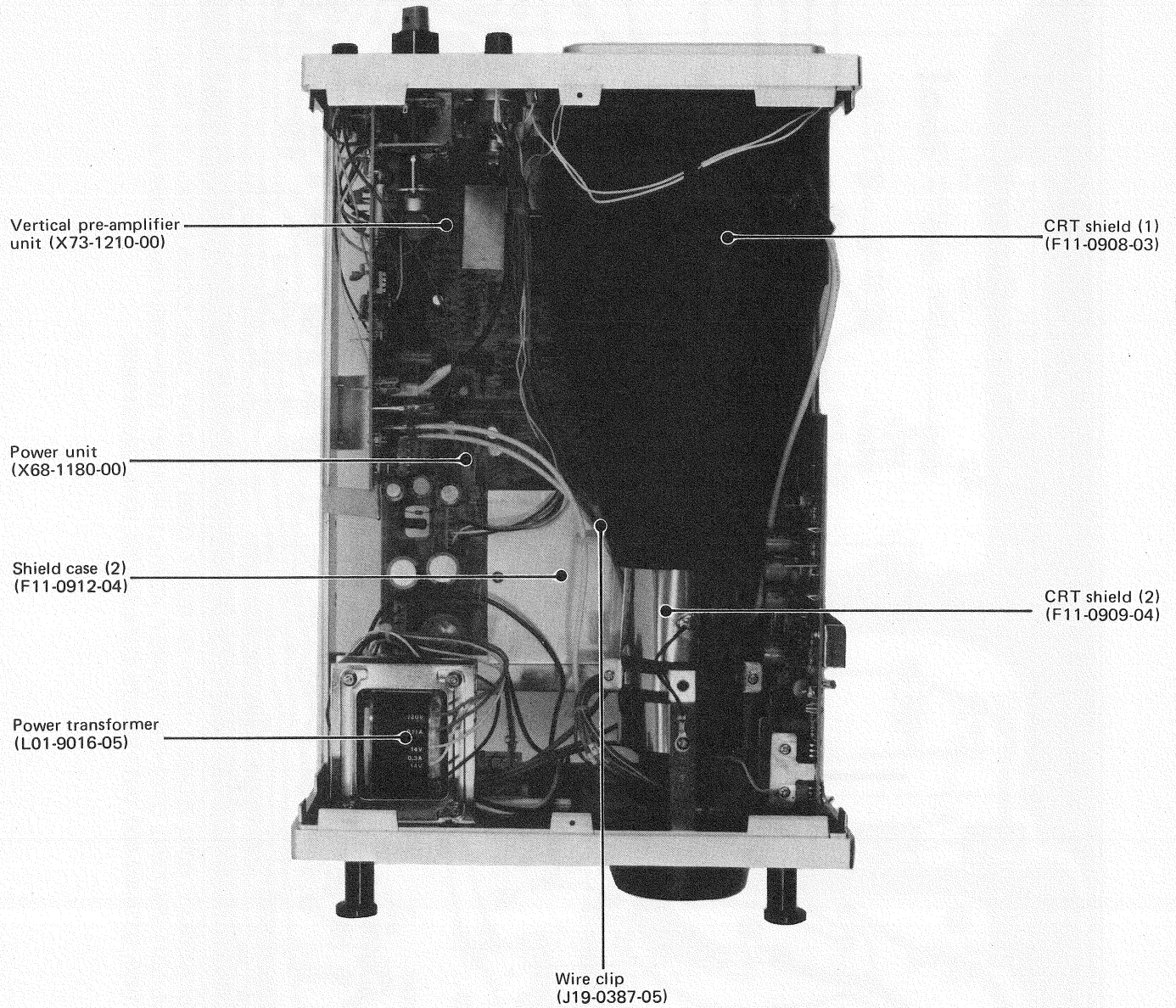


## Chassis (Left Side)



# PARTS ALIGNMENT

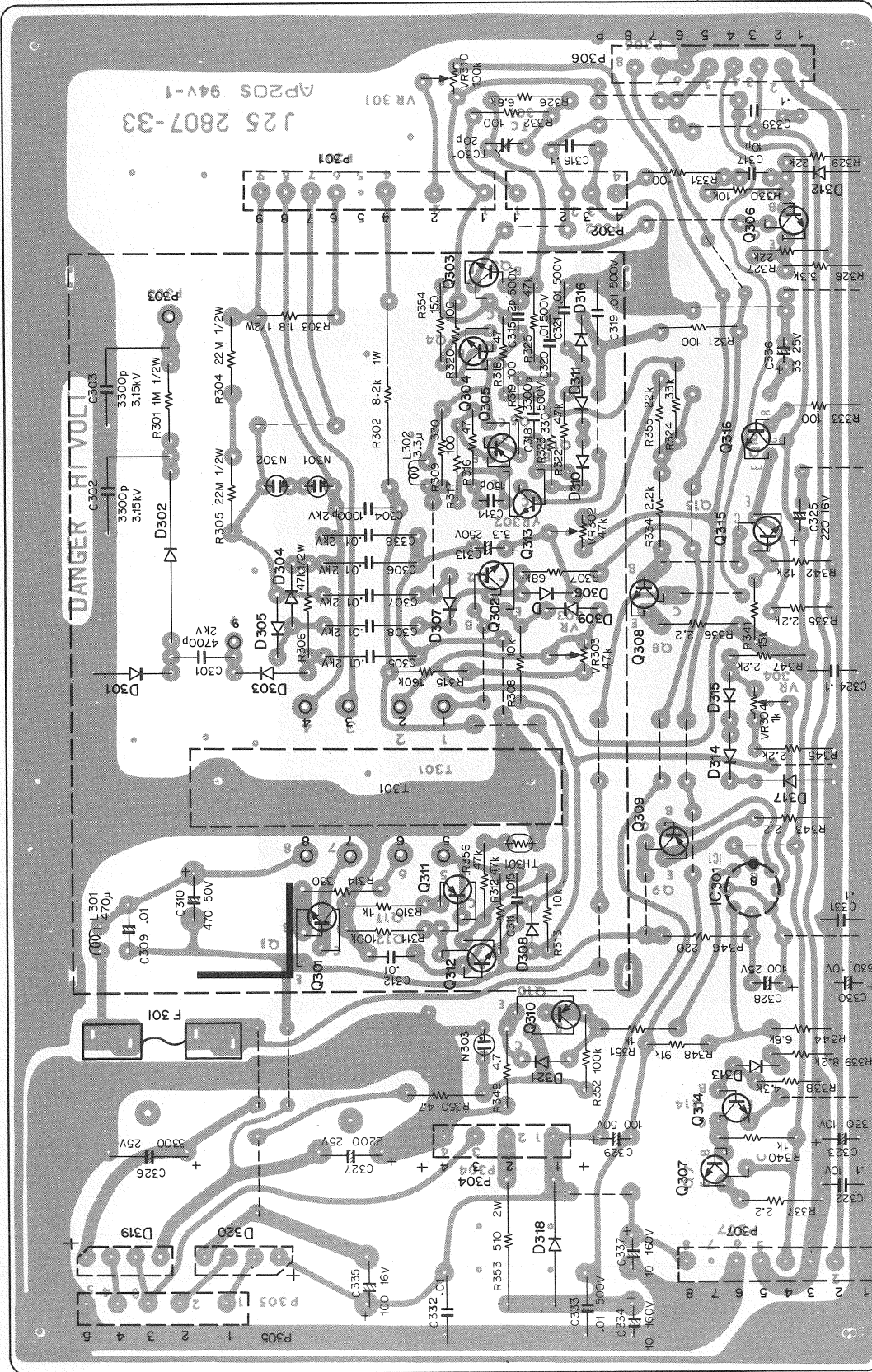
## Chassis (Upper)





# PC BOARD

▼ POWER UNIT (X68-1180-00)

