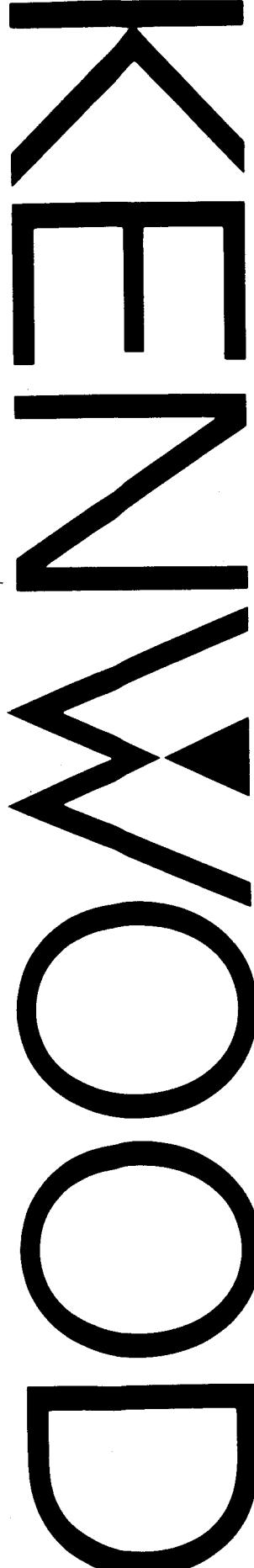


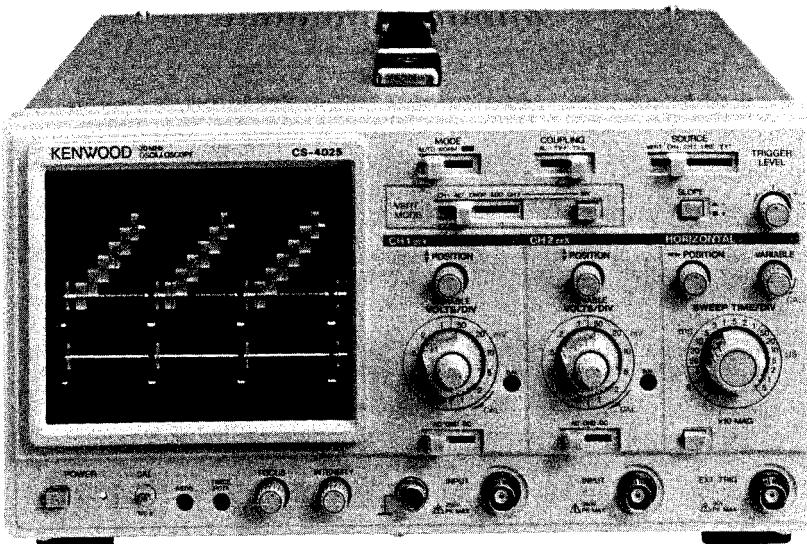
3003

18  
3  
  
20MHz OSCILLOSCOPE

# CS-4025

## SERVICE MANUAL

KENWOOD CORPORATION



3003

## **WARNING**

The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do so.

## **CONTENTS**

SPECIFICATIONS .....	3
SAFETY .....	6
CIRCUIT DESCRIPTION .....	7
BLOCK DIAGRAM .....	9
ADJUSTMENT .....	10
TROUBLESHOOTING .....	15
PARTS LIST .....	20
DISASSEMBLY .....	21
PARTS LIST (ELECTRICAL) .....	22
SCHEMATIC DIAGRAM/WAVEFORM .....	26
P.C. BOARD .....	31
SEMICONDUCTORS .....	33

# SPECIFICATION

		CS-4025
<b>CRT:</b>		
Type:	Rectangular with internal graticule	
Acceleration Voltage:	Approx. 2 kV	
Display Area:	8 × 10 div (1 div = 10 mm)	
<b>VERTICAL AXIS (CH1 and CH2):</b>		
Sensitivity:	1 mV · 2 mV/div ± 5%; 5 mV ~ 5 V ± 3%	
Attenuator:	1-2-5 step, 12 range with fine adjustment	
Input Impedance:	1 MΩ ± 2% resistance Approx. 28 pF capacitance	
Frequency Response 5 mV/div ~ 5 V/div:	DC: DC ~ 20 MHz within -3 dB	
	AC: 10 Hz ~ 20 MHz within -3 dB	
1 mV/div · 2 mV/div:	DC: DC ~ 5 MHz within -3 dB	
	AC: 10 Hz ~ 5 MHz within -3 dB	
Rise Time:	17.5 ns maximum (20 MHz)	
	70 ns maximum (5 MHz)	
Crosstalk:	-40 dB maximum	
Operating Modes:	CH1: CH1 single trace	
	CH2: CH2 single trace	
	ALT: Alternating display of two signals	
	CHOP: Chopped display of two signals	
	ADD: Display of combined CH1 + CH2 waveforms	
CHOP Frequency:	Approx. 250 kHz	
Channel Polarity:	Normal or inverted, channel 2 only inverted	
Maximum Input Voltage:	500 V <sub>P-P</sub> or 250 V (DC + AC <sub>peak</sub> )	
<b>HORIZONTAL AXIS:</b>		
Sensitivity:	Same as vertical axis (CH2)	
Input Impedance:	Same as vertical axis (CH2)	
Frequency Response:	DC: DC ~ 500 kHz within -3 dB	
	AC: 10 Hz ~ 500 kHz within -3 dB	
X-Y Phase Difference:	3° or less at 50 kHz	
Operating Modes:	X-Y operation is selectable with MODE switch	
	CH1: Y-axis	
	CH2: X-axis	
Maximum Input Voltage:	Same as vertical axis (CH2)	
<b>SWEEP SYSTEM:</b>		
Sweep Modes:	NORM: Triggered sweep	
	AUTO: Auto free run with no signal input	
Sweep Time:	0.5 μs/div ~ 0.5 s/div, ± 3%	
	1-2-5 step, 19 range with fine adjustment	
Sweep Expansion:	10 × magnification, ± 5%	
Linearity:	± 3% (± 5% at × 10 MAG)	

# SPECIFICATIONS

	CS-4025																									
<b>TRIGGERING:</b>																										
Trigger Signal Sources:	VERT: Input signal selection with VERT MODE control CH1: CH1 input signal CH2: CH2 input signal LINE: Commercial-use power source EXT: Signal input through EXT.TRIG terminal																									
External trigger:																										
Input impedance:	1 MΩ ; Approx 35 pF																									
Maximum Input Voltage:	100 V <sub>P-P</sub> or 50 V (DC + AC <sub>peak</sub> )																									
Trigger Coupling Modes:	AC: Trigger is capacitively coupled; dc component is blocked. TV-F: Vertical sync pulses of a composite video signal are selected for triggering. TV-L: Horizontal sync pulses of a composite video signal are selected for triggering.																									
Trigger Sensitivity:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">MODE</th> <th rowspan="2">COUPLING</th> <th rowspan="2">SIGNAL FREQ</th> <th colspan="2">SOURCE</th> </tr> <tr> <th>VERT CH1, CH2</th> <th>EXT</th> </tr> </thead> <tbody> <tr> <td rowspan="2">NORM</td> <td rowspan="2">AC</td> <td>10 Hz ~ 10 MHz</td> <td>1 div</td> <td>0.2 V<sub>P-P</sub></td> </tr> <tr> <td>10 MHz ~ 20 MHz</td> <td>1.5 div</td> <td>0.3 V<sub>P-P</sub></td> </tr> <tr> <td>AUTO</td> <td>TV-F, TV-L</td> <td>Composite Video Signal</td> <td>1 div</td> <td>0.2 V<sub>P-P</sub></td> </tr> <tr> <td></td> <td></td> <td></td> <td colspan="2">Same as above specs at 50 Hz or above</td> </tr> </tbody> </table>	MODE	COUPLING	SIGNAL FREQ	SOURCE		VERT CH1, CH2	EXT	NORM	AC	10 Hz ~ 10 MHz	1 div	0.2 V <sub>P-P</sub>	10 MHz ~ 20 MHz	1.5 div	0.3 V <sub>P-P</sub>	AUTO	TV-F, TV-L	Composite Video Signal	1 div	0.2 V <sub>P-P</sub>				Same as above specs at 50 Hz or above	
MODE	COUPLING				SIGNAL FREQ	SOURCE																				
		VERT CH1, CH2	EXT																							
NORM	AC	10 Hz ~ 10 MHz	1 div	0.2 V <sub>P-P</sub>																						
		10 MHz ~ 20 MHz	1.5 div	0.3 V <sub>P-P</sub>																						
AUTO	TV-F, TV-L	Composite Video Signal	1 div	0.2 V <sub>P-P</sub>																						
			Same as above specs at 50 Hz or above																							
<b>CALIBRATED SIGNALS:</b>																										
Waveform:	Positive square wave																									
Voltage:	1 V <sub>P-P</sub> , ± 3%																									
Frequency:	100 Hz or 120 Hz																									
<b>INTENSITY MODULATION:</b>																										
Sensitivity:	TTL level, positive voltage decreases brightness																									
Input Impedance:	Approx. 5 kΩ																									
Usable Frequency Range:	DC ~ 3.5 MHz																									
Maximum Input Voltage:	100 V <sub>P-P</sub> or 50 V (DC + AC <sub>peak</sub> )																									
<b>CH1 SIGNAL OUTPUT:</b>																										
Output Voltage:	Approx. 50 mV/div (50 Ω termination)																									
Output Impedance:	Approx. 50 Ω																									
Frequency Response:	100 Hz ~ 10 MHz within ± 3 dB (50 Ω termination)																									
<b>TRACE ROTATION:</b>																										
Adjustment:	Adjustable from front panel																									
<b>POWER SOURCE:</b>																										
Line Voltage:	AC 100 V/120 V/220 V/240 V, ± 10%																									
Line Frequency:	50/60 Hz																									
Power Consumption:	Approx. 29 W																									
<b>DIMENSIONS/WEIGHT</b> (figures in parenthesis include attachments):																										
Width:	290 mm (290 mm)																									
Height:	150 mm (170 mm)																									
Depth:	380 mm (440 mm)																									
Weight:	Approx. 6.8 kg																									

# SPECIFICATIONS

CS-4025	
<b>ENVIRONMENTAL:</b>	
Within specifications:	Temp: 10~35°C; Humidity: 85% max
Full operation:	Temp: 0~40°C; Humidity: 85% max
<b>ACCESSORIES:</b>	
Probes (PC-35)	2 Attenuation: 1/10 Input impedance: 10 MΩ (±2%); 19.5 pF (±10%)
Instruction manual:	1
Power supply cable:	1 (Power cord receptacle type only)
Replacement fuse:	2

Note:

The above specifications are subject to change without notice.

# SAFETY

## SAFETY

Before connecting the instrument to a power source, carefully read the following information, then verify that the proper power cord is used and the proper line fuse is installed for power source. If the power cord is not applied for specified voltage, there is always a certain amount of danger from electric shock.

### Line voltage

This instrument operates using ac-power input voltages that 100/120/220/240 V at frequencies from 50 Hz to 60 Hz.

### Power cord

The ground wire of the 3-wire ac power plug places the chassis and housing of the oscilloscope at earth ground. Do not attempt to defeat the ground wire connection or float the oscilloscope; to do so may pose a great safety hazard.

The appropriate power cord is supplied by an option that is specified when the instrument is ordered.

The optional power cords are shown as follows in Fig. 1.

### Line fuse

The fuse holder is located inside the instrument or on the rear panel and contains the line fuse. Verify that the proper fuse is installed by replacing the line fuse.

### Voltage conversion

This oscilloscope may be operated from a 100 V to 240 V, 50/60 Hz power source. Use the following procedure to change from 100 to 240 volt operation or vice versa.

1. Remove the fuse.
2. Replace fuse F 1 with a fuse of appropriate value, 0.8 amp for 100 VAC to 120 VAC operation, 0.5 amp for 220 VAC to 240 VAC operation.
3. Reinsert it for appropriate voltage range.
4. When performing the reinsertion of fuse holder for the voltage conversion, the appropriate power cord should be used. (See Fig. 1.)

