KS-16608, L1 AMPLIFIER — DESCRIPTION

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1. GENERAL

1.01 This practice provides descriptive information on the KS-16608, L1 Amplifier. This amplifier is designed for general purpose applications and may be used in paging and announcement systems requiring 12 watts of audio power.

1.02 The input arrangements for this amplifier are identical to those for the KS-16610, L1 Amplifier. For this reason they are discussed in detail in Section 024-150-104.

1.03 The KS-16608, L1 Amplifier is a basic amplifier which has a single high impedance input and is designed to deliver a nominal 12 watts output. It is equipped with sockets into which may be plugged, in suitable combinations, the KS-16607, L1 Amplifier, the KS-16611, L1 Transformer and the KS-16612, L1 Mixer Unit. The basic amplifier supplies the ac and dc voltages required to operate the KS-16607, L1 Amplifier.

1.04 The circuit schematic drawing for the amplifier is SD95272-01. The application schematic is SD95275-01. These drawings are not attached to this practice. The detailed description of the amplifier will be found in CD95272-01 which also is not attached.

1.05 Fig. 1 shows a photograph of the amplifier with the cover mat and perforated rear cover assembled. The mounting brackets, which are held in place by screws, are also shown.

1.06 Fig. 2 shows a rear view photograph of the amplifier with the plug-in units assembled. Two KS-16611, L1 Transformers are shown in the upper right hand corner of the photograph. One is shown mounted in the mixer unit. The plug-in units are not included with the amplifier and must be ordered separately.

1.07 Fig. 3 shows a rear view photograph of the amplifier with a 9-pin shorting plug mounted in the INPUT NO. 2 LINE socket. The amplifier is equipped with one shorting plug.

2. ELECTRICAL CHARACTERISTICS

2.01 The nominal electrical characteristics of the amplifier are as follows:

Power Supply:

110 to 130 volts, 60 cps ac. 95 watts at 115 volts (0.86 amps). When equipped with KS-16607, L1 Amplifier, 100 watts at 115 volts (0.9 amps). Fused with 2-amp fuse.

Power Output:

12 watts into rated resistive load with less than 2% harmonic distortion from 100 to 5000 cycles.

Load Impedance:

Nominal rated loads of 1, 4, 9, 16 and 400 ohms.

Loudspeaker Distribution Line Voltage:

70 volts.

Internal Output Impedance:

Approximately 15% of nominal load impedance.

Input Impedance:

Unbalanced, 250,000 ohm gain control.