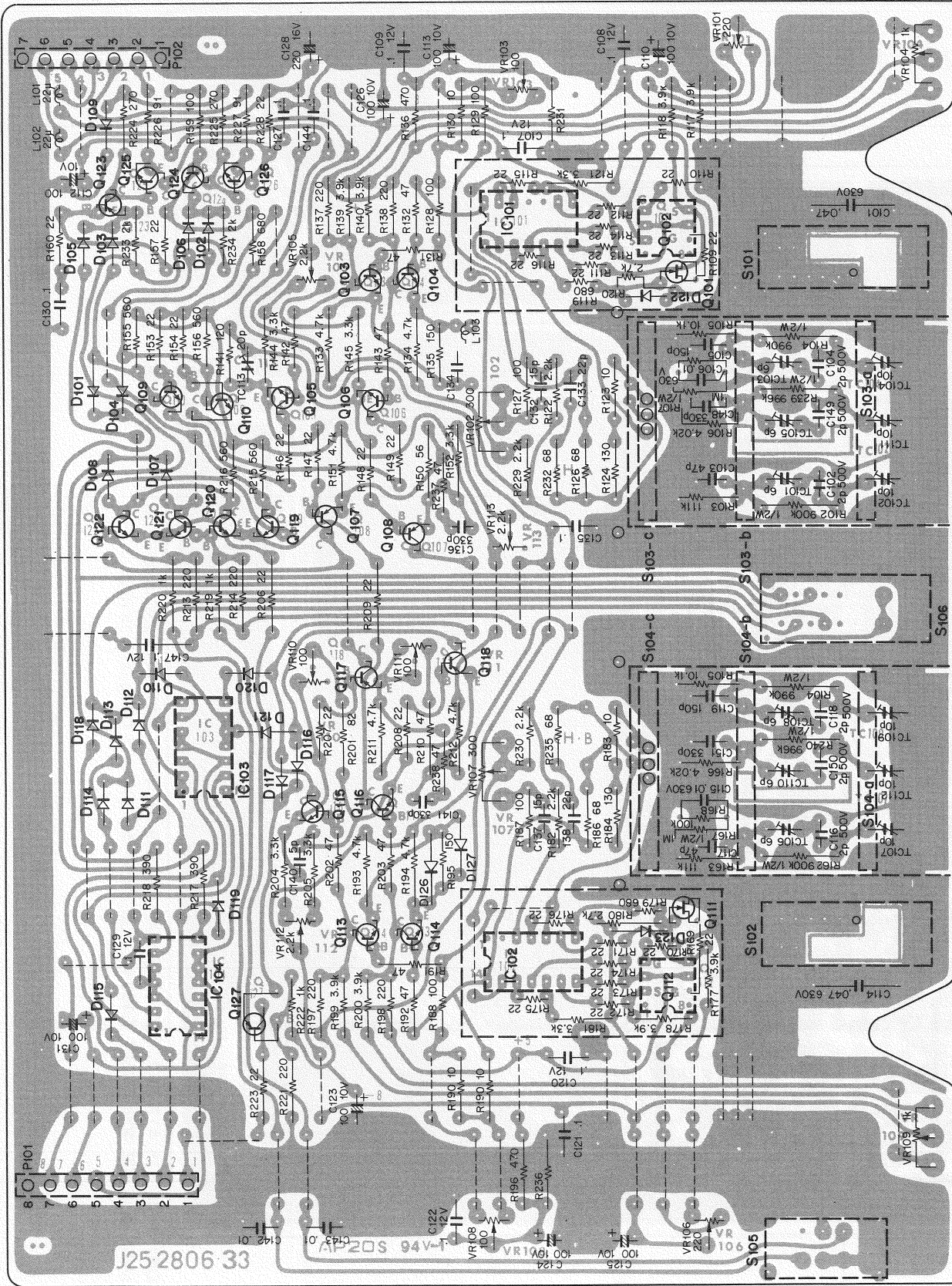


Q301:2SD401, Q302:2SC983-Y, Q303:2SC458-C, Q304:2SC1628-Y, Q305:2SA818-Y, Q306:2SC535-B, Q307, 308:2SC1419-C, Q309:2SA755-C, Q310:2SB536(2)LM, Q311:2SA733-O, Q312~316:2SC945-P, IC301a, b:RC4558T, D301~303:Y16JA, D304~306:1S2463, D307:1S1705, D308~315, 321:1S1555, D316:WZ-050, D317:WZ-075, D318:WZ-150, D319, 320:510B60



# PC BOARD

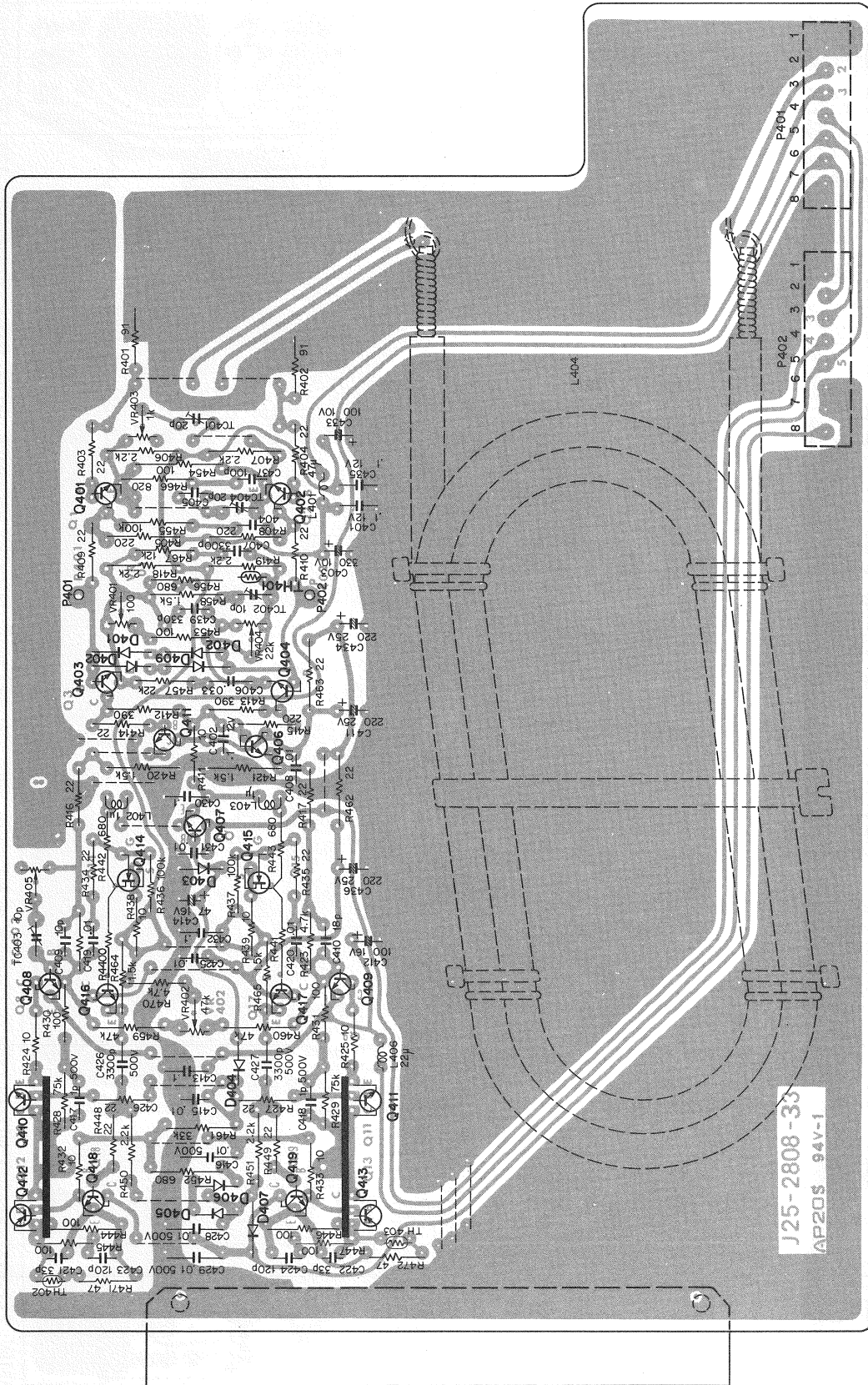
## ▼ VERTICAL PRE AMP UNIT (X73-1210-00)



Q101, 111:2SK30A-O, Q102a, b, 112a, b:2SK58-M, Q103~106, 109, 110, 113~116, 119~122:2SC535-B, Q107, 108, 117, 118, 123, 124, 127:2SA844-D, Q125, 126:2SC458-C, IC101, 102:HA1127, IC103:TD3400AP, IC104:TD3472AP, D101~108, 122, 123:1S1587, D109~121:1S1555, D124~127:1N60

# PC BOARD

## ▼ VERTICAL MAIN AMP UNIT (X73-1220-00)

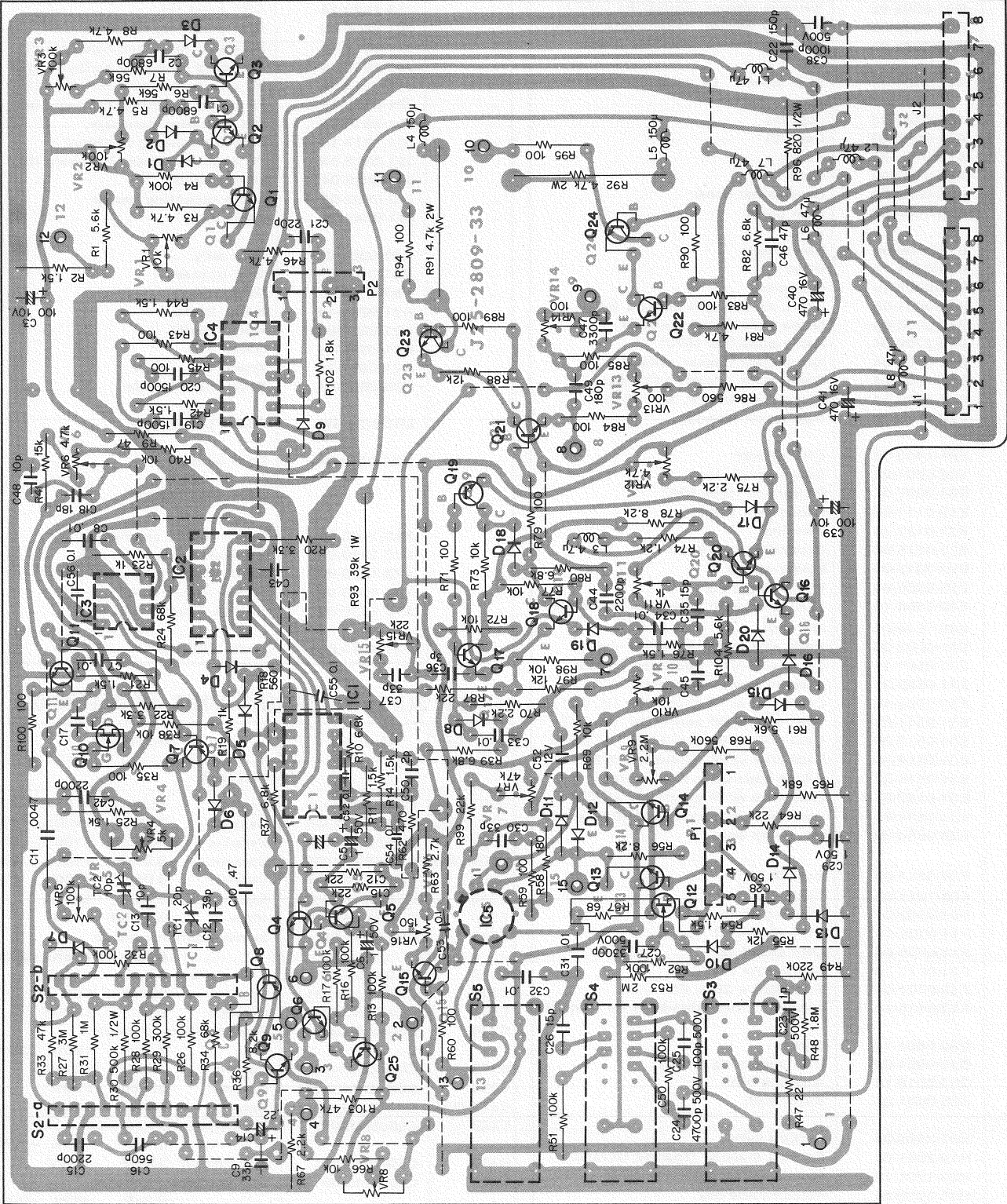


Q401~404, 416, 417:2SC535-B, Q405~409, 418, 419:2SC458-C, Q410, 411:2SC1628-Y, Q412, 413:2SA818-Y, Q414, 415:2SK19-GR,  
 D401, 402, 408, 409:1S1587, D403:WZ-130, D404, 407:WZ-050, D405, 406:1S1555



