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11-23-40 L.S.

COASTAL HARBOR, HIGH SEAS, AND OVERSEAS RADIO COMMON EQUIPMENT
A-1 VOGAD
DESCRIPTION

1. GENERAL

1.01 The A-1 Vogad (Voice Operated Gain Adjusting Device) is designed to regulate input speech volumes to values suitable for fully modulating a radiotelephone transmitter. The range of input volumes for which it is designed is -45 to -5 db referred to reference volume. Most outputs are within a range of about -5 to 0 db. The vogad includes arrangements for insuring that the transmitter is not overloaded by peaks of speech which are too brief to operate a volume indicator. Consequently, it is not necessary to make any further adjustments of volume when the vogad is used with the range of input volumes stated above.

2. CIRCUIT DESCRIPTION

2.01 The complete circuit of the vogad is shown on drawing SD-64377-01, and its detailed description is given in the circuit description CD-64377-01. A schematic drawing of the vogad is shown in Figure 1, page 6. It consists of a vario-amplifier whose gain is determined by various control circuits which influence the charge on a pair of condensers in the integrator. These control circuits function in response to the applied speech waves.

2.02 Referring to Figure 1, the operation may be explained as follows: When no speech is applied, the gain may increase extremely slowly because of the gradual leakage of the normally-negative charge from condensers G and H through various paths.

2.03 When speech is applied to the input at the left, one of three actions may take place, depending upon whether the speech volume is above, below or within the desired range at the output. In the first two cases, the resultant action will change the voltage on the integrator.

2.04 If the output speech volume is too weak and hence below the range, the output voltage will be too small to operate the gain decreaser or the gain increase disabler. On the other hand, the highly-sensitive gain increaser (which is bridged across the input circuit ahead of the vario-amplifier) will operate the gain increase enabler relay GI through the rectifier and produce an increase in the vario-amplifier gain as follows: The relay GI closes a circuit from the +39-volt supply such that the cold-cathode tube R1 operates, permitting the speech output of the GI branch to be applied across R2, and thereby causing R2 to operate. This permits charging current to flow from the battery to ground through tubes R1 and R2 in series and the condensers G and H of the integrator, making the charge on G and H less negative.

2.05 The steady-state gain of the vario-amplifier is controlled by the combined charge of G and H. Rapid variations of gain are permitted by G which for short periods may have a different potential than the large reservoir condenser H which has ten times the capacitance of G.

2.06 The decrease in negative voltage of the integrator causes an increase in the gain and space current of the vario-amplifier. This increases the voltage drop across resistances V and W so that point 3, 6 of the LOSS varistor unit in the input of the vario-amplifier is made less negative or even positive with respect to point 1,4. The resulting decrease in current flow in the varistor increases its impedance which decreases the amount of loss in the input to the amplifier and so causes the overall gain of the vogad to increase, thereby increasing the output speech volume to within the desired range.

2.07 As the output volume increases, the voltage applied to the gain decreaser and the gain increase disabler also increases until the point is reached where the gain increase disabler operates to prevent further increase by blocking the grid circuit of the gain increaser amplifier at resistance AL. The vogad now has the correct gain if the speech input volume remains constant; and, except for leakage, the vario-amplifier will remain at a constant gain whether or not speech continues.

2.08 If the input volume increases further, the output voltage will be strong enough to operate the gain decreaser tube GD, which increases the negative charge on the integrator. If this increase lasts for only a few syllables, the increase in negative charge on G has little effect in changing the charge on H; and G will return to nearly its original potential. If the volume increase lasts for a considerable period, however, the resulting increase of the negative charge on G will produce a corresponding increase on H, the two capacities equalizing their voltages through resistance C. In either case, the increase in the negative charge on G reduces the vario-amplifier space current, decreasing the voltage drop across resistances V and W so that point 3,6 of the LOSS varistor is made more negative with respect to point 1,4, reducing the impedance of the varistor and increasing the loss through the device, resulting in a net decrease in the output voltage.