Fig. 1 – Front View with Covers Assembled

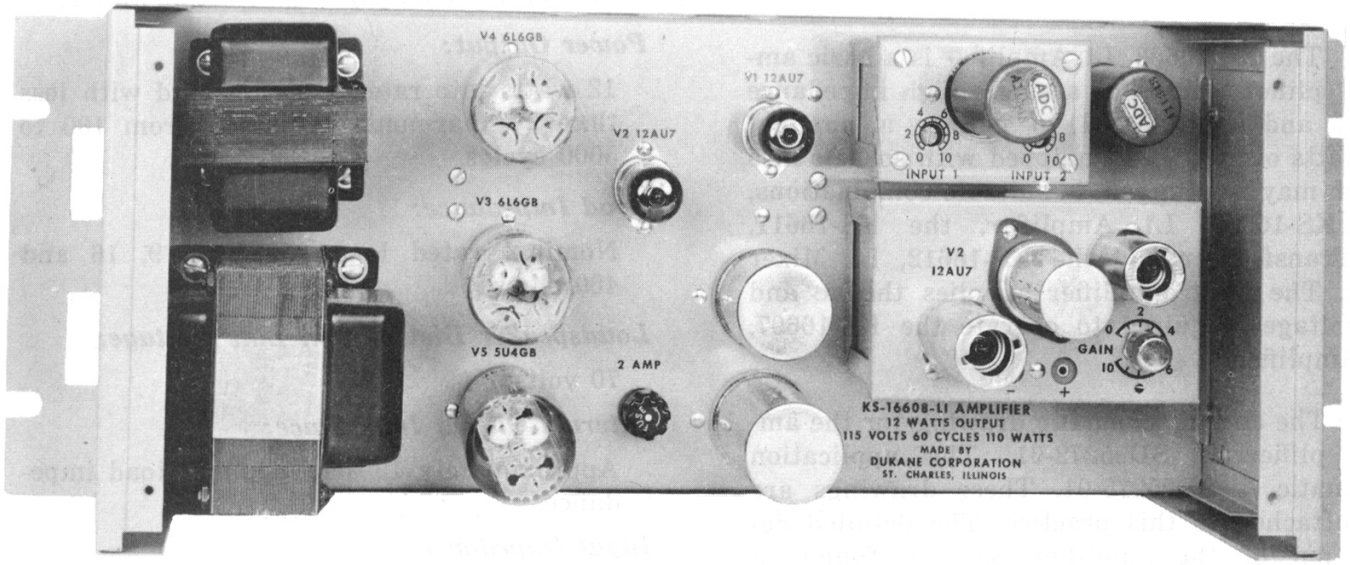

Fig. 2 – Rear View with Cover Removed and Plug-In Units Assembled

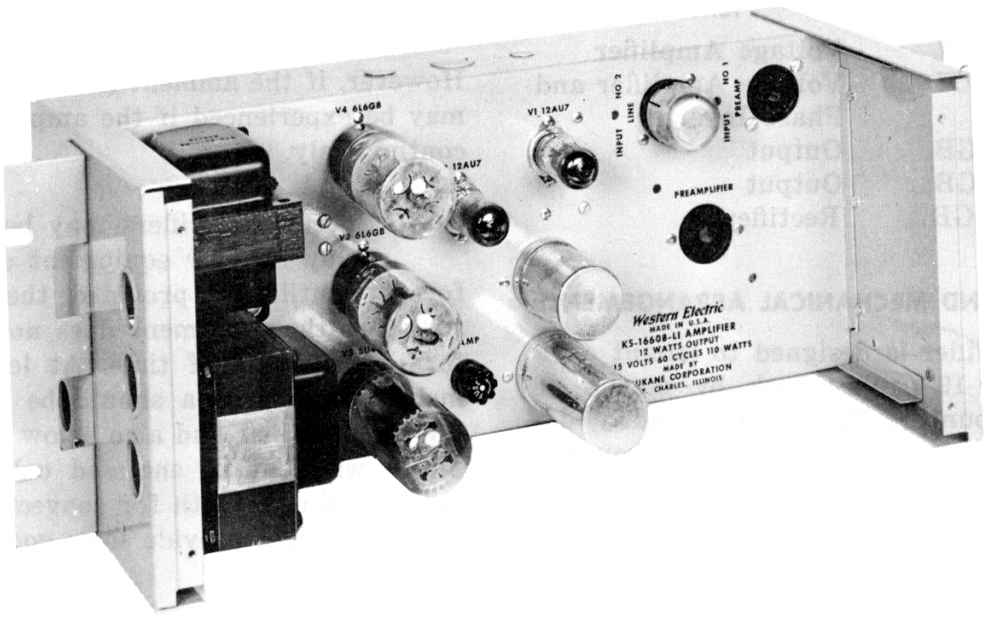

Fig. 3 – Rear View Showing 9-Pin Shorting Plug

Gain:

Approximately 53 db from 600-ohm source.

Approximately 0.4 volts in for 12 watts output.

When equipped with the KS-16611, L1 Transformer, approximately 71 db. Approximately 40 db when bridging input.

When equipped with KS-16607, L1 Amplifier and KS-16611, L1 Transformer, approximately 118 db.

When equipped with KS-16607, L1 Amplifier and KS-16611, L1 Transformers and KS-16612, L1 Mixer Unit, approximately 108 db for high gain channel and approximately 60 db for line level channel.

Frequency Response:

±1 db from 50 to 10,000 cycles.

Low Frequency Roll-Off:

Three low frequency roll-off filters can be connected in circuit by screw terminals to give low frequency attenuation of 6 db per octave with 3 db points at approximately 100, 400 and 1000 cycles. The application of the roll-off is discussed with the curves in Part 6 of this practice.

Gain Control:

Continuously variable potentiometer.

Output Noise:

−40 dbm (unweighted) with maximum gain.

3. MECHANICAL CHARACTERISTICS

3.01 The mechanical characteristics of the amplifier are as follows:

Mechanical:

Width: 16-1/4″ without mounting flanges. 19″ with mounting flanges.

Height: 6-31/32″.

Depth: 8-5/16″ (front projection from mounting surface approximately 4-3/4″).

Weight: 20 pounds.

Mounting: Held in place by four No. 12-24 screws on 19″ relay rack.

Finish: Light gray enamel — chassis.

Dark gray — perforated cover.

