



HITACHI



MODEL V-425/V-225
OSCILLOSCOPE

SERVICE MANUAL



Hitachi Denshi, Ltd.

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— N O T I C E —

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-225/V-425 OSCILLOSCOPE Service Manual

1. SPECIFICATIONS

[] : Specifications for V-425

CRT

Type

Large 6" screen with internal graticule

Approximate 2kV [12kV] acceleration potential

Screen type

P31 phosphor standard

Useful screen area

8 × 10 div

Graticule

Internal graticule with centimeter divisions and 2 mm subdivisions along the central axis, 10 % and 90 % lines are indicated.

Focussing

Possible (with automatic focus correction circuit:)

Trace rotation Provided

Intensity control Provided

Z-AXIS INPUT (INTENSITY MODULATION)

DC-coupled, positive-going signal decreases intensity: 5 Vp-p signal causes noticeable modulation at normal intensity: DC to 2 MHz.

Input impedance 47 k Ω (typ.) [33 k Ω (typ.)]

Maximum input voltage 30 V (DC + peak AC)

Coupling DC

VERTICAL DEFLECTION SYSTEMS (2 Identical Channels)

Bandwidth and rise time

DC to at least 20 MHz [40 MHz] and rise time 17.5 ns [8.8 ns] or less.

DC to at least 7 MHz and rise time 50 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 $\times 5$ magnifier increases sensitivity of each deflection factor setting to 1 mV/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

1 M Ω $\pm 3\%$ in parallel with 23 ± 3 pF

Maximum input voltage

300 V (DC + peak AC)

Input coupling

AC, GND, DC

HORIZONTAL DEFLECTION SYSTEM

Time base

0.2 μ s/div to 0.2 s/div in 19 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 100 ns/div [20 ns/div].

Accuracy

$\pm 3\%$ (+10 to +35 °C)

Additional error for magnifier $\pm 2\%$

TRIGGERING SYSTEM

Trigger modes

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

Trigger source

Internal (CH1, CH2, V.MODE), Line, External

Trigger slope

+ or -

TV sync polarity

TV (-)

Triggering level Internal ; +6 div or more

variable range External ; approx. +2 V

Triggering sensitivity

and frequency

Frequency	Internal (V. MODE)	External
20 Hz - 2 MHz [20 Hz - 5 MHz]	0.5 div (2.0 div)	200 mV
2 - 20 MHz [5 - 40 MHz]	1.5 div (3.0 div)	800 mV

TV-V, TV-H sensitivity: SYNC level more than 1 div or 1 V

AUTO: Approx. 25 Hz (when time base is 0.1 μ s/div to 2 ms/div)

Trigger coupling

AC : 25 Hz to full bandwidth

External trigger input impedance

1 M Ω +20 % in parallel with 25 pF +5 pF

Maximum input voltage

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

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 $\pm 2\%$

X-bandwidth

DC to at least 500 kHz

Phase error

3° or less from DC to 50 kHz

READOUT FUNCTION (applicable to the modes other than X-Y)

Panel setting displays Vertical axis (CH1 only): V/DIV, UNCAL,
MAG(converted value)

Note: Displayed when the vertical mode is CH1, ALT, or CHOP.

Horizontal axis: S/DIV, UNCAL,
MAG(converted value)

Note: Displayed when the vertical mode is the modes other than ADD.

Cursor readout function Voltage difference ΔV : Δ -REF

Time difference ΔT : Δ -REF

Note: Displayed when the vertical mode is the modes other than ADD.

Effective cursor range from center graticule:

Vertical: Within ± 3 DIV

Horizontal: Within ± 4 DIV

CALIBRATOR

An approx. 1 kHz frequency 0.5 V ($\pm 3\%$) square wave.

POWER SUPPLY

VOLTAGE (50/60 Hz)	FUSE
100 V (90 - 110 V)	2A
120 V (108 - 132 V)	2A
220 V (198 - 242 V)	1A
240 V (216 - 264 V)	1A

Nominal voltage $\pm 5\%$ at 400 Hz

Power supply frequency : 50, 60, 400 Hz

Power consumption : Approximately 35W

ENVIRONMENT

Limit of operation temperature	0 - 40°C
Limit of operation humidity	35 - 85 %
Rated range of use temperature	10 - 35°C
Rated range of use humidity	45 - 85 %
Storage and transportation temperature	-20 - 70°C

DIMENSIONS AND WEIGHT

Approx. 310(W) × 130(H) × 370(D) mm
(12.4(W) × 5.2(H) × 14.8(D) inch)

Approx. 7kg (15.7 lbs)

2. ACCESSORIES

This instrument is shipped along with following accessories.

- 2 Probes (AT-10AK 1.5)
- 1 AC 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 all of the screws on the top cover of the instrument, then gently remove the top cover.

Take the same procedure for the bottom cover.

Most of the internal parts of the instrument are now accessible.

(See section 11. 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 in 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 indicates 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-225, V-425 at least every 1000 hours of operations or every six months 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-225, V-425.

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

4. 4 Preliminary control settings

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

Controls	Settings	Controls	Settings
FOCUS	Midrange		
TRACE ROTATION	As desired		
- VERT -			
V. POSITION	Midrange, pushed in	SWP VAR	Fully clockwise
V. VARIABLE	CAL, fully clockwise	CH1 ALT MAG	Normal (Button Out)
INPUT COUPLING	GND (AC-GND-DC)	- TRIG -	
VOLTS/DIV	5 mV/DIV		
V.MODE	CH1	LEVEL	Midrange, Normal
CH2 INV	Normal, Pushed in	SLOPE	+ Normal
- HORZ -			
H. POSITION	Midrange	MODE	AUTO
PULL ×10 MAG	Normal, Pushed in	SOURCE	INT
TIME/DIV	1 ms	INT TRIG	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 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 (13).
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 (P1105-2) and ground
: +7.3 to +8.3 V
 - b. Connect the DVM between the -8 V line (P1105-4) and ground
: -8.3 to -7.7 V
 - c. Connect the DVM between the +5 V line (P1105-3) and ground
: +4.8 to +5.2 V
 - d. Connect the DVM from the +120 V/+75 V line (P1105-1) and ground
: +110 to +130 V (For V-225)
: +67.5 to +82.5 V (For V-425)
- ② Check high voltage supply.
 - a. Connect the DVM to the H.V. test point (P1001-1) with a high voltage probe.
 - b. Check for a reading of -1.995 to 1.805 kV --- V-225
-1.732 to 1.568 kV --- V-425

DISPLAY

Control setting

Preset the controls as given in the preliminary control setting.

- ③ Check/adjust CRT bias.

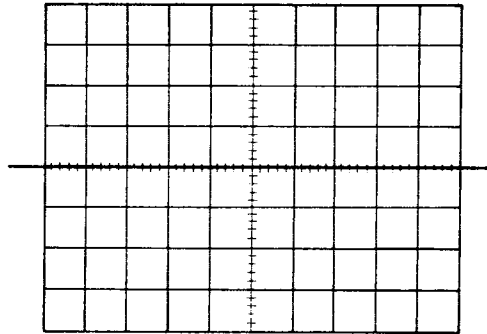
Set the Trig MODE switch to the AUTO, and set the TIME/DIV switch to the 1 ms.

 - a. Connect the digital voltmeter (DVM) to the R904 (or D1022-Ⓐ) and ground.
 - b. Adjust the INTENSITY control so that the DVM indicates 15.0 V.
 - c. Observe the trace of CRT.

d. Adjust the grid bias adjustment RV1021 for the trace makes a just appear.

④ 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 front panel) for a trace that is in parallel with the horizontal graticule lines.

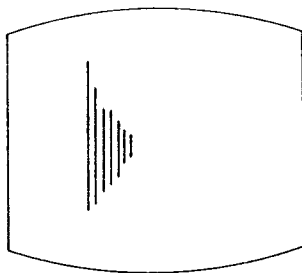


⑤ Check/adjust GEOMETRY

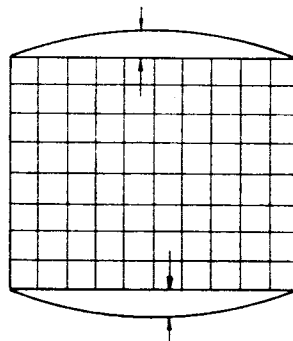
- a. Set the TIME/DIV to the 0.1 ms, and the input coupling switch to DC.
- b. Connect the constant amplitude signal generator to the input.
- c. Set the VOLTS/DIV switch setting for a full-screen (8 division) deflection.
- d. Check that horizontal bowing is less than ± 0.15 division.

For V-425

- e. Adjust the GEOM adjustment RV1033 for a display so that horizontal bowing is less than ± 0.15 division.

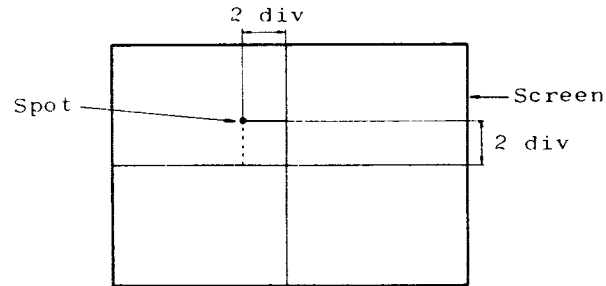


Less than +0.15 div



Less than +0.15 div

- ⑥ Check/adjust ASTIGmatism and FOCUS.
- Set the TIME/DIV 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.



- Check that the spot is round.
- Adjust the FOCUS adjustment and ASTIG adjustment RV1035 for a round spot.

HORIZONTAL SYSTEM

Control settings

Preset the controls as given in the preliminary control settings.

- ⑦ Check/adjust horizontal gain.
- Set the input AC-GND-DC to DC.
 - Connect the cable to the output of the time mark generator.
 - Set the time mark generator for 1 ms time marks.
 - Check that the time marks align with the graticule lines over the center eight divisions, within 3 %.
 - Adjust the H GAIN adjustment RV824 so that the time marks coincide with the middle eight graticule lines.
- ⑧ Check/adjust Horizontal $\times 10$ MAG Gain.
- Set the TIME/DIV switch to 1 ms.
 - Set $\times 10$ MAG (pull out the knob of the POSITION control).
 - Check that the one-cycle time marks align with the ten-divisions graticule lines, within 5 %.

- d. Adjust the MAG GAIN adjustment RV831 so that one-cycle time marks coincide with the ten-divisions graticule lines.
 - e. Push in the POSITION control after adjustment and check.
- ⑨ Check/adjust MAG CENT.
- a. Set the TIME/DIV switch to 1 ms.
 - b. So that the knob of H.POSITION is pulled out ($\times 10$ MAG), the left end of the trace is brought to the center point and then the knob of H.POSITION is depressed.
 - c. Observe the movement of the left end of the trace.
 - d. Adjust the MAG CENT adjustment RV821 for the movement of the left end of the trace within ± 0.2 div.
- ⑩ Check/adjust low speed sweep accuracy.
- a. Set the time mark generator for 10 ms time marks.
 - b. Set the TIME/DIV switch to 10 ms.
 - c. Check that the time marks align with the graticule lines over the middle eight divisions, within 3 %.
 - d. Adjust the 10 ms/DIV adjustment RV542 so that the time marks coincide with the middle eight graticule lines.
- ⑪ Check/adjust high speed sweep accuracy.
- a. Set the input coupling switch to DC.
 - b. Set the time mark generator for 2 μ s time marks.
 - c. Set the TIME/DIV switch to 2 μ s.
 - d. Check that the time marks align with the graticule lines over the middle eight divisions.
 - e. Adjust CV520 so that the time marks coincide with middle eight graticule lines.
- ⑫ Check/adjust high speed $\times 10$ MAG GAIN
- a. Set the TIME/DIV switch to the 2 μ s.
 - b. Set $\times 10$ MAG (pull out the knob of the POSITION control).
 - c. Check that the one-cycle time marks align with the ten-divisions graticule lines, within 5 %.
 - d. Adjust the high speed Mag gain adjustment CV840 so that one-cycle time marks align with the ten-divisions graticule lines.
 - e. Push in the POSITION control after adjustment and check.

VERTICAL SYSTEM

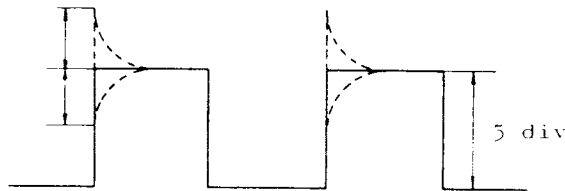
- ⑬-1 Check/adjust DC balance (Step attenuator balance).
- Set the VOLTS/DIV switch to the 5 mV position.
 - Position the trace to the horizontal center line.
 - Change the VOLTS/DIV switch to the 10 mV position.
 - Check that the trace is within ± 1.0 division of the center horizontal line.
 - Adjust the CH1 (CH2) DC BAL adjustment, RV22 (CH1) or RV122 (CH2), for a trace at the horizontal center line.
 - Repeat the part (a) through (e) until less than ± 0.05 division shift is noted when changing the VOLTS/DIV setting.
- ⑬-2 Check/adjust ADD BALANCE.
- Set the TIME/DIV to the 1 ms position.
 - Set the CH1 and CH2 input coupling switches to GND.
 - Set the V MODE switch to CH1.
 - Adjust the vertical position control so that the trace aligns with the center horizontal graticule line.
 - 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.
 - Set the V MODE switch to ADD.
 - Check that the trace aligns with the center horizontal graticule line within ± 0.5 division.
 - Adjust the ADD BAL adjustment RV339 for two times of the difference from the center horizontal graticule line.
- ⑭ Check/adjust vertical position center.
(CH1 only)
- Pull out the vertical POSITION control (set the DC OFFSET mode).
 - Connect a DVM to the DC OFFSET VOLT OUTPUT terminal.
 - Adjust the vertical POSITION control so that the DVM indicates 0 V.
 - Adjust the position center adjustment RV63 (CH1 only), for a trace at the horizontal center line.

(CH2)

- e. Confirm the vertical POSITION control at the midrange.
- f. Check the trace is within 1 division.
- g. Adjust the position center adjustment RV163 (CH2) for a trace at the horizontal center line.

⑮ Check/adjust $\times 1$ AC GAIN.

- a. Set the 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.

⑯ Check/adjust vertical gain.

- a. Set the 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 for display) signal.
- d. Check for a display of five divisions.
- e. Adjust the GAIN adjustment RV62 (CH1), RV162 (CH2) for a display of 5 divisions within 2 %.
- f. Check all the VOLTS/DIV switch settings.

⑰ 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 approx. 23 pF.

⑱ Check/adjust vertical step response.

a. Set the VOLTS/DIV switch to the 5 mV position.

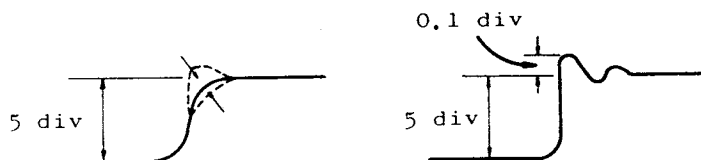
b. Set the TIME/DIV switch to the 0.5 μ s position.

c. Connect the fast-rise, positive output (50 mV, 1 MHz) of the square-wave generator to the input. Use a 50 Ω termination and cable.

d. Adjust the square-wave generator output for a 5-divisions display.

e. CH1 - Adjust CV336 (and CV355 : V-425 only) so that a square wave is flat. Then, adjust CV337 for overshoot of +0.2 div.

CH2 - Adjust CV161 for overshoot of +0.2 div.



⑲ 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 capacitors (refer to the circuit board illustration with adjustment location) 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	CV4 (CV104)
÷ 100	1 V	5 V	CV7 (CV107)

- ②0 Check/adjust input capacity (ATT: ÷ 10, ÷ 100).
- Connect the L-C meter to the input connector.
 - Check the input capacity for approximately 23 pF.
 - Adjust the trimmer capacitors for a 2 pF input capacity under the following settings.

ATT	VOLTS/DIV	Adjust CH1 (CH2)
÷ 1	5 mV	—
÷ 10	0.1 V	CV3 (CV103)
÷ 100	1 V	CV6 (CV106)

②1 X-Y operation

②1-1 Check/adjust X gain.

- Set the TIME/DIV switch to X-Y, the input coupling switch of CH1 to AC, the input coupling switch of CH2 to GND.
- Set the VOLTS/DIV switch to the 10 mV position.
- Connect the standard amplitude calibrator to the CH1 input connector.
- Set the standard amplitude calibrator for 50 mV.
- Check for a display of five divisions.
- Adjust the X GAIN adjustment RV550 for a display of five divisions within 6 %.

②1-2 Check/adjust X position center.

- Set the TIME/DIV switch to the X-Y position, and the horizontal POSITION control to the midposition, the input coupling switch of CH1 to GND.
- 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 RV85 to the position spot at the center.

TRIGGER SYSTEM

- ②② Check/adjust TRIG CENT.
 - a. Set the TRIG SOURCE switch to INT, the INT TRIG switch to CH1, the TRIG SLOPE knob push in, the VOLTS/DIV switch to 50 mV, the TIME/DIV switch to 10 μ s.
 - b. Connect the sine-wave generator to the input connector for a 0.5 div (50 kHz).
 - c. Set the TRIG LEVEL knob to the midposition.
 - d. Adjust RV420 so that synchronization is effected on the waveform, 0.5 div on the screen.
 - e. Next, set the TRIG SLOPE to - (pulled out state) and insure that the waveform is triggered. After confirmation, leave the TRIG SLOPE in depressed state. Readjust when stepped out.
- ②③ Check/adjust CH2 TRIG BAL.
 - a. Set the VOLTS/DIV switch to 50 mV (CH1 and CH2), the TIME/DIV switch to 10 μ s, the TRIG SOURCE switch to INT, the INT TRIG switch to VERT MODE, the V.MODE switch to ALT, and the CH1 POSITION knob to the midposition.
 - b. Connect the sine-wave generator to the input connectors (CH1 and CH2) for a 5 div (50 kHz).
 - c. Adjust CH2 POSITION control so that CH2 waveform comes to CH1.
 - d. Next, adjust RV185 so that both waveforms (CH1 and CH2) coincides.

CALIBRATOR







- ②④ Check/adjust CAL terminal (0.5 V_{p-p}, 1 kHz).
 - a. Connect the CAL terminal to the digital multimeter, short the terminal 1 to 3 of the connector (P1206).
 - b. Check for the CAL output of 0.5 V, within 1 %.
 - c. Adjust the 0.5 V adjustment RV1201 for the CAL output of 0.495 to 0.505 V.

READOUT & CURSOR

② Check/Adjust of GAIN and CENTER.

a. Set the following controls as shown.

Controls	Settings
TIME/DIV	All the modes other than X-Y
V mode	All the modes other than ADD
CH1 ALT MAG	OFF

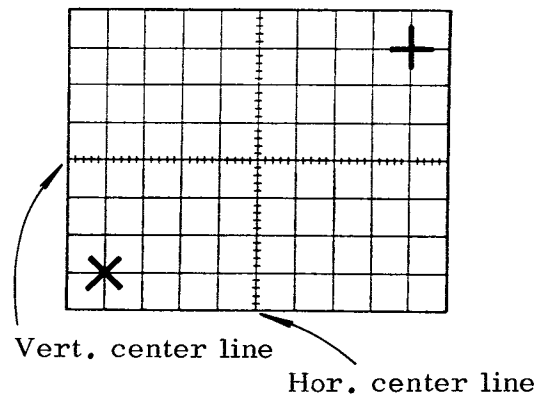
b. Press the , , , ,  and  keys simultaneously.

When the TEST mode is established, and the REF cursor (X) and the ▲ cursor (+) are displayed, position the cursor (X) to the center of the lower left four divisions and the + to that of the upper right four divisions with controls on the ^{*1} REF-791.

Note: To release the TEST mode, press one of the above six keys.

*1 Controls on the PEF-791 board:

- o CHR-X CENT: RV2003
- o CHR-X GAIN: RV2005
- o CHR-Y CENT: RV2001
- o CHR-Y GAIN: RV2002



- c. Check the ON/OFF operation of the READOUT function a few times.
- d. Check that readout display disappears by setting the CH1 ALT MAG switch to ON.

②6 Check of the Control setting display

- a. Check of Vertical MODE : Select the V. MODE switch and check the each mode as shown below.

CH1, ALT, CHOP: V/DIV display of CH1 appears.

CH2: V/DIV display disappears.

ADD: Readout display disappears.

- b. Check of V/DIV : Set the V. MODE switch to CH1, and check the following three functions.

- o V/DIV switch: V/DIV is displayed.

- o UNCAL mode:

- o PULL X5 GAIN switch:

The signal is magnified.

The UNCAL is disabled when the magnification is on.

- c. Check of TIME/DIV : Set the V MODE switch to CH1, and check the following three functions.

- o TIME/DIV switch:

TIME/DIV is displayed in all the modes other than X-Y mode.







- o UNCAL mode: UNCAL LED lights.

- o PULL X10 MAG switch:

The signal is magnified.

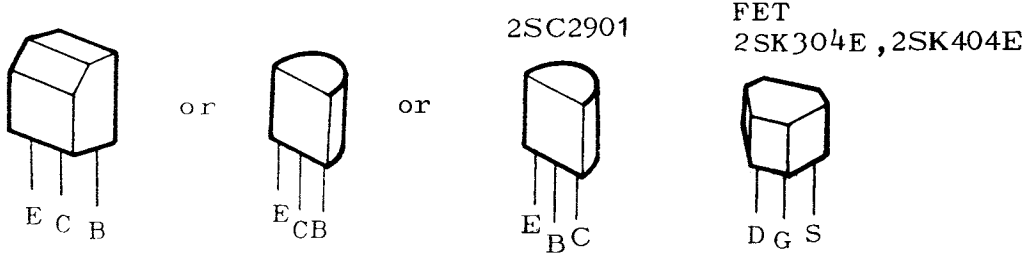
The UNCAL is disabled when the magnification is on.

