

## KS-20378 L1 AND L2 AMPLIFIERS

### DESCRIPTION

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#### 1. GENERAL

**1.01** The KS-20378 L1 (Manufacture Discontinued) and L2 amplifiers are plug-in, solid-state amplifiers designed for use in various voice-frequency applications.

**1.02** This section is reissued to include information covering the L2 amplifier and delete reference to the J68647A amplifier.

**1.03** The KS-20378 L2 amplifier is equipped with lightning protection at both the input and output and replaces the L1 amplifier.

**1.04** The J68647B (V3) amplifier, designed for ac filament supply, is not replaceable with the KS-20378 L1 or L2 amplifier.

**1.05** The KS-20378 L1 and L2 amplifiers consist of circuit components mounted on a printed wiring board and assembled in a metal can. The circuit is connected to the 11-pin connector plug on the rear of the can for use in plug-in mounting in the associated shelf. Two lugs are provided on the front of the can to facilitate removal of the amplifier from its mounting shelf socket with a 602E tool.

**1.06** A gain-control potentiometer and two pin jacks for monitoring the amplifier output are mounted on the faceplate. The gain-control potentiometer provides a gain adjustment range from 0 to 36 dB and is equipped with a locknut to prevent accidental movement.

**1.07** The KS-20378 L1 and L2 amplifiers are designed for mounting on a shelf per J98615 on 1-3/4 inch centers or any V3 repeater shelf. Overall dimensions are approximately 1 5/8 by 1 5/8 by 5 inches long. (See Fig. 1.)

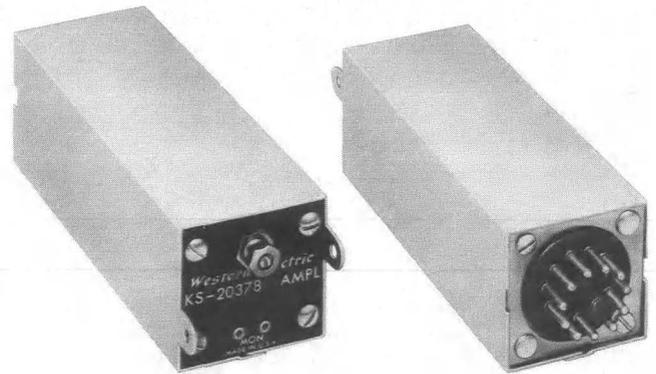


Fig. 1—KS-20378 Amplifier

**1.08** The KS-20378 amplifier is to be adjusted **ONLY** and, when repair is to be made, should be sent to the service center.

#### 2. ELECTRICAL CHARACTERISTICS

**2.01** The electrical characteristics of the amplifier are as follows.

- (a) **Gain:** 36 dB (+5 dB, -0 dB) at 1000 Hz.
- (b) **Frequency Response:**  $\pm 1$  dB from 200 to 6000 Hz.
- (c) **Power Output:** +17 dBm into 600-ohm resistive load from 200 to 6000 Hz.
- (d) **Input Impedance:** 600 ohms nominal at 1000 Hz.
- (e) **Output Impedance:** 600 ohms nominal at 1000 Hz.

- (f) **Harmonic Content:** At +10 dBm output level and 1000 Hz; 2F is minimum of 42 dB below fundamental, and 3F is minimum of 50 dB below fundamental.
- (g) **Noise:** -70 dBm maximum with gain control at maximum gain.
- (h) **Gain Control:** Continuously adjustable from 0 dB to 36 dB.
- (i) **Monitor Voltage Level:**  $11 \pm 1.5$  dB below the amplifier output level.
- (j) **Power Requirements:**  $20 \pm 2$  Vdc with a current drain of 50 milliamperes.

### 3. CIRCUIT DESCRIPTION

**3.01** The KS-20378 amplifier schematic is shown in Fig. 2. The circuit consists of two transistors, input and output transformers, a gain control potentiometer, resistor, capacitors, diodes, and monitoring jacks.

**3.02** The input and output transformers are designed to present 600-ohm impedances to the line circuits.

**3.03** Signal is applied through T1 to gain control R3. The desired signal level is coupled by C2 to amplifier stages consisting of Q1 and Q2. The output of Q2 drives the primary of transformer T2.