Electron Tubes:

The electron tube complement (furnished with amplifier) is as follows:

DESIGNATION	TUBE TYPE	FUNCTION
V1	12AU7	Voltage Amplifier
V2	12AU7	Voltage Amplifier and Phase Inverter
V3	6L6GB	Output
V4	6L6GB	Output
V5	5U4GB	Rectifier

4. MOUNTING AND MECHANICAL ARRANGEMENTS

4.01 The amplifier is designed to mount on a standard 19" relay rack by means of screws. The mounting flanges are readily detachable so that the amplifier may be mounted on a table or shelf.

4.02 The amplifier is equipped with a front cover which is held in place by means of four screws. The cover may be removed to provide access to the wiring side of the chassis. A perforated rear cover protects the electron tubes and it can be easily removed for access to the tubes.

4.03 The gain control, pilot light and power switch are located on the front of the chassis and extend through the front cover for accessibility. When the unit is to be mounted on a wall or shelf (with tubes in vertical position), the above components may be relocated on the side of the chassis in holes provided for this purpose. The snap-buttons which normally cover these holes may be used to cover the holes from which the components were removed.

4.04 When the amplifier is mounted on a wall, the mounting flanges should be removed, rotated 90 degrees and fastened to the tapped holes provided in the bottom of the end plates for this purpose. The controls should be relocated in the holes provided in the side of the chassis. The amplifier can then be bolted to the wall with the electron tubes in a vertical position. The operating controls will then be accessible from the front.

4.05 When the amplifier is to be placed on a shelf or table, the mounting flanges should be removed. The controls should also be moved as discussed above. The four rubber feet furnished with the amplifier should be fastened under the screws which normally hold the front cover in place.

4.06 The amplifier should operate satisfactorily in normal ambient room temperatures. However, if the ambient is above 100°F, trouble may be experienced if the amplifier is operated continuously.

4.07 Several amplifiers may be mounted in a relay rack or equipment cabinet without forced ventilation provided the ambient surrounding the equipment does not exceed 100°F for long periods of time. At least 100 square inches of open area should be provided above the top amplifier and also below the bottom amplifier when in an enclosed cabinet. This will provide an open path for convection currents to flow which will provide some cooling.

4.08 The recommended minimum spacing between cabinet or open rack mounted amplifiers (electron tubes horizontal) is shown in Table I.

TABLE I

NO. OF AMPLIFIERS	RECOMMENDED SPACING BETWEEN AMPLIFIERS
2 or 3	1-3/4"
4	3-1/2"
5 to 8	5-1/4"

4.09 The amplifiers should be mounted so that the tubes are toward the rear of the frame (normally the "wiring side" of the frame or rack). The cover mat and external controls will then be on the "apparatus side" of the frame or rack.

4.10 The end of the gain control shaft is slotted for screwdriver adjustment and is protected from accidental turning by means of a removable cap. The power switch is also protected from accidental operation by means of a guard.

4.11 Two 13/16" diameter holes, equipped with spun eyelets, are located on the left end of the chassis and one is located on the right end. These are provided for external connections. In addition to these, one 7/8" diameter hole is provided on the right end of the chassis for the ac power connections.

4.12 All terminal boards are located on the wiring side of the chassis and are designated TB1, TB2, TB3 and TB4.

5. EXTERNAL CONNECTIONS

5.01 All power connections should be made in accordance with local wiring codes. Terminal No. 41 is provided for a ground connection where the local code requires a 3-conductor cord. The ac power leads should be brought through the lower right-hand entrance hole adjacent to TB3. Power connections to the amplifiers should be made in accordance with Table II. A satisfactory central office ground wire should be connected to terminal No. 32 of terminal board TB2.

TABLE II

TERMINAL NO.	CONNECTION
42	Ungrounded side of ac line
43	Grounded side of ac (110-120 volts)
44	Grounded side of ac (120-130 volts)

5.02 A 2-conductor flexible cord, 8 feet long, is provided with each amplifier. It is equipped with a parallel blade molded plug. An adapter and a strain relief bushing are also furnished with the cord. The black conductor should be connected to terminal No. 42 and the white conductor to terminal No. 43 or 44.

5.03 The input circuit arrangements are discussed in detail in Section 024-150-104. The connections should be brought through one of the entrance holes on the left end of the chassis.

5.04 The lead with the spade tip from terminal No. 7 on the INPUT NO. 2-LINE socket should normally be connected to the unmarked terminal on TB4. If low frequency roll-off is desired, this connection should be changed to one of the terminals marked 1000, 400 or 100 depending upon the amount of low frequency attenuation required. The terminals marked HI FREQ on TB4 should be strapped if high frequency roll-off is required. These are discussed in more detail in Part 6.

