INSTRUCTION MANUAL

SOLTEC

540 P/D

40MHz Dual-trace Oscilloscope

New address & Phone No
March 27 1996

SolTec

SolTec Vista Park
12977 ARROYO ST
SAN FERNANDO Calif 91340-1597

OAI LAN

K 8506 Return Auth. No
March 27 1996

INSTRUCTION MANUAL

UT NO 352834
S/N 111673

SOLTEC

540 P/D

40MHz Dual-trace Oscilloscope

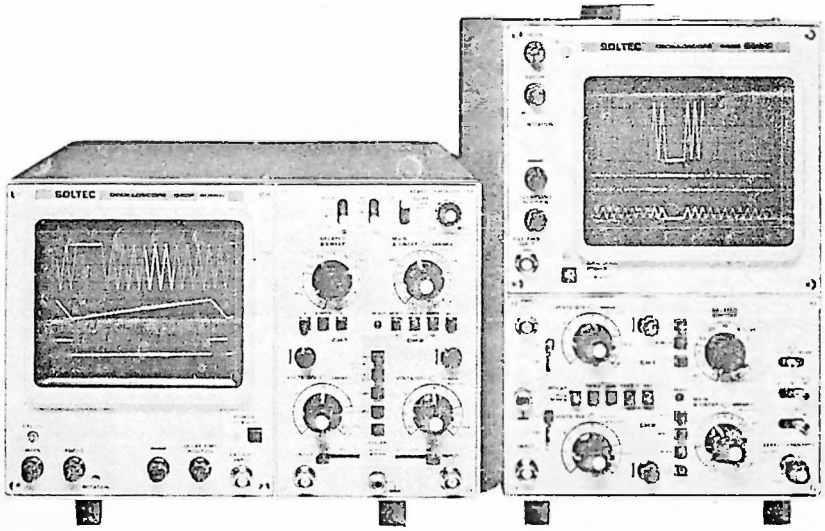
Before operating this set, please read these instructions completely.

Soltec Corporation
~~11684 Pendleton Street~~
~~Sun Valley, California 91352~~

~~Tel. (213) 767-0044 Telex 67-41-88~~

1-800 423 2344 San Fernando Calif.
also 818-365-0800 ext 111 Fax 818-365-7839
as of March 27 1996

NO LONGER IN SERVICE



540P 540D

External View

CONTENTS

CORRECTION

Line Voltage

The line voltage described in this instruction manual is 115 V AC. When the instrument is modified at the factory before shipment for some other line voltage, a tag marking this voltage is attached to the power cord. Please correct the circuit diagram and description according to the line voltage indication on the tag.

SECTION 1 GENERAL

The 540 P/D oscilloscope is intended to cover a wide range of usages for such equipment as audio, video, digital, and many more similar electronic devices.

It has a 6-inch square CRT with an internal graticule, and incorporates a variety of useful functions.

Both the 540 P horizontal and 540 D vertical type oscilloscopes are available for selection by users.

It is a compact, lightweight unit designed for use in laboratories, maintenance, as well as for non-professional use at home. The oscilloscope provides low cost performance ratio and high operational reliability.

Distinctive features of the 540 P/D are:

(1) A 6-inch square CRT with the adoption of an internal graticule.

(2) Both horizontal (540 P) and vertical (540 D) Models are available.

(3) Triple wave signals can be observed.

(4) A built-in delayed sweep function

(5) Digital signals can be readily observed by holdoff control.

(6) Easy sweep triggering is provided by AUTO FIX.

(7) Hi-mic has been adopted to enhance reliability (objective MTBF value: 15,000H)

(8) A built-in TV synchronous separator circuit

(9) Observation of two non-correlated signals by a built-in alternate trigger

(10) Output terminal for recording vertical signals (option)

SECTION 2 SPECIFICATIONS

2.1 VERTICAL DEFLECTION SYSTEM

2.1.1 Deflection factor

20 mV/DIV ~ 10 V/DIV (with no magnifier)

2 mV/DIV ~ 1 V/DIV (with magnifier set at ×10)

9 steps in 1 - 2 - 5 sequence

2.1.2 Deflection factor accuracy

Within 3% of indicated deflection

with VARIABLE set at CAL position

2.1.3 Uncalibrated (variable) range

Provides continuously variable deflection factors between the calibrated steps. Extends maximum uncalibrated deflection factor to at least 25 V/DIV.

2.1.4 Frequency response

Bandwidth	Risetime
DC ~ 40 MHz (at ×1)	8.7 nsec
DC ~ 25 MHz (at ×10)	14 nsec

2.1.5 Input impedance

Direct 1 MΩ paralleled by approx. 30 pF

With probe 10 MΩ paralleled by approx. 20 pF

2.1.6 Maximum input voltage

500 V_{p-p} (DC + AC_{p-p})

2.1.7 Input coupling

AC or DC selected by front-panel Input Coupling switch (AC-GND-DC).

2.1.8 Vertical desplay modes

CH1, CH2, DUAL, ADD, TRIPLE

(DUAL; CHOP ... 0.5 S/DIV ~ 0.1 mS/DIV
ALT ... 50 µS/DIV ~ 0.1 mS/DIV)

2.1.9 Chopping rate

500 kHz ±30 %.

2.1.10 Polarity inversion

Displayed signal on CH2 can be inverted.

2.1.11 CH3 deflection factor

INT ; 1/5 of the displayed signal ±30%

EXT; 1 V/DIV ±30%

Frequency response

DC ~ 10 MHz

Position

(1 ± 0.2) DIV from the bottom graticule line

2.2 TRIGGERING

2.2.1 Trigger mode

NORM, AUTO FIX

2.2.2 Trigger source

INT (NORM, CH1, CH2), LINE, EXT

2.2.3 Trigger coupling

AC-DC-TV

(TV; 0.5 S/DIV ~ 0.1 mS/DIV ... TV-V
50 μS/DIV ~ 0.2 μS/DIV ... TV-H)

2.2.4 Slope

Sweep can be triggered from positive-going or negative-going portion of trigger signal.

2.2.5 Maximum external input voltage

300 V_{p-p} (DC + AC_{p-p})

2.2.6 External input impedance

1 MΩ ± 20% paralleled by 30 pF ± 20%

2.2.7 Trigger level control range

±1 V ~ ±2 V

2.2.8 Trigger sensitivity

NORM TRIGGER

		INT	EXT
AC	30 Hz ~ 5 MHz	0.4 DIV	0.2 V
	~40 MHz	2.0 DIV	1 V
DC	DC ~ 5 MHz	0.4 DIV	0.2 V
	~40 MHz	2.0 DIV	1 V
TV	Video signal (Composite sync)	1 DIV_{p-p}	0.5 V_{p-p}

AUTO FIX TRIGGER

		INT	EXT
AC	400 Hz ~ 5 MHz	0.5 DIV	0.2 V
	400 Hz ~30 MHz	2 DIV	1 V
DC	400 MHz ~ 5 MHz	0.5 DIV	0.2 V
	400 Hz ~30 MHz	2 DIV	1 V
TV	Video signal (Composit sync)	1 DIV_{p-p}	0.5 V_{p-p}

2.2.9 Auto triggering

Stable display is presented with signal amplitudes (given in internal and external sensitivities) above about 100 Hz. When no sweep is triggered, nor is any input signal, the sweep goes free running.

2.3 SWEEP

2.3.1 Trigger mode

AUTO, NORM, SINGLE

2.3.2 HORIZ DISPLAY

A, A INTEN, B

2.3.3 A SWEEP

0.5 S/DIV ~ 0.2 μS/DIV in 20 calibrated steps in 1-2-5 sequence

2.3.4 B SWEEP

0.5 mS/DIV ~ 0.2 μS/DIV in 11 calibrated steps in 1-2-5 sequence

2.3.5 Uncalibrated (variable) sweep rates

Provides continuously variable sweep rate between the calibrated steps. Extends slowest uncalibrated sweep rate to at least 1.25 S/DIV for A sweep, or 1.25 mS/DIV for B sweep.

2.3.6 Sweep rate accuracy

0.2 S/DIV ~ 0.2 μS/DIV ±3%

0.5 S/DIV ±4%

2.3.7 Sweep magnification

Display is magnified 10 times at center screen.

2.3.8 Magnification accuracy

Unmagnified sweep rate accuracy plus 2%.

2.3.9 Delayed sweep starting point

0.5 to 10 divisions for A sweep

2.3.10 Delay time jitter

One part or less in 10000 of the maximum available delay time

2.3.11 Single sweep

"A" sweep generator produces only one time when triggered.

2.3.12 Holdoff

Holdoff time is continuously variable up to 4 times or longer.

2.4 X-Y OPERATION

2.4.1 External horizontal input (1)

CH1 = X, CH2 = Y

Deflection factor

For both X and Y ... 2 mV/DIV ~ 10 V/DIV ±5%

Frequency bandwidth

DC ~ 1 MHz

Phase difference

3° or less at 1 MHz

2.4.2 External horizontal input (2)

EXT INPUT = X

CH1 and CH2 = Y (Dual signal operation is enabled)

Deflection factor

X ... 0.2 V/DIV ±20%

Frequency bandwidth

DC ~ 1 MHz

Input impedance

1 MΩ ± 20% paralleled by 30 pF ± 20%

2.5 Z AXIS

2.5.1 Polarity

5-volt peak-to-peak signal produces noticeable modulation at normal intensity.

2.5.2 Frequency range

DC ~ 10 MHz

2.5.3 Input resistance

47 kΩ ± 20%

2.5.4 Maximum allowable input voltage

50 V_{p-p} (DC + AC_{p-p})

2.5.5 Input coupling

DC coupling

2.6 CALIBRATION VOLTAGE

2.6.1 Output voltage

0.1 V

2.6.2 Accuracy

±1%

2.6.3 Waveform

Positive square wave

2.6.4 Frequency and risetime

1 kHz ± 10%, 10 μsec or less

2.7 CATHODE-RAY TUBE

2.7.1 Tube type

Square CRT with internal graticule.

2.7.2 Accelerating potential

6 kV/1.5 kV

2.7.3 Graticule area

8 divisions vertical by 10 divisions horizontal
(1 division 9.5 mm)

2.8 POWER SOURCE

2.8.1 Line voltage

100 V	90 V ~ 110 V
115 V	104 V ~ 126 V
215 V	194 V ~ 236 V
230 V	207 V ~ 250 V

2.8.2 Line frequency

50 Hz ~ 400 Hz

2.8.3 Power consumption

39 W

2.9 ENVIRONMENTAL CHARACTERISTICS

2.9.1 Operating temperature

0 ~ 50°C

2.9.2 Storage temperature

-20 ~ 70°C

2.9.3 Operating relative humidity

20 ~ 80%

2.9.4 Vibration and shock requirement

Factory sampling tests assure the following operating and non-operating performance.

(1) Vibration test

15 minutes of vibration along each of three major axes at a total displacement of 0.6 mm peak-to-peak from 600 - 3300 - 600 r.p.m. in one minute cycles.
Held at 3300 r.p.m. for 3 minutes on each axis; total test time, 54 minutes.

(2) Shock test

Two shocks of 30 G, one-half sine, on each surface.
Total of 12 shocks.

(3) Transportation package drop

55-cm drop on a corner and three edges, and 65-cm drop on each flat surface. Total of 10 drops.

These tests repeated twice or more may cause partial cause to the instrument.

2.10 STANDARD ACCESSORIES

Probe (VQ-054K3015) 10:1	2
BNC adaptor (YXFC46004190)	1
Grounding adaptor (YXFC76J003)	1
Rush proof fuse (YXAFTSC1A)	1
Instruction manual	1
Allen wrench (5/64 inch)	1
Allen wrench (3/64 inch)	1

2.11 OPTIONS

- Readout circuit
- CH1 Signal out
- Front cover

2.12 MECHANICAL CHARACTERISTICS

2.12.1 Overall dimensions

		Width (mm)	Height (mm)	Depth (mm)
540P	Main body only	264 ± 3	177 ± 3	375 ± 3
(Horizontal type)	(Measured at maximum points)	294 or less	197 or less	450 or less
540D	Main body only	177 ± 3	264 ± 3	375 ± 3
(Vertical type)	(Measured at maximum points)	184 or less	294 or less	450 or less

2.12.2 Net weight (without accessories) about 7.8 kg

AG-88-5088

SECTION 3 OPERATING INSTRUCTIONS

3.1 OPERATIONS

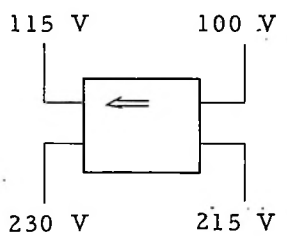
3.1.1 Line voltage

The Model 540 P/D can be operated from either a 100 V or 200 V nominal line voltage. Please check before turning on the instrument whether the conversion plug has been set properly.

The fuse current capacity must be determined based on the fuse data indicated on the rear panel.

A line frequency of 50 Hz to 400 Hz can be used.

Line voltage range	
100 V	90 ~ 110 V
115 V	104 ~+126 V
215 V	194 ~ 236 V
230 V	207 ~ 250 V



1A	90 ~ 126 V
0.5A	194 ~ 250 V

3.1.2 Description of Controls and Connectors

A brief description of the function and operation of the front-, side- and rear-panel controls and connectors follows:

· Front panel

① INTEN — Controls brightness of display.

② FOCUS — Provides adjustment for optimum display difinition.

③ ROTATION — Corrects inclination of the trace caused by earth magnetism.

④ CAL 0.1 V — Used to calibrate the vertical deflection factor and the square waveform of a 10:1 probe. 0.1-volt square wave of a frequency of 1 kHz is obtained. For probe calibration, a display of 5 divisions is obtained by setting the VOLTS/DIV switch to 2 mV/DIV (magnifier set at X10).

⑤ INPUT — Input connector for channel deflection signals. (X) and (Y) are used as the connections for the X- and Y- signals, respectively, in X-Y operation.

⑥ AC-GND-DC — Selects method of coupling input signal to gate of Input Amplifier.

AC: DC component of input signal is blocked with a capacitor; only AC component is passed to the Input Amplifier. A notable sag appears for the square waveform with a frequency of 1 kHz or lower.
Low frequency limit (-3 dB point) is approximately 3.4 Hz.

GND: Input circuit is grounded (does not ground applied signal).

DC: All components of the input signal are passed to the Input Amplifier.

4G-88-5008

⑦ VOLTS/DIV — Selects vertical deflection factor in 1-2-5 sequence. (VARIABLE knob ⑧ must be in CAL position for indicated deflection factor.)

⑧ VARIABLE PULL X10 — Provides continuously variable uncalibrated deflection factor between the calibrated settings of the VOLTS/DIV switch. The indicated deflection factor may be reduced in minimum 1/2.5 ratio. The factor can be multiplied by 10 by pulling this knob.

⑨ CH1 CH2 DUAL TRIPLE
BOTH IN ADD

Selects vertical mode of operation.

CH1: The signal connected to the INPUT CH1 connector is displayed.

CH2: The signal connected to the INPUT CH2 connector is displayed.

DUAL: 0.5 S/DIV ~ 0.1 mS/DIV ... CHOP
50 µS/DIV ~ 0.2 S/DIV ... ALT

Remove the housing to reveal a slide switch on the frame side of the printed circuit board fitted with the TIME/DIV switch. CHOP-ALT is inverted by sliding the switch forward.

CHOP ... Dual-trace display of signals on both channels. Display is switched between channels at a repetition frequency of 500 kHz regardless of the sweep.

ALT .... Dual-trace display of signals on both channels. Display is switched at end of each sweep.

TRIPLE: Triple-trace display of signals on three channels with the trigger circuit used as CH3 to which the EXT INPUT signal is input.

ADD: Signals applied to the INPUT CH1 and INPUT CH2 connectors are algebraically added and the algebraic sum is displayed on the CRT by simultaneously pressing CH1 and CH2 buttons.

⑩ POLAR — Two-motion switch which inverts CH2 display, when pressed, and the polarity returns to normal when pressed again.
(INV ▬ ; NORM ▮)

⑪ ↕ — Controls vertical position of trace.

⑫ NORM-CH1-CH2 — Selects source of internal trigger signal from vertical deflection system.

NORM: Sweep circuits are triggered from displayed channel(s). In the ALT mode, sweep is triggered alternately, even by signal sources having no timing relation. However, no stable display is obtained in the CHOP mode.

CH1: Sweep circuits are triggered only from signal applied to INPUT CH1 connector.

CH2: Same as above, except INPUT CH2.

⑬ INT-LINE-EXT — Selects source of trigger signal.

INT: Internal trigger signal obtained from vertical deflection system.

LINE: Trigger signal obtained from sample of the line voltage applied to this instrument. (Selection range is narrow for the 400-Hz line voltage.)

EXT: Trigger signal obtained from an external signal applied to the EXT INPUT connector.

(14) AC-DC-TV Determines method of coupling trigger signal to trigger circuit.

AC: Rejects DC components of trigger signal with a capacitor.

DC: Accepts all trigger signals.

TV: Trigger signal is obtained from TV synchronizing signal separator circuit.

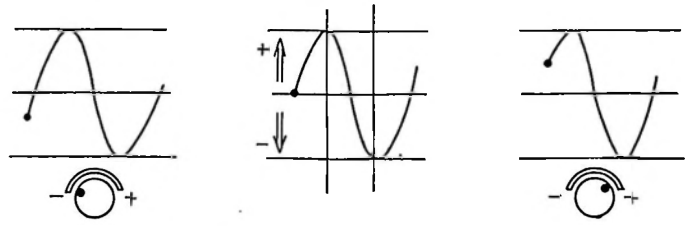
TV-V; 0.5 S/DIV ~ 0.1 msec/DIV

TV-H; 50 μS/DIV ~ 0.2 μsec/DIV

Signal polarity can also be inverted See (9).

(15) HOLDOFF Used to get stable display with such a complex and repetitive waveform that sweep cannot be triggered by simple trigger level control. Holdoff time increases when this knob is turned clockwise.

(16) LEVEL Selects amplitude point on trigger signal at which sweep is triggered.



When this knob is pulled, sweep can be triggered from negative going portion of trigger signal. When this knob is turned to the extreme left, the switch clicks, causing the horizontal system to go FIX trigger. In this triggering mode, sweep is triggered automatically by a signal above a certain level.

(17) MAIN A SWEEP — Selects the sweep rate of the A sweep circuit and the delay time for delayed sweep.

EXT X-Y — X-Y operation is set when this switch is rotated fully counterclockwise.

(i) An X-Y oscilloscope with CH1 = X and [CH2] = Y is obtained by setting the V MODE (9) to [CH2], INT TRIG SOURCE (12) to [CH1], TRIG SOURCE (13) to INT, and COUPLING (14) to [AC] or [DC].

(ii) An X-Y oscilloscope where EXT INPUT = X and CH1 or CH2 = Y is obtained by setting the V MODE (9) to any position, TRIG SOURCE (13) to EXT, and COUPLING (14) to AC or DC. When the V MODE (9) is set to DUAL, X-Y dual-trace operation occurs.

(18) A VARIABLE PULL X10 — Provides continuously variable A sweep rate at least 1-2.5 times between the calibrated settings selected by the MAIN A SWEEP (TIME/DIV) switch "A" sweep rate is calibrated when VARIABLE control is set to CAL. Pulling this control increases sweep rate to ten times setting of A or B TIME/DIV switch by horizontally

expanding the center division of the display. The maximum sweep rate is 20 nsec/DIV.

⑲ AUTO-NORM-SINGLE-RESET

Determines the operating mode for A sweep.

AUTO: A stable display is obtained in a sweep-triggered state. When there is no trigger signal or its level is deviated, the sweep free runs at the sweep rate selected by the TIME/DIV switch. This is useful to measure the DC voltage.

NORM: Sweep is initiated by the applied trigger signal using the A triggering controls. No trace when there is no trigger signal.

SINGLE: Sweep is triggered only once when there is a trigger signal.

RESET: When the RESET button is pressed, a single display will be presented (with correct triggering). After the sweep is completed, the RESET button must be pressed again before another sweep can be displayed.

⑳ EXT-CH3 INPUT

This external input terminal serves not only as external trigger signal connector, but also as CH3 input connector for triple-trace display. It is also used as an external horizontal input connector, and provides the X-axis signal for X-Y operations. See ⑰.

㉑ ←→

Controls horizontal position of display.

(22)	DELAYED B SWEEP	This B TIME/DIV switch is used to select sweep rate in the DELAYED SWEEP mode of operation.
(23)	A-A INTEN-B	Selects horizontal mode of operation. A: Horizontal deflection is provided by A sweep. A INTEN: Horizontal deflection is provided by A sweep. An intensified portion appears on the display during the B sweep time. This switch position provides a check of the duration and position of B sweep (delayed sweep) with respect to the delaying sweep A. B: Horizontal deflection is provided by B sweep. The intensified portion at A INTEN is displayed.
(24)	DELAY TIME POSITION	Selects the portion to be magnified by B sweep. The A sweep deflection range is 0.5 DIV to 10.5 DIV.
(25)	POWER	Power ON-OFF switch controls power to the instrument. The pilot lamp indicates that power is on and the instrument is connected to a line-voltage source.
(26)	⏚	Grounding terminal.

· Rear panel

(27)	A GATE	Output connector providing a positive square pulse coincident with A sweep. (Option)
(28)	B GATE	Output connector providing a positive square pulse coincident with B sweep. (Option)

(29) Z AXIS INPUT — Input connector for intensity modulation of the CRT display.

(30) FUSE — 1-amp fuses are used for 90 to 126 V lines, and 0.5-amp fuses for 194 to 250 V lines. Fuses are removed and fitted with a philips screwdriver.

(31) CH1 SIG OUT — Output terminal for CH1 signals. (Option)

(32) ⏚ — Protection grounding terminal.

(33) RECORD OUT — Output connector for the sampling output signal to record the waveform displayed on the CRT into an X-Y recorder ... and for the pen lift signal. (Option)

· Bottom panel or Left side panel

(34) CH3 POSITION — Adjusts CH3 display position. It has been set to the third DIV from the center of the graticule. Readjust as required.

(35) (Line voltage conversion plug)
The plug is inserted to the 100V, 115V, 215V, or 230V position based on the line voltage.

(36) CH1 GAIN — Adjusts the CH1 gain. Adjust it by setting CH1 VOLTS/DIV switch (7) to the 20 mV/DIV position.

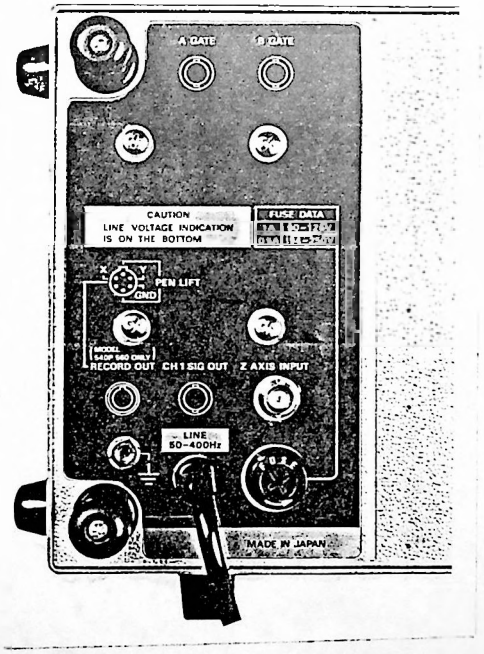
(37) CH2 GAIN — Adjusts the CH2 gain. Adjust it by setting CH2 VOLTS/DIV switch (7) to the 20 mV/DIV position.

(38) CH1 STEP ATT BAL — Screwdriver adjustment for CH1 amplifier DC balance. It must be adjusted so the trace does not shift when the CH1 VOLTS/DIV switch (8) is pulled.

(39) CH2 STEP ATT BAL — Screwdriver adjustment for CH2 amplifier DC balance. It must be adjusted so the trace does not shift when the CH2 VOLTS/DIV switch (8) is pulled.

3.2 RECORD OUT OPERATION (Option)

1. Connect the X and Y axis on the rear of the instrument to the X-Y recorder.
   The output sensitivity (gain) is 600 mV/DIV for the X-axis, and 100 mV/DIV for the Y-axis.
   If the recoder has a pen-lift signal terminal, connect it with the Record Out connector of this instrument.



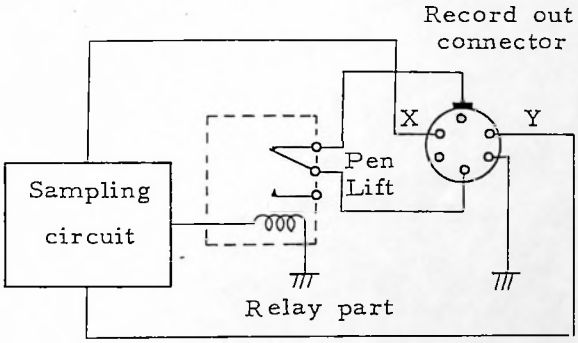


Fig. 3-2-1 Record out connector

2. Obtain a desplay of a waveform to be recorded on CRT screen, and adjust appropriate controls for proper amplitude and sweep rate.

3. Change the Horizontal mode to the A INTEN position, and pull the scan switch knob to set to SCAN.
   Now, with the controls set as described above, the delayed sweep travels on the displayed waveform in approximately 20 seconds from left to right.

4. For the easier observation, set the B sweep switch at a position between 1/100 and 1/1000 of the A sweep switch setting.

5. When the pen lift switch is set to ON in the X-Y recoder, a waveform per scanning is recorded.

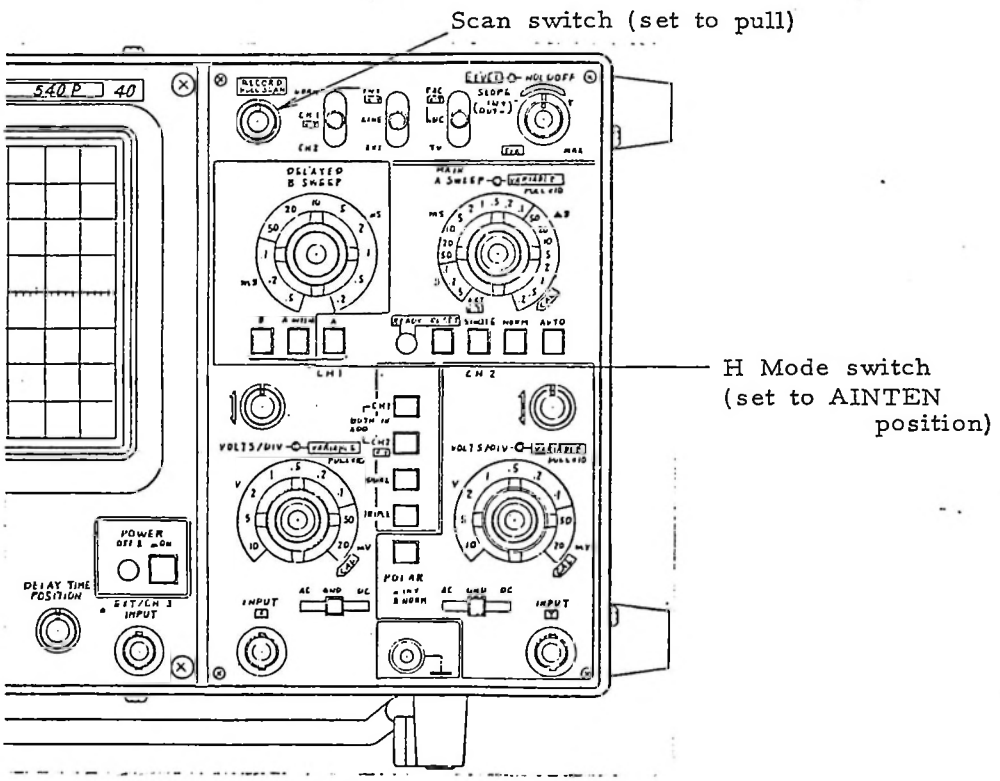
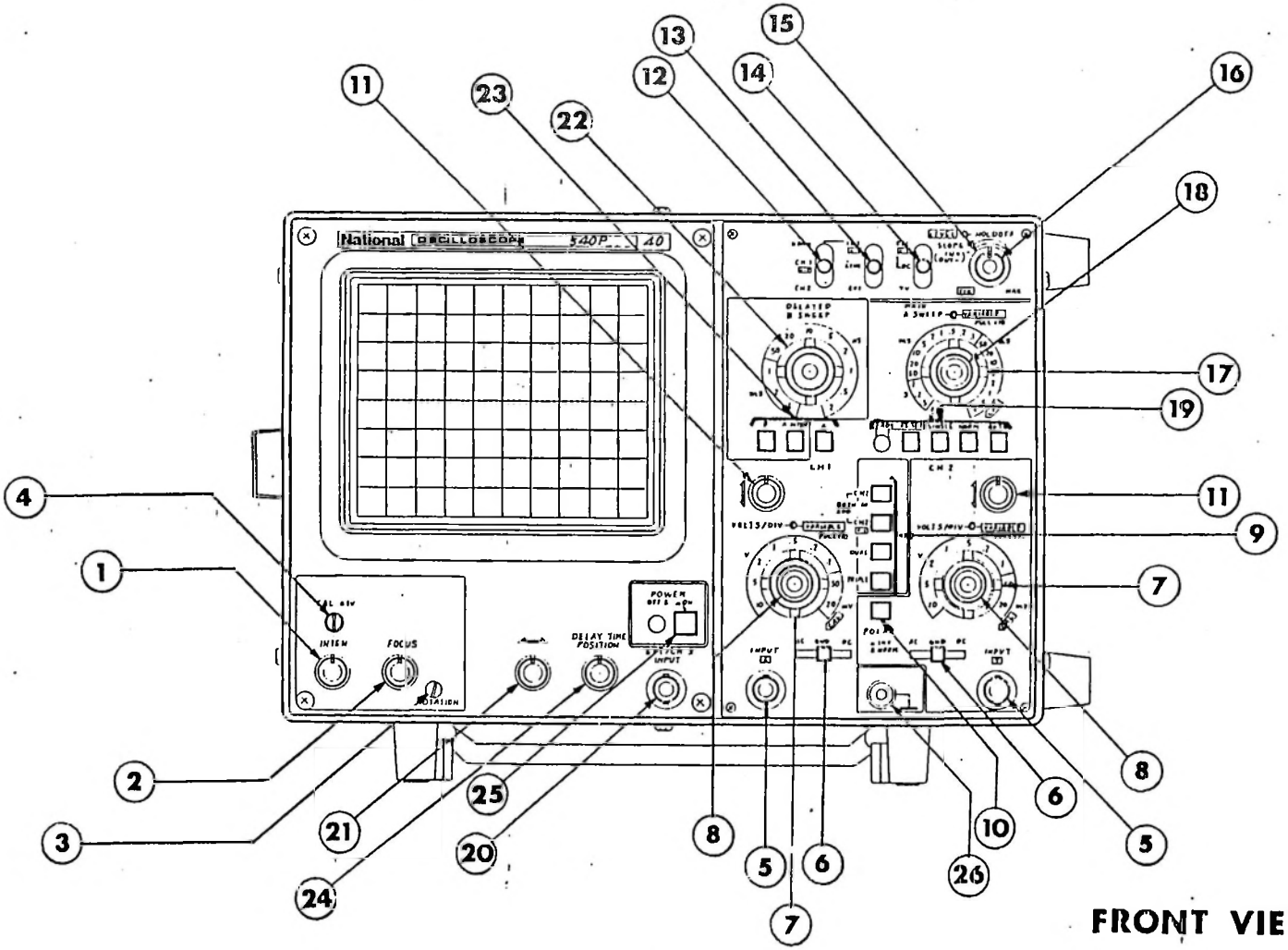


