
HITACHI

MODEL V-509
OSCILLOSCOPE

SERVICE MANUAL



Hitachi Denshi, Ltd.

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NOTICE

This Service Manual describes the most typical product of this model. If there are any specific differences between this Manual and the servicing unit, please contact Hitachi Denshi sales office in your area.

MODEL V-509
OSCILLOSCOPE
Service Manual

1. SPECIFICATIONS

CRT

Type

Hitachi 95LB31 rectangular mesh type tube with 12 kV acceleration potential and metal backed phosphor

Phosphor

P31 standard

Graticule

8 × 10 div (div = 6.35 mm) internal graticule

Focusing

Possible (with automatic focus correction circuit)

Trace rotation

Present

Brightness adjustment

Possible

Z-AXIS INPUT (INTENSITY MODULATION)

DC-coupled, positive-going signal decreases intensity: 5 V_{p-p}
signal causes noticeable modulation at normal intensity: DC to 1 MHz.

Input impedance

Approx. 20 k Ω

Maximum input voltage

50 V (DC + peak AC)

Coupling

DC

VERTICAL DEFLECTION SYSTEMS (2 identical channels)

Bandwidth and rise time

DC to at least 50 MHz and rise time 7 ns or less. DC to at least 10 MHz
and rise time 35 ns or less at magnifier extends. The AC coupled lower
-3 dB point is 10 Hz or less.

Deflection factor

5 mV/div to 5 V/div in 10 calibrated steps, in a 1-2-5 sequence.

The uncalibrated continuous control extends deflection factor to at least 12.5 V per division in the 5 volts/div position. The x5 magnifier increases sensitivity of each deflection factor setting to 1 m/div.

Accuracy

$\pm 3\%$ (+10 to +35 °C)

Additional error for magnifier $\pm 2\%$

Display modes

CH1, CH2 (normal or invert), Alternate, Chopped (Approx. 250 kHz),
Added

Input impedance

$1M\Omega \pm 2\%$ in parallel with $30 \pm 3\text{pF}$.

Maximum input voltage

250 V (DC + peak AC)

Input coupling

AC, GND, DC

Delay line

Permits to view the leading edge of display waveform.

HORIZONTAL DEFLECTION SYSTEM

Time base A

0.1 $\mu\text{s}/\text{div}$ to 0.2s/div in 20 calibrated steps, in a 1-2-5 sequence

The uncalibrated continuous control extends deflection factor to at least 0.5 seconds per division in the 0.2 sec/div position. The $\times 10$ magnifier extends maximum sweep rate to 10 ns/div.

Time base B

0.1 $\mu\text{s}/\text{div}$ to 2 ms/div in 14 calibrated steps in a 1-2-5 sequence

The $\times 10$ magnifier extends maximum sweep rate to 10 ns/div.

Accuracy

$\pm 3\%$ (+10 to +35 °C)

Additional error for magnifier $\pm 2\%$

Horizontal display modes

A only, A intensified by B, B delayed, X-Y operation

Delayed sweep position adjustment 1 div or less - 10 div or more

Delay sweep variable Present

Delay time jitter Better than 1:20,000

A AND B TRIGGERING SYSTEMS

A trigger modes

Automatic, Normal, Single sweep, TV (TV-H or TV-V)

A trigger hold-off

Adjustable control permits a stable presentation of repetitive complex waveform.

A trigger source

Internal (CH1, CH2), Line, External, External $\div 10$

A trigger slope

+ or -

TV sync polarity

TV(-)

Triggering level variable range

For both A and B. Internal; ± 4 div or more
External; approx. ± 1 V
External $\div 10$; approx. ± 10 V

Triggering sensitivity and frequency

For both A and B. However, () is only for B

Frequency	Internal	External	External $\div 10$
DC (30 Hz) - 10 MHz	0.5 div	150 mV	1.5 V
10 - 50 MHz	1.5 div	500 mV	5 V

TV-V sensitivity: SYNC section less than 0.7 div or 200 mV
AUTO: Approx. 30 Hz (when time base A is 0.1 μ s/div to 2 ms/div)

A trigger coupling

AC : 30 Hz to full bandwidth
HF REJ : Attenuates signals below approx. 60 KHz
DC : DC to full bandwidth

A external trigger input impedance

1M Ω \pm 20 % in parallel with 30 \pm 6 pF (However, the setting of HF REJ is not included.)

Maximum input voltage

250 V (DC + AC to 1 kHz or less)

B trigger modes

Automatic, Normal

B trigger slope

+ or -

Trigger coupling

AC only; 30 Hz to full bandwidth

X-Y OPERATION (CH1; Horiz, CH2; Vert)

Deflection factor

Same as vertical deflection

Accuracy

Y: \pm 3 % (+10 to +35 °C)

X: \pm 5 % (+10 to +35 °C)

Additional error for magnifier +2 %

X-bandwidth

DC to at least 500 kHz

Phase error

3° or less from DC to 100 kHz

CALIBRATOR

An approx. 1 kHz frequency, 0.5 V ($\pm 1\%$) square wave

SIGNAL OUTPUT

CH1 VERT SIGNAL OUTPUT

Output voltage is at least 25 mV/div into a 50 Ω load. Bandwidth is DC to at least 10 MHz.

POWER SUPPLY

VOLTAGE	FUSE
100 V (90 - 130 V)	1 A
200 V (180 - 260 V)	0.5 A

Power supply frequency:

50, 60, 400 Hz

Power consumption:

Approx. 25 W

ENVIRONMENT

Limit of operation temperature

0 - 50 °C

Limit of operation humidity

35 - 85 %

Rated range of use temperature

10 - 35 °C

Rated range of use humidity

45 - 85 %

Storage and transport temperature

-20 - 70 °C

DIMENSIONS AND WEIGHT

Approx. 215(W) \times 110(H) \times 330(D) mm

(8.6(W) \times 4.4(H) \times 13(D) in)

Approx. 5 kg (11 lbs)

2. ACCESSORIES

This instrument is shipped along with following accessories.

- 2 Probes (AT - 10AH 1.5)
- 1 Fuse (1 A for 100 V set or 0.5 A for 200 V set)
- 1 Fuse (5 A for DC line)
- 1 Front cover
- 1 AC power cord
- 1 DC power cord
- 1 Operation Manual

3. PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can prevent instrument breakdown and may improve the reliability of the oscilloscope. The severity of environment to which this instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is just prior to the recalibration of the instrument.

Disassembly

Remove the 4 screws in the top cover of the instrument. Gently remove the top cover from the instrument. Most of the internal parts of the instrument are now accessible.

If it is necessary to have access to the front of the circuit boards the knobs from the external control shafts on the board. Remove the two screws securing the side panel to the input circuit board, and remove the instrument side panel. (See section 9. Exploded view)

Cleaning

The instrument should be cleaned as often as the operating conditions require, since the accumulation of dirt in the instrument may cause the component breakdown. The covers can provide protection against dust in the interior of the instrument. Loose dust accumulated on these covers can be removed with a soft cloth or small brush.

Dirt that remains can be removed with a soft cloth applying a mild detergent and water solution. Abrasive cleaners should not be used.

Cleaning the interior should be only occasionally necessary. The best way to clean the interior is to blow off the dust with a dry, low-velocity stream of air. A soft-bristle brush or a cotton-tipped applicator is useful for cleaning narrow spaces or for cleaning more delicate components.

Visual Inspection

The instrument should be inspected occasionally for such defects as broken connections, improperly seated transistors, damaged circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is apparent; however, particular care must be taken if heat-damaged

components are found. Overheating usually indicated other trouble in the instrument; therefore, correcting the cause of the overheating is important to prevent the recurrence of the damage.

4. CALIBRATION

Hitachi Denshi, Ltd. provides complete instrument repair and recalibration at our office, and authorized dealer. Contact your local Hitachi Denshi, Sales office or representative.

4.1 Calibration interval

To maintain instrument accuracy, perform the calibration of the V-509 at least every 1000 hours of operations or every six month if used infrequently.

4.2 Test equipment required

The following test equipment and accessories, or its equivalent, are required for the complete calibration of the V-509. Specifications given for the test equipment are the minimum necessary for accurate calibration. Therefore, the specifications of any test equipment used must meet or exceed the listed specifications. All the test equipment is assumed to be correctly calibrated and operated within the listed specification. Operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

4.3 Preliminary procedure

This instrument should be calibrated at an ambient temperature of $+20^{\circ}\text{C}$ ($\pm 5^{\circ}\text{C}$) for best overall accuracy.

1. Connect the instrument to AC line voltage, 50/60/400 Hz line source.
2. Set the instrument controls as given in the preliminary control settings. Allow at least fifteen minutes of warmup before proceeding.
3. See the adjustment locations in the pullout pages.

Table 4-2

TEST EQUIPMENT REQUIRED

Description	Minimum specification	Usage	Example of applicable test equipment
1. Constant amplitude signal generator	50kHz reference frequency; maximum frequency 70MHz; variable amplitude.	Check horizontal, vertical and trigger bandwidth.	
2. Standard amplitude calibrator	Amplitude accuracy: 0.25%, variable amplitude; 5mV to 40V; frequency: 1 kHz square wave.	Check horizontal and vertical gain.	
3. Square-wave generator	Variable frequency: 10Hz to 1MHz; output amplitude; 10mV to 100V.	Check probe and vertical compensation.	
4. Digital voltmeter	0.1% accuracy.	Check power supply	
5. Time mark generator	0.1% accuracy.	Check horizontal timing.	
6. Cable	Impedance, 50 ohms; type, RG-58/U; length, 42 inches, connectors, BNC	External trigger operation check. Horizontal gain check and adjustment.	Hitachi part No.4202
7. Termination	Impedance, 50 ohms; connectors, BNC	Vertical amplifier compensation checks and adjustment.	
8. Attenuator	Ratio, 1/10; connectors, BNC; impedance, 50 ohms.	Vertical amplifier bandwidth check.	
9. T-connector	Connectors, BNC.	External trigger operation checks.	Hitachi part No.1301
10. Power supply	Voltage range: 10-16V stability 0.5% or less	Battery charger operation check and adjustment	
11. Resistor	56-68 ohms 5W	Battery charger operation check and adjustment	

4.4 Preliminary control settings

Set the instrument controls as follows, when starting the calibration procedures.

Controls	Setting	Controls	Setting
FOCUS	Midrange	FINE	Midrange
TRACE ROTATION	As desired	VAR HOLD OFF	Fully counterclockwise
- VERT -			
V. POSITION	Midrange, pushed in	SWP VAR	Fully clockwise, push in
V. VARIABLE	CAL, fully clockwise	DISPLAY	A
INPUT COUPLING	GND (AC-GND-DC)	-B TRIG-	
VOLTS/DIV	5 mV/DIV	SOURCE	AUTO
V. MODE	CH1	LEVEL	Midrange
		SLOPE	+ (Button Out)
CH2 INV	Normal (Button Out)	-A TRIG-	
		LEVEL	Midrange, pushed in
- HORZ -			
H. POSITION	Midrange	RESET	Normal
PULL X10 MAG	Midrange, pushed in	MODE	Auto
A TIME/DIV	1 ms	COUPLING	AC
DLY TIME MULT	Midrange	SOURCE	CH1

4.5 Initial starting procedure

1. Rotate the INTENSity control to the midrange and set the POWER switch to ON.

2. Wait a few seconds for the cathode ray tube (CRT) to warm up. A trace should appear on the display of the CRT.
3. If trace disappears, increase (clockwise) the INTENSity control setting until the trace is easily observed, or roughly check/adjust the DC balance to get a trace as same as ⑭.
4. Adjust the FOCUS control for the best focused display.
5. Readjust the POSITION controls if necessary, to center the trace.

POWER SUPPLY SYSTEM

NOTE

Before you start operation see the adjustment locations in the pullout pages.

Control settings

Preset the controls as given in the preliminary control setting.

- ① Check low-voltage supply, if necessary.
 - a. Connect the digital voltmeter (DVM) between the +8 V line (P1101-3) and ground
 - : +7.8 to +8.2 V
 - b. Connect the DVM between the -8 V line P1101-5 and ground
 - : -7.85 to -8.15 V
 - c. Connect the DVM between the +5 V line P1101-4 and ground
 - : +4.8 to +5.4 V
 - d. Connect the DVM from the +80 V line and ground
 - : +80 to 84 V (C1174+)
- ② Adjust low-voltage supply.

Adjust the adjustment RV1102 for +43.6 V \pm 0.1 (P1101-2).
- ③ Check high voltage supply.
 - a. Connect the DVM to the H.V. test point (P904-3) with a high voltage probe.
 - b. Check for a reading of -1.3 - -1.4 kV.

DISPLAY

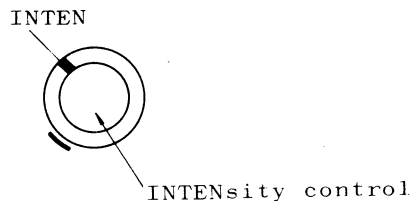
Control setting

Preset the controls as given in the preliminary control setting.

④ Check/adjust CRT bias.

Set DISPLAY to the A position, and set the A TIME/DIV switch to the 1 ms.

a. Set the INTENsity to the "I" letter of the "INTENsity" as shown.



b. Observe the trace on the CRT.

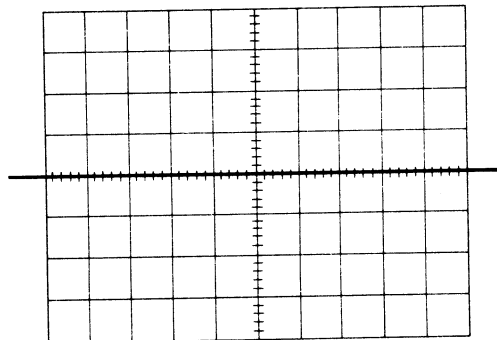
c. Adjust the Grid Bias Adjustment RV1021 so that the trace just appears.

⑤ Check/adjust trace rotation.

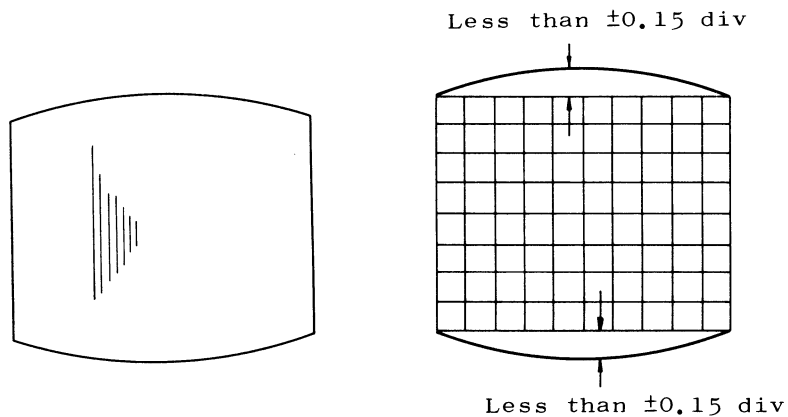
a. Position the trace to the center graticule line.

b. Check that the trace is in parallel with the center horizontal line.

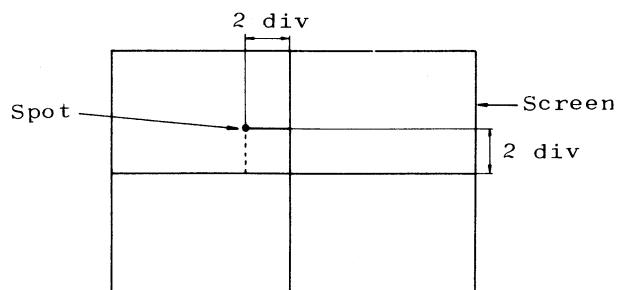
c. Adjust TRACE ROTATION (screwdriver adjustment on side panel) for a trace that is in parallel with the horizontal graticule lines.



- ⑥ Check/adjust GEOMETRY.
- Set the A TIME/DIV to the 1 ms, and the input coupling switch to DC.
 - Connect the constant amplitude signal generator to the input.
 - Set the VOLTS/DIV switch setting for a full-screen (8 div/50 kHz) deflection.
 - Check that horizontal bowing is less than ± 0.15 division.
 - Adjust the GEOM adjustment RV1041 for a display that is in parallel with top and bottom horizontal lines.



- ⑦ Check/adjust ASTIGMATISM and FOCUS.
- Set the vertical mode switch to the CH2 X-Y position, and the display switch to the X-Y position, and the input coupling switch to GND.
 - Set the INTENSity control for a small spot, as the following figure, using the position controls.



- c. Check that the spot is round.
- d. Adjust the FOCUS adjustment and ASTIG adjustment RV1042 for a round spot.

HORIZONTAL SYSTEM

Control settings

Preset the controls as given in the preliminary control settings.

- ⑧ Check/adjust horizontal gain.
 - a. Set the DISPLAY switch to the A position.
 - b. Check that the time marks align with the graticule lines over the center eight divisions, within 2 %.
 - c. Adjust the H GAIN adjustment RV830 so that the time marks align with the center eight graticule lines.
- ⑨ Check/adjust B sweep calibration.
 - a. Set the A TIME/DIV switch to the 2 ms and the B TIME/DIV switch to the 1 ms.
 - b. Set the Display switch to the B position.
 - c. Check that the time marks align with the graticule lines over the center eight divisions, within 2 %.
 - d. Adjust the B SWEEP CAL adjustment RV734 so that the time marks align with the center eight graticule lines.
- ⑩ Check/adjust horizontal $\times 10$ MAG gain.
 - a. Set the DISPLAY to the A position and the A TIME/DIV switch to the 1 ms.
 - b. Set $\times 10$ MAG (Pull out the inner knob of the POSITION control).
 - c. Check that the one-cycle time marks align with the ten-divisions graticule lines, within 2 %.
 - d. Adjust the MAG GAIN adjustment RV831 for one-cycle time marks align with the ten-divisions graticule lines.
 - e. Push in the inner of the POSITION control after adjustment and check.

- ⑪ Check/adjust MAG CENT
- a. Set the A TIME/DIV switch to the 0.1 ms.
 - b. So that the inner shaft of H. POSITION is pulled out ($\times 10$ MAG), the left end of the trace is brought to the center point and then the inner shaft of H. POSITION is depressed.
 - c. Observe the movement of the left end of the trace.
 - d. Adjust the MAG CENT adjustment RV828 for the movement of the left end of the trace within ± 0.2 div.
- ⑫ Check/adjust high speed sweep accuracy.
- a. Set the input coupling switch to DC.
 - b. Set the display switch to the A position.
 - c. Set the time mark generator for 0.1 μ s time marks.
 - d. Set the A TIME/DIV switch to 0.1 μ s.
 - e. Check that the time marks align with the graticule lines over the center eight divisions.
 - f. Adjust CV514 so that the time marks align with center eight graticule lines.
 - g. Display switch to the A position.
 - h. Set the A TIME/DIV switch to 10 μ s.
 - i. Refer to the part (e) through (f) (in this case, adjust CV564).
 - j. Display switch to the B position.
 - k. Set the A TIME/DIV switch to 0.5 μ s.
 - l. Set the B TIME/DIV switch to 0.1 μ s.
 - m. Set the time mark generator for 0.1 μ s time marks.
 - n. Refer to the part (e) through (f) (in this case, adjust CV701).
 - o. Display switch to the B position.
 - p. Set the A TIME/DIV switch to 50 μ s.
 - q. Set the B TIME/DIV switch to 10 μ s.
 - r. Refer to the part (e) through (f) (in this case, adjust CV729).
 - s. Check all other ranges of timing within 2 %.
- Use appropriate settings on the time mark generator.