# PC BOARD

## ▼ SWEEP CIRCUIT UNIT (X74-1080-00)



Q1~6, 9, 11, 13~19, 21, 22, 25:2SC458-C, Q7, 8:2SA733-Q, Q10, 12:2SK30A-O, Q20:2SC535-C, Q23, 24:2SC1507, IC1:SN74H00N, IC2:SN74H72N, IC3:RC555NB, IC4:SN7400N, IC5:RC733T, D1, 5, 11, 13, 14:1N60, D2~4, 7~10, 15, 17~20:1S1555, D6:1S1587, D16:YZ-030

# PARTS LIST

## TOTAL

Ref. No.	Parts No.	Description
R201~202	RD14BY2B220J	Carbon 22Ω ±5% 1/8W
VR201	R01-0041-05	Variable resistor 500Ω(B) (INTE)
VR202	R01-2012-05	Variable resistor 5kΩ(B) with pull SW (H-POS)
VR203	R01-6003-05	Variable resistor 250kΩ(B) (AST)
VR204	R03-1502-05	Variable resistor 1kΩ(C) with SW(ILL)
VR205	R05-8001-05	Variable resistor 3MΩ(B) (FOC)
S201ab	S40-2501-05	Push switch (A. LEV)
-	A01-0807-13	Case (1)
-	A01-0808-03	Case (2)
-	A13-0701-23	Frame
-	A20-2707-02	Panel
-	A21-0809-02	Ornamental panel
-	A23-1604-02	Rear panel
-	B07-0190-04	Escutcheon
-	B19-0701-14	Filter
-	B20-0903-14	Graticule
-	B30-0901-05	Lamp mounting (LED/ILL lamp)
-	B40-2703-04	Name plate (serial number)
-	B40-2709-04	Name plate (CS-1570)
-	B41-0701-04	Name plate (power voltage)
-	B42-1802-04	Name plate (VARI. ATT. BAL)
-	B42-1803-04	Name plate (STEP. ATT. BAL)
-	B50-2815-00	Instruction manual
-	E01-1403-05	CRT socket
-	E03-0201-05	Power connector
-	E04-0002-05	Receptacle, type BNC
-	E13-0111-05	Phono jack (CAL)
-	E21-0137-14	Terminal
-	E23-0015-04	Grounding lug (3mm)
-	E23-0018-04	Soldering lug
-	E23-0505-04	Grounding plate
-	E30-0554-15	Lead wire w/3P connector (POW SW)
-	E30-1818-05	JIS cord
-	E31-0502-05	Lead wire w/3P connector (INT)
-	E31-0507-15	Lead wire w/4P connector (POW)
-	E31-0508-25	Lead wire w/1P connector (CAL)
-	E31-0509-15	Lead wire w/1P connector (H. DEF)
-	E31-0511-05	Lead wire w/4P connector (Z. AX)
-	E31-0513-05	Lead wire w/5P connector (A. LEV)
-	E31-0514-05	Lead wire w/9P connector (CRT)
-	E31-0515-05	Anode code ass'y w/connector
-	E31-0532-05	Lead wire w/1P connector (GND)
-	E31-0533-05	Lead wire w/1P connector (CRT shield)
-	E33-0856-00	Lead wire ass'y
-	F05-3011-05	Fuse (0.3A)
-	F05-7011-05	Fuse (0.7A)
-	F07-0902-04	Molding cover
-	F11-0908-13	CRT shield (1)
-	F11-0909-04	CRT shield (2)
-	F11-0912-04	Shield case (2)
-	F15-0701-04	Felt 420 x 20 x 2t
-	F19-0125-14	Insulator (Insulation plate for case (2))
-	G02-0601-14	Spring
-	G13-0091-04	CRT mounting rubber
-	G53-0015-14	Antenna bush
-	G53-0601-04	Bezel bush
-	H01-2808-04	Packing case
-	H10-2801-03	Packing material (foamed styrene)
-	H20-1701-14	Protection cover
-	H25-0029-04	Polyethylene bag
-	J02-0501-05	Rubber leg

Ref. No.	Parts No.	Description
-	J10-0026-22	Bezel
-	J10-0032-13	Bezel ass'y
-	J13-0033-15	Fuse holder
-	J19-0387-05	Wire clip
-	J19-1602-14	CRT band (1)
-	J19-1603-14	CRT band (2)
-	J21-2805-05	Grip mounting hardware
-	J21-2812-14	PC board mounting hardware (1)
-	J21-2813-14	PC board mounting hardware (2)
-	J21-2814-23	PC board mounting hardware (3)
-	J21-2815-14	PC board mounting hardware (4)
-	J21-2816-04	VR mounting hardware
-	J21-2817-14	Switch mounting hardware
-	J21-2818-24	PC board mounting hardware (5)
-	J42-0038-04	Hole bush(B)
-	J42-0502-04	Lamp mounting rubber
-	J61-0049-05	Cable band
-	K01-0501-05	Grip ass'y
-	K01-0502-05	Grip (diecast)
-	K01-0503-05	Grip (styrol)
-	K21-0259-14	Knob 22.8φ
-	K21-0282-04	Knob (push)
-	K21-0306-04	Knob 17φ
-	K21-0801-14	Knob 13φ Blue
-	K29-0801-04	Knob (lever) Green
-	L01-9016-05	Power transformer
-	W01-0058-04	Cord winder
-	X68-1180-00	Power supply circuit unit
-	X73-1210-00	Vertical pre-amplifier unit
-	X73-1220-00	Vertical main amp unit
-	X74-1080-00	Sweep circuit unit
-	X77-1020-00	Voltage selector unit
-	Y87-1210-00	Probe (PC-28)

## POWER SUPPLY CIRCUIT UNIT (X68-1180-00)

Ref. No.	Parts No.	Description
<b>CAPACITOR</b>		
C301	CK45E3D472P	Ceramic 4700pF +100%, -0%
C302, 303	CK45E3F332P	Ceramic 3300pF +100%, -0%
C304	CK45E3D102P	Ceramic 1000pF +100%, -0%
C305~308	CK45E3D103P	Ceramic 0.01μF +100%, -0%
C309	CK45E1H103P	Ceramic 0.01μF +100%, -0%
C310	CE04W1H471	Electrolytic 470μF 50WV
C311	CQ93M1H153K	Mylar 0.015μF ±10%
C312	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C313	CE04W2E3R3	Electrolytic 3.3μF 250WV
C314	CC45SL1H221J	Ceramic 220pF ±5%
C315	CC45CH2H020D	Ceramic 2pF ±0.5pF
C316	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C317	CC45CH1H100D	Ceramic 10pF ±0.5pF
C318	CK45D2H332M	Ceramic 3300pF ±20%
C319~321	CK45D2H103M	Ceramic 0.01μF ±20%
C322	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C323	CE04W1A331	Electrolytic 330μF 10WV
C324	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C325	CE04W1C221	Electrolytic 220μF 16WV
C326	CE04W1E332	Electrolytic 3300μF 25WV



# PARTS LIST

Ref. No.	Parts No.	Description
C327	CE04W1E222	Electrolytic 2200 $\mu$ F 25WV
C328	CE04W1E101	Electrolytic 100 $\mu$ F 25WV
C329	CE04W1H101	Electrolytic 100 $\mu$ F 50WV
C330	CE04W1A331	Electrolytic 330 $\mu$ F 10WV
C331	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
C332, 333	CK45D2H103M	Ceramic 0.01 $\mu$ F $\pm$ 20%
C334	CE04W2C100	Electrolytic 10 $\mu$ F 160WV
C335	CE04W2C101	Electrolytic 100 $\mu$ F 160WV
C336	CE04W1E330	Electrolytic 33 $\mu$ F 25WV
C337	CE04W2C100	Electrolytic 10 $\mu$ F 160WV
C338	CK45E3D103P	Ceramic 0.01 $\mu$ F +100%, -0%
C339, 340	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
RESISTOR		
R301	RC05GF2H105J	Carbon 1M $\Omega$ $\pm$ 5% 1/2W
R302	R92-0707-05	Metal film 8.2M $\Omega$ $\pm$ 5% 1W
R303	RC05GF2H185J	Carbon 1.8M $\Omega$ $\pm$ 5% 1/2W
R304, 305	RC05GF2H226K	Carbon 22M $\Omega$ $\pm$ 10% 1/2W
R306	RC05GF2H473J	Carbon 47k $\Omega$ $\pm$ 5% 1/2W
R307	RD14BY2E683J	Carbon 68k $\Omega$ $\pm$ 5% 1/4W
R308	RD14BY2E103J	Carbon 10k $\Omega$ $\pm$ 5% 1/4W
R309	RD14BY2E331J	Carbon 330 $\Omega$ $\pm$ 5% 1/4W
R310	RD14BY2E102J	Carbon 1k $\Omega$ $\pm$ 5% 1/4W
R311	RD14BY2E104J	Carbon 100k $\Omega$ $\pm$ 5% 1/4W
R312	RD14BY2E473J	Carbon 47k $\Omega$ $\pm$ 5% 1/4W
R313	RD14BY2E103J	Carbon 10k $\Omega$ $\pm$ 5% 1/4W
R314	RD14BY2E331J	Carbon 330 $\Omega$ $\pm$ 5% 1/4W
R315	RN14BK2E1303F	Metal film 130k $\Omega$ $\pm$ 1% 1/4W
R316	Blank number	
R317	RD14BY2E101J	Carbon 100 $\Omega$ $\pm$ 5% 1/4W
R318	RD14BY2E470J	Carbon 47 $\Omega$ $\pm$ 5% 1/4W
R319~321	RD14BY2E101J	Carbon 100 $\Omega$ $\pm$ 5% 1/4W
R322	RD14BY2E472J	Carbon 4.7k $\Omega$ $\pm$ 5% 1/4W
R323	RD14BY2E331J	Carbon 330 $\Omega$ $\pm$ 5% 1/4W
R324	RD14BY2E333J	Carbon 33k $\Omega$ $\pm$ 5% 1/4W
R325	RD14BY2E473J	Carbon 47k $\Omega$ $\pm$ 5% 1/4W
R326	RD14BY2E682J	Carbon 6.8k $\Omega$ $\pm$ 5% 1/4W
R327	RD14BY2E223J	Carbon 22k $\Omega$ $\pm$ 5% 1/4W
R328	RD14BY2E332J	Carbon 3.3k $\Omega$ $\pm$ 5% 1/4W
R329	RD14BY2E223J	Carbon 22k $\Omega$ $\pm$ 5% 1/4W
R330	RD14BY2E103J	Carbon 10k $\Omega$ $\pm$ 5% 1/4W
R331~333	RD14BY2E101J	Carbon 100 $\Omega$ $\pm$ 5% 1/4W
R334	RD14BY2E222J	Carbon 2.2k $\Omega$ $\pm$ 5% 1/4W
R335	RD14BY2E122J	Carbon 1.2k $\Omega$ $\pm$ 5% 1/4W
R336, 337	RD14BY2E2R2J	Carbon 2.2 $\Omega$ $\pm$ 5% 1/4W
R338	RN14BK2E4301F	Metal film 4.3k $\Omega$ $\pm$ 1% 1/4W
R339	RN14BK2E8201F	Metal film 8.2k $\Omega$ $\pm$ 1% 1/4W
R340	RD14BY2E102J	Carbon 1k $\Omega$ $\pm$ 5% 1/4W
R341	RN14BK2E1502F	Metal film 15k $\Omega$ $\pm$ 1% 1/4W
R342	RN14BK2E1202F	Metal film 12k $\Omega$ $\pm$ 1% 1/4W
R343	RD14BY2E2R2J	Carbon 2.2 $\Omega$ $\pm$ 5% 1/4W
R344	RN14BK2E6801F	Metal film 6.8k $\Omega$ $\pm$ 1% 1/4W
R345	RD14BY2E682J	Carbon 6.8k $\Omega$ $\pm$ 5% 1/4W
R346	RD14BY2E221J	Carbon 220 $\Omega$ $\pm$ 5% 1/4W
R347	RD14BY2E222J	Carbon 2.2k $\Omega$ $\pm$ 5% 1/4W
R348	RN14BK2E9102F	Metal film 91k $\Omega$ $\pm$ 1% 1/4W
R349, 350	RD14BY2E4R7J	Carbon 4.7 $\Omega$ $\pm$ 5% 1/4W
R351	RD14BY2E102J	Carbon 1k $\Omega$ $\pm$ 5% 1/4W
R352	RD14BY2E104J	Carbon 100k $\Omega$ $\pm$ 5% 1/4W
R353	RS14GB3D511J	Oxidized metal film 510 $\Omega$ $\pm$ 5% 2W
R354	RD14BY2E151J	Carbon 150 $\Omega$ $\pm$ 5% 1/4W
R355	RD14BY2E223J	Carbon 22k $\Omega$ $\pm$ 5% 1/4W
R356	RD14BY2E473J	Carbon 47k $\Omega$ $\pm$ 5% 1/4W
—	R92-0150-05	Jumper resistor
POTENTIOMETER		
VR301	R12-5002-05	Semi-fixed resistor 100k $\Omega$
VR302	R12-3004-05	Semi-fixed resistor 47k $\Omega$