Fig. 3-2-2 Control settings



FRONT VIEW

540P

Fig. 1

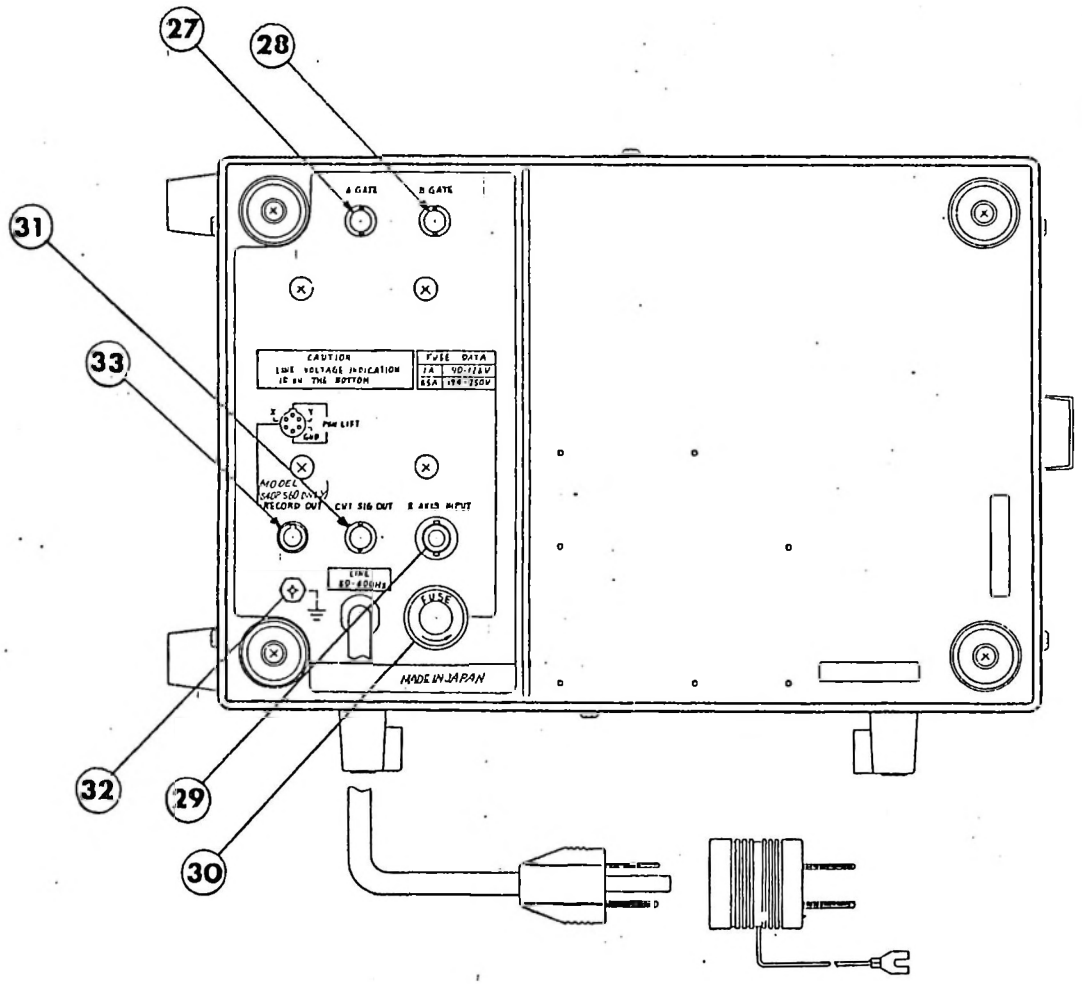
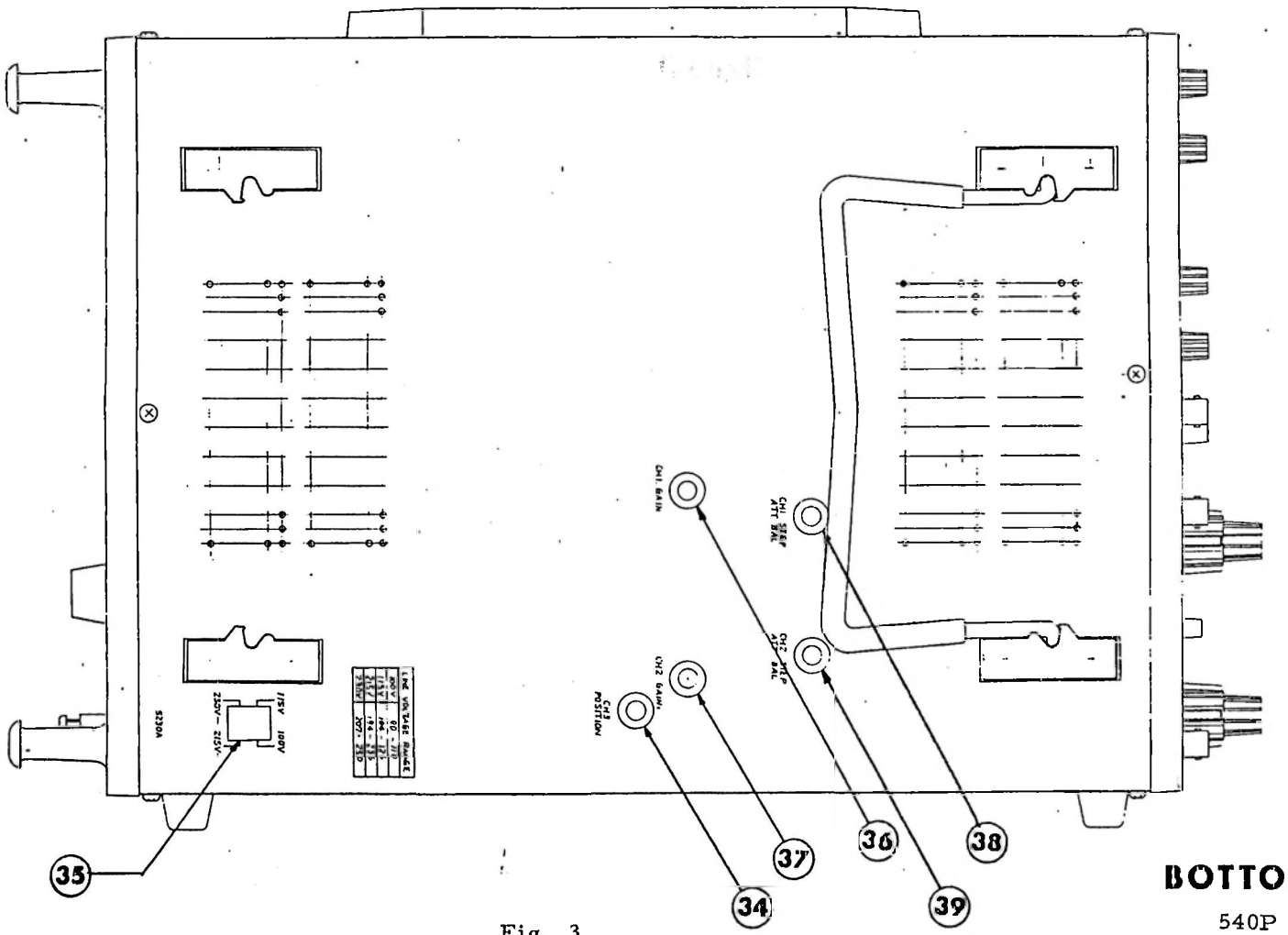


Fig. 2

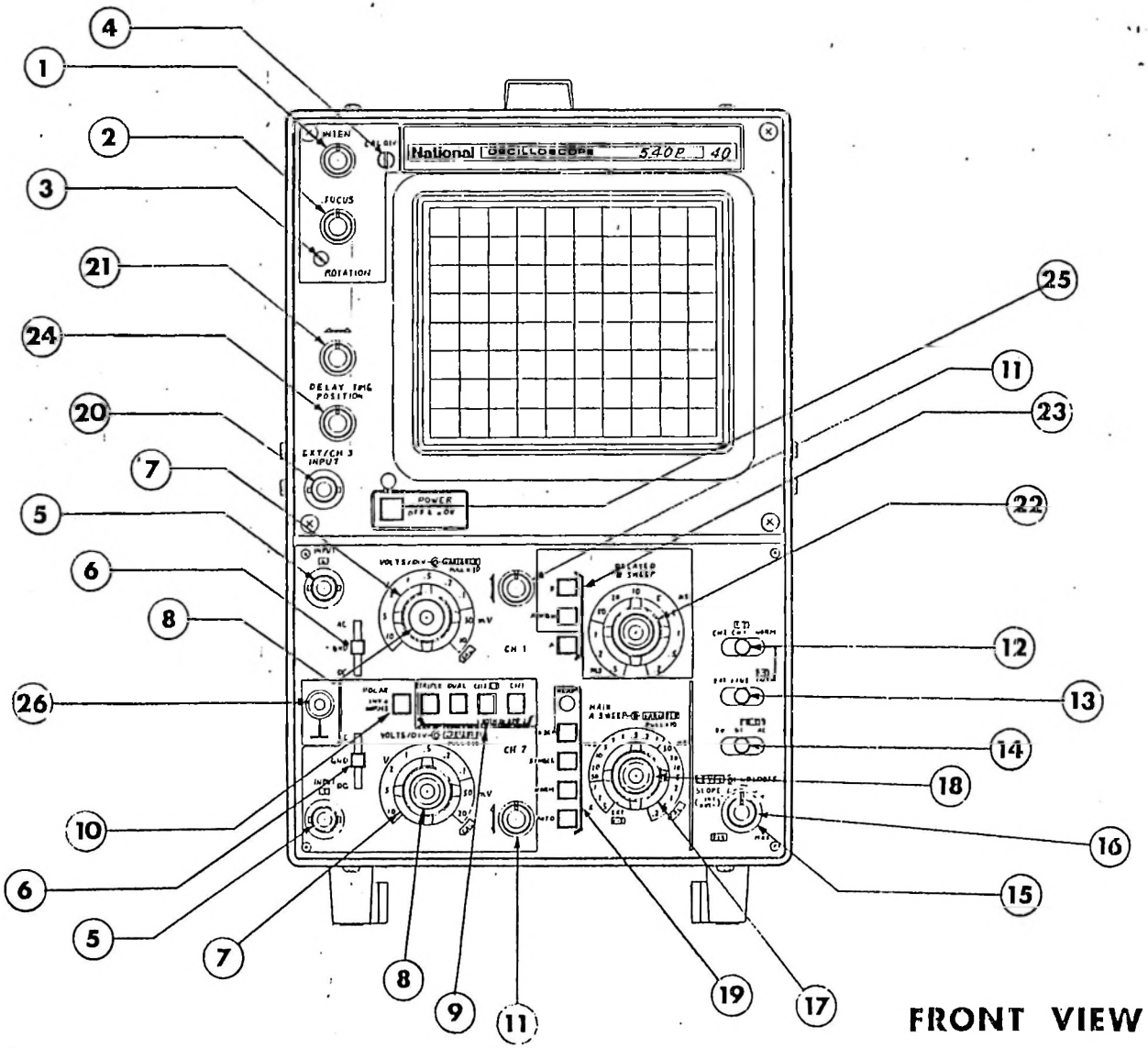
REAR VIEW
540P



BOTTOM VIEW

540P

Fig. 3



FRONT VIEW

540D

Fig. 4

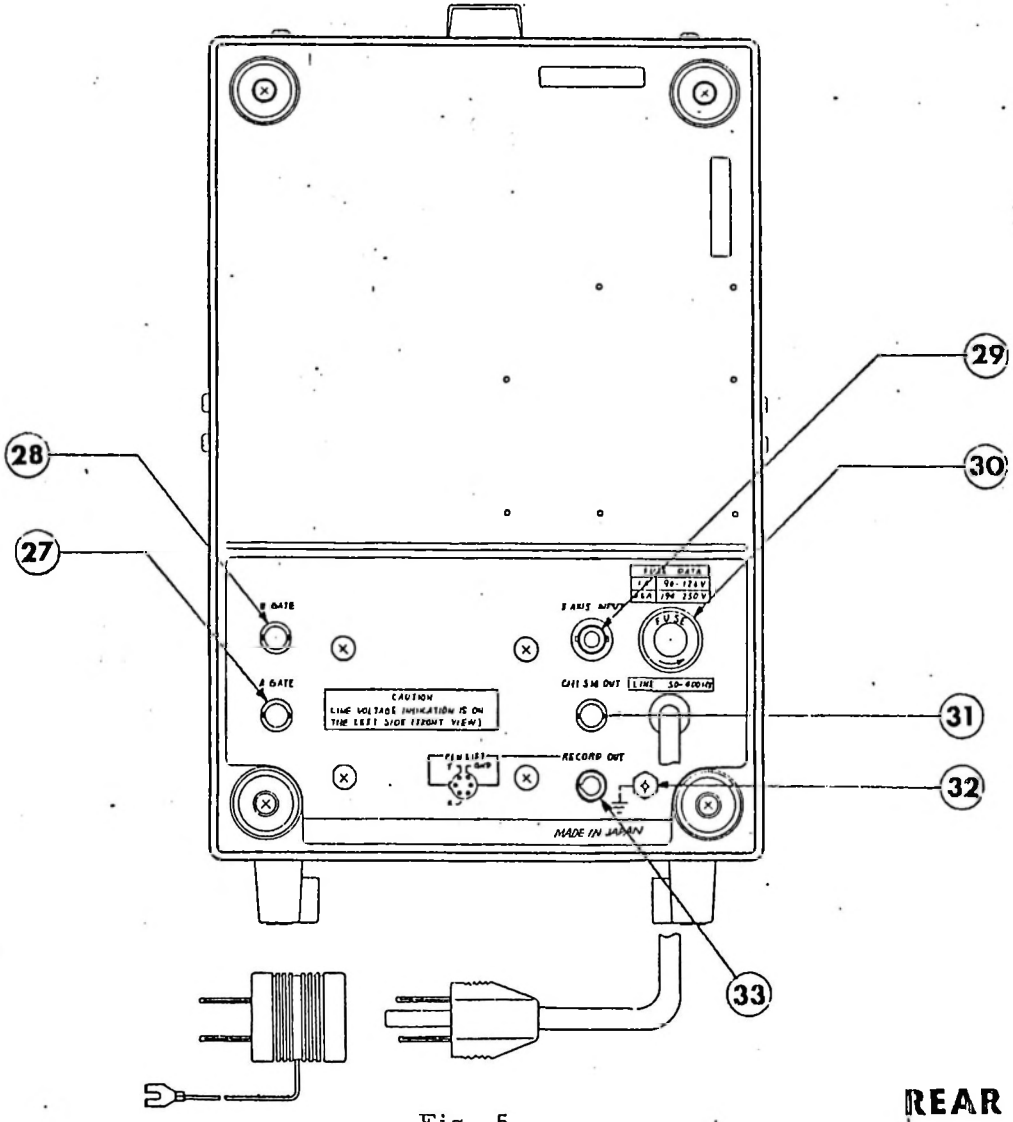


Fig. 5

REAR VIEW
540D

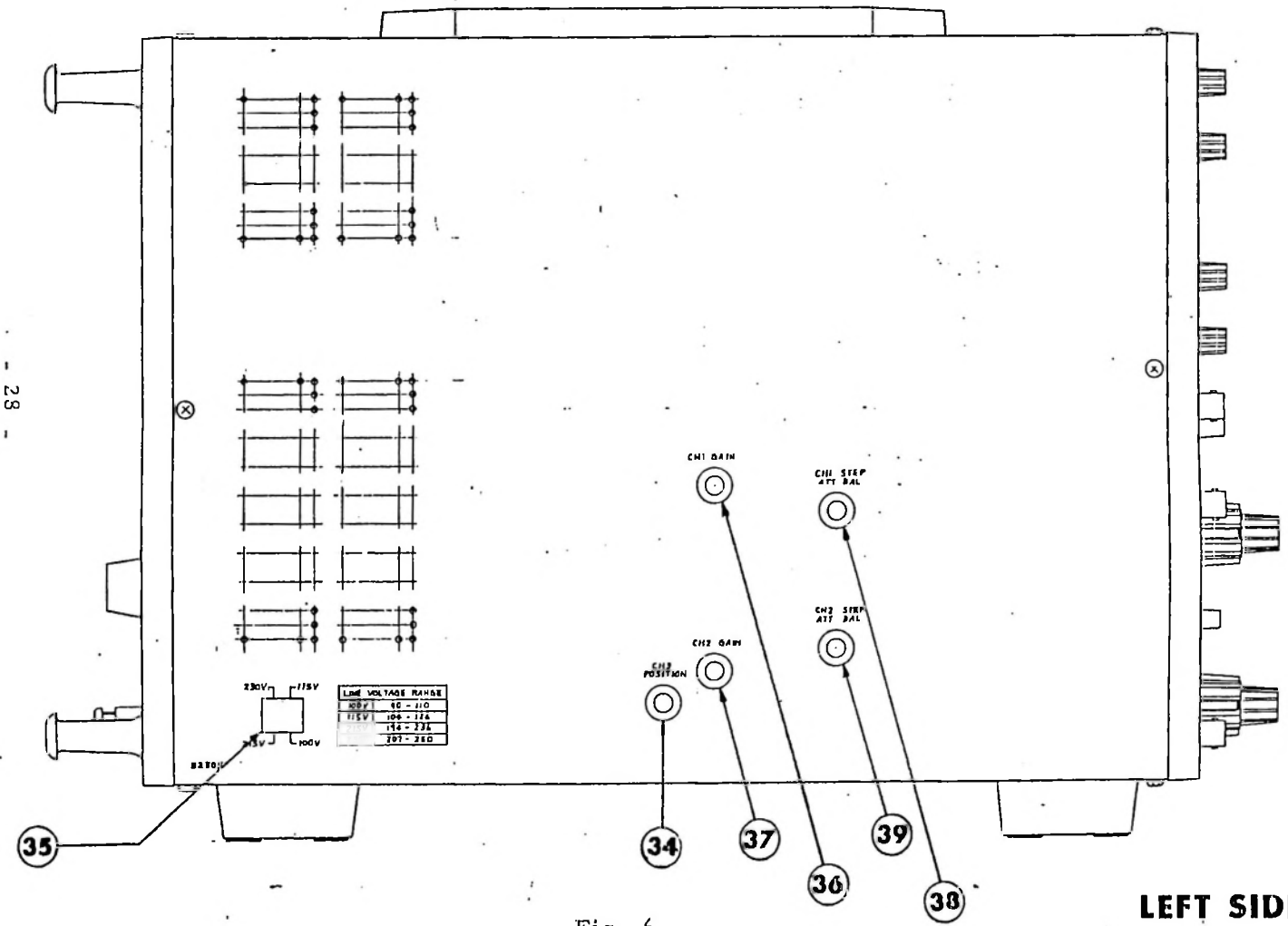
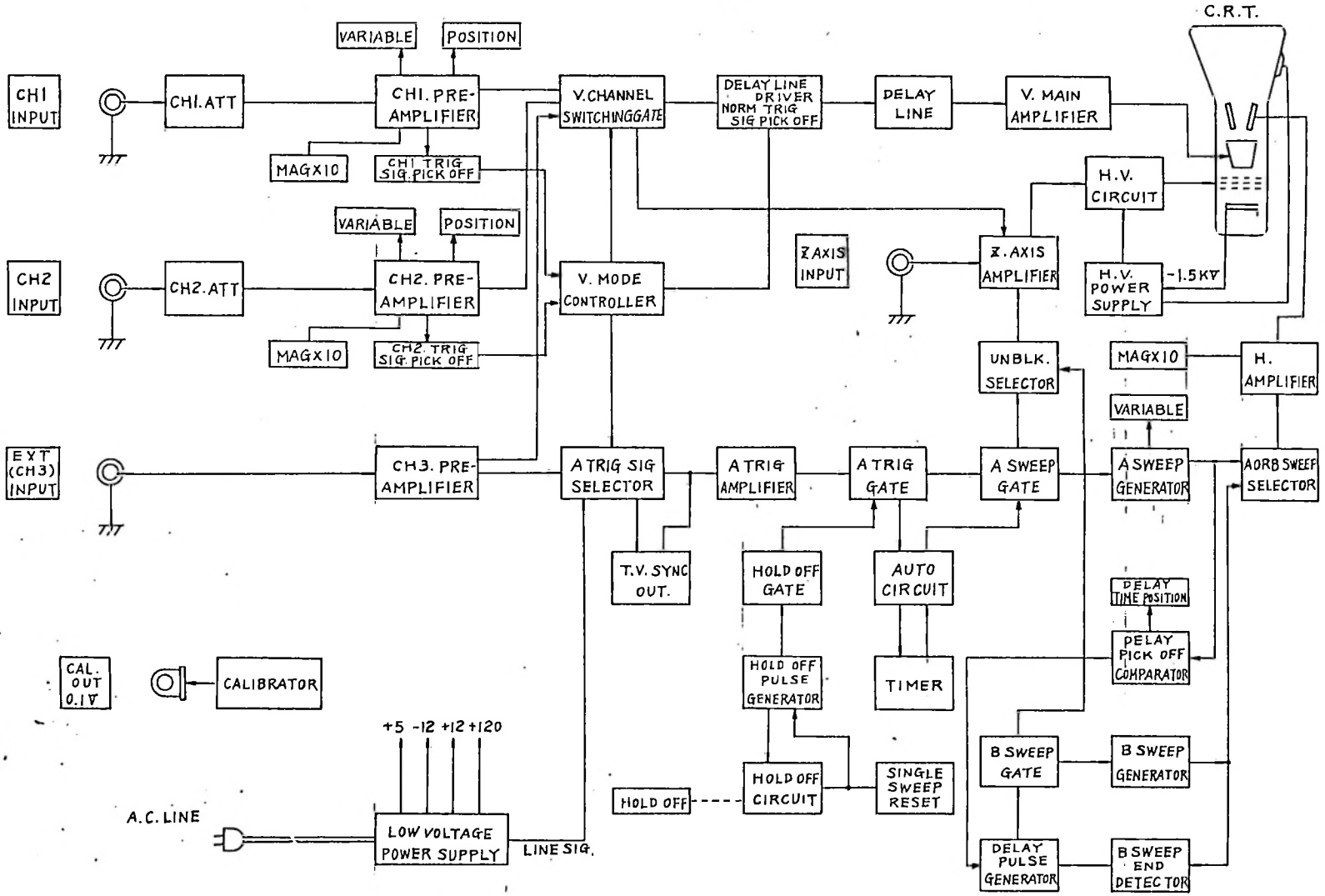


