

INSTRUCTIONS  
LEVELING AMPLIFIER  
MODEL LA - 2

TELETRONIX ENGINEERING CO.  
4688 EAGLE ROCK BOULEVARD  
LOS ANGELES, CALIFORNIA

9/63

LA - 2

## OPERATING INSTRUCTIONS

### TELETRONIX MODEL LA-2 LEVELING AMPLIFIER

#### INTRODUCTION

The Teletronix Leveling Amplifier Model LA-2 will automatically compress audio peaks which might otherwise over drive broadcast or recording equipment.

Automatic gain reduction is accomplished by use of an electro optical variable attenuator ahead of the first amplifier stage. The attenuation is controlled by the amplitude of the LA-2 input signal.

This system permits up to 40 DB of instantaneous gain reduction, yet causes no wave form or harmonic distortion. The amplifier provides sufficient gain and output level (10DBM nominal) to be used as a line or program amplifier for direct connection to the transmitter in the case of radio or TV operation.

Provisions are made for interconnection of the optical attenuators to provide equal gain reduction when the LA-2 is to be used in a compatible FM stereo system.

#### SPECIFICATIONS

1. Gain Reduction: up to 40 DB
2. Distortion: less than 0.5% total harmonic
3. Response:  $\pm$  0.1 DB 50 cycles to 15 KC
4. Noise: 75 DB below + 10 DB output level
5. Gain: 40 DB
6. Output Level: + 10 DBM nominal
7. Input Level: + 16 DBM maximum
8. Attack Time: essentially instantaneous (10 micro sec.)
9. Release Time: aprox. 0.06 seconds for 50% release, 0.5 to 5 seconds for complete release depending on amount of previous reduction.
10. Input Impedance: 50, 150, 250, and 600 ohms, balanced or unbalanced

11. Output Impedance: 50, 150, 250, and 600 ohms, balanced or unbalanced
12. Panel Size: standard 19" x 5 1/4"
13. Depth Behind Panel: 6 1/4 "
14. Controls: Gain (input level), Peak Reduction, and Meter Selector Switch
15. Meter: DB Gain Reduction and DB Output
16. Power Requirement: 115 volts 60 cycle 35 watts
17. Tube Complement: (2) 12AX7A  
(1) 12BH7A  
(1) 6AQ5

#### OPERATION

The LA-2 Leveling Amplifier is designed to prevent an increase in output level beyond a pre determined point, and due to its unique design, functions as a combined compressor and limiter. This effect is illustrated in Figure 1. The point at which the compressed curve breaks away from the straight "No-Gain Reduction" line is determined by the setting of the "Peak Reduction" control. It can be seen from the curve that compression occurs and gradually increases over the first 10 DB of input level rise. The slope of the curve then becomes horizontal preventing an increase in output level regardless of input increase.

It is recommended that the "Peak Reduction" control be set to prevent increase in output level beyond the 100% modulation point.

Setting of the "Gain" and "Peak Reduction" controls are independent. However, the "Gain" control should be set to provide sufficient output after the "Peak Reduction" control has been adjusted.

The VU meter serves two functions; it indicates output level as well as gain reduction directly in DB. When the meter selector switch is placed in the "Output" position the meter will indicate output level across the 600 ohm terminals. The meter is calibrated to read 0 VU or 100% when the amplifier output is +10 DBM. When the switch is moved to the spring return position the meter calibration is changed to indicate +4 DBM at 0 VU or 100%.

The "DB Leveling" position permits the meter to indicate DB of gain reduction. During periods of no reduction the pointer will remain at 0 VU. The pointer is initially set to this position by means of the screw driver adjusted pot located on the panel.

The "Peak Reduction" control should be set for the desired amount of gain reduction as indicated by the meter. Continuous extreme reduction such as 20 or 30 DB does tend to reduce the dynamic range of music.

For ease of control and to prevent overload of the input transformer sufficient fixed pad should be placed ahead of the LA-2 to allow normal output at approx. 50% setting of the gain control.