Plug configuration	Power cord and plug type	Factory installed instrument fuse	Line cord plug fuse	Parts No. for power cord or cord set
	North American 120 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.8 A, 250 V Fast blow 6×30 mm	None	Cord: E30-1854-05 Cord set: E30-1820-05
	Universal Europe 220 volt/50 Hz Rated 16 amp	North Europe 500 mA, 250 V Slow blow 5×20 mm	None	Cord: E30-1852-05 Cord set: E30-1819-05
		Other Europe 0.5 A, 250 V Fast blow 6×30 mm		
	U.K. 240 volt/50 Hz Rated 13 amp	0.5 A, 250 V Fast blow 6×30 mm	0.8 A Type C	—
	Australian 240 volt/50 Hz Rated 10 amp	0.5 A, 250 V Fast blow 6×30 mm	None	Cord: E30-1853-05 Cord set: E30-1821-05
	North American 240 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.5 A, 250 V Fast blow 6×30 mm	None	—
	Switzerland 240 volt/50 Hz Rated 10 amp	0.5 A, 250 V Fast blow 6×30 mm	None	—

Fig. 1 Power Input Voltage Configuration

# CIRCUIT DESCRIPTION

## VERTICAL ATTENUATOR CIRCUIT

The attenuators of channel 1 and 2 basically consist of rotary switches and passive elements (resistors, condensers, and trimmer condensers) on PC boards. The resistors have a precision of 0.5% for minimizing any error between the steps of the attenuators.

Vertical input signals from the BNC input receptacle enter the first-stage attenuator circuit, along the path selected by the AC-GND-DC switch. Then they pass through either attenuator 1/1, 1/10, or 1/100, along the path selected by the vertical rotary switch, and become input into the 1st preamplifier (first-stage buffer amplifier).

The 1st preamplifier consists of U1 and Q1 (CH2: U2 and Q2). The element used for U1 features a wide dynamic range and minimized temperature drifting. U1 functions in the preamplifier as a circuit in which temperature drifting is considered. Input signals, impedance converted in this buffer amplifier, are sent to the second-stage attenuator where they are passed through either attenuator 1/1, 1/2, 1/4, or 1/10. They are then sent to the vertical amplifier. The second-stage attenuator constitutes a low impedance resistance network with favorable frequency characteristics. The resistors used, as is those of the first-stage attenuator, have a precision of 0.5% for minimizing any error between the steps of the attenuators. The rotary switches in this stage include one which increases the gain of the preamplifier to 5-fold when the sensitivity is 1 mV/div or 2 mV/div.

Q1 (Q2) is provided in the input circuit as a diode equivalent for protecting the elements (U1 and U2) during a great amplitude input.

TC1 (51) and TC3 (53) are input capacitance regulators for attenuator 1/10 and 1/100, respectively; while TC2 (52) and TC4 (54) are 1 kHz square wave characteristic regulators for attenuator 1/10 and 1/100. VR1 (51) and VR2 (52) are step DC balance regulators for attenuators, the former is for user use with adjustment enabled from the front panel.

## VERTICAL PREAMPLIFIER CIRCUIT

Signals output from the attenuator circuits are then input into the 2nd preamplifier which consists of a U3 (4) hybrid IC. This IC, with a gain of approximately 12-fold, is an amplifier for suppressing DC level temperature drifting. When the sensitivity is either 1 mV/div or 2 mV/div, the gain is further increased another 5-fold (sum of approximately 60-fold) as a result of the gain resistivity of U3 (4) being switched over by the second attenuator switches S1 d and e. VR3 (53) is the regulator for the DC offset which occurs during this time. Setting the 5-fold gain is done by a resistor with a 1% precision and a non-regulated operation is achieved. VR4 (54) and VR5 (55) are 1 kHz square wave characteristic regulators for the sensitivity of 1 mV/div and 2 mV/div.

Signals which become sufficiently amplified in the 2nd preamplifier pass through the vertical axis sensitivity variable circuit, constituted by the volume of the attenuator rotary switch, and then become input into the 3rd amplifier. The 3rd amplifier is a U5 (6) hybrid IC. Signals input into this amplifier become as complementary signals 33 and are output to the 4th amplifier as electric current signals. The IC contains the CH1 (CH2) position circuit, CH2 INV circuit, and CH switch circuit. These are controlled by the CH1 (CH2) position volume and CH2 INV switch on the panel unit (X66-1100-00) and the vertical mode

switch signals coming from the horizontal side.

VR57 is a sensitivity regulator for CH2 signals while TC6 and TC56 are frequency characteristic regulators for CH1 and CH2, respectively.

CH1 (CH2) trigger signals from the 3rd terminal of U5 (6) become amplified in the feedback amplifier in Q16 (19). These trigger signals are converted into electric current signals in Q17 (20) and sent to the trigger source switch on the horizontal side. CH1 trigger signals become amplified between the collector of Q16 and Q18 and in turn become output as CH1 out signals via the emitter follower of Q23. In contrast, CH2 trigger signals become amplified between the collectors in Q19 to Q21, become X-axis signals by being passed through the emitter follower in Q22, converted into electric current signals in VR151 and R182, and in turn output into the horizontal signal switch circuit on the horizontal side. VR151 is the sensitivity regulator of X signals while VR152 is an X position regulator for regulating the DC level of X signals.

The electric current signals which were switched over in the 3rd amplifier are input into the 4th amplifier consisting of Q4 and Q5. After becoming amplified they are directly input into the output amplifier as voltage signals. The 4th amplifier is a feedback amplifier which features minimized fluctuation in the frequency characteristics even when the 3rd amplifiers of CH1 and CH2 are parallel-connected during ADD. Also, the vertical output amplifier can be driven by low output impedance. Q3 becomes turned on during ADD. The operating current is passed through R103, R104, and VR101 so that the operating current in the 4th amplifier does not become fluctuated when the operating currents from the 3rd amplifiers of CH1 and CH2 flow into the 4th amplifier. VR101 is the ADD balance regulator.

VR102 is the balance regulator of +Y and -Y on the CRT. Adjustment is made so that the luminescent line comes to the center of the CRT.

## VERTICAL OUTPUT AMPLIFIER CIRCUIT

Signals output from the 4th amplifier are amplified about 45-fold in the output amplifier, Q6 through Q15, and drive the Y deflecting plate of the CRT.

This output amplifier is a feedback amplifier. The final stage Q12 and Q14 are driven by complimentary emitter followers Q8 and Q10, Q9 and Q11, respectively. By doing so, the linearity of the first and last transition high frequencies is improved and the input impedance is made higher. Q13 and Q15 work to obtain sufficient gain during constant-current loss in Q12 and Q14, respectively. Negative feedback is sufficiently applied as well. Consequently, this circuit achieves low impedance output of large amplitude signals with good linearity.

VR103 is a sensitivity regulator based on CH1 signals for the entire vertical amplifier. TC101 is a frequency characteristic regulator for the entire vertical amplifier in general and for the output amplifier in particular. VR104 is the operating point voltage regulator for the output amplifier.

## HORIZONTAL SYSTEM (X65-1380-00)

The horizontal system can be roughly divided up into the trigger circuit, sweep circuit, output circuit, and blanking circuit. The TRIG SOURCE switch on the panel unit drives the trigger source switch circuits Q311-Q314, D202-D205, and Q202. Desired trigger signals can be elected. The trigger source switch

# CIRCUIT DESCRIPTION

Selected synchronizing signals are sent to the trigger level setting circuits Q204-Q206 and U202a via the emitter follower in Q201. The trigger level setting circuit constitutes a Schmitt circuit and its threshold level can be adjusted by VOLUME for trigger level setting on the panel unit.

Signals are sent to Q207-Q211 for video-synch separation via C206. Q207, D206 and D207 are polarity switch circuits and Q209 is a synch tip clumper. Q211 is a switch circuit for vertical synchronizing signal separation.

Either ordinary synchronizing signals or video-synch signals become selected at U202c and the sweep gate flip-flop becomes activated.

Gate signals from U204b turn Q221 ON/OFF in both AUTO and NORM modes and control the sweep HIC in U201. The interior of U201 comprises a constant-current charged type ramp wave generating circuit and its time constant becomes determined by an S201 code and C215 or C216. If the S201 code is below 1 ms/div, the time constant adjustment circuit in Q219 becomes activated and VR201 contributes in determining the time constant as well.

If there are no trigger signals during the AUTO mode, the AUTO circuits in Q212-Q214 work and generate sweep gates automatically.

U201 does not generate ramp waves as the sweep gate becomes shut by U205b in the X-Y mode.

Q216-Q218, U205b and U205c determine the upper limit and hold off time of ramp waves.

Ramp waves from U201 become output as sweep signals via Q222. Sweep signals and X-axis signals, the latter from the vertical system, become selected by switching circuit Q223, Q224, Q226, and Q227. They are then applied to output systems after Q301.

## OUTPUT CIRCUIT

When horizontal signals are input into Q301 and voltage signals, corresponding to the horizontal position, are input into Q306, differential signals become generated by the collectors in Q305 and Q308, Q309 and Q310. Q303-Q311 are feedback amplifiers for constant-current load. They constitute horizontal output amplifiers which feature good linearity and low power consumption. Q315 and Q316 become conductive during X10MAG and increase the horizontal amplifier gain to 10-fold.

Signals from the horizontal output amplifier are sent to the horizontal deflecting plate of the CRT via P7.

## BLANKING CIRCUIT

Blanking system circuits generate blanking signals for the CRT and signals which switch each channel in the vertical system. A CHOP transmitter (approx. 500 kHz) constitutes U206a and U206b. Signals from the CHOP transmitter and sweep gate signals become selected at U203b, whereby CHOP signals are selected during a CHOP operation, while sweep gate signals are selected during an ACT operation. The selected signals are divided into 1/2 in U204b, which is T-shaped flip-flop connected, and become channel switching signals.

In contrast, signals from the CHOP transmitter and sweep gate negative-phase signals (U204b Q-signals) are turned into blanking signals in Q230 and U205a. They are then sent to the blanking amplifier in the power supply system.

## POWER SUPPLY SYSTEM (X68-1570-00)

The power supply system includes the low voltage circuit and blanking circuit.

### Low Voltage Circuit

U1 constitutes an HIC for controlling 4 circuit lines consisting of those for  $+/- 8\text{ V}$ ,  $+140\text{ V}$ , and  $+5\text{ V}$ . Each voltage becomes determined based on  $-8\text{ V}$ .

Switching signals for CAL output are extracted from the output of  $+140\text{ V}$  rectifier diode D1.

The  $+10\text{ V}$  circuits, D6 and C10, are unstable and constitute a power source for the horizontal sweep HIC.

### High Voltage Blanking Circuit

Q8 oscillates at approximately 50 kHz applying the reactance of the converter transformer. The oscillation voltage appearing in the high voltage coil are turned into stable  $-1800\text{ V}$  in the voltage doubler rectifier circuits C25, C26, D9, and D10, and in rectifier circuits Q9 and U2a. The coil of the CRT heater is switched on by signals from R52.

Voltage signals, approximately 300Vp-p, become extracted from the high voltage coil and used as modulated signals for blanking. This is necessary for employing signals from blanking amplifiers Q15, Q6, and Q7 for the cathode potential. The modulated signals drive the DC regeneration circuits, D11-D14, C23 and C24, and provide signals for controlling the brightness of the CRT G1 electrode.

Q10-Q12 are transistors for controlling the focus and they achieve high pressure resistance by being cascade connected. R50 and R51 are circuits which provide specific voltage to the CRT G2 electrode, while Q13 and Q14 are those for driving the rotation coil.

## OTHER CIRCUIT

### X81-2810-00 B/3 Circuit

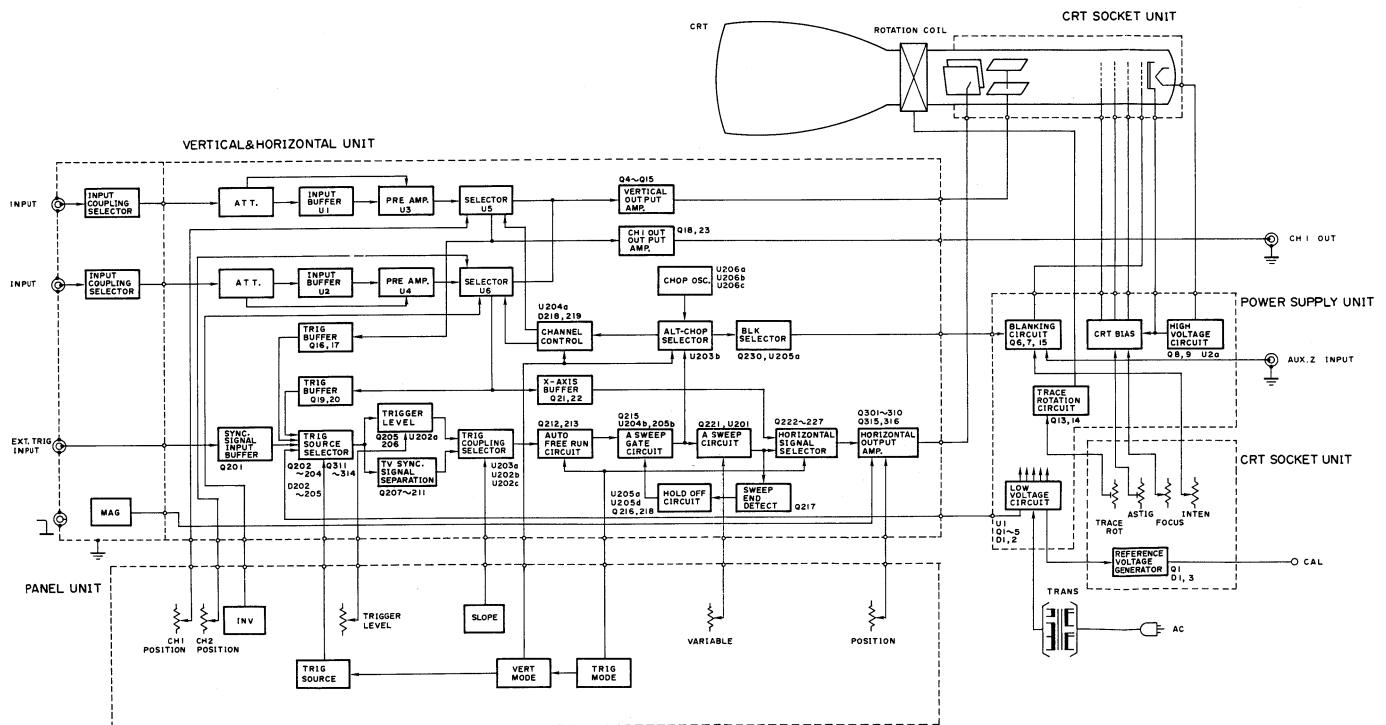
Q1 is turned ON/OFF by switching signals for the calibration from the power supply system. Calibration voltage (100kHz) becomes generated in R3 and R4.