- d. Check of cursors movement

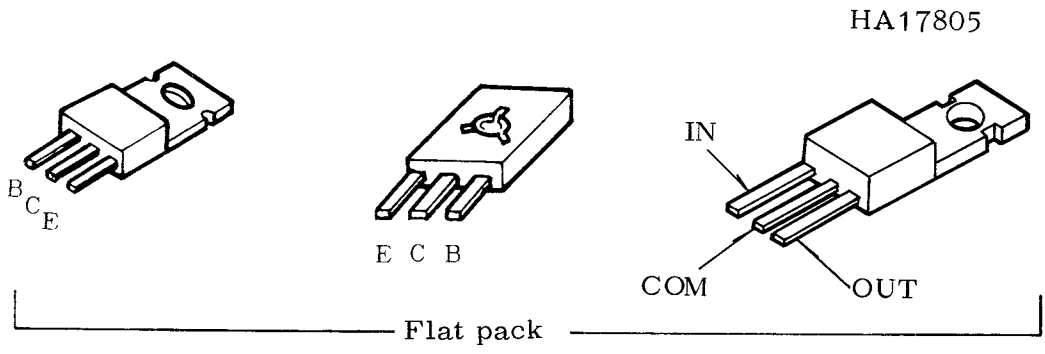
Check the X or + cursor move with the , , , , , and  keys.

5. SEMICONDUCTOR LEAD CONFIGURATIONS

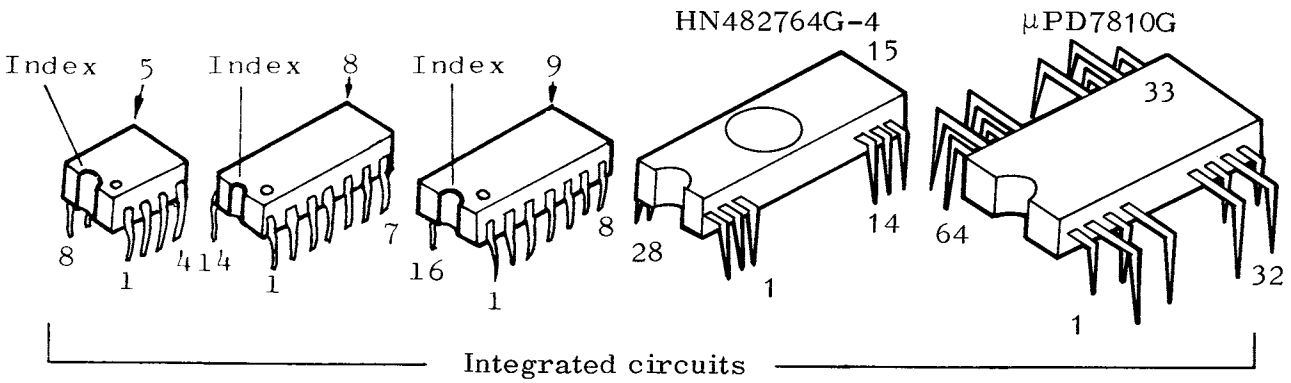
Lead configurations and case styles are typical, but may vary due to vendor changes or instrument modifications.



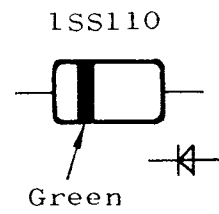
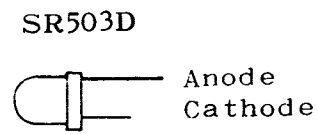
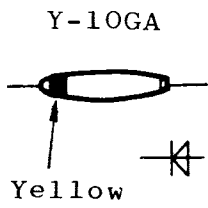
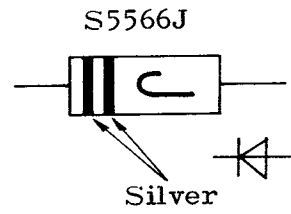
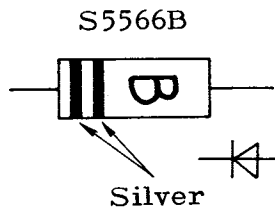
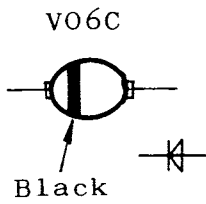
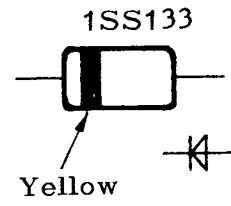
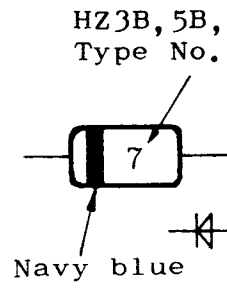
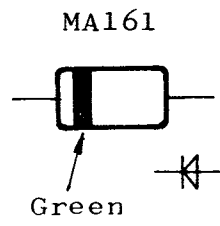
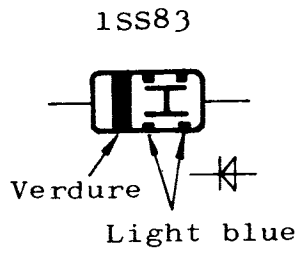
Plastic case transistors



Flat pack



Integrated circuits



6. CIRCUIT DESCRIPTION

— Introduction —

This section of the manual contains a description of the circuitry used in V-225/V425 Oscilloscope.

The block diagram shows the overall relationship between all of the circuits. Complete schematics of each circuit are also given in section schematic diagrams. Refer to these diagrams throughout the following circuit description for electrical values and relationships.

CHANNELS 1 and 2 VERTICAL PREAMP

Input signals for vertical deflection on the CRT can be connected to the "CH1 OR X " and (or) "CH2 OR Y " input connectors. In the X-Y mode of operation, CH1 input signal provides the horizontal (X-axis) deflection and CH2 input signal provides the vertical (Y-axis) deflection.

The Channel 1 and 2 Vertical Preamp circuits provide control of input coupling, vertical deflection factor, DC balance, vertical position and vertical gain.

They also contain a stage to provide a sample of the input signal to the Trigger Preamp circuit for internal triggering from the Channel 1 and (or) Channel 2 signal only.

VERTICAL SWITCHING CIRCUIT

The vertical switching circuit determines whether the CH1 or CH2 or both Vertical Preamp output signals are connected to the Vertical Output Amplifier circuit (through the Delay Line Driver and Delay Line stages: V-425 only).

In the ALT and CHOP modes, both channels are alternately displayed on a shared time basis.

VERTICAL OUTPUT AMPLIFIER

The Vertical Output Amplifier circuit provides the final amplification for the signal before it is applied to the vertical deflection plates of the CRT.

TRIGGER PREAMP

The Trigger Preamp circuit amplifies the internal trigger signal to the

level necessary to drive the Trigger Generator circuit.

Input signal for the Trigger Preamplifier circuit is obtained by sampling the signal applied to Channel 1 or the composite vertical signal from the Vertical Switching circuit.

This circuit also provides a signal to the Horizontal Amplifier for X-Y mode operation.

TRIGGER GENERATOR

The Trigger Generator circuit produces trigger pulses to start the Sweep Generator circuit. These trigger pulses are derived either from the internal trigger signal from the vertical deflection system, an external signal connected to the EXT TRIG Input connector or a sample of the line voltage applied to the instrument.

Controls are provided in this circuit to select trigger level, slope and source.

The Trigger MODE switch determines the operating mode for the trigger circuit. In the NORM Trig position, a sweep is produced only when a trigger pulse is received from the Trigger Generator circuit. Operation in the AUTO Trig mode is the same mode as NORM Trig mode, except that a free-running trace is displayed when a trigger pulse is not present or when the amplitude of the trigger signal is not adequate.

SWEEP GENERATOR

The Sweep Generator circuit produces a sawtooth voltage which is amplified by the Horizontal Amplifier circuit to provide horizontal deflection on the CRT. This sawtooth voltage is generated on command (trigger pulse) from the Trigger Generator circuit.

The Sweep Generator circuit also produces an unblanking gate to unblank the CRT during sweep time.

HORIZONTAL AMPLIFIER

The Horizontal Amplifier circuit provides the output signal to the CRT horizontal deflection plates. In all positions of the TIME/DIV select switch except X-Y, the horizontal deflection signal is a sawtooth from the Sweep Generator circuit. In the X-Y position, the horizontal deflection

signal is obtained from the Channel 1 Vertical Preamp through the Trigger Preamp circuit. In addition, the horizontal amplifier contains the horizontal magnifier and the horizontal positioning circuits.

POWER SUPPLY

The low-voltage Power Supply circuit provides the operating power for this instrument from four regulated supplies and one unregulated supply. The Power Input stage is provided with a Voltage Selector Assembly. This selector allows selection of the nominal operating voltage and regulating range for the instrument.

CALIBRATOR

The Calibrator circuit produces a square-wave output with accurate amplitude and frequency. This output is available as a square-wave voltage at the CAL 0.5 V (1 kHz) connector.

Z AXIS AMPLIFIER

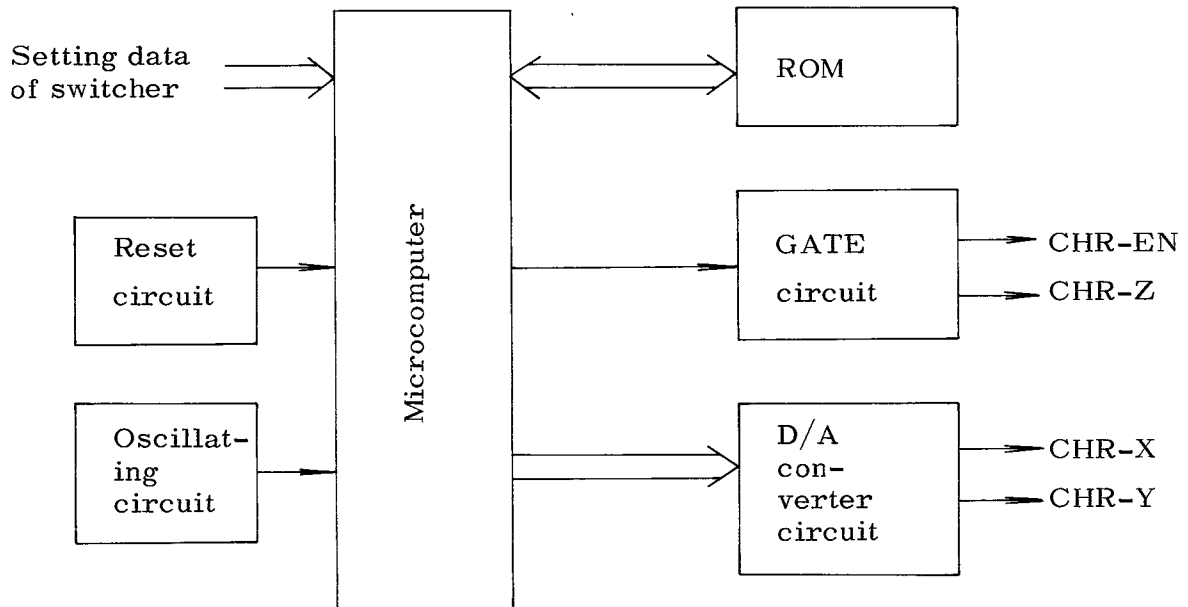
The Z-Axis Amplifier circuit controls the CRT intensity level from several inputs. The effect of these input signals is to either increase or decrease the trace intensity, or to completely blank portions of the display.

CRT CIRCUIT

The CRT Circuit provides the high-voltage and control circuits necessary for operation of the cathode-ray tube (CRT).

READOUT CIRCUIT

A block diagram of this circuit is illustrated below.



The microcomputer in this circuit controls all of the readout functions. The microcomputer is controlled by a program in the external ROM. The oscillating circuit provides the master oscillation for the microcomputer and oscillates the 12 MHz clock pulses. The reset circuit automatically sets the microcomputer to the initial setting state when the power of the oscilloscope is turned on.

Setting data of the switches on the front panel are supplied to the microcomputer as digital signals.

The setting data are also supplied to the microcomputer as analog signals whose voltages are different each other according to the combination of the switches. The analog signals are converted into digital signals by the A/D converter in the microcomputer, and the setting state of the switches is recognized.

According to the setting state, the microcomputer delivers data for the pattern and display location of characters and cursors to the D/A converter circuit.

There are four D/A converters in the D/A converter circuit. They convert the digital signals for the pattern and display location of one character and one cursor in the X and Y directions into analog signals. The analog signals for the character pattern and for the display location in the X and Y directions are added, and fed out from the D/A converter circuit as the CHR-X and the CHR-Y signals.

After the recognition of the CHR-X and CHR-Y signal the microcomputer supplies a timing signal to the GATE circuit so that the waveform signal and the character signal are switched, and the GATE circuit generates the CHR-EN and the CHR-Z signals.

9. ELECTRICAL PARTS LIST

PEF-620 CH1 ATT

Symbol	Part Code	Description	Q'ty	
			A	B
C	2	CCG0132	C, Ceramic Chip 50V 22 pF ±5%	1
C	5	CCG0139	C, Ceramic Chip 50V 47 pF ±5%	1
C	9	CCG0144	C, Ceramic Chip 50V 220 pF ±5%	1
C	10	CCG0142	C, Ceramic Chip 50V 82 pF ±5%	1
P	2	JBB0021	Connector B3B-XH-A	1
R	2	RME0860	R, MET Chip 1/8W 47Ω ±5%	1
R	4	RMS0043	R, Metal 1/4W 900kΩ ±0.5%	1
R	5	RME1163	R, Metal 1/4W 111kΩ ±0.5%	1
R	7	RMS0044	R, Metal 1/4W 990kΩ ±0.5%	1
R	8	RME1156	R, Metal 1/4W 10.1kΩ ±0.5%	1
R	9	RME0852	R, MET Chip 1/8W 10Ω ±5%	1
R	10	RME0864	R, MET Chip 1/8W 100Ω ±5%	1
R	12	RCE0749	R, Carbon 1/4W 22Ω ±5%	1

PEF-620 CH1 INPUT, 2ND ATT

Symbol	Part Code	Description	Q'ty	
			A	B
ATT	1	8402067	SW, Rotary ADR-255S-2A	1
C	16	CCD0328	C, Ceramic 500V 1000 pF +100% -0%	1
C	16	CCD0286	C, Ceramic 500V 1000 pF +100% -0%	1
C	18	CCC0996	C, Ceramic 50V 2 pF ±0.25pF	1
C	20	CCC1014	C, Ceramic 50V 47 pF ±5%	1
C	23	CQA0091	C, Plastic 50V 1000 pF ±10%	1
C	25	CCC1014	C, Ceramic 50V 47 pF ±5%	1
C	26	CES0028	C, AL Elyc 10V 47μF ±20%	1
C	30	CES0028	C, AL Elyc 10V 47μF ±20%	1
C	32	CCC1002	C, Ceramic 50V 10 pF ±5pF	1
C	35	CCC1030	C, Ceramic 50V 0.01μF ±80% -20%	1
C	40	CES0028	C, AL Elyc 10V 47μF ±20%	1
C	42	CCC1007	C, Ceramic 50V 22 pF ±5%	1
C	44	CES0028	C, AL Elyc 10V 47μF ±20%	1
C	53	CEX0189	C, AL Elyc 16V 10μF ±20%BP	1
CV	3	CVE0059	C, Variable ECR-HA010A41	1
CV	4	CVE0065	C, Variable ECR-HA007A41	1
CV	6	CVE0059	C, Variable ECR-HA010A41	1
CV	7	CVE0064	C, Variable ECR-HA003A41	1
D	16	HDS0437	Diode 1SS133	1
D	20	HDS0477	Diode 1SS110	1
D	21	HDS0477	Diode 1SS110	1
D	22	HDS0477	Diode 1SS110	1
D	51	HDS0407	Diode SR503D (RED)	1
IC	16	8397023A	IC LF411CN	1
JP	1	RME0912	R, MET Chip 0Ω RESISTOR	1
L	34	TLE0107	Coil ELF-Y R47 MA	1
P	50	JBB0021	Connector B3B-XH-A	1
R	16	RME1168	R, Metal 1/4W 500kΩ ±0.5%	1

Note: A:V-225/B:V-425

Symbol	Part Code	Description	Q'ty	
			A	B
R	17	RME1168	R, Metal 1/4W 500kΩ ±0.5%	1
R	18	RCE0757	R, Carbon 1/4W 100Ω ±5%	1
R	19	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1
R	20	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1
R	21	RSE0434	R, Solid 1/4W 10MΩ ±5%	1
R	23	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1
R	25	RCE0757	R, Carbon 1/4W 100Ω ±5%	1
R	25	RCE0755	R, Carbon 1/4W 68Ω ±5%	1
R	26	RME1081	R, Metal 1/4W 5.62kΩ ±1%	1
R	26	RME1079	R, Metal 1/4W 3.92kΩ ±1%	1
R	28	RCE0745	R, Carbon 1/4W 10Ω ±5%	1
R	30	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1
R	30	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1
R	32	RCE0753	R, Carbon 1/4W 47Ω ±5%	1
R	33	RCE0762	R, Carbon 1/4W 270Ω ±5%	1
R	34	RME1145	R, Metal 1/4W 60.0Ω ±0.5%	1
R	35	RCE0766	R, Carbon 1/4W 560Ω ±5%	1
R	36	RME1154	R, Metal 1/4W 600Ω ±0.5%	1
R	40	RCE0745	R, Carbon 1/4W 10Ω ±5%	1
R	41	RCE0745	R, Carbon 1/4W 10Ω ±5%	1
R	42	RCE0764	R, Carbon 1/4W 390Ω ±5%	1
R	43	RCE0767	R, Carbon 1/4W 680Ω ±5%	1
R	44	RCE0765	R, Carbon 1/4W 470Ω ±5%	1
R	45	RCE0745	R, Carbon 1/4W 10Ω ±5%	1
R	46	RME1157	R, Metal 1/4W 16.0kΩ ±0.5%	1
R	47	RME1162	R, Metal 1/4W 80.0kΩ ±0.5%	1
R	48	RME1157	R, Metal 1/4W 16.0kΩ ±0.5%	1
R	49	RME1155	R, Metal 1/4W 4.00kΩ ±0.5%	1
R	50	RME1157	R, Metal 1/4W 16.0kΩ ±0.5%	1
R	51	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1
R	52	RME1069	R, Metal 1/4W 562Ω ±1%	1
R	53	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1
R	54	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1
R	55	RCE0771	R, Carbon 1/4W 1.5kΩ ±5%	1
R	56	RME1157	R, Metal 1/4W 16.0kΩ ±0.5%	1
R	57	RME1155	R, Metal 1/4W 4.00kΩ ±0.5%	1
R	115	RCE0757	R, Carbon 1/4W 100Ω ±5%	1
RM	43	3173846B	R, Block For ATT	1
RV	22	RNE0057	VR, Metal EVN 49C00YB54(50K)	1
RV	33	RNE0048	VR, Metal EVN 39C00YB22(200)	1
RV	61	RDE0003	VR, Carbon EVH-YK3325B14	1
TR	24	HTK0099	Transistor 2SK404E	1
TR	30	HTC0148	Transistor 2SC458 C	1
TR	30	HTC0557	Transistor 2SC1674K	1
TR	40	HTA0224	Transistor 2SA1029 D	1

PEF-620 CH1 PREAMP

Symbol	Part Code	Description	Q'ty	
			A	B
C 61	CCC1011	C, Ceramic 50V 33 pF ±5%	1	
C 61	CCC1014	C, Ceramic 50V 47 pF ±5%		1
C 67	CQA0099	C, Plastic 50V 22000 pF ±10%	1	
C 67	CQA0097	C, Plastic 50V 10000 pF ±10%		1
C 69	CCC1365	C, Ceramic 50V 680 pF ±10%	1	1
C 71	CCC1365	C, Ceramic 50V 680 pF ±10%	1	1
C 72	CCC1030	C, Ceramic 50V 10000 pF ±80%	1	1
C 77	CCC0997	C, Ceramic 50V 3 pF ±0.25pF	1	1
R 59	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	
R 59	RCE0759	R, Carbon 1/4W 150Ω ±5%		1
R 60	RCE0797	R, Carbon 1/4W 220kΩ ±5%	1	
R 60	RCE0795	R, Carbon 1/4W 150kΩ ±5%		1
R 61	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	
R 62	RCE0753	R, Carbon 1/4W 47Ω ±5%		1
R 62	RCE0755	R, Carbon 1/4W 68Ω ±5%	1	
R 63	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	
R 63	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 64	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	
R 64	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 65	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 66	RCE0785	R, Carbon 1/4W 22kΩ ±5%	1	1
R 67	RCE0758	R, Carbon 1/4W 120Ω ±5%	1	1
R 68	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 69	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	
R 69	RCE0767	R, Carbon 1/4W 680Ω ±5%		1
R 70	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	
R 70	RCE0767	R, Carbon 1/4W 680Ω ±5%		1
R 71	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 72	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 73	RME1191	R, Metal 1/4W 432Ω ±1%		1
R 73	RME1070	R, Metal 1/4W 681Ω ±1%	1	
R 74	RME1191	R, Metal 1/4W 432Ω ±1%		1
R 74	RME1070	R, Metal 1/4W 681Ω ±1%	1	
R 75	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 76	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 77	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
RV 62	RNE0049	VR, Metal EVN 39C00YB12(100)	1	1
RV 63	RNE0047	VR, Metal EVN 39C00YB54(50K)	1	1
TR 61	HTC0168	Transistor 2SC535 C	1	1
TR 62	HTC0168	Transistor 2SC535 C	1	1
TR 63	HTA0224	Transistor 2SA1029 D	1	1
TR 64	HTA0224	Transistor 2SA1029 D	1	1

