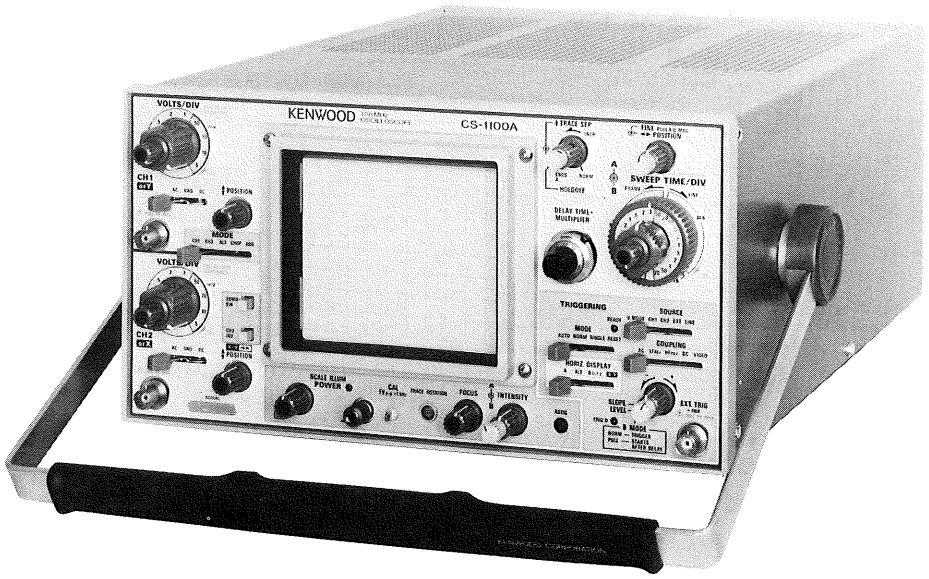
KENWOOD

100MHz DUAL TRACE OSCILLOSCOPE

# CS-1100A

# SERVICE MANUAL

KENWOOD CORPORATION



**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 16000 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 whether the AC plug is removed from the AC power source. Contacting exposed high voltage could result in fatal electric shock.

# CONTENTS

# 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. 1.

**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.

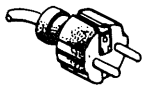
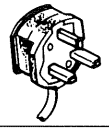
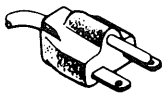
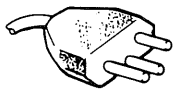
| Plug configuration | Power cord and plug type | Factory installed instrument fuse | Line cord plug fuse | Parts No. for power cord |
|---|---|---|---|---|
|  | North American<br>120 volt/60 Hz<br>Rated 15 amp<br>(12 amp max; NEC) | 1.2 A, 250 V<br>Fast blow<br>AGC/3AG | None | E30-1820-05 |
|  | Universal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

**Fig. 1 Power Input Voltage Configuration**

# SPECIFICATIONS

## CRT

| | |
|---|---|
| Model: | 150WTM31<br>150 mm Rectangular, with internal graticule |
| Acceleration Voltage: | 16 kV |
| Display Area: | 8×10 div<br>(1 div=10 mm) |

## VERTICAL AXIS (CH1 and CH2)

| | |
|---|---|
| Sensitivity: | 5 mV/div to 5 V/div (×1 mode)<br>1 mV/div to 1 V/div (×5 mode) |
| Accuracy: | ±3% (10~35°C)<br>±5% (0~50°C) |
| Attenuator: | 10 steps, 5 mV/div to 5 V/div in 1-2-5 sequence<br>Vernier control for fully adjustable sensitivity between steps |
| Input Impedance: | 1 MΩ±2%, approx. 22pF |
| Frequency Response: | |
| ×1 mode: | DC; DC to 100 MHz, −3 dB<br>AC; 5Hz to 100MHz, −3dB |
| 5V/div range and ×5 mode: | DC; DC to 50 MHz, −3 dB<br>AC; 5 Hz to 50 MHz, −3dB |
| Risetime: | 3.5 nsec or less (100 MHz) |
| Signal Delay Time: | Approx. 10 nsec on the CRT screen |
| Crosstalk | −40 dB or less |
| Operating Modes: | CH1; single trace<br>CH2; single trace<br>ADD; CH1+CH2 added as a single trace<br>ALT; dual trace, alternating<br>CHOP; dual trace, chopped |
| Chop Frequency: | Approx. 250 kHz |
| Channel Polarity: | Normal or inverted, channel 2 only inverted |
| Maximum Input Voltage: | 500 Vp-p or 250 V (DC+AC peak) |
| Non-Distorted Maximum Amplitude: | More than 8 div (DC to 100 MHz) |
| Bandwidth Limiting: | Vertical system bandwidth with the 20 MHz BW push button switch pushed is approximately 20 MHz (−3 dB) |

## HORIZONTAL AXIS (Input thru CH2)

| | |
|---|---|
| Operating Modes: | With HORIZ. DISPLAY switch, X-Y operation is selectable<br>CH1; Y axis<br>CH2; X axis |
| Sensitivity: | Same as vertical axis (CH2) |
| Accuracy: | Same as vertical axis (CH2) |
| Input Impedance: | Same as vertical axis (CH2) |
| Frequency Response | DC; DC to 5 MHz, −3 dB<br>AC; 5 Hz to 5 MHz, −3 dB |
| X-Y Phase Difference: | 3° or less at 100 kHz |
| Maximum Input Voltage: | Same as vertical axis (CH2) |

## SWEEP

| | | |
|---|---|---|
| Type: | A; | A sweep |
| | ALT; | A sweep (intensified for duration of B sweep) and B sweep (delayed sweep) alternating |
| | B DLYD; | Delayed sweep |
| | X-Y; | X-Y oscilloscope |
| Sweep Time: | A; | 20 ns/div to 0.5 s/div in 23 ranges, in 1-2-5 sequence<br>Vernier control provides fully adjustable sweep time between steps |
| | B; | 20 ns/div to 50 ms/div in 20 ranges, in 1-2-5 sequence |
| Accuracy: | | ±3% (10~35°C)<br>±6% (0~50°C) |
| Sweep Magnification: | | ×10 (ten times)<br>±5% (10~35°C)<br>±7% (0~50°C) |
| Linearity: | | ±3% (on 20 ns/div to 0.5 s/div)<br>±5% (×10 MAG) |
| HOLDOFF: | | Continuously variable from NORM to more than five times (MAX) |
| TRACE SEPARATION: | | B sweep can be separated downward from A sweep up to approx. 4 divisions, continuously adjustable |
| Delay Method (B MODE): | | Continuous delay (STARTS AFTER DELAY), Trigger delay (TRIGGER) |
| Delay Time: | | From 200 nsec to 0.5 sec<br>Available delay time is 0.2 to 10 times the A sweep time setting, continuously adjustable |

# SPECIFICATIONS

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

Delay Jitter: 1/20000 of ten times of A sweep time setting

## TRIGGERING

Trigger Mode: AUTO, NORM, SINGLE

Trigger Source:
- V MODE; Trigger selected by vertical MODE switch
- CH1; Triggered by CH1 signal
- CH2; Triggered by CH2 signal
- EXT; Triggered by external trigger signal
- LINE; Triggered by line voltage

Coupling: AC, $LF_{REJ}$, $HF_{REJ}$, DC, VIDEO LINE sync (horizontal sync pulses) automatically selected at A sweep times of 50 μs/div to 20 ns/div and FRAME sync (vertical sync pulses)automatically selected at A sweep times of 0.5 s/div to 0.1 ms/div

Trigger Level: ±90° adjustable

Polarity: +/−

B Trigger Mode: STARTS AFTER DELAY, TRIGGERABLE AFTER DELAY

Trigger Sensitivity

| COUPLING | FREQ. RANGE | MINIMUM SYNC AMPLITUDE | |
|---|---|---|---|
| | | INT | EXT |
| DC | DC~50 MHz<br>DC~100 MHz | 1.0 div<br>1.5 div | 100 mV<br>210 mV |
| 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 |

AUTO: Same as above specifications for above 50 Hz.

**Table-1**

External Trigger:
Input impedance: 1 MΩ, approx. 40 pF
Maximum Input Voltage: 250 V (DC+AC peak)

## CALIBRATING VOLTAGE

Square wave, positive polarity, 1 V ±2%, 1 kHz ±3%

## INTENSITY MODULATION

Sensitivity: TTL compatible positive voltage decreases brightness
Input Impedance: Approx. 10 kΩ
Usable Frequency Range: DC to 5 MHz
Maximum Input Voltage: 50 V (DC+AC peak)

## VERTICAL AXIS SIGNAL OUTPUT (CH1 OUT)

Output Voltage: 50 mVp-p/div into 50 Ω load
Output Impedance: Approx. 50 Ω
Frequency Response: DC to 100 MHz, −3 dB into 50 Ω load (Unapplied ×5 GAIN mode)

## POWER REQUIREMENT

Power Supply: 90 V~264 V
Line Frequency: 45 Hz~400 Hz
Power Consumption: Approx. 60 W (into 100 V, 50 Hz)

## DIMENSIONS (W×H×D)

304(346)×160(173)×351(411) mm
( ) dimensions include protrusion from basic outline dimensions

## WEIGHT:

Approx. 8.8 kg

## ENVIRONMENTAL

Within Specifications: 10°C to 35°C, 85% max. relative humidity
Full Operation: 0°C to 50°C, 90% max, relative humidity

## STANDARD ACCESSORIES INCLUDED

Probe (PC-39)×2 ..... W03-2305-05
Attenuation ..... 1/10
Input Impedance ..... 10 MΩ, 18pF or less
Instruction Manual ..... B50-7644-00
AC Power Cord ..... Fig. 1

## OPTIONAL ACCESSORIES

Accessory Bag (MC-78) ..... Y87-1600-00
Probe Holder ..... J21-2903-03
Service Manual ..... B51-1063-00

# SPECIFICATIONS

## CRT 150WTM 31 SPECIFICATIONS

**Screen and Shape**

Dimensions;

| | |
|---|---|
| Overall length; | 310 ± 7 mm (300 ± 7 mm) |
| Face plate dimensions; | 149 ± 3 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; | Medium short |
| Useful display area | Y axis.....80 mm<br>X axis.....100 mm |

**Heating**

| | |
|---|---|
| Heater voltage | 6.3 V |
| Heater current | 95 mA |

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

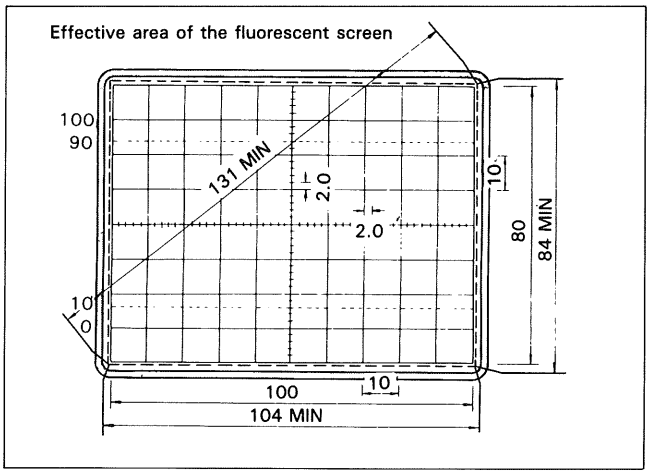



**Fig. 2 Graticule**

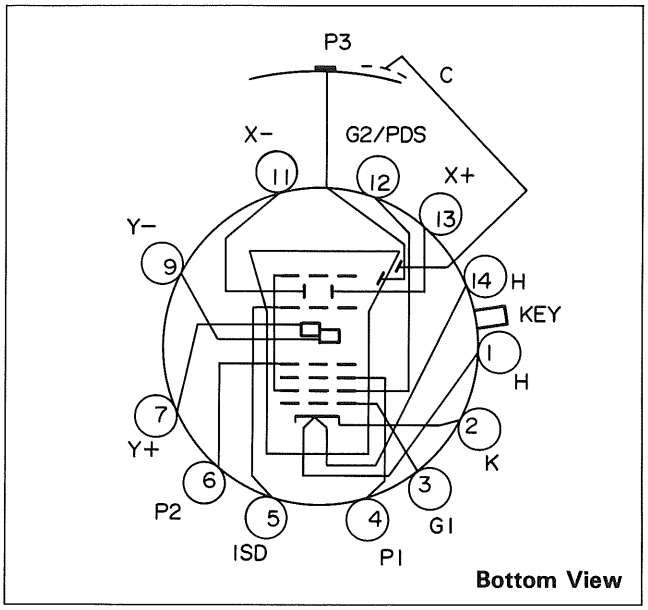



**Fig. 3 150WTM31 Basing**

# CIRCUIT DESCRIPTION

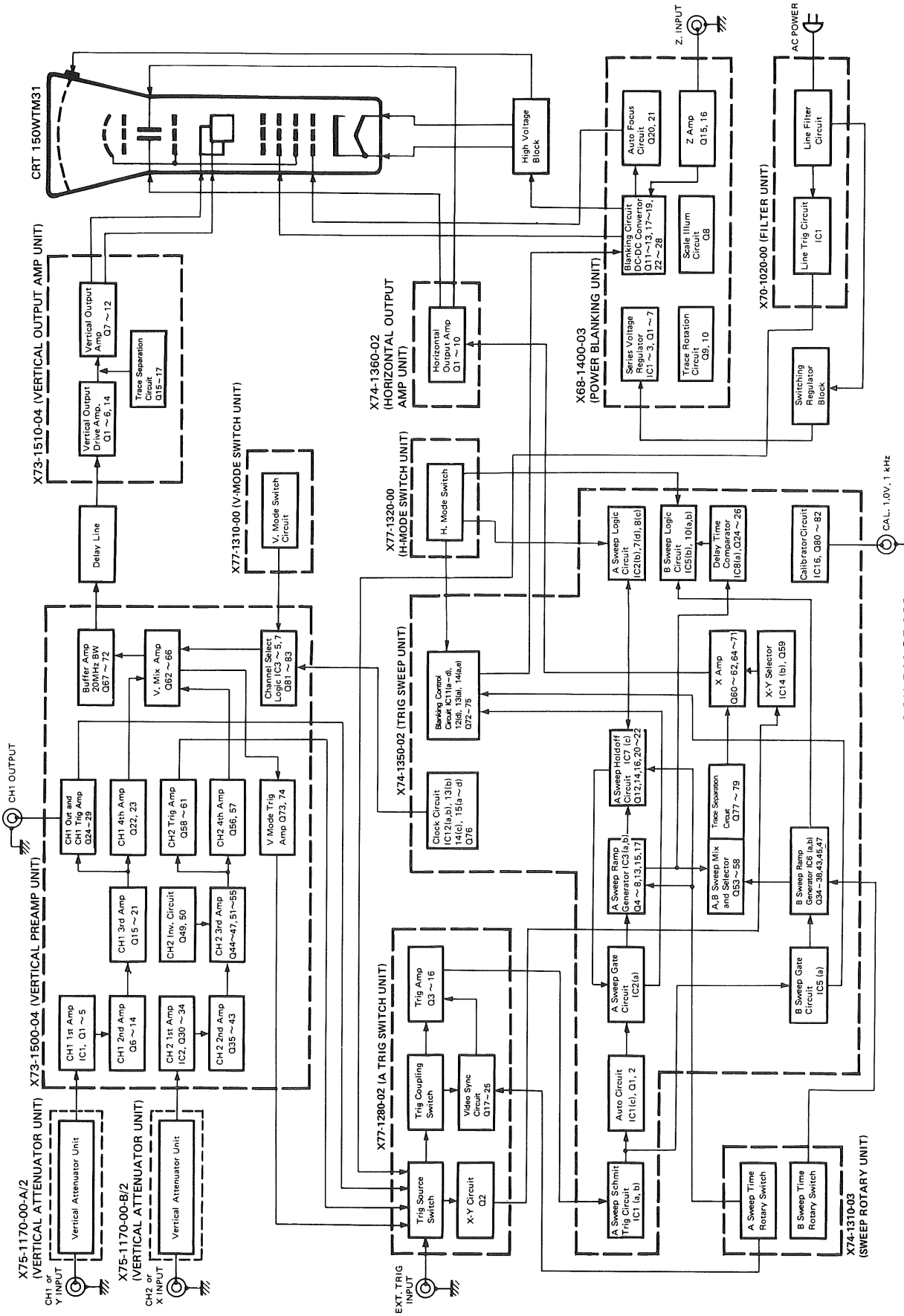



Fig. 4 BLOCK DIAGRAM

# CIRCUIT DESCRIPTION

## VERTICAL ATTENUATOR UNIT

The input attenuator consists of four stages. The first stage attenuates to 1/100, the second stage to 1/10, and the third stage to 1/2 and 1/5. The attenuator output signal passes through the head amp, and is attenuated to 1/1 (at 5 mV/div) or 1/2 (at 10 mV/div to 5 V/div) by the fourth stage with the low impedance. These attenuations are combined to provide one of 10 point input attenuations in 1-2-5 sequence.

The attenuator is composed of only resistors, capacitors and inductors and is not that type which varies gain of an amplifier. For this reason, it is not necessary to adjust step attenuator balance.

Frequency response is good because no 1/1000 attenuator is used. The same attenuator is used respectively in channels 1 and 2.

## VERTICAL PREAMPLIFIER

The CS-1100A incorporates two preamplifiers to permit two-channel operation.

The first-stage of channel 1 is a low-drift, wide-band amplifier that composed of a single-ended transistor amplifier (Q1-5) of good frequency response to which DC feedback is applied by a low-offset, lowdrift operational amplifier (IC1).

The amplifiers following the first-stage one are differential ones. In the second stage, gain is varied for $\times 5$ GAIN operation by transistor switches Q13, 14.

The third-stage amplifier includes the vertical position control. Q17 is the constant-current source which keeps the average output voltage of this stage fixed independently of the vertical position control setting. For channel 2, CH2 INV operation is performed when transistor switches Q49, 50 invert phase.

Q24, 25 is a trigger amplifier which delivers signal to the A-trigger switch board via buffer amplifier Q27 and Q29 of 50-ohm output impedance. Only in channel 1, CH1 OUT signal is delivered to the rear panel via Q26 and Q28.

The fourth-stage amplifier forms a cascode amplifier together with mixer amplifier Q62, 63.

The circuitry of channel 2 is the same as of channel 1.

Two signals of channels 1 and 2 are delivered to the emitters of Q62, 63 after being selected with diode switches D7-10 and D21-24.

Q67, 68 are a buffer amplifier for matching with the delay line. Having a good CMRR, it delivers balanced output to the delay line so that waveform distortion in the delay line is reduced.

Q73, 74 are a trigger amplifier which sends the output of the mixer amplifier to the A-trigger switch board as the V. MODE trigger source.

Q64 is a switching transistor for selecting load resistor in ADD mode.

Q69-72 form the 20 MHz bandwidth circuit which determines the frequency response of the vertical axis as 20 MHz ($-3$ dB).

Signals of channel 1 and 2 are suitably selected by the logic circuit of IC3-5 and IC7 for a combination of vertical and horizontal modes.

## VERTICAL OUTPUT AMPLIFIER

The output signal of the delay line comes to the vertical output amplifier. Q1-4 are a cascode-connected differential amplifier. Q14 is a bias circuit of constant current. Q7-12 are the final output amplifier. Q11, 12 are mounted directly on the chassis with aluminum fins fitted to them. This design has improved efficiency of heat dissipation very much. Variable capacitance diodes D2, 3 and thermistor TH1 connected to the emitters of Q7-10 form the temperature compensation circuit that keeps square wave characteristics and frequency response unchanged at varying temperature.

Q15-17 form the trace separation circuit.

## A-TRIGGER SWITCH CIRCUIT

Signals of CH1, CH2, V. MODE, external, and LINE trigger come to the A-trigger switch circuit. S1 is the trigger source selection switch and S2 is the trigger coupling selection switch.

Q3 is a dual FET which eliminates drift due to temperature changes even during DC synchronization. Q4, 5 form an emitter follower to lower drive impedance of the next stage. Q6, 7 are a feedback amplifier and improve CMRR of positive and negative trigger signals. Q10-15 are a cascode amplifier which selects polarity of the trigger signal.

Q17-25 are the VIDEO synchronization circuit where Q17-19 select polarity of the trigger signal and Q21, 22 shape the trigger signal. Q24 connecting to the SWEEP TIME/DIV switch separates vertical and horizontal sync-signals.

Q16 receives trigger signal from Q10-15 or Q25 and sends it with the output impedance of 50 ohms to the trigger sweep unit.

Q2 picks up the trigger signal of CH2 and sends the X-signal of X-Y operation to the trigger sweep unit.

## ROTARY SWITCH CIRCUIT

Part of the sweep circuit is mounted on a separate board. It includes the rotary switch of sweep time selection, resistors, and resistors of the hold-off circuit.

## TRIGGER SWEEP CIRCUIT

The sweep circuit uses a constant-current integration circuit which produces sawtooth waves by charging a capacitor with a constant current. Q13, 15, and Q17 are the transistors which switch over capacitors determining A-sweep time. Q43, 45, and Q47 work for B-sweep as in A-sweep.

# CIRCUIT DESCRIPTION

Q12, 14, and Q16 are the transistors which switch hold-off capacitors of A-sweep.
The voltage supplied from the voltage regulator is converted to a constant-current source by the constant-voltage setting circuit of IC3a and Q7 and resistors which the rotary switch selects. As the current charges a capacitor determining sweep time, its terminal voltage rises. The voltage is delivered to a buffer amplifier (Q18, 19) of high input impedance. When the output of the amplifier reaches a fixed level, it turns on IC7d, resets flip-flop IC2b, and sets IC2a. The output of IC2a turns on Q6 to short the capacitor determining sweep time so that the terminal voltage of the capacitor falls. On the other hand, the constant-current circuit composed of Q20 charges one of the hold-off capacitors C12, 16, and C20. The terminal voltage of the capacitor rises gradually and, as it reaches a certain level, Q22 turns on. The Q22's output turns on the Schmitt trigger of IC7c and releases IC2b from set state. The IC2b's output, in turn, resets IC2a so that sweeping restarts.
The trigger signal then triggers IC2a via IC1a and IC1b and releases the flip-flop from set state which are set so that sweeping starts synchronously with the trigger signal.
IC1a and IC1b make up a Schmitt trigger.
The trigger signal shaped by IC1a and IC1b comes to IC1c, Q1, and Q2. When the trigger signal is applied, gate IC1d is closed and IC2a operates as a master-slave flip-flop. When no trigger signal is applied, gate IC1d is open and IC2a works as an R-S flip-flop. This is the auto-free-run circuit.
Q24-26 form the level detector circuit for delayed sweep. When the voltage level set with DELAY TIME MULTIPLIER has been reached, Q24 turns on and triggers gate IC8a. IC8a and IC10b form a logical differentiation circuit which generates pulse of a fixed width. The pulse sets IC5b to start B-sweep. The circuitry for B-sweep is almost the same as for A-sweep but that three slow sweep ranges are not provided. The trigger signal of B-sweep is supplied from IC1a and IC1b as in A-sweep.
It is possible to convert gate IC12c from a triggerable master-slave flip-flop over to an R-S flip-flop with the B STARTS AFTER DELAY switch and to start sweeping at the voltage level set with DELAY TIME MULTIPLIER.
Q53 adjusts horizontal position of A-sweep and Q54 that of B-sweep. Q55-58 work with HORIZ DISPLAY.
The waveforms of A- and B-sweeps are composed at the collectors of Q55 and Q58. The X-Y signal is also composed at the same point after it passes Q59. Q62, 63 improve CMRR of the signal which has passed Q60 before delivering it to the next stage. Q69 selects $\times 1$ or $\times 10$ for Q64, 65 and Q68 for Q66, 67. Q70, 71 converts impedance to 50 ohms. The signal then comes to the horizontal final amplifier.
Q77-79 form the TRACE SEPARATION circuit. Two bias voltages are generated from the A/B-sweep selection signal and supplied to the vertical output amplifier.
IC8d generates reset pulse during single operation.
IC13a, 14a, and IC14e generate a blanking control signal to display the horizontal axis. The signal is combined with sweep signal and chop switching signal in IC11a-11d and IC12d, and is converted impedance by Q72-75 before coming to the blanking circuit.
The channel selection signal during ALT and CHOP of vertical mode is generated by IC12a, IC12b, IC13b, IC14c, IC15a-15d, and Q76.
IC12a, 12b are the chop oscillator. It is turned on and off with the signals coming from the vertical axis mode logic and the horizontal mode switch unit. When it is not oscillating, it receives signal from Q76 to output an alternate signal. Outputs of IC12a, 12b are cut off during vertical axis single trace mode and are output on otherwise. The output of IC 15d is supplied to the vertical preamplifier to function as the chop and alternate signals.

## CALIBRATION VOLTAGE GENERATOR

Q80, 81 form a multivibrator and Q82 outputs a calibration voltage with low impedance. IC 16 supplies the circuit with regulated power.

## HORIZONTAL OUTPUT AMPLIFIER

Q1, 2 amplify the sweep signal delivered from the trigger sweep circuit. The output of Q1, 2 passes the emitter follower Q3, 4 which converts impedance then drives Q5, 6. Q7, 8 form a constant-current circuit which is the DC load of Q5, 6 and AC-peaked by C11, 12. Q9, 10 compose the auto-bias circuit which sets bias of the output stage automatically.

## VERTICAL MODE SWITCH CIRCUIT

This circuit controls the vertical preamplifier. S1a, S1b, S2a, and S2b send signal to the vertical axis mode logic. S3a and S3b control the CH2 INV circuit.
VR1 and VR2 are respectively the vertical position controls of channels 1 and 2.

## HORIZONTAL MODE SWITCH CIRCUIT

S1a and S1b select control signal for displaying the horizontal axis and send it to the trigger sweep circuit. S2a and S2b select trigger mode control signal and send it to the trigger sweep circuit.
VR1 adjusts astigmatism of the CRT.

# CIRCUIT DESCRIPTION

## SWITCHING POWER SUPPLY UNIT

The CS-1100A incorporates a switching power supply which is compact, lightweight, and efficient. Power consumption is reduced to 60 W thanks to elimination of power loss which the ordinary series regulator type power supply with a power transformer suffers.
The regulator rectifies 90-264 V and smoothes to DC with the aid of capacitors. A power transistor switches the DC and converts to AC which drives a converter transformer. The transformer has six secondary windings and six AC outputs are rectified and smoothed separately to supply the power blanking unit with DC voltages. The output of the control winding is compared with a reference voltage and is amplified by an error amplifier whose output, isolated from the primary voltage, controls the base of the power transistor to stabilize the secondary voltages.

## POWER BLANKING UNIT

Five out of six output voltages of the switching power supply unit are regulated again by a series regulator. Q1 and Q3-6 are control transistors. IC1a, 1b, 2a, and 2b compose the error amplifier. IC3 supplies the reference voltage to the error amplifier. A regulator which divides voltage with resistors stabilizes +20 V as its stability need not be so high.
The DC-DC converter for high voltage is the same as the ordinary one. Q24-26 are an error amplifier and Q28 is a control transistor. The CS-1100A permits to vary intensity of A-and B-sweeps independently as Q11-13 work for it. Q15, 16 compose the external intensity modulation circuit and intensity is low at "H" (TTL level).
The signals are composed at the base of Q17 to drive Q18. Q19 is the DC load of Q18 and AC-peaked by C25.
Q20, 21 are an auto-focus circuit which applies a signal whose phase is inverse to the blanking waveform to the focusing electrode of the CRT.
Q22, 23 form a DC regeneration circuit for the blanking and focus circuits. It is a differential amplifier which sends isolated signals to the circuits.
Q8 is the transistor for illuminating the scale. Q9, 10 are the transistors for trace rotation.

## FILTER UNIT

L1 and C1-3 compose the line filter that keeps out noises included in supply power and prevents internal noises from going out to the power line.
IC 1 is a photocoupler which provides the trigger source for LINE trigger.

## HIGH VOLTAGE BLOCK

The final acceleration voltage is 14 kV and the high voltage block is so sealed with resin that the inside is not accessible (otherwise it would be not only dangerous but also electrical requirements might not be met if leakage occurs). The high voltage block includes a DC-DC converter and the rectification circuit of 1.7 kV supplied to the cathode. The outputs are −1.7 kV DC, 6.3 V AC, and 14 kV which is sent to the anode cap. The DC voltages except 14 kV are 1/2 to 1/3 as high as those appearing in other KENWOOD oscilloscopes, and shock hazard is prevented.

# 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 requires an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer.
For optimum adjustment, turn the power on and warm up the scope sufficiently (more than 30 minutes) before staring.

**NOTE:**
Calibrate the unit under the following condition.
Temperature: 10~35°C
Humidity: Less than 85%

## POWER SUPPLY VOLTAGE

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

## TEST EQUIPMENT REQUIRED

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

| Test Equipment | Model | Minimum Specification |
|---|---|---|
| Digital Multi-Meter | DL-720 (KENWOOD) | Impedance: More than 10 MΩ, Measuring range: 0.01 V to 199 V |
| Sine-Wave Generator | SG-502 (Tektronix) | Frequency: 10 Hz to 10 MHz, 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 (KENWOOD) | — |
| 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 (KENWOOD) | Impedance: 50 Ω |
| Attenuator | 011-0059-02 (Tektronix) | −20 dB attenuation (50 Ω) |
| Power Meter | 2041 (YEW) | — |
| Auto transformer (variable) | SD-265 (Matsunaga) | — |
| Current Probe | P6302 AM-503 (Tektronix) | — |
| Frequency Counter | FC-756 (KENWOOD) | — |

**Table-2**

## 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 | 12 o'clock position |
| B INTENSITY | 12 o'clock position |
| FOCUS and ASTIG | Optimum position |
| SCALE ILLUM | Arbitrary position |

**Vertical Section**

| | |
|---|---|
| VARIABLE (CH1 and CH2) | CAL |
| ▲▼POSITION (CH1 and CH2) | 12 o'clock position |
| AC-GND-DC (CH1 and CH2) | DC |
| VOLTS/DIV (CH1 and CH2) | 5 mV/DIV |

**Horizontal Sweep Section**

| | |
|---|---|
| A SWEEP TIME/DIV | 0.1ms/DIV |
| B SWEEP TIME/DIV | 0.1ms/DIV |
| A VARIABLE | CAL |
| DELAY TIME MULT | 0.20 position |
| ▲▼ TRACE SEP. | Fully CW |
| HOLDOFF | NORM |
| B ENDS A | OFF |
| ◀▶ POSITION | 12 o'clock position |
| FINE PULL×10 MAG | 12 o'clock position (×10 MAG OFF) |

**TRIG Section**

| | |
|---|---|
| SOURCE | V MODE |
| COUPLING | AC |
| LEVEL | 12 o'clock position |
| SLOPE | + |

**Mode Section**

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

# ADJUSTMENT

## POWER AND CRT ADJUSTMENT

**Check of Power Supply**

Connect a DC voltmeter to measure the voltage at P27(X68-1400) as shown in table 3.

| Pin no. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Voltage(V) | +120 ±2 | +55 ±1 | +20 | | | +5.2 ±0.1 | +10 | −10 |

**Table-3**

**−1.7 kV Adjustment**

Connect a DC voltmeter to measure the voltage at H.V. TP (X68-1400) using a high voltage probe and adjust VR3 (X68-1400) for −1.700 kV reading on the meter. (−1.700 kV ~ −1.705 kV)

**ASTIG and FOCUS Coarse Adjustment**

1. Set the controls and switches at follows;
   HORIZ DISPLAY: X-Y CH1, CH2 AC-GND-DC: GND
   20 MHz BW: on A INTENSITY: 12 to 3 o'clock
2. Operate ▲▼ POSITION controls for CH 1 and CH 2 to position the spot in the center of the CRT screen.
3. Adjust the FOCUS and ASTIG controls for the sharpest,roundest spot.

**A INTENSITY Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: X-Y CH1, CH2 AC-GND-DC: GND
   20 MHz BW: on
2. Adjust VR1(X68-1400) so that the spot disappears when the A INTENSITY control setting is reduced to 8:30 o'clock position.
3. Clockwise rotation should increase brightness of the spot and counterclockwise rotation should decrease brightness of the spot. Fully counterclockwise should disappear the spot.

**B INTENSITY Check**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: ALT Vertical MODE: CH1
   TRIG MODE: AUTO
   B MODE: pull STARTS AFTER DELAY
   CH1,CH2 AC-GND-DC: AC B SWEEP TIME/DIV: 0.1 ms
2. Check that the clockwise rotation should increase brightness of the trace and counterclockwise should decrease brightness of the trace. Fully counterclockwise should disappear the trace.

**Blanking Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A Vertical MODE: CH1
   TRIG MODE: AUTO SOURCE: V MODE
   COUPLING: AC A INTENSITY: Fully CW
   CH1 AC-GND-DC: AC
   A SWEEP TIME/DIV: 0.2 μs
2. Apply a 1MHz sine wave signal to CH1 INPUT jack and operate ▲▼POSITION, ◀▶POSITION and CH1 VOLTS/DIV controls to display a waveform of 6 divisions vertical amplitude.
3. Adjust TC2 (X68-1400) so that there is no unevenness in intensity of trace at the waveform starting point and there is no retrace.

**Z AXIS Input Blanking Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A Vertical MODE: CH1
   TRIG MODE: AUTO SOURCE: V MODE
   COUPLING: AC CH1 VOLTS/DIV: 1 V
   CH1 AC-GND-DC: AC A SWEEP TIME/DIV: 0.5μs
2. Apply a 1MHz 5 Vp-p sine wave signal to CH1 and Z INPUT jacks to display a waveform of 5 divisions vertical amplitude.
3. Turn the A INTENSITY control to CCW so that the dark and bright area of the sine waveform is symmetrical to the peak point.
4. Adjust TC1 (X68-1400) for unblanking symmetry; that is; so the beginning and ending of the visible portion occur at equal vertical points.
   If symmetry cannot be achieved, adjust for maximum length of brightness on waveform's falling edge.

**Auto Focus Level Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A
   CH1 AC-GND-DC: GND
   A INTENSITY: Fully CW TRIG MODE: AUTO
   Vertical MODE: CH1 SOURCE: V MODE
   A SWEEP TIME/DIV: 20 μs HOLDOFF: NORM
2. Set the oscilloscope (475A) for the vertical axis sensitivity at 2 V/div.
3. Observe the waveform of AUTO FOCUS pattern with the probe (1/10) and adjust VR2 (X68-1400) so that DC level of the top of the square wave is approx. 90 V.

**Auto Focus Wave forming Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A
   CH1 AC-GND-DC: GND
   A INTENSITY: Fully CW TRIG MODE: AUTO
   Vertical MODE: CH1 SOURCE: V MODE
   A SWEEP TIME/DIV: 20 μs HOLDOFF: NORM
2. Adjust TC3 (X68-1400) to display an ideal waveform at above-mentioned point.

**ASTIG and FOCUS Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: X-Y CH1,CH2 AC-GND-DC: GND
   A INTENSITY: 12 o'clock
2. Operate ▲▼ POSITION control for CH1 and CH2 to display a spot on the CRT screen.
3. Adjust ASTIG and FOCUS controls for the sharpest, roundest spot when centering the ASTIG and FOCUS controls.

**Trace Rotation Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A Vertical MODE: CH1
   TRIG MODE: AUTO CH1 AC-GND-DC: GND
   A INTENSITY: 12 o'clock

2. Use CH1 ▲▼ POSITION control as required to position the trace along a horizontal line of the graticule scale.
3. Adjust TRACE ROTATION control so trace is parallel with the reference line on the graticule scale.

**CRT Centering Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   TRIG MODE: AUTO  CH1 AC-GND-DC: GND
   A INTENSITY: 12 o'clock
2. Short the short circuit (TP3) on the vertical preamp unit (X73-1500).
3. Adjust VR3 (X73-1510) to center the trace vertically.

## VERTICAL AXIS ADJUSTMENT

**CH1 DC Balance Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   TRIG MODE: AUTO  CH1 AC-GND-DC: GND
   CH1 VOLTS/DIV: 5 mV
   CH1 PULL×5 GAIN: PULL
2. Rotate the CH1 VARIABLE control to fully counterclockwise position.
3. Operate the ▲▼ POSITION control to display a trace on the horizontal center graticule line.
4. Rotate the CH1 VARIABLE control to CAL and adjust VR2 (X73-1500) to align the trace on the horizontal center graticule line.
5. Repeat the above procedure.

**CH2 DC Balance Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH2
   TRIG MODE: AUTO  CH2 AC-GND-DC: GND
   CH2 VOLTS/DIV: 5 mV
   CH2 PULL×5 GAIN: PULL
2. Same with the adjustment of CH1 DC Balance adjustment, adjusting VR12 (X73-1500).

**CH1 Waveforming in Low Range**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   TRIG MODE: AUTO  SOURCE: V MODE
   CH1 AC-GND-DC: DC  CH1 VOLTS/DIV: 5 mV
   CH1 VARIABLE: CAL  A SWEEP TIME/DIV: 0.2 ms
2. Apply a 1kHz square wave signal to CH1 INPUT jack to display a waveform of 6 divisions vertical amplitude.
3. Adjust VR1 (X73-1500) to shape the square waveform in the low range.

**CH2 Waveforming in Low Range**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH2
   TRIG MODE: AUTO  SOURCE: V MODE
   CH2 AC-GND-DC: DC  CH2 VOLTS/DIV: 5 mV
   CH2 VARIABLE: CAL  A SWEEP TIME/DIV: 0.2 ms
2. Perform the same procedure as described above to make adjustment, adjusting VR11 (X73-1500).