- ⑬ Check/adjust delay time
- a. Set the vertical mode switch to the CH1 position.
 - b. Set the A TIME/DIV switch to the 1 ms.
 - c. Set the B TIME/DIV switch to the 0.5 μ s.
 - d. Set the input coupling switch to DC, connect the cable to the output of the time mark generator, set the time mark generator for 1 ms time marks.
 - e. Set the display switch to the INTEN.
 - f. Set the DELAY TIME MULT dial to 1.00.
 - g. Check that the intensified portion of the sweep begins at the second time marker. (It may be necessary to readjust the INTENSITY control, so that the intensified portion of the sweep is visible.)
 - h. Adjust RV549 so that the intensified portion of the sweep begins at the start of the second time marker.
 - i. Set the DELAY TIME MULT dial to 9.00.
 - j. Check that intensified portion of the sweep begins at the tenth time marker.
 - k. Adjust RV551 so that the intensified portion of the sweep begins at the start of the tenth time marker.
 - l. Repeat both the RV549 and RV551 adjustments for no visible interaction.

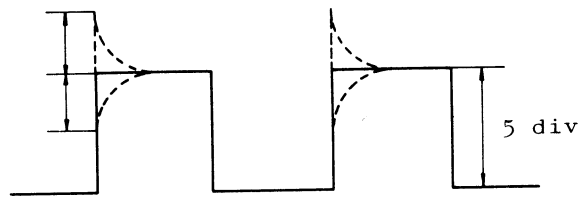
VERTICAL SYSTEM

Control setting

Preset the controls as given in the preliminary control settings.

- ⑭ Check/adjust DC balance (step attenuator balance).
- a. Set the VOLTS/DIV switch to the 5 mV position.
 - b. Position the trace to the horizontal center line.
 - c. Change the VOLTS/DIV switch to the 10 mV position.
 - d. Check that the trace is within 0.1 division of the center horizontal line.

- e. Adjust the CH1 (CH2) DC BAL adjustment, RV27 (CH1) or RV127 (CH2), for a trace at the horizontal center line.
 - f. Repeat the part (a) through (e) until less than 0.1 division shift is noted when changing the VOLTS/DIV setting.
- ⑮ Check/adjust vertical position center.
- a. Confirm the vertical POSITION control at the midrange.
 - b. Check the trace is within 1 division.
 - c. Adjust the position center adjustment RV97 (CH1), RV197 (CH2) for a trace at the horizontal center line.
- ⑯ Check/adjust ADD BALANCE.
- a. Set the A TIME/DIV to the 1 ms position, the display switch to A.
 - b. Set the CH1 and CH2 input coupling switches to GND.
 - c. Set the V MODE switch to CH1.
 - d. Adjust the vertical position control so that the trace aligns with the center horizontal graticule line.
 - e. Next, set the V MODE switch to CH2 and adjust the vertical position control so that the trace aligns with the center horizontal graticule line.
 - f. Set the V MODE switch to ADD.
 - g. Check that the trace aligns with the center horizontal graticule line within ± 0.5 division.
 - h. Adjust the ADD BAL adjustment RV305 for two times of the difference from the center horizontal graticule line.
- ⑰ Check/adjust $\times 1$ AC GAIN.
- a. Set the A TIME/DIV switch to the 1 ms position.
 - b. Set the VOLTS/DIV switch to the 10 mV position.
 - c. Set the input coupling switch to DC.
 - d. Connect the square-wave generator (using 1 kHz output range).
 - e. Adjust the output amplitude of that generator for 5 division deflection of screen.
 - f. Check the high-voltage level of pulse is flat.



g. Adjust the $\times 1$ AC GAIN RV33 (CH1), RV133 (CH2) adjustment for a flat level.

⑱ Check/adjust vertical gain.

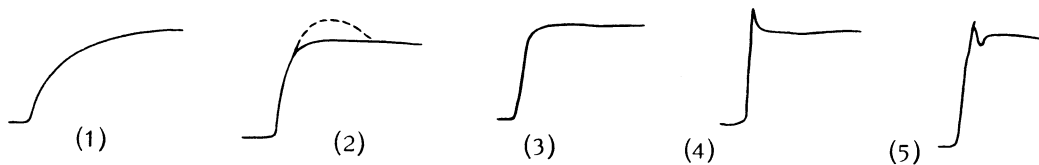
- a. Set the A VOLTS/DIV switch to the 10 mV position and the input coupling switch to DC.
- b. Connect the standard amplitude calibrator to the input connector.
- c. Set the standard amplitude calibrator for a 50 mVp-p (5 divisions of display) signal.
- d. Check for a display of five divisions.
- e. Adjust the GAIN adjustment RV84 (CH1), RV184 (CH2) for a display of 5 divisions within 2 %.
- f. Check all the VOLTS/DIV switch settings.

⑲ Check/adjust input capacity (ATT: $\div 1$).

- a. Set the VOLTS/DIV switch to the 10 mV position.
- b. Set the input coupling switches to DC.
- c. Connect the L-C meter to the input terminals.
- d. Check the input capacity for approximately 30 pF

⑳ Check/adjust vertical step response.

- a. Set the CH1 and CH2 VOLTS/DIV switches to the 10 mV position.
- b. Connect the fast-rise, positive output (50 mV, 1 MHz) of the square-wave generator to the CH1 input. Use a 50 Ω termination and cable.
- c. Adjust the square-wave generator output for 5-divisions display.
- d. Set the A TIME/DIV switch to 0.5 μ s position.
- e. Preset CV308 and CV326, the wave-form shown in the figure (1)



- f. Set the A TIME/DIV switch to 0.5 or $1\mu s/div$.
- g. Adjust CV309 for the best flat top as the figure (2)
- h. Set the A TIME/DIV switch to the $0.1 \mu s$ position.
- i. Adjust CV326 for the best corner of the displayed signal.
- j. Adjust CV308 to get the overshoot of $+0.2$ div. (see the figure (4))
- k. Adjust CV326 to get the overshoot of $+0.15$ div. (see figure (5))
- l. Connect the output of the square-wave generator to the CH2 input.
- m. Adjust CV182 to get the overshoot of $+0.15$ div.

②1 Check/adjust attenuation compensation.

(ATT : $\div 10$, $\div 100$)

- a. Set the input coupling switch to DC.
- b. Connect the square-wave generator to the CH1 (CH2) input terminal check for a square wave that is flat (flat top) under the following settings.

ATT	VOLTS/DIV	Square-wave generator output
$\div 10$	0.1 V	0.5 V
$\div 100$	1 V	5 V

- c. Adjust the trimmer condensers (refer to the circuit board illustration with adjustment location - page 27) for a square wave that is flat (flat top) under the following settings.

ATT	VOLTS/DIV	Square-wave generator output	Adjust CH1 (CH2)
÷10	0.1 V	0.5 V	CV7 (CV107)
÷100	1 V	5 V	CV12 (CV112)

- ② Check/adjust input capacity (ATT : ÷10, ÷100).
- Connect the L-C meter to the input connector.
 - Check the input capacity for a approx. 32 pF.
 - Adjust the trimmer condensers for a 32 pF input capacity under the following settings.

ATT	VOLTS/DIV	Adjust CH1 (CH2)
÷ 1	5 mV	—
÷ 10	0.1 V	CV6 (CV106)
÷ 100	1 V	CV11 (CV111)

TRIGGERING SYSTEM

- ② Check/adjust TRIG CENT.
- Set the A TRIG SOURCE switch to CH1, the A TRIG COUPLING switch to AC, the A TRIG SLOPE knob push in, the VOLTS/DIV switch to 50 mV, the A TIME/DIV switch to 20 μ s.
 - Connect the sine-wave generator to the input connector for a 0.3 div (50 kHz).
 - Set the A TRIG LEVEL knob to the midposition.
 - Adjust RV406 so that synchronization is effected on the waveform, 0.3 div on the screen.
 - Under the state of (d), if synchronization is not effected by switching the A TRIG COUPLING to "DC," set the CH1 (CH2) DC LEVEL adjustment RV64 (CH1) and RV164 (CH2) so that synchronization is effected.

- f. Next, set the A TRIG SLOPE to -(pulled out state) and insure that synchronization is effected. After confirmation, leave the A TRIG-SLOPE in depressed state. Readjust when stepped out.

②④ X-Y operation

24-1 Check/adjust X gain.

- a. Set the vertical MODE switch to CH2 X-Y, the DISPLAY switch to X-Y, the input coupling switch of CH1 to DC, the input coupling switch of CH2 to GND.
- b. Set the VOLTS/DIV switch to the 10 mV position, with $\times 1$ GAIN.
- c. Connect the standard amplitude calibrator to the CH1 input connector.
- d. Set the standard amplitude calibrator for a 50 mV.
- e. Check for a display of five divisions.
- f. Adjust the X GAIN adjustment RV591 for a display of five divisions within 4 %.

24-2 Check/adjust X position center.

- a. Set the DISPLAY switch to the X-Y position, the vertical MODE switch to the CH2/ X-Y position and the horizontal POSITION control to the midposition, the input coupling switch of CH1 to GND.
- b. Check to see that the round spot is near the center graticule and is within 0.2 division against horizontal line.
- c. Adjust the X CENT adjustment RV509 to the position spot at the center.

CALIBRATOR

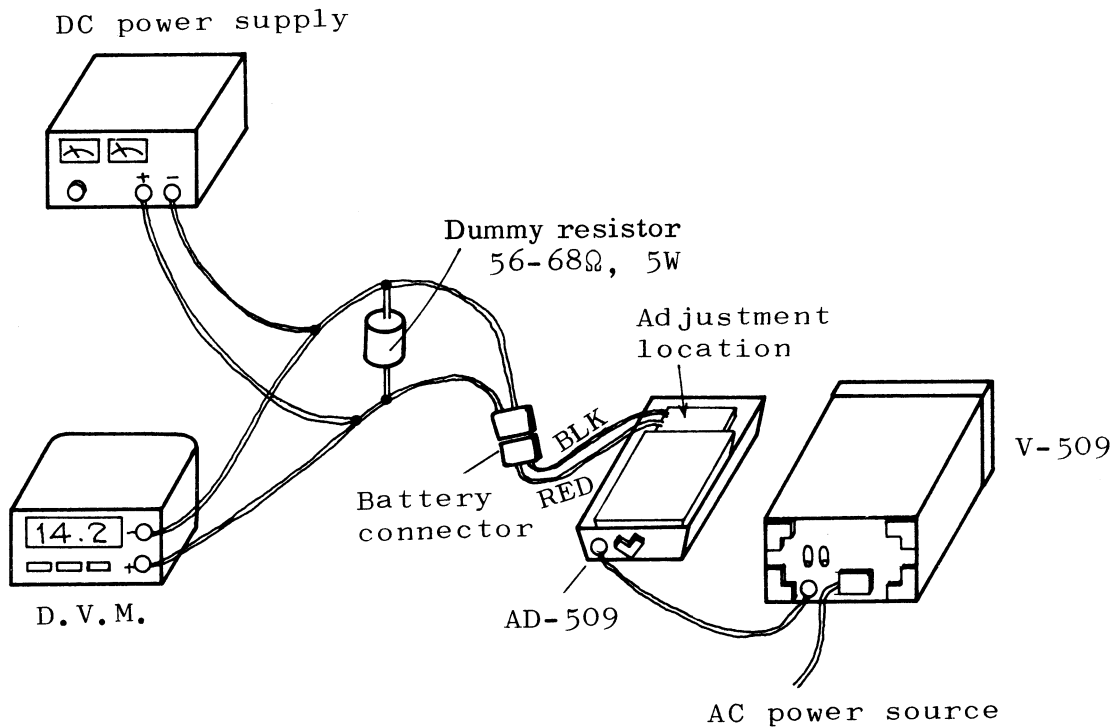
②⑤ Check/adjust CAL terminal (0.5 Vp-p, 1 kHz).

- a. Connect the CAL terminal to the digital multimeter, short the terminal 1 to 3 of the connector (P1201).
- b. Check for the CAL output of 0.5 V, within 1 %.
- c. Adjust the 0.5 V adjustment RV1207 for the CAL output of 0.495 to 0.505 V.

AD-509 BATTERY CHARGER

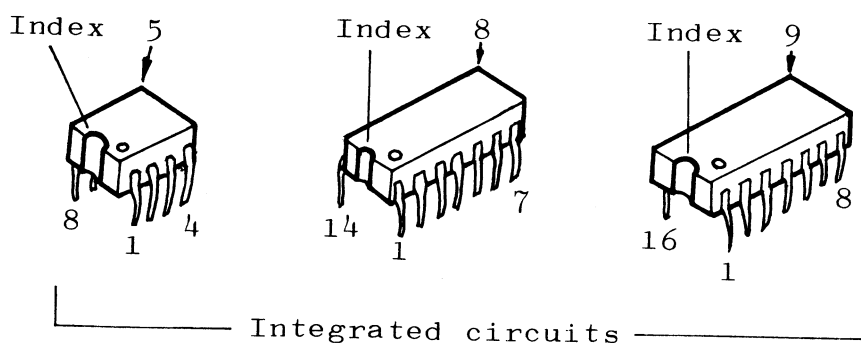
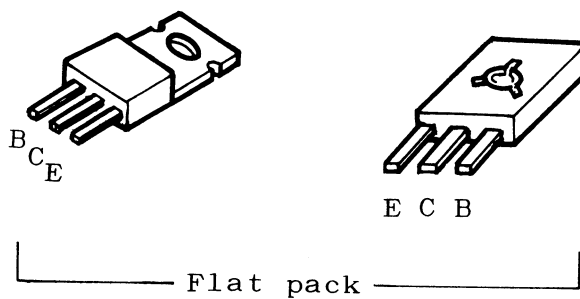
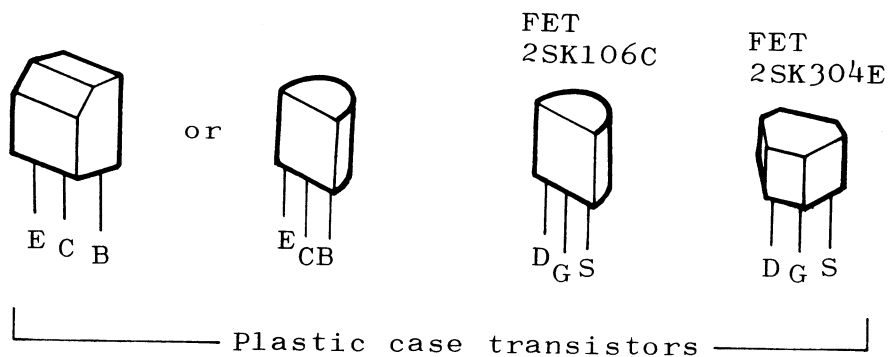
Check/adjust the battery charger

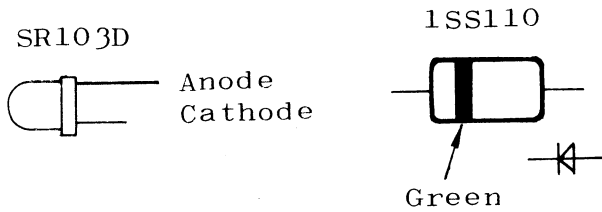
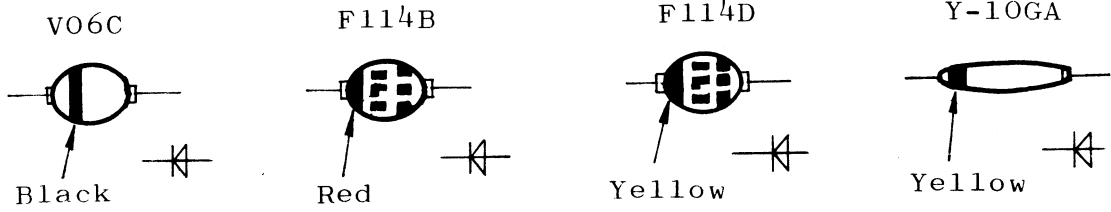
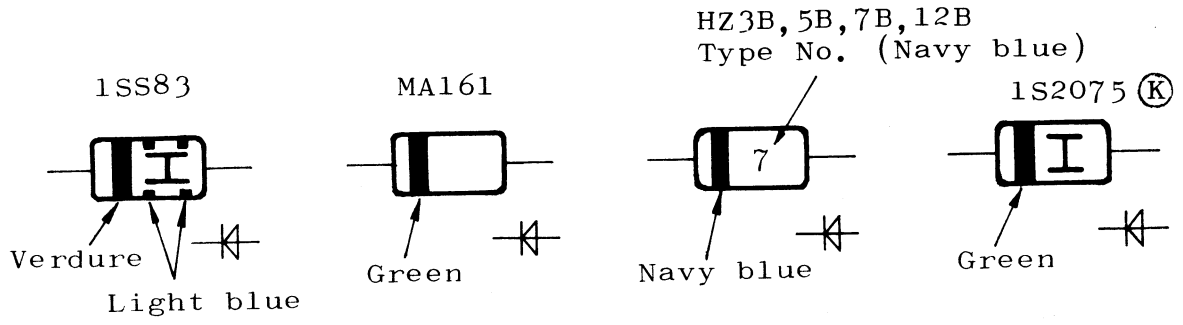
- a. Connect the cable of AD-509 to the BATT INPUT connector.
- b. Connect the power supply, dummy resistor and digital voltmeter to the battery connector.
- c. Set the power source switch to the DC position and the charge-operation switch to the BATT CHARGE position.
- d. Set the voltage of the power supply to 14.2 V.
- e. Adjust RV1501 so that the CHARGE lamp becomes dim.
(Prior to this adjustment check that the lamp is illuminated.)



5. SEMICONDUCTOR LEAD CONFIGURATIONS

Lead configurations and case styles are typical, but may vary due to vendor changes or instrument modifications.