PEF-620 CH1 TRIG PICK OFF + CH1

Symbol	Part Code	Description	Q'ty	
			A	B
C 83	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 86	CCC1034	C, Ceramic 50V 68 pF ±5%		1
C 86	CCC1365	C, Ceramic 50V 680 pF ±10%	1	
C 90	CCC1365	C, Ceramic 50V 680 pF ±10%	1	1
C 91	CCC1365	C, Ceramic 50V 680 pF ±10%	1	1
C 94	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 96	CCC1030	C, Ceramic 50V 10000 pF ±80%	1	1
C 97	CQA0032	C, Plastic 50V 0.22μF ±5%		1
C 97	CCC1027	C, Ceramic 50V 220 pF ±10%	1	
D 97	HDH0024	Diode HZ3B	1	1
P 3	JBB0022	Connector B6B-XH-A	1	1
P 90	JBB0021	Connector B3B-XH-A	1	1
L 98	TLF0067	Coil FL5H 100μH ±10%		1
R 81	RCE0693	R, Carbon 1/2W 100Ω ±5%		1
R 82	RME1107	R, Metal 1/4W 86.6Ω ±1%	1	1
R 83	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 84	RCE0759	R, Carbon 1/4W 150Ω ±5%	1	1
R 85	RCE0783	R, Carbon 1/4W 15kΩ ±5%	1	1
R 86	RCE0771	R, Carbon 1/4W 1.5kΩ ±5%	1	
R 86	RCE0757	R, Carbon 1/4W 100Ω ±5%		1
R 87	RCE0755	R, Carbon 1/4W 68Ω ±5%	1	
R 87	RCE0751	R, Carbon 1/4W 33Ω ±5%		1
R 88	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 88	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 89	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 89	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 90	RCE0745	R, Carbon 1/4W 10Ω ±5%		1
R 90	RCE0763	R, Carbon 1/4W 330Ω ±5%	1	
R 91	RCE0763	R, Carbon 1/4W 330Ω ±5%	1	
R 91	RCE0761	R, Carbon 1/4W 220Ω ±5%		1
R 93	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 93	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 94	RCE0771	R, Carbon 1/4W 1.5kΩ ±5%	1	
R 94	RME1070	R, Metal 1/4W 681Ω ±1%		1
R 95	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 96	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 96	RCE0755	R, Carbon 1/4W 68.2 ±5%	1	
R 97	RCE0781	R, Carbon 1/4W 10kΩ ±5%		1
R 97	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 98	RCE0767	R, Carbon 1/4W 680Ω ±5%	1	
R 98	RCE0767	R, Carbon 1/4W 680Ω ±5%		1
R 99	RCE0768	R, Carbon 1/4W 820Ω ±5%	1	
R 99	RCE0767	R, Carbon 1/4W 680Ω ±5%		1
RV 85	RNE0051	VR, Metal EVN 39C00YB14(10K)	1	1
TR 85	HTC0168	Transistor 2SC535 C	1	1
TR 86	HTC0168	Transistor 2SC535 C	1	1
TR 87	HTC0148	Transistor 2SC458 C	1	1

PEF-620 CH2 ATT

Symbol	Part Code	Description	Q'ty	
			A	B
C 102	CCG0132	C, Ceramic Chip 50V 22 pF ±5%	1	1
C 105	CCG0139	C, Ceramic Chip 50V 47 pF ±5%	1	1
C 109	CCG0144	C, Ceramic Chip 50V 220 pF ±5%	1	1
C 110	CCG0142	C, Ceramic Chip 50V 82 pF ±5%	1	1
P 102	JBB0021	Connector B3B-XH-A	1	1
R 102	RME0860	R, MET Chip 1/8W 47Ω ±5%	1	1
R 104	RMS0043	R, Metal 1/4W 900kΩ ±0.5%	1	1
R 105	RME1163	R, Metal 1/4W 111kΩ ±0.5%	1	1
R 107	RMS0044	R, Metal 1/4W 990kΩ ±0.5%	1	1
R 108	RME1156	R, Metal 1/4W 10.1kΩ ±0.5%	1	1
R 109	RME0852	R, MET Chip 1/8W 10Ω ±5%	1	1
R 110	RME0864	R, MET Chip 1/8W 100Ω ±5%	1	1
R 112	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1

PEF-620 CH2 INPUT + 2ND ATT

Symbol	Part Code	Description	Q'ty	
			A	B
ATT 101	8398872B	SW, Rotary ADR-255SA	1	1
ATT 101	8398872A	SW, Rotary ADR-255S	1	1
C 116	CCD0328	C, Ceramic 500V 1000 pF +100% -0%	1	1
C 116	CCD0286	C, Ceramic 500V 1000 pF +100% -0%	1	1
C 118	CCC0996	C, Ceramic 50V 2 pF ±0.25pF	1	1
C 120	CCC1014	C, Ceramic 50V 47 pF ±5%	1	1
C 123	CQA0091	C, Plastic 50V 1000 pF ±10%	1	1
C 125	CCC1014	C, Ceramic 50V 47 pF ±5%	1	1
C 126	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 130	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 132	CCC1002	C, Ceramic 50V 10 pF ±5pF	1	1
C 140	CES0028	C, AL Elyc 10V 47μF ±5%	1	1
C 142	CCC1007	C, Ceramic 50V 22 pF ±5%	1	1
C 144	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
CV 103	CVE0059	C, Variable ECR-HA010A41	1	1
CV 104	CVE0065	C, Variable ECR-HA007A41	1	1
CV 106	CVE0059	C, Variable ECR-HA010A41	1	1
CV 107	CVE0064	C, Variable ECR-HA003A41	1	1
D 116	HDS0437	Diode 1SS133	1	1
D 120	HDS0477	Diode 1SS110	1	1
D 121	HDS0477	Diode 1SS110	1	1
D 122	HDS0477	Diode 1SS110	1	1
D 151	HDS0407	Diode SR503D (RED)	1	1
IC 116	8397023	IC LF411CN	1	1
L 134	TLE0107	Coil ELE-Y R47 MA	1	1
R 115	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 116	RME1168	R, Metal 1/4W 500kΩ ±0.5%	1	1
R 117	RME1168	R, Metal 1/4W 500kΩ ±0.5%	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 118	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 119	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	1
R 120	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	1
R 121	RSE0434	R, Solid 1/4W 10MΩ ±5%	1	1
R 123	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 125	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 125	RCE0755	R, Carbon 1/4W 68Ω ±5%	1	1
R 126	RME1081	R, Metal 1/4W 5.62kΩ ±1%	1	1
R 126	RME1079	R, Metal 1/4W 3.92kΩ ±1%	1	1
R 128	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 130	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 130	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 132	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 133	RCE0762	R, Carbon 1/4W 270Ω ±5%	1	1
R 134	RME1145	R, Metal 1/4W 60.0Ω ±0.5%	1	1
R 135	RCE0766	R, Carbon 1/4W 560Ω ±5%	1	1
R 136	RME1154	R, Metal 1/4W 600Ω ±0.5%	1	1
R 140	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 141	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 142	RCE0764	R, Carbon 1/4W 390Ω ±5%	1	1
R 143	RCE0767	R, Carbon 1/4W 680Ω ±5%	1	1
R 144	RCE0766	R, Carbon 1/4W 560Ω ±5%	1	1
R 144	RCE0767	R, Carbon 1/4W 680Ω ±5%	1	1
R 145	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 146	RME1157	R, Metal 1/4W 16.0kΩ ±0.5%	1	1
R 147	RME1162	R, Metal 1/4W 80.0kΩ ±0.5%	1	1
R 148	RME1155	R, Metal 1/4W 4.00kΩ ±0.5%	1	1
R 151	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
RM 143	3173846B	R, Block For ATT	1	1
RV 122	RNE0057	VR, Metal EVN 49C00YB54(50K)	1	1
RV 133	RNE0048	VR, Metal EVN 39C00YB22(200)	1	1
TR 124	HTK0099	Transistor 2SK404E	1	1
TR 130	HTC0148	Transistor 2SC458-C-	1	1
TR 130	HTC0557	Transistor 2SC1674K	1	1
TR 140	HTA0224	Transistor 2SA1029 D	1	1

PEF-620 CH2 PREAMP

Symbol	Part Code	Description	Q'ty	
			A	B
C 167	CQA0099	C, Plastic 50V 22000 pF ±10%	1	
C 167	CQA0097	C, Plastic 50V 10000 pF ±10%		1
C 169	CCC1365	C, Ceramic 50V 680 pF ±10%	1	1
C 171	CCC1365	C, Ceramic 50V 680 pF ±10%	1	1
C 179	CCC1030	C, Ceramic 50V 10000 pF ±10%	1	1
CV 161	CVE0062	C, Variable ECR-HA040E41		1
CV 161	CVE0060	C, Variable ECR-HA020D41	1	
R 159	RCE0759	R, Carbon 1/4W 150Ω ±5%		1
R 159	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	
R 160	RCE0795	R, Carbon 1/4W 150kΩ ±5%		1
R 160	RCE0797	R, Carbon 1/4W 220kΩ ±5%	1	
R 161	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 162	RCE0753	R, Carbon 1/4W 47Ω ±5%		1
R 162	RCE0755	R, Carbon 1/4W 68Ω ±5%	1	
R 163	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	
R 163	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 164	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	
R 164	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 165	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 166	RCE0785	R, Carbon 1/4W 22kΩ ±5%	1	1
R 167	RCE0758	R, Carbon 1/4W 120Ω ±5%	1	1
R 168	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 169	RCE0767	R, Carbon 1/4W 680Ω ±5%		1
R 169	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	
R 170	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	
R 170	RCE0767	R, Carbon 1/4W 680Ω ±5%		1
R 171	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 172	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 173	RME1070	R, Metal 1/4W 681Ω ±1%	1	
R 173	RME1191	R, Metal 1/4W 432Ω ±1%		1
R 174	RME1070	R, Metal 1/4W 681Ω ±1%	1	
R 174	RME1191	R, Metal 1/4W 432Ω ±1%		1
R 175	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 176	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 177	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 178	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 179	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
RV 161	RDE0003	VR, Carbon EVH-YK3325B14	1	1
RV 162	RNE0049	VR, Metal EVN 39C00YB12(100)	1	1
RV 163	RNE0047	VR, Metal EVN 39C00YB54(50K)	1	1
TR 161	HTC0168	Transistor 2SC535 C	1	1
TR 162	HTC0168	Transistor 2SC535 C	1	1
TR 163	HTA0224	Transistor 2SA1029 D	1	1
TR 164	HTA0224	Transistor 2SA1029 D	1	1
TR 165	HTA0224	Transistor 2SA1029 D	1	1
TR 166	HTA0224	Transistor 2SA1029 D	1	1

PEF-620 CH2 TRIG PICK OFF

Symbol	Part Code	Description	Q'ty	
			A	B
C 186	CCC1365	C, Ceramic 50V 680 pF ±10%	1	
C 186	CCC1034	C, Ceramic 50V 68 pF ±5%		1
C 190	CCC1365	C, Ceramic 50V 680 pF ±10%	1	1
R 181	RCE0757	R, Carbon 1/4W 100Ω ±5%		1
R 184	RCE0759	R, Carbon 1/4W 150Ω ±5%	1	1
R 185	RCE0783	R, Carbon 1/4W 15kΩ ±5%	1	1
R 186	RCE0757	R, Carbon 1/4W 100Ω ±5%		1
R 186	RCE0771	R, Carbon 1/4W 1.5kΩ ±5%	1	
R 187	RCE0755	R, Carbon 1/4W 68Ω ±5%	1	
R 187	RCE0751	R, Carbon 1/4W 33Ω ±5%		1
R 188	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 188	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 189	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 189	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 190	RCE0745	R, Carbon 1/4W 10Ω ±5%		1
R 190	RCE0763	R, Carbon 1/4W 330Ω ±5%	1	
R 191	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%		1
R 191	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	
R 192	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 192	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%		1
RV 185	RNE0051	VR, Metal EVN 39C00YB14(10K)	1	1
TR 185	HTC0168	Transistor 2SC535 C	1	1
TR 186	HTC0168	Transistor 2SC535 C	1	1

PEF-620 VERT SWITCHING

Symbol	Part Code	Description	Q'ty	
			A	B
C 221	CCC1160	C, Ceramic 50V 330 pF ±10%	1	1
C 222	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 223	CCC1160	C, Ceramic 50V 330 pF ±10%	1	1
C 223	CCC1365	C, Ceramic 50V 680 pF ±10%		1
C 224	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
D 221	HDS0437	Diode 1SS133	1	1
D 222	HDS0437	Diode 1SS133	1	1
D 224	HDS0437	Diode 1SS133	1	1
D 225	HDS0437	Diode 1SS133	1	1
D 226	HDS0437	Diode 1SS133	1	1
D 230	HDS0437	Diode 1SS133	1	1
D 231	HDS0437	Diode 1SS133	1	1
IC 222	IDH0467	Digital IC HD74LS00P	1	1
IC 226	IDH0586	Digital IC HD74LS74AP	1	1
P 202	JBB0021	Connector B3B-XH-A	1	1
P 203	JBB0021	Connector B3B-XH-A	1	1
R 221	RCE0748	R, Carbon 1/4W 18Ω ±5%		1
R 221	RCE0750	R, Carbon 1/4W 27Ω ±5%	1	
R 222	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	
R 222	RCE0758	R, Carbon 1/4W 120Ω ±5%		1

Symbol	Part Code	Description	Q'ty	
			A	B
R 223	RCE0750	R, Carbon 1/4W 27Ω ±5%	1	
R 223	RCE0748	R, Carbon 1/4W 18Ω ±5%		1
R 224	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	
R 224	RCE0758	R, Carbon 1/4W 120Ω ±5%		1
R 225	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 226	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 228	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 229	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	1
R 230	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 231	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 232	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	
R 232	RCE0768	R, Carbon 1/4W 820Ω ±5%		1
R 233	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 234	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 235	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 236	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 237	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 238	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 239	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
S 201	3165210	SW, Rotary SBU 1025	1	1
TR 232	HTA0224	Transistor 2SA1029 D	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 248	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 249	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%		1
TR 241	HTC0192	Transistor 2SC641K-C	1	1
TR 242	HTC0192	Transistor 2SC641K-C	1	1
TR 246	HTA0099	Transistor 2SA781K		1
TR 246	HTA0224	Transistor 2SA1029 D	1	

PEF-620 V OUT DRIVER

Symbol	Part Code	Description	Q'ty	
			A	B
	JBB0030	Connector B4P-SHF-GB	4	4
C 201	CCC1030	C, Ceramic 50V 10000pF +80% -20%	1	1
C 207	CCC1014	C, Ceramic 50V 47pF ±5%	1	
C 207	CCC1026	C, Ceramic 50V 150pF ±10%		1
C 210	CEX0189	C, AL Elyc 16V 10μF ±20%BP	1	1
C 217	CCC1002	C, Ceramic 50V 10pF ±5pF		1
P 201	JBB0021	Connector B3B-XH-A		1
R 201	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%		1
R 201	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 202	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%		1
R 202	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 203	RME1063	R, Metal 1/4W 182Ω ±1%		1
R 203	RME1066	R, Metal 1/4W 332Ω ±1%	1	
R 204	RME1063	R, Metal 1/4W 182Ω ±1%		1
R 204	RME1066	R, Metal 1/4W 332Ω ±1%	1	
R 205	RCE0766	R, Carbon 1/4W 560Ω ±5%		1
R 205	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	
R 206	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 207	RCE0785	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 207	RCE0782	R, Carbon 1/4W 12kΩ ±5%		1
R 208	RME1064	R, Metal 1/4W 221Ω ±1%		1
R 208	RME1066	R, Metal 1/4W 332Ω ±1%	1	
R 209	RME1064	R, Metal 1/4W 221Ω ±1%		1
R 209	RME1066	R, Metal 1/4W 332Ω ±1%	1	
R 210	RCE0789	R, Carbon 1/4W 47kΩ ±5%		1
R 210	RCE0791	R, Carbon 1/4W 68kΩ ±5%	1	
R 211	RCE0766	R, Carbon 1/4W 560Ω ±5%	1	
R 211	RCE0768	R, Carbon 1/4W 820Ω ±5%		1
R 212	RCE0768	R, Carbon 1/4W 820Ω ±5%		1
R 212	RCE0766	R, Carbon 1/4W 560Ω ±5%	1	
R 213	RME1107	R, Metal 1/4W 86.6Ω ±1%		1
R 213	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	
R 214	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	
R 214	RME1107	R, Metal 1/4W 86.6Ω ±1%		1
R 215	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 215	RCE0772	R, Carbon 1/4W 1.8kΩ ±5%		1
R 216	RCE0772	R, Carbon 1/4W 1.8kΩ ±5%		1
R 216	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 217	RCE0761	R, Carbon 1/4W 220Ω ±5%		1

PEF-620 INT TRIG AMP

Symbol	Part Code	Description	Q'ty	
			A	B
C 241	CCC1030	C, Ceramic 50V 10000pF +80% -20%	1	
C 242	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 243	CCC1007	C, Ceramic 50V 22pF ±5%	1	1
C 244	CCC1007	C, Ceramic 50V 22pF ±5%	1	1
C 245	CQA0097	C, Plastic 50V 10000pF ±10%	1	1
C 248	CCC1032	C, Ceramic 50V 82pF ±5%	1	
C 248	CCC1025	C, Ceramic 50V 100pF ±10%		1
C 249	CCC0999	C, Ceramic 50V 5pF ±0.25pF		1
D 243	HDS0437	Diode 1SS133	1	1
D 244	HDS0437	Diode 1SS133	1	1
D 245	HDH0029	Diode HZ5B	1	1
R 241	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 242	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 243	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 244	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 245	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	
R 245	RCE0766	R, Carbon 1/4W 560Ω ±5%		1
R 246	RCE0766	R, Carbon 1/4W 560Ω ±5%		1
R 246	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	
R 247	RCE0765	R, Carbon 1/4W 470Ω ±5%		1
R 247	RCE0768	R, Carbon 1/4W 820Ω ±5%	1	

Symbol	Part Code	Description	Q'ty	
			A	B
TR_ 201	HTC0338	Transistor 2SC1906	1	1
TR 202	HTC0338	Transistor 2SC1906	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 331	RME1060	R, Metal 1/4W 100Ω ±1%		1
R 331	RME1062	R, Metal 1/4W 150Ω ±1%	1	
R 332	RME1060	R, Metal 1/4W 100Ω ±1%		1
R 332	RME1062	R, Metal 1/4W 150Ω ±1%	1	
R 333	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%		1
R 336	RCE0758	R, Carbon 1/4W 120Ω ±5%		1
R 336	RCE0754	R, Carbon 1/4W 56Ω ±5%	1	
R 337	RCE0745	R, Carbon 1/4W 10Ω ±5%		1
R 337	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	
R 338	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%		1
R 338	RCE0759	R, Carbon 1/4W 150Ω ±5%	1	
R 339	RCE0766	R, Carbon 1/4W 560Ω ±5%	1	
R 339	RCE0765	R, Carbon 1/4W 470Ω ±5%		1
R 340	RCE0765	R, Carbon 1/4W 470Ω ±5%		1
R 340	RCE0766	R, Carbon 1/4W 560Ω ±5%	1	
R 341	RCE0745	R, Carbon 1/4W 10Ω ±5%		1
R 342	RCE0797	R, Carbon 1/4W 220kΩ ±5%	1	
R 343	RCE0797	R, Carbon 1/4W 220kΩ ±5%	1	
R 344	RCE0755	R, Carbon 1/4W 68Ω ±5%	1	
R 345	RCE0753	R, Carbon 1/4W 47Ω ±5%		1
R 346	RCE0753	R, Carbon 1/4W 47Ω ±5%		1
R 347	RCE0759	R, Carbon 1/4W 150Ω ±5%		1
R 348	RCE0759	R, Carbon 1/4W 150Ω ±5%		1
R 349	RCE0759	R, Carbon 1/4W 150Ω ±5%		1
R 350	RCE0759	R, Carbon 1/4W 150Ω ±5%		1
R 355	RCE0758	R, Carbon 1/4W 120Ω ±5%		1
R 356	RCE0757	R, Carbon 1/4W 100Ω ±5%		1
R 360	RCE0766	R, Carbon 1/4W 560Ω ±5%		1
R 361	RCE0766	R, Carbon 1/4W 560Ω ±5%		1
R 362	RCE0781	R, Carbon 1/4W 10kΩ ±5%		1
R 363	RME1066	R, Metal 1/4W 332Ω ±1%		1
R 364	RME1065	R, Metal 1/4W 267Ω ±1%	1	
R 364	RME1066	R, Metal 1/4W 332Ω ±1%		1
R 365	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	
R 365	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%		1
R 366	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	
R 366	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%		1
R 367	RMR3724	R, Metal 1W 10kΩ ±5%	1	
R 367	RMR3778	R, Metal 1W 22kΩ ±5%		1
R 368	RMR3724	R, Metal 1W 10kΩ ±5%	1	
R 368	RMR3778	R, Metal 1W 22kΩ ±5%		1
R 369	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 371	RCE0751	R, Carbon 1/4W 33Ω ±5%	1	1
R 372	RCE0751	R, Carbon 1/4W 33Ω ±5%	1	1
R 373	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 374	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 375	RCE0751	R, Carbon 1/4W 33Ω ±5%	1	1
R 376	RCE0751	R, Carbon 1/4W 33Ω ±5%	1	1
R 377	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 378	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 381	RCE0711	R, Carbon 1/2W 3.3kΩ ±5%		1
R 381	RCE0715	R, Carbon 1/2W 6.8kΩ ±5%	1	
R 382	RCE0711	R, Carbon 1/2W 3.3kΩ ±5%		1
R 382	RCE0715	R, Carbon 1/2W 6.8kΩ ±5%	1	
R 383	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 384	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 385	RCE0757	R, Carbon 1/4W 100Ω ±5%		1
R 385	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	
R 386	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	
R 386	RCE0757	R, Carbon 1/4W 100Ω ±5%		1
R 387	RCE0711	R, Carbon 1/2W 3.3kΩ ±5%		1
R 387	RCE0715	R, Carbon 1/2W 6.8kΩ ±5%	1	