VR1-VR4 are either semi-fixed or adjustable resistors for adjusting the CRT's astigmatism, correcting the CRT's trace rotation, adjusting the CRT's focus and brightness.

### X66-1100-00 A/2 Circuit

S1, S2, S4, and S5 are switches which determine the conditions of motion and they control the vertical and horizontal systems. VR4 and VR5 determine the vertical position of each vertical channel, while VR1 determines the horizontal positions. S3 determines the trigger slope and S6 determines the polarity of CH2.

## BLOCK DIAGRAM



## ADJUSTMENT

To obtain the best performance, periodically calibrate the unit. Sometimes, only one mode need be calibrated, while at other times, all modes should be calibrated. When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.

The following calibration required an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer. For optimum adjustment, turn the power on and warm up the scope sufficiently (about 30 minutes) before starting.

Before calibrating the scope, check the power supply voltage.

### TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustment.

Test Equipment	Model	Minimum Specification
Digital Multi-Meter	DL-711 (KENWOOD)	Impedance: More than 10 MΩ, Measuring range: 0.01 V to 199 V
Sine-Wave Generator	651 B (YHP)	Frequency: 10 Hz to 10 MHz, constant voltage over tuning range
Sine-Wave Generator	SG-503 (Tektronix)	Frequency: 50 kHz to 100 MHz, Output impedance: 50 Ω, constant voltage over tuning range
Square-Wave Generator	PG-506 (Tektronix)	Output signal: 1 kHz, Amplitude: 10 mV p-p to 10 V p-p, Accuracy: within ± 1 %, Rise time: 35ns or less, 100 kHz, Rise time: 1 ns or less
Q Meter	4343B (YHP)	—
Color Pattern Generator	CG-911A (KENWOOD)	—
Oscilloscope	475A (Tektronix)	Sensitivity: more than 5 mV, Frequency response: More than 250 MHz
Time-Marker Generator	TG-501 (Tektronix)	Time mark: 0.5 s to 0.1 μs repetitive waveform
High-Voltage Probe	—	Input Impedance: 1000 MΩ
Termination	—	Impedance: 50 Ω, Accuracy: within 3%
Termination	—	3 watts type impedance: 50 Ω
Attenuator	—	-20 dB attenuation (50 Ω)

Table 1

### PREPARATION FOR ADJUSTMENT

#### Control Settings

The control settings listed below must be used for each adjustment procedure.

Exceptions to these settings will be noted as they occur. After completing a adjustment, return the controls to the following settings.

NAME OF KNOBS	POSITION
MODE	AUTO
COUPLING	AC
SOURCE	VERT
VERT MODE	CH1
INV	OFF
SLOPE	+
TRIGGER LEVEL	12 o'clock
CH1/CH2 POSITION	12 o'clock
CH1/CH2 ATT	10 mV/DIV
CH1/CH2 VARIABLE	Fully clockwise
CH1/CH2 AC-GND-DC	DC
SWEEP POSITION	12 o'clock
SWEEP VARIABLE	Fully clockwise
SWEEP ATT	0.2 ms
x10 MAG	OFF
FOCUS	Optimum position
INTENSITY	12 o'clock after adjustment

Table 2

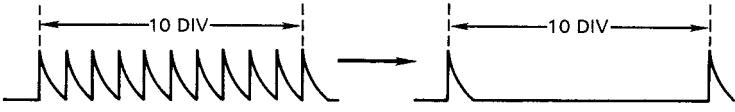
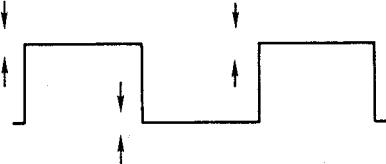
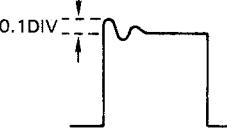
## ADJUSTMENT

Item	Adjustment VR (TC)	P.C.B.	Procedure
Supply voltage	VR1	X68-1570	Adjust VR1 to give 8.00 V at pin P1-6.
Intensity	VR2	X68-1570	MODE: X-Y With a spot on the screen, turn the INTENSITY knob to a 9 o'clock position and then adjust VR2 until the spot disappears.
CRT center	VR102	X65-1380	CH2: 50 mV/DIV, GND V-MODE: CH2 Pull and push INV to find a position of POSITION knob where the luminescent line does not vary. Leaving POSITION unchanged, adjust to the center of the screen using VR102.
Y operating point	VR104	X65-1380	Position after CRT center adjustment Adjust VR104 to give +57.0 V at pin P6-1.
X operating point	VR301	X65-1380	MODE: X-Y X-POSITION: Center Adjust VR301 to give +68.0 V at pin P7-1.
ASTIG/FOCUS	VR3	X68-1570	MODE: X-Y INTENSITY: 12 o'clock FOCUS: 12 o'clock CH1,2: 50 mV/DIV, GND Adjust the spot " " to the best position with the ASTIG knob and VR3. *Best position = smallest spot
CH1 Step ATT Balance	VR2	X65-1380	CH1: GND Adjust VR2 so that the luminescent line does not vary when switching between 1 mV/DIV and 2 mV/DIV.
CH1 MAG Balance	VR3	X65-1380	CH1: GND Adjust VR3 so that the luminescent line does not vary when switching between 2 mV/DIV and 5 mV/DIV.
CH2 Step ATT Balance	VR52	X65-1380	V-MODE: CH2 CH2: GND Adjust VR52 so that the luminescent line does not vary when switching between 1 mV/DIV and 2 mV/DIV.
CH2 MAG Balance	VR53	X65-1380	V-MODE: CH2 CH2: GND Adjust VR53 so that the luminescent line does not vary when switching between 2 mV/DIV and 5 mV/DIV.
ADD Position	VR101	X65-1380	CH1,2: GND Bring the luminescent line to the center for both CH1 and CH2. Switch V-MODE to ADD and adjust VR101 so that the luminescent line comes to the center.
CH1 waveform shaping	VR5	X65-1380	Apply a 1 kHz square wave to CH1 INPUT (with the amplitude extending over 6 div.) Adjust so that CH1 ATT waveform is flat for both 10 mV/DIV and 1 mV/DIV ranges.
	VR4		10 mV/DIV: VR5 1 mV/DIV: VR4

# ADJUSTMENT

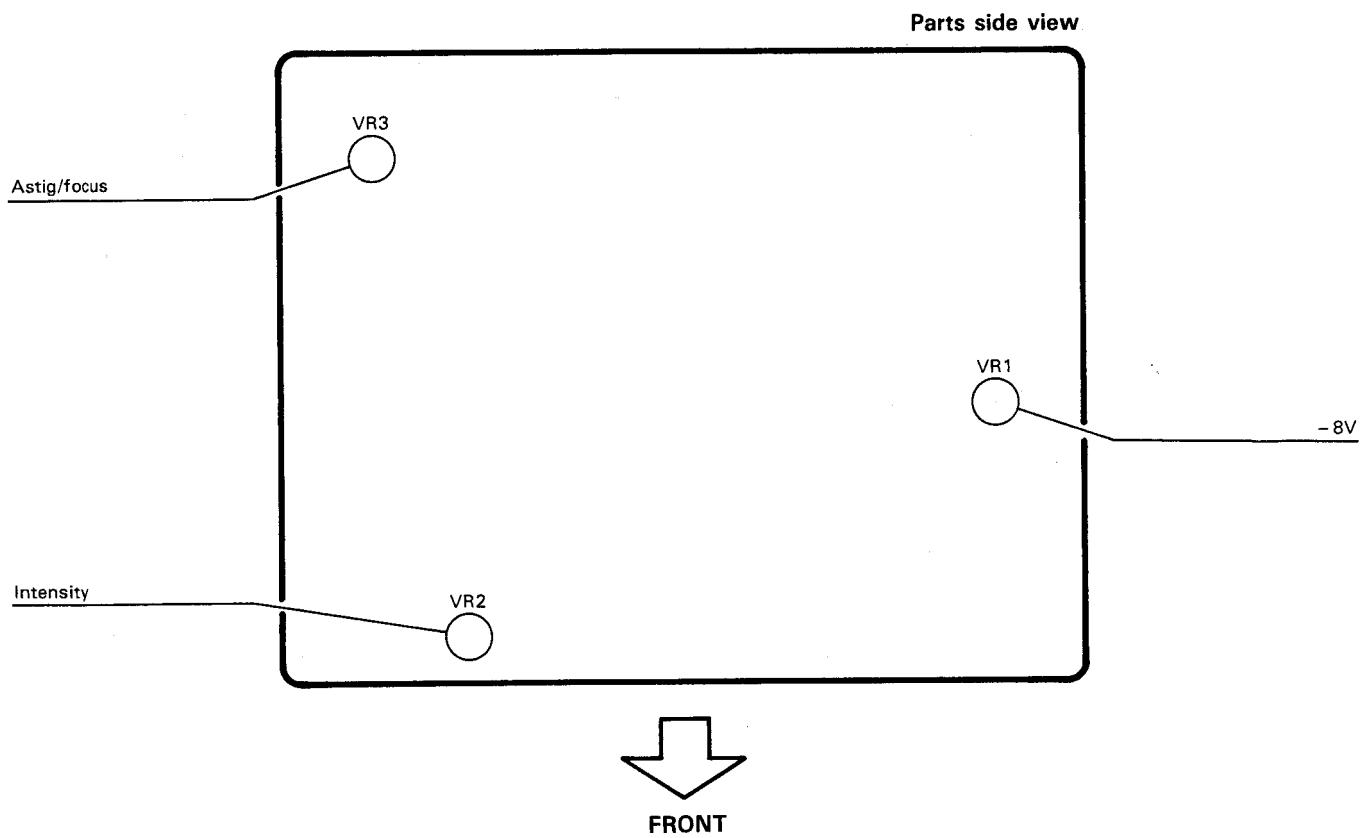
Item	Adjustment VR (TC)	P.C.B.	Procedure
CH2 waveform shaping 10 mV 1 mV	VR55 VR54	X65-1380	<p>Apply a 1kHz square wave to CH2 INPUT (with the amplitude extending over 6 div.) Adjust so that CH2 ATT waveform is flat for both 10 mV/DIV and 1 mV/DIV ranges.</p> <p>10 mV/DIV: VR55 1 mV/DIV: VR54</p>
CH1 Gain	VR103	X65-1380	<p>Apply a 50 mV square wave to CH1 INPUT. Adjust VR103 so that amplitude extends over 5 divisions.</p>
CH2 Gain	VR57	X65-1380	<p>V-MODE: CH2</p> <p>Apply a 50 mV square wave to CH2 INPUT.</p> <p>Adjust VR57 so that amplitude extends over 5 divisions.</p>
X Gain	VR151	X65-1380	<p>CH1: GND</p> <p>MODE: X-Y</p> <p>Apply a 50 mV square wave to CH2 INPUT.</p> <p>Adjust VR151 so that horizontal amplitude extends over 5 divisions.</p>
CH1 waveform shaping	TC2 TC4	X65-1380	<p>Apply a 1kHz square wave to CH1 INPUT (with the amplitude extending over 6 div.) Adjust so that CH1 ATT waveform is flat for both 0.1 V/DIV and 1 V/DIV ranges.</p> <p>0.1 V/DIV: TC2 1 V/DIV: TC4</p>
CH2 waveform shaping	TC52 TC54	X65-1380	<p>V-MODE: CH2</p> <p>Apply a 1 kHz square wave to CH2 INPUT (with the amplitude extending over 6 div.)</p> <p>Adjust so that CH2 ATT waveform is flat for both 0.1 V/DIV and 1 V/DIV ranges.</p> <p>0.1 V/DIV: TC52 1 V/DIV: TC54</p>
CH1 input capacity	TC1 TC3	X65-1380	<p>Connect a capacity meter to CH1 INPUT.</p> <p>Check that the capacity value for the CH1 10 mV/DIV range is within the standard. (28pF +/ - 3pF)</p> <p>Adjust so that the same capacity value for 10 mV/DIV is obtained in both 0.1 V/DIV and 1 V/DIV ranges.</p> <p>0.1 V/DIV: TC1 1 V/DIV: TC3</p>

# ADJUSTMENT

Item	Adjustment VR (TC)	P.C.B.	Procedure
CH2 input capacity	TC51 TC53	X65-1380	Connect a capacity meter to CH2 INPUT. Adjust in the same way as for CH1. 0.1 V/DIV: TC51 1 V/DIV: TC53
0.1 ms Sweep time	VR202	X65-1380	SWEEP TIME: 0.1 ms/DIV Input a 0.1 ms marker signal to CH1 INPUT. Adjust VR202 so that each marker peak aligns with a division on the scale.
2 ms Sweep time	VR201	X65-1380	SWEEP TIME: 2 ms/DIV Input a 2 ms marker signal to CH1 INPUT. Adjust VR201 so that each marker peak aligns with a division on the scale.
X10 MAG Gain	VR302	X65-1380	SWEEP TIME: 0.1 ms/DIV H.POSITION: Center Input a 0.1 ms marker signal to CH1 INPUT. Turn on X10 MAG and adjust VR302 so that there are 10 divisions on the scale between adjacent marker peaks.
			