2.09 The purpose of the rectifier and relay GI is to delay the operation of the gain increaser for approximately 10 milliseconds so that the gain does not increase on short clicks of noise that are not accompanied by longer speech sounds. The purpose of the tube BL is to prevent the integrator from ever becoming too positive, which would reduce the gain and disrupt the control functions.

2.10 The 40-kcps oscillator, acting under control of tube CONT, is primarily for equalizing the rate of charge with voltage on the integrator when the gain decreaser operates. If it were not used, a given charge would have less effect when the charge on the integrator was high than when it was low. When there is low gain (high charge), for instance, the vario-amplifier plate current is low and the drop across resistances L and V is low. This causes a larger plate current in tube CONT and a larger voltage across the combined resistance Y and YT than when the gain is high and the integrator charge is low. The net effect of this circuit is to insert in the charging circuit a voltage across the combined resistance Y and YT which is proportional to the existing charge on the integrator. This has the effect of making the rate of operation independent of the gain.

2.11 The gain increaser is connected across the bridged varistor in the vario-amplifier circuit so that its sensitivity is greatest when the vogad gain is high. This makes the gain increaser operate better on low volumes which improves its action on speech.

2.12 The voltage drop across resistance L, which is a measure of the vogad gain, may be measured with a portable meter in the TEST jack or by an external meter connected to terminals C1 and C2, as in the C2 control terminal.

3. EQUIPMENT FEATURES

3.01 The vogad apparatus is assembled on a 15-3/4 inch relay rack-mounted aluminum panel shown on Photographs A and B, pages 4 and 5. For its operation, -24 and +130-volt regulated battery supplies are provided.

3.02 **The following vacuum and gas-filled tubes are used:**

Type of Tube	Quantity	Designation
262A	2	D, BL
309A	2	A2, A3
310A	6	A1, A4, A5, A6, CONT, OSC
313-type	3	GD, R1, R2

4. TRANSMISSION CHARACTERISTICS

4.01 The frequency range is 300-6000 cps so that an auxiliary pilot channel may be passed through the vogad in order to transfer to other circuits an indication of its gain.

4.02 A typical gain vs test voltage characteristic is shown in Figure 2, page 7, which also shows the limits of the gain increaser sensitivity over the same range of test voltage.

4.03 Tests indicate that the high volume-indicator readings at the output of the vogad with certain speakers are attributable to the fact that the peak factor is different for these speakers than it is for average speech. In spite of the high volume-indicator readings:

(a) The instantaneous peak load on a radiotelephone transmitter is not increased.

(b) The extra-band modulation as measured by inter-channel crosstalk in a single-sideband short-wave twin-channel radiotelephone system is not increased.

(c) The slightly compressed speech obtained from the vogad should be more satisfactory for operating voice-operated relays.

(d) The signal-to-noise ratio of the radio circuit is improved by compressed speech.

4.04 Applied noise may operate the vogad if it is strong enough. The maximum permissible noise at the vogad input (which does not operate the vogad), varies with the vogad gain. For average gain, the two-wire noise allowable is about 38 db above reference noise.

5. PHOTOGRAPHS, FIGURES, AND DRAWINGS

5. (Continued)

Subject

(C) References

ES-378915 - A-1 Vogad - Details for Specification
SD-64377-01 - A-1 Vogad - Circuit Diagram
J68310A-90 - A-1 Vogad Equipment Layout