7. ELECTRICAL PARTS LIST

PEF-559 V. PRE

Part Code	Symbol	Description	Remarks
<u>Resistors</u>			
RCE0614	R 3	Carbon 1/8W 47Ω ±5%	
RCE0649	19	Carbon 1/8W 22kΩ ±5%	
RME0828	20	Metal 1/4W 500kΩ ±0.5%	
RME0828	21	Metal 1/4W 500kΩ ±5%	
RCE0620	22	Carbon 1/8W 100Ω ±5%	
RSE0434	23	Solid 1/4W 10MΩ ±5%	
RCE0606	24	Carbon 1/8W 10Ω ±5%	
RCE0617	25	Carbon 1/8W 68Ω ±5%	
RCE0614	26	Carbon 1/8W 47Ω ±5%	
RCE0641	27	Carbon 1/8W 4.7kΩ ±5%	
RCE0640	28	Carbon 1/8W 3.9kΩ ±5%	
RCE0620	29	Carbon 1/8W 100Ω ±5%	
RCE0657	30	Carbon 1/8W 100kΩ ±5%	
RCE0657	31	Carbon 1/8W 100kΩ ±5%	
RCE0637	32	Carbon 1/8W 2.2kΩ ±5%	
RCE0631	33	Carbon 1/8W 680Ω ±5%	
RME0711	34	Metal 1/4W 60.0Ω ±5%	
RME0931	35	Metal 1/8W 475Ω ±1%	
RME0928	36	Metal 1/8W 267Ω ±1%	
RME1003	37	Metal 1/4W 600Ω ±0.5%	
RME0830	38	Metal 1/4W 16.0kΩ ±0.5%	
RME1004	39	Metal 1/4W 80kΩ ±0.5%	
RME0707	40	Metal 1/4W 4.00kΩ ±0.5%	
RCE0606	41	Carbon 1/8W 10Ω ±5%	
RCR3044	42	Carbon 1/4W 470Ω ±5%	
RCE0606	43	Carbon 1/8W 10Ω ±5%	
RCR3004	44	Carbon 1/4W 10Ω ±5%	
RCE0614	47	Carbon 1/8W 47Ω ±5%	
RCE0624	49	Carbon 1/8W 220Ω ±5%	
RCE0624	50	Carbon 1/8W 220Ω ±5%	
RCE0627	51	Carbon 1/8W 390Ω ±5%	
RCE0631	52	Carbon 1/8W 680Ω ±5%	
RME0708	53	Metal 1/4W 300Ω ±0.5%	
RME0709	54	Metal 1/4W 150Ω ±0.5%	
RME0710	55	Metal 1/4W 90.0Ω ±0.5%	
RME0711	56	Metal 1/4W 60.0Ω ±0.5%	
RCE0622	57	Carbon 1/8W 150Ω ±5%	
RCE0613	58	Carbon 1/8W 39Ω ±5%	
RCE0620	59	Carbon 1/8W 100Ω ±5%	
RCE0622	61	Carbon 1/8W 150Ω ±5%	
RCE0639	62	Carbon 1/8W 3.3kΩ ±5%	
RCE0620	63	Carbon 1/8W 100Ω ±5%	
RCE0635	64	Carbon 1/8W 1.5kΩ ±5%	
RCE0641	65	Carbon 1/8W 4.7kΩ ±5%	
RME0923	66	Metal 1/8W 100Ω ±1%	
	67		
RME0934	68	Metal 1/8W 82Ω ±1%	
RCE0635	69	Carbon 1/8W 1.5kΩ ±5%	
RCE0606	70	Carbon 1/8W 10Ω ±5%	
RCE0610	72	Carbon 1/8W 22Ω ±5%	
RCE0614	73	Carbon 1/8W 47Ω ±5%	
RCE0629	74	Carbon 1/8W 560Ω ±5%	
RCE0614	75	Carbon 1/8W 47Ω ±5%	
RCE0610	76	Carbon 1/8W 22Ω ±5%	
	77		
RCE0645	80	Carbon 1/8W 10kΩ ±5%	
RCE0610	81	Carbon 1/8W 22kΩ ±5%	
RCE0617	82	Carbon 1/8W 68Ω ±5%	
RCE0620	83	Carbon 1/8W 100Ω ±5%	
RCE0617	84	Carbon 1/8W 68Ω ±5%	
RME0939	85	Metal 1/8W 2.2kΩ ±1%	
RME0939	86	Metal 1/8W 2.2kΩ ±1%	
RCF0633	87	Carbon 1/8W 1kΩ ±5%	

Part Code	Symbol	Description	Remarks
RCE0633	R 88	Carbon 1/8W 1kΩ ±5%	
RCE0620	89	Carbon 1/8W 100Ω ±5%	
RME0929	90	Metal 1/8W 332Ω ±1%	
RME0929	91	Metal 1/8W 332Ω ±1%	
RME0939	92	Metal 1/8W 2.21kΩ ±1%	
RCE0614	96	Carbon 1/8W 47Ω ±5%	
RCE0645	97	Carbon 1/8W 10kΩ ±5%	
RCE0639	98	Carbon 1/8W 3.3kΩ ±5%	
RME0941	93	Metal 1/8W 3.32kΩ ±1%	
<u>Capacitors</u>			
CCC1007	C 3	Ceramic 50V 22 pF ±5%	
CCC1001	20	Ceramic 50V 8 pF ±0.5pF	
CCC1034	21	Ceramic 50V 68 pF ±5%	
CCD0217	23	Ceramic 500V 1000 pF ±100%	
CCC1014	25	Plastic 50V 1000 pF ±10%	
CCC1002	26	Ceramic 50V 10 pF ±10%	
CQA0091	27	Plastic 50V 1000 pF ±10%	
CES0036	29	Al Elyc 25V 22μF ±20%	
CES0033	31	Al Elyc 25V 100μF ±20%	
CES0033	41	Al Elyc 25V 100μF ±20%	
CES0033	43	Al Elyc 25V 100μF ±20%	
CCC1002	49	Ceramic 50V 10 pF ±0.5pF	
CCC1002	50	Ceramic 50V 10 pF ±0.5pF	
CCC1004	56	Ceramic 50V 39 pF ±5%	
	67	Not Used	
CCC0996	68	Ceramic 50V 2 pF ±0.25pF	
CES0036	70	Al Elyc 25V 22MF ±20%	
CCC1034	71	Ceramic 50V 68 pF ±5%	
CES0036	72	Al Elyc 25V 22μF ±20%	
	77	Not Used	
CCC1007	82	Ceramic 50V 22 pF ±5%	
CCC1365	87	Ceramic 50V 680 pF ±10%	
CCC1365	89	Ceramic 50V 680 pF ±10%	
CCC1030	92	Ceramic 50V 10000 pF ±80%	
CCC0997	93	Ceramic 50V 3 pF ±0.25pF	
CQA0101	96	Plastic 50V 47000 pF ±10%	
<u>Var. Resistors</u>			
RNT0242	RV 33	Metal TM64K (PV2) 1kΩ	
RNC0032	27	Metal CR19R8 47kΩ	
RNT0239	64	Metal TM64K (PH) 2kΩ	
8348450	84	Metal CR29R 220Ω	
RNT0240	97	Metal TM64K (PH) 50kΩ	
RDE0003	98	Carbon EVH-Y13K20B14	
<u>Coils</u>			
TLF0052	L 34	FL3H 0.47μH ±20%	
TLE0058	74	EL0606 10μH ±10%	
<u>Transistors</u>			
HTK0068	TR 1	2SK106C	
HTC0557	3	2SC1674K	
HTA0099	4	2SA781K	
HTC0167	5	2SC535-B-	
HTC0167	6	2SC535-B-	
HTA0099	7	2SA781K	
HTA0099	8	2SA781K	
HTA0099	15	2SA781K	
HTC0167	16	2SC535-B-	
HTA0099	17	2SA781K	

Part Code	Symbol	Description	Remarks
<u>Diodes</u>			
8385433	D 1	1S5110	
HDS0108	2	1S2075	
HDH0024	3	Zenner HZ-3B	
HDH0024	4	Zenner HZ-3B	
<u>IC</u>			
ILT0041	IC 1	Analog TL071CP	
<u>Connectors</u>			
JBX0468	P 2	171825-3	
JBX0468	3	171825-3	
JBX0468	4	171825-3	
RAA0029	ATT1	Attenuator ADR-255-1	
RCE0614	R 103	Carbon 1/8W 47Ω	+5%
RCE0649	119	Carbon 1/8W 22kΩ	+5%
RME0828	120	Metal 1/4W 500kΩ	±0.5%
RME0828	121	Metal 1/4W 500kΩ	±0.5%
RCE0620	122	Carbon 1/8W 100Ω	+5%
RSE0434	123	Solid 1/4W 10MΩ	+5%
RCE0606	124	Carbon 1/8W 10Ω	+5%
RCE0617	125	Carbon 1/8W 68Ω	+5%
RCE0614	126	Carbon 1/8W 47Ω	+5%
RME0943	127	Metal 1/8W 4.75kΩ	+5%
RME0942	128	Metal 1/8W 3.92kΩ	+5%
RCE0620	129	Carbon 1/8W 100Ω	+5%
RCE0657	130	Carbon 1/8W 100kΩ	+5%
RCE0657	131	Carbon 1/8W 100kΩ	+5%
RCE0637	132	Carbon 1/8W 2.2kΩ	+5%
RCE0631	133	Carbon 1/8W 680Ω	+5%
RME0711	134	Metal 1/4W 60.0Ω	+5%
RME0931	135	Metal 1/8W 475Ω	+1%
RME0931	136	Metal 1/8W 475Ω	+1%
RME1003	137	Metal 1/4W 600Ω	±0.5%
RME0830	138	Metal 1/4W 16.0kΩ	±0.5%
RME1004	139	Metal 1/4W 80kΩ	±0.5%
RME0707	140	Metal 1/4W 4.00kΩ	±0.5%
RCE0606	141	Carbon 1/8W 10Ω	+5%
RCR3046	142	Carbon 1/4W 56Ω	+5%
RCE0606	143	Carbon 1/8W 10Ω	+5%
RCR3004	144	Carbon 1/4W 10Ω	+5%
RCE0624	149	Carbon 1/8W 220Ω	+5%
RCE0624	150	Carbon 1/8W 220Ω	+5%
RCE0627	151	Carbon 1/8W 390Ω	+5%
RCE0631	152	Carbon 1/8W 680Ω	+5%
RME0708	153	Metal 1/4W 300Ω	±0.5%
RME0709	154	Metal 1/4W 150Ω	±0.5%
RME0710	155	Metal 1/4W 90.0Ω	±0.5%
RME0711	156	Metal 1/4W 60.0Ω	±0.5%
RCE0622	157	Carbon 1/8W 150Ω	+5%
RCE0613	158	Carbon 1/8W 39Ω	+5%
RCE0620	159	Carbon 1/8W 100Ω	+5%
RCE0622	161	Carbon 1/8W 150Ω	+5%
RCE0639	162	Carbon 1/8W 3.3kΩ	+5%
RCE0620	163	Carbon 1/8W 100Ω	+5%
RCE0635	164	Carbon 1/8W 1.5kΩ	+5%
RCE0641	165	Carbon 1/8W 4.7kΩ	+5%
RME0923	166	Metal 1/8W 100Ω	+1%
	167	Not Used	
RME0934	168	Metal 1/8W 825Ω	+1%
RCE0635	169	Carbon 1/8W 1.5kΩ	+5%
RCE0606	170	Carbon 1/8W 10Ω	+5%

Part Code	Symbol	Description	Remarks
RCE0614	R 171	Carbon 1/8W 47Ω	+5%
RCE0610	172	Carbon 1/8W 22Ω	+5%
RCE0614	173	Carbon 1/8W 47Ω	+5%
RCE0614	175	Carbon 1/8W 47Ω	+5%
RCE0610	176	Carbon 1/8W 22Ω	+5%
RCE0645	180	Carbon 1/8W 10kΩ	+5%
RCE0610	181	Carbon 1/8W 22Ω	+5%
RCE0610	182	Carbon 1/8W 22Ω	+5%
RCE0620	183	Carbon 1/8W 100Ω	+5%
RCE0617	184	Carbon 1/8W 68Ω	+5%
RME0939	185	Metal 1/8W 2.21kΩ	+1%
RME0939	186	Metal 1/8W 2.21kΩ	+1%
RCE0633	187	Carbon 1/8W 1kΩ	+5%
RCE0633	188	Carbon 1/8W 1kΩ	+5%
RCE0620	189	Carbon 1/8W 100Ω	+5%
RME0929	190	Metal 1/8W 332Ω	+1%
RME0929	191	Metal 1/8W 332Ω	+1%
RME0939	192	Metal 1/8W 2.21kΩ	+1%
RME0939	193	Metal 1/8W 2.21kΩ	+1%
RME0941	194	Metal 1/8W 3.32kΩ	+1%
RME0941	195	Metal 1/8W 3.32kΩ	+1%
RCE0614	196	Carbon 1/8W 47Ω	+5%
RCE0645	197	Carbon 1/8W 10kΩ	+5%
RCE0639	198	Carbon 1/8W 3.3kΩ	+5%
TLF0052	L 134	Coil FL3H 0.47μH	+20%
<u>Capacitors</u>			
CQA0091	C 127	Plastic 50V 1000 pF	+10%
CCC1001	120	Ceramic 50V 8 pF	+0.5pF
CCD0217	123	Ceramic 500V 1000 pF	+100% -0
CCC1034	121	Ceramic 50V 68 pF	+5%
CQA1014	125	Ceramic 50V 47 pF	+10%
CCC1002	126	Ceramic 50V 10 pF	+10%
CES0036	129	Al Elyc 25V 22 pF	±20%
CES0033	141	Al Elyc 25V 100μF	+20%
CES0033	143	Al Elyc 25V 100μF	+20%
CCC1002	149	Ceramic 50V 10 pF	±0.5pF
CCC1002	150	Ceramic 50V 10 pF	±0.5pF
CCC1004	156	Ceramic 50V 15 pF	+5%
	167	Not Used	
CCC0996	168	Ceramic 50V 2 pF	+0.25pF
CES0036	170	Al Elyc 25V 22μF	±20%
CCC1007	103	Ceramic 50V 22 pF	+5%
CES0033	131	Al Elyc 25V 100μF	±20%
CCC1034	171	Ceramic 50V 68 pF	+5%
CES0036	172	Al Elyc 25V 22μF	±20%
CES0036	173	Al Elyc 25V 22μF	±20%
CCC1365	187	Ceramic 50V 680 pF	+10%
CCC1365	189	Ceramic 50V 680 pF	+10%
CCC1030	192	Ceramic 50V 10000 pF	+80% -20%
CCC1030	193	Ceramic 50V 10000 pF	+80% -20%
CQA0101	196	Plastic 50V 47000 pF	+10%
<u>Var. Resistors</u>			
RNT0242	RV 133	Metal TM64K (PV2) 1kΩ	
RNC0032	127	Metal CR19RB 47kΩ	
RNT0239	164	Metal TM 64K (PH) 2kΩ	
8348450	184	Metal CR29R 220Ω	
RNT0240	197	Metal TM64K (PH) 50kΩ	
RDE0003	198	Carbon EVH-Y13K20B14	

Part Code	Symbol	Description	Remarks
CVE0027	CV 182	<u>Var. Capacitor</u> ECV-1ZW40X60	
		<u>Transistors</u>	
HTK0068	TR 101	2SK106C	
HTC0557	103	2SC1674K	
HTA0224	104	2SA1029D	
HTC0167	105	2SC535-B-	
HTC0167	106	2SC535-B-	
HTA0099	107	2SA781K	
HTA0099	108	2SA781K	
HTA0099	109	2SA781K	
HTA0099	110	2SA781K	
HTA0099	115	2SA781K	
HTC0167	116	2SC535-B-	
HTA0099	117	2SA781K	
		<u>Diodes</u>	
8385433	D 101	1S110	
HDS0108	102	1S2075	
HDH0024	103	Zenner HZ-3B	
HDH0024	104	Zenner HZ-3B	
		<u>IC</u>	
ILT0041	IC 101	Analog TL071CP	
RAA0029	ATT101	Attenuator ADR-255-1	
		<u>Connectors</u>	
JBX0468	P 102	171825-3	
JBX0468	103	171825-3	
		<u>Switch</u>	
8376780	S 107	PB SPJ222N (Lock)	
		<u>Resistors</u>	
RCE0606	R 261	Carbon 1/8W 10Ω ±5%	
RCE0635	262	Carbon 1/8W 1.5kΩ ±5%	
RME0923	264	Metal 1/8W 100Ω ±5%	
RME0923	268	Metal 1/8W 100Ω ±1%	
		<u>Transistor</u>	
HTC0148	TR 261	2SC458-C	
		<u>Diode</u>	
HDS0108	D 251	1S2075	
		<u>Connector</u>	
JBX0468	P 5	171825-3	
		<u>Transistors</u>	
HTA0099	TR 205	2SA781K	
HTA0099	206	2SA781K	
		<u>IC</u>	
IDH0586	IC 201	HD74LS74AP	
		<u>Connectors</u>	
JBX0468	P 201	171825-3	
JBX0470	202	171825-6	
JBX0468	204	171825-3	

Part Code	Symbol	Description	Remarks
3165210	S 201	<u>Switch</u> Rotary SBU1025	
119584	PEF-559	PCB PB-10	
JBX0557		163740-1	
		<u>Resistors</u>	
RME0937	R 221	Metal 1/8W 1.50kΩ ±1%	
RME0937	222	Metal 1/8W 1.50kΩ ±1%	
RME0661	225	Metal 1/4W 562Ω ±1%	
RME0661	226	Metal 1/4W 562Ω ±1%	
RME0926	229	Metal 1/8W 182Ω ±1%	
RME0926	230	Metal 1/8W 182Ω ±1%	
RME0927	231	Metal 1/8W 221Ω ±1%	
RME0927	232	Metal 1/8W 221Ω ±1%	
RCE0652	233	Carbon 1/8W 39kΩ ±5%	
RCE0653	234	Carbon 1/8W 47kΩ ±5%	
RME1006	239	Metal 1/8W 86.6Ω ±1%	
RME1006	240	Metal 1/8W 86.6Ω ±1%	
RCE0626	241	Carbon 1/8W 330Ω ±5%	
RCE0620	243	Carbon 1/8W 100Ω ±5%	
RME0935	251	Metal 1/8W 1kΩ ±5%	
RCE0622	252	Carbon 1/8W 150Ω ±5%	
RCE0622	253	Carbon 1/8W 150Ω ±5%	
RCE0606	254	Carbon 1/8W 10Ω ±5%	
RCE0606	255	Carbon 1/8W 10Ω ±5%	
		<u>Capacitors</u>	
CES0036	C 223	Al Elyc 25V 22μF ±20%	
CES0036	224	Al Elyc 25V 22μF ±20%	
CEC0391	233	Al Elyc 50V 1μF	
CCC1025	234	Ceramic 50V 100 pF ±10%	
CES0029	244	Al Elyc 10V 100μF ±20%	
CCC0999	241	Ceramic 50V 5 pF ±0.25 pF	
		<u>Diodes</u>	
HDS0108	D 201	1S2075	
HDS0108	202	1S2075	
HDS0108	203	1S2075	
HDS0108	204	1S2075	
HDS0108	205	1S2075	
HDS0108	206	1S2075	
HDS0108	207	1S2075	
HDS0108	208	1S2075	
HDS0108	213	1S2075	
HDS0108	214	1S2075	
HDH0024	D 244	Zenner HZ-3B	

PEF-563 V. OUT

Part Code	Symbol	Description	Remarks
8376798	L 338	<u>Coils</u> TCOIL (7T, 18T)	
8376798	339	TCOIL (7T, 18T)	
		<u>Transistors</u>	
HTC0338	TR 301	2SC1906	
HTC0338	302	2SC1906	
HTC0192	305	2SC641K-C	
HTC0192	306	2SC641K-C	
HTC0669	307	2SC2912S	
HTC0669	308	2SC2912S	
CCC1004	304	Ceramic 50V 39 pF	+5%
CCC1007	307	Ceramic 50V 22 pF	+5%
		<u>Capacitors</u>	
CCC1029	C 311	Ceramic 50V 1000 pF	+80% -20%
CCC1029	312	Ceramic 50V 1000 pF	+80% -20%
CCC1025	325	Ceramic 50V 100 pF	+10%
CCC1030	329	Ceramic 50V 10000 pF	+80% -20%
CCC1030	330	Ceramic 50V 10000 pF	+80% -20%
CES0029	354	Al Elyc 10V 100µF	+20%
CES0036	353	Al Elyc 25V 22µF	+20%
CES0036	355	Al Elyc 25V 22µF	+20%
CCC1030	310	Ceramic 50V 10000 pF	+80% -20%
		<u>Var. Capacitors</u>	
CVE0039	CV 308	ECV1ZW 40X53N	
CVE0039	309	ECV1ZW 40X53N	
CVF0039	326	ECV1ZW 40X53N	
		<u>Resistors</u>	
RME0923	R 301	Metal 1/8W 100Ω	+1%
RME0923	302	Metal 1/8W 100Ω	+1%
RCE0620	303	Carbon 1/8W 100Ω	+5%
RCE0637	304	Carbon 1/8W 2.2kΩ	+5%
RME0935	305	Metal 1/8W 1kΩ	+1%
RME0935	306	Metal 1/8W 1kΩ	+1%
RCE0620	307	Carbon 1/8W 100Ω	+5%
RCE0606	308	Carbon 1/8W 10Ω	+5%
RCE0634	309	Carbon 1/8W 1.2kΩ	+5%
RCE0622	311	Carbon 1/8W 150Ω	+5%
RCE0622	312	Carbon 1/8W 150Ω	+5%
RME0924	319	Metal 1/8W 121Ω	+1%
RME0924	320	Metal 1/8W 121Ω	+1%
RME0921	321	Metal 1/8W 68.1Ω	+1%
RME0654	323	Metal 1/4W 150Ω	+1%
RME0654	324	Metal 1/4W 150Ω	+1%
RCE0635	325	Carbon 1/8W 1.5kΩ	+5%
RCE0627	326	Carbon 1/8W 390Ω	+5%
RCE0614	320	Carbon 1/8W 47Ω	+5%
RCE0614	330	Carbon 1/8W 47Ω	+5%
RCE0620	331	Carbon 1/8W 100Ω	+5%
RMR2798	335	Metal 2W 680Ω	+5%
RMR2798	336	Metal 2W 680Ω	+5%
RCE0606	337	Carbon 1/8W 10Ω	+5%
RCE0624	338	Carbon 1/8W 220Ω	+5%
RCE0624	339	Carbon 1/8W 220Ω	+5%
RCE0614	340	Carbon 1/8W 47Ω	+5%

