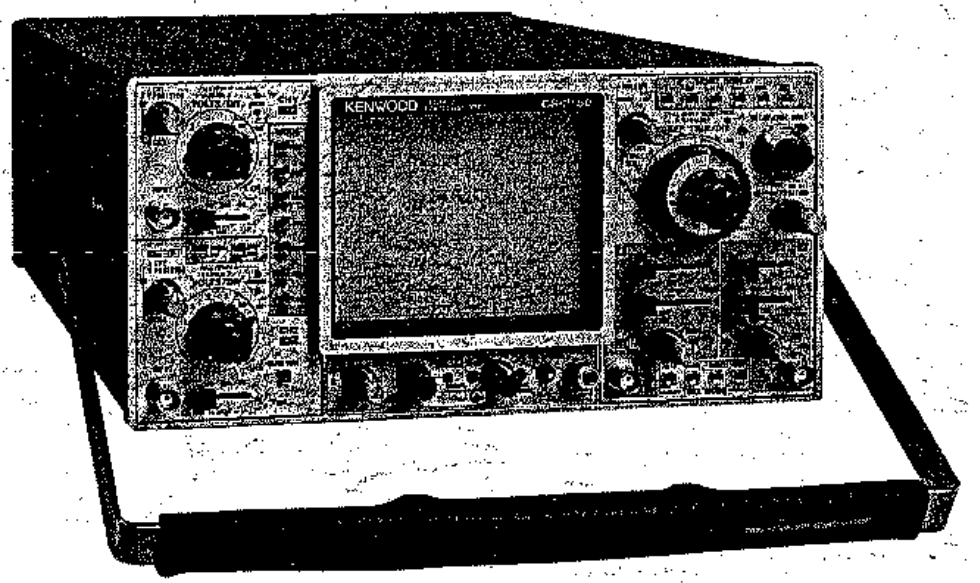
CS-2150

150MHz QUAD-TRACE OSCILLOSCOPE

SERVICE MANUAL



KENWOOD

WARNING

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

2. High voltage up to 20000 volts dc is present when the oscilloscope is operating. Line voltage (90 to 264 VAC) is present on the power supply UNIT, on-off switch, and fuse holder, any time the oscilloscope is connected to an ac power source, even if turned off. Always observe caution when the housing is removed from the unit. contacting exposed high voltage could result in fatal electric shock.

CONTENTS

SPECIFICATIONS

CRT

Model:	150KTM31
Type:	Rectangular, with internal graticule
Accelerating potential:	20kV
Display area:	8 div x 10 div (1 div = 1 cm)

VERTICAL AXIS (Channel 1 and Channel 2 identical specifications)

Sensitivity	5mV/div to 5V/div (X1 mode) 1 mV/div to 1V/div (X5 mode) 500μV/div (Cascaded operation, CH1 to CH2)
Accuracy:	± 2% (10 ~ 35°C) ± 4% (0 ~ 50°C) ± 7% (Cascaded operation, CH1 to CH2)
Attenuator:	5mV/div to 5V/div in 1-2-5 sequence, all 10 ranges with fine adjustment between steps.
Input resistance:	1 MΩ ± 1%
Input capacitance:	Approx 22pF
Frequency response	
DC:	DC to 150 MHz (−3 dB) (not include at 5 V/div range) DC to 100 MHz (−3 dB) (×5 mode) DC to 70 MHz (−3 dB) (Cascaded operation, CH1 to CH2)
AC:	5 Hz to 150 MHz (−3 dB) (not include at 5 V/div range) 5 Hz to 100 MHz (−3 dB) (×5 mode) 7 Hz to 70 MHz (−3 dB), (Cascaded operation, CH1 to CH2)
Risetime:	2.3ns
Signal delay time:	Approx 10ns as displayed on CRT screen
Crosstalk:	−40 dB minimum
Operating modes:	
CH1	CH1, single trace
CH2	CH2, single trace
DUAL	CH1 and CH2, dual trace
ADD	CH1 + CH2 (added) display
QUAD	CH1 ~ CH4, quad trace
ALT	Dual or quad trace alternating
CHOP	Dual or quad trace chopped
CHOP frequency:	Approx 250 kHz, adjustable
Channel polarity:	Normal or inverted, CH2 only inverted
⚠ Maximum input voltage:	800 Vp-p or 400V (dc + ac peak)
Maximum undistorted amplitude:	8 divisions, minimum (DC to 150 MHz)
Bandwidth limiting:	Vertical system bandwidth with the 20 MHz BW pushbutton switch pushed is approximately 20 MHz
Delay time difference	
CH1 to CH2:	Less than 0.5ns
CH1, CH2 to CH3, CH4:	Less than 1ns

VERTICAL AXIS (Channel 3 and Channel 4 common specifications)

Sensitivity	0.1V/div, 1V/div ± 2%
Attenuator:	1/1, 1/10
Input resistance:	1 MΩ ± 1%
Input capacitance:	Approx. 22 pF
Input coupling mode:	DC only
Frequency response:	DC to 100 MHz (−3 dB)
Risetime:	3.5ns
Signal delay time:	Same as CH1 and CH2
Maximum allowable voltage	
DC component:	± 0.5V or less (ac + dc) (± 5V, 1/10 attenuated)
AC component:	1 Vp-p (10 Vp-p, 1/10 attenuated) or less
⚠ Maximum input voltage:	400V (dc + ac peak)

HORIZONTAL AXIS (Channel 2 input)

Modes:	X-Y mode is switch selectable (HORIZ DISPLAY)
X-Y mode:	CH1: Y-axis CH2: X-axis
Sensitivity:	Same as CH2
Accuracy:	Same as CH2
Input resistance:	Same as CH2
Input capacitance:	Same as CH2
Frequency response:	
DC:	DC to 5 MHz (−3 dB)
AC:	5 Hz to 5 MHz (−3 dB)
X-Y phase difference:	Less than 3° at 100 kHz

SWEEP

Modes	(switchable with the HORIZ DISPLAY switch):
A	A sweep
ALT	B sweep waveform is displayed as an intensified portion of the A sweep and B sweep alternating
A-INT-B	B sweep waveform is displayed as an intensified portion of the A sweep.
B DLY'D	Delayed B sweep
DUAL	Dual sweep – A and B sweeps, independently
X-Y	X-Y display mode

SPECIFICATIONS

A sweep time: 20 ns/div to 0.5s/div in 23 ranges, in 1-2-5 sequence, verniier control provides fully adjustable sweep time between steps.

B sweep time: 20ns/div to 50ms/div in 20 ranges, in 1-2-5 sequence.

Accuracy: ±2% (10 ~ 35°C)
±4% (0 ~ 50°C)

Sweep magnification: X10 ±5% (10 ~ 35°C)
±6% (0 ~ 50°C)

Linearity: 20ns/div to 0.5s/div ±3% (±5% with X10 magnification)

HOLDOFF: Continuously adjustable for A sweep from NORM to X5

Trace separation: B positionable up to 4 divisions separated from A sweep, continuously adjustable.

Delay method: Continuous delay, Trigger delay

Delay time: 0.2 to 10 times the sweep time from 200ns to 0.5s, continuously adjustable.

Time difference measurement accuracy:
±(1% of measurement + 0.1% of full scale) (10 ~ 35°C)
±4% (0 ~ 50°C)

Delay jitter: 1/20000 of the full scale sweep time.

TRIGGERING

A TRIG

A trigger modes: AUTO, NORM, SINGLE, FIX: at the center of the waveform

Trigger source: V MODE, CH1, CH2, (EXT) CH3 1/1 and 1/10, LINE

Coupling modes: AC, LF$_{REJ}$, HF$_{REJ}$, DC, VIDEO
VIDEO-LINE sync automatically selected at sweep times of 50 μs/div to 20ns/div.
VIDEO-FRAME sync automatically selected at sweep times of 0.5s/div to 0.1ms/div.

Trigger level: ±90° adjustable

Polarity: +/−

B TRIG

B trigger modes: STARTS AFTER DELAY, TRIGGERABLE AFTER DELAY

Trigger source: CH1, CH2, (EXT) CH4 1/1 and 1/10

Coupling modes: AC, LF$_{REJ}$, HF$_{REJ}$, DC

Trigger level: ±90° adjustable

Polarity: +/−

TRIGGER SENSITIVITY (A AND B)

COUPLING	FREQ RANGE	MINIMUM SYNC AMPLITUDE		
		INT	EXT	EXT 1/10
DC	DC ~ 20 MHz	0.5 div	50 mV	0.5V
	DC ~ 50 MHz	1.0 div	100 mV	1.0V
	DC ~ 150MHz	2.0 div	280 mV	2.8V
AC	Same as for DC but with increased minimum level for below 20 Hz.			
AC HF$_{REJ}$	Increased minimum level below 20 Hz and above 30 kHz.			
AC LF$_{REJ}$	Increased minimum level below 30 kHz.			
VIDEO	FRAME/LINE	0.5 div	50 mV	0.5V

AUTO: Same as above specifications for above 50 Hz.

FIX: 40 Hz ~ 20 MHz, 1.5 div (150 mV)
40 Hz ~ 150 MHz, 3.0 div (420 mV)

Jitter: 0.5ns maximum at 150 MHz at 2ns/div sweep rate (X10 MAG on)

CALIBRATING VOLTAGE AND CURRENT

1 kHz ±3% Positive square wave
1V ±1% (10 ~ 35°C)
±2% (0 ~ 50°C)
10 mA ±2% (10 ~ 35°C)
±4% (0 ~ 50°C)

INTENSITY MODULATION

Input signal: TTL level, intensity decreasing with more positive levels

Input impedance: Approx. 10 kΩ

Usable frequency range: DC to 10 MHz

⚠ Maximum input voltage: 50V (dc + ac peak)

VERTICAL AXIS OUTPUT

Sampled CH1 output

Output voltage: 50 mVp-p/div (into 50Ω load)

Output impedance: Approx. 50Ω

Frequency response: DC to 100 MHz (−3 dB) (into 50Ω load)

GATE OUTPUT (A and B)

Output voltage: Approx. 1.5V positive gate (into 500Ω load)

TRACE ROTATION

Electrical, adjustable

POWER SUPPLY

Line voltage: 90 ~ 264V

Line frequency: 45 ~ 400 Hz

Power consumption: Approx. 60W (at 100V, 50Hz)

DIMENSIONS

Width: 284 mm (328 mm)

Height: 138 mm (150 mm)

Depth: 400 mm(471 mm)

( ) dimensions include protrusions from basic case outline dimensions.

SPECIFICATIONS

WEIGHT 7.4 kg

ENVIRONMENT

Operating temperature and humidity for guaranteed specifications:	10 ~ 35°C, 85% maximum RH
Full operating range:	0 ~ 50°C, 90% maximum RH
Storage temperature and humidity range:	–20 ~ +70°C 80% maximum
Altitude:	
Operating:	5000 m
Non-operating:	12000 m

■ Circuit and ratings are subject to change without notice due to developments in technology.

ACCESSORIES

STANDARD ACCESSORIES INCLUDED

Probe (PC-29) × 2	Y87-1250-00
Attenuation	1/10
Input Impedance	10MΩ, 18 pF of less
Instruction Manual	B50-7541-00
Handbook	B50-7543-00
AC Power Cord	See Fig. 3
Panel Cover	F07-0923-02
Probe Holder	J21-2903-03

OPTIONAL ACCESSORIES

Probe Pouch (MC-78)	Y87-1600-00
AC Power Cord	See Fig. 3

SPECIFICATIONS

CRT 150KTM31 SPECIFICATIONS

Screen and shape

Dimensions

Overall length;	380 mm Max.
Face plate dimensions;	149.3 ±3.0 mm
Screen shape;	Rectangular flat face, internal graticule, metal back
Deflection and focusing system;	Electrostatic deflection, electrostatic focusing and post-deflection acceleration
Color;	Green
Persistence;	Midium short
Useful display area;	Y axis.....80 mm X axis.....100 mm

Heating

Heater voltage;	6.0 V
Heater current;	75 mA
Weight;	Approx. 1.1 kg

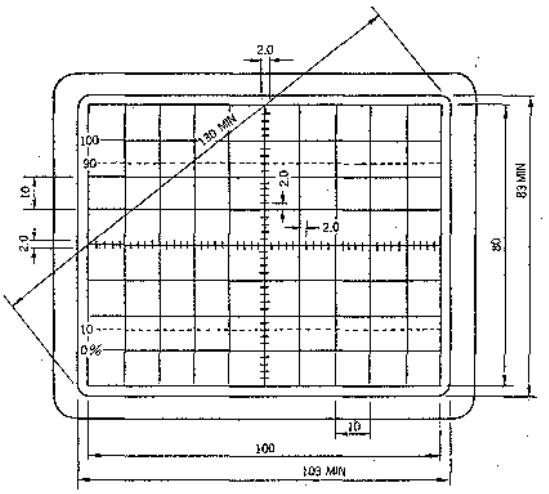


Fig. 1

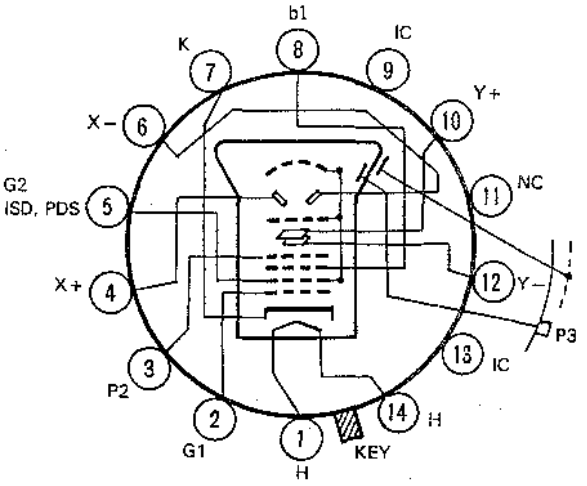


Fig. 2

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 90 V to 264 V at frequencies from 45 Hz to 400 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. 3.

Line fuse

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

Plug configuration	Power cord and plug type	Factory installed instrument fuse	Line cord plug fuse	Parts No. for power cord
	North American 120 volt/60 Hz Rated 15 amp (12 amp max; NEC)	1.2 A, 250 V Fast blow AGC/3AG	None	E30-1820-05
	Universal Europe 220 volt/50 Hz Rated 16 amp	1.2 A, 250 V Fast blow 5×20 mm	None	E30-1819-05
	U.K. 240 volt/50 Hz Rated 13 amp	1.2 A, 250 V Fast blow 5×20 mm	1.2 A Type C	—
	Australian 240 volt/50 Hz Rated 10 amp	1.2 A, 250 V Fast blow 5×20 mm	None	E30-1821-05
	North American 240 volt/60 Hz Rated 15 amp (12 amp max; NEC)	1.2 A, 250 V Fast blow AGC/3AG	None	—
	Switzerland 240 volt/50 Hz Rated 10 amp	1.2 A, 250 V Fast blow AGC/3AG 5×20 mm	None	—

Fig. 3 Power Input Voltage Configuration

CIRCUIT DESCRIPTION

VERTICAL ATTENUATOR

The input attenuator unit has a three stage configuration; the attenuation factor of the first stage is 1/100, of the second stage 1/10 and of the third stage 1/2 and 1/4. In combination, these comprise a 10 point input attenuator in 1, 2 and 5 sequence.

The attenuator consists of resistors and capacitors only and does not vary the gain of amplifiers. For this reason, step attenuator balance adjustment is not required.

In addition, since a 1/1000 attenuator is not used, the frequency response is good. The attenuators in both channel 1 and channel 2 use the same configuration.

VERTICAL PRE-AMPLIFIER CIRCUIT

Since this model employs four channel operation, four pre-amplifiers are used.

In the first stage amplifier of channel 1, single-ended transistor amplifiers (Q1 - Q5) with improved high-frequency response are applied with the dc feedback by low offset, low drift op-amp (IC1) to produce a low drift wide-band amplifier.

From the second stage amplifier onward, the amplifier is of a differential configuration. In the second stage amplifier circuit, switching transistors Q13 and Q14 are switched to vary gain to perform X5 gain operation.

In the third stage amplifier circuit, the vertical position control (VR) is connected. Q17 is provided as a constant current source so that the average potential of the output of this stage will not vary if the vertical position control is turned. In channel 2, the phase is inverted by switching transistors Q49 and Q50 to perform channel 2 INV.

Q24 and Q25 are trigger amplifiers whose output passes through buffer output amplifiers Q27 and Q29, and the output signal with an output impedance of 50 ohms is fed to A trigger switch PC board. In channel 1, the CH1 OUT signal is output to the rear panel via Q26 and Q28.

The fourth stage amplifier circuit comprises a cascade amplifier together with mixing amplifiers Q62 and Q63. Channel 2 has a similar circuit configuration to that of channel 1. The second amplifier of channels 3 and 4 has a similar circuit configuration to that of the fourth amplifier of channel 1 and 2.

The four signals of channel 1 through 4 are selected by diode switches D7 through D10, D21 through D24 and D29 through D36 and are connected to the emitter of Q62 and Q63.

Q67 and Q68 are buffer amplifiers to obtain matching with the delay line. These amplifiers have superb CMRR (common mode rejection ratio) in order to provide a balanced output to the delay line and reduce distortion in the waveform of the delay line.

Q73 and Q74 are trigger amplifiers which output the output signal of the mixing amplifier to the A trigger switch unit and are V MODE trigger source. Q64 is a load resistor switching transistor during ADD mode.

Q69 through Q72 make up a 20 MHz band width circuit which sets the frequency response of the vertical axis to 20 MHz, (−3 dB).

The signals of channel 1 through 4 are appropriately switched by a combination of the vertical and horizontal modes by means of the logic circuit consisting of IC3 through IC7.

CH3, CH4 AMPLIFIER CIRCUIT

This circuit consists of the attenuator unit, buffer amplifier, first stage amplifier and trigger amplifier. Q1 drives relay RL1 to switch the attenuator unit to 1/1 and 1/10.

The output signal from this attenuator unit is converted in impedance by Q2 through Q4, amplified by Q5 and Q6, and fed to the second amplifier of the vertical pre-amplifier circuit. At the same time, the trigger signal is passed through trigger amplifiers Q7 and Q8, and applied to the A trigger switch unit.

Although channel 4 has an identical circuit to that of channel 3, the trigger signal is fed to the B trigger switch unit. On the same PC board, the wiring network connecting the CPU unit and trigger sweep unit to the HORIZ DISPLAY and TRIG MODE PC board is incorporated.

VERTICAL OUTPUT AMPLIFIER CIRCUIT

The signal passed through the delay line is applied to the vertical output amplifier. Q1 through Q4 are the cascade connection differential amplifiers. Q14 is a constant current biasing circuit. Q7 through Q12 are final stage output amplifiers; as the cases of Q11 and Q12 are mounted on the chassis to draw off heat, the heat radiation effect is improved compared with former final stage amplifiers. Q15, Q16 and Q17 make up the trace separation circuit, and Q13 and Q18 make up the beam finder circuit.

A TRIGGER SWITCH CIRCUIT

CH1, CH2, CH3, V MODE and LINE trigger signals are fed to the A trigger switch circuit. S1 is a trigger source select switch and S2 is a trigger coupling select switch. Q1 and Q2 are fixed sync circuits which detect the peak value of the trigger input signal to automatically set the trigger level.

Q3 is a dual FET to prevent temperature drift during the dc sync. Q4 and Q5 make up the emitter follower circuit which serves to lower the driving impedance for the following stage. Q6 and Q7 are feedback amplifiers which improve the CMRR (common mode rejection ratio) of both polarities of the trigger signal. Q8 and Q9 are circuits which prevent temperature drift. Q10 through Q15 are cascode amplifiers and make up a switching circuit of the negative and positive polarities of the trigger signal.

Q17 through Q25 are video sync circuits. Q17 through Q19 make up a switching circuit of the negative and positive polarities of the trigger signal and Q21 and Q22 make up a trigger waveshape circuit. Separation and selection of the vertical and horizontal sync signals are performed by Q24 which is interlocked with the SWEEP TIME/DIV control. Q16 receives the trigger signals from Q10 through Q15 or Q25 and feeds the trigger signal to the trigger sweep unit with an output impedance of 50 ohms.

B TRIGGER SWITCH CIRCUIT

Basically, this is the same as the A trigger switch circuit. However, the B trigger switch circuit does not have the video sync circuit and fixed sync circuit.
Q1 extracts the trigger signal of channel 2, then feeds the X signal to the trigger sweep unit during the X-Y operation.

ROTARY SWITCH CIRCUIT

This is part of the sweep circuit and is mounted on a separate PC board which the rotary switch for selecting the sweep time resistors and the resistors for the holdoff circuit are installed.

TRIGGER SWEEP CIRCUIT

The sweep circuit employs a constant current integrating circuit which charges capacitors with a constant current to provide sawtooth waves. Q13, Q15 and Q17 are switching transistors of capacitors for A sweep time. In the case of the B sweep, Q43, Q45 and Q47 operate in the same manner as in the A sweep.
Q12, Q14 and Q16 are switching transistors for holdoff capacitors of the A sweep. In the case of the B sweep, Q42, Q44 and Q46 operate in the same manner as in the A sweep. The voltage supplied from the constant voltage circuit is converted into the constant current source by the voltage setting circuit consisting of IC3a and Q7 and resistors switched by the rotary switch. The capacitor for the sweep time is charged by this current and its terminal voltage is increased. This voltage is fed to the high impedance buffer amplifier consisting of Q18 and Q19. When the output of this amplifier reaches a certain voltage, IC7d is turned on and the flip-flop IC2b is reset; at the same time, IC2a is set. The output of IC2a turns Q6 on, then short-circuits the capacitor for the sweep time with the result that its terminal voltage is decreased. The constant current circuit formed by Q20 charges any one of holdoff capacitors C12, C16 or C20. The terminal voltage of the capacitor gradually increases and when it reaches a certain value, Q22 turns on. The output of Q22 turns on the Schmitt trigger consisting of IC7c, setting IC2b. The output from IC2b releases IC2a setting and starts sweeping again.
The trigger signal is passed through IC1a and IC1b, then triggers IC2a and releases the set flip-flop to start the sweep which is in sync with the trigger signal. IC1a and IC1b make up the Schmitt trigger circuit.
The trigger signal shaped by IC1a and IC1b is applied to IC1c, Q1 and Q2. When the trigger signal is present, the gate of IC1d is closed and IC2a acts as a master-slave flip-flop. When the trigger signal disappears, as the gate of IC1d opens, IC2a acts as an R-S flip-flop. This is an auto free-running circuit.
Q24 through Q26 are the detection circuit for delayed sweep. When a voltage level determined by the delay time multiplier is reached, Q24 turns on and the gate of IC8a is triggered. IC8a and IC10b make up the logic differentiating circuit which produces a pulse with a certain pulse width. This pulse sets IC5b and starts the B sweep. The B sweep circuit is almost the same as the A sweep circuit except that the B sweep circuit does not have three ranges of low speed sweep.
The B STARTS AFTER DELAY switch permits the gate of the IC4d to switch from the trigger priority master-slave flip-flop to the R-S flip-flop, and it is possible to start sweep from the voltage level determined by the delay time multiplier.
The A sweep is adjusted in horizontal position by Q53 while the B sweep is adjusted in horizontal position by Q54 and the horizontal display is switched by Q55 through Q58. The A and B sweep waveforms are synthesized at the collectors of Q55 and Q58. The X-Y signals also pass through Q59 where they are synthesized. The signal passed through Q60 is improved in CMRR with Q62 before it is fed to the following stage. The signals at Q64, Q65 and Q66, Q68 are switched by Q69 and Q68 respectively to X1 and X10, then converted in impedance to 50 ohms and fed to the horizontal final stage amplifier.
Q77 through Q79 is a trace separation circuit which supplies two types of bias voltage to the vertical output amplifier by means of the select signals of the A and B sweeps. IC8d is a reset pulse generating circuit during single sweep operation.
IC13a, 14a, and 14e also produce a blanking control signal when the horizontal axis is displayed. This signal is combined by IC11 and 12d with the sweep signal and chop signal, then converted in impedance by Q72 through Q75 to become an input signal to the blanking circuit.
The channel select signal during dual and quad traces in the vertical axis mode is produced by IC12a, IC12b, IC13b, IC14c, IC15a, IC15b, IC15c, IC15d, Q76 and D62 through D64.
IC12a and IC12b are chop oscillators. The on/off of these oscillators is controlled by the vertical axis mode logic and the signal from the CPU unit. While the oscillation is stopped, these oscillators output the alternate signal by receiving the signal from Q76. The output from IC12a and IC12b turns off during vertical axis single trace, and is output in all other modes. The output from IC15d is fed to the vertical pre-amplifier and becomes the chop signal and alternate signal.

CIRCUIT DESCRIPTION

CALIBRATION VOLTAGE GENERATOR CIRCUIT

Q80 and Q81 make up a multivibrator circuit, and the signal decreased in impedance by Q82 is output as a calibration voltage. This voltage is changed into constant current by R307 and R308 and output to the current calibration loop on the rear panel. The power sources to all these circuits are stabilized by IC16 before being supplied.

HORIZONTAL OUTPUT AMPLIFIER CIRCUIT

The sweep signal supplied from the trigger sweep circuit is amplified by differential amplifier Q1 and Q2. The output from Q1 and Q2 is converted in impedance by the emitter-follower circuit Q3 and Q4 and drives Q5 and Q6. Q7 and Q8 make up a constant current circuit. These circuits each serve as a dc load for Q5 and Q6, and are provided with ac peaking by means of C11 and C12. Q9 and Q10 make up an auto biasing circuit which automatically determines the operation point of the output stage, These circuits also serve as a beam finder circuit; when the base of Q11 is grounded, the operation point of the output stage decreases and serves to compress the output waveform.

CPU CIRCUIT

The control of vertical MODE, HORIZ DISPLAY and TRIG MODE is performed by the CPU.

By means of the software key scanning system, the signal corresponding to the mode switch pressed is processed, and "L" output is sent to each LED indicator and each unit as a control signal.

The CH2 INV signal and 20 MHz B.W. switching signal are individually fed to the CPU, and their LED indicators are activated by the circuit in the vertical pre-amplifier.

As the lithium battery serves as a memory back-up power supply, information is held in memory even when the power is switched off.

SWITCHING POWER SUPPLY UNIT

Although this unit aims is compact and lightweight, it consumes nearly 60 W power. Therefore, the conventional series regulator system using a power transformer is not able to meet the specification. For this reason, a switching regulator is employed in this unit.

This switching regulator directly rectifies a voltage of 90 - 264 V, whose output is then converted into a dc current by smoothing capacitors. Next, this dc current is switched by power transistors and converted into ac current to drive the converter transformer. The converter transformer has six taps on its secondary winding. The six ac outputs are each rectified and filtered and supply dc outputs to the power blanking unit. However, the voltage at the control winding is compared with the reference voltage, then amplified by the differential amplifier. The output from the differential amplifier controls the base of the power transistor as the control winding is separate and isolated from the primary winding, thereby stabilizing the output voltage from the secondary winding.

POWER BLANKING UNIT

Of the six voltages output from the switching power supply unit, five are stabilized by the series regulator again. Q1 and Q3 through Q6 are control transistors. IC1a, IC1b, IC2a and IC2b are differential amplifiers. With respect to the +20 V supply, as its stabilization is not so important, a voltage divider type regulator is used.

The dc-dc converter for high voltage employs the same circuit as conventional models. Q24 through Q26 make up a differential amplifier and Q28 is a control transistor. This scope allows the brightness of the A and B sweep to be varied independently. Q11 through Q13 are responsible for this operation.

Q14 is a beam finder circuit and even if the INTENSITY control is set to CCW., this circuit serves to provide trace on the CRT.

Q15 and Q16 make up an external intensity modulation circuit which darkens the screen of the CRT with "H" level signal of the TTL level.

These signals are synthesized at the base of Q17, and drive Q18. Q19 is a dc load for Q18 and is provided with ac peaking by C25.

Q20 and Q21 are an auto-focus circuit, and oposite phase signal to phase the blanking waveform is applied to the focus electrode of the CRT.

Q22 and Q23 are dc restorer circuit for the blanking and auto-focus circuits and configured as a differential amplifier, so that an isolated signal can be fed to each circuit. Q8 is a transistor for scale illumination, and Q9 and Q10 are transistors for trace rotation.

FILTER UNIT

L1 and C1 through C3 make up a line filter which prevents noise entering from the power line; the line filter also prevents the unit's internal signal radiating through the power line.

IC1 is a photocoupler which provides the trigger source for the line sync.

HIGH VOLTAGE BLOCK

The acceleration voltage at the subsequent stage of the unit extends to as much as 18 kV. Therefore, if the high voltage rectifier section is exposed, it is potentially dangerous. Besides, leakage current would not meet the safety standards. So, the unit employs a high voltage block whose high voltage rectifier section is solidified with resin. The dc-dc converter transformer and the rectifier circuit for 2 kV cathode voltage are incorporated in this block. The external output includes −2 kV dc, 6 V ac and 18 kV, which are output from the anode cap. Therefore, unless the anode cap is intentionally removed, as all other voltages are dc output, the high voltages are in the order of approx. 1/2

BLOCK DIAGRAM

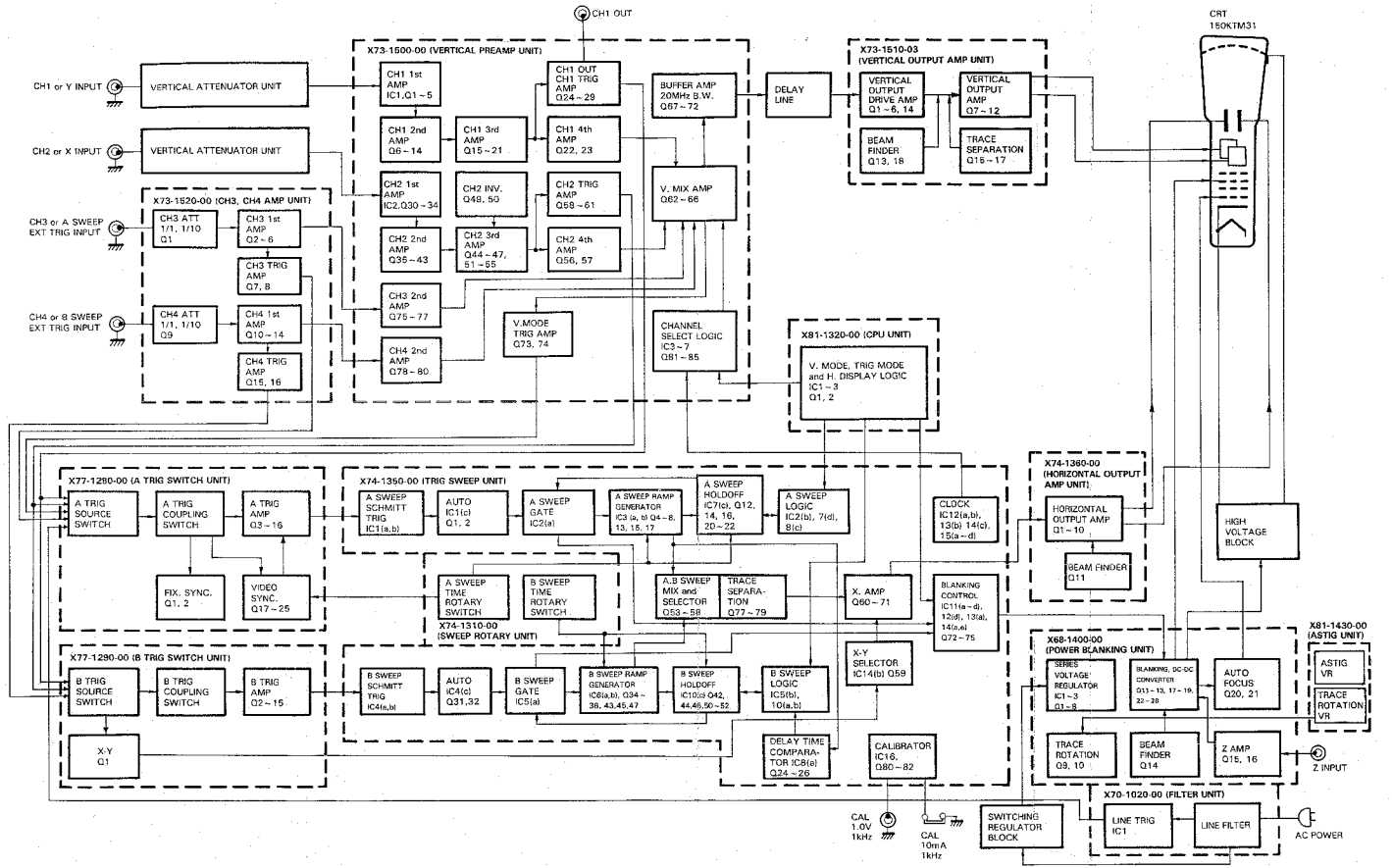
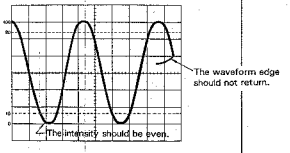


Fig. 4

ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
ADJUSTMENT OF POWER SUPPLY AND CRT							
Check of Power Supply		X68-1400	475A DL-720		(1) Measurement and checking of voltages at P27 and P30 pins P27: 1P +120V, 2P +55±1V, 3P 20V, 5P 5.2V, 6P 10V, 7P −10V P30: 1P +130V±3V, 2P 55V, 3P 24V±2V, 5P 12V +1.5V −0.5V, 6P 7V±0.5V, 7P −12V +0.5V −1.5V		
Adjustment of −2.0 kV	VR3	X68-1400	DL-720 High voltage probe		(2) Measure the voltage on 2P of P33 and adjust VR3 to obtain −2.00kV (−2.00kV ~ −2.005kV).		
Coarse Adjustment of ASTIG and FOCUS	VR9 FOCUS Knob	X81-1430		HORIZ DISPLAY: X-Y CH1, CH2 AC-GND-DC: GND A INTENSITY: 3 o'clock 20MHz BW: ON	(1) Operate ▲▼ POSITION knobs for CH1 and CH2 to position the spot in the center of the CRT screen. (2) Adjust VR9 to make the spot round and smaller.		
Adjustment of A INTENSITY	VR1	X68-1400		HORIZ DISPLAY: X-Y A INTENSITY: 9 o'clock CH1, CH2 AC-GND-DC: GND 20MHz BW: ON	Adjust VR1 so that the spot on the CRT screen disappears when A INTENSITY is set in the position of 9 o'clock. <Check> Make sure that the spot on the CRT screen increases in brightness when A INTENSITY is turned CW and that the trace becomes almost extinguished when A INTENSITY is turned CCW (9 o'clock position).		
Check of B INTENSITY				HORIZ DISPLAY: ALT Vertical MODE: CH1 TRIG MODE: AUTO STARTS AFTER DELAY: PULL CH1 AC-GND-DC: AC B SWEEP TIME/DIV: 0.1ms	(1) Operate ▲▼ TRACE SEP to cause B sweep line in the center of the CRT screen. (2) Make adjustment so that the trace on the CRT screen increases in brightness when B INTENSITY is turned CW and that the trace becomes extinguished when B INTENSITY is turned to fully CCW. (3) Make adjustment so that the trace becomes extinguished when B INTENSITY is turned to fully CCW.		
Adjustment of Blanking	TC2	X68-1400	SG-502	HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO A SOURCE: V MODE A COUPLING: AC A INTENSITY : Fully CW CH1 AC-GND-DC: AC A SWEEP TIME/DIV: 0.02μs	(1) Apply a sine wave signal of 10 MHz to CH1 INPUT and operate ▲▼ POSITION, ◄► POSITION and CH1 VOLTS/DIV to bring out a waveform with a vertical amplitude of 6 div on the screen. (2) Make adjustment so that there is no unevenness in intensity of the trace at the waveform starting point and there is no retrace.		
Adjustment of Z-axis Input Blanking	TC1	X68-1400	SG-503	HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO A SOURCE: V MODE CH1 AC-GND-DC: DC VOLTS/DIV: 2V	(1) Set A SWEEP TIME/DIV at 0.5 μs and apply a 1 MHz sine wave signal of 10Vp-p to CH1 INPUT so that a waveform with a vertical amplitude of 5 div appears on the screen. (2) Apply the same signal above to the Z INPUT, and turn A INTENSITY CCW so that the dark and bright area of the waveform are distinct. (3) Adjust so that the bright area of the sine waveform is symmetrical to the peak point.		

to 1/3 as compared with our former oscilloscope models, thereby eliminating danger.

ASTIGMATISM CONTROL UNIT

In the power blanking unit, the variable resistor for trace rotation and the variable resistor for astigmatism control are mounted on a separate PC board to allow these controls to be adjusted on the front panel.

MAINTENANCE

REMOVAL OF CASE

1. Remove the 4 screws located at the rear of the case and the 1 located at bottom with a ⊕ screwdriver. Carefully slide the body forward from the case.
2. To install the body in the case, place the case horizontally and slide the body into the case using the rails located at the bottom of the case. Then, place the body vertically and engage the case front edge into the front panel groove.
3. Temporarily insert the case retaining screws and then tighten them evenly.

CAUTION:
A voltage of 20 kV is applied to the CRT socket and anode cap. Before removing the case, turn the power off and pull out the power plug. After removing the case, take care not to touch them.

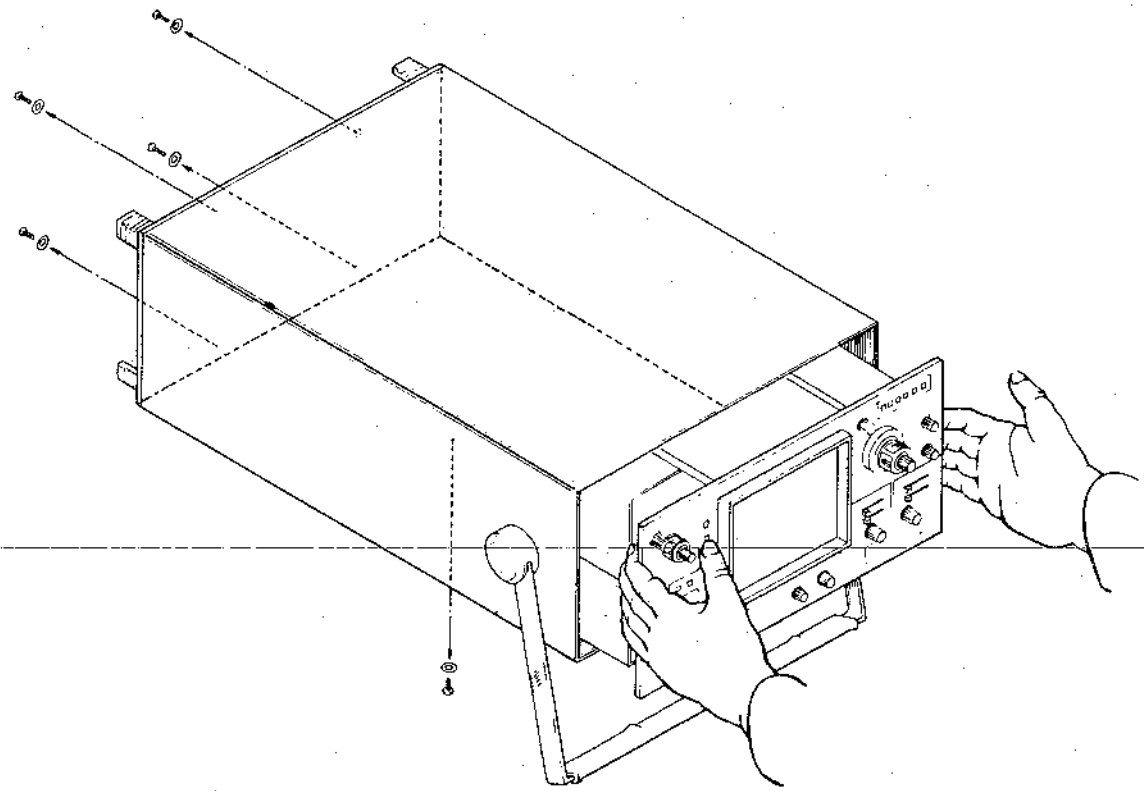


Fig. 5

REMOVING/INSTALLING CRT

1. To remove the cathode ray tube for servicing, disconnect the parallel cord connector located at the top of the shield case. Remove the screws securing the shield case.
   Remove the bracket screws without loosening the CRT band, move the CRT backward and remove the CRT by lifting up the socket.
2. To install the CRT, move the CRT together with the shield case to the front and tighten the screws securing the CRT band and shield case.
3. As slots are provided in the CRT brackets and the brackets are inclined by 45°, the CRT can be moved back and forth and right and left and positioned at any position.
   Always secure the CRT band first, then the CRT brackets.

CAUTION:
There is a high tension voltage at the anode of the CRT. Before removing the CRT, connect the anode to the ground via a 100 kΩ load for 5 seconds to discharge the voltage.

TROUBLESHOOTING

1. If one of the mode LEDs does not light, the unit will not operate correctly. When using the unit, confirm that the LED lights up.
2. To service the unit effectively, isolate the falure first. Then, remove the case and check the wiring, P.C.B. pattern and parts.

ADJUSTMENT

To obtain the best performance, periodically accurately 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 are warm up the scope sufficiently (more than 30 minutes) before starting.

NOTE:
Calibrate the unit under the following condition.
Temperature: 10 — 35°C
Hunmidity: Less than 85%

POWER SUPPLY VOLTAGE

Before calibrating the unit check the power supply voltage. (90 ~ 264 V).

TEST EQUIPMENT REQUIRED

The following instrument of their equivalent should be used for making adjustments.

Test Equipment	Model	Minimum Specification
Digital Multi-Meter	DL-720 (TRIO)	Impedance: More than 10MΩ, Measuring range: 0.01 V to 199V
Sine Wave Generator	SG-502 (Tektronix)	Frequency: 10 Hz to 10MHz, constant voltage over tuning range
Sine Wave Generator	SG-503 (Tektronix)	Frequency:50kHz to 100MHz, Output impedance: 50 Ω, constant voltage over tuning range.
Square Wave Generator	PG-506 (Tektronix)	Output signal: 1 kHz, Amplitude: 10 mVp-p to 10 Vp-p, Accuracy: within ±1%, Rise time: 35ns or less (1 MHz, 1ns or less)
Q Meter	4343B (YHP)	—
Color Pattern Generator	CG-911A (TRIO)	—
Oscilloscope	475A (Tektronix)	Sensitivity: More than 5 mV Frequency response: More than 250 MHz
Time Marker Generator	TG-501 (Tektronix)	Time mark: 0.5s to 0.1 μs repetitive waveform, Accuracy: within 0.1%
High Voltage Probe	—	Input Impedance: 1000 MΩ
Termination	TA-57 (TRIO)	Impedance: 50 Ω
Attenuator	011-0059-02 (Tektronix)	—20 dB attenuation (50 Ω)

Table-2

Test Equipment	Model	Minimum Specification
Power Meter	2041 (YEW)	—
Auto transformer (variable)	SD-265 (Matsunaga)	—
Current Probe	P6302 AM-503 (Tektronix)	—
Frequency Counter	FC-756 (TRIO)	—

Table-3

PREPARATION FOR ADJUSTMENT

Control Setting

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.

Power Section

POWER	ON

CRT Control Section

A INTENSITY	Between 12 and 3 o'clock position
B INTENSITY	Between 12 and 3 o'clock position
FOCUS	Optimum position
SCALE ILLUM	Arbitrary position
BEAM FIND	OFF

Vertical Section

VARIABLE (CH1 and CH2)	CAL
▲▼ POSITION (CH1 – CH4)	12 o'clock position
AC-GND-DC (CH1 and CH2)	AC
VOLTS/DIV (CH1 and CH2)	5V/DIV
×5 GAIN	OFF (PUSH)

Horizontal Sweep Section

A SWEEP TIME/DIV	0.1ms/DIV
B SWEEP TIME/DIV	0.1ms/DIV
A VARIABLE	CAL
DELAY TIME MULT	Arbitrary position
▲▼ TRACE SEP.	Fully CCW
HOLDOFF	NORM
B ENDS A	OFF
◄► POSITION	12 o'clock position
FINE PULL×10 MAG	12 o'clock position (×10 MAG OFF)
PULL CHOP F. SELECT	OFF (PUSH)

TRIG. Section

A SOURCE	V MODE
A COUPLING	AC
A LEVEL	12 o'clock position
A SLOPE	+
FIX	(PUSH)
B SOURCE	CH1
B COUPLING	AC
B LEVEL	12 o'clock position
B SLOPE	+
STARTS AFTER DELAY	(PUSH)

Mode Section

Vertical MODE	CH1
20 MHz BW	OFF
CH2 INV	OFF
TRIG MODE	AUTO
HORIZ DISPLAY	A

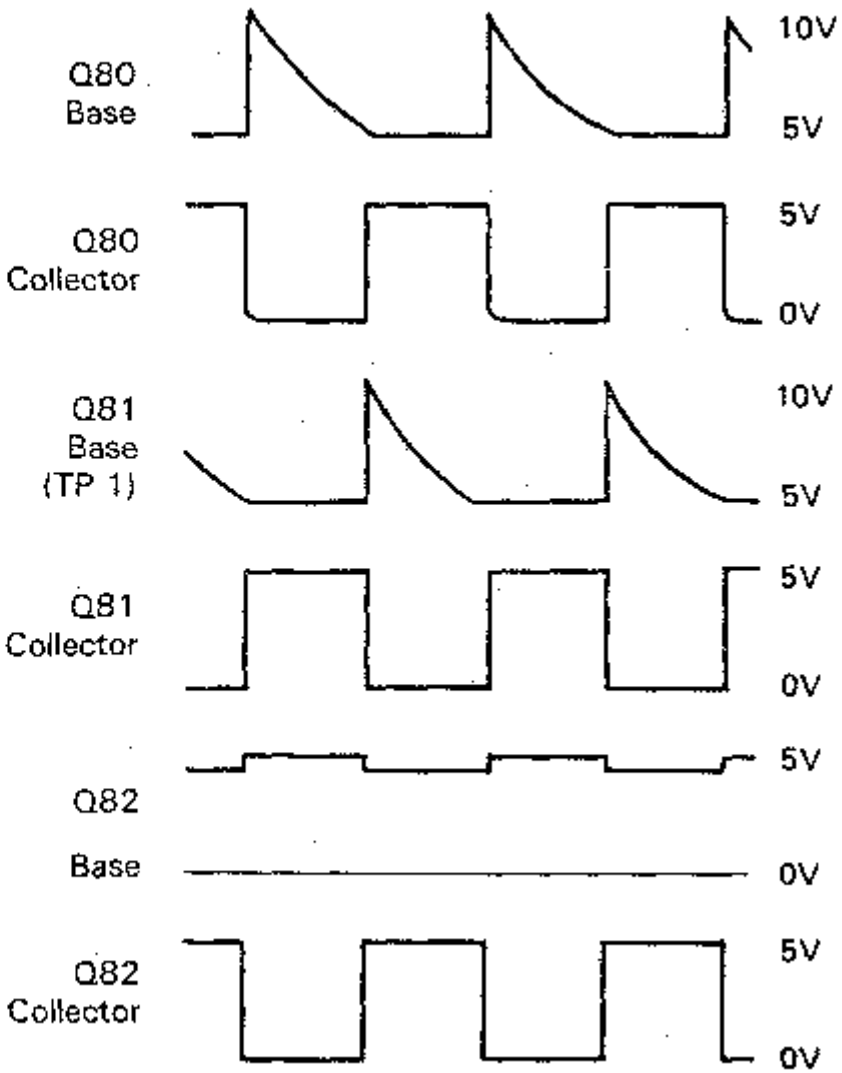
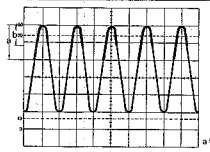
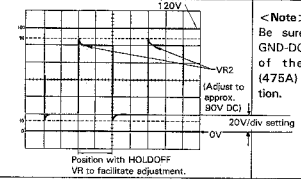
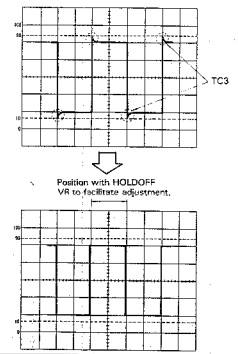
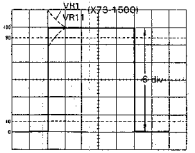


Fig. 7 CAL CIRCUIT WAVEFORMS

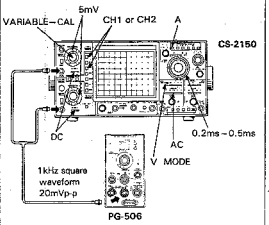
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
							
Adjustment of Auto FOCUS Level	VR2	X68-1400	475A Probe (1/10)	HORIZ DISPLAY: A A INTENSITY: Fully CW TRIG MODE: AUTO Vertical MODE: CH1 A SOURCE: V MODE A SWEEP TIME/DIV:20μs HOLDOFF: NORM	(1) Set the oscilloscope (475A) for the vertical axis sensitivity at 2V/div. (2) Observe the waveform of AUTO FOCUS circuit (Autofocus test point FTP marked pattern) with a probe and make adjustment so that DC level of top of the square wave is approx. 90V (4.5 – 5 div.)		<Note> Be sure that the AC-GND-DC selector switch of the oscilloscope (475A) is at "DC" position.
Adjustment of Auto FOCUS Wave Forming	TC3	X68-1400		HORIZ DISPLAY: A A INTENSITY: Fully CW TRIG MODE: AUTO Vertical MODE: CH1 A SOURCE: V MODE A SWEEP TIME/DIV: 20μs HOLDOFF: NORM	Make adjustment so that the above-mentioned circuit has an ideal waveform.		
Adjustment of ASTIG and FOCUS	VR9 FOCUS Knob	X81-1430		HORIZ DISPLAY: X-Y CH1, CH2 AC-GND-DC: GND A INTENSITY : 3 o'clock	(1) Operate ↕ POSITION for CH1 and CH2 so that the bright spot is brought into the center of the CRT screen. (2) Make adjustment to make the spot round and smaller. <**Check**> (1) Make sure that the bright spot grows larger when the FOCUS knob is turned CW or CCW. (2) Make sure that the FOCUS knob is in a position within the range of 9 and 3 o'clock when the spot is smallest. (3) The most ideal point should be obtained by repeating the above operations and adjustment.		<**Note**> Be sure to bring the bright spot into the center of the CRT screen. It may be difficult to obtain the correct adjusting position near the edge of the screen due to the CRT peripheral blur.

ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of Trace Rotation	VR8	X81-1430		HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO CH1 AC-GND-DC: GND	(1) Operate ▲▼ POSITION for CH1 to move the trace to the center of the CRT screen. (2) Make adjustment to align the trace with the horizontal center graticule line. **<Check>** (1) Make sure that the trace moves more than 0.5 div (10°) up and down from the horizontal center graticule line at its righthand end.		**<Note>** When the trace does not appear fully across the screen, make proper adjustment by operating VR9 (X74-1350) and VR7 (X74-1350).
Adjustment of CRT Center	VR3	X73-1510		HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO CH1 AC-GND-DC: GND	Short-circuit the test point of X73-1500 and adjust VR3 so that the trace becomes aligned with the horizontal center graticule line.		
ADJUSTMENT OF VERTICAL AXIS (I)							
Adjustment of CH1 DC BAL	VR2	X73-1500		HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO CH1 AC-GND-DC: GND CH1 VOLTS/DIV: 5mV CH1 X5 GAIN: PULL	(1) Turn CH1 VARIABLE knob to fully CCW. (2) Adjust CH1 ▲▼ POSITION so that the trace becomes aligned with the horizontal center graticule line on the CRT screen. (3) Turn CH1 VARIABLE to CAL and make adjustment so that the trace becomes aligned with the horizontal center graticule line on the CRT screen. (4) Repeat the above procedure. **<Check>** Movement of trace: less than 0.3 div.		**<Note>** If the trace does not come to the center of the screen even when ▲▼ position is operated, adjust VR6 (X73-1500).
Adjustment of CH2 DC BAL	VR12	X73-1500		HORIZ DISPLAY: A Vertical MODE: CH2 TRIG MODE: AUTO CH2 AC-GND-DC: GND CH2 VOLTS/DIV: 5mV CH2 X5 GAIN: PULL	Same with the adjustment of CH1 DC BAL.		**<Note>** CH2 position center can be adjusted by VR16 (X73-1500).
CH1 Waveform Shaping in the Low Range (5mV range)	VR1	X73-1500	BNC-BNC cord PG-506	HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO A SOURCE: V MODE CH1 AC-GND-DC: DC CH1 VOLTS/DIV: 5mV CH1 VARIABLE: CAL	(1) Apply a 1 kHz square wave signal to CH1 INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen. (2) Adjust VR1 to shape the square waveform in the low range.		
CH2 Waveform Shaping in the Low Range (5mV range)	VR11	X73-1500		HORIZ DISPLAY: A Vertical MODE: CH2 TRIG MODE: AUTO A SOURCE: V MODE CH2 AC-GND-DC: GND CH2 VOLTS/DIV: 5mV CH2 VARIABLE : CAL	With vertical MODE selected to CH2, perform the same operations as described above to make adjustment.		