Ref. No.	Parts No.	Description
VR303	R12-3042-05	Semi-fixed resistor 47k $\Omega$
VR304	R12-1002-05	Semi-fixed resistor 1k $\Omega$
TC301	C05-0401-05	Ceramic trimmer 20pF
SEMICONDUCTOR		
Q301		Transistor 2SD401
Q302		Transistor 2SC983-Y
Q303		Transistor 2SC458-C
Q304		Transistor 2SC1628-Y
Q305		Transistor 2SA818-Y
Q306		Transistor 2SC535-B
Q307, 308		Transistor 2SC1419-C
Q309		Transistor 2SA755-C
Q310		Transistor 2SB536(2)LM
Q311		Transistor 2SA733-Q
Q312~316		Transistor 2SC945-P
IC301ab		Linear IC RC4558T
D301~303		Diode Y16JA
D304~306		Diode 1S2463
D307		Diode 1S1705
D308~315		Diode 1S1555
D316		Zener diode WZ-050
D317		Zener diode WZ-075
D318		Zener diode WZ-150
D319, 320		Bridge diode SIQB60
D321		Diode 1S1555
TH301		Thermistor SDT-1000
MISCELLANEOUS		
L301	L40-4711-03	Ferri-inductor 470 $\mu$ F
L302	L40-3391-03	Ferri-inductor 3.3 $\mu$ F
T301	L19-0402-05	Convertor transformer
N301~303		Neon lamp NE-2
P301	E40-0903-05	Pin connector 9P
P302	E40-0403-05	Pin connector 4P
P304	E40-0432-05	Pin connector 4P
P305	E40-0532-05	Pin connector 5P
P306	E40-0801-05	Pin connector 8P
P307	E40-0802-05	Pin connector 8P
—	E23-0047-04	Terminal
—	F01-0801-04	Heat sink
—	F05-5016-05	Fuse (0.5A)
—	F11-0911-03	Shield case (1)
—	J13-0039-05	Fuse holder
—	J25-2807-33	PC board
—	J42-0017-05	Rubber bush

## VERTICAL PRE-AMPLIFIER UNIT (X73-1210-00)

Ref. No.	Parts No.	Description
CAPACITOR		
C101	C91-0501-05	Metal film 0.047 $\mu$ F $\pm$ 10%
C102	Blank number	
C103	CM93BD2A470J	Mica 47pF $\pm$ 5%
C104	CC45CH2H020D	Ceramic 2pF $\pm$ 0.5pF
C105	CM93BD2A151J	Mica 150pF $\pm$ 5%
C106	C91-0502-05	Metal film 0.01 $\mu$ F $\pm$ 10%
C107, 108	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
C109	Blank number	

# PARTS LIST

Ref. No.	Parts No.	Description
C110	CE04W1A101	Electrolytic 100 $\mu$ F 10WV
C111	Blank number	
C112	CE04W1A101	Electrolytic 100 $\mu$ F 10WV
C113	Blank number	
C114	C91-0501-05	Metal film 0.047 $\mu$ F $\pm$ 10%
C115	C91-0502-05	Metal film 0.01 $\mu$ F $\pm$ 10%
C116	Blank number	
C117	CM93BD2A470J	Mica 47pF $\pm$ 5%
C118	CC45CH2H020D	Ceramic 2pF $\pm$ 0.5pF
C119	CM93BD2A151J	Mica 150pF $\pm$ 5%
C120~122	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
C123~126	CE04W1A101	Electrolytic 100 $\mu$ F 10WV
C127	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
C128	CE04W1C221	Electrolytic 220 $\mu$ F 16WV
C129, 130	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
C131	CE04W1A101	Electrolytic 100 $\mu$ F 10WV
C132	CC45CH1H150J	Ceramic 15pF $\pm$ 5%
C133	CC45CH1H220J	Ceramic 22pF $\pm$ 5%
C134	Blank number	
C135	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
C136	CC45SL1H331J	Ceramic 330pF $\pm$ 5%
C137	CC45CH1H150J	Ceramic 15pF $\pm$ 5%
C138	CC45CH1H220J	Ceramic 22pF $\pm$ 5%
C139	Blank number	
C140	CC45CH1H050D	Ceramic 5pF $\pm$ 0.5pF
C141	CC45SL1H331J	Ceramic 330pF $\pm$ 5%
C142, 143	CK45D1H103M	Ceramic 0.01 $\mu$ F $\pm$ 20%
C144	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
C145, 146	CK45D1H103M	Ceramic 0.01 $\mu$ F $\pm$ 20%
C147	C90-0298-05	Semiconductor ceramic 0.1 $\mu$ F +80%, -20%
C148	CM93BD2A331J	Mica 330pF $\pm$ 5%
C149, 150	CC45CH2H020D	Ceramic 2pF $\pm$ 0.5pF
C151	CM93BD2A331J	Mica 330pF $\pm$ 5%
C152, 153	Blank number	
C154, 155	CC45CH1H150J	Ceramic 15pF $\pm$ 5%

### RESISTOR

R101	RD14BY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R102	RN14BK2H9003F	Metal film 900k $\Omega$ $\pm$ 1% 1/2W
R103	RN14BK2E1113F	Metal film 111k $\Omega$ $\pm$ 1% 1/4W
R104	RN14BK2H9903F	Metal film 990k $\Omega$ $\pm$ 1% 1/2W
R105	RN14BK2E1012F	Metal film 10.1k $\Omega$ $\pm$ 1% 1/4W
R106	RN14BK2E4021F	Metal film 4.02k $\Omega$ $\pm$ 1% 1/4W
R107	RN14BK2H1004F	Metal film 1M $\Omega$ $\pm$ 1% 1/2W
R108	RD14BY2B104J	Carbon 100k $\Omega$ $\pm$ 5% 1/8W
R109~116	RD14CY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R117, 118	RN14BK2E3901F	Metal film 3.9k $\Omega$ $\pm$ 1% 1/4W
R119	RD14CY2B681J	Carbon 680 $\Omega$ $\pm$ 5% 1/8W
R120	RN14BK2E2701F	Metal film 2.7k $\Omega$ $\pm$ 1% 1/4W
R121	RN14BK2E3301F	Metal film 3.3k $\Omega$ $\pm$ 1% 1/4W
R122	RN14BK2E2201F	Metal film 2.2k $\Omega$ $\pm$ 1% 1/4W
R123	RD14BY2B100J	Carbon 10 $\Omega$ $\pm$ 5% 1/8W
R124	RN14BK2E1300F	Metal film 130 $\Omega$ $\pm$ 1% 1/4W
R125	Blank number	
R126	RN14BK2E69R8F	Metal film 69.8 $\Omega$ $\pm$ 1% 1/4W
R127~129	RN14BK2E100F	Metal film 100 $\Omega$ $\pm$ 1% 1/4W
R130	RN14BK2E10R0F	Metal film 10 $\Omega$ $\pm$ 1% 1/4W
R131, 132	RD14BY2B470J	Carbon 47 $\Omega$ $\pm$ 5% 1/8W
R133, 134	RD14BY2B472J	Carbon 4.7k $\Omega$ $\pm$ 5% 1/8W
R135	RN14BK2E1500F	Metal film 150 $\Omega$ $\pm$ 1% 1/4W
R136	RD14BY2B471J	Carbon 470 $\Omega$ $\pm$ 5% 1/8W
R137, 138	RD14BY2B221J	Carbon 220 $\Omega$ $\pm$ 5% 1/8W
R139, 140	RN14BK2E3901F	Metal film 3.9k $\Omega$ $\pm$ 1% 1/4W
R141	RN14BK2E1200F	Metal film 120 $\Omega$ $\pm$ 1% 1/4W
R142, 143	RD14BY2B470J	Carbon 47 $\Omega$ $\pm$ 5% 1/8W