Part Code	Symbol	Description	Remarks
RCE0614	R 341	Carbon 1/8W 47Ω	+5%
		<u>Var. Resistor</u>	
RNT0244	RV 305	Metal TM64K2 (PV2) 200	
		<u>Connector</u>	
JBX0470	P 302	171825-6	
119585	PEF-563	PCB PB-11	

PEF-565 TRIG

Part Code	Symbol	Description	Remarks
		<u>Resistors</u>	
RCR3104	R 402	Carbon 1/4W 470kΩ	+5%
RCE0661	404	Carbon 1/8W 470kΩ	+5%
RCE0620	405	Carbon 1/8W 100Ω	+5%
RCE0643	406	Carbon 1/8W 6.8kΩ	+5%
RCE0606	407	Carbon 1/8W 10Ω	+5%
RCE0636	408	Carbon 1/8W 1.8kΩ	+5%
RCE0633	409	Carbon 1/8W 1kΩ	+5%
RCE0620	411	Carbon 1/8W 100Ω	+5%
RCE0634	412	Carbon 1/8W 1.2kΩ	+5%
RCE0661	413	Carbon 1/8W 470kΩ	+5%
RCE0654	414	Carbon 1/8W 56kΩ	+5%
RCE0620	415	Carbon 1/8W 100Ω	+5%
RCE0652	416	Carbon 1/8W 39kΩ	+5%
RCE0642	418	Carbon 1/8W 5.6kΩ	+5%
RCE0620	419	Carbon 1/8W 100Ω	+5%
RCE0643	420	Carbon 1/8W 6.8kΩ	+5%
RCE0617	423	Carbon 1/8W 68Ω	+5%
RCE0627	424	Carbon 1/8W 390Ω	+5%
RCE0606	425	Carbon 1/8W 10Ω	+5%
RCE0620	430	Carbon 1/8W 100Ω	+5%
RCE0631	432	Carbon 1/8W 680Ω	+5%
RCE0633	433	Carbon 1/8W 1kΩ	+5%
RCE0612	434	Carbon 1/8W 33Ω	+5%
RCE0638	435	Carbon 1/8W 2.7kΩ	+5%
RCE0638	436	Carbon 1/8W 2.7kΩ	+5%
RCE0638	437	Carbon 1/8W 2.7kΩ	+5%
RCE0653	438	Carbon 1/8W 47kΩ	+5%
RCE0653	439	Carbon 1/8W 47kΩ	+5%
RCE0610	440	Carbon 1/8W 22Ω	+5%
RCE0633	441	Carbon 1/8W 1kΩ	+5%
RCE0653	442	Carbon 1/8W 47kΩ	+5%
RCE0635	444	Carbon 1/8W 1.5kΩ	+5%
RCE0645	445	Carbon 1/8W 10kΩ	+5%
RCE0638	446	Carbon 1/8W 2.7kΩ	+5%
RCE0606	448	Carbon 1/8W 10Ω	+5%
RCE0606	449	Carbon 1/8W 10Ω	+5%

Part Code	Symbol	Description				Remarks
RCE0631	R 461	Carbon	1/8W	680Ω	+5%	
RSE0434	462	Solid	1/4W	10MΩ	+5%	
RCE0633	463	Carbon	1/8W	1kΩ	+5%	
RCE0637	464	Carbon	1/8W	2.2kΩ	+5%	
RCE0645	501	Carbon	1/8W	10kΩ	+5%	
RCE0636	502	Carbon	1/8W	1.8kΩ	+5%	
RCE0647	503	Carbon	1/8W	15kΩ	+5%	
RCE0641	504	Carbon	1/8W	4.7kΩ	+5%	
RCE0645	505	Carbon	1/8W	10kΩ	+5%	
RCE0639	506	Carbon	1/8W	3.3kΩ	+5%	
RCE0620	507	Carbon	1/8W	100Ω	+5%	
RCE0620	508	Carbon	1/8W	100Ω	+5%	
RCE0653	509	Carbon	1/8W	47kΩ	+5%	
RCE0645	510	Carbon	1/8W	10kΩ	+5%	
RCE0628	511	Carbon	1/8W	470Ω	+5%	
RCE0644	512	Carbon	1/8W	8.2kΩ	+5%	
RCE0643	538	Carbon	1/8W	6.8kΩ	+5%	
RCE0624	539	Carbon	1/8W	220Ω	+5%	
RCE0644	544	Carbon	1/8W	8.2kΩ	+5%	
RCE0606	715	Carbon	1/8W	10Ω	+5%	
<u>Var. Resistors</u>						
RNT0239	RV 406	Metal	TM64K (PH)	2kΩ		
RDE0003	418	Carbon	EVH-Y13K20B14			
<u>Coil</u>						
TLE0084	L 432	EL0606	1μH		+10%	
<u>Capacitors</u>						
CCD0281	C 401	Ceramic	500V	33 pF	+5%	
CCD0282	402	Ceramic	500V	47 pF	+5%	
CQX0068	403	Plastic	400V	0.047μF	+20%	
CCC1029	404	Ceramic	50V	1000 pF	+80% -20%	
CCC1029	406	Ceramic	50V	1000 pF	+80% -20%	
GEC0176	408	Al Elyc	25V	10μF	NP	
CCD0282	412	Ceramic	500V	47 pF	+5%	
CCC1160	415	Ceramic	50V	330 pF	+10%	
CCC1034	416	Ceramic	50V	68 pF	+10%	
CCC1030	417	Ceramic	50V	10000 pF	+80% -20%	
CQA0101	424	Plastic	50V	47000 pF	+10%	
CES0036	425	Al Elyc	25V	22μF	+20%	
CET0031	442	Al Elyc	50V	1μF		
CES0032	444	Al Elyc	25V	47μF	+20%	
CCC1030	446	Ceramic	50V	10000 pF	+20%	
CCC1030	450	Ceramic	50V	10000 pF	+10%	
CQA0091	451	Plastic	50V	1000 pF	+10%	
CES0036	461	Al Elyc	25V	22μF	+20%	
CES0029	462	Al Elyc	10V	100μF	+20%	
CES0036	463	Al Elyc	25V	22μF	+20%	
CES0040	501	Al Elyc	50V	10μF	+20%	
CCC1030	506	Ceramic	50V	10000 pF	+80% -20%	
CCC1014	507	Ceramic	50V	47 pF	+5%	
CQA0103	513	Plastic	50V	0.1μF	+10%	
CCC1030	589	Ceramic	50V	10000 pF	+80% -20%	
CCC1030	590	Ceramic	50V	10000 pF	+80% -20%	

Part Code	Symbol	Description				Remarks
CCC1030	C 791	Ceramic	50V	10000 pF	+80% -20%	
CCC1030	792	Ceramic	50V	10000 pF	+80% -20%	
<u>Diodes</u>						
HDM0051	D 401	MA161				
HDS0108	407	1S2075				
HDS0108	409	1S2075				
HDS0108	411	1S2075				
HDS0108	412	1S2075				
HDS0108	413	1S2075				
HDS0108	414	1S2075				
HDS0108	501	1S2075				
HDS0108	502	1S2075				
HDS0108	503	1S2075				
HDS0108	507	1S2075				
HDS0108	508	1S2075				
HDS0108	509	1S2075				
HDS0108	510	1S2075				
HDS0108	511	1S2075				
HDS0108	519	1S2075				
HDS0108	712	1S2075				
<u>Transistors</u>						
HTK0068	TR 401	2SK106C				
HTC0167	402	2SC535-B				
HTC0167	404	2SC535-B				
HTC0167	405	2SC535-B				
HTC0167	406	2SC535-B				
HTA0224	407	2SA1029 D				
HTC0148	501	2SC458-C				
HTC0148	502	2SC458-C				
HTC0148	507	2SC458-C				
<u>IC's</u>						
IDH0402	IC 402	HD74S00				
IDH0467	403	HD74LS00P				
IDH0428	501	HD74S74				
IDH0467	503	HD74LS00P				
IDH0467	602	HD74L00P				
IDH0428	701	HD74S74				
<u>Switches</u>						
8374067	S 401	Lever	SLR02402			
8374067	402	Lever	SLR02402			
8374067	403	Lever	SLR04401			
<u>Connectors</u>						
JBX0470	P 401	171825-6				
JBX0468	403	171825-3				
JBX0468	406	171825-3				
JBX0470	408	171825-6				
JBX0470	501	171825-6				
JBX0470	701	171825-6				
JBX0468	545	171825-3				
JBX0468	546	171825-3				
JBX0468	1302	171825-3				

Part Code	Symbol	Description	Remarks
119585	PEF565	PCB PB-11	
<u>Resistors</u>			
RCE0648	R 1202	Carbon 1/8W 18k Ω $\pm 5\%$	
RCE0655	1203	Carbon 1/8W 68k Ω $\pm 5\%$	
RCE0657	1204	Carbon 1/8W 100k Ω $\pm 5\%$	
RCE0658	1205	Carbon 1/8W 150k Ω $\pm 5\%$	
RME0941	1207	Metal 1/8W 3.32k Ω $\pm 1\%$	
RME0928	1208	Metal 1/8W 267 Ω $\pm 1\%$	
RCE0647	1206	Carbon 1/8W 15k Ω $\pm 5\%$	
<u>Capacitors</u>			
CQA0099	C 1203	Plastic 50V 22000 pF $\pm 10\%$	
	1203B	Not Used	
<u>Transistors</u>			
HTC0148	TR 1201	2SC458-C-	
HTC0148	1202	2SC458-C-	
HTA0224	1203	2SA1029 D	
<u>Var. Resistors</u>			
RNT0237	RV 1207	Metal TM64K (PH) 1k Ω	
<u>Connector</u>			
JBX0468	P 1209	171825-3	
<u>Resistors</u>			
RCE0644	R 545	Carbon 1/8W 8.2k Ω $\pm 5\%$	
RCE0628	595	Carbon 1/8W 470 Ω $\pm 5\%$	
RME0943	596	Metal 1/8W 4.75k Ω $\pm 5\%$	
RME0936	597	Metal 1/8W 1.21k Ω $\pm 5\%$	
RCE0626	599	Carbon 1/8W 330 Ω $\pm 5\%$	
<u>Var. Carbon</u>			
8374077	RV 544	Carbon PR(P)124S65 100k Ω	
8374077	545	Carbon PR(P)124S65 5k Ω	
8376778	618	Carbon V16L4G3-1S20KG-(B20K+102Z)	
8374088	1302	Carbon V12LG3N10SB (20K+20K)	
<u>Transistors</u>			
HTC0148	TR 1302	2SC458-C-	
HTA0224	TR 1303	2SA1029 D	
<u>Switches</u>			
8376780	S 404	PB SPJ222T (Nonlock)	
8376780	601	PB SPJ222N (Lock)	
<u>Resistors</u>			
RCE0645	R 618	Carbon 1/8W 10k Ω $\pm 5\%$	
RCE0638	617	Carbon 1/8W 2.7k Ω $\pm 5\%$	
RCE0628	616	Carbon 1/8W 470 Ω $\pm 5\%$	
RCE0641	615	Carbon 1/8W 4.7k Ω $\pm 5\%$	
RCE0620	606	Carbon 1/8W 100 Ω $\pm 5\%$	
RCE0638	621	Carbon 1/8W 2.7k Ω $\pm 5\%$	
RCE0631	628	Carbon 1/8W 680 Ω $\pm 5\%$	
RCE0633	627	Carbon 1/8W 1k Ω $\pm 5\%$	
RCE0612	629	Carbon 1/8W 33 Ω $\pm 5\%$	
RCE0638	630	Carbon 1/8W 2.7k Ω $\pm 5\%$	
RCE0606	623	Carbon 1/8W 10 Ω $\pm 5\%$	
RCE0653	635	Carbon 1/8W 47k Ω $\pm 5\%$	
RCE0653	636	Carbon 1/8W 47k Ω $\pm 5\%$	

Part Code	Symbol	Description	Remarks
RCE0638	R 632	Carbon 1/8W 2.7k Ω $\pm 5\%$	
RCE0638	631	Carbon 1/8W 2.7k Ω $\pm 5\%$	
RCE0606	633	Carbon 1/8W 10 Ω $\pm 5\%$	
RCE0620	713	Carbon 1/8W 100 Ω $\pm 5\%$	
RCE0620	714	Carbon 1/8W 100 Ω $\pm 5\%$	
<u>Capacitors</u>			
CET0031	C 604	Al Elyc 50V 1 μ F	
CCC1030	605	Ceramic 50V 10000 pF $\pm 80\%$ $\pm 20\%$	
CES0036	623	Al Elyc 25V 22 μ F $\pm 20\%$ $\pm 80\%$ $\pm 20\%$	
CCC1030	633	Ceramic 50V 10000 pF $\pm 80\%$ $\pm 20\%$	
<u>Coil</u>			
TLE0084	L 628	EL0606 1 μ H $\pm 10\%$	
<u>Transistors</u>			
HTC0167	TR 602	2SC535-B-	
HTC0167	604	2SC535-B-	
HTC0167	605	2SC535-B-	
<u>IC</u>			
IDH0402	IC 601	HD74S00	
<u>Diodes</u>			
HDS0108	D 605	1S2075	
HDS0108	607	1S2075	
HDS0108	609	1S2075	
HDS0108	610	1S2075	

PEF-566 SWEEP

Part Code	Symbol	Description	Remarks
RCE0637	R 513	Carbon 1/8W 2.2k Ω $\pm 5\%$	
RCE0641	514	Carbon 1/8W 4.7k Ω $\pm 5\%$	
RCE0649	515	Carbon 1/8W 22k Ω $\pm 5\%$	
RCE0649	516	Carbon 1/8W 22k Ω $\pm 5\%$	
RCE0626	527	Carbon 1/8W 330 Ω $\pm 5\%$	
RCE0620	529	Carbon 1/8W 100 Ω $\pm 5\%$	
RME0937	531	Metal 1/8W 1.50k Ω $\pm 1\%$	
RME0940	532	Metal 1/8W 2.67k Ω $\pm 1\%$	
RCE0641	533	Carbon 1/8W 4.7k Ω $\pm 5\%$	
RCE0606	534	Carbon 1/8W 10 Ω $\pm 5\%$	
RCE0606	535	Carbon 1/8W 10 Ω $\pm 5\%$	
RCE0624	526	Carbon 1/8W 220 Ω $\pm 5\%$	
RCE0655	544	Carbon 1/8W 68k Ω $\pm 5\%$	
RCE0620	546	Carbon 1/8W 100 Ω $\pm 5\%$	
RCE0620	547	Carbon 1/8W 12k Ω $\pm 5\%$	
RCE0641	548	Carbon 1/8W 4.7k Ω $\pm 5\%$	
RME0931	549	Metal 1/8W 475 Ω $\pm 1\%$	
RCE0633	550	Carbon 1/8W 1k Ω $\pm 5\%$	
RCE0633	551	Carbon 1/8W 1k Ω $\pm 5\%$	

Part Code	Symbol	Description	Remarks
RCE0620	R 552	Carbon 1/8W 100Ω ±5%	
RCE0633	553	Carbon 1/8W 1kΩ ±5%	
RCE0628	543	Carbon 1/8W 470Ω ±5%	
RCE0639	554	Carbon 1/8W 3.3kΩ ±5%	
RSE0434	570	Solid 1/4W 10MΩ ±5%	
RCE0633	556	Carbon 1/8W 1kΩ ±5%	
RCE0640	557	Carbon 1/8W 3.9kΩ ±5%	
RCE0628	558	Carbon 1/8W 470Ω ±5%	
RCE0647	559	Carbon 1/8W 15kΩ ±5%	
RMS0023	562	Metal 1/4W 1.43MΩ ±0.5%	
RMS0024	563	Metal 1/4W 715kΩ ±0.5%	
RME0699	564	Metal 1/4W 429kΩ ±0.5%	
RME0718	565	Metal 1/4W 143kΩ ±0.5%	
RME0717	566	Metal 1/4W 71.5kΩ ±0.5%	
RME0717	567	Metal 1/4W 71.5kΩ ±0.5%	
RME0700	568	Metal 1/4W 17.8kΩ ±5%	
RME0700	569	Metal 1/4W 17.8kΩ ±5%	
RCE0634	571	Carbon 1/8W 1.2kΩ ±5%	
RCE0635	572	Carbon 1/8W 1.5kΩ ±5%	
RCE0645	573	Carbon 1/8W 10kΩ ±5%	
RCE0633	574	Carbon 1/8W 1kΩ ±5%	
RCE0644	575	Carbon 1/8W 8.2kΩ ±5%	
RCE0643	576	Carbon 1/8W 6.8kΩ ±5%	
RCE0645	577	Carbon 1/8W 10kΩ ±5%	
RCE0637	578	Carbon 1/8W 2.2kΩ ±5%	
RCE0653	581	Carbon 1/8W 47kΩ ±5%	
RCE0631	669A	Carbon 1/8W 680kΩ ±5%	
RCE0653	582	Carbon 1/8W 47kΩ ±5%	
RCE0653	583	Carbon 1/8W 47kΩ ±5%	
RCE0653	584	Carbon 1/8W 47kΩ ±5%	
RCE0653	585	Carbon 1/8W 47kΩ ±5%	
RCE0645	586	Carbon 1/8W 10kΩ ±5%	
RCE0645	587	Carbon 1/8W 10kΩ ±5%	
RME0943	588	Metal 1/8W 4.75kΩ ±1%	
RME0672	589	Metal 1/8W 4.75kΩ ±1%	
RCE0645	590	Carbon 1/8W 10kΩ ±5%	
RCE0643	591	Carbon 1/8W 6.8kΩ ±5%	
<u>Capacitors</u>			
CCC1007	C 514	Ceramic 50V 22 pF ±5%	
CCC1004	523	Ceramic 50V 15 pF ±5%	
CCC0997	524	Ceramic 50V 3 pF ±0.25pF	
CES0036	525	Al Elyc 25V 22μF ±20%	
CES0036	526	Al Elyc 25V 22μF ±20%	
CCC1025	536	Ceramic 50V 100 pF ±10%	
CCC1014	543	Ceramic 50V 47 pF ±10%	
CES0037	544	Al Elyc 50V 1μF ±20%	
CES0036	548	Al Elyc 25V 22μF ±20%	
CCC1030	556	Ceramic 50V 10000 pF ±80% -20%	
CCC1014	557	Ceramic 50V 47 pF ±5%	
CCC1027	558	Ceramic 50V 220 pF ±10%	
CCC1025	559	Ceramic 50V 100 pF ±10%	
CES0036	560	Al Elyc 25V 22μF ±20%	
3142077	561	Plastic 1MF+0.01MF D 100V	
CQA0091	562	Plastic 50V 1000 pF ±10%	
3142077	563	Plastic 1MF+0.01MF D 100V	
CCC1014	564	Ceramic 50V 47 pF ±5%	
CES0040	565	Al Elyc 50V 10μF ±20%	
CET0031	566	Al Elyc 50V 1μF	
CQA0103	567	Plastic 50V 0.1μF ±10%	
CQA0097	568	Plastic 50V 10000 pF ±10%	
CQA0091	569	Plastic 50V 1000 pF ±10%	
CCC1025	570	Ceramic 50V 100 pF ±10%	