X10 MAG Center	VR303	X65-1380	SWEEP TIME: 0.1 ms/DIV Input a 0.5 ms marker signal to CH1 INPUT. With X10 MAG on, align the second peak with the center. Adjust VR303 so that the second peak remains aligned with the center when X10 MAG is turned off. Repeat several times to find the center.
X Position Center	VR152	X65-1380	CH1, 2: GND CH1, 2 POSITION: Center H-POSITION: Mechanical center MODE: X-Y Adjust VR152 so that the spot comes to the center
CH1, 2 1MHz square wave	TC101	X65-1380	Apply a 1 MHz square wave to CH1 (with the amplitude extending over 6 div.) Adjust with TC101 so that the waveform is flat.
			
CH1 1 MHz overshoot	TC6	X65-1380	Apply a 1 MHz square wave to CH1 (with the amplitude extending over 6 div.) Adjust the overshoot with TC6.
			
CH2 1 MHz overshoot	TC56	X65-1380	Apply a 1 MHz square wave to CH2 (with the amplitude extending over 6 div.) Adjust the overshoot with TC56.

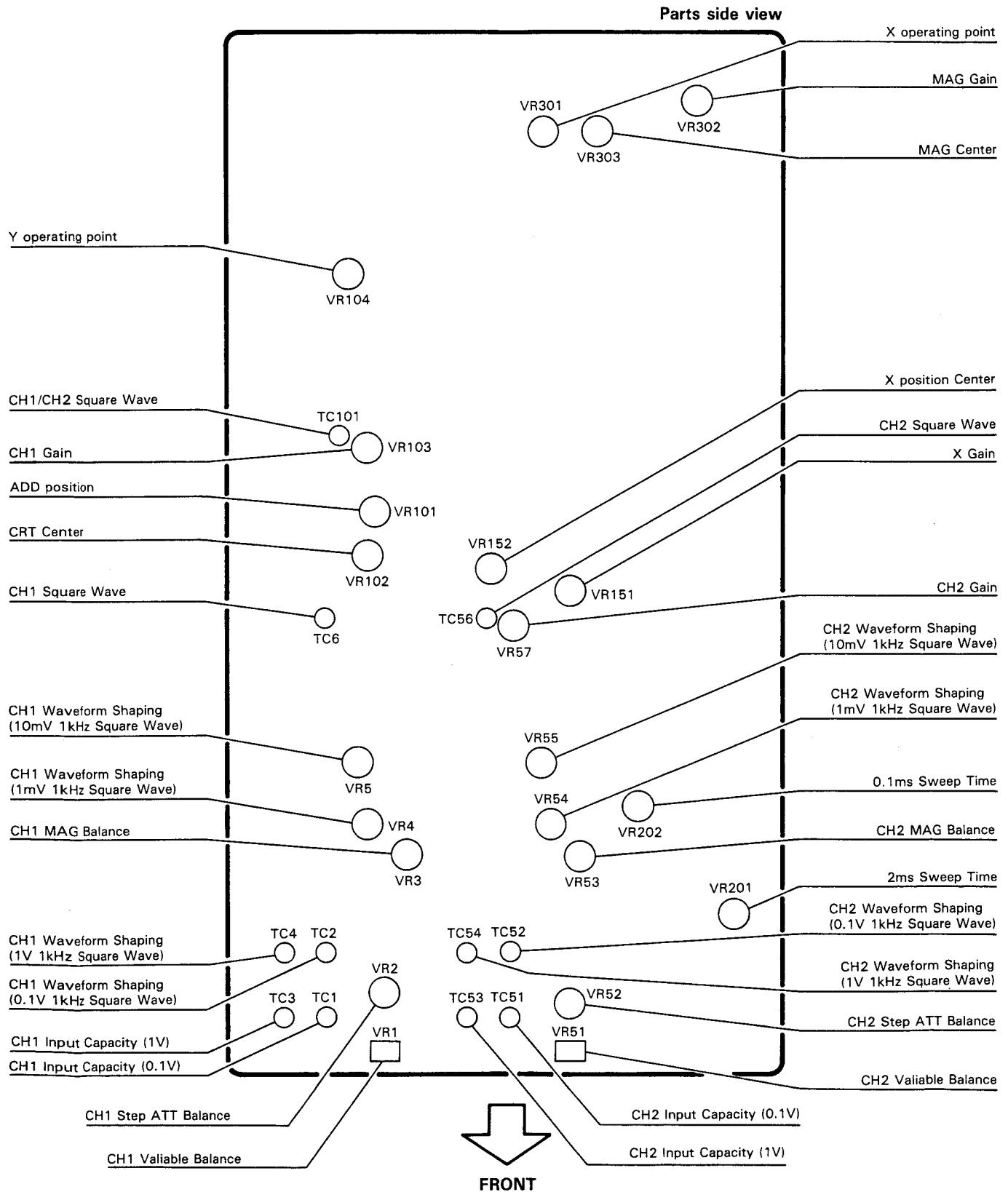
# ADJUSTMENT

POWER SUPPLY UNIT (X68-1570-00)



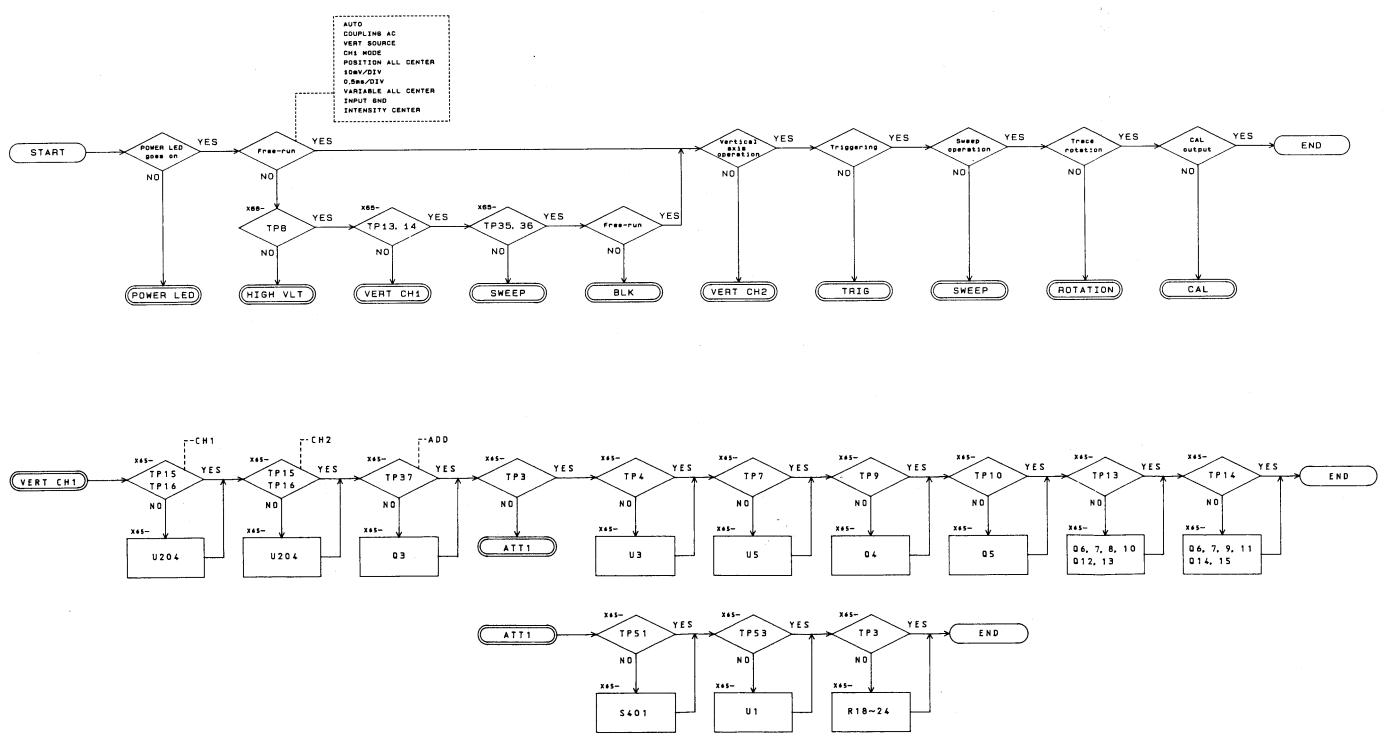
# ADJUSTMENT

VERTICAL&HORIZONTAL UNIT (X65-1380-00)

