# INSTRUCTIONS

# MODEL 212C TV

# CHAIN AMPLIFIER

SKL SPENCER • KENNEDY LABORATORIES, INC.
1320 SOLDIERS FIELD ROAD · BOSTON 35, MASS.

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# CHAIN AMPLIFIER

SPENCER - KENNEDY LABORATORIES, INC.

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IB 212C-1

# SKL MODEL 212C TV CHAIN AMPLIFIER

## SPECIFICATIONS

| | |
|---|---|
| BANDWIDTH: | 50 to 220 MC |
| VOLTAGE GAIN: | 20db ± 2db |
| TRANSMISSION CHARACTERISTIC: | ± 2 db (less than 0.7 db variation over any TV channel) |
| MAXIMUM OUTPUT VOLTAGE: | 3 volts peak |
| OVERLOAD CHARACTERISTICS: | |
| INTERMODULATION DISTORTION: | With two 0.5 volt RMS sinusoidal output signals in the pass band the amplitude of the sum or difference frequency component is 11 millivolts RMS or -39 dbv. |
| HARMONIC DISTORTION: | 2.2% second harmonic at 1 volt RMS output in the pass band. Higher harmonics less than 0.05%. |
| IMPEDANCE (Unbalanced): | Input & Output: 75 ohms<br>Reflection coefficient at 75 ohms over VHF TV Bands: less than 0.25. |
| TUBE COMPLEMENT: | Twelve 6AK5 (or the long-life equivalent, type 5654, in Model 212C TV-72L) |
| POWER CONSUMPTION: | 60 watts |
| WEIGHT: | 14 lbs. |
| DIMENSIONS: | 3-1/2" - wide<br>19" - long<br>8" - deep, back of front panel |
| FINISH: | Gray baked enamel |

## DESCRIPTION

The Model 212C TV Amplifier is a dual-stage instrument using twelve 6AK5 vacuum tubes, in two stages of six tubes each. The vacuum tubes of each stage are coupling elements between the input and output delay lines. (See circuit diagram, page 5.) The use of delay lines enables the outputs of the tubes to be additive at all frequencies up to the cutoff of approximately 230 MC. The tubes of each stage are mounted in a line, and each delay line is formed by series inductances connected between successive control grids and plates of each stage. The grid-ground and plate-ground capacitances form the shunt arms of the delay lines, so that the cutoff frequency is dependent only on the capacitances of one tube in each stage and the characteristic impedance of the delay lines. The second stage has been inverted so that the output of the first stage feeds directly into the input of the second stage.

The delay lines are terminated in their characteristic impedances at the ends remote from the inputs and outputs, and use is made of these terminations to introduce the necessary grid bias and plate voltages. The input of the grid delay line of each stage is connected to a source of equal impedance, and the output of the plate line to a load equal to its impedance. Each tube forms a direct path between the input and output. With each line designed for the same cutoff frequency, the total phase delay of the signal is the same in each path so that the output signals' components add.

Power is absorbed by the line terminating resistors; those in the grid constitute the load on the input source, while those in the plate constitute the equivalent source impedance of the plate circuit. The plate load, therefore, on each tube is one-half the line impedance at low frequencies. At high frequencies the plate load line impedance rises, but by careful design this factor has been controlled by utilizing the increased transmission loss of the grid line, so that the resulting gain characteristic can rise in a uniform manner. The end sections of the delay lines have been designed to offset impedance variations due to tubes and stray inductances as well as the capacitance of the terminations and input and output connectors. In addition, proper impedance matching of the delay lines makes the standing wave effect negligible.

These instruments are provided with a manual gain control and a plug to allow its use with the SKL Model 442 Automatic Level Control Unit.

Selection of either automatic or manual control is made by a slide switch on the back of the unit.

When the switch is in the "Manual" position the potentiometer on the back of the unit controls the gain of the first stage by changing its bias. A variation in gain of approximately 5 1/2 decibels can be obtained.

With the selector switch in the "Automatic" position, the grid return of both stages is connected to the two-prong plug in the back of the unit so that the gain may be controlled by an external automatic level control unit. Detailed instructions for operation with ALC are furnished with the ALC unit.

## IMPEDANCE

To obtain the optimum bandwidth, output voltage, gain, and loading properties, the input and output impedances have been made dissimilar. The input impedance without transformers is 180 ohms and the output impedance without transformers is 235 ohms. Transformers in the form of coaxial cables are used to obtain the standard unbalanced impedance of 75 ohms. The impedance is stamped on the rear of the amplifier in blue ink. These cables cannot be removed or shortened without affecting the characteristics of the amplifier.