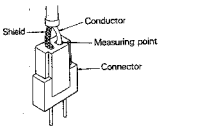
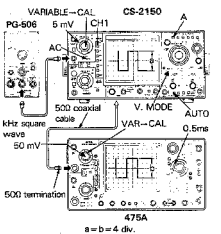
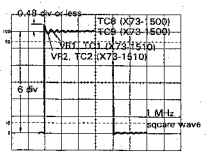
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of CH1 Gain	VR7	X73-1500	BNC-BNC cord (T junction) PG-506	HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO A SOURCE: V MODE CH1 AC-GND-DC: DC CH1 VOLTS/DIV: 5mV CH1 VARIABLE: CAL 20MHz BW: ON	(1) Apply a square wave signal of 20 mVp-p, 1 kHz to CH1 and CH2 INPUT. (2) Vertical MODE select to CH1 and operate CH1 ▲▼ POSITION to produce a waveform in the center of the CRT screen. (3) Synchronize by operating A trigger LEVEL. (4) Adjust VR7 so that the vertical amplitude of the waveform becomes 4 div. <Check> Turn CH1 VOLTS/DIV and input a reference signal so that the vertical amplitude will be 4 to 6 div in each range. Sensitivity error: within ±2%		<Refrence> Method of calculatin of sensitivity error Sensitivity error = $\frac{a-b}{b} \times 100\%$ a = CRT screen amplitude b = Input signal voltage : (VOLTS/DIV) (Example): CRT screen amplitude: 4.2 div Input signal: 20mVp-p 1 kHz square wave VOLTS/DIV: 5mV Sensitivity error = $\frac{4.2\text{div} - 20\text{mV}/5\text{mV}}{20\text{mV}/5\text{mV}} \times 100 = 5\%$ <Note> Overshoot or tilt might appear to the reference signal of 1 kHz square wave. In this case, make corase adjustment of square wave characteristics.
Adjustment of CH2 Gain	VR18	X73-1500		HORIZ DISPLAY: A Vertical MODE: CH2 TRIG MODE: AUTO A SOURCE: V MODE CH2 AC-GND-DC: DC CH2 VOLTS/DIV: 5mV CH2 VARIABLE: CAL 20MHz BW: ON	(1) With vertical MODE selected to CH2, turn VOLTS/DIV to 5 mV and perform the same operations as described above to make adjustment and check. <Check> (1) Select vertical MODE to DUAL and ALT position and turn VOLTS/DIV for CH1 and CH2 and apply a square wave of 20 mVp-p, 1 kHz to CH1 and CH2 INPUT jacks. Make sure that CH1 and CH2 have the same amplitude. (2) Switch vertical MODE to ADD and A SOURCE to CH1 (CH2) and press CH2 INV pushbutton switch (the lamp will go on when this switch is pressed). Operate ▲▼ POSITION for CH1 and CH2 to produce a single trace in the center of the CRT screen. If a single and straight trace cannot be obtained, adjust VR7 again. Channel error: within 2%		
Adjustment of CH3 Gain and CH4 Gain	VR21 VR23	X73-1500 X73-1500	PG506	HORIZ DISPLAY: A Vertical MODE: QUAD, ALT A SOURCE: 1/1 B SOURCE: 1/1 A SWEEP TIME/DIV: 0.2ms TRIG MODE: AUTO CH1, CH2 AC-GND-DC: GND	(1) Apply a 0.5Vp-p, 1 kHz square wave signal simultaneously to CH3 and CH4 INPUT jacks and adjust A trigger LEVEL and B trigger LEVEL to obtain synchronization. Operate CH3 and CH4 ▲▼ POSITION controls to bring the pattern to the center of the CRT screen. (2) Make adjustment so that the amplitude of CH3 and CH4 waveforms becomes 5 div respectively. <Check> (1) Sensitivity error must be within ±2%. (See to reference for the adjustment of CH1 Gain) (2) With A SOURCE and B SOURSE switches set to 1/10, make the 1 kHz square wave signal 5 Vp-p and operate CH3 and CH4 ▲▼ POSITION controls to bring the waveform to the center of the CRT screen. The amplitude at this time must be within the range of 4.9 ~ 5.1 div.		<Note> If tilt or overshoot occurs to the 1 kHz waveform, refer to the section devoted to CH3 and CH4 waveform shaping.

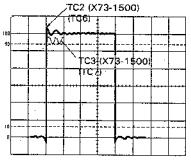
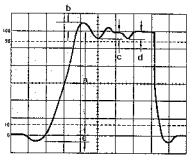
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of CH1 ▲ POSITION and CH2 ▲ POSITION	VR6 VR16	X73-1500 X73-1500		Vertical MODE: DUAL, ALT HORIZ DISPLAY: A TRIG MODE: AUTO CH1, CH2 VOLTS/DIV: 5mV CH1, CH2 AC-GND-DC: GND CH1, CH2 ▲ POSITION: 12 o'clock A SWEEP TIME/DIV: 0.1ms	Adjust VR6 and VR16 so that the CH1 and CH2 traces become aligned with the horizontal center graticule line on the CRT screen. <Check> (1) The deviation from the horizontal center graticule line on the CRT screen must be within ±1 div. (2) When ▲ POSITION controls for both CH1 and CH2 are turned fully CW, each trace must move upward more than 4 div and when the knobs are turned fully CCW the trace must move downward more than 4 div.		
Adjustment of CH2 INV Position	VR17	X73-1500			Press CH2 INV (the lamp is on) and adjust VR17 to bring the trace to its position at CH2 NORM (the lamp is off). <Check> (1) Vertical deviation between CH2 NORM and INV must be within ±0.5 div (2) Press CH2 INV and turn CH2 ▲ POSITION fully CW and see if the trace moves more than 4 div upward and it moves more than 4 div downward when the knob is turned fully CCW.		
Adjustment of CH3 ▲ POSITION and CH4 ▲ POSITION	VR22 VR24	X73-1500 X73-1500		HORIZ DISPLAY: A Vertical MODE: QUAD, ALT A SOURCE: 1/1 B SOURCE: 1/1 TRIG MODE: AUTO CH3, CH4 ▲ POSITION: 12 o'clock A SWEEP TIME/DIV: 0.1ms	Adjust VR22 and VR24 so that the CH3 and CH4 traces become aligned with the horizontal center graticule line on the CRT screen. <Check> (1) The deviation from the horizontal center graticule line on the CRT screen must be within ±1 div. (2) When ▲ POSITION controls for both CH3 and CH4 are turned fully CW, each trace must move upward more than 4 div and when the knobs are turned fully CCW, each trace must move downward more than 4 div.		
Adjustment of CH1 X5 Gain and CH2 X5 Gain	VR4 VR14	X73-1500 X73-1500	PG-506	HORIZ DISPLAY: A Vertical MODE: DUAL, ALT TRIG MODE: AUTO CH1, CH2 VOLTS/DIV: 5mV CH1, CH2 AC-GND-DC: DC CH1, CH2 X5 GAIN: PULL A SWEEP TIME/DIV: 0.2ms CH1, CH2 VARIABLE: CAL	(1) Apply a square wave signal of 5 mVp-p, 1 kHz to CH1 INPUT and make adjustment so that the CRT screen amplitude becomes 5 div. (2) Apply the same signal to CH2 and make the similar adjustment. <Check> (1) The sensitivity error must be within ±2% (2) For both CH1 and CH2, the lamp must go on when PULL X5 GAIN is pulled and go off when the knob is pressed. (3) The UNCAL lamp must go off when CH1 and CH2 VARIABLE controls are operated to CAL and go on when the knobs are turned to UNCAL. (CCW)		<Note> If no waveform appears on the screen when the knob is pulled, make coarse adjustment by operating X5 Gain Position Adjustment. CH1: VR5 (X73-1500) CH2: VR15 (X73-1500)
Adjustment of CH1 X5 Gain Position and CH2 X5 Gain Position	VR5 VR15	X73-1500 X73-1500		HORIZ DISPLAY: A Vertical MODE: DUAL, ALT TRIG MODE: AUTO CH1, CH2 VOLTS/DIV: 5mV CH1, CH2 AC-GND-DC: GND CH1, CH2 X5 GAIN: PULL CH1, CH2 ▲ POSITION: 12 o'clock A SWEEP TIME/DIV: 0.1ms	Adjust VR5 and VR15 so that the traces of CH1 and CH2 become aligned with the horizontal center graticule line on the CRT screen. <Check> The distance from the center graticule line must be within ±1 div.		<Note> If sometimes happens that the trace grows thicker at X5 GAIN, thus making it difficult to obtain proper adjustment. In this case, press 20 MHz BW (the lamp is on) button switch to make the line thinner.

ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of CH1 DC Trigger Level CH2 DC Trigger Level CH3 DC Trigger Level CH4 DC Trigger Level	VR10 VR19 VR1 VR2	X73-1500 X73-1500 X73-1520 X73-1520	DL-720	HORIZ DISPLAY: A Vertical MODE: QUAD CH1, CH2 AC-GND-DC: GND TRIG MODE: AUTO	(1) Operate CH1 and CH2 ▲▼ POSITION and CH3 and CH4 ▲▼ POSITION controls to align the trace with each other on the center of the CRT screen. (2) Make adjustment so that the voltage at all the check points may be zero (−0.008 − +0.008 V). Item of Adj / Adj control / Check point CH1 DC Trigger Level / VR10 / P15 (X73-1500) CH2 DC Trigger Level / VR19 / P16 (X73-1500) CH3 DC Trigger Level / VR1 / P17 (X73-1520) CH4 DC Trigger Level / VR2 / P18 (X73-1520)		<Note>. Use the connector lead for making measurement at the check points. Adjust the voltage in the conductor to zero.
Adjustment of V MODE Trigger DC Level	VR20	X73-1500		Vertical MODE: CH1 CH1 AC-GND-DC: GND	(1) Operate CH1 ▲▼ POSITION to align the trace with horizontal center graticule line on the CRT screen. (2) Make adjustment so that the voltage in the conductor of the connector P19 is zero (−0.008 ~ +0.008 V).		
Adjustment of CH1 OUT Gain	VR8	X73-1500	475A 50Ω Termination 50Ω Coaxial cable PG-506	HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO CH1 AC-GND-DC: AC CH1 VOLTS/DIV: 5mV CH1 VARIABLE: CAL	(1) Set the vertical axis sensitivity of oscilloscope (475A) to 50 mV and AC-GND-DC to DC. (2) Connect the cable to CH1 OUT on the rear panel of CS-2150 and oscilloscope (475A) via the 50Ω termination. (3) Apply a 1 kHz square wave signal to CH1 INPUT and adjust the oscillator output and ▲▼ POSITION so that the amplitude may be 2 div upward and downward from the horizontal center graticule line on the CRT screen. (4) Make adjustment so that the oscilloscope (475A) waveform becomes 4 div.		
Adjustment of CH1 OUT DC Level	VR9	X73-1500	DL-720	HORIZ DISPLAY: A Vertical MODE: CH1 CH1 AC-GND-DC: GND TRIG MODE: AUTO	(1) Operate CH1 ▲▼ POSITION to align the trace with the horizontal center graticule line on the CRT screen. (2) Make adjustment so that the voltage in the connector P21 (X73-1500) becomes less than 0V (±10 mV).		
Adjustment of Square wave Characteristics of CH3	VR1 TC1 VR2 TC2 TC8	X73-1510 X73-1510 X73-1510 X73-1510 X73-1500	PG-506 50Ω Termination	HORIZ DISPLAY: A Vertical MODE: QUAD, ALT TRIG MODE: AUTO CH1, CH2 AC-GND-DC: GND A SOURCE: CH3 1/1 A COUPLING: AC A SLOPE: +	(1) With A SOURCE to 1/1 (CH3) apply a 1 MHz square wave signal to CH3 INPUT and adjust the oscillator output to produce a square waveform of 6 div on the CRT screen. (2) Adjust VR1 and TC1 to shape the square waveform in the medium range. (3) Adjust VR2 and TC2 to shape the square waveform in the high range. (4) Adjust TC8 to shape the square waveform in the ultra-high range. <Check> Overshoot / less than 8%		<Note> When shaping the waveform, terminate the input terminal of oscilloscope to match the output impedance of the oscillator.

ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of Square wave Characteristics of CH4	TC9	X73-1500	PG-506 50Ω Termination	HORIZ DISPLAY: B DLY'D Vertical MODE: QUAD, ALT TRIG MODE: AUTO CH1, CH2 AC-GND-DC: GND B SOURCE: CH4 1/1 B COUPLING: AC B SLOPE: +	Apply a 1 MHz square wave signal to CH4 INPUT and take the same steps as in (4) above to shape the waveform. <Check> Overshoot | less than 8%		
Adjustment of Square wave Characteristics of CH1 5 mV Range	TC3 TC2	X73-1500 X73-1500	PG-506 50Ω 20dB Attenuator 60Ω Termination 50 Ω Coaxial cable (BNC-BNC)	HORIZ DISPLAY: A TRIG MODE: AUTO CH1 AC-GND-DC: DC CH1 VOLTS/DIV: 5mV A SOURCE: CH1 A COUPLING: AC A SLOPE: + CH1 VARIABLE: CAL	(1) Set vertical MODE to CH1 and repeatedly apply a 1 MHz square wave signal to CH1 INPUT from the square wave oscillator and adjust the oscillator output so that the amplitude becomes 6 div. In doing this, the input terminal must be terminated to match the output impedance of the oscillator. When the output impedance is 50 Ω terminate the 50 Ω termination. (2) Adjust TC3 to shape the square waveform in the high range. (3) Adjust TC2 to shape the square waveform in the ultra-high range. Overshoot | less than 8%		(1) Adjust A SWEEP TIME/DIV between 20 ns and 0.2 μs so that the waveform is visible. (2) As all measuring instruments are affected, repeat the adjustment individually.
Adjsutment of Square wave Characteristics of CH2 5 mV Range	TC7 TC6	X73-1500 X73-1500		HORIZ DISPLAY: A TRIG MODE: AUTO CH2 AC-GND-DC: DC CH2 VOLTS/DIV: 5mV A SOURCE: CH2 A COUPLING: AC A SLOPE: + CH2 VARIABLE: CAL	Set vertical MODE to CH2 and make adjustment as in the case of CH1. <Check> With VOLTS/DIV remaining at 5 mV, check the waveform quality when A SWEEP TIME/DIV is changed by varying the square wave frequency, from 100 kHz to 10 kHz, 1 kHz and back to 100 Hz sequentially. Overshoot | less than 8%	 a = 6 div. b = Overshoot c = Ringing d = Hall e = Pre-shoot	
CH1, CH2 Waveform Shaping in the Low Range (10 mV range)	TC1 TC5	X73-1500 X73-1500	PG-506 BNC-BNC cord	HORIZ DISPLAY: A Vertical MODE: CH1 or CH2 TRIG MODE: AUTO A SOURCE: V MODE CH1, CH2 AC-GND-DC: DC CH1, CH2 VOLTS/DIV: 10mV CH1, CH2 VARIABLE: CAL	(1) Apply a 1 kHz square wave signal to CH1 INPUT and adjust the oscillator output to produce a waveform of 5 ~ 6 div. In doing this, make adjustment so that the waveform quality of the 10mV range is equal to that of the 5 mV range. (2) Set vertical MODE to CH2 and make adjustment as in the case of CH1.		

ADJUSTMENT

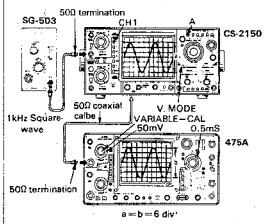
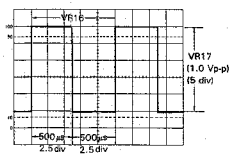
<table>
<tr><th>Item</th><th>Adjustment Control</th><th>P.C.B. No.</th><th>Test Equipment</th><th>Control Setting</th><th>Adjustment and Check</th><th>Illustration</th><th>Remark</th></tr>
<tr><td>Adjustment of CH1 ATT and CH2 ATT</td><td></td><td>S02-4502 -05</td><td>4343B PG-506</td><td>HORIZ DISPLAY: A
CH1, CH2 AC-GND-DC: DC
A SOURCE: V MODE
A SWEEP TIME/DIV: 0.2 ms
CH1, CH2 VARIABLE: CAL</td><td>(1) Shaping of waveform
Apply a 1 kHz square wave signal to CH1 and CH2 INPUT jacks and adjust the oscillator output to produce a waveform of 5~6 div. In doing this, make adjustment so that the waveform quality of each range is equal to that of the 5 mV range.
(2) Input capacity (22 pF±3 pF)
Connect a Q-meter (4343B) to CH1 and CH2 INPUT jacks and make adjustment so that the input capacity of each range is equal to that of the 5mV range.

CH1 and CH2 Reference range: 5mV Range
<table><tr><th>Sequence</th><th colspan="2">Adjustment</th><th>Adj. control</th></tr><tr><td>1</td><td>10mV range</td><td>Wave Shape</td><td>TC6</td></tr><tr><td>2</td><td>20mV range</td><td>Wave Shape</td><td>TC8</td></tr><tr><td>3</td><td>10mV range</td><td>Input Capacity</td><td>TC5</td></tr><tr><td>4</td><td>20mV range</td><td>Input Capacity</td><td>TC7</td></tr><tr><td>5</td><td>50mV range</td><td>Wave Shape</td><td>TC3</td></tr><tr><td>6</td><td>50mV range</td><td>Input Capacity</td><td>TC4</td></tr><tr><td>7</td><td>5V range</td><td>Wave Shape</td><td>TC1</td></tr><tr><td>8</td><td>5V range</td><td>Input Capacity</td><td>TC2</td></tr></table></td><td></td><td><Note>
Be sure to make the adjustment with the shield case being fitted in place.</td></tr>
<tr><td>CH3 Waveform Shaping</td><td>TC2 (A SOURCE 1/10)</td><td>X73-1520</td><td>PG-506</td><td>HORIZ DISPLAY: A
Vertical MODE: QUAD, ALT
A SOURCE: CH3 1/1
A SWEEP TIME/DIV: 0.2ms
TRIG MODE: AUTO
CH1, CH2 AC-GND-DC: GND</td><td>(1) Apply a 1 kHz square wave signal of fast rise time to CH3 INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen.
(2) With A SOURCE set to 1/10, produce a waveform of 6 div in the same manner and adjust TC3 to obtain the similar waveform as (1) above.</td><td></td><td></td></tr>
<tr><td>CH4 Waveform Shapping</td><td>TC6 (B SOURCE 1/10)</td><td>X73-1520</td><td></td><td>HORIZ DISPLAY: DUAL
Vertical MODE: QUAD, ALT
A SOURCE: CH3 1/1
B SOURCE: CH4 1/1
A SWEEP TIME/DIV: 0.2ms
B SWEEP TIME/DIV: 0.2ms</td><td>(1) Apply a 1 kHz square wave signal of fast rise time to CH4 INPUT and take the same steps as in (1) above to shape the waveform.</td><td></td><td></td></tr>
<tr><td>Adjustment of CH3 Input Capacity</td><td>TC3 (1/10)</td><td>X73-1520</td><td>4343B</td><td>A SOURCE: CH3 1/1</td><td>(1) Check that the input capacity of CH3 becomes equal to the value of CH1 5mV range (22 pF±3 pF).
(2) Make adjustment so that the input capacity of CH3 setted to 1/10 to become equal to that at 1/1.
<Check>
The difference between A SOURCE 1/1 and A SOURCE 1/10: less than 1pF.
It shall be the same with B SOURCE.</td><td></td><td><Note>
Be sure to make adjustment of input capacity after making 1 kHz square waveshape.</td></tr>
</table>

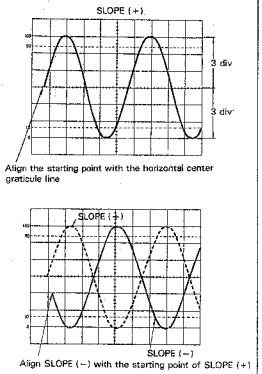
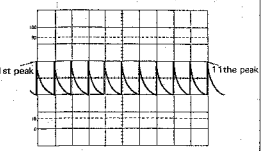
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of CH4 Input Capacity	TC7(1/10)	X73-1520	4343B	B SOURCE: CH4 1/1	Adjust the input capacity in the same manner as CH3. <**Check**> Check the input capacity in the same manner as CH3.		<**Note**> Be sure to make adjustment of input capacity after making 1 kHz square waveshape.
ADJUSTMENT OF VERTICAL AXIS (II)							
Check of 1 MHz Square wave Characteristics **Square wave Characteristics of CH1 and CH2**			PG-506 50Ω Termination	HORIZ DISPLAY: A A SOURCE: V MODE A SWEEP TIME/DIV: 0.2 μs ~ 20 ns TRIG MODE: AUTO A COUPLING: AC	(1) Check the square wave characteristics of CH1 and CH2 5 mV range. Turn the VOLTS/DIV knob for each channel to adjust the oscillator output so that CH1 and CH2 will produce a waveform of 6 div, respectively. (2) The overshoot must be less than 3% for each range.		<**Note**> As the VOLTS/DIV is manually rotated, the amplitude of 6 div cannot be obtained amplitude.
Square wave Characteristics of CH3 and CH4				HORIZ DISPLAY: DUAL, ALT Vertical MODE: QUAD, ALT A SOURCE: CH3 1/1 B SOURCE: CH4 1/1	(1) Apply a 1 MHz square wave signal to CH3 and CH4 INPUT jacks and see if the overshoot is less than 8% at this time. (2) The overshoot must be less than 8% when A SOURCE is turned from 1/1 to 1/10 and B SOURCE from 1/1 to 1/10.		
Check of CH1 and CH2 Frequency Characteristics			SG-503 50Ω Coaxial cable (BNC-BNC) 50Ω 20dB Attenuator 50Ω Termination	HORIZ DISPLAY: A TRIG MODE: AUTO A SOURCE: V MODE A COUPLING: AC CH1, CH2 AC-GND-DC: DC A SWEEP TIME/DIV: 2μs ~ 20 ns	(1) With CH1 VOLTS/DIV set to 5 mV, apply a sine wave signal of 50 kHz to INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen. (2) When the frequency is varied to 150 MHz with the oscillator output remaining unchanged, the amplitude on the screen must be over 4.25 div and there must be no sudden dips and peaks during attenuation. (3) Perform the same operations for CH2. Frequency characteristic | 150 MHz, less than − 3 dB (4) When the specification are not satisfied, readjust the 1 MHz square wave characteristics.		
Adjustment of CH3 and CH4 Frequency Characteristics	TC4 (CH3 1/10) TC8 (CH4 1/10)	X73-1520	SG-503 50Ω Termination 50Ω Coaxial cable (BNC-BNC)	HORIZ DISPLAY: DUAL Vertical MODE: QUAD, ALT TRIG MODE: AUTO A SOURCE: CH3 1/1 B SOURCE: CH4 1/1	(1) Apply a sine wave signal of 50 kHz to CH3 INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen. (2) When the frequency is changed to 100 MHz with the oscillator output remaining unchanged, the amplitude on the screen must be over 4.25 div. (3) With A SOURCE to 1/10 position adjust TC4 so that the amplitude at 100 MHz is within the specification limits. Frequency characteristic | 100 MHz, less than − 3 dB (4) Perform the same operations for CH4. (5) When the specification is not satisfied, readjust the 1 MHz square wave characteristics. (6) Perform the same adjustment for B SOURCE (TC8).		

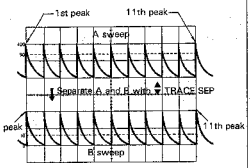
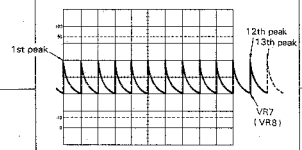
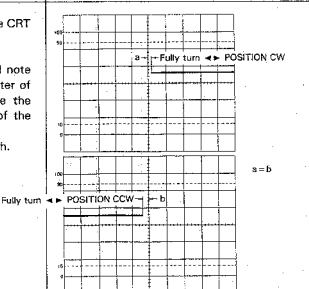
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Check of CH1 and CH2 X5 GAIN Frequency Characteristics			SG-503 50Ω Termination	HORIZ DISPLAY: A A SOURCE: V MODE TRIG MODE: AUTO CH1, CH2 AC-GND-DC: DC CH1, CH2 VOLTS/DIV: 5mV CH1, CH2 X5 GAIN: PULL	(1) With vertical MODE set to CH1, apply a sine wave signal of 50 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 6 div on the CRT screen. (2) When the frequency is varied to 100 MHz with the oscillator output remaining unchanged, the amplitude on the screen must be over 4.25 div. (3) Set vertical MODE to CH2 and make a similar check. X5 GAIN frequency characteristic: 100 MHz, less than −3 dB.		
Check of 20 MHz BW Frequency Characteristics			SG-503 50Ω Termination	HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE CH1 AC-GND-DC: DC CH1 VOLTS/DIV: 5mV 20 MHz BW: ON TRIG MODE: AUTO	(1) Apply a sine wave signal of 50 kHz to CH1 INPUT to produce a waveform of 6 div. (2) Vary the frequency of the input signal without changing to oscillator output and read the frequency at which the amplitude on the screen becomes 4.25 div. This frequency must be within the specification limits. 20 MHz BW frequency characteristics: frequency of −3dB:15MHz to 25MHz.		
Adjustment of CH1 OUT Frequency Characteristics	TC4	X73-1500	475A 50Ω Termination (through type) 50Ω Coaxial cord (BNC-BNC) SG-503	CH1 AC-GND-DC: AC CH1 VOLTS/DIV: 5mV CH1 ▲ POSITION: 12 o'clock	(1) With the vertical axis sensitivity of 475A set to 50 mV, lead a 50Ω coaxial cable from CH1 OUT and terminate it with 50Ω termination and connect it to CH1 OUT of 475A. (2) Apply a sine wave signal of 50 kHz to CH1 INPUT and adjust the oscillator output so that the vertical amplitude of 475A becomes 6 div. When the frequency is varied to 100 MHz without changing the oscillator output, adjust TC4 so that the amplitude on the CRT screen of 475A becomes over 4.25 div. CH1 OUT frequency characteristic: 100 MHz, less than −3 dB		<Note> If the square wave characteristics of CH1 PREAMP and V. OUTPUT AMP are readjusted the square wave characteristic and frequency characteristic will also change.
Adjustment of CAL Output	VR16 VR17	X74-1350 X74-1350	475A FC-756 DL-720		(1) Short-circuit TP1 (X74-1350) and adjust VR17 so that the voltage at CAL output terminal becomes 1.0 V ±1%. (2) Set the vertical axis sensitivity of 475A to 20 mV and the sweep time to 0.2 ms. (3) Lead a probe from the calibration voltage output terminal (CAL) of CS-2150 and connect it to CH1 INPUT of 475A. (4) Adjust VR16 so that the frequency becomes 1 kHz. <Check> Frequency: within 1 kHz ±3%. Output voltage: within 1.0 Vp-p ±1%. Duty ratio: within (50 ±2)%		<Note> For checking the frequency, a frequency counter (FC-756) may be used.

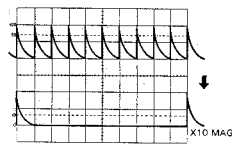
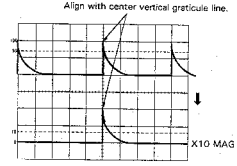
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
ADJUSTMENT OF HORIZONTAL SWEEP							
Coarse Adjustment of A and B Trigger Center and SLOPE **Coarse Adjustment of A Trigger Center and SLOPE**	VR2 VR4	X77-1280 X77-1280	SG-502	HORIZ DISPLAY: A Vertical MODE: CH1 TRIG MODE: AUTO CH1 AC-GND-DC: AC A SWEEP TIME/DIV: 0.2ms A SOURCE: V MODE A COUPLING: AC A trigger LEVEL: 12 o'clock A SLOPE: +	(1) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscilloscope output and ▲▼ POSITION to produce a waveform of amplitude 3 div above and below the horizontal center graticule line on the CRT screen. (2) Adjust VR2 so that the starting point of the waveform is aligned with the horizontal center graticule line on the CRT screen. (3) Set A SLOPE to (−) and adjust VR4 to bring the starting point to the position of the starting point of the waveform produced when A SLOPE is set to (+).		
Coarse Adjustment of B Trigger Center and SLOPE	VR2 VR3	X77-1280 X77-1290	SG-502	HORIZ DISPLAY: DUAL Vertical MODE: CH1 A SOURCE: V MODE B SOURCE: CH1 B COUPLING: AC B trigger LEVEL: 12 o'clock B SLOPE: + A SWEEP TIME/DIV: 0.5 ms B SWEEP TIME/DIV: 0.2 ms TRIG MODE: AUTO ▲▼ TRACE SEP: NORM	(1) Set A INTENSITY to fully CCW. (2) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output and ▲▼ POSITION to produce a waveform of amplitude 3 div above and below the horizontal center graticule line on the CRT screen. (3) Adjust VR2 so that the starting point of the waveform is aligned with the horizontal center graticule line on the CRT screen. (4) Next, set B SLOPE to (−) and adjust VR3 to bring the starting point of the waveform to the position of the starting point of the waveform produce when B SLOPE is set to (+).		
Adjustment of A Sweep Time	VR9	X74-1350	TG-501 50Ω Termination	HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE A SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO A VARIABLE: CAL	(1) Apply a marker signal of 0.5 ms to CH1 INPUT. (2) Operate ◄► POSITION to bring the first peak of the marker signal to the left end of the graticule line and adjust VR9 for the 11th peak to the right end of the graticule line.		<Note> (1) When TG-501 is used, set CH1 AC-GND-DC to AC, VOLTS/DIV to 0.5 V/div, thru 50Ω termination. (2) If the 11th peak is not visible, adjust VR7 (X74-1350) for A sweep length adjustment.

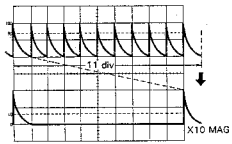
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of B Sweep Time	VR10	X74-1350	TG-501 50Ω Termination	HORIZ DISPLAY: DUAL Vertical MODE: CH1 A SOURCE: V MODE B SOURCE: CH1 A SWEEP TIME/DIV: 0.5ms B SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO A, B SLOPE: + A, B INTENSITY: Fully CW DELAY TIME MULT: 0.20	(1) Apply a marker signal of 0.5 ms to CH1 INPUT. (2) On the screen A and B sweeps of CH1 input signal will appear. Operate ▲▼ TRACE SEP to bring these sweeps into the positions where they can be easily adjusted. (3) Make adjustment so that the first peak of B sweep is brought to the left end of the graticule line on the screen and the 11th peak to the right end of graticule line on the screen. (4) Make sure that A and B TRIG'D lamps are on.		<Note> 1. When TG-501 is used, the knobs must be operated in the same manner as described above. 2. If the 11th peak is not visible adjust VR8 (X74-1350) for B sweep length adjustment. 3. The B sweep time will not change even if A VARIABLE is turned.
Adjustment of A Sweep Length	VR7	X74-1350	TG-501 50Ω Termination	HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE A SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO	(1) Apply a marker signal of 0.5 ms to CH1 INPUT. (2) Make adjustment so that the total length is 12 div.		<Note> Turn ◄► POSITION to shift the base line two markers to the left then you can see the 12th time marker with the graticule area.
Adjustment of B Sweep	VR8	X74-1350		HORIZ DISPLAY: DUAL Vertical MODE: CH1 A SOURCE: V MODE B SOURCE: CH1 A SWEEP TIME/DIV: 0.5ms B SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO A, B SLOPE: + A, B INTENSITY: Fully CW DELAY TIME MULT: 0.20	(1) Apply a marker signal of 0.5 ms to CH1 INPUT. (2) A and B sweeps will appear on the screen. Use ▲▼ TRACE SEP to separate them. (3) Make adjustment so that the total length of B sweep is 12 div.		
Adjustment of A Sweep Position	VR11	X74-1350		HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE A SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO	(1) Set CH1 AC-GND-DC to GND to bring the trace to the center of the CRT screen. (2) Set the FINE knob of ◄► POSITION to 12 o'clock. (3) Turn ◄► POSITION fully CW without turning the FINE knob and note the deviation between the starting point of the trace and the center of the screen. Next, turn ◄► POSITION fully CCW and measure the distance between the ending point of the trace and the center of the screen. Make adjustment so that these deviations will have the same width. Width error | less than 1 div.		

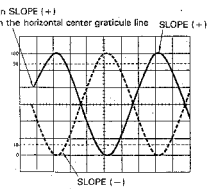
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of B Sweep Position	VR12	X74-1350	TG-501 50Ω Termination	HORIZ DISPLAY: DUAL Vertical MODE: CH1 A SOURCE: V MODE B SOURCE: CH1 A,B SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO A, B SLOPE: + A, B INTENSITY: Fully CW DELAY TIME MULT: 0.20	(1) Apply a marker signal of 0.5 ms to CH1 INPUT and align the first peak of A sweep to the leftmost division of the CRT screen. (2) Operate ▲▼ TRACE SEP to separate A sweep and B sweep and set A VARIABLE to CAL. (3) Make adjustment so that the starting point of B sweep is aligned with that of A sweep in the horizontal position. **<Check>** Operate ▲▼ TRACE SEP so that A sweep and B sweep are superimposed on one another and make sure that their starting points coincide with each other.		
Adjustment of X10 MAG Gain	VR13	X74-1350	TG-501 50Ω Termination	HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE A SWEEP TIME/DIV: 0.1ms TRIG MODE: AUTO CH1 VOLTS/DIV: 1V CH1 AC-GND-DC: DC	(1) Apply a marker signal of 0.1 ms to CH1 INPUT to produce a waveform of vertical amplitude of about 2 div. (2) Align the first peak of the marker signal with the left end of the graticule line on the CRT screen and the 11th peak with the right end and pull the X10 MAG switch. (3) Make adjustment so that the peak-to-peak distance is 10 div. **<Check>** Specification: 10 times ±5%		
Adjustment of X10 MAG Center	VR14	X74-1350		HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE A SWEEP TIME/DIV: 0.1ms A VARIABLE: CAL TRIG MODE: AUTO A SLOPE: +	(1) Apply a marker signal of 0.5 ms to CH1 INPUT to produce 3 peaks waveform on the CRT screen. (2) Operate ◄► POSITION to bring the central peak to the vertical center graticule line on the screen. (3) Make adjustment so that the waveform will be aligned with the vertical center graticule line on the screen when the FINE knob is pulled out (X10 MAG position). **<Check>** Repeatedly push and pull the FINE knob to make sure that the center of the waveform does not move. Deviation: less than 1 div.		
Adjustment of MAG Center and Gain					Recheck the center at X10 MAG and Gain.		
Adjustment of A Sweep Time, 50ms, 5μs and 0.1μs.	VR2 (50ms) VR1 (5μs) TC1 (0.1μs)	X74-1350 X74-1350 X74-1350	TG-501 50Ω Termination	HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE TRIG MODE: AUTO A VARIABLE: CAL	(1) With A SWEEP TIME/DIV set to 50ms apply a marker signal of 50ms to CH1 INPUT. (2) Adjust VR2 so that the first peak of the marker signal is aligned with the left end of the graticule on the screen and the 11th peak with the right end. (3) Next, rotate the A SWEEP TIME/DIV to 5μs and apply a 5μs time marker to CH1 INPUT and adjust VR1 in the same manner as (2). (4) Next, A SWEEP TIME/DIV to 0.1μs and with 0.1μs time marker to CH1 INPUT, adjust TC1 in the same manner as (2).		

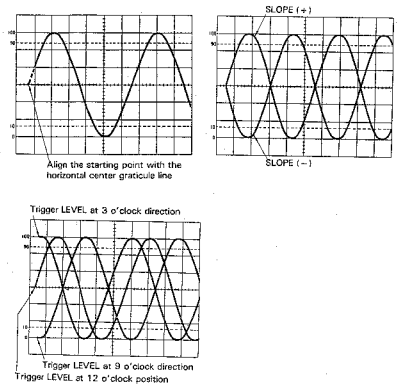
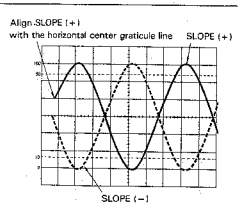
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of B Sweep Time 50ms, 5μs and 0.1μs	VR4 (50ms) VR3 (5μs) TC2 (0.1μs)	X74-1350 X74-1350 X74-1350	TG-501 50Ω Termination	HORIZ DISPLAY: DUAL Vertical MODE: CH1 A SOURCE: V MODE B SOURCE: CH1 A,B SWEEP TIME/DIV: 0.5ms TRIG MODE: AUTO A, B SLOPE: + A, B INTENSITY: Fully CW DELAY TIME MULT: 0.20	(1) Set A and B SWEEP TIME/DIV to 50ms and apply a marker signal of 50ms to CH1. (2) Operate ▲▼ TRACE SEP to separate A sweep and B sweep to be in the positions where adjustment can be made easily. (3) Adjust VR4 so that the first peak of the marker signal is aligned with the left end of the graticule line on the screen and the 11th peak with the right end. (4) Rotate A and B SWEEP TIME/DIV to 5μs and apply a 5μs time marker to CH1 INPUT and adjust VR3 in the same manner as (3). (5) Next, A and B SWEEP TIME/DIV to 0.1μs and with 0.1μs times marker to CH1 INPUT, adjust TC2 in the same manner as (3).		
Adjustment of 20ns A Sweep Linearity	TC3 TC5	X74-1350		HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE A SWEEP TIME/DIV: 20ns A VARIABLE: CAL TRIG MODE: AUTO A SLOPE: +	(1) Apply a marker signal of 20ns to CH1 INPUT. (2) Make adjustment so that the total length of the waveform is 11 div. (3) Adjust TC5 to align the first peak of the marker signal with the left end of the graticule line and 2nd peak of marker signal with the right end of the graticule line when the FINE knob pulled out (×10 MAG position).		
Adjustment of 20ns B Sweep Linearity	TC4 TC6	X74-1350		HORIZ DISPLAY: DUAL Vertical MODE: CH1 A SOURCE: V MODE B SOURCE: CH1 TRIG MODE: AUTO A, B SLOPE: + A, B INTENSITY: Fully CW DELAY TIME MULT: 1.00	(1) With A and B SWEEP TIME/DIV to 20ns, apply a marker signal of 20ns to CH1 INPUT. (2) Operate ▲▼ TRACE SEP to separate A sweep and B sweep into the positions where they can be easily adjusted. (3) Make adjustment so that the total length of the waveform is 11 div. (4) Adjust TC6 to align the first peak of the marker signal with the left end of the graticule line and 2nd peak of marker signal with the right end of the graticule line when the FINE knob pulled out (×10 MAG position).		
Check of Sweep Time Error in All the Range **(I)**				HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE TRIG MODE: AUTO A VARIABLE: CAL	(1) Apply a reference time marker signal for each range of A SWEEP TIME/DIV. (2) Measure the time error rate and make sure it is within the specification limits. Specification | within ±2%.		
(II)				HORIZ DISPLAY: DUAL Vertical MODE: CH1 A SOURCE: V MODE B SOURCE: CH1 A VARIABLE: CAL TRIG MODE: AUTO A, B SLOPE: + A, B INTENSITY: Fully CW DELAY TIME MULT: 1.00	(1) Operate ▲▼ TRACE SEP to separate A sweep and B sweep into the positions where they can be easily adjusted. (2) Apply a reference time marker signal in each of all the ranges (50ms – 20ns) of B sweep. (3) Measure the time error rate and make sure it is within the specification limits. Specification | within ±2%.		

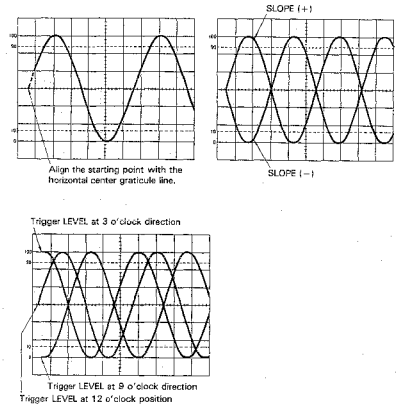
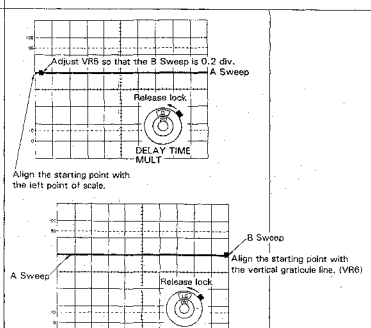
ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
ADJUSTMENT OF X-Y OPERATION							
Adjustment of X Position Center	VR15	X74-1350		HORIZ DISPLAY: A Vertical MODE: DUAL, ALT CH1, CH2 VOLTS/DIV: 5mV CH1, CH2 AC-GND-DC: GND A SOURCE: CH1 TRIG MODE: AUTO A SWEEP TIME/DIV: 0.1ms	(1) Operate ▲▼ POSITION for both CH1 and CH2 to superimpose the two traces on one another in the center of the CRT screen. (2) Make adjustment so that the bright spot comes to the center of the screen when HORIZ DISPLAY is switched in X-Y. <Check> Operate CH2 ▲▼ POSITION and make sure that the spot will move as described below. (1) When the knob is turned counterclockwise, the spot moves leftward more than 5 div. (2) When the knob is turned clockwise, the spot moves rightward more than 5 div. Distance between the spot and the center of screen. — within ±1 div from the center of the screen.		<Note> When making X-Y adjustment, do not set both CH1 and CH2 to X5 GAIN.
Adjustment of X Gain	VR25	X73-1500	PG-506	HORIZ DISPLAY: X-Y CH2 AC-GND-DC: AC CH2 VOLTS/DIV: 5mV	Apply a square wave signal of 20 mVp-p, 1 kHz to CH2 INPUT and make adjustment so that the horizontal amplitude is 4 div.		
Readjustment of X Position Center and X Gain					Readjust X position Center and X Gain.		
Check of X Axis Frequency Characteristic			SG-502	HORIZ DISPLAY: X-Y CH2 AC-GND-DC: DC CH2 VOLTS/DIV: 5mV	(1) Apply a sine wave signal of 1 kHz to CH2 INPUT and adjust the oscillator output to produce a waveform of 10 div. (2) When the frequency is varied to 5 MHz without changing the oscillator output, the amplitude must be over 7.1 div (−3 dB). Frequency characteristic — DC to 5 MHz, less than −3 dB.		
ADJUSTMENT OF TRIGGERING							
Adjustment of A Slope	VR4	X77-1280	SG-502	HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE A COUPLING: AC CH1, CH2 AC-GND-DC: AC CH1, CH2 VOLTS/DIV: 5mV A SWEEP TIME/DIV: 0.2ms A SLOPE: + TRIG MODE: AUTO	(1) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4 – 6 div on the CRT screen. (2) Operate A trigger LEVEL and CH1 ▲▼ POSITION so that the waveform may have an amplitude equaliy above and below the horizontal center graticule line on the CRT screen. (3) Set A SLOPE to (−) and make adjustment so that the starting point of the waveform will be in the position of the starting point of the waveform when A SLOPE is in the (+) position. <Check> (1) Repeatedly turn the A SLOPE knob from (+) to (−) and make sure that the starting points are in the same positions. (2) Make sure that the rise slope of the waveform will be synchronized when the A SLOPE knob is in the (+) position and the fall slope will be synchronized when the knob is in the (−) position. (3) Feed the same signal to CH2 and set vertical MODE to CH2 to produce a waveform of CH2 and make sure that the rise slope of the waveform is synchronized when the A SLOPE knob is at (+) and the fall slope is synchronized when it is at (−) position.		

ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment A Trigger Level Center and Fix Sensitivity	VR2 VR3	X77-1280 X77-1280	SG-502	HORIZ DISPLAY: A Vertical MODE: CH1 A SOURCE: V MODE A COUPLING: AC CH1, CH2 AC-GND-DC: AC CH1, CH2 VOLTS/DIV: 5mV A SWEEP TIME/DIV: 0.2ms A SOURCE: + TRIG MODE: AUTO	(1) Set A trigger LEVEL to 12 o'clock. (2) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4 ~ 6 div on the CRT screen. (3) Operate CH1 ▲▼ POSITION to move the waveform so that its amplitude is equally above and below the horizontal center graticule line on the CRT screen. (4) Adjust VR2 so that the starting point of the waveform is on the horizontal center graticule line on the CRT screen. (5) Pull FIX knob and adjust the sine wave input signal of CH1 to obtain a waveform of 1 div. (6) When A SLOPE is alternately turned to (+) and (−), adjust VR3 to synchronize. (7) Repeat (2) ~ (6) procedures for several times. <Check> (1) When A SLOPE is alternately turned to (+) and (−), the starting point must be always on the horizontal center graticule line. (2) With A SLOPE remaining in the position of (+), turn trigger LEVEL clockwise toward 3 o'clock from near 9 o'clock and see if the waveform is as shown at right. (3) Adjust the oscillator output so that the waveform amplitude becomes 0.5 div and make sure that synchronization can be obtained by A trigger LEVEL.		
Adjustment of 150 MHz Trigger	TC1 TC1	X77-1280 X77-1290	SG-503	A, B SOURCE: CH1	(1) Apply a 150 MHz sine wave signal to CH1 INPUT and adjust the oscillator output to produce a waveform of 2 div on the CRT screen. (2) Adjust TC1 so that the waveform is synchronized at 2 div. <Check> Adjust the oscillator output so that the waveform amplitude becomes 1.5 div and make sure that synchronization can't be obtained by trigger LEVEL.		
Adjustment of B Slope	VR3	X77-1290	SG-502	HORIZ DISPLAY: DUAL Vertical MODE: CH1 A SOURCE: V MODE B SOURCE: CH1 A, B COUPLING: AC CH1, CH2 AC-GND-DC: AC CH1, CH2 VOLTS/DIV: 5mV A,B SWEEP TIME/DIV: 0.2ms A VARIABLE: CAL A, B SLOPE: + TRIG MODE: AUTO A, B INTENSITY: Fully CW	(1) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4 ~ 6 div on the CRT screen. (2) Operate A trigger LEVEL, B trigger LEVEL and CH1 ▲▼ POSITION to move waveform so that its amplitude is equally above and below the horizontal center graticule line on the screen. (3) Set A INTENSITY to CCW and B INTENSITY to an arbitrary position near 3 o'clock. (4) Set B SLOPE to (−) and make adjustment so that the starting point of the waveform comes to the same position of the starting point of waveform when B SLOPE is in the (−) position. <Check> (1) Turn B SLOPE knob alternately to (+) and (−) and make sure that the starting point is always on the horizontal center graticule line. (2) When B SLOPE is in the (+) position, the rise slope of the waveform should be synchronized and its fall slope be synchronized at (−). (3) Apply the same signal to CH2 and set vertical MODE to CH2 to produce a waveform of B sweep of CH2 on the screen to make sure that the rise slope of the waveform is synchronized when B SLOPE is at (+) and the fall slope is synchronized at (−).		

ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
Adjustment of B Trigger Level Center	VR2	X77-1290	SG-502	HORIZ DISPLAY: DUAL Vertical MODE: CH1 A, B COUPLING: AC CH1, CH2 AC-GND-DC: AC CH1, CH2 VOLTS/DIV: 5mV A,B SWEEP TIME/DIV: 0.2ms A VARIABLE: CAL B SOURCE: CH1	(1) Turn B trigger LEVEL knob to 12 o'clock. (2) Apply a sine wave signal of 1 kHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4 – 6 div on the CRT screen. (3) Operate CH1 ▲▼ POSITION so that the waveform has an amplitude equally above and below the horizontal center graticule line on the screen. (4) Turn A INTENSITY to CCW and B INTENSITY to position near 3 o'clock and make adjustment so that the starting point of the waveform is on the horizontal center graticule line. <Check> (1) Turn B SLOPE alternately to (+) and (–) and make sure that the starting point of the waveform is always on the horizontal center graticule line. (2) With B SLOPE knob remaining in the (+) position, turn trigger LEVEL knob clockwise toward 3 o'clock from near 9 o'clock and see if the waveform appear as shown at right. (3) Adjust the oscillator output so that the waveform amplitude becomes 0.5 div and make sure that synchronization is obtained at this time by operating B trigger LEVEL.		
Adjustment of DELAY TIME MULT	VR5 VR6	X74-1350 X74-1350		HORIZ DISPLAY: ALT Vertical MODE: CH1 CH1 AC-GND-DC: GND TRIG MODE: AUTO A SWEEP TIME/DIV: 0.1ms B SWEEP TIME/DIV: 1μs ▲▼ TRACE SEP: NORM STARTS AFTER DELAY: PULL	(1) Set DELAY TIME MULT to 0.20. (2) Operate A INTENSITY and B INTENSITY properly to make B trace brighter and A trace light dimmer. (3) Operate ◄► POSITION to bring the starting point of A trace to the left end of the graticule line on the CRT screen. (4) Make adjustment so that B trace may appear as shown at right. (5) Next, set DELAY TIME MULT to 10.00. (6) Repeat (1) thru (5) 2 or 3 times. <Check> Set DELAY TIME MULT to 5.00 and make sure that the starting point of B trace is in a position within 5 div ±0.2 div from the left end of the screen.		

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
OPERATING CHECKS							
Check of Current CAL			Current probe P6302 AM503 475A		Touch a current proble to current CAL terminal on the rear panel to make sure that the calibration current is 1 kHz ±3% and 10 mA ±2%.		
Check of Trigger Sensitivity			SG-502 SG-503 475A	Vertical MODE: CH1 CH1 VOLTS/DIV: 5mV A, B SWEEP TIME/DIV: arbitrary position CH1 AC-GND-DC: AC TRIG MODE: NORM	(1) Make measurements of trigger sensitivity according to the table given next page. (For both A and B sweeps) **[I] A Sweep, INT** (1) Set HORIZ DISPLAY to A and A SOURCE to CH1. (2) Apply a sine wave signal to CH1 INPUT, vary the oscillator output and operate A trigger LEVEL to measure the minimum synchronizing amplitude on the CRT screen. When doing this, make sure that the A TRIG' D lamp is on. Check synchronization by each check frequency. **[II] B Sweep, INT** (1) Set HORIZ DISPLAY to B DLY'D, A SOURCE to CH1 and B SOURCE to CH1. (2) Apply a sine wave to CH1 INPUT, vary the oscillator output and operate B trigger LEVEL to measure the minimum synchronizing amplitude. When doing this, make sure that the A TRIG'D and B TRIG'D lamps are on. Check synchronization by each frequency. **[III] A Sweep, EXT** (1) Set HORIZ DISPLAY to A and A SOURCE to EXT 1/1 or 1/10. (2) Apply a signal of the same voltage simultaneously to CH1 and CH3 INPUT jacks. (3) Operate CH1 VOLTS/DIV to produce a waveform of 6 div on the CRT screen. (4) Vary the oscillator output and operate A trigger LEVEL to measure the minimum synchronizing amplitude by the oscilloscope (475A). Check synchronization by each check frequency. When doing this, make sure that A TRIG'D lamp is on. **[IV] B Sweep, EXT** (1) Set HORIZ DISPLAY to ALT, A SOURCE to CH1 and B SOURCE to EXT 1/1 or 1/10. (2) Apply a signal of the same voltage simultaneously to CH1 and CH4 INPUT jacks. (3) Operate CH1 VOLTS/DIV to produce a waveform of 6 div on the CRT screen. (4) Operate B trigger LEVEL and A trigger LEVEL to synchronize both A sweep and B sweep. (5) Vary the oscillator output and operate B trigger LEVEL and measure the minimum synchronizing amplitude by the oscilloscope (475A). Check synchronization by each check frequency. (6) Make sure that the B TRIG'D lamp is on.		