5.05 The amplifier output connections should be brought into the chassis through the upper entrance hole at the right end of the chassis. Connections should be made to terminals of TB2 in accordance with Table III.

TABLE III

NOMINAL LOAD IMPEDANCE	STRAP TERMINAL	OUTPUT CONNECTIONS
1 ohm	24-26-28-30, 25-27-29-31	24 and 25
4 ohms	25-26, 29-30, 24-28, 27-31	24 and 27
9 ohms	25-26, 27-28	24 and 29
16 ohms	25-26, 27-28, 29-30	24 and 31
400 ohms (70 volts)	NONE	21 and 23

5.06 The input and output circuit shields should be electrically continuous and grounded only at the amplifier. Type BF shielded wire, or equivalent, should be used in central office installations for 600-ohm circuits. Type SK wire, or equivalent, should be used at the customer's premises.

6. TRANSMISSION INFORMATION

6.01 Fig. 4 shows the frequency response of the KS-16608, L1 Amplifier. The response of the low impedance outputs is combined into one curve since they are almost identical.

6.02 Fig. 5 shows the frequency response of the amplifier with low frequency roll-off. This feature is provided to reduce the output level of the frequencies in the low end of the band and thereby prevent damage to reproducing horns. This feature may also be used to minimize auditorium reverberation. The connections for the desired roll-off are made on TB4.

6.03 Fig. 6 shows the power output characteristics of the amplifier for 1% and 5% distortion. The curves shown are typical for all the output impedances.

6.04 Fig. 7 shows the frequency response of the KS-16608, L1 Amplifier when it is equipped with a KS-16611, L1 Transformer. In most situations, the amplifier will be used with a transformer input.

6.05 Fig. 8 shows the frequency response when the KS-16608, L1 Amplifier is equipped with a KS-16607, L1 Amplifier and a KS-16611, L1 Transformer. The curves show the over-all