**CH1 Gain Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   TRIG MODE: AUTO  SOURCE: V MODE
   CH1 AC-GND-DC: DC  CH1 VOLTS/DIV: 10 mV
   CH1 VARIABLE: CAL  20 MHz BW: on
   A SWEEP TIME/DIV: 0.2 ms
2. Apply a 1kHz, 50 mVp-p square wave signal to both CH1 and CH2 INPUT jacks.
3. Select the vertical MODE switch to CH1 and operate the ▲▼ POSITION control to display a waveform on the center of the CRT screen.
4. Synchronize by operating the trigger LEVEL control.
5. Adjust VR7 (X73-1500) to display a waveform of 5 divisions vertical amplitude.
   **(Reference)**
   Methode of calculation of sensitivity error.

$$\text{Sensitivity error} = \frac{a-b}{b} \times 100\%$$

$a$ = CRT screen amplitude

$$b = \frac{\text{Input signal voltage}}{\text{VOLTS/DIV setting}}$$

**Example;**
CRT screen amplitude; 4.2 div
Input signal; 20 mVp-p, 1 kHz square wave
VOLTS/DIV; 5 mV

$$\text{Sensitivity error} = \frac{4.2\ \text{div} - 20\ \text{mV}/5\ \text{mV}}{20\ \text{mV}/5\ \text{mV}} \times 100 = 5\%$$

**CH2 Gain Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH2
   TRIG MODE: AUTO  SOURCE: V MODE
   CH2 AC-GND-DC: DC  CH2 VOLTS/DIV: 10 mV
   CH2 VARIABLE: CAL  20MHz BW: on
   A SWEEP TIME/DIV: 0.2 ms
2. Rotate the VOLTS/DIV control to 10 mV and perform the same procedure above to make adjustment, adjusting VR18 (X73-1500)

<**Check**>

1. Select the vertical MODE switch to ALT and rotate the VOLTS/DIV control. Apply a 1 kHz, 50 mVp-p square wave to both CH1 and CH2 INPUT jacks. Make sure that CH1 and CH2 have the same amplitude.
2. Select the vertical MODE switch to ADD and SOURCE to CH1 (CH2) and press the CH2 INV pushbutton switch . Operate ▲▼ POSITION controls (CH1 and CH2) to display a single trace on the center of the CRT screen.
   If a single and straight trace cannot be obtained, adjust VR7 and VR18 again.

# ADJUSTMENT

**CH1 and CH2 ▲▼ POSITION Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: ALT
   TRIG MODE: AUTO  CH1,CH2 VOLTS/DIV: 5 mV
   CH1,CH2 AC-GND-DC: GND
   CH1,CH2 ▲▼ POSITION: 12 o'clock
   A SWEEP TIME/DIV: 0.2 ms
2. Adjust VR6 and VR16 (X73-1500) to align with CH1 trace and CH2 trace on the horizontal center graticule line.

<**Check**>

When the ▲▼ POSITION controls (CH1 and CH2) are rotated to maximum clockwise, the trace should move upward more than 4 divisions and to maximum counterclockwise,the trace should move downward more than 4 divisions.

**CH2 INVERT position**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: ALT
   TRIG MODE: AUTO  CH1, CH2 VOLTS/DIV: 5 mV
   CH1, CH2 AC-GND-DC: GND
   CH1,CH2 ▲▼ POSITION: 12 o'clock
   A SWEEP TIME/DIV: 0.2 ms
2. Press the CH2 INV pushbutton switch and adjust VR17 (X73-1500) to display a trace to its position at CH2 NORM.

<**Check**>

1. Press the CH2 INV switch and rotate the CH2 ▲▼ POSITION control fully clockwise and see if the trace move more than 4 divisions upward and it moves more than 4 divisions downward when the control is rotated fully counterclockwise.

**CH1 and CH2×5 Gain Adjustment**

1. HORIZ DISPLAY: A  Vertical MODE: ALT
   TRIG MODE: AUTO
   CH1,CH2 VOLTS/DIV: 10 mV
   CH1,CH2 PULL×5 GAIN: PULL
   CH1,CH2 AC-GND-DC: DC
   CH1,CH2 VARIABLE: CAL
   A SWEEP TIME/DIV: 0.2 ms  20 MHz BW: on
2. Apply a 1kHz 10 mVp-p square wave signal to CH1 INPUT jack and adjust VR4 (VR14 for CH2) to display a waveform of 5 divisions vertical amplitude.
3. Apply a same signal to CH2 and make the similar adjustment.

**CH1 and CH2 ×5 Gain Position Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  TRIG MODE: AUTO
   Vertical MODE: ALT  CH1, CH2 VOLTS/DIV: 10 mV
   CH1,CH2 PULL×5 GAIN: PULL
   CH1,CH2 AC-GND-DC: GND
   CH1,CH2 ▲▼ POSITION: 12 o'clock
   A SWEEP TIME/DIV: 0.2 ms
2. Adjust VR5 and VR15 (X73-1500) to align with CH1 trace and CH2 trace on the horizontal center graticule line.

**CH1 and CH2 Trigger DC Level Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CHOP
   CH1,CH2 AC-GND-DC: GND  TRIG MODE: AUTO
2. Operate the CH1 and CH2 ▲▼ POSITION controls to align the trace with each other on the center of the CRT screen.
3. Adjust VR9 for CH1 and VR19 for CH2 (X73-1500) so that the voltage at all the check points may be zero (−0.008 ~ +0.008 V).

| Item | Adj. control | Check point |
|---|---|---|
| CH1 trig DC level | VR9 | P15 (X73-1500) |
| CH2 trig DC level | VR19 | P16 (X73-1500) |

**Table-4**

**V MODE Trigger DC Level Adjustment**

1. Set the controls and switches as follows;
   Vertical MODE: CH1  CH1 AC-GND-DC: GND
2. Operate the CH1 ▲▼ POSITION control to align the trace with horizontal center graticule line.
3. Adjust VR20 (X73-1500) so that the voltage in the conductor of the connector P19 is zero (−0.008 ~ +0.008 V).

**CH1 OUT Gain Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   TRIG MODE: AUTO  CH1 AC-GND-DC: DC
   CH1 VOLTS/DIV: 10 mV  CH1 VARIABLE: CAL
2. Set the vertical axis sensitivity of oscilloscope(475A) to 50 mV and input selector to DC position.
3. Connect the cable to CH1 OUT on the rear panel of CS-1100A and oscilloscope (475A) via the 50 Ω termination.
4. Apply a 1kHz 50 mVp-p square wave signal to CH1 INPUT jack and operate the oscillator output and ▲▼ POSITION control to display a waveform of 2.5 divisions vertical amplitude upward and downward from the horizontal center graticule line.
5. Adjust VR8 (X73-1500) to display waveform of 5 divisions vertical amplitude on the oscilloscope (475A).

**Square wave Characteristics of CH1 20 mV Range Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   TRIG MODE: AUTO  CH1 AC-GND-DC: DC
   CH1 VOLTS/DIV: 20 mV  SOURCE: CH1
   COUPLING: AC  SLOPE: +
   CH1 VARIABLE: CAL
2. Apply a 1kHz square wave signal to CH1 INPUT jack to display a waveform of 6 divisions vertical amplitude.
   <**Note**>
   Input terminal should be terminated to match the output impedance of the oscillator. When the output impedance is 50 Ω, terminate the 50 Ω termination.
3. Adjust TC1 (X73-1500) to shape the square waveform for the best flat top waveform.

# ADJUSTMENT

**Square wave Characteristics of CH2 20 mV Range Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH2
   TRIG MODE: AUTO  SOURCE: V MODE
   CH2 AC-GND-DC: DC  CH2 VOLTS/DIV: 20 mV
   CH2 VARIABLE: CAL  SLOPE: +
2. Apply a 1kHz square wave signal to CH2 INPUT jack to display a waveform of 6 divisions vertical amplitude.
3. Adjust TC5 (X73-1500) to shape the square waveform for the best flat top waveform.

**CH1 and CH2 Square wave Characteristics Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  CH1, CH2 AC-GND-DC: DC
   SOURCE: V MODE  SWEEP TIME/DIV: 0.2 ms
   CH1, CH2 VARIABLE: CAL
2. I) Wave shaping
   Apply a 1 kHz square wave signal to both CH1 and CH2 INPUT jacks to display a waveform of 5 or 6 divisions vertical amplitude.
   Adjust the adj. control listed below to display a waveform for the best flat top waveform to that of the 10 mV range.
   II) Input capacity (22pF ± 3pF)
   Connect a Q-meter (4343B) to CH1 and CH2 INPUT jacks to be the same value of 10 mV range.

CH1 and CH2 reference range; 10 mV range

| Sequence | Adjustment | | Adj. control |
|---|---|---|---|
| 1 | 20 mV range | Wave shape | TC5 |
| 2 | 50 mV range | Wave shape | TC7 |
| 3 | 20 mV range | Input cap. | TC6 |
| 4 | 50 mV range | Input cap. | TC8 |
| 5 | 0.1 V range | Wave shape | TC3 |
| 6 | 0.1 V range | Input cap. | TC4 |
| 7 | 1 V range | Wave shape | TC1 |
| 8 | 1 V range | Input cap. | TC2 |

**Table-5 (S02-4508)**

**Square wave Characteristics of CH1 5 mV Range Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   TRIG MODE: AUTO  CH1 AC-GND-DC: DC
   SOURCE: V MODE  COUPLING: AC
2. Apply a 1MHz square wave signal to CH1 INPUT jack to display a waveform of 6 divisions vertical amplitude.
3. Adjust the adj. control listed below to display a waveform for the best flat top of the waveform.

| Sequence | Adjustment | Adj. control | Unit No. |
|---|---|---|---|
| 1 | Mid and high frequency compensation | VR1 | X73-1510 |
| 2 | Peak top waveform compensation | VR2 | X73-1510 |
| 3 | Mid and high frequency compensation<br>High frequency compensation | TC1<br>TC2 | X73-1510 |
| 4 | Ultra high frequency compensation | TC2 | X73-1500 |
| 5 | High frequency compensation | TC3 | X73-1500 |

**Table-6**

**Square wave Characteristics of CH2 5 mV Range Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH2
   TRIG MODE: AUTO  CH2 AC-GND-DC: DC
   SOURCE: V MODE  COUPLING: AC
2. Apply a 1 MHz square wave signal to CH2 INPUT jack to display a waveform of 6 divisions vertical amplitude.
3. Adjust the adj. control listed below to display a waveform for the best flat top of the waveform.

| Sequence | Adjustment | Adj. control | Unit No. |
|---|---|---|---|
| 1 | Ultra high frequency compensation | TC6 | X73-1500 |
| 2 | High frequency compensation | TC7 | X73-1500 |

**Table-7**

**CH1 OUT Frequency Characteristics Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   SOURCE: V MODE  CH1 AC-GND-DC: DC
   CH1 VOLTS/DIV: 5 mV  TRIG MODE: AUTO
2. With the vertical axis sensitivity of 475A set to 50 mV, lead a 50 Ω coaxial it to CH1 INPUT jack of test oscilloscope (475A).
3. Apply a 50 kHz sine wave signal to CH1 INPUT jack to display a waveform of 6 divisions vertical amplitude on the test oscilloscope (475A).
4. When the frequency is varied to 100 MHz without changing the oscillator output, adjust TC4 (X73-1500) so that the vertical amplitude on the test oscilloscope (475A) is equivalent to that on the CS-1100A.

**CAL Output Adjustment**

1. Short circuit TP1 (X74-1350) and adjust VR17 (X74-1350) to read the voltage at CAL output terminal for 1.0 V on the voltmeter.
2. Set the vertical sensitivity of test oscilloscope (475A) to 20 mV and sweep time to 0.2 ms.

3. Connect a probe from the calibration voltage output terminal (CAL) of CS-1100A and connect it to CH1 INPUT jack of the test oscilloscope (475A).
4. Adjust VR16 (X74-1350) to read the frequency for 1kHz.

<Check>
Frequency: within 1 kHz±3%
Output voltage: within 1.0 Vp-p±2%
Duty ratio: within (50±2.5)%

## HORIZONTAL SWEEP ADJUSTMENT

**A Sweep Time Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   SOURCE: V MODE  A SWEEP TIME/DIV: 0.5 ms
   TRIG MODE: AUTO  A VARIABLE: CAL
2. Apply a 0.5 ms marker signal to CH1 INPUT jack. Operate the ◀▶ POSITION control to align with the first peak of the marker signal to the left end of graticule line and adjust VR9 (X74-1350) for the 11th peak to the right end of the graticule line.

**A Sweep Length Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   SOURCE: V MODE  A SWEEP TIME/DIV: 0.5 ms
   TRIG MODE: AUTO
2. Apply a 0.5 ms marker signal to CH1 INPUT jack.
3. Adjust VR7 (X74-1350) to display a waveform of 11.5 divisions horizontal length.

**A Sweep Position Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   SOURCE: V MODE  A SWEEP TIME/DIV: 0.5 ms
   TRIG MODE: AUTO
2. Apply a 0.5 ms marker signal to CH1 INPUT jack to display a waveform to the center of the CRT screen.
3. Set the FINE control to 12 o'clock position.
4. Rotate the ◀▶ POSITION control to maximum clockwise. Measure the deviation between the starting point of the trace and the center of the graticule line. Next, rotate the ◀▶ POSITION control to maximum counterclockwise and measure the distance between the 12th peak of the waveform and the center of the graticule line.
5. Adjust VR11 (X74-1350) so that these deviations will have the same width.

**B Sweep Time Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: ALT  Vertical MODE: CH1
   SOURCE: V MODE
   A, B SWEEP TIME/DIV: 0.5 ms
   TRIG MODE: AUTO
2. Apply a 0.5 ms marker signal to CH1 INPUT jack. On the screen A and B traces of CH1 input signal will appear. Operate the ▲▼ TRACE SEP control to bring these traces into the positions where they can be easily adjusted.
3. Operate the ◀▶ POSITION control to align with the first peak of the marker signal to the left end of the graticule line and adjust VR10 (X74-1350) for the 11th peak to the right end of the graticule line.

<Check>
Make sure that A and B TRIG'D lamps are on.

**B Sweep Length Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: ALT  Vertical MODE: CH1
   SOURCE: V MODE
   A, B SWEEP TIME/DIV: 0.5 ms
   A VARIABLE: Fully CCW
   TRIG MODE: AUTO  SLOPE: +
   A, B INTENSITY: Fully CW
   DELAY TIME MULT: 0.20
2. Apply a 0.5 ms marker signal to CH1 INPUT jack. A and B traces will appear on the screen. Use the ▲▼ TRACE SEP control to separate them.
3. Adjust VR8 (X74-1350) to display a waveform of 11.5 divisions horizontal length.

**B Sweep Position Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: ALT  Vertical MODE: CH1
   SOURCE: V MODE
   A, B SWEEP TIME/DIV: 0.5 ms
   TRIG MODE: AUTO  SLOPE: +
   A, B INTENSITY: Fully CW
   DELAY TIME MULT: 0.20
2. Operate ▲▼ TRACE SEP control to separate the A sweep and B sweep. Set the A VARIABLE to CAL.
3. Adjust VR12 (X74-1350) to align the starting point of B sweep with that of A sweep in the horizontal position.

**X10MAG Gain Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   SOURCE: V MODE  A SWEEP TIME/DIV: 0.1 ms
   TRIG MODE: AUTO
2. Apply a 0.1 ms marker signal to CH1 INPUT jack.
3. Align the first peak of the marker signal with the left end of the graticule line and the 11th peak with the right end and pull the X10MAG switch.
4. Adjust VR13 (X74-1350) so that the peak-to-peak distance is 10 divisions.

**X10MAG Center Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   SOURCE: V MODE  A SWEEP TIME/DIV: 0.1 ms
   A VARIABLE: CAL  TRIG MODE: AUTO
   SLOPE: +
2. Apply a 0.5 ms marker signal to CH1 INPUT jack to display a waveform of 3-peaks.
3. Operate the ◀▶ POSITION control to align the center peak with the vertical center graticule line.

# ADJUSTMENT

4. Adjust VR14 (X74-1350) to align the center peak of the waveform with the vertical center graticule line when the FINE control pulled out (X10MAG on).

**A and B Sweep Time 50 ms adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: ALT  Vertical MODE: CH1
   SOURCE: V MODE  TRIG MODE: AUTO
   A VARIABLE: CAL
2. Rotate the A SWEEP TIME/DIV control to 50 ms position. Apply a 50 ms time marker signal to CH1 INPUT jack.
3. Adjust VR2 (X74-1350) to align the first peak of the marker signal with the left end of the graticule line and the 11th peak with the right end.
4. Repeat the entire procedure for B sweep time 50 ms adjustment, adjusting VR4.

**A and B Sweep Time 5 μs and 0.1 μs Adjustment**

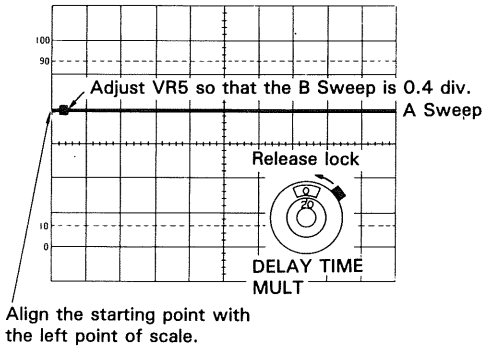
1. Set the controls and switches as follows;
   HORIZ DISPLAY: ALT  Vertical MODE: CH1
   SOURCE: V MODE  TRIG MODE: AUTO
   A VARIABLE: CAL
2. Rotate the A SWEEP TIME/DIV control to 5 μs position. Apply a 5 μs time marker signal to CH1 INPUT jack.
3. Adjust VR1(X74-1350) in the same procedure "Sweep Time 50 ms adjustment".
4. Next, set the A SWEEP TIME/DIV control to 0.1 μs position. Apply a 0.1 μs time marker signal to CH1 INPUT jack.
5. Adjust TC1 (X74-1350) in the procedure "Sweep Time 50 ms adjustment".
6. Repeat the entire procedure for B sweep time 5 μs and 0.1 μs sweep time adjustment, adjusting VR3 and TC2 respectively.

**20ns A and B Sweep Linearity Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: ALT  Vertical MODE: CH1
   SOURCE: V MODE  A VARIABLE: CAL
   TRIG MODE: AUTO  SLOPE: +
2. Apply a 20ns time marker signal to CH1 INPUT jack.
3. Adjust TC3 (X74-1350) so that the all peaks intervals of the marker display in the A Sweep are uniform.
4. Set the A VARIABLE to the maximum counterclockwise and adjust TC4 as the same way in step 3.
5. Set the A VARIABLE to CAL.
6. Set the ×10 MAG knob to be pulled. And adjust TC5 (for A Sweep) and TC6 (for B Sweep) so that the interval between first peak and second peak of the marker signal is 10 divisions.

**DELAY TIME MULT Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: ALT  Vertical MODE: CH1
   CH1 AC-GND-DC: GND  TRIG MODE: AUTO
   A SWEEP TIME/DIV: 0.1 ms  B SWEEP TIME/DIV: 1 μs
   ▲▼ TRACE SEP: Fully CCW
   B MODE: Pull STARTS AFTER DELAY
2. Set the DELAY TIME MULT to 0.20.
3. Operate A and B INTENSITY controls properly to make the B trace brighter and A trace light dimmer.
4. Operate the ◀▶ POSITION to bring the starting point of A trace to the left end of the graticule line. Adjust VR5 (X74-1350) so that the B trace appears as shown below.
5. Next, set the DELAY TIME MULT control to 10.00.
6. Adjust VR6 (X74-1350) so that the B trace appears as shown below.
7. Repeat step 2 through 6.



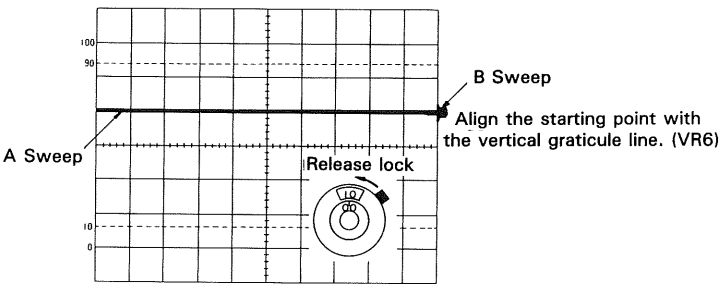




**Fig. 5**

## X-Y OPERATION ADJUSTMENT

**X Position Center Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: ALT
   CH1,CH2 VOLTS/DIV: 10 mV
   CH1,CH2 AC-GND-DC: GND  SOURCE: CH1
   TRIG MODE: AUTO
   A SWEEP TIME/DIV: 0.1 ms
   Operate ▲▼ POSITION for both CH1 and CH2 to superimpose the two traces on one another in the center of the CRT screen.
2. Adjust VR15 (X74-1350) to center the center of the CRT screen when HORIZ DISPLAY is switched in X-Y position.

<**Check**>

Counterclockwise rotation of CH2 ▲▼ POSITION (X-Y ◀▶) controls moves the spot leftward more than 5 divisions. Clockwise rotation moves rightward more than 5 divisions.

**X Gain Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: X-Y  CH2 AC-GND-DC: DC
   CH2 VOLTS/DIV: 10 ms
2. Apply a 1 kHz 50 mVp-p to CH2 INPUT jack to display a waveform of 5 divisions horizontal amplitude, adjusting VR25 (X73-1500).

## TRIGGERING ADJUSTMENT

**Trigger Slope Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   COUPLING: AC  CH1 AC-GND-DC: DC
   CH1 VOLTS/DIV: 5 mV
   A SWEEP TIME/DIV: 0.2 ms  SLOPE: +
   TRIG MODE: AUTO
2. Apply a 1kHz sine wave signal to CH1 INPUT jack to display a waveform of 4 to 6 divisions vertical amplitude.
3. Operate TRIG LEVEL control and CH1 ▲▼ POSITION control to have an amplitude equally above and below the horizontal center graticule line.
4. Set the SLOPE switch to (−) position and adjust VR4 (X77-1280) to align the starting point of the waveform in the (+) SLOPE.

<**Check**>

Repeatedly rotate the SLOPE control from (+) to (−) and make sure that the starting points are in the same positions.

5. Repeat the entire procedure for CH2.

<**Check**>

Make sure that the rise slope of the waveform will be synchronized when the SLOPE switch is in the (+) position and fall slope will be synchronized when the switch is in the (−) position.

**Trigger Level Center Adjustment**

1. Set the controls and switches as follows;
   HORIZ DISPLAY: A  Vertical MODE: CH1
   SOURCE: V MODE  COUPLING: AC
   CH1 AC-GND-DC: DC
   CH1 VOLTS/DIV: 5 mV
   A SWEEP TIME/DIV: 0.2 ms  SLOPE: +
   TRIG MODE: AUTO
2. Set the TRIG LEVEL control to 12 o'clock position.
3. Apply a 1 kHz sine wave signal to CH1 INPUT jack to display a waveform of 4 to 6 divisions vertical amplitude.
4. Operate CH1 ▲▼ POSITION control to have an amplitude equally above and below the horizontal center graticule line.
5. Adjust VR2 (X77-1280) to align the starting point of the waveform with the horizontal center graticule line.

<**Check**>

When SLOPE switch is alternately turned to (+) and (−), the starting point must be always on the horizontal center graticule line.

**100 MHz Trigger Adjustment**

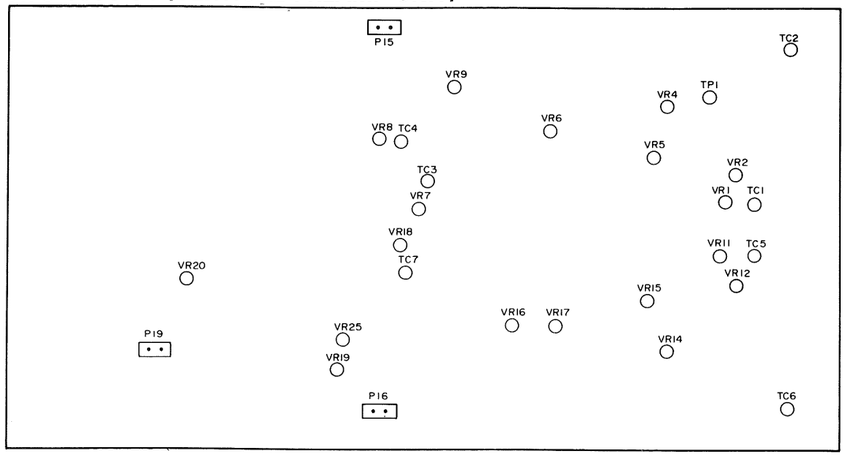
1. Set the controls and switches as follows;
   SOURCE: CH1
   A SWEEP TIME/DIV: 20 ns
2. Apply 100 MHz sine wave signal to CH1 INPUT jack to display a waveform of 0.8 division vertical amplitude.
3. Adjust TC1 (X77-1280) to synchronize at 0.8 division.

(+) and (−),
izontal center

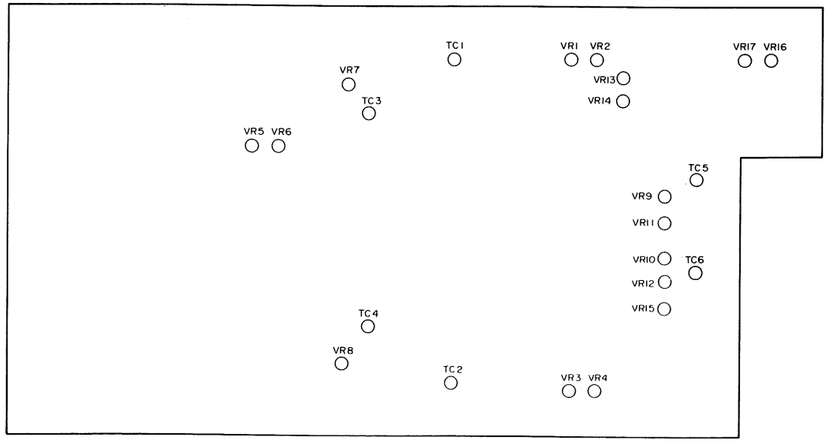
;

NPUT jack to
al amplitude.
0.8 division.

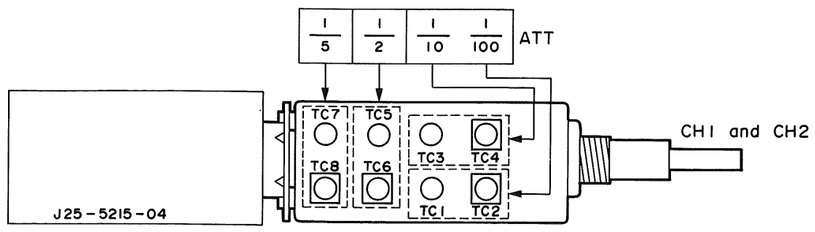
### X73-1500-04 (VERTICAL PREAMP UNIT)



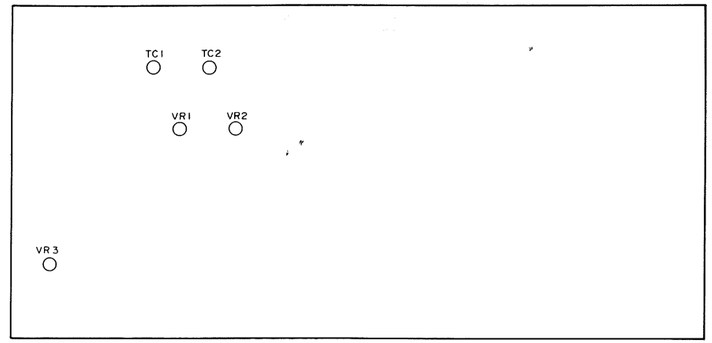

### X74-1350-02 (TRIG SWEEP UNIT)




### X75-1170-00 (VERTICAL ATTENUATOR UNIT)

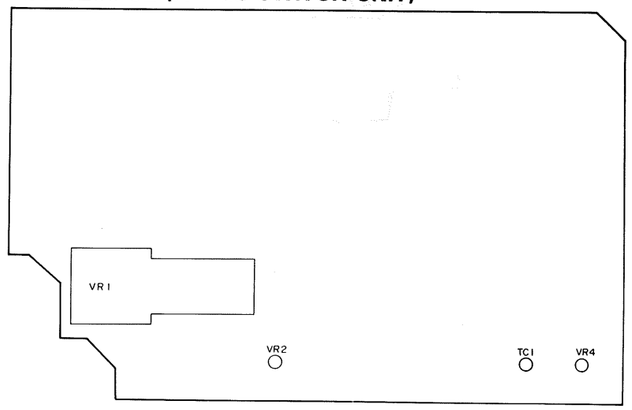



### X73-1510-04 (VERTICAL OUTPUT AMP UNIT)

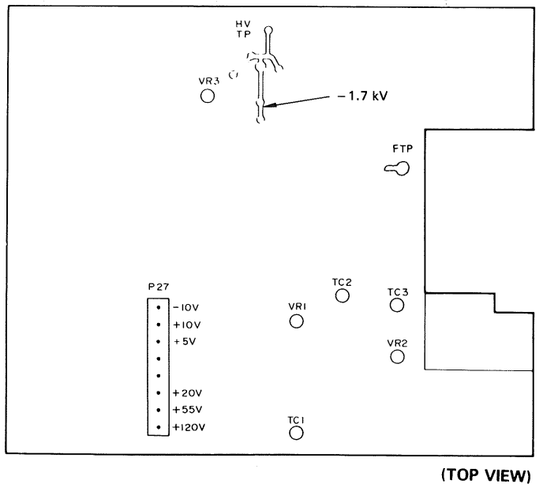



(TOP VIEW)

### X77-1280-02 (A TRIG SWITCH UNIT)

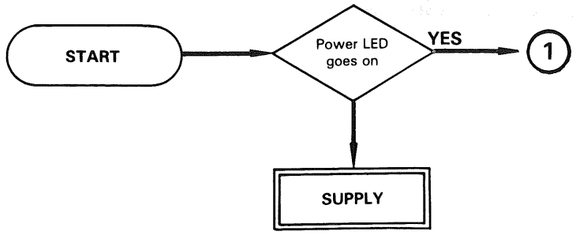


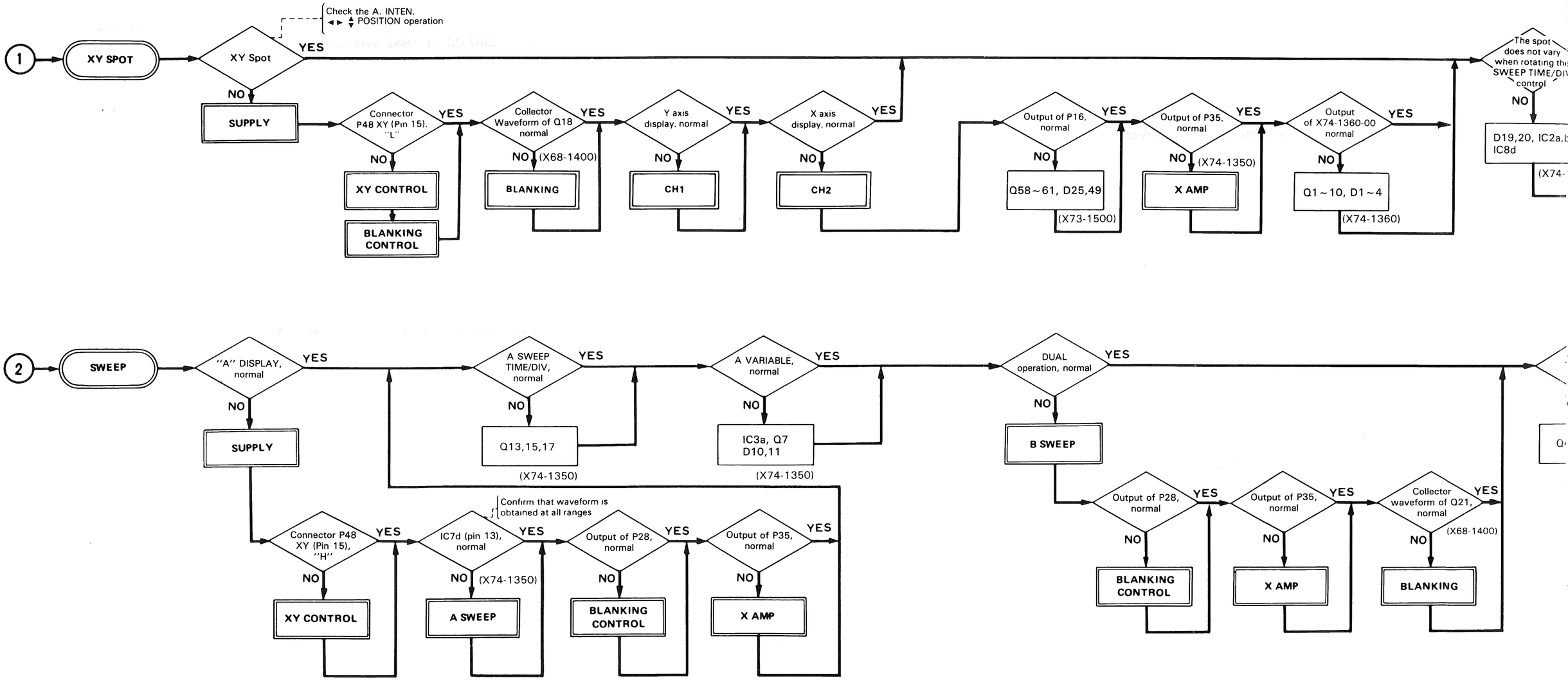

### X68-1400-03 (POWER BLANKING UNIT)

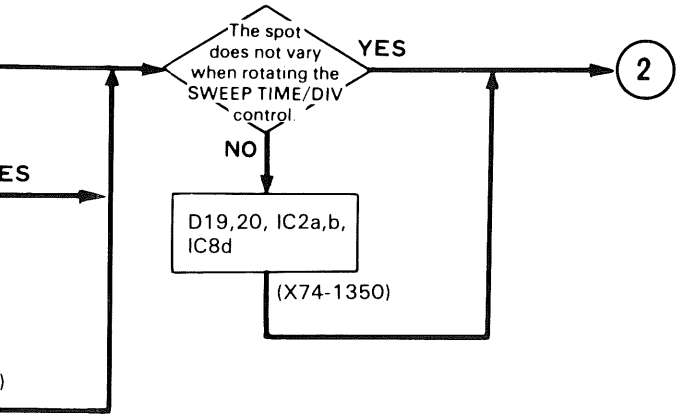


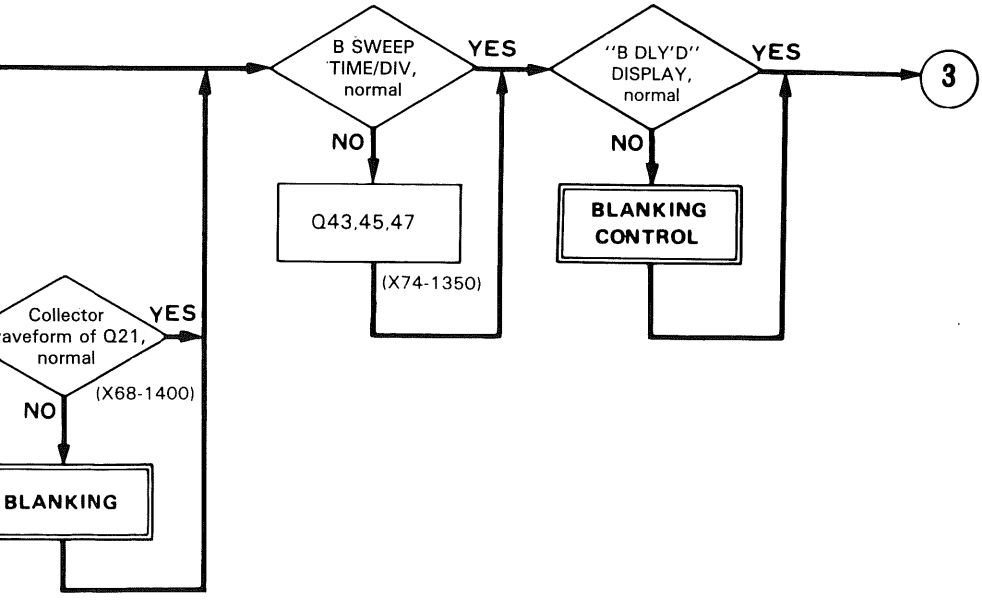

(TOP VIEW)