## CONNECTORS

The output connector is a 72 ohm type N female connector; the input connector is a 72 ohm type N male connector. This arrangement of connectors permits the amplifiers to be connected in cascade without additional fittings.

Mating connectors are supplied with each amplifier; additional ones may be purchased from SKL or from suppliers of type N connectors. The male connector is UG-94A/U and the female connector is UG-95A/U; both are designed for use with type RG-11/U cables, or cables of the same diameter.

## TUBES

Because the outputs of the tubes are added in each stage, the failure of one will result in only 1.6 db loss in gain providing the failure is electrical (e.g., loss of emission). The resulting change in electrical capacitance will not produce a measurable effect on the frequency characteristic. Since the voltage gain of the amplifier is directly proportional to the transconductance of the tubes, values of approximately 5,000 micro-mhos should be used wherever possible. Tubes of this value will give a gain of approximately 10 db per stage; higher values will provide greater gain, and lower values less gain. Normal variations in tube performance will have the same effect as in conventional amplifier circuits; hence, there is no need to select tubes. However, if a tube has a high gas content or is of abnormally low input capacity some change in characteristics may be noted. It is particularly true if such a tube is used in the first or second tube socket of each stage. The effect may be an increase in the standing wave ratio and a decrease in high frequency response. If a set of six tubes is substituted at the same time, it may be advisable to check the gain and frequency response of the amplifier.

## POWER SUPPLY

The power supply provides 125 volts at 140 milliamperes plate supply, 115 volts at 40 ma screen supply, 6.3 volts at 2.5 amperes filament supply, and -1 volt bias.

The supply is of the half wave type and uses a selenium rectifier and an L-C type filter. (See circuit diagram, page 5.) The primary fuse is 0.8 ampere, MDL cartridge type and the plate supply fuse is 0.25 ampere AGX cartridge type.

## POWER SUPPLY TAPS

All Model 212C TV Amplifiers, bearing serial numbers higher than 1204, have been provided with tap connections in the transformer primary to allow for operation on line voltages 10% higher or lower than the normal 117V. The units are shipped connected for 117V operation. If consistently high or low line voltages are encountered, the input line connection should be moved to the appropriate connection point on the power supply terminal strip, as shown on the schematic.