Part Code	Symbol	Description	Remarks
CCC1030	C 571	Ceramic 50V 10000 pF +80% -20%	
CCC1030	577	Ceramic 50V 10000 pF +80% -20%	
CCC1030	582	Ceramic 50V 10000 pF +80% -20%	
CCC1030	583	Ceramic 50V 10000 pF +80% -20%	
CCC1030	588	Ceramic 50V 10000 pF +80% -20%	
CCC1025	591	Ceramic 50V 100 pF ±10%	
CCC1030	592	Ceramic 50V 10000 pF +80% -20%	
CEC0213	596	Al Elyc 160V 1μF	
CES0036VA	597	Al Elyc 25V 22μF ±20%	
CES0029	598	Al Elyc 10V 100μF ±20%	
CES0036	599	Al Elyc 25V 22μF ±20%	
<u>Var. Resistors</u>			
RNT0237	RV 550	Metal TM64K(PH) 1kΩ	
RNT0238	551	Metal TM64K(PH) 10kΩ	
RNT0238	590	Metal TM64K(PH) 10kΩ	
8348450	591	Metal CR29R 470Ω	
<u>Var. Capacitors</u>			
CVE0026	CV 564	ECV-1Z20x60	
CVE0026	564	ECV-1Z20x60	
<u>Coil</u>			
TLE0058	L 558	EL0606 10μH ±10%	
<u>Diodes</u>			
HDM0051	D 504	MA161	
HDM0051	505	MA161	
HDM0051	506	MA161	
HDS0108	512	1S2075	
HDS0108	513	1S2075	
HDS0108	514	1S2075	
HDS0108	515	1S2075	
HDS0108	516	1S2075	
HDS0108	517	1S2075	
HDS0108	518	1S2075	
<u>Transistors</u>			
HTC0167	TR 505	2SC535-B-	
HTC0148	506	2SC458-C-	
<u>Transistors</u>			
HTA0224	TR 509	2SA1029 D	
HTA0224	510	2SA1029 D	
HTC0148	511	2SC458-C-	
<u>IC's</u>			
IDH0646	IC 504	Digital HD74LS02P	
IDH0802	505	Digital HD14053BP	
IDH0802	506	Digital HD14053BP	
ILT0052	507	Analog TL080CP	
<u>Switches</u>			
8374081	S 501	Rotary S21P 3320/2214	
8374067	502	Lever SLR02402	
<u>Resistors</u>			
RCE0637	R 701	Carbon 1/8W 2.2kΩ ±5%	
RCE0641	702	Carbon 1/8W 4.7kΩ ±5%	
RCE0649	703	Carbon 1/8W 22kΩ ±5%	

Part Code	Symbol	Description	Remarks
RCE0620	R 716	Carbon 1/8W 100Ω ±5%	
RME0937	717	Metal 1/8W 1.50kΩ ±1%	
RME0940	718	Metal 1/8W 2.67kΩ ±1%	
RCE0649	706	Carbon 1/8W 22kΩ ±5%	
RCE0626	721	Carbon 1/8W 330Ω ±5%	
RCR3036	720	Carbon 1/4W 220Ω ±5%	
RMS0023	726	Metal 1/4W 1.43MΩ ±5%	
RMS0024	727	Metal 1/4W 715kΩ ±0.5%	
RMS0024	728	Metal 1/4W 715kΩ ±0.5%	
RME0718	729	Metal 1/4W 143kΩ ±0.5%	
RME0717	730	Metal 1/4W 71.5kΩ ±0.5%	
RME0717	731	Metal 1/4W 71.5kΩ ±0.5%	
RSE0434	732	Solid 1/4W 10MΩ ±5%	
RCE0640	734	Carbon 1/8W 3.9kΩ ±5%	
RME0700	736	Metal 1/4W 17.8kΩ ±0.5%	
RME0700	737	Metal 1/4W 17.8kΩ ±0.5%	
RCE0628	737A	Carbon 1/8W 470Ω ±5%	
RME0717	738	Metal 1/4W 71.5kΩ ±0.5%	
<u>Capacitors</u>			
CCC1007	C 701	Ceramic 50V 22 pF ±5%	
CCC1025	721	Ceramic 50V 100 pF ±10%	
CCC0997	724	Ceramic 50V 3 pF ±0.25pF	
CES0036	726	Al Elyc 25V 22μF ±20%	
CQA0097	728	Plastic 50V 10000 pF ±10%	
CCC1014	729	Ceramic 50V 47 pF ±5%	
CCC1004	723	Ceramic 50V 15 pF ±5%	
<u>Diodes</u>			
HDM0051	D 701	MA161	
HDM0051	702	MA161	
HDM0051	703	MA161	
<u>Var. Resistor</u>			
RNT0237	RV 734	Metal TM64K (PH) 1kΩ	
<u>Var. Capacitors</u>			
CVE0026	CV 701	ECV-1ZW20X60	
CVE0026	729	ECV-1ZW20X60	
<u>Transistors</u>			
HTC0148	TR 704	2SC458-C	
HTC0167	705	2SC535-B	
<u>IC's</u>			
IDH0467	IC 702	Digital HD74LS00P	
ILT0052	703	Analog TL080CP	
<u>Resistors</u>			
RCE0633	R 593	Carbon 1/8W 1kΩ ±5%	
RCE0657	594	Carbon 1/8W 100kΩ ±5%	
RCE0645	598	Carbon 1/8W 10kΩ ±5%	
RME0944	801	Metal 1/8W 5.62kΩ ±1%	
RME0665	804	Metal 1/4W 1.21kΩ ±1%	
RCE0614	805	Carbon 1/8W 47Ω ±5%	
RCE0614	806	Carbon 1/8W 47Ω ±5%	
RME0939	820	Metal 1/8W 2.21kΩ ±1%	
RME0939	821	Metal 1/8W 2.21kΩ ±1%	
RME0666	822	Metal 1/4W 1.50kΩ ±1%	
RME0666	823	Metal 1/4W 1.50kΩ ±1%	
RCE0614	824	Carbon 1/8W 47Ω ±5%	
RCE0614	825	Carbon 1/8W 47Ω ±5%	
RCE0637	826	Carbon 1/8W 2.2kΩ ±5%	

Part Code	Symbol	Description	Remarks
RCE0637	R 827	Carbon 1/8W 2.2kΩ ±5%	
RCE0614	891	Carbon 1/8W 47Ω ±5%	
RCE0610	892	Carbon 1/8W 22Ω ±5%	
<u>Capacitors</u>			
CCC1030	C 593	Ceramic 50V 10000 pF +80/-20%	
CCC1133	820	Ceramic 50V 1 pF ±0.25pF	
CCC1133	821	Ceramic 50V 1 pF ±0.25pF	
CES0036	822	Al Elyc 25V 22μF ±20%	
CES0036	830	Al Elyc 25V 22μF ±20%	
<u>Transistors</u>			
HTC0148	TR 822	2SC458-C	
HTC0148	823	2SC458-C	
HTA0224	824	2SA1029 D	
HTA0224	825	2SA1029 D	
<u>Var. Resistor</u>			
3142080	RV 552	16Type 10KB+50KB With SW	
<u>Connectors</u>			
JBX0468	P 507	171825-3	
JBX0468	701	171825-3	
JBX0468	511	171825-3	
JBX0470	502	171825-6	
JBX0470	503	171825-6	
JBX0470	504	171825-6	
JBX0468	505	171825-3	
JBX0468	506	171825-3	
JBX0468	508	171825-3	
JBX0468	509	171825-3	
JBX0468	510	171825-3	
JBX0470	702	171825-6	
119585	PEF-566	PB-11	
JBX0468	P 1401	Connector 171825-3	
HDS0408	1401	Diode SR503D With Mount (RED)	
JBX0470	P 512	Connector 171825-6	
JBX0470	513	Connector 171825-6	

PEF-560 H. LV. HV

Part Code	Symbol	Description	Remarks
<u>Resistors</u>			
RME0951	R 828	Metal 1/8W 22.1kΩ ±1%	
RME0951	829	Metal 1/8W 22.1kΩ ±1%	
RCE0637	830	Carbon 1/8W 2.2kΩ ±5%	
RCE0622	831	Carbon 1/8W 150Ω ±5%	
RCE0606	838	Carbon 1/8W 10Ω ±5%	
RCE0635	839	Carbon 1/8W 1.5kΩ ±5%	
RME0951	840	Metal 1/8W 22.1kΩ ±1%	

Part Code	Symbol	Description	Remarks
RME0951	R 841	Metal 1/8W 22.1kΩ ±1%	
RME0939	842	Metal 1/8W 2.21kΩ ±1%	
RME0939	843	Metal 1/8W 2.21kΩ ±1%	
RME0683	844A	Metal 1/4W 39.2kΩ ±1%	
RME0683	844B	Metal 1/4W 39.2kΩ ±1%	
RCE0636	846	Carbon 1/8W 1.8kΩ ±5%	
RCE0636	847	Carbon 1/8W 1.8kΩ ±5%	
RCE0657	848	Carbon 1/8W 100kΩ ±5%	
RCE0657	849	Carbon 1/8W 100kΩ ±5%	
RCE0645	850	Carbon 1/8W 10kΩ ±5%	
RCE0645	851	Carbon 1/8W 10kΩ ±5%	
RCE0631	852	Carbon 1/8W 680Ω ±5%	
RCE0631	853	Carbon 1/8W 680Ω ±5%	
RME0683	845A	Metal 1/4W 39.2kΩ ±1%	
RME0683	845B	Metal 1/4W 39.2kΩ ±1%	
RCE0620	856	Carbon 1/8W 100Ω ±5%	
RCE0620	857	Carbon 1/8W 100Ω ±5%	
RCE0606	858	Carbon 1/8W 10Ω ±5%	
RCE0645	832	Carbon 1/8W 10kΩ ±5%	
RCE0606	859	Carbon 1/8W 10Ω ±5%	
RCE0659	860	Carbon 1/8W 220kΩ ±5%	
RCE0606	862	Carbon 1/8W 10Ω ±5%	
RCE0606	863	Carbon 1/8W 10Ω ±5%	
<u>Var. Resistors</u>			
RNT0235	RV 829	Metal TM64K(PH) 5kΩ	
RNT0237	830	Metal TM64K(PH) 1kΩ	
RNT0234	831	Metal TM64K(PH) 200Ω	
<u>Capacitors</u>			
CCC1027	C 832	Ceramic 50V 220 pF ±10%	
CCC0111	844	Ceramic 500V 0.5 pF ±0.25pF	
CCC0111	845	Ceramic 500V 0.5 pF ±0.25pF	
CCD0287	846	Ceramic 500V 4700 pF +100% -0%	
CCD0287	847	Ceramic 500V 4700 pF +100% -0%	
CCD0287	854	Ceramic 500V 4700 pF +100% -0%	
CCD0287	855	Ceramic 500V 4700 pF +100% -0%	
CCC1034	860	Ceramic 50V 68 pF ±10%	
CEC0213	855B	Al Elyc 160V 1μF	
<u>Diodes</u>			
HDS0108	D 852	1S2075	
HDS0108	853	1S2075	
<u>Transistors</u>			
HTA0224	TR 828	2SA1029 D	
HTA0224	829	2SA1029 D	
HTA0224	840	2SA1029 D	
HTA0224	841	2SA1029 D	
HTA0099	846	2SA781K	
HTA0099	847	2SA781K	
HTA0258	852	2SA1210S	
HTA0258	853	2SA1210S	
HTC0669	856	2SC2912S	
HTC0669	857	2SC2912S	
<u>Connector</u>			
JBX0470	P 828	171825-6	

Part Code	Symbol	Description	Remarks
<u>Resistors</u>			
RME0943	R 901	Metal 1/8W 4.75kΩ ±1%	
RME0941	902	Metal 1/8W 3.32kΩ ±1%	
RCE0656	903	Carbon 1/8W 82kΩ ±5%	
RCE0635	904	Carbon 1/8W 1.5kΩ ±5%	
RCE0659	906	Carbon 1/8W 220kΩ ±5%	
RCE0647	907	Carbon 1/8W 15kΩ ±5%	
RCE0634	908	Carbon 1/8W 1.2kΩ ±5%	
RCE0624	910	Carbon 1/8W 220Ω ±5%	
RCE0610	911	Carbon 1/8W 22Ω ±5%	
RCE0620	912	Carbon 1/8W 100Ω ±5%	
RCE0637	913	Carbon 1/8W 2.2kΩ ±5%	
RCE0638	921	Carbon 1/8W 2.7kΩ ±5%	
RCE0649	931	Carbon 1/8W 22kΩ ±5%	
RCE0653	932	Carbon 1/8W 47kΩ ±5%	
RMV0005	935	Metal 1/2W 10MΩ ±5%	
RCR3476	936	Carbon 1/2W 1.8MΩ ±5%	
RCR4279	1016	Carbon RD50S 2.2MΩ ±5%	
<u>Capacitors</u>			
CES0036	C 902	Al Elyc 25V 22μF ±20%	
CCC0111	905	Ceramic 500V 0.5 pF ±0.25pF	
CCD0287	906	Ceramic 500V 4700 pF +100% -0%	
CCD0287	911	Ceramic 500V 4700 pF +100% -0%	
CCD0282	913	Ceramic 500V 47 pF ±5%	
<u>Diodes</u>			
HDS0108	D 901	1S2075	
HDS0108	902	1S2075	
HDS0108	908	1S2075	
<u>Transistors</u>			
HTC0192	TR 901	2SC641K-C	
HTC0167	904	2SC535-B	
HTC0669	905	2SC2912S	
HTA0258	908	2SA1210S	
HTA0104	936	2SA778A K	
<u>Resistors</u>			
RME0683	R 905A	Metal 1/4W 39.2kΩ ±1%	
RME0683	905B	Metal 1/4W 39.2kΩ ±1%	
<u>Connectors</u>			
JBX0468	P 901	171825-3	
JBX0468	902	171825-3	
JBX0468	903	171825-3	
<u>Capacitors</u>			
CQA0103	C 1001	Plastic 50V 0.1μF ±10%	
CES0033	1002	Al Elyc 25V 100μF ±20%	
CQA0101	1005	Plastic 50V 4700 pF ±10%	
CCD0231	1012	Ceramic 2000V 4700 pF +80% -20%	
CCD0231	1013	Ceramic 2000V 4700 pF +80% -20%	
CCD0231	1014	Ceramic 2000V 4700 pF +80% -20%	
CCD0245	1016	Ceramic 2000V 100 pF ±10%	
CCD0286	1020	Ceramic 500V 1000 pF +100% -0%	
CEC0213	1021	Al Elyc 160V 1μF	
CCD0231	1023	Ceramic 2000V 4700 pF +80% -20%	

Part Code	Symbol	Description	Remarks
CCD0231	C 1025	Ceramic 2000V 4700 pF $\begin{matrix} +80\% \\ -20\% \end{matrix}$	
		<u>Resistors</u>	
RMS0024	R 1001B	Metal 1/4W 715k Ω $\pm 0.5\%$	
RCE0649	1002	Carbon 1/8W 22k Ω $\pm 5\%$	
RCE0631	1003	Carbon 1/8W 680k Ω $\pm 5\%$	
RCE0635	1004	Carbon 1/8W 1.5k Ω $\pm 5\%$	
RCE0614	1006	Carbon 1/8W 47 Ω $\pm 5\%$	
RCE0606	1001	Carbon 1/8W 10 Ω $\pm 5\%$	
RCE0645	1014	Carbon 1/8W 10k Ω $\pm 5\%$	
RMV0004	1015	Metal 1/2W 22.1M Ω $\pm 1\%$	
RCE0660	1020	Carbon 1/8W 330k Ω $\pm 1\%$	
RSE0434	1034	Solid 1/4W 10M Ω $\pm 5\%$	
		<u>Var. Resistor</u>	
RNT0241	RV 1021	Metal TM64K(PH) 200k Ω	
		<u>Diodes</u>	
HDY0031	D 1013	Y10GA	
HDH0072	1020	HZ22	
HDS0250	1021	1SS83	
HDS0250	1022	1SS83	
HDS0250	1023	1SS83	
HDS0250	1024	1SS83	
		<u>Transistors</u>	
HTK0081	TR 1001	2SK304E	
HTA0224	1002	2SA1029 D	
HTC0032	1006	2SC1061-C	
		<u>Lamps</u>	
ELL0019	NL 1024	NE-2	
ELL0019	NL 1025	NE-2	
		<u>Connector</u>	
JBX0468	P 904	171825-3	
3142165	T 1001	XFMR D#3142165	
8374083	MUT1001	Multiplier 10kV(with anode cap)	
EF1.0016	F 1001	Fuse FR-11125V 1A	
		<u>Resistor</u>	
RCE0628	R 1401	Carbon 1/8W 470 Ω $\pm 5\%$	
		<u>Capacitor</u>	
CCD0287	C 1041	Ceramic 500V 4700 pF $\begin{matrix} +100\% \\ -0\% \end{matrix}$	
JBX0468	P 1401	Connector 171825-3	
		<u>Var. Resistors</u>	
RNT0241	1041	Metal TM64K(PH) 200k Ω	
RNT0241	1042	Metal TM64K(PH) 200k Ω	
		<u>Diodes</u>	
HDV0019	D 1101	V06C	
HDS0250	1113	1SS83	
HDH0019	1147	Zenner HZ12(B)	
HDF0041	1161	F114B	
HDF0041	1162	F114B	