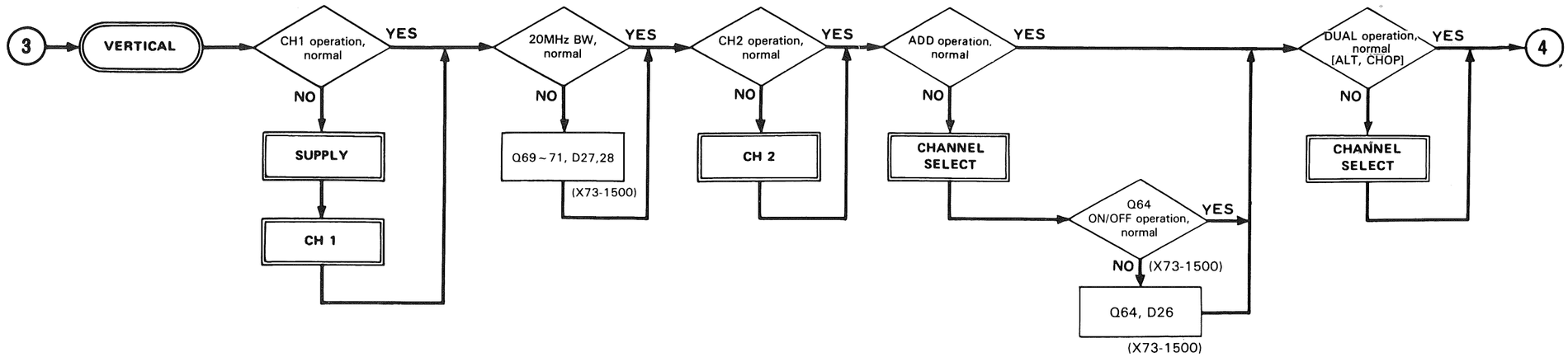
Fig. 6 LOCATION OF ADJ. CONTROLS

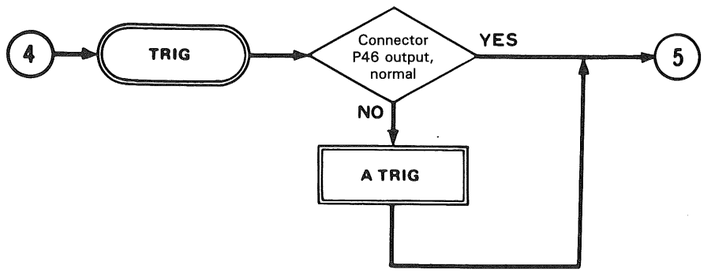

START
Power LED goes on
YES
1
SUPPLY

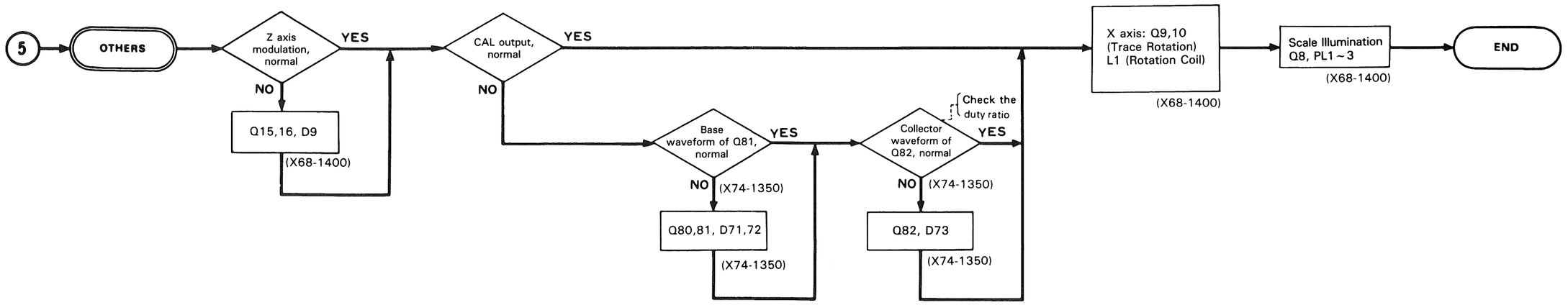

1
XY SPOT
XY Spot
YES
Check the A. INTEN. ◄ ► ▲ ▼ POSITION operation
NO
SUPPLY
Connector P48 XY (Pin 15), "L"
YES
NO
XY CONTROL
BLANKING CONTROL
Collector Waveform of Q18 normal
YES
NO (X68-1400)
BLANKING
Y axis display, normal
YES
NO
CH1
X axis display, normal
YES
NO
CH2
Output of P16, normal
YES
NO
Q58~61, D25,49
(X73-1500)
Output of P35, normal
YES
NO (X74-1350)
X AMP
Output of X74-1360-00 normal
YES
NO
Q1~10, D1~4
(X74-1360)
The spot does not vary when rotating the SWEEP TIME/DIV control
NO
D19,20, IC2a,b IC8d
(X74-
2
SWEEP
"A" DISPLAY, normal
YES
NO
SUPPLY
A SWEEP TIME/DIV, normal
YES
NO
Q13,15,17
(X74-1350)
A VARIABLE, normal
YES
NO
IC3a, Q7 D10,11
(X74-1350)
Confirm that waveform is obtained at all ranges
Connector P48 XY (Pin 15), "H"
YES
NO
XY CONTROL
IC7d (pin 13), normal
YES
NO (X74-1350)
A SWEEP
Output of P28, normal
YES
NO
BLANKING CONTROL
Output of P35, normal
YES
NO
X AMP
DUAL operation, normal
YES
NO
B SWEEP
Output of P28, normal
YES
NO
BLANKING CONTROL
Output of P35, normal
YES
NO
X AMP
Collector waveform of Q21, normal
YES
NO (X68-1400)
BLANKING
Q4


The spot does not vary when rotating the SWEEP TIME/DIV control.
YES
2
NO
D19,20, IC2a,b, IC8d
(X74-1350)
ES


B SWEEP TIME/DIV, normal
YES
"B DLY'D" DISPLAY, normal
YES
3
NO
NO
Q43,45,47
(X74-1350)
BLANKING CONTROL
Collector waveform of Q21, normal
YES
(X68-1400)
NO
BLANKING


3
VERTICAL
CH1 operation, normal
YES
NO
SUPPLY
CH 1
20MHz BW, normal
YES
NO
Q69~71, D27,28
(X73-1500)
CH2 operation, normal
YES
NO
CH 2
ADD operation, normal
YES
NO
CHANNEL SELECT
Q64 ON/OFF operation, normal
YES
NO (X73-1500)
Q64, D26
(X73-1500)
DUAL operation, normal [ALT, CHOP]
YES
NO
CHANNEL SELECT
4


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


5
OTHERS
Z axis modulation, normal
YES
NO
Q15,16, D9
(X68-1400)
CAL output, normal
YES
NO
Base waveform of Q81, normal
YES
NO (X74-1350)
Q80,81, D71,72
(X74-1350)
Collector waveform of Q82, normal
YES
NO (X74-1350)
Check the duty ratio
Q82, D73
(X74-1350)
X axis: Q9,10
(Trace Rotation)
L1 (Rotation Coil)
(X68-1400)
Scale Illumination
Q8, PL1~3
(X68-1400)
END

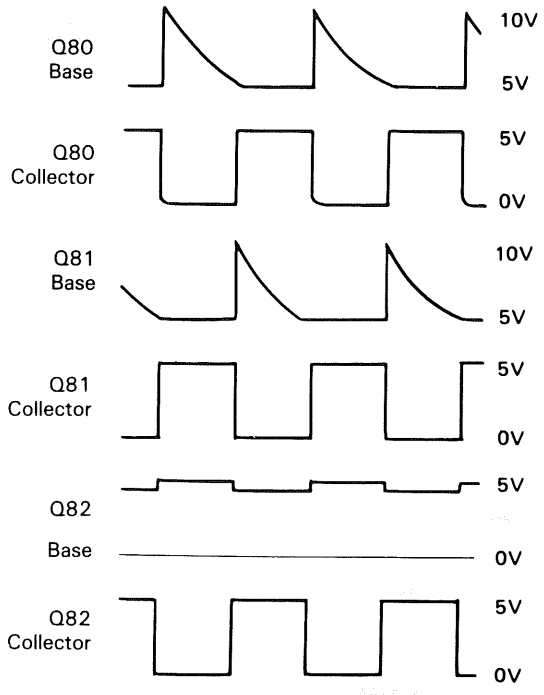
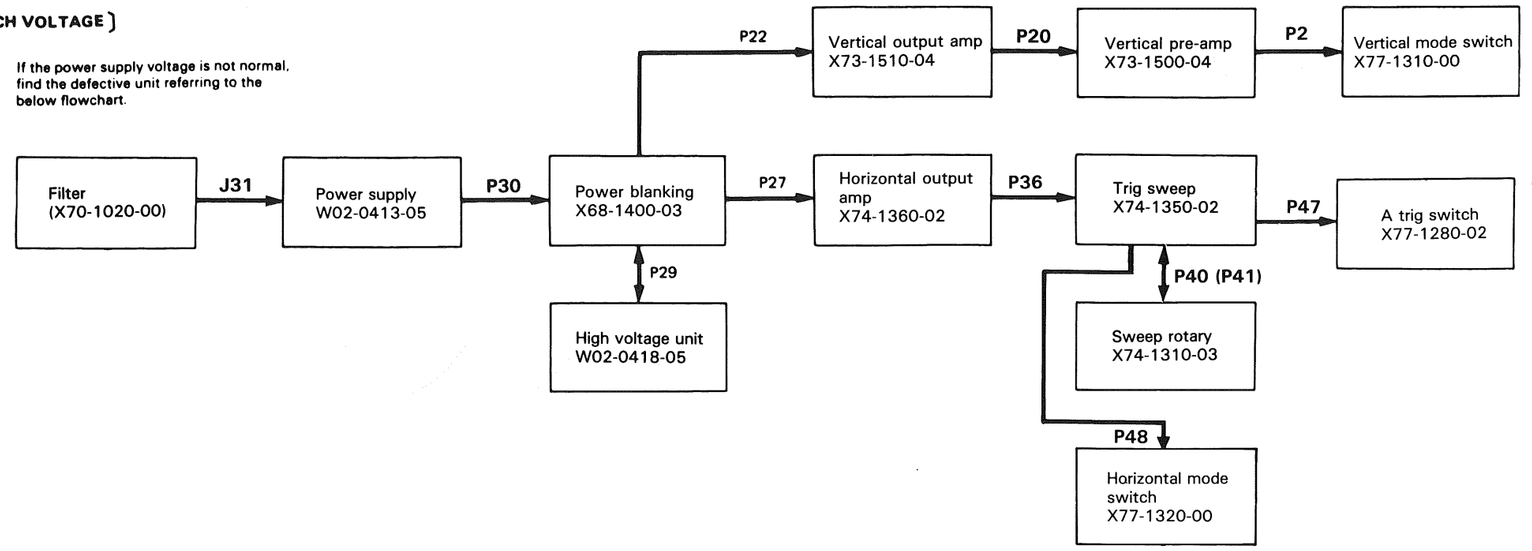
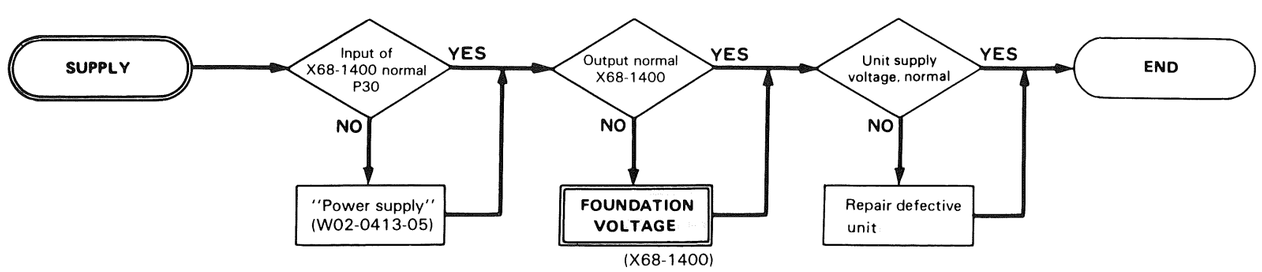


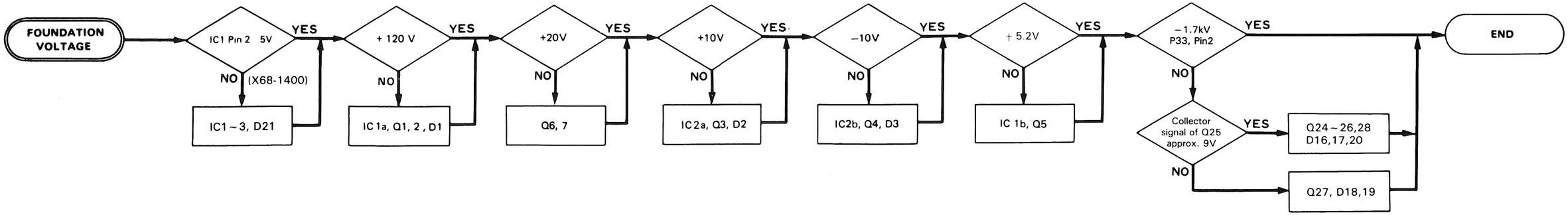

**Fig. 7 CAL CIRCUIT WAVEFORMS**

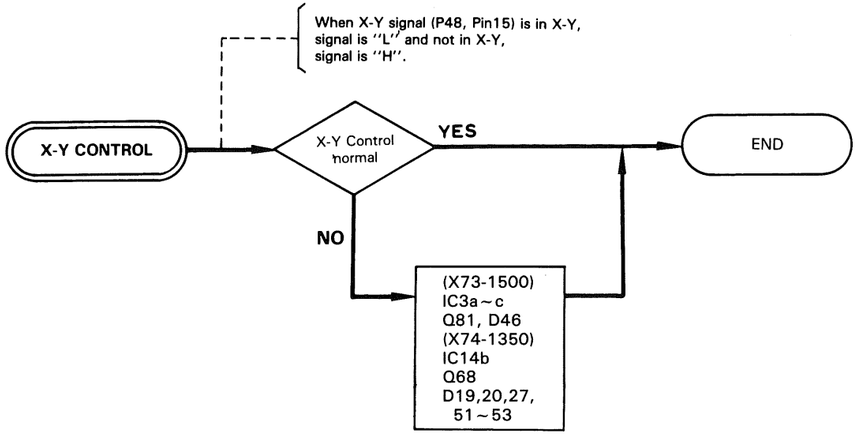
## ( POWER SUPPLY OF EACH VOLTAGE )

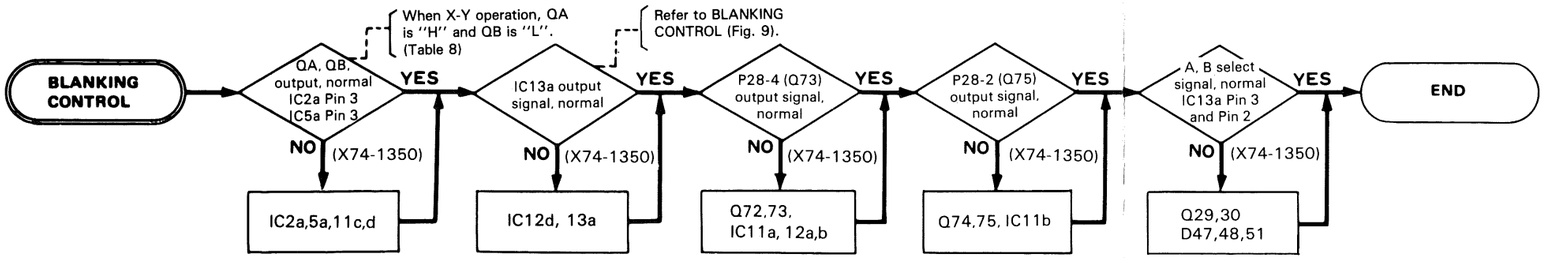
If the power supply voltage is not normal, find the defective unit referring to the below flowchart.

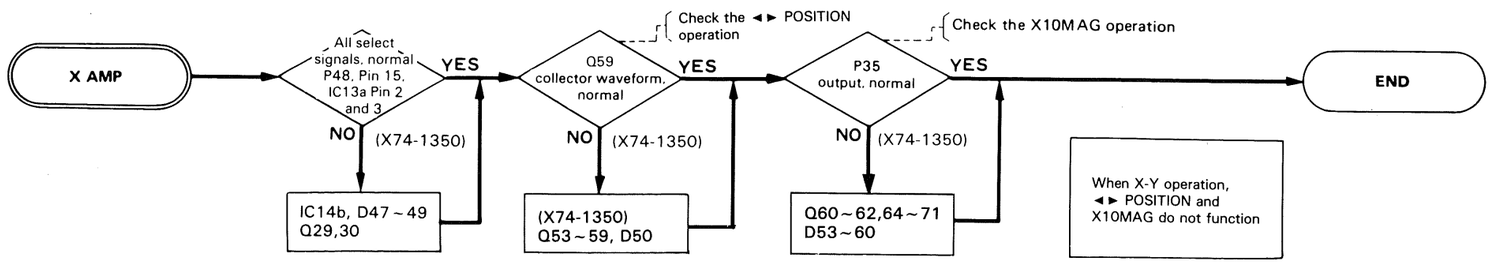


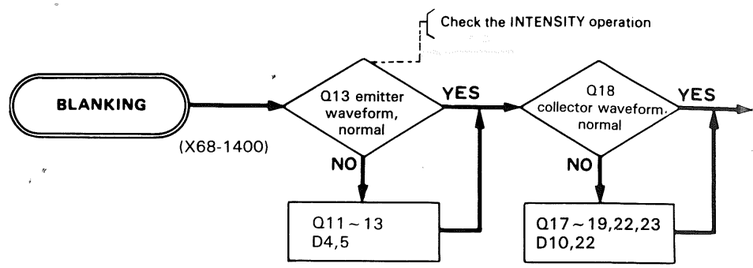






# TROUBLESHOOTING




**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 |
| B-DLY'D | H | L | H | L | H | H | H | 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-8**

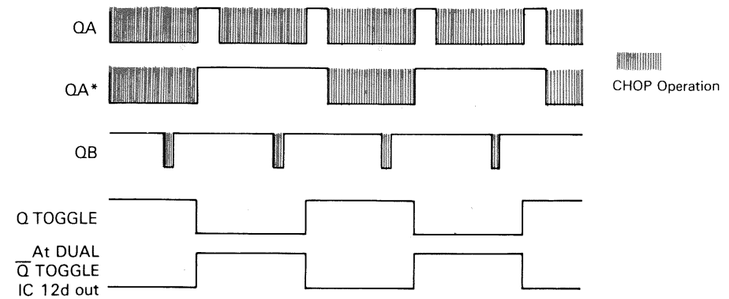
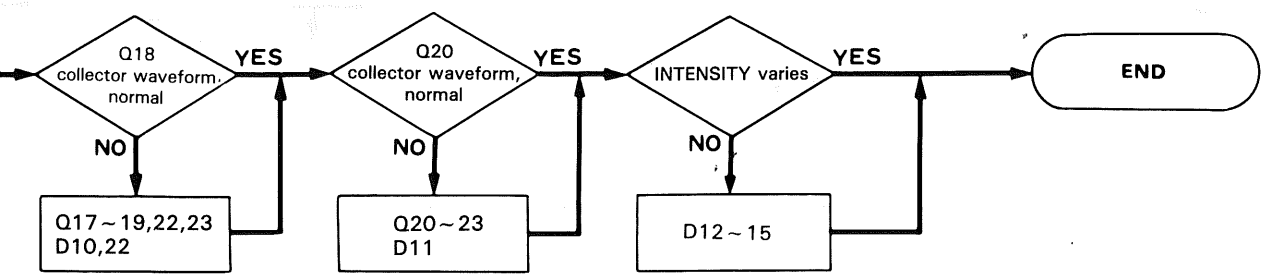
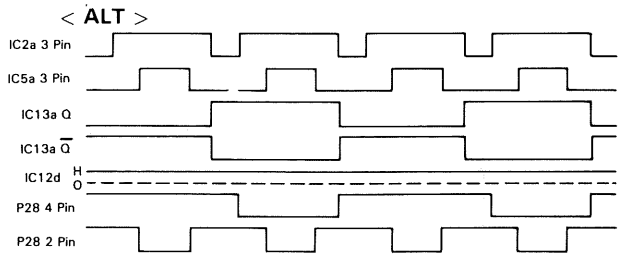


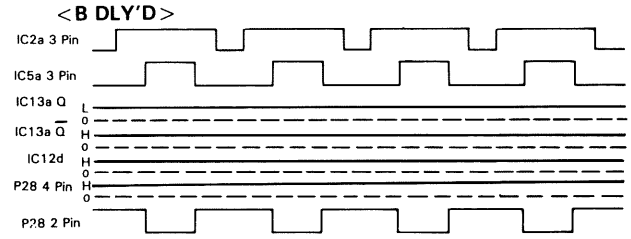

**Fig. 8 RELATIONSHIP BETWEEN A, B SWEEP AND QA, QB**

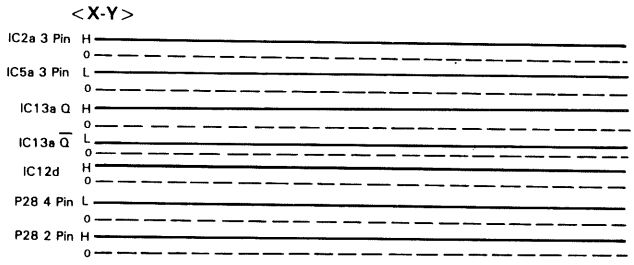
he INTENSITY operation




| |
|---|
| 8 |
| B. blank-ing 2 Pin |
| H |
| QB |
| QB |
| H |



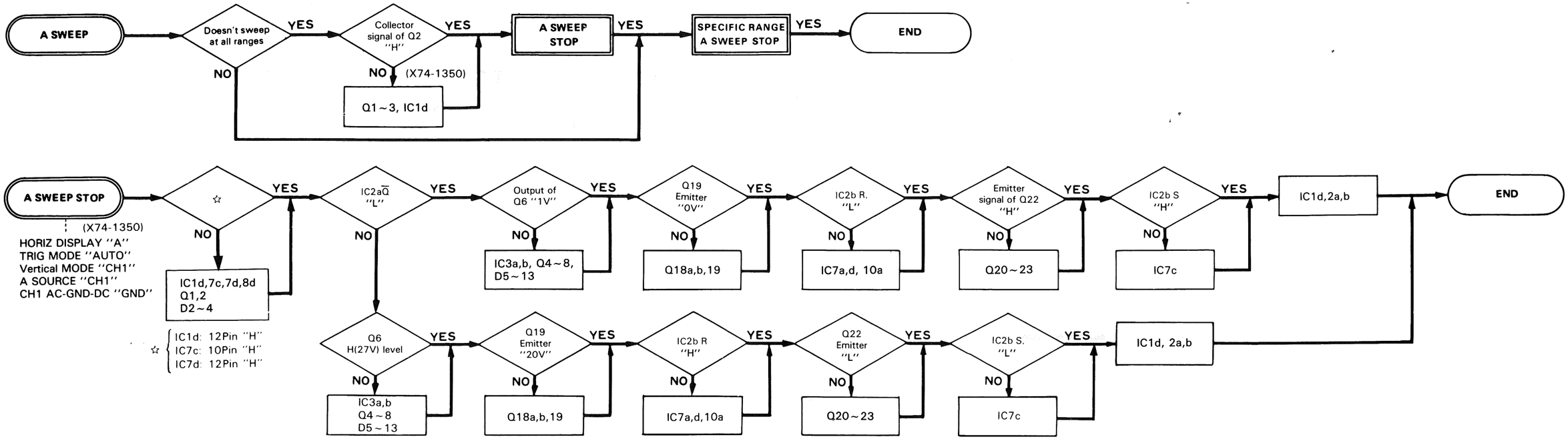



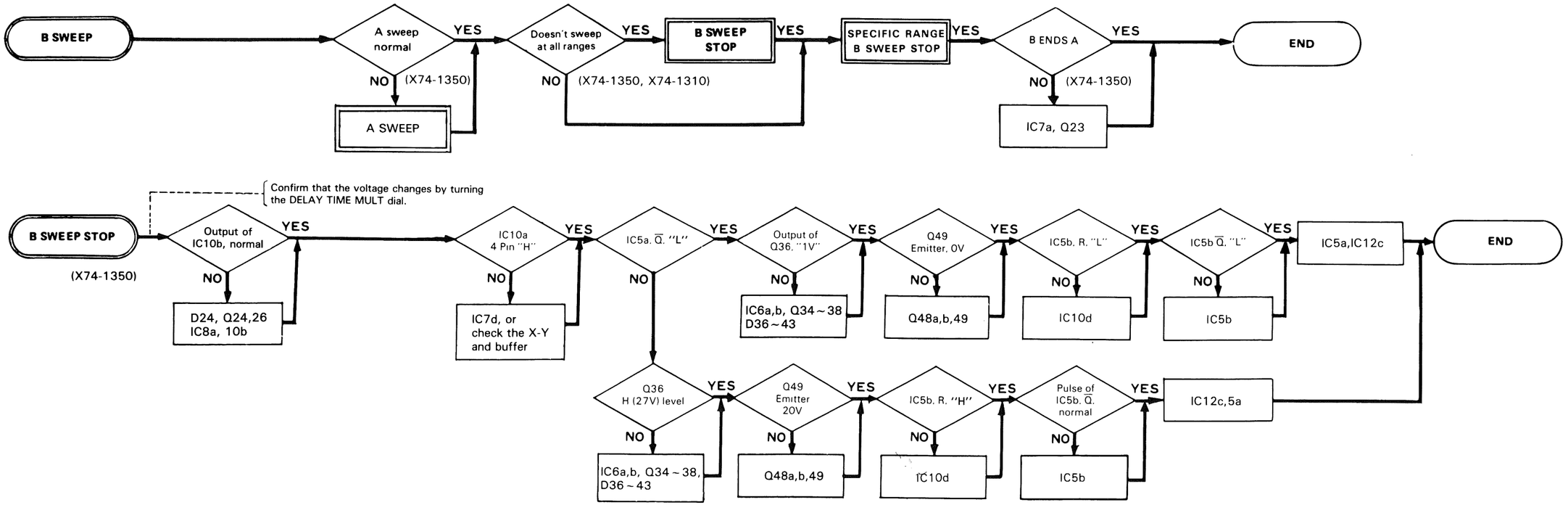




CHOP Operation

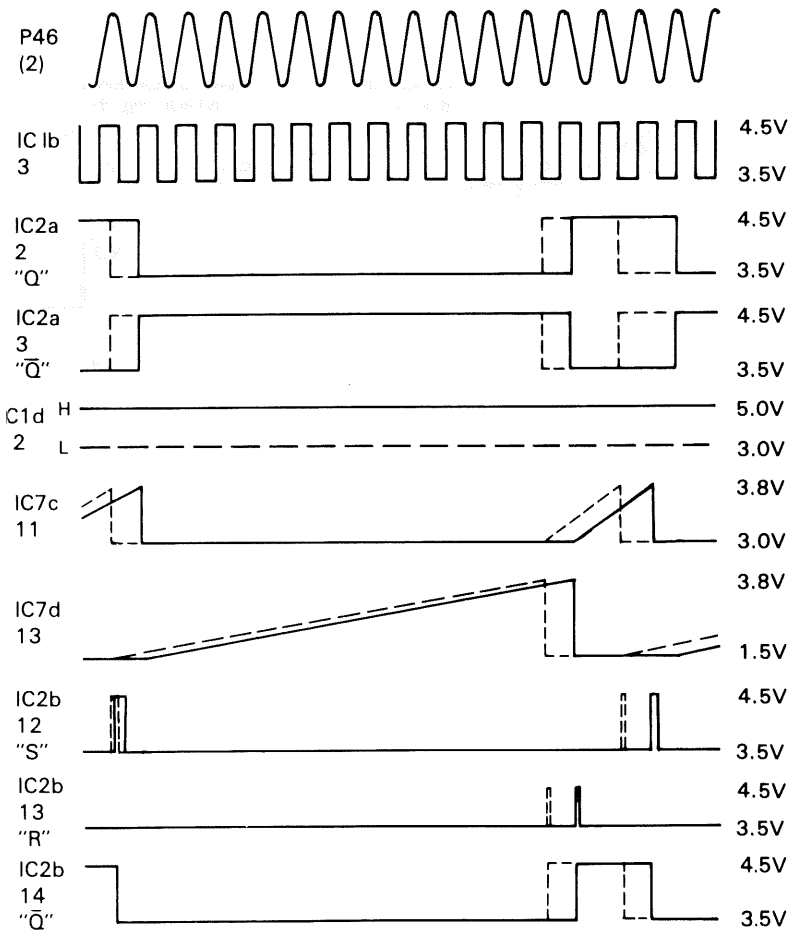
**Fig. 9 BLANKING CONTROL**

QB


A SWEEP
Doesn't sweep at all ranges
YES
NO
Collector signal of Q2 "H"
YES
NO (X74-1350)
Q1~3, 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,7c,7d,8d Q1,2 D2~4
IC1d: 12Pin "H"
IC7c: 10Pin "H"
IC7d: 12Pin "H"
IC2aQ̄ "L"
Output of Q6 "1V"
IC3a,b, Q4~8, D5~13
Q19 Emitter "0V"
Q18a,b,19
IC2b R. "L"
IC7a,d, 10a
Emitter signal of Q22 "H"
Q20~23
IC2b S "H"
IC7c
IC1d,2a,b
Q6 H(27V) level
IC3a,b Q4~8 D5~13
Q19 Emitter "20V"
Q18a,b,19
IC2b R "H"
IC7a,d,10a
Q22 Emitter "L"
Q20~23
IC2b S. "L"
IC7c
IC1d, 2a,b

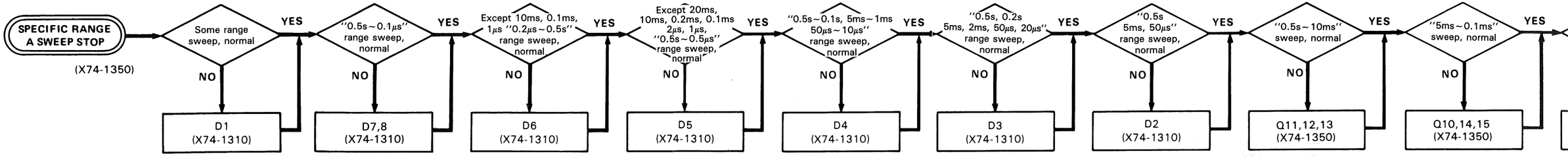

B SWEEP
A sweep normal
YES
NO (X74-1350)
A SWEEP
Doesn't sweep at all ranges
YES
NO (X74-1350, X74-1310)
B SWEEP STOP
YES
SPECIFIC RANGE B SWEEP STOP
YES
B ENDS A
YES
NO (X74-1350)
IC7a, Q23
END
B SWEEP STOP
(X74-1350)
Confirm that the voltage changes by turning the DELAY TIME MULT dial.
Output of IC10b, normal
YES
NO
D24, Q24,26 IC8a, 10b
IC10a 4 Pin "H"
IC7d, or check the X-Y and buffer
IC5a. Q̄. "L"
Output of Q36. "1V"
IC6a,b, Q34~38 D36~43
Q49 Emitter. 0V
Q48a,b,49
IC5b. R. "L"
IC10d
IC5b Q̄. "L"
IC5b
IC5a,IC12c
Q36 H (27V) level
IC6a,b, Q34~38, D36~43
Q49 Emitter 20V
Q48a,b,49
IC5b. R. "H"
IC10d
Pulse of IC5b. Q̄. normal
IC5b
IC12c,5a

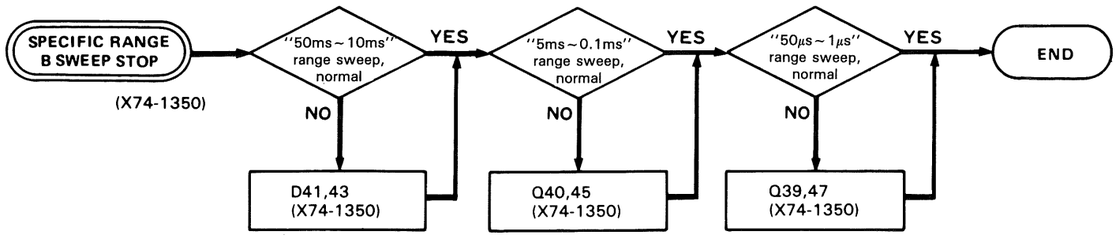
END

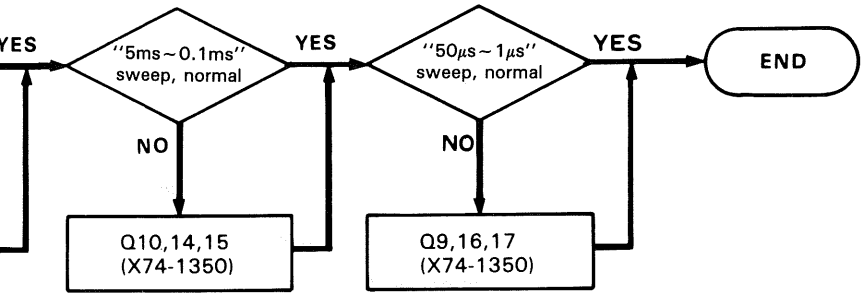


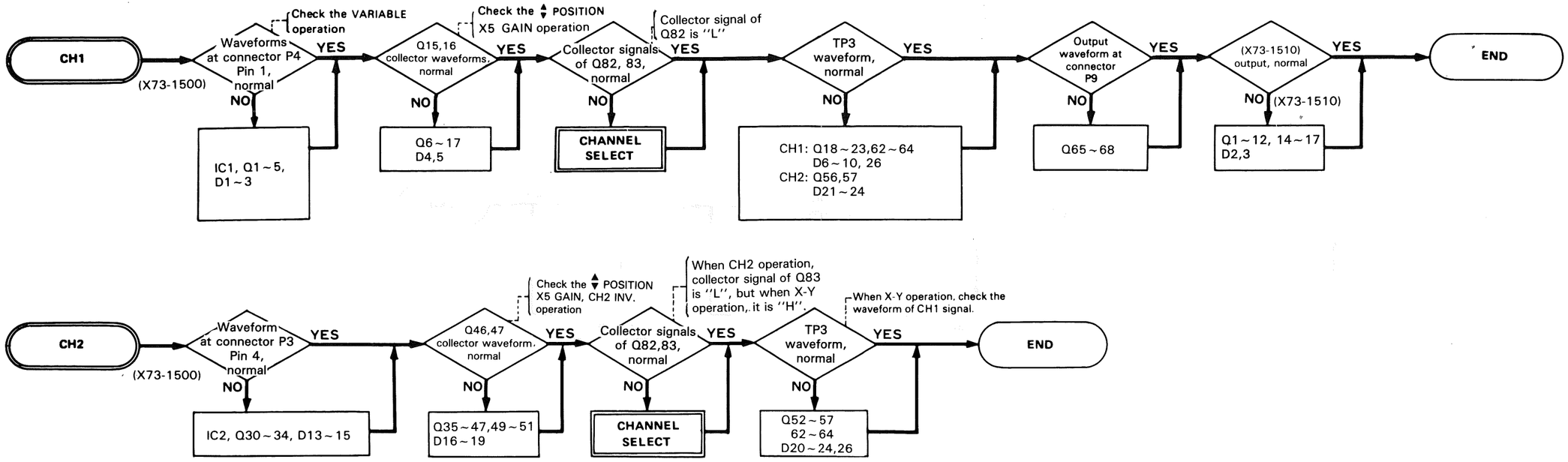

**Note: Broke-line auto free run (at non-signal)**

**Fig. 10 Waveform in Sweep circuit (X74-1350-02)**
**(Input signal 1 kHz, SWEEP TIME 1 ms/div)**


SPECIFIC RANGE A SWEEP STOP
(X74-1350)
Some range sweep, normal
YES
NO
D1 (X74-1310)
"0.5s~0.1μs" range sweep, normal
YES
NO
D7,8 (X74-1310)
Except 10ms, 0.1ms, 1μs "0.2μs~0.5s" range sweep, normal
YES
NO
D6 (X74-1310)
Except 20ms, 10ms, 0.2ms, 0.1ms 2μs, 1μs, "0.5s~0.5μs" range sweep, normal
YES
NO
D5 (X74-1310)
"0.5s~0.1s, 5ms~1ms 50μs~10μs" range sweep, normal
YES
NO
D4 (X74-1310)
"0.5s, 0.2s 5ms, 2ms, 50μs, 20μs" range sweep, normal
YES
NO
D3 (X74-1310)
"0.5s 5ms, 50μs" range sweep, normal
YES
NO
D2 (X74-1310)
"0.5s~10ms" sweep, normal
YES
NO
Q11,12,13 (X74-1350)
"5ms~0.1ms" sweep, normal
YES
NO
Q10,14,15 (X74-1350)
YES

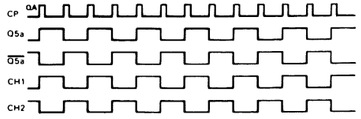

SPECIFIC RANGE B SWEEP STOP
(X74-1350)
"50ms~10ms" range sweep, normal
YES
NO
D41,43 (X74-1350)
"5ms~0.1ms" range sweep, normal
YES
NO
Q40,45 (X74-1350)
"50μs~1μs" range sweep, normal
YES
NO
Q39,47 (X74-1350)
YES
END


YES
"5ms~0.1ms"
sweep, normal
YES
"50μs~1μs"
sweep, normal
YES
END
NO
NO
Q10,14,15
(X74-1350)
Q9,16,17
(X74-1350)

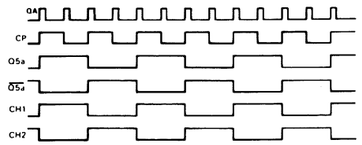



### ① Vertical MODE; ALT

HORIZ DISPLAY; A, B DLY'D

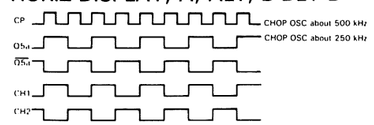



HORIZ DISPLAY; ALT



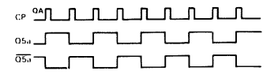

### ② Vertical MODE; CHOP

HORIZ DISPLAY; A, ALT, B DLY'D




### ③ Vertical MODE; ADD

HORIZ DISPLAY; A, B DLY'D



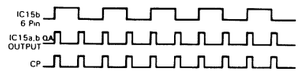

HORIZ DISPLAY; ALT

Q5a "H" or "L"

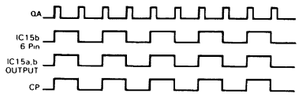
Q5a "L" or "H"

### ④ Vertical MODE; ALT, CHOP

HORIZ DISPLAY; A, B DLY'D



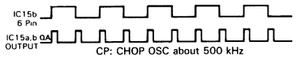

HORIZ DISPLAY; ALT



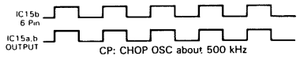

### Vertical MODE; CH1, CH2, ADD

HORIZ DISPLAY; ALT


HORIZ DISPLAY; A, B DLY'D




HORIZ DISPLAY; ALT




### ⑤ HORIZ DISPLAY; ALT

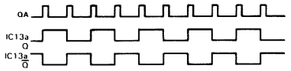
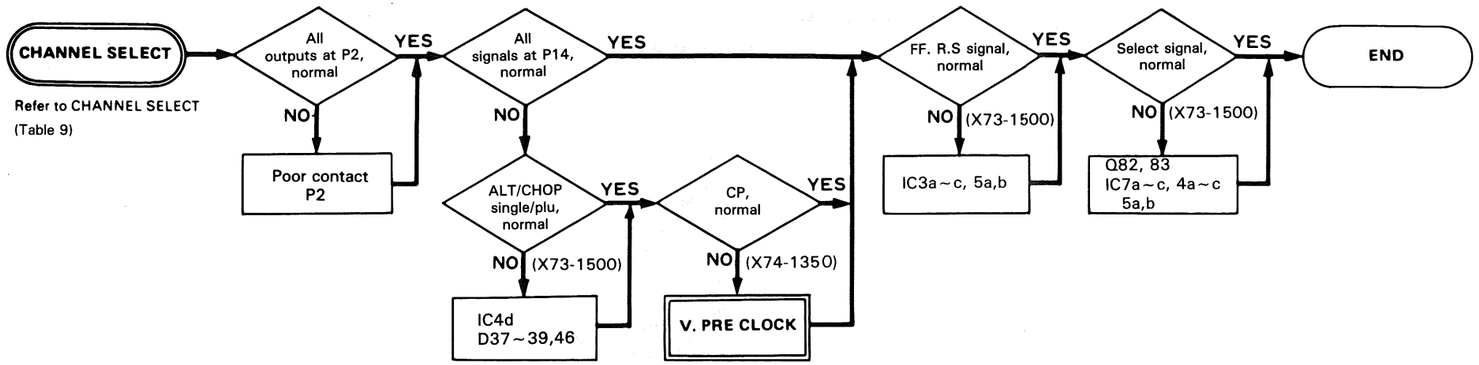
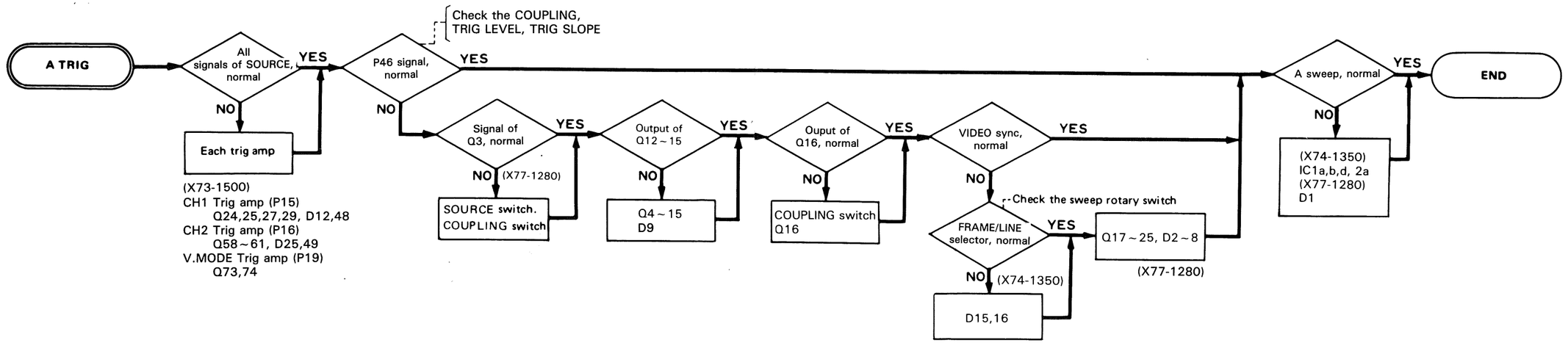
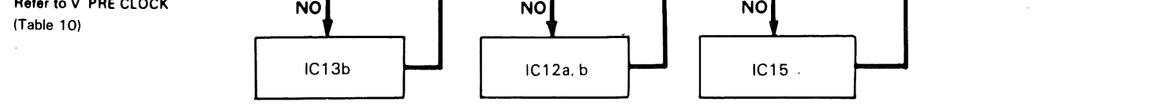



Fig. 11 Time Chart




**CHANNEL SELECT**

| | | | |
|---|---|---|---|
| SWEEP operation | CH1 | | |
| | CH2 | | |
| | DUAL | ALT | |
| | | CHOP | |
| | ADD | | |
| X-Y operation | | | |

Note; Number of ○ is No. of time c

V.