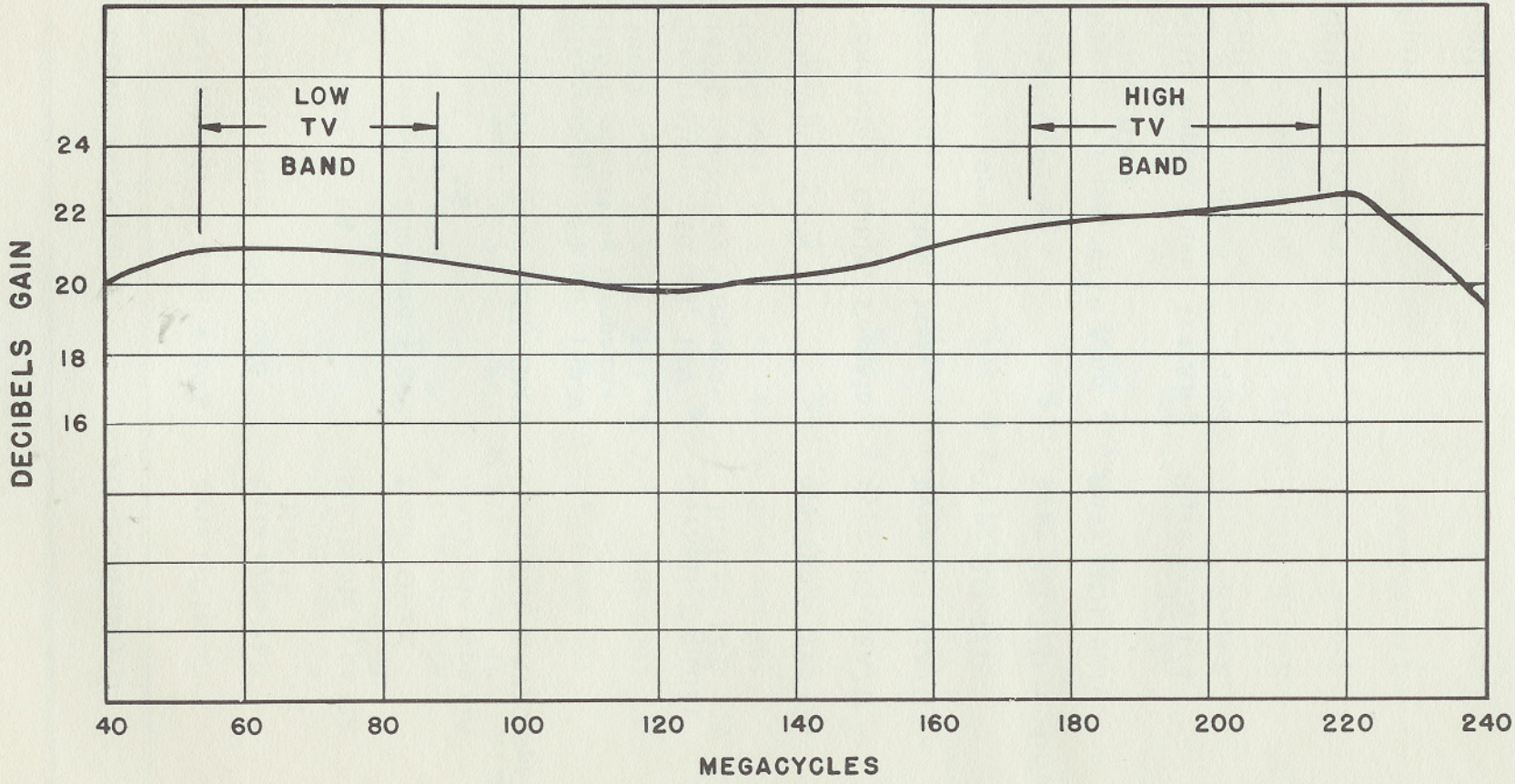
## GENERAL MAINTENANCE

The gain of the amplifier may change slightly as the tubes age. Other than replacing tubes over long periods of time no special maintenance procedure is required as high quality components and construction are used throughout the amplifier. If a component does fail, however, it is recommended that the suppliers and types listed in the component list be used as replacements.

## APPLICATIONS

For applications of the Model 212C TV, see SKL Publications on Wide Band Television Distribution Systems.