**3.04** The output transformer T2 has two secondary windings. The winding between connector pins 3 and 4 provides an output impedance of 600 ohms to the line. The other output winding between connector pins 5 and 6, when bridged by 600 ohms, provides points for monitoring the output signal at a level approximately 11 dB below the amplifier output. This winding is also connected to the MON jacks on the front panel.

### 4. TRANSMISSION CHARACTERISTICS

**4.01** The KS-20378 amplifier presents a nominal input and output impedance of 600 ohms at 1000 Hz. Figure 3 shows the input impedance of the amplifier with the gain control potentiometer adjusted for 0 dB at 1000 Hz. At 1000 Hz the inductive and capacitive reactance cancels out, resulting in approximately 600 ohms resistance. Figure 4 shows the output impedance of the amplifier with the gain control potentiometer adjusted for 0 dB at 1000 Hz.

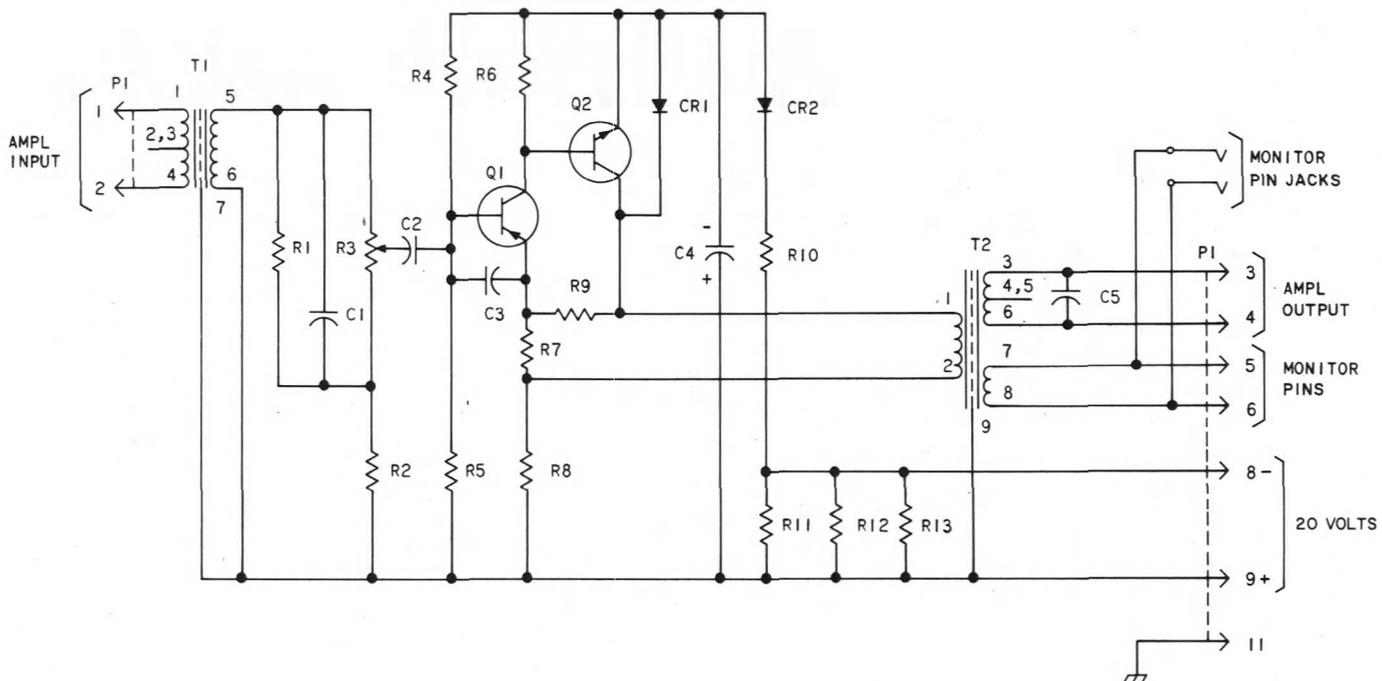


Fig. 2—KS-20378 Amplifier—Schematic Diagram

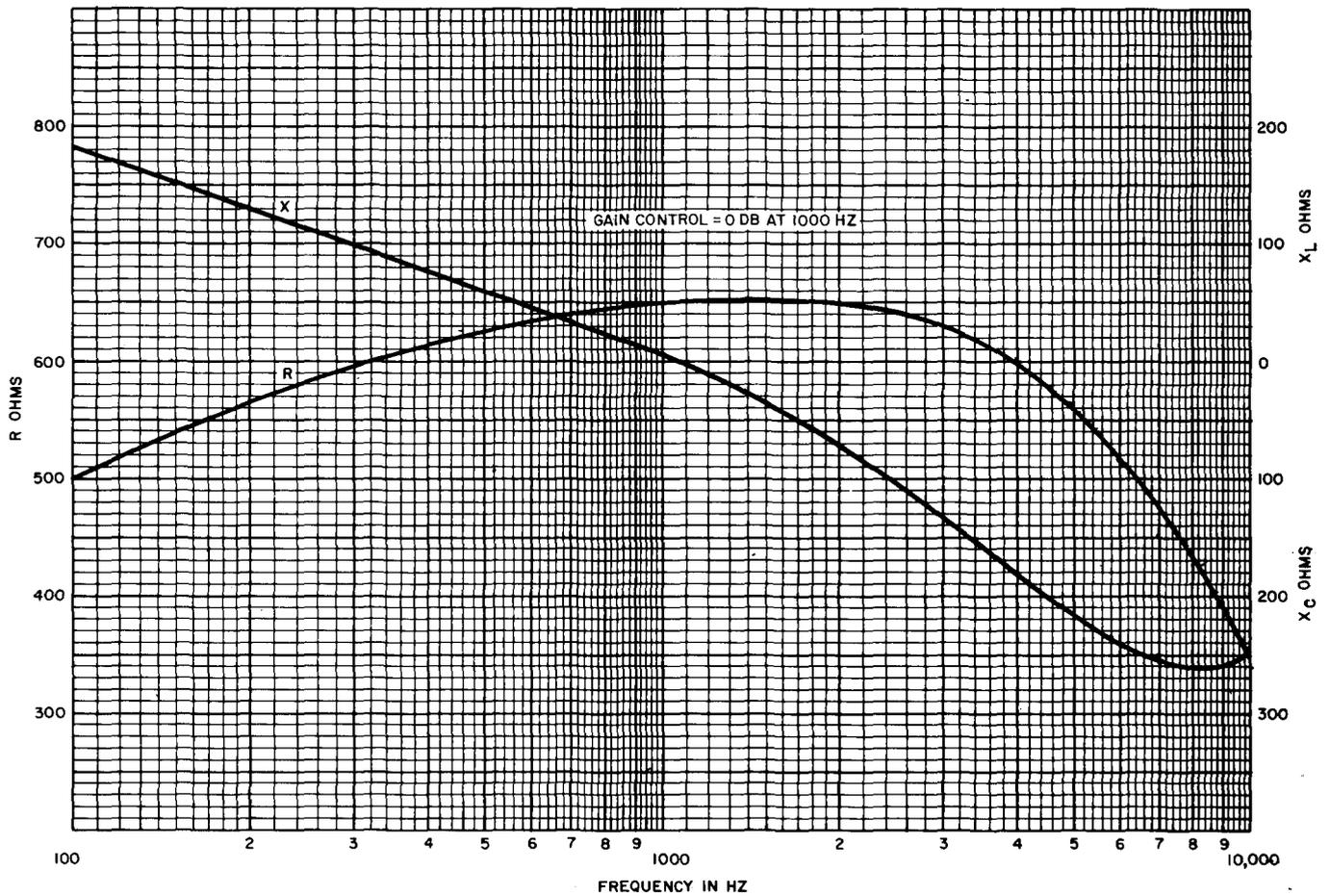


Fig. 3—KS-20378 Amplifier Input Impedance—600-Ohm Termination

**4.02** The gain-frequency characteristics of the amplifier are shown in Fig. 5. The upper curve shows maximum gain of the amplifier, and the curve is essentially flat between 200 and 10,000 Hz. The other curve, labeled 0 dB gain at 1000 Hz, is essentially flat from 1000 Hz to 10,000 Hz.