Part Code	Symbol	Description	Remarks
HDF0041	D 1163	F114B	
HDF0041	1164	F114B	
HDF0041	1165	F114B	
HDF0041	1166	F114B	
HDF0041	1173	F114B	
		<u>IC's</u>	
ILH0119	IC 1102	Analog HA17903PS	
ILH0120	1103	Analog HA17904PS	
ILM0319	1101	UPC1042C	
		<u>Transistors</u>	
HTC0054	TR 1110	2SC1212AC	
HTC0670	1112	2SC2334L	
HTC0054	1141	2SC1212AC	
HTC0054	1146	2SC1212AC	
HTC0148	1102	2SC458-C	
HTA0083	1107	2SA673AC	
		<u>Capacitors</u>	
CQA0097	C 1102	Plastic 50V 10000 pF $\pm 10\%$	
CCC1027	1104	Ceramic 50V 220 pF $\pm 10\%$	
CQA0092	1106	Plastic 50V 1500 pF $\pm 10\%$	
CES0147	1110	Al Elyc 50V 330 μ F $\pm 20\%$	
CQA0037	1113	Plastic 250V 10000 pF $\pm 10\%$	
CES0036	1114	Al Elyc 25V 22 μ F $\pm 20\%$	
CQA0092	1115	Plastic 50V 1500 pF $\pm 10\%$	
CES0040	1118	Al Elyc 50V 10 μ F $\pm 20\%$	
CQA0103	1030	Plastic 50V 0.1 μ F $\pm 10\%$	
CES0040	1122	Al Elyc 50V 10 μ F $\pm 20\%$	
CES0037	1130	Al Elyc 50V 1 μ F	
CQA0092	1133	Plastic 50V 1.500 pF $\pm 10\%$	
CQA0091	1134	Plastic 50V 1000 pF $\pm 10\%$	
CQA0095	1135	Plastic 50V 47000 pF $\pm 10\%$	
CES0036	1141	Al Elyc 25V 22 μ F $\pm 20\%$	
CES0036	1142	Al Elyc 25V 22 μ F $\pm 20\%$	
CES0033	1151	Al Elyc 25V 100 μ F $\pm 20\%$	
CES0036	1146	Al Elyc 25V 22 μ F $\pm 20\%$	
	1149	Not Used	
CES0033	1147	Al Elyc 25V 100 μ F $\pm 20\%$	
CES0145	1162	Al Elyc 50V 100 μ F $\pm 20\%$	
CES0145	1163	Al Elyc 50V 100 μ F $\pm 20\%$	
CES0145	1164	Al Elyc 50V 100 μ F $\pm 20\%$	
CES0145	1165	Al Elyc 50V 100 μ F $\pm 20\%$	
CES0145	1166	Al Elyc 50V 100 μ F $\pm 20\%$	
CEK0066	1161	Al Elyc 63V 33 μ F $\pm 20\%$	
CEK0066	1167	Al Elyc 63V 33 μ F $\pm 20\%$	
CES0033	1168	Al Elyc 25V 100 μ F $\pm 20\%$	
CEK0065	1173	Al Elyc 100V 10 μ F $\pm 20\%$	
CEK0065	1174	Al Elyc 100V 10 μ F $\pm 20\%$	
CQA0099	1182	Plastic 50V 22000 pF $\pm 10\%$	
		<u>Coils</u>	
TLF0034	L 1161	FL-5H 220 μ H $\pm 10\%$	
TLF0004	1162	FL7H 100 μ H $\pm 10\%$	
TLF0004	1163	FL7H 100 μ H $\pm 10\%$	
TLF0004	1141	FL7H 100 μ H $\pm 10\%$	
TLF0004	1147	FL7H 100 μ H $\pm 10\%$	

Part Code	Symbol	Description	Remarks
TLE0020	L 1173	FL-7H 1μH ±5%	
TLE0063	1114	FL0606 33μH ±10%	
TLS0016	1117	SN-8S-400	
TLE0063	1030	EL0606 33μH ±10%	
<u>Resistors</u>			
RCE0645	R 1101	Carbon 1/8W 10kΩ ±5%	
RME0947	1102	Metal 1/8W 10kΩ ±1%	
RME0947	1103	Metal 1/8W 10kΩ ±1%	
RME0948	1104	Metal 1/8W 12.1kΩ ±1%	
RME0702	1105	Metal 1/4W 200kΩ ±0.5%	
RCE0649	1106	Carbon 1/8W 22kΩ ±5%	
RCE0620	1107	Carbon 1/8W 100Ω ±5%	
RCE0626	1108	Carbon 1/8W 330Ω ±5%	
RMR2766	1110	Metal RSF1B 22Ω	
RCE0610	1112	Carbon 1/8W 22Ω ±5%	
RCR3016	1113	Carbon 1/4W 33Ω ±5%	
RCE0614	1115	Carbon 1/8W 47Ω ±5%	
RCR3016	1114A	Carbon 1/4W 33Ω ±5%	
RCR3016	1114B	Carbon 1/4W 33Ω ±5%	
RCR3016	1114C	Carbon 1/4W 33Ω ±5%	
RCE0617	1118	Carbon 1/8W 68Ω ±5%	
RME0954	1119	Metal 1/8W 39.2kΩ ±1%	
RME0949	1120	Metal 1/8W 15.0kΩ ±1%	
RCE0657	1121	Carbon 1/8W 100kΩ ±5%	
RME0949	1122	Metal 1/8W 15.0kΩ ±1%	
RCE0637	1123	Metal 1/8W 2.2kΩ ±1%	
RME0947	1124	Metal 1/8W 15.0kΩ ±1%	
RCE0647	1125	Carbon 1/8W 15kΩ ±5%	
RCE0643	1126	Carbon 1/8W 6.8kΩ ±5%	
RCE0653	1127	Carbon 1/8W 47kΩ ±5%	
RCE0659	1128	Carbon 1/8W 220kΩ ±5%	
RCE0655	1129	Carbon 1/8W 68kΩ ±5%	
RCE0659	1130	Carbon 1/8W 220kΩ ±5%	
RME0949	1131	Metal 1/8W 15.0kΩ ±1%	
RME0947	1132	Metal 1/8W 10kΩ ±1%	
RCE0658	1133	Carbon 1/8W 150kΩ ±5%	
RCE0657	1136	Carbon 1/8W 100kΩ ±5%	
RCE0631	1137	Carbon 1/8W 680Ω ±5%	
RCE0602	1030	Carbon 1/8W 2.2Ω ±5%	
RCE0624	1142	Carbon 1/8W 220Ω ±5%	
RME0947	1144	Metal 1/8W 10kΩ ±1%	
RME0947	1145	Metal 1/8W 10kΩ ±1%	
RCE0620	1146	Carbon 1/8W 100Ω ±5%	
RCE0633	1147	Carbon 1/8W 1kΩ ±5%	
RME1014	1150	Metal 1/4W 121kΩ ±1%	
RME0951	1151	Metal 1/8W 22.1kΩ ±1%	
RCE0661	1181	Carbon 1/8W 470kΩ ±5%	
RCE0645	1182	Carbon 1/8W 10kΩ ±5%	
<u>Var. Resistor</u>			
RNT0235	RV 1102	Metal TM64K(PH) 5kΩ	
8380273 A	T 1102	XFMR Converter ST-50	
<u>Connectors</u>			
JBX0470	P 1101	171825-6	
JBX0470	1102	171825-6	
JBX0470	1103	171825-6	

Part Code	Symbol	Description	Remarks
JBX0468	P 1110	171825-3	
JBX0468	1130	171825-3	
119584	PEF-560	PCB PB-10	

CHASSIS

Part Code	Symbol	Description	Remarks
DPH0006	V 1101	<u>CRT</u> 95LB31 (H6101-P31)	
8374082	L 1101	Coil Trace Rotation	
119585	PEF-567	PCB PB-11	
8360665		Cial CA-10	
<u>Var. Resistor</u>			
8360666	RV 561	Wire M22S10 2kΩ	
3165202	DL 1401	Delay Line DL-100 H-1 100NS	
CES0144	C 1401	AL Elyc 35V 2200μF ±20%	
8376777	T 1401	XFMR For V-509	
HDS0450	D 1401	Diode S4VB-10	
<u>Var. Resistor</u>			
RDE0028	RV 1401	Carbon EVM-R7GS20B26	
<u>Resistors</u>			
RCR3076	R 1401	Carbon 1/4W 10kΩ ±5%	
JHB0088	1404	Coax. Con BNC071	
JHB0088	1405	Coax. Con BNC071	
JJC0026	J 1411	Jack CM3 (C-170)	
<u>Connector</u>			
JPS0033	J 1412	S-I6930	
JMR0261	1413	R03-R6M	
8338351	TP 1402	Terminal Z-048	
EFG0344		Fuse MF61NM 1 (1A 250V)JIS	
EFH0193	F 1401	Socket, Fus SN-1301	
EFG0357		Fuse MF61NM5 (5A 250V) JIS	
EFH0193	F 1402	Socket, Fus SN-1301	
BSE0001		Wire 0.75SQ	
BBI0042		Wire, Newfl 1/0.5WHT	
BSA0031			
BSB0001			

PEF-564, PEF-571 CRT

Part Code	Symbol	Description	Remarks
324662		<u>Terminals</u>	
324662		B5	
		D3	
		<u>Connector</u>	
3169392		Connector Assembly for V-509	
3169394			
JHB0088	J 1401	Coax. Con BNC071	
JHB0088	1402	Coax. Con BNC071	
JHB0088	1403	Coax. Con BNC071	
SST0071	S 1401	Switch Toggle 8A2011	
SST0071	S 1402	Switch Toggle 8A2011	
		<u>Diodes</u>	
HDS0408	D 1402	SR503D with mount (red)	
HDS0408	1403	SR503D with mount (red)	
4114183	TP 1401	Terminal BLK	
CCC1356	C 1205	Capacitor Ceramic 50V 470pF ±10%	
BSE0001		Wire 0.75SQ	
BBA0465		Wire PVC UL-1015 #22	YEL
BBE0028		Wire PVC UL-1007 #24	YEL
BBE0035		Wire PVC UL-1007 #24	BLK
BBE0026		Wire PVC UL-1007 #24	RED
BBA0062		Wire WL1H 12/0.18	GRN
BBA0060		Wire WL1H 12/0.18	BRN
BBA0040		Wire WL1H 12/0.18	YEL
BBA0039		Wire WL1H 12/0.18	RED
BBA0041		Wire WL1H 12/0.18	BLK
BBA0043		Wire WL1H 12/0.18	WHT

Part Code	Symbol	Description	Remarks
JSP0001	J 1101	<u>Socket</u> PS-085	
		<u>Connectors</u>	
JBX0468	P 1030	171825-3	
JBX0468	1031	171825-3	
JBX0468	1032	171825-3	
119584	PEF-564	PCB PB-10	

PEF-568 INTEN

Part Code	Symbol	Description	Remarks
8369340	RV 1301	<u>Var. Resistor</u> Carbon V12LG3N20KC 10KB+10KB	
RCE0637	R 1301	<u>Resistor</u> Carbon 1/8W 2.2kΩ ±5%	
119585	PEF-568	PCB PB-11	

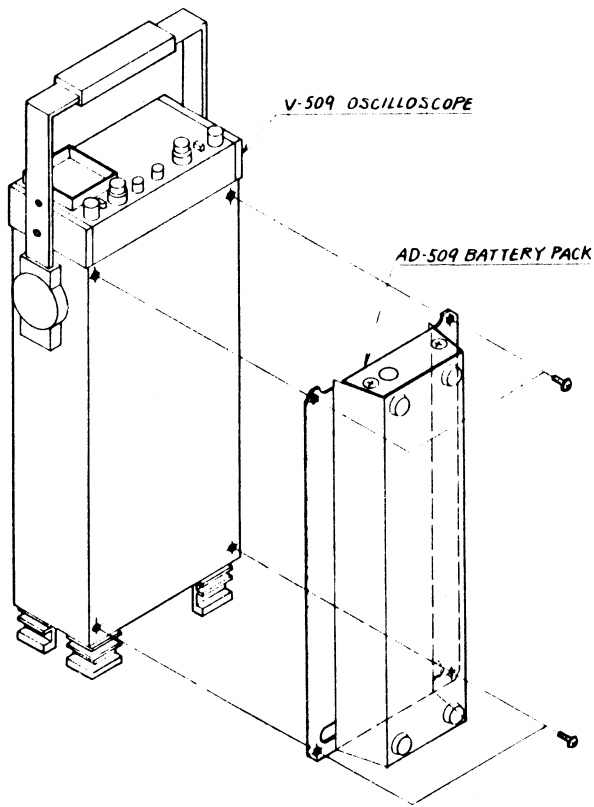
PEF-561, 562 INPUT

Part Code	Symbol	Description	Remarks
CQX0068	C 1	<u>Capacitor</u> Plastic 400V 0.047µF ±20%	
SSV0042	S 1	<u>Switch</u> Slide SSB023 L=9 NS PCB	
119584	PEF-561	PCB PB-10	
CQX0068	C 101	<u>Capacitor</u> Plastic 400V 0.047µF ±20%	
SSV0042	S 101	<u>Switch</u> Slide SSB023 L=9 NS PCB	
119584	PEF-562	PCB PB-10	

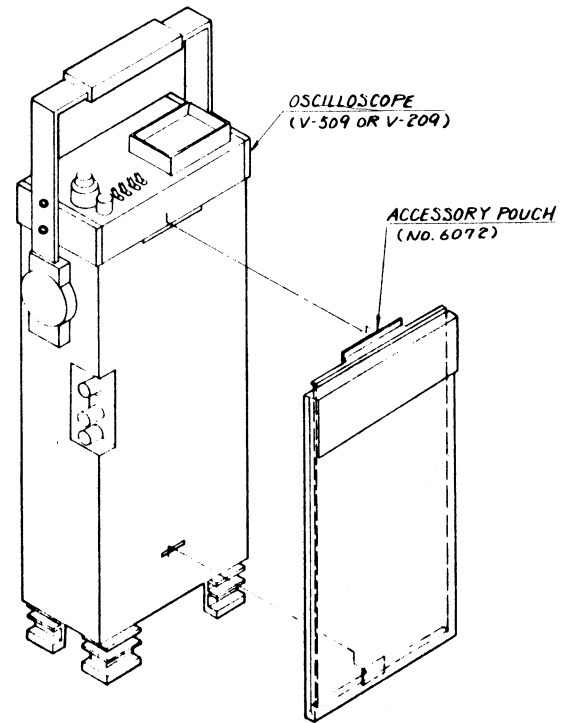
PEF-569 PS SW

Part Code	Symbol	Description	Remarks
SST0071	S 1403	<u>Switches</u> Toggle 8A2011	
SST0071	1404	Toggle 8A2011	
HDS0108	D 1405	Diode 1S2075	
RMR2768	R 1405	Resistor, Metal 1W 47Ω ±5%	
RMR2770	R 1405	Metal 1W 100Ω ±5%	
119585	PEF-569	PCB PB-11	

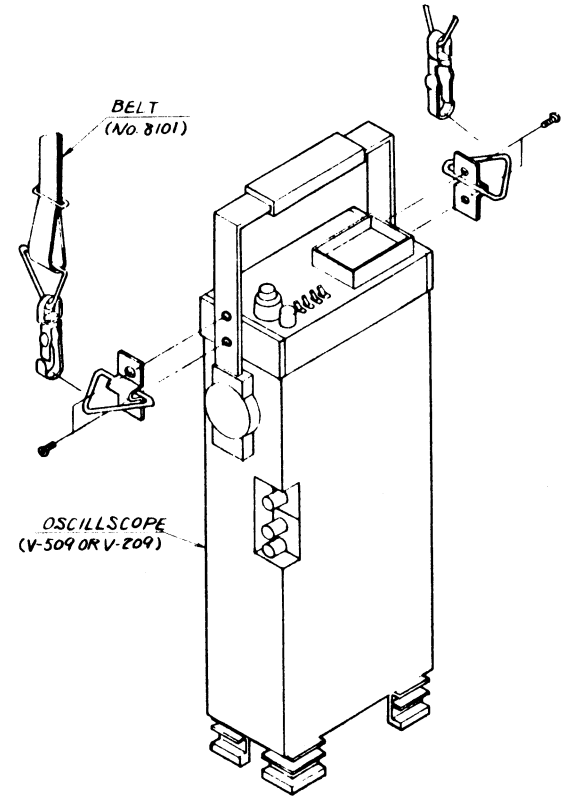
ACCESSORIES ATTACHMENT



ATTACHMENT OF THE AD-509 BATTERY PACK

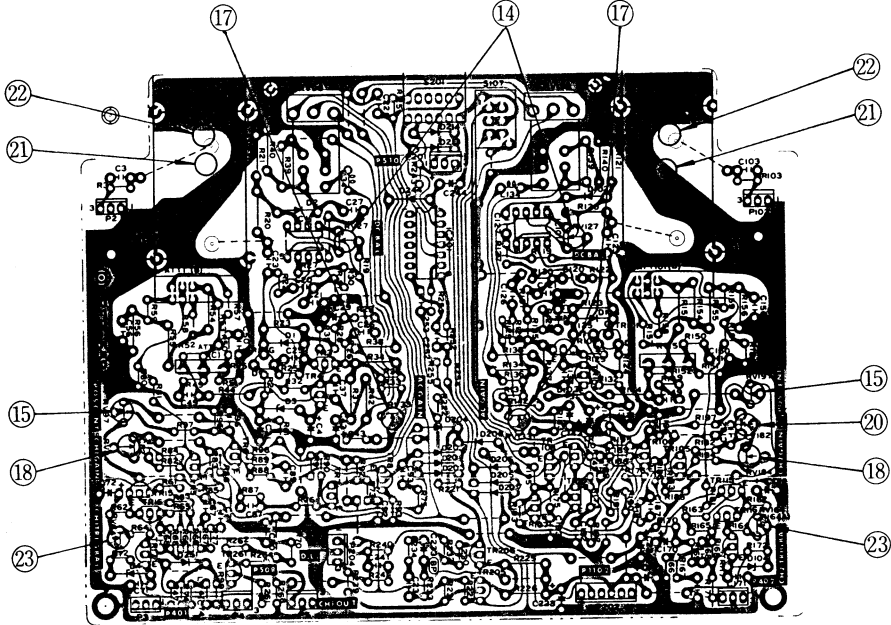


ATTACHMENT OF THE ACCESSORY POUCH

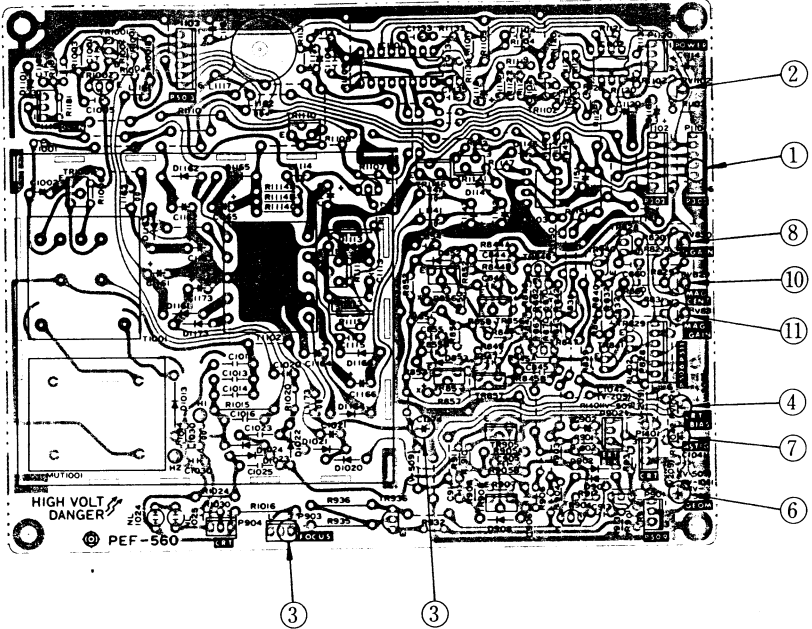


ATTACHMENT OF THE SHOULDER BELT

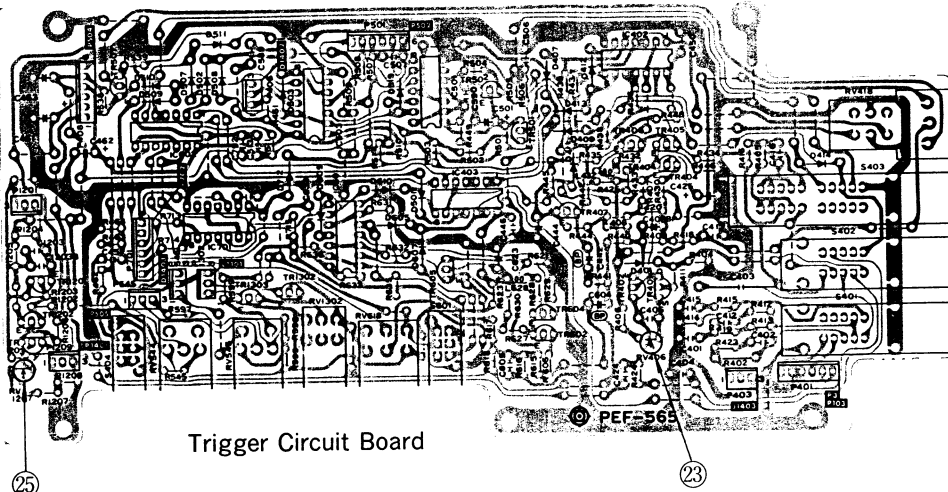
6. ELECTRICAL PARTS ARRANGEMENT



Vertical Output Amplifier Board



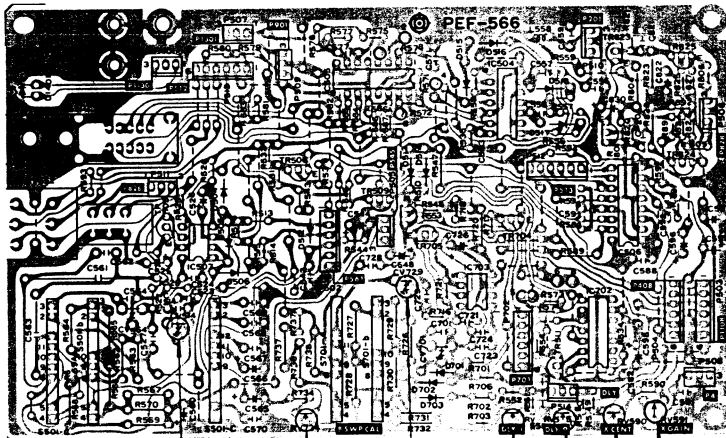
Power, Horizontal Output and Z-axis Circuits Board