ADJUSTMENT

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark

[V] Check of trigger sensitivity

COUPLING	FREQ. RANGE (Hz)	Trig. sensitivity (Min. sync amplitude)		
		SOURCE V. MODE (CH1 or CH2)	SOURCE EXT 1/1	SOURCE EXT 1/10
AC	20Hz ~ 20MHz ~ 50MHz ~ 150MHz	0.5div 1div 2.0div	50mVp-p 100mVp-p 280mVp-p	0.5Vp-p 1Vp-p 2.8Vp-p
DC	DC ~ 20MHz ~ 50MHz ~ 150MHz	0.5div 1div 2.0div	50mVp-p 100mVp-p 280mVp-p	0.5Vp-p 1Vp-p 2.8Vp-p
AC HF_{REJ}	1kHz 1MHz	0.5div Not to be synchronized at 1div	50mVp-p Not to be synchronized at 100mVp-p	0.5Vp-p Not to be synchronized at 1Vp-p
AC LF_{REJ}	1MHz 1kHz	0.5div Not to be synchronized at 1div	50mVp-p Not to be synchronized at 100mVp-p	0.5Vp-p Not to be synchronized at 1Vp-p
VIDEO	VIDEO signal FRAME LINE	0.5div	50mVp-p	0.5Vp-p

[VI] Check of trigger sensitivity by TRIG MODE

HORIZ DISPLAY: A, A SOURCE: AC

TRIG MODE	FREQ. RANGE (Hz)	Trig. sensitivity (Min. sync amplitude)		
		SOURCE V. MODE (CH1 or CH2)	SOURCE EXT 1/1	SOURCE EXT 1/10
AUTO	50Hz ~ 20MHz ~ 50MHz ~ 150MHz	0.5div 1div 2.0div	50mVp-p 100mVp-p 280mVp-p	0.5Vp-p 1Vp-p 2.8Vp-p
FIX	40Hz ~ 20 MHz ~ 150MHz	1.5div 3.0div	150mVp-p 420mVp-p	1.5Vp-p 4.2Vp-p

[VII] Check of trigger source (A sweep)

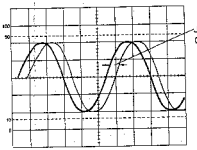
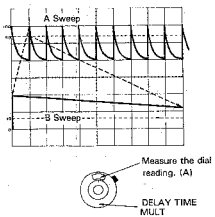
1 TRIG MODE: AUTO, HORIZ DISPLAY: A

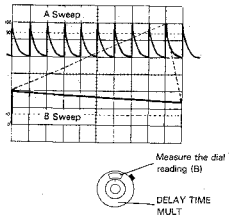
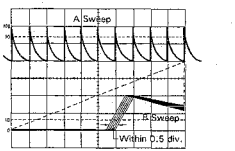
2 Applied different signals to CH1 ~ CH4 and operate A SOURCE as described below and make sure to operate as follow.

A SOURCE	Operation
V. MODE	Vertical MODE ~ CH1, The signal of CH1 is synchronized with A sweep Vertical MODE → CH2, The signal of CH2 is synchronized with A sweep Vertical MODE ~ DUAL, ALT When the signals of CH1 and CH2 are superimposed on one another they are synchronized with the A sweep of CH1 and CH2, respectively, but there will be no synchronization when there is no signal Vertical MODE ~ DUAL, CHOP, No Sync. Vertical MODE ~ ADD Synchronized with the signal of CH2 when CH1 + CH2 (CH1 ~ CH2 at CH2 INV) Vertical MODE ~ QUAD, ALT When the signals of CH1 ~ CH4 are superimposed on one another on the CRT screen, the signals will be synchronized with the A sweep of CH1 ~ CH4 respectively but there will be no sync when there is no signal. Vertical MODE → QUAD, CHOP, No Sync.
CH1	The signal of CH1 is synchronized with A sweep
CH2	The signal of CH2 is synchronized with A sweep
EXT1/1	The signal of CH3 is synchronized with A sweep
EXT 1/10	The signal of CH3 is attenuated to 1/10 and synchronized with A sweep.

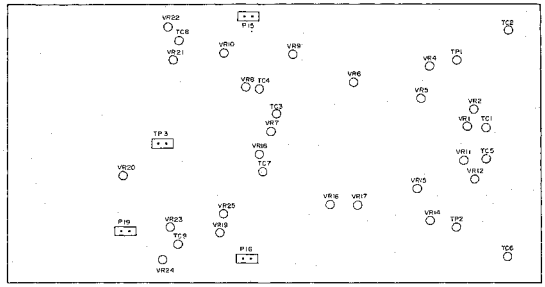
3 Check sync by the lighting of A TRIG'D lamp.

ADJUSTMENT

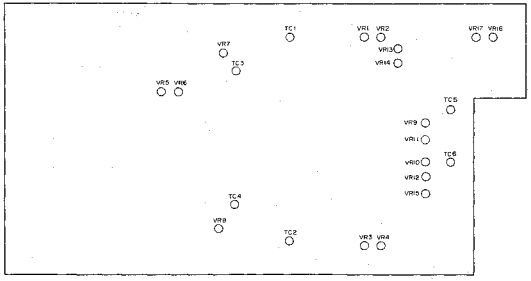
<table>
<tr><th>Item</th><th>Adjustment Control</th><th>P.C.B. No.</th><th>Test Equipment</th><th>Control Setting</th><th>Adjustment and Check</th><th>Illustration</th><th>Remark</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>[VIII] Check of trigger source (B sweep)
(1) Set HORIZ DISPLAY to A, TRIG MODE to AUTO, Vertical MODE to DUAL, ALT and A SOURCE to V MODE.
(2) Apply different signals to CH1, CH2 and CH4 and superimpose the signals of CH1 and CH2 on one another on the CRT screen and synchronize them by A trigger LEVEL.
(3) Set HORIZ DISPLAY to B DLY'D and operate B SOURCE as described below to check the synchronization.
<table>
<tr><th>B SOURCE</th><th>Operation</th></tr>
<tr><td>CH1</td><td>The signal of CH1 is synchronized with B sweep.</td></tr>
<tr><td>CH2</td><td>The signal of CH2 is synchronized with B sweep.</td></tr>
<tr><td>EXT 1/1</td><td>The signal of CH4 is synchronized with B sweep.</td></tr>
<tr><td>EXT 1/10</td><td>The signal of CH4 is attenuated to 1/10 and synchronized with B sweep.</td></tr>
</table>
(4) Make sure that the B TRIG'D lamp is on.</td><td></td><td></td></tr>
<tr><td>Check of Jitter</td><td></td><td></td><td>SG503
50Ω Termination</td><td>HORIZ DISPLAY: A
A SOURCE: CH1
TRIG MODE: NORM
A COUPLING: AC
A SWEEP TIME/DIV: 20ns
CH1 VOLTS/DIV: 0.1V
CH1 AC-GND-DC: AC
X10 MAG: PULL
HOLDOFF: NORM</td><td>(1) Apply a sine wave signal of 150 MHz to CH1 INPUT and adjust the oscillator output to produce a waveform of 4 div on the CRT screen.
(2) Operate A trigger LEVEL to find a point where the jitter is minimized.
<table>
<tr><td>Jitter</td><td>less than 0.25 div</td></tr>
</table></td><td> 
</td><td></td></tr>
<tr><td>Check of
DELAY TIME MULT</td><td></td><td></td><td>TG-501
50Ω Termination</td><td>HORIZ DISPLAY: ALT
A, B SOURCE: CH1
TRIG MODE: AUTO
Vertical MODE: CH1
STARTS AFTER DELAY: PULL
CH1 AC-GND-DC: AC
A SWEEP TIME/DIV: 1ms
B SWEEP TIME/DIV: 5μs</td><td>(1) Apply a marker signal of 1 ms to CH1 INPUT to produce a waveform of 2 ~ 3 div on the CRT screen.
(2) Operate ▲▼ TRACE SEP to separate B sweep and A sweep.
(3) Operate ◄► POSITION to align the first peak of the waveform with the left end of the screen.
(4) Adjust A INTENSITY and B INTENSITY to bring the waveform into the positions where they can be easily visible.
(5) Operate DELAY TIME MULT so that the patterns of the screen appear as shown at right (the second peak of the A sweep should be intensity modulated and should be aligned with the left end of B sweep scale) and note the dial reading at this time.</td><td> 
</td><td><Note>
When TG-501 is used, CH1 VOLTS/DIV should be set to 0.5V thru 50Ω termination.</td></tr>
</table>

Item	Adjustment Control	P.C.B. No.	Test Equipment	Control Setting	Adjustment and Check	Illustration	Remark
					(6) Turn DELAY TIME MULT and operate ◄► POSITION so that what is shown at right will happen at the 10th peak and note the dial reading at this time. (7) Make the following calculation from the dial reading to make sure that the error is within the specification limits. (B) − (A) = 8.00 ± 0.2 Time multiplication error | within ±(1% of measurement +0.1% of full scale)		
Check of Delay Time Jitter			TG-501 50Ω Termination	HORIZ DISPLAY: ALT A SOURCE: CH1 B SOURCE: CH2 TRIG MODE: AUTO Vertical MODE: CH1 STARTS AFTER DELAY: PULL B ENDS A: ON CH1 AC-GND-DC: AC A SWEEP TIME/DIV: 1ms B SWEEP TIME/DIV: 1μs	(1) Apply a marker signal of 1 ms to CH1 INPUT to produce a waveform of 2 ~ 3 div on the CRT screen. (2) Operate ▲▼ TRACE SEP to separate A sweep and B sweep. (3) Operate DELAY TIME MULT to obtain the patterns as shown at right. (DELAY TIME MULT is to be set to about 10.00). (4) Make sure that the jitter of B sweep is less than 0.5 div at this time. Specification | less than 1/20,000		
Check of BEAM FIND				HORIZ DISPLAY: ALT A SOURCE: CH1 B SOURCE: CH2 TRIG MODE: AUTO Vertical MODE: CH1 STARTS AFTER DELAY: PULL B ENDS A: ON CH1 AC-GND-DC: AC A SWEEP TIME/DIV: 1ms B SWEEP TIME/DIV: 1μs	Make sure that the trace length is fully covered the screen when rotated SWEEP TIME/DIV to each range.		

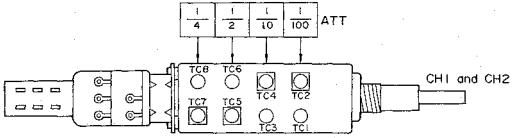
X73-1500-00 (VERTICAL PREAMP UNIT)



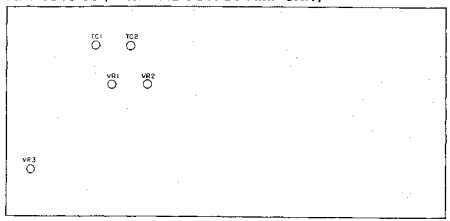
X74-1350-00 (TRIG SWEEP UNIT)



VERTICAL ATT.

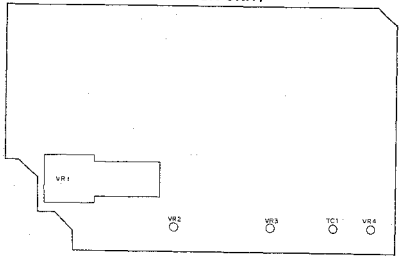


X73-1510-03 (VERTICAL OUTPUT AMP UNIT)

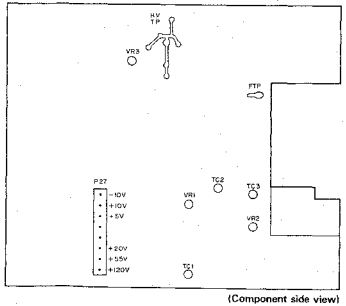


(Component side view)

X77-1280-00 (A TRIG SWITCH UNIT)

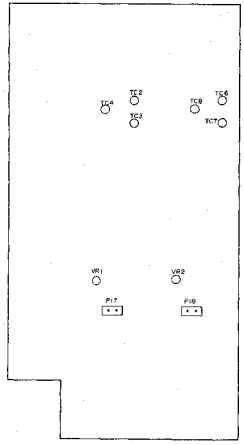


X68-1400-00 (POWER BLANKING UNIT)



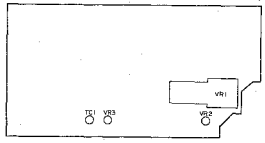
(Component side view)

X73-1520-00 (CH3, CH4 AMP UNIT)



(Component side view)

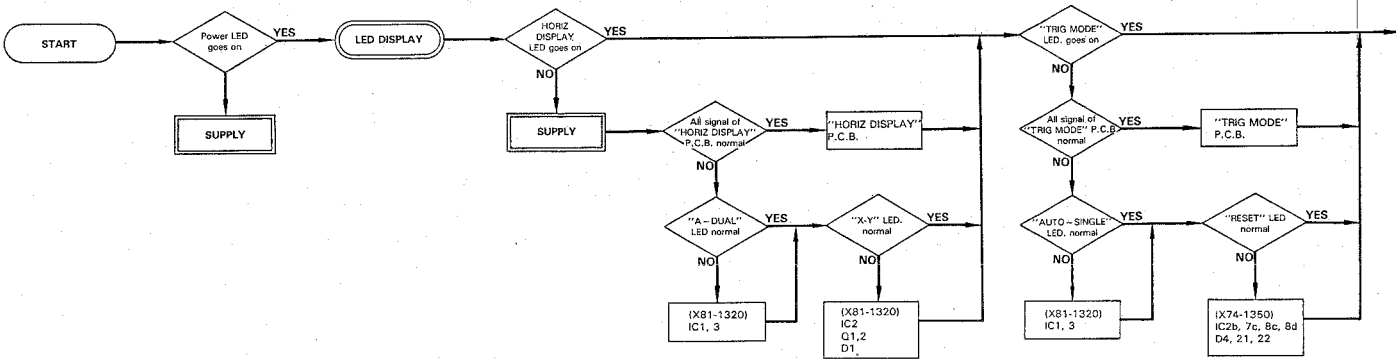
X77-1290-00 (B TRIG SWITCH UNIT)

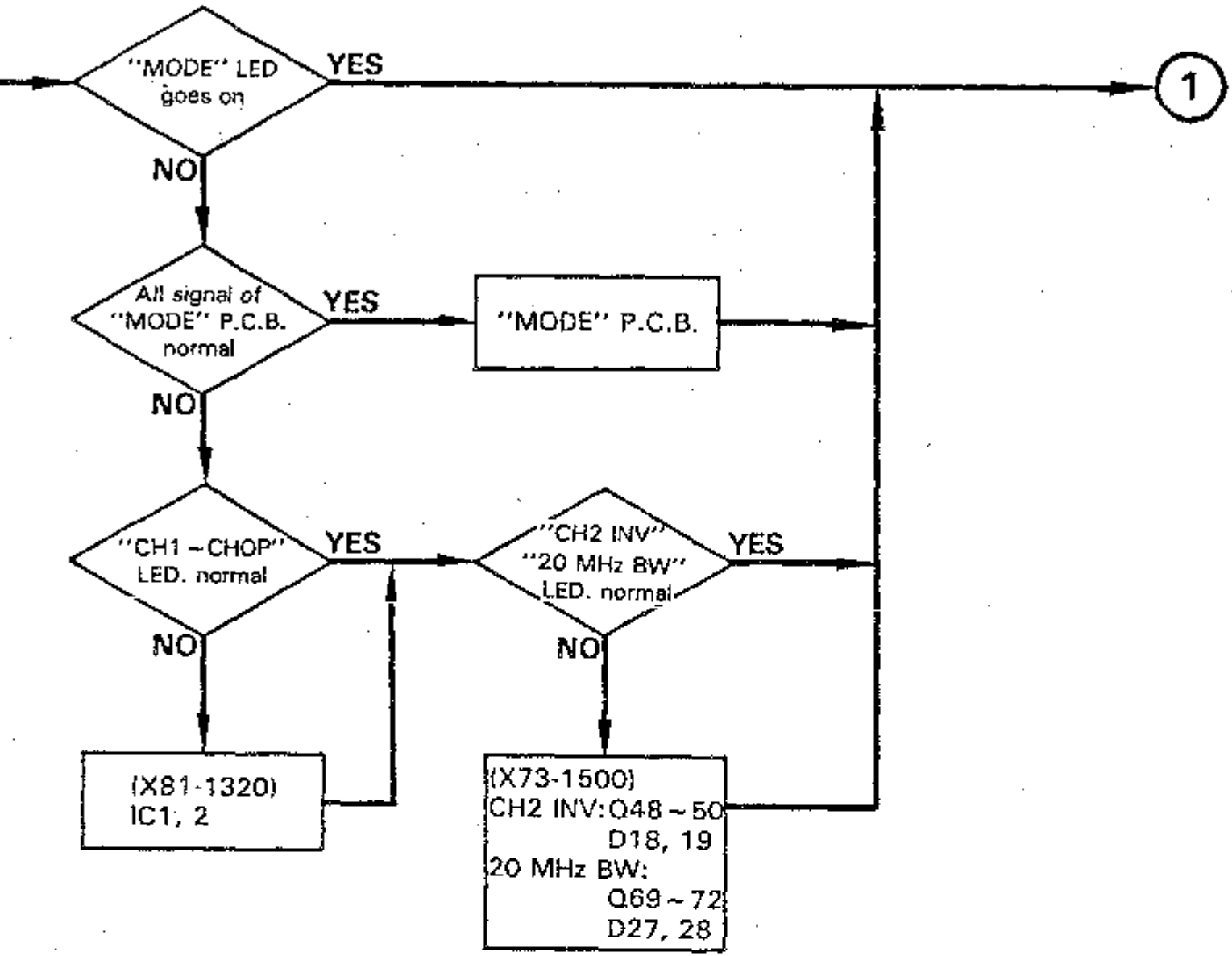


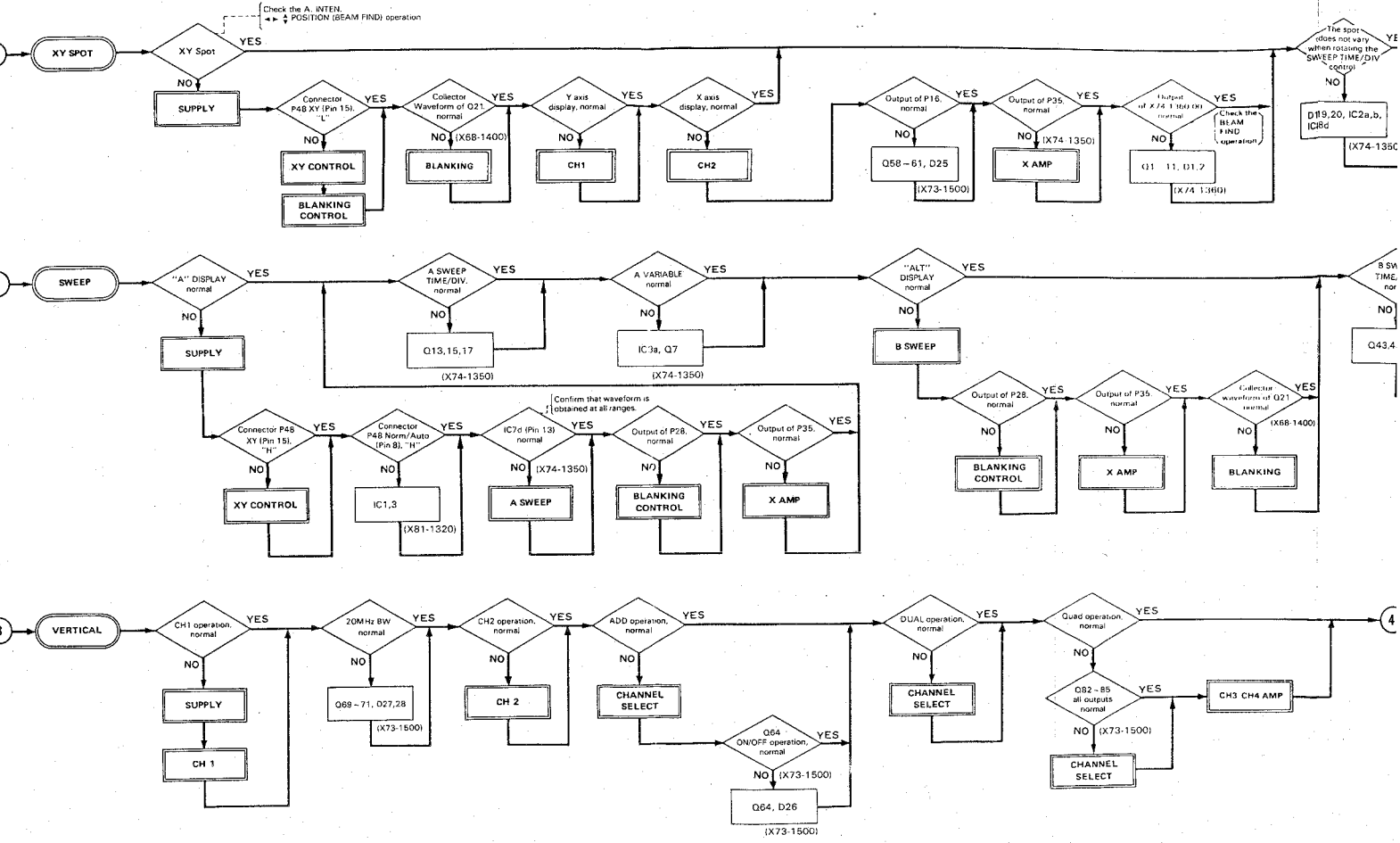
X81-1430-00 (ASTIG UNIT)

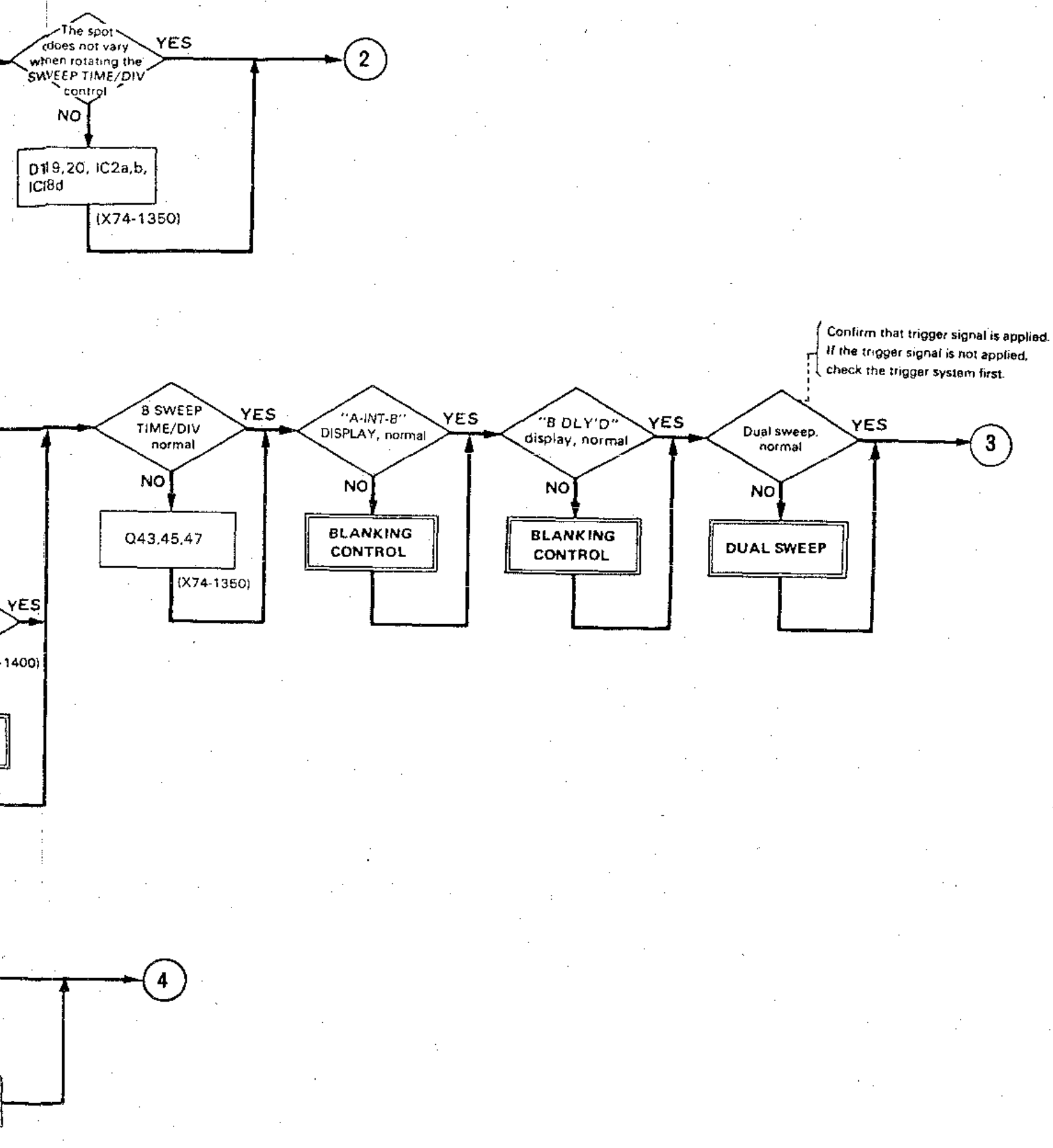
Fig. 6 LOCATION OF ADJ. CONTROLS

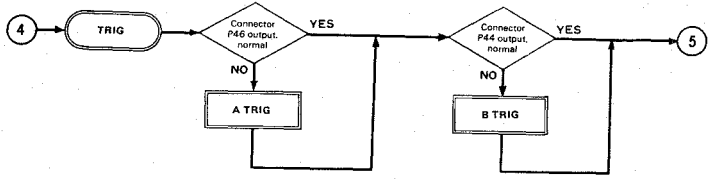
TROUBLESHOOTING

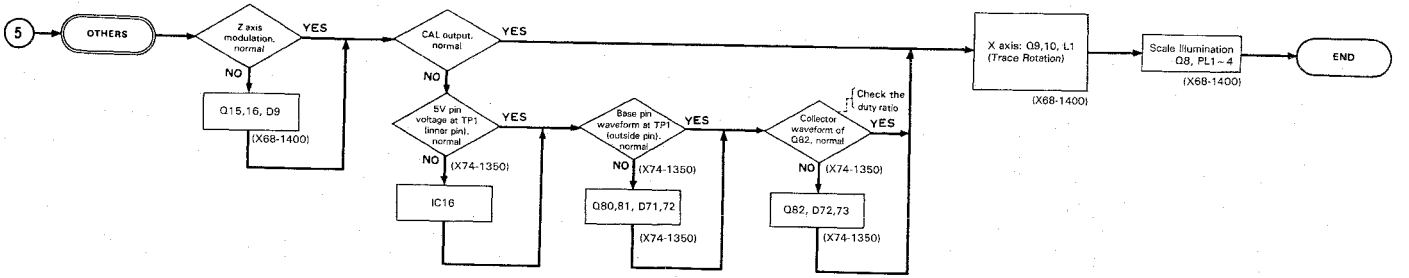



"MODE" LED goes on
YES
NO
1
All signal of "MODE" P.C.B. normal
YES
"MODE" P.C.B.
NO
"CH1 – CHOP" LED. normal
YES
"CH2 INV" "20 MHz BW" LED. normal
YES
NO
NO
(X81-1320) IC1, 2
(X73-1500) CH2 INV: Q48 ~ 50 D18, 19 20 MHz BW: Q69 ~ 72 D27, 28


XY SPOT
Check the A. INTEN, ◄► ↕ POSITION (BEAM FIND) operation
XY Spot
YES
NO
SUPPLY
Connector P48 XY (Pin 15), "L"
XY CONTROL
BLANKING CONTROL
Collector Waveform of Q21 normal
(X68-1400)
BLANKING
Y axis display, normal
CH1
X axis display, normal
CH2
Output of P16, normal
Q58 – 61, D25
(X73-1500)
Output of P35, normal
X AMP
(X74-1350)
Output of X74-1360 (X) normal
Q11, 11, D1,2
(X74-1360)
Check the BEAM FIND operation
The spot does not vary when rotating the SWEEP TIME/DIV control
D119,20, IC2a,b, IC8d
(X74-1350)
SWEEP
"A" DISPLAY normal
SUPPLY
A SWEEP TIME/DIV. normal
Q13,15,17
(X74-1350)
A VARIABLE normal
IC3a, Q7
(X74-1350)
"ALT" DISPLAY normal
B SWEEP
Connector P48 XY (Pin 15), "H"
XY CONTROL
Connector P48 Norm/Auto (Pin 8), "H"
IC1,3
(X81-1320)
Confirm that waveform is obtained at all ranges.
IC7d (Pin 13) normal
(X74-1350)
A SWEEP
Output of P28, normal
BLANKING CONTROL
Output of P35, normal
X AMP
Output of P28, normal
BLANKING CONTROL
Output of P35, normal
X AMP
Collector waveform of Q21 normal
(X68-1400)
BLANKING
B SW TIME/ nor
Q43,4
VERTICAL
CH1 operation, normal
SUPPLY
CH 1
20MHz BW normal
Q69 – 71, D27,28
(X73-1500)
CH2 operation, normal
CH 2
ADD operation, normal
CHANNEL SELECT
Q64 ON/OFF operation, normal
Q64, D26
(X73-1500)
DUAL operation, normal
CHANNEL SELECT
Quad operation, normal
Q82 – 85 all outputs normal
(X73-1500)
CHANNEL SELECT
CH3 CH4 AMP


The spot does not vary when rotating the SWEEP TIME/DIV control
YES
2
NO
D119,20, IC2a,b, IC18d
(X74-1350)
Confirm that trigger signal is applied. If the trigger signal is not applied, check the trigger system first.
B SWEEP TIME/DIV normal
YES
NO
Q43,45,47
(X74-1350)
"A-INT-B" DISPLAY, normal
YES
NO
BLANKING CONTROL
"B DLY'D" display, normal
YES
NO
BLANKING CONTROL
Dual sweep, normal
YES
NO
DUAL SWEEP
3
YES
-1400)
4

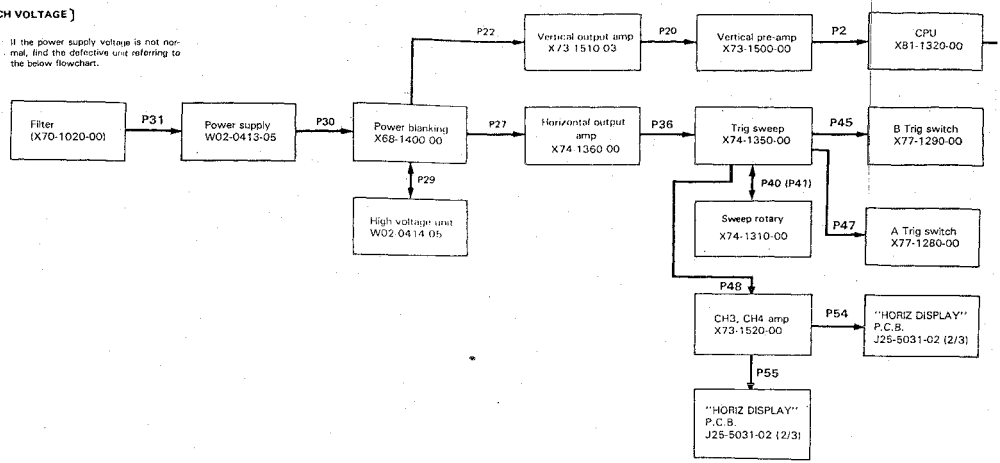

4
TRIG
Connector P46 output, normal
YES
NO
A TRIG
Connector P44 output, normal
YES
NO
B TRIG
5

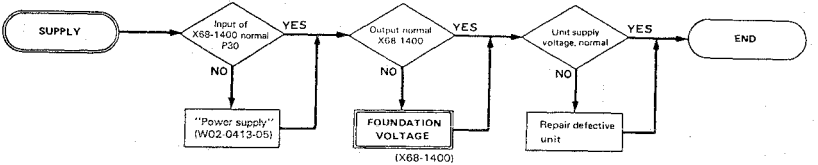

5
OTHERS
Z axis modulation, normal
YES
NO
Q15,16, D9
(X68-1400)
CAL output, normal
YES
NO
5V pin voltage at TP1 (inner pin), normal
YES
NO
(X74-1350)
IC16
Base pin waveform at TP1 (outside pin), normal
YES
NO
(X74-1350)
Q80,81, D71,72
(X74-1350)
Collector waveform of Q82, normal
Check the duty ratio
YES
NO
(X74-1350)
Q82, D72,73
(X74-1350)
X axis: Q9,10, L1 (Trace Rotation)
(X68-1400)
Scale illumination Q8, PL1 ~ 4
(X68-1400)
END

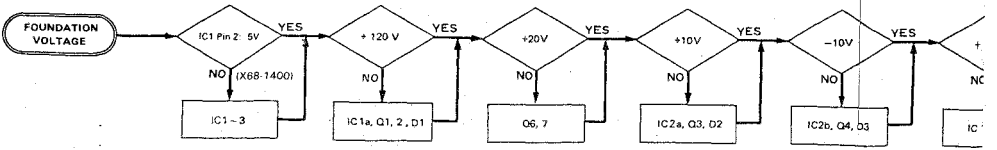
TROUBLESHOOTING

(POWER SUPPLY OF EACH VOLTAGE)

If the power supply voltage is not normal, find the defective unit referring to the below flowchart.

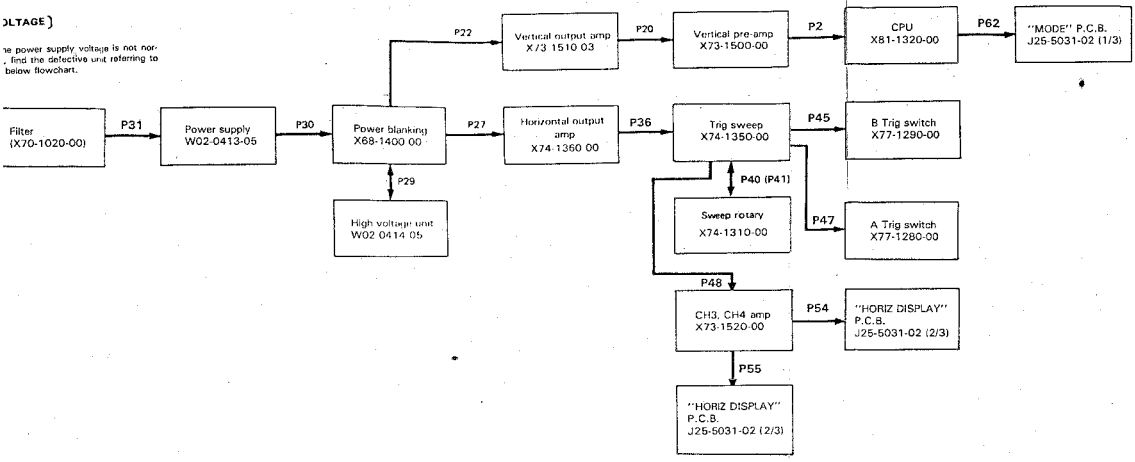


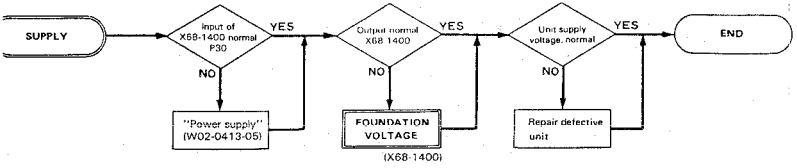


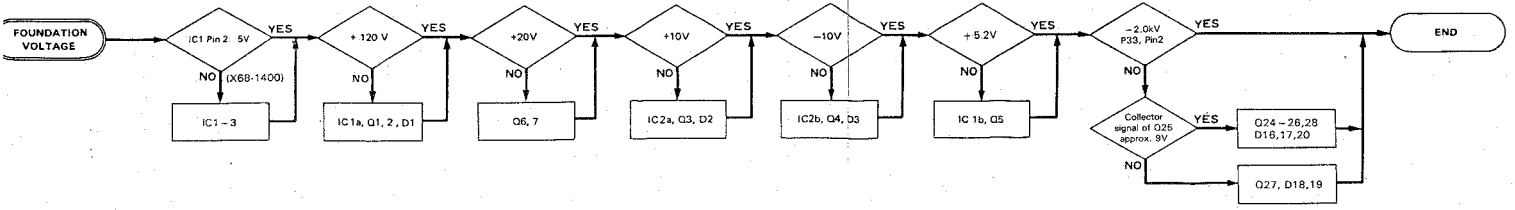


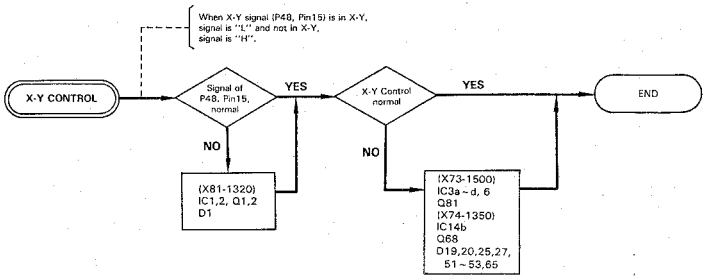
OLTAGE)

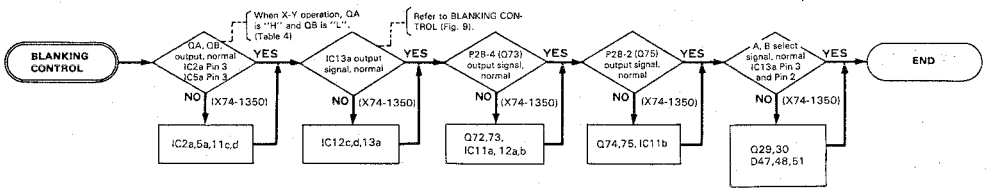
ne power supply voltage is not nor-
, find the defective unit referring to
below flowchart.

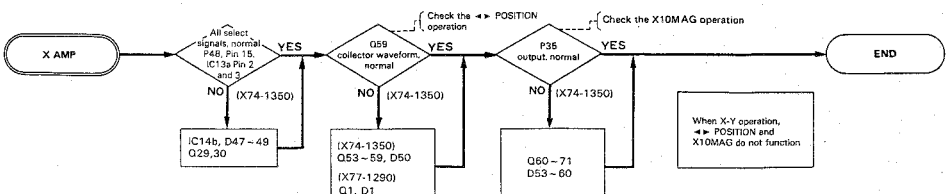




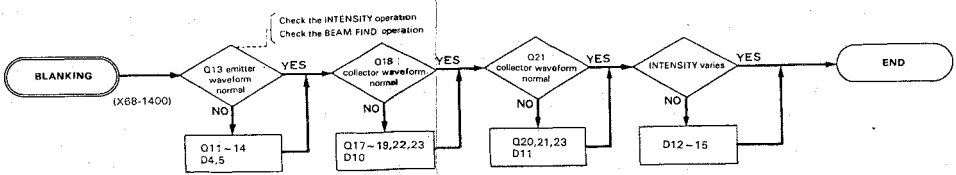



When X-Y signal (P48, Pin15) is in X-Y, signal is "L" and not in X-Y, signal is "H".
X-Y CONTROL
Signal of P48, Pin15, normal
YES
NO
X-Y Control normal
YES
NO
END
(X81-1320) IC1,2, Q1,2 D1
(X73-1500) IC3a ~ d, 6 Q81 (X74-1350) IC14b Q68 D19,20,25,27, 51 ~ 53,65


When X-Y operation, QA is "H" and QB is "L". (Table 4)
Refer to BLANKING CONTROL (Fig. 9).
BLANKING CONTROL
QA, QB output, normal IC2a Pin 3 IC5a Pin 3
YES
NO (X74-1350)
IC2a,5a,11c,d
IC13a output signal, normal
YES
NO (X74-1350)
IC12c,d,13a
P28-4 (Q73) output signal, normal
YES
NO (X74-1350)
Q72,73, IC11a, 12a,b
P28-2 (Q75) output signal, normal
YES
NO (X74-1350)
Q74,75, IC11b
A, B select signal, normal IC13a Pin 3 and Pin 2
YES
NO (X74-1350)
Q29,30 D47,48,51
END


X AMP
All select signals, normal P48, Pin 15, IC13a Pin 2 and 3
YES
NO (X74-1350)
IC14b, D47 ~ 49 Q29,30
Check the ◄► POSITION operation
Q59 collector waveform, normal
YES
NO (X74-1350)
(X74-1350) Q53 ~ 59, D50 (X77-1290) Q1, D1
Check the X10MAG operation
P36 output, normal
YES
NO (X74-1350)
Q60 ~ 71 D53 ~ 60
END
When X-Y operation, ◄► POSITION and X10MAG do not function

TROUBLESHOOTING



BLANKING CONTROL

HORIZ DISPLAY	P48 X-Y BUFFER 15Pin	IC13a IN S	IC13a IN R	IC13a OUT Q	IC13a OUT $\overline{Q}$	IC12d OUT	P28 A blanking 4 Pin	P28 B blanking 2 Pin
A	H	H	L	H	L	H	QA	H
ALT	H	L	L	TOGGLE		H	QA*	QB
A-INT-B	H	H	L	H	L	H	QA	QB
B-DLY'D	H	L	H	L	H	H	H	QB
DUAL	H	L	L	TOGGLE		TOGGLE	QA*	QB*
X-Y	L	H	L	H	L	H	L	H

Complex waveform IC11b output. When CHOP operation, output of P28 is complex CHOP signal waveform.

Table 4

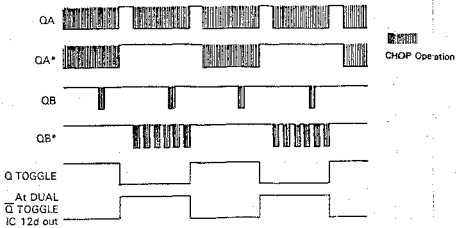


Fig. 8 RELATIONSHIP BETWEEN A, B SWEEP AND QA, QB

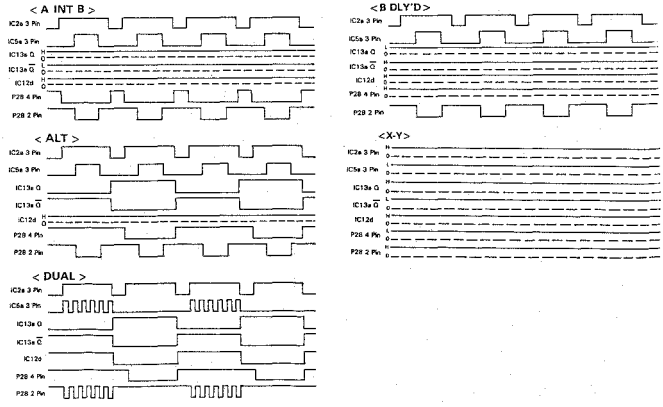
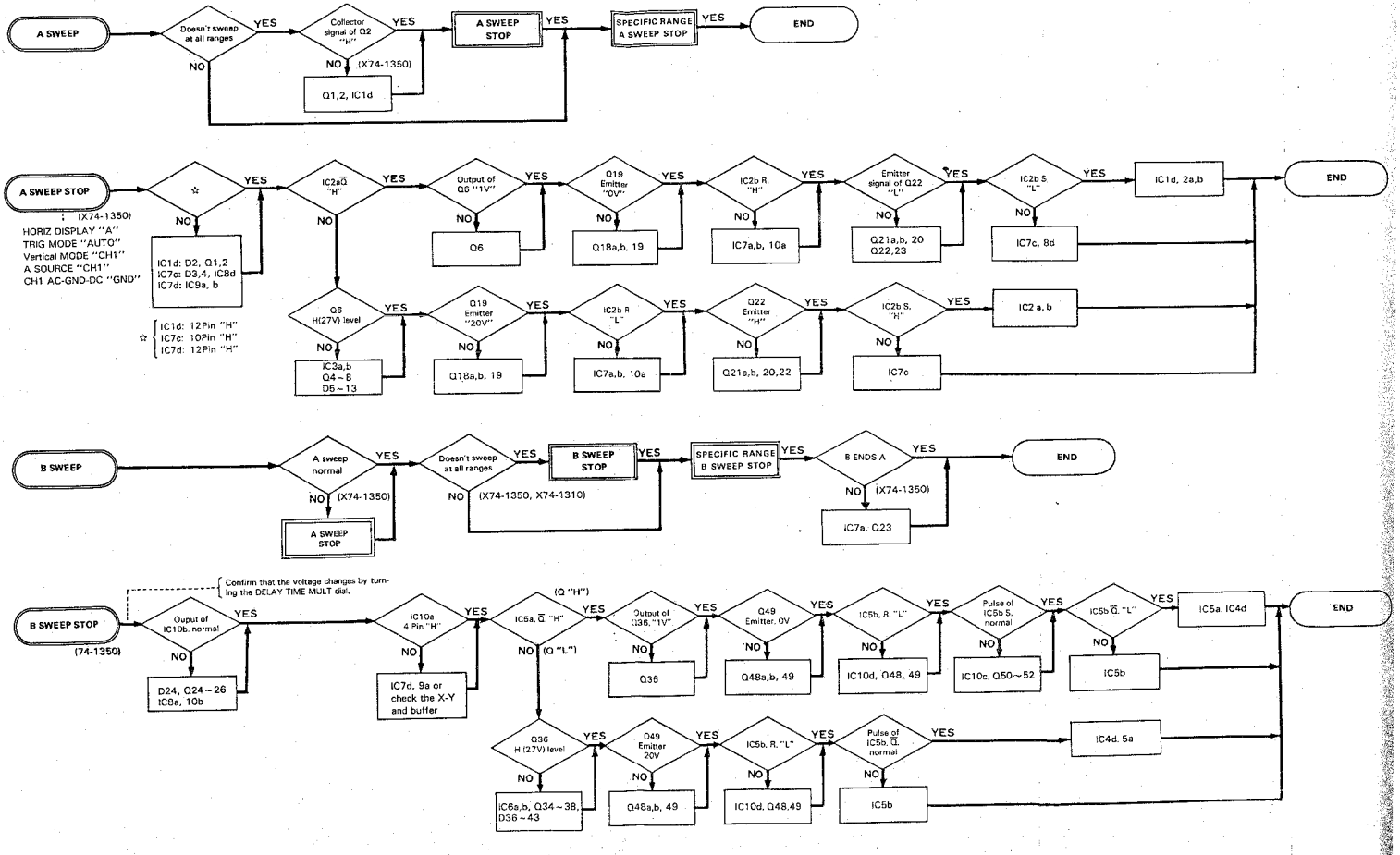
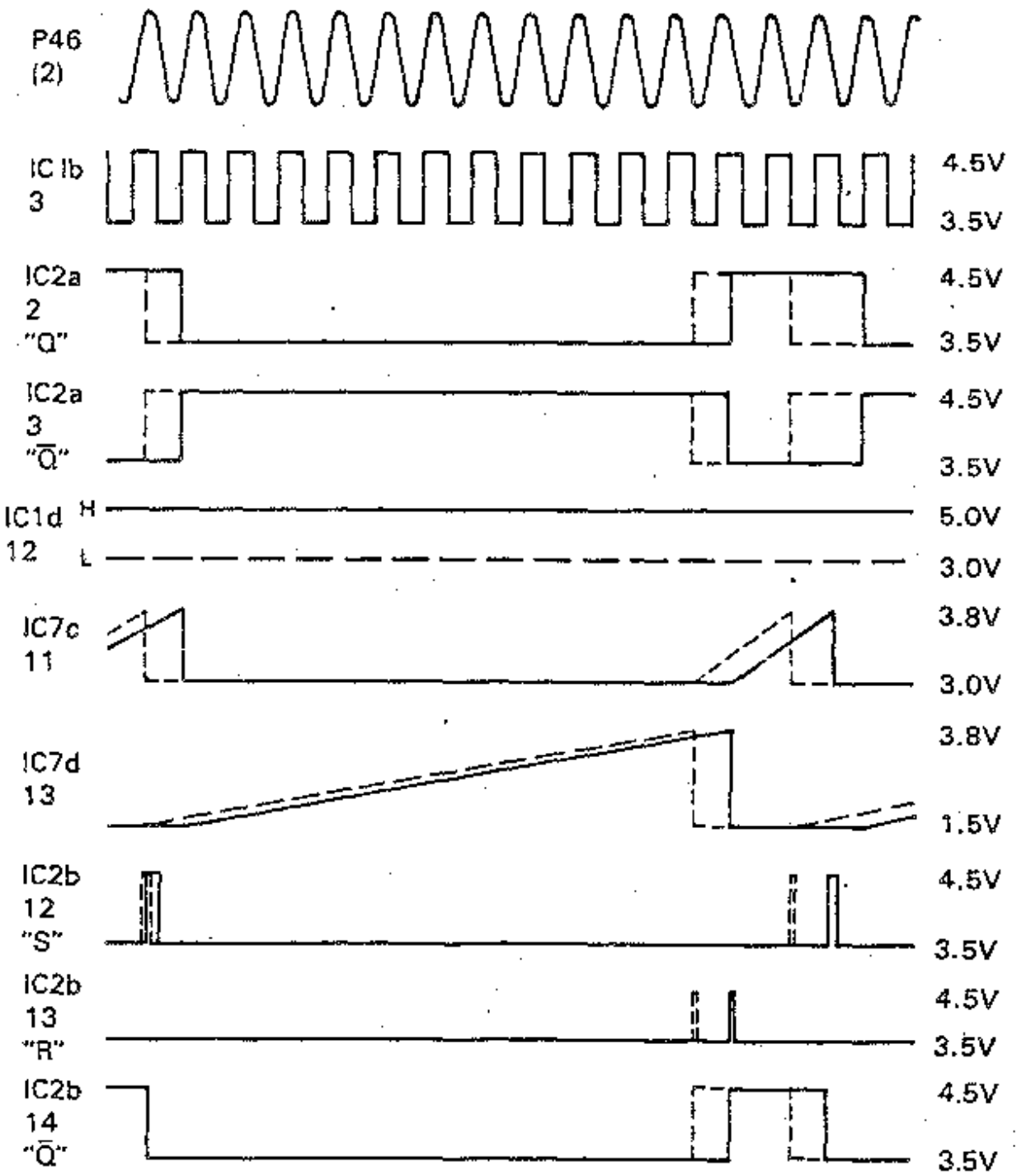


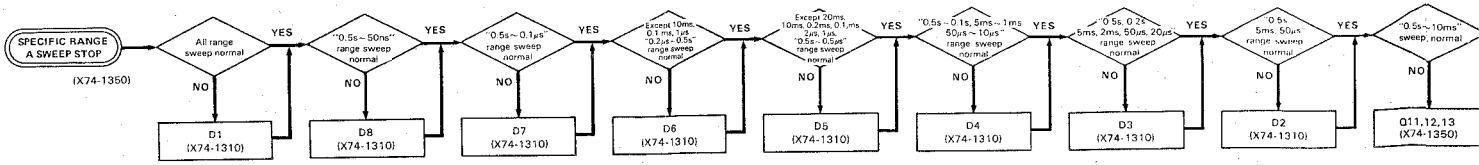
Fig. 9 BLANKING CONTROL

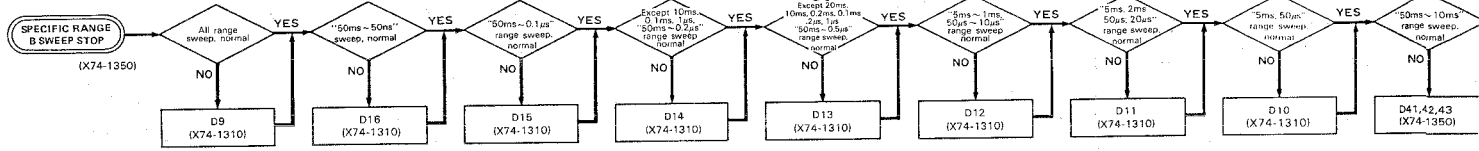

A SWEEP
Doesn't sweep at all ranges
YES
NO
Collector signal of Q2 "H"
YES
NO
(X74-1350)
Q1,2, IC1d
A SWEEP STOP
YES
SPECIFIC RANGE A SWEEP STOP
YES
END
A SWEEP STOP
(X74-1350)
HORIZ DISPLAY "A"
TRIG MODE "AUTO"
Vertical MODE "CH1"
A SOURCE "CH1"
CH1 AC-GND-DC "GND"
☆
IC1d: 12Pin "H"
IC7c: 10Pin "H"
IC7d: 12Pin "H"
IC1d: D2, Q1,2
IC7c: D3,4, IC8d
IC7d: IC9a, b
IC2a Q̄ "H"
Output of Q6 "1V"
Q6
Q19 Emitter "0V"
Q18a,b, 19
IC2b R. "H"
IC7a,b, 10a
Emitter signal of Q22 "L"
Q21a,b, 20 Q22,23
IC2b S. "L"
IC7c, 8d
IC1d, 2a,b
Q6 H(27V) level
IC3a,b Q4~8 D5~13
Q19 Emitter "20V"
Q18a,b, 19
IC2b R "L"
IC7a,b, 10a
Q22 Emitter "H"
Q21a,b, 20,22
IC2b S. "H"
IC7c
IC2 a, b
B SWEEP
A sweep normal
(X74-1350)
A SWEEP STOP
Doesn't sweep at all ranges
(X74-1350, X74-1310)
B SWEEP STOP
SPECIFIC RANGE B SWEEP STOP
B ENDS A
(X74-1350)
IC7a, Q23
B SWEEP STOP
(74-1350)
Confirm that the voltage changes by turning the DELAY TIME MULT dial.
Ouput of IC10b. normal
D24, Q24~26 IC8a, 10b
IC10a 4 Pin "H"
IC7d, 9a or check the X-Y and buffer
IC5a, Q̄ "H"
(Q "H")
(Q "L")
Output of Q36 "1V"
Q36
Q49 Emitter 0V
Q48a,b, 49
IC5b, R. "L"
IC10d, Q48, 49
Pulse of IC5b S. normal
IC10c, Q50~52
IC5b Q̄. "L"
IC5b
IC5a, IC4d
Q36 H (27V) level
IC6a,b, Q34~38, D36~43
Q49 Emitter 20V
Q48a,b, 49
IC5b, R. "L"
IC10d, Q48,49
Pulse of IC5b, Q̄. normal
IC5b
IC4d. 5a
END