## TYPICAL FREQUENCY RESPONSE CHARACTERISTIC - 212 TV-72 CHAIN AMPLIFIER

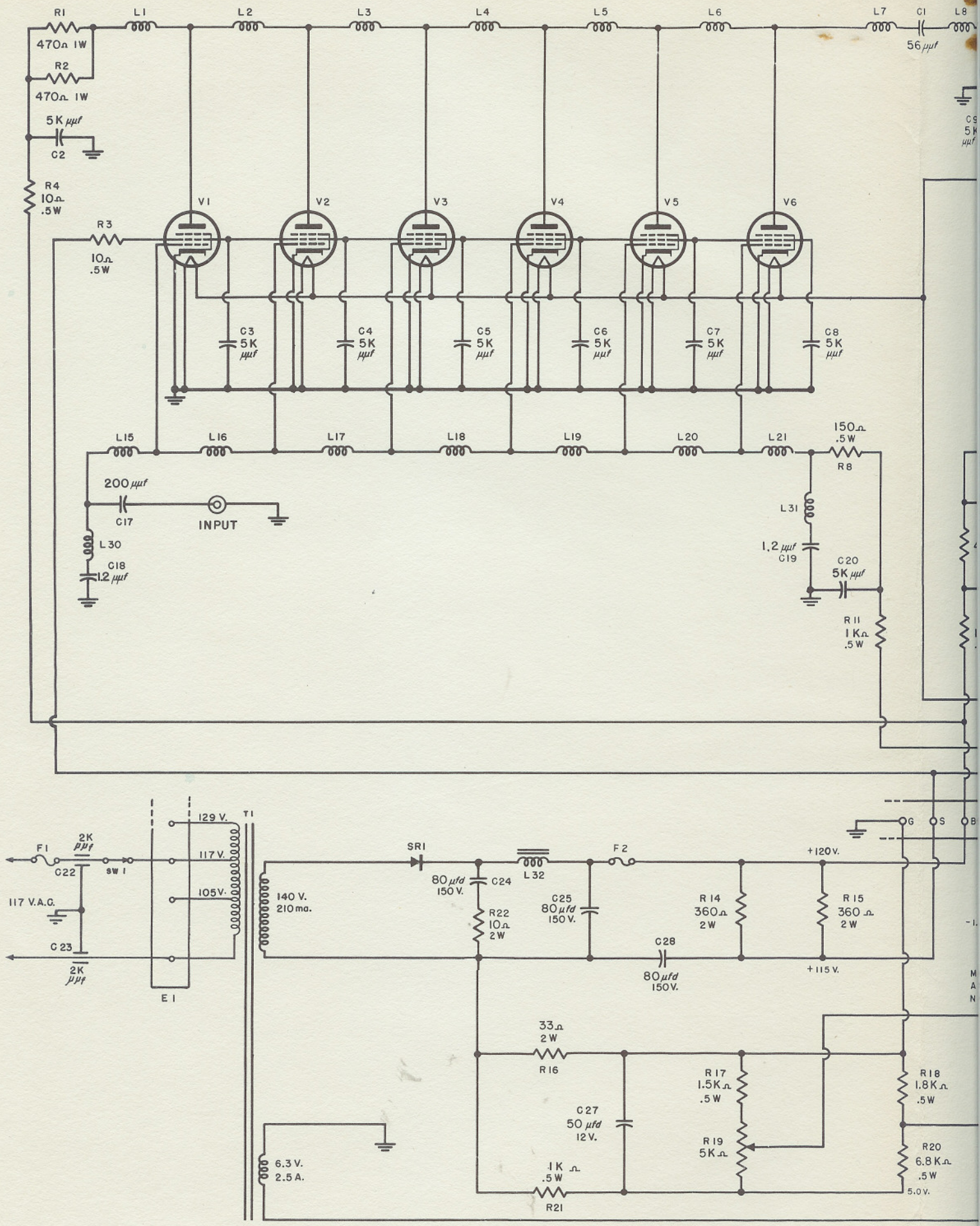


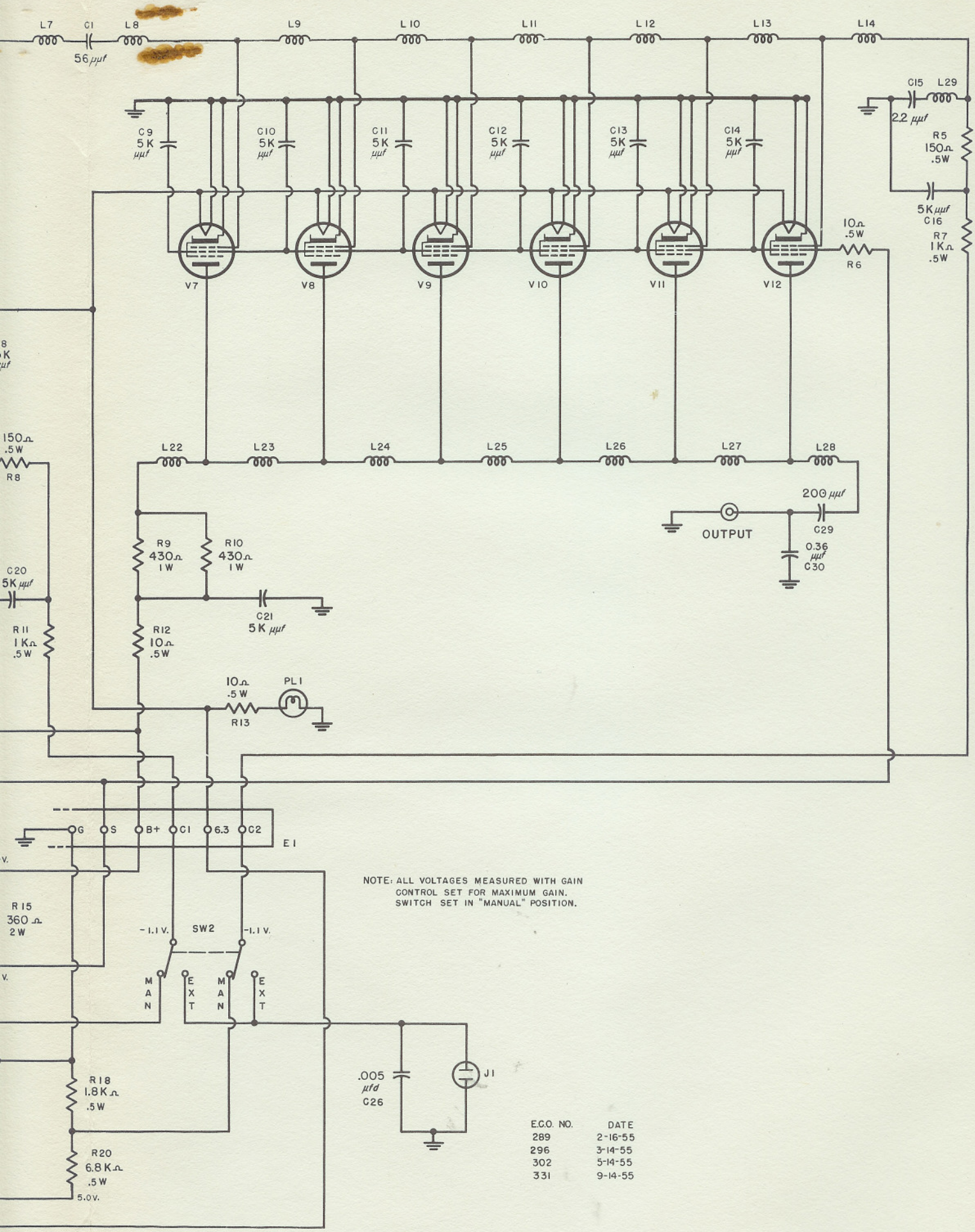
# WARRANTY

SPENCER-KENNEDY LABORATORIES, INC. (SKL) warrants each instrument manufactured or sold by it to be free from defects in material and workmanship under normal use and proper operation and service. Its obligation under this warranty is limited to repairing or replacing any instrument or part thereof (except fuses, tubes or batteries) which shall be returned to it with shipping charges prepaid prior to the end of the twelfth month after the sale of the instrument involved and which, upon examination by SKL, is reasonably determined to be defective. If SKL reasonably determines that the instrument or part thereof is not defective or that the defects discovered are due to abnormal or improper use, operation or service, then the original purchaser will be notified and the repairs, if authorized, will be charged to such purchaser at cost.

*REPAIRS*: If the instrument does not operate properly please notify SKL, supplying a full description of the trouble and the model and serial number of the instrument. Upon receipt of the notification, SKL will either send service instructions or a return repair authorization. Upon receipt of a return repair authorization, please forward the instrument, transportation charges prepaid, to SKL. If the fault in the instrument is not covered by the warranty, an estimate of the repair costs will be forwarded upon request. All returned instruments should be packed in a substantial box surrounded by several inches of excelsior or other shock absorbing material and shipped to SKL, via Railway Express.