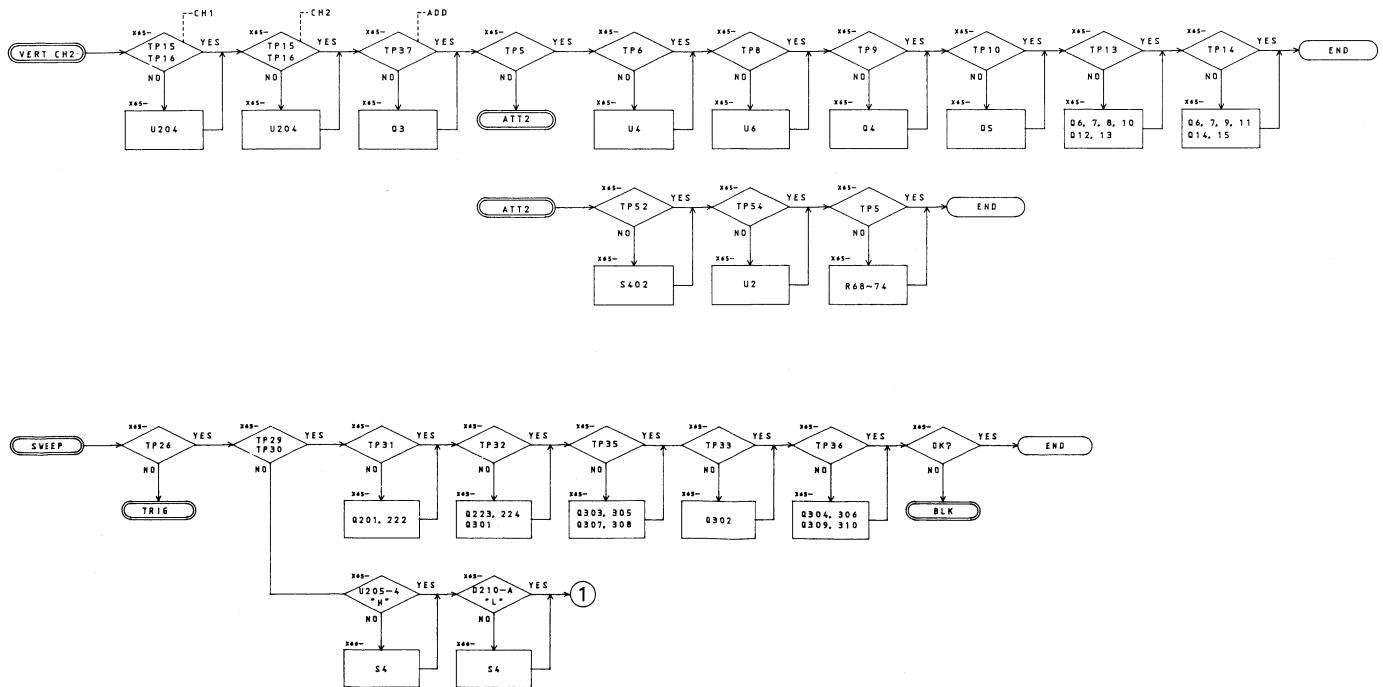


## TROUBLESHOOTING

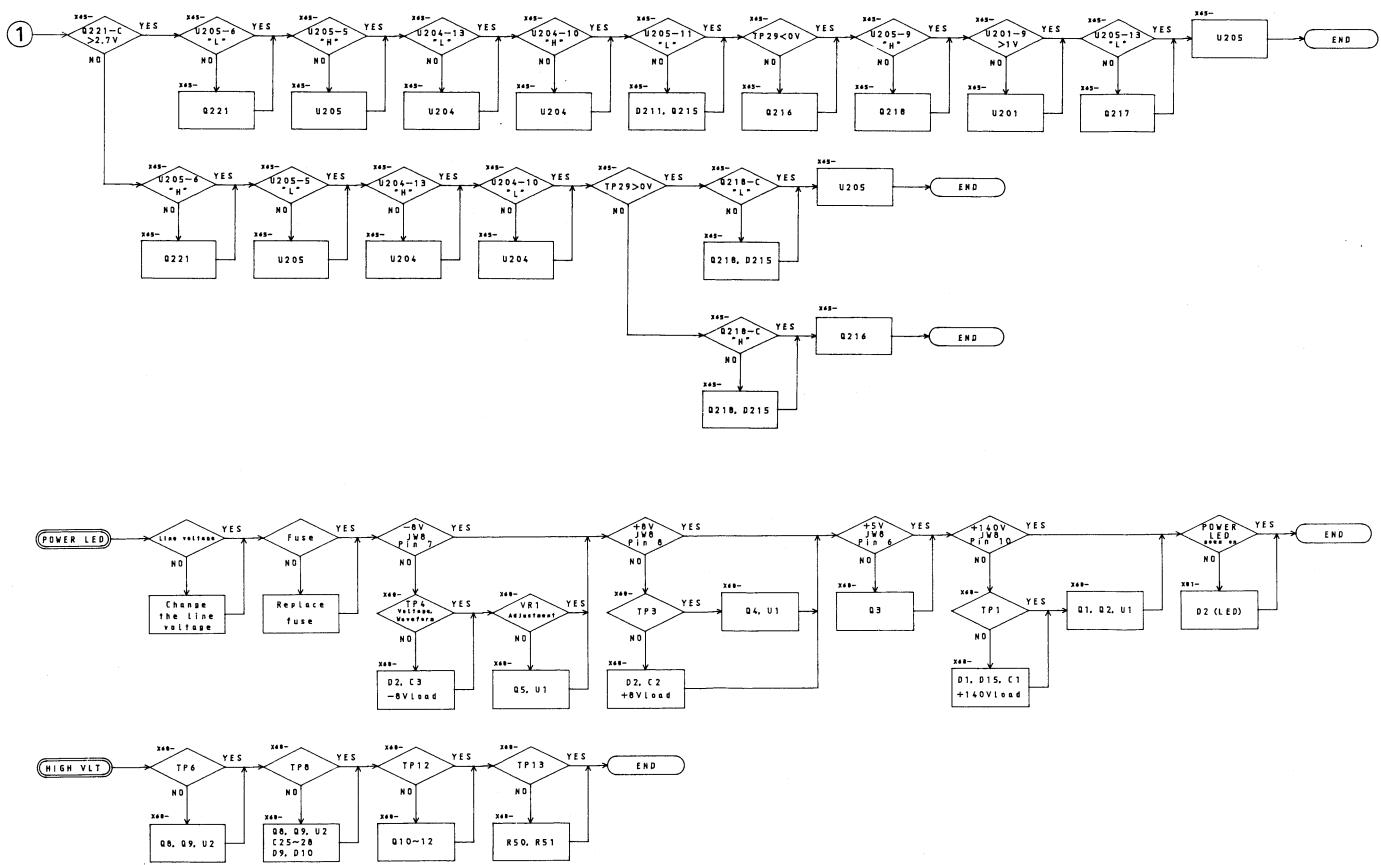
Note: When an index number in the form of "TP (number)" is found, refer to the corresponding location (e.g. figure of waveform, etc.) on the circuit diagram.



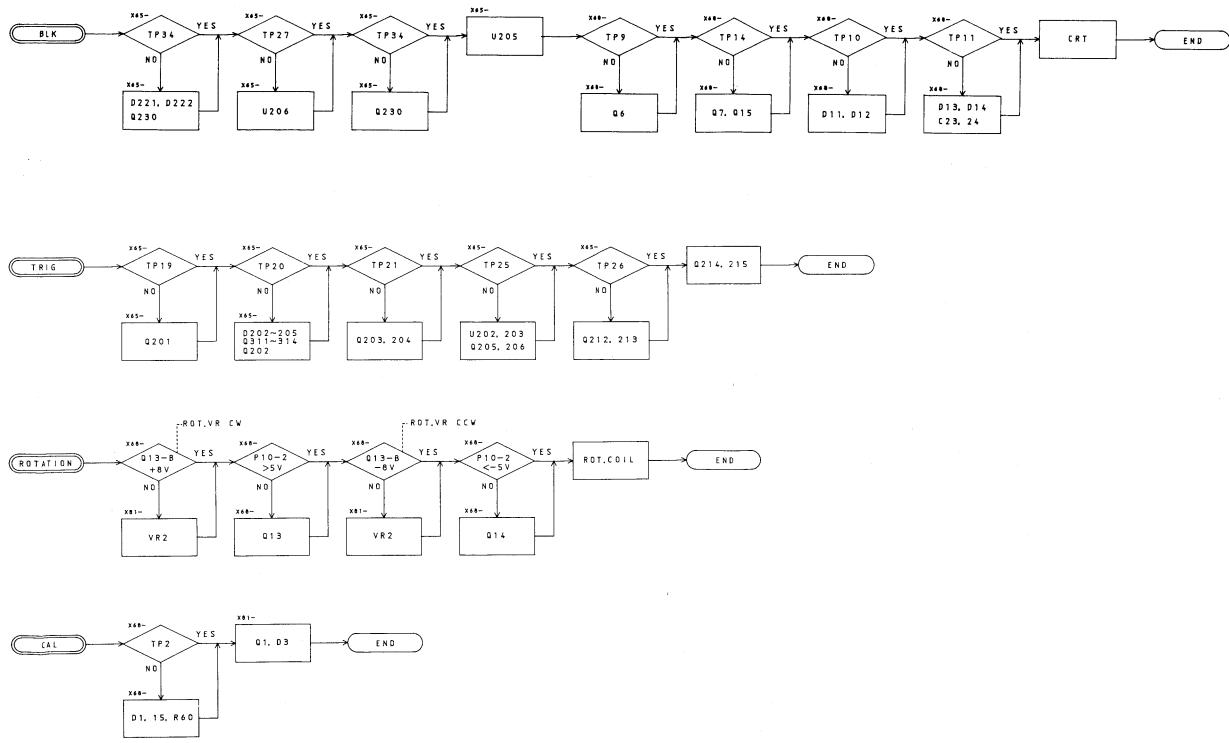
## TROUBLESHOOTING



## TROUBLESHOOTING



## TROUBLESHOOTING





# PARTS LIST

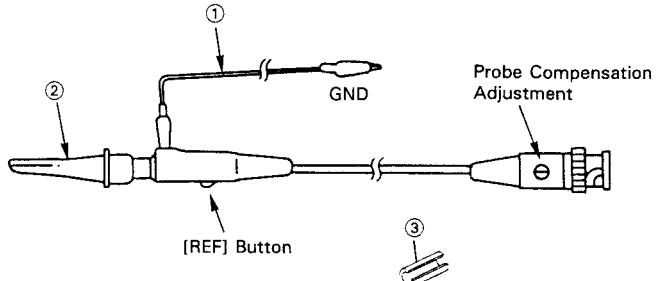
## CS-4025

(Y70-1680-00)

REF. NO.	PARTS NO.	NAME & DESCRIPTION
	B42-3699-04	SERIAL NO. PLATE
	B50-7731-00	INSTRUCTION MANUAL, JAPANESE
	B50-7732-10	INSTRUCTION MANUAL, ENGLISH
* 1	E30-1818-05	JIS POWER CORD SET
	E30-1851-05	POWER CORD ASS'Y (JIS)
	E30-1852-05	POWER CORD ASS'Y (CEE)
	E30-1853-05	POWER CORD ASS'Y (SAA)
	E30-1854-05	POWER CORD ASS'Y (UL/CSA)
	E30-1868-05	POWER CORD ASS'Y (BS)
	E31-5878-05	WIRE ASS'Y: P14 TO Z AXIS / P14
	E31-5879-05	WIRE ASS'Y: CH1 OUTPUT TO PS
	E31-5880-05	WIRE ASS'Y: P. TRANS TO P16
	E31-5881-05	WIRE ASS'Y: POWER SW TO PRIMARY
	F05-5013-05	FUSE (6X30MM) 0.5A
	F05-5016-05	FUSE (5X20MM) 500MA
	F05-8015-05	FUSE (6X30MM) 0.8A
H01	5925-04	CARTON BOX
H10	2848-02	FOAMED STYRENE PAD (FRONT)
H10	2849-02	FOAMED STYRENE PAD (REAR)
H20	1727-04	VINYL COVER
H25	0103-04	BAG
J19	1313-05	CLAMP
J19	1653-23	HOLDER FOR CRT
J42	0083-05	BUSHING
J42	0085-05	BUSHING (FOR AC CORD)
J61	0408-05	WIRE WRAPPING BAND
J61	0514-05	WIRE TIE
LN322GP		DIODE
RD14882C102J		RES. CARBON 1K 5% 1/6W
W03	2314-05	PROBE (PC-35)
1	A01-1225-22	CASE
2	A10-1458-22	CHASSIS
3	A13-0946-12	FRAME
4	A13-0947-13	FRAME
5	A20-2847-21	MOLDED PANEL
6A	A23-1703-22	REAR PANEL
6B	A23-1704-22	REAR PANEL
7	A40-0715-03	BOTTOM PLATE
8	B11-0518-04	FILTER
9	E04-0259-05	BNC RECEPTACLE
10	E18-0365-05	AC SELECTOR WITH 6X30MM FUSE
11	E21-0660-04	TERMINAL.CAL
12	F11-1241-04	CRT SHIELD
13	F15-0757-04	FELT
14	G16-0609-04	RUBBER SHEET
15	J02-0089-05	RUBBER FOOT (REAR)
16	J02-0524-04	TIKT STAND
17	J02-0525-13	RUBBER FOOT (FRONT)
18	J21-4695-03	BRACKET, FOR CRT
19	J21-4696-04	BRACKET, FOR POWER SW
20	J21-4737-04	BRACKET, FOR, PANEL UNIT
21	K01-0518-05	HANDLE
22	K21-0892-03	KNOB (VOLTS/DIV)
23	K21-0897-14	KNOB
24	K21-0910-03	KNOB (SWEEP TIME/DIV)
25	K23-0811-03	KNOB
26	K27-0590-04	KNOB, FOR PUSH SW
27	K27-0537-04	KNOB, FOR LEVER SWITCH
28A	L01-9947-05	POWER TRANSFORMER
* 28B	L01-9948-05	POWER TRANSFORMER
29	L39-0531-05	ROTATION COIL
30	S40-2532-05	POWER SW
31	W01-0503-04	REAR RUBBER FOOT/CORD WRAP
32	X65-1380-00	VERTICAL & HORIZONTAL UNIT
33	X66-1100-00	PANEL UNIT
34	X68-1570-00	POWER SUPPLY UNIT
35A	X81-2810-00	CRT SOCKET UNIT (FUSE 6x30 mm)
35B	X81-2810-01	CRT SOCKET UNIT (FUSE 5x20 mm)
* 35C	X81-2810-02	CRT SOCKET UNIT
36A	150GTM31A	CRT
36B	150GTM7A	CRT