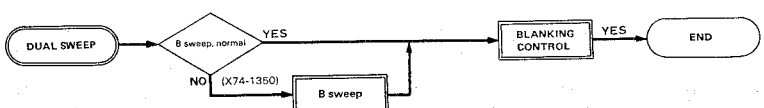


Note: Broke-line auto free run (at non-signal)

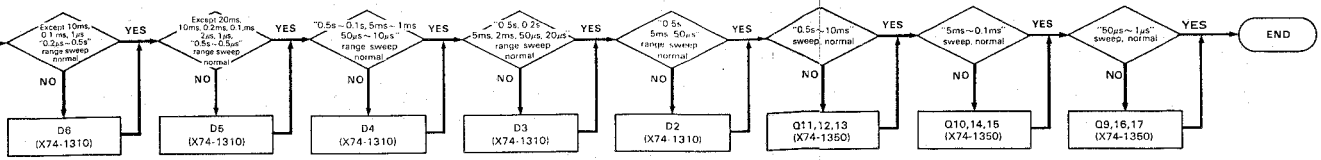
Fig. 10 Waveform in Sweep circuit (X74-1350-00)
(Input signal 1 kHz, SWEEP TIME 1 ms/div)

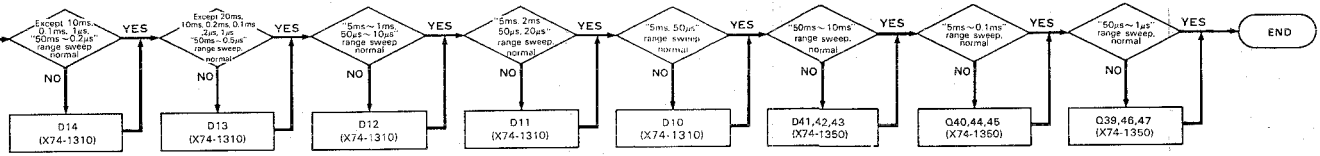

SPECIFIC RANGE A SWEEP STOP
(X74-1350)
All range sweep normal
YES
NO
D1 (X74-1310)
"0.5s ~ 50ns" range sweep normal
D8 (X74-1310)
"0.5s ~ 0.1μs" range sweep normal
D7 (X74-1310)
Except 10ms, 0.1ms, 1μs "0.2μs ~ 0.5s" range sweep normal
D6 (X74-1310)
Except 20ms, 10ms, 0.2ms, 0.1ms 2μs, 1μs "0.5s ~ 0.5μs" range sweep normal
D5 (X74-1310)
"0.5s ~ 0.1s, 5ms ~ 1ms 50μs ~ 10μs" range sweep normal
D4 (X74-1310)
"0.5s, 0.2s 5ms, 2ms, 50μs, 20μs" range sweep normal
D3 (X74-1310)
"0.5s 5ms, 50μs range sweep normal
D2 (X74-1310)
"0.5s ~ 10ms" sweep, normal
D11,12,13 (X74-1350)


SPECIFIC RANGE B SWEEP STOP
(X74-1350)
All range sweep, normal
YES
NO
D9 (X74-1310)
"50ms ~ 50ns" sweep, normal
D16 (X74-1310)
"50ms ~ 0.1μs" range sweep, normal
D15 (X74-1310)
Except 10ms, 0.1ms, 1μs, "50ms ~ 0.2μs" range sweep normal
D14 (X74-1310)
Except 20ms, 10ms, 0.2ms, 0.1ms 2μs, 1μs "50ms ~ 0.5μs" range sweep, normal
D13 (X74-1310)
"5ms ~ 1ms, 50μs ~ 10μs" range sweep normal
D12 (X74-1310)
"5ms, 2ms 50μs, 20μs" range sweep, normal
D11 (X74-1310)
"5ms, 50μs" range sweep normal
D10 (X74-1310)
"50ms ~ 10ms" range sweep, normal
D41,42,43 (X74-1350)

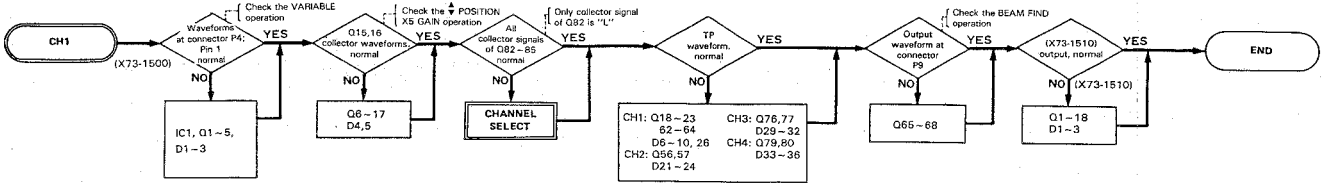

DUAL SWEEP
B sweep, normal
YES
NO
(X74-1350)
B sweep
BLANKING CONTROL
YES
END

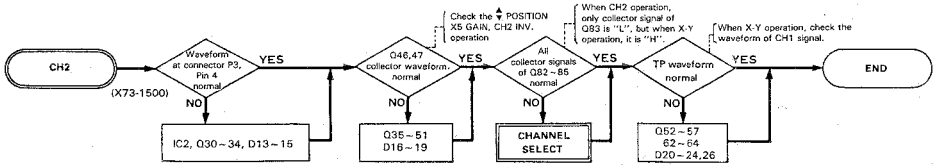
TROUBLESHOOTING

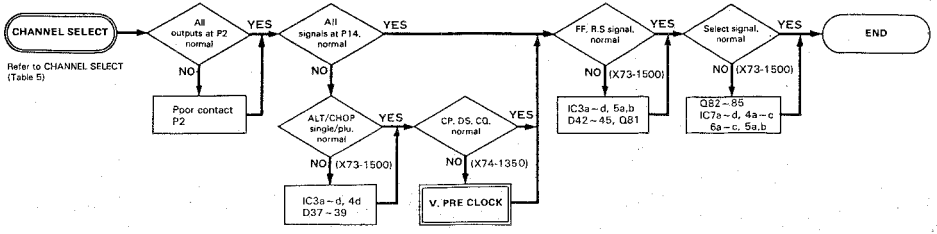




TROUBLESHOOTING







CHANNEL SELECT

			MODE INPUT LOG OUTPUT signal (P2)						FLIP-FLOP PRESET CLEAR signal		
			CH1	CH2	DUAL	ADD	ALT	X-Y	R5a	S5a	R5b
SWEEP operation	CH1		L	H	H	H	H	H	H	L	H
	CH2		H	L	H	H	H	H	L	H	H
	DUAL	ALT	H	H	L	H	L	H	L	L	H
		CHOP					H				
	ADD		H	H	H	L	H	H	L	L	H
	QUAD	ALT	H	H	H	H	L	H	L	L	L
		CHOP					H				
X-Y operation			Same as above					L	H	H	H

Note; Number of ○ is No. of time chart. (See Fig. 11)

*1 Vertical MOI
DUAL (ALT
QUAD (ALT
HORIZ DISP
Time chart

CHANNEL SELECT

SWEEP operation			MODE INPUT LOG OUTPUT signal (P2)						FLIP-FLOP PRESET CLEAR signal			CHANNEL SELECT signal				FLIP-FLOP OUTPUT signal				VERTICAL CLOCK (P14)				
			CH1	CH2	DUAL	ADD	ALT	X-Y	R5a	S5a	R5b	CH1	CH2	CH3	CH4	Q5a	$\overline{Q5a}$	Q5b	$\overline{Q5b}$	ALT/CHOP	Single/Plu	CP*2	DS	CQ*4
	CH1		L	H	H	H	H	H	H	L	H	L	H	H	H	L	H	L	H	L	L	QA	H	H
	CH2		H	L	H	H	H	H	L	H	H	H	L	H	H	H	L	L	H	L	L	QA	H	H
	DUAL	ALT	H	H	L	H	L	H	L	L	H	①		H	H	①*1		L	H	L	H	QA	L*3	H
		CHOP					H					③				③				H		③		
	ADD		H	H	H	L	H	H	L	L	H	L	L	H	H	⑤		L	H	L	L	QA	H	H
	QUAD	ALT	H	H	H	H	L	H	L	L	H	②				②*1		②		L	H	QA	L*3	H
		CHOP					H					④				④		④		H		④		
X-Y operation			Same as above					L	H	H	H	L	H	H	H			L	H	L	L	L	H	H

Note; Number of ○ is No. of time chart. (See Fig. 11)

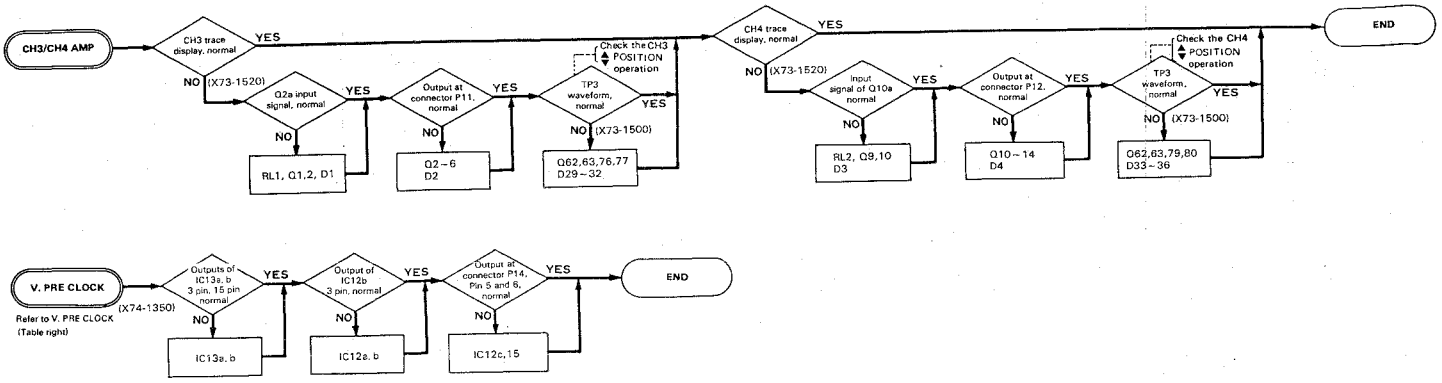
*1 Vertical MODE;
DUAL (ALT)
QUAD (ALT)
HORIZ DISPLAY; DUAL
Time chart No. ⑥.

*2 HORIZ DISPLAY;
ALT, DUAL
Time chart No. ⑥.

*3 Vertical MODE;
DUAL
QUAD
HORIZ DISPLAY;
DUAL
Time chart NO. ① – ④.

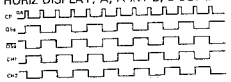
*4 HORIZ DISPLAY;
DUAL
Signal level "L"

Table-5

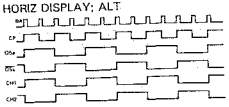


① Vertical MODE; DUAL (ALT)

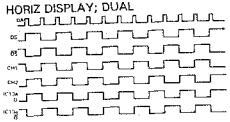
HORIZ DISPLAY; A, A-INT-B, B DLY'D



HORIZ DISPLAY; ALT



HORIZ DISPLAY; DUAL

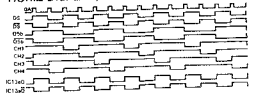


② Vertical MODE; QUAD (ALT)

HORIZ DISPLAY; A, A-INT-B, B DLY'D

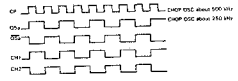
HORIZ DISPLAY; ALT

HORIZ DISPLAY; DUAL

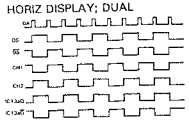


③ Vertical MODE; DUAL (CHOP)

HORIZ DISPLAY; A, ALT, A-INT-B, B DLY'D

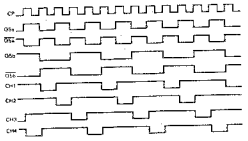


HORIZ DISPLAY; DUAL

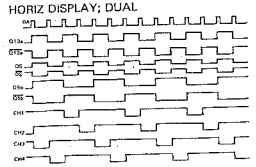


④ Vertical MODE; QUAD (CHOP)

HORIZ DISPLAY; A, ALT, A-INT-B, B DLY'D

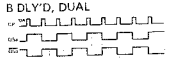


HORIZ DISPLAY; DUAL



⑤ Vertical MODE; ADD

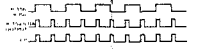
HORIZ DISPLAY; A, A-INT-B, B DLY'D, DUAL



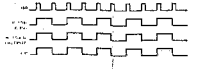
HORIZ DISPLAY; ALT

⑥ Vertical MODE; DUAL (ALT), QUA

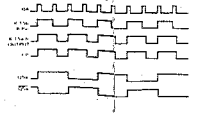
HORIZ DISPLAY; A, A-INT-B, B DLY'D



HORIZ DISPLAY; ALT



HORIZ DISPLAY; DUAL



Vertical MODE; CH1, CH2, ADD

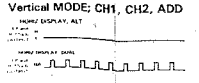
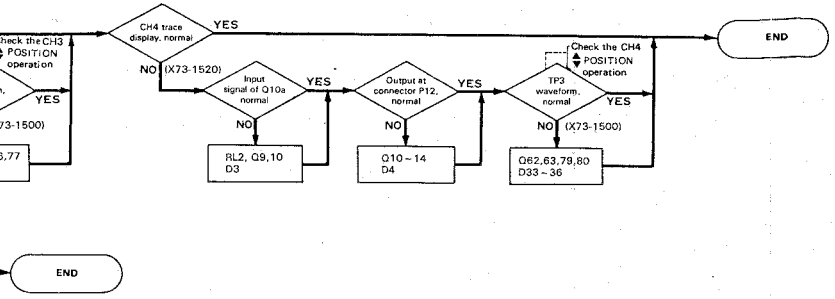


Fig. 11 Time Chart



V. PRE CLOCK

	MODE	INPUT ALT/CHOP	INPUT Single/Plu	OUTPUT Q76	OUTPUT IC15a,b	OUTPUT CP*3	OUTPUT DS
SWEEP operation DUAL	CH1	L	L	H	QA	QA	H
	CH2	L	L	H		QA	H
	ALT	L	H	H		QA	L*5
	CHOP	H		L		⑤	
SWEEP operation QUAD	ADD	L	L	H		QA	H
	ALT	L	H	H		QA	L*6
	CHOP	H		L		④	
X-Y Operation		L	L	H	L	L	H

Note; Number of ○ is No. of time chart. (See Fig. 11)

*5 HORIZ DISPLAY; ALT or DUAL
Time chart No. ⑤.

*6 Vertical MODE, DUAL or QUAD
Time chart No. ① ~ ④.

*7 HORIZ DISPLAY; DUAL
Time chart No. ① ~ ④.

V. PRE CLOCK

HORIZ DISPLAY	IC15b 7 Pin	IC15b 6 Pin*7	IC15a,b*7 OUTPUT	CQ	IC13a Q
A	L	L	QA	H	H
ALT	H	L	L	H	⑦*8
A-INT-B	L	L	QA	H	H
B DLY'D	L	L	QA	H	L
DUAL	H	L	QA	L	⑦*8
X-Y	H	L	L	H	H

*7 Vertical MODE DUAL, or QUAD
Time chart No. ⑤.

*8 Vertical MODE DUAL or QUAD
Time chart No. ① ~ ④.

Table-6

MODE; DUAL (CHOP)

PLAY; A, ALT, A-INT-B, B DLY'D

PLAY; DUAL

④ Vertical MODE; QUAD (CHOP)

HORIZ DISPLAY; A, ALT, A-INT-B, B DLY'D

HORIZ DISPLAY; DUAL

⑤ Vertical MODE; ADD

HORIZ DISPLAY; A, A-INT-B, B DLY'D, DUAL

HORIZ DISPLAY; ALT

⑥ Vertical MODE; DUAL (ALT), QUAD (ALT)

HORIZ DISPLAY; A, A-INT-B, B DLY'D

HORIZ DISPLAY; ALT

HORIZ DISPLAY; DUAL

HORIZ DISPLAY; A, A-INT-B, B DLY'D

HORIZ DISPLAY; ALT

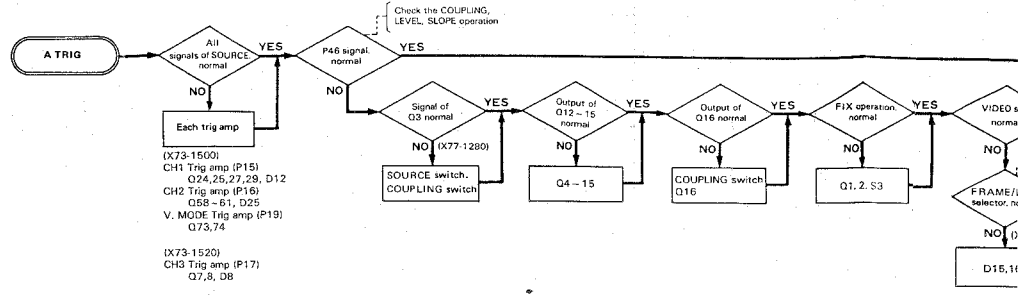
HORIZ DISPLAY; DUAL

⑦ HORIZ DISPLAY; ALT, DUAL

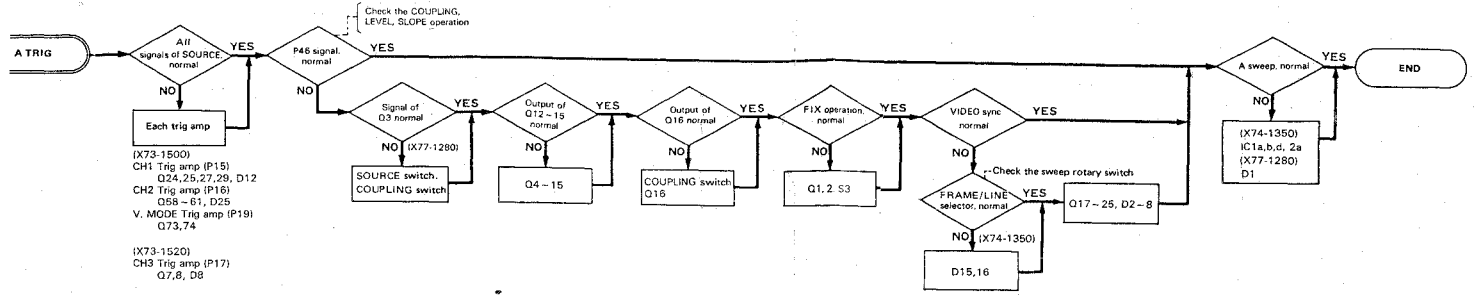
Vertical MODE; CH1, CH2, ADD

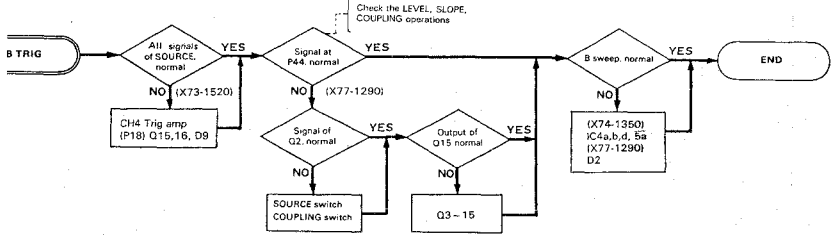
Fig. 11 Time Chart

TROUBLESHOOTING



TROUBLESHOOTING





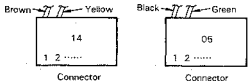
PARTS LIST

The specifications and parts list and schematic diagram may be changed without notice owing to a technical innovation.

The part No. of each connector is stamped or color-coded. The color-coding is as follows.

Black	Brown	Red	Orange	Yellow	Green	Blue	Purple	Grey	White
0	1	2	3	4	5	6	7	8	9

Example



Each connector can be classified by the color of pin 1 and pin 2.

PARTS LIST

MAIN CHASSIS

Y70-1490-21

REF.NO	PARTS NO	NAME & DESCRIPTION
—	A01-1109-22	CASE
1	A13-0763-22	FRAME(L)
2	A13-0764-22	FRAME(R)
3	A20-2767-05	DIE-CAST PANEL
4	A21-1045-14	DECORATIVE PANEL
5	A21-1046-04	DECORATIVE PANEL
6	A21-1047-14	DECORATIVE PANEL
7	A22-0817-33	SUB PANEL
8	A22-0833-03	SUB PANEL
9	A23-1645-22	REAR PANEL
10	A33-0501-14	REFLECTOR
—	B07-0710-02	REAR ESCUTCHEON
11	B19-0735-03	FILTER
12	B20-0927-04	SCALE
—	B40-2765-04	NAME PLATE (SERIAL NO)
—	B41-0710-04	CAUTION LABEL (HIGH VOLTAGE)
—	B50-7541-10	INSTRUCTION MANUAL
—	B50-7543-10	INSTRUCTION MANUAL
13	D21-0906-04	EXTENSION SHAFT
14	D23-0801-04	SPACER
15	E01-1404-05	CRT SOCKET
16	E04-0251-05	BNC RECEPTACLE
17	E21-0654-04	TERMINAL (CAL)
18	E21-0657-04	TERMINAL (GND)
19	E21-0659-15	TERMINAL (CURRENT)
20	E23-0015-04	EARTH LUG
21	E23-0018-04	EARTH LUG
22	E23-0513-05	EARTH LUG
23	E23-0520-05	EARTH LUG
25	E23-0529-04	EARTH LUG
—	E30-1818-05	POWER CORD (JIS)
—	E31-2473-05	LEAD WIRE WITH CONNECTOR
—	E31-2474-05	LEAD WIRE WITH CONNECTOR
—	E31-2546-05	LEAD WIRE WITH CONNECTOR
—	E33-4047-00	WIRE ASSY
26	F05-1224-05	FUSE 1.2A
—	F07-0908-14	PROTECTION COVER
—	F07-0923-02	PROTECTION COVER
27	F10-1553-14	SHIELD PLATE (FOR CH3)
28	F10-1567-14	SHIELD PLATE
29	F10-1568-04	SHIELD PLATE (FOR SW)
30	F10-1569-14	SHIELD PLATE
—	F10-1583-04	SHIELD PLATE
31	F11-0983-12	SHIELD CASE(FOR CRT)
32	F11-0984-04	SHIELD CASE (FOR CRT)
33	F11-0985-04	SHIELD CASE
—	F15-0138-04	BLIND PLATE
—	F15-0716-24	BLIND PLATE
36	F20-0621-04	INSULATOR
37	F20-0624-04	INSULATOR (FOR BLANKING)
—	F20-0627-04	INSULATOR (FOR BATTERY)
—	F20-0639-04	INSULATOR
—	F20-0654-04	INSULATOR
—	G02-0606-14	SPRING FOR HANDLE
40	G16-0602-04	REFLECTOR SHEET(L)
41	G16-0603-04	REFLECTOR SHEET(R)
42	G16-0609-04	RUBBER SHEET
—	H01-5734-04	CARTON BOX
—	H01-5734-04	CARTON BOX
—	H10-2812-12	FOAMED STYRENE PAD
—	H12-0535-03	PAD
—	H12-0536-03	PAD
—	H20-1719-04	VINYL COVER
—	J02-0507-05	LEG
44	J13-0033-15	FUSE HOLDER
45	J19-1620-05	CORD CLAMP
46	J19-1622-05	CORD CLAMP
47	J19-1639-14	CRT BAND
48	J21-0392-04	HOLDER FOR LEAD
49	J21-2871-14	HOLDER FOR D.LINE
—	J21-2903-03	HOLDER FOR PROBE
—	J21-2906-05	GEAR FOR HANDLE
—	J21-2907-05	RING FOR HANDLE
50	J21-2925-13	BLACKET FOR CRT
51	J21-2926-13	BLACKET FOR CRT
52	J21-2927-14	BLACKET FOR CRT
53	J21-2989-04	BLACKET
54	J25-5031-02	PCB (UNMOUNTED)
55	J29-0505-04	GUIDE
56	J32-0838-04	BOSS
57	J39-0506-04	SPACER FOR V.R
58	J42-0512-14	CRT MOUNTING RUBBER
59	J42-0513-14	CRT MOUNTING RUBBER
60	J42-0514-04	BUSHING
61	J42-0515-05	BUSHING
—	J61-0049-05	WIRE BAND
—	J61-0408-05	WIRE WRAPPING BAND
62	J61-0511-05	SADDLE FOR WIRE
63	J61-0520-05	SADDLE
—	K01-0522-05	HANDLE
64	K21-0868-03	KNOB
65	K21-0869-04	KNOB
66	K21-0870-04	KNOB
67	K21-0871-04	KNOB
68	K21-0872-04	KNOB
69	K21-0873-04	KNOB
70	K21-0874-03	KNOB
71	K27-0524-14	KNOB FOR PUSH SW
72	K27-0530-04	KNOB FOR LEVER
—	N08-0611-04	DRESSED SCREW
73	N09-0402-05	SCREW
—	N09-0705-05	SCREW, HEX SOCKET FLAT HD
74	N09-0707-05	SCREW
75	N09-0709-05	SCREW
76	N09-0710-05	SCREW, SEMS PAN HD
77	N09-0711-05	SCREW
78	N09-0721-04	SCREW
79	N10-2030-41	NUT
80	N10-2060-46	NUT
81	N14-0602-34	NUT
82	N14-0609-04	NUT
83	N14-0617-05	NUT
—	N15-1030-41	WASHER, FLAT FOR M3
84	N16-0026-46	SPRING WASHER
85	N16-0030-46	SPRING WASHER
86	N16-0060-46	SPRING WASHER
87	N17-1030-41	LOCK WASHER
88	N19-0191-05	WASHER NONMETAL
89	N19-0704-04	WASHER
—	N19-0710-05	WASHER
90	N30-2606-46	SCREW, PAN HD M 2.6X6
91	N30-2608-41	SCREW, PAN HD M 2.6X8
—	N30-3004-41	SCREW, PAN HD M 3X4
92	N30-3006-46	SCREW, PAN HD M 3X6
93	N30-3008-41	SCREW, PAN HD M 3X8
94	N32-2006-46	SCREW, FLAT HD M 2X6
95	N32-2606-46	SCREW, FLAT HD M 2.6X6
96	N32-3006-46	SCREW, FLAT HD M 3X6
97	N32-3008-41	SCREW, FLAT HD M 3X8
98	N89-3006-46	SCREW, BINDING TAP TITE
99	N89-3010-41	SCREW, BINDING TAP TITE
	R92-0150-05	JUMPING RES. ZERO OHM
100	S02-4502-05	ROTARY SWITCH
—	W01-0503-04	CORD WRAP
101	W02-0413-05	SWITCHING POWER SUPPLY
102	W02-0414-05	HIGH VOLTAGE BLOCK
—	W09-0405-05	LITHIUM BATTERY 3V 0.2AH
103	X68-1400-00	POWER BLANKING UNIT
104	X70-1020-00	FILTER UNIT
105	X73-1500-03	AMPLIFIER UNIT
106	X73-1510-03	AMPLIFIER UNIT
107	X73-1520-00	CH3,CH4 AMP UNIT
108	X74-1310-00	SWEEP ROTARY UNIT
109	X74-1350-00	TRIG SWEEP UNIT
110	X74-1360-00	HORIZONTAL OUTPUT UNIT
111	X77-1280-00	A TRIG SWITCH UNIT
112	X77-1290-00	B TRIG UNIT
113	X81-1320-00	CPU UNIT
114	X81-1430-00	ASTIG UNIT
—	Y87-1250-00	PROBE(PC-29)
	001-0801-05	COATING WIRE
	002-0001-05	BRAIDED WIRE
	002-0006-05	BRAIDED WIRE
	150KTM31	CRT
	212-2014-05	TUBE (PLASTIC)
	212-3017-05	TUBE (PLASTIC)
	420-0010-05	ADHESIVES
	490-0007-05	TAPE
	490-0010-05	TAPE
	490-0012-05	TAPE
	490-0040-05	TAPE
	490-0127-05	TAPE
C001	C91-0501-05	CAP. METAL FILM 0.047 10% 630
C002	C91-0501-05	CAP. METAL FILM 0.047 10% 630
D001	LN222RP	DIODE
D002	LN322GP	DIODE
D003	LN222RP	DIODE
D004	LN322GP	DIODE
D005	LN322GP	DIODE
D006	LN322GP	DIODE
D007	LN222RP	DIODE
115 D008	B30-0903-15	LED LAMP (RED)
J002	E31-2445-15	LEAD WIRE WITH CONNECTOR
J003	E31-2441-05	LEAD WIRE WITH CONNECTOR
J004	E31-2441-05	LEAD WIRE WITH CONNECTOR
J005	E31-2444-05	LEAD WIRE WITH CONNECTOR
J006	E31-2444-05	LEAD WIRE WITH CONNECTOR
J007	E31-2443-15	LEAD WIRE WITH CONNECTOR
J008	E31-2443-15	LEAD WIRE WITH CONNECTOR
J030	E31-2464-05	LEAD WIRE WITH CONNECTOR
J031	E31-2468-05	LEAD WIRE WITH CONNECTOR
J032	E31-2465-15	LEAD WIRE WITH CONNECTOR
J033	E31-2466-05	LEAD WIRE WITH CONNECTOR
J044	E31-2452-15	LEAD WIRE WITH CONNECTOR
J045	E31-2471-05	LEAD WIRE WITH CONNECTOR
J046	E31-2449-15	LEAD WIRE WITH CONNECTOR

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
J049	E31-2446-15	LEAD WIRE WITH CONNECTOR			
J050	NO USE				
J051	E31-2451-15	LEAD WIRE WITH CONNECTOR			
J052	NO USE				
J053	E31-2460-15	LEAD WIRE WITH CONNECTOR			
J054	NO USE				
J055	E31-2472-05	LEAD WIRE WITH CONNECTOR			
J056	E31-2475-25	LEAD WIRE WITH CONNECTOR			
J059	E31-2448-05	LEAD WIRE WITH CONNECTOR			
J060	E31-2475-25	LEAD WIRE WITH CONNECTOR			
J061	E31-2470-05	LEAD WIRE WITH CONNECTOR			
J062	E31-2469-05	LEAD WIRE WITH CONNECTOR			
L001	L39-0514-15	Y ALIGNMENT COIL			
L002	L76-0108-25	DELAY LINE			
R001	RD14BB2E105J	RES. CARBON	1M	5%	1/4W
R002	RD14BB2E105J	RES. CARBON	1M	5%	1/4W
R003	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R004	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R005	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R006	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R007	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R008	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R012	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R013	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R014	RD14BB2E473J	RES. CARBON	47K	5%	1/4W
S001	S40-1504-05	PUSH SWITCH			
S002	S40-1504-05	PUSH SWITCH			
S003	S40-1504-05	PUSH SWITCH			
S004	S40-1504-05	PUSH SWITCH			
S005	S40-1504-05	PUSH SWITCH			
S006	S40-1504-05	PUSH SWITCH			
S007	S40-1504-05	PUSH SWITCH			
S008	S40-1504-05	PUSH SWITCH			
S009	S40-1504-05	PUSH SWITCH			
S010	S40-1504-05	PUSH SWITCH			
S011	S40-1504-05	PUSH SWITCH			
S012	S40-1504-05	PUSH SWITCH			
S013	S40-1504-05	PUSH SWITCH			
S014	S40-1504-05	PUSH SWITCH			
S015	S40-1504-05	PUSH SWITCH			
S016	S40-1504-05	PUSH SWITCH			
S017	S40-1504-05	PUSH SWITCH			
S018	S40-1504-05	PUSH SWITCH			
S019	S40-1504-05	PUSH SWITCH			
S020	S40-1505-05	PUSH SWITCH			
116 S023	S33-1501-05	LEVER SWITCH			
— S024	S33-1501-05	LEVER SWITCH			
117 VR001	R23-1502-05	V.R.	1K B		
VR002	R23-1502-05	V.R.	1K B		
118 VR005	R23-2501-05	V.R.	5K B X2		
119 VR006	R06-2502-05	V.R. WITH PUSH,SW			
120 VR007	R29-0504-05	V.R.	1K B		

VERTICAL PREAMP UNIT

X73-1500-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E23-0015-04	EARTH LUG			
	E29-0504-05	TEFLON TERMINAL			
	J25-5038-22	PCB (UNMOUNTED)			
	L92-0110-05	BEAD CORE			
	001-0801-05	COATING WIRE			
	002-0001-05	BRAIDED WIRE			
	212-3017-05	TUBE (PLASTIC)			
C001	C91-0502-05	CAP. METAL FILM	0.01	20%	630V
C002	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C003	CC45CH1H151J	CAP. CERAMIC	150P	5%	50V
C004	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C005	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C006	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C007	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C008	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C009	CE04FW1A101M	CAP. ELECTRO	100	20%	10V
C010	CM93BD2A680J	CAP. MICA	68P	5%	100V
C013	CK45B1H472K	CAP. CERAMIC	4700P	10%	50V
C014	CC45CH1H020C	CAP. CERAMIC	2P	0.25P	50V
C021	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C027	CC45CH1H390J	CAP. CERAMIC	39P	5%	50V
C028	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C034	CC45SL1H470J	CAP. CERAMIC	47P	5%	50V
C035	CC45SL1H470J	CAP. CERAMIC	47P	5%	50V
C036	C91-0502-05	CAP. METAL FILM	0.01	20%	630V
C037	NO USE				
C038	CC45CH1H151J	CAP. CERAMIC	150P	5%	50V
C039	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C040	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C041	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C042	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C043	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C044	CE04FW1A101M	CAP. ELECTRO	100	20%	10V
C045	CM93BD2A680J	CAP. MICA	68P	5%	100V
C046	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C047	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C048	CK45B1H472K	CAP. CERAMIC	4700P	10%	50V
C049	CC45CH1H020C	CAP. CERAMIC	2P	0.25P	50V
C050	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C051	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C052	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C053	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C054	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C055	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C056	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C057	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C058	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C059	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C060	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C061	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C062	CC45CH1H330J	CAP. CERAMIC	33P	5%	50V
C063	NO USE				
C064	CC45CH1H120J	CAP. CERAMIC	12P	5%	50V
C065	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C066	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C067	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C068	CC45SL1H470J	CAP. CERAMIC	47P	5%	50V
C071	CC45CH1H020C	CAP. CERAMIC	2P	0.25P	50V
C072	CC45CH1H020C	CAP. CERAMIC	2P	0.25P	50V
C075	CC45SL1H181J	CAP. CERAMIC	180P	5%	50V
C076	CC45SL1H181J	CAP. CERAMIC	180P	5%	50V
C077	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C080	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C081	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C082	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C083	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C084	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C085	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C086	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C087	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C088	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C089	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C090	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C091	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C092	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C093	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C094	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C095	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C096	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C097	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C098	CE04W1C101M	CAP. ELECTRO	100	20%	16V
C099	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C100	CE04FW1A101M	CAP. ELECTRO	100	20%	10V
C101	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C102	CE04W1A470M	CAP. ELECTRO	47	20%	10V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
C103	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C104	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C105	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C106	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C107	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C108	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C109	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C110	CE04W1C101M	CAP. ELECTRO	100	20%	16V
C111	CE04FW1A101M	CAP. ELECTRO	100	20%	10V
C112	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C113	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C114	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C115	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C116	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C117	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C118	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C119	NO USE				
C120	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C121	CC45SL1H221J	CAP. CERAMIC	220P	5%	50V
C122	CC45SL1H221J	CAP. CERAMIC	220P	5%	50V
C123	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C124	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C125	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C126	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C127	NO USE				
C128	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C132	CC45SL1H101J	CAP. CERAMIC	100P	5%	50V
C136	CC45CH1H010C	CAP. CERAMIC	1P	0.25P	50V
C137	CC45CH1H010C	CAP. CERAMIC	1P	0.25P	50V
C138	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C139	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C140	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C141	CC45CH1H100D	CAP. CERAMIC	10P	0.5P	50V
C142	CC45CH1H100D	CAP. CERAMIC	10P	0.5P	50V
C145	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C146	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C147	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C148	CC45CH1H010C	CAP. CERAMIC	1P	0.25P	50V
D001	1S1544A	DIODE			
D002	1S1544A	DIODE			
D003	MTZ3.3JA	DIODE, ZENER	3.2V		
D004	1SS132	DIODE			
D005	1SS132	DIODE			
D006	1SS132	DIODE			
D007	1SS132	DIODE			
D008	1SS132	DIODE			
D009	1SS132	DIODE			
D010	1SS132	DIODE			
D011	MTZ3.3JA	DIODE, ZENER	3.2V		
D012	MTZ3.3JA	DIODE, ZENER	3.2V		
D013	1S1544A	DIODE			
D014	1S1544A	DIODE			
D015	MTZ3.3JA	DIODE, ZENER	3.2V		
D016	1SS132	DIODE			
D017	1SS132	DIODE			
D018	MTZ7.5JA	DIODE, ZENER	7.1V		
D019	1N60	DIODE			
D020	1SS132	DIODE			
D021	1SS132	DIODE			
D022	1SS132	DIODE			
D023	1SS132	DIODE			
D024	1SS132	DIODE			
D025	MTZ3.3JA	DIODE, ZENER	3.2V		
D026	MTZ7.5JA	DIODE, ZENER	7.1V		
D027	1SS132	DIODE			
D028	MTZ7.5JA	DIODE, ZENER	7.1V		
D029	1SS132	DIODE			
D030	1SS132	DIODE			
D031	1SS132	DIODE			
D032	1SS132	DIODE			
D033	1SS132	DIODE			
D034	1SS132	DIODE			
D035	1SS132	DIODE			
D036	1SS132	DIODE			
D037	1SS132	DIODE			
D038	1SS132	DIODE			
D039	1SS132	DIODE			
D040	1SS132	DIODE			
D041	1SS132	DIODE			
D042	1SS132	DIODE			
D043	1SS132	DIODE			
D044	1SS132	DIODE			
D045	1SS132	DIODE			
D046	1SS132	DIODE			
IC001	LF441ACN	IC, LOW-POWER JFET OP-AMP			
IC002	LF441ACN	IC, LOW-POWER JFET OP-AMP			
IC003	SN7400N	IC, QUAD 2-INPUT NAND			
IC004	MC10104L	IC, QUAD 2-INPUT AND GATE			
IC005	MC10131L	IC, DUAL D-FFS			
IC006	MC10102L	IC, QUAD 2-INPUT NOR GATE			
IC007	MC10102L	IC, QUAD 2-INPUT NOR GATE			
IC008	LM337LZ	IC, REGULATOR			
IC009	LM317LZ	IC, REGULATOR			

REF.NO	PARTS NO	NAME & DESCRIPTION	
L001	L40-4791-02	FERRI INDUCTOR	4.7UH
L002	L40-4791-02	FERRI INDUCTOR	4.7UH
L003	L40-4791-02	FERRI INDUCTOR	4.7UH
L004	L40-4791-02	FERRI INDUCTOR	4.7UH
L005	L40-4791-02	FERRI INDUCTOR	4.7UH
L006	L40-4791-02	FERRI INDUCTOR	4.7UH
L007	L40-4791-02	FERRI INDUCTOR	4.7UH
L008	L40-4791-02	FERRI INDUCTOR	4.7UH
L009	L40-4791-02	FERRI INDUCTOR	4.7UH
L010	L40-4791-02	FERRI INDUCTOR	4.7UH
L011	L40-1011-04	FERRI INDUCTOR	100UH
L012	L40-4791-02	FERRI INDUCTOR	4.7UH
L013	L40-4791-02	FERRI INDUCTOR	4.7UH
L014	L40-4791-02	FERRI INDUCTOR	4.7UH
L015	L40-4791-02	FERRI INDUCTOR	4.7UH
L016	L40-4791-02	FERRI INDUCTOR	4.7UH
L017	L40-4791-02	FERRI INDUCTOR	4.7UH
L018	L40-4791-02	FERRI INDUCTOR	4.7UH
L019	NO USE		
L020	L40-4791-02	FERRI INDUCTOR	4.7UH
L021	L40-4791-02	FERRI INDUCTOR	4.7UH
L022	L40-4791-02	FERRI INDUCTOR	4.7UH
L023	L40-4791-02	FERRI INDUCTOR	4.7UH
P001	E40-0473-05	PIN CONNECTOR	4 P
P002	E40-1273-05	PIN CONNECTOR	12 P
P003	E40-0473-05	PIN CONNECTOR	4 P
P004	E40-0473-05	PIN CONNECTOR	4 P
P005	E40-0373-05	PIN CONNECTOR	3 P
P006	E40-0373-05	PIN CONNECTOR	3 P
P007	E40-0573-05	PIN CONNECTOR	5 P
P008	E40-0573-05	PIN CONNECTOR	5 P
P009	E40-0315-05	PIN CONNECTOR	3 P
P010	NO USE		
P011	E40-0473-05	PIN CONNECTOR	4 P
P012	E40-0473-05	PIN CONNECTOR	4 P
P013	NO USE		
P014	E40-0773-05	PIN CONNECTOR	7 P
P015	E40-0273-05	PIN CONNECTOR	2 P
P016	E40-0273-05	PIN CONNECTOR	2 P
P019	E40-0273-05	PIN CONNECTOR	2 P
P020	E40-0573-05	PIN CONNECTOR	5 P
P021	E40-0273-05	PIN CONNECTOR	2 P
Q001	J304	FET, N-CHANNEL	
Q002	2SC2671(H)	TR, SI, NPN	
Q003	2SC2671(H)	TR, SI, NPN	
Q004	2SC2671(H)	TR, SI, NPN	
Q005	2SC2671(H)	TR, SI, NPN	
Q006	2SC3354(T,S)	TR, SI, NPN	
Q007	2SC3354(T,S)	TR, SI, NPN	
Q008	2SC1733	TR, SI, NPN	
Q009	2SC3354(T,S)	TR, SI, NPN	
Q010	2SC3354(T,S)	TR, SI, NPN	
Q011	2SC3354(T,S)	TR, SI, NPN	
Q012	2SC3354(T,S)	TR, SI, NPN	
Q013	2SC3315(C,D)	TR, SI, NPN	
Q014	2SC3311(R)	TR, SI, NPN	
Q015	2SA1161	TR, SI, PNP	
Q016	2SA1161	TR, SI, PNP	
Q017	2SC3311(R)	TR, SI, NPN	
Q018	2SA1323(B)	TR, SI, PNP	
Q019	2SA1323(B)	TR, SI, PNP	
Q020	2SC3354(T,S)	TR, SI, NPN	
Q021	2SC3354(T,S)	TR, SI, NPN	
Q022	2SC2671(H)	TR, SI, NPN	
Q023	2SC2671(H)	TR, SI, NPN	
Q024	2SC2671(H)	TR, SI, NPN	
Q025	2SC2671(H)	TR, SI, NPN	
Q026	2SC3315(C,D)	TR, SI, NPN	
Q027	2SC3315(C,D)	TR, SI, NPN	
Q028	2SC3354(T,S)	TR, SI, NPN	
Q029	2SC3354(T,S)	TR, SI, NPN	
Q030	J304	FET, N-CHANNEL	
Q031	2SC2671(H)	TR, SI, NPN	
Q032	2SC2671(H)	TR, SI, NPN	
Q033	2SC2671(H)	TR, SI, NPN	
Q034	2SC2671(H)	TR, SI, NPN	
Q035	2SC3354(T,S)	TR, SI, NPN	
Q036	2SC3354(T,S)	TR, SI, NPN	
Q037	2SC1733	TR, SI, NPN	
Q038	2SC3354(T,S)	TR, SI, NPN	
Q039	2SC3354(T,S)	TR, SI, NPN	
Q040	2SC3354(T,S)	TR, SI, NPN	
Q041	2SC3354(T,S)	TR, SI, NPN	
Q042	2SC3315(C,D)	TR, SI, NPN	
Q043	2SC3311(R)	TR, SI, NPN	
Q044	2SA1161	TR, SI, PNP	
Q045	2SA1161	TR, SI, PNP	
Q046	2SA1161	TR, SI, PNP	
Q047	2SA1161	TR, SI, PNP	
Q048	2SC3311(R)	TR, SI, NPN	
Q049	2SA1309(Q,R)	TR, SI, PNP	
Q050	2SA1309(Q,R)	TR, SI, PNP	
Q051	2SC3311(R)	TR, SI, NPN	
Q052	2SA1323(B)	TR, SI, PNP	
Q053	2SA1323(B)	TR, SI, PNP	

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
Q054	2SC3354(T,S)	TR. SI, NPN
Q055	2SC3354(T,S)	TR. SI, NPN
Q056	2SC2671(H)	TR. SI, NPN
Q057	2SC2671(H)	TR. SI, NPN
Q058	2SC2671(H)	TR. SI, NPN
Q059	2SC2671(H)	TR. SI, NPN
Q060	2SC3315(C,D)	TR. SI, NPN
Q061	2SC3354(T,S)	TR. SI, NPN
Q062	2SC3354(T,S)	TR. SI, NPN
Q063	2SC3354(T,S)	TR. SI, NPN
Q064	2SA1309(Q,R)	TR. SI, PNP
Q065	2SC3354(T,S)	TR. SI, NPN
Q066	2SC3354(T,S)	TR. SI, NPN
Q067	2SA1161	TR. SI, PNP
Q068	2SA1161	TR. SI, PNP
Q069	2SC3315(C,D)	TR. SI, NPN
Q070	2SC3315(C,D)	TR. SI, NPN
Q071	2SA1309(Q,R)	TR. SI, PNP
Q072	2SC3311(R)	TR. SI, NPN
Q073	2SA1161	TR. SI, PNP
Q074	2SA1161	TR. SI, PNP
Q075	2SC3311(R)	TR. SI, NPN
Q076	2SC2671(H)	TR. SI, NPN
Q077	2SC2671(H)	TR. SI, NPN
Q078	2SC3311(R)	TR. SI, NPN
Q079	2SC2671(H)	TR. SI, NPN
Q080	2SC2671(H)	TR. SI, NPN
Q081	2SC3311(R)	TR. SI, NPN
Q082	2SA1309(Q,R)	TR. SI, PNP
Q083	2SA1309(Q,R)	TR. SI, PNP
Q084	2SA1309(Q,R)	TR. SI, PNP
Q085	2SA1309(Q,R)	TR. SI, PNP
Q086	2SC3311(R)	TR. SI, NPN
Q087	2SC3311(R)	TR. SI, NPN

REF.NO	PARTS NO	NAME & DESCRIPTION			
R001	RD14BB2E684J	RES. CARBON	680K	5%	1/4W
R002	RN14BK2E1803D	RES. METAL FILM	180K	0.5%	1/4W
R003	RN14BK2E823D	RES. METAL FILM	820K	0.5%	1/4W
R004	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R005	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R006	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R007	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R008	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R009	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R010	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R011	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R012	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R013	RN14BK2C1100F	RES. METAL FILM	110	1%	1/6W
R014	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R015	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R016	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R017	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R018	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R019	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R020	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R021	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R022	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R023	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R024	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R025	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R026	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R027	RN14BK2C9100F	RES. METAL FILM	910	1%	1/6W
R028	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R029	RD14BB2C204J	RES. CARBON	200K	5%	1/6W
R030	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R031	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R032	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R033	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R034	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R035	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R036	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R037	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R038	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R039	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R040	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R041	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R042	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R043	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R044	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R045	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R046	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R047	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R048	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R049	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R050	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R051	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R052	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R053	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R054	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R055	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R056	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R057	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R058	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R059	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R060	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R061	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R062	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R063	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R064	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R065	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R066	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R067	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R068	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R069	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R070	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R071	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R072	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R073	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R074	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R075	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R076	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R077	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R078	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R079	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R080	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R081	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R082	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R083	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R084	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R085	RN14BK2C1200F	RES. METAL FILM	120	1%	1/6W
R086	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R087	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R088	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R089	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R090	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R091	NO USE				
R092	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R093	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R094	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R095	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R096	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R097	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R098	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R099	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R100	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R101	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R102	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R103	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R104	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R105	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R106	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R107	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R108	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R109	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R110	RD14BB2E684J	RES. CARBON	680K	5%	1/4W
R111	RN14BK2E1803D	RES. METAL FILM	180K	0.5%	1/4W
R112	RN14BK2E823D	RES. METAL FILM	820K	0.5%	1/4W
R113	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R114	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R115	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R116	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R117	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R118	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R119	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R120	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R121	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R122	RN14BK2C1100F	RES. METAL FILM	110	1%	1/6W
R123	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R124	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R125	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R126	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R127	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R128	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R129	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R130	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R131	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R132	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R133	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R134	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R135	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R136	RN14BK2C9100F	RES. METAL FILM	910	1%	1/6W
R137	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R138	RD14BB2C204J	RES. CARBON	200K	5%	1/6W
R139	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R140	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R141	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R142	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R143	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R144	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R145	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R146	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R147	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R148	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R149	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R150	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R151	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R152	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R153	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R154	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R155	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R156	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R157	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R158	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R159	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R160	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R161	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R162	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R163	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R164	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R165	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R166	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R167	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R168	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R169	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R170	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R171	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R172	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R173	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R174	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R175	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R176	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R177	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R178	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R179	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R180	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R181	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R182	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R183	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R184	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R185	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R186	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R187	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R188	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R189	NO USE				
R190	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R191	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R192	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R193	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R194	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R195	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R196	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R197	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R198	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R199	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R200	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R201	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R202	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R203	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R204	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R205	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R206	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R207	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R208	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R209	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R210	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R211	RN14BK2C1200F	RES. METAL FILM	120	1%	1/6W
R212	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R213	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R214	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R215	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R216	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R217	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R218	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R219	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R220	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R221	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R222	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R223	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R224	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R225	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R226	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R227	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R228	RD14BB2C330J	RES. CARBON	33	5%	1/6W
R229	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R230	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R231	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R232	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R233	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R234	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R235	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R236	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R237	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R238	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R239	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R240	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R241	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R242	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R243	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R244	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R245	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R246	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R247	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R248	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R249	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R250	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R251	RN14BK2C75R0F	RES. METAL FILM	75.0	1%	1/6W
R252	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R253	RN14BK2C75R0F	RES. METAL FILM	75.0	1%	1/6W
R254	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R255	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R256	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R257	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R258	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R259	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R260	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R261	NO USE				
R262	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R263	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R264	RN14BK2C3900F	RES. METAL FILM	390	1%	1/6W
R265	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R266	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R267	RN14BK2C3900F	RES. METAL FILM	390	1%	1/6W
R268	NO USE				
R269	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R270	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R271	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R272	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R273	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R274	NO USE				
R275	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R276	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R277	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R278	NO USE				
R279	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R280	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R281	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R282	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R283	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R284	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R285	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R286	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R287	NO USE				
R288	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R289	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R290	NO USE				
R291	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R292	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R293	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R294	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R295	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R296	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R297	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R298	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R299	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R300	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R301	NO USE				
R302	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R303	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R304	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R305	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R306	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R307	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R308	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R309	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R310	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R311	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R312	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R313	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R314	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R315	RD14BB2C270J	RES. CARBON	27	5%	1/6W
R316	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R317	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R318	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R319	RD14BB2C270J	RES. CARBON	27	5%	1/6W
R320	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R321	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R322	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R323	RD14BB2C270J	RES. CARBON	27	5%	1/6W
R324	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R325	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R326	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R327	RD14BB2C270J	RES. CARBON	27	5%	1/6W
R328	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R329	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R330	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R331	RN14BK2C2400F	RES. METAL FILM	240	1%	1/6W
R332	RN14BK2C1101F	RES. METAL FILM	1.1K	1%	1/6W
R333	RN14BK2C2400F	RES. METAL FILM	240	1%	1/6W
R334	RN14BK2C1101F	RES. METAL FILM	1.1K	1%	1/6W
R335	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R336	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R337	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R338	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R339	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R340	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R341	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R342	NO USE				
R343	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R344	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R345	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R346	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R347	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R348	RD14BB2C510J	RES. CARBON	51	5%	1/6W
TC001	C05-0309-05	CAP. TRIMMER	40P		
TC002	C05-0031-15	CAP. TRIMMER	10P		
TC003	C05-0031-15	CAP. TRIMMER	10P		
TC004	C05-0030-15	CAP. TRIMMER	20P		
TC005	C05-0309-05	CAP. TRIMMER	40P		
TC006	C05-0031-15	CAP. TRIMMER	10P		
TC007	C05-0031-15	CAP. TRIMMER	10P		
TC008	C05-0031-15	CAP. TRIMMER	10P		