Ref. No.	Parts No.	Description
R144, 145	RD14BY2B332J	Carbon 3.3k $\Omega$ $\pm$ 5% 1/8W
R146~149	RD14BY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R150	RD14BY2B560J	Carbon 56 $\Omega$ $\pm$ 5% 1/8W
R151	RD14BY2B472J	Carbon 4.7k $\Omega$ $\pm$ 5% 1/8W
R152	RD14BY2B332J	Carbon 3.3k $\Omega$ $\pm$ 5% 1/8W
R153, 154	RD14BY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R155, 156	RN14BK2E5600F	Metal film 560 $\Omega$ $\pm$ 1% 1/4W
R157	RD14BY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R158	RD14BY2B681J	Carbon 680 $\Omega$ $\pm$ 5% 1/8W
R159	RD14BY2B101J	Carbon 100 $\Omega$ $\pm$ 5% 1/8W
R160, 161	RD14BY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R162	RN14BK2H9003F	Metal film 900k $\Omega$ $\pm$ 1% 1/2W
R163	RN14BE2E1113F	Metal film 111k $\Omega$ $\pm$ 1% 1/4W
R164	RN14BK2H9903F	Metal film 990k $\Omega$ $\pm$ 1% 1/2W
R165	RN14BK2E1012F	Metal film 10.1k $\Omega$ $\pm$ 1% 1/4W
R166	RN14BK2E4021F	Metal film 4.02k $\Omega$ $\pm$ 1% 1/4W
R167	RN14BK2H1004F	Metal film 1M $\Omega$ $\pm$ 1% 1/2W
R168	RD14BY2B104J	Carbon 100k $\Omega$ $\pm$ 5% 1/8W
R169~176	RD14CY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R177, 178	RN14BK2E3901F	Metal film 3.9k $\Omega$ $\pm$ 1% 1/4W
R179	RD14CY2B681J	Carbon 680 $\Omega$ $\pm$ 5% 1/8W
R180	RN14BK2E2701F	Metal film 2.7k $\Omega$ $\pm$ 1% 1/4W
R181	RN14BK2E3301F	Metal film 3.3k $\Omega$ $\pm$ 1% 1/4W
R182	RN14BK2E2201F	Metal film 2.2k $\Omega$ $\pm$ 1% 1/4W
R183	RD14BY2B100J	Carbon 10 $\Omega$ $\pm$ 5% 1/8W
R184	RN14BK2E1300F	Metal film 130 $\Omega$ $\pm$ 1% 1/4W
R185	Blank number	
R186	RN14BK2E69R8F	Metal film 69.8 $\Omega$ $\pm$ 1% 1/4W
R187~189	RN14BK2E1000F	Metal film 100 $\Omega$ $\pm$ 1% 1/4W
R190	RN14BK2E10R0F	Metal film 10 $\Omega$ $\pm$ 1% 1/4W
R191, 192	RD14BY2B470J	Carbon 47 $\Omega$ $\pm$ 5% 1/8W
R193, 194	RD14BY2B472J	Carbon 4.7k $\Omega$ $\pm$ 5% 1/8W
R195	RN14BK2E1500F	Metal film 150 $\Omega$ $\pm$ 1% 1/4W
R196	RD14BY2B471J	Carbon 470 $\Omega$ $\pm$ 5% 1/8W
R197, 198	RD14BY2B221J	Carbon 220 $\Omega$ $\pm$ 5% 1/8W
R199, 200	RN14BK2E3901F	Metal film 3.9k $\Omega$ $\pm$ 1% 1/4W
R201	RD14BY2B820J	Carbon 82 $\Omega$ $\pm$ 5% 1/8W
R202, 203	RD14BY2B470J	Carbon 47 $\Omega$ $\pm$ 5% 1/8W
R204, 205	RD14BY2B332J	Carbon 3.3k $\Omega$ $\pm$ 5% 1/8W
R206~209	RD14BY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R210	RD14BY2B470J	Carbon 47 $\Omega$ $\pm$ 5% 1/8W
R211, 212	RD14BY2B472J	Carbon 4.7k $\Omega$ $\pm$ 5% 1/8W
R213, 214	RD14BY2B221J	Carbon 220 $\Omega$ $\pm$ 5% 1/8W
R215, 216	RN14BK2E5600F	Metal film 560 $\Omega$ $\pm$ 1% 1/4W
R217, 218	RD14BY2B391J	Carbon 390 $\Omega$ $\pm$ 5% 1/8W
R219, 220	RD14BY2B102J	Carbon 1k $\Omega$ $\pm$ 5% 1/8W
R221	RD14BY2B221J	Carbon 220 $\Omega$ $\pm$ 5% 1/8W
R222	RD14BY2B102J	Carbon 1k $\Omega$ $\pm$ 5% 1/8W
R223	RD14BY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R224, 225	RN14BK2E2700F	Metal film 270 $\Omega$ $\pm$ 1% 1/4W
R226, 227	RN14BK2E91R0F	Metal film 91 $\Omega$ $\pm$ 1% 1/4W
R228	RD14BY2B220J	Carbon 22 $\Omega$ $\pm$ 5% 1/8W
R229, 230	RN14BK2E2201F	Metal film 2.2k $\Omega$ $\pm$ 1% 1/4W
R231	Blank number	
R232	RD14BY2B680J	Carbon 68 $\Omega$ $\pm$ 5% 1/8W
R233, 234	RN14BK2E2001F	Metal film 2k $\Omega$ $\pm$ 1% 1/4W
R235	RD14BY2B680J	Carbon 68 $\Omega$ $\pm$ 5% 1/8W
R236	Blank number	
R237, 238	RD14BY2B470J	Carbon 47 $\Omega$ $\pm$ 5% 1/8W
R239, 240	RN14BK2H9963F	Metal film 996k $\Omega$ $\pm$ 1% 1/2W
-	R92-0150-05	Jumper resistor

### POTENTIOMETER

VR101	R12-0504-05	Semi-fixed resistor 220 $\Omega$ (B)
VR102	R01-0501-05	Variable resistor 300 $\Omega$ (B) with SW
VR103	R12-0501-05	Semi-fixed resistor 100 $\Omega$ (B)
VR104	R01-1013-25	Variable resistor 1k $\Omega$ (B)
VR105	R12-1003-05	Semi-fixed resistor 2.2k $\Omega$ (B)
VR106	R12-0504-05	Semi-fixed resistor 220 $\Omega$ (B)
VR107	R01-0501-05	Variable resistor 300 $\Omega$ (B) with SW
VR108	R12-0501-05	Semi-fixed resistor 100 $\Omega$ (B)
VR109	R01-1013-25	Variable resistor 1k $\Omega$ (B)



# PARTS LIST

Ref. No.	Parts No.	Description
VR110,111	R12-0502-05	Semi-fixed resistor 100Ω(B)
VR112,113	R12-1003-05	Semi-fixed resistor 2.2kΩ(B)
TC101	C05-0065-05	Ceramic trimmer 6pF
TC102	C05-0066-05	Ceramic trimmer 10pF
TC103	C05-0065-05	Ceramic trimmer 6pF
TC104	C05-0066-05	Ceramic trimmer 10pF
TC105,106	C05-0065-05	Ceramic trimmer 6pF
TC107	C05-0066-05	Ceramic trimmer 10pF
TC108	C05-0065-05	Ceramic trimmer 6pF
TC109	C05-0066-05	Ceramic trimmer 10pF
TC110	C05-0065-05	Ceramic trimmer 6pF
TC111,112	C05-0066-05	Ceramic trimmer 10pF
TC113	C05-0401-05	Ceramic trimmer 20pF

### SEMICONDUCTOR

Q101		FET	2SK30A-O
Q102a, b		Dual FET	2SK58-M
Q103~106		Transistor	2SC535-B
Q107, 108		Transistor	2SA844-D
Q109, 110		Transistor	2SC535-B
Q111		FET	2SK30A-O
Q112a, b		Dual FET	2SK58-M
Q113~116		Transistor	2SC535-B
Q117, 118		Transistor	2SA844-D
Q119~122		Transistor	2SC535-B
Q123, 124		Transistor	2SA844-D
Q125, 126		Transistor	2SC458-C
Q127		Transistor	2SA844-D
IC101,102		Linear IC	HA1127
IC103		Digital IC	TD3400AP
IC104		Digital IC	TD3472AP
D101~108		Diode	1S1587
D109~121		Diode	1S1555
D122, 123		Diode	1S1587
D124~127		Diode	1N60

### MISCELLANEOUS

S101, 102	S32-4007-05	Lever switch (AC-G-DC)
S103a,b,c, S104a,b,c	S03-3501-05	Rotary switch (V. ATT)
S105	S40-2502-05	Push switch (POLA)
S106	S37-2005-05	Lever switch (MODE)
L101, 102	L40-2201-03	Ferri-inductor 22μH
—	E29-0503-05	Terminal
—	E29-0504-05	Terminal
—	E40-0701-05	Connector 7P
—	E40-0802-05	Connector 8P
—	F10-1510-04	Shield board
—	F11-0147-14	Shield case
—	F11-0910-13	Shield case
—	J25-2806-33	PC board

### VERTICAL MAIN AMP UNIT (X73-1220-00)

Ref. No.	Parts No.	Description
<b>CAPACITOR</b>		
C401, 402	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C403	CE04W1A331	Electrolytic 330μF 10WV
C404	Blank number	
C405	CC45CH1H100D	Ceramic 10pF ±0.5pF
C406	CQ93M1H333K	Mylar 0.033μF ±10%
C407	CQ93M1H222K	Mylar 2200pF ±10%