**4.03** The second- and third-order harmonic distortion versus the output power of the fundamental is shown in Fig. 6. The curves are for the amplifier

with the gain control set at 0 dB at 1000 Hz. Harmonic distortion increases with increased output load and is typically 29 dB minimum below the fundamental at an output power of +18 dBm.

**4.04** The envelope-delay characteristics of the KS-20378 amplifier are not sensitive to potentiometer settings. The delay characteristics of typical KS-20378 amplifiers are shown in Table A.

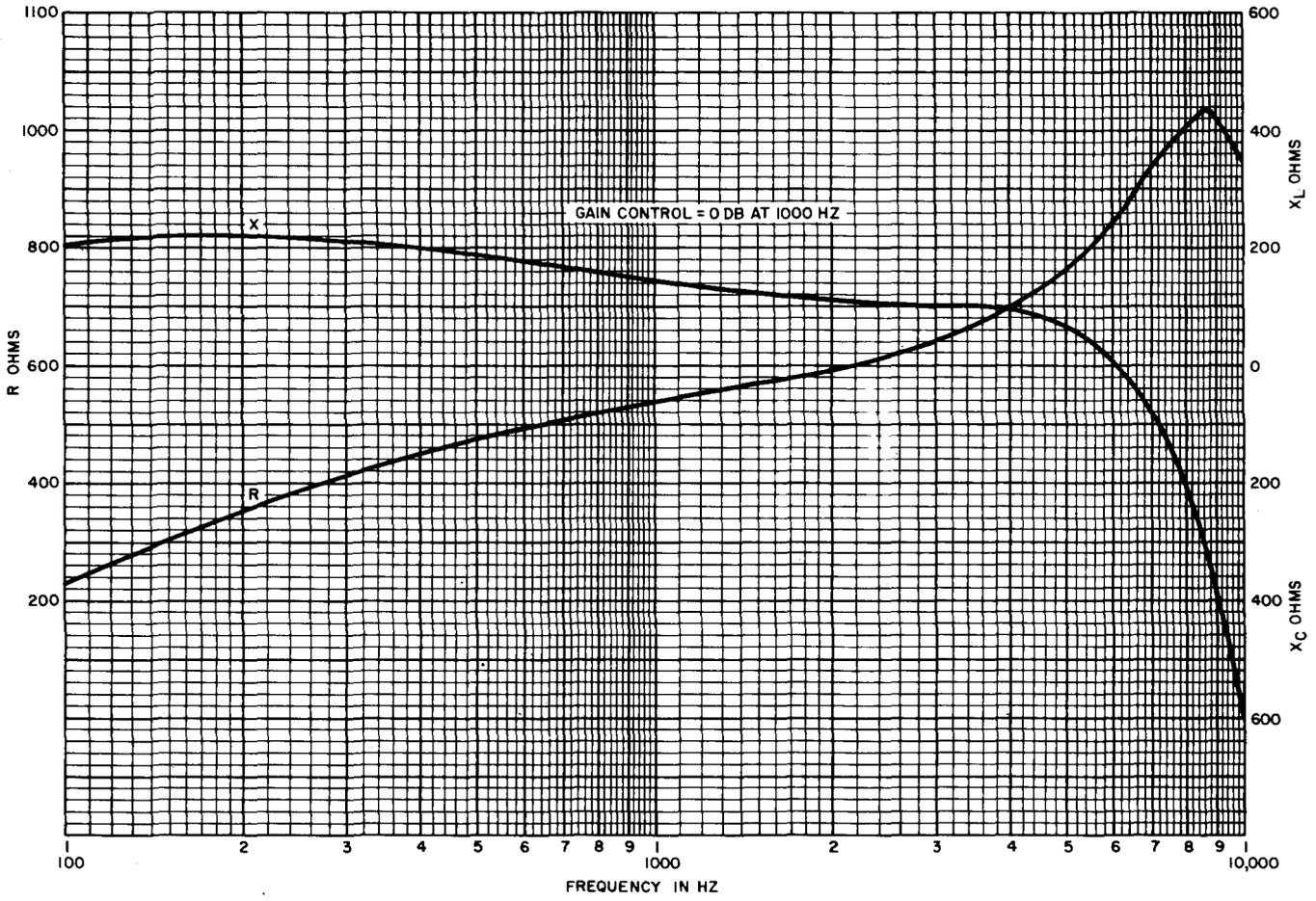


Fig. 4—KS-20378 Amplifier Output Impedance—600-Ohm Termination