Trigger Circuit Board

25

23



Sweep Circuit Board

12

9

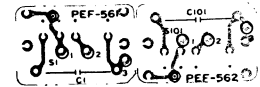
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13

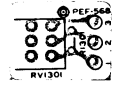
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24-2

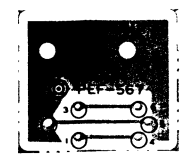
24-1



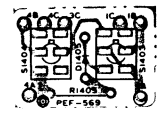
Input Coupling Board



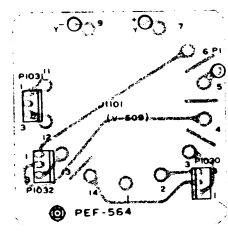
Intensity Control Board



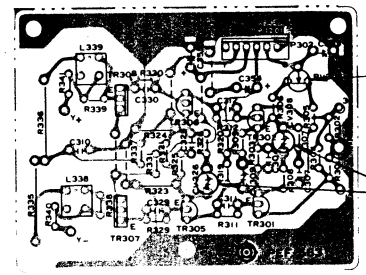
Delay Line Board



Switch Board



CRT Board

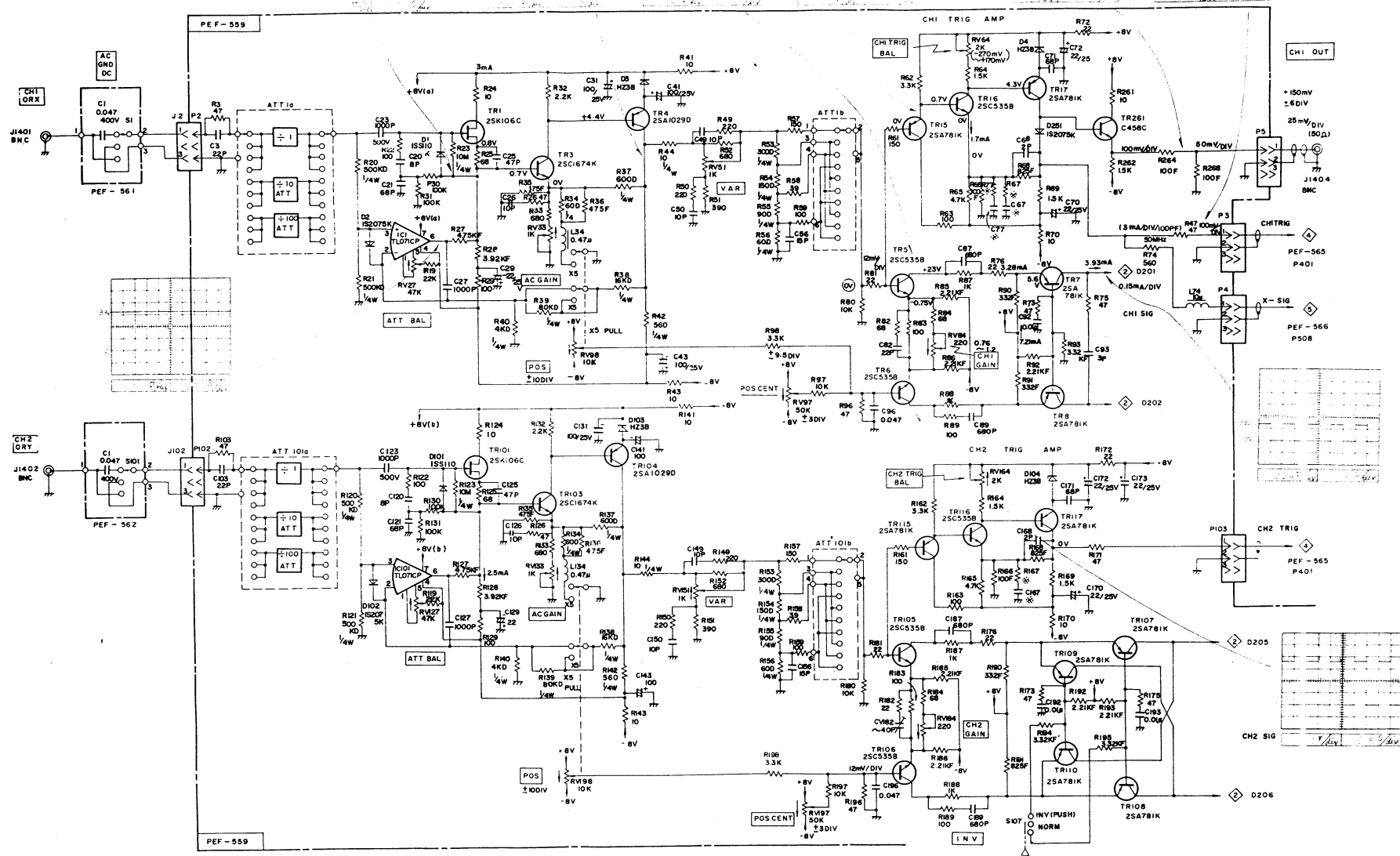


Vertical Output Amplifier Board

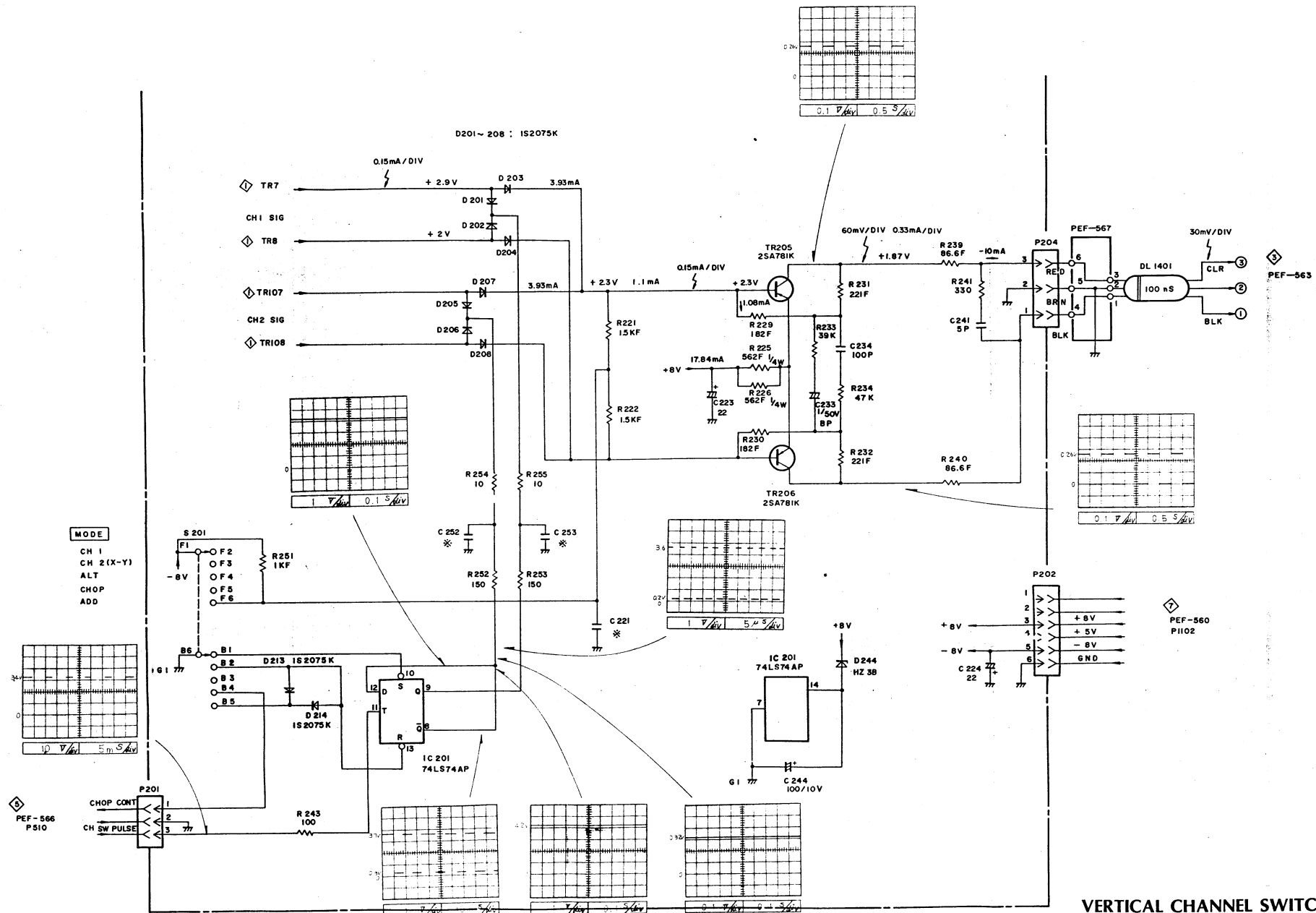
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20