PEF-620 V OUT AMP

Symbol	Part Code	Description	Q'ty	
			A	B
C 270	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 271	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 301	CET0033	C, AL Elyc 160V 1μF ±20%	1	1
C 302	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 303	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 304	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 305	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 337	CCC1005	C, Ceramic 50V 18pF ±5%	1	1
C 337	CCC1032	C, Ceramic 50V 82pF ±5%	1	
C 338	CCC1011	C, Ceramic 50V 33pF	1	1
C 345	CCC1029	C, Ceramic 50V 1000pF +80% -20%	1	
C 346	CCC1029	C, Ceramic 50V 1000pF +80% -20%	1	
C 355	CCC1002	C, Ceramic 50V 10pF ±5pF	1	1
C 363	CCC1030	C, Ceramic 50V 10000pF +80% -20%	1	1
C 364	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 365	CCC1007	C, Ceramic 50V 22pF ±5%	1	1
C 365	CCC1034	C, Ceramic 50V 68pF ±5%	1	
C 366	CCC1002	C, Ceramic 50V 10pF ±5pF	1	
C 366	CCC1014	C, Ceramic 50V 47pF ±5%	1	
C 367	CCD0273	C, Ceramic 500V 2pF ±0.25pF	1	
C 367	CCD0273	C, Ceramic 500V 2pF ±0.25pF	1	1
C 368	CCD0273	C, Ceramic 500V 2pF ±0.25pF	1	
C 368	CCD0273	C, Ceramic 500V 2pF ±0.25pF	1	
C 379	CCD0217	C, Ceramic 500V 1000pF ±10%	1	1
C 380	CCD0217	C, Ceramic 500V 1000pF ±10%	1	1
C 385	CCC0591	C, Ceramic 500V 10000pF +100% -0%	1	1
C 386	CCC0591	C, Ceramic 500V 10000pF +100% -0%	1	1
C 389	CCD0287	C, Ceramic 500V 4700pF +100% -0%	1	1
CV 337	CVE0062	C, Variable ECR-HA040E41	1	
CV 337	CVE0060	C, Variable ECR-HA020D41		1
CV 355	CVE0062	C, Variable ECR-HA040E41	1	
CV 366	CVE0062	C, Variable ECR-HA040E41	1	
CV 366	CVE0060	C, Variable ECR-HA020D41		1
D 374	HDH0029	Diode HZ5B	1	1
D 375	HDH0029	Diode HZ5B	1	1
D 377	HDH0029	Diode HZ5B	1	1
D 394	HDS0437	Diode 1SS133	1	1
D 395	HDS0437	Diode 1SS133	1	1
L 385	TLE0091	Coil ELE-Y 2R2MA	1	
L 385	TLE0109	Coil ELE-Y R68 MA		1
L 386	TLE0091	Coil ELE-Y 2R2MA	1	
L 386	TLE0109	Coil ELE-Y R68 MA		1
P 301	JBB0021	Connector B3B-XH-A	1	1
P 302	JBB0022	Connector B6B-XH-A	1	1
P 304	JBB0021	Connector B3B-XH-A	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 388	RCE0711	R, Carbon 1/2W 3.3kΩ ±5%		1
R 388	RCE0715	R, Carbon 1/2W 6.8kΩ ±5%	1	
R 389	RCE0721	R, Carbon 1/2W 22kΩ ±5%		1
R 389	RCE0723	R, Carbon 1/2W 33kΩ ±5%	1	
R 390	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	
R 390	RCE0781	R, Carbon 1/4W 10kΩ ±5%		1
R 391	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 392	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%		1
R 392	RCE0778	R, Carbon 1/4W 5.6kΩ ±5%	1	
R 393	RCE0767	R, Carbon 1/4W 680Ω ±5%	1	1
R 394	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 395	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 396	RCE0785	R, Carbon 1/4W 22Ω ±5%	1	1
R 398	RCE0414	R, Carbon 1/4W 120Ω ±5%	1	1
R 399	RCE0414	R, Carbon 1/4W 120Ω ±5%	1	1
RV 339	RNE0048	VR, Metal EVN 39C00YB22(200)		1
RV 339	RNE0050	VR, Metal EVN 39C00YB52(500)	1	
TR 331	HTC0192	Transistor 2SC641K-C	1	
TR 331	HTA0099	Transistor 2SA781K		1
TR 332	HTA0099	Transistor 2SA781K		1
TR 332	HTC0192	Transistor 2SC641K-C	1	
TR 349	HTC0721	Transistor 2SC2901		1
TR 350	HTC0721	Transistor 2SC2901	1	1
TR 365	HTC0721	Transistor 2SC2901	1	1
TR 366	HTC0721	Transistor 2SC2901	1	1
TR 371	HTC0669	Transistor 2SC2912S	1	1
TR 372	HTC0669	Transistor 2SC2912S	1	1
TR 375	HTA0258	Transistor 2SA1210S	1	1
TR 376	HTA0258	Transistor 2SA1210S	1	1
TR 377	HTA0099	Transistor 2SA781K	1	1
TR 378	HTA0099	Transistor 2SA781K	1	1
TR 390	HTC0148	Transistor 2SC458 C	1	1
TR 396	HTC0148	Transistor 2SC458 C	1	1

PEF-620 CAL

Symbol	Part Code	Description	Q'ty	
			A	B
C 1201	CCC1002	C, Ceramic 50V 10pF ±5pF	1	1
C 1202	CQA0091	C, Plastic 50V 1000pF ±10%	1	1
C 1208	CQA0099	C, Plastic 50V 22000pF ±10%	1	1
C 1210	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
P 1201	JBB0021	Connector B3B-XH-A	1	1
P 1206	JBB0021	Connector B3B-XH-A	1	1
R 1201	RME1174	R, Metal 1/4W 2.00kΩ ±1%	1	1
R 1202	RME1065	R, Metal 1/4W 267Ω ±1%	1	1
R 1203	RCE0783	R, Carbon 1/4W 15kΩ ±5%	1	1
R 1204	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 1205	RCE0783	R, Carbon 1/4W 15kΩ ±5%	1	1
R 1206	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 1207	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 1208	RCE0787	R, Carbon 1/4W 33kΩ ±5%	1	1
R 1209	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 1210	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
RV 1201	RNE0058	VR, Metal EVN 39C00YB13(1K)	1	1
TR 1201	HTA0224	Transistor 2SA1029 D	1	1
TR 1208	HTC0148	Transistor 2SC458-C-	1	1
TR 1209	HTC0148	Transistor 2SC458-C-	1	1

PEF-621 TRIG GEN

Symbol	Part Code	Description	Q'ty	
			A	B
C 402	CCD0279	C, Ceramic 500V 22pF ±5%	1	1
C 403	CQX0068	C, Plastic 400V 47μF ±10%	1	1
C 404	CCC1029	C, Ceramic 50V 1000pF ±10%	1	1
C 405	CQA0101	C, Plastic 50V 47000pF ±10%	1	1
C 407	CCC0999	C, Ceramic 50V 5pF ±0.25pF	1	1
C 408	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 417	CES0213	C, AL Elyc 16V 10μF ±20%BP	1	1
C 418	CCC1030	C, Ceramic 50V 10000pF ±80% -20%	1	1
C 425	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 442	CES0249	C, AL Elyc 50V 1μF ±20%BP	1	1
C 444	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 452	CQA0097	C, Plastic 50V 10000pF ±10%	1	1
C 460	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
D 401	HDS0437	Diode 1SS133	1	1
D 444	HDS0437	Diode 1SS133	1	1
IC 401	IDH0403	Digital IC HD74S00P		1
IC 401	IDH0467	Digital IC HD74LS00P	1	
L 432	TLE0120	Coil ELE-Y 6R8 KA		1
P 404	JBB0021	Connector B3B-XH-A	1	1
R 401	RCE0800	R, Carbon 1/4W 470kΩ ±5%	1	1
R 402	RCE0755	R, Carbon 1/4W 68Ω ±5%	1	1
R 404	RCE0764	R, Carbon 1/4W 390Ω ±5%	1	1
R 406	RCE0800	R, Carbon 1/4W 470kΩ ±5%	1	1
R 407	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 408	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 409	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%		1
R 409	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 410	RCE0772	R, Carbon 1/4W 1.8kΩ ±5%		1
R 417	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 418	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%	1	1
R 420	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 425	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 430	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 432	RCE0767	R, Carbon 1/4W 680Ω ±5%	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 433	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	
R 433	RCE0768	R, Carbon 1/4W 820Ω ±5%		1
R 434	RCE0689	R, Carbon 1/2W 47Ω ±5%	1	1
R 435	RCE0774	R, Carbon 1/4W 2.7kΩ ±5%	1	1
R 436	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 437	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 438	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 439	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 441	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 443	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 444	RCE0771	R, Carbon 1/4W 1.5kΩ ±5%	1	1
R 445	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 450	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 452	RCE0785	R, Carbon 1/4W 22kΩ ±5%	1	1
R 460	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 460	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	
RV 418	RDE0003	VR, Carbon EVH-YK3325B14	1	1
RV 420	RNE0051	VR, Metal EVN 39C00YB14(10K)	1	1
S 401	8374067D	SW, Lever SLR024(LEVER 12 MM)	1	1
S 403	8374067D	SW, Lever SLR024(LEVER 12 MM)	1	1
TR 401	HTK0099	Transistor 2SK404E	1	1
TR 402	HTC0148	Transistor 2SC458 C		1
TR 431	HTC0168	Transistor 2SC535 C	1	1
TR 432	HTC0168	Transistor 2SC535 C	1	1
TR 441	HTA0224	Transistor 2SA1029 D	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
C 545	CES0249	C, AL Elyc 50V 1μF ±20%BP	1	1
C 550	CCC1014	C, Ceramic 50V 47μF ±5% +80%	1	1
C 551	CCC1030	C, Ceramic 50V 10000 pF ±20%	1	1
C 552	CCC1030	C, Ceramic 50V 10000 pF ±80% -20%	1	1
C 553	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 554	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 571	CCC1030	C, Ceramic 50V 10000 pF ±80% -20%	1	1
C 572	CCC1014	C, Ceramic 50V 47μF ±5%	1	1
C 573	CCC1027	C, Ceramic 50V 220 pF ±10%	1	1
C 575	CCC1027	C, Ceramic 50V 220 pF ±10%	1	1
C 576	CCC1030	C, Ceramic 50V 10000 pF ±80% -20%	1	1
C 577	CES0028	C, AL Elyc 10V 47μF ±20%		1
CV 520	CVE0062	C, Variable ECR-HA040E41	1	1
D 501	HDS0437	Diode 1SS133	1	1
D 520	HDM0051	Diode MA161	1	1
D 521	HDM0051	Diode MA161	1	1
D 522	HDM0051	Diode MA161	1	1
D 530	HDS0437	Diode 1SS133	1	1
D 535	HDM0051	Diode MA161	1	1
D 536	HDS0437	Diode 1SS133	1	1
D 541	HDS0437	Diode 1SS133	1	1
D 543	HDS0407	Diode SR503D (RED)	1	1
D 571	HDS0437	Diode 1SS133	1	1
D 572	HDS0437	Diode 1SS133	1	1
D 573	HDS0437	Diode 1SS133	1	1
D 574	HDS0437	Diode 1SS133	1	1
IC 501	IDH0586	Digital IC HD74LS74AP	1	
IC 501	IDH0429	Digital IC HD74S74P		1
IC 502	IDH0469	Digital IC HD74LS03P	1	1
IC 550	IDH0802	Digital IC HD14053BP	1	1
IC 571	IDH0646	Digital IC HD74LS02P	1	1
L 537	TLE0092	Coil ELE-Y 331KA		1
L 537	TLE0138	Coil ELE-Y 681KA	1	
L 571	TLE0128	Coil ELE-Y 330KA	1	1
R 501	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 502	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 503	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 504	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 505	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 506	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 507	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 508	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 509	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 510	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 513	RCE0780	R, Carbon 1/4W 8.2kΩ ±5%	1	1
R 514	RCE0771	R, Carbon 1/4W 1.5kΩ ±5%	1	1
R 515	RCE0783	R, Carbon 1/4W 15kΩ ±5%	1	1
R 519	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 520	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 521	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 522	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 523	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 524	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	1
R 524	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 525	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 526	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%	1	1
R 527	RSE0434	R, Solid 1/4W 10MΩ ±5%	1	1

PEF-621 SWEEP GEN

Symbol	Part Code	Description	Q'ty	
			A	B
C 501	CCC1030	C, Ceramic 50V 10000 pF ±80% -20%	1	1
C 505	CCC1133	C, Ceramic 50V 1 pF ±0.25pF	1	1
C 507	CES0028	C, AL Elyc 10V 47μF ±20%		1
C 508	CCC1030	C, Ceramic 50V 10000 pF ±80% -20%	1	
C 510	CCC1030	C, Ceramic 50V 10000 pF ±80% -20%	1	1
C 511	CES0036	C, AL Elyc 25V 22μF ±20%	1	1
C 519	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 520	CCC1032	C, Ceramic 50V 82 pF ±5%	1	1
C 524	CCC1001	C, Ceramic 50V 8 pF ±0.5pF	1	1
C 525	CQE0049	C, Plastic ECQ-E1105JN(JNB) TYPE-1	1	1
C 526	CQE0050	C, Plastic ECQ-P1103JZ (100V 0.01MF)	1	1
C 527	CCC1030	C, Ceramic 50V 10000 pF ±80% -20%	1	1
C 528	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 530	CCC1025	C, Ceramic 50V 100 pF ±10%	1	1
C 538	CCC1011	C, Ceramic 50V 33 pF ±5%		1
C 538	CCC1014	C, Ceramic 50V 47 pF ±5%	1	
C 544	CQA0099	C, Plastic 50V 22000 pF ±10%	1	1

PEF-621 H AMP

Symbol	Part Code	Description	Q'ty	
			A	B
R 528	RCE0736	R, Carbon 1/2W 1.5MΩ ±5%	1	1
R 529	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 530	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 531	RME1174	R, Metal 1/4W 2.00kΩ ±1%	1	1
R 532	RME1078	R, Metal 1/4W 3.32kΩ ±1%	1	1
R 533	RCE0774	R, Carbon 1/4W 2.7kΩ ±5%	1	1
R 533	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 534	RCE0785	R, Carbon 1/4W 22kΩ ±5%	1	1
R 535	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 536	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 536	RCE0774	R, Carbon 1/4W 2.7kΩ ±5%	1	1
R 537	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 538	RCR3306	R, Carbon 1/4W 15kΩ ±5%	1	1
R 540	RCE0766	R, Carbon 1/4W 560Ω ±5%	1	1
R 541	RCE0764	R, Carbon 1/4W 390Ω ±5%	1	1
R 542	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	1
R 544	RCE0783	R, Carbon 1/4W 15kΩ ±5%	1	1
R 545	RCE0780	R, Carbon 1/4W 8.2kΩ ±5%	1	1
R 546	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 547	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 548	RCE0778	R, Carbon 1/4W 5.6kΩ ±5%	1	1
R 549	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 550	RCE0778	R, Carbon 1/4W 5.6kΩ ±5%	1	1
R 551	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 552	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 553	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 554	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 555	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 556	RCE0767	R, Carbon 1/4W 680Ω ±5%	1	1
R 571	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 572	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	1
R 573	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 574	RCE0783	R, Carbon 1/4W 15kΩ ±5%	1	1
R 576	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 578	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	1
R 581	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 582	RCE0798	R, Carbon 1/4W 330kΩ ±5%	1	1
RM 520	3173847B	R, Block For TIMING	1	1
RV 540	8397021	VR, Carbon V16L5(7X6.5) 20KC-B2kΩ	1	1
RV 542	RNE0052	VR, Metal EVN 39C00YB23(2K)	1	1
RV 550	RNE0058	VR, Metal EVN 39C00YB13(1K)	1	1
S 501	8404097	SW, Rotary S21P2YL	1	1
TR 503	HTA0224	Transistor 2SA1029 D	1	1
TR 514	HTC0148	Transistor 2SC458 C	1	1
TR 520	HTK0081	Transistor 2SK304E	1	1
TR 521	HTC0148	Transistor 2SC458 C	1	1
TR 522	HTC0148	Transistor 2SC458 C	1	1
TR 532	HTC0148	Transistor 2SC458 C	1	1
TR 544	HTC0148	Transistor 2SC458 C	1	1
TR 545	HTC0148	Transistor 2SC458 C	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
C 801	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 805	CCC1030	C, Ceramic 50V 10000 pF ±80%	1	1
C 806	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 808	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 811	CCC0996	C, Ceramic 50V 2 pF ±0.25pF	1	1
C 811	CCC1002	C, Ceramic 50V 10 pF ±5pF	1	1
C 812	CCC1002	C, Ceramic 50V 10 pF ±5pF	1	1
C 812	CCC0996	C, Ceramic 50V 2 pF ±0.25pF	1	1
C 823	CCC1004	C, Ceramic 50V 39 pF ±5%	1	1
C 832	CCC1007	C, Ceramic 50V 22 pF ±5%	1	1
C 845	CCD0330	C, Ceramic 500V 2 pF ±0.25pF	1	1
C 845	CCD0331	C, Ceramic 500V 3 pF ±0.25pF	1	1
C 846	CCD0331	C, Ceramic 500V 3 pF ±0.25pF	1	1
C 846	CCD0330	C, Ceramic 500V 2 pF ±0.25pF	1	1
C 847	CCC1007	C, Ceramic 50V 22 pF ±5%	1	1
C 848	CCC1007	C, Ceramic 50V 22 pF ±5%	1	1
C 857	CCD0287	C, Ceramic 500V 4700 pF ±100%	1	1
C 861	CCC1030	C, Ceramic 50V 10000 pF ±20%	1	1
C 873	CCC1025	C, Ceramic 50V 100 pF ±10%	1	1
C 874	CCC1025	C, Ceramic 50V 100 pF ±10%	1	1
C 880	CCC1030	C, Ceramic 50V 10000 pF ±80%	1	1
CV 840	CVE0059	C, Variable ECR-HA010A41	1	1
CV 840	CVE0062	C, Variable ECR-HA040E41	1	1
D 820	HDS0437	Diode 1SS133	1	1
D 821	HDS0437	Diode 1SS133	1	1
D 822	HDS0437	Diode 1SS133	1	1
D 823	HDS0437	Diode 1SS133	1	1
D 851	HDS0437	Diode 1SS133	1	1
D 852	HDS0437	Diode 1SS133	1	1
D 853	HDS0437	Diode 1SS133	1	1
D 854	HDS0437	Diode 1SS133	1	1
IC 801	IDH0586	Digital IC HD74LS74AP	1	1
L 852	TLF0148	Coil FL-7H 6.8MH ±5%	1	1
L 852	TLE0138	Coil ELE-Y 681 KA	1	1
P 501	JBB0021	Connector B3B-XH-A	1	1
R 801	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%	1	1
R 802	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 804	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 805	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 806	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 807	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 808	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 811	RME1076	R, Metal 1/4W 2.21kΩ ±1%	1	1
R 812	RME1076	R, Metal 1/4W 2.21kΩ ±1%	1	1
R 813	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	1
R 814	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	1
R 821	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 821	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 822	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 822	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 823	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 824	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%	1	1
R 824	RCE0774	R, Carbon 1/4W 2.7kΩ ±5%	1	1
R 831	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 831	RCE0762	R, Carbon 1/4W 270Ω ±5%	1	1
R 832	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
R 833	RME1073	R, Metal 1/4W 1.21kΩ ±1%	1	1
R 833	RME1076	R, Metal 1/4W 2.21kΩ ±1%	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 834	RME1073	R, Metal 1/4W 1.21kΩ ±1%		1
R 834	RME1076	R, Metal 1/4W 2.21kΩ ±1%	1	
R 840	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	
R 840	RCE0757	R, Carbon 1/4W 100Ω ±5%		1
R 841	RME1074	R, Metal 1/4W 1.50kΩ ±1%		1
R 841	RME1079	R, Metal 1/4W 3.92kΩ ±1%	1	
R 842	RME1074	R, Metal 1/4W 1.50kΩ ±1%		1
R 842	RME1079	R, Metal 1/4W 3.92kΩ ±1%	1	
R 843	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	
R 843	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
R 844	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 844	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	
R 845	RMR3726	R, Metal 1W 22kΩ ±5%		1
R 845	RMR3779	R, Metal 1W 100kΩ ±5%	1	
R 846	RMR3779	R, Metal 1W 100kΩ ±5%	1	
R 846	RMR3726	R, Metal 1W 22kΩ ±5%		1
R 847	RCE0755	R, Carbon 1/4W 68Ω ±5%	1	1
R 851	RCE0714	R, Carbon 1/2W 5.6kΩ ±5%		1
R 851	RCE0721	R, Carbon 1/2W 22kΩ ±5%	1	
R 852	RCE0721	R, Carbon 1/2W 22kΩ ±5%	1	
R 852	RCE0714	R, Carbon 1/2W 5.6kΩ ±5%		1
R 853	RCE0714	R, Carbon 1/2W 5.6kΩ ±5%		1
R 853	RCE0721	R, Carbon 1/2W 22kΩ ±5%	1	
R 854	RCE0721	R, Carbon 1/2W 22kΩ ±5%	1	
R 854	RCE0714	R, Carbon 1/2W 5.6kΩ ±5%		1
R 855	RCE0721	R, Carbon 1/2W 22kΩ ±5%	1	
R 855	RCE0714	R, Carbon 1/2W 5.6kΩ ±5%		1
R 856	RCE0721	R, Carbon 1/2W 22kΩ ±5%	1	
R 856	RCE0714	R, Carbon 1/2W 5.6kΩ ±5%		1
R 857	RCE0763	R, Carbon 1/4W 330Ω ±5%	1	1
R 858	RCE0763	R, Carbon 1/4W 330Ω ±5%	1	1
R 859	RZZ0031	R, Fusing RF-25S 220Ω		1
R 859	RZZ0032	R, Fusing RF-25S 470Ω	1	
R 860	RME1089	R, Metal 1/4W 26.7kΩ ±1%	1	
R 860	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%		1
R 861	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 862	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 863	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 864	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 865	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 866	RME1085	R, Metal 1/4W 12.1kΩ ±1%		1
R 866	RME1090	R, Metal 1/4W 33.2kΩ ±1%	1	
R 869	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 871	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 872	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 873	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 874	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 880	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 881	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
RV 805	RDE0003	VR, Carbon EVH-YK3325B14	1	1
RV 821	RNE0052	VR, Metal EVN 39C00YB23(2K)	1	
RV 821	RNE0050	VR, Metal EVN 39C00YB52(500)		1
RV 824	RNE0053	VR, Metal EVN 39C00YB24(20K)	1	
RV 824	RNE0070	VR, Metal EVN 39C00YB53(5K)	1	
RV 831	RNE0048	VR, Metal EVN 39C00YB22(200)	1	
RV 831	RNE0050	VR, Metal EVN 39C00YB52(500)	1	
S 502	8376780A	SW, PB SPJ222N (LOCK)	1	1
TR 811	HTC0148	Transistor 2SC458 C	1	1
TR 812	HTC0148	Transistor 2SC458 C	1	1
TR 821	HTA0099	Transistor 2SA781K	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
TR 822	HTA0099	Transistor 2SA781K	1	1
TR 831	HTA0099	Transistor 2SA781K	1	1
TR 832	HTA0099	Transistor 2SA781K	1	1
TR 843	HTA0224	Transistor 2SA1029 D	1	1
TR 844	HTA0224	Transistor 2SA1029 D	1	1
TR 851	HTC0722	Transistor 2SC2909S		1
TR 851	HTC0649	Transistor 2SC2610	1	
TR 852	HTC0649	Transistor 2SC2610	1	
TR 852	HTC0722	Transistor 2SC2909S		1
TR 853	HTC0722	Transistor 2SC2909S		1
TR 853	HTC0649	Transistor 2SC2610	1	
TR 854	HTC0722	Transistor 2SC2909S		1
TR 854	HTC0649	Transistor 2SC2610	1	
TR 860	HTA0224	Transistor 2SA1029 D	1	1
TR 861	HTA0224	Transistor 2SA1029 D	1	1