SWEEP operation

X

No

## CHANNEL SELECT

| | | | 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 | Q5a | Q5a | Q5b | Q5b | ALT/CHOP | Single/Plu | CP*1 |
| SWEEP operation | CH1 | | L | H | H | H | H | H | H | L | H | L | H | L | H | L | H | L | L | QA |
| | CH2 | | H | L | H | H | H | H | L | H | H | H | L | H | L | L | H | L | L | QA |
| | DUAL | ALT | H | H | L | H | L | H | L | L | H | (1) | | (1) | | L | H | L | H | QA |
| | | CHOP | | | | | H | | | | | (2) | | (2) | | | | H | | 2 |
| | ADD | | H | H | H | L | H | H | L | L | H | L | L | (3) | | L | H | L | L | QA |
| X-Y operation | | | Same as above | | | | | L | H | H | H | L | H | | | L | H | L | L | L |

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

*1 HORIZ DISPLAY; ALT
Time chart No. ④.

**Table-9**

## V. PRE CLOCK

| | | INPUT | | OUTPUT | | |
|---|---|---|---|---|---|---|
| | MODE | ALT/CHOP | Single/Plu | Q76 | IC15a,b | CP*2 |
| SWEEP operation | CH1 | L | L | H | QA | QA |
| | CH2 | L | L | H | | QA |
| | DUAL ALT | L | H | H | | QA |
| | DUAL CHOP | H | | L | | 2 |
| | ADD | L | L | H | | QA |
| X-Y operation | | L | L | H | L | L |

Note; Nomber of ◯ is No. of time chart.

*2 HORIZ DISPLAY; ALT
Time chart No. 4 .

## V. PRE CLOCK

| HORIZ DISPLAY | IC15b 7 Pin | IC15b 6 Pin*3 | IC15a,b*3 OUTPUT | IC13a Q |
|---|---|---|---|---|
| A | L | L | QA | H |
| ALT | H | L | L | (5) *4 |
| B DLY'D | L | L | QA | H |
| X-Y | H | L | L | H |

*3 Vertical MODE; DUAL
Time chart No. 4 .

*4 Vertical MODE; DUAL
Time chart No. 1, 2 .

**Table-10**

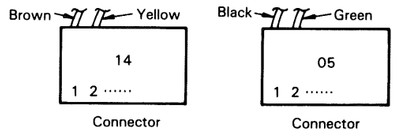
# PARTS LIST

**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

## CS-1100A UNIT

## Y70-1610-61

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| 1 | A01-1119-02 | CASE (TOP) |
| 2 | A01-1120-12 | CASE (BOTTOM) |
| 3 | A13-0779-12 | FRAME (R) |
| 4 | A13-0780-02 | FRAME (L) |
| 5 | A20-2764-11 | MOLDED PANEL |
| 6 | A21-1059-32 | DECORATIVE PANEL |
| 7 | A22-0839-22 | SUB PANEL |
| 8 | A23-1651-22 | REAR PANEL |
| 9 | B07-0703-04 | ESCUTCHEON FOR ASTIG |
| 10 | B07-0712-13 | FILTER FRAME |
| 11 | B19-0726-04 | FILTER |
| 12 | B20-0929-04 | SCALE |
| 13 | B30-0945-05 | SCALE ILLUMI LAMP ASS'Y |
| 14 | B40-2765-04 | NAME PLATE (SERIAL NO) |
| | B41-0710-04 | CAUTION LABEL (HIGH VOLTAGE) |
| | B41-0764-23 | CAUTION LABEL (REAR PANEL) |
| | B50-7644-10 | INSTRUCTION MANUAL |
| 15 | E01-1403-05 | CRT SOCKET |
| 16 | E04-0259-05 | BNC RECEPTACLE |
| 17 | E21-0657-04 | TERMINAL (GND) |
| 18 | E21-0660-04 | TERMINAL (CAL) |
| | E23-0043-04 | EARTH LUG (FUSE HOLDER) |
| | E23-0513-05 | EARTH LUG (BNC) |
| | E23-0522-14 | EARTH LUG (CRT EARTH) |
| | E23-0528-04 | EARTH PLATE (FRAME-CASE) |
| | E23-0531-04 | EARTH PLATE |
| | E23-0532-04 | EARTH PLATE |
| | E30-1818-05 | JIS POWER CORD |
| | E30-1819-05 | CEE POWER CORD |
| | E30-1820-05 | UL/CSA POWER CORD |
| | E30-1821-05 | SAA POWER CORD |
| | E31-0564-05 | WIRE ASS'Y |
| | E31-2473-05 | WIRE ASS'Y (AC,GND) |
| | E31-2488-35 | LEAD WIRE WITH HARNESSES |
| | E31-2502-05 | WIRE ASS'Y (V.FINAL) |
| | E31-2503-05 | WIRE ASS'Y (H.FINAL) |
| 19A | F05-1222-05 | FUSE 1.25AT (5X20MM) N.EUROPE |
| 19B | F05-1224-05 | FUSE 1.2A (6X30MM) |
| 20 | F07-0908-14 | PROTECTION COVER (HANDLE) |
| 21 | F10-1567-14 | EARTH BAND (FOR H.V.BLOCK) |
| 22 | F10-1568-04 | SHIELD PLATE (FOR SW P.S.) |
| 23 | F11-0985-04 | SHIELD CASE (H) FOR H.V.BLOCK |
| 24 | F11-0990-13 | CRT SHIELD |
| 25 | F15-0733-04 | FELT (CRT SHIELD) |
| 26 | F20-0624-04 | INSULATOR (FOR BLANKING) |
| 27 | G02-0606-14 | SPRING FOR HANDLE |
| 28 | G02-0607-04 | SPRING FOR CRT |
| 29 | G16-0611-04 | REFLECTOR SHEET (L) |
| 30 | G16-0612-04 | REFLECTOR SHEET (R) |
| | H01-5725-24 | CARTON BOX |
| | H10-2817-11 | FOAMED STYRENE PAD (FRONT) |
| | H10-2818-11 | FOAMED STYRENE PAD (REAR) |
| | H20-1727-04 | VINYL COVER |
| 31 | J02-0089-05 | RUBBER LEG |
| 32 | J10-0100-22 | BEZEL |
| 33A | J13-0031-05 | FUSE HOLDER (NORTH EUROPE) |
| 33B | J13-0033-15 | FUSE HOLDER |
| 34 | J19-1620-05 | CORD KEEP |
| 35 | J19-1635-04 | HOLDER FOR LED |
| 36 | J21-2906-05 | GEAR FOR HANDLE |
| 37 | J21-2907-05 | RING FOR HANDLE |
| 38 | J21-2970-23 | BLACKET FOR CRT |
| 39 | J21-2979-14 | BLACKET FOR SCALE |
| 40 | J21-4511-04 | BLACKET FOR CRT SHIELD |
| 41 | J31-0603-04 | COLLAR (TRACE ROTATION) |
| 42 | J39-0522-04 | SPACER FOR V.R. |
| 43 | J42-0515-05 | BUSHING |
| 44 | J42-0522-04 | BUSHING (FREE) |
| 45 | J42-0523-04 | BUSHING A (CRT) |
| | J59-0403-05 | NYLON RIVET (ILLUMI) |
| | J61-0049-05 | WIRE BAND |
| 46 | J61-0511-05 | SADDLE FOR WIRE (WS-2NA) |
| 47 | K01-0520-15 | HANDLE |
| 48 | K21-0868-03 | KNOB (ATT) |
| 49 | K21-0869-04 | KNOB (VARI) |
| 50 | K21-0870-04 | KNOB (FOR SINGLE V.R.) |
| 51 | K21-0871-04 | KNOB (FOR INSIDE V.R.) |
| 52 | K21-0872-04 | KNOB (FOR OUTSIDE V.R.) |
| 53 | K21-0873-04 | KNOB (A SWEEP) |
| 54 | K21-0874-03 | KNOB (B SWEEP) |
| 55 | K27-0528-14 | KNOB (FOR PUSH SW) |
| 56 | K27-0530-14 | KNOB (FOR LEVER SW) |
| | N08-0611-04 | SCREW (FOR CORD WRAP) |
| | N09-0402-05 | SCREW (FOR PULLEY) |

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| | N09-0705-05 | SCREW; HEX SOCKET FLAT HD M4X8 |
| | N09-0709-05 | SCREW, WITH WASHER |
| | N09-0715-04 | SCREW, PAN HD M4X31 |
| | N09-0757-05 | SCREW, SEMS TAP TITE M3X6 |
| | N10-2030-41 | NUT, HEX |
| | N10-2070-41 | NUT, HEX |
| | N15-1110-41 | WASHER |
| | N17-1030-41 | LOCK WASHER M3 |
| | N19-0704-04 | WASHER (FOR SW KNOB) |
| | N19-0710-05 | WASHER |
| | N30-3006-41 | SCREW, PAN HD M3X6 |
| | N30-3008-41 | SCREW, PAN HD M3X8 |
| | N30-3010-41 | SCREW, PAN HD M3X10 |
| | N32-3006-41 | SCREW, FLAT HD M3X6 |
| | N32-3008-41 | SCREW, FLAT HD M3X8 |
| | N34-3012-41 | SCREW, TRUSS M3X12 |
| | N88-3006-41 | SCREW, FLAT HD TAP TITE |
| | N89-3006-41 | SCREW, BINDING TAP TITE |
| | N89-3010-41 | SCREW, BINDING TAP TITE |
| | R92-0150-05 | JUMPING RES. ZERO OHM |
| 57 | W01-0503-04 | CORD WRAP |
| 58 | W02-0413-05 | SWITCHING POWER SUPPLY |
| 59 | W02-0418-05 | HIGH VOLTAGE POWER BLOCK |
| 60 | X68-1400-03 | POWER BLANKING UNIT |
| 61 | X70-1020-00 | FILTER UNIT |
| 62 | X73-1500-04 | VERTICAL PREAMP UNIT |
| 63 | X73-1510-04 | VERTICAL OUTPUT AMP UNIT |
| 64 | X74-1310-03 | SWEEP ROTARY UNIT |
| 65 | X74-1350-02 | TRIG SWEEP UNIT |
| 66 | X74-1360-02 | HORIZONTAL OUTPUT AMP UNIT |
| 67 | X75-1170-00 | VERTICAL ATTENUATOR UNIT |
| 68 | X77-1280-02 | A TRIG SWITCH UNIT |
| 69 | X77-1310-00 | VERTICAL MODE SWITCH UNIT |
| 70 | X77-1320-00 | HORIZONTAL MODE SWITCH UNIT |
| | 002-0001-05 | BRAIDED WIRE |
| 71 | 150WTM31 | CRT |
| | 212-2014-05 | TUBE (PLASTIC) |
| | 490-0007-05 | TAPE |
| | 490-0012-05 | TAPE |
| C001 | C91-0501-05 | CAP. METAL FILM 0.047 10% 630V |
| C002 | C91-0501-05 | CAP. METAL FILM 0.047 10% 630V |
| D001 | PG4133SX | LED (GREEN) TRIG |
| D002 | AR4133S | LED (RED) POWER,RESET |
| D008 | AR4133S | LED (RED) POWER,RESET |
| J001 | E31-2492-05 | WIRE ASS'Y (CH2 INV) |
| J002 | E31-2493-05 | WIRE ASS'Y (V.MODE) |
| J007 | E31-2907-05 | WIRE ASS'Y (CH1 POSI,X5 GAIN) |
| J008 | E31-2908-05 | WIRE ASS'Y (CH2 POSI,X5 GAIN) |
| J030 | E31-2497-05 | WIRE ASS'Y (DC INPUT) |
| J031 | E31-2498-05 | WIRE ASS'Y (AC INPUT) |
| J032 | E31-2499-15 | WIRE ASS'Y (P2,G2,ISD) |
| J033 | E31-2500-05 | WIRE ASS'Y (P1,K,G1) |
| J048 | E31-2501-05 | WIRE ASS'Y (H.MODE) |
| 72 L001 | L39-0520-05 | ROTATION COIL |
| 73 L002 | L76-0108-25 | DELAY LINE |
| L003 | L40-2282-13 | AXIAL COIL 0.22UH |
| L004 | L40-2282-13 | AXIAL COIL 0.22UH |
| R001 | RD14BB2E105J | RES. CARBON 1M 5% 1/4W |
| R002 | RD14BB2E105J | RES. CARBON 1M 5% 1/4W |
| R003 | RD14BB2C220J | RES. CARBON 22 5% 1/6W |
| R004 | RD14BB2C220J | RES. CARBON 22 5% 1/6W |
| R009 | RD14BB2E471J | RES. CARBON 470 5% 1/4W |
| R010 | RD14BB2E471J | RES. CARBON 470 5% 1/4W |
| R014 | RD14BB2C473J | RES. CARBON 47K 5% 1/6W |
| 74 S023 | S33-1501-05 | LEVER SWITCH (AC-GND-DC) |
| 74 S024 | S33-1501-05 | LEVER SWITCH (AC-GND-DC) |
| 75 S025 | R23-2501-05 | V.R. (HOLD OFF) 5KBX2 |
| 76 S026 | R06-2502-05 | V.R. (H.POSI) 5KBX2 |
| 77 VR007 | R29-0504-25 | V.R. (D.T.M.) 1KB |
| 78 VR008 | R05-3505-05 | V.R. (ROTATION) 20KB |
| 75 VR05A | R23-2501-05 | V.R. (HOLD OFF) 5KBX2 |
| 75 VR05B | R23-2501-05 | V.R. (HOLD OFF) 5KBX2 |
| 76 VR06A | R06-2502-05 | V.R. (H.POSI) 5KBX2 |
| 76 VR06B | R06-2502-05 | V.R. (H.POSI) 5KBX2 |
| 79 VR11A | R23-1502-05 | V.R. (INTEN) 1KBX2 |
| 79 VR11B | R23-1502-05 | V.R. (INTEN) 1KBX2 |

# PARTS LIST

## POWER BLANKING UNIT

### X68-1400-03

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | E29-0504-05 | TEFLON TERMINAL | | | |
| | F02-0503-24 | HEAT SINK | | | |
| | F09-0506-05 | PROTECTION COVER (CAPACITOR) | | | |
| | F15-0727-04 | HOLDER (NEON LAMP) | | | |
| | F20-0516-05 | INSULATOR | | | |
| | F20-0623-05 | INSULATOR | | | |
| | J25-5038-72 | PCB (UNMOUNTED) | | | |
| | N09-0167-05 | SCREW, POLYCARBONATE | | | |
| | R92-1061-05 | JUMPING RES. | ZERO OHM | | |
| | 212-1018-05 | TUBE (PLASTIC) | | | |
| | 212-3017-05 | TUBE (PLASTIC) | | | |
| C001 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C002 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C003 | CE04EW1A101M | CAP. ELECTRO | 100 | 20% | 10V |
| C004 | CE04EW1J330M | CAP. ELECTRO | 33 | 20% | 63V |
| C005 | CE04W2C3R3M | CAP. ELECTRO | 3.3 | 20% | 160V |
| C006 | CE04W2C3R3M | CAP. ELECTRO | 3.3 | 20% | 160V |
| C007 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C008 | C91-0549-05 | CAP. TANTALUM | 1 | 20% | 35V |
| C009 | CE04EW1E101M | CAP. ELECTRO | 100 | 20% | 25V |
| C010 | CE04EW1E101M | CAP. ELECTRO | 100 | 20% | 25V |
| C011 | CE04EW1A221M | CAP. ELECTRO | 220 | 20% | 10V |
| C012 | CE04EW1V100M | CAP. ELECTRO | 10 | 20% | 35V |
| C013 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C014 | CE04EW1V470M | CAP. ELECTRO | 47 | 20% | 35V |
| C015 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C016 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C017 | CC45CH1H101J | CAP. CERAMIC | 100P | 5% | 50V |
| C018 | CC45CH1H101J | CAP. CERAMIC | 100P | 5% | 50V |
| C019 | CC45SL1H681J | CAP. CERAMIC | 680P | 5% | 50V |
| C020 | CC45SL1H681J | CAP. CERAMIC | 680P | 5% | 50V |
| C023 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| C024 | CC45CH2H0R5C | CAP. CERAMIC | 0.5P | 0.25P | 500V |
| C025 | CK45B2H472K | CAP. CERAMIC | 4700P | 10% | 500V |
| C026 | C91-0549-05 | CAP. TANTALUM | 1 | 20% | 35V |
| C027 | CC45CH2H030C | CAP. CERAMIC | 3P | 0.25P | 500V |
| C028 | CK45B2H472K | CAP. CERAMIC | 4700P | 10% | 500V |
| C029 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C030 | CE04W2C3R3M | CAP. ELECTRO | 3.3 | 20% | 160V |
| C031 | CK45B2H472K | CAP. CERAMIC | 4700P | 10% | 500V |
| C032 | CE04EW1A221M | CAP. ELECTRO | 220 | 20% | 10V |
| C033 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C034 | CE04EW1E101M | CAP. ELECTRO | 100 | 20% | 25V |
| C035 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C036 | C91-0571-05 | CAP. CERAMIC | 0.01 | | 2KV |
| C037 | C91-0571-05 | CAP. CERAMIC | 0.01 | | 2KV |
| C038 | C91-0571-05 | CAP. CERAMIC | 0.01 | | 2KV |
| C039 | C91-0571-05 | CAP. CERAMIC | 0.01 | | 2KV |
| C040 | CK45E3F102P | CAP. CERAMIC | 1000P | | 3.1K |
| C041 | CQ93M1H154K | CAP. MYLAR | 0.15 | 10% | 50V |
| C042 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C043 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C044 | CE04EW1E470M | CAP. ELECTRO | 47 | 20% | 25V |
| C045 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C046 | CE04EW1E470M | CAP. ELECTRO | 47 | 20% | 25V |
| C047 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C048 | CE04EW1E470M | CAP. ELECTRO | 47 | 20% | 25V |
| C049 | CQ93M1H472K | CAP. MYLAR | 4700P | 10% | 50V |
| C050 | CE04EW1E470M | CAP. ELECTRO | 47 | 20% | 25V |
| C051 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C052 | C91-0571-05 | CAP. CERAMIC | 0.01 | | 2KV |
| C053 | C91-0571-05 | CAP. CERAMIC | 0.01 | | 2KV |
| C054 | CK45E3D102P | CAP. CERAMIC | 1000P | | 2KV |
| C055 | CK45B2H222K | CAP. CERAMIC | 2200P | 10% | 500V |
| C056 | CK45B2H222K | CAP. CERAMIC | 2200P | 10% | 500V |
| C059 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C060 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C061 | CE04EW1C470M | CAP. ELECTRO | 47 | 20% | 16V |
| C062 | CK45B1H222K | CAP. CERAMIC | 2200P | 10% | 50V |
| C063 | CK45B2H472K | CAP. CERAMIC | 4700P | 10% | 500V |
| C064 | C91-0571-05 | CAP. CERAMIC | 0.01 | | 2KV |
| D001 | 1SS132 | DIODE | | | |
| D002 | MTZ12JC | DIODE, ZENER | 12V | | |
| D003 | MTZ12JC | DIODE, ZENER | 12V | | |
| D004 | MTZ3.3JA | DIODE, ZENER | 3.2V | | |
| D005 | 1SS132 | DIODE | | | |
| D009 | MTZ5.1JB | DIODE, ZENER | 5.0V | | |
| 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 | | | |
| D022 | 1SS83 | DIODE | | | |
| IC001 | NJM4558D | IC, OP AMP | | | |
| IC002 | NJM4558D | IC, OP AMP | | | |
| IC003 | LM340LAZ5.0 | IC, REGULATOR | | | |
| L001 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| L002 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| L003 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| L004 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| L005 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| L006 | L40-1011-03 | FERRI INDUCTOR | 100UH (5H) | | |
| NL001 | NE-2B | NEON LAMP | | | |
| NL002 | NE-2B | NEON LAMP | | | |
| NL003 | NE-2B | NEON LAMP | | | |
| NL004 | NE-2B | NEON LAMP | | | |
| P022 | E40-0773-05 | PIN CONNECTOR | 7P | | |
| P023 | E40-0473-05 | PIN CONNECTOR | 4P | | |
| P024 | NO USE | | | | |
| P025 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| P026 | E40-0573-05 | PIN CONNECTOR | 5P | | |
| P027 | E40-0873-05 | PIN CONNECTOR | 8P | | |
| P028 | E40-0473-05 | PIN CONNECTOR | 4P | | |
| P029 | E40-0703-05 | PIN CONNECTOR | 7P | | |
| P030 | E40-0746-05 | PIN CONNECTOR | 7P | | |
| P031 | NO USE | | | | |
| P032 | E40-0373-05 | PIN CONNECTOR | 3P | | |
| P033 | E40-0332-05 | PIN CONNECTOR | 3P | | |
| P034 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| P063 | E40-0673-05 | PIN CONNECTOR | 6P | | |
| Q001 | 2SC2591(Q,R) | TR. SI, NPN | | | |
| Q002 | 2SC1505(L) | TR. SI, NPN | | | |
| Q003 | 2SB633(E) | TR. SI, PNP | | | |
| Q004 | 2SD613(E) | TR. SI, NPN | | | |
| Q005 | 2SB633(E) | TR. SI, PNP | | | |
| Q006 | 2SC1505(L) | TR. SI, NPN | | | |
| Q007 | 2SC3311(R) | TR. SI, NPN | | | |
| Q008 | 2SC1505(L) | TR. SI, NPN | | | |
| Q009 | 2SC3311(R) | TR. SI, NPN | | | |
| Q010 | 2SA1309(Q,R) | TR. SI, PNP | | | |
| Q011 | 2SC3354(S,T) | TR. SI, NPN | | | |
| Q012 | 2SC3354(S,T) | TR. SI, NPN | | | |
| Q013 | 2SA1323(B,C) | TR. SI, PNP | | | |
| Q014 | NO USE | | | | |
| Q015 | 2SC3315(C,D) | TR. SI, NPN | | | |
| Q016 | 2SC3315(C,D) | TR. SI, NPN | | | |
| Q017 | 2SC3315(C,D) | TR. SI, NPN | | | |
| Q018 | 2SC2912(S) | 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-BL | 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 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R006 | RN14BK2C1303F | RES. METAL FILM | 130K | 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 | RN14BK2C5101F | RES. METAL FILM | 5.1K | 1% | 1/6W |
| R011 | RN14BK2C5101F | 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 |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| 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 |
| R028 | RD14BB2C512J | RES. CARBON | 5.1K | 5% | 1/6W |
| R029 | RD14BB2C512J | RES. CARBON | 5.1K | 5% | 1/6W |
| R030 | RD14BB2C272J | RES. CARBON | 2.7K | 5% | 1/6W |
| R031 | RD14BB2C681J | RES. CARBON | 680 | 5% | 1/6W |
| R032 | RN14BK2C2201F | RES. METAL FILM | 2.2K | 1% | 1/6W |
| R033 | RN14BK2C9101F | RES. METAL FILM | 9.1K | 1% | 1/6W |
| R034 | RD14BB2C510J | RES. CARBON | 51 | 5% | 1/6W |
| R035 | RD14BB2C510J | RES. CARBON | 51 | 5% | 1/6W |
| R036 | RD14BB2C101J | RES. CARBON | 100 | 5% | 1/6W |
| R037 | RD14BB2C101J | RES. CARBON | 100 | 5% | 1/6W |
| R038 | RD14BB2C332J | RES. CARBON | 3.3K | 5% | 1/6W |
| R039 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R040 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R041 | RD14BB2E751J | RES. CARBON | 750 | 5% | 1/4W |
| R042 | RD14BB2C242J | RES. CARBON | 2.4K | 5% | 1/6W |
| R043 | NO USE | | | | |
| R044 | RD14BB2C361J | RES. CARBON | 360 | 5% | 1/6W |
| R045 | RD14BB2C221J | RES. CARBON | 220 | 5% | 1/6W |
| R046 | RD14BB2C272J | RES. CARBON | 2.7K | 5% | 1/6W |
| R047 | RD14BB2C622J | RES. CARBON | 6.2K | 5% | 1/6W |
| R048 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R049 | RD14BB2C753J | RES. CARBON | 75K | 5% | 1/6W |
| R050 | RD14BB2C124J | RES. CARBON | 120K | 5% | 1/6W |
| R051 | RD14BB2C752J | RES. CARBON | 7.5K | 5% | 1/6W |
| R052 | RD14BB2C132J | RES. CARBON | 1.3K | 5% | 1/6W |
| R053 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| R054 | RD14BB2C124J | RES. CARBON | 120K | 5% | 1/6W |
| R055 | RD14BB2C221J | RES. CARBON | 220 | 5% | 1/6W |
| R056 | RD14BB2C562J | RES. CARBON | 5.6K | 5% | 1/6W |
| R057 | RD14BB2C124J | RES. CARBON | 120K | 5% | 1/6W |
| R058 | RD14BB2C124J | RES. CARBON | 120K | 5% | 1/6W |
| R059 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| R060 | RD14BB2C332J | RES. CARBON | 3.3K | 5% | 1/6W |
| R061 | RD14BB2C561J | RES. CARBON | 560 | 5% | 1/6W |
| R062 | RD14BB2C683J | RES. CARBON | 68K | 5% | 1/6W |
| R063 | RD14BB2C683J | RES. CARBON | 68K | 5% | 1/6W |
| R064 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R065 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R066 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R067 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R068 | RN14BK2C6802F | RES. METAL FILM | 68K | 1% | 1/6W |
| R069 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R070 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R071 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R072 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R073 | RD14BB2C680J | RES. CARBON | 68 | 5% | 1/6W |
| R074 | R92-0793-05 | RES. FIXED | 15M | 5% | 1/2W |
| R075 | R92-1027-05 | RES. FIXED | 8.2M | 5% | 1/2W |
| R076 | R92-1051-05 | RES. FIXED | 4.7M | 5% | 1W |
| R077 | R92-1413-05 | RES. FIXED | 9.1M | 5% | 1W |
| R078 | R92-0755-05 | RES. FIXED | 3M | 5% | 1/2W |
| R079 | R92-0756-05 | RES. FIXED | 47M | 5% | 1/2W |
| R080 | RD14BB2C562J | RES. CARBON | 5.6K | 5% | 1/6W |
| R081 | RD14BB2C152J | RES. CARBON | 1.5K | 5% | 1/6W |
| R082 | RD14BB2C152J | RES. CARBON | 1.5K | 5% | 1/6W |
| R083 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R084 | RD14BB2C221J | RES. CARBON | 220 | 5% | 1/6W |
| R085 | RD14BB2C134J | RES. CARBON | 130K | 5% | 1/6W |
| R086 | RD14BB2C104J | RES. CARBON | 100K | 5% | 1/6W |
| R087 | RD14BB2C104J | RES. CARBON | 100K | 5% | 1/6W |
| R088 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R091 | RD14BB2C101J | RES. CARBON | 100 | 5% | 1/6W |
| R092 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R093 | RD14BB2C114J | RES. CARBON | 110K | 5% | 1/6W |
| R094 | RD14BB2C303J | RES. CARBON | 30K | 5% | 1/6W |
| TC001 | C05-0405-05 | CAP. TRIMMER | 20P | | |
| TC002 | C05-0439-05 | CAP. TRIMMER | 40P | | |
| TC003 | C05-0403-05 | CAP. TRIMMER | 2P | | |
| VR001 | R12-1028-05 | RES. SEMI FIXED | 4.7KB | | |
| VR002 | R12-3041-05 | RES. SEMI FIXED | 10KB | | |
| VR003 | R12-3042-05 | RES. SEMI FIXED | 47KB | | |
| VR004 | R05-8001-05 | V.R. | 3MB | | |
| VR005 | R03-3504-05 | V.R. WITH SW | 10KB | | |

## FILTER UNIT

### X70-1020-00

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | E18-0364-05 | AC INLET | 3P | | |
| | E23-0503-05 | TERMINAL | | | |
| | J25-5038-72 | PCB (UNMOUNTED) | | | |
| C001 | C91-0551-05 | CAP. POLYESTER | 0.22 | 10% | 630V |
| C002 | C91-0575-05 | CAP. CERAMIC | 1000P | | 400V |
| C003 | C91-0575-05 | CAP. CERAMIC | 1000P | | 400V |
| C004 | CE04EW1H010M | CAP. ELECTRO | 1 | 20% | 50V |
| D001 | 1SS132 | DIODE | | | |
| IC001 | ON3101 | IC, PHOTO COUPLER | | | |
| L001 | L33-0808-05 | CHOKE COIL | | | |
| P024 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| R001 | RD14BY2H224J | RES. CARBON | 220K | 5% | 1/2W |
| R002 | RD14BY2H225J | RES. CARBON | 2.2M | 5% | 1/2W |

## VERTICAL PREAMP UNIT

### X73-1500-04

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | E23-0557-14 | EARTH LUG | | | |
| | E29-0504-05 | TEFLON TERMINAL | | | |
| | J25-5038-72 | PCB (UNMOUNTED) | | | |
| | L92-0110-05 | FERRITE BEADS | | | |
| | R92-0150-05 | JUMPING RES. | ZERO OHM | | |
| | 002-0001-05 | BRAIDED WIRE | | | |
| | 212-2014-05 | 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 | CE04EW1A470M | 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 | CE04EW1A101M | CAP. ELECTRO | 100 | 20% | 10V |
| C010 | CM93BD2A680J | CAP. MICA | 68P | 5% | 100V |
| C011 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C012 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C013 | CK45B1H472K | CAP. CERAMIC | 4700P | 10% | 50V |
| C014 | CC45CH1H020C | CAP. CERAMIC | 2P | 0.25P | 50V |
| C015 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C016 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C017 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C018 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C019 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C020 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C021 | NO USE | | | | |
| C022 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C023 | NO USE | | | | |
| C024 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C025 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C026 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C027 | CC45CH1H390J | CAP. CERAMIC | 39P | 5% | 50V |
| C028 | CC45CH1H050C | CAP. CERAMIC | 5P | 0.25P | 50V |
| C029 | CK45B1H102K | CAP. CERAMIC | 1000P | 10% | 50V |
| C030 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C031 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C032 | CQ92FM1H104K | CAP. MYLAR | 0.1 | 10% | 50V |
| C033 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C034 | CC45SL1H101J | CAP. CERAMIC | 100P | 5% | 50V |
| C035 | CC45SL1H470J | CAP. CERAMIC | 47P | 5% | 50V |
| C036 | C91-0502-05 | CAP. METAL FILM | 0.01 | 20% | 630V |
| C037 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C038 | CC45CH1H151J | CAP. CERAMIC | 150P | 5% | 50V |
| C039 | CE04EW1A470M | CAP. ELECTRO | 47 | 20% | 10V |
| C040 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C041 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C042 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C043 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| C044 | CE04EW1A101M | 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 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| C051 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C052 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C053 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C054 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C055 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C058 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C059 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C060 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C061 | CK45F1H103Z | 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 | CK45F1H103Z | 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 | CC45SL1H151J | CAP. CERAMIC | 150P | 5% | 50V |
| C076 | CC45SL1H151J | CAP. CERAMIC | 150P | 5% | 50V |
| C077 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C080 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C088 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C089 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C090 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C091 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C092 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C093 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C094 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C095 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C096 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C097 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C098 | CE04EW1C101M | CAP. ELECTRO | 100 | 20% | 16V |
| C099 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C100 | CE04EW1A101M | CAP. ELECTRO | 100 | 20% | 10V |
| C101 | CE04EW1A470M | CAP. ELECTRO | 47 | 20% | 10V |
| C102 | CE04EW1A470M | CAP. ELECTRO | 47 | 20% | 10V |
| C103 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C104 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C105 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C106 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C107 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C108 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C109 | CE04EW1C100M | CAP. ELECTRO | 10 | 20% | 16V |
| C110 | CE04EW1C101M | CAP. ELECTRO | 100 | 20% | 16V |
| C111 | CE04EW1A101M | CAP. ELECTRO | 100 | 20% | 10V |
| C112 | CE04EW1A470M | CAP. ELECTRO | 47 | 20% | 10V |
| C113 | CE04EW1A470M | CAP. ELECTRO | 47 | 20% | 10V |
| C114 | CK45F1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C115 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C116 | NO USE | | | | |
| C117 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C118 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| 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 | CE04EW1A470M | CAP. ELECTRO | 47 | 20% | 10V |
| C124 | CE04EW1A470M | CAP. ELECTRO | 47 | 20% | 10V |
| C128 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C132 | CC45SL1H101J | CAP. CERAMIC | 100P | 5% | 50V |
| C135 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| 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 |
| C148 | CC45CH1H020C | CAP. CERAMIC | 2P | 0.25P | 50V |
| C149 | CC45CH1H020C | CAP. CERAMIC | 2P | 0.25P | 50V |
| C150 | CC45CH1H020C | CAP. CERAMIC | 2P | 0.25P | 50V |
| C153 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| C154 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| C155 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| C156 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| C157 | CC45CH1H220J | CAP. CERAMIC | 22P | 5% | 50V |
| C158 | CC45CH1H220J | CAP. CERAMIC | 22P | 5% | 50V |
| C159 | CC45CH1H030C | CAP. CERAMIC | 3P | 0.25P | 50V |
| C160 | CC45CH1H030C | CAP. CERAMIC | 3P | 0.25P | 50V |

| REF.NO | PARTS NO | NAME & DESCRIPTION | |
|---|---|---|---|
| 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 |
| D037 | 1SS132 | DIODE | |
| D038 | 1SS132 | DIODE | |
| D039 | 1SS132 | DIODE | |
| D040 | 1SS132 | DIODE | |
| D041 | 1SS132 | DIODE | |
| D046 | 1SS132 | DIODE | |
| D047 | 1SS132 | DIODE | |
| D048 | 1SS132 | DIODE | |
| D049 | 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 GATE | |
| IC004 | MC10104L | IC, QUAD 2-INPUT AND GATE | |
| IC005 | MC10131L | IC, DUAL D-FLIP FLOP | |
| IC006 | NO USE | | |
| IC007 | MC10102L | IC, QUAD 2-INPUT NOR GATE | |
| IC008 | LM337LZ | IC, REGULATOR | |
| IC009 | LM317LZ | IC, REGULATOR | |
| L001 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L002 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L003 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L004 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L005 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L006 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L007 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L008 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L009 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L010 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L011 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) |
| L012 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L013 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L014 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L015 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L016 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L017 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L018 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L019 | NO USE | | |
| L020 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L021 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L022 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| L023 | L40-4791-02 | FERRI INDUCTOR | 4.7UH (4H) |
| P001 | E40-0473-05 | PIN CONNECTOR | 4P |
| P002 | E40-1273-05 | PIN CONNECTOR | 12P |
| P003 | E40-0473-05 | PIN CONNECTOR | 4P |
| P004 | E40-0473-05 | PIN CONNECTOR | 4P |
| P007 | E40-0573-05 | PIN CONNECTOR | 5P |
| P008 | E40-0573-05 | PIN CONNECTOR | 5P |
| P009 | E40-0315-05 | PIN CONNECTOR | 3P |
| P014 | E40-0573-05 | PIN CONNECTOR | 5P |
| P015 | E40-0273-05 | PIN CONNECTOR | 2P |
| P016 | E40-0273-05 | PIN CONNECTOR | 2P |
| P019 | E40-0273-05 | PIN CONNECTOR | 2P |
| P020 | E40-0573-05 | PIN CONNECTOR | 5P |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| P021 | E40-0273-05 | PIN CONNECTOR 2P |
| 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(S,T) | TR. SI, NPN |
| Q007 | 2SC3354(S,T) | TR. SI, NPN |
| Q008 | 2SC3066 | TR. SI, NPN-DUAL |
| Q009 | 2SC3354(S,T) | TR. SI, NPN |
| Q010 | 2SC3354(S,T) | TR. SI, NPN |
| Q011 | 2SC3354(S,T) | TR. SI, NPN |
| Q012 | 2SC3354(S,T) | 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,C) | TR. SI, PNP |
| Q019 | 2SA1323(B,C) | TR. SI, PNP |
| Q020 | 2SC3354(S,T) | TR. SI, NPN |
| Q021 | 2SC3354(S,T) | 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(S,T) | TR. SI, NPN |
| Q029 | 2SC3354(S,T) | 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(S,T) | TR. SI, NPN |
| Q036 | 2SC3354(S,T) | TR. SI, NPN |
| Q037 | 2SC3066 | TR. SI, NPN-DUAL |
| Q038 | 2SC3354(S,T) | TR. SI, NPN |
| Q039 | 2SC3354(S,T) | TR. SI, NPN |
| Q040 | 2SC3354(S,T) | TR. SI, NPN |
| Q041 | 2SC3354(S,T) | 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,C) | TR. SI, PNP |
| Q053 | 2SA1323(B,C) | TR. SI, PNP |
| Q054 | 2SC3354(S,T) | TR. SI, NPN |
| Q055 | 2SC3354(S,T) | 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(S,T) | TR. SI, NPN |
| Q062 | 2SC3354(S,T) | TR. SI, NPN |
| Q063 | 2SC3354(S,T) | TR. SI, NPN |
| Q064 | 2SA1309(Q,R) | TR. SI, PNP |
| Q065 | 2SC3354(S,T) | TR. SI, NPN |
| Q066 | 2SC3354(S,T) | 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 |
| Q081 | 2SC3311(R) | TR. SI, NPN |
| Q082 | 2SA1309(Q,R) | TR. SI, PNP |
| Q083 | 2SA1309(Q,R) | TR. SI, PNP |
| R001 | RD14BB2E684J | RES. CARBON 680K 5% 1/4W |
| R002 | RN14BK2E1803D | RES. METAL FILM 180K 0.5% 1/4W |
| R003 | RN14BK2E8203D | 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 |