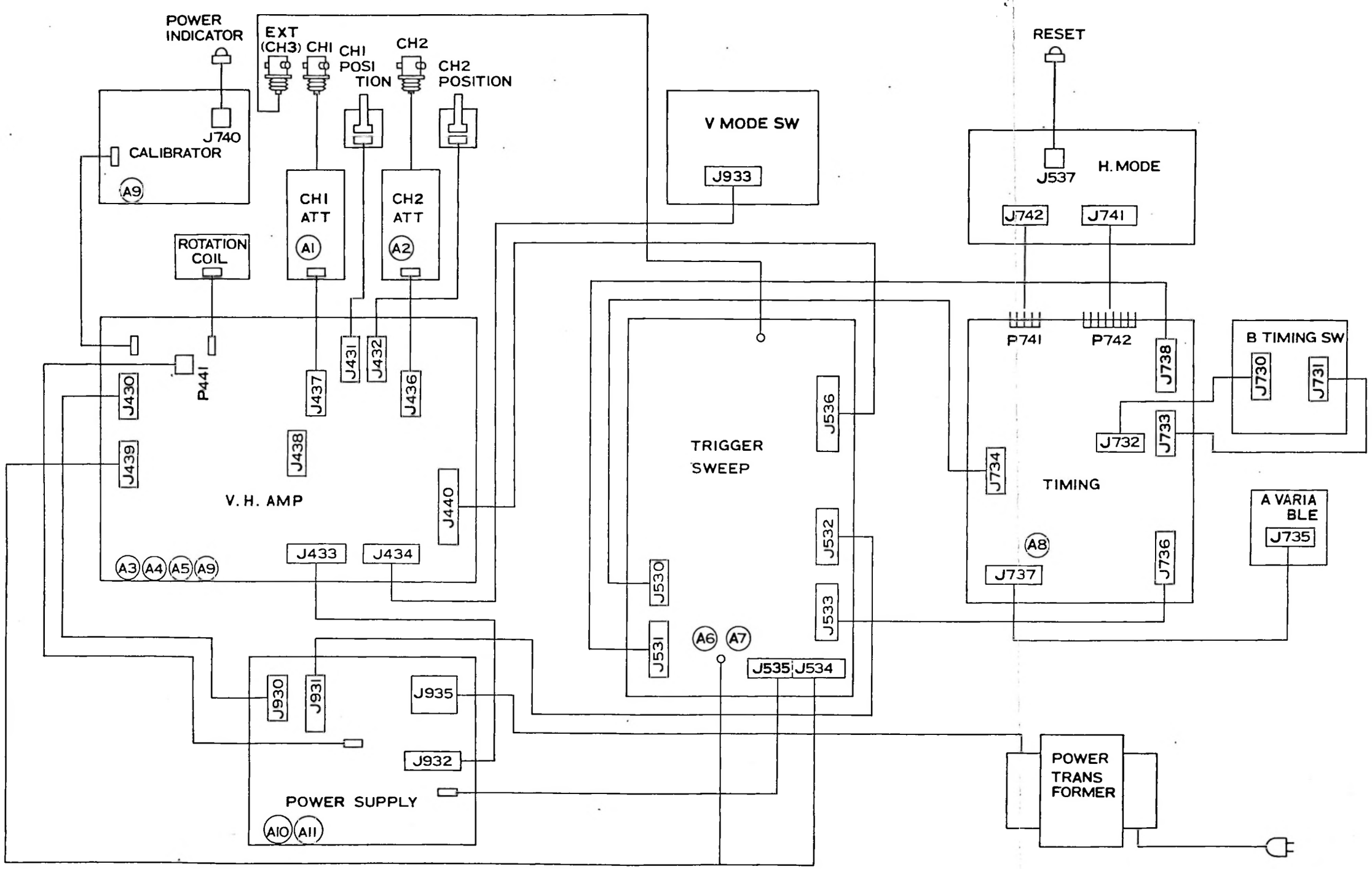
Fig. 6

LEFT SIDE VIEW

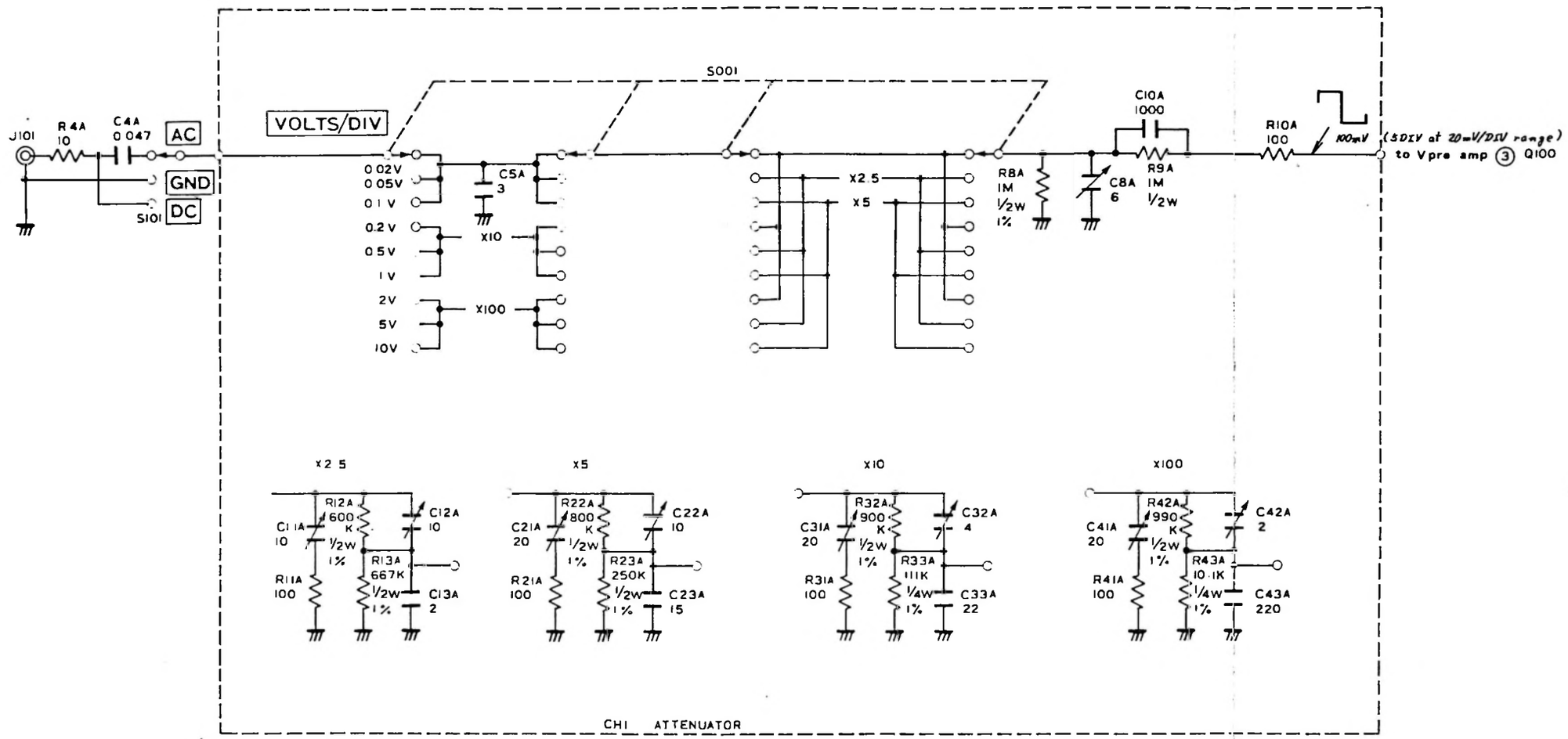
540D



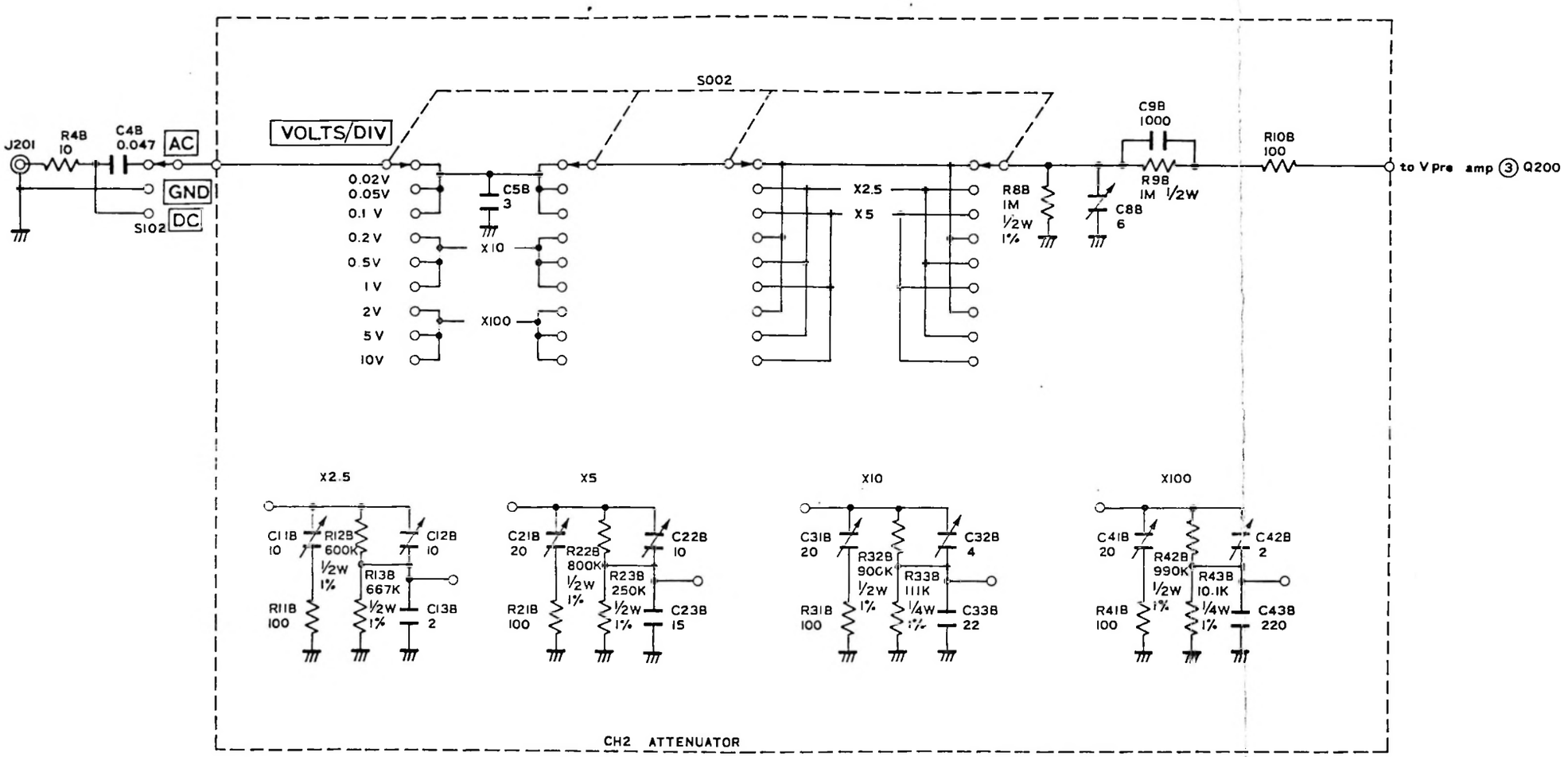
540P/D BLOCK DIAGRAM



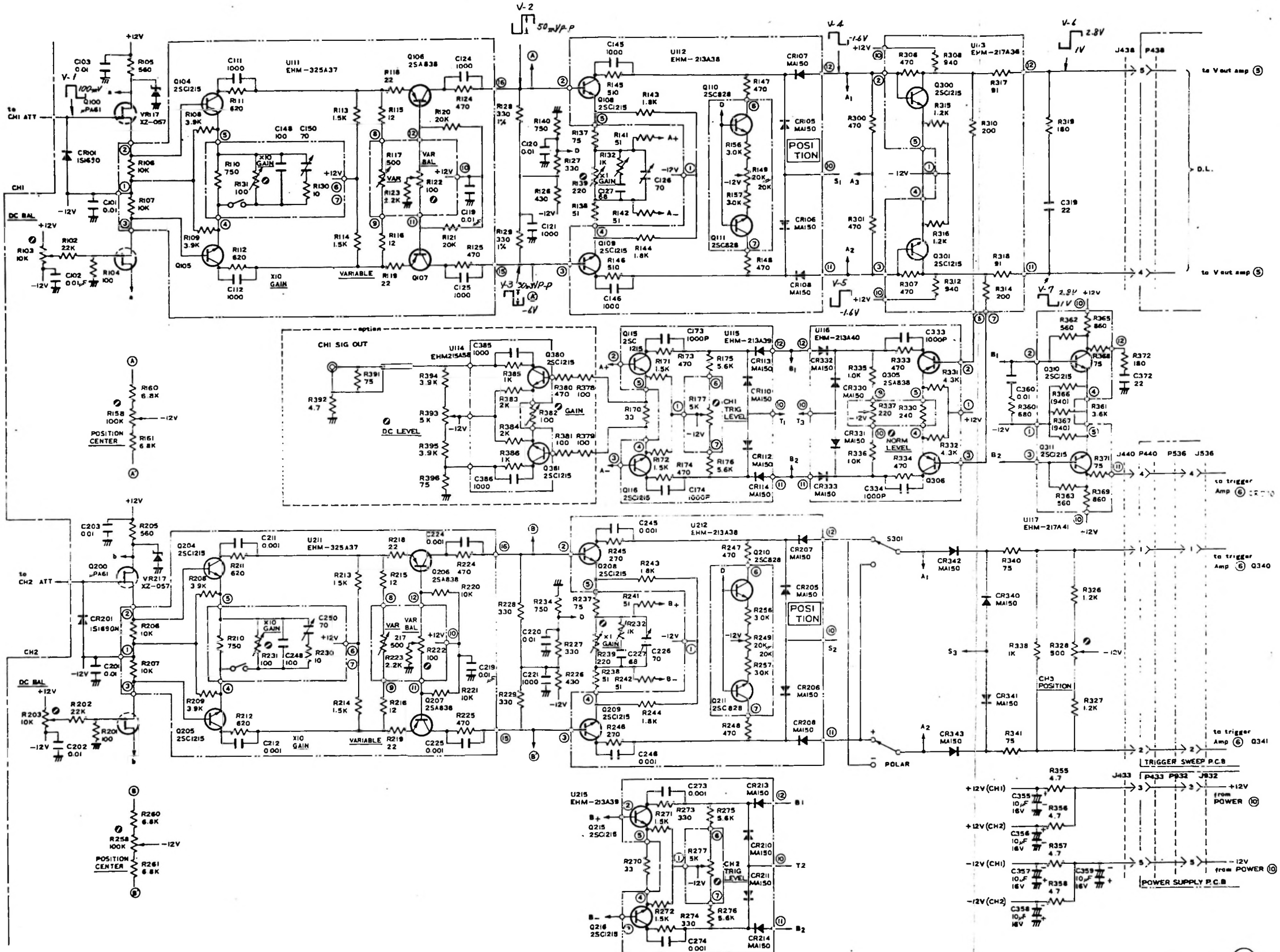
OVERALL INTERCONNECTION (A0)

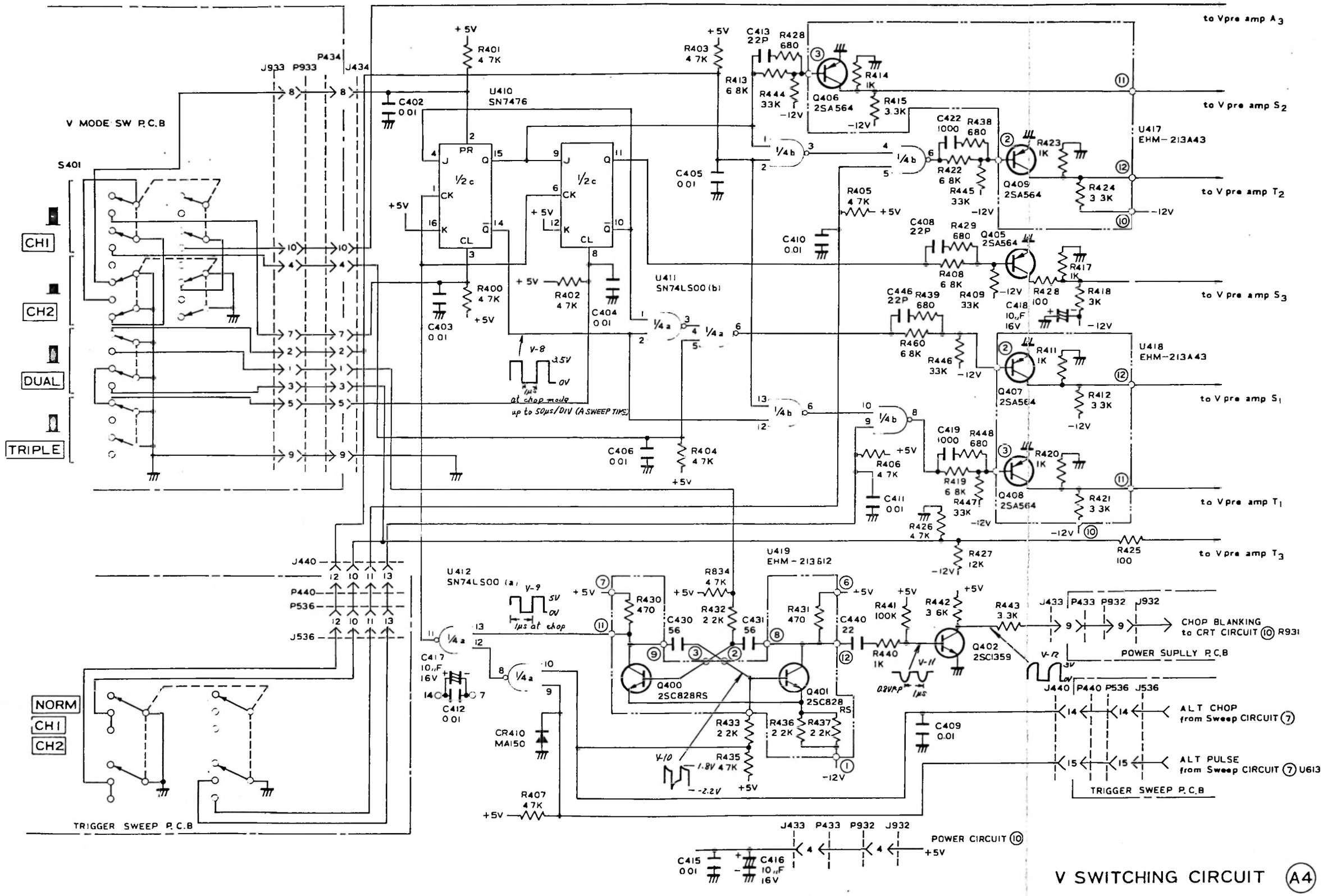


CH1 INPUT ATTENUATOR (A1)

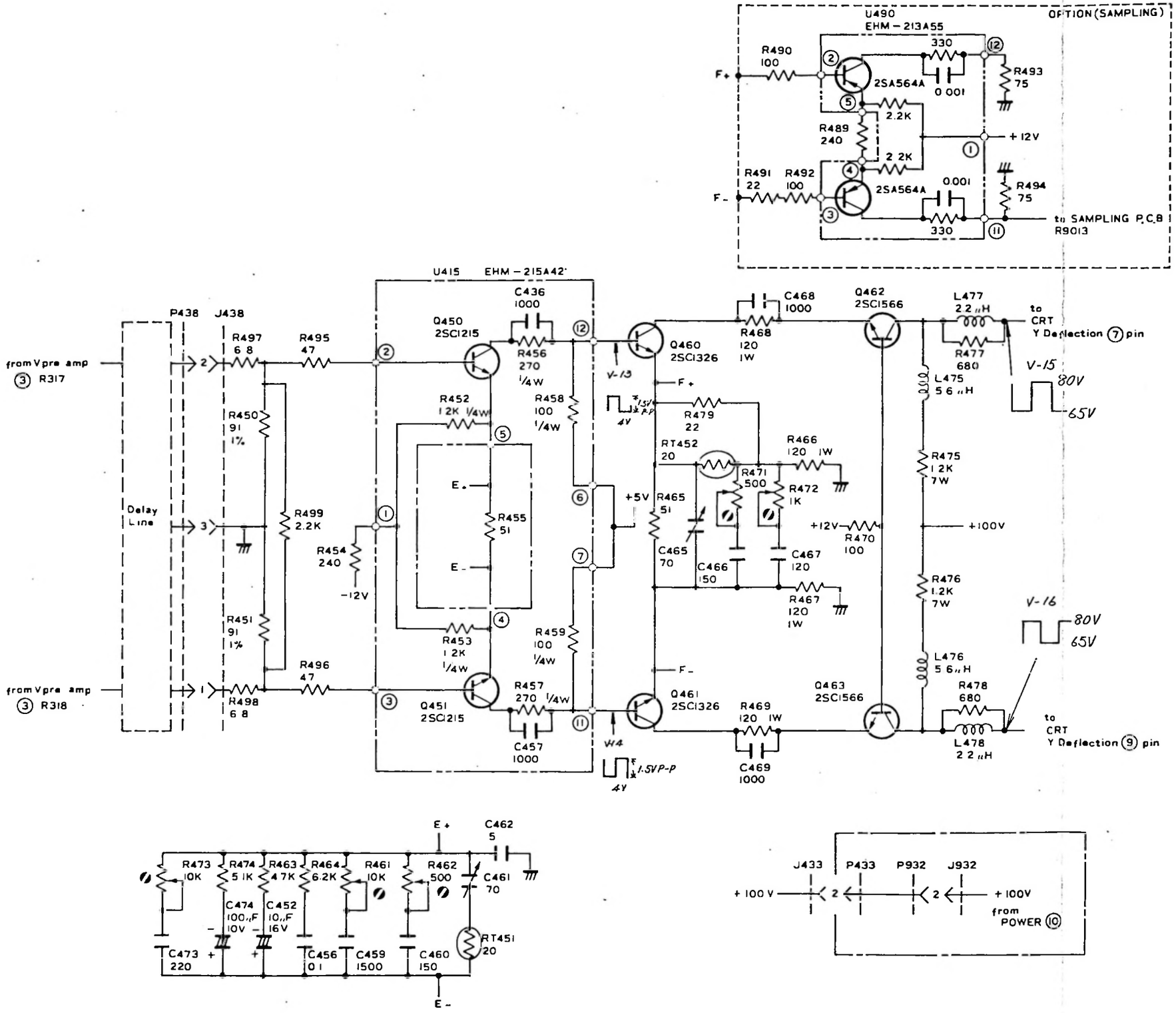


CH2 INPUT ATTENUATOR (A2)

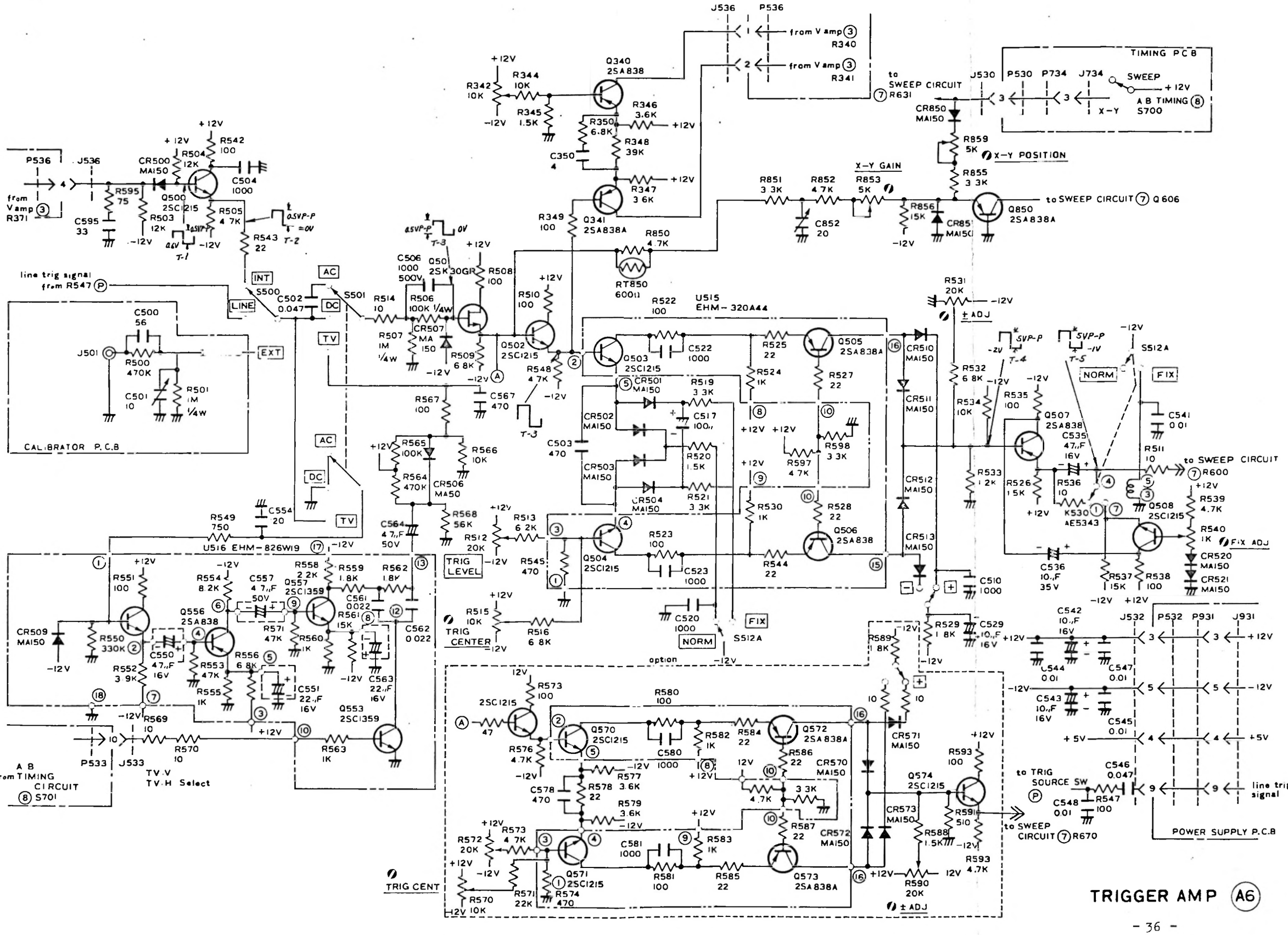

V PRE AMP (A3)
CH1 SIG OUT
option
DC BAL
DC LEVEL
CH1 TRIG LEVEL
POSITION CENTER
POSITION
CH2 TRIG LEVEL
CH3 POSITION
NORM LEVEL
VARIABLE
VAR BAL
X1 GAIN
X10 GAIN
to CH1 ATT
to CH2 ATT
to V out amp ⑤
to trigger Amp ⑥ Q340
to trigger Amp ⑥ Q341
to trigger Amp ⑥ CR310
D.L.
S301
POLAR
TRIGGER SWEEP P.C.B
POWER SUPPLY P.C.B
from POWER ⑩
+12V (CH1)
+12V (CH2)
-12V (CH1)
-12V (CH2)

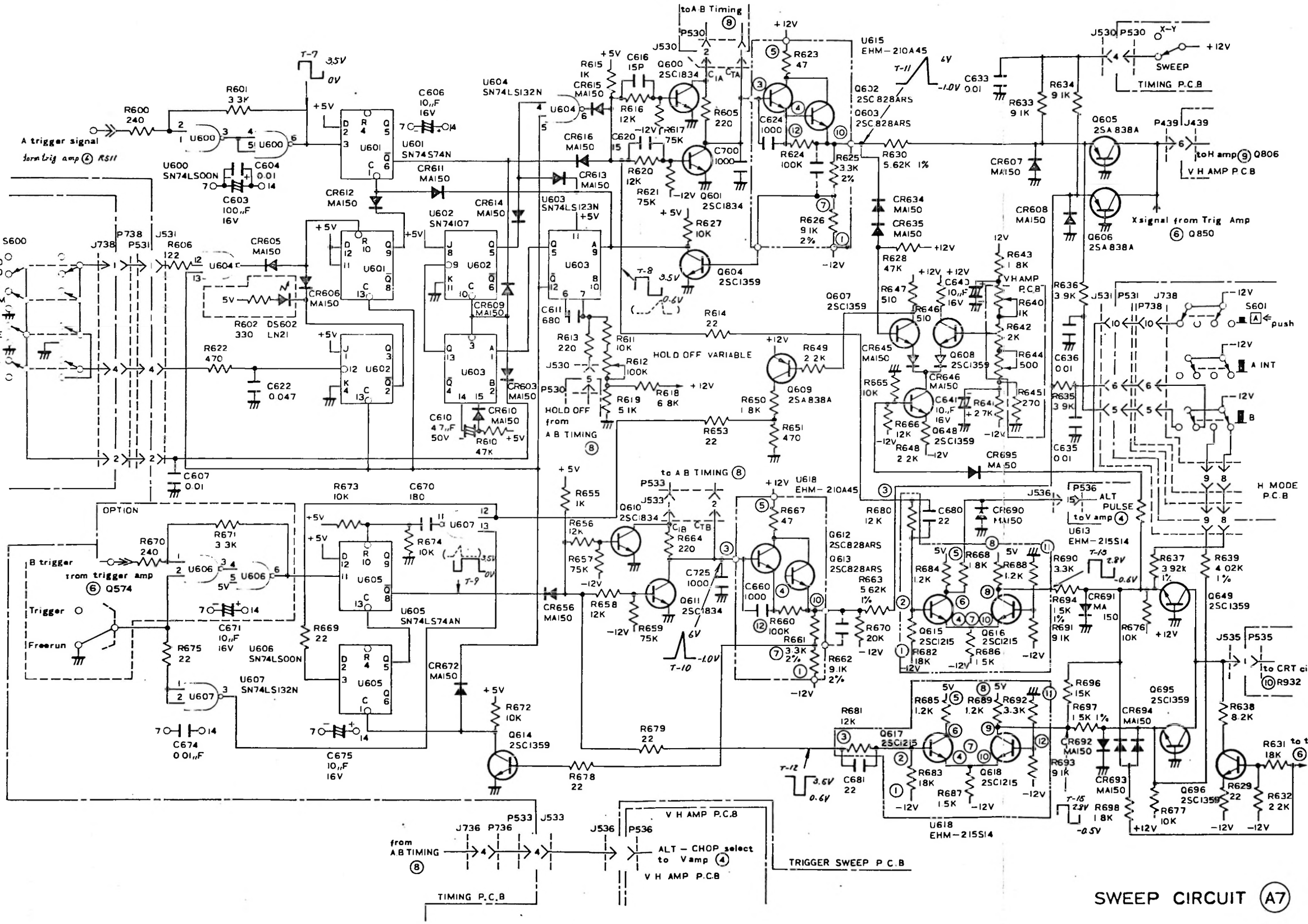


V SWITCHING CIRCUIT (A4)

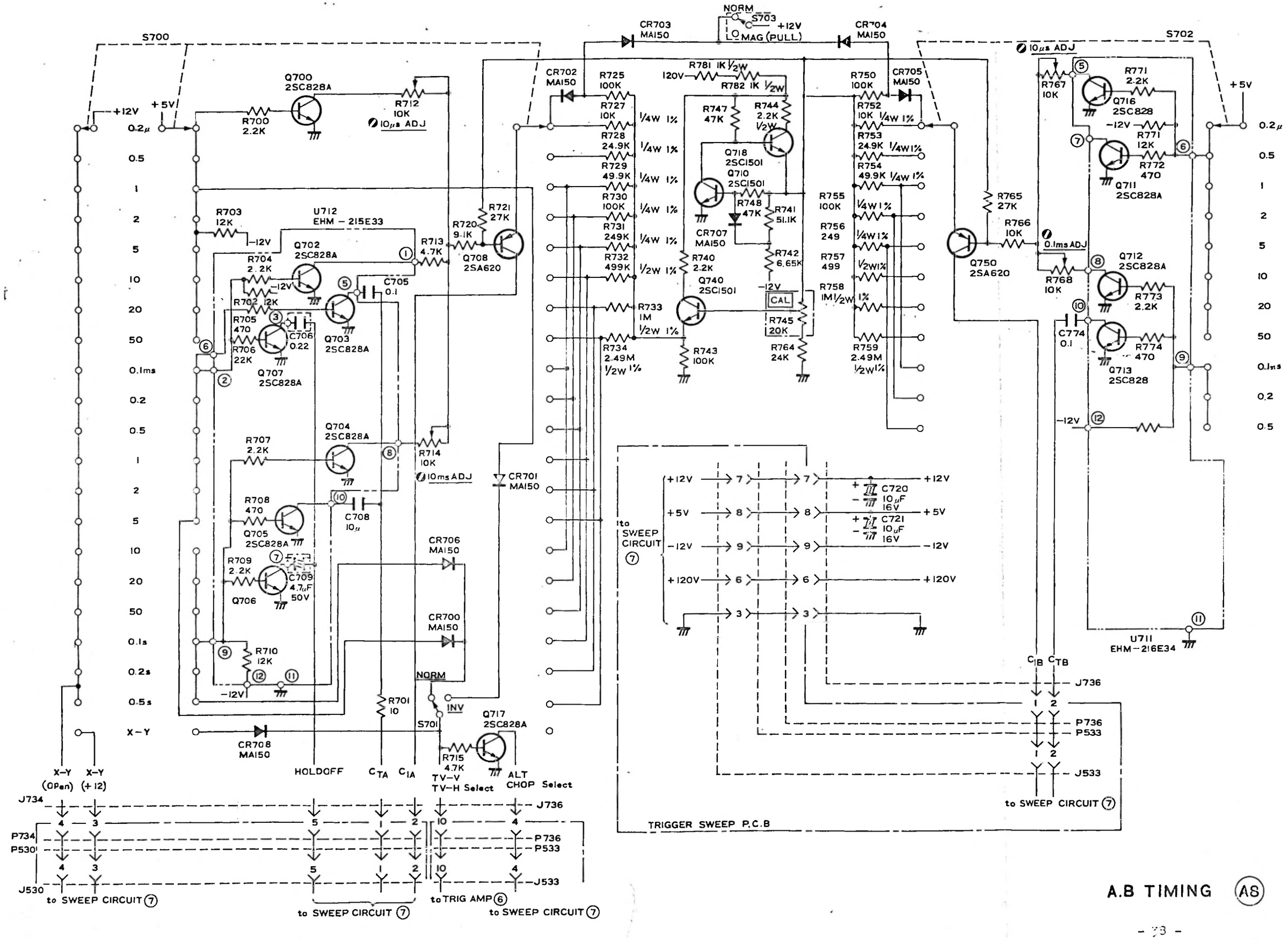

U490
EHM – 213A55
OPTION (SAMPLING)
R490 100
330
R493 75
2SA564A
0 001
2.2K
R489 240
+ 12V
2 2K
R491 22
R492 100
0.001
R494 75
2SA564A
330
to SAMPLING P.C.B R9013
F+
F-
U415 EHM – 215A42
C436 1000
Q450 2SC1215
R456 270 1/4W
R458 100 1/4W
R452 1 2K 1/4W
R450 91 1%
R451 91 1%
R453 1 2K 1/4W
R454 240
-12V
R455 51
E+
E-
R457 270 1/4W
C457 1000
Q451 2SC1215
R459 100 1/4W
R499 2.2K
R496 47
R497 6 8
R498 6 8
R495 47
P438
J438
Delay Line
from V pre amp ③ R317
from V pre amp ③ R318
V-13
4V
W4
1.5V P-P
4V
Q460 2SC1326
Q461 2SC1326
F+
F-
R479 22
RT452 20
R471 500
R472 1K
R465 51
C465 70
C466 150
C467 120
R466 120 1W
R467 120 1W
+5V
+12V
R470 100
C468 1000
R468 120 1W
R469 120 1W
C469 1000
Q462 2SC1566
Q463 2SC1566
L477 2 2 μH
R477 680
L475 5 6 μH
R475 1 2K 7W
R476 1.2K 7W
L476 5 6 μH
R478 680
L478 2 2 μH
to CRT Y Deflection ⑦ pin
to CRT Y Deflection ⑨ pin
V-15
80V
65V
V-16
80V
65V
+100V
E+
E-
C462 5
R473 10K
R474 5 1K
R463 4.7K
R464 6.2K
R461 10K
R462 500
C461 70
C474 100 μF 10V
C452 10 μF 16V
C473 220
C456 0 1
C459 1500
C460 150
RT451 20
J433
P433
P932
J932
+ 100 V
+ 100V from POWER ⑩