Subject

T-64377-80 - A-1 Vogad Wiring Diagram

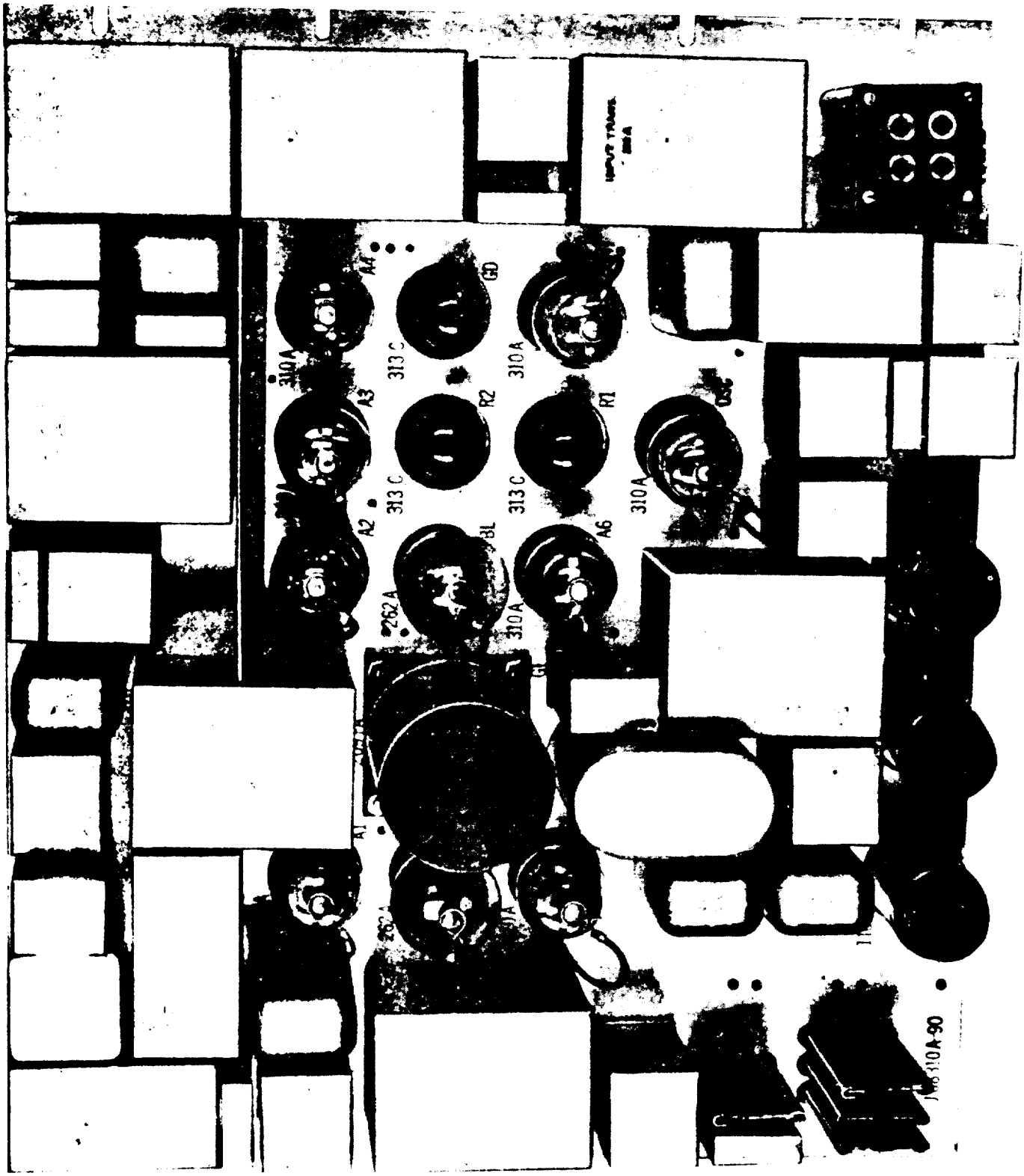