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| 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 | R92-1061-05 | JUMPING RES. ZERO OHM |
| R022 | R92-1061-05 | JUMPING RES. ZERO OHM |
| 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 | RN14BK2C8200F | RES. METAL FILM 820 1% 1/6W |
| R028 | RN14BK2C3001F | RES. METAL FILM 3K 1% 1/6W |
| R029 | RD14BB2C474J | RES. CARBON 470K 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 | RD14BB2C201J | RES. CARBON 200 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 | NO USE | |
| 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 |
| 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 | RD14BB2C221J | RES. CARBON 220 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 | RD14BB2C223J | RES. CARBON 22K 5% 1/6W |
| R092 | RD14BB2C100J | RES. CARBON 10 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 | NO USE | |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| 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 | RN14BK2E8203D | 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 | R92-1061-05 | JUMPING RES. | ZERO | OHM | |
| R131 | R92-1061-05 | JUMPING RES. | ZERO | OHM | |
| 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 | RN14BK2C8200F | RES. METAL FILM | 820 | 1% | 1/6W |
| R137 | RN14BK2C3001F | RES. METAL FILM | 3K | 1% | 1/6W |
| R138 | RD14BB2C474J | RES. CARBON | 470K | 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 | RD14BB2C201J | RES. CARBON | 200 | 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 |
| 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 | NO USE | | | | |
| 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 | NO USE | | | | |
| 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 |

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| 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 | RD14BB2C221J | RES. CARBON | 220 | 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 | NO USE | | | | |
| 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 |
| 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 |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| 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 | NO USE | | | | |
| 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 | NO USE | | | | |
| R312 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R313 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R314 | RD14BB2C471J | RES. CARBON | 470 | 5% | 1/6W |
| R315 | RD14BB2C270J | RES. CARBON | 27 | 5% | 1/6W |
| R316 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| R317 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R318 | RD14BB2C471J | RES. CARBON | 470 | 5% | 1/6W |
| R319 | RD14BB2C270J | RES. CARBON | 27 | 5% | 1/6W |
| R320 | 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 |
| 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 |
| R344 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| R350 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| R351 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| R352 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| R353 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| R354 | RD14BB2C221J | RES. CARBON | 220 | 5% | 1/6W |
| R355 | RD14BB2C221J | RES. CARBON | 220 | 5% | 1/6W |
| R356 | NO USE | | | | |
| R357 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R358 | RD14BB2C430J | RES. CARBON | 43 | 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 | C05-0309-05 | CAP. TRIMMER | 40P | | |
| TC005 | C05-0309-05 | CAP. TRIMMER | 40P | | |
| TC006 | C05-0031-15 | CAP. TRIMMER | 10P | | |
| TC007 | C05-0031-15 | CAP. TRIMMER | 10P | | |
| TP003 | E40-0211-05 | PIN CONNECTOR | 2P | | |
| VR001 | R12-0540-05 | RES. SEMI FIXED | 500B | | |
| VR002 | R12-3520-05 | RES. SEMI FIXED | 10KB | | |
| VR003 | NO USE | | | | |
| VR004 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR005 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR006 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR007 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR008 | R12-0539-05 | RES. SEMI FIXED | 200B | | |
| VR009 | R12-3520-05 | RES. SEMI FIXED | 10KB | | |
| VR010 | NO USE | | | | |
| VR011 | R12-0540-05 | RES. SEMI FIXED | 500B | | |
| VR012 | R12-3520-05 | RES. SEMI FIXED | 10KB | | |
| VR013 | NO USE | | | | |
| VR014 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR015 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR016 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR017 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR018 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR019 | R12-3520-05 | RES. SEMI FIXED | 10KB | | |
| VR020 | R12-0539-05 | RES. SEMI FIXED | 200B | | |
| VR025 | R12-0539-05 | RES. SEMI FIXED | 200B | | |

## VERTICAL OUTPUT AMP UNIT

## X73-1510-04

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | E23-0512-05 | TERMINAL | | | |
| | F02-0502-04 | HEAT SINK | | | |
| | F02-0513-04 | HEAT SINK | | | |
| | J25-5039-52 | PCB (UNMOUNTED) | | | |
| | L92-0110-05 | FERRITE BEADS | | | |
| | N09-0709-05 | SCREW, WITH WASHER | | | |
| | N89-3008-41 | SCREW, BINDING TAP TITE M3X8 | | | |
| | 212-1018-05 | TUBE (PLASTIC) | | | |
| | 212-2014-05 | TUBE (PLASTIC) | | | |
| | 420-0010-05 | ADHESIVES | | | |
| | 490-0010-05 | TAPE, MYLAR | | | |
| C001 | CC45CH1H470J | CAP. CERAMIC | 47P | 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 | CC45CH1H100D | CAP. CERAMIC | 10P | 0.5P | 50V |
| C007 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C008 | CK45B2H472K | CAP. CERAMIC | 4700P | 10% | 500V |
| C009 | NO USE | | | | |
| 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 | CE04EW1V330M | CAP. ELECTRO | 33 | 20% | 35V |
| C016 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C017 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| C018 | CE04EW1C470M | 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 | CE04EW1C470M | 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 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| D002 | 1SV71 | DIODE, VARIABLE CAPACITANCE | | | |
| D003 | 1SV71 | DIODE, VARIABLE CAPACITANCE | | | |
| D004 | MTZ7.5JC | DIODE, ZENER | 7.5V | | |
| L001 | L33-0806-05 | CHOKE COIL (0.52UH) | | | |
| L002 | L33-0806-05 | CHOKE COIL (0.52UH) | | | |
| L005 | L40-4701-03 | FERRI INDUCTOR | 47UH (5H) | | |
| L006 | L40-4701-03 | FERRI INDUCTOR | 47UH (5H) | | |
| L007 | L40-4701-03 | FERRI INDUCTOR | 47UH (5H) | | |
| L008 | L40-4701-03 | FERRI INDUCTOR | 47UH (5H) | | |
| L009 | NO USE | | | | |
| P010 | E40-0315-05 | PIN CONNECTOR | 3P | | |
| P013 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| P020 | E40-0573-05 | PIN CONNECTOR | 5P | | |
| P021 | NO USE | | | | |
| P022 | E40-0773-05 | PIN CONNECTOR | 7P | | |
| 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(D)*S | TR. SI, NPN | | | |
| Q012 | 2SC1164(D)*S | TR. SI, NPN | | | |
| Q013 | NO USE | | | | |
| 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 | | | |
| R002 | RD14BB2C220J | RES. CARBON | 22 | 5% | 1/6W |
| R003 | RD14BB2C220J | RES. CARBON | 22 | 5% | 1/6W |
| R004 | RD14BB2C432J | RES. CARBON | 4.3K | 5% | 1/6W |
| R005 | RN14BK2C75R0F | RES. METAL FILM | 75.0 | 1% | 1/6W |
| R006 | RN14BK2C75R0F | RES. METAL FILM | 75.0 | 1% | 1/6W |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| 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 |
| 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 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R022 | RD14BB2C153J | RES. CARBON | 15K | 5% | 1/6W |
| R023 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| R024 | RN14BK2E36R0F | RES. METAL FILM | 36.0 | 1% | 1/4W |
| R025 | RN14BK2E36R0F | RES. METAL FILM | 36.0 | 1% | 1/4W |
| R026 | RD14BB2E220J | RES. CARBON | 22 | 5% | 1/4W |
| R027 | RD14BB2E220J | RES. CARBON | 22 | 5% | 1/4W |
| R028 | RD14BB2E220J | RES. CARBON | 22 | 5% | 1/4W |
| R029 | RD14BB2C471J | RES. CARBON | 470 | 5% | 1/6W |
| R030 | RD14BB2C471J | RES. CARBON | 470 | 5% | 1/6W |
| R031 | RS14AB3H471J | RES. METAL FILM | 470 | 5% | 5W |
| R032 | RS14AB3H471J | RES. METAL FILM | 470 | 5% | 5W |
| 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 | RD14BB2C220J | RES. CARBON | 22 | 5% | 1/6W |
| R043 | RN14BK2C47R0F | RES. METAL FILM | 47.0 | 1% | 1/6W |
| R044 | RD14BB2C220J | RES. CARBON | 22 | 5% | 1/6W |
| R045 | RN14BK2C47R0F | RES. METAL FILM | 47.0 | 1% | 1/6W |
| R046 | RN14BK2C91R0F | 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 | NO USE | | | | |
| R052 | R92-1061-05 | JUMPING RES. | ZERO OHM | | |
| R053 | RD14BB2C101J | RES. CARBON | 100 | 5% | 1/6W |
| R054 | RD14BB2C822J | RES. CARBON | 8.2K | 5% | 1/6W |
| R055 | RD14BB2C911J | RES. CARBON | 910 | 5% | 1/6W |
| R056 | RD14BB2C911J | RES. CARBON | 910 | 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 | SDT1000 | THERMISTOR | | | |
| VR001 | R12-0567-05 | RES. SEMI FIXED | 500B | | |
| VR002 | R12-0567-05 | RES. SEMI FIXED | 500B | | |
| VR003 | R12-0567-05 | RES. SEMI FIXED | 500B | | |

## SWEEP ROTARY UNIT

### X74-1310-03

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | J25-2971-13 | PCB (UNMOUNTED) | | | |
| D001 | 1SS132 | DIODE | | | |
| D002 | 1SS135 | DIODE | | | |
| D003 | 1SS135 | DIODE | | | |
| D004 | 1SS135 | DIODE | | | |
| D005 | 1SS135 | DIODE | | | |
| D006 | 1SS135 | DIODE | | | |
| D007 | 1SS135 | DIODE | | | |
| D008 | 1SS135 | DIODE | | | |
| J040 | E31-2507-05 | LEAD WIRE WITH CONNECTOR | | | |
| J041 | E31-2508-05 | LEAD WIRE WITH CONNECTOR | | | |
| J057 | E31-2509-25 | LEAD WIRE WITH CONNECTOR | | | |
| R001 | RN14BK2C3603F | RES. METAL FILM | 360K | 1% | 1/6W |
| R002 | RN14BK2C1203F | RES. METAL FILM | 120K | 1% | 1/6W |
| R003 | RN14BK2C3002F | RES. METAL FILM | 30K | 1% | 1/6W |
| R004 | RN14BK2C3002F | RES. METAL FILM | 30K | 1% | 1/6W |
| R005 | RN14BK2C3602F | RES. METAL FILM | 36K | 1% | 1/6W |
| R006 | RN14BK2C1202F | RES. METAL FILM | 12K | 1% | 1/6W |
| R007 | RN14BK2C3001F | RES. METAL FILM | 3K | 1% | 1/6W |
| R008 | RN14BK2C3001F | RES. METAL FILM | 3K | 1% | 1/6W |
| R009 | RN14BK2C3601F | RES. METAL FILM | 3.6K | 1% | 1/6W |
| 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 | RN14BK2C3603F | RES. METAL FILM | 360K | 1% | 1/6W |
| R021 | RN14BK2C1203F | RES. METAL FILM | 120K | 1% | 1/6W |
| R022 | RN14BK2C3002F | RES. METAL FILM | 30K | 1% | 1/6W |
| R023 | RN14BK2C3002F | RES. METAL FILM | 30K | 1% | 1/6W |
| R024 | RN14BK2C3602F | RES. METAL FILM | 36K | 1% | 1/6W |
| R025 | RN14BK2C1202F | RES. METAL FILM | 12K | 1% | 1/6W |
| R026 | RN14BK2C3001F | RES. METAL FILM | 3K | 1% | 1/6W |
| R027 | RN14BK2C3001F | RES. METAL FILM | 3K | 1% | 1/6W |
| R028 | RN14BK2C3601F | RES. METAL FILM | 3.6K | 1% | 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 | S02-2513-05 | ROTARY SWITCH | | | |
| S002 | S02-2513-05 | ROTARY SWITCH | | | |
| VR001 | S02-2513-05 | ROTARY SWITCH | | | |

## TRIG SWEEP UNIT

### X74-1350-02

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | J25-5039-52 | PCB (UNMOUNTED) | | | |
| | J61-0408-05 | WIRE WRAPPING BAND | | | |
| | 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 | CE04EW1E100M | CAP. ELECTRO | 10 | 20% | 25V |
| C003 | CE04EW1E100M | 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 | CE04EW1V220M | 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 | CE04EW1H4R7M | CAP. ELECTRO | 4.7 | 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 | CQ93M1H473K | CAP. MYLAR | 0.047 | 10% | 50V |
| C017 | CQ93BP2A104F | CAP. MYLAR | 0.1 | 1% | 100V |
| C018 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C019 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C020 | CC45SL1H331J | CAP. CERAMIC | 330P | 5% | 50V |
| C021 | CQ93BP2A102F | CAP. MYLAR | 1000P | 1% | 100V |
| C022 | NO USE | | | | |
| C023 | CM93BD2A101J | CAP. MICA | 100P | 5% | 100V |
| C024 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C025 | CC45SL1H471J | CAP. CERAMIC | 470P | 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 |
| C034 | C91-0549-05 | CAP. TANTALUM | 1 | 20% | 35V |
| C035 | NO USE | | | | |
| C036 | CE04EW1V220M | CAP. ELECTRO | 22 | 20% | 35V |
| C037 | C91-0549-05 | CAP. TANTALUM | 1 | 20% | 35V |
| C038 | NO USE | | | | |
| C039 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C040 | NO USE | | | | |
| C041 | C91-0583-05 | CAP. PLASTIC | 10 | 10% | |
| C042 | NO USE | | | | |
| C043 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C044 | NO USE | | | | |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| C045 | CQ93BP2A104F | CAP. MYLAR | 0.1 | 1% | 100V |
| C046 | NO USE | | | | |
| C047 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C048 | NO USE | | | | |
| C049 | CQ93BP2A102F | CAP. MYLAR | 1000P | 1% | 100V |
| C053 | CM93BD2A101J | CAP. MICA | 100P | 5% | 100V |
| C054 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C055 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C056 | CE04EW1C100M | 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 | CQ93M1H472K | CAP. MYLAR | 4700P | 10% | 50V |
| C067 | CQ93M1H472K | CAP. MYLAR | 4700P | 10% | 50V |
| C068 | CE04EW1C470M | CAP. ELECTRO | 47 | 20% | 16V |
| C069 | NO USE | | | | |
| C070 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C071 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C072 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C073 | CE04EW1C470M | CAP. ELECTRO | 47 | 20% | 16V |
| C074 | CE04EW1C470M | CAP. ELECTRO | 47 | 20% | 16V |
| C075 | CE04EW1C470M | CAP. ELECTRO | 47 | 20% | 16V |
| C076 | CE04EW1C101M | CAP. ELECTRO | 100 | 20% | 16V |
| C077 | CE04EW1C470M | CAP. ELECTRO | 47 | 20% | 16V |
| C078 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C079 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C080 | CE04EW1C101M | 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 | CE04EW1A470M | CAP. ELECTRO | 47 | 20% | 10V |
| C086 | CE04EW1A101M | CAP. ELECTRO | 100 | 20% | 10V |
| C087 | CE04EW1A101M | CAP. ELECTRO | 100 | 20% | 10V |
| C088 | CE04EW1A101M | CAP. ELECTRO | 100 | 20% | 10V |
| C089 | CE04EW1A221M | 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 | CE04EW1E220M | CAP. ELECTRO | 22 | 20% | 25V |
| C105 | CE04EW1E220M | CAP. ELECTRO | 22 | 20% | 25V |
| C106 | CE04EW1E220M | CAP. ELECTRO | 22 | 20% | 25V |
| C107 | CE04EW1E101M | CAP. ELECTRO | 100 | 20% | 25V |
| C108 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C109 | CE04EW1E330M | CAP. ELECTRO | 33 | 20% | 25V |
| C110 | CE04EW1J4R7M | CAP. ELECTRO | 4.7 | 20% | 63V |
| C111 | CE04EW1J100M | 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 | CE04EW1C470M | CAP. ELECTRO | 47 | 20% | 16V |
| C117 | CC45SL1H220J | CAP. CERAMIC | 22P | 5% | 50V |
| C118 | CC45SL1H331J | CAP. CERAMIC | 330P | 5% | 50V |
| C119 | CC45CH1H100D | CAP. CERAMIC | 10P | 0.5P | 50V |
| D002 | 1SS132 | DIODE | | | |
| D003 | 1SS132 | DIODE | | | |
| D004 | 1SS132 | DIODE | | | |
| D005 | MTZ3.0JB | DIODE, ZENER | 3.0V | | |
| D006 | 1SS132 | DIODE | | | |
| D007 | 1SS132 | DIODE | | | |
| D008 | 1SS132 | DIODE | | | |
| D009 | MA700 | DIODE | | | |
| D010 | 1SS132 | DIODE | | | |
| D011 | 1SS132 | DIODE | | | |
| D012 | 1SS132 | DIODE | | | |
| D013 | MTZ16JA | DIODE, ZENER | 15V | | |
| D014 | 1SS132 | DIODE | | | |
| D015 | 1SS132 | DIODE | | | |
| D016 | 1SS132 | DIODE | | | |

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| D017 | 1SS132 | DIODE |
| D018 | 1SS132 | DIODE |
| D019 | 1SS132 | DIODE |
| D020 | 1SS132 | DIODE |
| D021 | 1SS16 | DIODE |
| D022 | 1SS132 | DIODE |
| D023 | 1SS132 | DIODE |
| D024 | 1SS132 | DIODE |
| D025 | 1SS132 | DIODE |
| D026 | NO USE | |
| D027 | 1SS132 | DIODE |
| D028 | 1SS132 | DIODE |
| D029 | NO USE | |
| D030 | 1SS132 | DIODE |
| D034 | 1SS132 | DIODE |
| D035 | NO USE | |
| D036 | 1SS132 | DIODE |
| D037 | 1SS132 | DIODE |
| D038 | 1SS132 | DIODE |
| D039 | MA700 | DIODE |
| D040 | 1SS132 | DIODE |
| D041 | 1SS132 | DIODE |
| D042 | 1SS132 | DIODE |
| D043 | MTZ16JA | DIODE, ZENER 15V |
| 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 | SV06YS | DIODE, SILICON VARISTOR |
| D056 | 1S1587 | DIODE |
| D057 | 1S1587 | DIODE |
| D058 | 1S1587 | DIODE |
| D059 | 1S1587 | DIODE |
| D060 | SV06YS | DIODE, SILICON VARISTOR |
| D061 | 1SS132 | DIODE |
| D066 | 1SS132 | DIODE |
| D067 | 1SS132 | DIODE |
| D068 | 1SS132 | DIODE |
| 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-FLIP FLOP |
| IC003 | LF412CN | IC, DUAL JFET INPUT OP AMP |
| IC004 | NO USE | |
| IC005 | MC10H131L | IC, DUAL D-FLIP FLOP |
| IC006 | LF412CN | IC, DUAL JFET INPUT OP AMP |
| IC007 | MC10104L | IC, QUAD 2-INPUT AND GATE |
| IC008 | MC10103L | IC, QUAD 2-INPUT OR GATE |
| IC009 | NO USE | |
| IC010 | MC10104L | IC, QUAD 2-INPUT AND GATE |
| IC011 | MC10104L | IC, QUAD 2-INPUT AND GATE |
| IC012 | MC10102L | IC, QUAD 2-INPUT NOR GATE |
| IC013 | MC10131L | IC, DUAL D-FLIP FLOP |
| IC014 | SN7406N | IC, HEX INVERTER |
| IC015 | MC10104L | IC, QUAD 2-INPUT AND GATE |
| IC016 | NO USE | |
| IC017 | MC78L15ACP | IC, VOLTAGE REGULATOR (5V) |
| L001 | L40-3392-01 | FERRI INDUCTOR 3.3UH (3H) |
| L002 | L40-3392-01 | FERRI INDUCTOR 3.3UH (3H) |
| L003 | L40-2201-03 | FERRI INDUCTOR 22UH (5H) |
| P013 | E40-0273-05 | PIN CONNECTOR 2P |
| P014 | E40-0573-05 | PIN CONNECTOR 5P |
| P028 | E40-0473-05 | PIN CONNECTOR 4P |
| P035 | E40-0473-05 | PIN CONNECTOR 4P |
| P036 | E40-0673-05 | PIN CONNECTOR 6P |
| P037 | E40-0773-05 | PIN CONNECTOR 7P |
| P038 | E40-0373-05 | PIN CONNECTOR 3P |
| P039 | E40-0773-05 | PIN CONNECTOR 7P |
| P040 | E40-0873-05 | PIN CONNECTOR 8P |
| P041 | E40-0873-05 | PIN CONNECTOR 8P |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION |
|---|---|---|
| P042 | NO USE | |
| P043 | E40-0273-05 | PIN CONNECTOR 2P |
| P046 | E40-0274-05 | PIN CONNECTOR 2P |
| P047 | E40-0573-05 | PIN CONNECTOR 5P |
| P048 | E40-1811-05 | PIN CONNECTOR 18P |
| P052 | E40-0273-05 | PIN CONNECTOR 2P |
| P057 | E40-0373-05 | PIN CONNECTOR 3P |
| Q001 | 2SC3311(R) | TR. SI, NPN |
| Q002 | 2SC3311(R) | TR. SI, NPN |
| Q003 | 2SC3311(R) | TR. SI, NPN |
| Q004 | 2SA1323(B,C) | TR. SI, PNP |
| Q005 | 2SC3354(S,T) | TR. SI, NPN |
| Q006 | 2SC1973(T) | TR. SI, NPN |
| Q007 | 2SA1309(Q,R) | TR. SI, PNP |
| Q008 | 2SD438(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 | UPA68H(L) | FET, N-CHANNEL DUAL |
| Q019 | 2SC3315(C,D) | TR. SI, NPN |
| Q020 | 2SA1309(Q,R) | TR. SI, PNP |
| Q021 | UPA68H(L) | FET, N-CHANNEL DUAL |
| Q022 | 2SC3315(C,D) | TR. SI, NPN |
| Q023 | 2SC3311(R) | TR. SI, NPN |
| Q024 | 2SC3066 | TR. SI, NPN-DUAL |
| Q025 | NO USE | |
| Q026 | 2SC3311(R) | TR. SI, NPN |
| Q029 | 2SA1323(B,C) | TR. SI, PNP |
| Q030 | 2SA1323(B,C) | TR. SI, PNP |
| Q031 | 2SC3311(R) | TR. SI, NPN |
| Q034 | 2SA1323(B,C) | TR. SI, PNP |
| Q035 | 2SC3354(S,T) | TR. SI, NPN |
| Q036 | 2SC1973(T) | TR. SI, NPN |
| Q037 | 2SA1309(Q,R) | TR. SI, PNP |
| Q038 | 2SD438(F) | TR. SI, NPN |
| Q039 | 2SC3311(R) | TR. SI, NPN |
| Q040 | 2SC3311(R) | TR. SI, NPN |
| Q041 | 2SC3311(R) | TR. SI, NPN |
| Q042 | NO USE | |
| Q043 | 2SC3311(R) | TR. SI, NPN |
| Q044 | NO USE | |
| Q045 | 2SC3311(R) | TR. SI, NPN |
| Q046 | NO USE | |
| Q047 | 2SC3311(R) | TR. SI, NPN |
| Q048 | UPA68H(L) | FET, N-CHANNEL DUAL |
| Q049 | 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,C) | TR. SI, PNP |
| Q073 | 2SC3354(S,T) | TR. SI, NPN |
| Q074 | 2SA1323(B,C) | TR. SI, PNP |
| Q075 | 2SC3354(S,T) | TR. SI, NPN |
| Q076 | 2SA1309(Q,R) | TR. SI, PNP |
| Q077 | 2SA1323(B,C) | 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,C) | TR. SI, PNP |
| 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 |
| 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 | RD14BB2C222J | RES. CARBON 2.2K 5% 1/6W |
| R061 | RD14BB2C122J | RES. CARBON 1.2K 5% 1/6W |
| R062 | RD14BB2C182J | RES. CARBON 1.8K 5% 1/6W |
| R063 | NO USE | |
| R064 | RD14BB2C222J | RES. CARBON 2.2K 5% 1/6W |
| R065 | RD14BB2C152J | RES. CARBON 1.5K 5% 1/6W |
| R066 | NO USE | |
| 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 | RD14BB2C271J | RES. CARBON 270 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 |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| 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 |
| R105 | RD14BB2C102J | RES. CARBON | 1K | 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 |
| R124 | RD14BB2C102J | RES. CARBON | 1K | 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 |
| R151 | RN14BK2C5101F | RES. METAL FILM | 5.1K | 1% | 1/6W |
| R152 | RN14BK2C2401F | RES. METAL FILM | 2.4K | 1% | 1/6W |
| R153 | RD14BB2C123J | RES. CARBON | 12K | 5% | 1/6W |
| R154 | RN14BK2C2402F | RES. METAL FILM | 24K | 1% | 1/6W |
| R155 | RN14BK2C3001F | RES. METAL FILM | 3K | 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 | RN14BK2C3001F | RES. METAL FILM | 3K | 1% | 1/6W |
| R162 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R163 | RD14BB2C104J | RES. CARBON | 100K | 5% | 1/6W |
| R164 | NO USE | | | | |
| R165 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R166 | RD14BB2C104J | RES. CARBON | 100K | 5% | 1/6W |
| R167 | NO USE | | | | |
| R168 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R169 | RD14BB2C104J | RES. CARBON | 100K | 5% | 1/6W |
| R170 | NO USE | | | | |
| 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 | RD14BB2C222J | RES. CARBON | 2.2K | 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 |
| R190 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R191 | NO USE | | | | |
| R192 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R193 | NO USE | | | | |
| 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 | RN14BK2C6801F | RES. METAL FILM | 6.8K | 1% | 1/6W |
| R202 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| R203 | RN14BK2C4701F | RES. METAL FILM | 4.7K | 1% | 1/6W |
| R204 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| R205 | RN14BK2C6801F | RES. METAL FILM | 6.8K | 1% | 1/6W |
| R206 | RN14BK2C3301F | RES. METAL FILM | 3.3K | 1% | 1/6W |
| R207 | RN14BK2C1201F | RES. METAL FILM | 1.2K | 1% | 1/6W |
| R208 | RN14BK2C3301F | RES. METAL FILM | 3.3K | 1% | 1/6W |
| R209 | RN14BK2C1201F | RES. METAL FILM | 1.2K | 1% | 1/6W |
| R210 | RD14BB2C392J | RES. CARBON | 3.9K | 5% | 1/6W |
| R211 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R212 | RD14BB2C132J | RES. CARBON | 1.3K | 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 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R218 | RD14BB2C470J | RES. CARBON | 47 | 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 | RN14BK2C4700F | RES. METAL FILM | 470 | 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 | RN14BK2C1601F | RES. METAL FILM | 1.6K | 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 | RN14BK2C8200F | RES. METAL FILM | 820 | 1% | 1/6W |
| R237 | RN14BK2C8200F | RES. METAL FILM | 820 | 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 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R244 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R245 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| 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 | NO USE | | | | |
| R273 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| R274 | NO USE | | | | |
| 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 | NO USE | | | | |
| 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 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| R291 | RD14BB2C220J | RES. CARBON | 22 | 5% | 1/6W |
| R292 | RD14BB2C271J | RES. CARBON | 270 | 5% | 1/6W |
| R293 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| 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 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R299 | RD14BB2C2R7J | RES. CARBON | 2.7 | 5% | 1/6W |
| R300 | NO USE | | | | |
| R301 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R302 | RN14BK2C9102F | RES. METAL FILM | 91K | 1% | 1/6W |
| R303 | RN14BK2C1003F | RES. METAL FILM | 100K | 1% | 1/6W |
| R304 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R305 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R306 | RD14BB2C223J | RES. CARBON | 22K | 5% | 1/6W |
| R307 | RN14BK2C8201F | RES. METAL FILM | 8.2K | 1% | 1/6W |
| R308 | RN14BK2C1001F | RES. METAL FILM | 1K | 1% | 1/6W |
| R309 | RD14BB2C222J | RES. CARBON | 2.2K | 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 | RD14BB2C820J | RES. CARBON | 82 | 5% | 1/6W |
| R320 | RD14BB2C301J | RES. CARBON | 300 | 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 |
| R330 | RD14BB2C182J | RES. CARBON | 1.8K | 5% | 1/6W |
| R331 | RD14BB2C202J | RES. CARBON | 2K | 5% | 1/6W |
| R332 | RD14BB2C182J | RES. CARBON | 1.8K | 5% | 1/6W |
| R333 | RD14BB2C202J | RES. CARBON | 2K | 5% | 1/6W |
| R334 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R335 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R336 | RD14BB2C561J | RES. CARBON | 560 | 5% | 1/6W |
| TC001 | C05-0309-05 | CAP. TRIMMER | 40P | | |
| TC002 | C05-0309-05 | CAP. TRIMMER | 40P | | |
| TC003 | C05-0031-15 | CAP. TRIMMER | 10P | | |
| TC004 | C05-0031-15 | CAP. TRIMMER | 10P | | |
| TC005 | C05-0031-15 | CAP. TRIMMER | 10P | | |
| TC006 | C05-0031-15 | CAP. TRIMMER | 10P | | |
| VR001 | R12-2512-05 | RES. SEMI FIXED | 5KB | | |
| VR002 | R12-1518-05 | RES. SEMI FIXED | 2KB | | |
| VR003 | R12-2512-05 | RES. SEMI FIXED | 5KB | | |
| VR004 | R12-1518-05 | RES. SEMI FIXED | 2KB | | |
| VR005 | R12-0539-05 | RES. SEMI FIXED | 200B | | |
| VR006 | R12-1517-05 | RES. SEMI FIXED | 1KB | | |
| VR007 | R12-1517-05 | RES. SEMI FIXED | 1KB | | |
| VR008 | R12-1517-05 | RES. SEMI FIXED | 1KB | | |
| VR009 | R12-2512-05 | RES. SEMI FIXED | 5KB | | |
| VR010 | R12-2512-05 | RES. SEMI FIXED | 5KB | | |
| VR011 | R12-1518-05 | RES. SEMI FIXED | 2KB | | |
| VR012 | R12-1518-05 | RES. SEMI FIXED | 2KB | | |
| VR013 | R12-0421-05 | RES. SEMI FIXED | 100B | | |
| VR014 | R12-0540-05 | RES. SEMI FIXED | 500B | | |
| VR015 | R12-1518-05 | RES. SEMI FIXED | 2KB | | |
| VR016 | R12-5516-05 | RES. SEMI FIXED | 100KB | | |
| VR017 | R12-1518-05 | RES. SEMI FIXED | 2KB | | |

## HORIZONTAL OUTPUT AMP UNIT

### X74-1360-02

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | E23-0512-05 | TERMINAL | | | |
| | F01-0849-05 | HEAT SINK | | | |
| | J25-5039-52 | PCB (UNMOUNTED) | | | |
| | N30-3006-41 | SCREW, PAN HD | M3X6 | | |
| C001 | CK45B2H472K | CAP. CERAMIC | 4700P | 10% | 500V |
| C002 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C003 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C004 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C005 | CK45FF1H103Z | 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 | CK45FF1H103Z | 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 | C91-0549-05 | CAP. TANTALUM | 1 | 20% | 35V |
| C015 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C016 | C91-0549-05 | CAP. TANTALUM | 1 | 20% | 35V |
| C017 | CK45B2H472K | CAP. CERAMIC | 4700P | 10% | 500V |
| C018 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C019 | CE04EW1C101M | CAP. ELECTRO | 100 | 20% | 16V |
| C020 | CE04EW1C101M | CAP. ELECTRO | 100 | 20% | 16V |
| C021 | CE04EW2A100M | CAP. ELECTRO | 10 | 20% | 100V |
| C022 | CE04W2C2R2M | CAP. ELECTRO | 2.2 | 20% | 160V |
| C023 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| D001 | 1SS132 | DIODE | | | |
| D002 | MTZ5.1JB | DIODE, ZENER | 5.0V | | |
| D003 | 1SS132 | DIODE | | | |
| D004 | 1SS132 | DIODE | | | |
| L001 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| L002 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| L003 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| L004 | L40-1011-04 | FERRI INDUCTOR | 100UH (7H) | | |
| P027 | E40-0873-05 | PIN CONNECTOR | 8P | | |
| P035 | E40-0473-05 | PIN CONNECTOR | 4P | | |
| P036 | E40-0673-05 | PIN CONNECTOR | 6P | | |
| Q001 | 2SA1323(B,C) | TR. SI, PNP | | | |
| Q002 | 2SA1323(B,C) | TR. SI, PNP | | | |
| Q003 | 2SA1323(B,C) | TR. SI, PNP | | | |
| Q004 | 2SC3311(R) | TR. SI, NPN | | | |
| 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 | 2SC3311(R) | TR. SI, NPN | | | |
| Q010 | 2SC3311(R) | TR. SI, NPN | | | |
| R001 | RD14BB2C272J | RES. CARBON | 2.7K | 5% | 1/6W |
| R002 | RD14BB2C272J | RES. CARBON | 2.7K | 5% | 1/6W |
| R003 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| R004 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| R005 | RD14BB2C152J | RES. CARBON | 1.5K | 5% | 1/6W |
| R006 | RD14BY2H473J | RES. CARBON | 47K | 5% | 1/2W |
| R007 | RD14BY2H473J | RES. CARBON | 47K | 5% | 1/2W |
| R008 | RD14BB2C821J | RES. CARBON | 820 | 5% | 1/6W |
| R009 | RD14BB2C821J | RES. CARBON | 820 | 5% | 1/6W |
| R010 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R011 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R012 | RS14GB3A223J | RES. METAL FILM | 22K | 5% | 1W |
| R013 | RS14GB3A223J | RES. METAL FILM | 22K | 5% | 1W |
| R014 | RD14BB2C134J | RES. CARBON | 130K | 5% | 1/6W |
| R015 | RD14BB2C134J | RES. CARBON | 130K | 5% | 1/6W |
| R016 | RD14BY2H123J | RES. CARBON | 12K | 5% | 1/2W |
| R017 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R018 | RD14BB2C102J | RES. CARBON | 1K | 5% | 1/6W |
| R019 | RD14BB2C220J | RES. CARBON | 22 | 5% | 1/6W |
| R020 | RD14BB2C220J | RES. CARBON | 22 | 5% | 1/6W |
| R021 | RD14BB2C561J | RES. CARBON | 560 | 5% | 1/6W |
| R022 | RD14BB2C561J | RES. CARBON | 560 | 5% | 1/6W |
| R023 | NO USE | | | | |
| R024 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R025 | RD14BB2C472J | RES. CARBON | 4.7K | 5% | 1/6W |
| R026 | RD14BB2C271J | RES. CARBON | 270 | 5% | 1/6W |
| R027 | RD14BB2C512J | RES. CARBON | 5.1K | 5% | 1/6W |