V OUT AMP (A5)

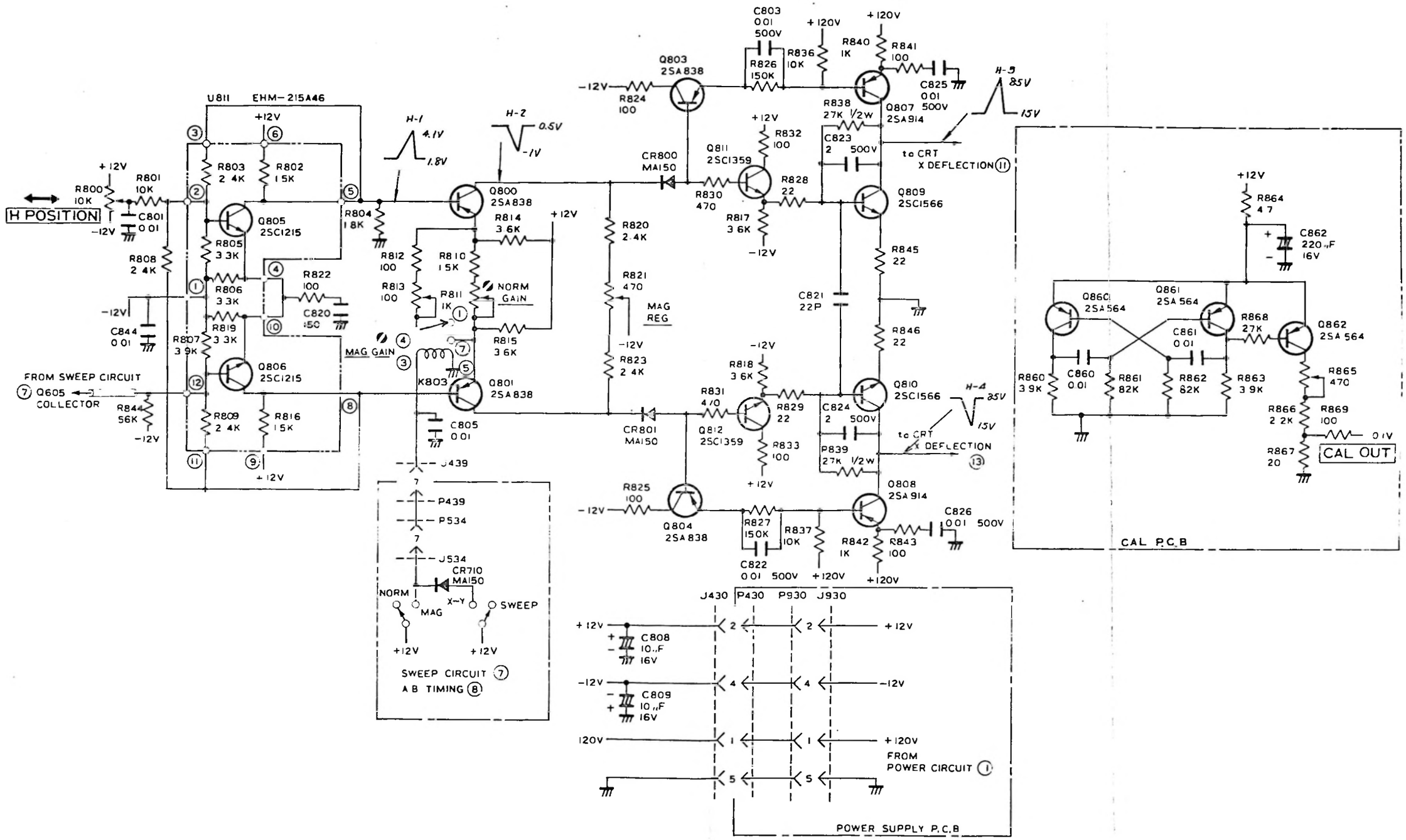

P536
J536
from V amp ③ R371
+12V
R542 100
R504 12K
CR500 MA150
C504 1000
Q500 2SC1215
R595 75
C595 33
R503 12K
R505 4.7K
R543 22
0.5VP-P
≒0V
0.6V
T-1
T-2
-12V
line trig signal from R547 Ⓟ
INT
LINE
EXT
S500
C502 0.047
AC
DC
TV
S501
C500 56
J501
R500 470K
C501 10
R501 1M 1/4W
CALIBRATOR P.C.B
R514 10
R506 100K 1/4W
CR507 MA 150
R507 1M 1/4W
R509 6.8K
C506 1000 500V
Q501 2SK30GR
R508 100
T-3
R510 100
Q502 2SC1215
R548 4.7K
R567 100
C567 470
R565 100K
R564 470K
R566 10K
CR506 MA50
C564 47μF 50V
R568 56K
C554 20
R549 750
U516 EHM-826W19
R569 10
R570 10
P533
J533
TV-V
TV-H Select
A B from TIMING CIRCUIT ⑧ S701
R551 100
R554 8.2K
C557 4.7μF 50V
Q557 2SC1359
R558 2.2K
R559 1.8K
R562 1.8K
C561 0.022
R561 15K
C562 0.022
Q556 2SA838
R571 47K
R560 1K
R556 6.8K
C550 47μF 16V
R553 47K
R555 1K
C551 22μF 16V
C563 22μF 16V
Q553 2SC1359
R563 1K
CR509 MA150
R550 330K
R552 3.9K
R513 6.2K
R512 20K
TRIG LEVEL
R545 470
Q504 2SC1215
R515 10K
TRIG CENTER
R516 6.8K
R523 100
C523 1000
C520 1000
FIX
NORM
S512A
option
R522 100
U515 EHM-320A44
Q503 2SC1215
C522 1000
R525 22
Q505 2SA838A
R524 1K
R527 22
CR501 MA150
R519 3.3K
C517 100μ
CR502 MA150
CR503 MA150
CR504 MA150
R520 1.5K
R521 3.3K
R530 1K
R528 22
Q506 2SA838
R598 3.3K
R597 4.7K
R544 22
C503 470
CR510 MA150
CR511 MA150
CR512 MA150
CR513 MA150
C510 1000
R529 1.8K
C529 10μF 16V
R589 8K
10
CR571 MA150
R531 20K
±ADJ
R532 6.8K
R534 10K
R535 100
Q507 2SA838
C535 47μF 16V
R526 1.5K
R536 10
K530 AE5343
R533 1.2K
R537 15K
R538 100
C536 10μF 35V
R511 10
to SWEEP CIRCUIT ⑦ R600
R539 4.7K
R540 1K
FIX ADJ
CR520 MA150
CR521 MA150
Q508 2SC1215
C541 0.01
C542 10μF 16V
C544 0.01
C543 10μF 16V
C547 0.01
C545 0.01
C546 0.047
C548 0.01
R547 100
to TRIG SOURCE SW Ⓟ
line trig signal
POWER SUPPLY P.C.B
J532
P532
P931
J931
+5V
Q570 2SC1215
R573 100
R580 100
R582 1K
R584 22
Q572 2SA838A
R576 4.7K
C580 1000
R586 22
CR570 MA150
R577
R578 3.6K
C578 470
R579 3.6K
3.3K
4.7K
Q574 2SC1215
R591 510
R588 1.5K
R593 100
R593 4.7K
R572 20K
R573 4.7K
R587 22
CR572 MA150
CR573 MA150
C581 1000
R583 1K
R581 100
R585 22
Q573 2SA838A
R590 20K
±ADJ
Q571 2SC1215
R574 470
R571 22K
R570 10K
TRIG CENT
to SWEEP CIRCUIT ⑦ R670
J536
P536
from V amp ③ R340
from V amp ③ R341
Q340 2SA838
R344 10K
R342 10K
R345 1.5K
R346 3.6K
R350 6.8K
R348 39K
C350 4
R347 3.6K
R349 100
Q341 2SA838A
R850 4.7K
RT850 600Ω
to SWEEP CIRCUIT ⑦ R631
J530
P530
P734
J734
SWEEP
A B TIMING ⑧ S700
X-Y
TIMING P.C.B
CR850 MA150
R859 5K
X-Y POSITION
R855 3.3K
X-Y GAIN
R851 3.3K
R852 4.7K
R853 5K
C852 20
R856 15K
CR851 MA150
Q850 2SA838A
to SWEEP CIRCUIT ⑦ Q606
TRIGGER AMP (A6)



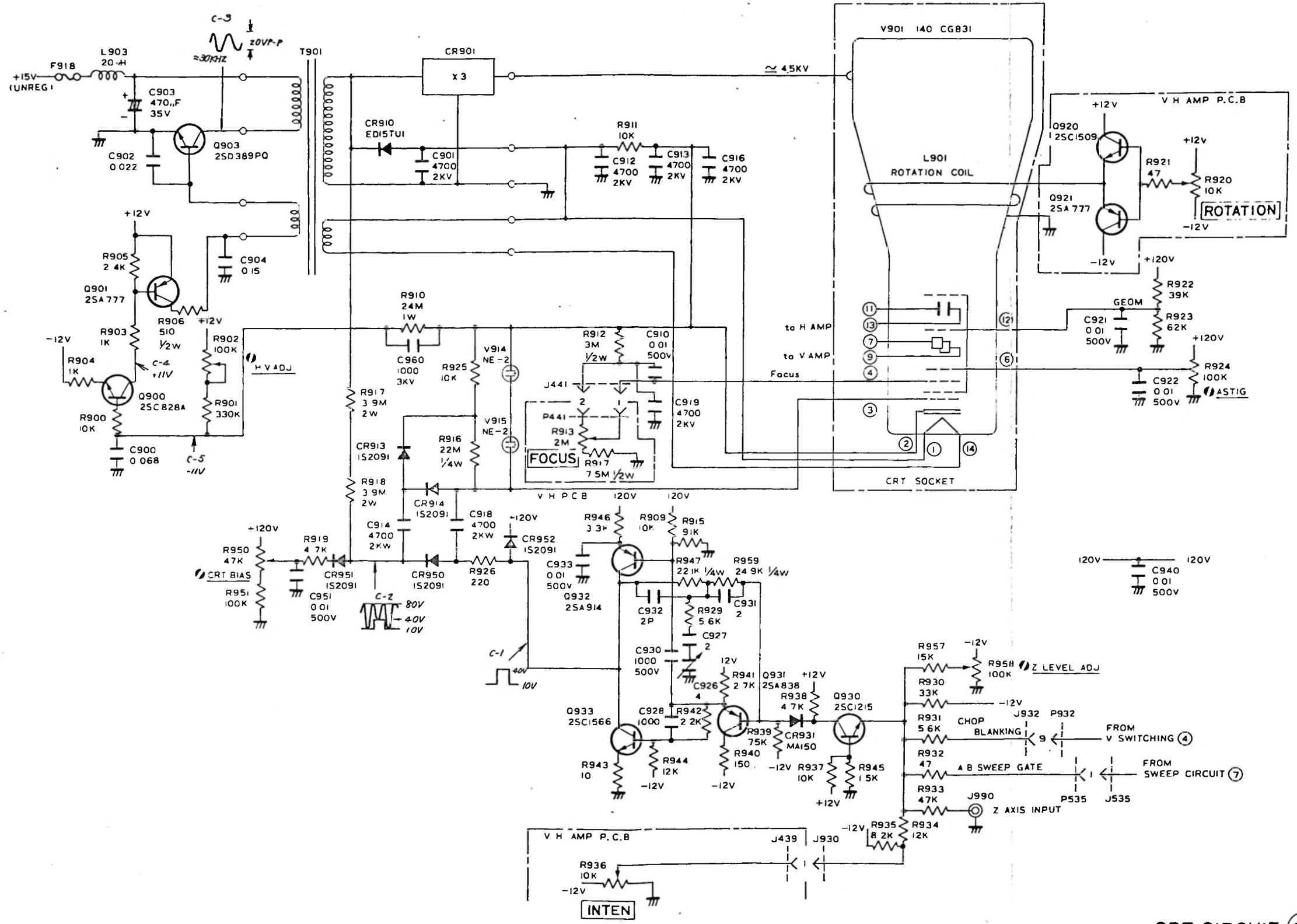
SWEEP CIRCUIT (A7)


S700
S702
+12V
+5V
0.2μ
0.5
1
2
5
10
20
50
0.1ms
0.2
0.5
1
2
5
10
20
50
0.1s
0.2s
0.5s
X-Y
Q700 2SC828A
R700 2.2K
R712 10K
10μs ADJ
R703 12K
U712 EHM – 215E33
Q702 2SC828A
R704 2.2K
R702 12K
R705 470
R706 22K
C706 0.22
Q707 2SC828A
Q703 2SC828A
C705 0.1
R713 4.7K
R720 9.1K
R721 27K
Q708 2SA620
Q704 2SC828A
R707 2.2K
R714 10K
10ms ADJ
CR701 MA150
R708 470
Q705 2SC828A
C708 10μ
R709 2.2K
C709 4.7μF 50V
Q706
CR706 MA150
CR700 MA150
R710 12K
NORM
INV
S701
R701 10
Q717 2SC828A
R715 4.7K
CR708 MA150
X-Y (Open)
X-Y (+12)
HOLDOFF
CTA
CIA
TV-V
TV-H Select
ALT CHOP Select
J734
P734
P530
J530
J736
P736
P533
J533
to SWEEP CIRCUIT ⑦
to TRIG AMP ⑥
CR703 MA150
NORM
S703
MAG (PULL)
CR704 MA150
R781 1K 1/2W
120V
R782 1K 1/2W
CR702 MA150
R725 100K
R727 10K
R728 24.9K
R729 49.9K
R730 100K
R731 249K
R732 499K
R733 1M
R734 2.49M 1/2W 1%
1/4W 1%
1/2W 1%
R747 47K
R744 2.2K 1/2W
Q718 2SC1501
Q710 2SC1501
R748 47K
R741 51.1K
CR707 MA150
R740 2.2K
Q740 2SC1501
R742 6.65K
-12V
CAL
R745 20K
R764 24K
R743 100K
CR705 MA150
R750 100K
R752 10K 1/4W 1%
R753 24.9K 1/4W 1%
R754 49.9K 1/4W 1%
R755 100K
R756 249
R757 499
R758 1M 1/2W 1%
R759 2.49M 1/2W 1%
R765 27K
Q750 2SA620
R766 10K
0.1ms ADJ
R767 10K
R771 2.2K
Q716 2SC828
R771 12K
R772 470
Q711 2SC828A
Q712 2SC828A
R773 2.2K
C774 0.1
R774 470
Q713 2SC828
U711 EHM – 216E34
to SWEEP CIRCUIT ⑦
+12V
+5V
-12V
+120V
C720 10μF 16V
C721 10μF 16V
CIB
CTB
J736
P736
P533
J533
TRIGGER SWEEP P.C.B

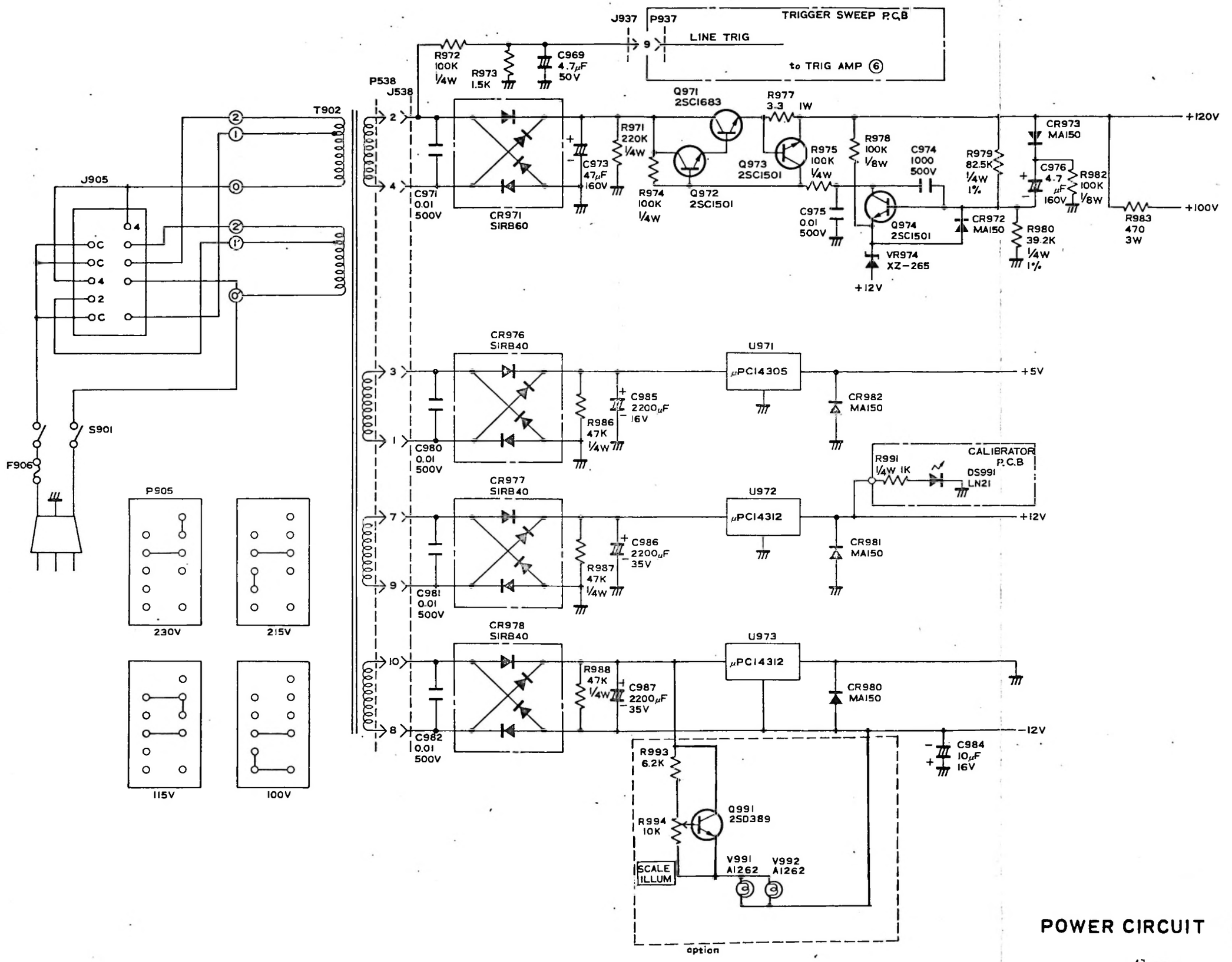
A.B TIMING (AS)



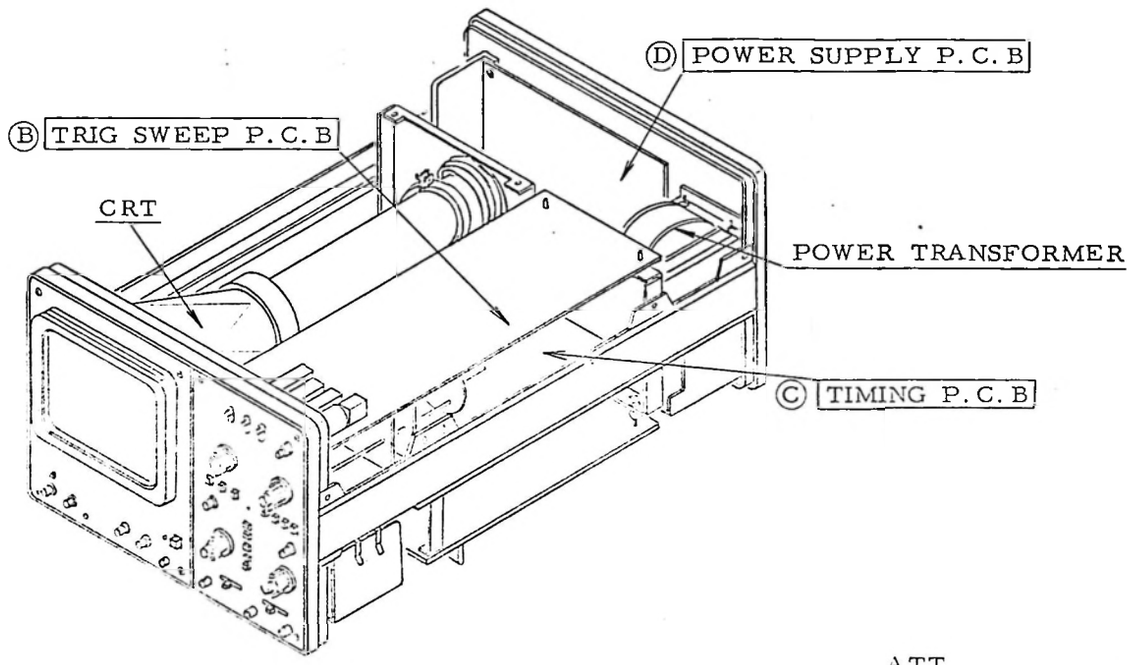
H OUT AMP & CALIBRATOR (A9)



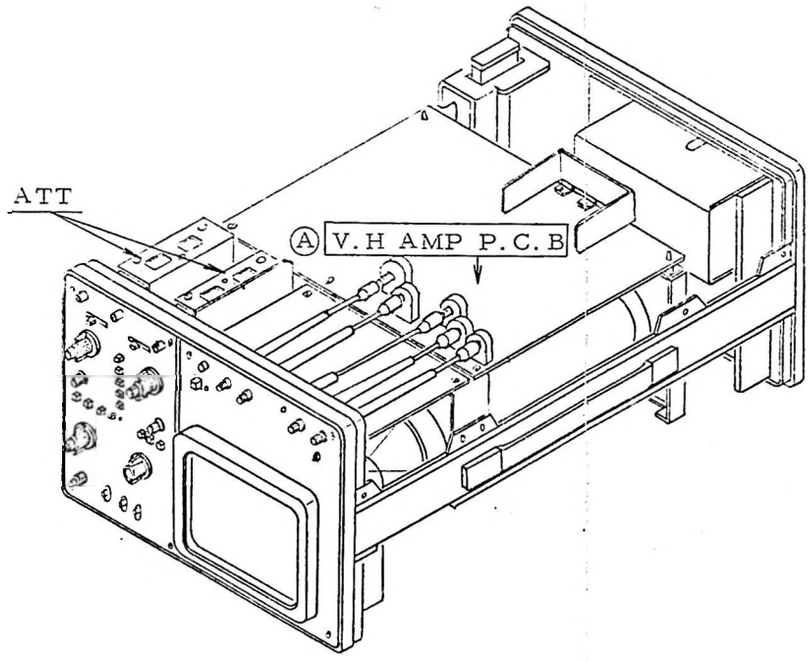
CRT CIRCUIT (A10)



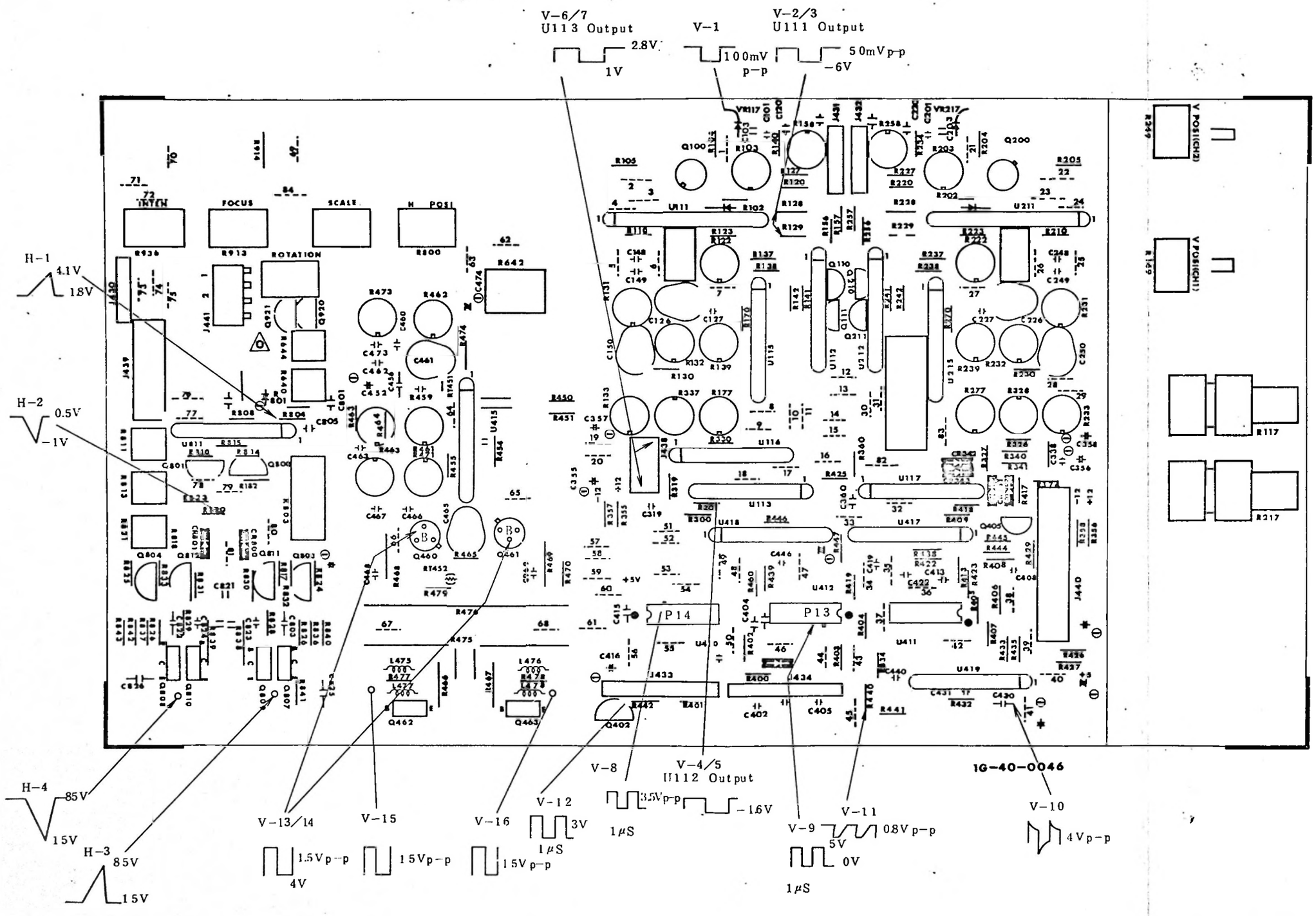
POWER CIRCUIT (A11)



