

**AMPLIFIER KS-19219 L1**

**(3 WATTS)**

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- Adjustable release time of voice-operated relay ↗

- Designation of KS-19220 L2 Amplifier ↘

**1.03** The KS-19219 L1 Amplifier is an assembly basically consisting of the following printed circuit board plug-in units:

- KS-19219 L2 Oscillator and Voice-Operated Relay
- KS-19220 L2 Amplifier
- KS-19221 L1 Amplifier

**1. GENERAL**

These units are assemblies on printed wiring boards which plug into the KS-19219 L1 Assembly to form the completed amplifier.

**1.01** This practice provides information on the KS-19219 L1 Amplifier which has a nominal output of 3 watts. The amplifier is designed for general use with recorder-reproducer announcement systems requiring moderate power capabilities. ←

**1.04** These instructions are based on the following drawings:

**1.02** This section is reissued to incorporate the following changes: ↗

- Output of amplifier ↘

ASSEMBLY	DRAWING NO.
KS-19219 L1 Amplifier	SD-99723-01
KS-19220 L2 Amplifier	SD-99724-01 ←
KS-19221 L1 Amplifier	SD-99725-01

1.05 Fig. 1 shows a front view of the amplifier with the protective cover removed. Fig. 2 shows a rear view of the amplifier. The amplifier is furnished as a complete assembly, including all transistors.

1.06 The amplifier has a record channel, a reproduce channel, and a transfer relay for switching from the reproduce to the record condition. It also has a high-frequency oscillator for supplying bias and erase current to the magnetic heads and a voice-operated relay for operating alarm circuits in case of amplifier failure. The

amplifier is designed to operate from a 48-volt central office battery supply.