## VERTICAL ATTENUATOR UNIT

### X75-1170-00

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | J25-5215-04 | PCB (UNMOUNTED) | | | |
| | R92-0150-05 | JUMPING RES. | ZERO OHM | | |
| | R92-1061-05 | JUMPING RES. | ZERO OHM | | |
| | S02-4508-05 | ATTENUATOR UNIT | | | |
| | 002-0001-05 | BRAIDED WIRE | | | |
| | 212-2014-05 | TUBE (PLASTIC) | | | |
| | 212-3017-05 | TUBE (PLASTIC) | | | |
| C001 | CC45CH1H100D | CAP. CERAMIC | 10P | 0.5P | 50V |
| C002 | CC45CH1H470J | CAP. CERAMIC | 47P | 5% | 50V |
| C003 | CC45CH1H100D | CAP. CERAMIC | 10P | 0.5P | 50V |
| C004 | CC45CH1H100D | CAP. CERAMIC | 10P | 0.5P | 50V |
| C011 | CC45CH1H100D | CAP. CERAMIC | 10P | 0.5P | 50V |
| C012 | CC45CH1H470J | CAP. CERAMIC | 47P | 5% | 50V |
| C013 | CC45CH1H100D | CAP. CERAMIC | 10P | 0.5P | 50V |
| C014 | CC45CH1H100D | CAP. CERAMIC | 10P | 0.5P | 50V |
| J003 | E31-2906-05 | WIRE ASS'Y (CH2 VARI) | | | |
| J004 | E31-2905-05 | WIRE ASS'Y (CH1 VARI) | | | |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| L001 | L40-2282-70 | FERRI INDUCTOR | 0.22UH | | |
| L011 | L40-2282-70 | FERRI INDUCTOR | 0.22UH | | |
| P007 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| P008 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| R001 | RD14BB2C821J | RES. CARBON | 820 | 5% | 1/6W |
| R002 | RN14BK2C1000D | RES. METAL FILM | 100 | 0.5% | 1/6W |
| R003 | RN14BK2C1000D | RES. METAL FILM | 100 | 0.5% | 1/6W |
| R004 | RD14BB2C151J | RES. CARBON | 150 | 5% | 1/6W |
| R005 | RN14BK2C1000D | RES. METAL FILM | 100 | 0.5% | 1/6W |
| R006 | RN14BK2C1000D | RES. METAL FILM | 100 | 0.5% | 1/6W |
| R007 | RD14BB2C390J | RES. CARBON | 39 | 5% | 1/6W |
| R008 | RD14BB2C150J | RES. CARBON | 15 | 5% | 1/6W |
| R009 | RD14BB2C510J | RES. CARBON | 51 | 5% | 1/6W |
| R010 | NO USE | | | | |
| R011 | RD14BB2C821J | RES. CARBON | 820 | 5% | 1/6W |
| R012 | RN14BK2C1000D | RES. METAL FILM | 100 | 0.5% | 1/6W |
| R013 | RN14BK2C1000D | RES. METAL FILM | 100 | 0.5% | 1/6W |
| R014 | RD14BB2C151J | RES. CARBON | 150 | 5% | 1/6W |
| R015 | RN14BK2C1000D | RES. METAL FILM | 100 | 0.5% | 1/6W |
| R016 | RN14BK2C1000D | RES. METAL FILM | 100 | 0.5% | 1/6W |
| R017 | RD14BB2C390J | RES. CARBON | 39 | 5% | 1/6W |
| R018 | RD14BB2C150J | RES. CARBON | 15 | 5% | 1/6W |
| R019 | RD14BB2C510J | RES. CARBON | 51 | 5% | 1/6W |
| R020 | RD14BB2C100J | RES. CARBON | 10 | 5% | 1/6W |
| R021 | RD14BB2C100J | RES. CARBON | 10 | 5% | 1/6W |
| R022 | RD14BB2C330J | RES. CARBON | 33 | 5% | 1/6W |
| R023 | RD14BB2C330J | RES. CARBON | 33 | 5% | 1/6W |

## A TRIG SWITCH UNIT

### X77-1280-02

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | J23-5039-52 | PCB (UNMOUNTED) | | | |
| | L92-0110-05 | FERRITE BEADS | | | |
| | 212-2014-05 | TUBE (PLASTIC) | | | |
| 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 |
| 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 | CE04BW1H010M | CAP. ELECTRO | 1 | 20% | 50V |
| C016 | NO USE | | | | |
| C017 | CE04BW1H010M | CAP. ELECTRO | 1 | 20% | 50V |
| C018 | C90-0298-05 | CAP. CERAMIC | 0.1 | 20% | 12V |
| C019 | CE04EW1H010M | CAP. ELECTRO | 1 | 20% | 50V |
| C020 | CK45B1H102K | CAP. CERAMIC | 1000P | 10% | 50V |
| C021 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C022 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C023 | CE04EW1C330M | CAP. ELECTRO | 33 | 20% | 16V |
| C024 | CE04EW1C330M | 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 | CE04EW1H3R3M | CAP. ELECTRO | 3.3 | 20% | 50V |
| C050 | NO USE | | | | |
| C051 | CK45B2H102K | CAP. CERAMIC | 1000P | 10% | 500V |

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| D001 | SV03YS | DIODE, SILICON VARISTOR | | | |
| D002 | 1SS132 | DIODE | | | |
| D003 | 1SS132 | DIODE | | | |
| D004 | MTZ16JA | DIODE, ZENER | 15V | | |
| D005 | 1SS132 | DIODE | | | |
| D006 | 1SS132 | DIODE | | | |
| D007 | 1SS132 | DIODE | | | |
| D008 | 1SS132 | DIODE | | | |
| D009 | SV04YS | DIODE, SILICON VARISTOR | | | |
| D010 | NO USE | | | | |
| D011 | 1SS135 | DIODE | | | |
| D012 | 1SS135 | DIODE | | | |
| L001 | L40-1011-03 | FERRI INDUCTOR | 100UH (5H) | | |
| L002 | L40-1011-03 | FERRI INDUCTOR | 100UH (5H) | | |
| P024 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| P043 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| P046 | E40-0273-05 | PIN CONNECTOR | 2P | | |
| P047 | E40-0573-05 | PIN CONNECTOR | 5P | | |
| P059 | E40-0973-05 | PIN CONNECTOR | 9P | | |
| Q003 | DN1901 | FET, DUAL, N-CHANNEL | | | |
| Q004 | 2SC3354(S,T) | TR. SI, NPN | | | |
| Q005 | 2SC3354(S,T) | 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-DUAL | | | |
| Q010 | 2SC2671(H) | TR. SI, NPN | | | |
| Q011 | 2SC2671(H) | TR. SI, NPN | | | |
| Q012 | 2SC3354(S,T) | TR. SI, NPN | | | |
| Q013 | 2SC3354(S,T) | TR. SI, NPN | | | |
| Q014 | 2SC3354(S,T) | TR. SI, NPN | | | |
| Q015 | 2SC3354(S,T) | TR. SI, NPN | | | |
| Q016 | 2SC2671(H) | TR. SI, NPN | | | |
| Q017 | 2SK241(Y) | FET, N-CHANNEL, MOS | | | |
| Q018 | 2SA1309(Q,R) | TR. SI, PNP | | | |
| Q019 | 2SK30A(D) | 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 | | | |
| Q024 | 2SK30A(D) | FET, N-CHANNEL | | | |
| Q025 | 2SA1309(Q,R) | TR. SI, PNP | | | |
| R001 | RD14BB2C510J | RES. CARBON | 51 | 5% | 1/6W |
| R002 | RD14BB2C510J | RES. CARBON | 51 | 5% | 1/6W |
| R003 | RD14BB2C510J | RES. CARBON | 51 | 5% | 1/6W |
| R006 | RD14BB2C473J | RES. CARBON | 47K | 5% | 1/6W |
| R007 | RD14BB2C473J | RES. CARBON | 47K | 5% | 1/6W |
| R011 | RD14BB2C821J | RES. CARBON | 820 | 5% | 1/6W |
| R012 | NO USE | | | | |
| R013 | RD14BB2C822J | RES. CARBON | 8.2K | 5% | 1/6W |
| R014 | RD14BB2C103J | RES. CARBON | 10K | 5% | 1/6W |
| R015 | RD14BB2C431J | RES. CARBON | 430 | 5% | 1/6W |
| R016 | RD14BB2C220J | RES. CARBON | 22 | 5% | 1/6W |
| R017 | RD14BB2C101J | RES. CARBON | 100 | 5% | 1/6W |
| R018 | NO USE | | | | |
| R019 | RD14BB2C754J | RES. CARBON | 750K | 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 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| R027 | RN14BK2C2200F | RES. METAL FILM | 220 | 1% | 1/6W |
| R028 | RN14BK2C2200F | RES. METAL FILM | 220 | 1% | 1/6W |
| R029 | RD14BB2C470J | RES. CARBON | 47 | 5% | 1/6W |
| R030 | RN14BK2C1501F | RES. METAL FILM | 1.5K | 1% | 1/6W |
| R031 | RN14BK2C1501F | RES. METAL FILM | 1.5K | 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 | RD14BB2C432J | RES. CARBON | 4.3K | 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 |

# PARTS LIST

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| 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 | RD14BB2C473J | RES. CARBON | 47K | 5% | 1/6W |
| R049 | RD14BB2C103J | RES. CARBON | 10K | 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 | RD14BB2C752J | RES. CARBON | 7.5K | 5% | 1/6W |
| R057 | RD14BB2C222J | RES. CARBON | 2.2K | 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 |
| R079 | RD14BB2E274J | RES. CARBON | 270K | 5% | 1/4W |
| R080 | RD14BB2C101J | RES. CARBON | 100 | 5% | 1/6W |
| R081 | RD14BB2C754J | RES. CARBON | 750K | 5% | 1/6W |
| S001 | S33-2504-05 | LEVER SWITCH 2-6 | | | |
| S002 | S32-4008-05 | LEVER SWITCH 4-5 | | | |
| S003 | R01-5506-05 | V.R. SWITCH | 100KB | | |
| S004 | R01-5506-05 | V.R. SWITCH | 100KB | | |
| TC001 | C05-0412-05 | CAP. TRIMMER | 20P | | |
| VR001 | R01-5506-05 | V.R. SWITCH | 100KB | | |
| VR002 | R12-3522-05 | RES. SEMI FIXED | 10KB | | |
| VR003 | NO USE | | | | |
| VR004 | R12-1520-05 | RES. SEMI FIXED | 2KB | | |

## VERTICAL MODE SWITCH UNIT

### X77-1310-00

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | J25-5051-23 | PCB (UNMOUNTED) | | | |
| C001 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C002 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C003 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| P001 | E40-0473-05 | PIN CONNECTOR | 4P | | |
| P002 | E40-1273-05 | PIN CONNECTOR | 12P | | |
| P007 | E40-0373-05 | PIN CONNECTOR | 3P | | |
| P008 | E40-0373-05 | PIN CONNECTOR | 3P | | |
| R001 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R002 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R003 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R004 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| S001 | S33-2501-05 | LEVER SWITCH 2-5 | | | |
| S002 | S42-2512-05 | PUSH SWITCH 2-2 X2 | | | |
| S003 | S42-2512-05 | PUSH SWITCH 2-2 X2 | | | |
| VR001 | R05-1504-05 | V.R. | 1KB | | |
| VR002 | R05-1504-05 | V.R. | 1KB | | |

## HORIZONTAL MODE SWITCH UNIT

### X77-1320-00

| REF.NO | PARTS NO | NAME & DESCRIPTION | | | |
|---|---|---|---|---|---|
| | E31-0762-05 | UNIVERSAL LED SOCKET | | | |
| | E31-2510-05 | UNIVERSAL LED SOCKET | | | |
| | J25-5051-23 | PCB (UNMOUNTED) | | | |
| | R92-0150-05 | JUMPING RES. | ZERO OHM | | |
| C001 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| C002 | CK45FF1H103Z | CAP. CERAMIC | 0.01 | | 50V |
| D001 | 1SS132 | DIODE | | | |
| D002 | 1SS132 | DIODE | | | |
| P048 | E40-1811-05 | PIN CONNECTOR | 18P | | |
| P063 | E40-0373-05 | PIN CONNECTOR | 3P | | |
| R001 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R002 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R003 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R004 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R005 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R006 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R007 | RD14BB2C222J | RES. CARBON | 2.2K | 5% | 1/6W |
| R008 | RD14BB2C331J | RES. CARBON | 330 | 5% | 1/6W |
| S001 | S33-2505-05 | LEVER SWITCH 2-5 | | | |
| S002 | S33-2501-05 | LEVER SWITCH 2-5 | | | |
| VR001 | R12-5520-05 | RES. SEMI FIXED | 150KB | | |

# PARTS LIST

## 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 | HZ3.6CP | 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 | C91-0599-08 | 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 | C90-0926-08 | 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 | 22μF | 160V |
| C18 | C90-0934-08 | Electrolytic cap | 220μF | 16V |
| C19 | C90-0931-08 | Electrolytic cap | 220μF | 35V |
| C20 | C90-0935-08 | Electrolytic cap | 22μF | 50V |
| C21 | C90-0936-08 | Electrolytic cap | 10μF | 100V |
| C22 | C90-0933-08 | Electrolytic cap | 22μF | 160V |
| C23 | C91-0600-08 | Ceramic cap | 0.01μF | 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 | |
| | F20-0643-08 | Insulating sheet | (STK7308) | |
| | F20-0644-08 | Insulating sheet | (STK732) | |

# VOLTMETER 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<br>DC for waveform measurement |
| ▲▼ POSITION | Midrange |
| CH1, CH2 VARIABLE | CAL |
| CH1, CH2 VOLTS/DIV | 0.2 V |
| CH2 INV | OFF |
| V. MODE | Unless otherwise specified CH1 |
| 20 MHz BW | OFF |
| COUPLING | AC |
| 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 |

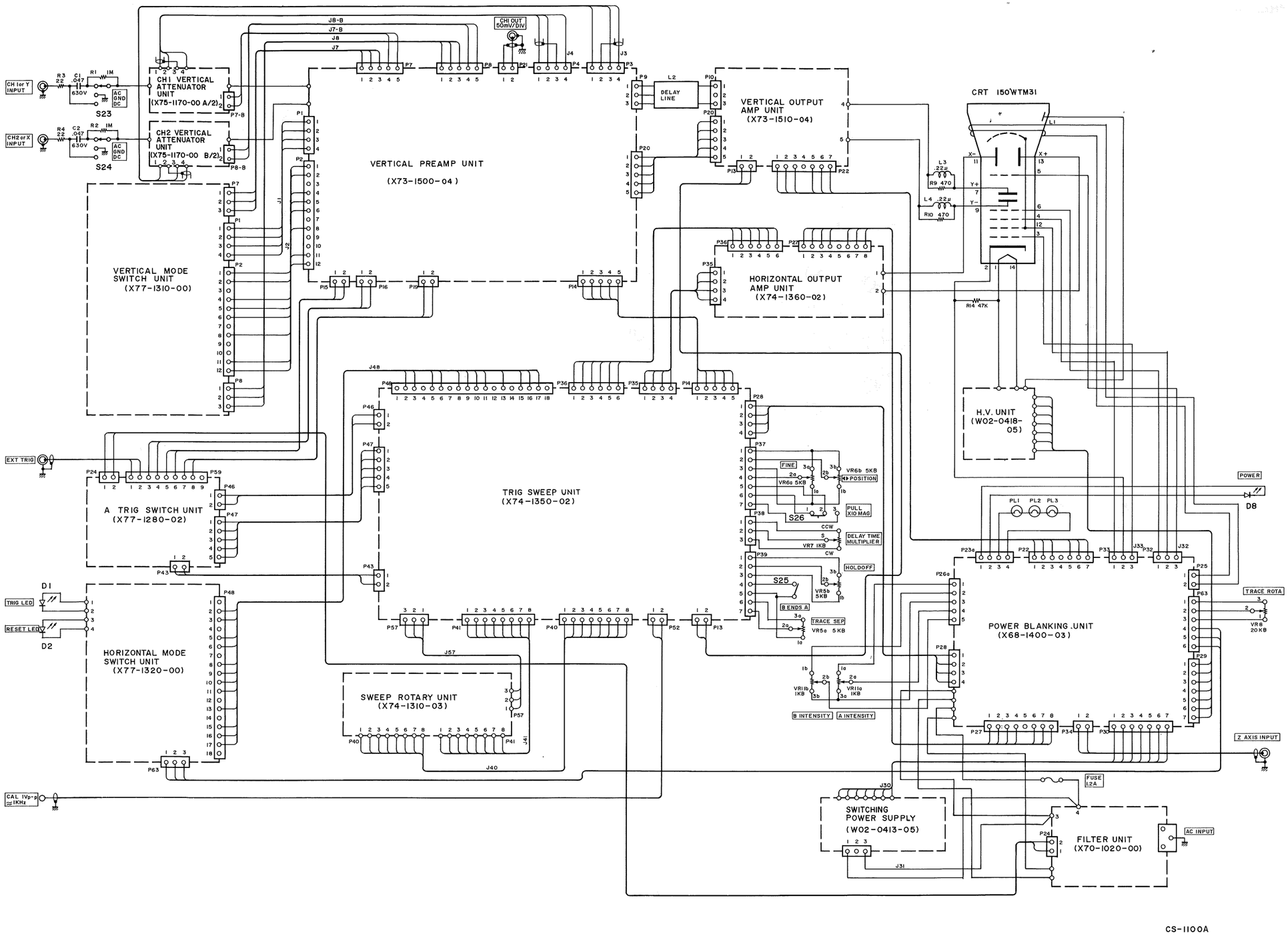
**Voltage Measurements**

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.

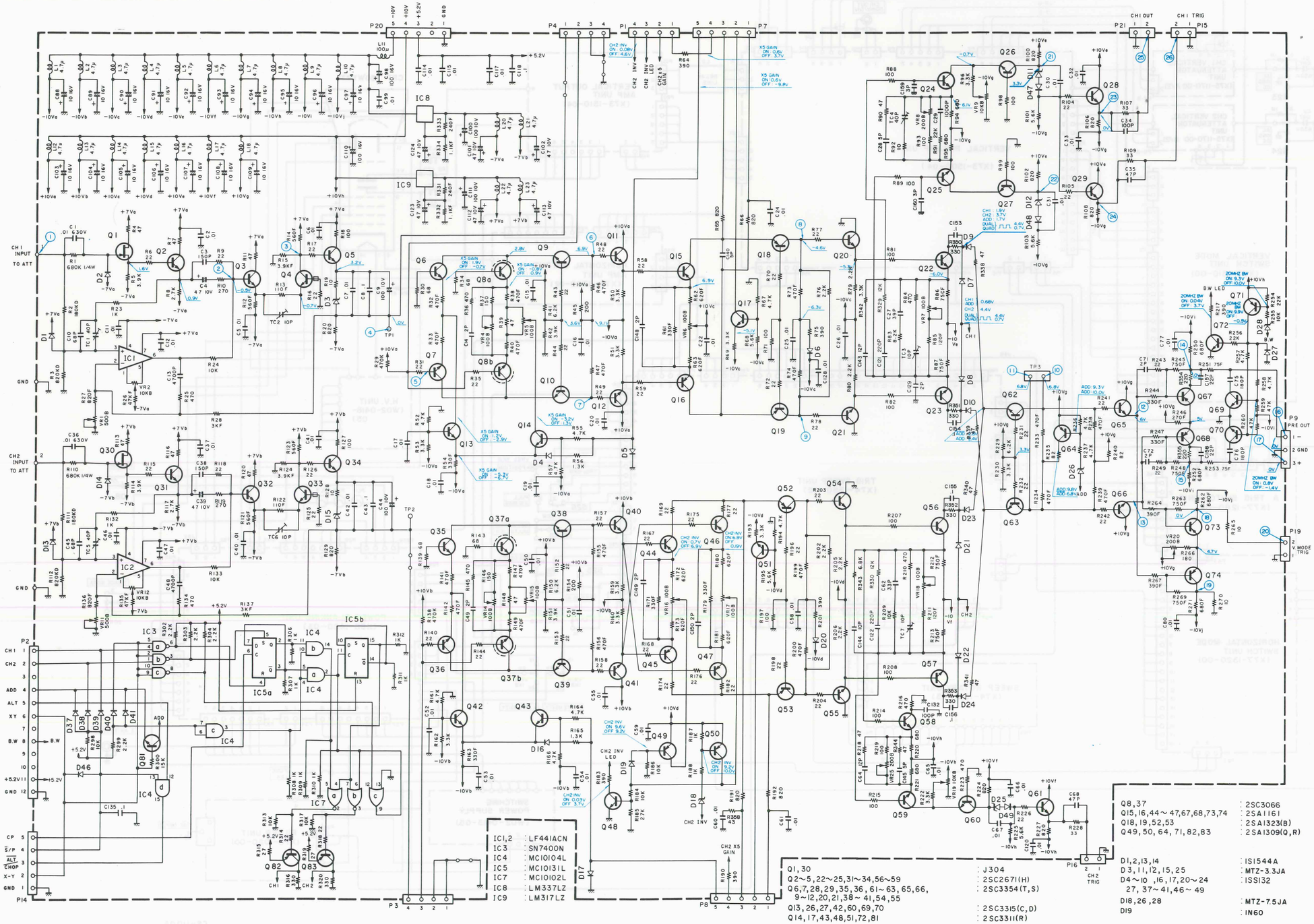
# SCHEMATIC DIAGRAM



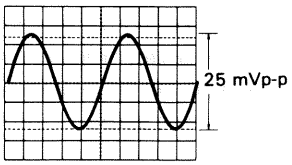

CS-1100A

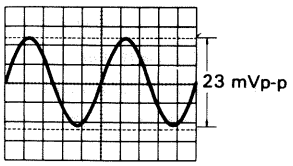
# SCHEMATIC DIAGRAM

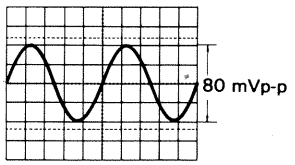
## VERTICAL PREAMP UNIT (X73-1500-04)

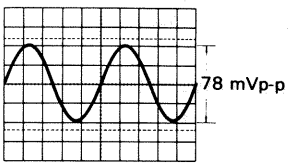


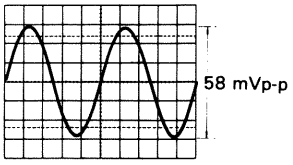
# WAVEFORMS

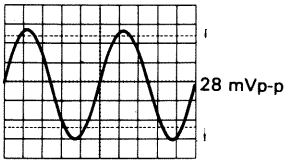
① 

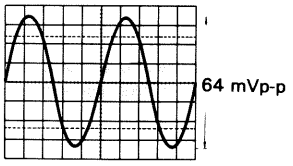

② 

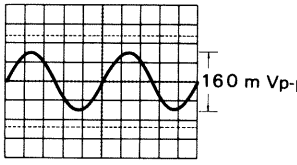

③ 

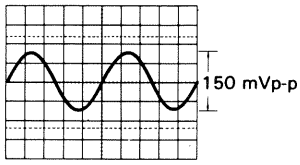

④ 

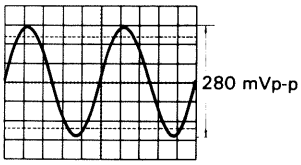

⑤ 

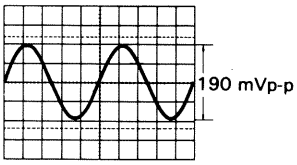

⑥ ⑦ 

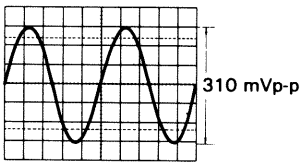

⑧ ⑨ 

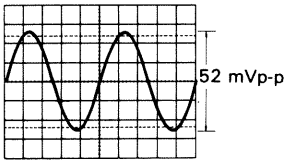

⑩ ⑪ 

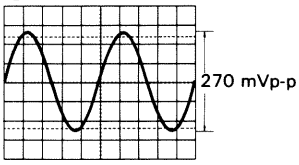

⑫ ⑬ 

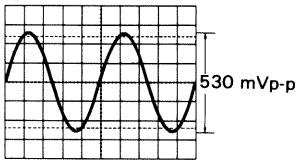

⑭ ⑮ 

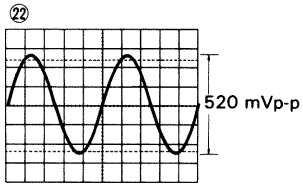

⑯ ⑰ 

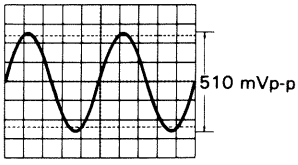

⑱ 

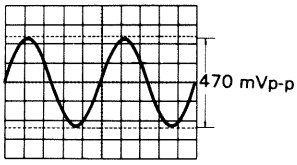

⑲ 

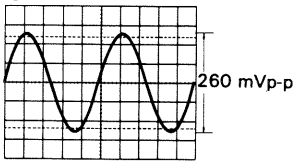

⑳ 


㉑ 


㉒ 

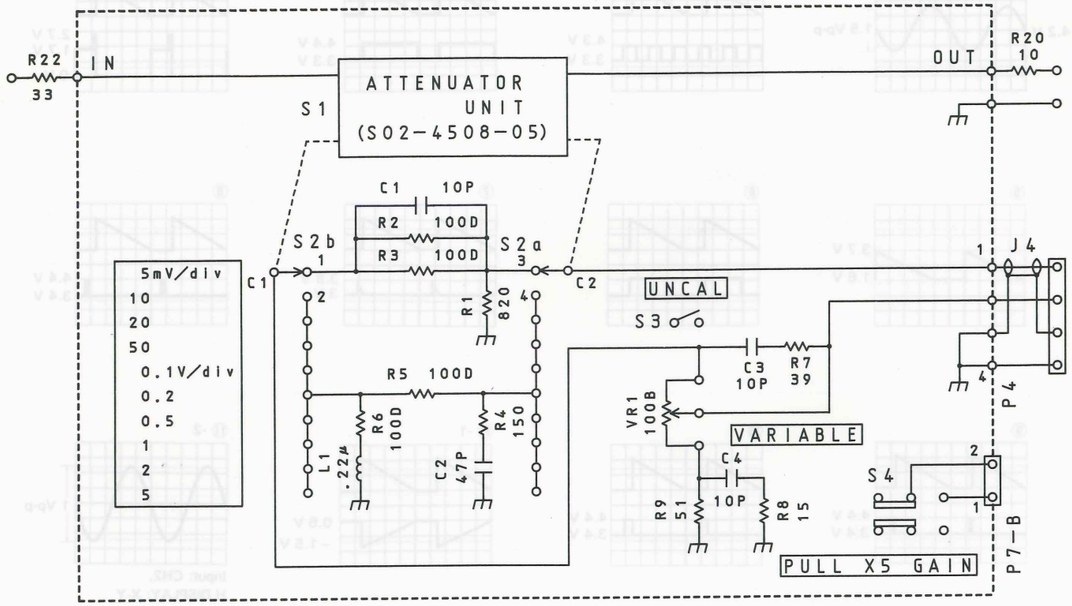

㉓ ㉕ 


㉔ 

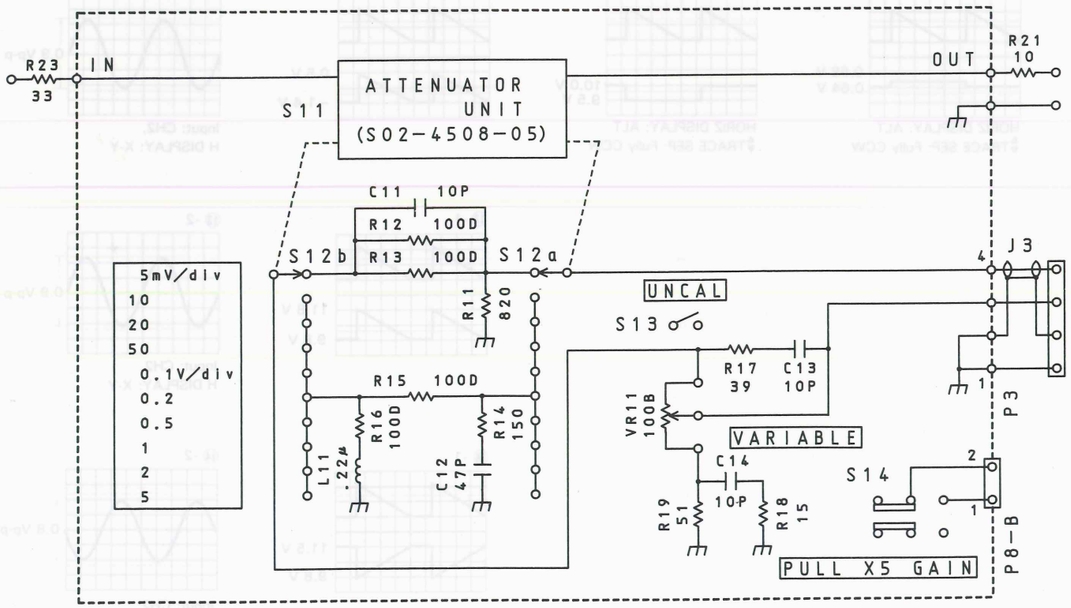

㉖ 

# SCHEMATIC DIAGRAM

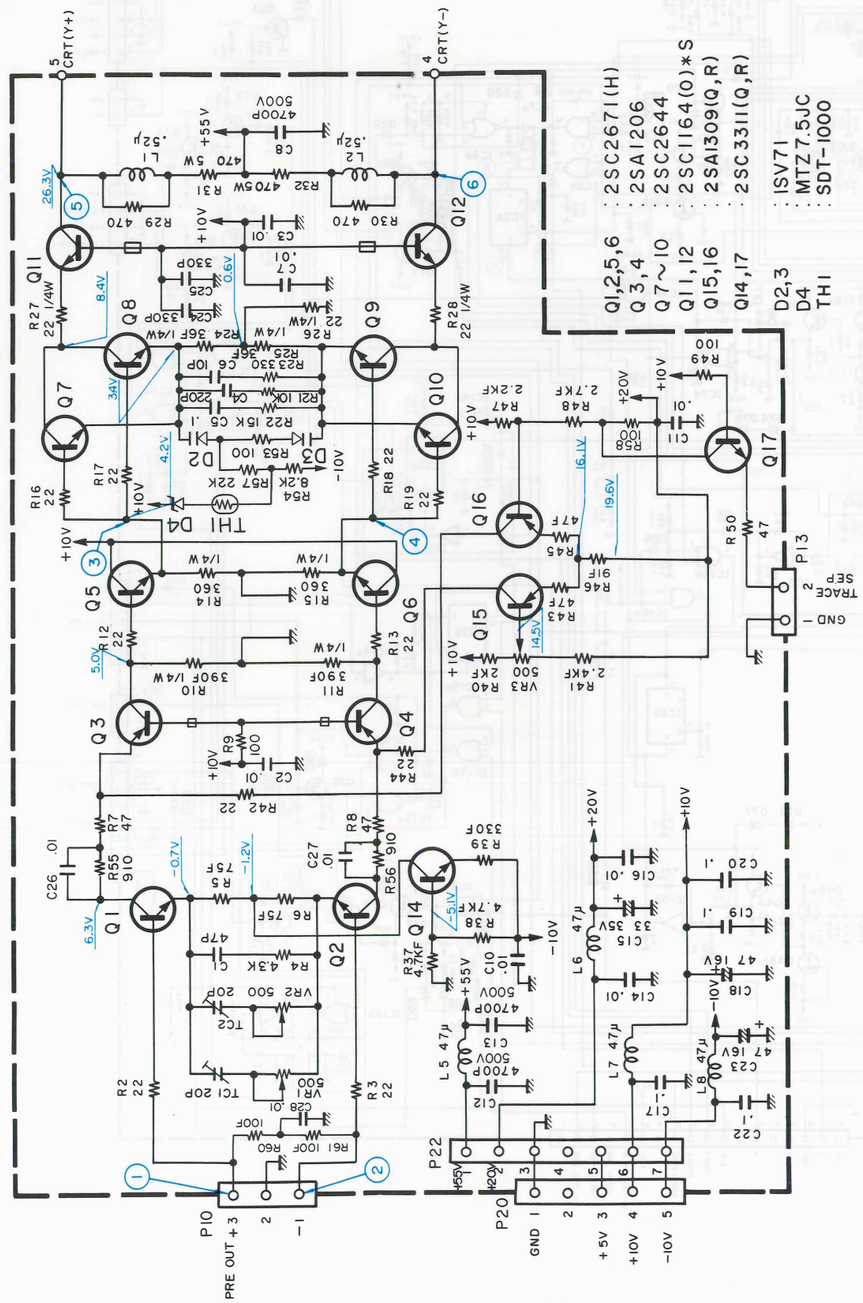
## VERTICAL ATTENUATOR UNIT (CH1) (X75-1170-00 A/2)




## VERTICAL ATTENUATOR UNIT (CH2) (X75-1170-00 B/2)

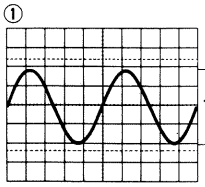



## VERTICAL OUTPUT AMP UNIT (X73-1510-04)

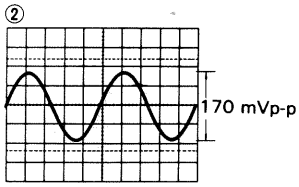


# WAVEFORMS

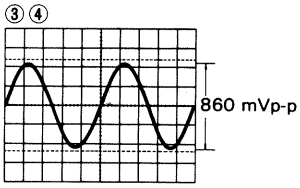
①




②




③④

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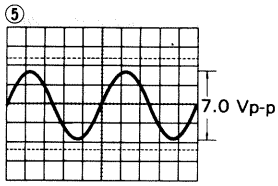
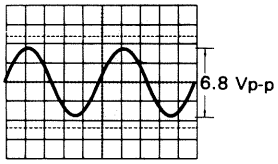
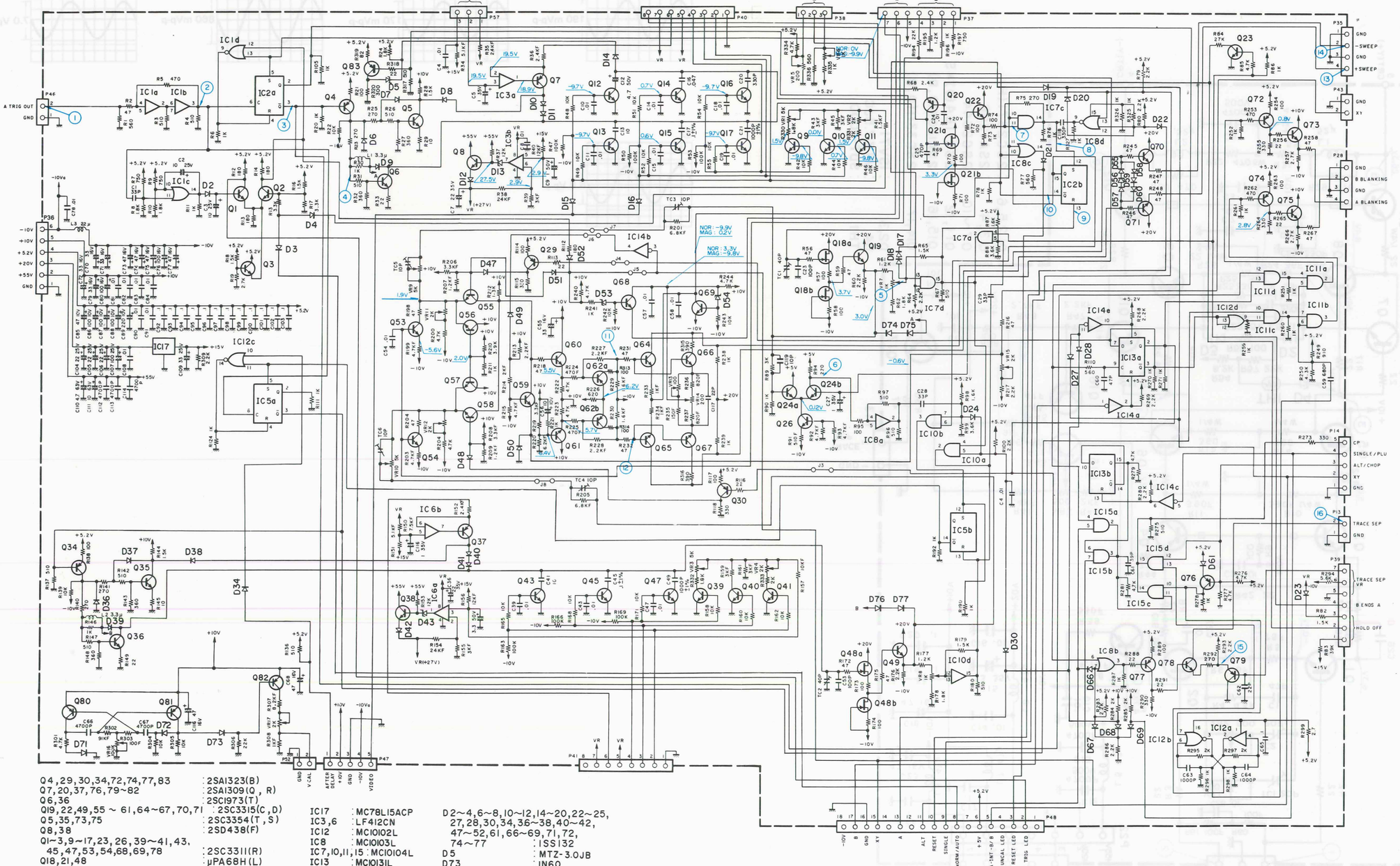



⑥



# SCHEMATIC DIAGRAM

## TRIG SWEEP UNIT (X74-1350-02)

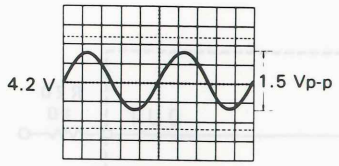


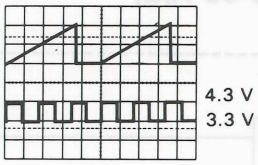

| | |
|---|---|
| Q4,29,30,34,72,74,77,83 | : 2SAI323(B) |
| Q7,20,37,76,79~82 | : 2SAI309(Q , R) |
| Q6,36 | : 2SCI973(T) |
| QI9,22,49,55 ~ 61,64~67,70,71 | : 2SC3315(C,D) |
| Q5,35,73,75 | : 2SC3354(T,S) |
| Q8,38 | : 2SD438(F) |
| QI~3,9~17,23,26,39~41,43, 45,47,53,54,68,69,78 | : 2SC3311(R) |
| QI8,21,48 | : μPA68H(L) |
| Q62 | : 2SAI239 |
| Q24 | : 2SC3066 |