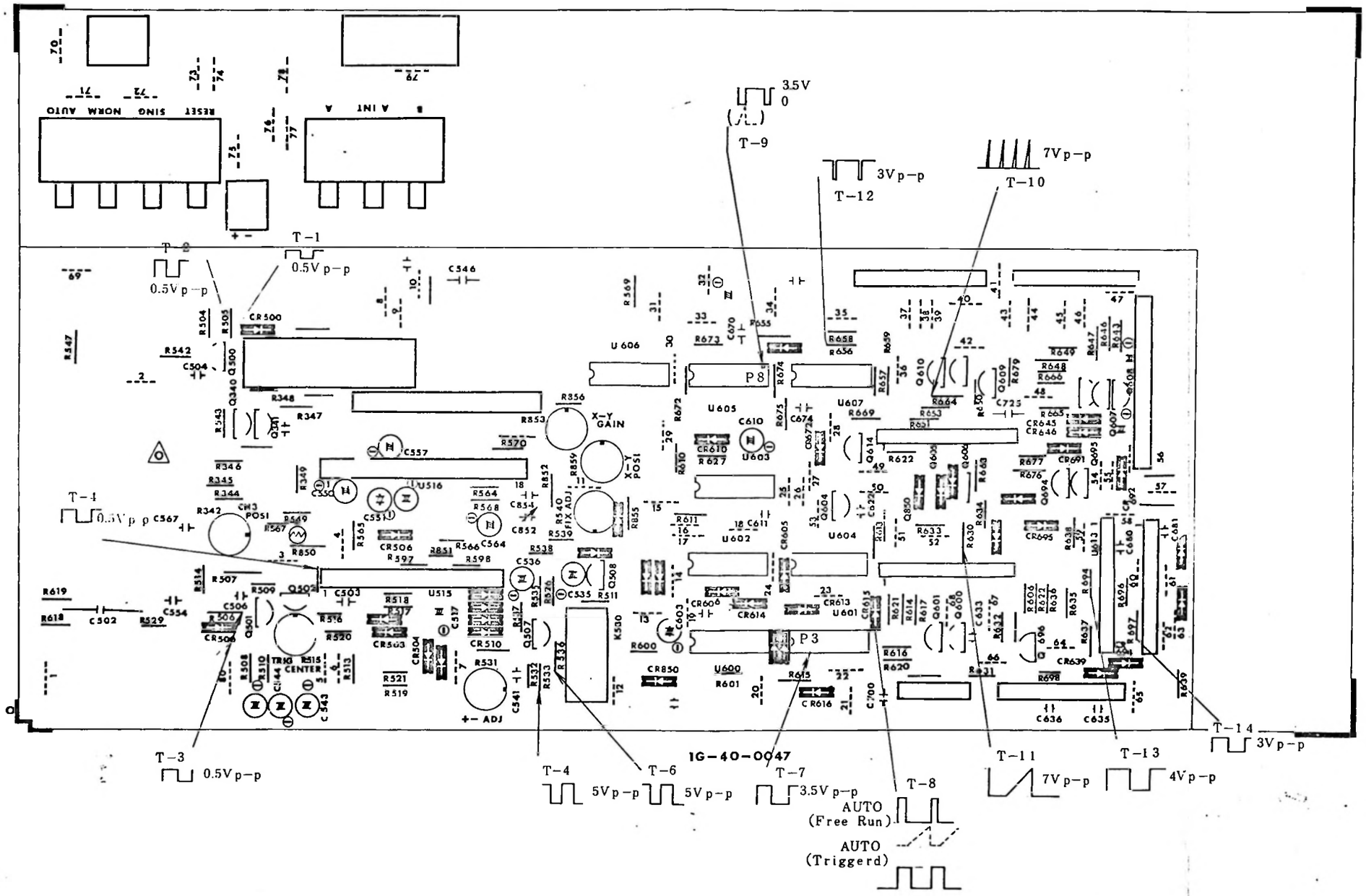
Top view



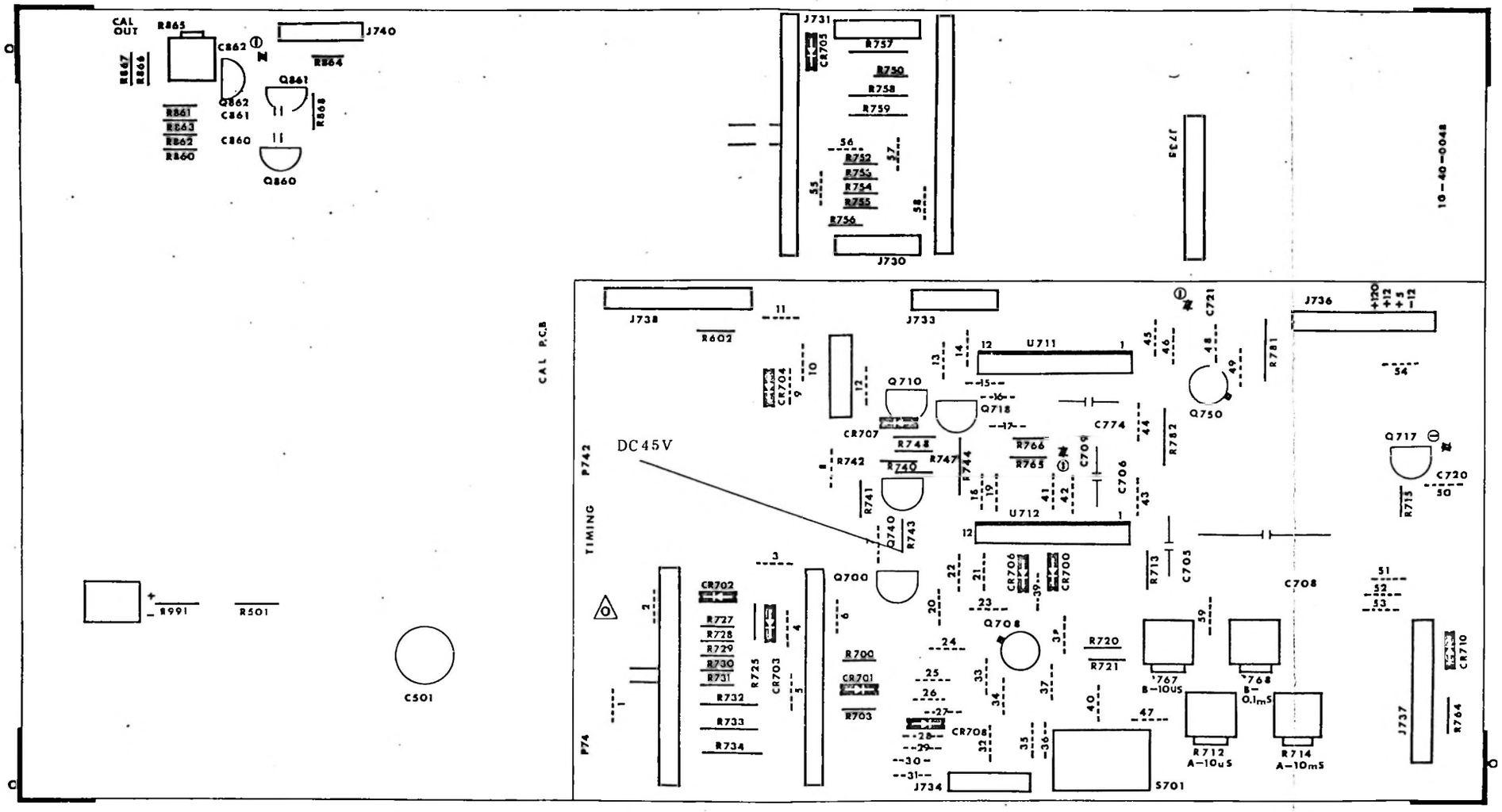
Bottom view


V-6/7
U113 Output
2.8V
1V
V-1
100mV
p-p
V-2/3
U111 Output
50mVp-p
-6V
H-1
4.1V
1.8V
H-2
0.5V
-1V
H-4
85V
15V
H-3
85V
15V
V-13/14
1.5Vp-p
4V
V-15
15Vp-p
V-16
15Vp-p
V-12
3V
1μS
V-8
3.5Vp-p
V-4/5
U112 Output
-16V
V-9
5V
0V
1μS
V-11
0.8Vp-p
V-10
4Vp-p
P14
P13
INTEN
FOCUS
SCALE
H POSI
ROTATION
V POS(CH2)
V POS(CH1)
1G-40-0046

Ⓐ V.H AMP P.C.B

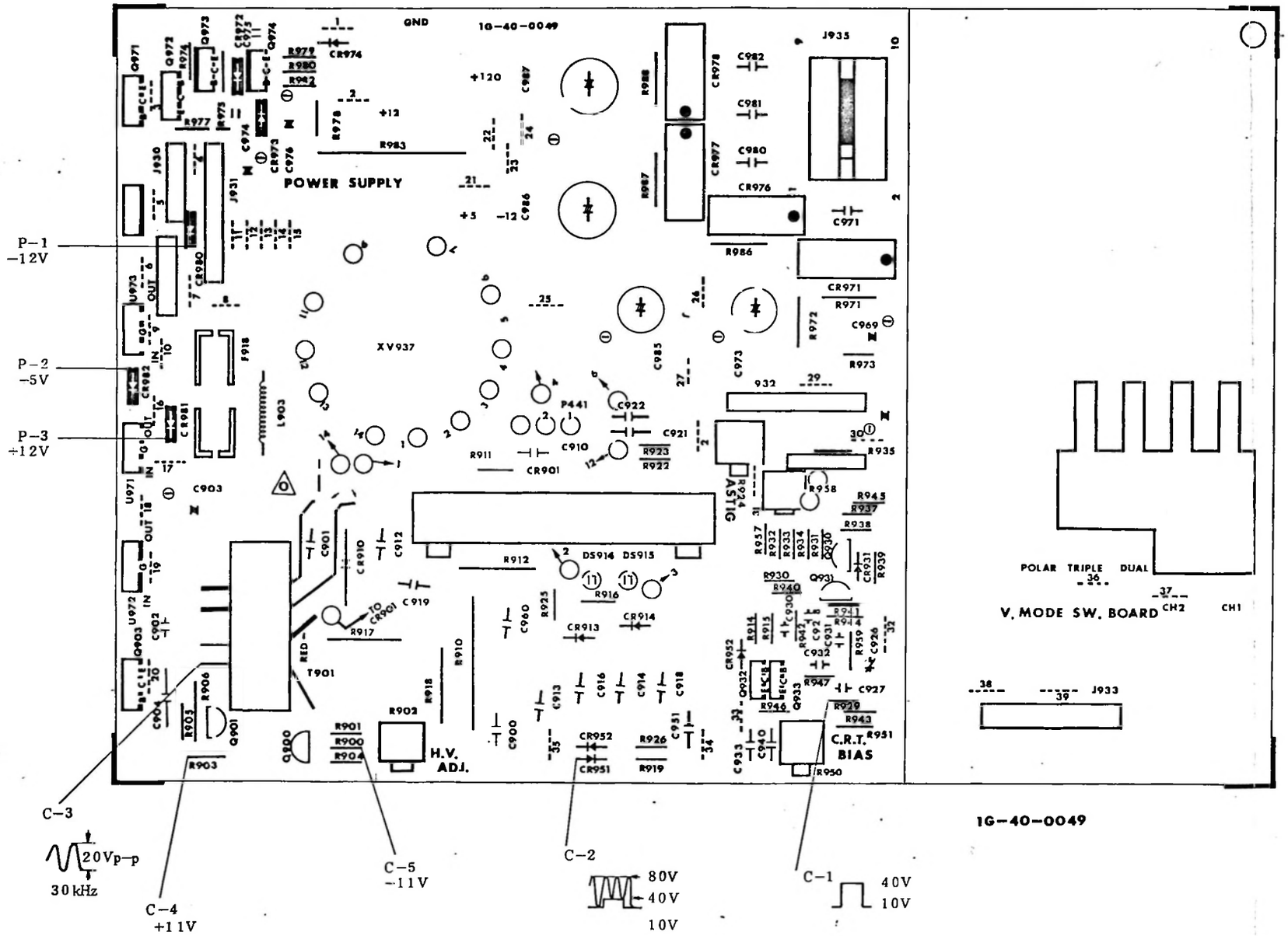


Ⓑ TRIG SWEEP P.C.B

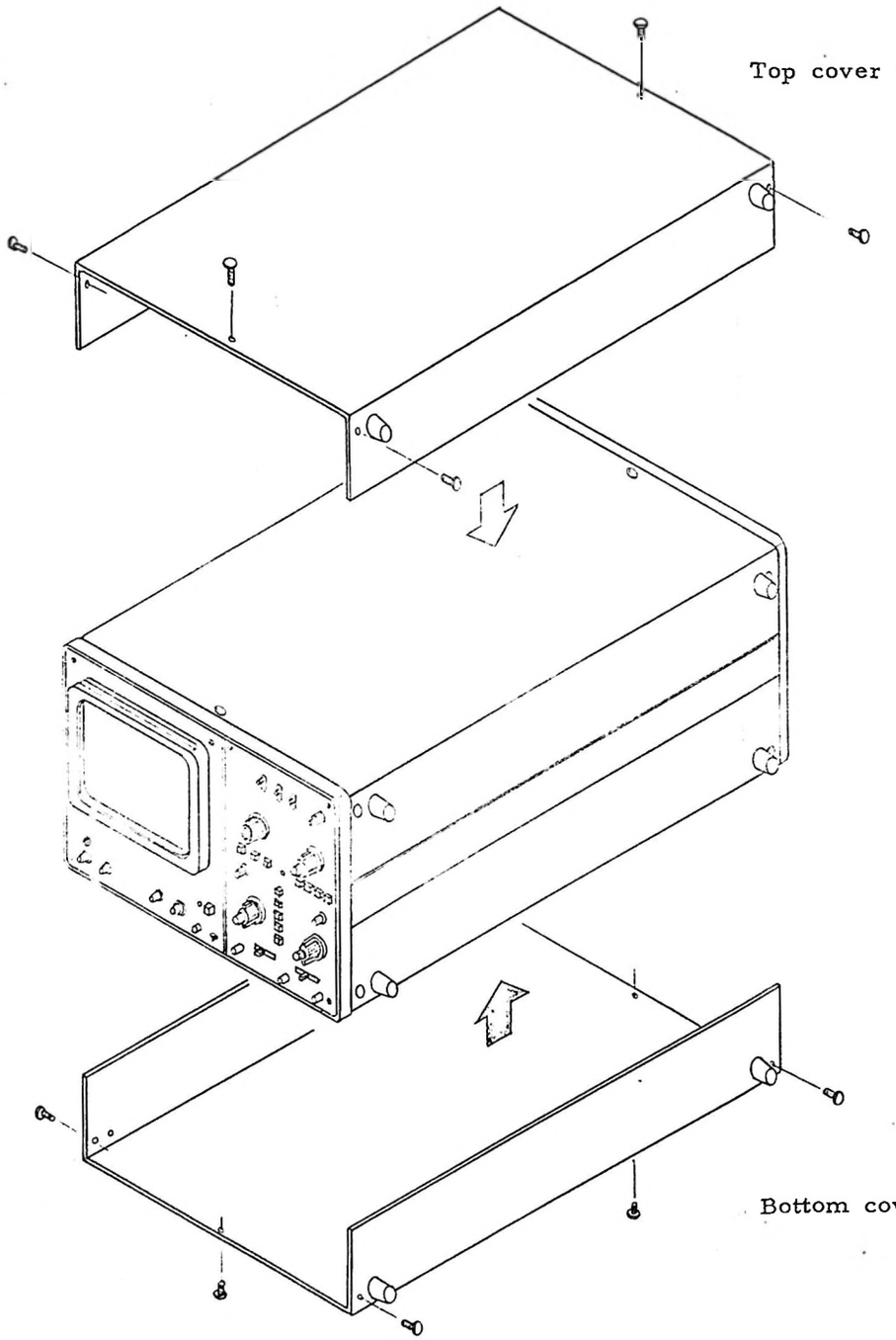


1G-40-0048

© TIMING P.C.B

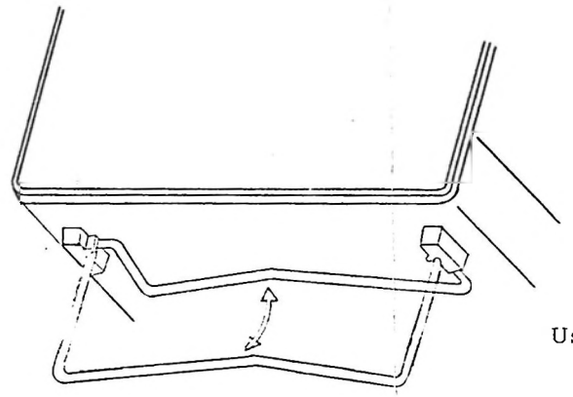


Ⓔ POWER SUPPLY P.C.B

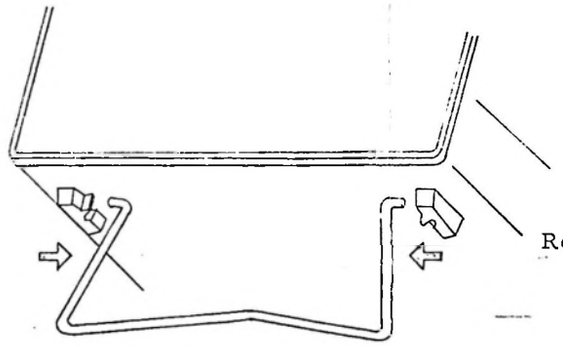


Top cover (6 screws)

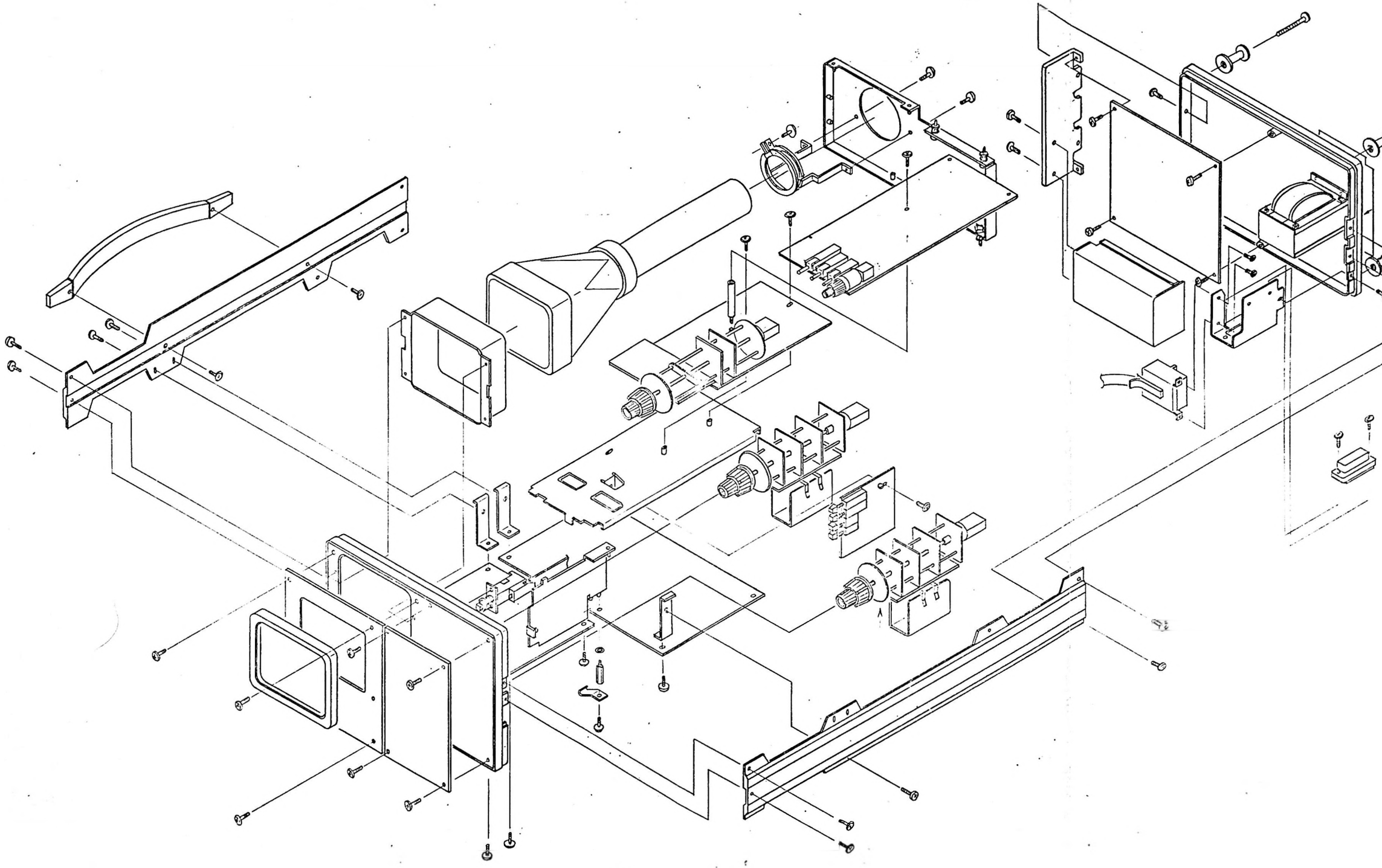
Bottom cover (6 screws)



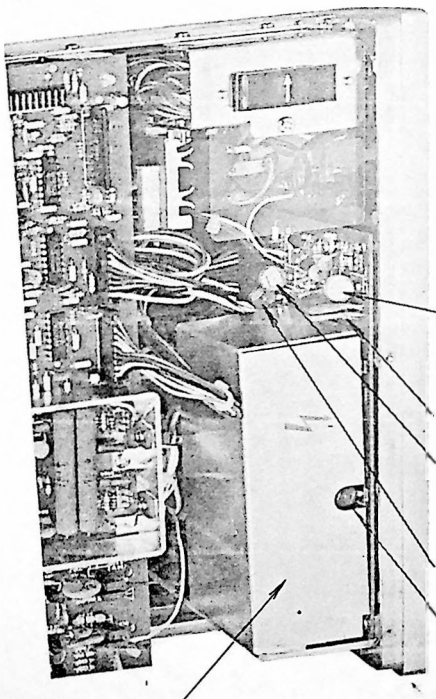
Use of the tilt stand



Removing the tilt stand



1. Power supply PCB	Adjustment Procedure



1.	Power Supply and High Voltage Parts

1-1 Low voltage part

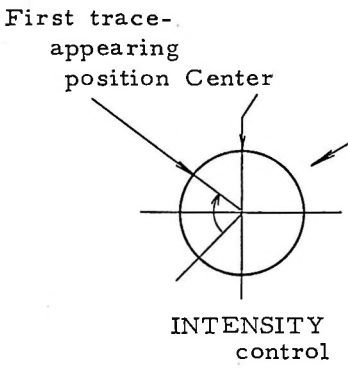
Confirm a ripple of $5mV_{p-p}$ and $50mV_{p-p}$, or less for a power supply of ±12V, +5V and +100V, +120V, respectively, using digital voltmeter.

Voltage	Regulation	Ripple
+12V	+11.5~+12.5V	$5mV_{p-p}$, or less
+5V	+4.8 ~ +5.2V	$5mV_{p-p}$, or less
-12V	-11.5 ~ -12.5V	$5mV_{p-p}$, or less
+100V	+95 ~ +105V	$50mV_{p-p}$, or less
+120V	+110 ~ +130V	$50mV_{p-p}$, or less

1-2 High voltage part

Adjust this control for a CRT pin 14 voltage of -1.5kV.

Adjustment Procedure



1-3 CRT BIAS

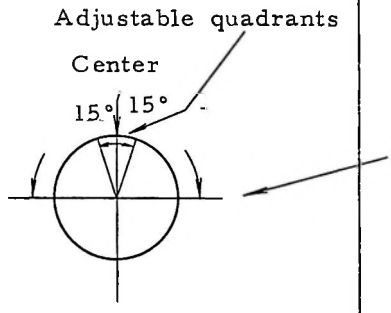
Set the INTENSITY control to 90° from the minimum position and adjust control A so that the trace begins to appear just there.

Use an oscilloscope to measure the Z-axis output at "a" point, with the INTENSITY control set fully counter clockwise, and adjust the control B till the output voltage shows the following pattern:

1-4 ASTIGMATISM

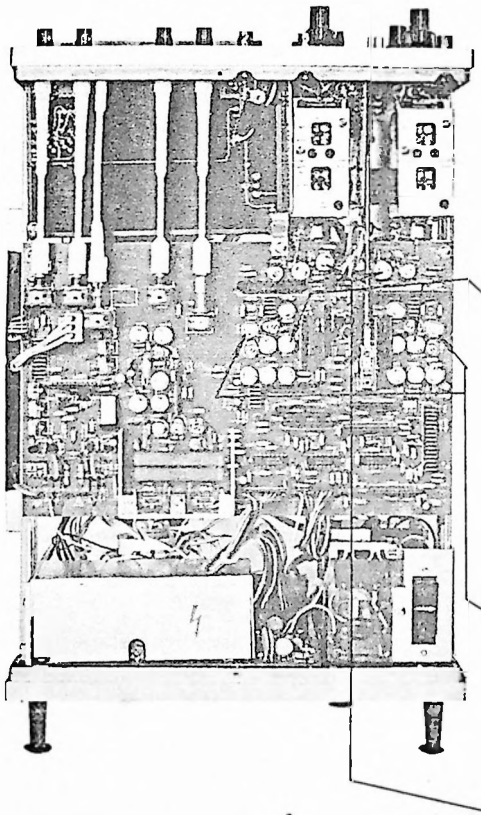
Apply a 1 kHz sinewave so that the display covers the entire graticule area.

Adjust this control and the front panel FOCUS control together for a well-defined trace.



1-5 Confirming FOCUS control setting

Ensure the dot (.) on the FOCUS control matches the midposition of trace clearness (see figure) with ±15° tolerance.



Adjustment Procedure

1-6 Confirming high-voltage oscillator start

Confirm the oscillator for high-tension circuit starts the moment the POWER switch is turned on.

2. Vertical Deflection System

2-1 20mV/DIV (×1)

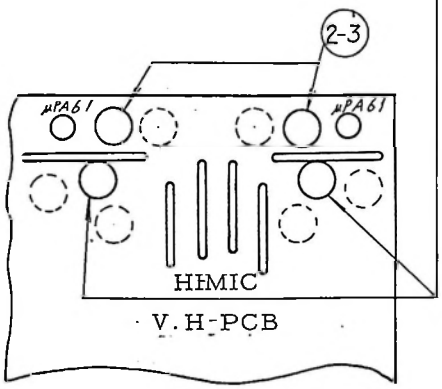
Apply a signal of $0.1V_{p-p}$ and adjust both CH1 and CH2 gain controls for exact 5-division display.

2-2 2mV/DIV (×10)

Same as above, but with an input signal of $0.01V_{p-p}$

2-3 Magnifier (×1, ×10) balance

Set the VARIABLE control (both CH1 and CH2) to CAL position and get a trace at center with the magnifier set to ×1 position. Change the magnifier setting to ×10 and confirm the trace does not move vertically.



2-4 VARIABLE control balance

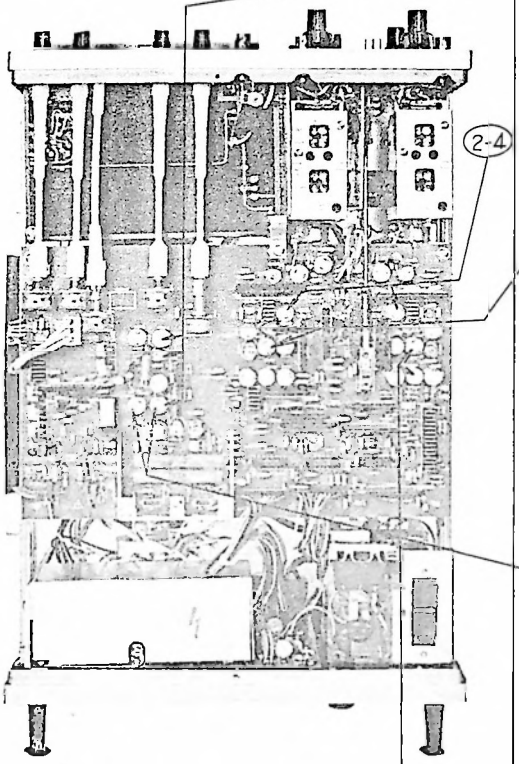
Get a trace at center with the VARIABLE control set to CAL position. Turn the control setting to UNCAL (fully CCW); this may cause the trace to move somewhere. If so, adjust this control (CH1, CH2) to bring the trace to its original central position.

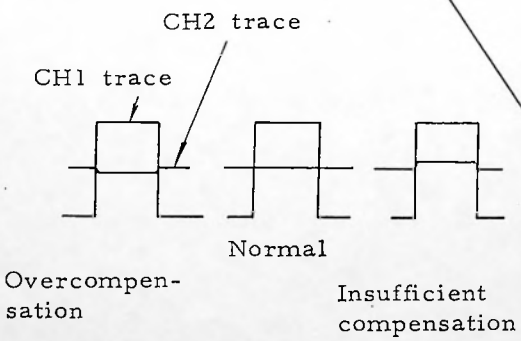
Repeat this procedure so that the VARIABLE control causes no vertical movement of trace in CAL and UNCAL positions.

2-5 Square wave and frequency response-I (x1)

① Set CH1 VOLTS/DIV switch at 20mV/DIV. Apply a 1 kHz square wave to CH1 input connector and adjust this control for flat top.

Adjustment Procedure





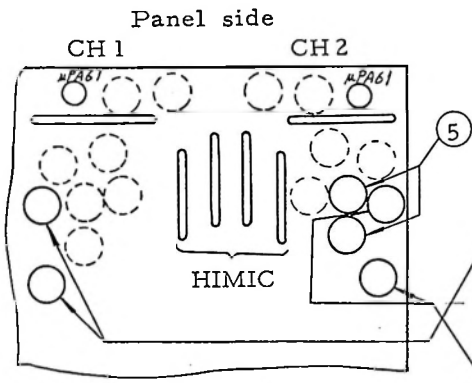
(2) In condition (1) above, change the input signal to 100 kHz square wave, and adjust this control for flat top.

(3) Adjust these controls for flat square wave while confirming the frequency response meets the requirement. (The control in step (2) may be adjusted along with it.)

(4) Confirming CHOP crosstalk

Set the V MODE switch to CHOP and CH1 VOLTS/DIV switch at 20mV/DIV. Apply a 1 kHz square wave and ensure the CH2 trace is a straight line. Should interference exist, repeat the above steps (2) and (3).

(5) Set CH2 VOLTS/DIV switch at 20mV/DIV and adjust these controls on CH2 for flat 100 kHz square wave, with the required



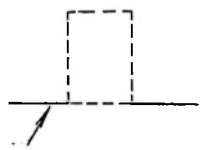
V.H PCB

frequency response.

. Square wave and frequency response-II (x10)

⑥ Set CH1 VOLTS/DIV switch at 2mV/DIV and adjust these controls on CH1 for flat 100 kHz square wave, with the required frequency response.

⑦ Repeat the above step with CH2 VOLTS/DIV switch set at 2mV/DIV.

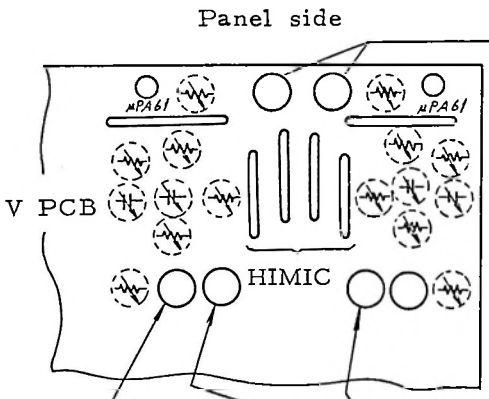


Apply and disconnect 1 kHz square wave alternately.

⑧ DC shift (both CH1 and CH2)

Apply a 1 kHz square wave of 5-division amplitude to either channel at 2mV/DIV (x10) and 20mV/DIV (x1) setting respectively. Change the input coupling switch AC-GND-DC between GND and DC, and ensure the baseline trace does not move.

Adjustment Procedure



2-6 POSITION CENT (both CH1 and CH2)

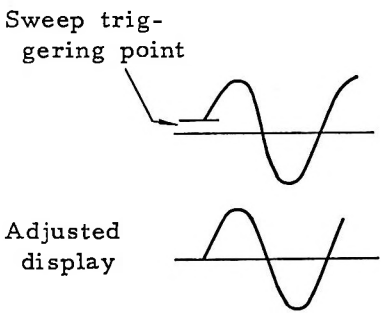
Set the POSITION control to mid-range and adjust these controls to get a trace at center.