PEF-621 Z AXIS AMP

Symbol	Part Code	Description	Q'ty	
			A	B
C 901	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 904	CCD0272	C, Ceramic 500V 1 pF ±0.25pF	1	1
C 908	CCD0287	C, Ceramic 500V 4700 pF ±100% -0%	1	1
C 912	CET0033	C, AL Elyc 160V 1μF ±20%	1	1
D 901	HDS0437	Diode 1SS133	1	1
D 902	HDS0437	Diode 1SS133	1	1
D 910	HDS0437	Diode 1SS133	1	1
D 920	HDS0437	Diode 1SS133	1	1
D 921	HDS0437	Diode 1SS133	1	1
P 901	JBB0021	Connector B3B-XH-A	1	1
P 902	JBB0021	Connector B3B-XH-A	1	1
R 901	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	
R 901	RCE0787	R, Carbon 1/4W 33kΩ ±5%		1
R 902	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%	1	1
R 903	RCE0784	R, Carbon 1/4W 18kΩ ±5%		1
R 903	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%	1	
R 904	RCE0725	R, Carbon 1/2W 47kΩ ±5%	1	
R 904	RCE0723	R, Carbon 1/2W 33kΩ ±5%		1
R 905	RCE0792	R, Carbon 1/4W 82kΩ ±5%		1
R 906	RCE0793	R, Carbon 1/4W 100kΩ ±5%		1
R 906	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	
R 907	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 908	RCE0771	R, Carbon 1/4W 1.5kΩ ±5%		1
R 908	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	
R 909	RCE0797	R, Carbon 1/4W 220kΩ ±5%		1
R 909	RCE0798	R, Carbon 1/4W 330kΩ ±5%	1	
R 910	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	
R 910	RCE0783	R, Carbon 1/4W 15kΩ ±5%		1
R 911	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%		1
R 911	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	
R 912	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	
R 912	RCE0745	R, Carbon 1/4W 10Ω ±5%		1

Symbol	Part Code	Description	Q'ty	
			A	B
R 915	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 921	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%		1
R 921	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%	1	
R 930	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	
R 930	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%		1
R 931	RCE0787	R, Carbon 1/4W 33kΩ ±5%		1
R 931	RCE0787	R, Carbon 1/4W 33kΩ ±5%	1	
TR 901	HTC0192	Transistor 2SC641K-C	1	1
TR 906	HTC0148	Transistor 2SC458 C	1	1
TR 910	HTA0277	Transistor 2SA1207S	1	1
TR 912	HTC0722	Transistor 2SC2909S	1	1
TR 931	HTA0104	Transistor 2SA778A K	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 1103	RCE0774	R, Carbon 1/4W 2.7kΩ ±5%		1
R 1104	RME1096	R, Metal 1/4W 100kΩ ±1%	1	
R 1104	RME1091	R, Metal 1/4W 39.2kΩ ±1%		1
R 1105	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%		1
R 1105	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 1106	RME1084	R, Metal 1/4W 10.0kΩ ±1%		1
R 1106	RME1086	R, Metal 1/4W 15.0kΩ ±1%	1	
R 1107	RCE0785	R, Carbon 1/4W 22kΩ ±5%	1	1
R 1109	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 1110	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 1111	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 1121	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 1124	RCE0783	R, Carbon 1/4W 15kΩ ±5%	1	1
R 1125	RCE0753	R, Carbon 1/4W 47Ω ±5%	1	1
R 1131	RCE0685	R, Carbon 1/2W 22Ω ±5%	1	
R 1131	RCE0689	R, Carbon 1/2W 47Ω ±5%		1
R 1132	RCE0689	R, Carbon 1/2W 47Ω ±5%		1
R 1141	RCE0800	R, Carbon 1/4W 470kΩ ±5%	1	1
R 1142	RCE0787	R, Carbon 1/4W 33kΩ ±5%	1	1
TR 1101	HTA0104	Transistor 2SA778A K	1	1
TR 1102	HTC0671	Transistor 2SC1505L	1	1
TR 1103	HTA0224	Transistor 2SA1029 D	1	1
TR 1104	HTC0148	Transistor 2SC458 C	1	1

PEF-621 POWER SUPPLY

Symbol	Part Code	Description	Q'ty	
			A	B
C 1101	CES0201FY	C, AL Elyc 160V 47μF ±20%	1	1
C 1102	CES0203FY	C, AL Elyc 250V 47μF ±20%	1	1
C 1109	CES0202FY	C, AL Elyc 160V 10μF ±20%	1	1
C 1110	CQA0118	C, Plastic 50V 1500pF ±10%	1	1
C 1111	CES0204FY	C, AL Elyc 25V 2200μF ±20%	1	1
C 1112	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 1121	CES0204FY	C, AL Elyc 25V 2200μF ±20%	1	1
C 1122	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
C 1124	CQA0101	C, Plastic 50V 47000pF ±10%	1	1
C 1131	CES0036	C, AL Elyc 25V 22μF ±20%	1	1
C 1138	CES0028	C, AL Elyc 10V 47μF ±20%	1	1
D 1101	HDS0476	Diode S5566J	1	1
D 1102	HDS0476	Diode S5566J	1	1
D 1103	HDS0476	Diode S5566J	1	1
D 1104	HDS0476	Diode S5566J	1	1
D 1105	HDS0476	Diode S5566J	1	1
D 1106	HDS0476	Diode S5566J	1	1
D 1111	HDS0475	Diode S5566B	1	1
D 1112	HDS0475	Diode S5566B	1	1
D 1113	HDS0475	Diode S5566B	1	1
D 1114	HDS0475	Diode S5566B	1	1
IC 1111	ILH0109	Analog IC HA17808P	1	1
IC 1121	ILM0342	Analog IC μPC7908	1	1
IC 1131	ILH0108	Analog IC HA17805P	1	1
P 1101	JBX0703	Connector 1-171825-0	1	1
P 1104	JBB0022	Connector B6B-XH-A	1	1
P 1105	JBB0022	Connector B6B-XH-A	1	1
P 1301	JBB0021	Connector B3B-XH-A	1	1
R 1101	RCE0729	R, Carbon 1/2W 100kΩ ±5%	1	1
R 1102	RCE0425	R, Carbon 1/4W 1kΩ ±5%	1	1
R 1103	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1

PEF-621 HIGH VOLTAGE

Symbol	Part Code	Description	Q'ty	
			A	B
C 1001	CQA0099	C, Plastic 50V 22000pF ±10%	1	
C 1001	CQA0099	C, Plastic 50V 22000pF ±10%		1
C 1002	CES0035	C, AL Elyc 50V 47μF ±10%	1	1
C 1005	CQA0101	C, Plastic 50V 47000pF ±10%	1	1
C 1012	CCD0231	C, Ceramic 2000V 4700pF ±80%	1	1
C 1013	CCD0231	C, Ceramic 2000V 4700pF ±80%	1	1
C 1014	CCD0231	C, Ceramic 2000V 4700pF ±80%	1	1
C 1016	CCD0246	C, Ceramic 2kV 1000pF ±10%	1	1
C 1020	CCD0286	C, Ceramic 500V 1000pF ±100%	1	1
C 1021	CET0033	C, AL Elyc 160V 1μF ±20%	1	1
C 1023	CCD0246	C, Ceramic 2kV 1000pF ±10%	1	1
C 1025	CCD0231	C, Ceramic 2000V 4700pF ±80%	1	1
C 1034	CCD0287	C, Ceramic 500V 4700pF ±100%		1
C 1035	CCD0287	C, Ceramic 500V 4700pF ±100%	1	1
C 1038	CCD0287	C, Ceramic 500V 4700pF ±100%	1	1
D 1012	HDY0031	Diode Y10GA	1	
D 1013	HDY0031	Diode Y10GA		1
D 1020	HDH0072	Diode HZ22		1
D 1021	HDS0250	Diode 1SS83	1	1
D 1022	HDS0250	Diode 1SS83	1	1

PEF-622 INPUT

Symbol	Part Code	Description	Q'ty	
			A	B
D 4023	HDS0250	Diode 1SS83	1	1
D 1024	HDS0250	Diode 1SS83	1	1
D 1038	HDH0072	Diode HZ22	1	1
F 1001	EFL0147	Fuse TSCR UL 125V 0.5A		1
F 1001	EFL0148	Fuse TSCR UL 125V 0.25A	1	
F 1301	EFZ0013	IC Protect ICP-F10 (0.4A)	1	1
MUT1001	3180009	Multiplier 10KV X5		1
NL 1025	ELS0032	Lamps SA-200DSS-ON-1	1	1
P 1001	JBB0021	Connector B3B-XH-A	1	1
P 1002	JBB0021	Connector B3B-XH-A	1	1
P 1350	JBB0021	Connector B3B-XH-A	1	1
R 1001	RMS0023	R, Metal 1/4W 1.43MΩ ±0.5%	1	
R 1001	RMS0018	R, Metal 1/4W 1MΩ ±1%		1
R 1002	RCE0781	R, Carbon 1/4W 10kΩ ±5%		1
R 1002	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 1003	RCE0797	R, Carbon 1/4W 220kΩ ±5%	1	1
R 1004	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 1005	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	
R 1005	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%		1
R 1006	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 1012	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 1014	RCE0715	R, Carbon 1/2W 6.8kΩ ±5%	1	1
R 1016	RCE0745	R, Carbon 1/4W 10Ω ±5%	1	1
R 1016	RCE0800	R, Carbon 1/4W 470kΩ ±5%	1	
R 1017	RMV0004	R, Metal 1/2W 22.1MΩ ±1%	1	1
R 1020	RCE0798	R, Carbon 1/4W 330kΩ ±5%	1	1
R 1021	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 1021	RCE0785	R, Carbon 1/4W 22kΩ ±5%	1	
R 1023	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 1024	RSE0434	R, Solid 1/4W 10MΩ ±5%	1	1
R 1038	RCE0798	R, Carbon 1/4W 330kΩ ±5%	1	
R 1038	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	1
R 1350	RCE0749	R, Carbon 1/4W 22Ω ±5%	1	1
RV 1021	RNE0054	VR, Metal EVN 39C00YB15(100K)	1	1
RV 1035	RNE0055	VR, Metal EVN 39C00YB25(200K)	1	
RV 1035	RNE0054	VR, Metal EVN 39C00YB15(100K)		1
RV 1348	RNH0066	VR, Metal 0.5W 22kΩ	1	1
T 1001	3180008	XFMR For V-211,212,222,422	1	1
TR 1001	HTK0081	Transistor 2SK304E	1	1
TR 1002	HTA0224	Transistor 2SA1029 D	1	1
TR 1006	HTD0155	Transistor 2SD313E	1	1
TR 1348	HTC0148	Transistor 2SC458 C	1	1
TR 1349	HTA0224	Transistor 2SA1029 D	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
C 1	CQX0068	C, Plastic 400V 0.047μF ±10%	1	1
C 101	CQX0068	C, Plastic 400V 0.047μF ±10%	1	1
S 1	8393985	SW, Lever SLE623	1	1
S 101	8393985	SW, Lever SLE623	1	1
S 202	8393985	SW, Lever SLE623	1	1

PEF-624 DELAY LINE

Symbol	Part Code	Description	Q'ty	
			A	B
DL 201	8311741B	Delay Line CD-3A		1

PEF-625 FOCUS, INTEN

Symbol	Part Code	Description	Q'ty	
			A	B
R 932	RCE0738	R, Carbon 1/2W 2.2MΩ ±5%		1
R 932	RCE0737	R, Carbon 1/2W 1.8MΩ ±5%	1	
R 933	RMV0008	R, Metal VR37-15MΩJ	1	1
R 1019	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	
R 1019	RCE0798	R, Carbon 1/4W 330kΩ ±5%		1
R 1301	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	
R 1301	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%		1
RV 1301	8348452	VR, Carbon EVH-CCA20B14 10kΩ	1	1
RV 1401	RNE0059	VR, Metal EVM-NDG K20 B26	1	1

PEF-626 CRT (20 MHz)

Symbol	Part Code	Description	Q'ty	
			A	B
J 1001	8390152	Socket 1339 (CRT)	1	
P 1031	JBB0021	Connector B3B-XH-A	1	
P 1032	JBB0021	Connector B3B-XH-A	1	
P 1035	JBB0021	Connector B3B-XH-A	1	
R 1018	RCE0738	R, Carbon 1/2W 2.2M Ω $\pm 5\%$	1	
R 1030	RCE0781	R, Carbon 1/4W 10k Ω $\pm 5\%$	1	
R 1031	RCE0793	R, Carbon 1/4W 100k Ω $\pm 5\%$	1	

PEF-627 CRT (40MHz)

Symbol	Part Code	Description	Q'ty	
			A	B
J 1001	8390152	Socket 1339 (CRT)		1
P 1031	JBB0021	Connector B3B-XH-A		1
P 1032	JBB0021	Connector B3B-XH-A		1
P 1035	JBB0021	Connector B3B-XH-A		1
R 1018	RCE0738	R, Carbon 1/2W 2.2M Ω $\pm 5\%$		1
R 1030	RCE0777	R, Carbon 1/4W 4.7k Ω $\pm 5\%$		1
R 1031	RCE0793	R, Carbon 1/4W 100k Ω $\pm 5\%$		1
R 1032	RCE0757	R, Carbon 1/4W 100 Ω $\pm 5\%$		1
R 1033	RCE0781	R, Carbon 1/4W 10k Ω $\pm 5\%$		1
R 1034	RCE0785	R, Carbon 1/4W 22k Ω $\pm 5\%$		1

PANEL + OTHERS

Symbol	Part Code	Description	Q'ty	
			A	B
	8338351	Terminal Z-048(EARTH)	1	1
	8402043	Connector For Rotation-Coil	1	1
	4044797E	Terminal C5	1	1
	3180016D	Connector For V-422		1
	3180016C	Connector For V-222	1	
C 13	CCC1004	C, Ceramic 50V 39pF $\pm 5\%$		1
C 113	CCC1004	C, Ceramic 50V 39pF $\pm 5\%$		1
D 1110	HDL0036	Diode LN21RPHL. HT	1	1
J 1	JHB0088	CON, Coax BNC071	1	1
J 5	JJT0035	Jack TJ-10A Black	1	1
J 9	JHB0088	CON, Coax BNC071	1	1
J 80	JHB0088	CON, Coax BNC071	1	1
J 101	JHB0088	CON, Coax BNC071	1	1
J 403	JHB0088	CON, Coax BNC071	1	1
R 13	RCE0753	R, Carbon 1/4W 47 Ω $\pm 5\%$		1
R 113	RCE0753	R, Carbon 1/4W 47 Ω $\pm 5\%$		1
S 1101	8400067	SW, PB SDV 3P (UL, CSA)	1	1
T 1101	3173880	XFMR For V-211,212,222,422	1	1
TR 1310	HTD0145	Transistor 2SD1267AP	1	1
V 1001	DPX0077	CRT E2977B31		1
V 1001	DPX0076	CRT 150BTB31H	1	
		<i>D1101 845226 AC Inlet 8455061</i>		

PEF-791 M-COM

Symbol	Part Code	Description	Q'ty	
			A	B
C 2000	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2001	CES0133	C, AL Elyc 16V 47µF ±20%	1	1
C 2002	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2003	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2004	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2005	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2006	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2007	CES0133	C, AL Elyc 16V 47µF ±20%	1	1
C 2008	CES0133	C, AL Elyc 16V 47µF ±20%	1	1
C 2009	CES0133	C, AL Elyc 16V 47µF ±20%	1	1
C 2010	CCC1007	C, Ceramic 50V 22 pF ±5%	1	1
C 2011	CCC1007	C, Ceramic 50V 22 pF ±5%	1	1
C 2012	CES0133	C, AL Elyc 16V 47µF ±20%	1	1
C 2013	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2014	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2015	CCC1025	C, Ceramic 50V 100 pF +10%	1	1
C 2016	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2018	CES0133	C, AL Elyc 16V 47µF ±20%	1	1
C 2019	CCC1029	C, Ceramic 50V 1000 pF +80% -20%	1	1
C 2020	CCC1355	C, Ceramic 50V 270 pF	1	1
C 2021	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2022	CCC0991	C, Ceramic 50V 33 pF ±5%	1	1
C 2023	CCC1163	C, Ceramic 50V 680 pF +10%	1	1
C 2024	CCC1163	C, Ceramic 50V 680 pF +10%	1	1
C 2025	CCC0873	C, Ceramic 50V 270 pF ±10%	1	1
C 2026	CES0133	C, AL Elyc 16V 47µF ±20%	1	1
C 2027	CES0133	C, AL Elyc 16V 47µF ±20%	1	1
C 2028	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2029	CCC1007	C, Ceramic 50V 22 pF ±5%	1	1
C 2030	CCC1030	C, Ceramic 50V 10000 pF +80% -20%	1	1
C 2031	CCC1029	C, Ceramic 50V 1000 pF +80% -20%	1	1
C 2032	CCC1029	C, Ceramic 50V 1000 pF +80% -20%	1	1
D 2001	HDS0437	Diode 1SS133	1	1
D 2002	HDS0437	Diode 1SS133	1	1
D 2003	HDS0437	Diode 1SS133	1	1
D 2042	HDS0437	Diode 1SS133	1	1
IC 2000	IDM0515	Digital IC MM74HC123N (MC74HC123N)	1	1
IC 2001	IDM0542	Digital IC µPD7810G	1	1
IC 2002	IDT0048	Digital IC TC40H004P	1	1
IC 2003	IDT0048	Digital IC TC40H004P	1	1
IC 2004	IDT0047	Digital IC TC40H002P	1	1
IC 2005	IDT0048	Digital IC TC40H004P	1	1
IC 2006	IDT0048	Digital IC TC40H004P	1	1
IC 2007	ILH0108	Analog IC HA17805P	1	1
IC 2008	IDH0923	Digital IC HN482764G-4	1	1
IC 2028	IDT0055	Digital IC TC40H374P	1	1
P 2001	JBB0058	Connector B12B-XH-A	1	1
P 2002	JBB0024	Connector B15B-XH-A	1	1
P 2100	JBB0026	Connector B10B-XH-A	1	1
R 2001	RCE0802	R, Carbon 1/4W 1.0MΩ ±5%	1	1
R 2002	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 2003	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 2004	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	1
R 2005	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
R 2007	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 2009	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 2010	RME1080	R, Metal 1/4W 4.75kΩ ±1%	1	1
R 2011	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	1
R 2012	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	1
R 2013	RCE0771	R, Carbon 1/4W 1.5kΩ ±5%	1	1
R 2014	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 2015	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 2016	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 2016	RCE0780	R, Carbon 1/4W 8.2kΩ ±5%	1	1
R 2017	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	1
R 2018	RME1484	R, Metal 1W 18Ω ±5%	1	1
R 2019	RME1133	R, Metal 1/4W 71.5kΩ ±1%	1	1
R 2020	RCE0873	R, Carbon 1/4W 560kΩ ±5%	1	1
R 2021	RCE0792	R, Carbon 1/4W 82kΩ ±5%	1	1
R 2022	RME1213	R, Metal 1/4W 30.0kΩ ±0.5%	1	1
R 2023	RME1078	R, Metal 1/4W 3.32kΩ ±1%	1	1
R 2024	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 2026	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 2027	RCE0779	R, Carbon 1/4W 6.8kΩ ±5%	1	1
R 2028	RCE0766	R, Carbon 1/4W 560Ω ±5%	1	1
R 2029	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 2030	RCE0767	R, Carbon 1/4W 680Ω ±5%	1	1
R 2030	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 2032	RCE0785	R, Carbon 1/4W 22kΩ ±5%	1	1
R 2033	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 2034	RCE0777	R, Carbon 1/4W 4.7kΩ ±5%	1	1
R 2035	RCE0769	R, Carbon 1/4W 1.0kΩ ±5%	1	1
R 2036	RCE0773	R, Carbon 1/4W 2.2kΩ ±5%	1	1
R 2037	RCE0776	R, Carbon 1/4W 3.9kΩ ±5%	1	1
R 2038	RCE0793	R, Carbon 1/4W 100kΩ ±5%	1	1
R 2039	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	1
R 2040	RCE0765	R, Carbon 1/4W 470Ω ±5%	1	1
R 2040	RCE0763	R, Carbon 1/4W 330Ω ±5%	1	1
R 2041	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	1
R 2042	RCE0775	R, Carbon 1/4W 3.3kΩ ±5%	1	1
R 2043	RME1125	R, Metal 1/4W 5.11kΩ ±1%	1	1
R 2046	RCE0787	R, Carbon 1/4W 33kΩ ±5%	1	1
R 2047	RCE0790	R, Carbon 1/4W 56kΩ ±5%	1	1
R 2048	RCE0772	R, Carbon 1/4W 1.8kΩ ±5%	1	1
R 2049	RCE0757	R, Carbon 1/4W 100Ω ±5%	1	1
R 2050	RCE0770	R, Carbon 1/4W 1.2kΩ ±5%	1	1
R 2051	RCE0761	R, Carbon 1/4W 220Ω ±5%	1	1
R 2052	RME1090	R, Metal 1/4W 33.2kΩ ±1%	1	1
R 2053	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
R 2053	RCE0781	R, Carbon 1/4W 10kΩ ±5%	1	1
R 2054	RCE0763	R, Carbon 1/4W 330Ω ±5%	1	1
R 2055	RCE0789	R, Carbon 1/4W 47kΩ ±5%	1	1
RM 2002	RCE0852	R, Carbon EXB-LD8-503G	1	1
RM 2003	RCE0852	R, Carbon EXB-LD8-503G	1	1
RM 2004	RCE0854	R, Carbon EXB-LD4-503G	1	1
RM 2005	RCE0854	R, Carbon EXB-LD4-503G	1	1
RM 2006	RZA0115	R, Black EXB-P8-8-473-J	1	1
RV 2001	RNE0067	VR, Metal EVN 49C00YB13(1K)	1	1
RV 2002	RNE0071	VR, Metal EVN 49C00YB52(500)	1	1
RV 2003	RNE0071	VR, Metal EVN 49C00YB52(500)	1	1
RV 2005	RNE0068	VR, Metal EVN 49C00YB14(10K)	1	1
RV 2005	RNE0072	VR, Metal EVN 49C00YB24(20K)	1	1

Symbol	Part Code	Description	Q'ty	
			A	B
TR 2001	HTA0224	Transistor 2SA1029 D	1	1
TR 2002	HTC0192	Transistor 2SC641K-C	1	1
TR 2003	HTA0224	Transistor 2SA1029 D	1	1
TR 2004	HTA0224	Transistor 2SA1029 D	1	1
TR 2005	HTA0224	Transistor 2SA1029 D	1	1
TR 2006	HTA0224	Transistor 2SA1029 D	1	1
TR 2007	HTA0224	Transistor 2SA1029 D	1	1
TR 2008	HTA0224	Transistor 2SA1029 D	1	1
TR 2009	HTA0224	Transistor 2SA1029 D	1	1
X 2001	EZZ0101	Extal CSA 12.0MT	1	1