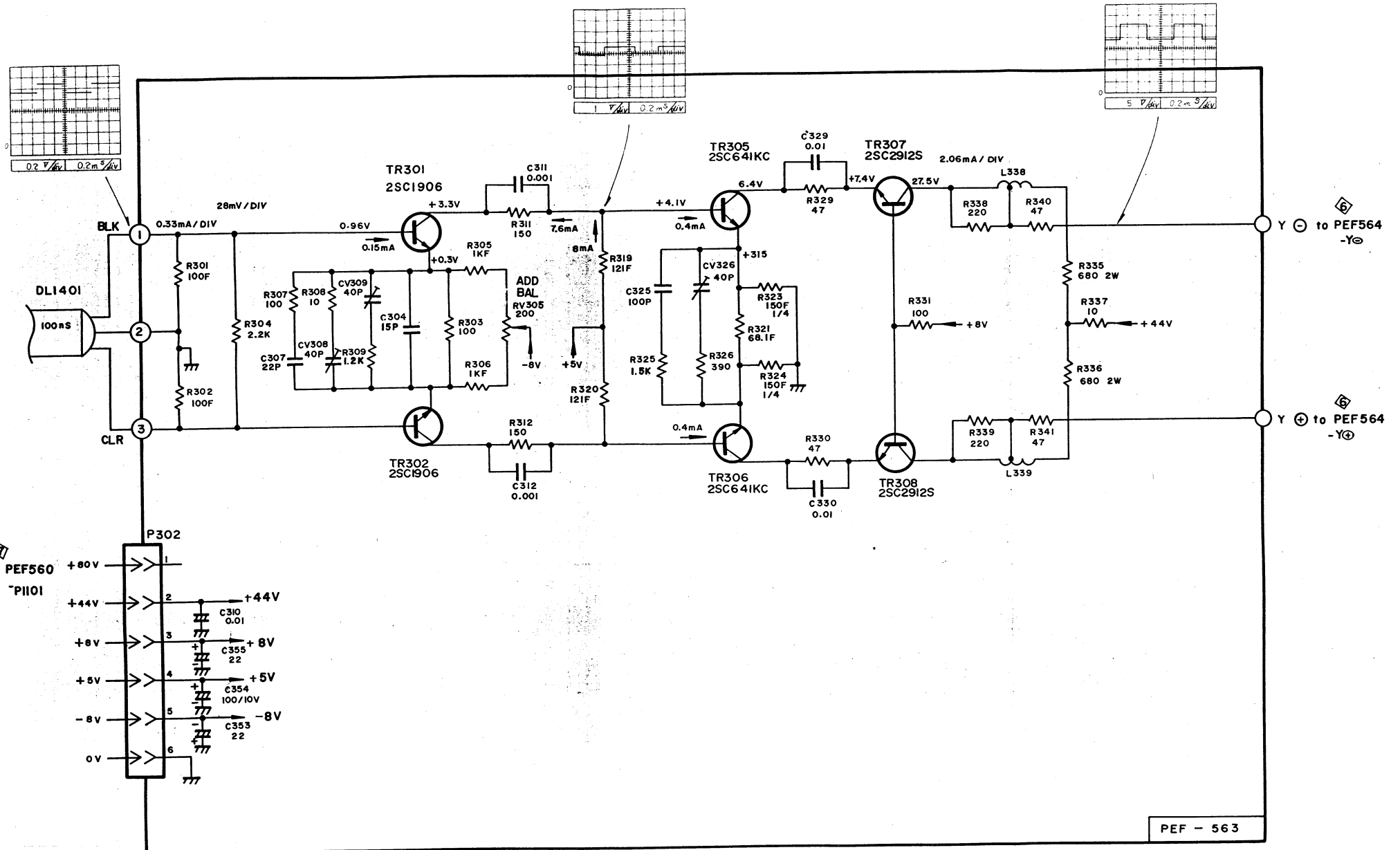
8. SCHEMATIC DIAGRAMS



VERTICAL PREAMPLIFIER
SCHEMATIC DIAGRAM

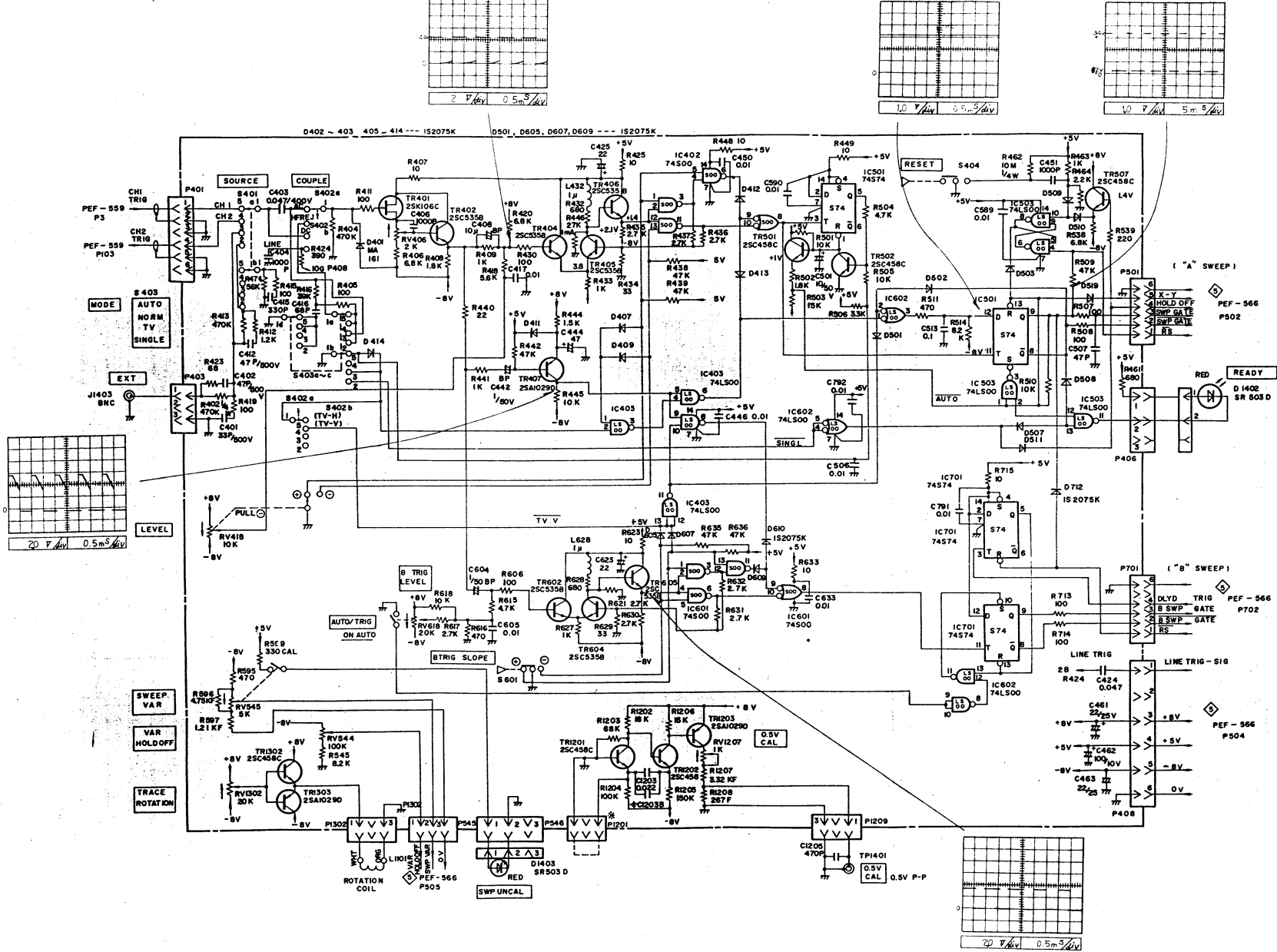


VERTICAL CHANNEL SWITCH
SCHEMATIC DIAGRAM

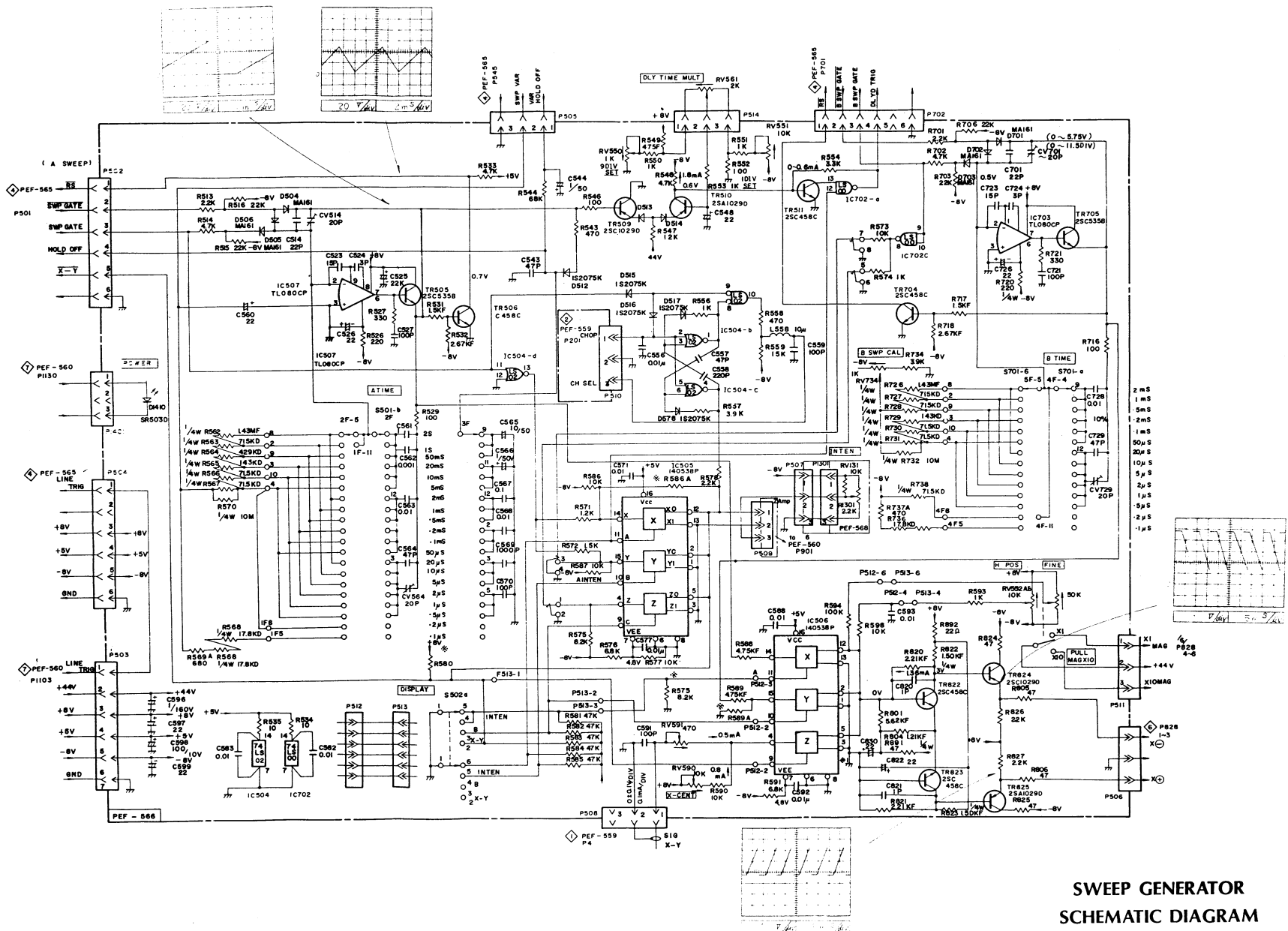


PEF - 563

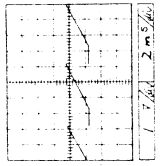
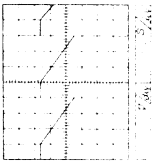
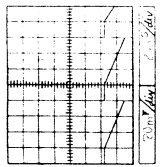
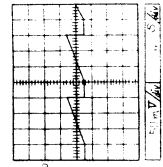
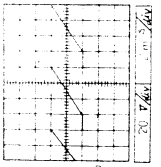
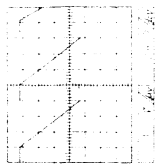
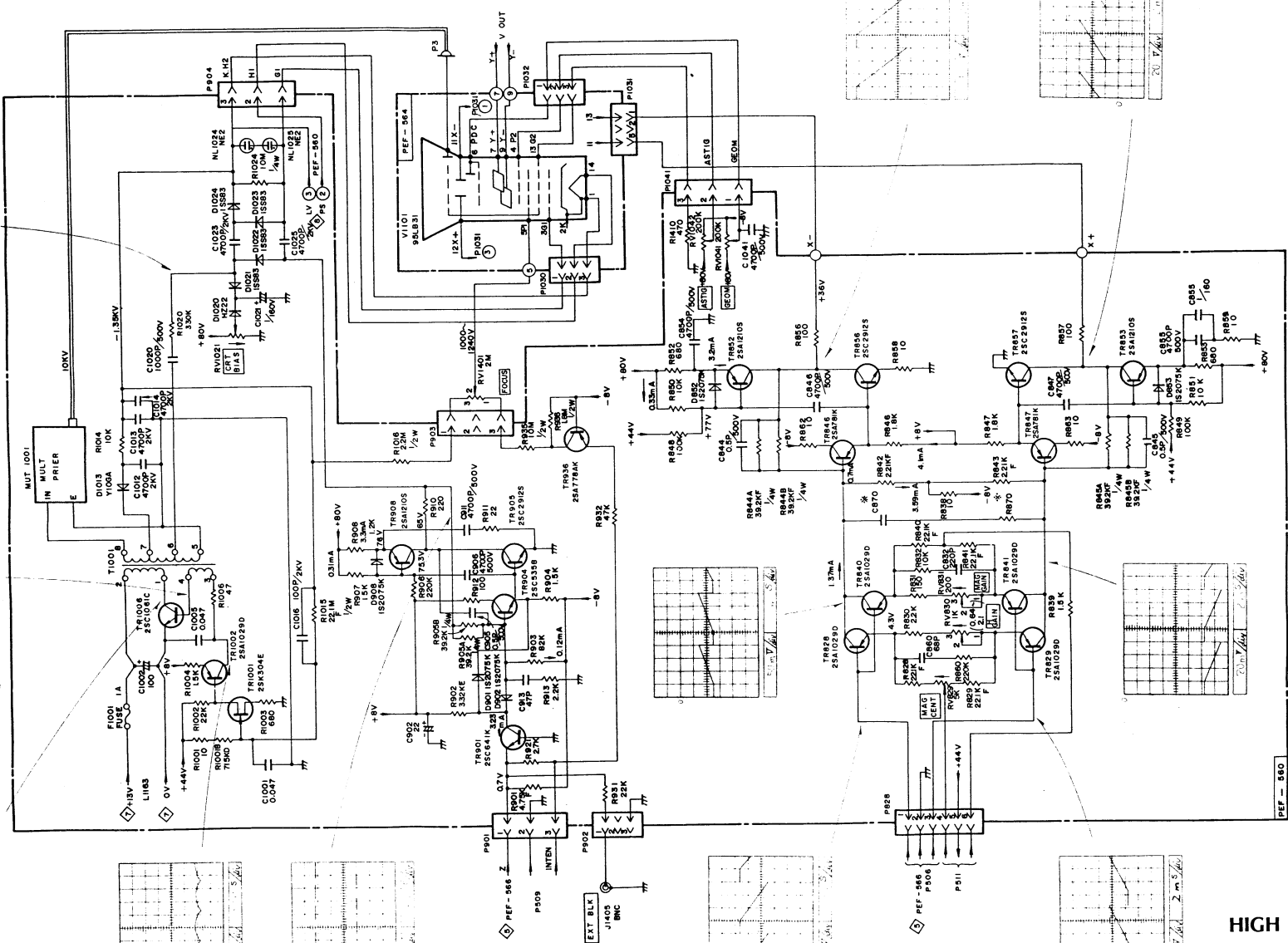
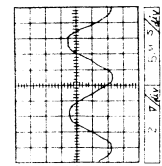
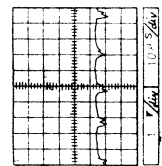
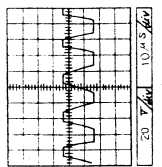
VERTICAL OUTPUT AMPLIFIER
SCHEMATIC DIAGRAM



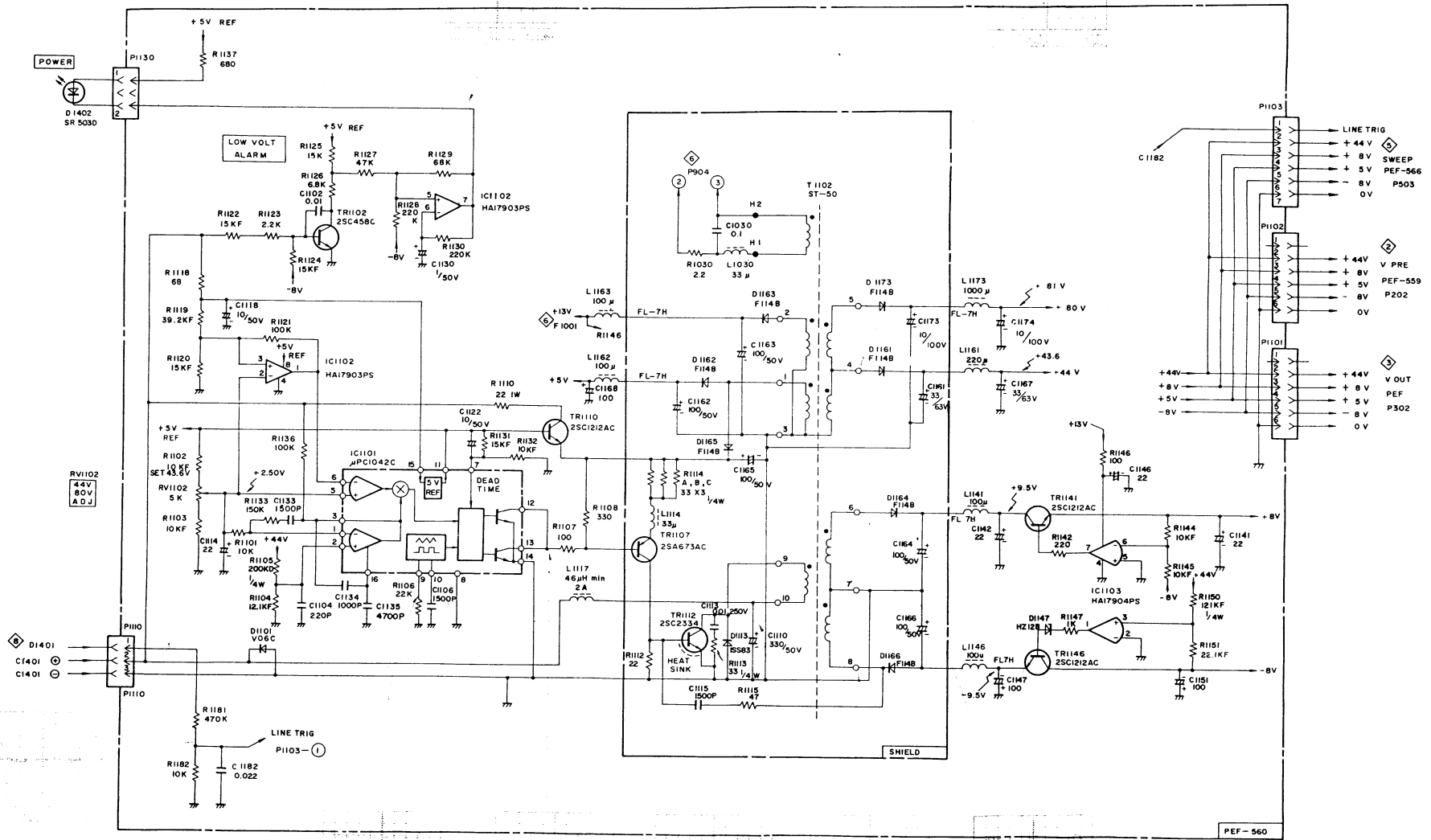
TRIGGER
SCHEMATIC DIAGRAM



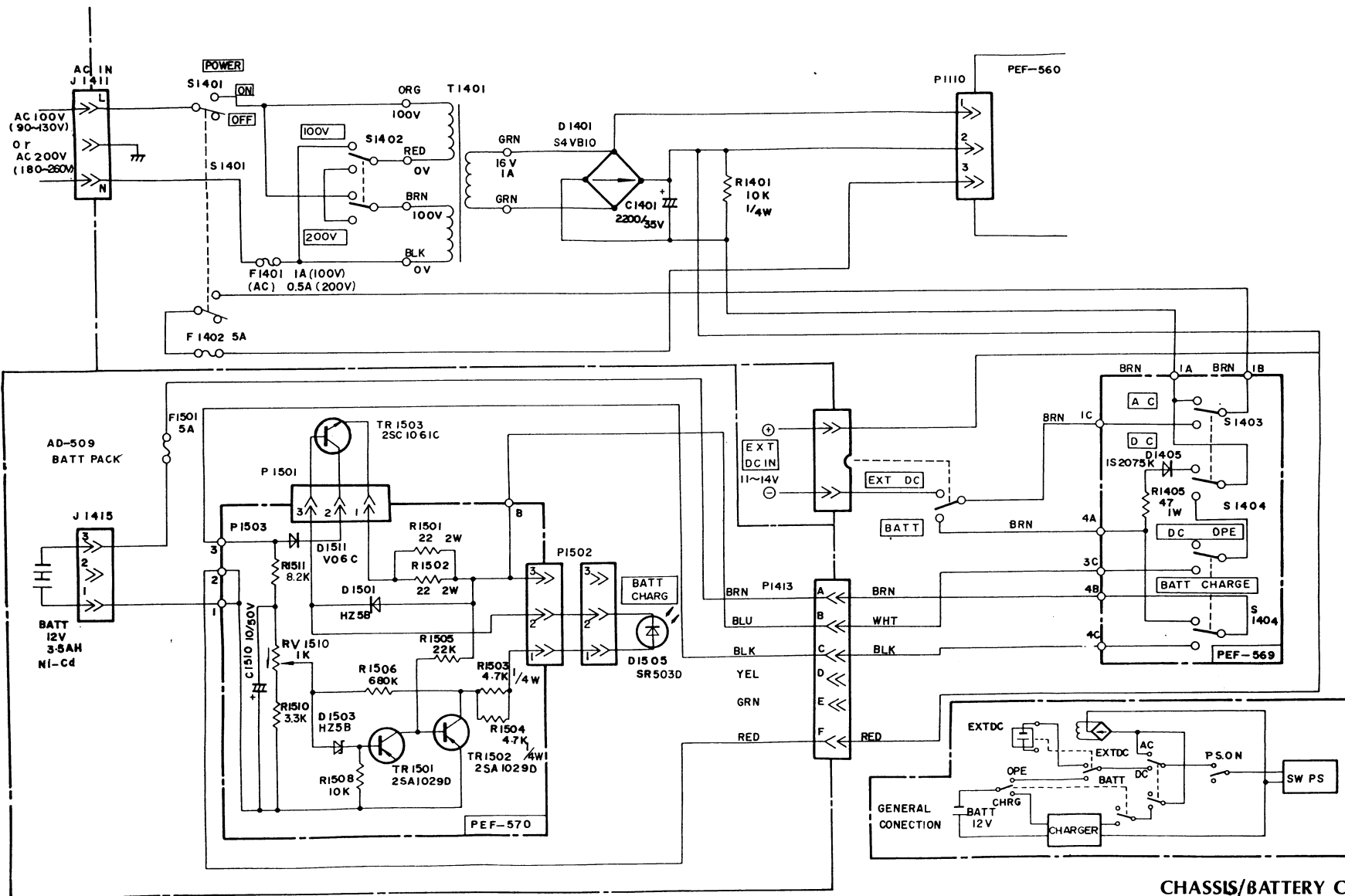
SWEEP GENERATOR SCHEMATIC DIAGRAM



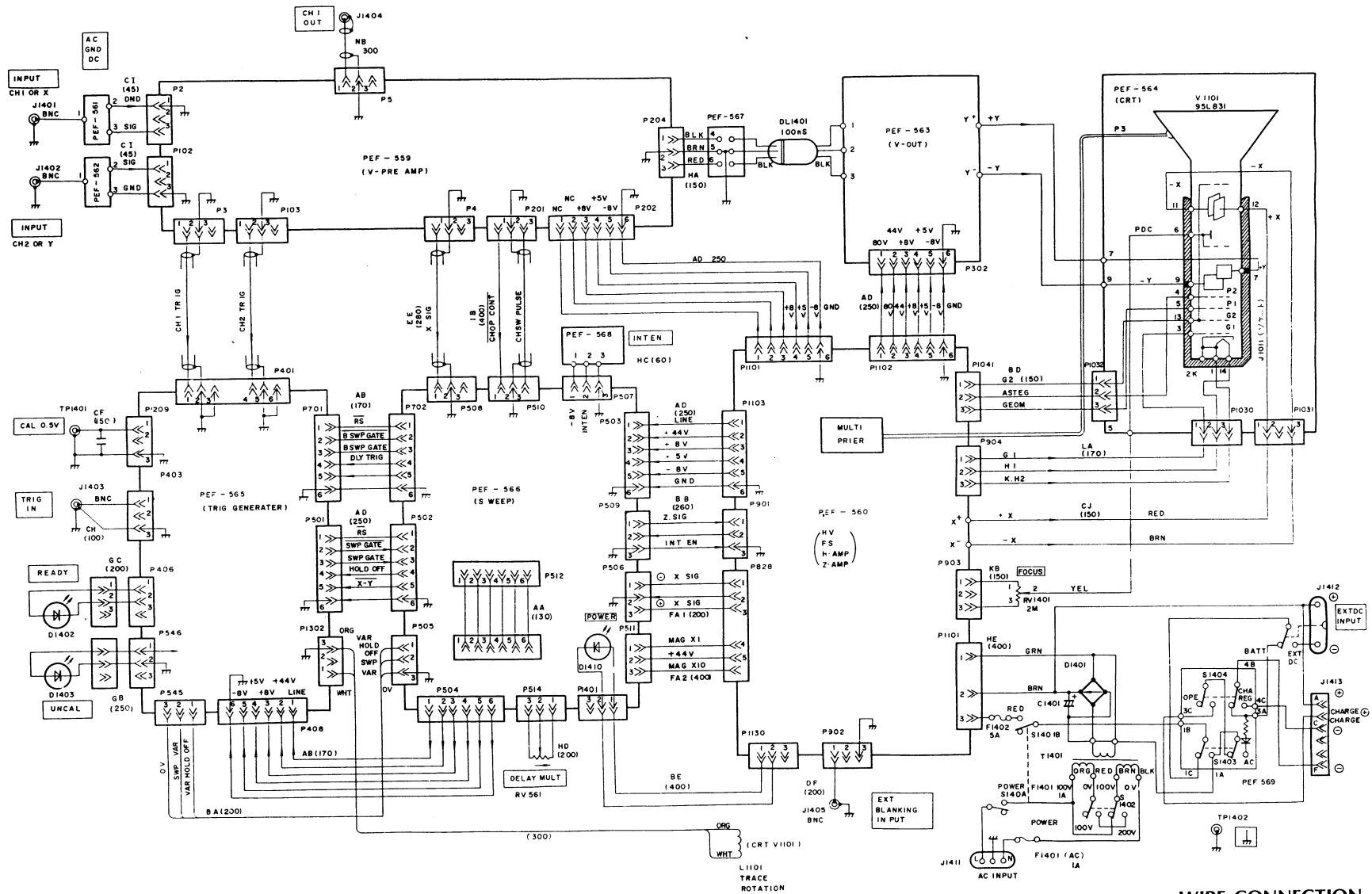
HIGH VOLTAGE, Z-AXIS
HORIZONTAL AMPLIFIER
SCHEMATIC DIAGRAM



POWER SUPPLY
SCHEMATIC DIAGRAM



CHASSIS/BATTERY CHARGER
SCHEMATIC DIAGRAM



WIRE CONNECTION