Photo A – A-1 Vogad — Front View

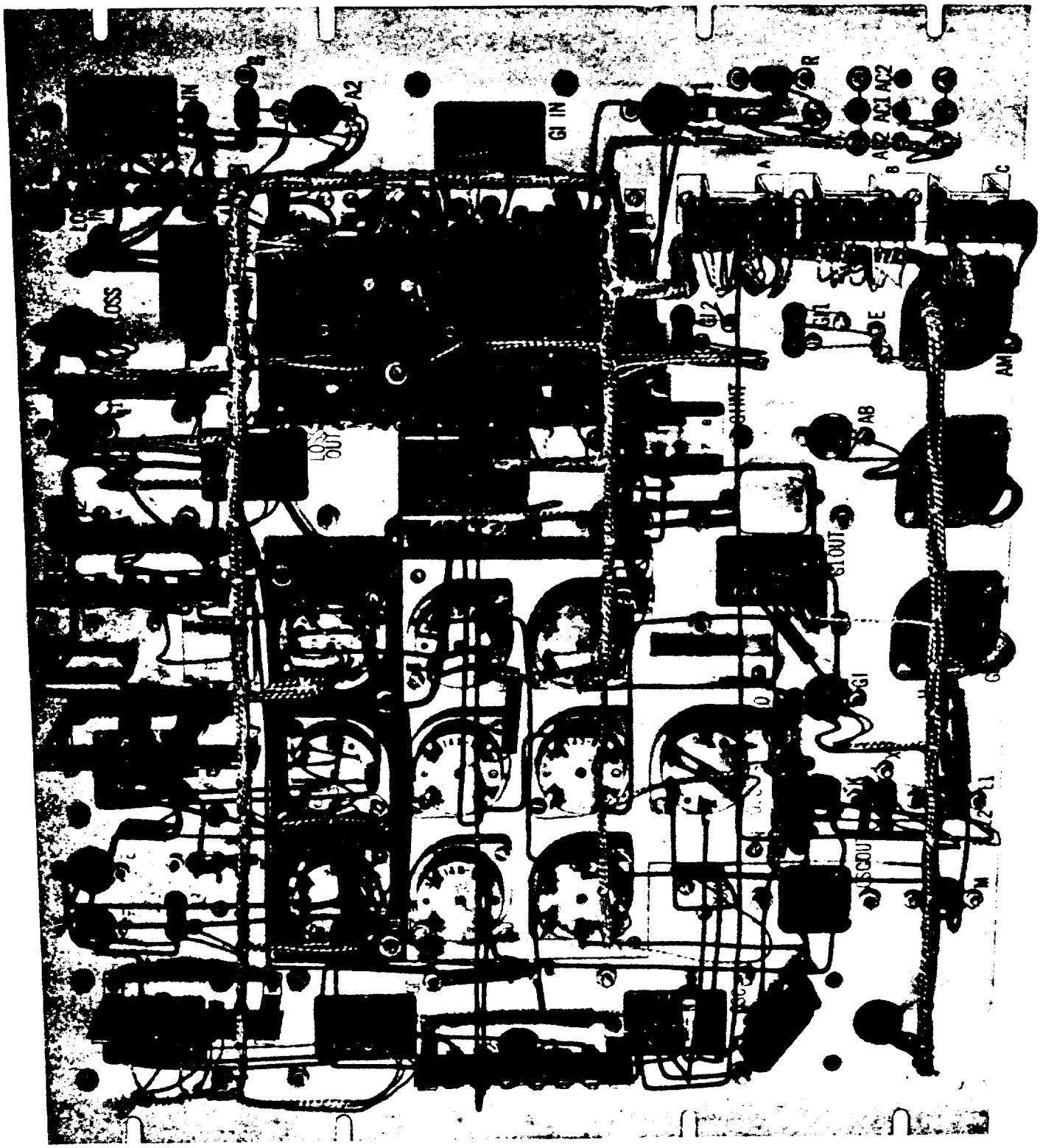