PEF-792 CURSOR SW

Symbol	Part Code	Description	Q'ty	
			A	B
P 2011	JBB0026	Connector B10B-XH-A	1	1
RV 2101	RNE0051	VR, Metal EVN 39C00YB14(10K)	1	1
S 2101	8471181A	Push SW	1	1
S 2102	8471181B	Push SW	1	1
S 2103	8471181C	Push SW	1	1
S 2104	8471181D	Push SW	1	1
S 2105	8471181D	Push SW	1	1
S 2106	8471181C	Push SW	1	1

PEF-793 ATT INF CONT

Symbol	Part Code	Description	Q'ty	
			A	B
P 703	JBB0027	Connector B2B-XH-A	1	1
RM 703	RZA0184	R, Network EXB-LE5 503S	1	1

PEF-794 TIME INF CONT

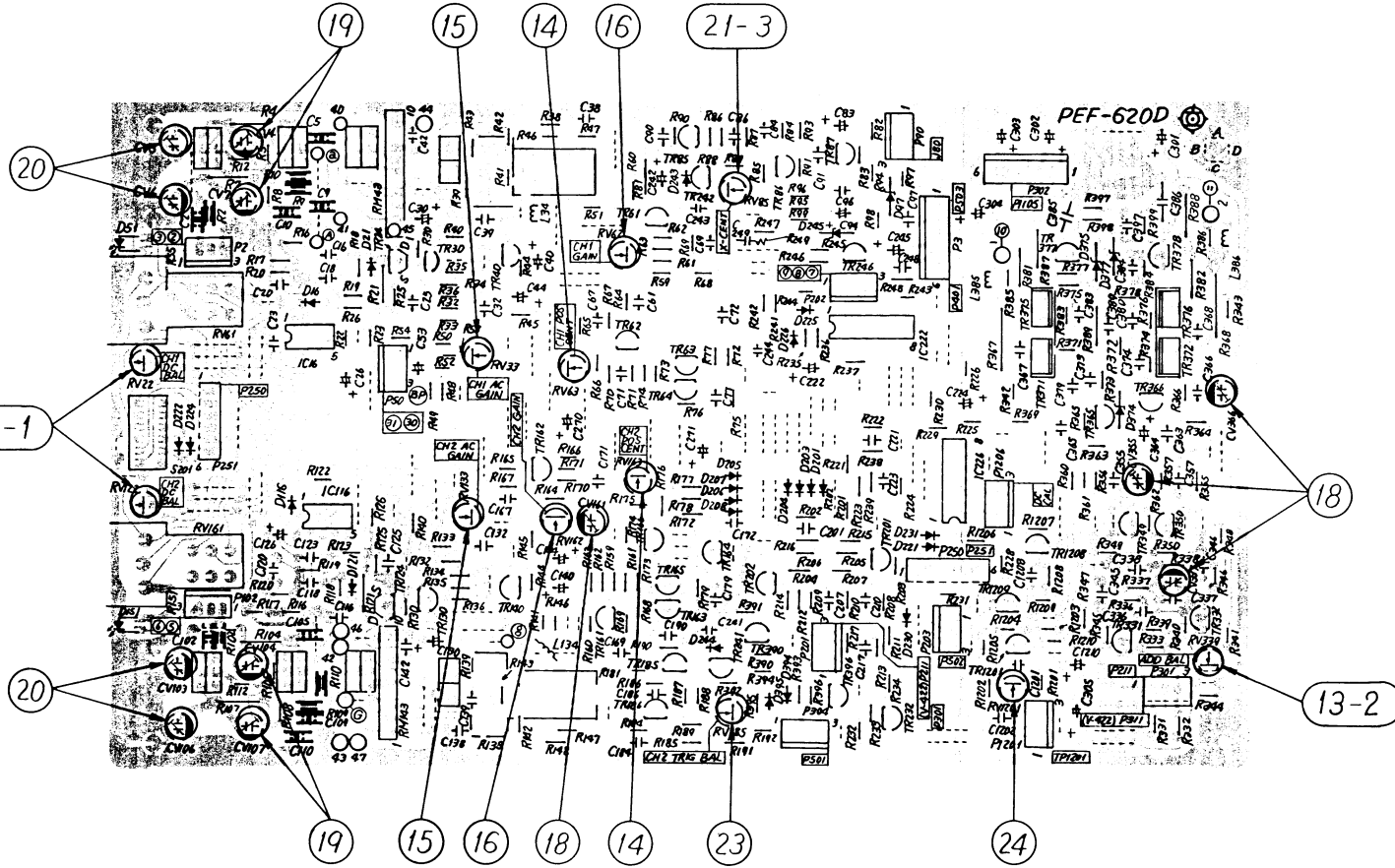
Symbol	Part Code	Description	Q'ty	
			A	B
P 701	JBS0022	Connector S3B-XH-A	1	1
P 702	JBS0032	Connector S2B-XH-A	1	1
RM 701	RZA0184	R, Network EXB-LE5 503S	1	1
RM 702	RZA0184	R, Network EXB-LE5 503S	1	1

PEF-803 V CHR CONT

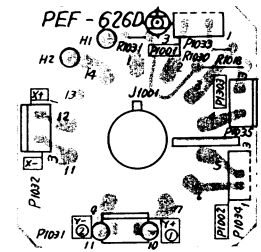
Symbol	Part Code	Description	Q'ty	
			A	B
	ETP0141	Pin DP-2	4	4
C 2201	CCC1365	C, Ceramic 50V 680 pF $\pm 10\%$	1	1
C 2202	CCC1014	C, Ceramic 50V 47 pF $\pm 5\%$	1	1
D 2201	HDS0437	Diode 1SS133	1	1
D 2202	HDS0437	Diode 1SS133	1	1
D 2203	HDS0437	Diode 1SS133	1	1
D 2204	HDS0437	Diode 1SS133	1	1
D 2205	HDS0437	Diode 1SS133	1	1
D 2206	HDS0437	Diode 1SS133	1	1
D 2207	HDS0437	Diode 1SS133	1	1
D 2208	HDS0437	Diode 1SS133	1	1
D 2209	HDS0437	Diode 1SS133	1	1
D 2210	HDS0437	Diode 1SS133	1	1
D 2211	HDS0437	Diode 1SS133	1	1
D 2212	HDS0437	Diode 1SS133	1	1
D 2213	HDS0437	Diode 1SS133	1	1
D 2214	HDS0437	Diode 1SS133	1	1
D 2215	HDS0437	Diode 1SS133	1	1
D 2216	HDS0437	Diode 1SS133	1	1
P 2201	JBS0064	Connector SQ-4-AP-GB-C	1	1
P 2202	JBS0064	Connector SQ-4-AP-GB-C	1	1
P 2203	JBS0064	Connector SQ-4-AP-GB-C	1	1
P 2204	JBS0064	Connector SQ-4-AP-GB-C	1	1
R 2201	RCE0777	R, Carbon 1/4W 4.7k Ω $\pm 5\%$	1	1
R 2202	RCE0781	R, Carbon 1/4W 10k Ω $\pm 5\%$	1	1
TR 2201	HTA0224	Transistor 2SA1029 D	1	1

PEF-804 H CHR CONT

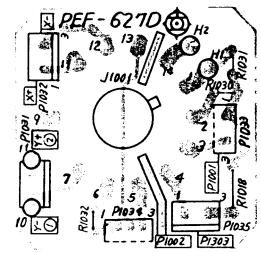
Symbol	Part Code	Description	Q'ty	
			A	B
	ETP0002	Pin 171255-1	1	1
	ETP0141	Pin DP-2	4	4
D 2501	HDS0437	Diode 1SS133	1	1
D 2502	HDS0437	Diode 1SS133	1	1
D 2503	HDS0437	Diode 1SS133	1	1
D 2504	HDS0437	Diode 1SS133	1	1
P 2501	JBB0021	Connector B3B-XH-A	1	1
R 2501	RCE0779	R, Carbon 1/4W 6.8k Ω $\pm 5\%$	1	1
R 2502	RCE0772	R, Carbon 1/4W 1.8k Ω $\pm 5\%$	1	1
TR 2501	HTA0290	Transistor 2SA1206	1	1



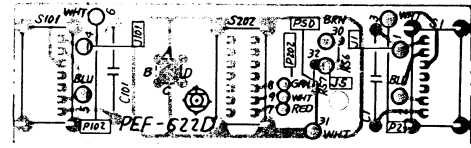
PEF-620 PCB



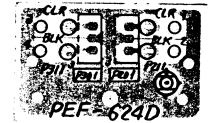
PEF-626 PCB



PEF-627 PCB

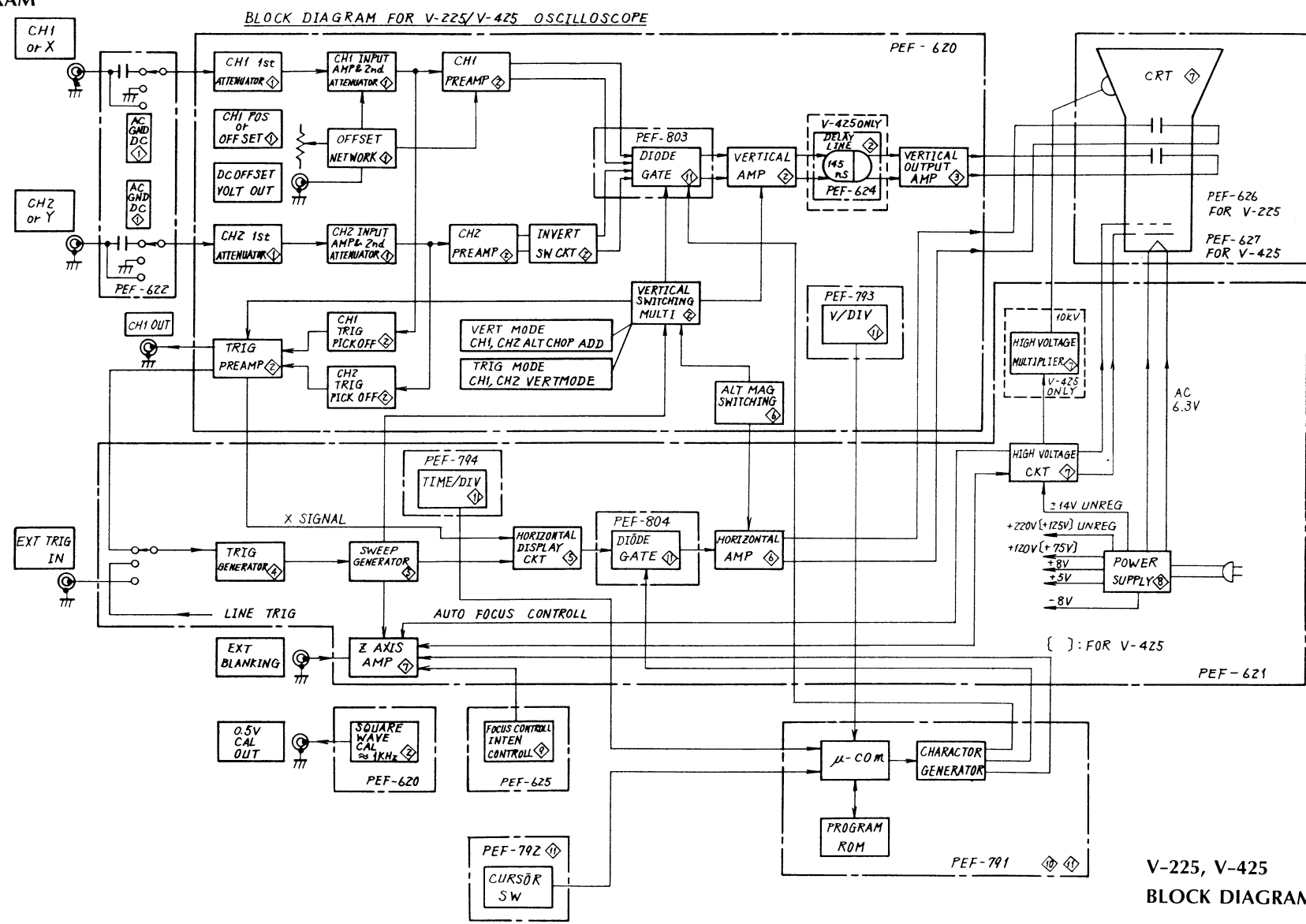


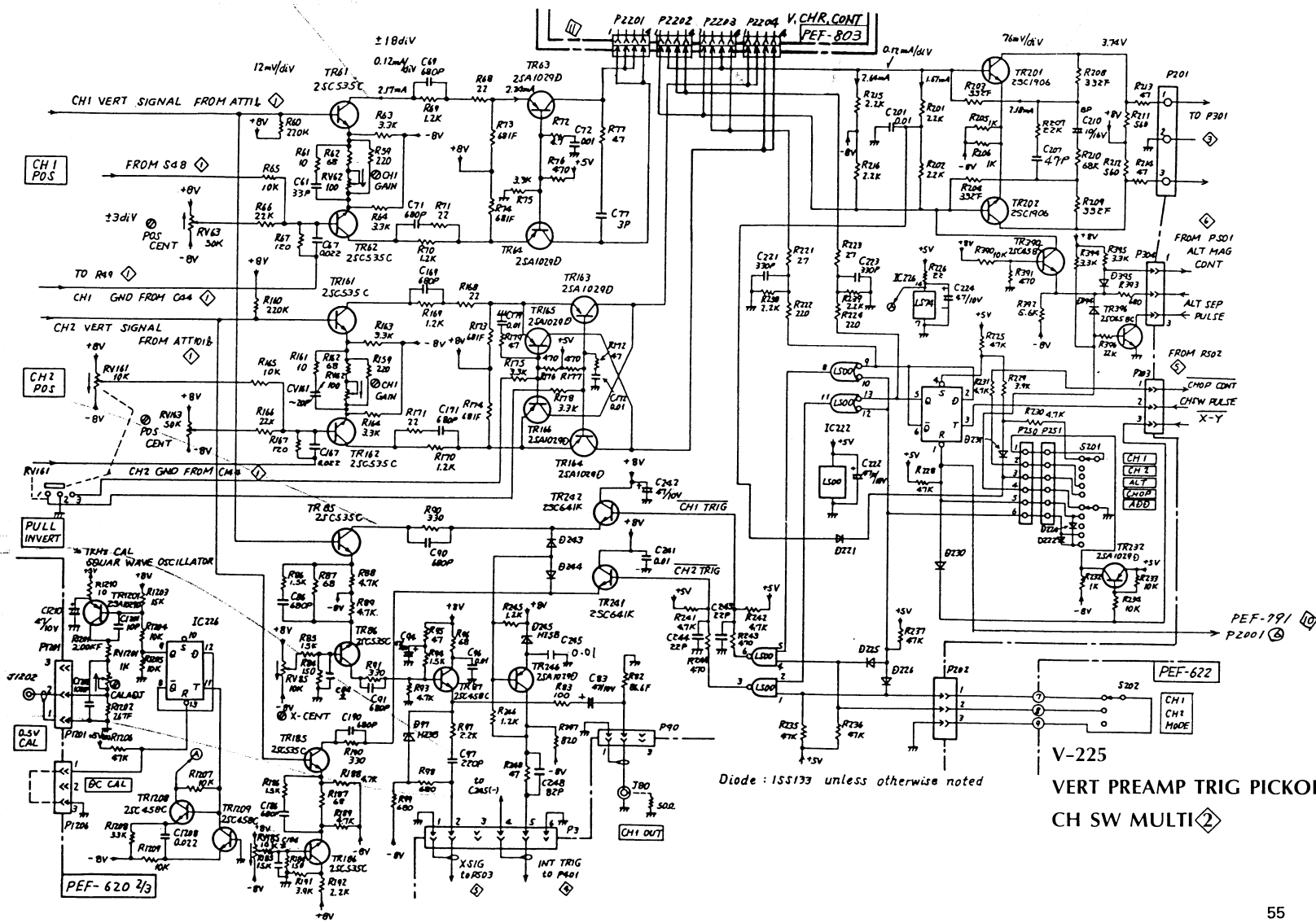
PEF-622 PCB

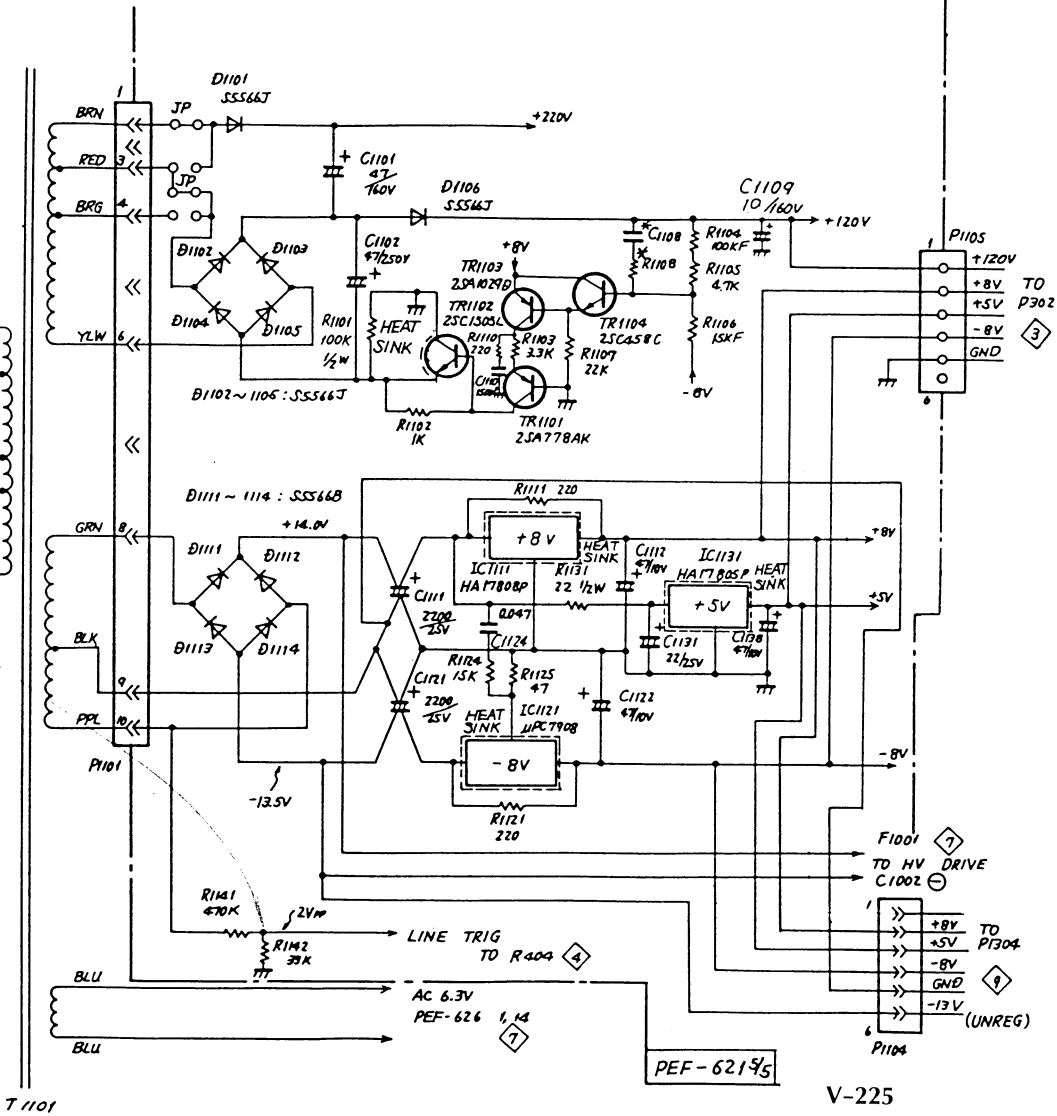
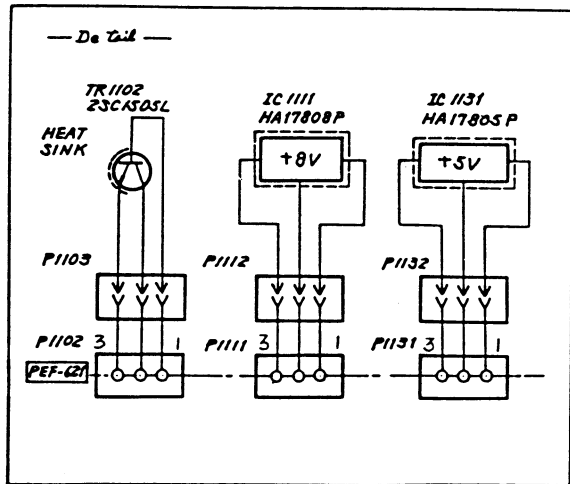
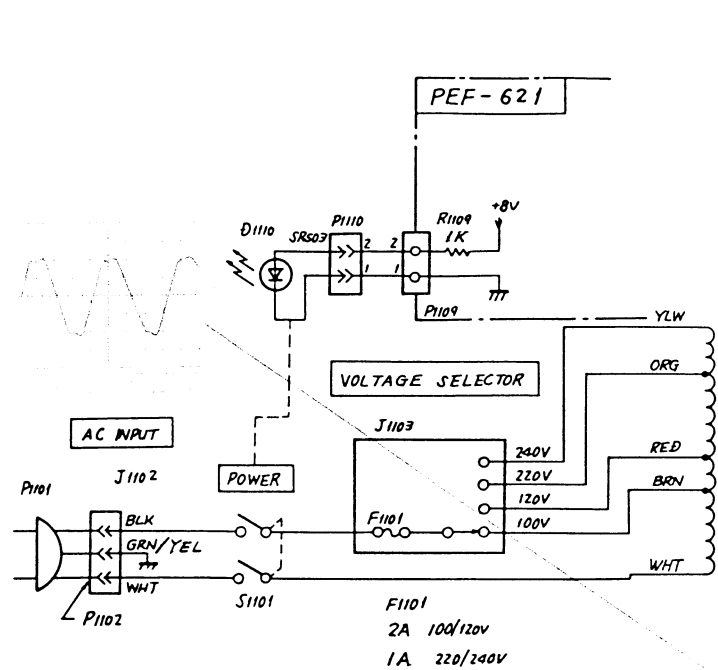