If two LA-2 amplifiers are to be used in tandem for stereo, the gain reduction of each amplifier can be made equal, regardless of which channel is instigating the gain reduction. This is accomplished by connecting terminals 6 and 7 of the left channel LA-2 to terminals 6 and 7 of the right channel LA-2. The inter-connecting wire should not be over 2 feet in length and should be shielded, the ends of the shield being connected to the #7 terminals (ground).

Stereo "set-up" is as follows:

1. Connect the amplifier input terminals in parallel and in phase to an audio oscillator.
2. Adjust the gain controls for equal amplifier output of +10 DBM.
3. Set the "Peak Reduction" control on the left channel LA-2 for approximately 5 DB of gain reduction.
4. Note the amount of gain reduction on the left channel. Set the "Peak Reduction" control on the right channel to 0, adjust the right channel rear chassis control R3 for an equal amount of reduction on the right channel.
5. The "Peak Reduction" controls may now be placed at equal settings and the gain reduction will be equal on each channel regardless of which channel is handling peaks.

#### CIRCUIT DESCRIPTION

A block diagram of the LA-2 is shown in Figure 2, and the schematic diagram on Drawing S-1014-1C.

The main amplifier portion consists of a 12AX7 voltage amplifier which drives the 12BH7 cathode follower output stage. This stage provides slightly less than unity gain, but because

of its low output, impedance is not effected by output load mismatch. Low distortion and excellent frequency response are provided regardless of load condition. Improved performance is obtained from the voltage amplifier by application of 19 DB of negative feed back from amplifier output to the cathode of the first amplifier stage. A rise in low frequency response can be obtained by placing a 0.02 to 0.05 mfd. capacitor between the 68 K feed back resistor and pin 3 of the 12AX7.