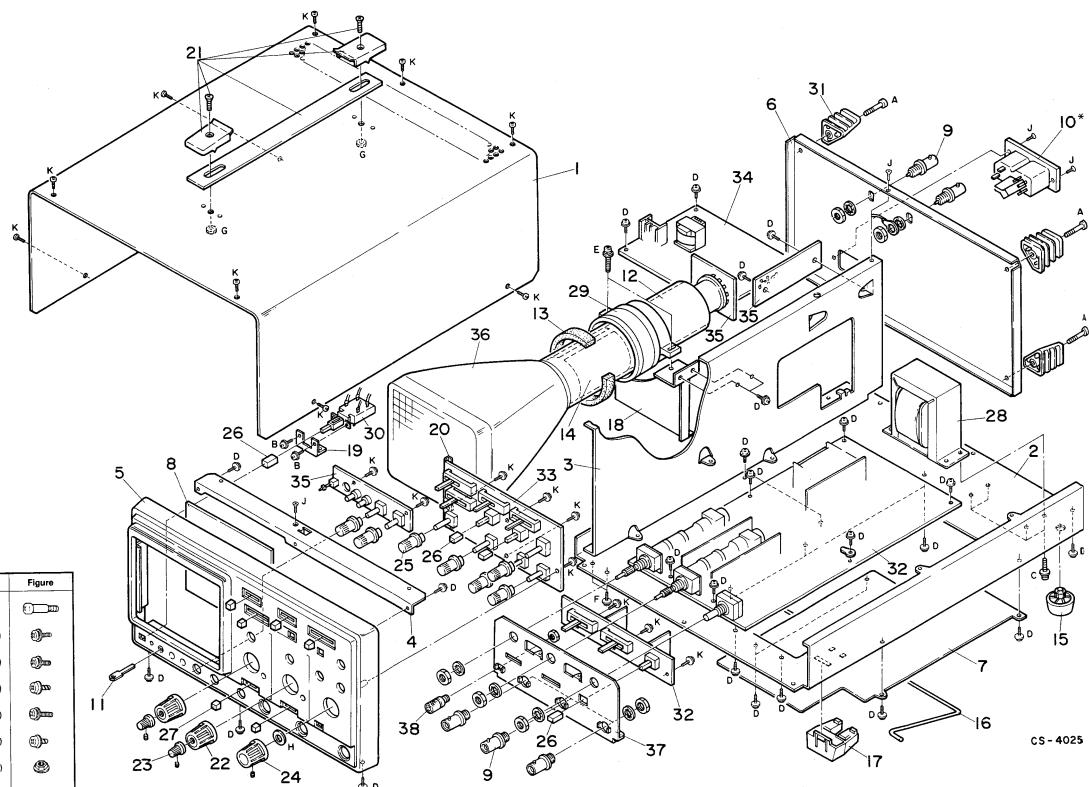
The parts marked with an \* are only for the units with a voltage selector.

## MODEL PC-35 (LOW CAPACITY PROBE)



ITEM	DESCRIPTION	PARTS NO.
①	Ground Wire Assembly	E30-1883-08
②	Retractable Hook Tip	E29-0540-08
③	Marker (Orange)	B42-1950-08

## DISASSEMBLY



### SCREWS

Parts No.	Parts Name	Figure
A N08-0611-04	Cord wrapping screw	①
B N09-0623-04	Sems screw	(M3 x 8)
C N09-0654-05	Sems screw	(M4 x 8)
D N09-0739-05	Sems taprite screw	(3 x 8)
E N09-0748-04	Sems screw	(M4 x 12)
F N09-0757-05	Sems taprite screw	(3 x 6)
G N14-0620-05	Flange nut	(M4)
H N19-0709-05	Plain washer	(t = 1, φ6)
I N30-4014-41	Pan head screw	(M4 x 14)
J N88-3008-41	Flat head taprite screw	(3 x 8)
K N89-3008-41	Binding head taprite screw	(3 x 8)

The parts marked with an \* are only for the units with a voltage selector.