Ref. No.	Parts No.	Description
C408	CK45D1H103M	Ceramic 0.01μF ±20%
C409	CC45CH1H100D	Ceramic 10pF ±0.5pF
C410	CC45CH1H150J	Ceramic 15pF ±5%
C411	CE04W1E221	Electrolytic 220μF 25WV
C412	CE04W1C101	Electrolytic 100μF 16WV
C413	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C414	CE04W1C470	Electrolytic 47μF 16WV
C415	CK45D1H103M	Ceramic 0.01μF ±20%
C416	CK45D2H103M	Ceramic 0.01μF ±20%
C417, 418	CC45CH2H010D	Ceramic 1pF ±0.5pF
C419, 420	CK45D1H103M	Ceramic 0.01μF ±20%
C421, 422	CC45CH1H330J	Ceramic 33pF ±5%
C423, 424	CC45SL1H121J	Ceramic 120pF ±5%
C425	CK45D1H103M	Ceramic 0.01μF ±20%
C426, 427	CK45D2H332M	Ceramic 3300pF ±20%
C428, 429	CK45D2H103M	Ceramic 0.01μF ±20%
C430	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C431	CK45D1H103M	Ceramic 0.01μF ±20%
C432	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C433	CE04W1A101	Electrolytic 100μF 10WV
C434	CE04W1E221	Electrolytic 220μF 25WV
C435	C90-0298-05	Semiconductor ceramic 0.1μF +80%, -20%
C436	CE04W1E221	Electrolytic 220μF 25WV
C437	CC45SL1H101J	Ceramic 100pF ±5%
C438	Blank number	
C439	CC45SL1H221J	Ceramic 220pF ±5%

### RESISTOR

R401, 402	RN14BK2E91R0F	Metal film 91Ω ±1%	1/4W
R403, 404	RD14BY2B220J	Carbon 22Ω ±5%	1/8W
R405	RD14BY2B221J	Carbon 220Ω ±5%	1/8W
R406, 407	RD14BY2B222J	Carbon 2.2kΩ ±5%	1/8W
R408	RD14BY2B221J	Carbon 220Ω ±5%	1/8W
R409, 410	RD14BY2B220J	Carbon 22Ω ±5%	1/8W
R411	RD14BY2B100J	Carbon 10Ω ±5%	1/8W
R412, 413	RD14BY2B381	Carbon 390Ω ±5%	1/8W
R414~417	RD14BY2B220J	Carbon 22Ω ±5%	1/8W
R418, 419	RD14BY2B222J	Carbon 2.2kΩ ±5%	1/8W
R420, 421	RD14BY2B152J	Carbon 1.5kΩ ±5%	1/8W
R422, 423	RN14BK2E4701F	Metal film 4.7kΩ ±1%	1/4W
R424, 425	RD14BY2B100J	Carbon 10Ω ±5%	1/8W
R426, 427	RD14BY2B220J	Carbon 22Ω ±5%	1/8W
R428, 429	RN14BK2E7502F	Metal film 75kΩ ±1%	1/4W
R430, 431	RD14BY2B101J	Carbon 100Ω ±5%	1/8W
R432, 433	RD14BY2B100J	Carbon 10Ω ±5%	1/8W
R434, 435	RD14BY2B220J	Carbon 22Ω ±5%	1/8W
R436, 437	RD14BY2B104J	Carbon 100kΩ ±5%	1/8W
R438, 439	RD14BY2B100J	Carbon 10Ω ±5%	1/8W
R440, 441	RD14BY2B220J	Carbon 22Ω ±5%	1/8W
R442, 443	RD14BY2B681J	Carbon 680Ω ±5%	1/8W
R444~447	RD14BY2B101J	Carbon 100Ω ±5%	1/8W
R448, 449	RD14BY2B220J	Carbon 22Ω ±5%	1/8W
R450, 451	RD14BY2B222J	Carbon 2.2kΩ ±5%	1/8W
R452	RD14BY2B681J	Carbon 680Ω ±5%	1/8W
R453, 454	RD14BY2B101J	Carbon 100Ω ±5%	1/8W
R455	Blank number		
R456	RD14BY2B681J	Carbon 680Ω ±5%	1/8W
R457	RD14BY2B223J	Carbon 22kΩ ±5%	1/8W
R458	RD14BY2B152J	Carbon 1.5kΩ ±5%	1/8W
R459, 460	RD14BY2B473J	Carbon 47kΩ ±5%	1/8W
R461	RD14BY2B333J	Carbon 33kΩ ±5%	1/8W
R462, 463	RD14BY2B220J	Carbon 22Ω ±5%	1/8W
R464, 465	RD14BY2B152J	Carbon 1.5kΩ ±5%	1/8W
R466	RD14BY2B821J	Carbon 820Ω ±5%	1/8W
R467	RD14BY2B153J	Carbon 15kΩ ±5%	1/8W
R468, 469	Blank number		
R470	RD14BY2B821J	Carbon 820Ω ±5%	1/8W

# PARTS LIST

Ref. No.	Parts No.	Description
R471, 472 R473 R474, 475 —	RD14BY2B470J Blank number RD14BY2B151J R92-0150-05	Carbon 47Ω ±5% 1/8W Carbon 150Ω ±5% 1/8W Jumper resistor
<b>POTENTIOMETER</b>		
VR401 VR402 VR403 VR404 VR405	R12-0502-05 R12-3004-05 R12-1002-05 R12-3004-05 R12-1002-05	Semi-fixed resistor 100Ω(B) Semi-fixed resistor 47kΩ(B) Semi-fixed resistor 1kΩ(B) Semi-fixed resistor 47kΩ(B) Semi-fixed resistor 1kΩ(B)
TC401 TC402, 403 TC404	C05-0401-05 C05-0066-05 C05-0401-05	Ceramic trimmer 20pF Ceramic trimmer 10pF Ceramic trimmer 20pF
<b>SEMICONDUCTOR</b>		
Q401~404 Q405~409 Q410, 411 Q412, 413 Q414, 415 Q416, 417 Q418, 419		Transistor 2SC535-B Transistor 2SC458-C Transistor 2SC1628-Y Transistor 2SA818-Y FET 2SK19-GR Transistor 2SC535-B Transistor 2SC458-C
D401, 402 D403 D404, 407 D405, 406 D408, 409		Diode 1S1587 Zener diode WZ-130 Zener diode WZ-050 Diode 1S1555 Diode 1S1587
TH401~403		Thermistor SDT-100
<b>MISCELLANEOUS</b>		
L401 L402, 403 L404 L406 L407, 408 — — — — — — — —	L40-4701-03 L40-1092-02 L76-0101-05 L40-2201-03 L40-1091-41 E23-0047-04 E29-0504-05 E29-0505-05 E33-0861-00 E40-0806-06 F01-0802-04 J21-2819-04 J25-2808-33	Ferri-inductor 47μH Ferri-inductor 1μH Delay line (1) Ferri-inductor 22μH Ferri-inductor 1μH Terminal Terminal Socket pin Lead wire ass'y Connector 8P Heat sink PC board mounting hardware PC board

## SWEEP CIRCUIT UNIT (X74-1080-00)

Ref. No.	Parts No.	Description
<b>CAPACITOR</b>		
C1, 2 C3 C4~6 C7, 8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18	CQ93M1H682K CE04W1A101 CE04W1H010 CK45D1H103M CC45CH1H330J C90-0320-05 C90-0321-05 CC45CH1H390J CC45CH1H100D CS15E1ER22M CQ93M1H222K CK45B1H561K Blank number CC45CH1H180J	Mylar 6800pF ±10% Electrolytic 100μF 10WV Electrolytic 1μF 50WV Ceramic 0.01μF ±20% Ceramic 33pF ±5% Metal film 0.47μF ±1% Metal film 4700pF ±1% Ceramic 39pF ±5% Ceramic 10pF ±0.5pF Tantalum 0.22μF 25WV Mylar 2200pF ±10% Ceramic 560pF ±10% Ceramic 18pF ±5%

Ref. No.	Parts No.	Description
C19, 20 C21 C22 C23 C24 C25 C26 C27 C28, 29 C30 C31~34 C35 C36 C37 C38 C39 C40, 41 C42 C43 C44 C45, 46 C47 C48 C49 C50 C51 C52~56	CQ93M1H152K CC45SL1H221J CC45SL1H151J CC45SL2H010D CK45D2H472M CC45SL2H101J CC45SL1H150J CK45D2H332M CE04BW1H010M CC45SL1H470J CK45D1H103M CC45SL1H150J CC45SL1H030D CC45CH1H330J CK45D2H102M CE04W1A101 CE04W1C471 CK45D1H222M CE04W1A470 CK45D1H222M Blank number CK45B1H681K CC45SL1H100D CC45SL1H181J CC45SL1H020D RD14BY2E223J C90-0298-05	Mylar 1500pF ±10% Ceramic 220pF ±5% Ceramic 150pF ±5% Ceramic 1pF ±0.5pF Ceramic 4700pF ±20% Ceramic 100pF ±5% Ceramic 15pF ±5% Ceramic 3300pF ±20% Electrolytic 1μF 50WV Ceramic 47pF ±5% Ceramic 0.01μF ±20% Ceramic 15pF ±5% Ceramic 3pF ±0.5pF Ceramic 33pF ±5% Ceramic 1000pF ±20% Electrolytic 100μF 10WV Electrolytic 470μF 16WV Ceramic 2200pF ±20% Electrolytic 47μF 10WV Ceramic 2200pF ±20% Ceramic 680pF ±10% Ceramic 10pF ±0.5pF Ceramic 180pF ±5% Ceramic 2pF ±0.5pF Semiconductor ceramic 0.1μF +80%, -20%
<b>RESISTOR</b>		
R1 R2 R3 R4 R5 R6, 7 R8 R9 R10 R11 R12 R13 R14 R15 R16, 17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R34 R35 R36 R37 R38 R39 R40 R41 R42 R43	RD14BY2E562J RD14BY2E152J RD14BY2E472J RD14BY2E104J RD14BY2E472J RD14BY2E563J RD14BY2E472J RD14BY2E470J RD14BY2E472J RD14BY2E152J RD14BY2E223J RD14BY2E104J RD14BY2E152J RD14BY2E223J RD14BY2E104J RD14BY2E152J RD14BY2E104J RD14BY2E152J RD14BY2E104J RD14BY2E102J RD14BY2E332J RD14BY2E152J RD14BY2E332J RD14BY2E102J RD14BY2E683J RD14BY2E152J RN14BK2E1003F R92-0709-05 RN14BK2E1003F RN14BK2E3003F RN14BK2H5003F RN14BK2H1004F RD14BY2E104J RD14BY2E473J RD14BY2E683J RD14BY2E101J RD14BY2E822J RD14BY2E682J RD14BY2E103J RD14BY2E682J RD14BY2E103J RD14BY2E103J RD14BY2E153J RD14BY2E152J RD14BY2E101J	Carbon 5.6kΩ ±5% 1/4W Carbon 1.5kΩ ±5% 1/4W Carbon 4.7kΩ ±5% 1/4W Carbon 100kΩ ±5% 1/4W Carbon 4.7kΩ ±5% 1/4W Carbon 56kΩ ±5% 1/4W Carbon 4.7kΩ ±5% 1/4W Carbon 47Ω ±5% 1/4W Carbon 4.7kΩ ±5% 1/4W Carbon 1.5kΩ ±5% 1/4W Carbon 22kΩ ±5% 1/4W Carbon 100kΩ ±5% 1/4W Carbon 1.5kΩ ±5% 1/4W Carbon 22kΩ ±5% 1/4W Carbon 100kΩ ±5% 1/4W Carbon 1.5kΩ ±5% 1/4W Carbon 22kΩ ±5% 1/4W Carbon 100kΩ ±5% 1/4W Carbon 1kΩ ±5% 1/4W Carbon 3.3kΩ ±5% 1/4W Carbon 1.5kΩ ±5% 1/4W Carbon 3.3kΩ ±5% 1/4W Carbon 1kΩ ±5% 1/4W Carbon 68kΩ ±5% 1/4W Carbon 1.5kΩ ±5% 1/4W Metal film 100kΩ ±1% 1/4W Carbon 3MΩ ±1% 1/4W Metal film 100kΩ ±1% 1/4W Metal film 300kΩ ±1% 1/4W Metal film 500kΩ ±1% 1/2W Metal film 1MΩ ±1% 1/2W Carbon 100kΩ ±5% 1/4W Carbon 47kΩ ±5% 1/4W Carbon 68kΩ ±5% 1/4W Carbon 100Ω ±5% 1/4W Carbon 8.2kΩ ±5% 1/4W Carbon 6.8kΩ ±5% 1/4W Carbon 10kΩ ±5% 1/4W Carbon 6.8kΩ ±5% 1/4W Carbon 10kΩ ±5% 1/4W Carbon 15kΩ ±5% 1/4W Carbon 1.5kΩ ±5% 1/4W Carbon 100Ω ±5% 1/4W