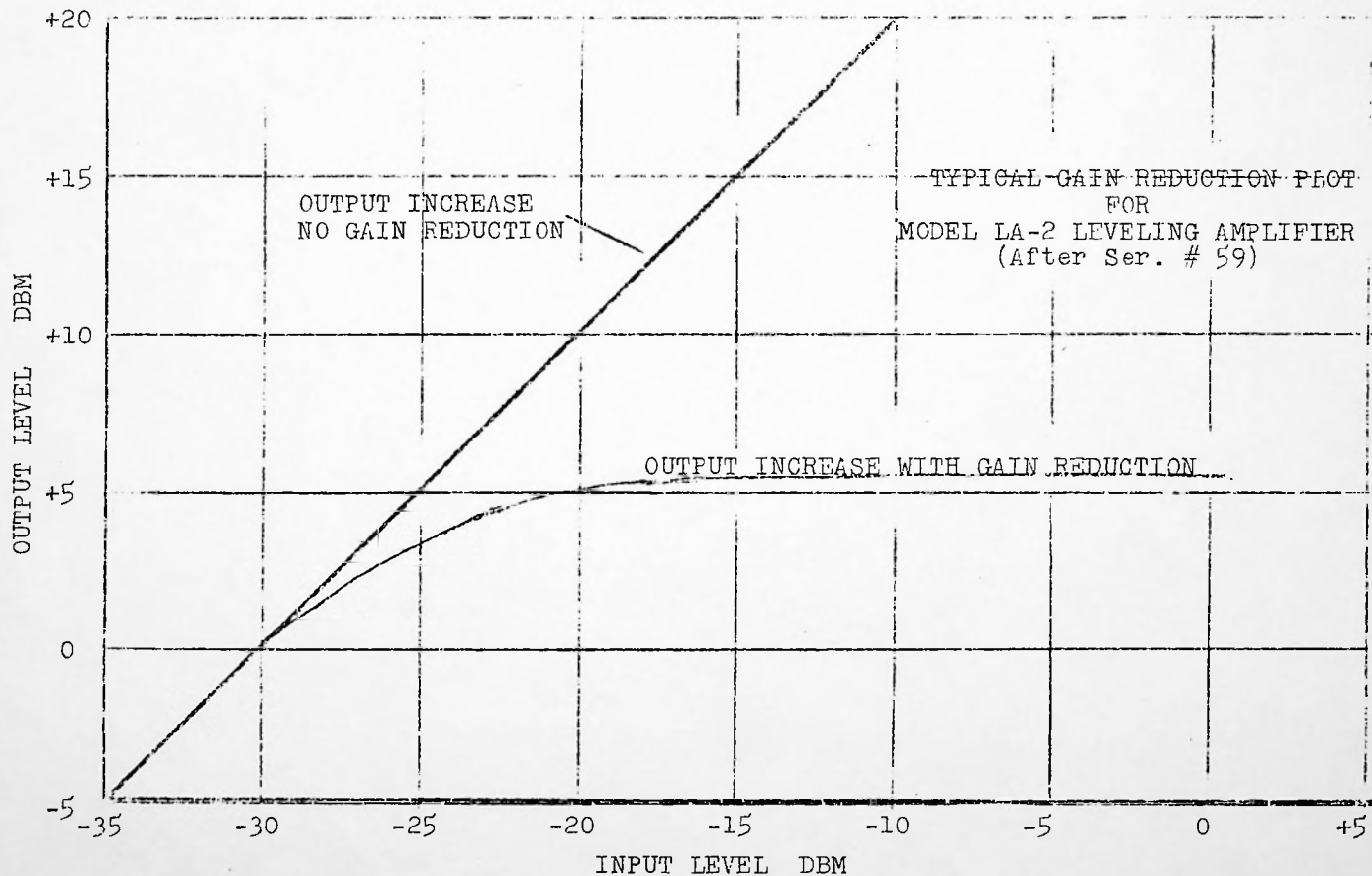
Connection of the input and output transformer for an impedance other than that normally available on the terminal board can be accomplished at the transformer terminals. An input jumper plug is provided in the 600 ohm circuit. A resistive pad may be built into the plug, or a standard FM pre-emphasis network may be inserted where it is desired to provide gain reduction primarily on the high frequencies for FM broadcasting.

The optical attenuator is contained in the plug-in can marked T-4. It contains two photo conductive cells and an electro-luminescent light source. When the input signal rises above a pre-set level the light output from the luminescent device increases and causes the resistance of the cells to decrease from many megohms to a few thousand ohms. Because of the resulting voltage divider action, the available audio voltage across the gain pot decreases, lowering the amplifier input level. The second cell is connected in a DC bridge circuit to operate the gain reduction meter.

The optical attenuator is a sealed unit and will normally provide a life of over 20 years. If trouble is suspected in the attenuator it should be returned to Teletronix for repair or replacement.

The electro-luminescent element is driven by the audio output from the 6AQ5 stage. The preceeding 12AX7 stage provides amplification of the input voltage obtained at the junction of the 70 K and 4.7 K resistors. The ratio of the 70 K and 4.7 K resistors is selected to allow some effect from the decrease of the cell resistance during leveling. The decrease in voltage at this point provides a smooth and gradual transition into gain reduction.

If it is desired to measure frequency response of the LA-2, an external output meter such as the H.P. 400D or 330B should be used because the response of the amplifier is normally much better than that of the front panel VU meter.