*CLAIMS FOR DAMAGE INCURRED IN TRANSIT:* As soon as the instrument is received, it should be tested. If it does not operate properly, or is damaged in any way, a claim should be filed with the carrier. Upon receipt of a full report of the damage, SKL will advise what disposition is to be made of the equipment and arrange for repair or replacement. Please include model and serial number and the date of purchase when referring to any instrument.


R1
470Ω 1W
R2
470Ω 1W
5K μμf
C2
R4
10Ω
.5W
R3
10Ω
.5W
L1
L2
L3
L4
L5
L6
L7
C1
56 μμf
L8
V1
V2
V3
V4
V5
V6
C3 5K μμf
C4 5K μμf
C5 5K μμf
C6 5K μμf
C7 5K μμf
C8 5K μμf
L15
L16
L17
L18
L19
L20
L21
150Ω
.5W
R8
200 μμf
C17
INPUT
L30
C18
1.2 μμf
L31
1.2 μμf
C19
C20
5K μμf
R11
1KΩ
.5W
F1
2K μμf
C22
SW 1
117 V.A.C.
C23
2K μμf
129 V.
117 V.
105 V.
E1
T1
140 V.
210 ma.
SR1
80 μfd
150 V.
C24
L32
F2
+120 V.
R22
10Ω
2W
C25
80 μfd
150 V.
R14
360Ω
2W
R15
360Ω
2W
C28
80 μfd
150 V.
+115 V.
33Ω
2W
R16
C27
50 μfd
12 V.
R17
1.5KΩ
.5W
R19
5KΩ
R18
1.8KΩ
.5W
R20
6.8KΩ
.5W
5.0 V.
1KΩ
.5W
R21
6.3 V.
2.5 A.
G
S
B




NOTE: ALL VOLTAGES MEASURED WITH GAIN CONTROL SET FOR MAXIMUM GAIN. SWITCH SET IN "MANUAL" POSITION.

| E.C.O. NO. | DATE |
|---|---|
| 289 | 2-16-55 |
| 296 | 3-14-55 |
| 302 | 5-14-55 |
| 331 | 9-14-55 |

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