# PARTS LIST

Ref. No.	Parts No.	Description	Ref. No.	Parts No.	Description
R44	RD14BY2E152J	Carbon 1.5kΩ ±5% 1/4W	TC1	C05-0401-05	Ceramic trimmer 20pF
R45	RD14BY2E101J	Carbon 100Ω ±5% 1/4W	TC2	C05-0066-05	Ceramic trimmer 10pF
R46	RD14BY2E472J	Carbon 4.7kΩ ±5% 1/4W	<b>SEMICONDUCTOR</b>		
R47	RD14BY2E220J	Carbon 22Ω ±5% 1/4W	Q1~6		Transistor 2SC458-C
R48	RD14BY2E185J	Carbon 1.8MΩ ±5% 1/4W	Q7, 8		Transistor 2SA733-Q
R49	RD14BY2E224J	Carbon 220kΩ ±5% 1/4W	Q9		Transistor 2SC458-C
R50~52	RD14BY2E104J	Carbon 100kΩ ±5% 1/4W	Q10		FET 2SK30A-O
R53	RD14BY2E205J	Carbon 2MΩ ±5% 1/4W	Q11		Transistor 2SC458-C
R54	RD14BY2E152J	Carbon 1.5kΩ ±5% 1/4W	Q12		FET 2SK30A-O
R55	RD14BY2E123J	Carbon 12kΩ ±5% 1/4W	Q13~19		Transistor 2SC458-C
R56	RD14BY2E822J	Carbon 8.2kΩ ±5% 1/4W	Q20		Transistor 2SC535-C
R57	RD14BY2E680J	Carbon 68Ω ±5% 1/4W	Q21, 22		Transistor 2SC458-C
R58	RD14BY2E181J	Carbon 180Ω ±5% 1/4W	Q23, 24		Transistor 2SC1507
R59	RD14BY2E220J	Carbon 22Ω ±5% 1/4W	Q25		Transistor 2SC458-C
R60	RD14BY2E101J	Carbon 100Ω ±5% 1/4W	IC1		Digital IC SN74H00N
R61	RD14BY2E562J	Carbon 5.6kΩ ±5% 1/4W	IC2		Digital IC SN74H72N
R62	RD14BY2E471J	Carbon 470Ω ±5% 1/4W	IC3		Linear IC RC555NB
R63	RD14BY2E272J	Carbon 2.7kΩ ±5% 1/4W	IC4		Digital IC SN7400N
R64	RD14BY2E223J	Carbon 22kΩ ±5% 1/4W	IC5		Linear IC RC733T
R65	RD14BY2E683J	Carbon 68kΩ ±5% 1/4W	D1		Diode 1N60
R66	RD14BY2E103J	Carbon 10kΩ ±5% 1/4W	D2~4		Diode 1S1555
R67	RD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W	D5		Diode 1N60
R68	RD14BY2E564J	Carbon 560kΩ ±5% 1/4W	D6		Diode 1S1587
R69	RD14BY2E103J	Carbon 10kΩ ±5% 1/4W	D7~10		Diode 1S1555
R70	RD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W	D11		Diode 1N60
R71	RD14BY2E101J	Carbon 100Ω ±5% 1/4W	D12		Blank number
R72, 73	RD14BY2E103J	Carbon 10kΩ ±5% 1/4W	D13, 14		Diode 1N60
R74	RD14BY2E122J	Carbon 1.2kΩ ±5% 1/4W	D15		Diode 1S1555
R75	RD14BY2E332J	Carbon 3.3kΩ ±5% 1/4W	D16		Zener diode YZ-030
R76	RD14BY2E152J	Carbon 1.5kΩ ±5% 1/4W	D17~20		Diode 1S1555
R77	RD14BY2E103J	Carbon 10kΩ ±5% 1/4W	<b>MISCELLANEOUS</b>		
R78	RD14BY2E822J	Carbon 8.2kΩ ±5% 1/4W	S2a,b,c,d,e	S29-2504-05	Rotary switch (w/VR4)(SWEEP TIME)
R79	RD14BY2E101J	Carbon 100Ω ±5% 1/4W	S3a,b	S37-2005-05	Lever switch (COUP)
R80	RD14BY2E682J	Carbon 6.8kΩ ±5% 1/4W	S4a,b	S32-2013-05	Lever switch (SLOPE)
R81	RD14BY2E472J	Carbon 4.7kΩ ±5% 1/4W	S5		
R82	RD14BY2E682J	Carbon 6.8kΩ ±5% 1/4W	L1, 2	L40-4701-03	Ferri-inductor 47μH
R83~85	RD14BY2E101J	Carbon 100Ω ±5% 1/4W	L3	L40-3991-02	Ferri-inductor 3.9μH
R86	RD14BY2E561J	Carbon 560Ω ±5% 1/4W	L4, 5	L40-1511-03	Ferri-inductor 150μH
R87	RD14BY2E223J	Carbon 22kΩ ±5% 1/4W	L6~8	L40-4701-03	Ferri-inductor 47μH
R88	RD14BY2E123J	Carbon 12kΩ ±5% 1/4W	P1	E40-0303-05	Connector
R89, 90	RD14BY2E101J	Carbon 100Ω ±5% 1/4W	P2	E40-0503-05	Connector
R91	RS14AB3D472G	Oxidized metal film 4.7kΩ ±2% 2W	J1, 2	E40-0808-05	Connector
R92	RS14AB3D512G	Oxidized metal film 5.1kΩ ±2% 2W	—	E02-0126-05	IC socket
R93	RS14AB3A393J	Oxidized metal film 39kΩ ±5% 1W	—	E02-0127-05	IC socket
R94, 95	RD14BY2E101J	Carbon 100Ω ±5% 1/4W	—	E23-0047-04	Terminal
R96	RD14BY2H821J	Carbon 820Ω ±5% 1/2W	—	E33-0857-00	Lead wire ass'y
R97	RD14BY2E123J	Carbon 12kΩ ±5% 1/4W	—		
R98	RD14BY2E103J	Carbon 10kΩ ±5% 1/4W	—		
R99	RD14BY2E223J	Carbon 22kΩ ±5% 1/4W	—		
R100	RD14BY2E101J	Carbon 100Ω ±5% 1/4W	—		
R101	Blank number		—		
R102	RD14BY2E182J	Carbon 1.8kΩ ±5% 1/4W	—		
R103	RD14BY2E223J	Carbon 22kΩ ±5% 1/4W	—		
R104	RD14BY2E562J	Carbon 5.6kΩ ±5% 1/4W	—		
—	R92-0150-05	Jumper resistor	—	J25-2809-33	PC board
<b>POTENTIOMETER</b>					
VR1	R12-3041-05	Semi-fixed resistor 10kΩ(B)			
VR2, 3	R12-5025-05	Semi-fixed resistor 100kΩ(B)			
VR4	R01-2501-05	Variable resistor 5kΩ(B) with SW			
VR5	R12-5025-05	Semi-fixed resistor 100kΩ(B)			
VR6	R12-1028-05	Semi-fixed resistor 4.7kΩ(B)			
VR7	R12-3042-05	Semi-fixed resistor 47kΩ(B)			
VR8, S1	R01-4024-05	Variable resistor 50kΩ(B) with SW			
VR9	R12-8501-05	Variable resistor 2.2MΩ(B)			
VR10	R12-3041-05	Semi-fixed resistor 10kΩ(B)			
VR11	R12-1029-05	Semi-fixed resistor 1kΩ(B)			
VR12	R12-1033-05	Semi-fixed resistor 2.2kΩ(B)			
VR13, 14	R12-0502-05	Semi-fixed resistor 100Ω(B)			
VR15	R12-3040-05	Semi-fixed resistor 22kΩ(B)			
VR16	R12-0051-05	Semi-fixed resistor 150Ω(B)			