Photo B – A-1 Vogad — Rear View

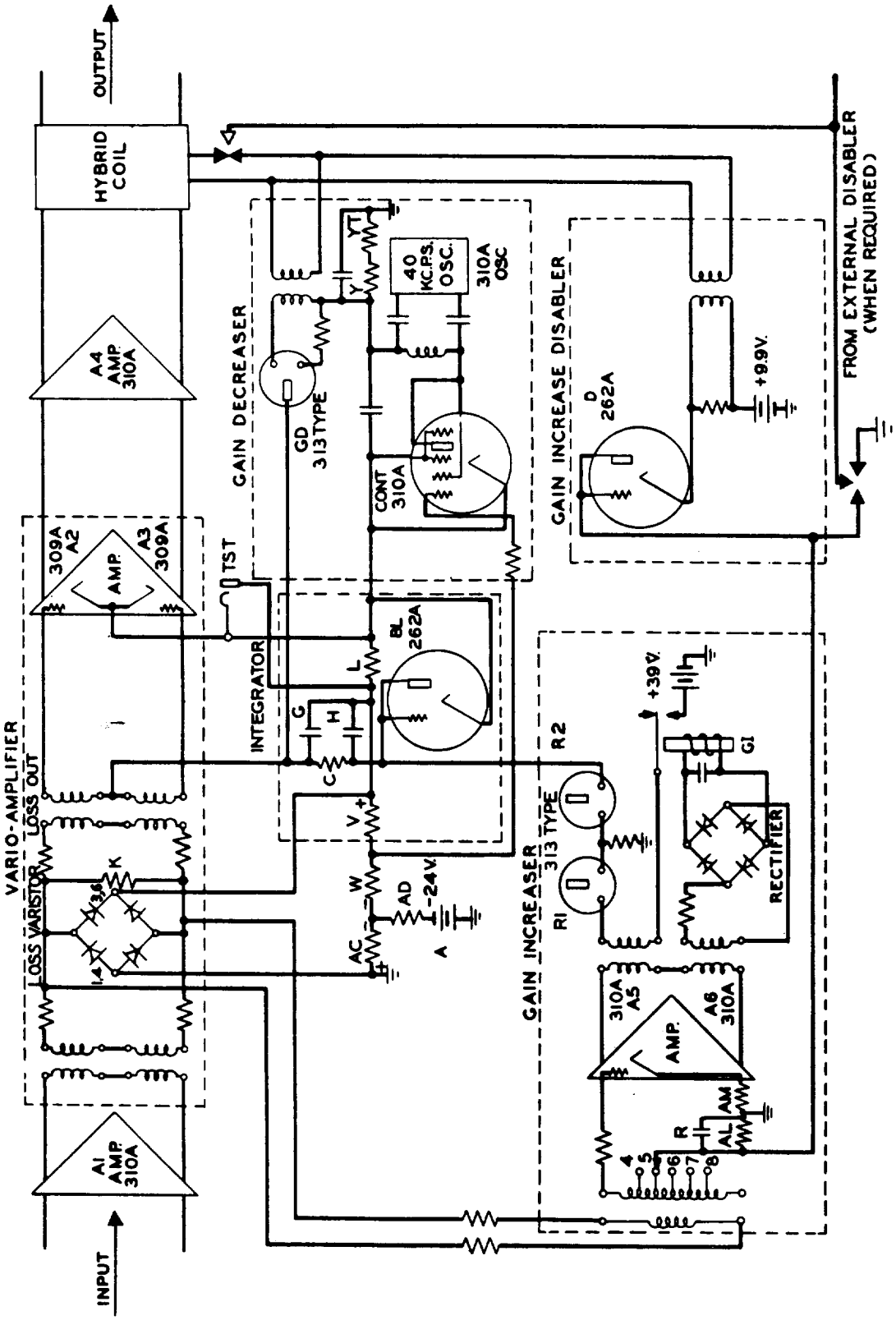

Fig. 1 – Simplified Schematic