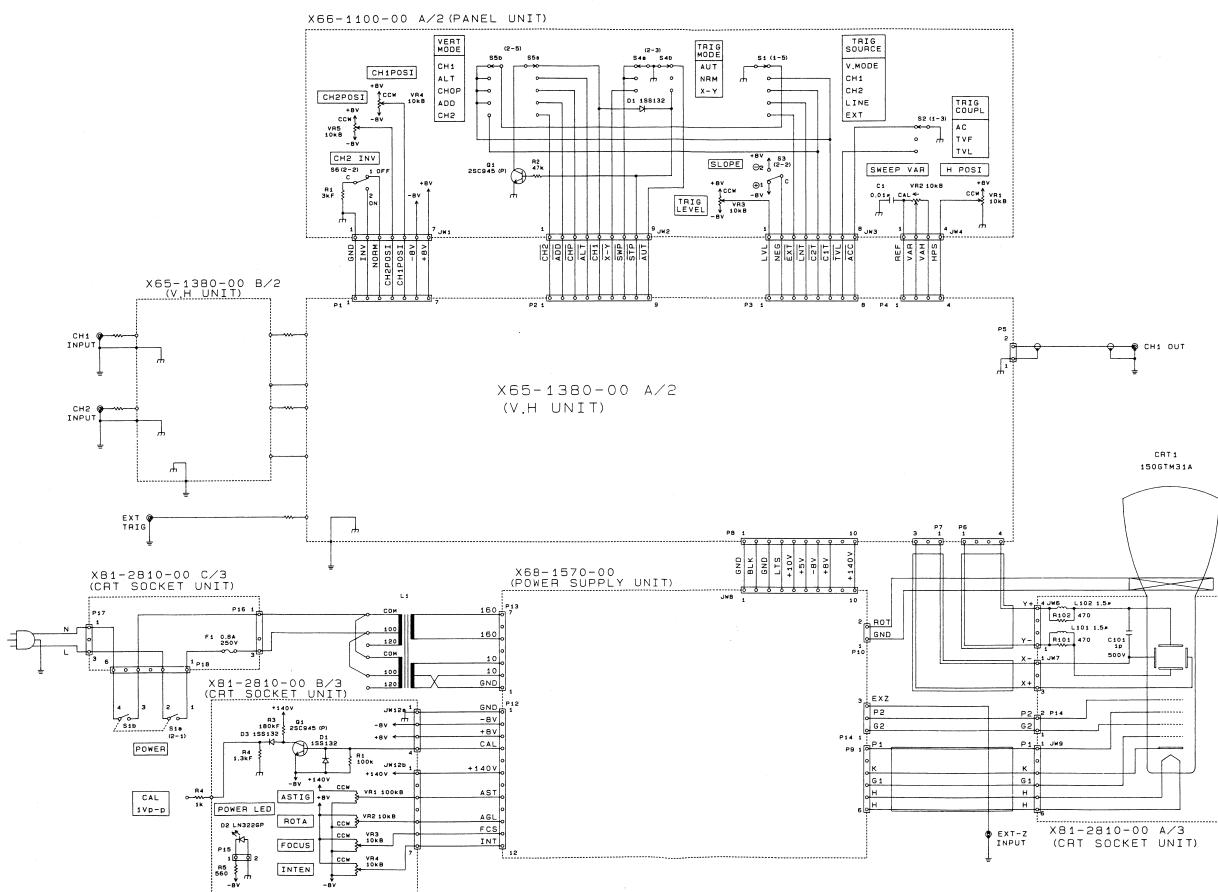




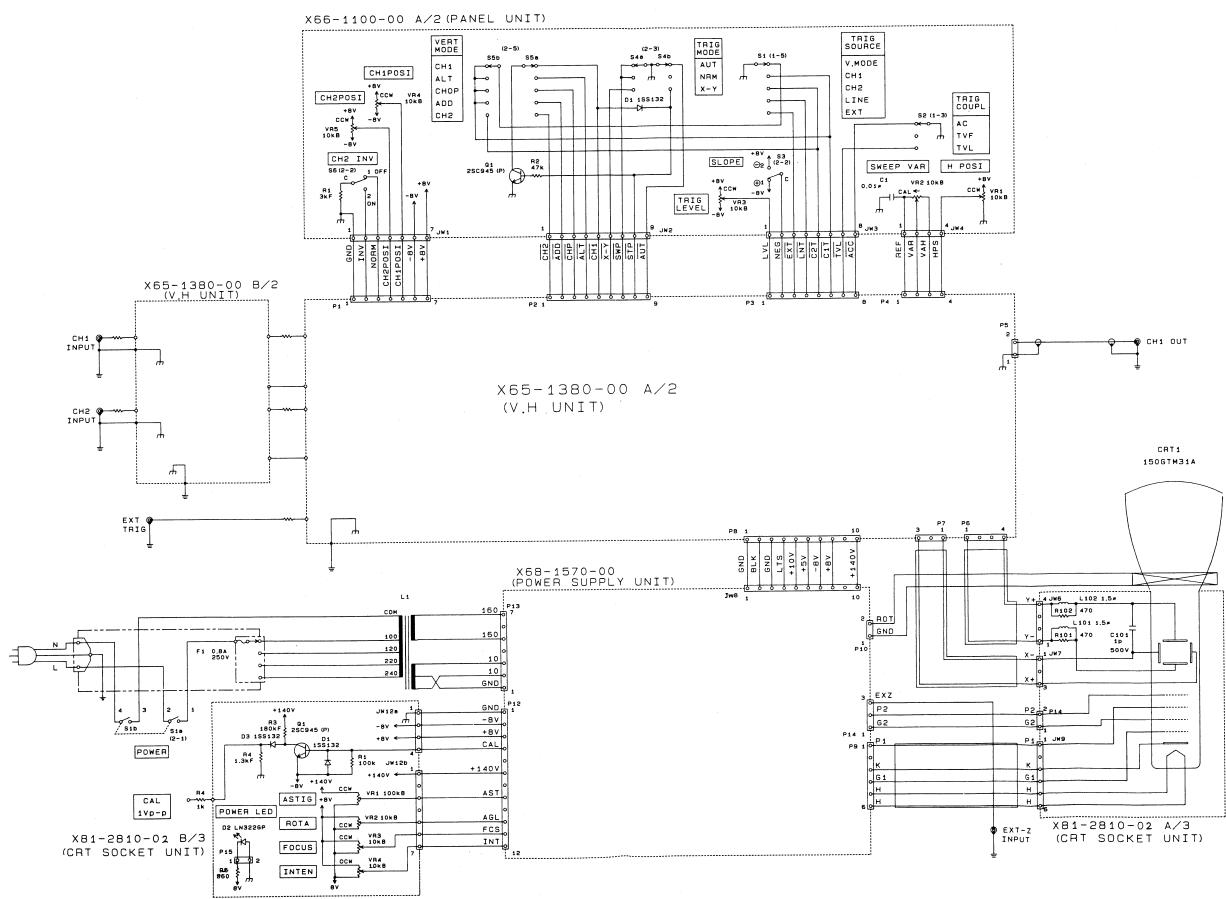




## SCHEMATIC DIAGRAM

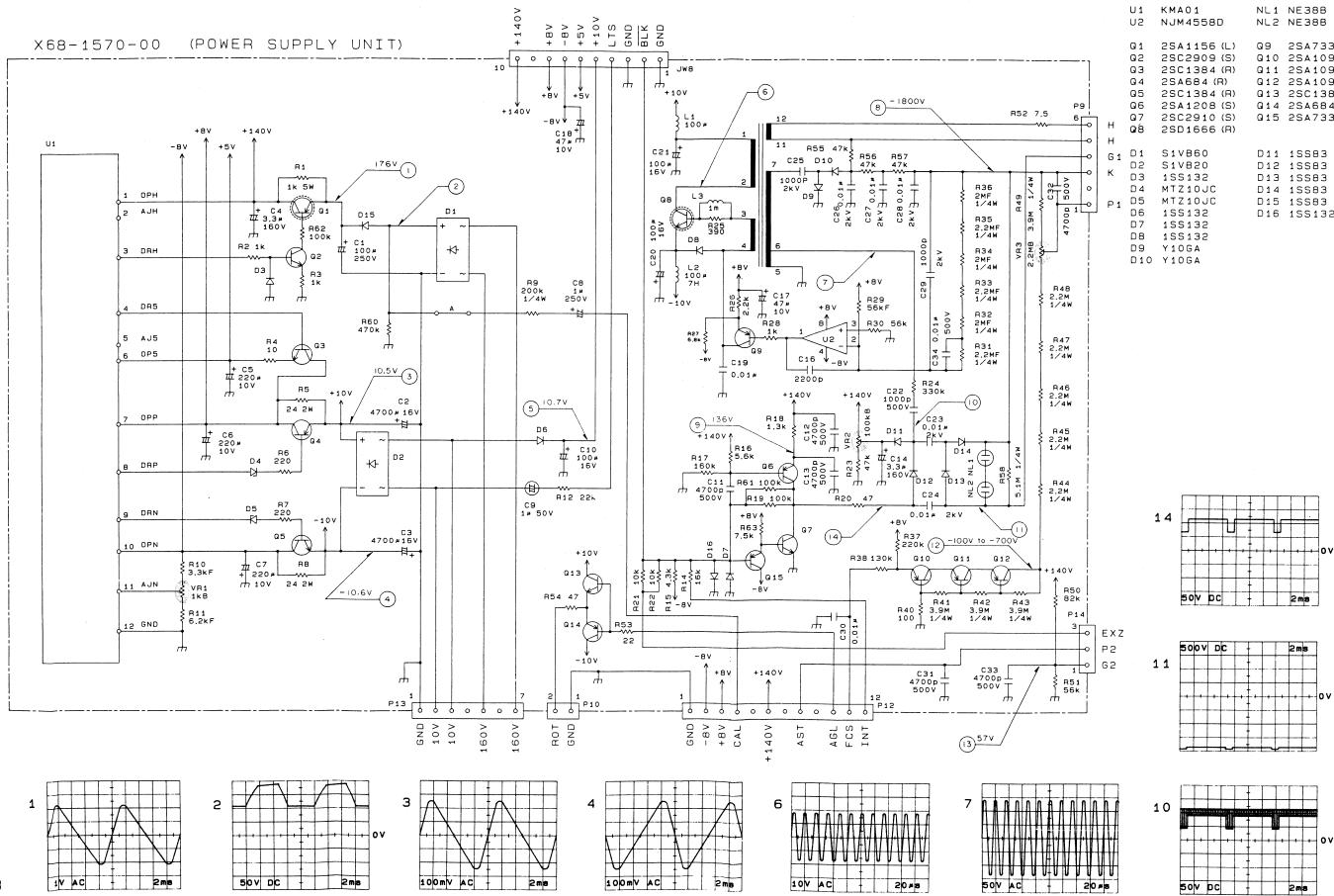


**SCHEMATIC DIAGRAM** (Only for the types with a voltage selector)



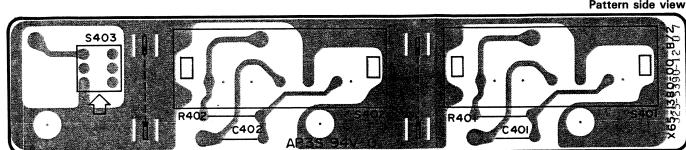
**SCHEMATIC DIAGRAM/WAVEFORM POWER SUPPLY UNIT (X68-1570-00)**

X68-1570-00 (POWER SUPPLY UNIT)

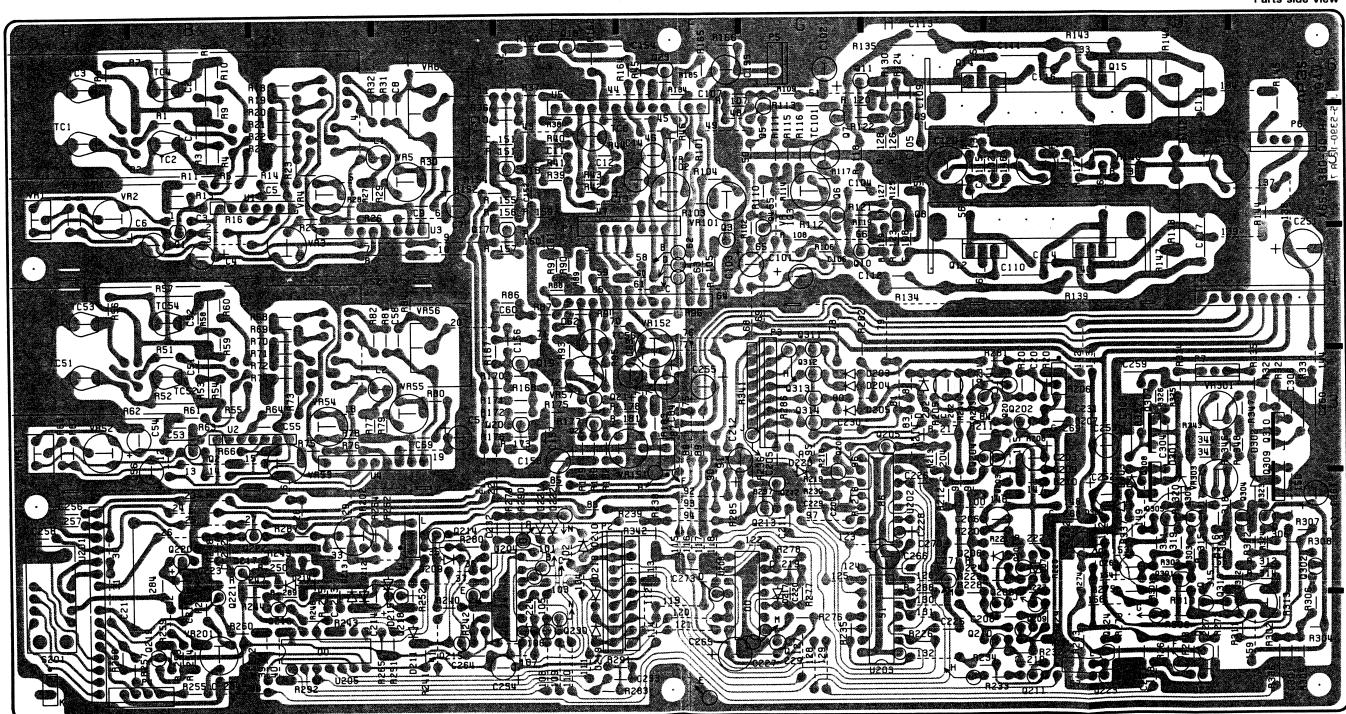


## P.C. BOARD

VERTICAL & HORIZONTAL UNIT (X65-1380-00)



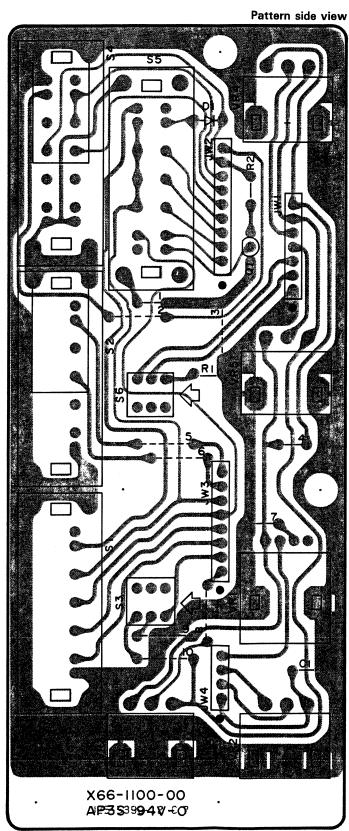
Pattern side view



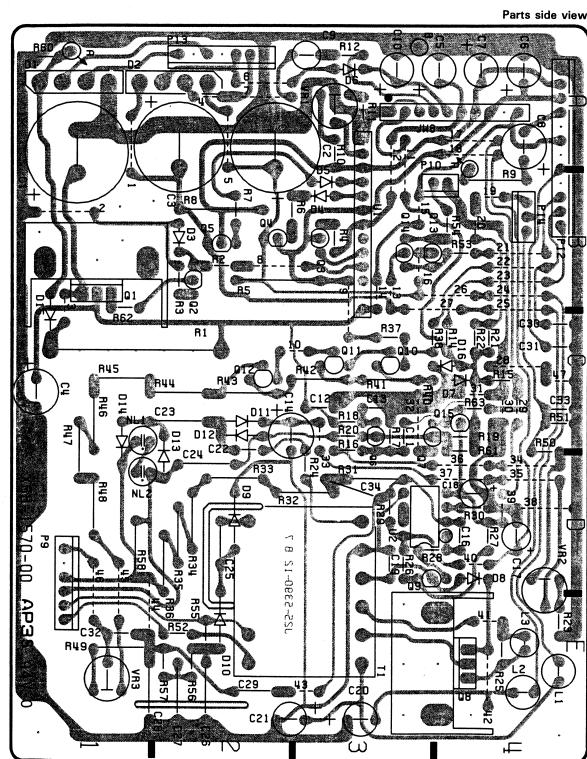
Parts side view

## P.C. BOARD

PANEL UNIT (X66-1100-00)

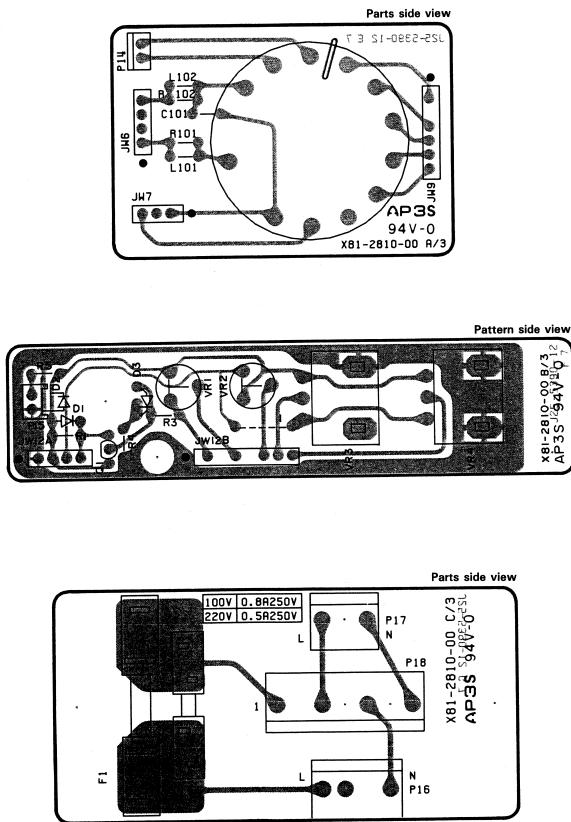


POWER SUPPLY UNIT (X68-1570-00)

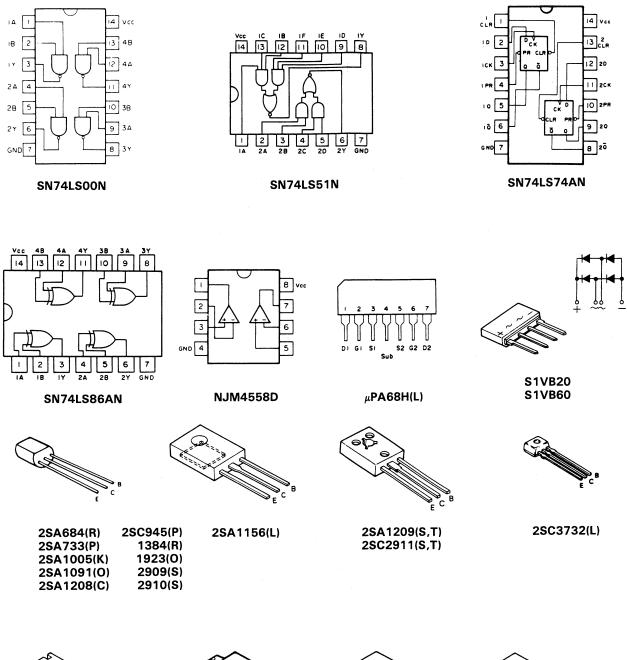


## P.C. BOARD

CRT SOCKET UNIT (X81-2810-00)



## SEMICONDUCTORS



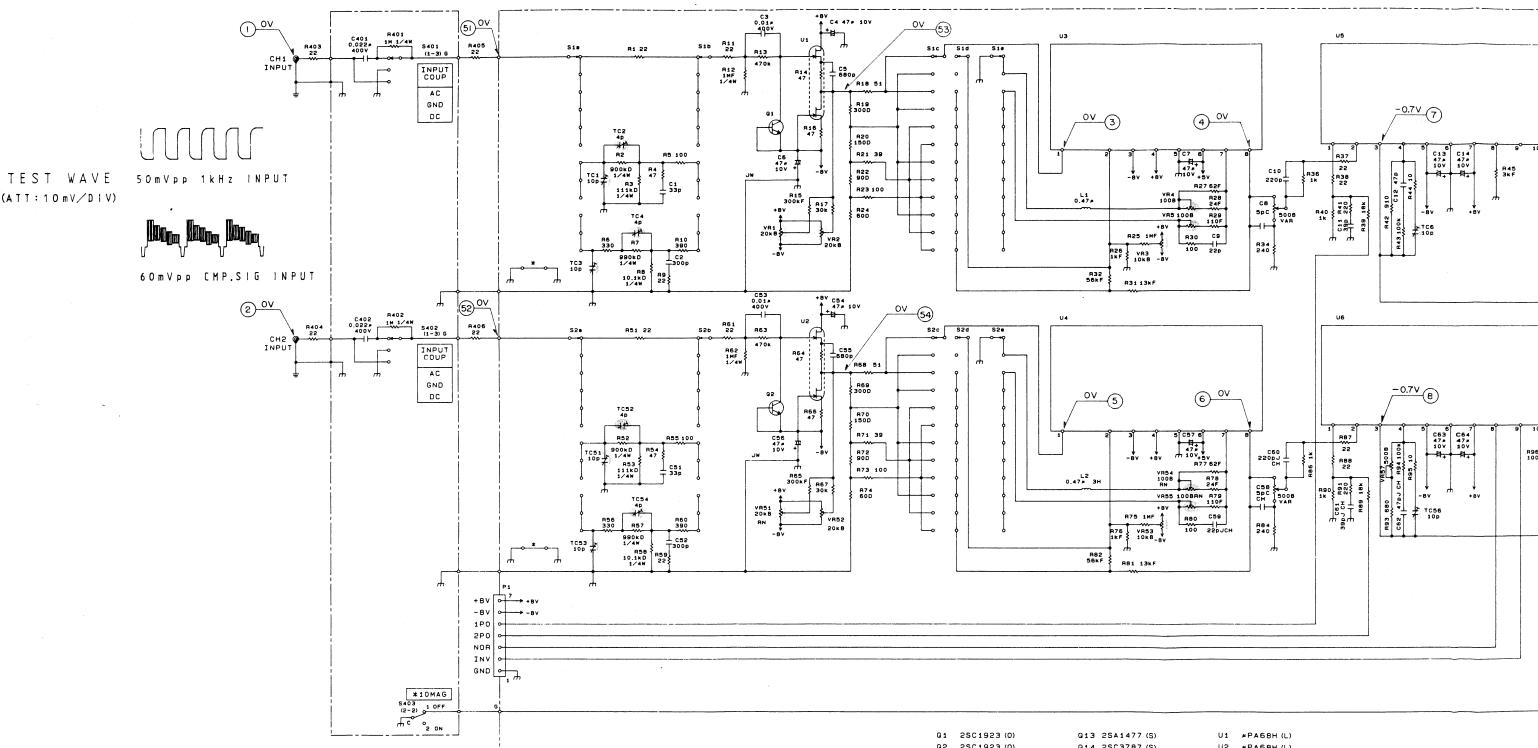
---

A product of  
**KENWOOD CORPORATION**  
175, 2-chome, Shibuya, Shibuya-ku, Tokyo 150, Japan