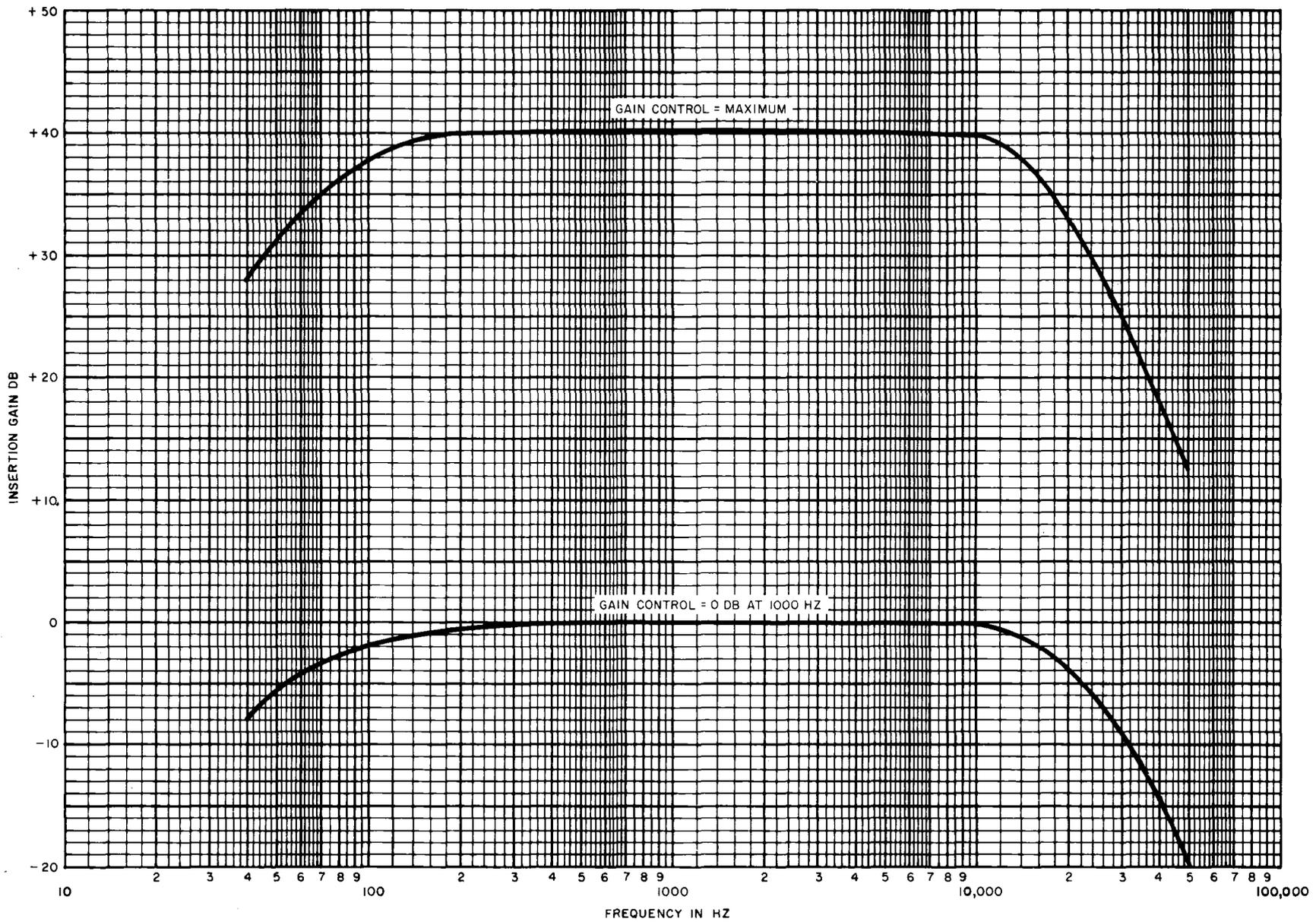


Fig. 5—KS-20378 Amplifier Gain-Frequency Characteristics

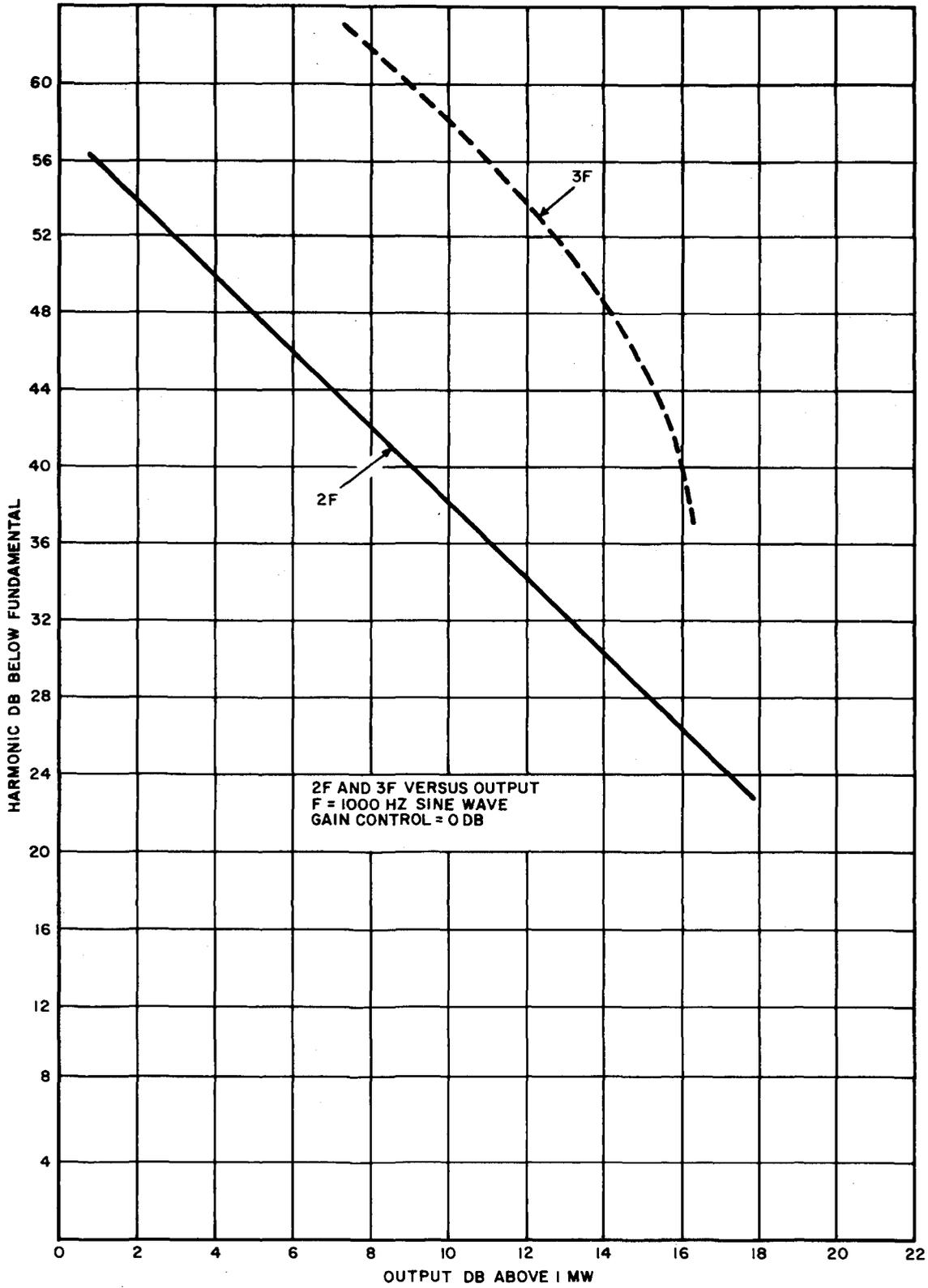


Fig. 6—Harmonic Content of KS-20378 Amplifier

TABLE A  
KS-20378 AMPLIFIER ENVELOPE DELAY

FREQUENCY IN HZ	MICROSECONDS
200	390
250	270
300	190
400	120
500	90
800	50
1,000	40
2,000	20
3,000	20
24,000	10