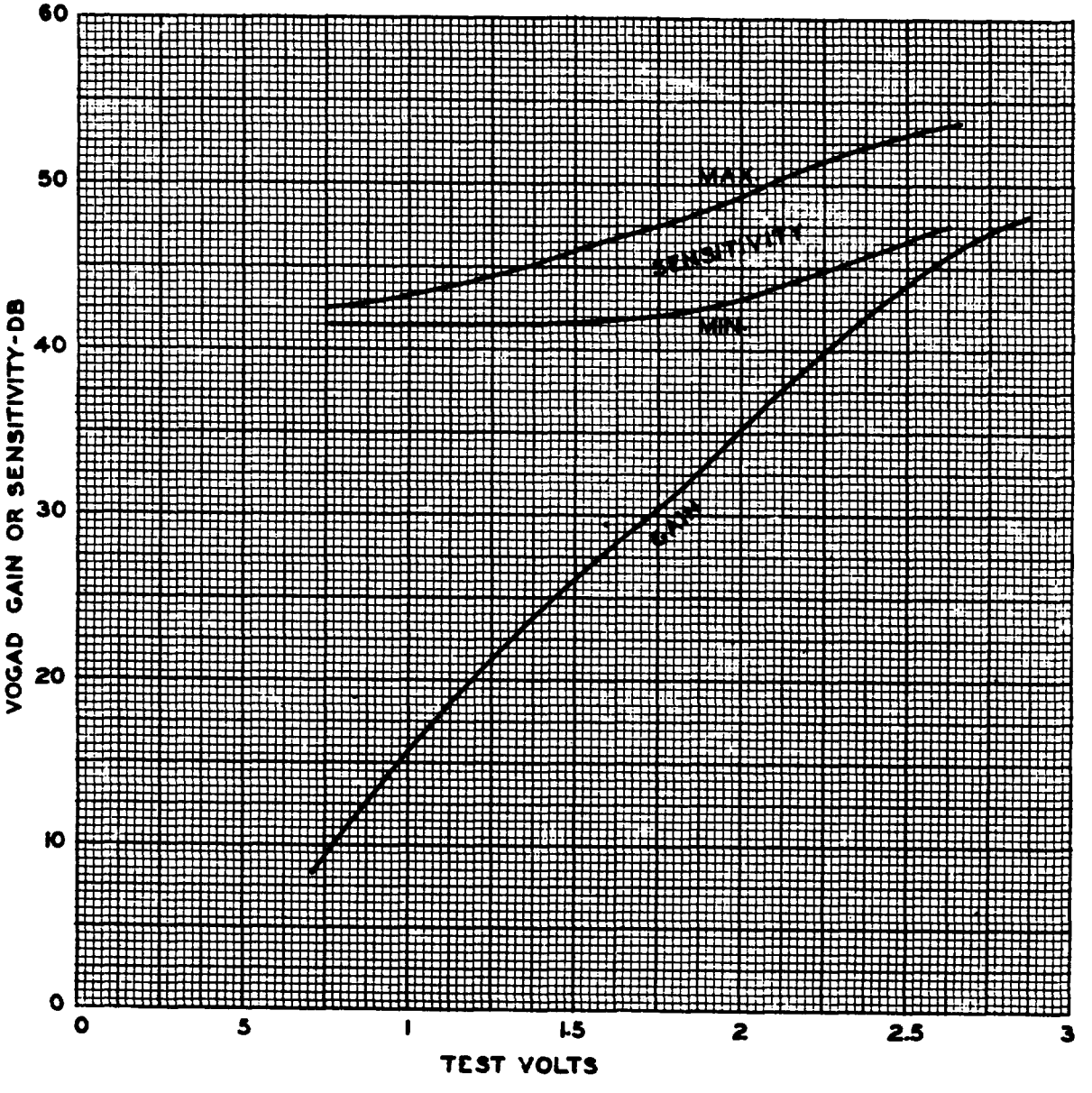

Fig. 2 – Gain and Sensitivity vs. Test Volts