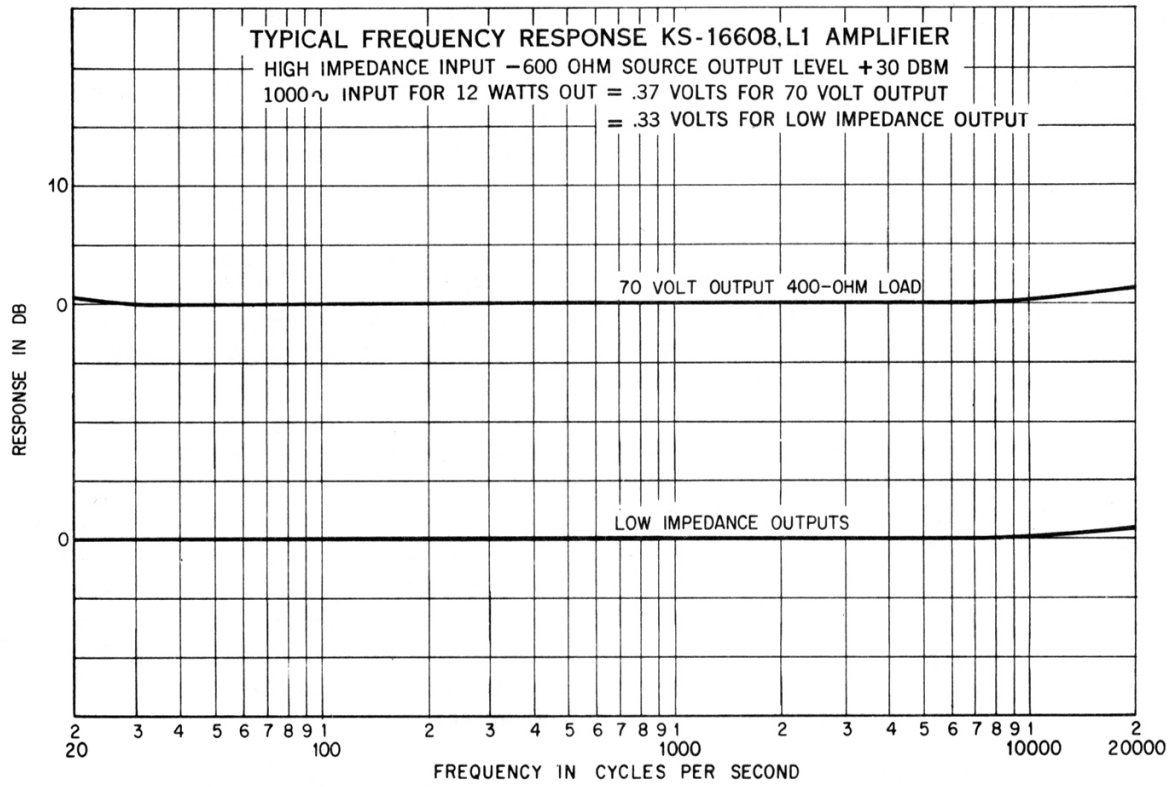

Fig. 4 — Frequency Response — High Impedance Input

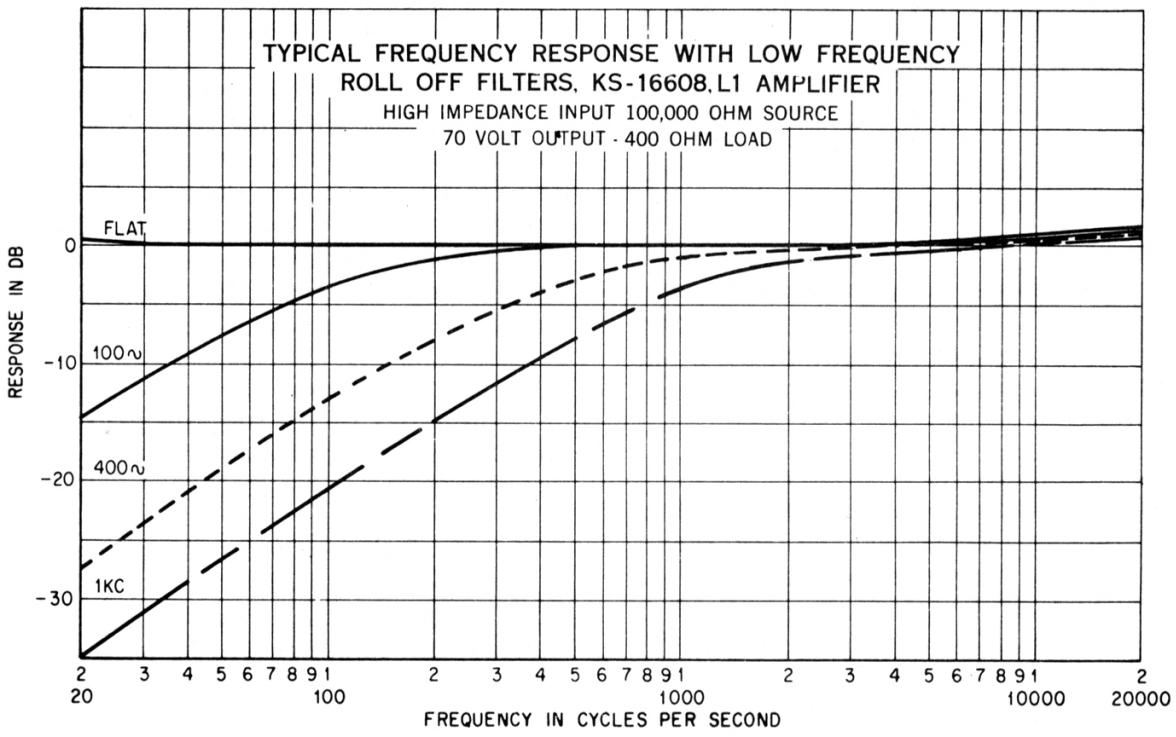

Fig. 5. — Response with Low Frequency Roll-Off

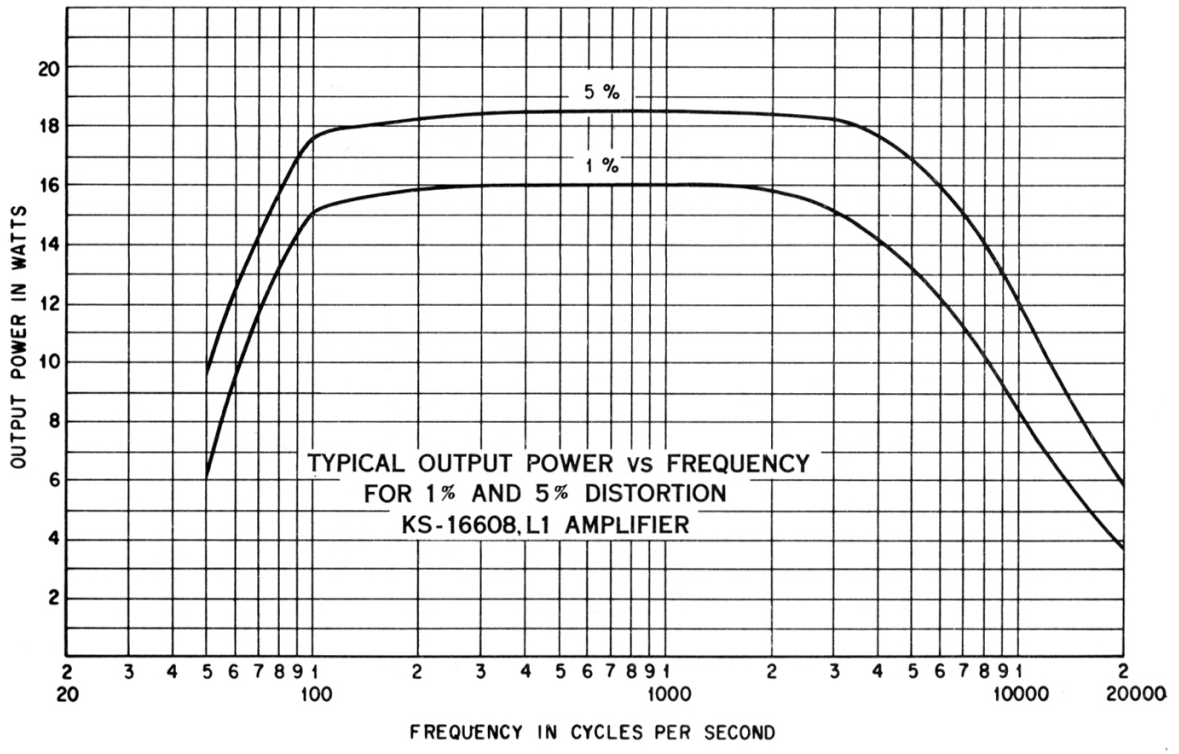

Fig. 6 — Output Power vs Frequency

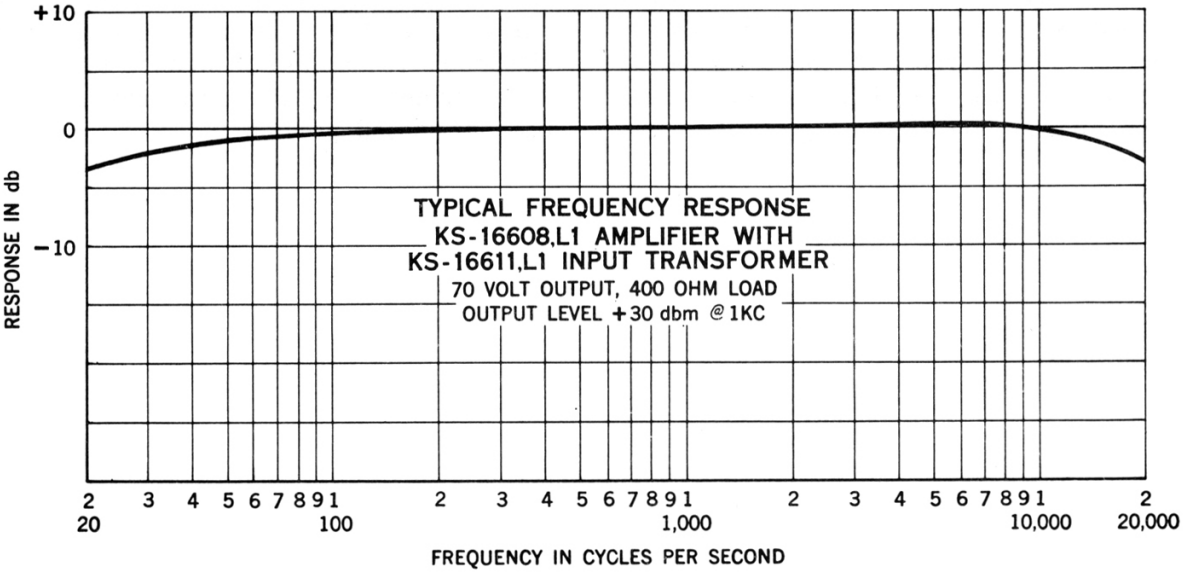

Fig. 7 — Frequency Response with Transformer Input

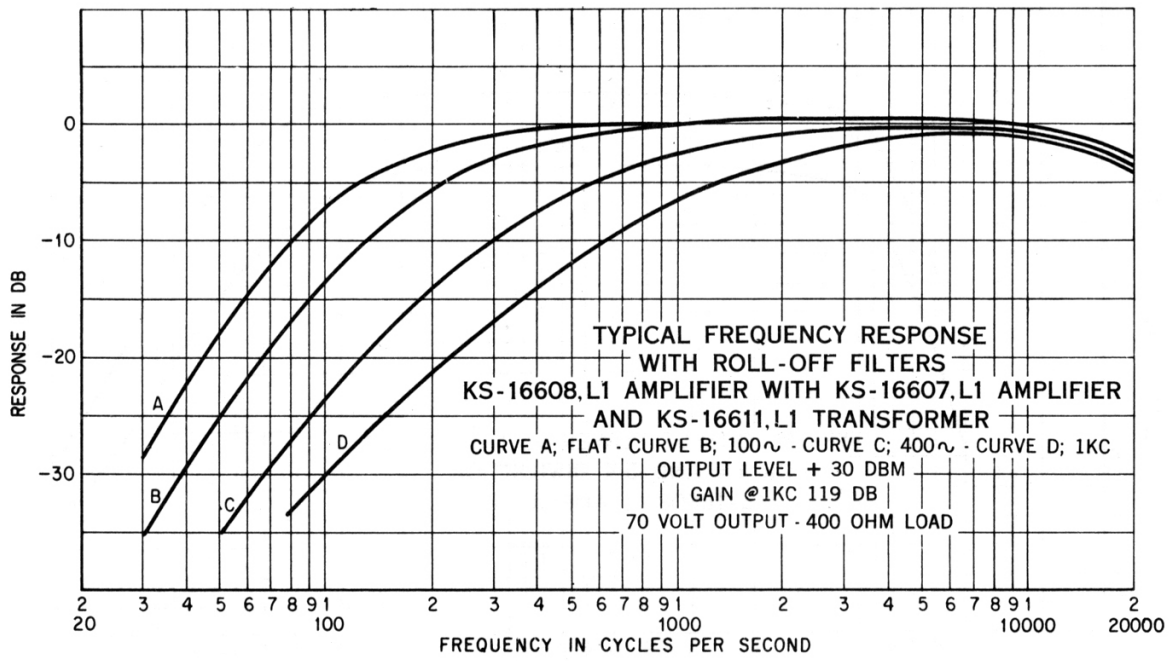

Fig. 8 — Roll-Off Frequency Response of Basic Amplifier Equipped with Preamp and Transformer

response for the various options of low frequency cut-off. These options are available for the reasons discussed above.

6.06 Fig. 9 shows the high frequency roll-off characteristics of the basic amplifier when it is equipped with a preamp and transformer. This drooping characteristic of the amplifier is used to compensate for the rising characteristic of a carbon microphone at the high end of the band. The end result is a more uniform over-all frequency response.

6.07 Fig. 10 shows the frequency response of the amplifier with various options for low frequency roll-off filters. The amplifier is equipped with a plug-in transformer. In most situations the amplifier will be equipped with a transformer. The need for roll-off filters has been discussed previously.