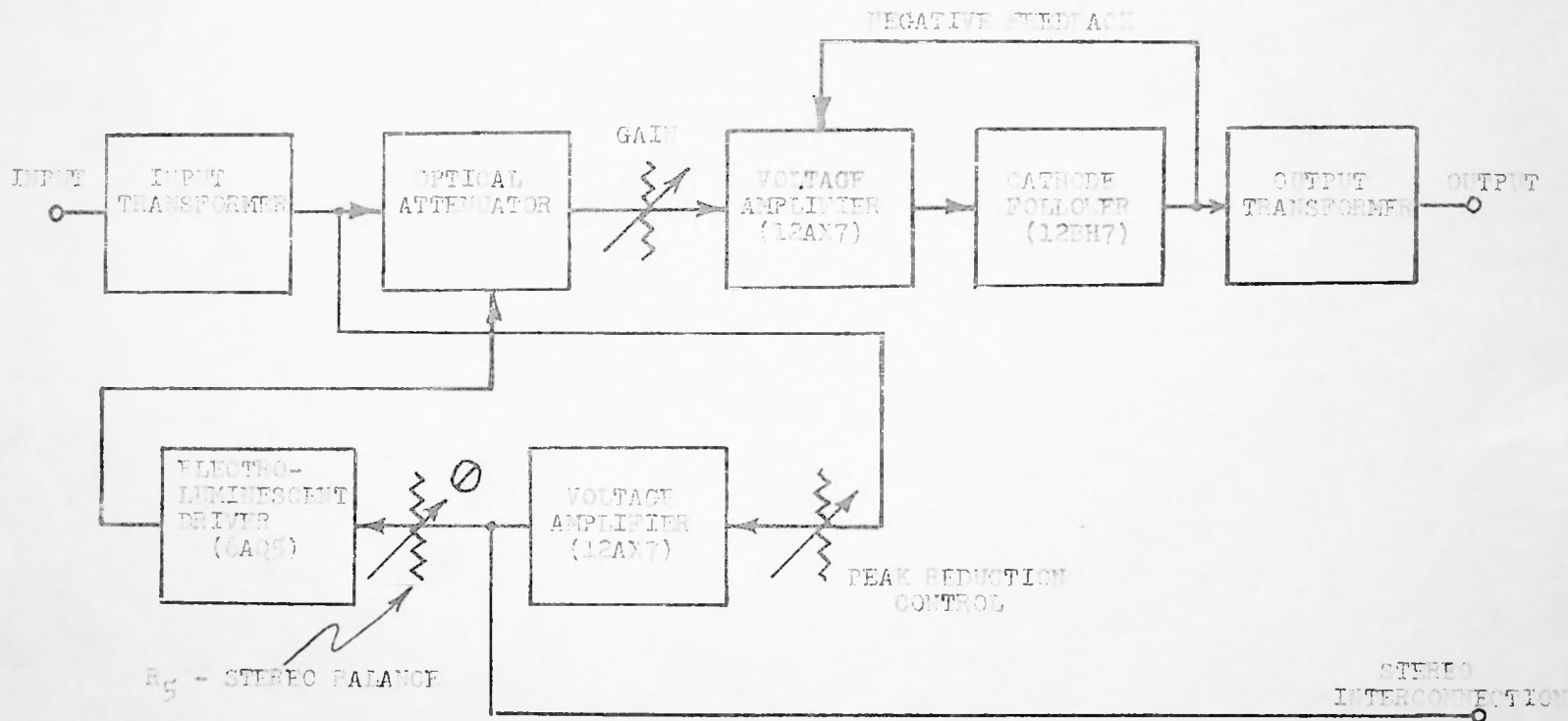