2-7 TRIG DC LEVEL

① Apply a 50 kHz sine wave to CH1 input connector and set TRIG to CH1, AC. Adjust this control so the sweep starts from the center of the signal when the trigger coupling switch is positioned to DC and ensure the sweep starts at the same point.

② Apply the signal to CH2 and proceed to adjustment in the same way as ①, setting TRIG to CH2.

③ In condition ② above, switch the TRIG to NORM and adjust this control so the sweep starts from the center of the signal



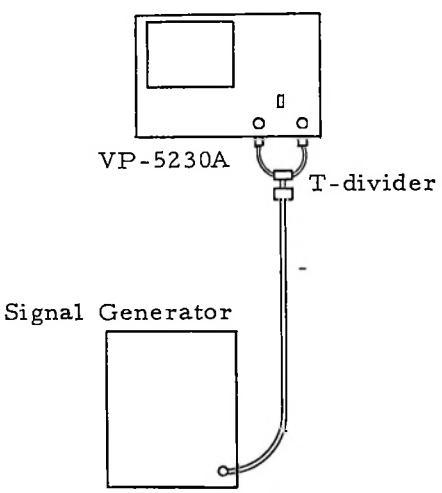
(In this case, POSITION control setting affects the triggering point.)

2-8 Confirming CH2 polarity inversion

Apply a 1 msec time marker (positive in polarity) to CH2 input connector and change the polarity switch to negative. Ensure the display changes as shown.

Normal

Invert



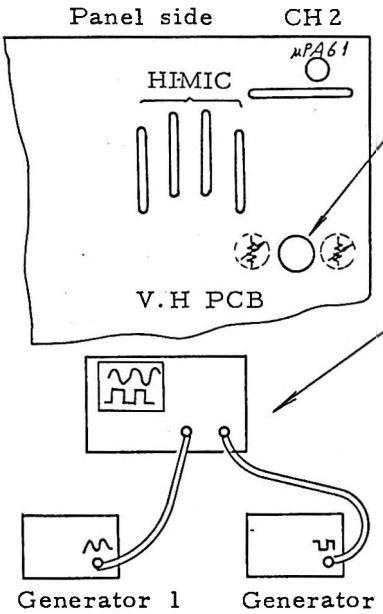
2-9 Confirming ADD function

① Common mode rejection of 50 kHz

Apply a 50 kHz sine wave to CH1 and CH2 simultaneously using a T-divider. (Get a 4-division display for each channel.)

Display on CH2 should be as follows:

Polarity	Amplitude
NORM	8 divisions
INV	0 divisions



No time relationship exists between generators 1 and 2 .

② Common mode rejection of 10 MHz

In condition ① above, change the input signal frequency to 10 MHz. { Display should be less than 0.4 division. }

2-10 CH3 POSITION

Depress DUAL and TRIPLE buttons of the V MODE switch at the same time and adjust the control so the CH3 trace appears in the two divisions from the bottom of graticule.

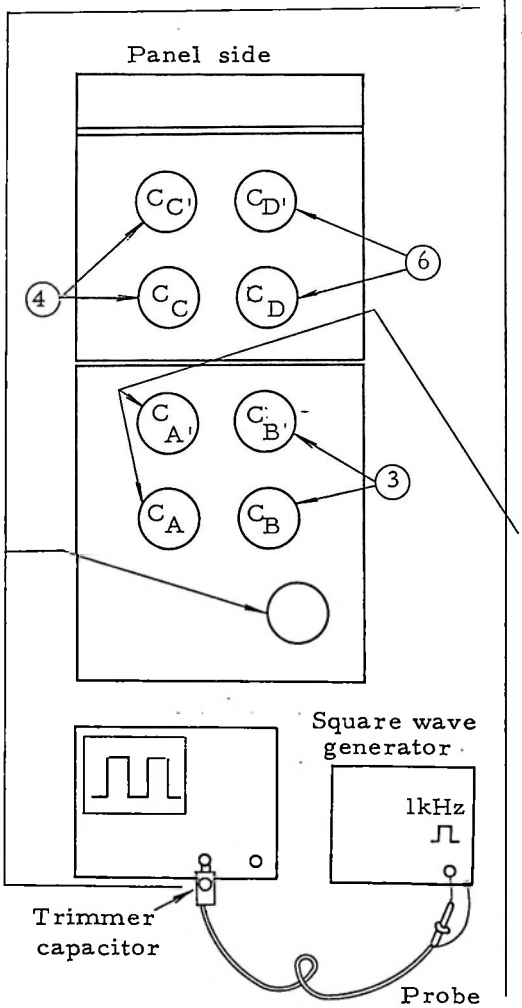
2-11 Confirming alternate trigger

Set the TRIG switch to NORM, apply a 1 kHz sine wave to CH1 and a 1 kHz square wave to CH2, and make sure you get stable display.

2-12 Confirming linearity

Get a two-division trace at center, and move it with the POSITION control over entire graticule, and ensure that the trace amplitude variation meets the requirements. (2 ±0.2 Div at 30 MHz)

	CH1	CH2
ATT interference	2mV/DIV, GND	1V/DIV $5V_{p-p}$ 50kHz INPUT Signal
	1V/DIV. $5V_{p-p}$ 50kHz INPUT Signal	2mV/DIV GND
Amplifier interference	2mV/DIV, GND	2mV/DIV $10mV_{p-p}$ 10kHz INPUT Signal
	2mV/DIV $10mV_{p-p}$ 10kHz INPUT Signal	2mV/DIV GND



2-13 Confirming interference

Make connections as in 2-9, apply sine wave signals and set controls as in this table. Ensure ATT and amplifier interferences are within 0.2 division.

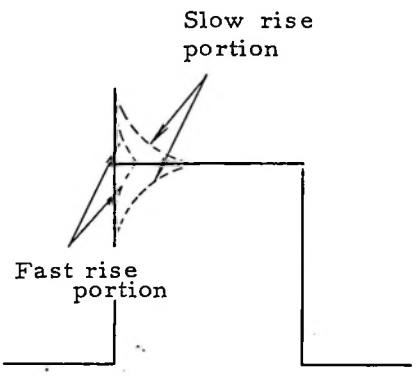
3. Attenuator

3-1 Input capacitance (both CH1 and CH2)

Set the VOLTS/DIV switch to 20mV/DIV and adjust this trimmer capacitor to 30pF. Connect the probe and adjust its trimmer capacitor for flat 1-kHz square wave applied.

3-2 50mV/DIV setting (both CH1 and CH2)

Apply a 1 kHz square wave, 6 divisions in amplitude and adjust C_A and $C_{A'}$ for fast and slow rise portions respectively.



Adjustment Procedure

3-3 0.1 V/DIV setting (both CH1 and CH2)

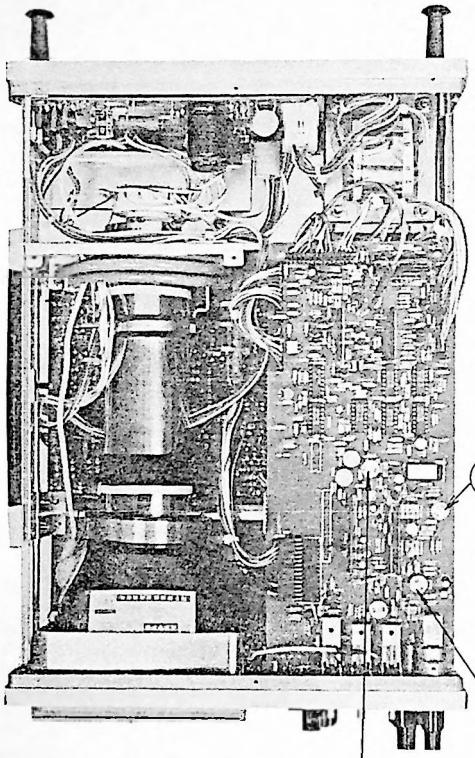
Same as above, but adjust C_B and C_B' for fast and slow rise portions respectively.

3-4 0.2 V/DIV setting (both CH1 and CH2)

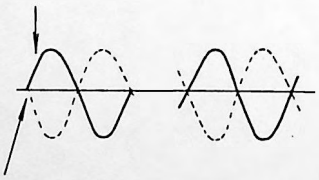
Adjust C_c and C_c' in the same way (cf. 3.2) for fast and slow rise portions respectively.

3-5 0.5V/DIV and 1V/DIV setting (both CH1 and CH2)

These settings hardly require any specific adjustment; however, if the trace shows acute overshoot or rounding, adjust C_A' and C_B' ensuring that 50mV/DIV and 0.1V/DIV setting adjustments meet the requirements.



Trigger start point



Adjusted waveform

3-6 2V/DIV setting (both CH1 and CH2)

Adjust C_D and C_D' in the same way (cf. 3.2) for fast and slow reise portions, respectively.

3-7 5V/DIV and 10V/DIV settings (both CH1 and CH2)

Confirm that there are not overshoot or-rounding when a 1 kHz square wave is applied.

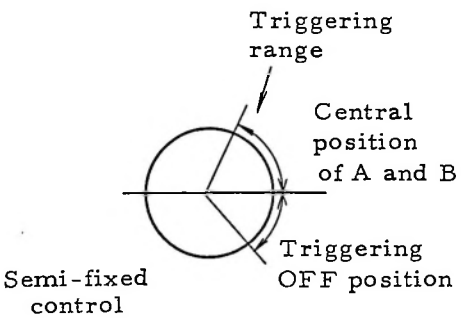
4. Trigger setting

(4-1) Trigger level center

Set the front-panel TRIG level to mid-range and adjust this control so the sweep is triggered at the center of the positive-going portion.

(4-2) SLOPE +, -

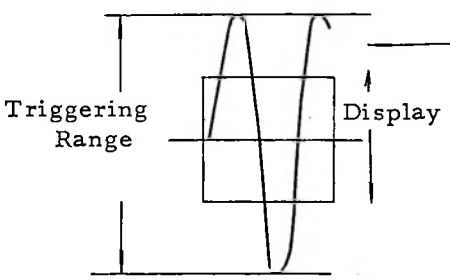
Turn the SLOPE switch to + and - positions, and adjust this control so the sweep is



triggered by different points on positive and negative-going portions.

4-3 FIX trigger sensitivity

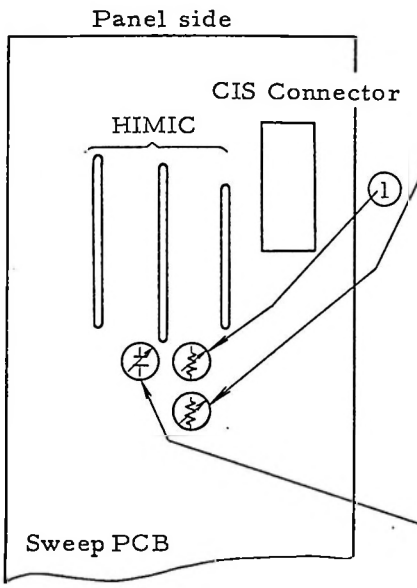
Apply a 50 kHz sine wave for a 0.4-division display. Turn the FIX trigger control gradually to the right to find a point where trace is triggered. Turn it further to find some other point where trace is not triggered, and then finally set the FIX control to the middle of these two points.



4-4 Trigger level selection

Apply a 50 kHz sine wave, and turn the TRIG LEVEL control fully to the left and then to the right to ensure a 20-division display.

	Adjustment Procedure
	4-5 TV triggering Set the AC-DC-TV switch to TV position and the SLOPE switch to position. Ensure that the trace is triggered by internal or external signal, or TV vertical and horizontal synchronizing signals, when setting the TIME/DIV switch as shown left. These trigger signals should meet the specified requirements.
0.5sec/DIV~0.1ms/DIV... TV-V 50μs/DIV ~0.2μs/DIV.... TV-H	
	4-6 LINE triggering Ensure that line frequency display of 8 divisions can be selected as a trigger signal.
	4-7 X-Y adjustments
	① Deflection factor Set the VOLTS/DIV switch at 20mV/DIV (x1) and adjust this control so that the 0.1V input produces an exact 5-division display.



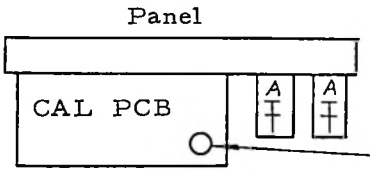
② POSITION setting

Adjust the POSITION control so that the A-sweep (1 msec/DIV) starts at the extreme left of the graticule.

Set the MODE switch to X-Y and adjust the X-Y POSITION control without disturbing H POSITION to bring the spot to the center.

③ Phase setting

Apply the 50 kHz sine wave of 4-division amplitude to both CH1 and CH2 connectors through T-divider. Change the frequency to 1 MHz and adjust this capacitor so the trace is a straight line.



4-8 External triggering

Set the V MODE to DUAL and TRIPLE, and apply a 1 kHz square wave to the CH1 input connector. Adjust this

capacitor for a flat-top CH3 display.

4-9 Confirming AUTO SWEEP

Apply a 100 Hz sinewave to the EXT TRIG input connector, ensuring that trace is triggered and that sweep free runs when no signals are applied.

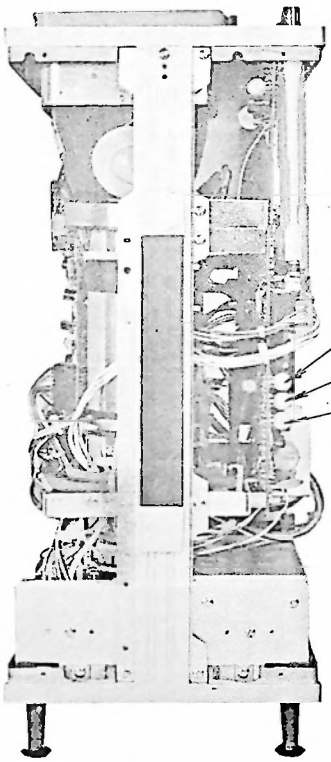
4-10 Trigger sensitivity

Ensure the trace is triggered by the trigger signal having the specified frequency amplitude, and voltage.

5. Horizontal Deflection System

5-1 NORM GAIN

Set the A TIME switch at 1 msec/DIV and connect 1 msec time marker signals. Adjust this control so that the time marker signals line up at intervals of 1 division.



5-2 MAG GAIN

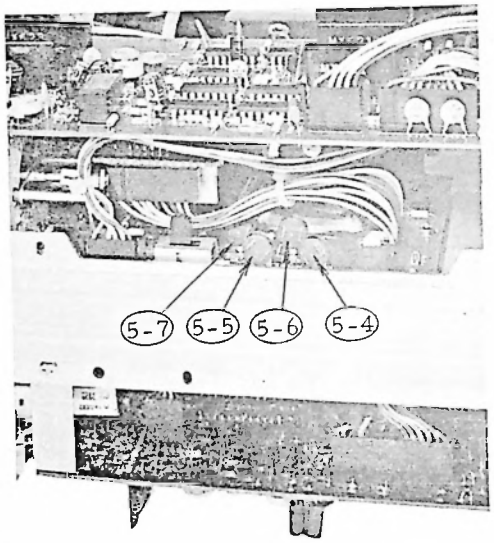
Keep the A TIME switch set at 1 msec/DIV and connect 0.1 msec time marker signals. Adjust this control so that the time marker signals line up at intervals of 1 division.

5-3 MAG REGI

Set the A TIME switch at 1 msec/DIV and connect 5 msec time marker signals. Position the second time marker to the center vertical graticule line. Adjust this control so that the second time marker still remains the same position when Horizontal gain is set to x10.

5-4 10 msec/DIV setting (A sweep)

Adjust this control so that the 10 msec time marker signals line up at intervals of 1 division.



5-5 10 µsec/DIV setting (A sweep)

Adjust this control so that the 10 µsec time marker signals line up at intervals of 1 division.

5-6 0.1 msec/DIV setting (B sweep)

Adjust this control so that the 0.1 msec time marker signals line up at intervals of 1 division.

5-7 10 µsec/DIV setting (B sweep)

Adjust this control so that the 10 µsec time marker signals line up at intervals of 1 division.

5-8 DELAY start/stop

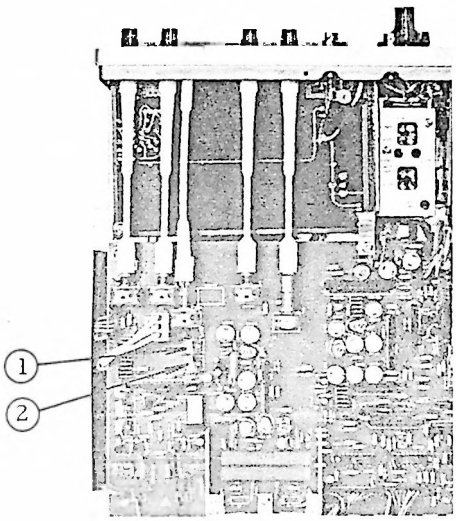
(1) Set the controls as follows:

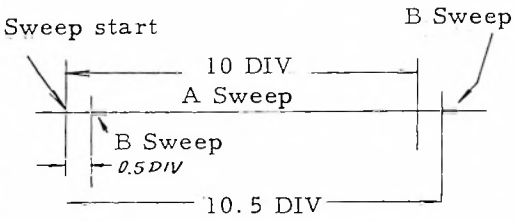
A, A INT, B ..... A INTEN

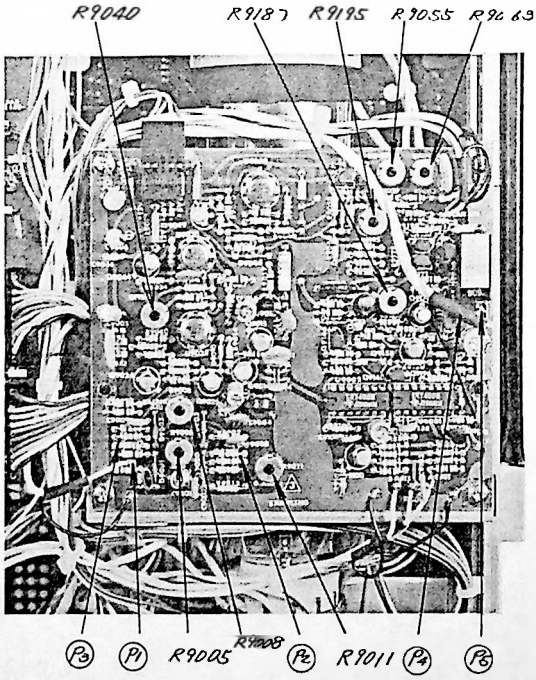
A Sweep time .... 0.5 msec/DIV

B Sweep time .... 0.5 µsec/DIV

Turn the DELAY TIME POSITION control fully counterclockwise







and adjust this control so the B sweep starts from 0.5 division point.

(2) Turn the DELAY TIME POSITION control fully clockwise and adjust this control so the B sweep starts from 10.5 division point Repeat the above settings (1) and (2) for more fine adjustment.

6. Record Out (option)

6-1 Input DC level

Set the V mode switch to CH1 or CH2 and position the trace to the center horizontal graticule line when the input coupling is set to GND. Adjust R9011 so that the voltage of test point P_1 becomes OV.

Adjustment Procedure

6-2 Diode bias

① Adjust R9005 so that the voltage across P_2 and P_3 becomes exactly 2V.

② Adjust R9008 so that the voltage at P_2 and P_3 becomes 1V and -1V respectively.

6-3 DC Offset

Adjust R9040 so that the voltage at pin ① and pin ④ of U9050 becomes the same.

6-4 GAIN Adjustment

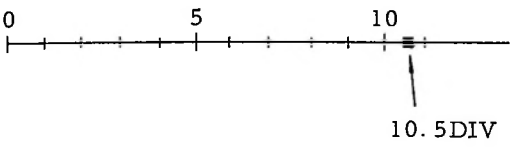
It is recommendable to use an X-Y recorder for this adjustment

Set A sweep time/DIV to 1mS/DIV and B sweep time/DIV to 10 μs/DIV.

Apply a 6 DIV sine wave (1 kHz) and adjust R9063 so that the output signal becomes $0.6V_{p\text{-}p}$.

6-5 Output DC level

Set the trace to the center of horizontal graticule line and adjust R9055 so that the output level is 0 V.



Adjustment Procedure

6-6 Pen lift timing

Adjust R9195 so that the pen in lifted just when the brightened point reaches 10.5 DIV from the beginning of the sweep. While pen is lifted, P_4 and P_5 are not closed.

6-7 Pen down timing

Adjust R9187 so that the pen comes down when the brightened point is at the starting of the A sweep.

(NOV.'79) 540P/D

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION		
		CAPACITOR .		
C 4A	YC@MD12J473M	0.047UF	630V	PLASTIC
C 4B	YC@MD12J473M	0.047UF	630V	PLASTIC
C 5A	ECCw2H030CC	3PF	500V	CERAMIC
C 5B	ECCw2H030CC	3PF	500V	CERAMIC
C 8A	ECV1ZW06X53	6PF	TRIMMER	CERAMIC
C 8B	ECV1ZW06X53	6PF	TRIMMER	CERAMIC
C 9A	ECKw2H102MD	1000PF	500V	CERAMIC
C 9B	ECKw2H102MD	1000PF	500V	CERAMIC
C 11A	ECV1ZW10X53D	10PF	TRIMMER	CERAMIC
C 11B	ECV1ZW10X53D	10PF	TRIMMER	CERAMIC
C 12A	ECV1ZW10X53D	10PF	TRIMMER	CERAMIC
C 12B	ECV1ZW10X53D	10PF	TRIMMER	CERAMIC
C 13A	ECCw2H020C	2PF	500V	CERAMIC
C 13B	ECCw2H020C	2PF	500V	CERAMIC
C 21A	ECV1ZW20X53D	20PF	TRIMMER	CERAMIC
C 21B	ECV1ZW20X53D	20PF	TRIMMER	CERAMIC
C 22A	ECV1ZW10X53D	10PF	TRIMMER	CERAMIC
C 22B	ECV1ZW10X53D	10PF	TRIMMER	CERAMIC
C 23A	ECCw2H150KC	15PF	500V	CERAMIC
C 23B	ECCw2H150KC	15PF	500V	CERAMIC
C 31A	ECV1ZW20X53D	20PF	TRIMMER	CERAMIC
C 31B	ECV1ZW20X53D	20PF	TRIMMER	CERAMIC
C 32A	ECV1ZW04X53D	4PF	TRIMMER	CERAMIC
C 32B	ECV1ZW04X53D	4PF	TRIMMER	CERAMIC
C 33A	ECCw2H220KC	22PF	500V	CERAMIC
C 33B	ECCw2H220KC	22PF	500V	CERAMIC
C 41A	ECV1ZW20X53D	20PF	TRIMMER	CERAMIC
C 41B	ECV1ZW20X53D	20PF	TRIMMER	CERAMIC
C 42A	ECV1ZW02X53D	2PF	VARIABLE CAPACITOR	
C 42B	ECV1ZW02X53D	2PF	VARIABLE CAPACITOR	
C 43A	ECCw1H221K2	220PF	50V	CERAMIC
C 43B	ECCw1H221K2	220PF	50V	CERAMIC
C 101	ECKw1H103PF	0.01UF	50V	CERAMIC
C 102	ECKw1H103PF	0.01UF	50V	CERAMIC
C 103	ECKw1H103PF	0.01UF	50V	CERAMIC
C 119	ECKw1H103PF	0.01UF	50V	CERAMIC
C 120	ECKw1H103PF	0.01UF	50V	CERAMIC
C 121	ECKw1H103PF	0.01UF	50V	CERAMIC
C 126	ECV1ZW70P32	70PF	VARIABLE CAP	CERAMIC
C 127	ECCw1H680K	68PF	50V	CERAMIC

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION
	CAPACITOR .	(CONT)
C 148	ECCw1H101KC2	100PF 50V CERAMIC
C 150	ECV1ZW70P32	70PF VARIABLE CAPCERAMIC
C 201	ECKw1H103PF	0.01UF 50V CERAMIC
C 202	ECKw1H103PF	0.01UF 50V CERAMIC
C 203	ECKw1H103PF	0.01UF 50V CERAMIC
C 219	ECKw1H103PF	0.01UF 50V CERAMIC
C 220	ECKw1H103PF	0.01UF 50V CERAMIC
C 221	ECKw1H103PF	0.01UF 50V CERAMIC
C 226	ECV1Zw70P32	70PF VARIABLE CAPCERAMIC
C 227	ECCw1H680K	68PF 50V CERAMIC
C 248	ECCw1H101KC2	100PF 50V CERAMIC
C 250	ECV1Zw70P32	70PF VARIABLE CAPCERAMIC
C 319	ECCw1H220KC	22PF 50V CERAMIC
C 350	ECCw1H020C	2PF 50V CERAMIC
C 355	ECEA1CS100	10UF 16V ELECT.
C 356	ECEA1CS100	10UF 16V ELECT.
C 357	ECEA1CS100	10UF 16V ELECT.
C 358	ECEA1CS100	10UF 16V ELECT.
C 360	ECKw1H103PF	0.01UF 50V CERAMIC
C 372	ECCw1H220KC	22PF 50V CERAMIC
C 402	ECKw1H103PF	0.01UF 50V CERAMIC
C 403	ECKw1H103PF	0.01UF 50V CERAMIC
C 404	ECKw1H103PF	0.01UF 50V CERAMIC
C 405	ECKw1H103PF	0.01UF 50V CERAMIC
C 406	ECKw1H103PF	0.01UF 50V CERAMIC
C 408	ECKw1H102KB2	1000PF 50V CERAMIC
C 409	ECKw1H103PF	0.01UF 50V CERAMIC
C 410	ECKw1H103PF	0.01UF 50V CERAMIC
C 411	ECKw1H103PF	0.01UF 50V CERAMIC
C 412	ECKw1H103PF	0.01UF 50V CERAMIC
C 413	ECKD1H102Mo	1000PF 50V CERAMIC
C 415	ECKw1H103PF	0.01UF 50V CERAMIC
C 416	ECEA1CS100	10UF 16V ELECT.
C 417	ECEA1CS100	10UF 16V ELECT.
C 418	ECEA1CS100	10UF 16V ELECT.
C 419	ECKw1H102KB2	1000PF 50V CERAMIC
C 422	ECKw1H102KB2	1000PF 50V CERAMIC
C 430	ECCw1H560K	56PF 50V CERAMIC
C 431	ECCw1H560K	56PF 50V CERAMIC
C 440	ECCw1H220KC	22PF 50V CERAMIC

PARTS LIST

CRT NO.	MFR. PART NO.	DESCRIPTION		
		CAPACITOR (CONT)		
C 446	ECKW1H102KB2	1000PF	50V	CERAMIC
C 452	ECEA1CS100	10UF	16V	ELECT.
C 456	ECQM05104KZ	0.1UF	50V	PLASTIC
C 459	ECQM05152KZ	1500PF	50V	PLASTIC
C 460	ECCW1H151K	150PF	50V	CERAMIC
C 461	ECV1ZW70P32	70PF	VARIABLE CAP	CERAMIC
C 462	ECCW1H050DC	5PF	50V	CERAMIC
C 465	ECV1ZW70P32	70PF	VARIABLE CAP	CERAMIC
C 466	ECCW1H151K	150PF	50V	CERAMIC
C 467	ECCW1H121KC	120PF	50V	CERAMIC
C 468	ECKW2H102MD	1000PF	500V	CERAMIC
C 469	ECKW2H102MD	1000PF	500V	CERAMIC
C 473	ECCW1H221K2	220PF	50V	CERAMIC
C 474	ECEA1AS101	100UF	10V	ELECT.
C 500	ECCD2H560KC	56PF	500V	CERAMIC
C 501	ECKW1H102KB2	1000PF	50V	CERAMIC
C 501	ECV1ZW10X44	10PF	VARIABLE CAPACITOR	
C 502	YCQMD12J473M	0.047UF	630V	PLASTIC
C 503	ECCW1H471K	470PF	50V	CERAMIC
C 506	ECKW2H102PE	1000PF	500V	CERAMIC
C 510	ECKW1H102KB2	1000PF	50V	CERAMIC
C 517	ECEA1AS101	100UF	10V	ELECT.
C 520	ECKW1H102KB2	1000PF	50V	CERAMIC
C 529	ECEA1CS100	10UF	16V	ELECT.
C 535	ECEA1CS470	47UF	16V	ELECT.
C 536	ECEA1VS100	10UF	35V	ELECT.
C 541	ECKW1H103PF	0.01UF	50V	CERAMIC
C 542	ECEA1CS100	10UF	16V	ELECT.
C 543	ECEA1CS100	10UF	16V	ELECT.
C 544	ECKW1H103PF	0.01UF	50V	CERAMIC
C 545	ECKW1H103PF	0.01UF	50V	CERAMIC
C 546	ECKW1H473ZF	0.047UF	50V	CERAMIC
C 550	ECEA1CS470	47UF	16V	ELECT.
C 551	ECEA1CS220	22UF	16V	ELECT.
C 554	ECCW1H121K	120PF	50V	CERAMIC
C 557	ECEA1HS4R7	4.7UF	50V	ELECT.
C 563	ECEA1CS220	22UF	16V	ELECT.
C 564	ECEA1HS4R7	4.7UF	50V	ELECT.
C 567	ECCW1H471K	470PF	50V	CERAMIC
C 595	ECCW1H330K	33PF	50V	CERAMIC