PEF-624 PCB

8. BLOCK DIAGRAM

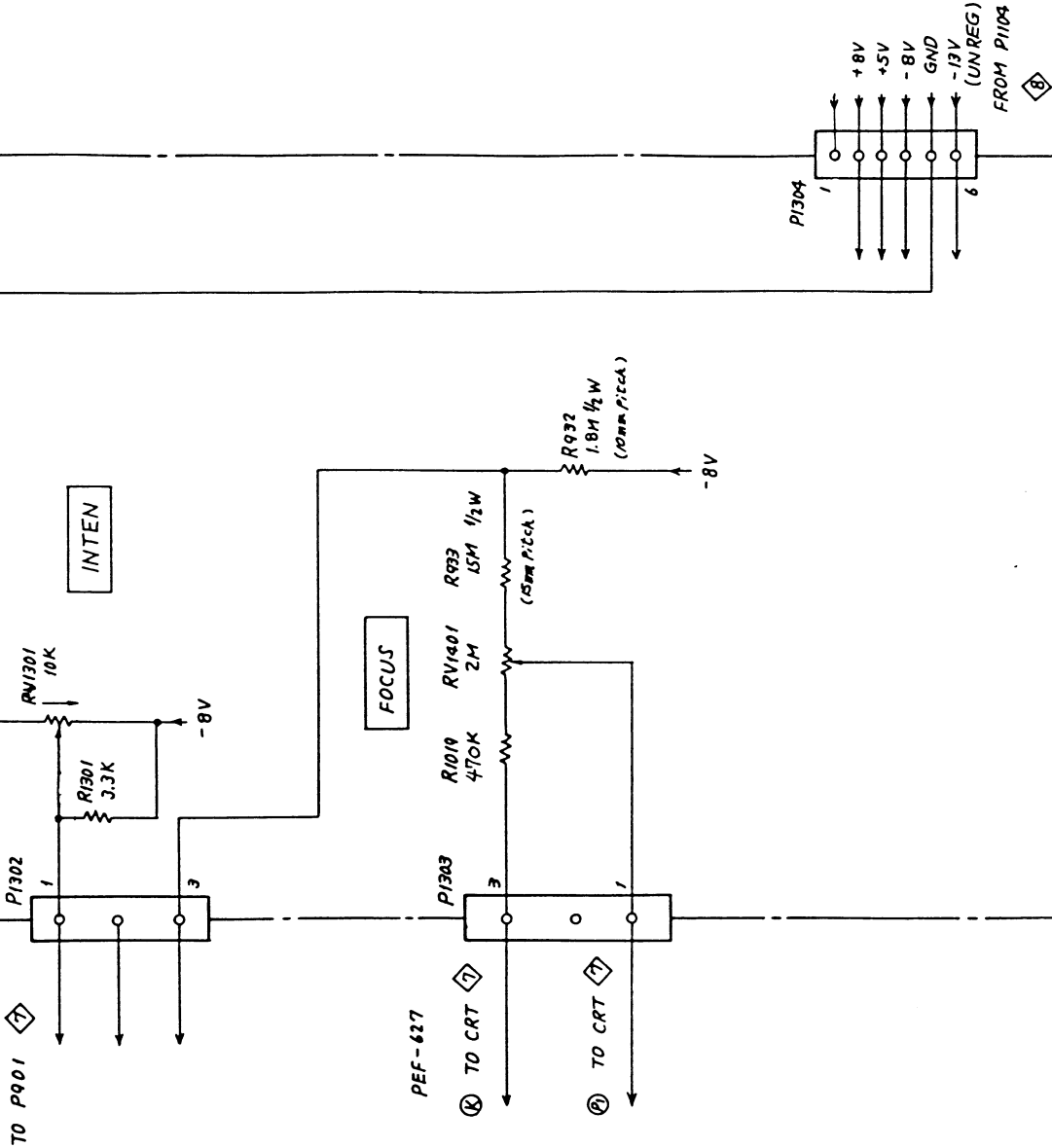






T 1101

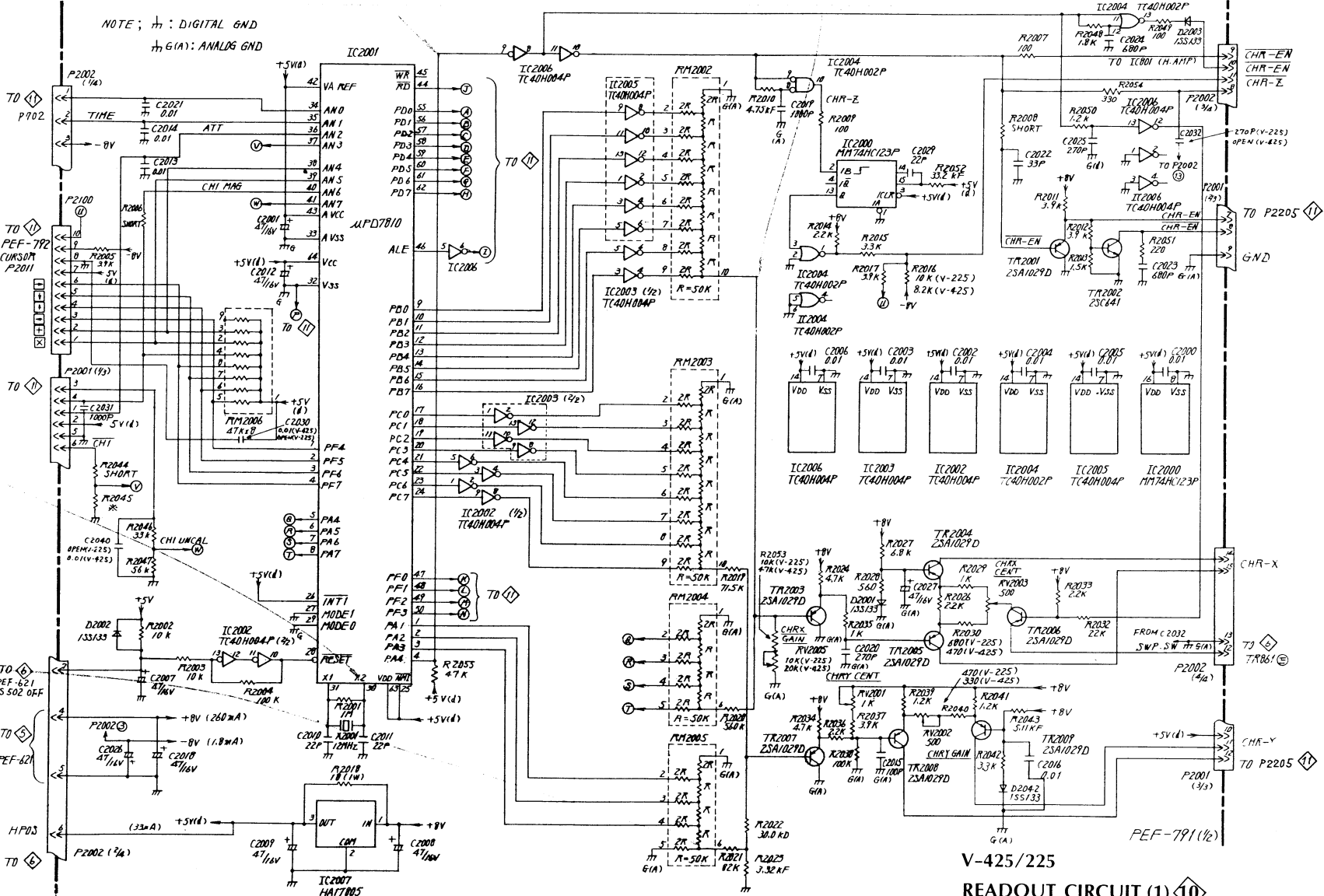
V-225
POWER SUPPLY



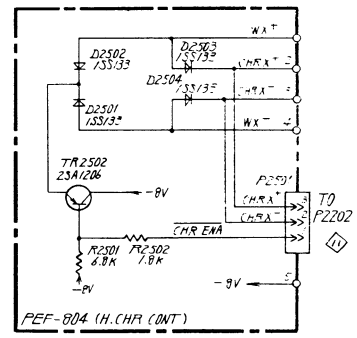
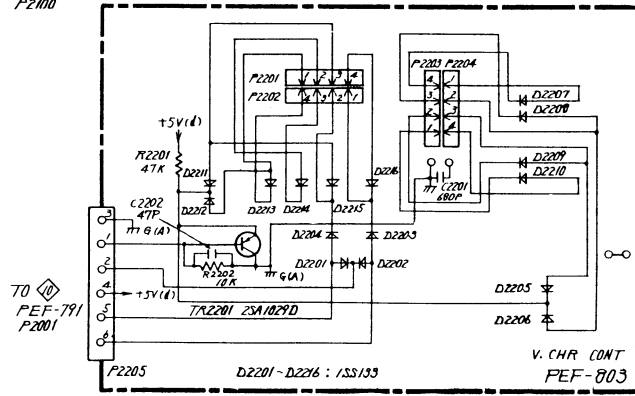
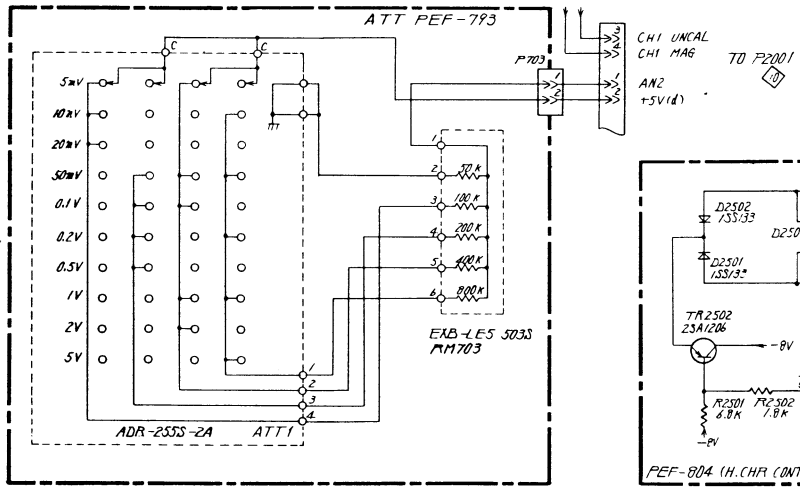
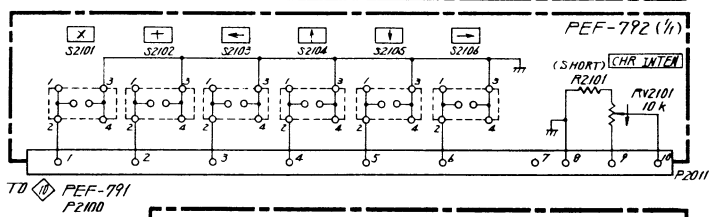
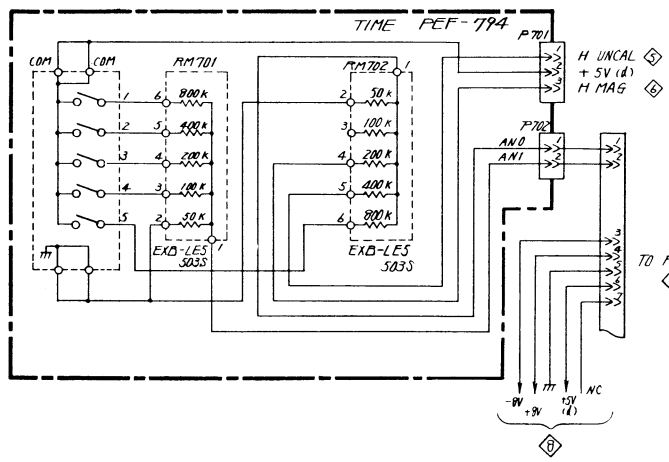
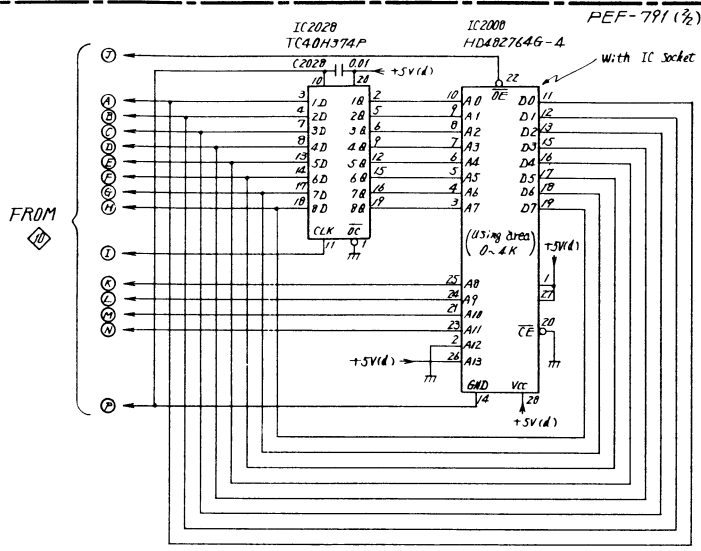
PEF-625

V-225
RV

NOTE: \square : DIGITAL GND
 \square G(A) : ANALOG GND

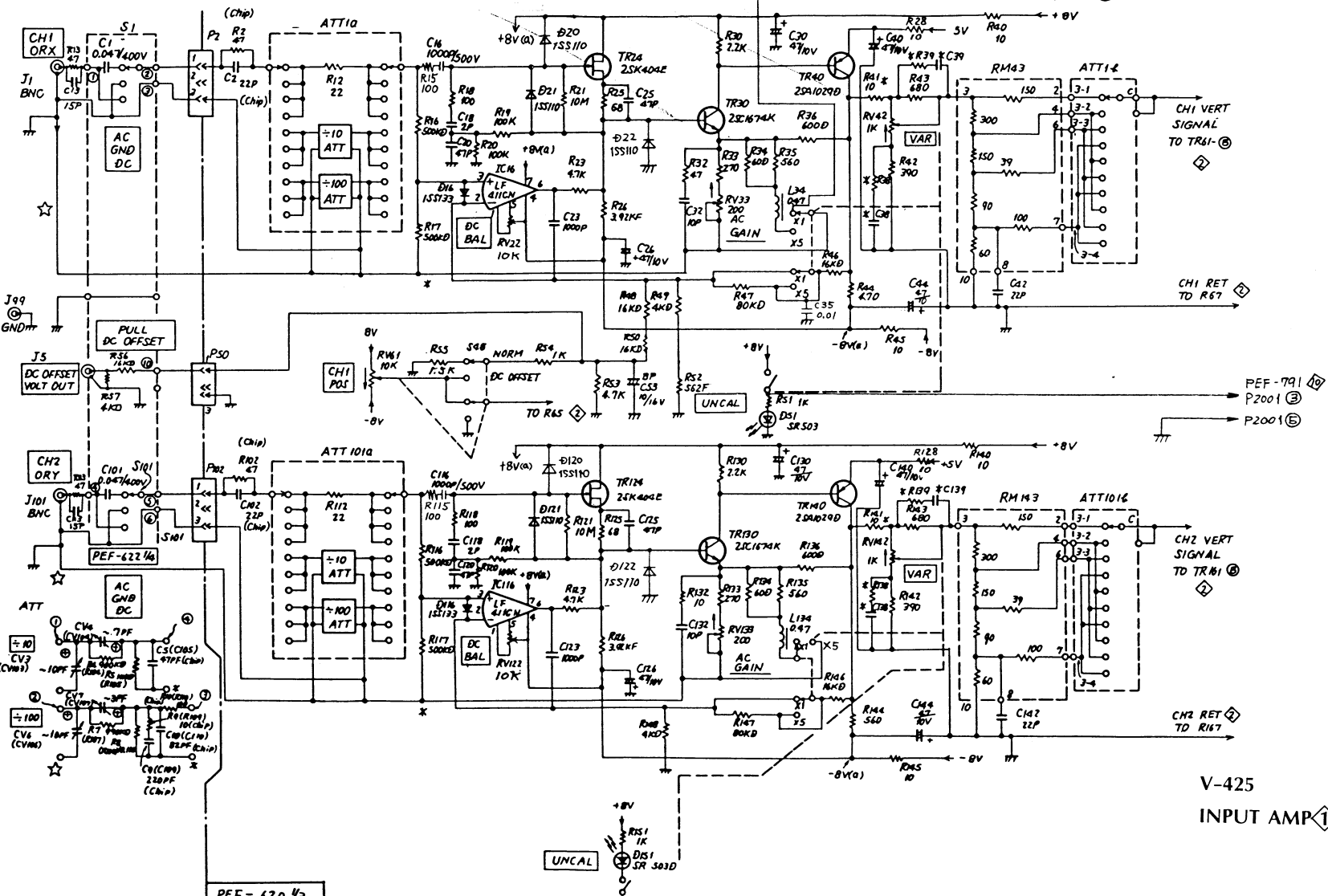


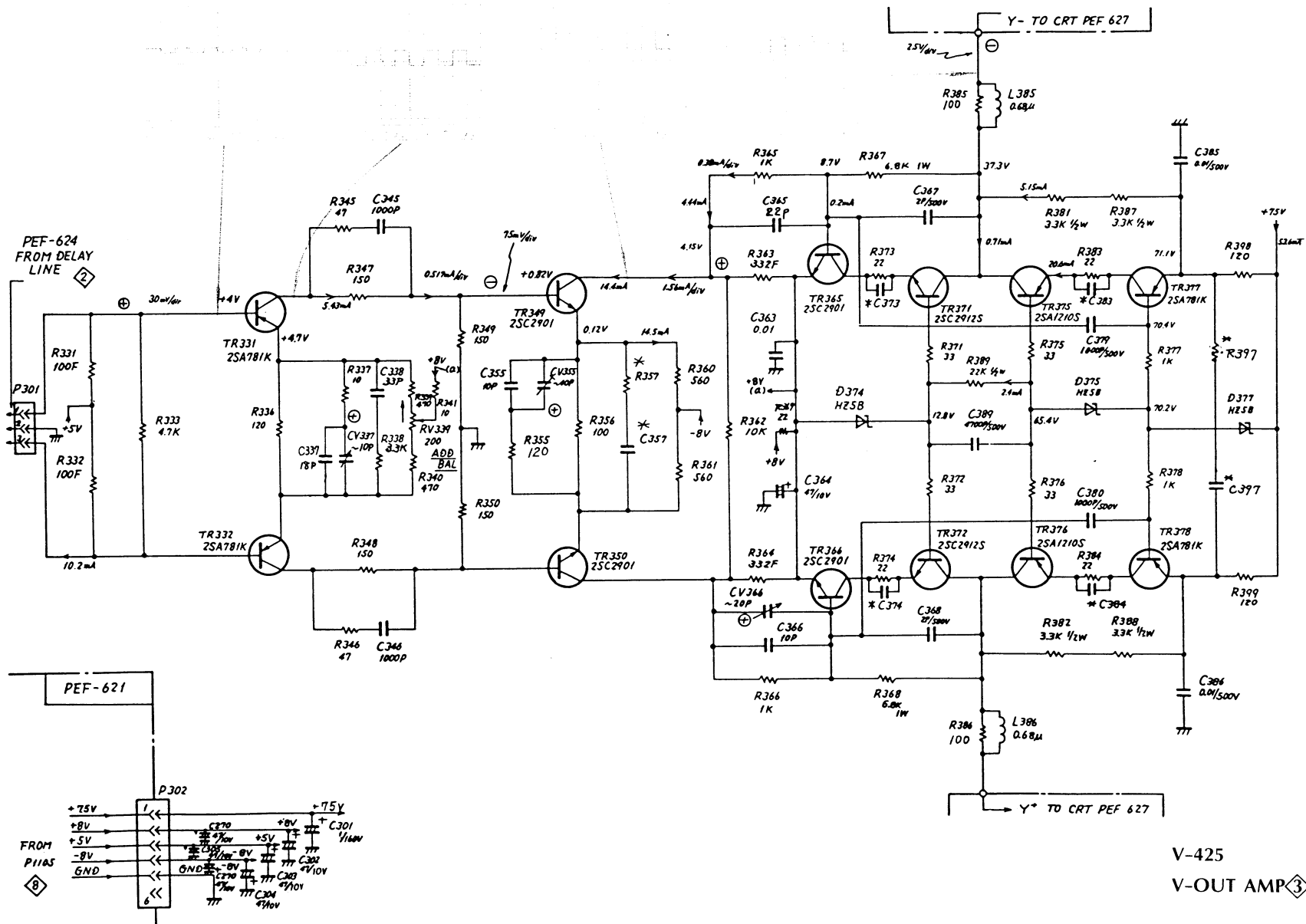
V-425/225
 READOUT CIRCUIT (1)



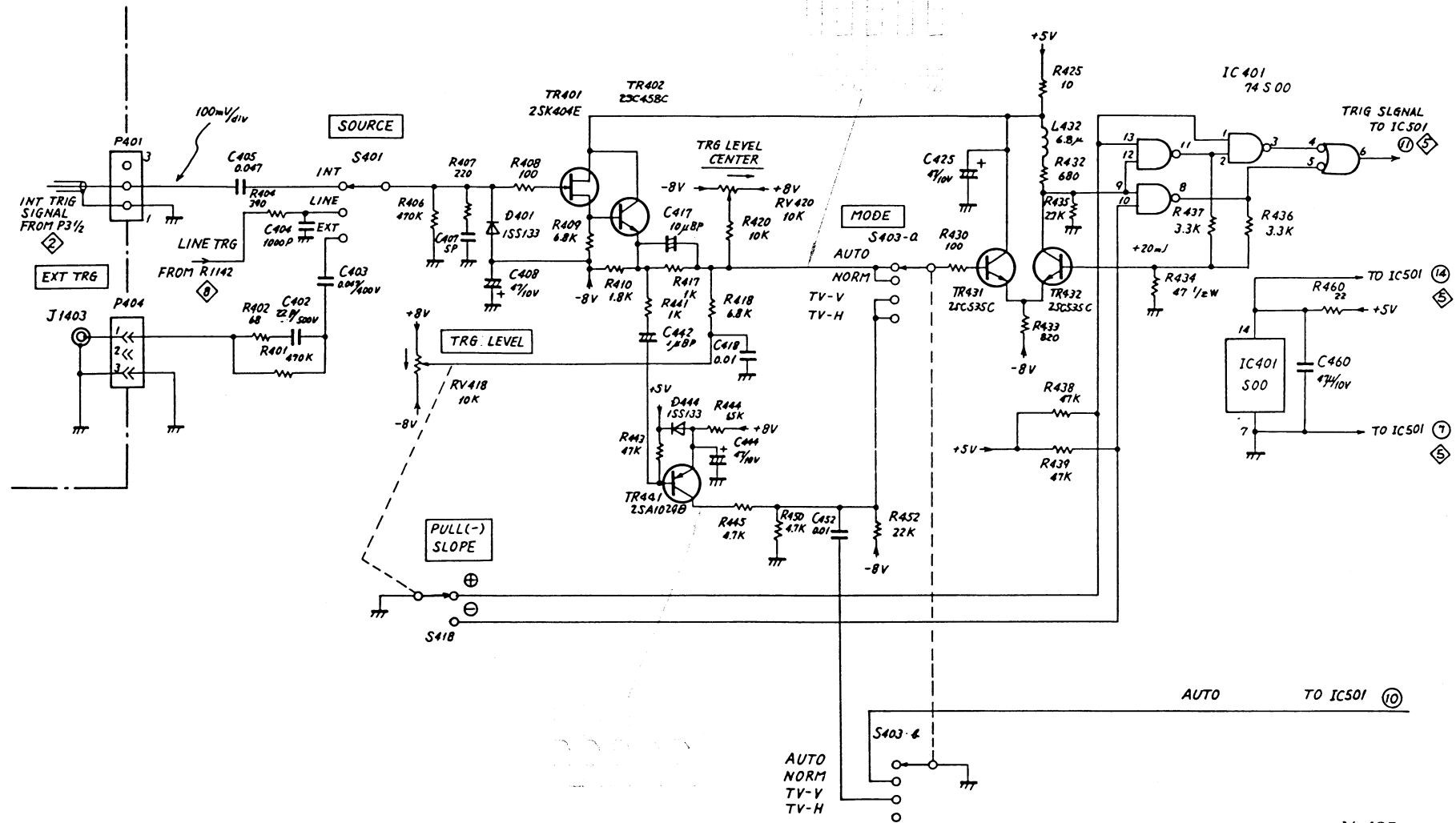
V-225/425
 READOUT CIRCUIT (2)