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
TC009	C05-0031-15	CAP. TRIMMER 10P
TP001	E23-0508-04	TEST TERMINAL
TP002	E23-0508-04	TEST TERMINAL
TP003	E40-0211-05	PIN CONNECTOR 2 P
VR001	R12-0539-05	RES. SEMI FIXED 200 B
VR002	R12-3520-05	RES. SEMI FIXED 10K B
VR003	NO USE	
VR004	R12-0421-05	RES. SEMI FIXED 100 B
VR005	R12-0421-05	RES. SEMI FIXED 100 B
VR006	R12-0421-05	RES. SEMI FIXED 100 B
VR007	R12-0421-05	RES. SEMI FIXED 100 B
VR008	R12-0539-05	RES. SEMI FIXED 200 B
VR009	R12-3520-05	RES. SEMI FIXED 10K B
VR010	R12-3520-05	RES. SEMI FIXED 10K B
VR011	R12-0539-05	RES. SEMI FIXED 200 B
VR012	R12-3520-05	RES. SEMI FIXED 10K B
VR013	NO USE	
VR014	R12-0421-05	RES. SEMI FIXED 100 B
VR015	R12-0421-05	RES. SEMI FIXED 100 B
VR016	R12-0421-05	RES. SEMI FIXED 100 B
VR017	R12-0421-05	RES. SEMI FIXED 100 B
VR018	R12-0421-05	RES. SEMI FIXED 100 B
VR019	R12-3520-05	RES. SEMI FIXED 10K B
VR020	R12-0539-05	RES. SEMI FIXED 200 B
VR021	R12-0540-05	RES. SEMI FIXED 500 B
VR022	R12-0539-05	RES. SEMI FIXED 200 B
VR023	R12-0540-05	RES. SEMI FIXED 500 B
VR024	R12-0539-05	RES. SEMI FIXED 200 B
VR025	R12-0539-05	RES. SEMI FIXED 200 B

VERTICAL OUTPUT AMP UNIT

X73-1510-03

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E23-0512-05	TERMINAL			
	F02-0501-04	HEAT SINK			
	F02-0502-05	HEAT SINK			
	J25-5039-22	PCB (UNMOUNTED)			
	L92-0110-05	BEAD CORE			
	N09-0711-05	SCREW			
	N89-3006-46	SCREW, BINDING TAP TITE			
	Z12-2014-05	TUBE (PLASTIC)			
C001	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C002	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C003	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C004	CC45SL1H221J	CAP. CERAMIC	220P	5%	50V
C005	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C006	CC45CH1H120J	CAP. CERAMIC	12P	5%	50V
C007	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C008	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C009	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C010	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C011	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C012	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C013	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C014	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C015	CE04FW1V330M	CAP. ELECTRO	33	20%	35V
C016	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C017	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C018	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C019	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C020	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C021	NO USE				
C022	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C023	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C024	CC45SL1H331J	CAP. CERAMIC	330P	5%	50V
C025	CC45SL1H331J	CAP. CERAMIC	330P	5%	50V
C026	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C027	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C028	CK45F1H103Z	CAP. CERAMIC	0.01		50V
D001	MTZ24JC	DIODE, ZENER	24V		
D002	1S2686	DIODE			
D003	1S2686	DIODE			
L001	L33-0806-05	CHOKE COIL			
L002	L33-0806-05	CHOKE COIL			
L003	L40-2282-13	FERRI INDUCTOR	0.22UH		
L004	L40-2282-13	FERRI INDUCTOR	0.22UH		
L005	L40-4701-03	FERRI INDUCTOR	47UH		
L006	L40-4701-03	FERRI INDUCTOR	47UH		
L007	L40-4701-03	FERRI INDUCTOR	47UH		
L008	L40-4701-03	FERRI INDUCTOR	47UH		
L009	L40-2282-01	FERRI INDUCTOR	0.22UH		
L010	L40-2282-01	FERRI INDUCTOR	0.22UH		
P010	E40-0315-05	PIN CONNECTOR	3 P		
P013	E40-0273-05	PIN CONNECTOR	2 P		
P020	E40-0573-05	PIN CONNECTOR	5 P		
P021	NO USE				
P022	E40-0773-05	PIN CONNECTOR	7 P		
Q001	2SC2671(H)	TR. SI, NPN			
Q002	2SC2671(H)	TR. SI, NPN			
Q003	2SA1206	TR, SI, PNP			
Q004	2SA1206	TR, SI, PNP			
Q005	2SC2671(H)	TR. SI, NPN			
Q006	2SC2671(H)	TR. SI, NPN			
Q007	2SC2644	TR. SI, NPN			
Q008	2SC2644	TR. SI, NPN			
Q009	2SC2644	TR. SI, NPN			
Q010	2SC2644	TR. SI, NPN			
Q011	2SC1164	TR. SI, NPN			
Q012	2SC1164	TR. SI, NPN			
Q013	2SA1309(Q,R)	TR. SI, PNP			
Q014	2SC3311(Q,R)	TR. SI, NPN			
Q015	2SA1309(Q,R)	TR. SI, PNP			
Q016	2SA1309(Q,R)	TR. SI, PNP			
Q017	2SC3311(Q,R)	TR. SI, NPN			
Q018	2SA1309(Q,R)	TR. SI, PNP			
R001	RN14BK2C2000F	RES. METAL FILM	200	1%	1/6W
R002	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R003	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R004	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R005	RN14BK2C75R0F	RES. METAL FILM	75.0	1%	1/6W
R006	RN14BK2C75R0F	RES. METAL FILM	75.0	1%	1/6W
R007	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R008	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R009	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R010	RN14BK2E3900F	RES. METAL FILM	390	1%	1/4W
R011	RN14BK2E3900F	RES. METAL FILM	390	1%	1/4W
R012	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R013	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R014	RD14BB2E361J	RES. CARBON	360	5%	1/4W
R015	RD14BB2E361J	RES. CARBON	360	5%	1/4W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R016	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R017	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R018	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R019	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R020	NO USE				
R021	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R022	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R023	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R024	R48-A2560#3				
R025	R48-A2560#3				
R026	RD14BB2E6R8J	RES. CARBON	6.8	5%	1/6W
R027	RD14BB2E220J	RES. CARBON	22	5%	1/6W
R028	RD14BB2E220J	RES. CARBON	22	5%	1/6W
R029	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R030	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R031	R47-5047-15				
R032	R47-5047-15				
R033	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R034	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R035	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R036	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R037	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R038	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R039	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R040	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R041	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R042	RD14BB2E220J	RES. CARBON	22	5%	1/6W
R043	RN14BK2C4780F	RES. METAL FILM	478.0	1%	1/6W
R044	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R045	RN14BK2C4760F	RES. METAL FILM	476.0	1%	1/6W
R046	RN14BK2C9180F	RES. METAL FILM	91.0	1%	1/6W
R047	RN14BK2C2201F	RES. METAL FILM	2.2K	1%	1/6W
R048	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R049	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R050	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R051	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R052	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R053	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R054	RD14BB2C133J	RES. CARBON	13K	5%	1/6W
R055	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R056	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R057	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R058	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R059	NO USE				
R060	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R061	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
TC001	C05-0412-05	CAP. TRIMMER	20P		
TC002	C05-0412-05	CAP. TRIMMER	20P		
TH001	2DT1000	THERMISTOR			
VR001	R12-0543-05	RES. SEMI FIXED	500	B	
VR002	R12-0543-05	RES. SEMI FIXED	500	B	
VR003	R12-0543-05	RES. SEMI FIXED	500	B	

CH3, CH4 AMP UNIT

X73-1520-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J21-2990-04	MOUNTING HARDWEAR			
	J25-5079-22	PCB (UNMOUNTED)			
	N09-0709-05	SCREW			
C001	CC45CH1H390J	CAP. CERAMIC	39P	5%	50V
C002	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C003	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C004	C91-0502-05	CAP. METAL FILM	0.01	20%	630V
C005	CC45SL1H101J	CAP. CERAMIC	100P	5%	50V
C006	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C007	NO USE				
C008	CC45CH1H390J	CAP. CERAMIC	39P	5%	50V
C009	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C010	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C011	C91-0502-05	CAP. METAL FILM	0.01	20%	630V
C012	CC45SL1H101J	CAP. CERAMIC	100P	5%	50V
C013	CC45CH1H050C	CAP. CERAMIC	5P	0.25P	50V
C014	NO USE				
C015	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C016	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C017	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C018	CK45FF1H102Z	CAP. CERAMIC	0.01		50V
C019	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C020	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C021	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C022	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C023	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C026	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C027	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C028	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C029	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C030	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C031	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C032	CC45CH1H220J	CAP. CERAMIC	22P	5%	50V
C033	CC45CH1H220J	CAP. CERAMIC	22P	5%	50V
D001	1SS132	DIODE			
D002	1SS154A	DIODE			
D003	1SS132	DIODE			
D004	1S1544A	DIODE			
D005	1SS132	DIODE			
D006	1SS132	DIODE			
D007	1SS132	DIODE			
D008	1SS132	DIODE			
D009	1SS132	DIODE			
L001	L40-2201-03	FERRI INDUCTOR	22UH		
L002	L40-2201-03	FERRI INDUCTOR	22UH		
L003	L40-2201-03	FERRI INDUCTOR	22UH		
P011	E40-0473-05	PIN CONNECTOR	4 P		
P012	E40-0473-05	PIN CONNECTOR	4 P		
P017	E40-0273-05	PIN CONNECTOR	2 P		
P018	E40-0273-05	PIN CONNECTOR	2 P		
P048	E40-1816-05	PIN CONNECTOR	18P		
P054	E40-7416-05	PIN CONNECTOR	16P		
P055	E40-7416-05	PIN CONNECTOR	16P		
P056	E23-0503-05	TERMINAL			
P057	NO USE				
P058	E40-0273-05	PIN CONNECTOR	2 P		
P059	NO USE				
P060	E23-0503-05	TERMINAL			
P061	E40-7416-05	PIN CONNECTOR	16P		
Q001	2SD438(F)	TR. SI. NPN			
Q002	DN1901	FET. DUAL SI. N-CHANNEL			
Q003	2SC3354(T.S)	TR. SI. NPN			
Q004	2SC3354(T.S)	TR. SI. NPN			
Q005	2SA1206	TR. SI. PNP			
Q006	2SB1206	TR. SI. PNP			
Q007	2SC2671(H)	TR. SI. NPN			
Q008	2SC2671(H)	TR. SI. NPN			
Q009	2SD438(F)	TR. SI. NPN			
Q010	DN1901	FET. DUAL SI. N-CHANNEL			
Q011	2SC3354(T.S)	TR. SI. NPN			
Q012	2SC3354(T.S)	TR. SI. NPN			
Q013	2SA1206	TR. SI. PNP			
Q014	2SB1206	TR. SI. PNP			
Q015	2SC2671(H)	TR. SI. NPN			
Q016	2SC2671(H)	TR. SI. NPN			
R001	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R002	RN14BK2E9003D	RES. METAL FILM	900K	0.5%	1/4W
R003	RN14BK2E1113D	RES. METAL FILM	111K	0.5%	1/4W
R004	RD14BB2C560J	RES. CARBON	56	5%	1/6W
R005	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R006	RN14BK2E1004D	RES. METAL FILM	1M	0.5%	1/4W
R007	RD14BB2E684J	RES. CARBON	680K	5%	1/4W
R008	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R009	RD14BB2C181J	RES. CARBON	180	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R010	RD14B2C220J	RES. CARBON	22	5%	1/6W
R011	RD14B2C220J	RES. CARBON	22	5%	1/6W
R012	RD14B2C101J	RES. CARBON	100	5%	1/6W
R013	RD14B2C392J	RES. CARBON	3.9K	5%	1/6W
R014	RD14B2C392J	RES. CARBON	3.9K	5%	1/6W
R015	RD14B2C101J	RES. CARBON	100	5%	1/6W
R016	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R017	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R018	RN14BK2C1101F	RES. METAL FILM	1.1K	1%	1/6W
R019	RN14BK2C1101F	RES. METAL FILM	1.1K	1%	1/6W
R020	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R021	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R022	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R023	RD14B2C220J	RES. CARBON	22	5%	1/6W
R024	RD14B2C220J	RES. CARBON	22	5%	1/6W
R025	RD14B2C220J	RES. CARBON	22	5%	1/6W
R026	RD14B2C122J	RES. CARBON	1.2K	5%	1/6W
R027	RD14B2C431J	RES. CARBON	430	5%	1/6W
R028	RD14B2C220J	RES. CARBON	22	5%	1/6W
R029	RD14B2C101J	RES. CARBON	100	5%	1/6W
R030	RD14B2C821J	RES. CARBON	820	5%	1/6W
R031	RD14B2C100J	RES. CARBON	10	5%	1/6W
R032	RD14B2C470J	RES. CARBON	47	5%	1/6W
R033	RN14BK2E9003D	RES. METAL FILM	900K	0.5%	1/4W
R034	RN14BK2E1113D	RES. METAL FILM	111K	0.5%	1/4W
R035	RD14B2C560J	RES. CARBON	56	5%	1/6W
R036	RD14B2C122J	RES. CARBON	1.2K	5%	1/6W
R037	RN14BK2E1004D	RES. METAL FILM	1M	0.5%	1/4W
R038	NO USE				
R039	RD14B2C181J	RES. CARBON	180	5%	1/6W
R040	RD14B2C181J	RES. CARBON	180	5%	1/6W
R041	RD14B2C220J	RES. CARBON	22	5%	1/6W
R042	RD14B2C220J	RES. CARBON	22	5%	1/6W
R043	RD14B2C101J	RES. CARBON	100	5%	1/6W
R044	RD14B2C392J	RES. CARBON	3.9K	5%	1/6W
R045	RD14B2C392J	RES. CARBON	3.9K	5%	1/6W
R046	RD14B2C101J	RES. CARBON	100	5%	1/6W
R047	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R048	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R049	RN14BK2C1101F	RES. METAL FILM	1.1K	1%	1/6W
R050	RN14BK2C1101F	RES. METAL FILM	1.1K	1%	1/6W
R051	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R052	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R053	RN14BK2C3600F	RES. METAL FILM	360	1%	1/6W
R054	RD14B2C220J	RES. CARBON	22	5%	1/6W
R055	RD14B2C220J	RES. CARBON	22	5%	1/6W
R056	RD14B2C220J	RES. CARBON	22	5%	1/6W
R057	RD14B2C122J	RES. CARBON	1.2K	5%	1/6W
R058	RD14B2C431J	RES. CARBON	430	5%	1/6W
R059	RD14B2C220J	RES. CARBON	22	5%	1/6W
R060	RD14B2C101J	RES. CARBON	100	5%	1/6W
R061	RD14B2C821J	RES. CARBON	820	5%	1/6W
R062	RD14B2C100J	RES. CARBON	10	5%	1/6W
R063	RD14B2C681J	RES. CARBON	680	5%	1/6W
R064	RD14B2C681J	RES. CARBON	680	5%	1/6W
R065	RD14B2C681J	RES. CARBON	680	5%	1/6W
R066	RD14B2C681J	RES. CARBON	680	5%	1/6W
R067	RD14B2C681J	RES. CARBON	680	5%	1/6W
R068	RD14B2C681J	RES. CARBON	680	5%	1/6W
R069	RD14B2C681J	RES. CARBON	680	5%	1/6W
R070	RD14B2C681J	RES. CARBON	680	5%	1/6W
R071	RD14B2C681J	RES. CARBON	680	5%	1/6W
R072	RD14B2C222J	RES. CARBON	2.2K	5%	1/6W
R073	RD14B2C121J	RES. CARBON	120	5%	1/6W
R074	RD14B2C121J	RES. CARBON	120	5%	1/6W
R075	RD14B2C470J	RES. CARBON	47	5%	1/6W
R076	RD14B2C470J	RES. CARBON	47	5%	1/6W
R077	RD14B2C330J	RES. CARBON	33	5%	1/6W
RL001	S51-2505-05	RELAY			
RL002	S51-2505-05	RELAY			
TC002	C05-0062-05	CAP. TRIMMER	6P		
TC003	C05-0031-15	CAP. TRIMMER	10P		
TC004	C05-0030-15	CAP. TRIMMER	20P		
TC005	NO USE				
TC006	C05-0062-05	CAP. TRIMMER	6P		
TC007	C05-0031-15	CAP. TRIMMER	10P		
TC008	C05-0030-15	CAP. TRIMMER	20P		
VR001	R12-0421-05	RES. SEMI FIXED	100 B		
VR002	R12-0421-05	RES. SEMI FIXED	100 B		

CPU UNIT

X81-1320-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J25-5036-22	PCB (UNMOUNTED)			
C001	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C002	CC45SL1H820J	CAP. CERAMIC	82P	5%	50V
C003	CE04W1H2R2M	CAP. ELECTRO	2.2	20%	50V
C004	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C005	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
D001	1SS132	DIODE			
D002	1SS132	DIODE			
D003	1SS132	DIODE			
D004	1SS132	DIODE			
IC001	MTM5010	MPU, 4-BIT MICROCOMPUTER			
IC002	AN90B20	IC, TR. ARRAY			
IC003	AN90B20	IC, TR. ARRAY			
J001	E31-2429-05	LEAD WIRE WITH CONNECTOR			
P002	E40-1274-05	PIN CONNECTOR			
P049	E40-0273-05	PIN CONNECTOR	2 P		
P061	E40-7516-05	PIN CONNECTOR	16P		
P062	E40-7526-05	PIN CONNECTOR	26P		
Q001	2SA1309(Q,R)	TR. SI. PNP			
Q002	2SC3311(R)	TR. SI. NPN			
R001	RD14B2C621J	RES. CARBON	620	5%	1/6W
R002	RD14B2C681J	RES. CARBON	680	5%	1/6W
R003	RD14B2C681J	RES. CARBON	680	5%	1/6W
R004	RD14B2C681J	RES. CARBON	680	5%	1/6W
R005	RD14B2C681J	RES. CARBON	680	5%	1/6W
R006	RD14B2C681J	RES. CARBON	680	5%	1/6W
R007	RD14B2C621J	RES. CARBON	620	5%	1/6W
R008	RD14B2C681J	RES. CARBON	680	5%	1/6W
R009	RD14B2C681J	RES. CARBON	680	5%	1/6W
R010	RD14B2C512J	RES. CARBON	5.1K	5%	1/6W
R011	RD14B2C103J	RES. CARBON	10K	5%	1/6W
R012	RD14B2C103J	RES. CARBON	10K	5%	1/6W
R013	RD14B2C103J	RES. CARBON	10K	5%	1/6W
R014	RD14B2C103J	RES. CARBON	10K	5%	1/6W
R015	RD14B2C472J	RES. CARBON	4.7K	5%	1/6W
R016	RD14B2C103J	RES. CARBON	10K	5%	1/6W

PARTS LIST

SWEEP ROTARY UNIT

X74-1310-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E31-2336-15	LEAD WIRE WITH CONNECTOR			
	F20-0640-04	INSULATOR			
	J25-2971-03	PCB (UNMOUNTED)			
	001-0004-05	COATING WIRE			
D001	1SS132	DIODE			
D002	1SS135	DIODE			
D003	1SS135	DIODE			
D004	1SS135	DIODE			
D005	1SS135	DIODE			
D006	1SS135	DIODE			
D007	1SS135	DIODE			
D008	1SS135	DIODE			
D009	1SS132	DIODE			
D010	1SS135	DIODE			
D011	1SS135	DIODE			
D012	1SS135	DIODE			
D013	1SS135	DIODE			
D014	1SS135	DIODE			
D015	1SS135	DIODE			
D016	1SS135	DIODE			
P015	E40-0973-05	PIN CONNECTOR	9 P		
P019	E40-1073-05	PIN CONNECTOR	10P		
P040	E40-0873-05	PIN CONNECTOR	8 P		
P041	E40-0873-05	PIN CONNECTOR	8 P		
P042	E40-0473-05	PIN CONNECTOR	4 P		
P051	E40-0773-05	PIN CONNECTOR	7 P		
P057	E40-0373-05	PIN CONNECTOR	3 P		
R001	RN14BK2B3603F	RES. METAL FILM	360K	1%	1/8W
R002	RN14BK281203F	RES. METAL FILM	120K	1%	1/8W
R003	RN14BK2B3002F	RES. METAL FILM	30K	1%	1/8W
R004	RN14BK2B3002F	RES. METAL FILM	30K	1%	1/8W
R005	RN14BK2B3602F	RES. METAL FILM	36K	1%	1/8W
R006	RN14BK291202F	RES. METAL FILM	12K	1%	1/8W
R007	RN14BK2B3001F	RES. METAL FILM	3K	1%	1/8W
R008	RN14BK2B3001F	RES. METAL FILM	3K	1%	1/8W
R009	RN14BK2B3601F	RES. METAL FILM	3.6K	1%	1/8W
R010	RD14BB2C124J	RES. CARBON	120K	5%	1/6W
R011	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R012	RD14BB2C203J	RES. CARBON	20K	5%	1/6W
R013	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R014	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R015	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R016	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R017	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R018	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R019	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R020	RN14BK2B3603F	RES. METAL FILM	360K	1%	1/8W
R021	RN14BK2B1203F	RES. METAL FILM	120K	1%	1/8W
R022	RN14BK2B3002F	RES. METAL FILM	30K	1%	1/8W
R023	RN14BK2B3002F	RES. METAL FILM	30K	1%	1/8W
R024	RN14BK2B3602F	RES. METAL FILM	36K	1%	1/8W
R025	RN14BK2B1202F	RES. METAL FILM	12K	1%	1/8W
R026	RN14BK2B3001F	RES. METAL FILM	3K	1%	1/8W
R027	RN14BK2B3001F	RES. METAL FILM	3K	1%	1/8W
R028	RN14BK2B3601F	RES. METAL FILM	3.6K	1%	1/8W
R029	RD14BB2C124J	RES. CARBON	120K	5%	1/6W
R030	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R031	RD14BB2C203J	RES. CARBON	20K	5%	1/6W
R032	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R033	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R034	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R035	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R036	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R037	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R038	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
S001	S02-2503-05	ROTARY SWITCH			
S002	S02-2503-05	ROTARY SWITCH			
S003	S02-2503-05	ROTARY SWITCH			
S004	S02-2503-05	ROTARY SWITCH			
VR001	S02-2503-05	ROTARY SWITCH			

TRIG SWEEP UNIT

X74-1350-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E33-4046-00	WIRE ASSY			
	J25-5039-22	PCB (UNMOUNTED)			
	R92-0150-05	JUMPING RES.	ZERO OHM		
	212-1018-05	TUBE (PLASTIC)			
	212-2014-05	TUBE (PLASTIC)			
	420-0008-05	ADHESIVES			
C001	CC45SL1H330J	CAP. CERAMIC	33P	5%	50V
C002	CE04W1E100M	CAP. ELECTRO	10	20%	25V
C003	CE04W1E100M	CAP. ELECTRO	10	20%	25V
C004	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C005	C91-0549-05	CAP. TANTALUM	1	20%	35V
C006	NO USE				
C007	CE04FW1V220M	CAP. ELECTRO	22	20%	35V
C008	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C009	C91-0549-05	CAP. TANTALUM	1	20%	35V
C010	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C011	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C012	CE04W1H3R3M	CAP. ELECTRO	3.3	20%	50V
C013	C91-0583-05	CAP. PLASTIC	10	10%	
C014	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C015	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C016	CQ93M1H333K	CAP. MYLAR	0.033	10%	50V
C017	C91-0584-05	CAP. CERAMIC	0.1	5%	
C018	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C019	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C020	CC45SL1H331J	CAP. CERAMIC	330P	5%	50V
C021	C91-0581-05	CAP. CERAMIC	1000P	10%	
C022	NO USE				
C023	CM93BD2A121J	CAP. MICA	120P	5%	100V
C024	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C025	CC45SL1H221J	CAP. CERAMIC	220P	5%	50V
C026	NO USE				
C027	C91-0549-05	CAP. TANTALUM	1	20%	35V
C028	CC45SL1H330J	CAP. CERAMIC	33P	5%	50V
C029	CC45SL1H330J	CAP. CERAMIC	33P	5%	50V
C030	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C031	CC45SL1H330J	CAP. CERAMIC	33P	5%	50V
C032	CE04W1E100M	CAP. ELECTRO	10	20%	25V
C033	CE04W1E100M	CAP. ELECTRO	10	20%	25V
C034	C91-0549-05	CAP. TANTALUM	1	20%	35V
C035	NO USE				
C036	CE04FW1V220M	CAP. ELECTRO	22	20%	35V
C037	C91-0549-05	CAP. TANTALUM	1	20%	35V
C038	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C039	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C040	CE04W1H3R3M	CAP. ELECTRO	3.3	20%	50V
C041	C91-0583-05	CAP. PLASTIC	10	10%	
C042	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C043	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C044	CQ93M1H333K	CAP. MYLAR	0.033	10%	50V
C045	C91-0584-05	CAP. CERAMIC	0.1	5%	
C046	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C047	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C048	CC45SL1H331J	CAP. CERAMIC	330P	5%	50V
C049	C91-0581-05	CAP. CERAMIC	1000P	10%	
C050	NO USE				
C051	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C052	CC45SL1H121J	CAP. CERAMIC	120P	5%	50V
C053	CM93BD2A121J	CAP. MICA	120P	5%	100V
C054	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C055	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C056	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C057	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C058	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C059	CK45B1H681K	CAP. CERAMIC	680P	10%	50V
C060	CM93BD2A470J	CAP. MICA	47P	5%	100V
C061	CM93BD2A390J	CAP. MICA	39P	5%	100V
C062	CC45SL1H220J	CAP. CERAMIC	22P	5%	50V
C063	CQ93M1H102J	CAP. MYLAR	1000P	5%	50V
C064	CQ93M1H102J	CAP. MYLAR	1000P	5%	50V
C065	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C066	CQ93M1H472J	CAP. MYLAR	4700P	5%	50V
C067	CQ93M1H472J	CAP. MYLAR	4700P	5%	50V
C068	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C069	CC45SL1H471J	CAP. CERAMIC	470P	5%	50V
C070	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C071	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C072	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C073	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C074	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C075	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C076	CE04W1C101M	CAP. ELECTRO	100	20%	16V
C077	CE04FW1C470M	CAP. ELECTRO	47	20%	16V
C078	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C079	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C080	CE04W1C101M	CAP. ELECTRO	100	20%	16V
C081	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C082	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C083	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C084	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C085	CE04W1A470M	CAP. ELECTRO	47	20%	10V
C086	CE04W1A101M	CAP. ELECTRO	100	20%	10V
C087	CE04W1A101M	CAP. ELECTRO	100	20%	10V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION				
C088	CE04W1A101M	CAP. ELECTRO	100	20%	10V	
C089	CE04W1A221M	CAP. ELECTRO	220	20%	10V	
C090	CK45FF1H103Z	CAP. CERAMIC	0.01		50V	
C091	CK45FF1H103Z	CAP. CERAMIC	0.01		50V	
C092	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C093	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C094	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C095	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C096	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C097	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C098	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C099	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C100	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C101	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C102	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C103	C90-0298-05	CAP. CERAMIC	0.1	20%	12V	
C104	CE04W1E220M	CAP. ELECTRO	22	20%	25V	
C105	CE04W1E220M	CAP. ELECTRO	22	20%	25V	
C106	CE04W1E220M	CAP. ELECTRO	22	20%	25V	
C107	NO USE					
C108	CK45FF1H103Z	CAP. CERAMIC	0.01		50V	
C109	CE04W1E330M	CAP. ELECTRO	33	20%	25V	
C110	CE04W1J475M	CAP. ELECTRO	4.7	20%	63V	
C111	CE04W1J100M	CAP. ELECTRO	10	20%	63V	
C112	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V	
C113	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V	
C114	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V	
C115	NO USE					
C116	CE04W1C470M	CAP. ELECTRO	47	20%	16V	
C117	CC45SL2220J	CAP. CERAMIC	22P	5%	50V	
C118	CC45SL1H331J	CAP. CERAMIC	330P	5%	50V	
D002	1SS132	DIODE				
D003	1SS132	DIODE				
D004	1SS132	DIODE				
D005	MTZ5.6JB	DIODE	ZENER	5.6V		
D006	1SS132	DIODE				
D007	1SS132	DIODE				
D008	1SS132	DIODE				
D009	1SS132	DIODE				
D010	1SS132	DIODE				
D011	1SS132	DIODE				
D012	1SS132	DIODE				
D013	MTZ16JA	DIODE	ZENER	15V		
D014	1SS132	DIODE				
D015	1SS132	DIODE				
D016	1SS132	DIODE				
D017	1SS132	DIODE				
D018	1SS132	DIODE				
D019	1SS132	DIODE				
D020	1SS132	DIODE				
D021	1SS132	DIODE				
D022	1SS132	DIODE				
D023	1SS132	DIODE				
D024	1SS132	DIODE				
D025	1SS132	DIODE				
D026	1SS132	DIODE				
D027	1SS132	DIODE				
D028	1SS132	DIODE				
D029	1SS132	DIODE				
D030	1SS132	DIODE				
D031	NO USE					
D032	1SS132	DIODE				
D033	1SS132	DIODE				
D034	1SS132	DIODE				
D035	1SS132	DIODE				
D036	1SS132	DIODE				
D037	1SS132	DIODE				
D038	1SS132	DIODE				
D039	1SS132	DIODE				
D040	1SS132	DIODE				
D041	1SS132	DIODE				
D042	1SS132	DIODE				
D043	MTZ16JA	DIODE	ZENER	15V		
D044	MTZ5.6JB	DIODE	ZENER	5.6V		
D045	1SS132	DIODE				
D046	1SS132	DIODE				
D047	1SS132	DIODE				
D048	1SS132	DIODE				
D049	1SS132	DIODE				
D050	1SS132	DIODE				
D051	1SS132	DIODE				
D052	1SS132	DIODE				
D053	MTZ12JC	DIODE	ZENER	12V		
D054	MTZ12JC	DIODE	ZENER	12V		
D055	SV04Y	DIODE				
D056	1SS132	DIODE				
D057	1SS132	DIODE				
D058	1SS132	DIODE				
D059	1SS132	DIODE				
D060	SV04Y	DIODE				
D061	1SS132	DIODE				
D062	1SS132	DIODE				
D063	1SS132	DIODE				
D064	1SS132	DIODE				
D065	1SS132	DIODE				
D066	1SS132	DIODE				
D067	1SS132	DIODE				
D068	1SS132	DIODE				

REF.NO	PARTS NO	NAME & DESCRIPTION
D069	1SS132	DIODE
D070	NO USE	
D071	1SS132	DIODE
D072	1SS132	DIODE
D073	1N60	DIODE
D074	1SS132	DIODE
D075	1SS132	DIODE
D076	1SS132	DIODE
D077	1SS132	DIODE
IC001	MC10H103L	IC. QUAD 2-INPUT OR GATE
IC002	MC10H131L	IC. DUAL D-FFS
IC003	LF412CN	IC. DUAL JFET INPUT OP-AMP
IC004	MC10H105L	IC. QUAD 2-INPUT OR GATE
IC005	MC10H131L	IC. DUAL D-FFS
IC006	LF412CN	IC. DUAL JFET INPUT OP-AMP
IC007	MC10104L	IC. QUAD 2-INPUT AND GATE
IC008	MC10102L	IC. QUAD 3-INPUT OR GATE
IC009	MC10104L	IC. QUAD 2-INPUT AND GATE
IC010	MC10104L	IC. QUAD 2-INPUT AND GATE
IC011	MC10104L	IC. QUAD 2-INPUT AND GATE
IC012	MC10102L	IC. QUAD 3-INPUT NOR GATE
IC013	MC10131L	IC. DUAL D-FFS
IC014	SN7406N	IC. HEX O.C.INVERTERS
IC015	MC10104L	IC. QUAD 2-INPUT AND GATE
IC016	MC78L05CP	VOLTAGE REGULATOR (5V, 100MA)
IC017	MC78L12ACP	VOLTAGE REGULATOR (5V, 100MA)
L001	L40-1001-01	FERRI INDUCTOR 10UH
L002	L40-1001-01	FERRI INDUCTOR 10UH
L003	L40-2201-03	FERRI INDUCTOR 22UH
P013	E40-0273-05	PIN CONNECTOR 2 P
P014	E40-0773-05	PIN CONNECTOR 7 P
P028	E40-0473-05	PIN CONNECTOR 4 P
P035	E40-0473-05	PIN CONNECTOR 4 P
P036	E40-0673-05	PIN CONNECTOR 6 P
P037	E40-0773-05	PIN CONNECTOR 7 P
P038	E40-0373-05	PIN CONNECTOR 3 P
P039	E40-0773-05	PIN CONNECTOR 7 P
P040	E40-0873-05	PIN CONNECTOR 8 P
P041	E40-0873-05	PIN CONNECTOR 8 P
P042	E40-0473-05	PIN CONNECTOR 4 P
P043	E40-0273-05	PIN CONNECTOR 2 P
P044	E40-0274-05	PIN CONNECTOR 2 P
P045	E40-0473-05	PIN CONNECTOR 4 P
P046	E40-0274-05	PIN CONNECTOR 2 P
P047	E40-0472-05	PIN CONNECTOR 4 P
P048	E40-1611-05	PIN CONNECTOR 16 P
P049	NO USE	
P050	E40-0473-05	PIN CONNECTOR 4 P
P051	NO USE	
P052	E40-0273-05	PIN CONNECTOR 2 P
P053	E40-0273-05	PIN CONNECTOR 2 P
P057	E40-0373-05	PIN CONNECTOR 3 P
Q001	2SC3311(R)	TR. SI. NPN
Q002	2SC3311(R)	TR. SI. NPN
Q003	2SC3311(R)	TR. SI. NPN
Q004	2SA1323(B)	TR. SI. PNP
Q005	2SC3354(T,S)	TR. SI. NPN
Q006	2SC1973(T)	TR. SI. NPN
Q007	2SA1309(Q,R)	TR. SI. PNP
Q008	2SD430(F)	TR. SI. NPN
Q009	2SC3311(R)	TR. SI. NPN
Q010	2SC3311(R)	TR. SI. NPN
Q011	2SC3311(R)	TR. SI. NPN
Q012	2SC3311(R)	TR. SI. NPN
Q013	2SC3311(R)	TR. SI. NPN
Q014	2SC3311(R)	TR. SI. NPN
Q015	2SC3311(R)	TR. SI. NPN
Q016	2SC3311(R)	TR. SI. NPN
Q017	2SC3311(R)	TR. SI. NPN
Q018	M47F(C)	FET
Q019	2SC3315(C,D)	TR. SI. NPN
Q020	2SA1309(Q,R)	TR. SI. PNP
Q021	M47F(C)	FET
Q022	2SC3315(C,D)	TR. SI. NPN
Q023	2SC3311(R)	TR. SI. NPN
Q024	2SC3311(R)	TR. SI. NPN
Q025	2SC3311(R)	TR. SI. NPN
Q026	2SC3311(R)	TR. SI. NPN
Q027	2SA1323(B)	TR. SI. PNP
Q028	2SA1323(B)	TR. SI. PNP
Q029	2SA1323(B)	TR. SI. PNP
Q030	2SA1323(B)	TR. SI. PNP
Q031	2SC3311(R)	TR. SI. NPN
Q032	2SC3311(R)	TR. SI. NPN
Q033	2SC3311(R)	TR. SI. NPN
Q034	2SA1323(B)	TR. SI. PNP
Q035	2SC3354(T,S)	TR. SI. NPN
Q036	2SC1973(T)	TR. SI. NPN
Q037	2SA1309(Q,R)	TR. SI. PNP
Q038	2SD430(F)	TR. SI. NPN
Q039	2SC3311(R)	TR. SI. NPN

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
Q040	2SC3311(R)	TR. SI, NPN
Q041	2SC3311(R)	TR. SI, NPN
Q042	2SC3311(R)	TR. SI, NPN
Q043	2SC3311(R)	TR. SI, NPN
Q044	2SC3311(R)	TR. SI, NPN
Q045	2SC3311(R)	TR. SI, NPN
Q046	2SC3311(R)	TR. SI, NPN
Q047	2SC3311(R)	TR. SI, NPN
Q048	M47F(C)	FET
Q049	2SC3315(C,D)	TR. SI, NPN
Q050	2SA1309(Q,R)	TR. SI, PNP
Q051	M47F(C)	FET
Q052	2SC3315(C,D)	TR. SI, NPN
Q053	2SC3311(R)	TR. SI, NPN
Q054	2SC3311(R)	TR. SI, NPN
Q055	2SC3315(C,D)	TR. SI, NPN
Q056	2SC3315(C,D)	TR. SI, NPN
Q057	2SC3315(C,D)	TR. SI, NPN
Q058	2SC3315(C,D)	TR. SI, NPN
Q059	2SC3315(C,D)	TR. SI, NPN
Q060	2SC3315(C,D)	TR. SI, NPN
Q061	2SC3315(C,D)	TR. SI, NPN
Q062	2SA1239(F)	TR. SI, PNP-DUAL
Q063	NO USE	
Q064	2SC3315(C,D)	TR. SI, NPN
Q065	2SC3315(C,D)	TR. SI, NPN
Q066	2SC3315(C,D)	TR. SI, NPN
Q067	2SC3315(C,D)	TR. SI, NPN
Q068	2SC3311(R)	TR. SI, NPN
Q069	2SC3311(R)	TR. SI, NPN
Q070	2SC3315(C,D)	TR. SI, NPN
Q071	2SC3315(C,D)	TR. SI, NPN
Q072	2SA1323(B)	TR. SI, PNP
Q073	2SC3354(T,S)	TR. SI, NPN
Q074	2SA1323(B)	TR. SI, PNP
Q075	2SC3354(T,S)	TR. SI, NPN
Q076	2SA1309(Q,R)	TR. SI, PNP
Q077	2SA1323(B)	TR. SI, PNP
Q078	2SC3311(R)	TR. SI, NPN
Q079	2SA1309(Q,R)	TR. SI, PNP
Q080	2SA1309(Q,R)	TR. SI, PNP
Q081	2SA1309(Q,R)	TR. SI, PNP
Q082	2SA1309(Q,R)	TR. SI, PNP
Q083	2SA1323(B)	TR. SI, PNP
Q084	2SA1323(B)	TR. SI, PNP

REF.NO	PARTS NO	NAME & DESCRIPTION			
R001	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R002	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R003	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R004	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R005	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R006	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R007	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R008	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R009	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R010	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R011	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R012	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R013	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R014	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R015	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R016	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R017	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R018	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R019	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R020	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R021	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R022	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R023	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R024	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R025	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R026	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R027	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R028	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R029	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R030	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R031	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R032	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R033	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R034	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R035	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R036	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R037	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R038	RN14BK2C2402F	RES. METAL FILM	24K	1%	1/6W
R039	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R040	RN14BK2C1202F	RES. METAL FILM	12K	1%	1/6W
R041	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R042	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R043	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R044	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R045	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R046	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R047	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R048	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R049	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R050	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R051	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R052	RD14BB2C103J	RES. CARBON	10K	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R053	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R054	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R055	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R056	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R057	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R058	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R059	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R060	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R061	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R062	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R063	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R064	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R065	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R066	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R067	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R068	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R069	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R070	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R071	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R072	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R073	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R074	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R075	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R076	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R077	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R078	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R079	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R080	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R081	NO USE				
R082	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R083	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R084	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R085	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R086	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R087	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R088	RD14BB2C362J	RES. CARBON	3.6K	5%	1/6W
R089	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R090	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R091	RN14BK2C5100F	RES. METAL FILM	510	1%	1/6W
R092	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R093	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R094	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R095	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R096	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R097	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R098	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R099	RD14BB2C362J	RES. CARBON	3.6K	5%	1/6W
R100	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R101	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R102	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R103	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R104	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R105	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R106	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R107	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R108	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R109	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R110	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R111	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R112	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R113	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R114	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R115	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R116	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R117	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R118	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R119	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R120	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R121	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R122	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R123	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R124	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R125	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R126	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R127	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R128	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R129	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R130	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R131	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R132	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R133	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R134	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R135	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R136	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R137	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R138	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R139	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R140	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R141	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R142	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R143	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R144	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R145	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R146	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R147	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R148	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R149	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R150	RN14BK2C7501F	RES. METAL FILM	7.5K	1%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R151	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R152	RN14BK2C6401F	RES. METAL FILM	6.4K	1%	1/6W
R153	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R154	RN14BK2C2402F	RES. METAL FILM	24K	1%	1/6W
R155	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R156	RN14BK2C1202F	RES. METAL FILM	12K	1%	1/6W
R157	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R158	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R159	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R160	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R161	RN14BK2C3091F	RES. METAL FILM	3K	1%	1/6W
R162	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R163	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R164	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R165	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R166	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R167	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R168	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R169	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R170	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R171	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R172	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R173	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R174	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R175	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R176	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R177	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R178	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R179	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R180	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R181	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R182	RD14BB2C295J	RES. CARBON	29K	5%	1/6W
R183	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R184	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R185	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R186	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R187	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R188	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R189	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R190	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R191	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R192	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R193	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R194	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R195	RD14BB2C122J	RES. CARBON	1.2K	5%	1/6W
R196	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R197	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R198	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R199	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R200	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R201	RN14BK2C5901F	RES. METAL FILM	5.6K	1%	1/6W
R202	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R203	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R204	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R205	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R206	RN14BK2C3301F	RES. METAL FILM	3.3K	1%	1/6W
R207	RN14BK2C3301F	RES. METAL FILM	3.3K	1%	1/6W
R208	RN14BK2C3301F	RES. METAL FILM	3.3K	1%	1/6W
R209	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R210	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R211	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R212	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R213	RN14BK2C2201F	RES. METAL FILM	2.2K	1%	1/6W
R214	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R215	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R216	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R217	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R218	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R219	RN14BK2C3301F	RES. METAL FILM	3.3K	1%	1/6W
R220	RN14BK2C6201F	RES. METAL FILM	6.2K	1%	1/6W
R221	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R222	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R223	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R224	RN14BK2C90JF	RES. METAL FILM	9.0	1%	1/6W
R225	RN14BK2C4700F	RES. METAL FILM	470	1%	1/6W
R226	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R227	RN14BK2C2201F	RES. METAL FILM	2.2K	1%	1/6W
R228	RN14BK2C2201F	RES. METAL FILM	2.2K	1%	1/6W
R229	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R230	RN14BK2C1001F	RES. METAL FILM	1.0K	1%	1/6W
R231	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R232	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R233	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R234	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R235	RN14BK2C1500F	RES. METAL FILM	150	1%	1/6W
R236	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R237	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R238	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R239	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R240	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R241	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R242	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R243	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R244	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R245	RD14BB2C470J	RES. CARBON	47	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R246	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R247	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R248	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R249	RD14BB2C911J	RES. CARBON	910	5%	1/6W
R250	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R251	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R252	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R253	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R254	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R255	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R256	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R257	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R258	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R259	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R260	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R261	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R262	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R263	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R264	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R265	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R266	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R267	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R268	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R269	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R270	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R271	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R272	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R273	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R274	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R275	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R276	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R277	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R278	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R279	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R280	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R281	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R282	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R283	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R284	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R285	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R286	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R287	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R288	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R289	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R290	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R291	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R292	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R293	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R294	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R295	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R296	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R297	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R298	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R299	RD14BB2C27J	RES. CARBON	27	5%	1/6W
R300	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R301	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R302	RN14BK2C9100F	RES. METAL FILM	91K	1%	1/6W
R303	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R304	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R305	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R306	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R307	RN14BK2C3000F	RES. METAL FILM	300	1%	1/6W
R308	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R309	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R310	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R311	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R312	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R313	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R314	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R315	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R316	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R317	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R318	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R319	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R320	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R321	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R322	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R323	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R324	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R325	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R326	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R327	RD14BB2C102J	RES. CARBON	1K	5%	1/6W

TC001	C05-0309-05	CAP. TRIMMER	40P
TC002	C05-0309-05	CAP. TRIMMER	40P
TC003	C05-0062-05	CAP. TRIMMER	6P
TC004	C05-0062-05	CAP. TRIMMER	6P
TC005	C05-0031-15	CAP. TRIMMER	10P
TC006	C05-0031-15	CAP. TRIMMER	10P
TP001	E40-0211-05	PIN CONNECTOR	2 P
VR002	R12-2512-05	RES. SEMI FIXED	5K B
VR003	NO USE		
VR004	R12-2512-05	RES. SEMI FIXED	5K B

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
VR005	R12-0539-05	RES. SEMI FIXED 200 B
VR006	R12-2512-05	RES. SEMI FIXED 5K B
VR007	R12-1517-05	RES. SEMI FIXED 1K B
VR008	R12-1517-05	RES. SEMI FIXED 1K B
VR009	R12-2612-05	RES. SEMI FIXED 5K B
VR010	R12-2512-05	RES. SEMI FIXED 5K B
VR011	R12-1518-05	RES. SEMI FIXED 2K B
VR012	R12-1518-05	RES. SEMI FIXED 2K B
VR013	R12-0421-05	RES. SEMI FIXED 100 B
VR014	R12-0540-05	RES. SEMI FIXED 500 B
VR015	NO USE	
VR016	R12-5516-05	RES. SEMI FIXED 100K B
VR017	R12-0539-05	RES. SEMI FIXED 200 B

HORIZONTAL OUTPUT AMP UNIT

X74-1360-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E23-0512-05	TERMINAL			
	F01-0544-05	HEAT SINK			
	J25-5039-22	PCB (UNMOUNTED)			
	J30-0605-05	SPACER			
	N30-3004-41	SCREW, PAN MD	M 3X6		
C001	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C002	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C003	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C004	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C005	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C006	CC45CH2H010C	CAP. CERAMIC	1P	0.25P	500V
C007	CC45CH2H010C	CAP. CERAMIC	1P	0.25P	500V
C008	CC45CH2H030C	CAP. CERAMIC	3P	0.25P	500V
C009	CC45CH2H010C	CAP. CERAMIC	1P	0.25P	500V
C010	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C011	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C012	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C013	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C014	C91-0540-05	CAP. TANTALUM	1	20%	35V
C015	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C016	C91-0549-05	CAP. TANTALUM	1	20%	35V
C017	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C018	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C019	CE04W1C101M	CAP. ELECTRO	100	20%	16V
C020	CE04W1C101M	CAP. ELECTRO	100	20%	16V
C021	CE04W2A100M	CAP. ELECTRO	10	20%	100V
C022	CE04W2C2R2	CAP. ELECTRO	2.2		160V
C023	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C024	CC45CH1H070D	CAP. CERAMIC	7P	0.5P	50V
C025	CE04W2C3R3	CAP. ELECTRO	3.3		160V
D001	1SS132	DIODE			
D002	MTZ5.1JB	DIODE ZENER	5V		
D003	1SS132	DIODE			
D004	1SS132	DIODE			
L001	L40-1011-04	FERRI INDUCTOR	100UH		
L002	L40-1011-04	FERRI INDUCTOR	100UH		
L003	L40-1011-04	FERRI INDUCTOR	100UH		
L004	L40-1011-04	FERRI INDUCTOR	100UH		
P027	E40-0073-05	PIN CONNECTOR	8 P		
P035	E40-0473-05	PIN CONNECTOR	4 P		
P036	E40-0673-05	PIN CONNECTOR	6 P		
Q001	2SA1323(B)	TR. SI. PNP			
Q002	2SA1323(B)	TR. SI. PNP			
Q003	2SA1323(B)	TR. SI. PNP			
Q004	2SA3311(R)	TR. SI. PNP			
Q005	2SC2912(S)	TR. SI. NPN			
Q006	2SC2912(S)	TR. SI. NPN			
Q007	2SA1210(S)	TR. SI. PNP			
Q008	2SA1210(S)	TR. SI. PNP			
Q009	2SA3311(R)	TR. SI. PNP			
Q010	2SA3311(R)	TR. SI. PNP			
Q011	2SA3311(R)	TR. SI. PNP			
R001	RD14B2C272J	RES. CARBON	2.7K	5%	1/6W
R002	RD14B2C272J	RES. CARBON	2.7K	5%	1/6W
R003	RD14B2C470J	RES. CARBON	47	5%	1/6W
R004	RD14B2C470J	RES. CARBON	47	5%	1/6W
R005	RD14B2C152J	RES. CARBON	1.5K	5%	1/6W
R006	RD14BY2H473J	RES. CARBON	47K	5%	1/2W
R007	RD14BY2H473J	RES. CARBON	47K	5%	1/2W
R008	RD14B2C821J	RES. CARBON	820	5%	1/6W
R009	RD14B2C821J	RES. CARBON	820	5%	1/6W
R010	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R011	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R012	RS14B3A223J	RES. METAL FILM	22K	5%	1W
R013	RS14B3A223J	RES. METAL FILM	22K	5%	1W
R014	RD14BB2C134J	RES. CARBON	130K	5%	1/6W
R015	RD14B2C134J	RES. CARBON	130K	5%	1/6W
R016	RD14BY2H123J	RES. CARBON	12K	5%	1/2W
R017	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R018	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R019	RD14B2C220J	RES. CARBON	22	5%	1/6W
R020	RD14B2C220J	RES. CARBON	22	5%	1/6W
R021	RD14B2C561J	RES. CARBON	560	5%	1/6W
R022	RD14B2C561J	RES. CARBON	560	5%	1/6W
R023	RD14B2C431J	RES. CARBON	430	5%	1/6W
R024	RD14B2C472J	RES. CARBON	4.7K	5%	1/6W
R025	RD14B2C472J	RES. CARBON	4.7K	5%	1/6W
R026	RD14B2C271J	RES. CARBON	270	5%	1/6W
R027	RD14B2C512J	RES. CARBON	5.1K	5%	1/6W

PARTS LIST

A TRIG SWITCH UNIT

X77-1280-00

REF.NO	PARTS NO.	NAME & DESCRIPTION			
	J25-5039-22	PCB (UNMOUNTED)			
	L92-0110-05	BEAD CORE			
C001	C91-0502-05	CAP. METAL FILM	0.01	20%	630V
C002	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C003	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C004	CE04W1E100M	CAP. ELECTRO	10	20%	25V
C005	CE04W1E100M	CAP. ELECTRO	10	20%	25V
C006	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C007	CC45CH1H070D	CAP. CERAMIC	7P	0.5P	50V
C008	CC45CH1H070D	CAP. CERAMIC	7P	0.5P	50V
C009	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C010	NO USE				
C011	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C012	NO USE				
C013	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C014	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C015	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C016	NO USE				
C017	CE04W1H010M	CAP. ELECTRO	1	20%	50V
C018	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C019	CE04W1H010M	CAP. ELECTRO	1	20%	50V
C020	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C021	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C022	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C023	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C024	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C025	NO USE				
C026	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C027	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C028	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C029	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C030	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C031	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C032	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C033	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C034	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C035	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C036	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C037	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C038	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C042	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C043	NO USE				
C044	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C045	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C046	NO USE				
C047	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C048	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C049	CE04W1H3R3M	CAP. ELECTRO	3.3	20%	50V
D001	SW03Y	DIODE			
D002	1SS132	DIODE			
D003	1SS132	DIODE			
D004	MTZ16JA	DIODE ZENER	15V		
D005	1SS132	DIODE			
D006	1SS132	DIODE			
D007	1SS132	DIODE			
D008	1SS132	DIODE			
D009	SW04Y	DIODE			
L001	L40-1011-03	FERRI INDUCTOR	100MH		
L002	L40-1011-03	FERRI INDUCTOR	100MH		
P024	E40-0273-05	PIN CONNECTOR	2 P		
P046	E40-0273-05	PIN CONNECTOR	2 P		
P047	E40-0473-05	PIN CONNECTOR	4 P		
P059	E40-0973-05	PIN CONNECTOR	9 P		
Q001	2SJ43(Q)	FET, P-CHANNEL			
Q002	2SK127(Q)	FET			
Q003	DN1901	FET, DUAL SI, N-CHANNEL			
Q004	2SC3354(T,S)	TR. SI, NPN			
Q005	2SC3354(T,S)	TR. SI, NPN			
Q006	2SA1161	TR. SI, PNP			
Q007	2SA1161	TR. SI, PNP			
Q008	2SA1309(Q,R)	TR. SI, PNP			
Q009	2SC3066	TR. SI, NPN			
Q010	2SC2671(H)	TR. SI, NPN			
Q011	2SC2671(H)	TR. SI, NPN			
Q012	2SC3354(T,S)	TR. SI, NPN			
Q013	2SC3354(T,S)	TR. SI, NPN			
Q014	2SC3354(T,S)	TR. SI, NPN			
Q015	2SC3354(T,S)	TR. SI, NPN			
Q016	2SC2671(H)	TR. SI, NPN			
Q017	2SC3311(R)	TR. SI, NPN			
Q018	2SA1309(Q,R)	TR. SI, PNP			
Q019	2SK304(Q)	FET,N-CHANNEL			
Q020	2SC3311(R)	TR. SI, NPN			
Q021	2SA1309(Q,R)	TR. SI, PNP			
Q022	2SC3311(R)	TR. SI, NPN			
Q023	2SA1309(Q,R)	TR. SI, PNP			