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION		
		CAPACITOR	(CONT)	
C 603	ECEA1CS101	100UF	16V	ELECT.
C 604	ECKW1H103PF	0.01UF	50V	CERAMIC
C 606	ECEA1CS100	10UF	16V	ELECT.
C 607	ECKW1H103PF	0.01UF	50V	CERAMIC
C 610	ECEA1HS4R7	4.7UF	50V	ELECT.
C 611	ECKW1H681KB	680PF	50V	CERAMIC
C 616	ECCW1H150K	15PF	50V	CERAMIC
C 620	ECCW1H150K	15PF	50V	CERAMIC
C 622	ECKW1H473ZF	0.047UF	50V	CERAMIC
C 633	ECKW1H103PF	0.01UF	50V	CERAMIC
C 635	ECKW1H103PF	0.01UF	50V	CERAMIC
C 636	ECKW1H103PF	0.01UF	50V	CERAMIC
C 640	ECEA1CS100	10UF	16V	ELECT.
C 641	ECEA1CS100	10UF	16V	ELECT.
C 670	ECCW1H181K	180PF	50V	CERAMIC
C 674	ECKW1H103PF	0.01UF	50V	CERAMIC
C 675	ECEA1CS100	10UF	16V	ELECT.
C 680	ECCW1H220K	22PF	50V	CERAMIC
C 681	ECCW1H220K	22PF	50V	CERAMIC
C 700	ECQP1102FZ	1000PF	DRAWING NO	77C10
C 705	ECQP1104GZ	0.1UF	DRAWING NO	77C10
C 706	ECQM05224KZ	0.22UF	50V	PLASTIC
C 708	ECQE1106KZ	10UF	500V	CERAMIC
C 709	ECEA1HS4R7	4.7UF	50V	ELECT.
C 720	ECEA1CS100	10UF	16V	ELECT.
C 721	ECEA1CS100	10UF	16V	ELECT.
C 722	ECEA1CS100	10UF	16V	ELECT.
C 725	ECQP1102FZ	1000PF	DRAWING NO	77C10
C 774	ECQP1104GZ	0.1UF	DRAWING NO	77C10
C 801	ECKW1H103PF	0.01UF	50V	CERAMIC
C 803	ECKW2H103PE	0.01UF	500V	CERAMIC
C 805	ECKW1H103PF	0.01UF	50V	CERAMIC
C 808	ECEA1CS100	10UF	16V	ELECT.
C 809	ECEA1CS100	10UF	16V	ELECT.
C 820	ECCW1H151K	150PF	50V	CERAMIC
C 821	ECCW1H220KC	22PF	50V	CERAMIC
C 822	ECKW2H103PE	0.01UF	500V	CERAMIC
C 823	ECCW2H020CC	2PF	500V	CERAMIC
C 824	ECCW2H020CC	2PF	500V	CERAMIC
C 825	ECKW2H103PE	0.01UF	500V	CERAMIC

PARTS LIST

CKT NO.	MFR. PART NO.	DESCRIPTION		
	CAPACITOR		(CONT)	
C 826	ECKW2H103PE	0.01UF	500V	CERAMIC
C 844	ECKW1H103PF	0.01UF	50V	CERAMIC
C 852	ECV1ZW20X53D	20PF	TRIMMER	CERAMIC
C 854	ECCW1H100F	10PF	50V	CERAMIC
C 860	ECQM05103KZ	0.01UF	50V	PLASTIC
C 861	ECQM05103KZ	0.01UF	50V	PLASTIC
C 862	ECEA1CS221	220UF	16V	ELECT.
C 900	ECQM05683KZ	0.068UF	50V	PLASTIC
C 901	YCKDCYZ472P2	4700PF	2KV	CERAMIC
C 902	ECKW1H223PF	0.022UF	50V	CERAMIC
C 903	ECEA1VS471	470UF	35V	ELECT.
C 904	ECQM05154KZ	0.15UF	50V	PLASTIC
C 910	ECKW2H103PE	0.01UF	500V	CERAMIC
C 912	YCKDCYZ472P2	4700PF	2KV	CERAMIC
C 913	YCKDCYZ472P2	4700PF	2KV	CERAMIC
C 914	YCKDCYZ472P2	4700PF	2KV	CERAMIC
C 916	YCKDCYZ472P2	4700PF	2KV	CERAMIC
C 918	YCKDCYZ472P2	4700PF	2KV	CERAMIC
C 919	YCKDCYZ472P2	4700PF	2KV	CERAMIC
C 921	ECKW2H103PE	0.01UF	500V	CERAMIC
C 922	ECKW2H103PE	0.01UF	500V	CERAMIC
C 927	ECV1ZW04X53D	4PF	TRIMMER	CERAMIC
C 927	ECCW2H020C	2PF	500V	CERAMIC
C 928	ECKW1H102KB2	1000PF	50V	CERAMIC
C 930	ECKW2H102MD	1000PF	500V	CERAMIC
C 931	ECCW2H020C	2PF	500V	CERAMIC
C 932	ECCW2H020C	2PF	500V	CERAMIC
C 933	ECKW2H103PE	0.01UF	500V	CERAMIC
C 940	ECKW2H103PE	0.01UF	500V	CERAMIC
C 951	ECKW2H103PE	0.01UF	500V	CERAMIC
C 960	ECKD3F102MB	1000PF	3KV	CERAMIC
C 969	ECEA1HS4R7	4.7UF	50V	ELECT.
C 971	ECKW2H103PE	0.01UF	500V	CERAMIC
C 973	ECEA160V47U	47UF	160V	ELECT.
C 974	ECKW2H102MD	1000PF	500V	CERAMIC
C 975	ECKW2H103PE	0.01UF	500V	CERAMIC
C 976	ECEA160V4R7U	4.7UF	160V	ELECT.
C 980	ECKW2H103PE	0.01UF	500V	CERAMIC
C 981	ECKW2H103PE	0.01UF	500V	CERAMIC
C 982	ECKW2H103PE	0.01UF	500V	CERAMIC

P A R T S L I S T

CKT NO.	MFR. PART NO.	DESCRIPTION		
		CAPACITOR (CONT)		
C 984	ECEA1CS100	10UF	16V	ELECT.
C 985	ECEA1CS222	2200UF	16V	ELECT.
C 986	ECET35R222SW	2200UF	35V	ELECT.
C 987	ECET35R222SW	2200UF	35V	ELECT.
		DIODE		
CR101	YUD1S169UN	1S1690N		SILICON
CR201	YUD1S169UN	1S1690N		SILICON
CR340	MA150-TAP	MA150		SILICON
CR341	MA150-TAP	MA150		SILICON
CR342	MA150-TAP	MA150		SILICON
CR343	MA150-TAP	MA150		SILICON
CR410	MA150-TAP	MA150		SILICON
CR500	MA150-TAP	MA150		SILICON
CR501	MA150-TAP	MA150		SILICON
CR502	MA150-TAP	MA150		SILICON
CR503	MA150-TAP	MA150		SILICON
CR504	MA150-TAP	MA150		SILICON
CR506	MA150-TAP	MA150		SILICON
CR507	MA150-TAP	MA150		SILICON
CR510	MA150-TAP	MA150		SILICON
CR511	MA150-TAP	MA150		SILICON
CR512	MA150-TAP	MA150		SILICON
CR513	MA150-TAP	MA150		SILICON
CR520	MA150-TAP	MA150		SILICON
CR520	MA150-TAP	MA150		SILICON
CR521	MA150-TAP	MA150		SILICON
CR603	MA150-TAP	MA150		SILICON
CR605	MA150-TAP	MA150		SILICON
CR606	MA150-TAP	MA150		SILICON
CR607	MA150-TAP	MA150		SILICON
CR608	MA150-TAP	MA150		SILICON
CR609	MA150-TAP	MA150		SILICON
CR610	MA150-TAP	MA150		SILICON
CR611	MA150-TAP	MA150		SILICON
CR612	MA150-TAP	MA150		SILICON
CR613	MA150-TAP	MA150		SILICON
CR614	MA150-TAP	MA150		SILICON
CR615	MA150-TAP	MA150		SILICON
CR616	MA150-TAP	MA150		SILICON
CR634	MA150-TAP	MA150		SILICON

PARTS LIST

CRT NO.	MFR. PART NO.	DESCRIPTION
	DIODE	(CONT)
CR635	MA150-TAP	MA150 SILICON
CR645	MA150-TAP	MA150 SILICON
CR646	MA150-TAP	MA150 SILICON
CR656	MA150-TAP	MA150 SILICON
CR656	MA150-TAP	MA150 SILICON
CR672	MA150-TAP	MA150 SILICON
CR672	MA150-TAP	MA150 SILICON
CR690	MA150-TAP	MA150 SILICON
CR691	MA150-TAP	MA150 SILICON
CR691	MA150-TAP	MA150 SILICON
CR692	MA150-TAP	MA150 SILICON
CR692	MA150-TAP	MA150 SILICON
CR693	MA150-TAP	MA150 SILICON
CR693	MA150-TAP	MA150 SILICON
CR694	MA150-TAP	MA150 SILICON
CR695	MA150-TAP	MA150 SILICON
CR700	MA150-TAP	MA150 SILICON
CR701	MA150-TAP	MA150 SILICON
CR702	MA150-TAP	MA150 SILICON
CR703	MA150-TAP	MA150 SILICON
CR704	MA150-TAP	MA150 SILICON
CR705	MA150-TAP	MA150 SILICON
CR706	MA150-TAP	MA150 SILICON
CR707	MA150-TAP	MA150 SILICON
CR708	MA150-TAP	MA150 SILICON
CR710	MA150-TAP	MA150 SILICON
CR800	MA150-TAP	MA150 SILICON
CR801	MA150-TAP	MA150 SILICON
CR850	MA150-TAP	MA150 SILICON
CR851	MA150-TAP	MA150 SILICON
CR901	YXAS346001B0	HV RECTIFIER BLOCK A
CR910	YUDED15TV1	ED15TV1
CR913	YUD1S2091	1S2091
CR914	YUD1S2091	1S2091
CR931	MA150-TAP	MA150 SILICON
CR950	YUD1S2091	1S2091
CR951	YUD1S2091	1S2091
CR952	YUD1S2091	1S2091
CR971	YUDSIRB60	SIRB60 BRIDGE RECTIFIER DIODE
CR972	MA150-TAP	MA150 SILICON

P A R T S L I S T

CKT NO.	MFR. PART NO.	DESCRIPTION
	DIODE	(CONT)
CR973	MA150-TAP	MA150 SILICON
CR976	YUDSIRB40	SIRB40 BRIDGE RECTIFIER DIODE
CR977	YUDSIRB40	SIRB40 BRIDGE RECTIFIER DIODE
CR978	YUDSIRB40	SIRB40 BRIDGE RECTIFIER DIODE
CR980	MA150-TAP	MA150 SILICON
CR981	MA150-TAP	MA150 SILICON
CR982	MA150-TAP	MA150 SILICON
DS602	LN21	LN-21 RED LED
DS991	LN21	LN-21 RED LED
	PC BOARD	
E 10	YXFP44005210	5230A/S INPUT ATT CKT PCB ONLY
E 20	YXFP44005210	5230A/S INPUT ATT CKT PCB ONLY
E 100	YXFP14000460	5230A/S VERTICAL AMP PCB ONLY
E 500	YXFP14000470	5230A/S TRIGGER SWEEP PCB ONLY
E 900	YXFP14000490	5230A/S POWER SUPPLY PCB ONLY
	FUSE	
F 906	YXAFTSC1A	1A FUSE DRAWING NO 77V05
F 916	YXAFTSC1A	1A FUSE DRAWING NO 77V05
	CONNECTOR	
F 930	YWAM3305P01	M33 STRAIGHT PLUG 5P
F 931	YWAM3310P01	M33-10P-01
F 932	YWAM3310P01	M33-10P-01
F 933	YWAM3310P03	DRAWING NO 46-47-0574
F 935	YXFC76J005	1-380991-0 10P
J 101	YWBUG-625-U	UG-625/U BNC CONTACT
J 201	YWBUG-625-U	UG-625/U BNC CONTACT
J 430	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 431	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 432	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 433	YWAM3310P01	M33-10P-01
J 434	YWAM3310P01	M33-10P-01
J 436	YWA163681-3	BOTTOM ENTRY TYPE 5P
J 437	YWA163681-3	BOTTOM ENTRY TYPE 5P
J 438	YWA163681-3	BOTTOM ENTRY TYPE 5P
J 439	YWA163681-8	163681-8 BOTTOM ENTRY 10P
J 440	YWA1-1636814	1-163681-4 BOTTOM ENTRY 15P
J 441	YWA350210-1	350210-1
J 501	YWBUG-625-U	UG-625/U BNC CONTACT

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION
	CONNECTOR . (CONT)	
J 530	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 531	YWAM3310P01	M33-10P-01
J 532	YWAM3310P01	M33-10P-01
J 533	YWAM3310P01	M33-10P-01
J 534	YWA1-163604	1-63680-4 TOP ENTRY 15P
J 536	YWA1163683-4	1-163683-4 SIDE ENTLY 15P
J 537	YWA1163663-1	163683-1 SIDE ENTRY 3P
J 730	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 731	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 732	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 733	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 734	YWAM3305P01	M33 STRAIGHT PLUG 5P
J 735	YWAM3310P01	M33-10P-01
J 736	YWAM3310P01	M33-10P-01
J 737	YWAM3310P01	M33-10P-01
J 738	YWAM3310P01	M33-10P-01
J 740	YWA1163663-1	163683-1 SIDE ENTRY 3P
J 741	YWA163683-3	163683-3 SIDE ENTRY 5P
J 742	YWA163663-8	163683-8 SIDE ENTRY 10P
J 905	YWA9361-2	VOLTAGE SELECTOR SOCKET
J 990	YWBUG-625-U	UG-625/U BNC CONTACT
	RELAY	
K 530	YSKAE5343	AE5343 NR RELEY NR
K 603	YSKAE5343	AE5343 NR RELEY NR
	COIL	
L 475	YXDLTP5R6K	TP0206L-5R6K CHOKING COIL
L 476	YXDLTP5R6K	TP0206L-5R6K CHOKING COIL
L 477	YXDLTP2R2K	TP0206L-2R2K CHOKING COIL
L 478	YXDLTP2R2K	TP0206L-2R2K CHOKING COIL
L 901	YXDL44312071	5230A/S TRACEROTATION COIL
L 903	YXDL44308441	20UH CHOKINK COIL
	SOCKET	
P 431	YWAM3305S13	DRAWING NO 4G-47-0574
P 432	YWAM3305S13	DRAWING NO 4G-47-0574

PARTS LIST

CRT NO.	MFR. PART NO.	DESCRIPTION		
		CONNECTOR		
P 433	YQAM3110S22	M3110S22	10P-20-10P	SOCKET
P 434	YXAM3110S23	M3310S23	HEAD TUKI	SOCKET
P 434	YXAM3305S23	M3305S23	HEAD TUKI	SOCKET
P 436	YQA163690-3	163690-3	HOUSING 5P	
P 437	YQA163690-3	163690-3	HOUSING 5P	
P 438	YQA163690-3	163690-3	HOUSING 5P	
P 439	YQA163690-8	163690-8	HOUSING 10P	
P 440	YQA1-1636904	1-163690-4	PIN 15P	
P 441	YQA1480303-0	1-480303-0	PLUG 3P (P)	
P 530	YXAM3305S23	M3305S23	HEAD TUKI	SOCKET
P 531	YXAM3110S23	M3310S23	HEAD TUKI	SOCKET
P 532	YXAM3110S23	M3310S23	HEAD TUKI	SOCKET
P 533	YXAM3110S21	M3310S21	HEAD TUKI	SOCKET
P 534	YQA163690-8	163690-8	HOUSING 10P	
P 535	YQA163690-3	163690-3	HOUSING 5P	
P 536	YQA1-1636904	1-163690-4	PIN 15P	
P 730	YQAM3305S21	M3305S21	5P-10-5P	SOCKET
P 731	YQAM3305S21	M3305S21	5P-10-5P	SOCKET
P 735	YXAM3110S21	M3310S21	HEAD TUKI	SOCKET
P 741	YQA163740-3	163740-3	PIN 5P	
P 742	YQA163740-8	163740-8	10PIN	
P 905	YQA9209	VOLTAGE SELECTOR PLUG		
P 955	YXFC76J006	1-480285-0		
		TRANSISTOR		
Q 100	YHTUPA61AM	UPA61AM		
Q 110	2SC828A-RS	2SC828A-RS		SILICON
Q 111	2SC828A-RS	2SC828A-RS		SILICON
Q 200	YHTUPA61AM	UPA61AM		
Q 210	2SC828A-RS	2SC828A-RS		SILICON
Q 211	2SC828A-RS	2SC828A-RS		SILICON
Q 340	2SA638	2SA838		SILICON
Q 341	2SA638	2SA838		SILICON
Q 402	2SC1359-AB	2SC1359-AB		SILICON
Q 405	2SA564A-RS	2SA564A-RS		SILICON
Q 460	2SC1326	2SC1326		SILICON
Q 461	2SC1326	2SC1326		SILICON
Q 462	2SC1566	2SC1566		SILICON
Q 463	2SC1566	2SC1566		SILICON
Q 500	2SC1215	2SC1215		SILICON

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION		
		TRANSISTOR. (CONT)		
Ⓥ 501	YUT2SK30A-GR	2SK30A-GR	FET	SILICON
Ⓓ 502	2SC1215	2SC1215		SILICON
Ⓥ 507	2SA638	2SA638		SILICON
Ⓥ 508	2SC1215	2SC1215		SILICON
Ⓥ 600	YUT2SC1834	2SC1834		SILICON
Ⓥ 601	YUT2SC1834	2SC1834		SILICON
Ⓓ 604	2SC1359-AB	2SC1359-AB		SILICON
Ⓥ 605	2SA838	2SA838		SILICON
Ⓥ 606	2SA838	2SA838		SILICON
Ⓥ 607	2SC1359-AB	2SC1359-AB		SILICON
Ⓓ 608	2SC1359-AB	2SC1359-AB		SILICON
Ⓥ 609	2SA838	2SA838		SILICON
Ⓥ 610	YUT2SC1834	2SC1834		SILICON
Ⓥ 611	YUT2SC1834	2SC1834		SILICON
Ⓓ 614	2SC1359-AB	2SC1359-AB		SILICON
Ⓓ 648	2SC1359-AB	2SC1359-AB		SILICON
Ⓥ 694	2SC1359-AB	2SC1359-AB		SILICON
Ⓓ 695	2SC1359-AB	2SC1359-AB		SILICON
Ⓓ 696	2SC1359-AB	2SC1359-AB		SILICON
Ⓓ 700	2SC828A-RS	2SC828A-RS		SILICON
Ⓥ 708	2SA620	2SA620		SILICON
Ⓓ 710	2SC1501-K	2SC1501K		SILICON
Ⓥ 717	2SC828A-RS	2SC828A-RS		SILICON
Ⓓ 716	2SC1501-K	2SC1501K		SILICON
Ⓓ 740	2SC1501-K	2SC1501K		SILICON
Ⓥ 750	2SA620	2SA620		SILICON
Ⓥ 800	2SA838	2SA838		SILICON
Ⓥ 801	2SA838	2SA838		SILICON
Ⓥ 803	2SA838	2SA838		SILICON
Ⓥ 804	2SA838	2SA838		SILICON
Ⓥ 807	2SA914-RS	2SA914RS		SILICON
Ⓥ 808	2SA914-RS	2SA914RS		SILICON
Ⓥ 809	2SC1566	2SC1566		SILICON
Ⓥ 810	2SC1566	2SC1566		SILICON
Ⓥ 811	2SC1359-AB	2SC1359-AB		SILICON
Ⓥ 812	2SC1359-AB	2SC1359-AB		SILICON
Ⓥ 850	2SA838	2SA838		SILICON
Ⓥ 860	2SA564A-RS	2SA564A-RS		SILICON
Ⓓ 861	2SA564A-RS	2SA564A-RS		SILICON
Ⓥ 862	2SA564A-RS	2SA564A-RS		SILICON

P A R T S L I S T

CKT NO.	MFR. PART NO.	DESCRIPTION			
		TRANSISTOR (CONT)			
Q 900	2SC828A-RS	2SC828A-RS			SILICON
Q 901	2SA777-RS	2SA777-RS			SILICON
Q 903	2SD389-PQ	2SD389-PQ			SILICON
Q 920	2SC1509-RS	2SC1509-RS			SILICON
Q 921	2SA777-RS	2SA777-RS			SILICON
Q 930	2SC1215	2SC1215			SILICON
Q 931	2SA838	2SA838			SILICON
Q 932	2SA914-RS	2SA914RS			SILICON
Q 933	2SC1566	2SC1566			SILICON
Q 971	2SC1683	2SC1683			SILICON
Q 972	2SC1501-K	2SC1501K			SILICON
Q 973	2SC1501-K	2SC1501K			SILICON
Q 974	2SC1501-K	2SC1501K			SILICON
Q 980	2SD389-PQ	2SD389-PQ			SILICON
		RESISTOR			
R 4A	ERD18TJ100V	10 OHM	5%	1/8W	CARBON
R 4B	ERD18TJ100V	10 OHM	5%	1/8W	CARBON
R 8A	YRNEF12F1004	1MOHM	1%	1/2W	METAL
R 8B	YRNEF12F1004	1MOHM	1%	1/2W	METAL
R 9A	ERD12TJ105	1MOHM	5%	1/2W	CARBON
R 9B	ERD12TJ105	1MOHM	5%	1/2W	CARBON
R 10A	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 10B	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 11A	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 11B	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 12A	YRNEF12F6003	600KOHM	1%	1/2W	METAL
R 12B	YRNEF12F6003	600KOHM	1%	1/2W	METAL
R 13A	YRNEF12F6673	667KOHM	1%	1/2W	METAL
R 13B	YRNEF12F6673	667KOHM	1%	1/2W	METAL
R 21A	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 21B	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 22A	YRNEF12F8003	800KOHM	1%	1/2W	METAL
R 22B	YRNEF12F8003	800KOHM	1%	1/2W	METAL
R 23A	YRNEF12F2503	250KOHM	1%	1/2W	METAL
R 23B	YRNEF12F2503	250KOHM	1%	1/2W	METAL
R 31A	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 31B	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 32A	YRNEF12F9003	900KOHM	1%	1/2W	METAL
R 32B	YRNEF12F9003	900KOHM	1%	1/2W	METAL
R 33A	YRNEF14F1113	111KOHM	1%	1/4W	METAL

PARTS LIST

CKT NO.	MFR. PART NO.	DESCRIPTION		
		RESISTOR (CONT)		
R 33B	YRNEF14F1113	111KOHM	1% 1/4W	METAL
R 41A	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 41B	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 42A	YRNEF12F9903	990KOHM	1% 1/2W	METAL
R 42B	YRNEF12F9903	990KOHM	1% 1/2W	METAL
R 43A	YRNEF14F1012	10.1KOHM	1% 1/4W	METAL
R 43B	YRNEF14F1012	10.1KOHM	1% 1/4W	METAL
R 101	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 102	ERD18TJ223V	22KOHM	5% 1/8W	CARBON
R 103	EVTR4AA00B14	10KOHM	VARIABLE	COMP.
R 104	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 105	ERD18TJ561V	510 OHM	5% 1/8W	CARBON
R 110	ERD18TJ751	750 OHM	5% 1/8W	CARBON
R 117	EWK241Z09C13	1KOHMX2	VARIABLE	CARBON
R 122	YRVSR19R101B	100 OHM	VARIABLE	COMP.
R 123	ERD18TJ222V	2.2KOHM	5% 1/8W	CARBON
R 126	ERD18TJ431	430 OHM	5% 1/8W	CARBON
R 127	ERD18TJ331V	330 OHM	5% 1/8W	CARBON
R 128	ERD25CKF3320	332 OHM	1% 1/4W	METAL
R 129	ERD25CKF3320	332 OHM	1% 1/4W	METAL
R 130	ERD18TJ100V	10 OHM	5% 1/8W	CARBON
R 131	YRVSR19R101B	100 OHM	VARIABLE	COMP.
R 132	EVTR4AA00B13	1KOHM	VARIABLE	COMP.
R 137	ERD18TJ750	75 OHM	5% 1/8W	CARBON
R 138	ERD18TJ510	51 OHM	5% 1/8W	CARBON
R 139	YRVSR19R221B	220 OHM	VARIABLE	COMP.
R 140	ERD18TJ751	750 OHM	5% 1/8W	CARBON
R 141	ERD18TJ510	51 OHM	5% 1/8W	CARBON
R 142	ERD18TJ510	51 OHM	5% 1/8W	CARBON
R 149	EWKEUA320B24	20KOHMX2	VARIABLE	CARBON
R 156	ERD18TJ302	3KOHM	5% 1/8W	CARBON
R 157	ERD18TJ302	3KOHM	5% 1/8W	CARBON
R 158	EVTR4AA00B15	100KOHM	VARIABLE	COMP.
R 160	ERD18TJ103V	10KOHM	5% 1/8W	CARBON
R 161	ERD18TJ103V	10KOHM	5% 1/8W	CARBON
R 170	ERD18TJ330V	33 OHM	5% 1/8W	CARBON
R 177	EVTR4AA00B53	5KOHM	VARIABLE	COMP.
R 202	ERD18TJ223V	22KOHM	5% 1/8W	CARBON
R 203	EVTR4AA00B14	10KOHM	VARIABLE	COMP.
R 205	ERD18TJ561V	510 OHM	5% 1/8W	CARBON

PARTS LIST

CRT NO.	MFR. PART NO.	DESCRIPTION		
	RESISTOR	(CONT)		
R 210	ERD18TJ751	750 OHM	5% 1/8W	CARBON
R 217	EWKZ41Z09C13	1KOHMX2	VARIABLE	CARBON
R 222	YRVSR19R101B	100 OHM	VARIABLE	COMP.
R 223	ERD18TJ222V	2.2KOHM	5% 1/8W	CARBON
R 226	ERD18TJ431	430 OHM	5% 1/8W	CARBON
R 227	ERD18TJ331V	330 OHM	5% 1/8W	CARBON
R 228	ERO25CKF3320	332 OHM	1% 1/4W	METAL
R 229	ERO25CKF3320	332 OHM	1% 1/4W	METAL
R 230	ERD18TJ100V	10 OHM	5% 1/8W	CARBON
R 231	YRVSR19R101B	100 OHM	VARIABLE	COMP.
R 232	EVTR4AA00B13	1KOHM	VARIABLE	COMP.
R 234	ERD18TJ751	750 OHM	5% 1/8W	CARBON
R 237	ERD18TJ750	75 OHM	5% 1/8W	CARBON
R 238	ERD18TJ510	51 OHM	5% 1/8W	CARBON
R 239	YRVSR19R221B	220 OHM	VARIABLE	COMP.
R 241	ERD18TJ510	51 OHM	5% 1/8W	CARBON
R 242	ERD18TJ510	51 OHM	5% 1/8W	CARBON
R 249	EWKEUA320B24	20KOHMX2	VARIABLE	CARBON
R 256	ERD18TJ302	3KOHM	5% 1/8W	CARBON
R 257	ERD18TJ302	3KOHM	5% 1/8W	CARBON
R 258	EVTR4AA00B15	100KOHM	VARIABLE	COMP.
R 260	ERD18TJ103V	10KOHM	5% 1/8W	CARBON
R 261	ERD18TJ103V	10KOHM	5% 1/8W	CARBON
R 270	ERD18TJ330V	33 OHM	5% 1/8W	CARBON
R 277	EVTR4AA00B53	5KOHM	VARIABLE	COMP.
R 300	ERD18TJ471V	470 OHM	5% 1/8W	CARBON
R 301	ERD18TJ471V	470 OHM	5% 1/8W	CARBON
R 319	ERD18TJ181V	180 OHM	5% 1/8W	CARBON
R 326	ERD18TJ122V	1.2KOHM	5% 1/8W	CARBON
R 327	ERD18TJ122V	1.2KOHM	5% 1/8W	CARBON
R 328	EVTR4AA00B52	500 OHM	VARIABLE	COMP.
R 330	ERD18TJ241V	240 OHM	5% 1/8W	CARBON
R 337	YRVSR19R221B	220 OHM	VARIABLE	COMP.
R 338	ERD18TJ102V	1KOHM	5% 1/8W	CARBON
R 340	ERD18TJ750	75 OHM	5% 1/8W	CARBON
R 341	ERD18TJ750	75 OHM	5% 1/8W	CARBON
R 342	EVTR4AA00B14	10KOHM	VARIABLE	COMP.
R 344	ERD18TJ103V	10KOHM	5% 1/8W	CARBON
R 345	ERD18TJ152V	1.5KOHM	5% 1/8W	CARBON
R 346	ERD18TJ362	3.6KOHM	5% 1/8W	CARBON

PARTS LIST

CKT NO.	MFR. PART NO.	DESCRIPTION			
		RESISTOR (CONT)			
R 347	ERD18TJ362	3.6KOHM	5%	1/8W	CARBON
R 348	ERD18TJ393V	39KOHM	5%	1/8W	CARBON
R 349	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 350	ERD18TJ682V	6.8KOHM	5%	1/8W	CARBON
R 355	ERD18TJ4R7	4.7 OHM	5%	1/8W	CARBON
R 356	ERD18TJ4R7	4.7 OHM	5%	1/8W	CARBON
R 357	ERD18TJ4R7	4.7 OHM	5%	1/8W	CARBON
R 358	ERD18TJ4R7	4.7 OHM	5%	1/8W	CARBON
R 360	ERD18TJ681V	680 OHM	5%	1/8W	CARBON
R 361	ERD18TJ362	3.6KOHM	5%	1/8W	CARBON
R 372	ERD18TJ181V	180 OHM	5%	1/8W	CARBON
R 400	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 401	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 402	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 403	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 404	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 405	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 406	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 407	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 408	ERD18TJ682V	6.8KOHM	5%	1/8W	CARBON
R 409	ERD18TJ333V	33KOHM	5%	1/8W	CARBON
R 413	ERD18TJ682V	6.8KOHM	5%	1/8W	CARBON
R 417	ERD18TJ102V	1KOHM	5%	1/8W	CARBON
R 418	ERD18TJ302	3KOHM	5%	1/8W	CARBON
R 419	ERD18TJ682V	6.8KOHM	5%	1/8W	CARBON
R 422	ERD18TJ682V	6.8KOHM	5%	1/8W	CARBON
R 425	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 426	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 427	ERD18TJ123V	12KOHM	5%	1/8W	CARBON
R 428	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 428	ERD18TJ681V	680 OHM	5%	1/8W	CARBON
R 429	ERD18TJ681V	680 OHM	5%	1/8W	CARBON
R 432	ERD18TJ222V	2.2KOHM	5%	1/8W	CARBON
R 433	ERD18TJ222V	2.2KOHM	5%	1/8W	CARBON
R 435	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 438	ERD18TJ681V	680 OHM	5%	1/8W	CARBON
R 439	ERD18TJ681V	680 OHM	5%	1/8W	CARBON
R 440	ERD18TJ102V	1KOHM	5%	1/8W	CARBON
R 441	ERD18TJ104V	100KOHM	5%	1/8W	CARBON
R 442	ERD18TJ362	3.6KOHM	5%	1/8W	CARBON