PEF-791 ④
P2001 ④

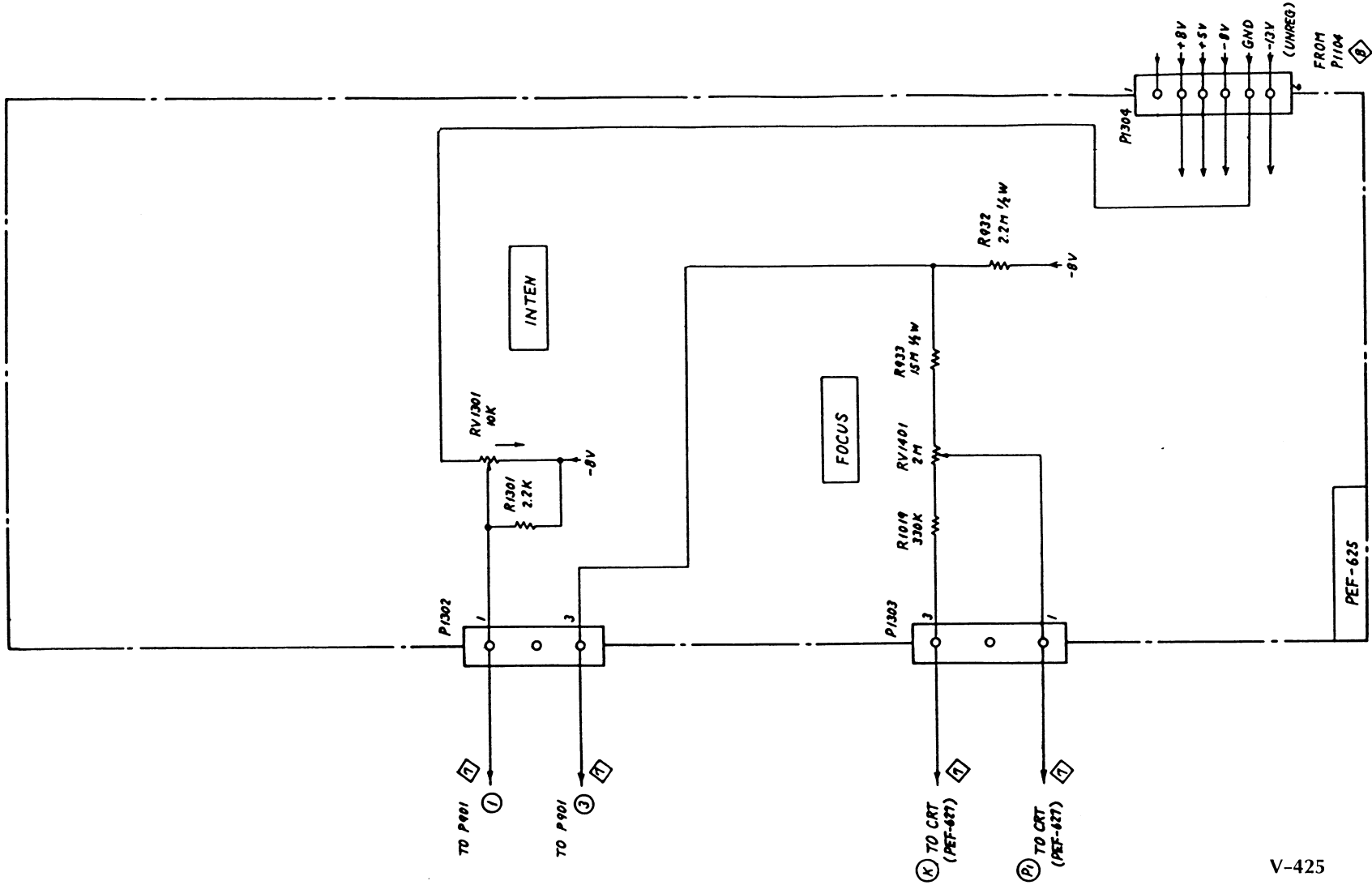




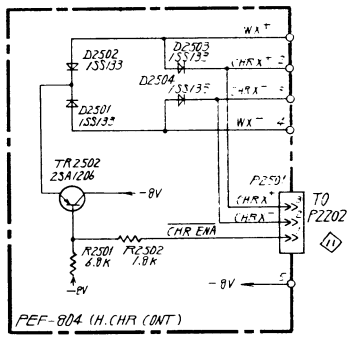
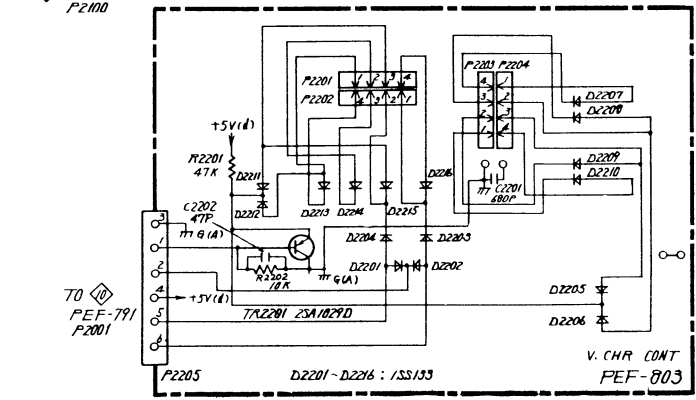
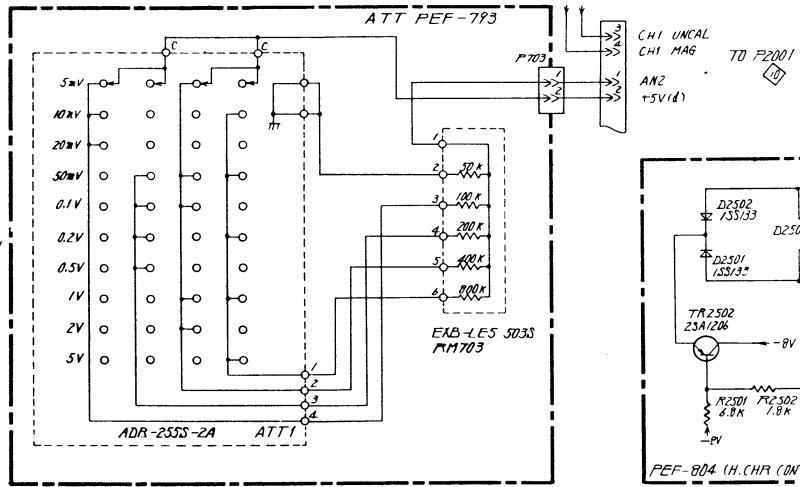
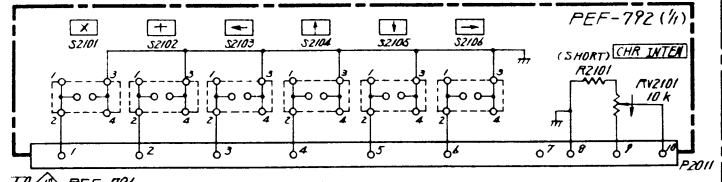
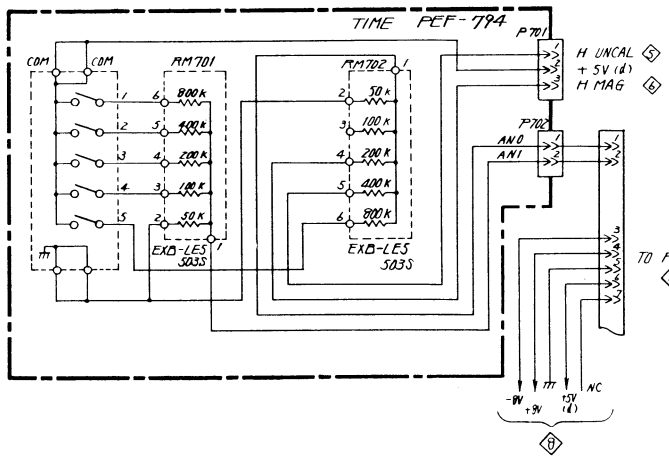
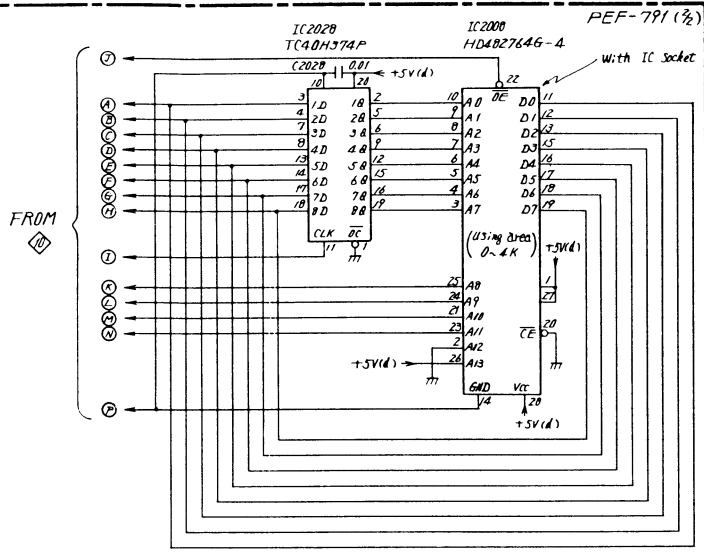
V-425
V-OUT AMP



V-425
TRIG GEN



V-425
RV



V-225/425
READOUT CIRCUIT (2)

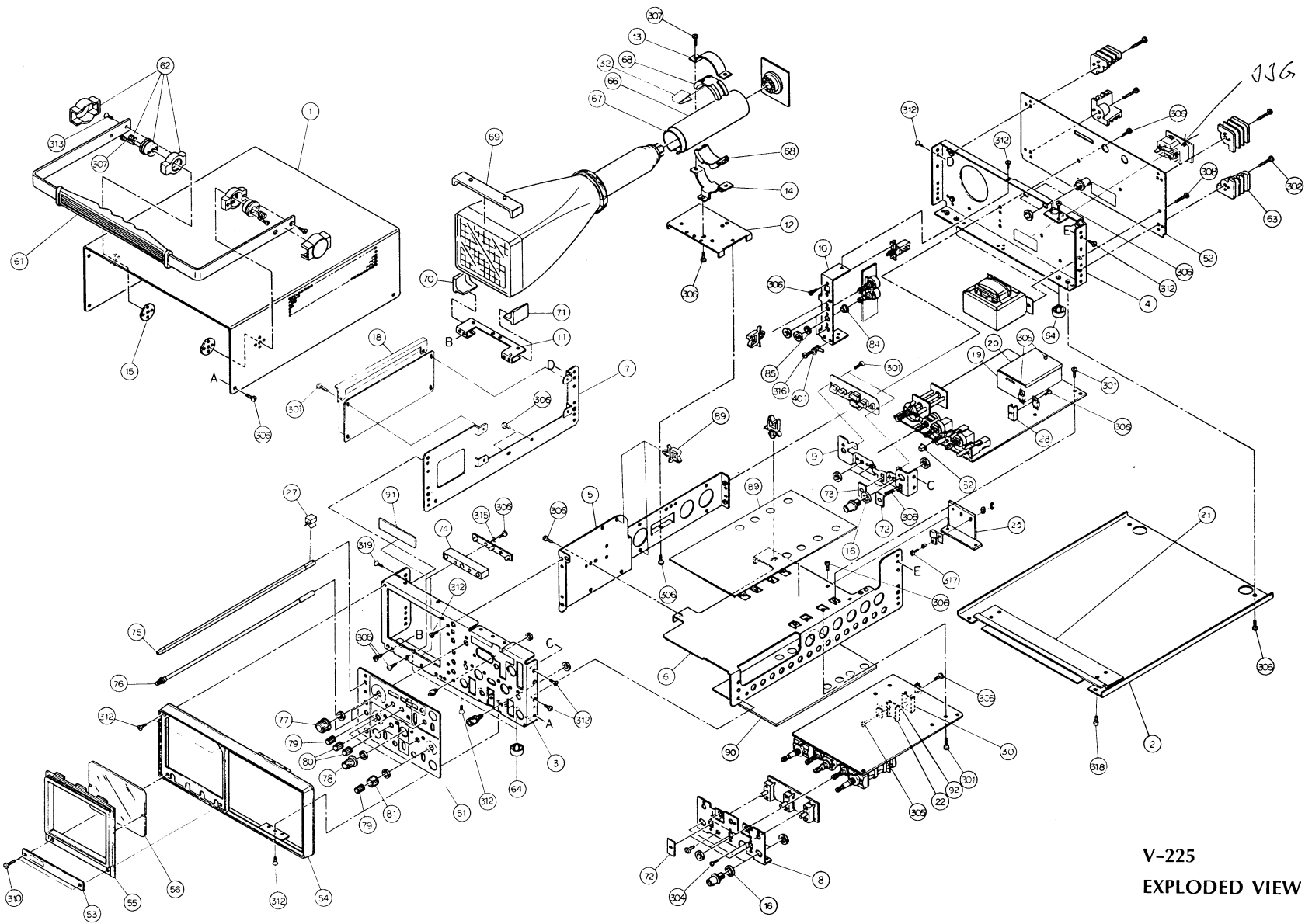
11. MECHANICAL PARTS LIST AND EXPLODED VIEW

V-225/V-425

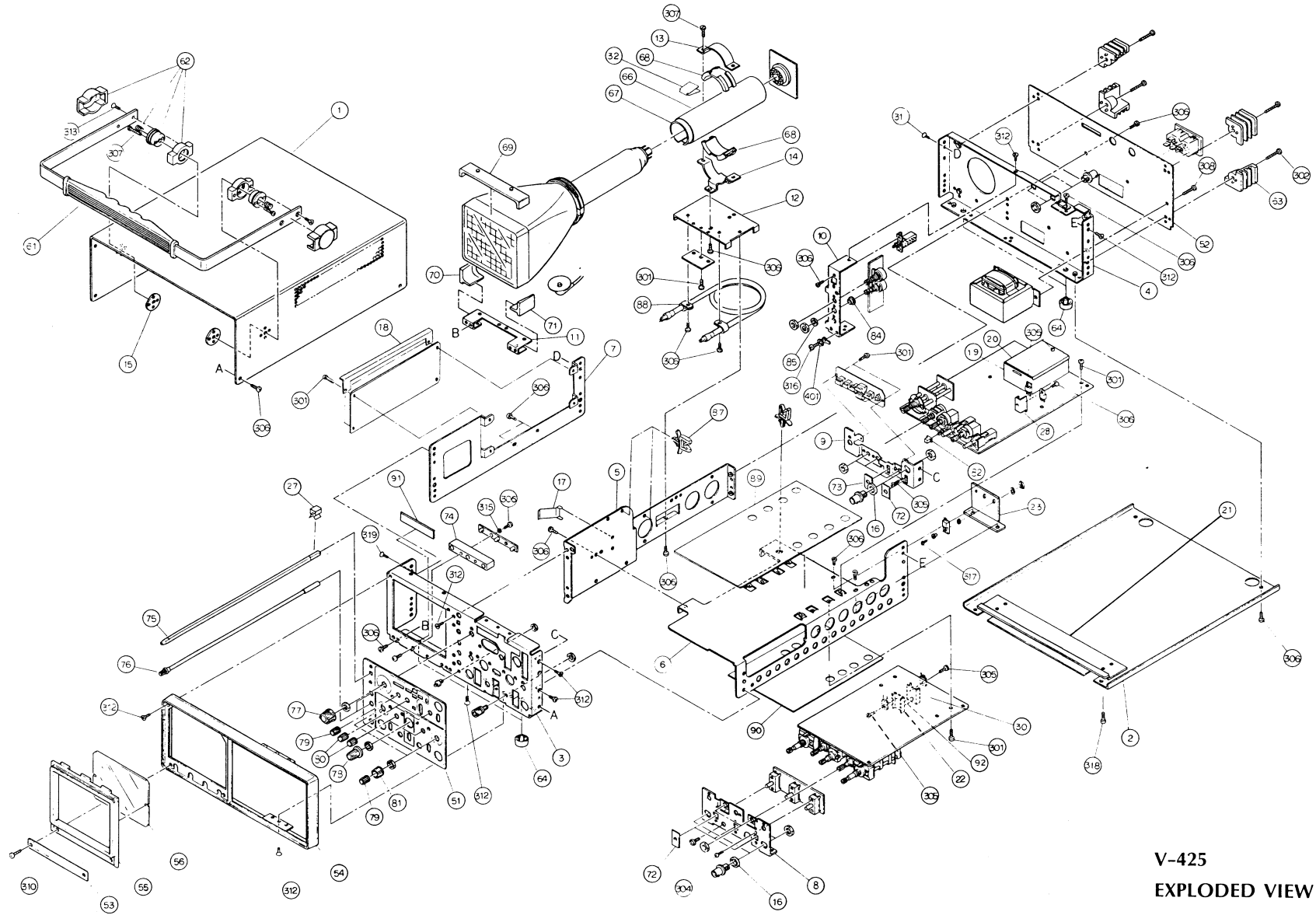
Symbol	Part Code	Description	Q'ty	
			V-225	V-425
1	3177956A	Cover	1	1
2	3177957B	Cover Bottom	1	1
3	2119563A	Chassis Front	1	1
4	2114597AA	Chassis R	1	1
5	2105418AA	Chassis C	1	1
6	2105419AA	Chassis P	1	1
7	2119562AA	Chassis L	1	1
8	3177959A	Bracket (1)	1	1
9	3207514A	Bracket (2)	1	1
10	8398471A	Bracket (3)	1	1
11	8398472A	Bracket CRT (1)	1	1
12	8398473A	Bracket CRT (2)	1	1
13	8398474A	CRT Band (1)	1	1
14	8398475A	CRT Band (2)	1	1
15	8398476A	NUT Plate	2	2
16	8398477A	Spacer BNC	3	3
17	8398479A	Earth Spring		1
18	8469955A	Support Plate	1	1
19	3180079A	Shield Case HV	1	1
20	8400305A	Shield Cover HV	1	1
21	8405466A	Support Plate	1	1
22	8405457-59A	Heat Sink (A)	1	1
23	8405460A	Heat Sink (B)	1	1
27	8406477A	Stopper	1	1
28	8419324A	Heat Sink (E)	1	1
30	8405457-58B	Heat Sink (A)	1	1
32	8446132A	Plate Earth	1	1
51	3207527A	Panel Front	1	1
52	3198704A	Panel Rear	1	1
53	8442895P	Name Plate	1	
53	8442895N	Name Plate		1
54	121381C	Front Mask	1	1
55	2110831D	Bezel	1	1
56	8395445A	Filter	1	1
61	3177922A	Handle	1	1
62	8377076A	Handle Stopper	2	2
63	3149317C	Foot	4	4
64	3022087A	Foot	4	4
66	8395432A	Shield Band	1	1
67	8396867A	Rubber Plate	1	1
68	3144055A	Rubber	2	
68	3144055B	Rubber		2
69	8395443A	Rubber (1)	1	1
70	8395444A	Rubber (2)	1	1
71	8395444B	Rubber (2)	1	1
72	8396868D	Spacer	4	4
73	8452650A	Spacer	1	1
74	8395431A	Plate Lampguide	1	1
75	3180083BB	Knob-PW	1	1
76	3180084CC	Knob-L	2	2
77	3140804A	Knob-S22	1	1
78	3149321A	Knob-S18	1	1
79	3149324A	Knob-S18B	3	3
80	3149324B	Knob-S18B	4	4
81	3196622B	Knob-ATS	2	2
82	8383451A	Knob-SW	1	1
84	8401613A	Insulator (1)	1	1
85	8401614B	Insulator (2)	1	1
87	8383455B	Saddle	5	5
88	4124935C	Clip		2
89	8420813A	Insulator	1	1
90	8420813B	Insulator	1	1

Symbol	Part Code	Description	Q'ty	
			V-225	V-425
91	8405486A	Rubber	1	1
92	XCI0020	Spacer	1	1
301	XCA0661	Screw Sems 3x8	14	15
302	8340167C	Screw Sems 4x20	4	4
304	XCA6005	Screw 2.6x5	3	3
305	XCA6306	Screw 3x6	5	5
306	XCA6308	Screw 3x8	28	31
307	XCA6316	Screw 3x16	6	6
308	XCA6412	Screw 4x12	2	2
310	XCA1820	Screw 3x10	2	2
312	XCA7306	Screw Flat 3x6	14	14
313	XCA7410	Screw Flat 4x10	4	4
315	XCA0379	Washer Insulator	1	1
316	XCA6408	Screw 4x8	1	1
317	XCA6312	Screw 3x12	3	3
318	XCA1817	Screw 3x6	4	4
319	XCA7304	Screw 3x4	1	1
401	XCA1881	Spring Washer	1	1

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V-225
EXPLODED VIEW



V-425
EXPLODED VIEW