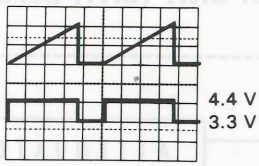
| | |
|---|---|
| IC17 | : MC78LI5ACP |
| IC3,6 | : LF412CN |
| IC12 | : MCIOI02L |
| IC8 | : MCIOI03L |
| IC7,10,11,15 | : MCIOI04L |
| IC13 | : MCIOI3IL |
| IC14 | : SN7406N |
| IC1 | : MCIOHI03L |
| IC2,5 | : MCIOHI3IL |

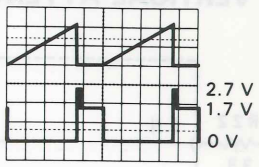
| | |
|---|---|
| D2~4,6~8,10~12,14~20,22~25, 27,28,30,34,36~38,40~42, 47~52,61,66~69,71,72, 74~77 | : ISS132 |
| D5 | : MTZ-3.0JB |
| D73 | : IN60 |
| D53,54 | : MTZ-12JC |
| DI3,43 | : MTZ-16JA |
| D55,60 | : SV06Y |
| D73 | : IN60 |
| D9,39 | : MA-700 |
| D2I | : ISSI6 |
| D56~59 | : IS1587 |

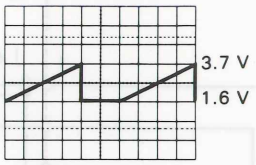
# WAVEFORMS

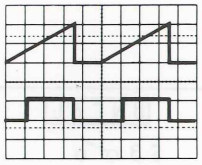
① 

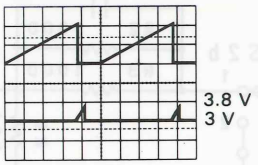

② 

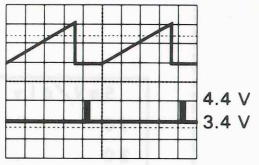

③ 

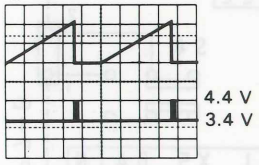

④ 

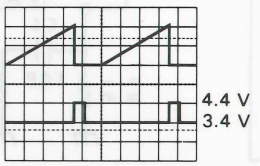

⑤ 

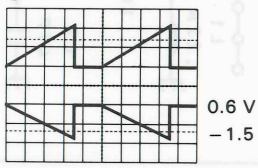

⑥ 

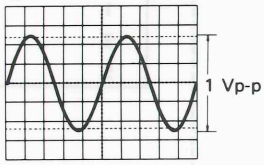
⑦ 


⑧ 

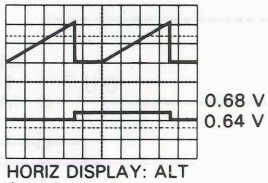

⑨ 


⑩ 

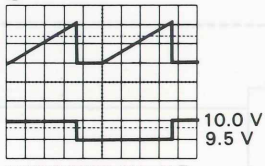

⑪ -1 


⑪ -2 

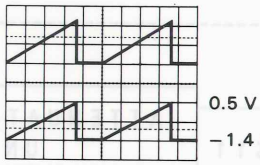
Input: CH2,
H DISPLAY: X-Y

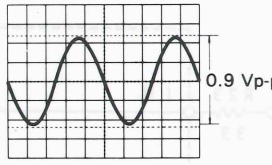
⑮ 

HORIZ DISPLAY: ALT
▲TRACE SEP: Fully CCW

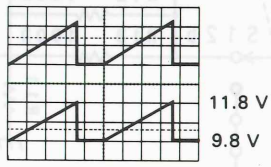
⑯ 

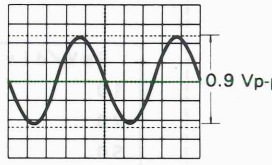
HORIZ DISPLAY: ALT
▲TRACE SEP: Fully CCW

⑫ -1 

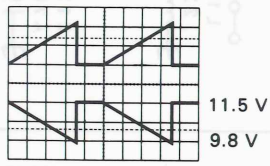

⑫ -2 

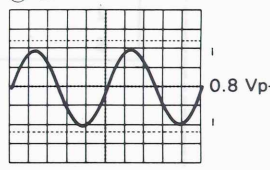
Input: CH2,
H DISPLAY: X-Y

⑬ -1 


⑬ -2 

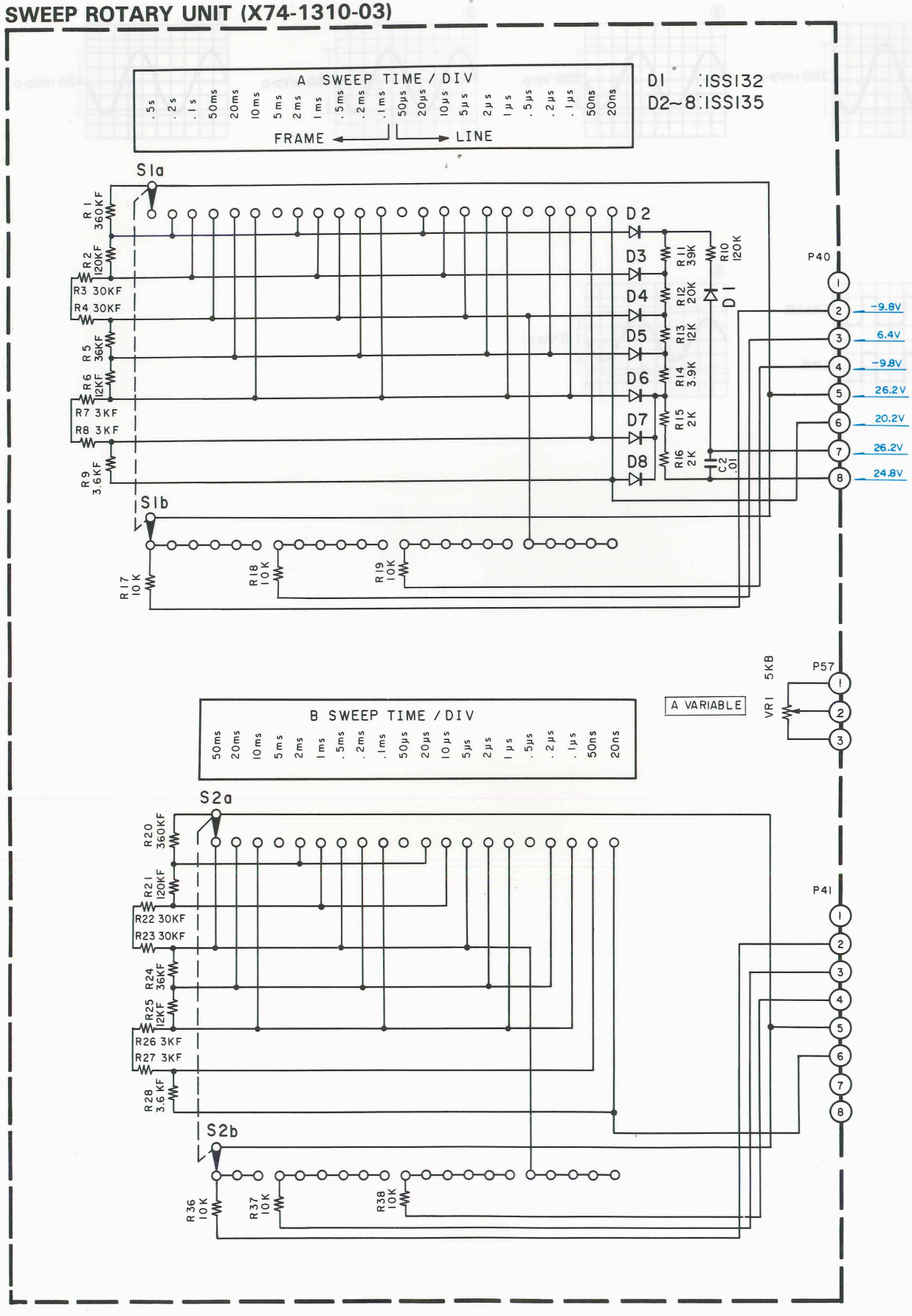
Input: CH2,
H DISPLAY: X-Y

⑭ -1 


⑭ -2 

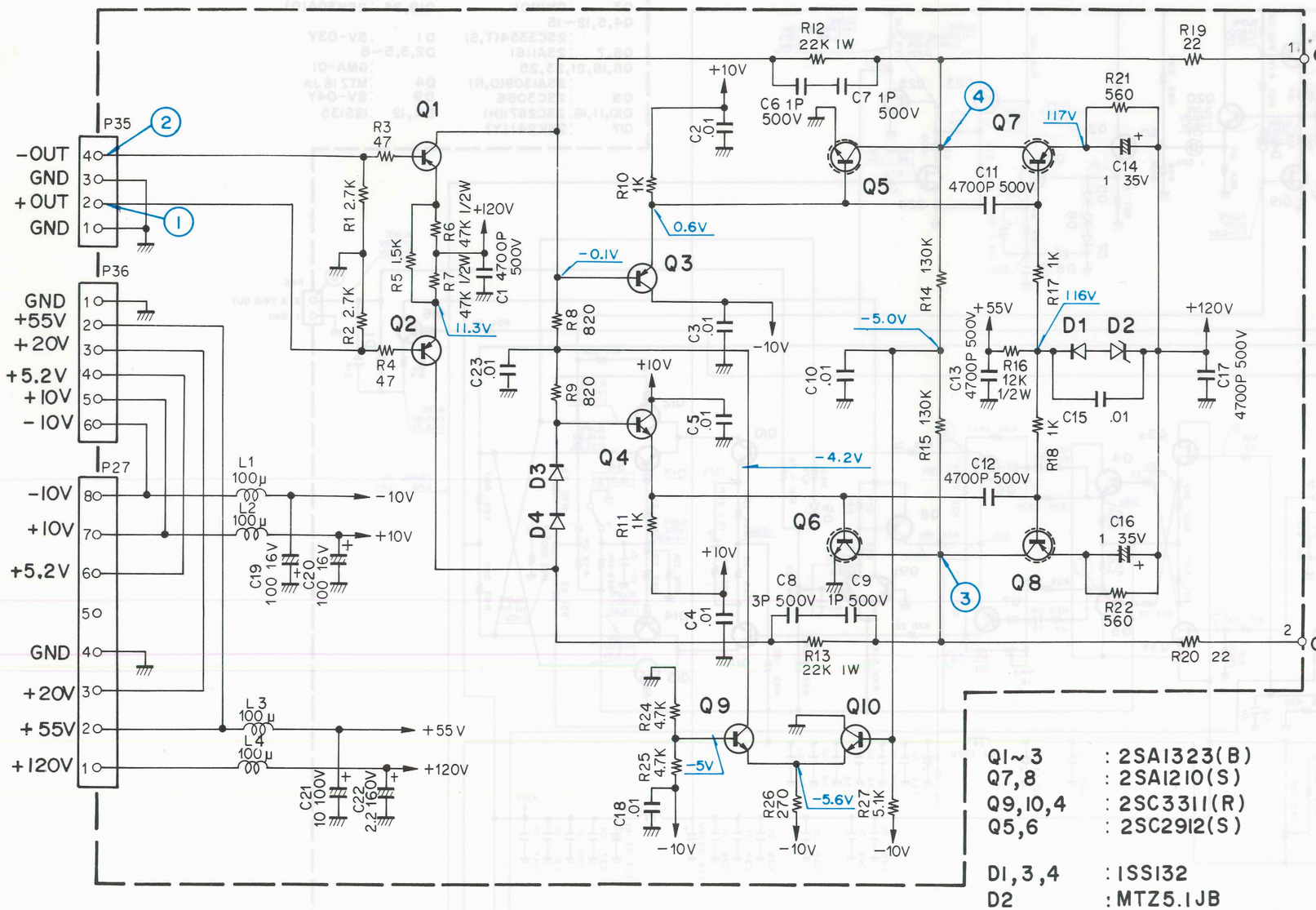
Input: CH2,
H DISPLAY: X-Y

## SWEEP ROTARY UNIT (X74-1310-03)



# SCHEMATIC DIAGRAM

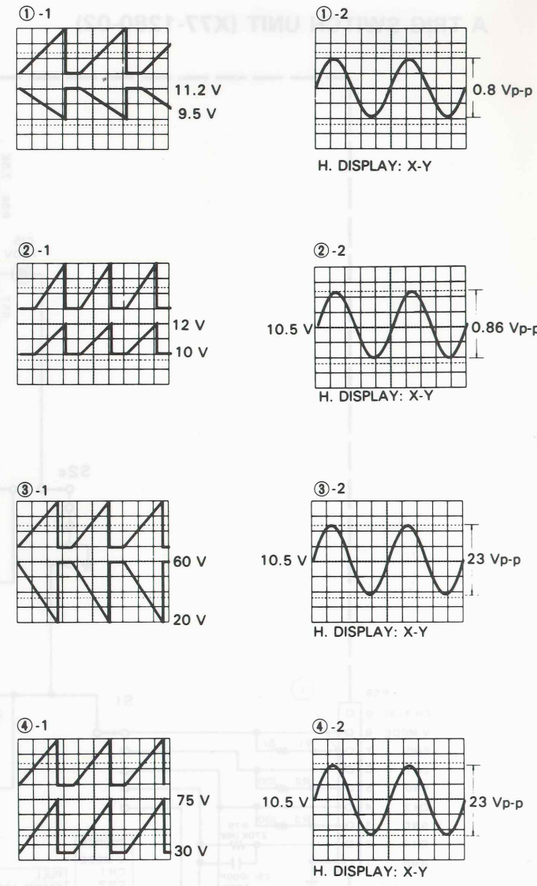
## HORIZONTAL OUTPUT AMP UNIT (X74-1360-02)




Q1~3 : 2SA1323(B)
Q7,8 : 2SA1210(S)
Q9,10,4 : 2SC3311(R)
Q5,6 : 2SC2912(S)

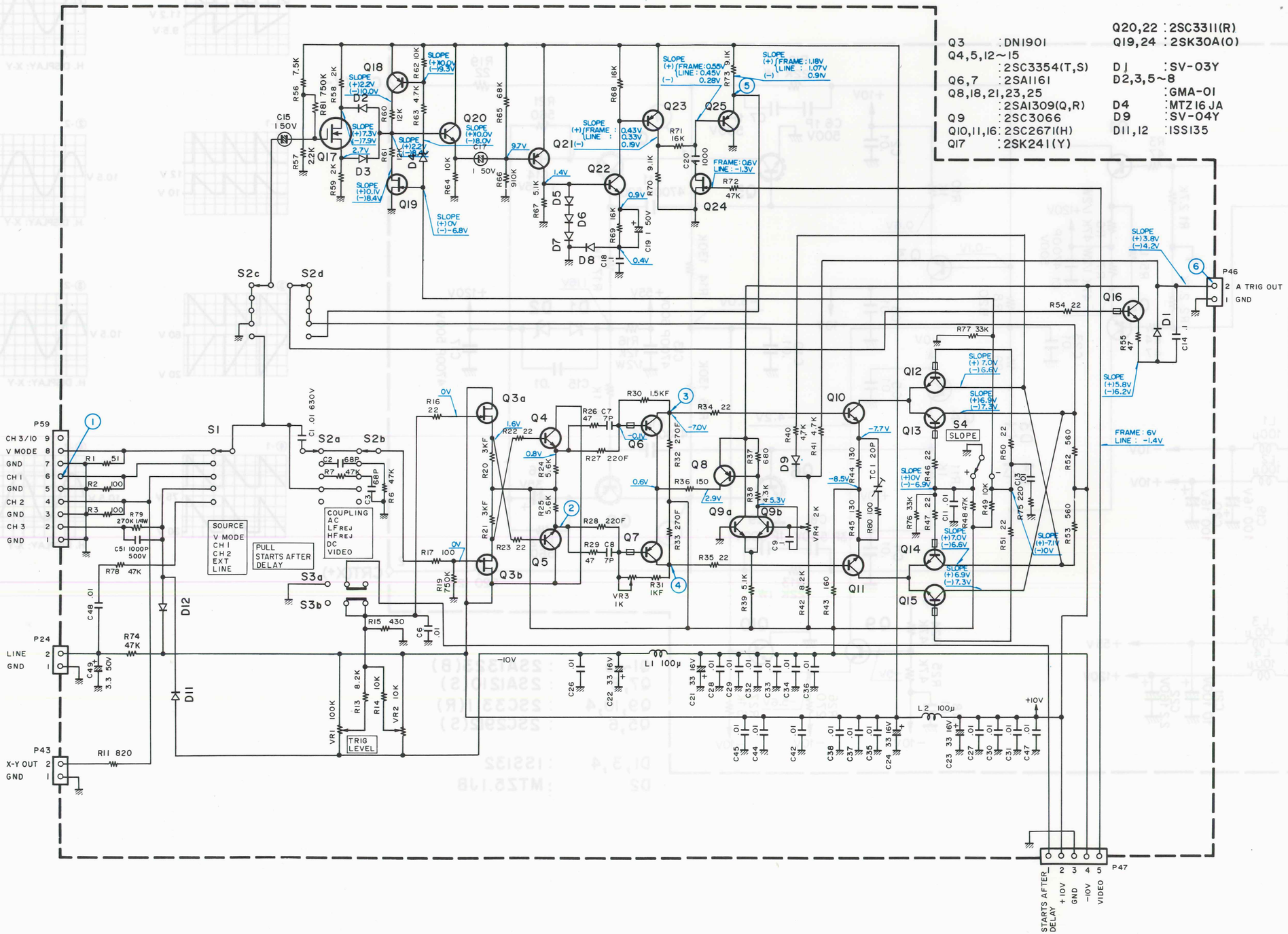
D1,3,4 : 1SS132
D2 : MTZ5.1JB

# WAVEFORMS



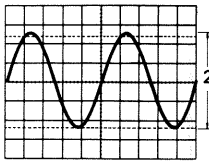
# SCHEMATIC DIAGRAM

## A TRIG SWITCH UNIT (X77-1280-02)

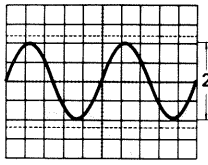


# WAVEFORMS

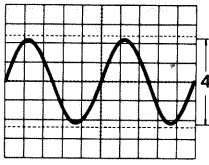
①



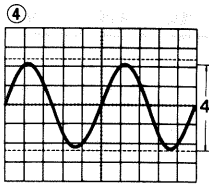

②



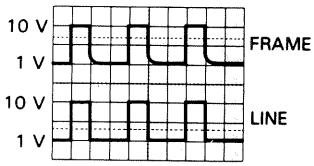

③



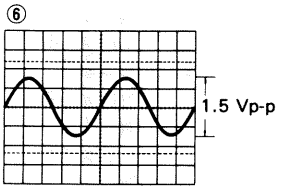

④




⑤

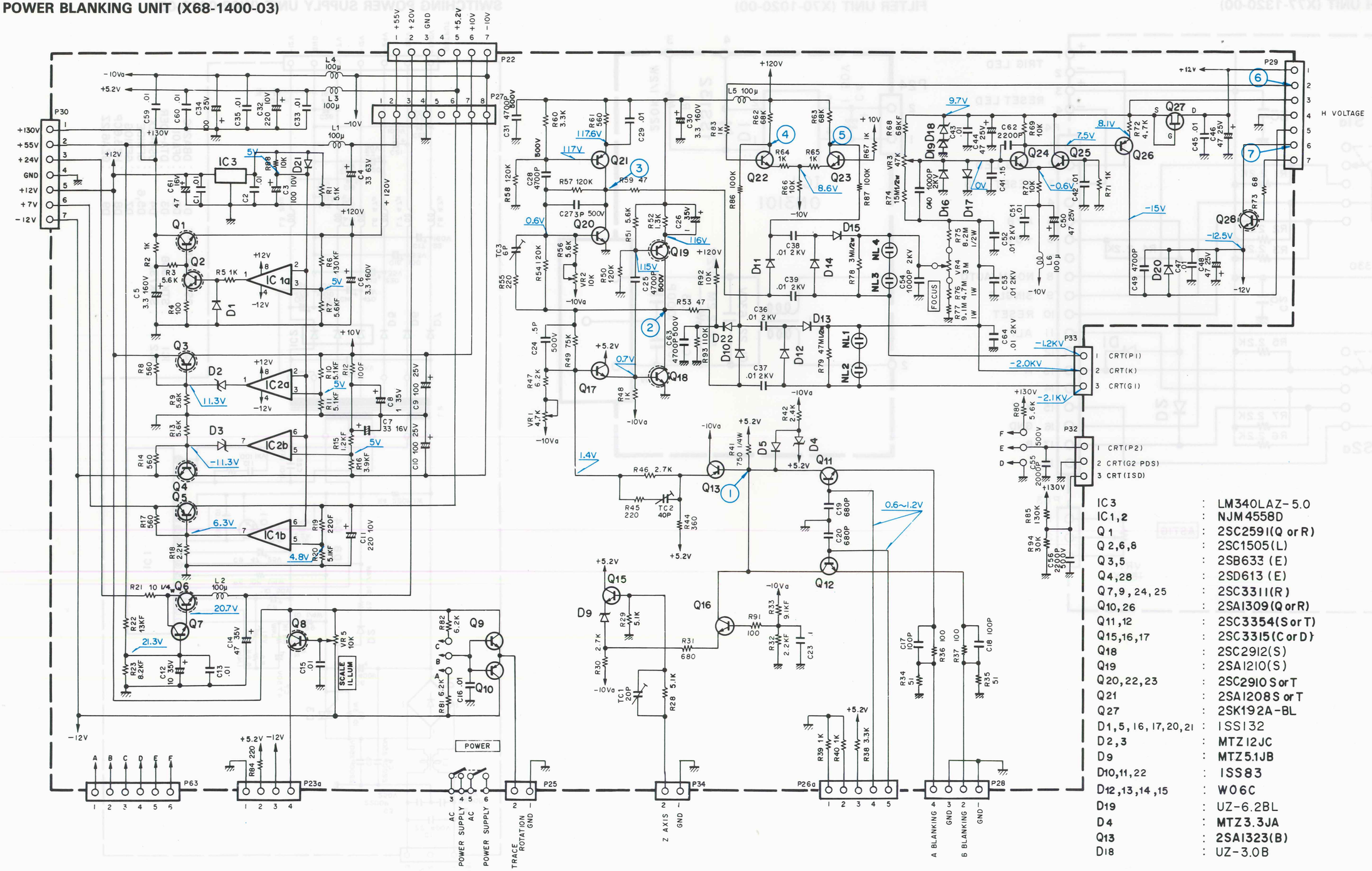



⑥

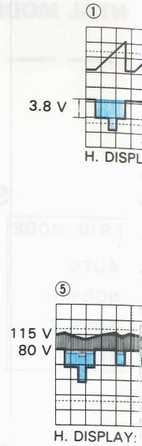


# SCHEMATIC DIAGRAM

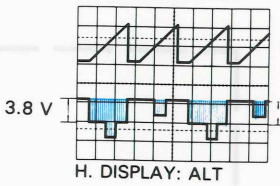
## POWER BLANKING UNIT (X68-1400-03)



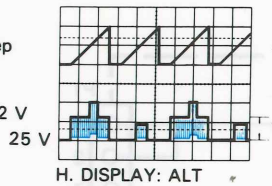

| | | |
|---|---|---|
| IC3 | : | LM340LAZ-5.0 |
| IC1,2 | : | NJM4558D |
| Q1 | : | 2SC2591(Q or R) |
| Q2,6,8 | : | 2SC1505(L) |
| Q3,5 | : | 2SB633 (E) |
| Q4,28 | : | 2SD613 (E) |
| Q7,9,24,25 | : | 2SC3311(R) |
| Q10,26 | : | 2SA1309(Q or R) |
| Q11,12 | : | 2SC3354(S or T) |
| Q15,16,17 | : | 2SC3315(C or D) |
| Q18 | : | 2SC2912(S) |
| Q19 | : | 2SA1210(S) |
| Q20,22,23 | : | 2SC2910 S or T |
| Q21 | : | 2SA1208S or T |
| Q27 | : | 2SK192A-BL |
| D1,5,16,17,20,21 | : | 1SS132 |
| D2,3 | : | MTZ12JC |
| D9 | : | MTZ5.1JB |
| D10,11,22 | : | 1SS83 |
| D12,13,14,15 | : | W06C |
| D19 | : | UZ-6.2BL |
| D4 | : | MTZ3.3JA |
| Q13 | : | 2SA1323(B) |
| D18 | : | UZ-3.0B |



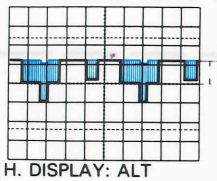
# WAVEFORMS

① 

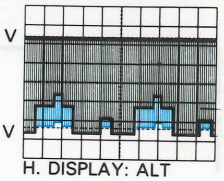
H. DISPLAY: ALT

② 

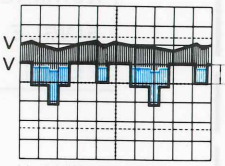
H. DISPLAY: ALT

③ 

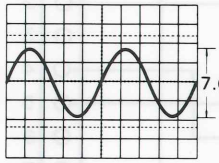
H. DISPLAY: ALT

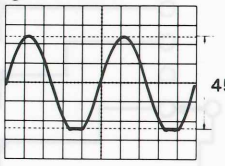
④ 

H. DISPLAY: ALT

⑤ 

H. DISPLAY: ALT

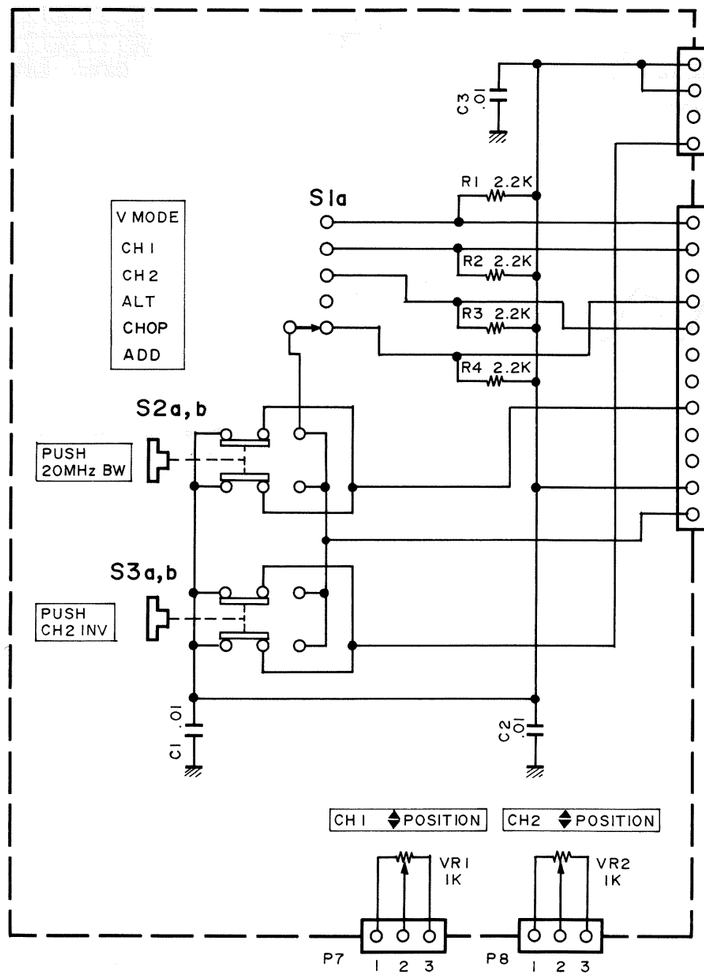
⑥ 


⑦ 

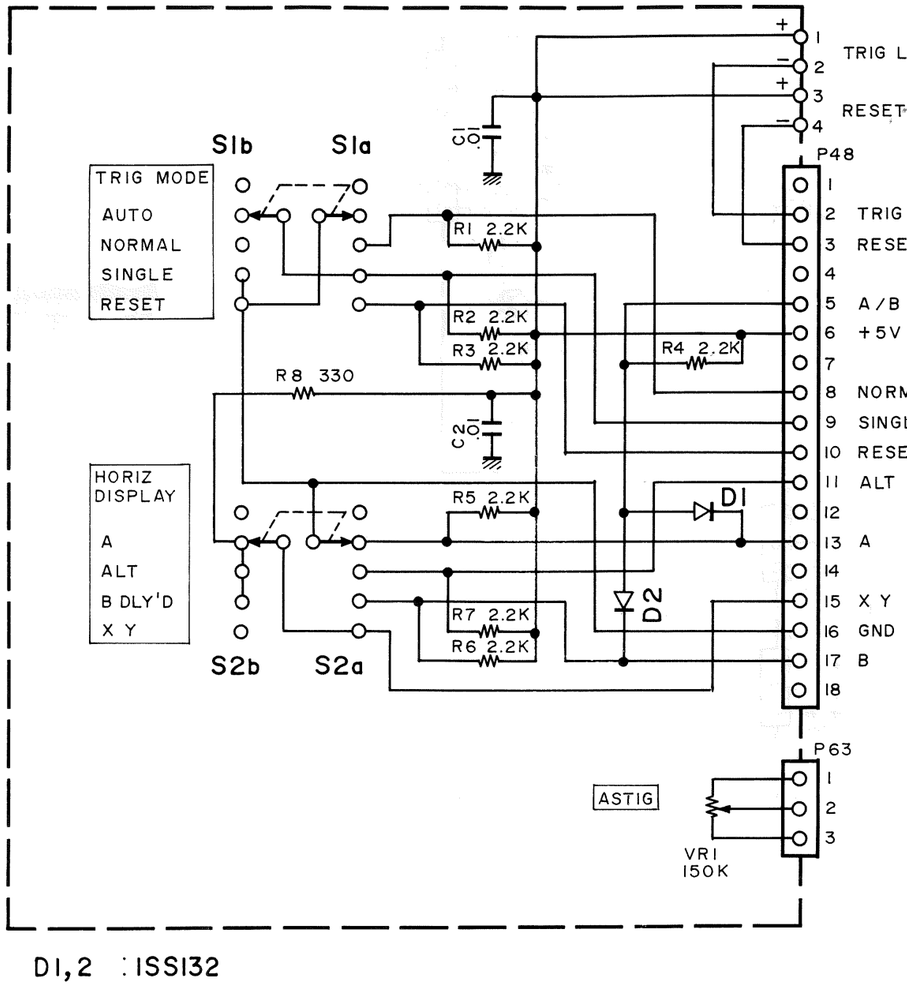

**Note : IIII : CHOP Operation**

# SCHEMATIC DIAGRAM

## VERTICAL MODE SWITCH UNIT (X77-1310-00)

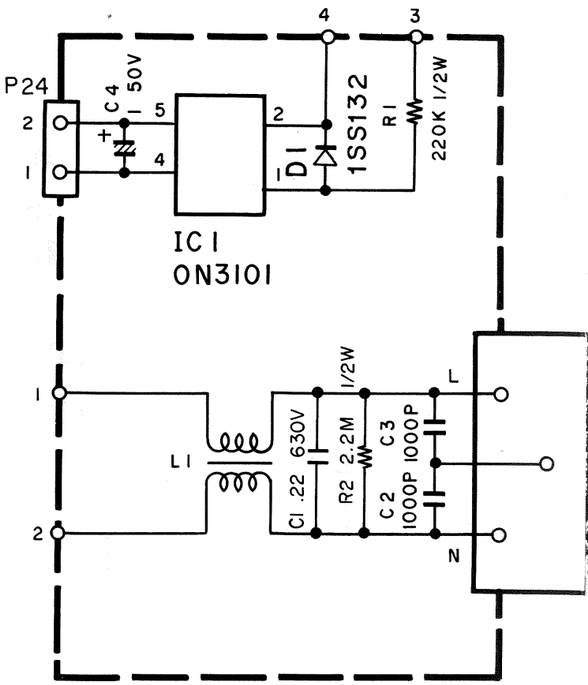



## HORIZONTAL MODE SWITCH UNIT (X77-1320-00)

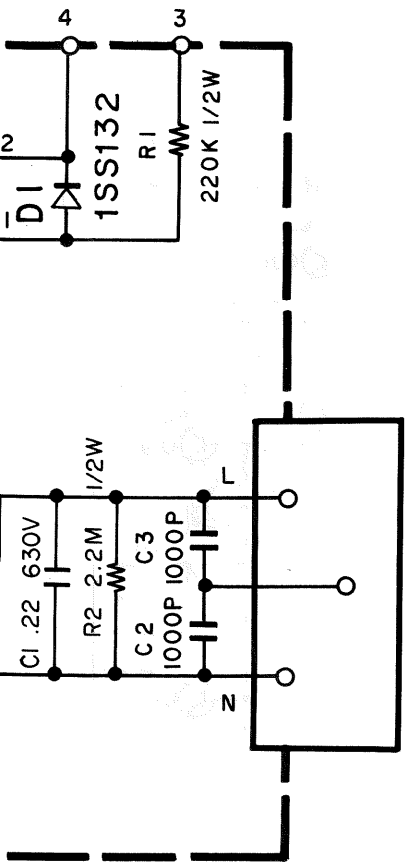



D1, 2 : 1SS132

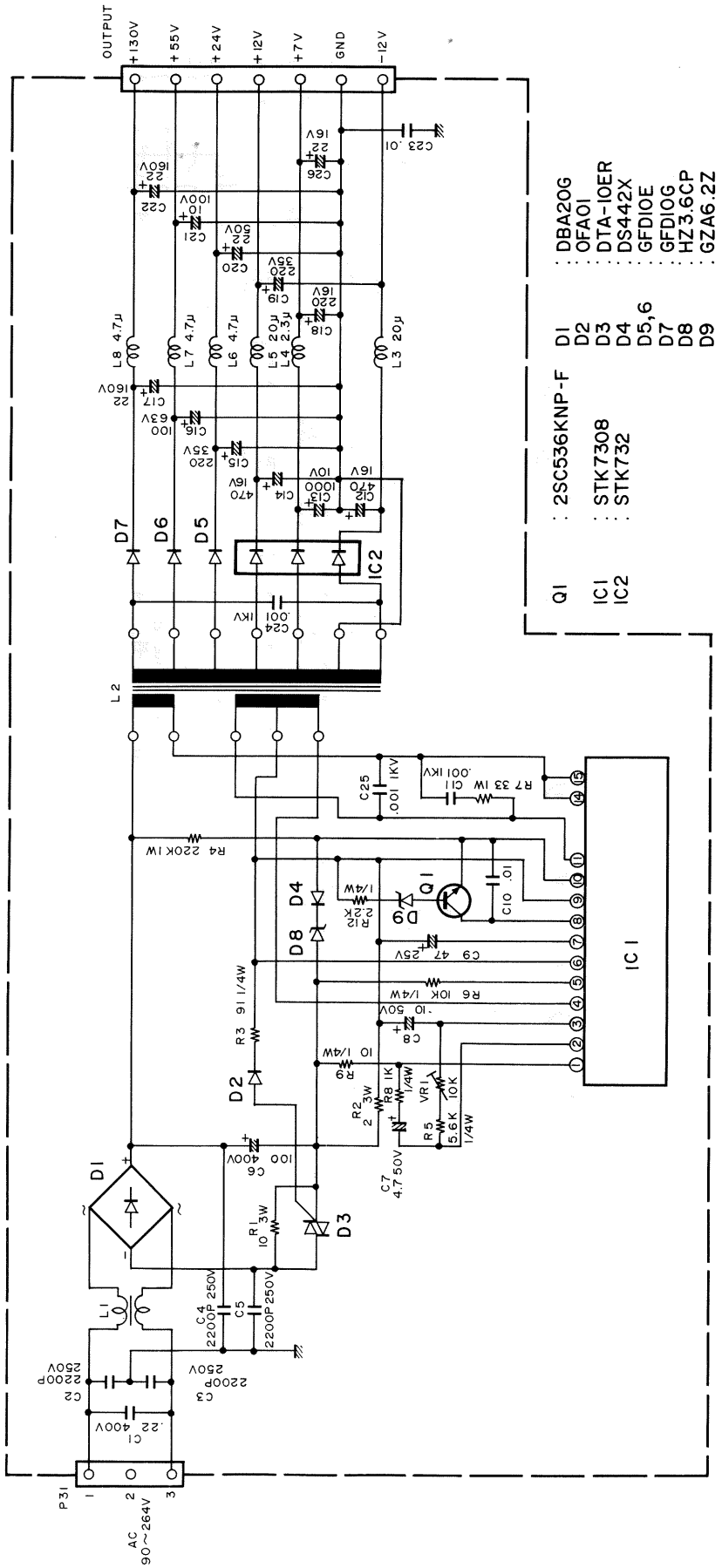
## FILTER UNIT (X70-1020-00)



-00)