REF.NO	PARTS NO.	NAME & DESCRIPTION			
0024	2SK304(D)	FET,N-CHANNEL			
0025	2SA1309(Q,R)	TR. SI, PNP			
R001	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R002	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R003	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R004	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R005	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R006	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R007	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R008	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R009	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R010	RN14BK2C1502F	RES. METAL FILM	15K	1%	1/6W
R011	RN14BK2C1502F	RES. METAL FILM	15K	1%	1/6W
R012	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R013	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R014	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R015	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R016	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R017	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R018	RD14BB2C914J	RES. CARBON	910K	5%	1/6W
R019	RD14BB2C914J	RES. CARBON	910K	5%	1/6W
R020	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R021	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R022	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R023	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R024	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R025	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R026	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R027	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R028	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R029	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R030	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R031	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R032	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R033	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R034	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R035	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R036	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R037	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R038	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R039	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R040	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R041	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R042	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R043	RD14BB2C161J	RES. CARBON	160	5%	1/6W
R044	RD14BB2C131J	RES. CARBON	130	5%	1/6W
R045	RD14BB2C131J	RES. CARBON	130	5%	1/6W
R046	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R047	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R048	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R049	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R050	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R051	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R052	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R053	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R054	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R055	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R056	RD14BB2C133J	RES. CARBON	13K	5%	1/6W
R057	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R058	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R059	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R060	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R061	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R062	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R063	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R064	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R065	RD14BB2C683J	RES. CARBON	68K	5%	1/6W
R066	RD14BB2C914J	RES. CARBON	910K	5%	1/6W
R067	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R068	RD14BB2C163J	RES. CARBON	16K	5%	1/6W
R069	RD14BB2C163J	RES. CARBON	16K	5%	1/6W
R070	RD14BB2C912J	RES. CARBON	9.1K	5%	1/6W
R071	RD14BB2C163J	RES. CARBON	16K	5%	1/6W
R072	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R073	RD14BB2C912J	RES. CARBON	9.1K	5%	1/6W
R074	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R075	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R076	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R077	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R078	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
S001	S33-2504-05	LEVER SWITCH			
S002	S32-4008-05	LEVER SWITCH			
TC001	C05-0412-05	CAP. TRIMMER	20P		
VR001	R01-5502-05	V.R.	10KK B		
VR002	R12-3522-05	RES. SEMI FIXED	10K B		
VR003	R12-1519-05	RES. SEMI FIXED	1K B		
VR004	R12-1520-05	RES. SEMI FIXED	2K B		

PARTS LIST

B TRIG SWITCH UNIT

X77-1290-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J25-5023-14				
	J61-0506-05	BOARD SUPPORT			
	L92-0110-05	BEAD CORE			
C001	CE04W1C100M	CAP. ELECTRO	10	20%	16V
C002	C91-0502-05	CAP. METAL FILM	0.01	20%	630V
C003	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C004	CC45CH1H680J	CAP. CERAMIC	68P	5%	50V
C005	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C006	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C007	CC45CH1H7R0D	CAP. CERAMIC	7P	0.5P	50V
C008	CC45CH1H7R0D	CAP. CERAMIC	7P	0.5P	50V
C009	NO USE				
C010	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C011	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C012	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C013	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C014	CK49F1H103Z	CAP. CERAMIC	0.01		50V
C015	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C016	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C017	C90-0298-05	CAP. CERAMIC	0.1	20%	12V
C018	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C019	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C020	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C021	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C022	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C023	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C024	CK49F1H103Z	CAP. CERAMIC	0.01		50V
C025	CK49F1H103Z	CAP. CERAMIC	0.01		50V
C026	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C027	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C028	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C029	CK49F1H103Z	CAP. CERAMIC	0.01		50V
C030	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C031	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C032	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C033	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C034	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C035	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C036	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C037	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
D001	MTZ8.2JB	DIODE, ZENER	8.1V		
D002	SV05Y	DIODE			
D003	SV04Y	DIODE			
L001	L40-2201-03	FERRI INDUCTOR	22UH		
L002	L40-2201-03	FERRI INDUCTOR	22UH		
P047	E40-0273-05	PIN CONNECTOR	2 P		
P044	E40-0275-05	PIN CONNECTOR	5 P		
P045	E40-0473-05	PIN CONNECTOR	4 P		
P051	E40-0573-05	PIN CONNECTOR	5 P		
P058	E40-0273-05	PIN CONNECTOR	2 P		
Q001	2SC3354(T,S)	TR. SI, NPN			
Q002	DN1901	FET, DUAL SI, N-CHANNEL			
Q003	2SC3354(T,S)	TR. SI, NPN			
Q004	2SC3354(T,S)	TR. SI, NPN			
Q005	2SA1161	TR. SI, PNP			
Q006	2SA1161	TR. SI, PNP			
Q007	2SA1309(G,R)	TR. SI, PNP			
Q008	2SC3354	TR. SI, NPN			
Q009	2SC2671(H)	TR. SI, NPN			
Q010	2SC2671(H)	TR. SI, NPN			
Q011	2SC3354(T,S)	TR. SI, NPN			
Q012	2SC3354(T,S)	TR. SI, NPN			
Q013	2SC3354(T,S)	TR. SI, NPN			
Q014	2SC3354(T,S)	TR. SI, NPN			
Q015	2SC2671(H)	TR. SI, NPN			
R001	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R002	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R003	RD14BB2C510J	RES. CARBON	51	5%	1/6W
R004	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R005	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R006	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R007	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R008	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R009	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R010	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R011	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R012	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R013	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R014	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R015	RD14BB2C914J	RES. CARBON	910K	5%	1/6W
R016	RM14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R017	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R018	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R019	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R020	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R021	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R022	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R023	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R024	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R025	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R026	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R027	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R028	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R029	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R030	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R031	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R032	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R033	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R034	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R035	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R036	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R037	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R038	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R039	RD14BB2C161J	RES. CARBON	160	5%	1/6W
R040	RD14BB2C131J	RES. CARBON	130	5%	1/6W
R041	RD14BB2C131J	RES. CARBON	130	5%	1/6W
R042	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R043	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R044	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R045	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R046	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R047	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R048	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R049	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R050	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R051	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R052	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R053	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
S001	S37-2005-05	LEVER SWITCH			
S002	S37-2005-05	LEVER SWITCH			
TC001	C05-0412-05	CAP. TRIMMER	20P		
VR001	R01-5503-05	V.R.	100KB		
VR002	R12-3522-05	RES. SEMI FIXED	10K B		
VR003	R12-1520-05	RES. SEMI FIXED	2K B		

PARTS LIST

POWER BLANKING UNIT

X68-1400-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E31-0762-05	LEAD WIRE WITH CONNECTOR			
	E33-0965-00	WIRE ASSY			
	F02-0414-05	HEAT SINK			
	F02-0503-14	HEAT SINK			
	F09-0955-05	PROTECTION COVER			
	F15-0727-04	HOLDER (NEON TUBE)			
	F20-0516-05	INSULATOR			
	F20-0625-05	INSULATOR			
	J21-2930-14	BRACKET FOR VR			
	J30-0605-05	SPACER			
	N09-0167-05	SCREW			
	N09-0711-05	SCREW			
	212-1018-05	TUBE (PLASTIC)			
	212-5017-05	TUBE (PLASTIC)			
C001	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C002	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C003	CE04W1A101M	CAP. ELECTRO	100	20%	10V
C004	CE04W1J330M	CAP. ELECTRO	33	20%	63V
C005	CE04W2C3R3	CAP. ELECTRO	3.3		160V
C006	CE04W2C3R3	CAP. ELECTRO	3.3		160V
C007	CE04W1C330M	CAP. ELECTRO	33	20%	16V
C008	C91-0549-05	CAP. TANTALUM	1	20%	35V
C009	CE04W1E101M	CAP. ELECTRO	100	20%	25V
C010	CE04W1E101M	CAP. ELECTRO	100	20%	25V
C011	CE04W1A221M	CAP. ELECTRO	220	20%	10V
C012	CE04W1V100M	CAP. ELECTRO	10	20%	35V
C013	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C014	CE04W1V47M	CAP. ELECTRO	47	20%	35V
C015	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C016	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C017	CC45D0J102J	CAP. CERAMIC	1000P	5%	50V
C018	CC45D1H101J	CAP. CERAMIC	100P	5%	50V
C019	CC45SL1H681J	CAP. CERAMIC	680P	5%	50V
C020	CC45SL1H681J	CAP. CERAMIC	680P	5%	50V
C023	C90-0296-05	CAP. CERAMIC	0.1	20%	12V
C024	CC45C0H5R0C	CAP. CERAMIC	0.5P	0.25P	500V
C025	CK45CB4H472K	CAP. CERAMIC	4700P	10%	500V
C026	C91-0549-05	CAP. TANTALUM	1	20%	35V
C027	CC45C0H5R0C	CAP. CERAMIC	5P	0.25P	500V
C028	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C029	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C030	CE04W2C3R3	CAP. ELECTRO	3.3		160V
C031	CK45B2H472K	CAP. CERAMIC	4700P	10%	500V
C032	CE04W1A221M	CAP. ELECTRO	220	20%	10V
C033	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C034	CE04W1E101M	CAP. ELECTRO	100	20%	25V
C035	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C036	C91-0580-05	CAP. CERAMIC	0.01	0.25P	3KV
C037	C91-0580-05	CAP. CERAMIC	0.01	0.25P	3KV
C038	C91-0580-05	CAP. CERAMIC	0.01	0.25P	3KV
C039	C91-0580-05	CAP. CERAMIC	0.01	0.25P	3KV
C040	CK45E3F102P	CAP. CERAMIC	1000P		3.1K
C041	CQ93M1H154K	CAP. MYLAR	0.15	10%	50V
C042	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C043	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C044	CE04W2C470M	CAP. ELECTRO	47	20%	35V
C045	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C046	CE04W1E470M	CAP. ELECTRO	47	20%	25V
C047	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C048	CE04W1E470M	CAP. ELECTRO	47	20%	25V
C049	CQ93M1H472K	CAP. MYLAR	4700P	10%	50V
C050	CE04W1E470M	CAP. ELECTRO	47	20%	25V
C051	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C052	C91-0580-05	CAP. CERAMIC	0.01	0.25P	3KV
C053	C91-0580-05	CAP. CERAMIC	0.01	0.25P	3KV
C054	CK45E3D102P	CAP. CERAMIC	1000P		2K
C055	CK45B2E222K	CAP. CERAMIC	2200P	10%	500V
C059	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C060	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C061	CE04W1C470M	CAP. ELECTRO	47	20%	16V
D001	1SS132	DIODE			
D002	MTZ12JC	DIODE, ZENER	12V		
D003	MTZ12JC	DIODE, ZENER	12V		
D004	MTZ3.3JB	DIODE, ZENER	3.2V		
D005	1SS132	DIODE			
D006	1SS132	DIODE			
D009	MTZ5.1JB	DIODE ZENER	5V		
D010	1SS83	DIODE			
D011	1SS83	DIODE			
D012	W06C	DIODE			
D013	W06C	DIODE			
D014	W06C	DIODE			
D015	W06C	DIODE			
D016	1SS132	DIODE			
D017	1SS132	DIODE			
D018	UZ-3.0B	DIODE:ZENER	3.0V		
D019	UZ-6.2BL	DIODE:ZENER	6.2V		
D020	1SS132	DIODE			
D021	1SS132	DIODE			

REF.NO	PARTS NO	NAME & DESCRIPTION			
	IC001	NJM4558D	IC		
	IC002	NJM4558D	IC		
	IC003	LM340LAZ5.0	IC:REGULATOR		
L001	L40-1011-04	FERRI INDUCTOR	100UH		
L002	L40-1011-04	FERRI INDUCTOR	100UH		
L003	L40-1011-04	FERRI INDUCTOR	100UH		
L004	L40-1011-04	FERRI INDUCTOR	100UH		
L005	L40-1011-04	FERRI INDUCTOR	100UH		
L006	L40-1011-03	FERRI INDUCTOR	100MH		
L007	L40-1011-04	FERRI INDUCTOR	100UH		
L008	L40-1011-04	FERRI INDUCTOR	100UH		
NL001	NE-2B	NEON LAMP			
NL002	NE-2B	NEON LAMP			
NL005	NE-2B	NEON LAMP			
NL004	NE-2B	NEON LAMP			
P023	E40-0773-05	PIN CONNECTOR	7 P		
P023	E40-0473-05	PIN CONNECTOR	4 P		
P024	NO USE				
P025	E40-0273-05	PIN CONNECTOR	2 P		
P029	E40-0573-05	PIN CONNECTOR	5 P		
P027	E40-0673-05	PIN CONNECTOR	6 P		
P028	E40-0473-05	PIN CONNECTOR	4 P		
P029	E40-0703-05	PIN CONNECTOR	7 P		
P030	E40-0746-05	PIN CONNECTOR	7 P		
P031	NO USE				
P032	E40-0273-05	PIN CONNECTOR	2 P		
P033	E40-0332-05	PIN CONNECTOR	3 P		
P036	E40-0275-05	PIN CONNECTOR	2 P		
P063	E40-0673-05	PIN CONNECTOR	6 P		
PL001	B30-0927-15	LAMP			
PL002	B30-0927-15	LAMP			
PL003	B30-0927-15	LAMP			
PL004	B30-0927-15	LAMP			
Q001	2SC2591(Q,R)	TR. SI. NPN			
Q002	2SC1509(L)	TR. SI. NPN			
Q003	2SB633(E,	TR. SI. PNP			
Q004	2SB621(E)	TR. SI. PNP			
Q005	2SB633(E)	TR. SI. PNP			
Q006	2SC1509(L)	TR. SI. NPN			
Q007	2SC3311(R)	TR. SI. NPN			
Q008	2SC1509(L)	TR. SI. NPN			
Q009	2SC3311(R)	TR. SI. NPN			
Q010	2SA1209(Q,R)	TR. SI. PNP			
Q011	2SC3354(T,S)	TR. SI. NPN			
Q012	2SC3354(T,S)	TR. SI. NPN			
Q015	2SA1323(B)	TR. SI. PNP			
Q014	2SC3311(R)	TR. SI. NPN			
Q015	2SC3315(C,D)	TR. SI. NPN			
Q016	2SC3315(C,D)	TR. SI. NPN			
Q017	2SC3315(C,D)	TR. SI. NPN			
Q018	2SC2412(K)	TR. SI. NPN			
Q019	2SA1210(S)	TR. SI. PNP			
Q020	2SC2910(S,T)	TR. SI. NPN			
Q021	2SA1208(S,T)	TR. SI. PNP			
Q022	2SC2910(S,T)	TR. SI. NPN			
Q023	2SC2910(S,T)	TR. SI. NPN			
Q024	2SC3311(R)	TR. SI. NPN			
Q025	2SC3311(R)	TR. SI. NPN			
Q026	2SA1309(Q,R)	TR. SI. PNP			
Q027	2SK192A-GL	FET. N-CHANNEL			
Q028	2SD613(E)	TR. SI. NPN			
R001	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R002	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R003	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R004	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R005	RD14BB2C132J	RES. CARBON	1K	5%	1/6W
R006	RN14BK2C1501F	RES. METAL FILM	150K	1%	1/6W
R007	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R008	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R009	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R010	RN14BK2C9101F	RES. METAL FILM	5.1K	1%	1/6W
R011	RN14BK2C9101F	RES. METAL FILM	5.1K	1%	1/6W
R012	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R013	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R014	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R015	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R016	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R017	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R018	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R019	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R020	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R021	RD14BB2E100J	RES. CARBON	10	5%	1/4W
R022	RN14BK2C1302F	RES. METAL FILM	13K	1%	1/6W
R023	RN14BK2C8201F	RES. METAL FILM	8.2K	1%	1/6W
R024	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R025	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R026	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R027	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R028	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R029	RD14B2C512J	RES. CARBON	5.1K	5%	1/6W
R030	RD14B2C272J	RES. CARBON	2.7K	5%	1/6W
R031	RD14B2C681J	RES. CARBON	680	5%	1/6W
R032	RN14BK2K2201F	RES. METAL FILM	2.2K	1%	1/6W
R033	RN14BK2C9101F	RES. METAL FILM	9.1K	1%	1/6W
R034	RD14B2C510J	RES. CARBON	51	5%	1/6W
R035	RD14B2C510J	RES. CARBON	51	5%	1/6W
R036	RD14B2C101J	RES. CARBON	100	5%	1/6W
R037	RD14B2C101J	RES. CARBON	100	5%	1/6W
R038	RD14B2C332J	RES. CARBON	3.3K	5%	1/6W
R039	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R040	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R041	RD14B2C751J	RES. CARBON	750	5%	1/6W
R042	RD14B2C242J	RES. CARBON	2.4K	5%	1/6W
R043	NO USE				
R044	RD14B2C361J	RES. CARBON	360	5%	1/6W
R045	RD14B2C221J	RES. CARBON	220	5%	1/6W
R046	RD14B2C272J	RES. CARBON	2.7K	5%	1/6W
R047	RD14B2C622J	RES. CARBON	6.2K	5%	1/6W
R048	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R049	RD14B2C753J	RES. CARBON	75K	5%	1/6W
R050	RD14B2C124J	RES. CARBON	120K	5%	1/6W
R051	RD14B2C562J	RES. CARBON	5.6K	5%	1/6W
R052	RD14B2C152J	RES. CARBON	1.5K	5%	1/6W
R053	RD14B2C470J	RES. CARBON	47	5%	1/6W
R054	RD14B2C244J	RES. CARBON	240K	5%	1/6W
R055	RD14B2C221J	RES. CARBON	220	5%	1/6W
R056	RD14B2C562J	RES. CARBON	5.6K	5%	1/6W
R057	RD14B2C124J	RES. CARBON	120K	5%	1/6W
R058	RD14B2C124J	RES. CARBON	120K	5%	1/6W
R059	RD14B2C470J	RES. CARBON	47	5%	1/6W
R060	RD14B2C332J	RES. CARBON	3.3K	5%	1/6W
R061	RD14B2C561J	RES. CARBON	560	5%	1/6W
R062	RD14B2C683J	RES. CARBON	68K	5%	1/6W
R063	RD14B2C683J	RES. CARBON	68K	5%	1/6W
R064	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R065	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R066	RD14B2C103J	RES. CARBON	10K	5%	1/6W
R067	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R068	RN14BK2K6202F	RES. METAL FILM	62K	1%	1/6W
R069	RD14B2C103J	RES. CARBON	10K	5%	1/6W
R070	RD14B2C103J	RES. CARBON	10K	5%	1/6W
R071	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R072	NO USE				
R073	RD14B2C680J	RES. CARBON	68	5%	1/6W
R074	R92-0795-05	RES. FIXED	15M	5%	1/2W
R075	R92-1119-05	RES. FIXED	GLAZE FILM		
R076	R92-0778-05	RES. FIXED	7.5M	5%	1W
R077	R92-1052-05	RES. FIXED	4.3M	5%	1W
R078	R92-0755-05	RES. FIXED	3M	5%	1/2W
R079	R92-0756-05	RES. FIXED	47M	5%	1/2W
R080	RD14B2C562J	RES. CARBON	5.6K	5%	1/6W
R081	RD14B2C302J	RES. CARBON	3K	5%	1/6W
R082	RD14B2C302J	RES. CARBON	3K	5%	1/6W
R083	RD14B2C102J	RES. CARBON	1K	5%	1/6W
R084	RD14B2C221J	RES. CARBON	220	5%	1/6W
R085	NO USE				
R086	RD14B2C104J	RES. CARBON	100K	5%	1/6W
R087	RD14B2C104J	RES. CARBON	100K	5%	1/6W
R088	RD14B2C103J	RES. CARBON	10K	5%	1/6W
R091	RD14B2C101J	RES. CARBON	100	5%	1/6W
TC001	C05-0405-05	CAP. TRIMMER	20P		
TC002	C05-0439-05	CAP. TRIMMER	40P		
TC003	C05-0438-05	CAP. TRIMMER	2P		
VR001	R12-1028-05	RES. SEMI FIXED	4.7K B		
VR002	R12-3041-05	RES. SEMI FIXED	10K B		
VR003	R12-3042-05	RES. SEMI FIXED	47K B		
VR004	R05-0901-05	V.R.	3M B		
VR005	R03-3502-15	V.R.	10K B		
VR006	R23-1501-05	V.R.	1K B		

FILTER UNIT

X70-1020-00

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E18-0351-05	INLET	3 P		
	E23-0903-05	TERMINAL			
	J25-5038-22	PCB (UNMOUNTED)			
C001	C91-0931-05	CAP. POLYESTER	0.22	10%	630V
C002	C91-0575-05	CAP. CERAMIC	1000P		630V
C003	C91-0575-05	CAP. CERAMIC	1000P		630V
C004	CE04W1H010M	CAP. ELECTRO	1	20%	50V
D001	1SS132	DIODE			
IC001	DN3101	PHOTO COUPLER			
L001	L33-0808-05	CHOKE COIL			
P026	E40-0273-05	PIN CONNECTOR	2 P		
R001	RD14BY2H224J	RES. CARBON	220K	5%	1/2W
R002	RC05GF2H225J	RES. SOLID	2.2M	5%	1/2W

ASTIG UNIT

X81-1430-00

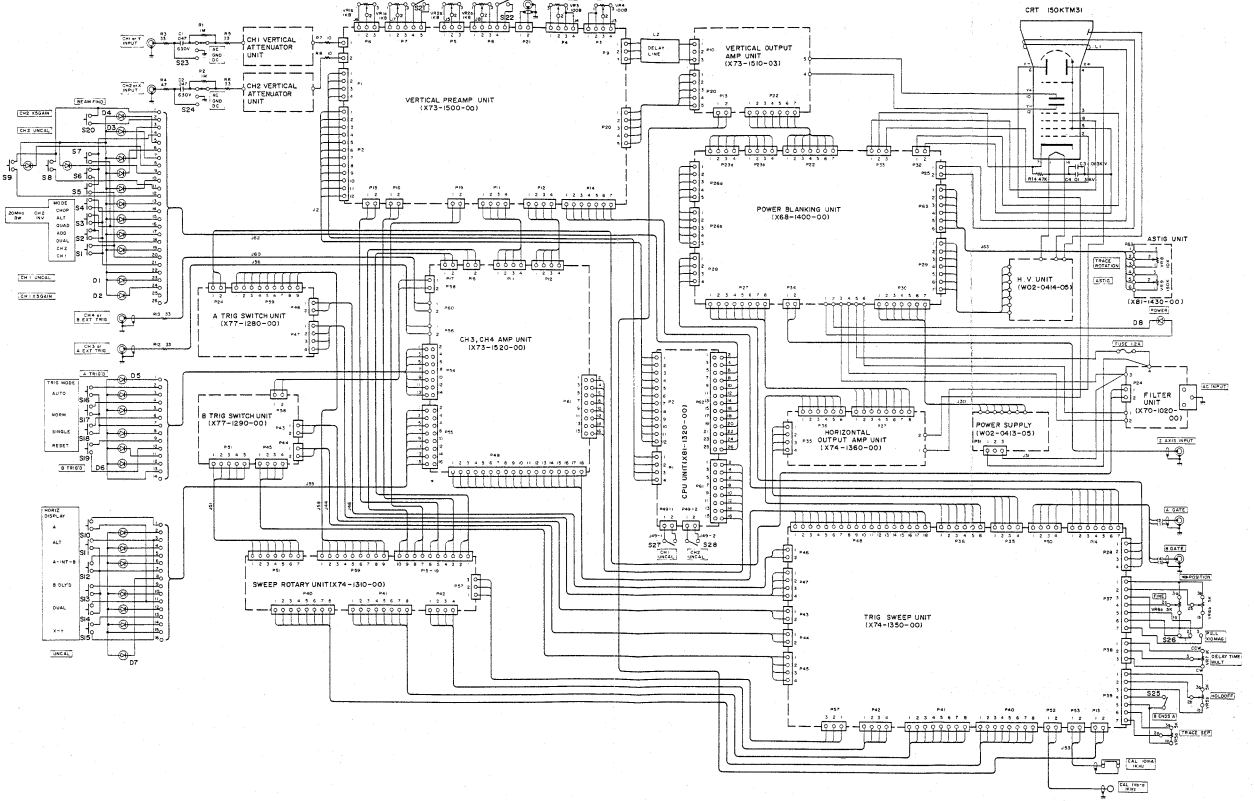
REF.NO	PARTS NO	NAME & DESCRIPTION
	J25-5035-22	PCB (UNMOUNTED)
J063	E31-2467-15	LEAD WIRE WITH CONNECTOR
VR006	R12-3526-05	RES. SEMI FIXED 10K B
VR009	R12-3519-05	RES. SEMI FIXED 150K B

SWITCHING POWER SUPPLY

W02-0413-05

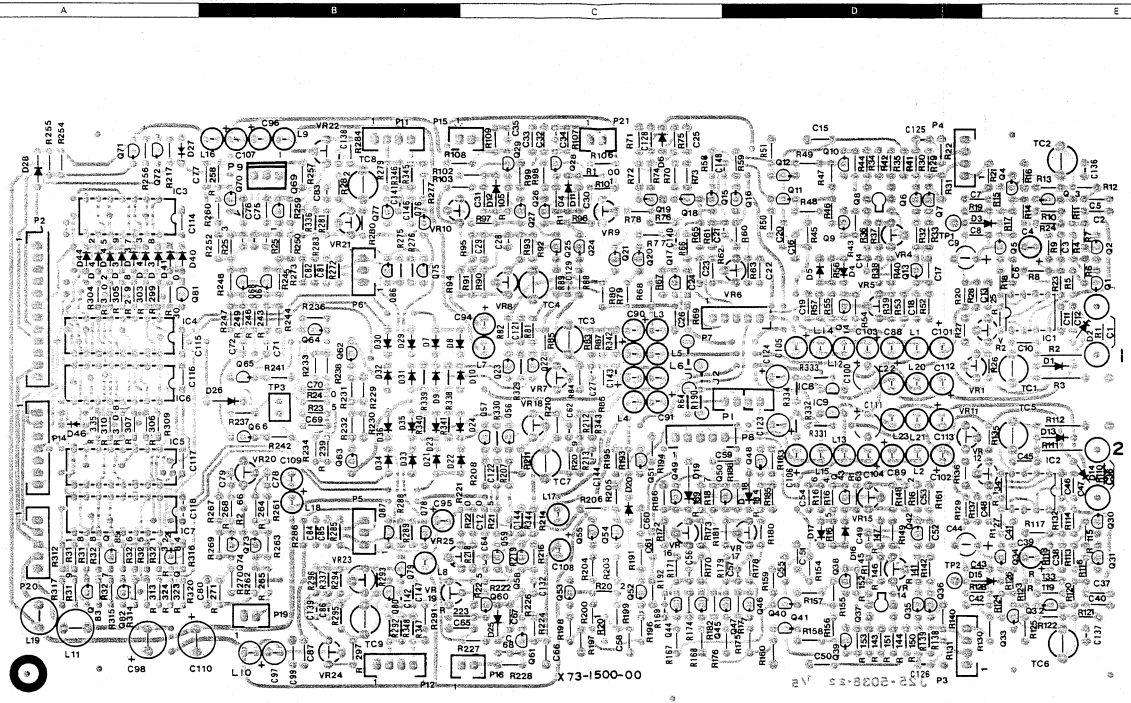
REF. NO	PARTS NO	NAME & DESCRIPTION		
D1	DBA20G	Diode		
D2	DFA01	Diode		
D3	DTA-10ER	Triac		
D4	DS442X	Diode		
D5	GFD10E	Diode		
D6	GFD10E	Diode		
D7	GFD10G	Diode		
D8	HZ3.8CP	Diode Zener		
D9	GZA6.2Z	Diode Zener		
Q1	2SC536KNP(F)	Transistor		
IC1	STK7308	IC		
IC2	STK732	IC		
L1	L19-0415-08	Line filter		
L2	L19-0414-08	Pulse Transformer		
L3	L33-0809-08	Coil	20μH	
L4	L33-0810-08	Coil	2.3μH	
L5	L33-0809-08	Coil	20μH	
L6	L40-4791-14	Ferri-inductor	4.7μH	
L7	L40-4791-14	Ferri-inductor	4.7μH	
L8	L40-4791-14	Ferri-inductor	4.7μH	
C1	C91-0598-08	Polyester cap	0.22μF	400V
C2	C91-0597-08	Ceramic cap	2200pF	250V
C3	C91-0597-08	Ceramic cap	2200pF	250V
C4	C91-0597-08	Ceramic cap	2200pF	250V
C5	C91-0597-08	Ceramic cap	2200pF	250V
C6	C90-0925-08	Electrolytic cap	100μF	400V
C7	C90-0924-08	Electrolytic cap	4.7μF	50V
C8	C90-0927-08	Electrolytic cap	10μF	50V
C9	C90-0928-08	Electrolytic cap	47μF	25V
C10	CK45B1H103K	Ceramic cap	0.01μF	50V
C11	C91-0598-08	Ceramic cap	0.001μF	1kV
C12	C90-0929-08	Electrolytic cap	470μF	16V
C13	C90-0930-08	Electrolytic cap	1000μF	10V
C14	C90-0929-08	Electrolytic cap	470μF	16V
C15	C90-0931-08	Electrolytic cap	220μF	35V
C16	C90-0932-08	Electrolytic cap	100μF	63V
C17	C90-0933-08	Electrolytic cap	47μF	160V
C18	C90-0934-08	Electrolytic cap	220μF	16V
C19	C90-0931-08	Electrolytic cap	220μF	35V
C20	C90-0936-08	Electrolytic cap	22μF	50V
C21	C90-0936-08	Electrolytic cap	10μF	100V
C22	C90-0930-08	Electrolytic cap	22μF	160V
C23	C81-0600-08	Ceramic cap	470pF	630V
C24	C91-0598-08	Ceramic cap	0.001μF	1kV
C25	C91-0598-08	Ceramic cap	0.001μF	1kV
C26	C90-0937-08	Electrolytic cap	22μF	16V
R1	R92-1111-08	Widing res	10Ω	3W
R2	R92-1112-08	Widing res	2Ω	3W
R3	RD14BB2E910J	Carbon res	91Ω	±5% 1/4W
R4	R92-1113-08	Metal oxide res	220kΩ	1W
R5	RD14BB2E562J	Carbon res	5.6kΩ	±5% 1/4W
R6	RD14BB2E103J	Carbon res	10kΩ	±5% 1/4W
R7	R92-1114-08	Metal oxide res	33Ω	1W
R8	RD14BB2E102J	Carbon res	1kΩ	±5% 1/4W
R9	RD14BB2E100J	Carbon res	10Ω	±5% 1/4W
R12	RN14BK2E2201F	Metal film	2.2kΩ	±1% 1/4W
VR1	R12-3532-08	Semi-fixed res	10kΩ	
	E40-7011-08	Pin connector	3P	
	E40-7012-08	Pin connector	7P	
	F20-0843-08	Insulating sheet	(STK7308)	
	F20-0844-08	Insulating sheet	(STK732)	

SCHEMATIC DIAGRAM



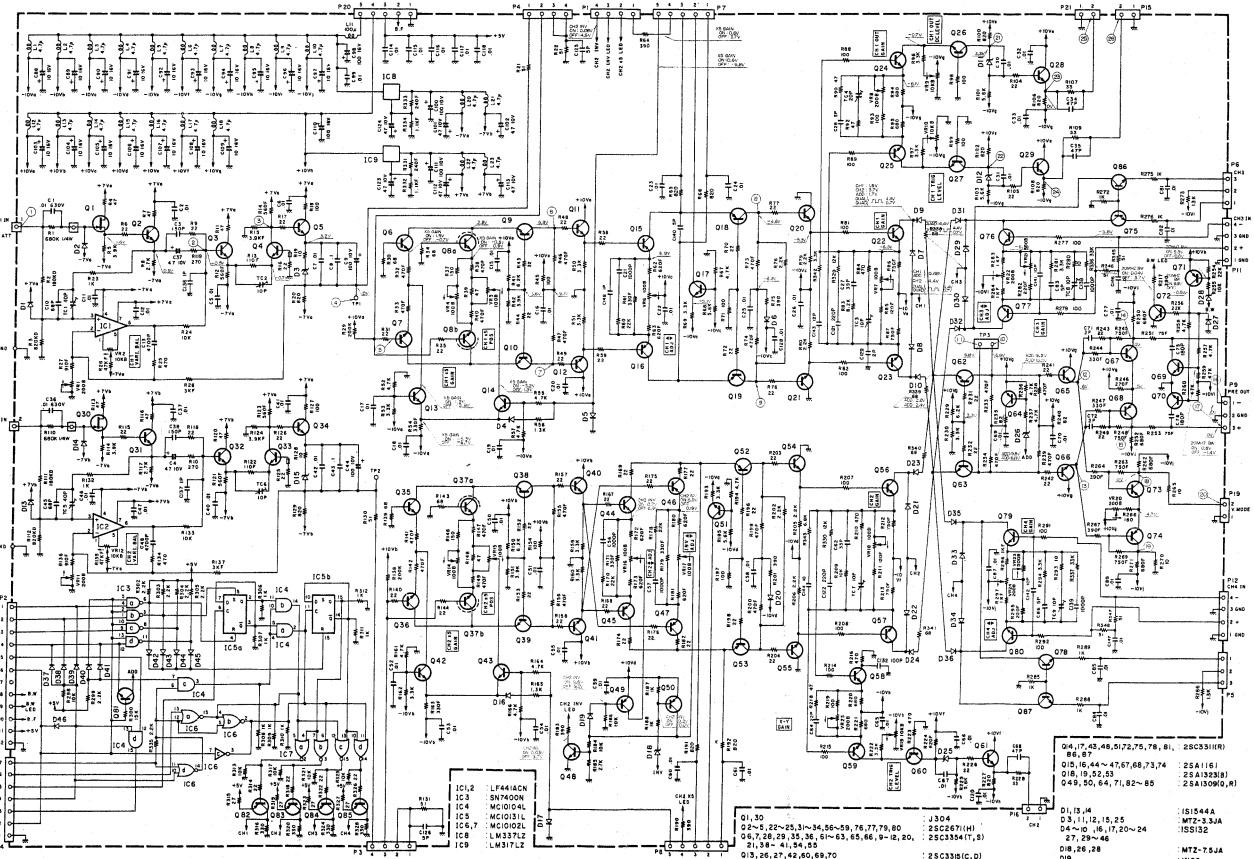
PC BOARD

VERTICAL PREAMP UNIT (X73-1500-00)



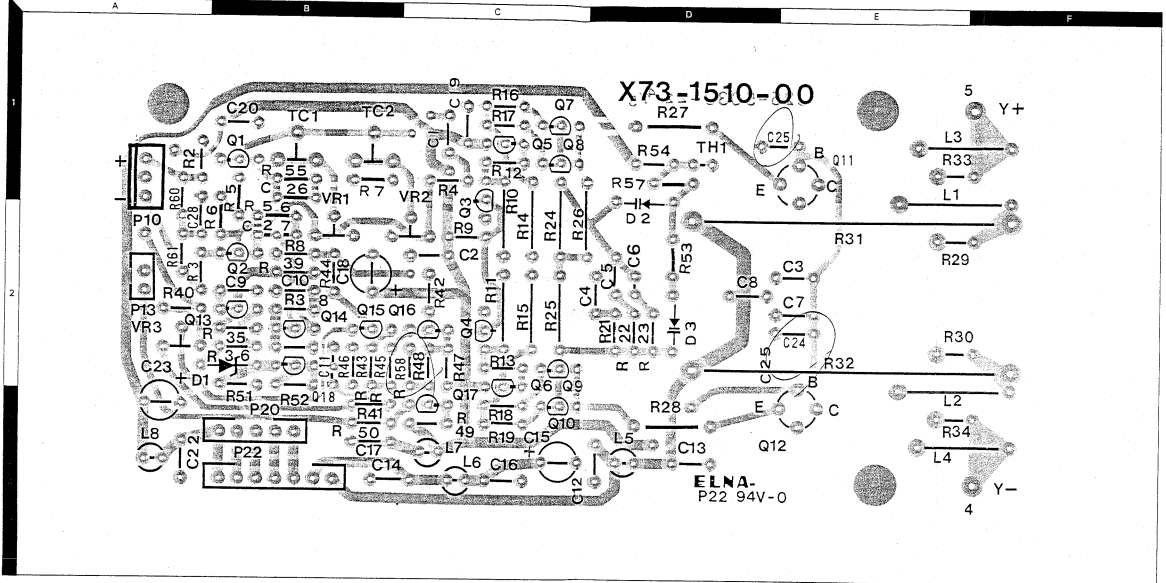
SCHEMATIC DIAGRAM

VERTICAL PREAMP UNIT (X73-1500-00)



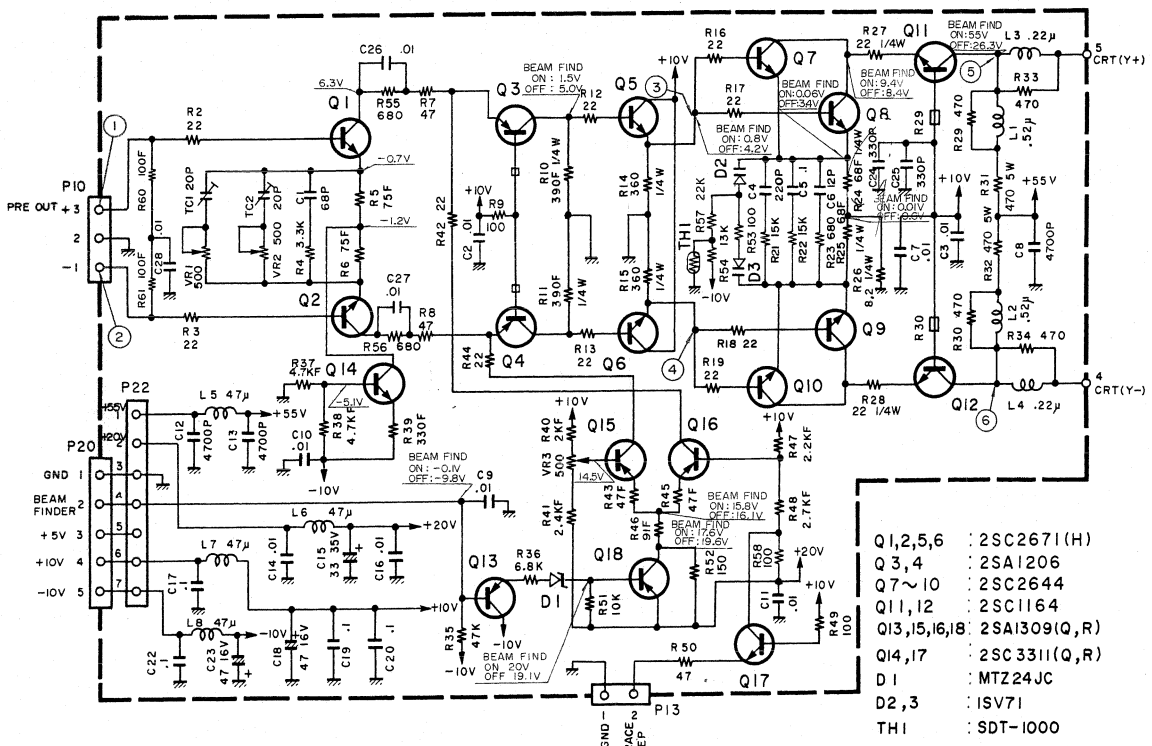
PC BOARD

VERTICAL OUTPUT AMP UNIT (X73-1510-03)



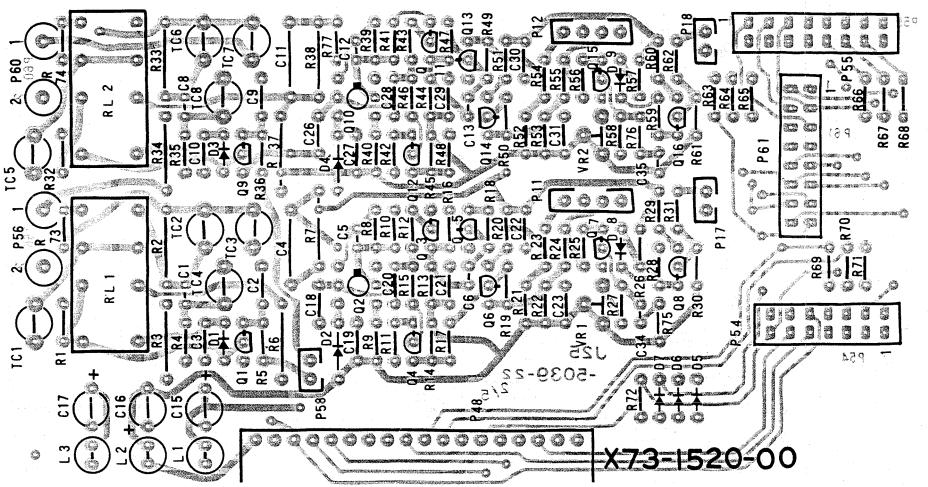
SCHEMATIC DIAGRAM

VERTICAL OUTPUT AMP UNIT (X73-1510-03)



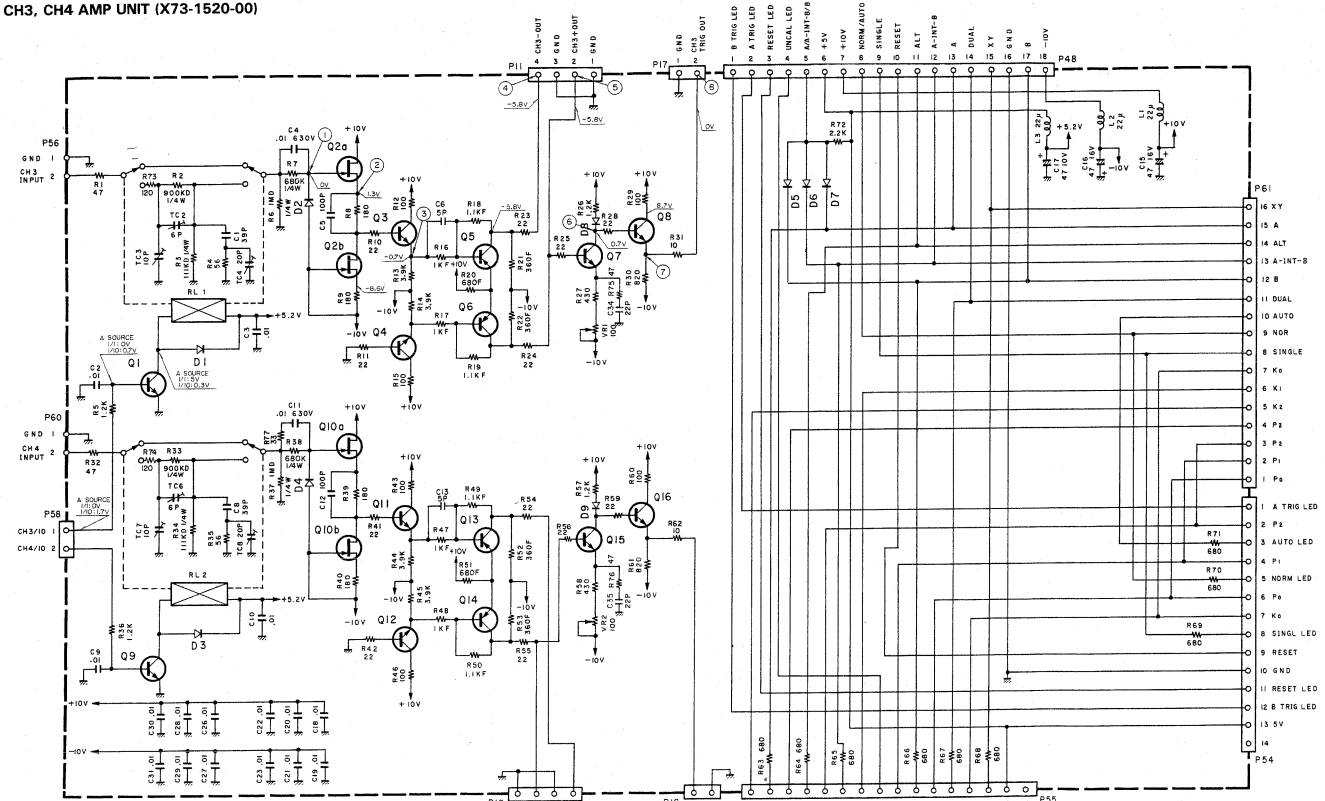
PC BOARD

CH3, CH4 AMP UNIT (X73-1520-00)



SCHEMATIC DIAGRAM

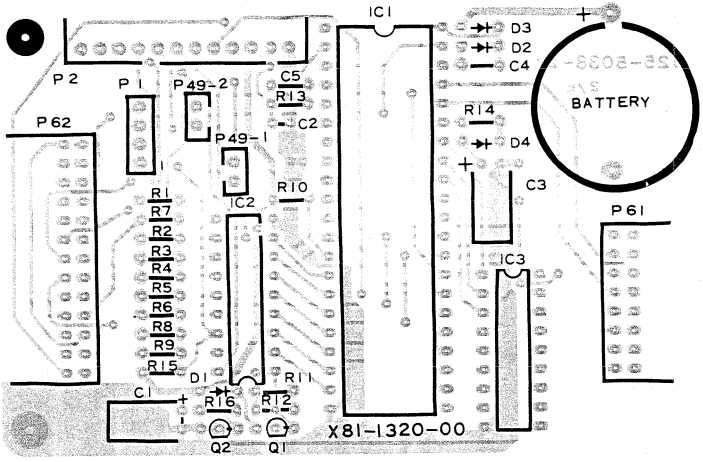
CH3, CH4 AMP UNIT (X73-1520-00)



Q1,9	: 2SD438(F)	D1,3,5~9	: ISSI32
Q2,10	: DN1901	D2,4	: ISI544A
Q3,4,11,12	: 2SC3354(T,S)		
Q5,6,13,14	: 2SA1206		
Q7,8,15,16	: 2SC2671(H)		

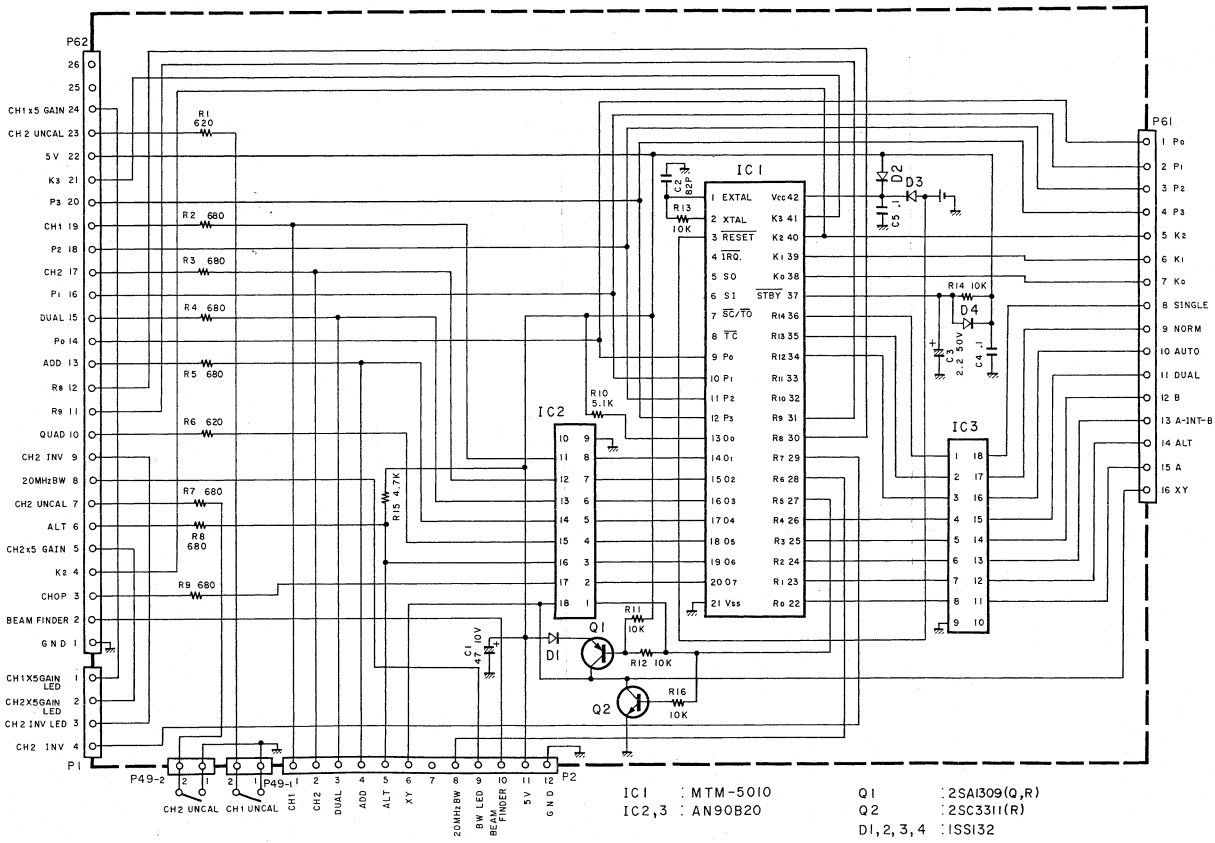
PC BOARD

CPU UNIT (X81-1320-00)



SCHEMATIC DIAGRAM

CPU UNIT (X81-1320-00)

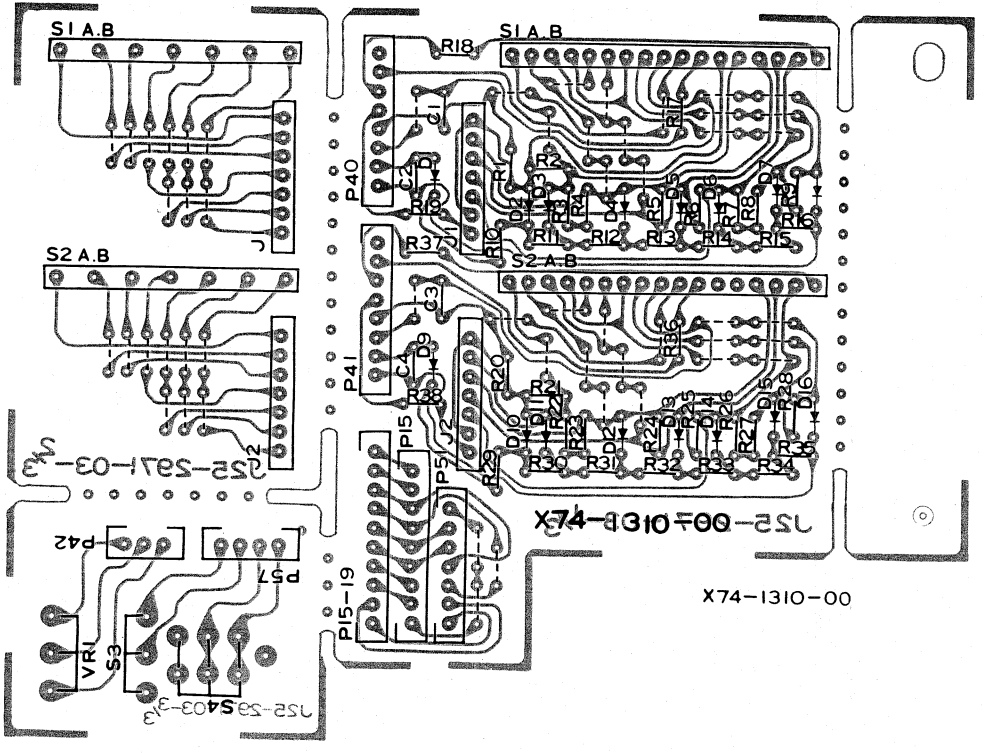


IC1 : MTM-5010
IC2,3 : AN90B20

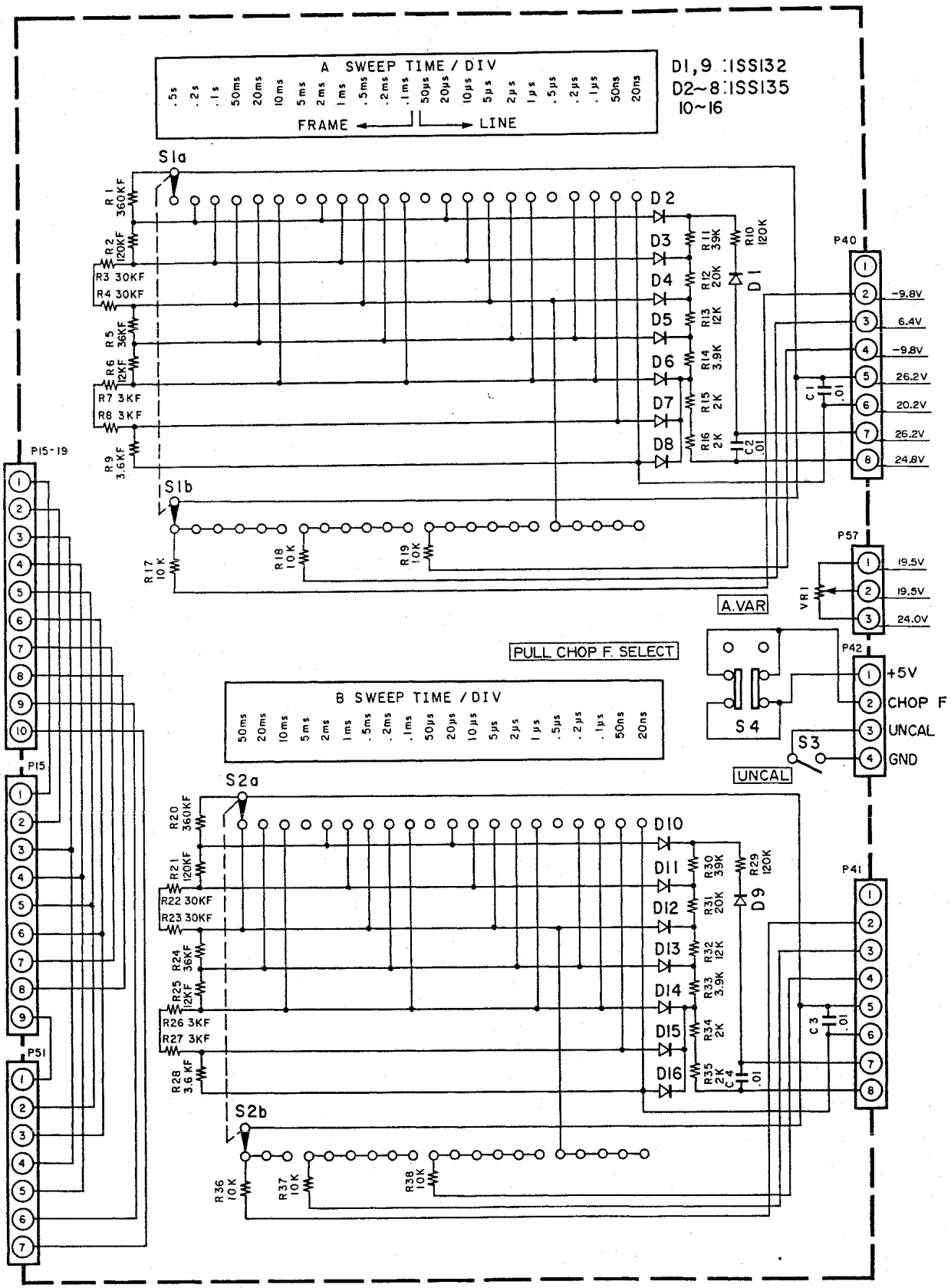
Q1 : 2SA1309(Q,R)
Q2 : 2SC3311(R)
D1, 2, 3, 4 : 1SS132