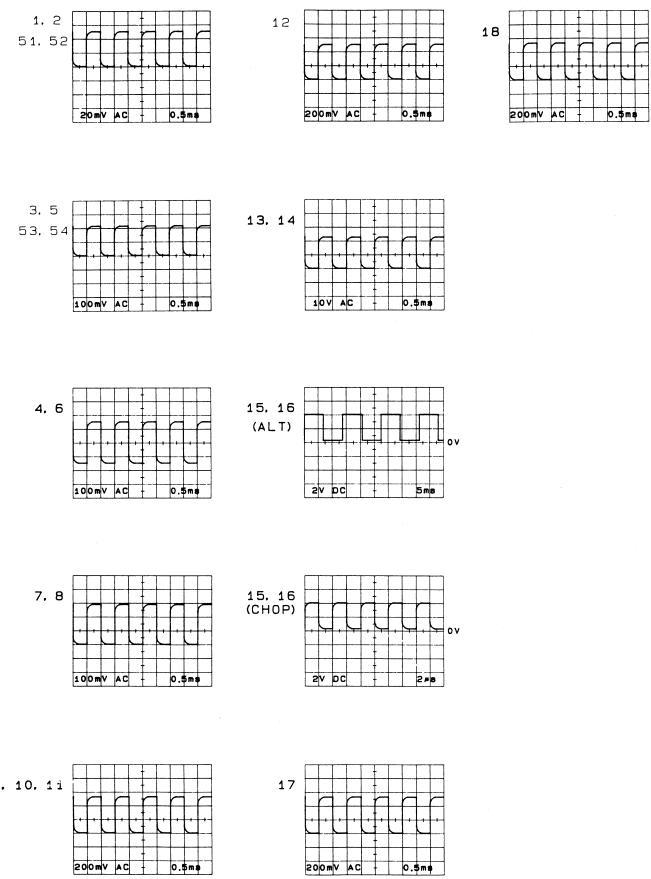
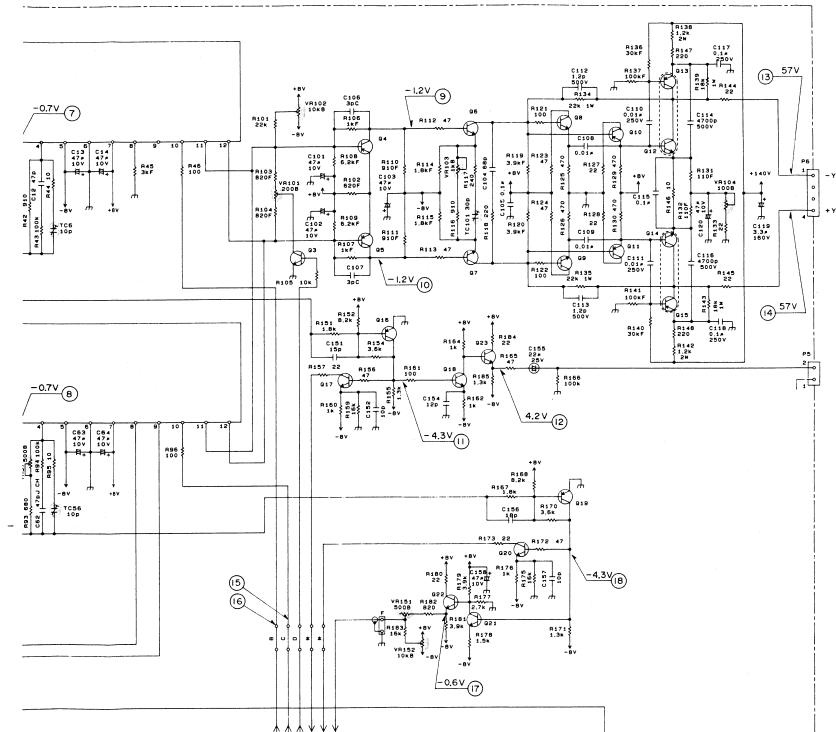
---

B51-1087-00 (T)

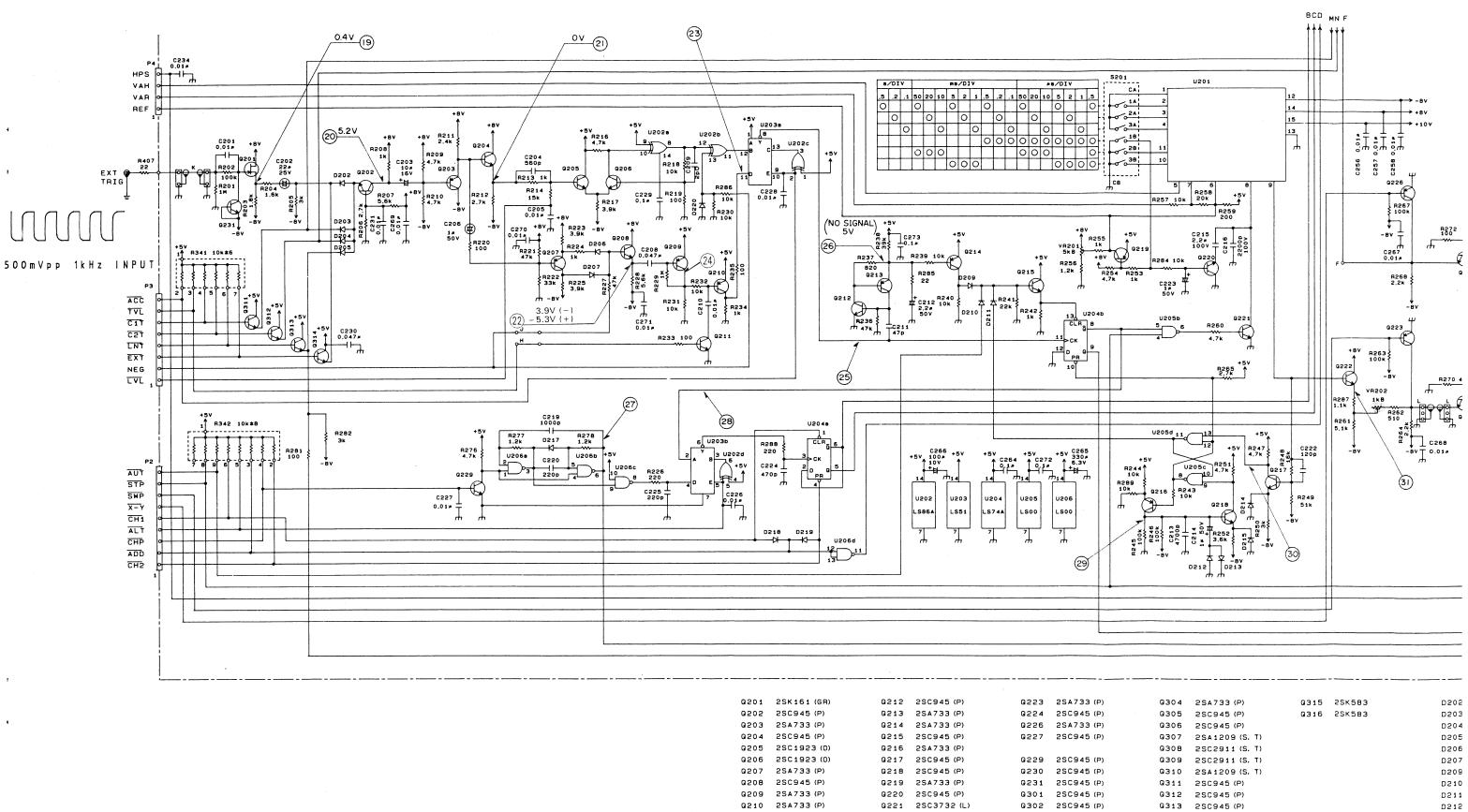
**SCHEMATIC DIAGRAM/WAVEFORM VERTICAL & HORIZONTAL UNIT (X65-1380-00)(1/2)**

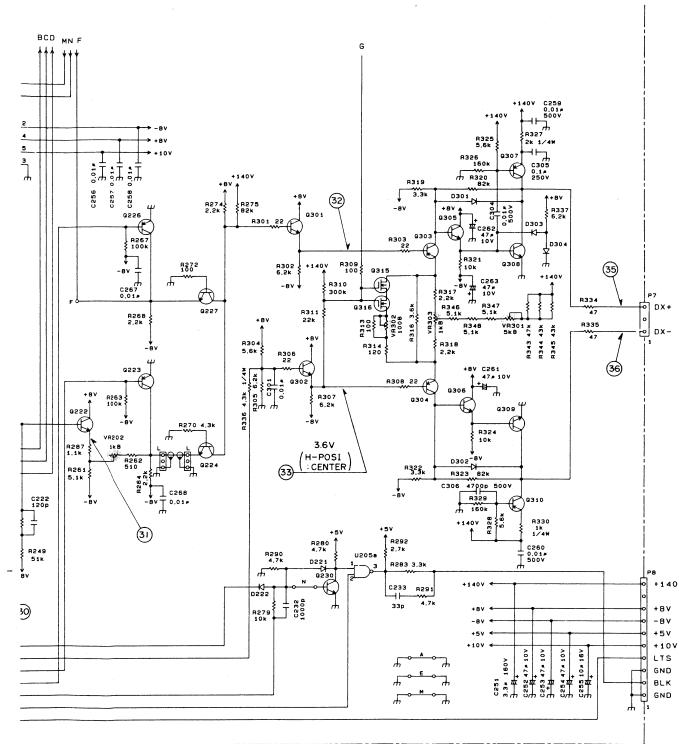


Q1 2SC1923 (I)	Q13 2SA1477 (S)	U1 2PA68H (L)
Q2 2SC1923 (I)	Q14 2SC3787 (S)	U2 2PA68H (L)
Q3 2SC945 (P)	Q15 2SA1477 (S)	U3 KMC01
Q4 2SA733 (P)	Q16 2SA733 (P)	U4 KMC01
Q5 2SA733 (P)	Q17 2SC945 (P)	U5 KMC02
Q6 2SC1923 (I)	Q18 2SC945 (P)	U6 KMC02
Q7 2SC1923 (I)	Q19 2SA733 (P)	
Q8 2SC1923 (I)	Q20 2SC945 (P)	
Q9 2SC1923 (I)	Q21 2SC945 (P)	
Q10 2SA1005 (K)	Q22 2SC945 (P)	
Q11 2SA1005 (K)	Q23 2SC945 (P)	
Q12 2SC3787 (S)		



**SCHEMATIC DIAGRAM/WAVEFORM VERTICAL & HORIZONTAL UNIT (X65-1380-00)(2/2)**





G315 2SK583  
 G316 2SK583  
 G202 1SS132  
 G203 1SS132  
 G204 1SS132  
 G205 1SS132  
 G206 1SS132  
 G207 1SS132  
 G209 1SS132  
 G210 1SS132  
 G211 1SS132  
 G212 1SS132  
 G213 1SS132