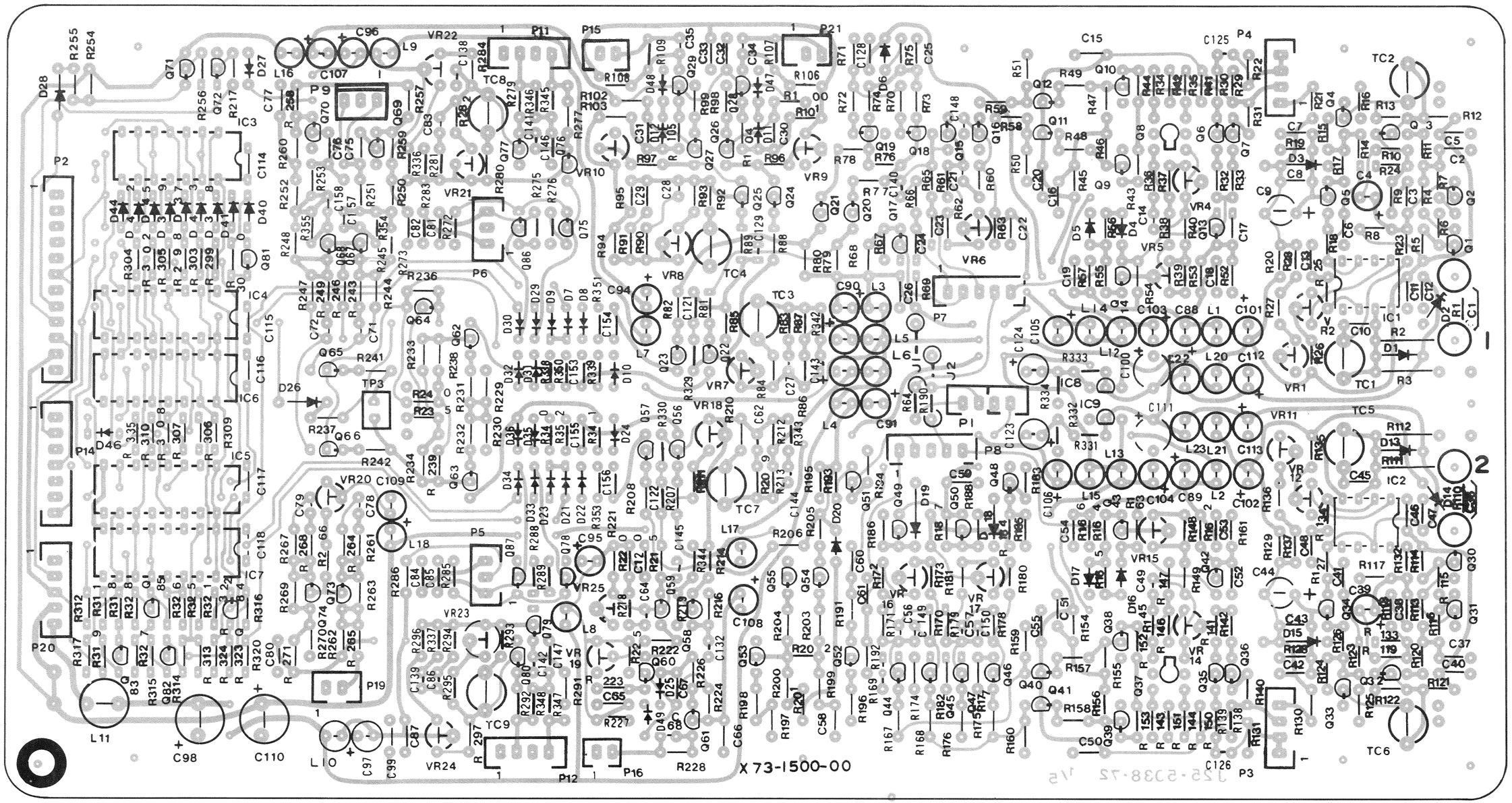



## SWITCHING POWER SUPPLY UNIT (W02-0413-05)



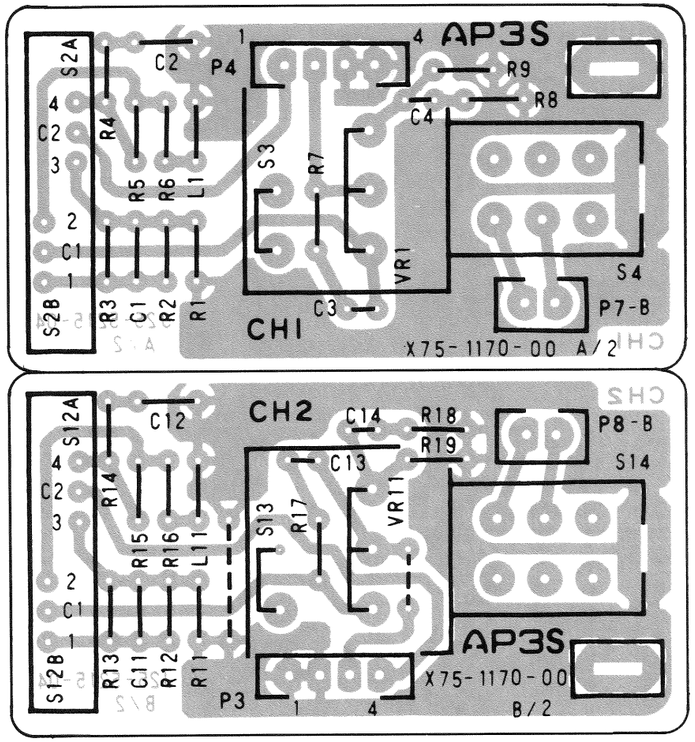
# PC BOARD

## VERTICAL PREAMP UNIT (X73-1500-04)

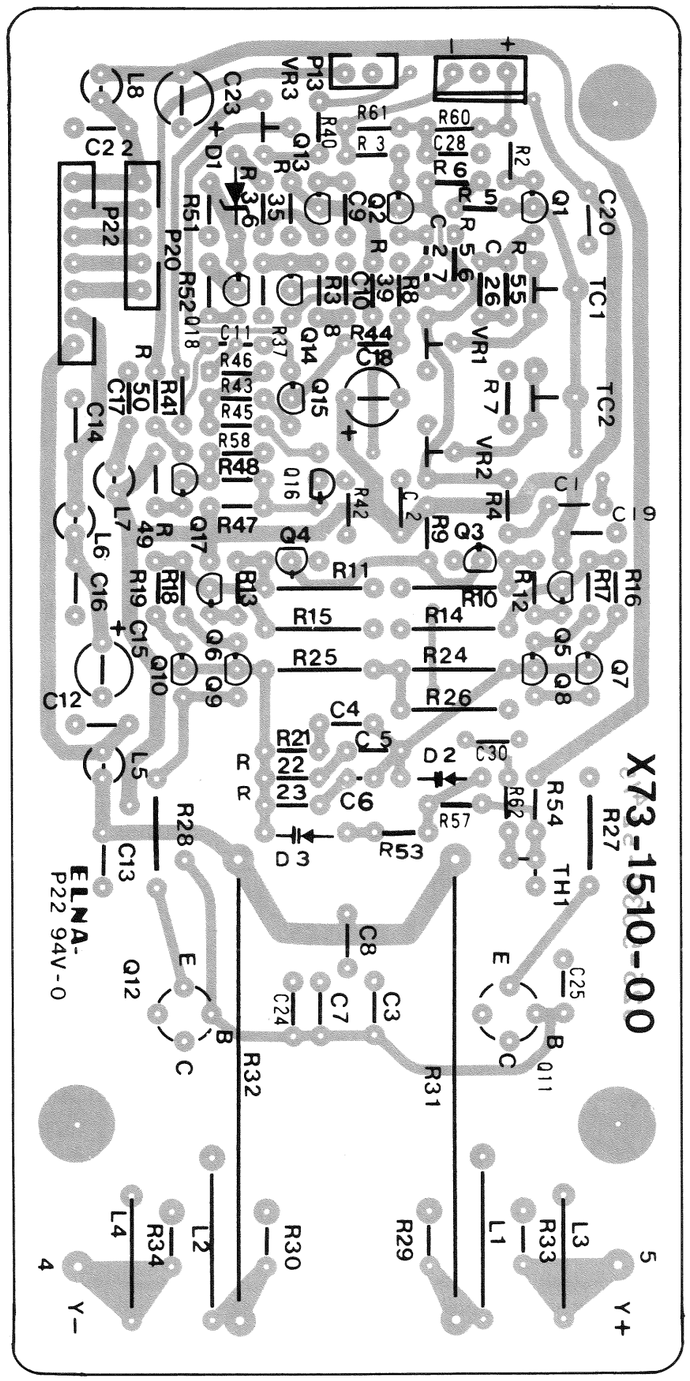


# PC BOARD

## VERTICAL ATTENUATOR UNIT (X75-1170-00)

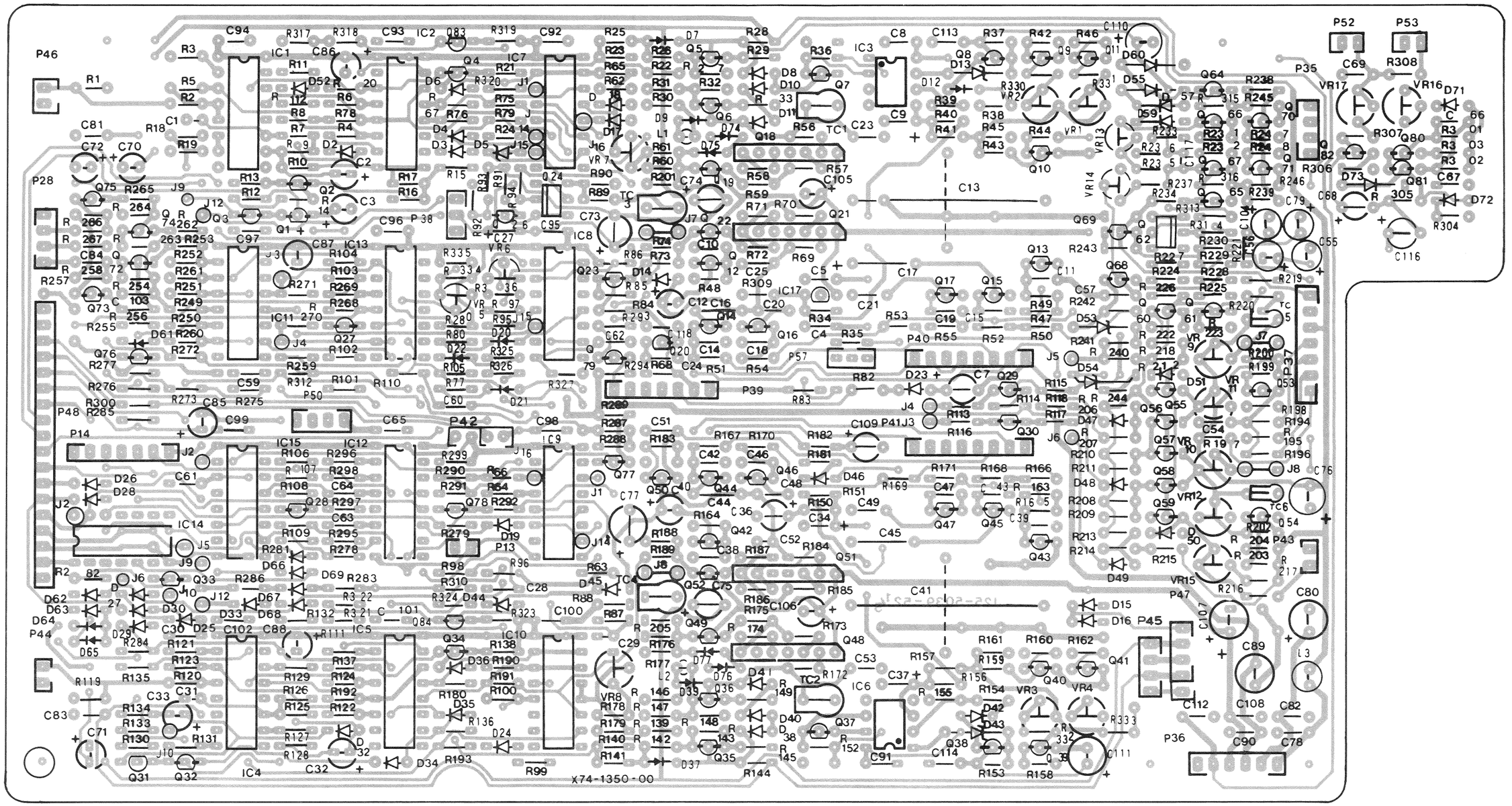



## VERTICAL OUTPUT AMP UNIT (X73-1510-04)



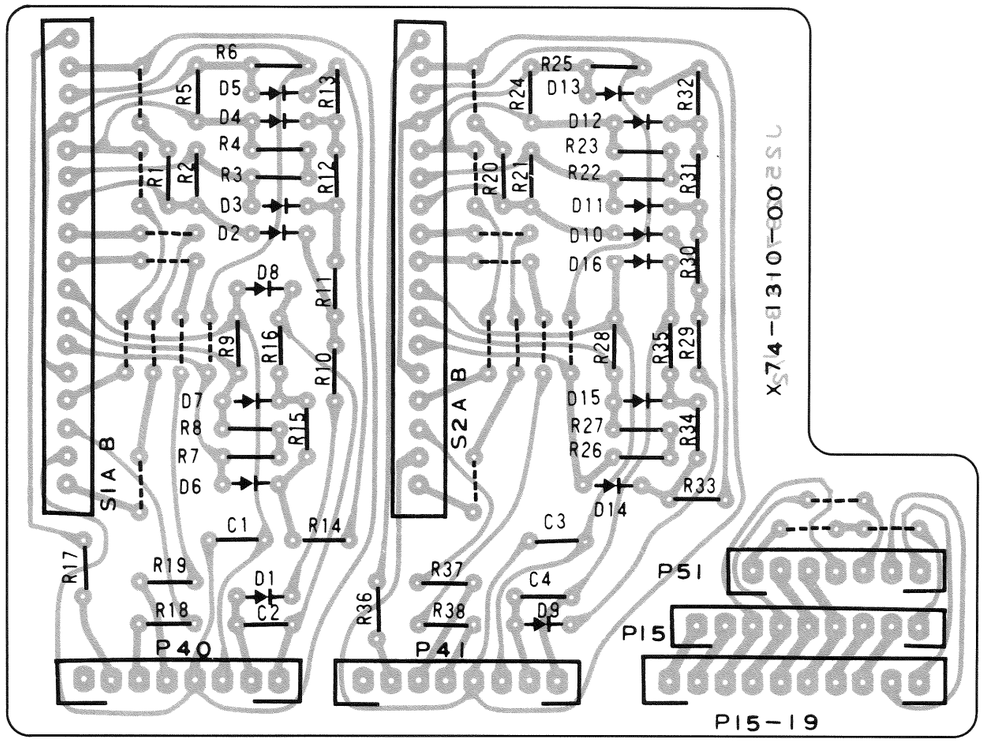
# PC BOARD

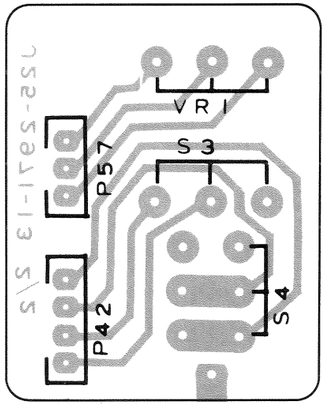
**TRIG SWEEP UNIT (X74-1350-02)**



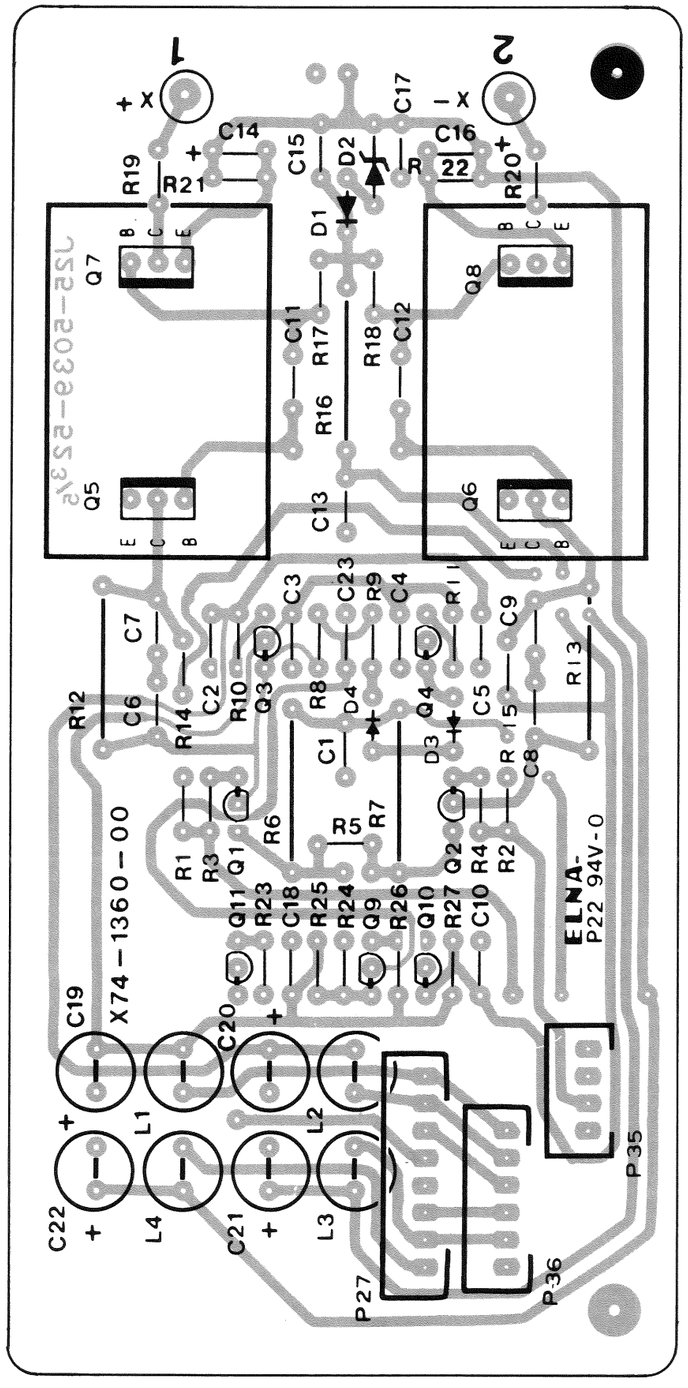
# PC BOARD

## SWEEP ROTARY UNIT (X74-1310-03)



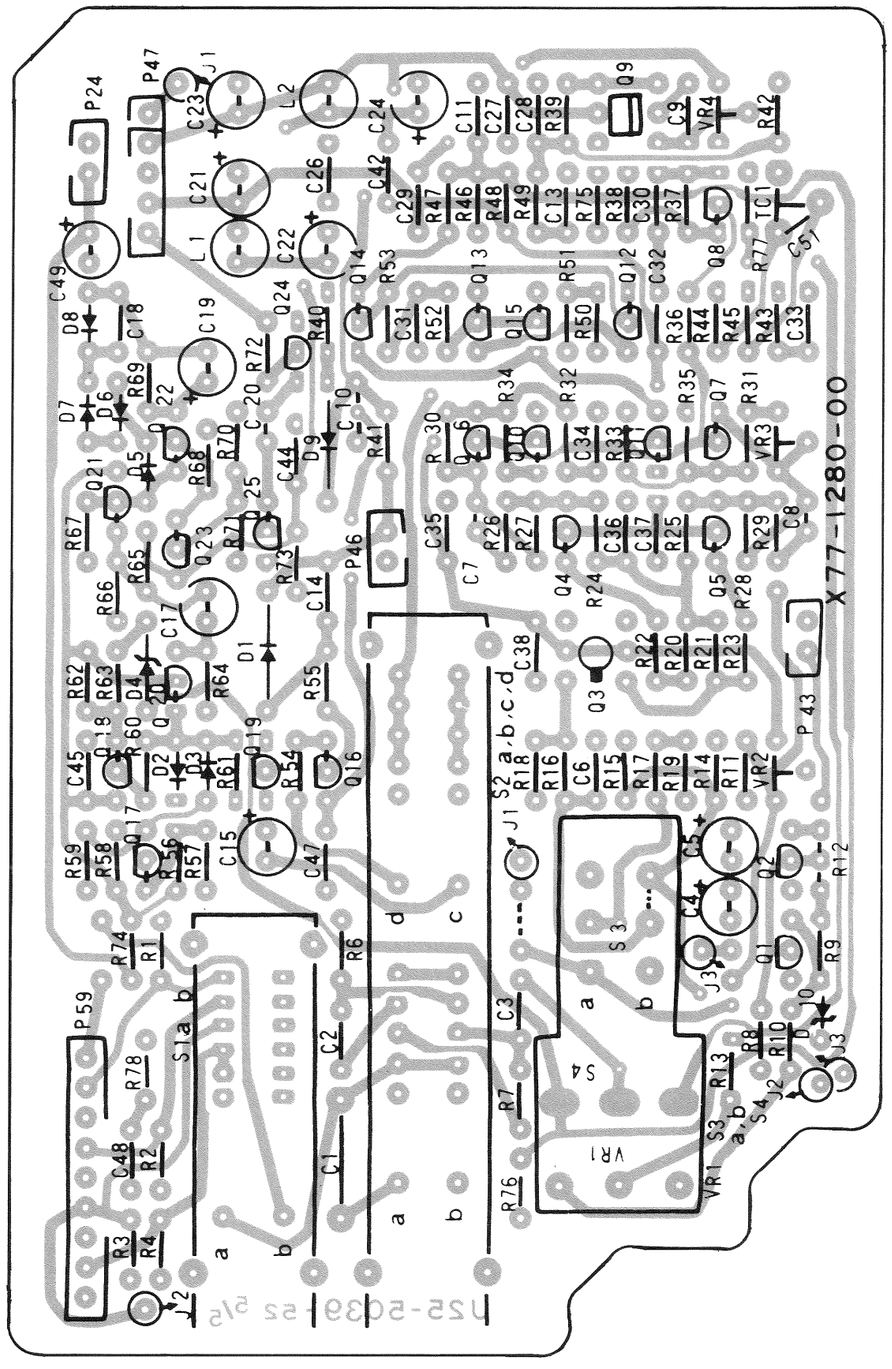




## HORIZONTAL OUTPUT AMP UNIT (X74-1360-02)

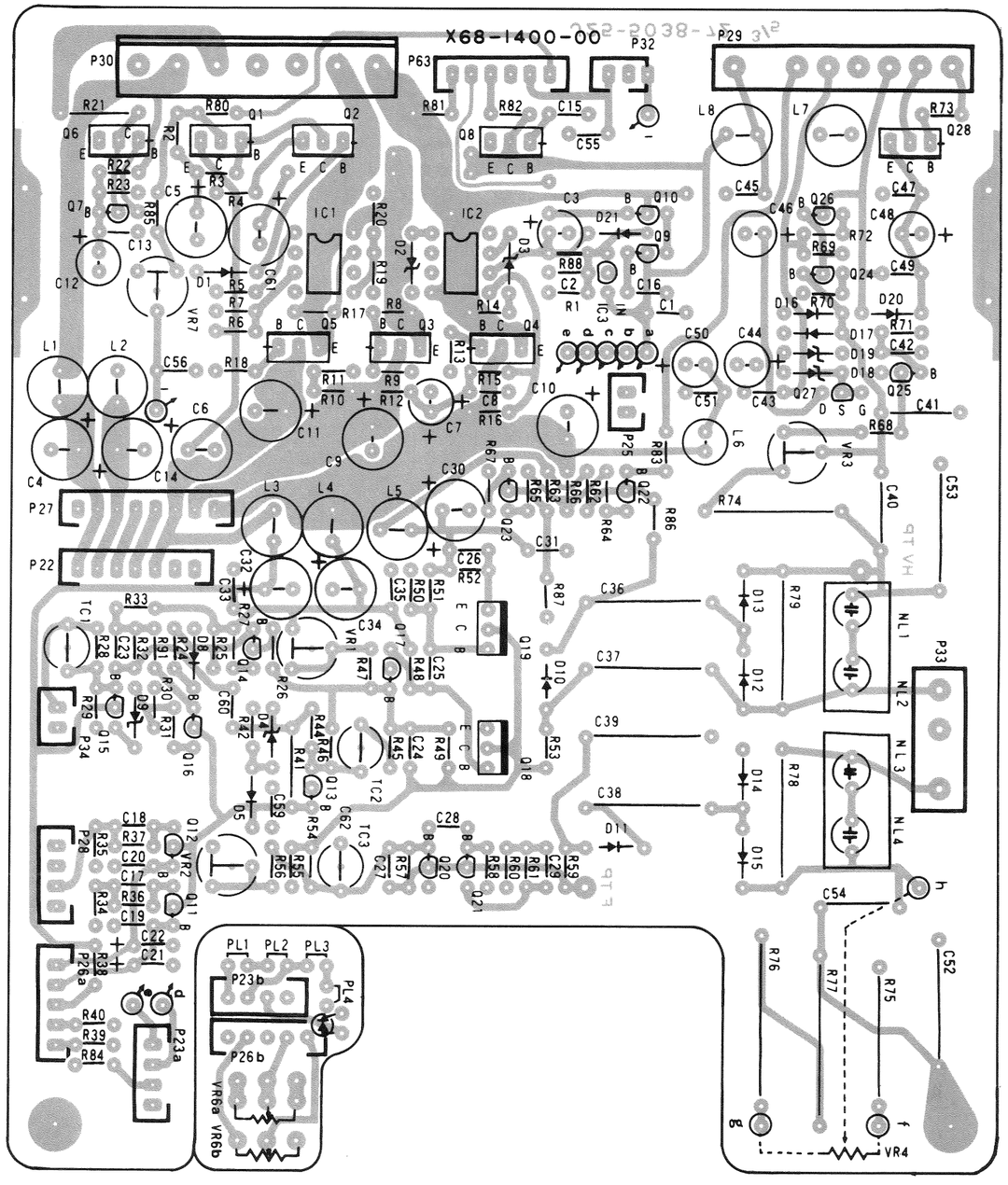


# PC BOARD

## A TRIG SWITCH UNIT (X77-1280-02)

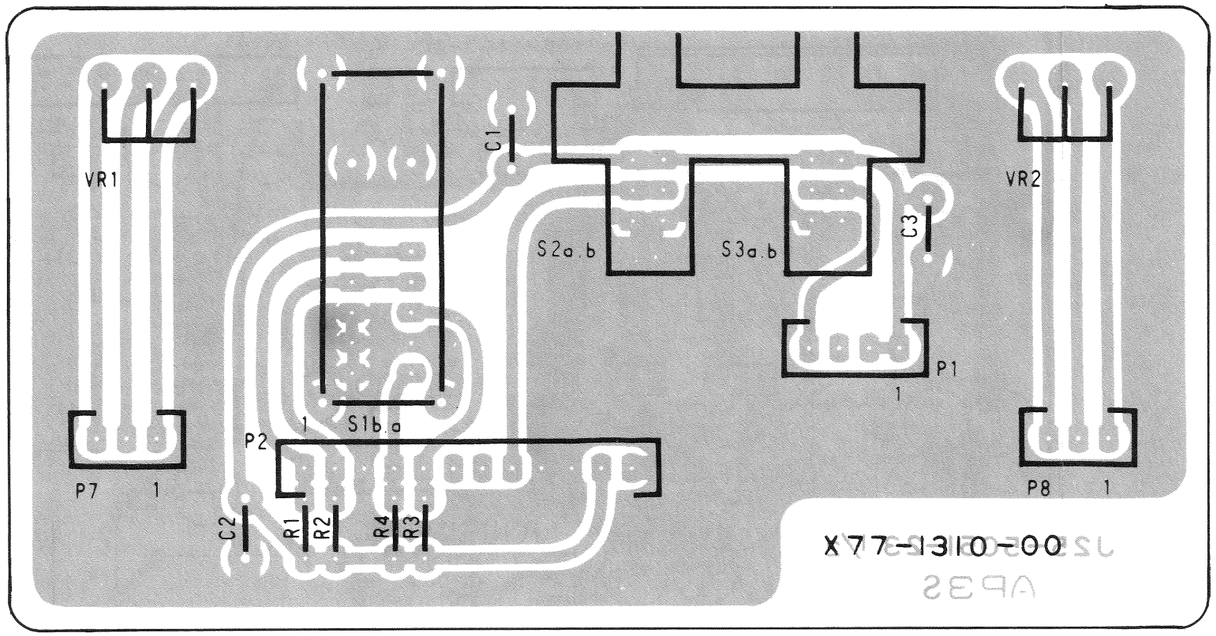



## POWER BLANKING UNIT (X68-1400-03)

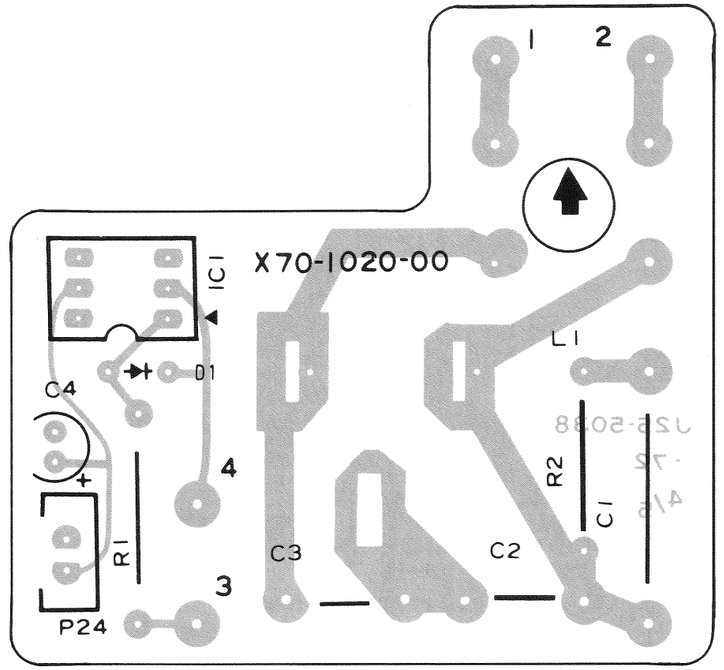


# PC BOARD

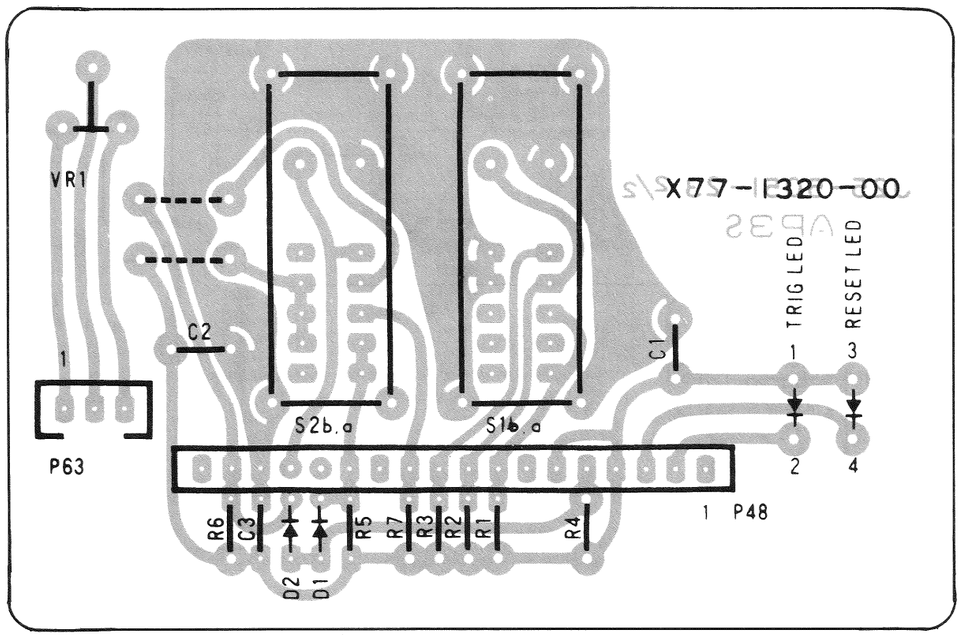
## VERTICAL MODE SWITCH UNIT (X77-1310-00)



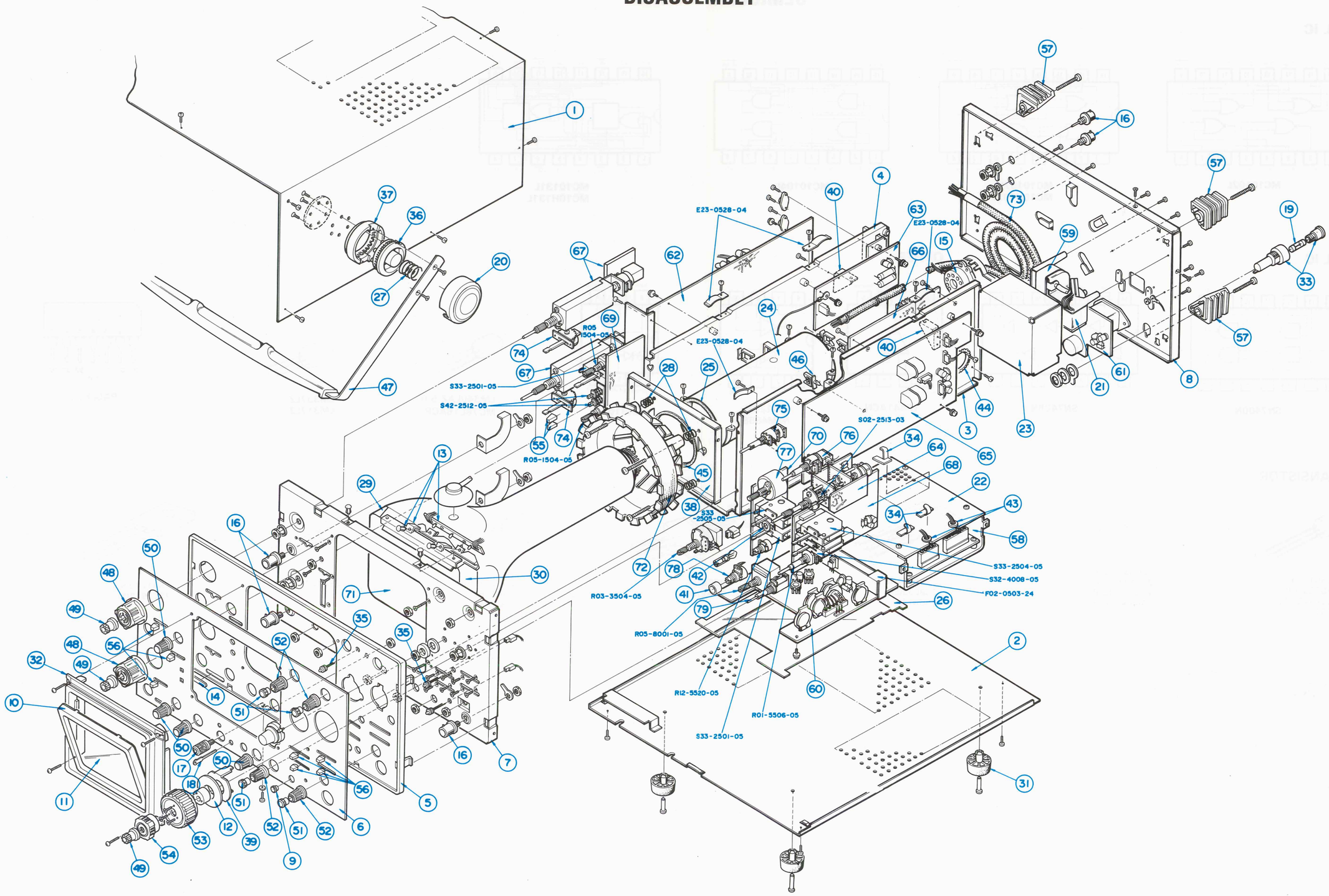

## FILTER UNIT (X70-1020-00)




## HORIZONTAL MODE SWITCH UNIT (X77-1320-00)

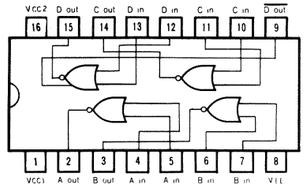


# DISASSEMBLY

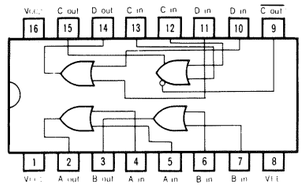


# SEMICONDUCTORS

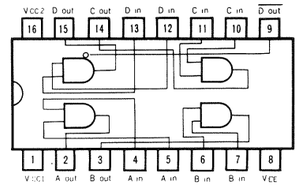
## ECL IC



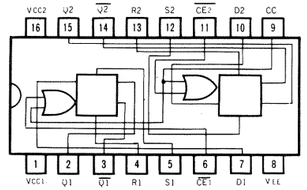

MC10102L




MC10103L
MC10H103L

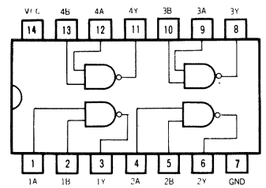



MC10104L

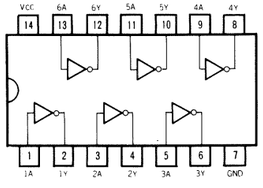



MC10131L
MC10H131L

## TTL IC

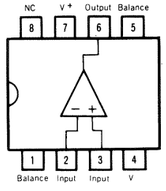



SN7400N




SN7406N

## OTHER

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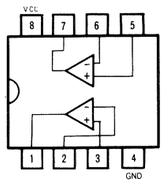


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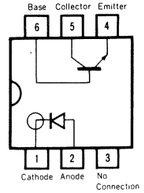


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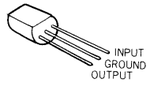


LM340LAZ-5.0
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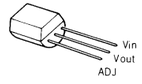
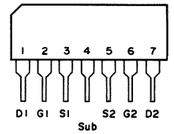
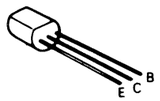



LM337LZ
LM317LZ

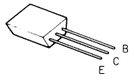



μPA68H(L)

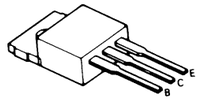
## TRANSISTOR




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

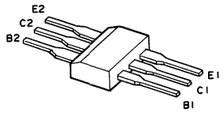



2SC3354(S,T)
2SC3315(C,D)
2SC3311(Q,R)
2SA1309(Q,R)
2SA1323(B,C)

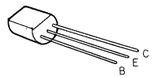



2SC2591(Q, R)
2SB633(E)
2SD613(E)
2SC1505(L)

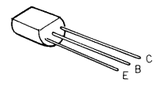
Bottom view



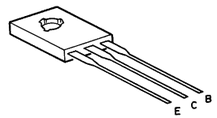

2SC3066
2SA1239




2SC2671(H)
2SA1161
2SC2644

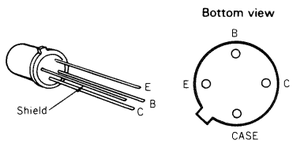



2SA1206



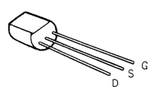

2SA1210(S)
2SC2912(S)

Bottom view

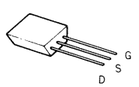



2SC1164(O)*S

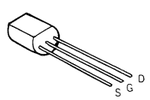
## FET




J304

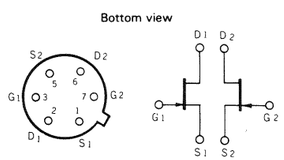



2SK192A-BL
2SK241Y




2SK30A(O)

Bottom view

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