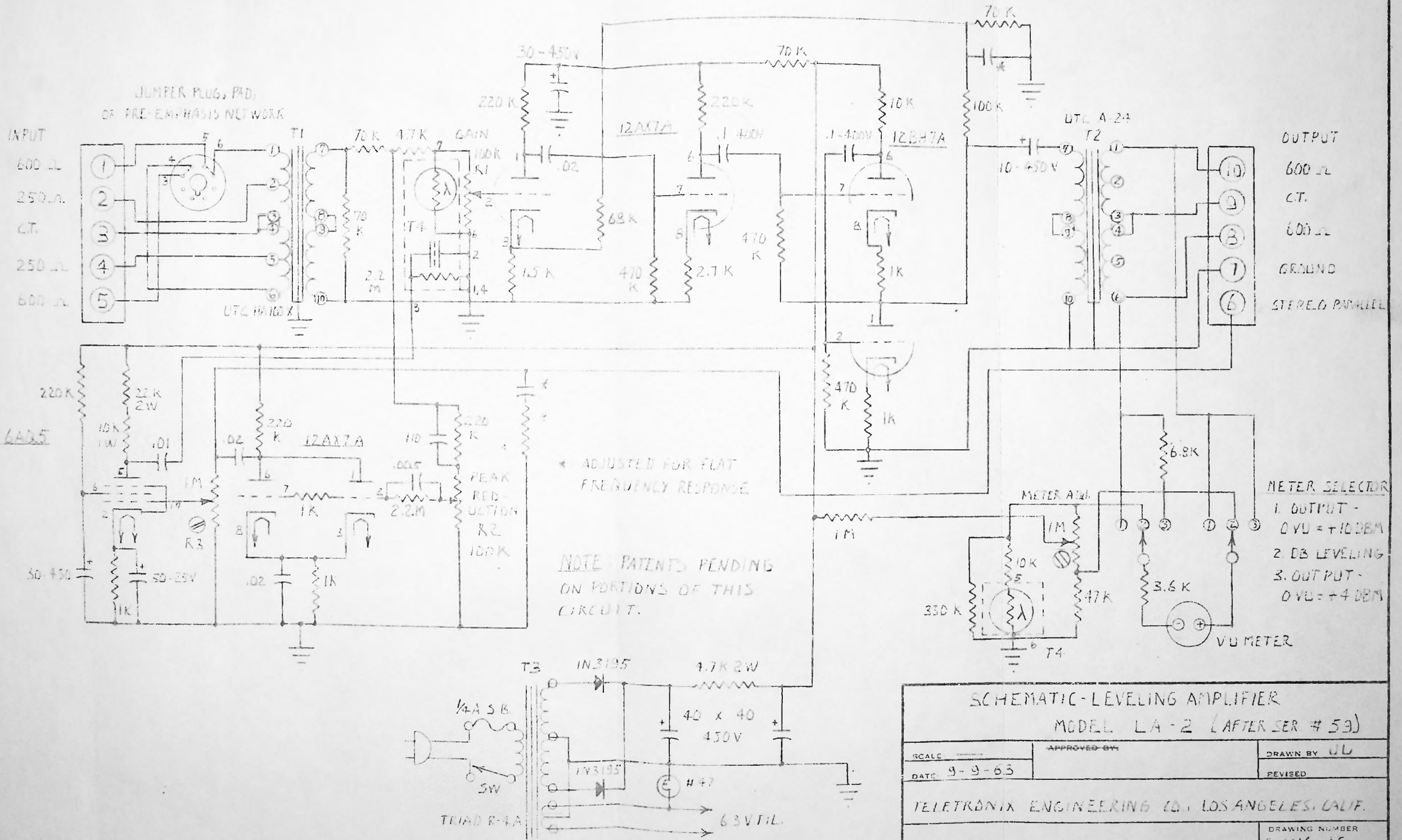