PC BOARD

SWEEP ROTARY UNIT (X74-1310-00)

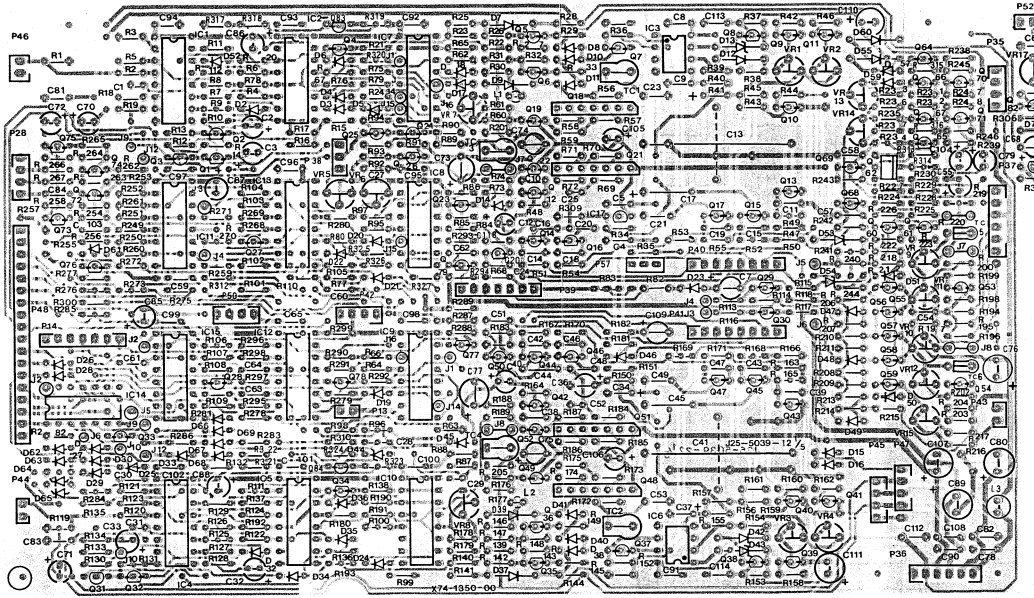


SWEEP ROTARY UNIT (X74-1310-00)



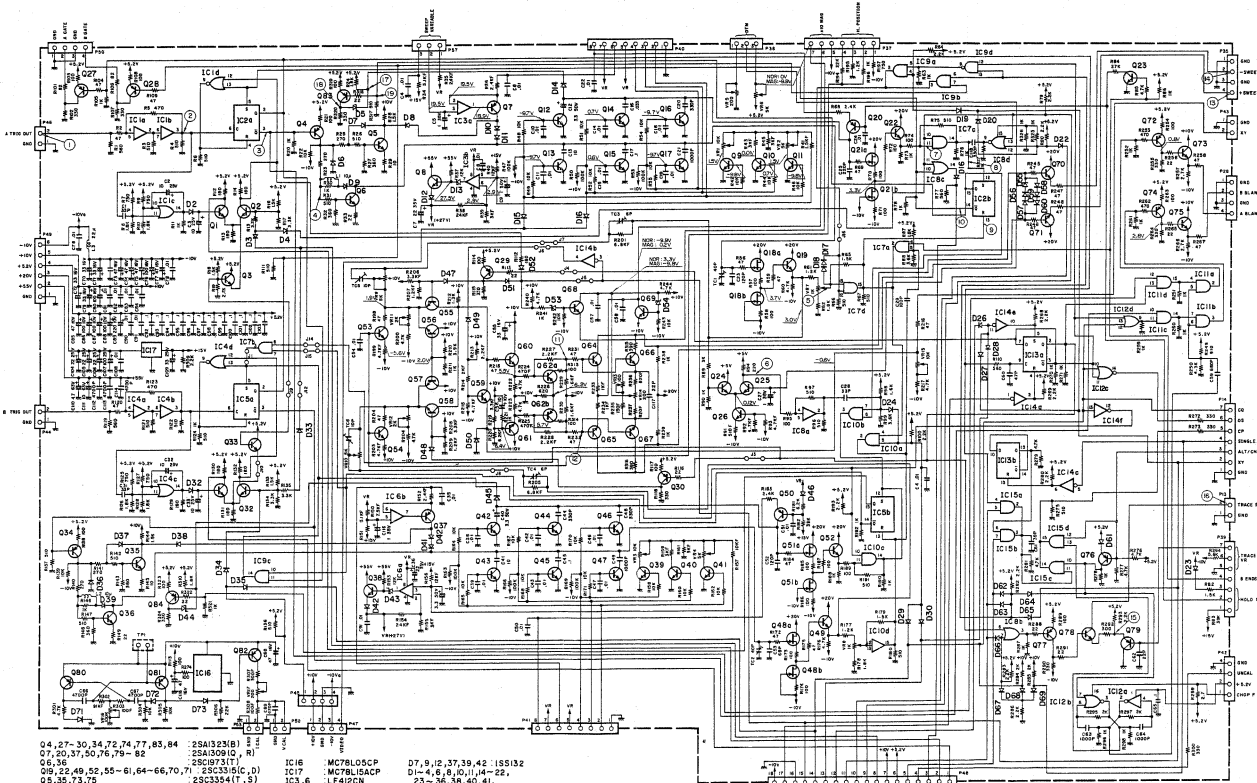
PC BOARD

TRIG SWEEP UNIT (X74-1350-00)



SCHEMATIC DIAGRAM

TRIG SWEEP UNIT (X74-1350-00)



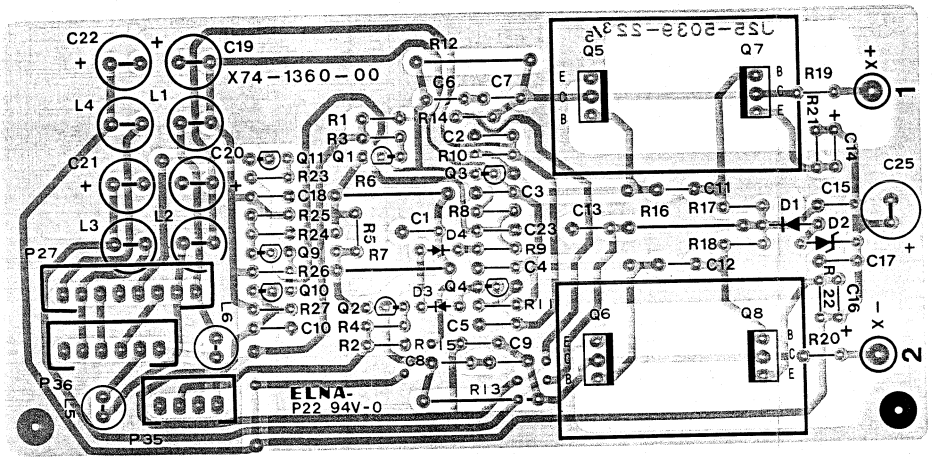
Q4,27~30,34,72,74,77,83,84 : 2SAI323(B)
Q7,20,37,50,76,79~82 : 2SAI309(Q,R)
Q6,36 : 2SC1973(T)
Q19,22,49,52,55~61,64~66,70,71 : 2SC3315(C,D)
Q8,35,73,75 : 2SC3354(F,S)
Q9,38 : 2SD438(F)
Q1~3,9~17,23~26,31~33,39~47 : 2SC3511(R)
53,54,68,69,78
Q18,21,48,51 : M47F(C)
Q62 : 2SAI239

IC16 : MC78L05CP
IC17 : MC78L15ACP
IC3,6 : LF412CN
IC12 : MC10102L
IC8 : MC10103L
IC7,9~11,15 : MC10104L
IC13 : MC10131L
IC14 : SN7405N
IC1,4 : MC10H103L
IC2,5 : MC10H131L

D7,9,12,37,39,42 : 1SS132
D1~4,6,8,10,11,14~22,
23~36,38,40,41,
45~52,56~59,
61~69,71,72
D5,44 : MTZ-3.0JB
D70 : MTZ-10JC
D53,54 : MTZ-12JC
D13,43 : MTZ-15JC
D55,60 : 5V06Y
D73 : IN60

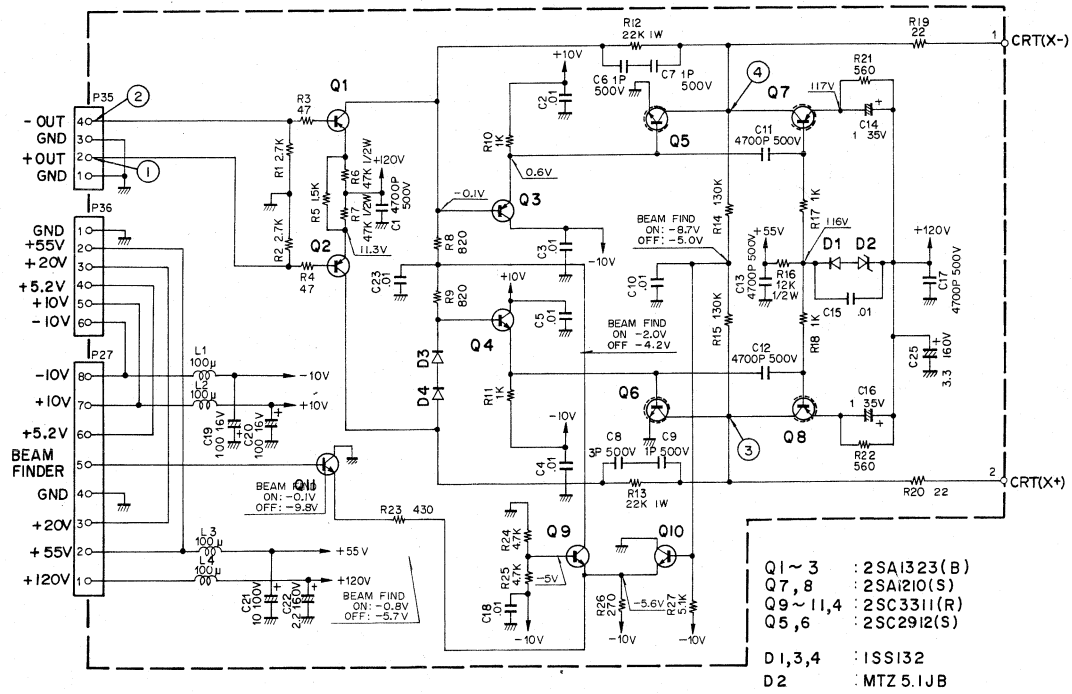
PC BOARD

HORIZONTAL OUTPUT AMP UNIT (X74-1360-00)



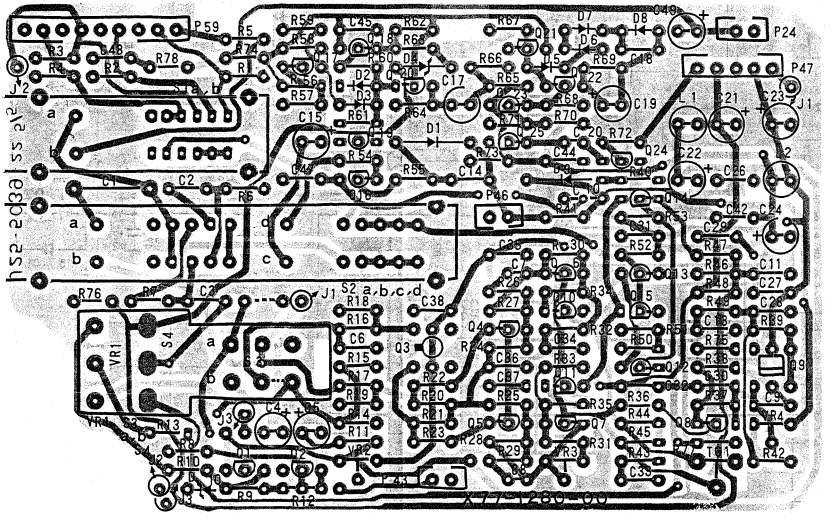
SCHEMATIC DIAGRAM

HORIZONTAL OUTPUT AMP UNIT (X74-1360-00)



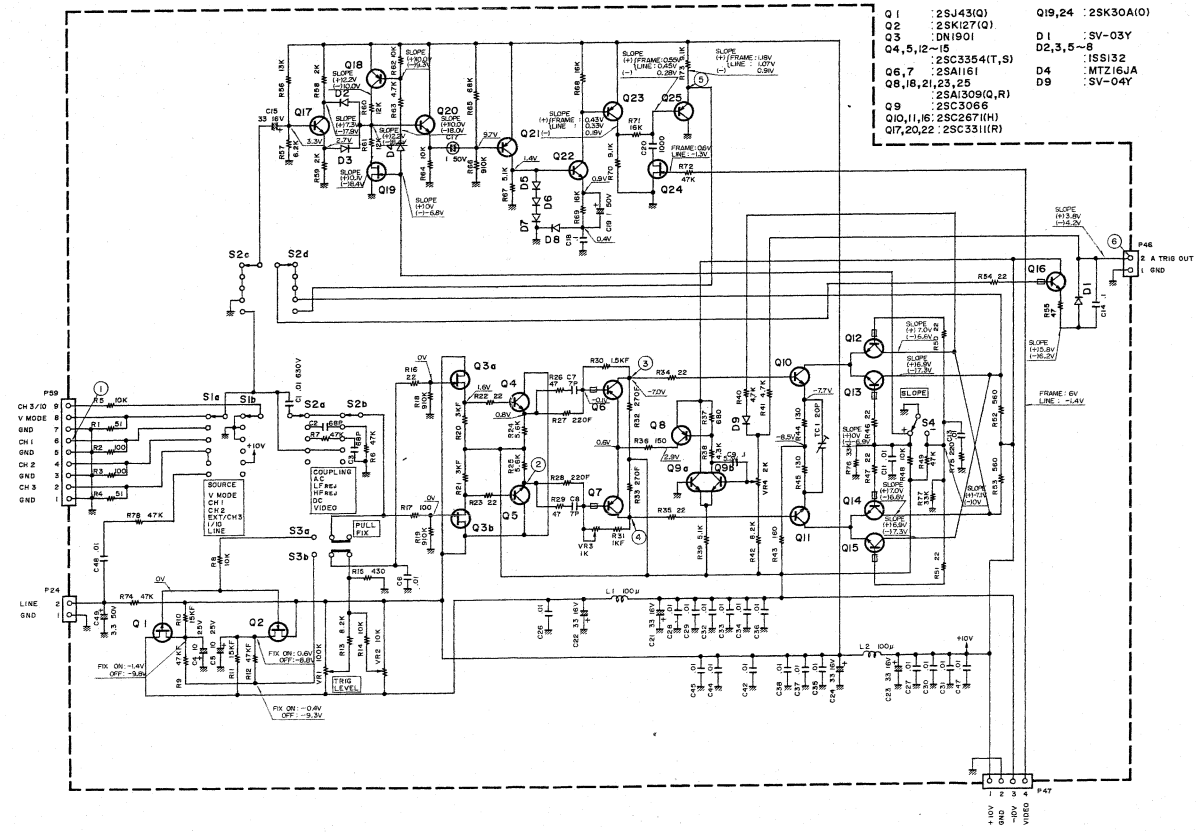
PC BOARD

A TRIG SWITCH UNIT (X77-1280-00)



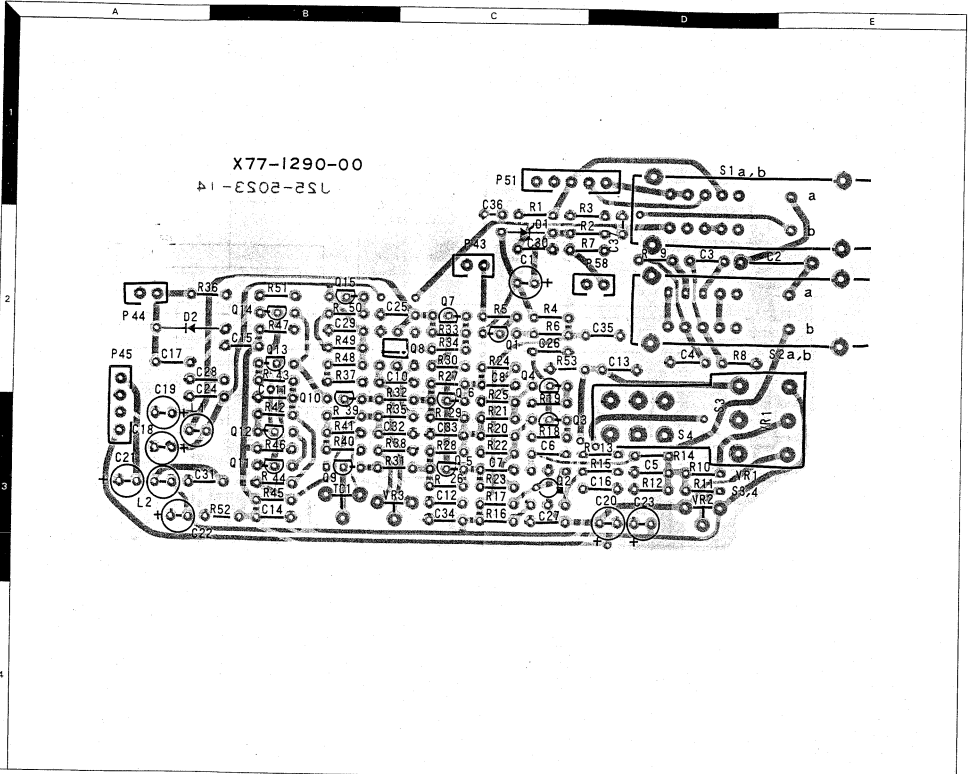
SCHEMATIC DIAGRAM

A TRIG SWITCH UNIT (X77-1280-00)



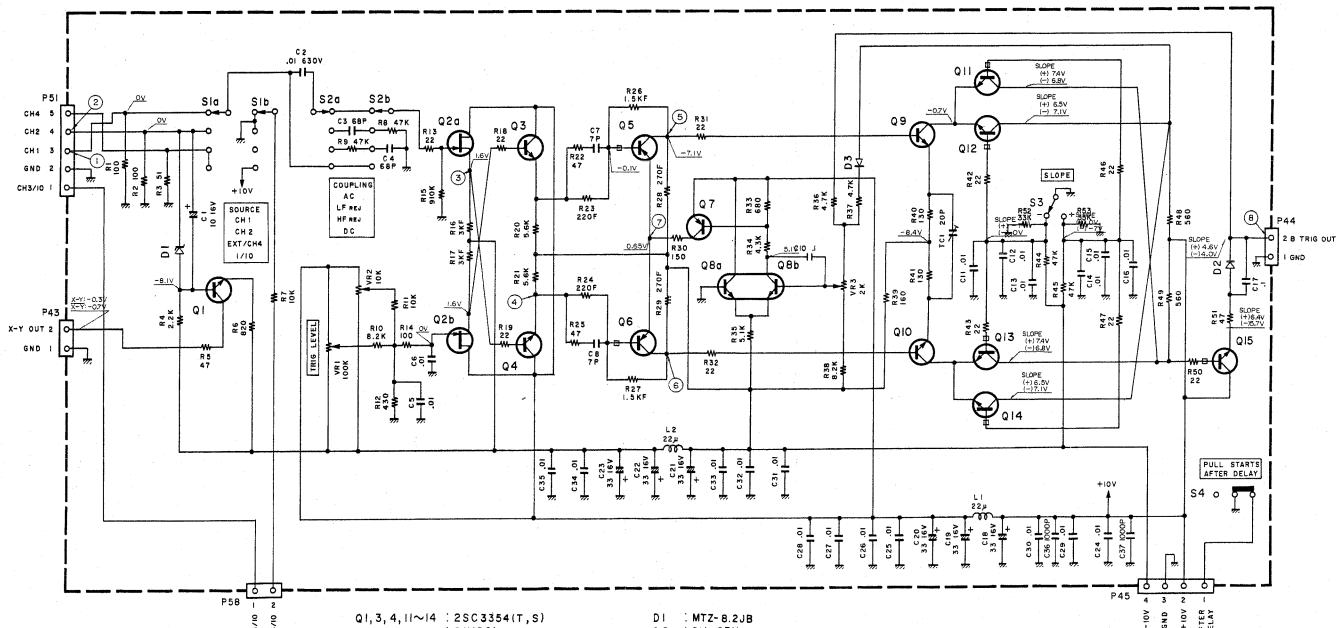
PC BOARD

B TRIG SWITCH UNIT (X77-1290-00)



SCHEMATIC DIAGRAM

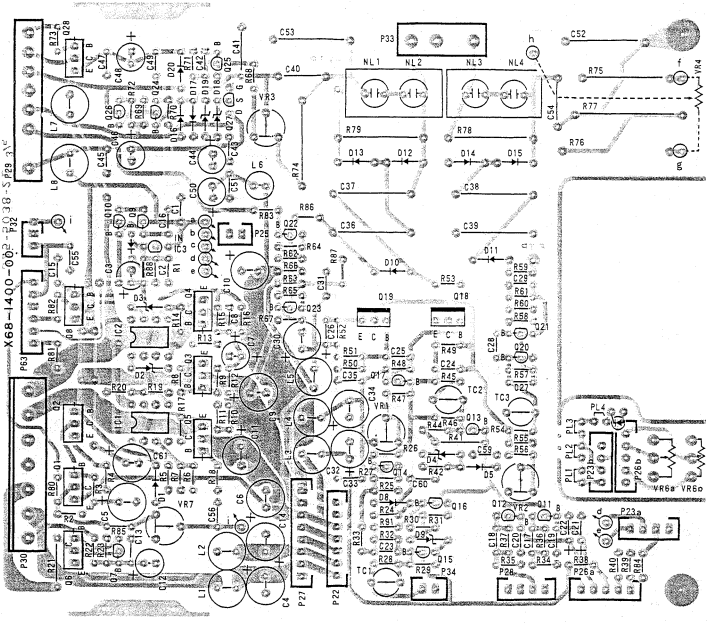
B TRIG SWITCH UNIT (X77-1290-00)



Q1, 3, 4, 11~14	: 2SC3354(T, S)	D1	: MTZ-8.2JB
Q2	: DN1901	D2	: SV-03Y
Q5, 6	: 2SA1161	D3	: SV-04Y
Q7	: 2SA1309(Q, R)		
Q8	: 2SC3066		
Q9, 10, 15	: 2SC2671(H)		

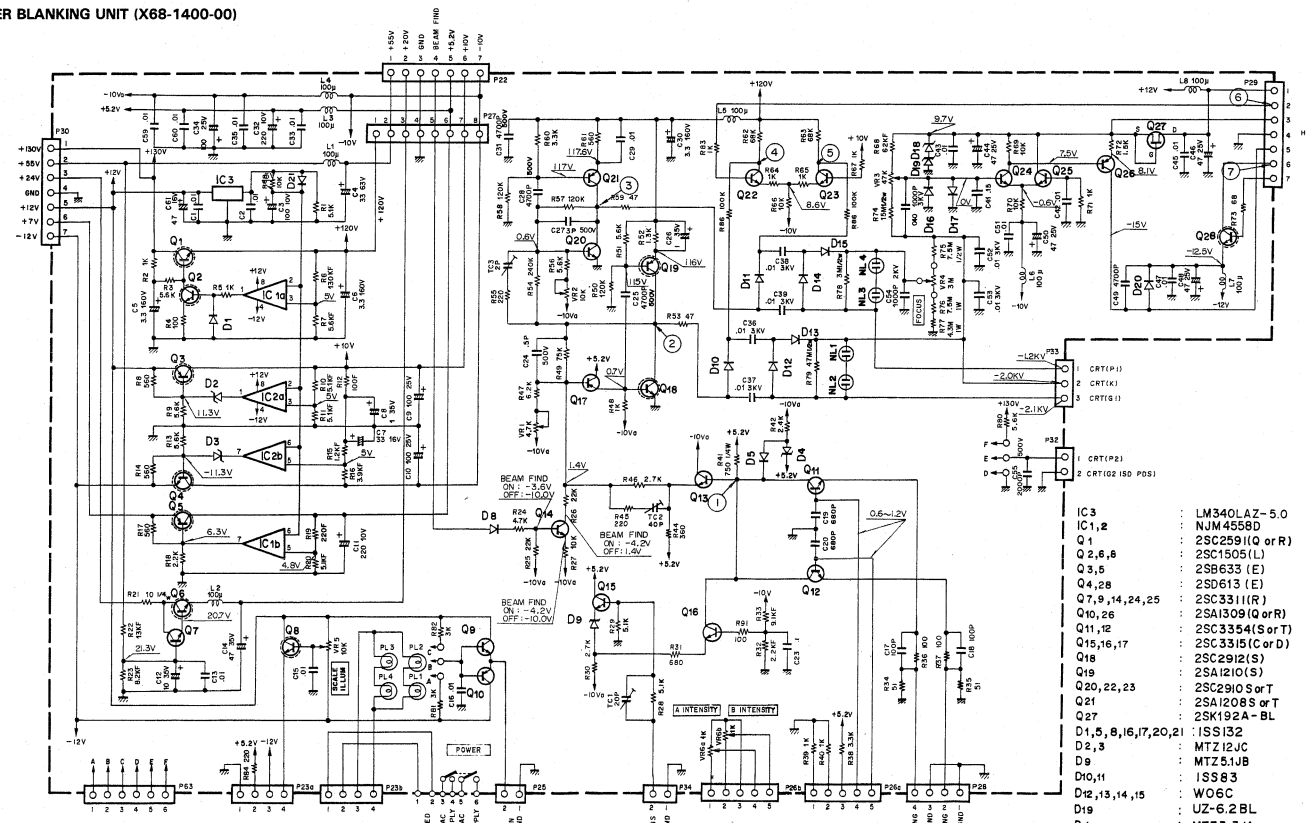
PC BOARD

POWER BLANKING UNIT (X68-1400-00)



SCHEMATIC DIAGRAM

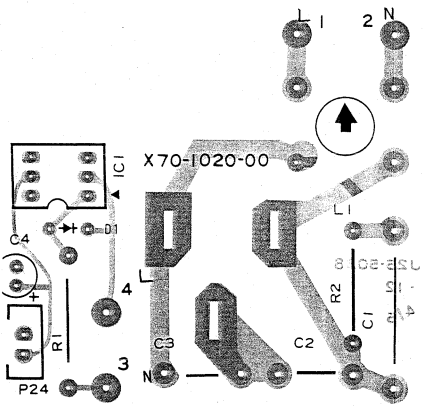
POWER BLANKING UNIT (X68-1400-00)



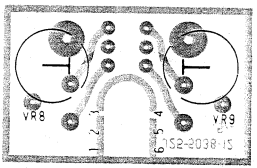
IC3	:	LM340LAZ-5.0
IC1,2	:	NJM4558D
Q1	:	2SC2591(Q or R)
Q2,6,8	:	2SC1505(L)
Q3,5	:	2SB633 (E)
Q4,28	:	2SD613 (E)
Q7,9,14,24,25	:	2SC3311(R)
Q10,26	:	2SA1309(Q or R)
Q11,12	:	2SC3354(S or T)
Q15,16,17	:	2SC3315(C or D)
Q18	:	2SC2912(S)
Q19	:	2SA1210(S)
Q20,22,23	:	2SC2910 S or T
Q21	:	2SA1208 S or T
Q27	:	2SK192A-BL
D1,5,8,16,17,20,21	:	1SS132
D2,3	:	MTZ12JC
D9	:	MTZ5.1JB
D10,11	:	1SS83
D12,13,14,15	:	WO6C
D19	:	UZ-6.2BL
D4	:	MTZ3.3JA
Q13	:	2SA1323(B)
D18	:	UZ-3.0B

PC BOARD

FILTER UNIT (X70-1020-00)

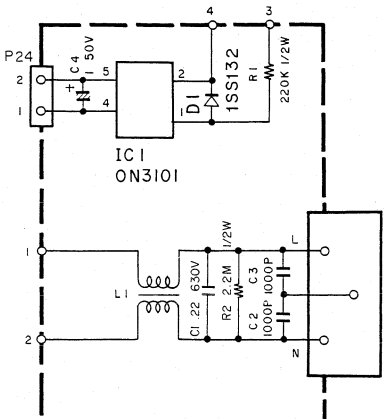


ASTIG UNIT (X81-1430-00)

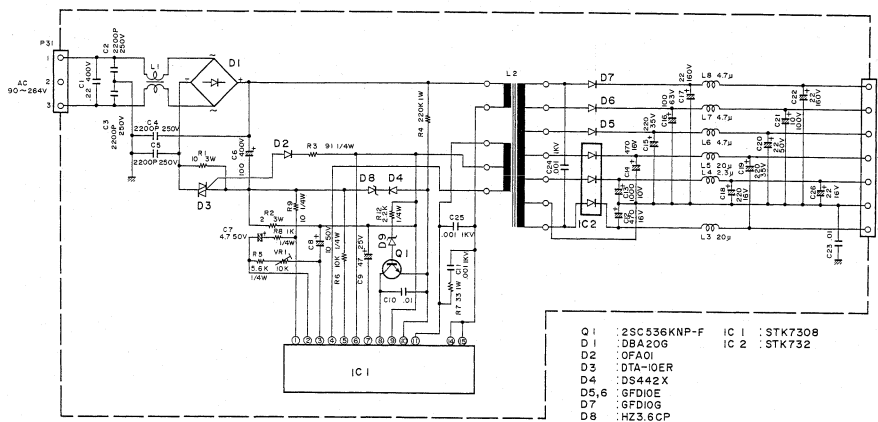


SCHEMATIC DIAGRAM

FILTER UNIT (X70-1020-00)



SWITCHING POWER SUPPLY UNIT (W02-0413-05)



Q1 : 2SC536KNP-F
D1 : DBA20G
D2 : GFA01
D3 : DTA-10ER
D4 : DS442X
D5,6 : GFD10E
D7 : GFD10G
D8 : HZ3.6CP
D9 : GZA6.2Z
IC1 : STK7308
IC2 : STK732

VOLTAGES AND WAVEFORMS

The voltages and waveforms are measured on each schematic diagram as follows;

TEST EQUIPMENT

Digital multimeter : DL-720 (TRIO)
Oscilloscope : 475A (TEKTRONIX)
Sine wave generator : SG-502 (TEKTRONIX)

CONTROL SETTINGS

A INTENSITY	Midrange
FOCUS	Midrange
AC-GND-DC	GND for voltage measurement DC for waveform measurement
▲▼ POSITION	Midrange
CH1, CH2 ×5 GAIN	OFF
CH1, CH2 VARIABLE	CAL
CH1, CH2 VOLTS/DIV	0.2 V
CH2 INV	OFF
V. MODE	Unless otherwise specified CH1
20 MHz BW	OFF
A, B COUPLING	AC
A, B SLOPE	+
TRIG. MODE	AUTO
HOLDOFF	NORM
A SWEEP TIME/DIV	0.2 ms
B SWEEP TIME/DIV	50 μs
A. VARIABLE	CAL
◄► POSITION	Midrange
HORIZ DISPLAY	A
X10 MAG	OFF

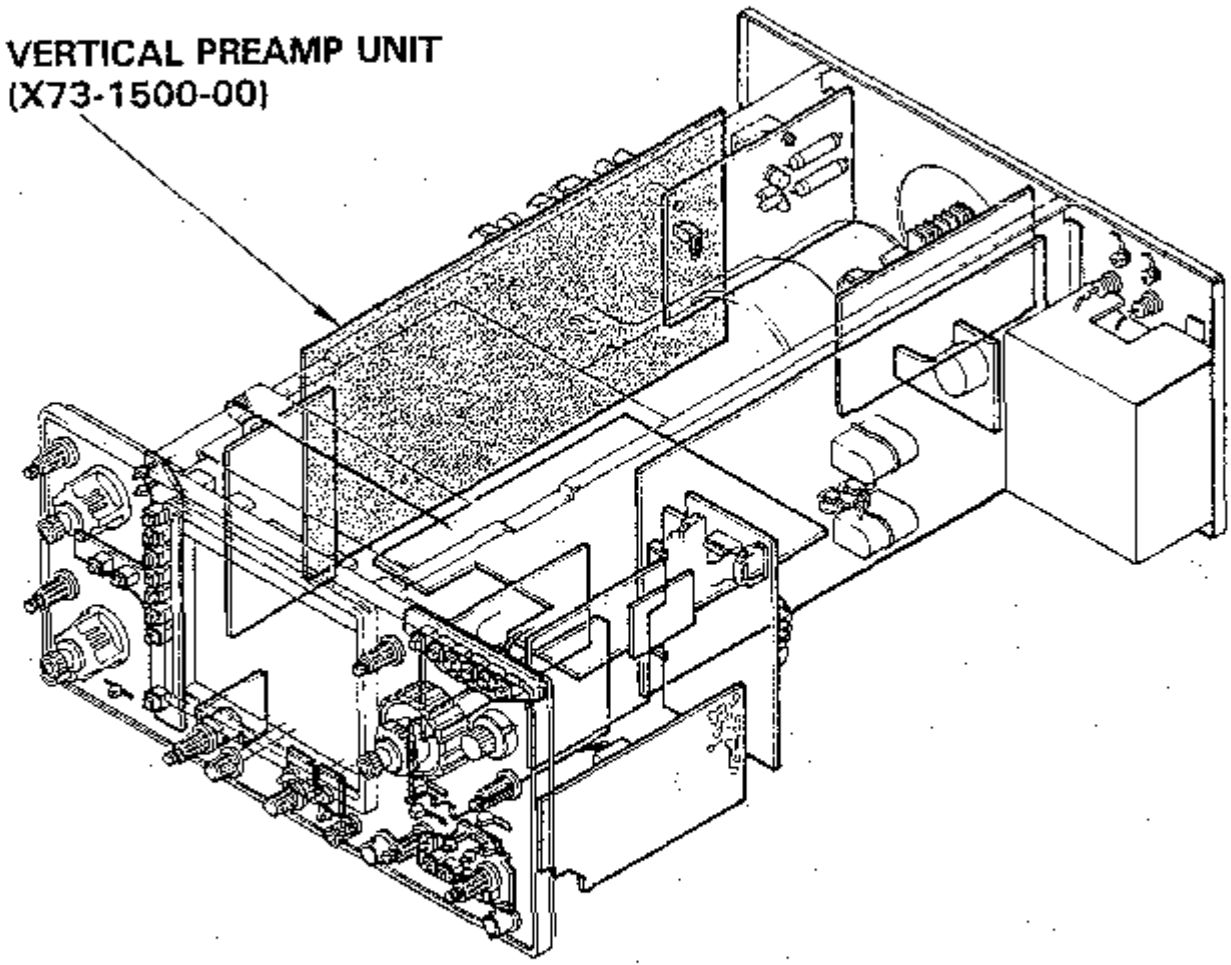
NOTE:
In differencial circuit, the voltages and waveforms are shown only CH1 and CH3.

Voltage Measurements

Voltage measurements are taken with no signal applied and the trace positioned to the center horizontal graticule line. The digital multimeter common should be connected to chassis ground at the nearest measurement point.

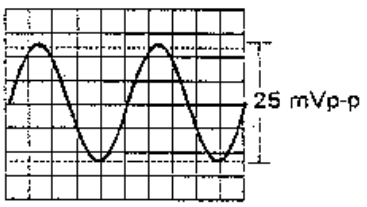
Waveform Condition

Waveforms are measured with 1 kHz 1 Vp-p sine wave applied CH1 input and 1 kHz 500 m Vp-p applied CH3 input.


VERTICAL PREAMP UNIT
(X73-1500-00)

WAVEFORMS

①



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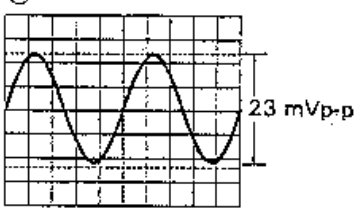

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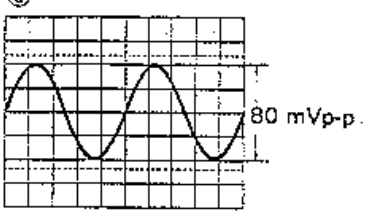

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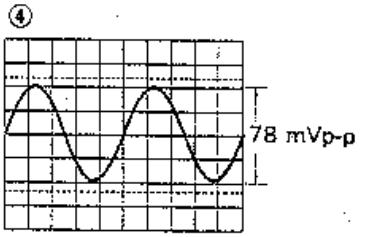

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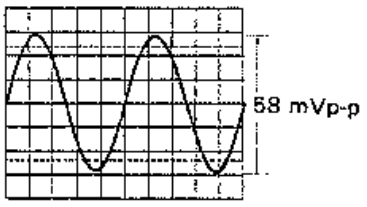

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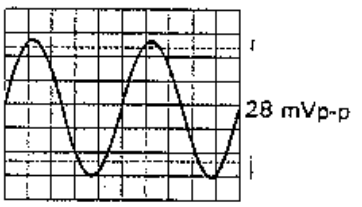

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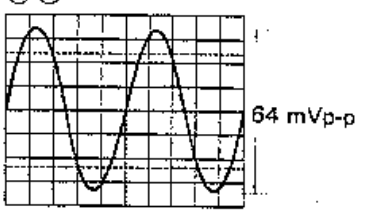

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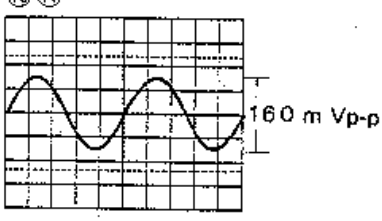

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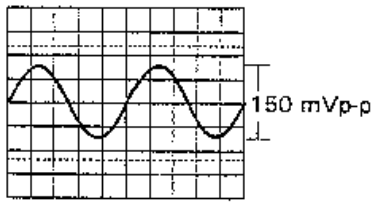

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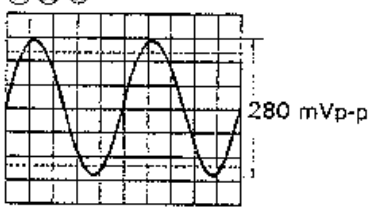

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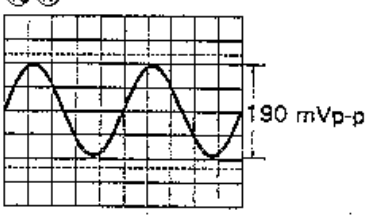

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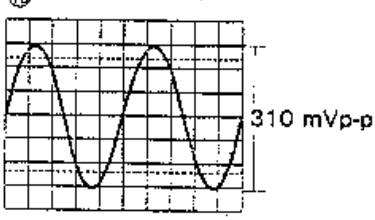

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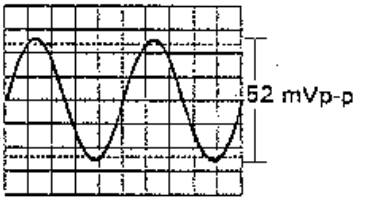

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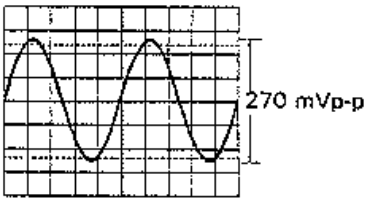

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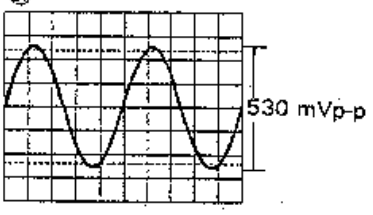

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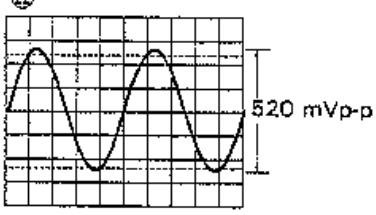

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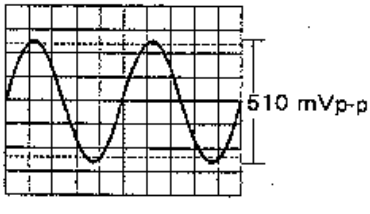

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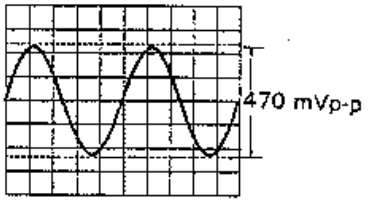

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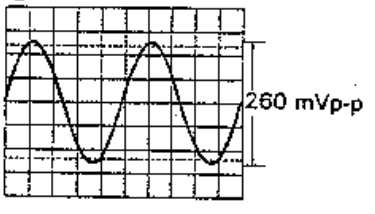

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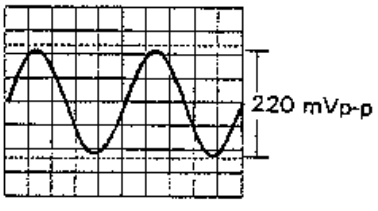
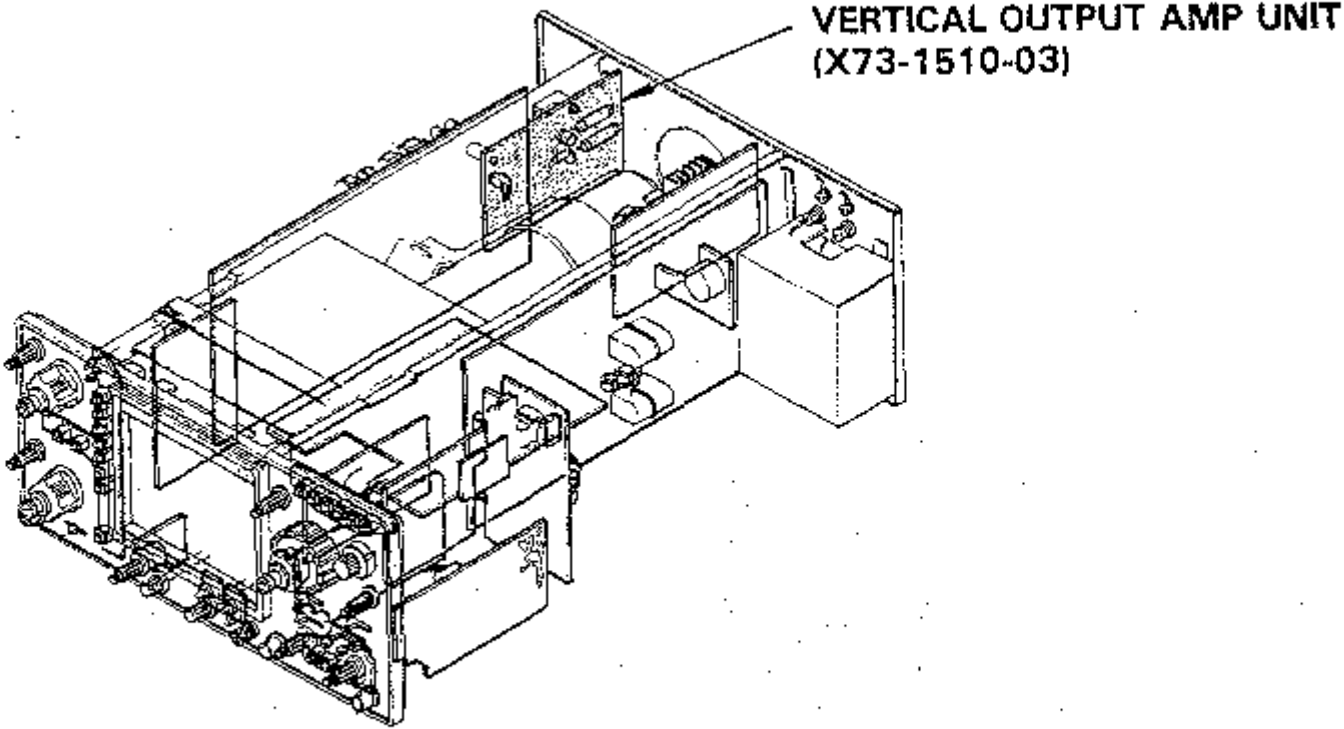
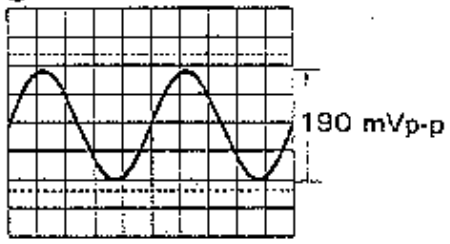


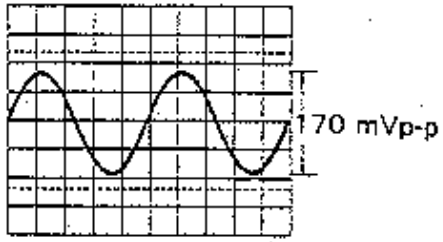

VERTICAL OUTPUT AMP UNIT
(X73-1510-03)

WAVEFORMS

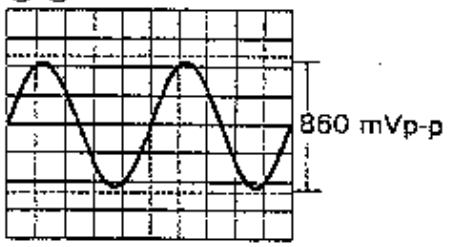
①



②



③④



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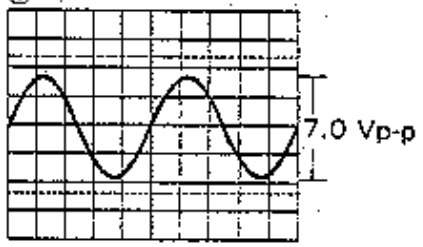

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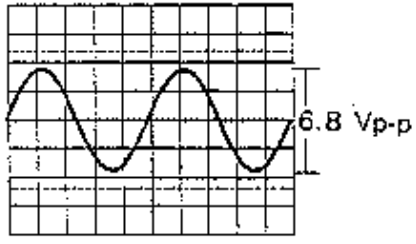