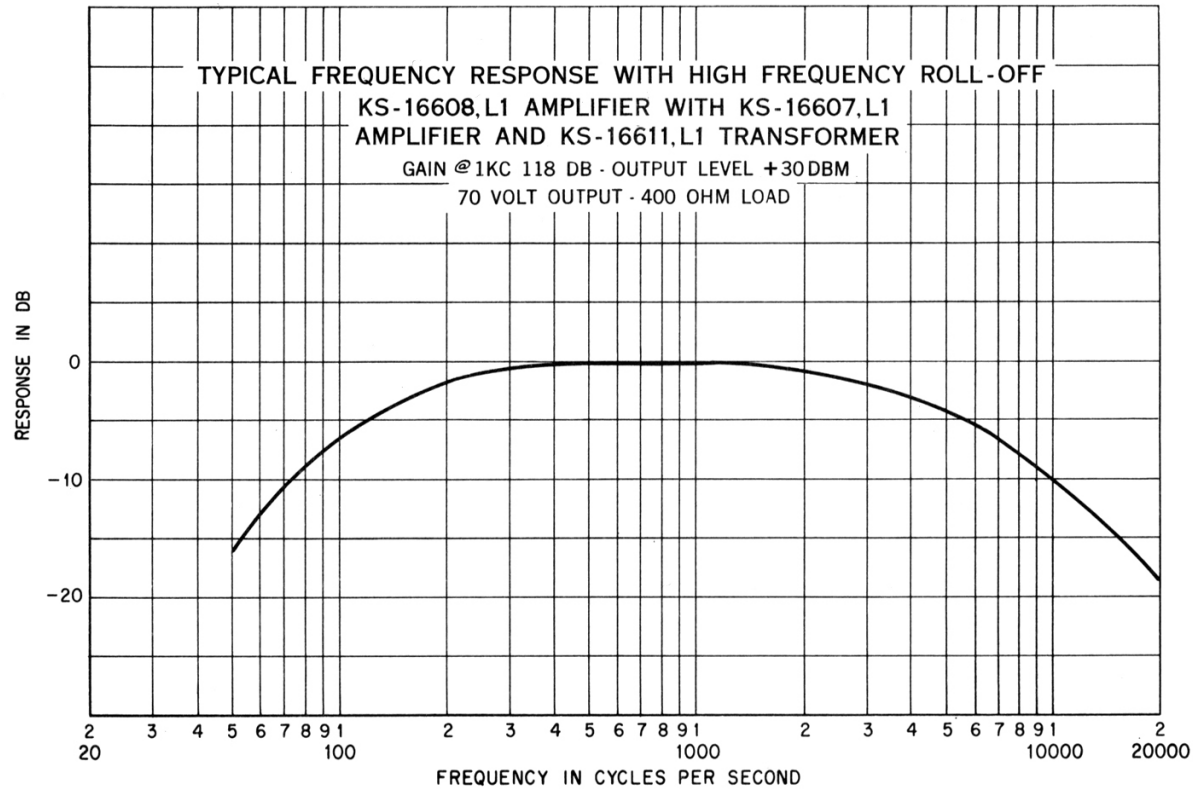

Fig. 9 – Response with High Frequency Roll-Off When Equipped with Preamp and Transformer

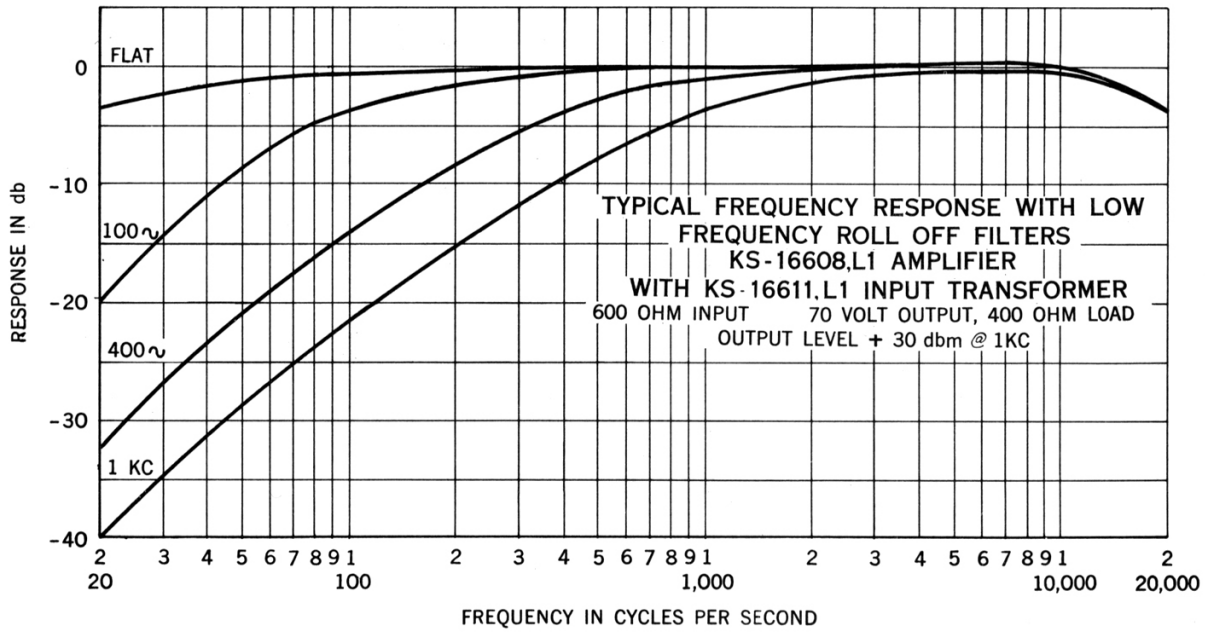

Fig. 10 – Frequency Response with Transformer and Low Frequency Roll-Off