PARTS LIST

CRT NO.	MFR. PART NO.	DESCRIPTION		
		RESISTOR (CONT)		
R 443	ERD18TJ332V	3.3KOHM	5% 1/8W	CARBON
R 444	ERD18TJ333V	33KOHM	5% 1/8W	CARBON
R 445	ERD18TJ333V	33KOHM	5% 1/8W	CARBON
R 446	ERD18TJ333V	33KOHM	5% 1/8W	CARBON
R 447	ERD18TJ333V	33KOHM	5% 1/8W	CARBON
R 448	ERD18TJ681V	680 OHM	5% 1/8W	CARBON
R 450	ERO25CKF90R9	90.9 OHM	1% 1/4W	METAL
R 451	ERO25CKF90R9	90.9 OHM	1% 1/4W	METAL
R 454	ERD18TJ241V	240 OHM	5% 1/8W	CARBON
R 455	ERD18TJ510	51 OHM	5% 1/8W	CARBON
R 460	ERD18TJ682V	6.8KOHM	5% 1/8W	CARBON
R 461	EVTR4AA00B14	10KOHM	VARIABLE	COMP.
R 462	EVTR4AA00B52	500 OHM	VARIABLE	COMP.
R 463	ERD18TJ472V	4.7KOHM	5% 1/8W	CARBON
R 464	ERD18TJ622V	6.2KOHM	5% 1/8W	CARBON
R 465	ERD18TJ510	51 OHM	5% 1/8W	CARBON
R 466	ERG1ANJ151	150 OHM	5% 1W	CARBON
R 467	ERG1ANJ151	150 OHM	5% 1W	CARBON
R 468	ERG1ANJ121	120 OHM	5% 1W	CARBON
R 469	ERG1ANJ121	120 OHM	5% 1W	CARBON
R 470	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 471	EVTR4AA00B52	500 OHM	VARIABLE	COMP.
R 472	EVTR4AA00B13	1KOHM	VARIABLE	COMP.
R 473	EVTR4AA00B14	10KOHM	VARIABLE	COMP.
R 474	ERD18TJ512V	5.1KOHM	5% 1/8W	CARBON
R 475	YRN10F7B122J	1.2KOHM	5% 7W	METAL
R 476	YRN10F7B122J	1.2KOHM	5% 7W	METAL
R 477	ERD18TJ681V	680 OHM	5% 1/8W	CARBON
R 478	ERD18TJ681V	680 OHM	5% 1/8W	CARBON
R 479	ERD18TJ220V	22 OHM	5% 1/8W	CARBON
R 495	ERD18TJ470V	47 OHM	5% 1/8W	CARBON
R 496	ERD18TJ470V	47 OHM	5% 1/8W	CARBON
R 497	ERD18TJ6R8V	6.8 OHM	5% 1/8W	CARBON
R 498	ERD18TJ6R8V	6.8 OHM	5% 1/8W	CARBON
R 500	ERD14TJ474	470KOHM	5% 1/4W	CARBON
R 501	ERD14TJ105	1MOHM	5% 1/4W	CARBON
R 503	ERD18TJ123V	12KOHM	5% 1/8W	CARBON
R 504	ERD18TJ123V	12KOHM	5% 1/8W	CARBON
R 505	ERD18TJ472V	4.7KOHM	5% 1/8W	CARBON
R 506	ERD14TJ104	100KOHM	5% 1/4W	CARBON

PARTS LIST

CKT NO.	MFR. PART NO.	DESCRIPTION		
	RESISTOR	(CONT)		
R 507	ERD14TJ105	1MOHM	5% 1/4W	CARBON
R 508	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 509	ERD18TJ682V	6.8KOHM	5% 1/8W	CARBON
R 510	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 511	ERD18TJ100V	10 OHM	5% 1/8W	CARBON
R 512	EWK260Z20Z30	20KOHMX2	VARIABLE	CARBON
R 513	ERD18TJ622V	6.2KOHM	5% 1/8W	CARBON
R 514	ERD18TJ100V	10 OHM	5% 1/8W	CARBON
R 515	EVTR4AA00B14	10KOHM	VARIABLE	COMP.
R 516	ERD18TJ682V	6.8KOHM	5% 1/8W	CARBON
R 519	ERD18TJ332V	3.3KOHM	5% 1/8W	CARBON
R 520	ERD18TJ152V	1.5KOHM	5% 1/8W	CARBON
R 521	ERD18TJ332V	3.3KOHM	5% 1/8W	CARBON
R 526	ERD18TJ152V	1.5KOHM	5% 1/8W	CARBON
R 529	ERD18TJ182V	1.8KOHM	5% 1/8W	CARBON
R 531	EVTR4AA00B24	20KOHM	VARIABLE	COMP.
R 532	ERD18TJ682V	6.8KOHM	5% 1/8W	CARBON
R 533	ERD18TJ102V	1KOHM	5% 1/8W	CARBON
R 534	ERD18TJ103V	10KOHM	5% 1/8W	CARBON
R 535	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 536	ERD18TJ100V	10 OHM	5% 1/8W	CARBON
R 537	ERD18TJ153V	15KOHM	5% 1/8W	CARBON
R 538	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 539	ERD18TJ472V	4.7KOHM	5% 1/8W	CARBON
R 540	EVTR4AA00B13	1KOHM	VARIABLE	COMP.
R 542	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 543	ERD18TJ220V	22 OHM	5% 1/8W	CARBON
R 547	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 548	ERD18TJ472V	4.7KOHM	5% 1/8W	CARBON
R 549	ERD18TJ751	750 OHM	5% 1/8W	CARBON
R 564	ERD18TJ474V	470KOHM	5% 1/8W	CARBON
R 565	ERD18TJ104V	100KOHM	5% 1/8W	CARBON
R 566	ERD18TJ103V	10KOHM	5% 1/8W	CARBON
R 567	ERD18TJ101V	100 OHM	5% 1/8W	CARBON
R 568	ERD18TJ563V	56KOHM	5% 1/8W	CARBON
R 569	ERD18TJ100V	10 OHM	5% 1/8W	CARBON
R 570	ERD18TJ100V	10 OHM	5% 1/8W	CARBON
R 595	ERD18TJ750	75 OHM	5% 1/8W	CARBON
R 597	ERD18TJ472V	4.7KOHM	5% 1/8W	CARBON
R 598	ERD18TJ332V	3.3KOHM	5% 1/8W	CARBON

PARTS LIST

CKT NO.	MFR. PART NO.	DESCRIPTION			
		RESISTOR	(CONT)		
R 600	ERD18TJ241V	240 OHM	5%	1/8W	CARBON
R 601	ERD18TJ332V	3.3KOHM	5%	1/8W	CARBON
R 602	ERD18TJ331V	330 OHM	5%	1/8W	CARBON
R 605	ERD18TJ221V	220 OHM	5%	1/8W	CARBON
R 606	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 610	ERD18TJ473V	47KOHM	5%	1/8W	CARBON
R 611	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 613	ERD18TJ221V	220 OHM	5%	1/8W	CARBON
R 614	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 615	ERD18TJ102V	1KOHM	5%	1/8W	CARBON
R 616	ERD18TJ123V	12KOHM	5%	1/8W	CARBON
R 617	ERD18TJ753V	75KOHM	5%	1/8W	CARBON
R 618	ERD18TJ682V	6.8KOHM	5%	1/8W	CARBON
R 619	ERD18TJ512V	5.1KOHM	5%	1/8W	CARBON
R 620	ERD18TJ123V	12KOHM	5%	1/8W	CARBON
R 621	ERD18TJ753V	75KOHM	5%	1/8W	CARBON
R 622	ERD18TJ471V	470 OHM	5%	1/8W	CARBON
R 627	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 628	ERD18TJ473V	47KOHM	5%	1/8W	CARBON
R 629	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 630	ERD25CKF5621	5.62KOHM	1%	1/4W	METAL
R 631	ERD18TJ183V	18KOHM	5%	1/8W	CARBON
R 632	ERD18TJ222V	2.2KOHM	5%	1/8W	CARBON
R 633	ERD18TJ912V	9.1KOHM	5%	1/8W	CARBON
R 634	ERD18TJ912V	9.1KOHM	5%	1/8W	CARBON
R 635	ERD18TJ392V	3.9KOHM	5%	1/8W	CARBON
R 636	ERD18TJ392V	3.9KOHM	5%	1/8W	CARBON
R 637	ERD25CKF3921	3.92KOHM	1%	1/4W	METAL
R 638	ERD18TJ822V	8.2KOHM	5%	1/8W	CARBON
R 639	ERD25CKF4021	4.02KOHM	1%	1/4W	METAL
R 640	YRUSR29R471B	470 OHM	VARIABLE		COMP.
R 641	ERD18TJ272V	2.7KOHM	5%	1/8W	CARBON
R 642	YXBV79R06	2KOHM	VARIABLE		COMP.
R 643	ERD18TJ182V	1.8KOHM	5%	1/8W	CARBON
R 644	YRUSR29R471B	470 OHM	VARIABLE		COMP.
R 645	ERD18TJ271V	270 OHM	5%	1/8W	CARBON
R 646	ERD18TJ511	510 OHM	5%	1/8W	CARBON
R 647	ERD18TJ511	510 OHM	5%	1/8W	CARBON
R 648	ERD18TJ222V	2.2KOHM	5%	1/8W	CARBON
R 649	ERD18TJ222V	2.2KOHM	5%	1/8W	CARBON

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION			
		RESISTOR	(CONT)		
R 650	ERD18TJ182V	1.8KOHM	5%	1/8W	CARBON
R 651	ERD18TJ471V	470 OHM	5%	1/8W	CARBON
R 652	ERD18TJ203	20KOHM	5%	1/8W	CARBON
R 653	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 655	ERD18TJ102V	1KOHM	5%	1/8W	CARBON
R 656	ERD18TJ123V	12KOHM	5%	1/8W	CARBON
R 657	ERD18TJ753V	75KOHM	5%	1/8W	CARBON
R 658	ERD18TJ123V	12KOHM	5%	1/8W	CARBON
R 659	ERD18TJ753V	75KOHM	5%	1/8W	CARBON
R 663	ERO25CKF5621	5.62KOHM	1%	1/4W	METAL
R 664	ERD18TJ221V	220 OHM	5%	1/8W	CARBON
R 665	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 666	ERD18TJ123V	12KOHM	5%	1/8W	CARBON
R 669	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 670	ERD18TJ203	20KOHM	5%	1/8W	CARBON
R 672	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 673	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 674	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 675	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 676	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 677	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 678	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 679	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 694	ERO25CKF1501	1.5KOHM	1%	1/4W	METAL
R 696	ERD18TJ153V	15KOHM	5%	1/8W	CARBON
R 697	ERO25CKF1501	1.5KOHM	1%	1/4W	METAL
R 698	ERD18TJ182V	1.8KOHM	5%	1/8W	CARBON
R 700	ERD18TJ222V	2.2KOHM	5%	1/8W	CARBON
R 701	ERD18TJ100V	10 OHM	5%	1/8W	CARBON
R 703	ERD18TJ123V	12KOHM	5%	1/8W	CARBON
R 712	YRVSR29R103B	10KOHM	VARIABLE		COMP.
R 713	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 714	YRVSR29R103B	10KOHM	VARIABLE		COMP.
R 715	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 720	ERD18TJ912V	9.1KOHM	5%	1/8W	CARBON
R 721	ERD18TJ273V	27KOHM	5%	1/8W	CARBON
R 725	ERD18TJ154V	150KOHM	5%	1/8W	CARBON
R 727	ERO25CKF1002	10.0KOHM	1%	1/4W	METAL
R 728	ERO25CKF2492	24.9KOHM	1%	1/4W	METAL
R 729	ERO25CKF4992	49.9KOHM	1%	1/4W	METAL

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION			
		RESISTOR	(CONT)		
R 730	ERO25CKF1003	100KOHM	1%	1/4W	METAL
R 731	ERO25CKF2493	249KOHM	1%	1/4W	METAL
R 732	ERO50CKF4993	499KOHM	1%	1/2W	METAL
R 733	ERO50CKF1004	1MOHM	1%	1/2W	METAL
R 734	ERL12CKF2494	2.49MOHM	1%	1/2W	METAL
R 740	ERD18TJ222V	2.2KOHM	5%	1/8W	CARBON
R 741	ERO25CKF5112	51.1KOHM	1%	1/4W	METAL
R 742	ERO25CKF6651	6.65KOHM	1%	1/4W	METAL
R 743	ERD18TJ104V	100KOHM	5%	1/8W	CARBON
R 744	ERD12TJ222	2.2KOHM	5%	1/2W	CARBON
R 745	EWKDF3101B24	20KOHM X2	VARIABLE		
R 747	ERD18TJ473V	47KOHM	5%	1/8W	CARBON
R 748	ERD18TJ473V	47KOHM	5%	1/8W	CARBON
R 750	ERD18TJ154V	150KOHM	5%	1/8W	CARBON
R 752	ERO25CKF1002	10.0KOHM	1%	1/4W	METAL
R 753	ERO25CKF2492	24.9KOHM	1%	1/4W	METAL
R 754	ERO25CKF4992	49.9KOHM	1%	1/4W	METAL
R 755	ERO25CKF1003	100KOHM	1%	1/4W	METAL
R 756	ERO25CKF2493	249KOHM	1%	1/4W	METAL
R 757	ERO50CKF4993	499KOHM	1%	1/2W	METAL
R 758	ERO50CKF1004	1MOHM	1%	1/2W	METAL
R 759	ERL12CKF2494	2.49MOHM	1%	1/2W	METAL
R 764	ERD18TJ243V	24KOHM	5%	1/8W	CARBON
R 765	ERD18TJ273V	27KOHM	5%	1/8W	CARBON
R 766	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 767	YRVSR29R1035	10KOHM	VARIABLE		COMP.
R 768	YRVSR29R103B	10KOHM	VARIABLE		COMP.
R 781	ERD12TJ102	1KOHM	5%	1/2W	CARBON
R 782	ERD12TJ102	1KOHM	5%	1/2W	CARBON
R 800	EWKENAK15B24	20KOHMX2	VARIABLE		CARBON
R 801	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 804	ERD18TJ182V	1.8KOHM	5%	1/8W	CARBON
R 808	ERD18TJ242V	2.4KOHM	5%	1/8W	CARBON
R 810	ERD18TJ182V	1.8KOHM	5%	1/8W	CARBON
R 811	YRVSR29R102B	1KOHM	VARIABLE		COMP.
R 812	ERD18TJ101V	100 OHM-	5%	1/8W	CARBON
R 813	YRVSR29R101B	100 OHM	VARIABLE		COMP.
R 814	ERD18TJ362	3.6KOHM	5%	1/8W	CARBON
R 815	ERD18TJ362	3.6KOHM	5%	1/8W	CARBON
R 817	ERD18TJ362	3.6KOHM	5%	1/8W	CARBON

PARTS LIST

CKT NO.	MFR. PART NO.	DESCRIPTION			
		RESISTOR (CONT)			
R 818	ERD18TJ362	3.6KOHM	5%	1/8W	CARBON
R 820	ERD18TJ242V	2.4KOHM	5%	1/8W	CARBON
R 821	YRUSR29R471B	470 OHM	VARIABLE		COMP.
R 822	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 823	ERD18TJ242V	2.4KOHM	5%	1/8W	CARBON
R 824	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 825	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 826	ERD18TJ154V	150KOHM	5%	1/8W	CARBON
R 827	ERD18TJ154V	150KOHM	5%	1/8W	CARBON
R 828	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 829	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 830	ERD18TJ471V	470 OHM	5%	1/8W	CARBON
R 831	ERD18TJ471V	470 OHM	5%	1/8W	CARBON
R 832	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 833	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 834	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 836	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 837	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 838	ERD12TJ273	27KOHM	5%	1/2W	CARBON
R 839	ERD12TJ273	27KOHM	5%	1/2W	CARBON
R 840	ERD18TJ102V	1KOHM	5%	1/8W	CARBON
R 841	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 842	ERD18TJ102V	1KOHM	5%	1/8W	CARBON
R 843	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 844	ERD18TJ563V	56KOHM	5%	1/8W	CARBON
R 845	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 846	ERD18TJ220V	22 OHM	5%	1/8W	CARBON
R 850	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 851	ERD18TJ332V	3.3KOHM	5%	1/8W	CARBON
R 852	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 853	EVTR4AA00B53	5KOHM	VARIABLE		COMP.
R 855	ERD18TJ332V	3.3KOHM	5%	1/8W	CARBON
R 856	ERD18TJ153V	15KOHM	5%	1/8W	CARBON
R 859	EVTR4AA00B53	5KOHM	VARIABLE		COMP.
R 860	ERD18TJ392V	3.9KOHM	5%	1/8W	CARBON
R 861	ERD18TJ753V	75KOHM	5%	1/8W	CARBON
R 862	ERD18TJ753V	75KOHM	5%	1/8W	CARBON
R 863	ERD18TJ392V	3.9KOHM	5%	1/8W	CARBON
R 864	ERD18TJ4R7	4.7 OHM	5%	1/8W	CARBON
R 865	YRUSR29R471B	470 OHM	VARIABLE		COMP.

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION			
		RESISTOR	(CONT)		
R 806	ERD18TJ222V	2.2KOHM	5%	1/8W	CARBON
R 807	ERD18TJ200V	20 OHM	5%	1/8W	CARBON
R 808	ERD18TJ273V	27KOHM	5%	1/8W	CARBON
R 809	ERD18TJ101V	100 OHM	5%	1/8W	CARBON
R 900	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 901	ERD18TJ334V	330KOHM	5%	1/8W	CARBON
R 902	YRVSR29R104B	100KOHM	VARIABLE		COMP.
R 903	ERD18TJ102V	1KOHM	5%	1/8W	CARBON
R 904	ERD18TJ102V	1KOHM	5%	1/8W	CARBON
R 905	ERD18TJ242V	2.4KOHM	5%	1/8W	CARBON
R 906	ERD12TJ511	510 OHM	5%	1/2W	CARBON
R 909	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 910	YRHMG1G24M	24MOHM	2%	1W	METAL
R 911	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 912	YRHMG12J3M	3.0MOHM	5%	1/2W	METAL
R 913	EWKENAK15B26	2MOHMX2	VARIABLE		CARBON
R 914	YRHMG12J7R5M	7.5MOHM	5%	1/2W	METAL
R 915	ERD18TJ913V	91KOHM	5%	1/8W	CARBON
R 916	ERC14GK226	22MOHM	10%	1/4W	COMP.
R 917	YRHMG12J3R9M	3.9MOHM	5%	1/2W	METAL
R 918	YRHMG12J3R9M	3.9MOHM	5%	1/2W	METAL
R 919	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 920	EWKE2AK25B24	20KOHMX2	VARIABLE		CARBON
R 921	ERD18TJ470V	47 OHM	5%	1/8W	CARBON
R 922	ERD18TJ393V	39KOHM	5%	1/8W	CARBON
R 923	ERD18TJ623V	62KOHM	5%	1/8W	CARBON
R 924	YRVSR29R104B	100KOHM	VARIABLE		COMP.
R 925	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 926	ERD18TJ221V	220 OHM	5%	1/8W	CARBON
R 929	ERD18TJ562V	5.6KOHM	5%	1/8W	CARBON
R 930	ERD18TJ333V	33KOHM	5%	1/8W	CARBON
R 931	ERD18TJ562V	5.6KOHM	5%	1/8W	CARBON
R 932	ERD18TJ470V	47 OHM	5%	1/8W	CARBON
R 933	ERD18TJ473V	47KOHM	5%	1/8W	CARBON
R 934	ERD18TJ123V	12KOHM	5%	1/8W	CARBON
R 935	ERD18TJ822V	8.2KOHM	5%	1/8W	CARBON
R 936	EWKENAK15B24	20KOHMX2	VARIABLE		CARBON
R 937	ERD18TJ103V	10KOHM	5%	1/8W	CARBON
R 938	ERD18TJ472V	4.7KOHM	5%	1/8W	CARBON
R 939	ERD18TJ753V	75KOHM	5%	1/8W	CARBON

P A R T S L I S T

CKT NO.	MFR. PART NO.	DESCRIPTION			
		RESISTOR	(CONT)		
R 940	ERD18TJ151V	150 OHM	5%	1/8w	CARBON
R 941	ERD18TJ272V	2.7KOHM	5%	1/8w	CARBON
R 942	ERD18TJ222V	2.2KOHM	5%	1/8w	CARBON
R 943	ERD18TJ100V	10 OHM	5%	1/8w	CARBON
R 944	ERD18TJ123V	12KOHM	5%	1/8w	CARBON
R 945	ERD18TJ152V	1.5KOHM	5%	1/8w	CARBON
R 946	ERD18TJ332V	3.3KOHM	5%	1/8w	CARBON
R-947	ERO25CKF2212	22.1KOHM	1%	1/4w	METAL
R 950	YRVSR29R473B	47KOHM	VARIABLE		COMP.
R 951	ERD18TJ104V	100KOHM	5%	1/8w	CARBON
R 957	ERD18TJ153V	15KOHM	5%	1/8w	CARBON
R 958	YRVSR29R104B	100KOHM	VARIABLE		COMP.
R 959	ERO25CKF2492	24.9KOHM	1%	1/4w	METAL
R 971	ERD14TJ224	220KOHM	5%	1/4w	CARBON
R 972	ERD14TJ104	100KOHM	5%	1/4w	CARBON
R 973	ERD18TJ152V	1.5KOHM	5%	1/8w	CARBON
R 974	ERD14TJ104	100KOHM	5%	1/4w	CARBON
R 975	ERD14TJ104	100KOHM	5%	1/4w	CARBON
R 977	ERX1ANJ4R7	4.7 OHM	5%	1W	METAL
R 978	ERD18TJ104V	100KOHM	5%	1/8W	CARBON
R 979	ERO25CKF8252	82.5KOHM	1%	1/4w	METAL
R 980	ERO25CKF3922	39.2KOHM	1%	1/4w	METAL
R 982	ERD18TJ104V	100KOHM	5%	1/8w	CARBON
R 985	ERG3ANJ331	330 OHM	5%	3W	METAL
R 986	ERD14TJ473	47KOHM	5%	1/4w	CARBON
R 987	ERD14TJ473	47KOHM	5%	1/4W	CARBON
R 988	ERD14TJ473	47KOHM	5%	1/4w	CARBON
R 991	ERD14TJ102	1KOHM	5%	1/4w	CARBON
		THERMISTOR			
RT451	ERTD2FEL200S	20 OHM			
RT452	ERTD2FEL200S	20 OHM			
RT850	ERTD2FGL601S	600 OHM	25°C		
		SWITCH			
S 1	YXEK34102260	5230A/S ATT SWITCH			LOTARY
S 2	YXEK34102260	5230A/S ATT SWITCH			LOTARY
S 101	YXEL34102260	5230A/S AC-DC SELECTOR			LEVER
S 102	YXEL34102260	5230A/S AC-DC SELECTOR			LEVER
S 301	YXEP44105250	5230A/S SWEEPMODE			PUSH

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION
	SWITCH	(CONT)
S 401	YXEP44105260	5230A/S V MODE PUSH
S 402	YXEL44105270	SLR-043 LEVER
S 500	YXEL77S53	SLR-023 LEVER
S 501	YXEL77S53	SLR-023 LEVER
S 600	YXEP44104600	PUSH
S 601	YXEP44105240	5230A/S DISPLAY MODE PUSH
S 700	YXER79S22	5230A/S TIMING SWITCH (A) LOTARY
S 701	YXES44104650	SLIDE SWITCH SSP042L9NS
S 702	YXER44105280	5230A/S TIMING SWITCH (B) LOTARY
S 901A	ESA287	ESA-287 POWER REMOTE SWITCH
S 901B	ESA30206	ESA-30206 WIRE REMOTE SWITCH
S 901C	ESA2111	ESA-2111 PUSH REMOTE SWITCH
	TRANSFORMER	
T 901	YXDT34304150	5230A/S HIGH VOLTAGE TRANSFORMER
T 902	YXDT34304160	5230A/S POWERTRANSFORMER
	IC	
U 111	EHM325A37	EHM325A37 HI-MIC
U 112	EHM213A36	EHM213A36 HI-MIC
U 113	EHM217A36	EHM217A36 HI-MIC
U 115	EHM213A39	EHM213A39 HI-MIC
U 116	EHM213A40	EHM213A40 HI-MIC
U 117	EHM217A41	EHM217A41 HI-MIC
U 211	EHM325A37	EHM325A37 HI-MIC
U 212	EHM213A38	EHM213A38 HI-MIC
U 215	EHM213A39	EHM213A39 HI-MIC
U 410	YHT7476N	SN7476N DIGITAL IC
U 411	YHT74LS00N	SN74LS00N
U 412	YHT74LS00N	SN74LS00N
U 415	EHM215A42	EHM215A42 HI-MIC
U 417	EHM213A43	EHM213A43 HI-MIC
U 418	EHM213A43	EHM213A43 HI-MIC
U 419	EHM213G12	EHM213G12 HI-MIC
U 515	EHM320A44	EHM320A44 HI-MIC
U 516	EHM826W19	EHM826W19 HI-MIC
U 600	YHT74LS00N	SN74LS00N
U 601	YHT74S74N	SN74S74N TTL
U 602	YHT74107N	SN74107N DIGITAL IC
U 603	YHT74LS123N	SN74LS123N

PARTS LIST

CKT NO.	MFR. PART NO.	DESCRIPTION
	IC	(CONT)
U 604	YHT74LS132N	SN74LS132N DIGITAL IC
U 605	YHT74LS74AN	SN74LS74N TTL
U 607	YHT74LS132N	SN74LS132N DIGITAL IC
U 613	EHM215A14	EHM215A14 HI-MIC
U 615	EHM210A45	EHM210A45 HI-MIC
U 616	EHM215A14	EHM215A14 HI-MIC
U 618	EHM210A45	EHM210A45 HI-MIC
U 711	EHM216E34	EHM216E34 HI-MIC
U 712	EHM215E33	EHM215E33 HI-MIC
U 611	EHM215A46	EHM215A46 HI-MIC
U 971	YHTUPC14305H	REGULETOR IC UPC14305H
U 972	YHTUPC14312H	UPC14312H REGULETOR
U 973	YHTUPC14312H	UPC14312H REGULETOR
	CATHODE-RAY TUBE	
V 901	140CGB31	140CGB31 FOR VP-5230A/S
	NEON TUBE	
V 914	YXAVNE2-45	NE2(4.5)
V 915	YXAVNE2-45	NE2(4.5)
	DIODE	
VR117	YUDXZ057	XZ-057 ZENER
VR217	YUDXZ057	XZ-057 ZENER
VR974	YUDXZ265	XZ-265
	COIL	
W 400	YXDL74W010	DELAYLINE COIL
	POWER CORD	
W 900	YXFW77W02	AWG-16 8FEET
	FUSE HOLDER	
XF906	YXFSSN2250	SN-2250
XF940	YXFS75A007	S-N5053 FUSE CLIP
XF941	YXFS75A007	S-N5053 FUSE CLIP
	HOLDER	
XV914	YXKC46115920	NEON TUBE HOLDER

P A R T S L I S T

CRT NO.	MFR. PART NO.	DESCRIPTION
		HOLDER (CONT)
XV915	YXKC46115920	NEON TUBE HOLDER
		SOCKET
XV937	YXFS76J019	CRT SOCKET HPS069
		ADAPTOR
	YXFC76J003	POWER CORD ADAPTER 3 TO 2 WIRE
		BEZEL
	YXKF77M19	5230A/S-BEZEL
		BINDING POST
	YXFC46436970	DRAWING NO 4G-64-3697
	YXFC46004761	DRAWING NO 4G-60-047o EARTH
		CONNECTOR
	YQA61173-1	CONNECTOR SOCKET
	YQA170146-1	170146-1 SOCKET (P)
	YQA61173-1	CONNECTOR SOCKET
	YQA170146-1	170146-1 SOCKET (P)
	YQA170146-1	170146-1 SOCKET (P)
	YQA61173-1	CONNECTOR SOCKET
	YQA61173-1	CONNECTOR SOCKET
	YQA61173-1	CONNECTOR SOCKET
	YQA61173-1	CONNECTOR SOCKET
	YQA61173-1	CONNECTOR SOCKET
	YQA61173-1	CONNECTOR SOCKET
	YQA61173-1	CONNECTOR SOCKET
	YQA61173-1	CONNECTOR SOCKET
		FILTER COVER
	YXM637001360	
		FOOT
	YXMG47003592	542A FOOT (LEFT)
	YXMH47011191	542A FOOT RUBBER
	YXMG47003470	542A REAR FOOT
	YXMG47003602	542A FOOT (RIGHT)

PARTS LIST

CKT NO.	MFR. PART NO.	DESCRIPTION
	HANDLE	
	YXMG46004480	DRAWING NO 4G-60-0446
	HANDLE HOLDER	
	YXKF46423030	DRAWING NO 4G-64-2303
	KNOB	
	YXMK10N6KS	DRAWING NO 3G-60-0163
	YXMK77M09B	DRAWING NO 77M09
	YXMK23F6K	23F6K
	YXMK10D3G	10D3G
	YXMK12D3G	12D3G
	YXMK10N3K	10N3K
	YXMK75M005-B	7X7 TWO COLOR
	YXMK23C6K	23C6K
	YXMK77M09W	
	YXMK46003430	LEVER SWITCH
	YXMK14D6K	14D6K
	PROBE	
	VQ-054K3015	VQ-054K3015
	SOCKET	
	YXFC46004190	CRT SIDEPIN SOCKET
	YXFC46004190	CRT SIDEPIN SOCKET