# PARTS LIST

## VOLTAGE SELECTOR UNIT (X77-1020-00)

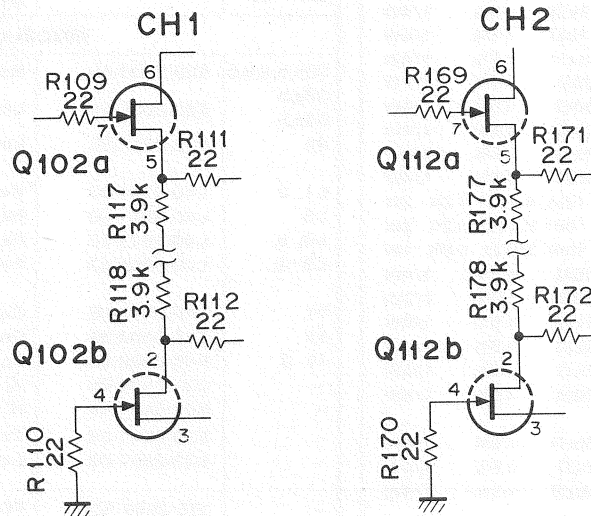
Ref. No.	Parts No.	Description
-	E08-1081-05	Voltage selector unit (Receptacle)
-	E09-0681-05	Voltage selector unit (Plug)
-	E23-0047-04	Terminal
-	E40-0233-05	Connector 2P
-	E40-0533-05	Connector 5P
-	E40-0635-05	Connector 6P

Ref. No.	Parts No.	Description
-	F19-0703-04	Switch cover plate
-	J12-0501-14	Mold pin
-	J21-2824-04	Selector mounting hardware
-	J25-2805-14	PC board

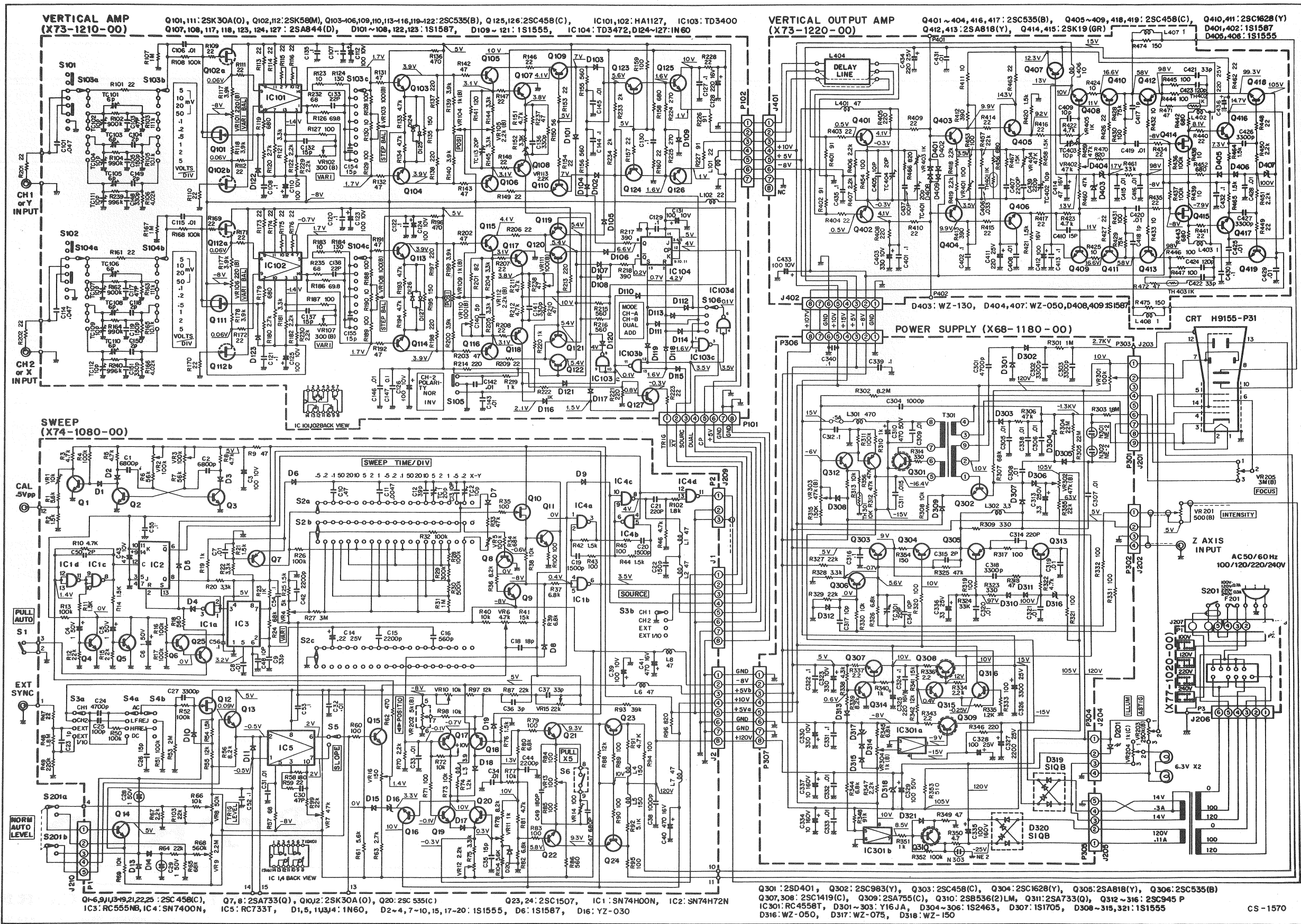
**Note:**

Although Q102, 112 in X73-1210-00 are used 2SK58(M), E412S(B) are available in setting before serial No. 456001.

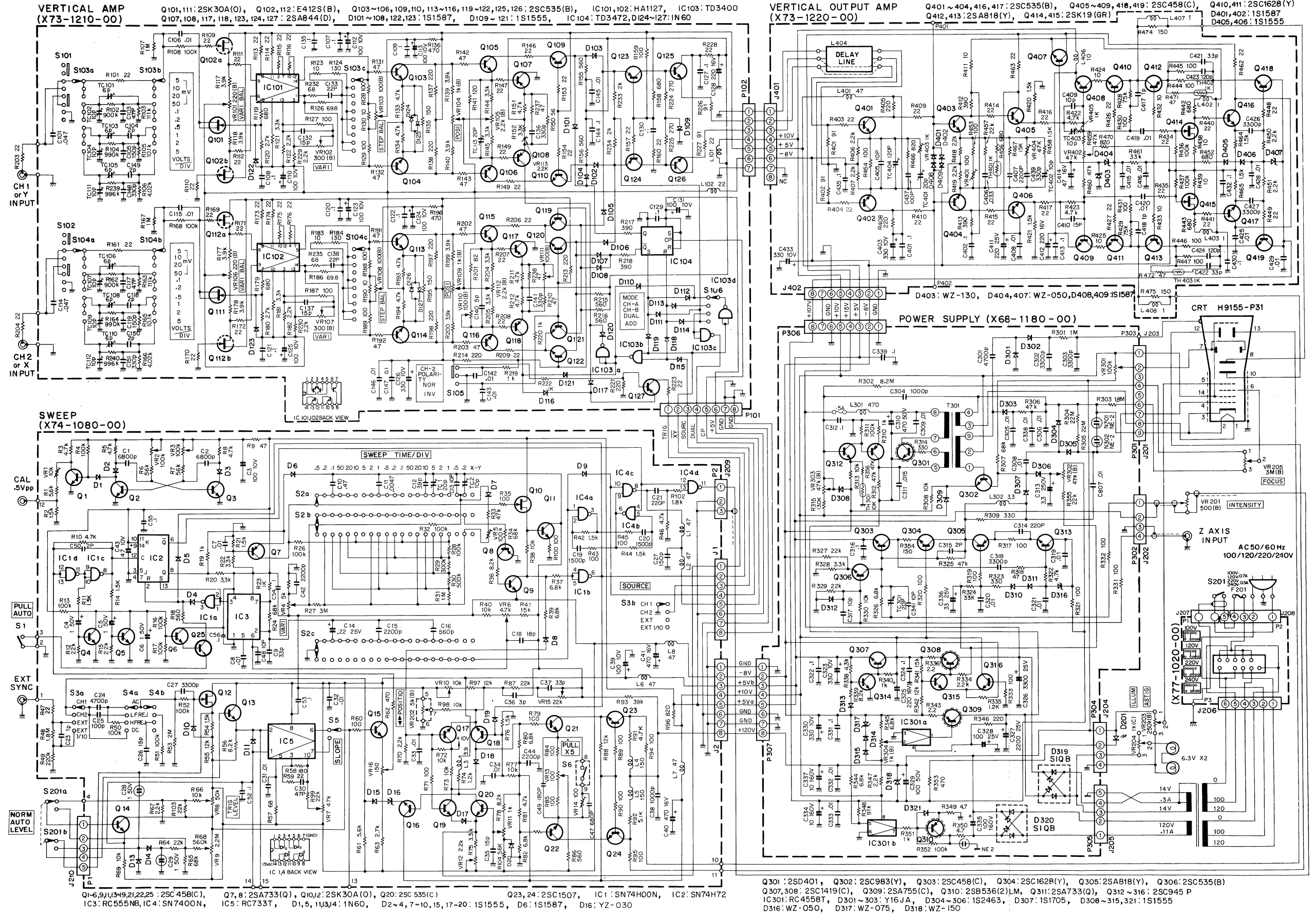
{ E412S(B) }



# SCHEMATIC DIAGRAM







Q1-6, 9, 11, 13, 9, 21, 22, 25: 2SC458(C), Q7, 8: 2SA733(Q), Q10, 12: 2SK30A(O), Q20: 2SC535(C), Q23, 24: 2SC1507, IC1: SN74H00N, IC2: SN74H72  
IC3: RC555NB, IC4: SN7400N, IC5: RC733T, D1, 5, 11, 13, 4: 1N60, D2-4, 7-10, 15, 17-20: 1S1555, D6: 1S1587, D16: YZ-030  
Q301: 2SD401, Q302: 2SC983(Y), Q303: 2SC458(C), Q304: 2SC162R(Y), Q305: 2SA818(Y), Q306: 2SC535(B)  
Q307, 308: 2SC1419(C), Q309: 2SA755(C), Q310: 2SB536(2)LM, Q311: 2SA733(Q), Q312-316: 2SC945 P  
IC301: RC4558T, D301-303: Y16JA, D304-306: 1S2463, D307: 1S1705, D308-315, 321: 1S1555  
D316: WZ-050, D317: WZ-075, D318: WZ-150



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