FIGURE 2

BLOCK DIAGRAM  
TELETRONIX MODEL IA-2  
LEVELING AMPLIFIER



SCHEMATIC-LEVELING AMPLIFIER		
MODEL LA-2 (AFTER SER # 59)		
SCALE _____	APPROVED BY _____	DRAWN BY <b>JL</b>
DATE <b>9-9-63</b>		REVISED _____
TELETRONIX ENGINEERING CO., LOS ANGELES, CALIF.		
		DRAWING NUMBER <b>S-1014-1C</b>



TELETRONIX ENGINEERING CO.  
308 MONTEREY ROAD  
SOUTH PASADENA, CALIF. 91030  
682-2792

BROADCAST & COMMUNICATION  
EQUIPMENT

TELETRONIX  
ENGINEERING CO.

4688 EAGLE ROCK BLVD.  
LOS ANGELES, CALIFORNIA  
CLINTON 5-5291

October 14, 1964

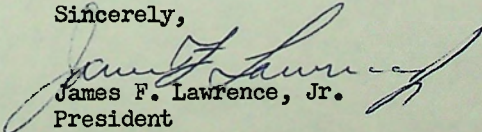
Chief Engineer  
Boyertown Broadcasting Co.  
Radio Station WBYO-FM  
Post Office Box 177  
Boyertown Penn.

Dear Sir:

We are shipping by air mail two optical attenuator units, T4-A, for use in the Teletronix Leveling Amplifiers Serial #77 and 78. Included with each of these units are 2.7 K and 39 K resistors. These should be installed as indicated on the enclosed schematic when replacing the T4 plug in with the T4-A's. The 39 K replaces the resistor which is mounted on a tie point attached to the meter adjustment pot. This is the screw driver adjustment on the left side of the front panel. The 2.7 K resistors replace the 5.6 K units running between the attenuator socket and the input transformer tie point.

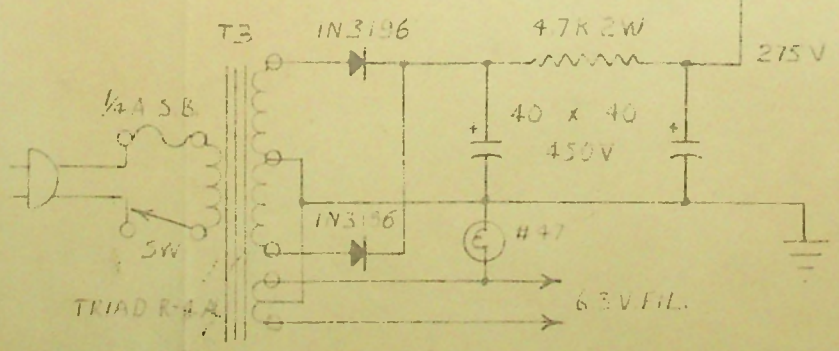
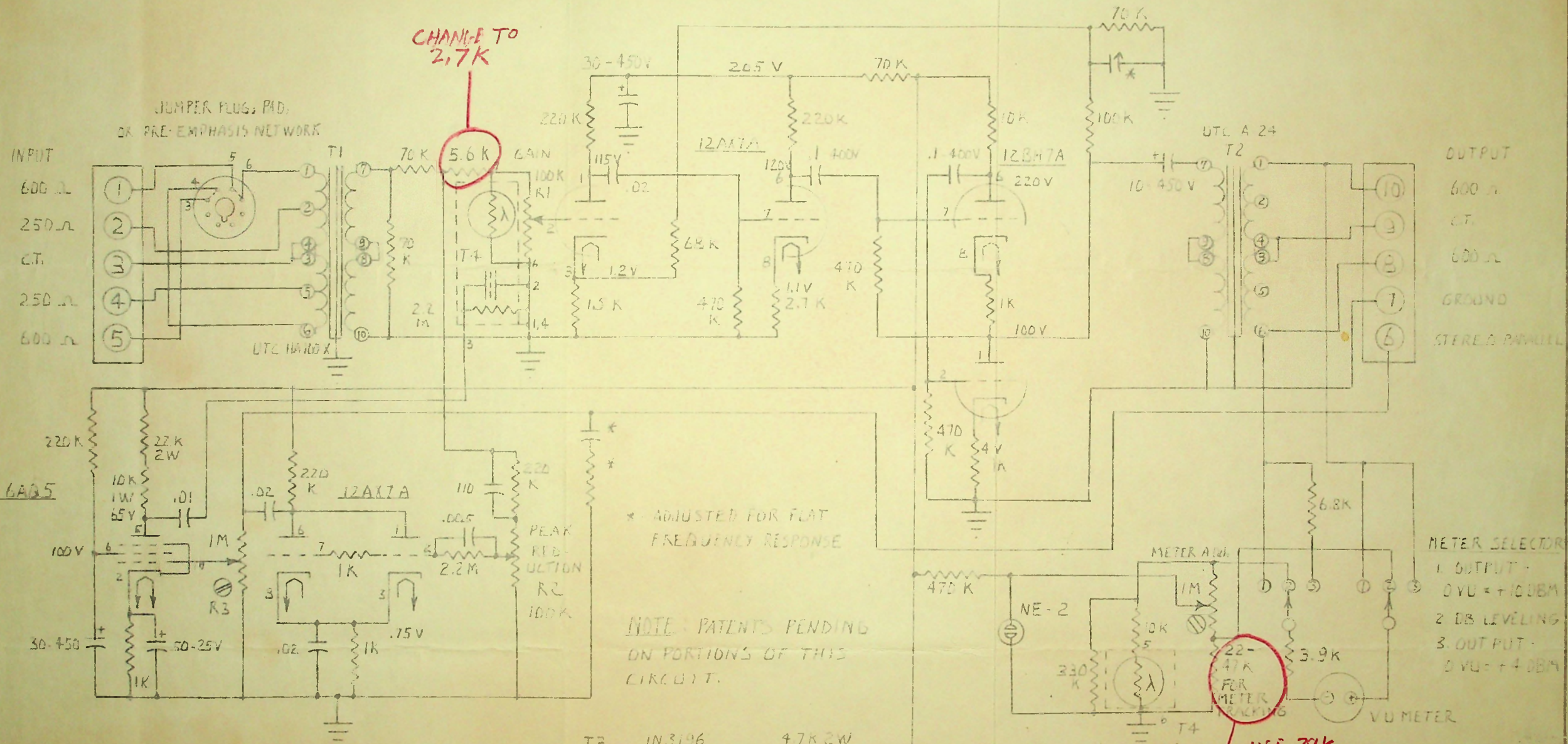
There is no charge for the replacement units provided that the old ones are returned to us.