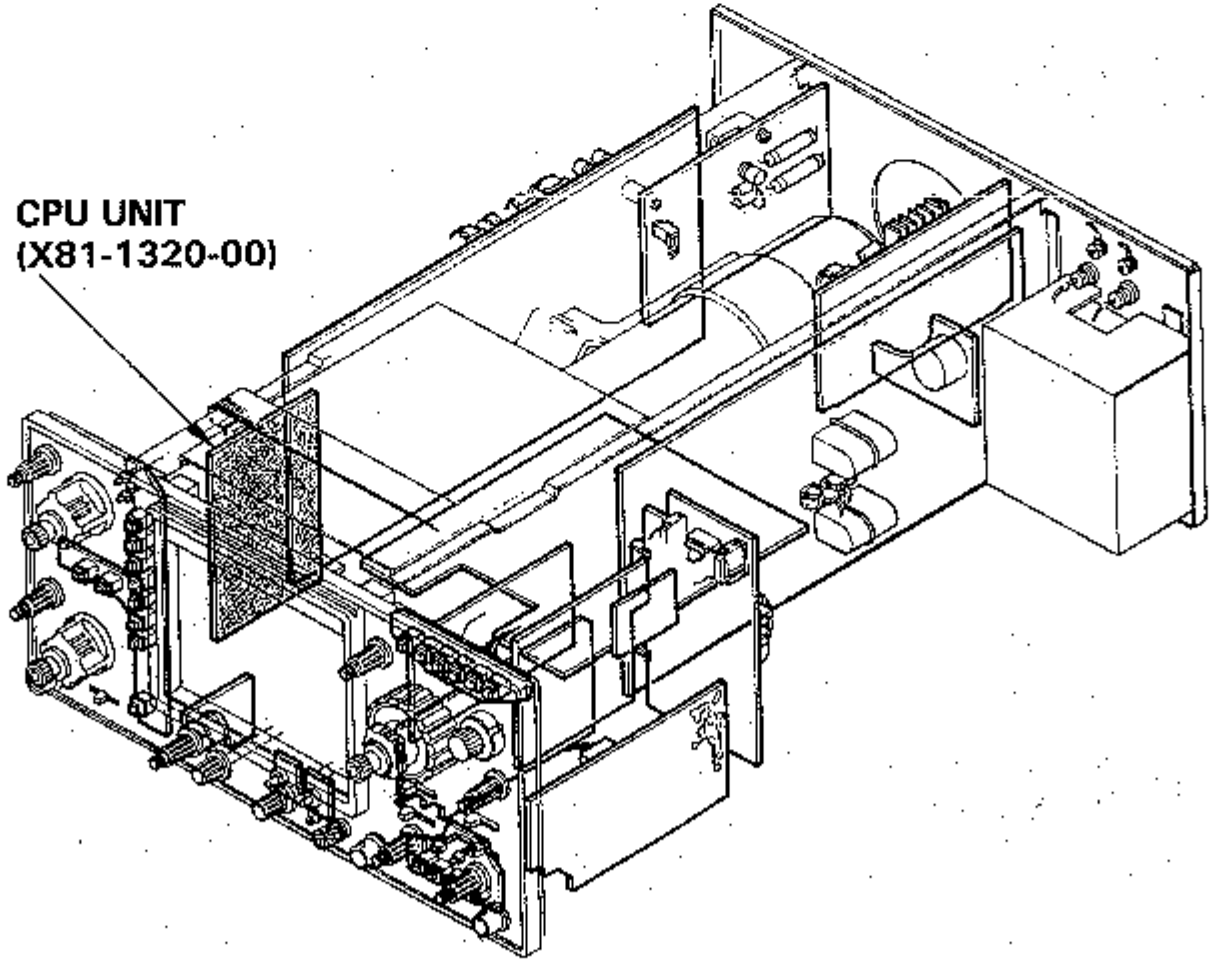
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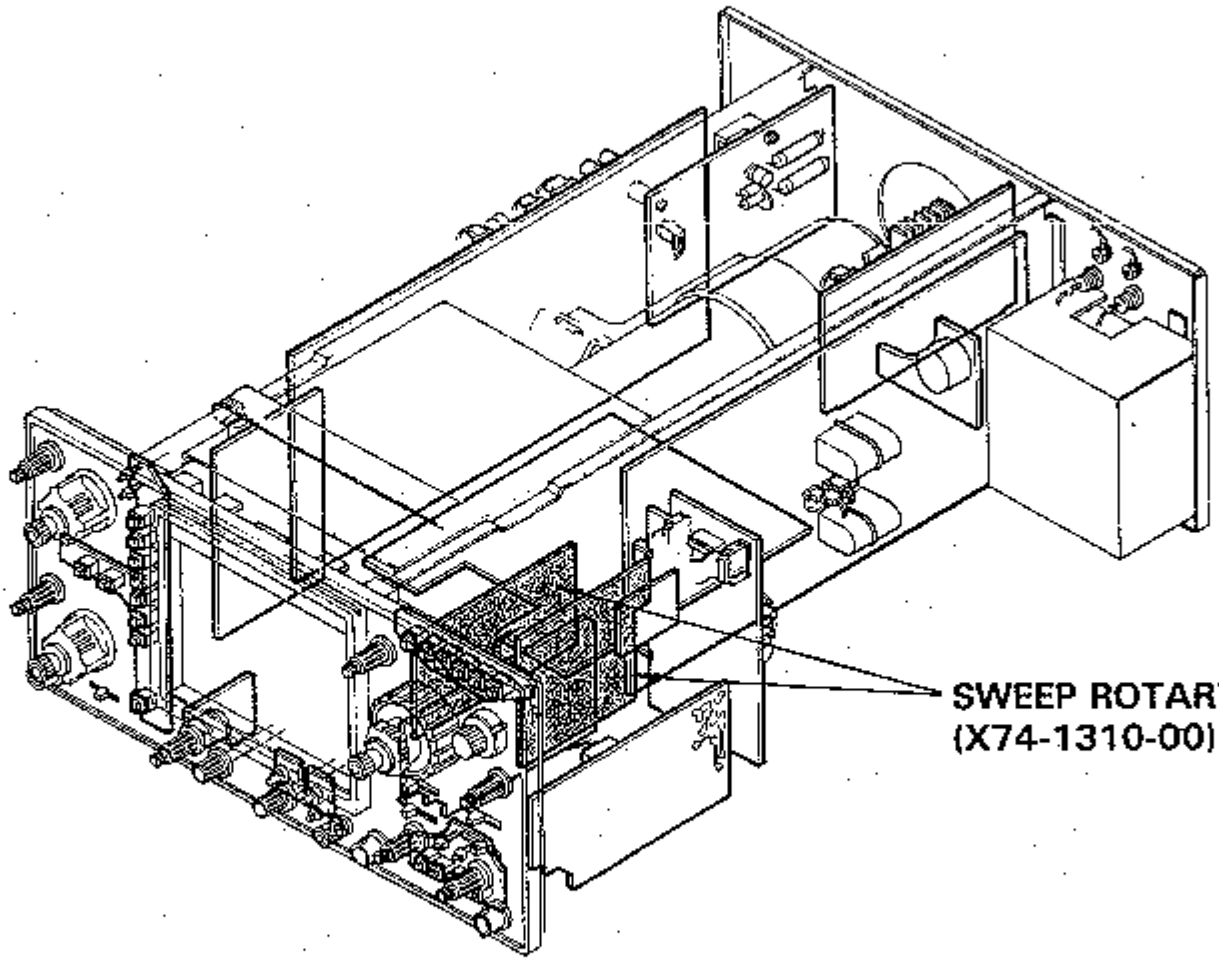
(X81-1320-00)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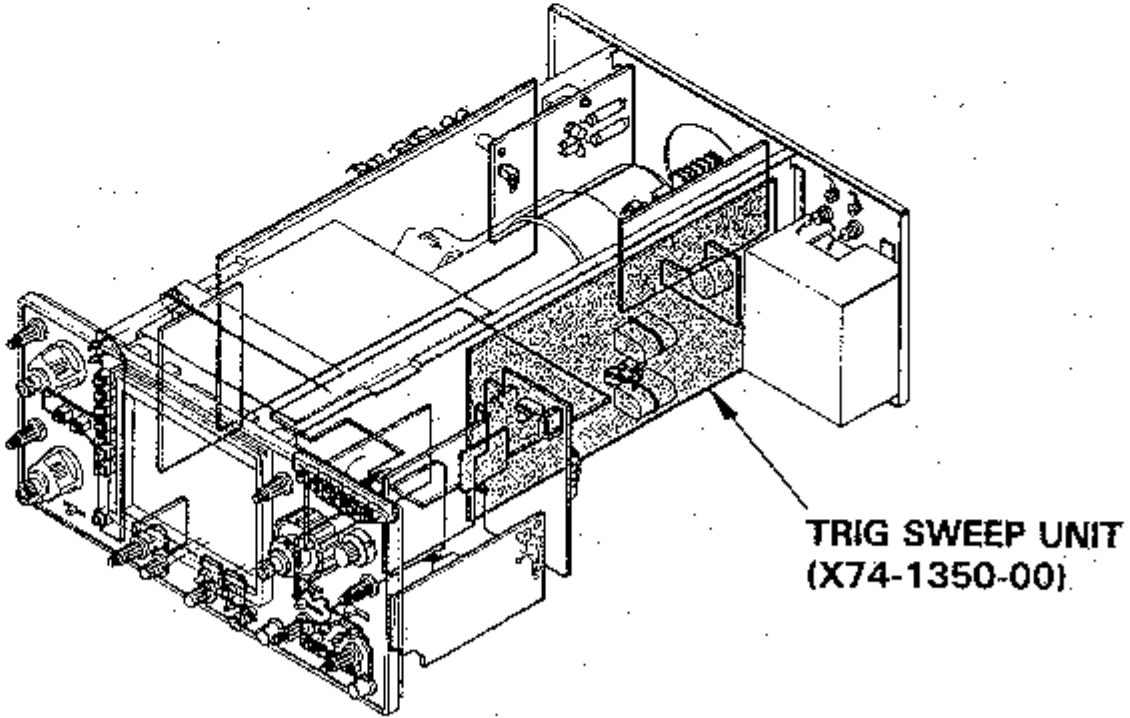
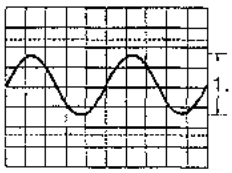
(X74-1310-00)


TRIG SWEEP UNIT
(X74-1350-00)

WAVEFORMS

①



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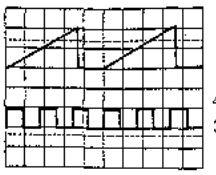

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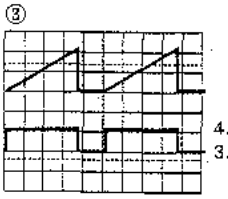

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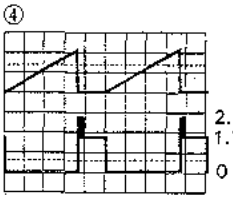

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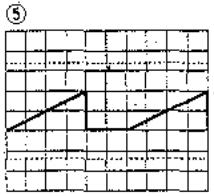

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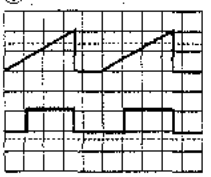

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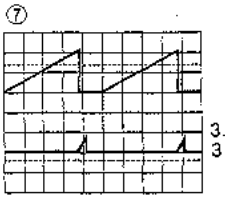

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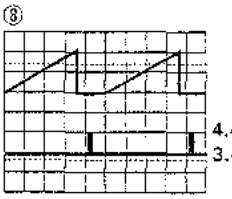

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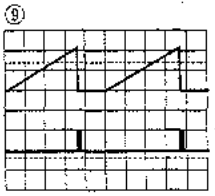

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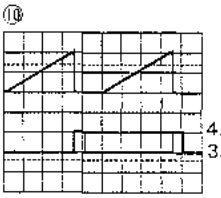
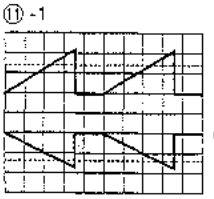
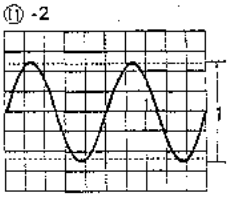


⑪ -1



⑪ -2



Input: CH2,
H DISPLAY: X-Y

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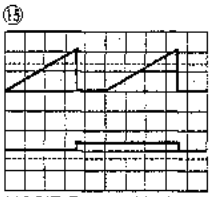
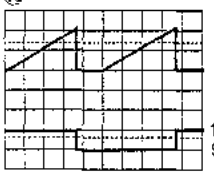


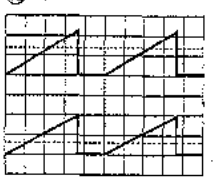
HORIZ DISPLAY: ALT
▲▼TRACE SEP: Fully CCW

⑯



HORIZ DISPLAY: ALT
▲▼TRACE SEP: Fully CCW

⑫ -1



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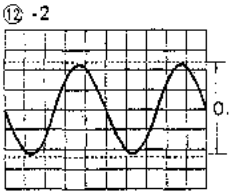

Input: CH2,
H DISPLAY: X-Y

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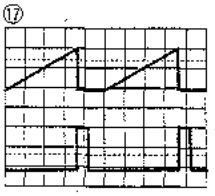

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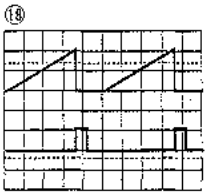

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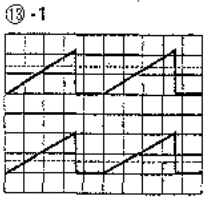

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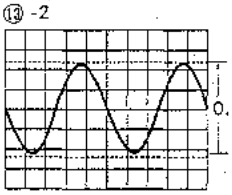

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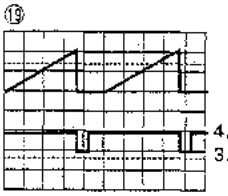
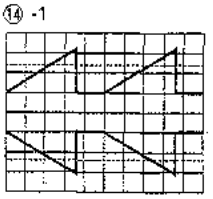
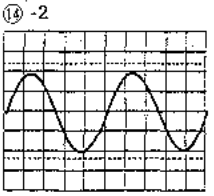


⑭ -1



⑭ -2



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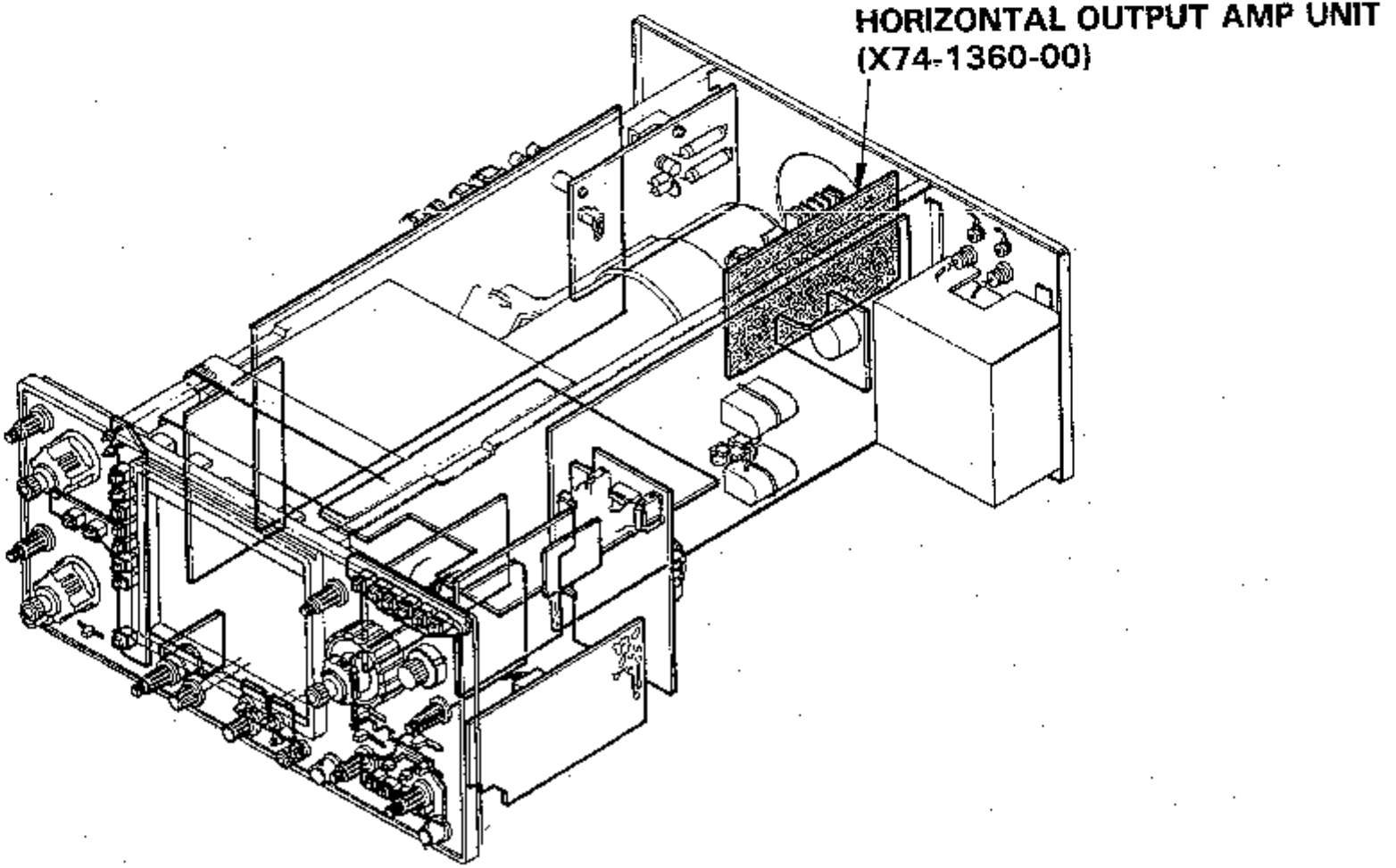
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(X74-1360-00)

WAVEFORMS

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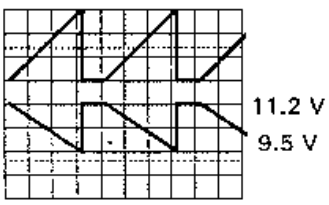
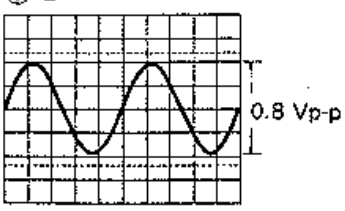
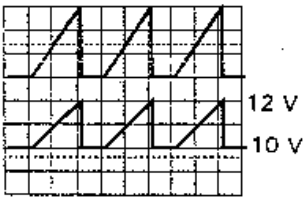


①-2

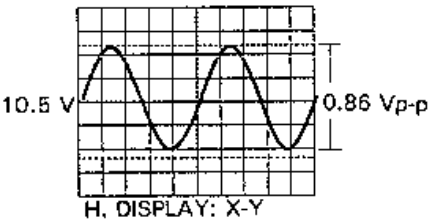


H. DISPLAY: X-Y

②-1

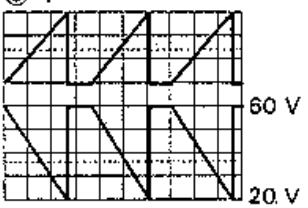


②-2



H. DISPLAY: X-Y

③-1



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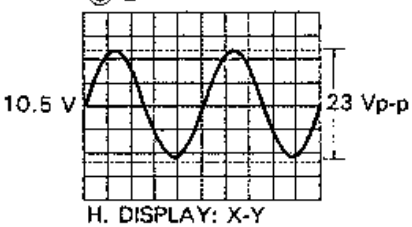
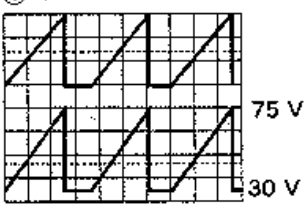


H. DISPLAY: X-Y

④-1



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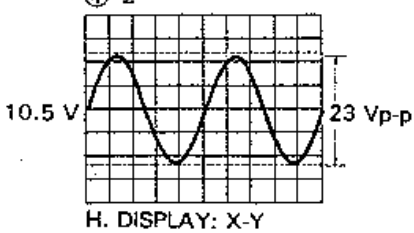
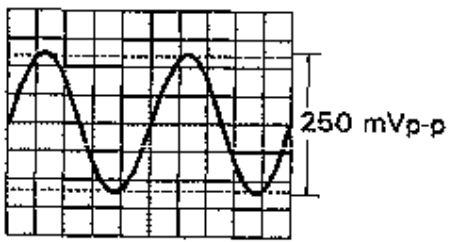
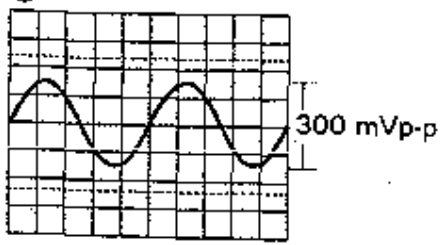
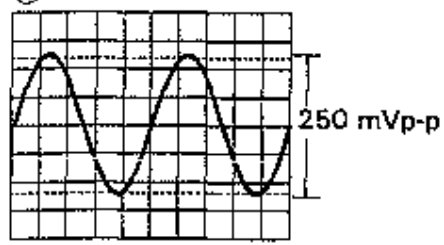


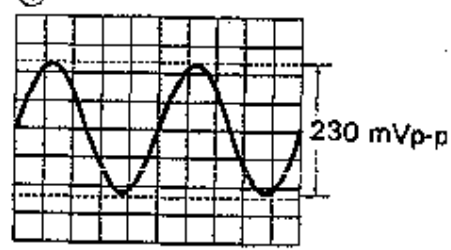
H. DISPLAY: X-Y

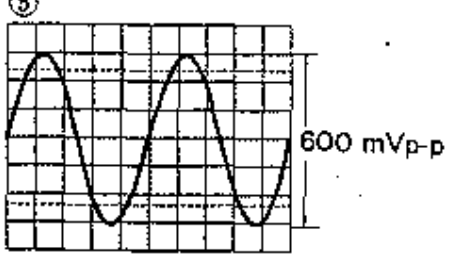
WAVEFORMS

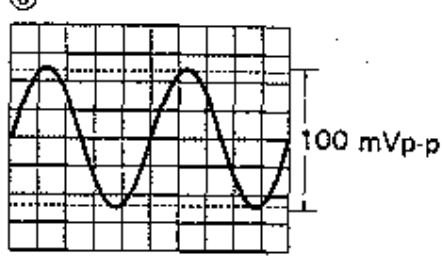
① 

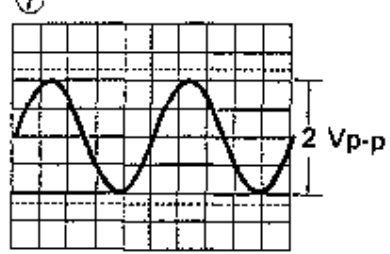
② 

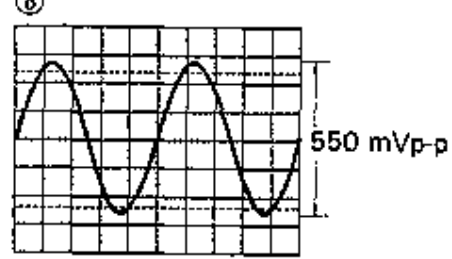
③ 

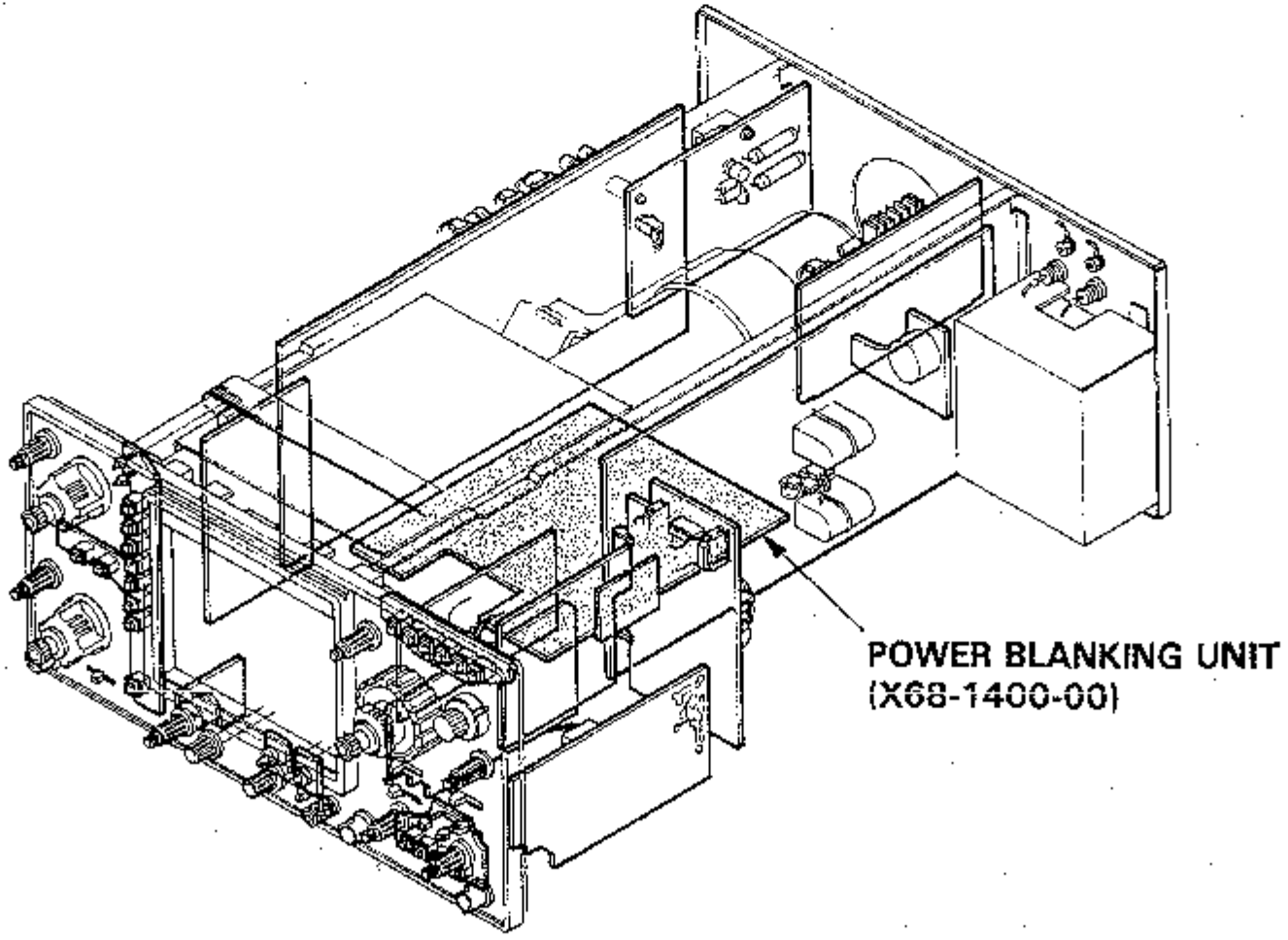
④ 

⑤ 

⑥ 

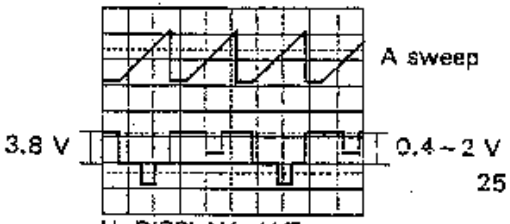
⑦ 

⑧ 


POWER BLANKING UNIT
(X68-1400-00)

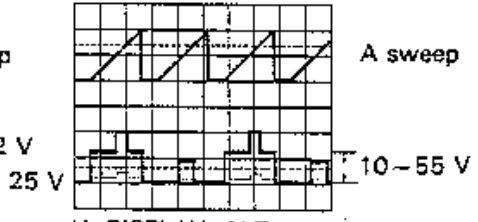
WAVEFORMS

①



H. DISPLAY: ALT

②



H. DISPLAY: ALT

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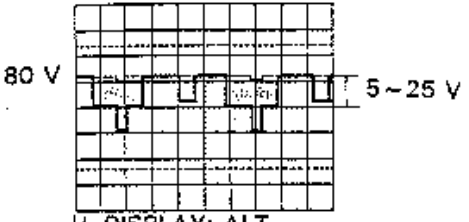
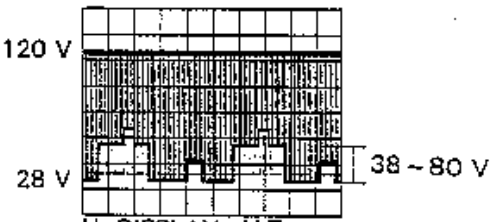


H. DISPLAY: ALT

④



H. DISPLAY: ALT

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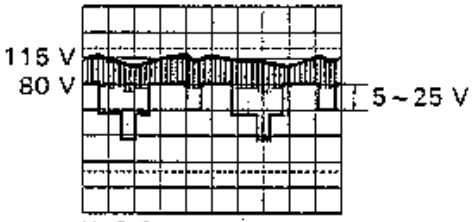

H. DISPLAY: ALT

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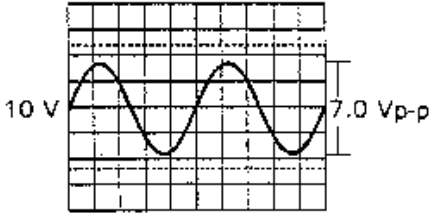

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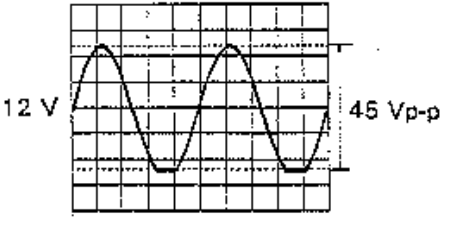
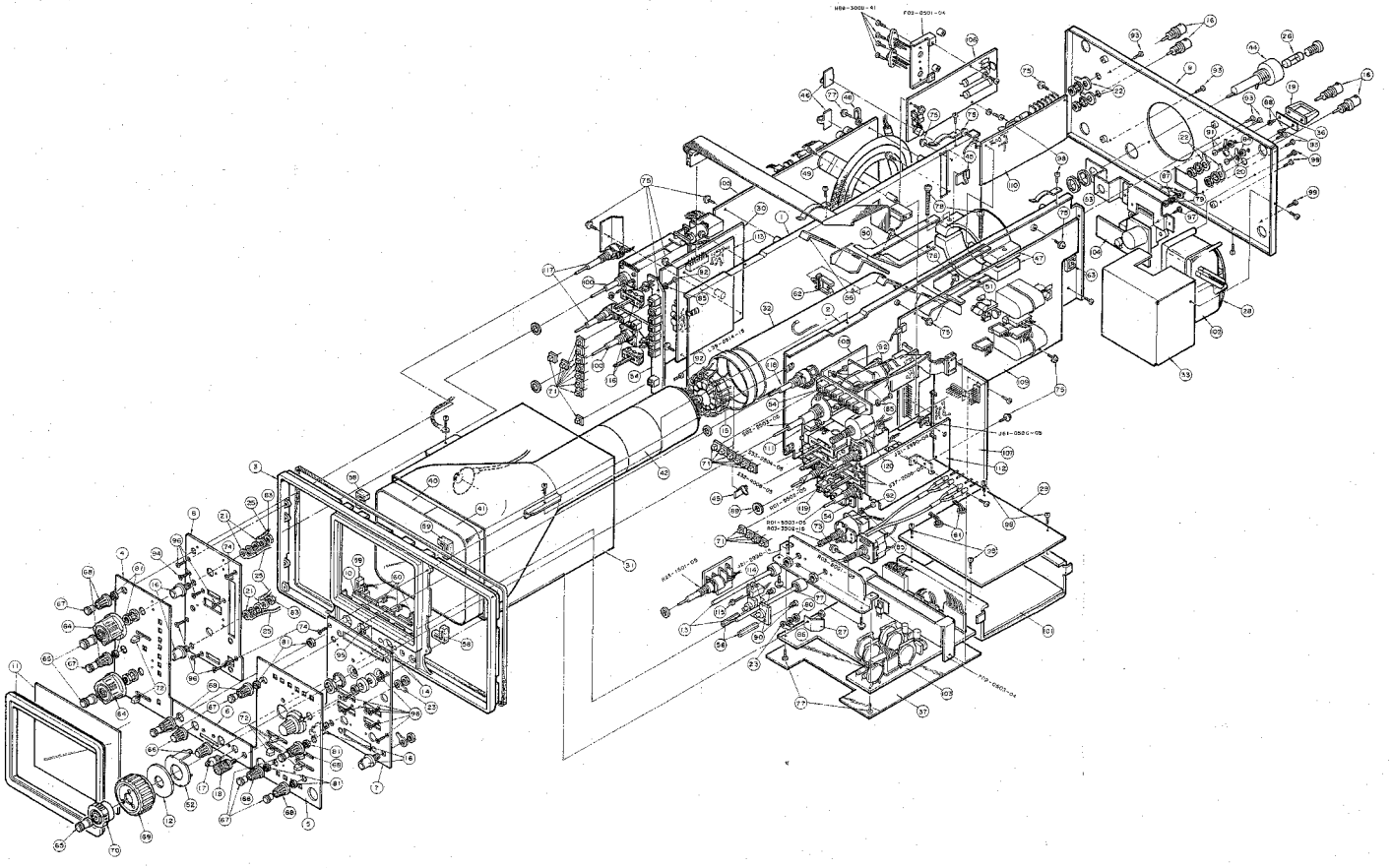
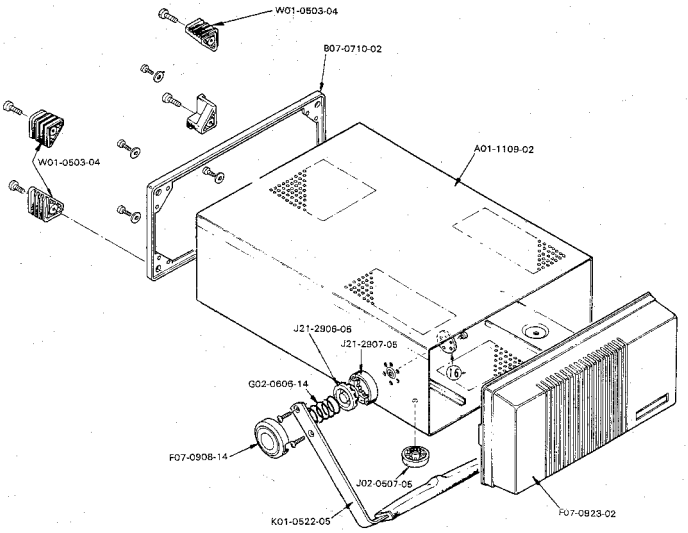


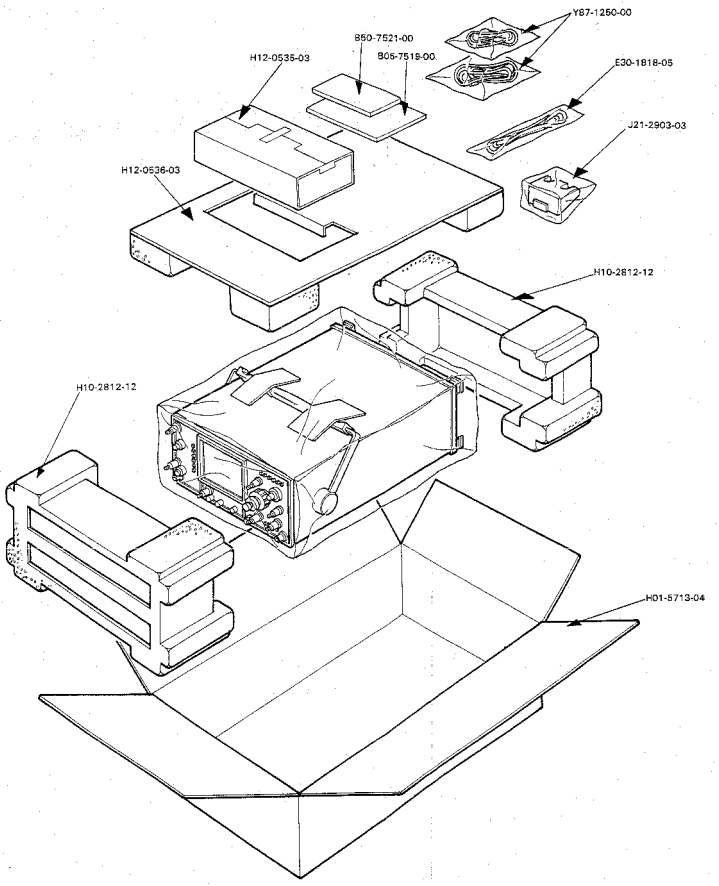
Note : IIII : CHOP Operation



DISASSEMBLY

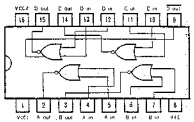


PACKING



SEMICONDUCTORS

C-MOS IC



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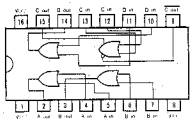

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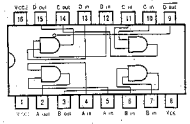

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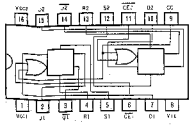

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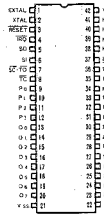
CPU



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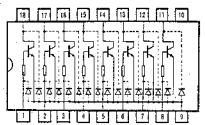
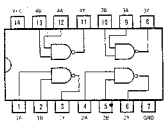


AN90B20

TTL IC



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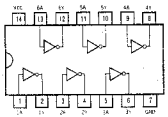

SN7405N

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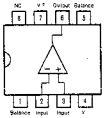

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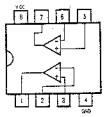

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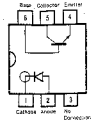

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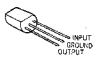

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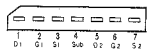
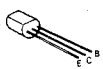
LM317LZ



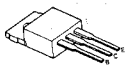
M47F(C)

TRANSISTOR

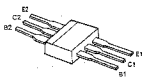


2SC1973(T)
2SC2910(S or T)
2SA1208(S or T)
2SD438(F)

2SC3354(T, S)
2SC3318(C, D)
2SC3311(Q, R)
2SA1309(Q, R)
2SA1323(S)



2SC2591(Q, R)
2SB633(E)
2SD613(E)
2SC1505(L)



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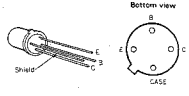
2SA1239

2SC2671(H)
2SA1161
2SC2644

2SA1206

2SA1210(S)
2SC2912(S)



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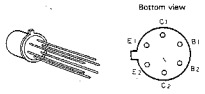


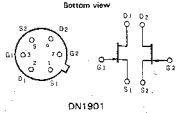
2SC1733

FET

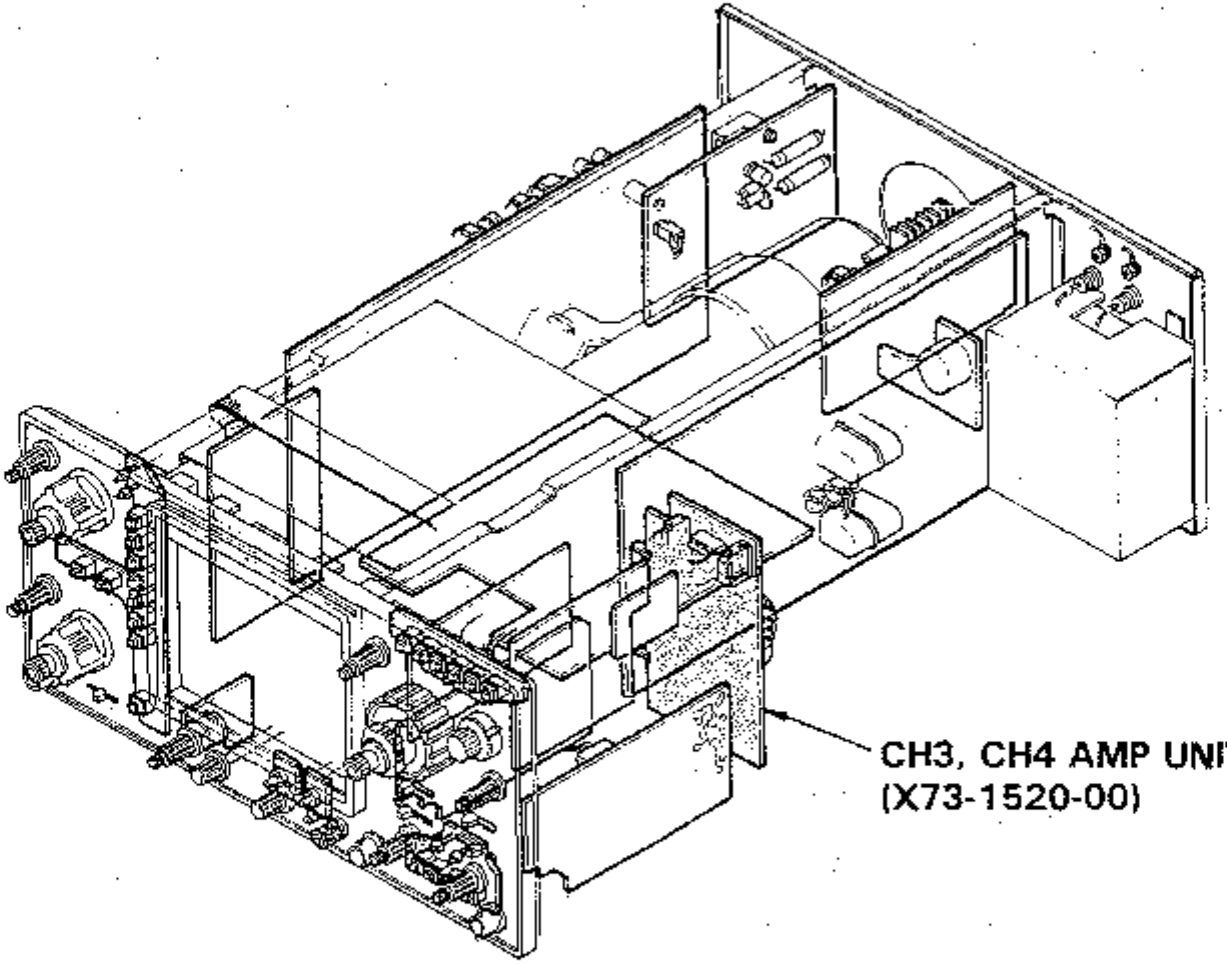
J304

2SK192A(BL)

2SK30A(O)
2SK127(Q)
2SJ43(Q)

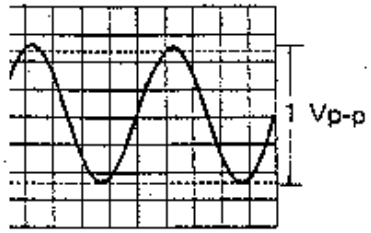


DN1901


CH3, CH4 AMP UNIT
(X73-1520-00)

WAVEFORMS

①②③



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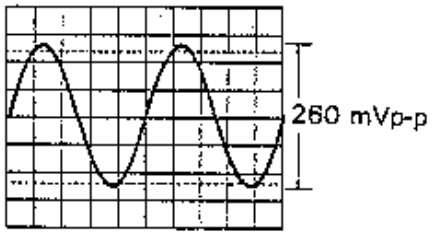

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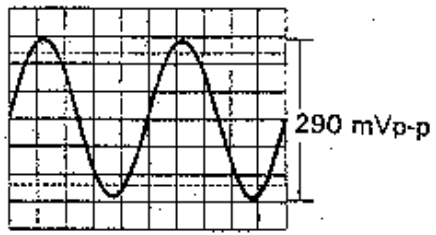

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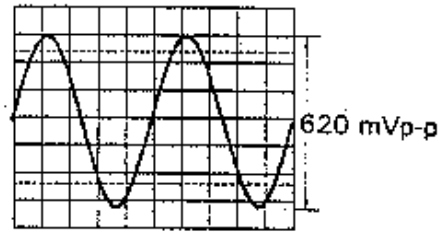

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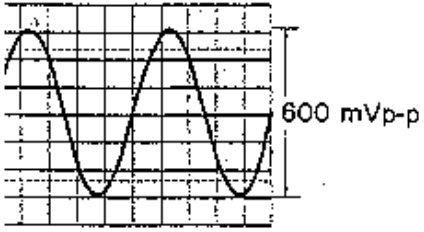

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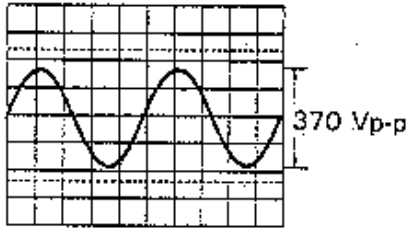
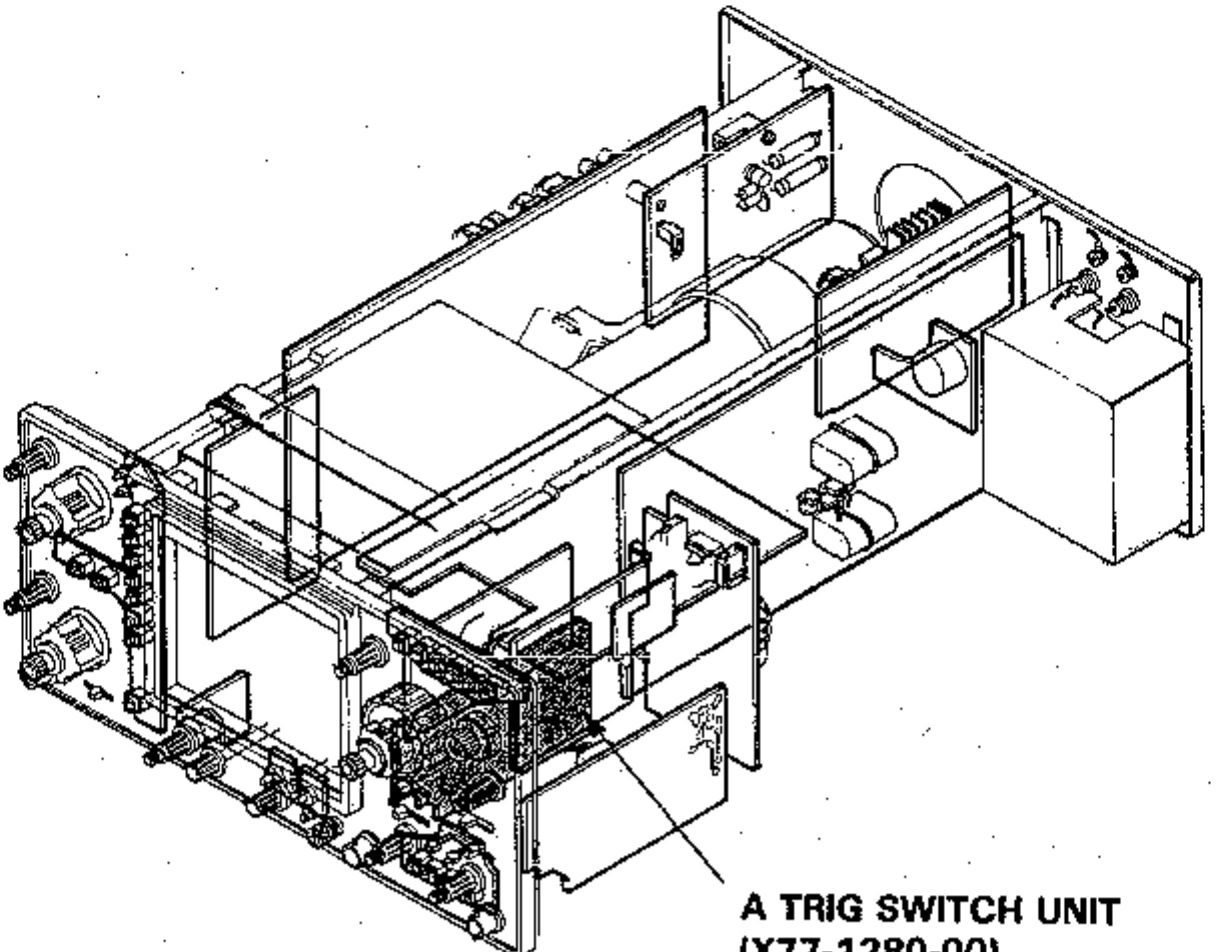
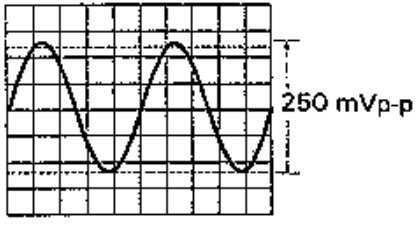



A TRIG SWITCH UNIT
(X77-1280-00)

WAVEFORMS

①



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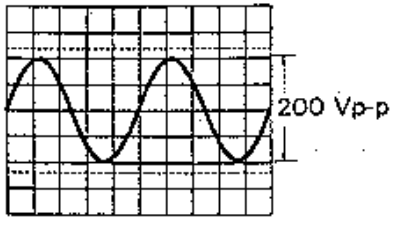

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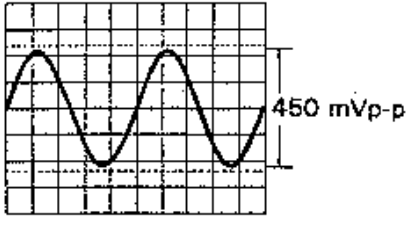

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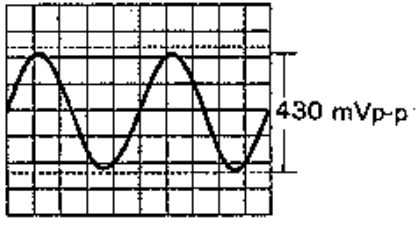

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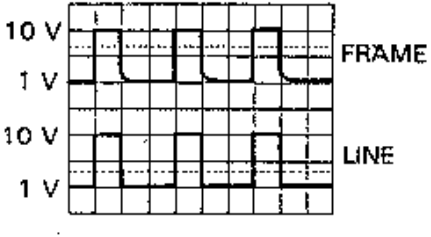

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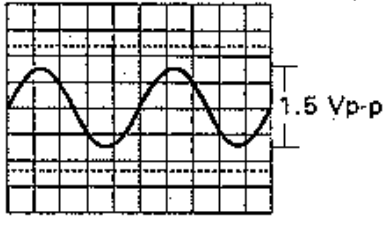
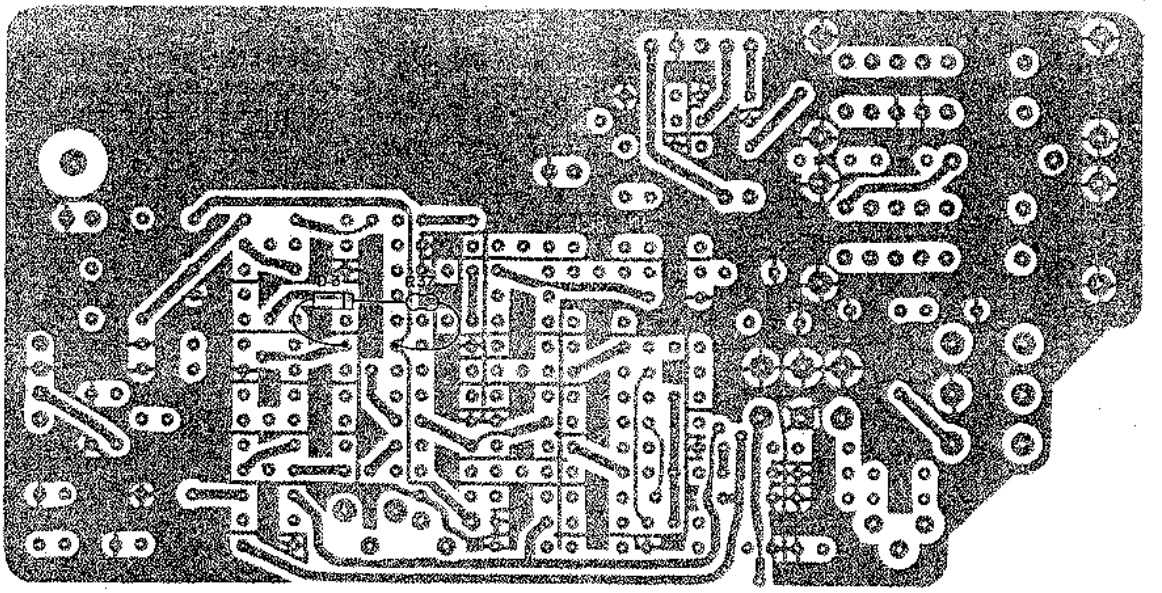
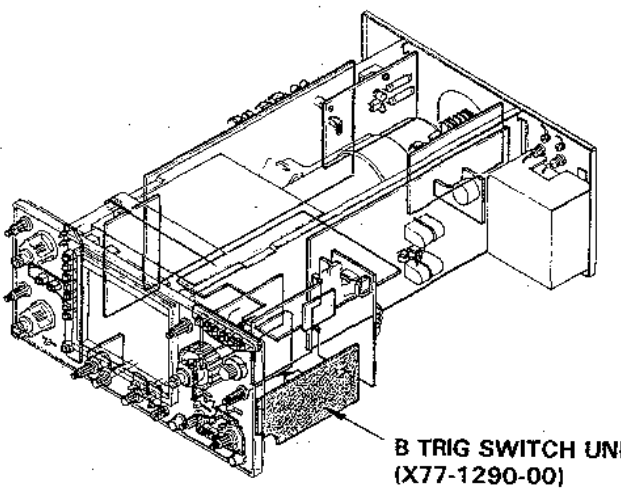
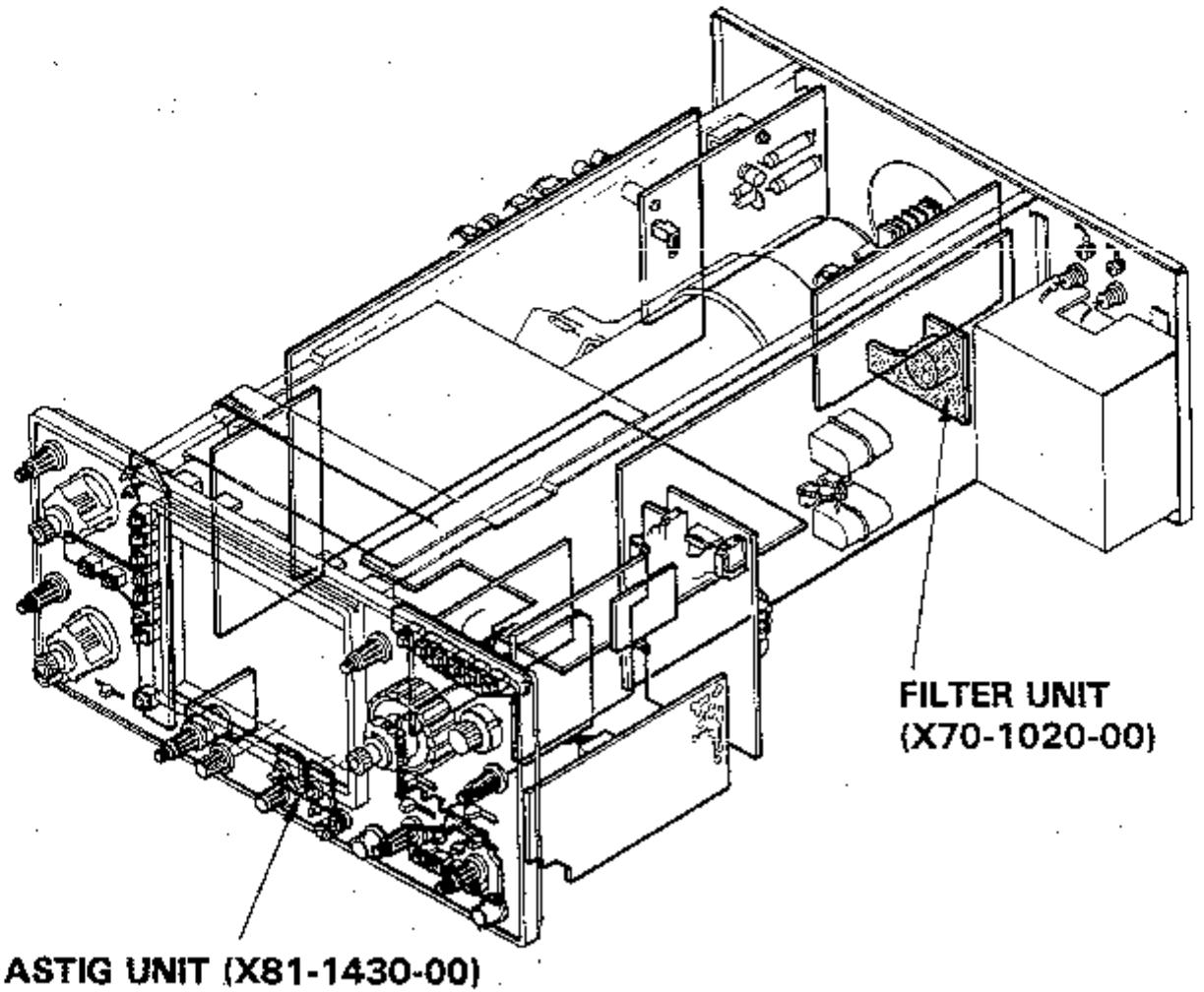




(COMPONENT SIDE VIEW)



B TRIG SWITCH UNIT
(X77-1290-00)


FILTER UNIT
(X70-1020-00)
ASTIG UNIT (X81-1430-00)