Sincerely,

  
James F. Lawrence, Jr.  
President

JFL/gg





SCHMATIC - LEVELING AMPLIFIER  
MODEL LA-2 (AFTER SER # 59)

SCALE	APPROVED BY	DRAWN BY UL
DATE 9-9-63		REVISED 6-64
TELETRONIX ENGINEERING CO., LOS ANGELES, CALIF.		
DRAWING NUMBER		5-1014-1D



TEST DATA - TELETRONIX MCDL LA-2 LEVELING AMPLIFIER

Test Frequency	Total Harmonic Distortion (+ 10 DBM)	Response
40 cps	<u>0.15%</u>	<u>0</u> DB
100	<u>0.15%</u>	<u>0</u>
400	<u>0.16%</u>	<u>0</u>
1000	<u>0.16%</u>	<u>0</u>
5000	<u>0.17%</u>	<u>-0.1</u>
10,000	<u>0.17%</u>	<u>-0.1</u>
15,000	<u>0.18%</u>	<u>+0.1</u>

Serial # 77

Max. Gain 39 DB

Date 3-7-64

Noise -76 DB

By S. N.

(400 cps + 10 DBM Ref.)

TEST DATA - TELETRONIX MODEL LA-2 LEVELING AMPLIFIER

Test Frequency	Total Harmonic Distortion (+10 DBM)	Response
40 cps	<u>0.18</u> %	<u>0</u> DB
100	<u>0.19</u>	<u>0</u>
400	<u>0.19</u>	<u>0</u>
1000	<u>0.19</u>	<u>0</u>
5000	<u>0.19</u>	<u>-0.1</u>
10,000	<u>0.21</u>	<u>-0.1</u>
15,000	<u>0.22</u>	<u>+0.1</u>

Serial # 78

Max. Gain 39 DB

Date 3-5-64

Noise -78 DB

By S.K.

(400 cps + 10 DBM Ref.)