## 2. ELECTRICAL CHARACTERISTICS

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

### Power Requirements:

48 volts dc

Reproduce — Standby — 95 ma

— 3 watts output — 300 ma

→

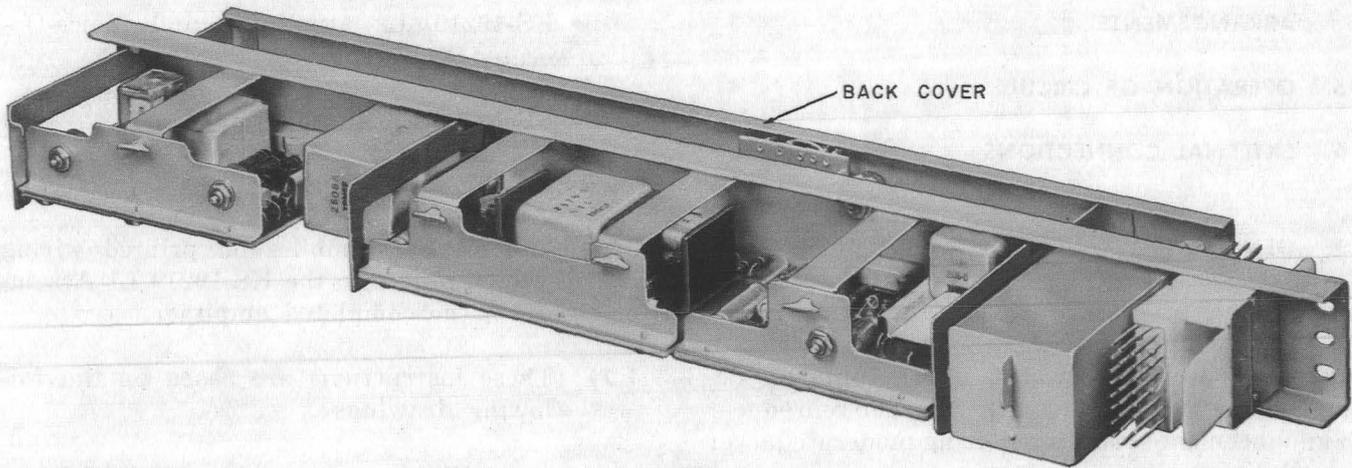


Fig. 1 — Front View with Cover Removed

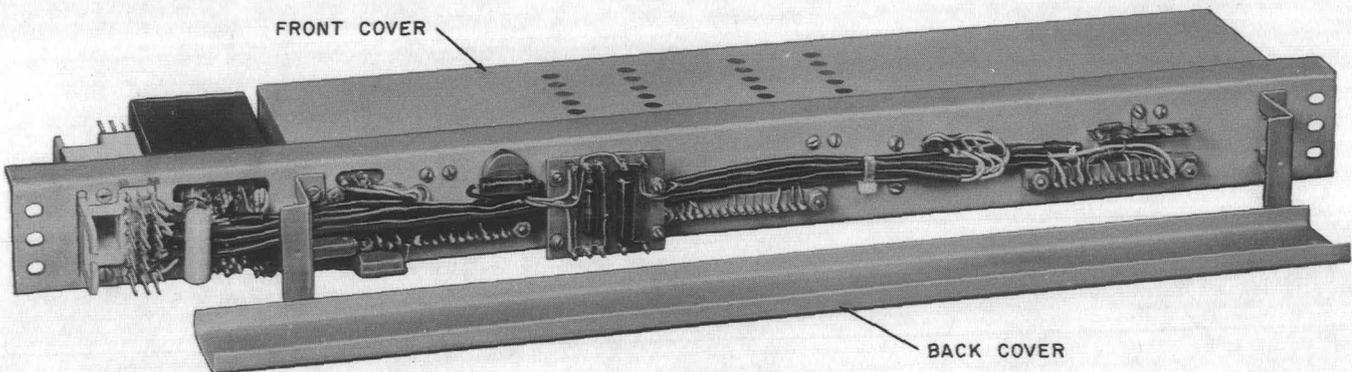


Fig. 2 — Rear View with Cover Removed

Record — Standby — 180 ma  
 — 3 watts output — 385 ma ←  
 (Includes 32 ma for operating relay).

**Power Output:**

3 watts into rated resistance load with less ←  
 than 5 percent harmonic distortion between  
 200 and 5000 cps.

**Output Circuit:**

May be connected for loads of 4 ohms or 1 ohm  
 with internal output impedances of approx-  
 imately 1.6 and 0.5 ohms.

**Recording Input:**

Source impedance — 600 ohms  
 Internal input impedance — approximately  
 600 ohms  
 Gain — 58 db at 1000 cps.

**Reproducing Input:**

High impedance, unbalanced  
 Rated output with 1 millivolt or less at input  
 terminals.

**Frequency Response:**

Record or Reproduce — without low-frequency  
 equalizer, 0 to -2 db with respect to 1000 cps  
 between 200 and 5000 cps. With low-frequency  
 equalizer, approximately +4.5 db at 200 cps  
 and -1 db at 5000 cps with respect to 1000 cps.

**Output Noise:**

Record — signal-to-noise ratio 60 db. During  
 recording, a component of oscillator frequency  
 (20 kc) about 35 db below maximum signal is  
 also present in the output.  
 Reproduce — signal-to-noise ratio, 44 db.

**Oscillator Output:**

Frequency —  $20 \pm 2$  kc  
 Recording Bias — .045 to 0.75 ma into  
 KS-14652 L2 Magnetic Head or equivalent,  
 shunted by 430 mmf capacitor. Erase Current  
 — 8 to 12 ma into KS-14652 L3 Magnetic Head  
 or equivalent, shunted by 430 mmf capacitor.

**Voice-Operated Relay:**

Indicates presence of amplifier output signal  
 above predetermined level.

Adjustable release time — 15 to 50 seconds. ←

**3. MECHANICAL CHARACTERISTICS**

**3.01** The mechanical characteristics of the am-  
 plifier are as follows:

Width — 23 inches (arranged for standard 23-  
 inch relay rack mounting)

Height — 2 inches

Depth — 6-1/4 inches (extends 4-1/4 inches be-  
 yond mounting surface on equipment  
 side)

Weight — 7 pounds

The amplifier is equipped with a removable cover  
 which protects the printed wiring boards.

**3.02** All transistors are furnished with the  
 amplifier.

**4. MOUNTING AND MECHANICAL ARRANGEMENTS**

**4.01** The KS-19219 L1 Amplifier is designed to  
 mount on a standard 23-inch relay rack or  
 cabinet. It is held in place by four 12-24 screws  
 inserted through holes in the mounting flanges.

**4.02** The amplifier is equipped with a remov-  
 able front cover. When the cover is re-  
 moved, all adjustments are exposed. A remov-  
 able protective plate covers the wiring on the  
 rear side of the mounting plate. All connections  
 are made at the rear to the D3A terminal  
 strip TB1.

**4.03** The RECORD GAIN control is screw-  
 driver-adjusted and is mounted on the  
 base plate. The reproduce GAIN control is  
 mounted on the bracket assembly of the  
 KS-19220 L2 Amplifier and is also screwdriver- ←  
 adjusted.

4.04 The OPERATE and RELEASE controls are mounted on the bracket assembly of the KS-19219 L2 Assembly. They are also adjusted by means of a screwdriver.

→ 4.05 The KS-19219 L2 Assembly, the KS-19220 L2 Amplifier, and the KS-19221 L1 Amplifier are all arranged to plug into the base plate assembly and are held in place with hand-operated fasteners.

4.06 The amplifier will operate satisfactorily in ambient temperatures up to 60° C (140° F).

4.07 The amplifier is mounted so the removable cover is on the apparatus side of the frame or rack.

## 5. OPERATION OF CIRCUIT

5.01 The amplifier provides two channels of amplification—one for recording and one for reproducing. These channels share a common preamplifier and output amplifier which are switched by means of relay K1.

5.02 During the reproduce cycle, as shown in Fig. 3, relay K1 is released. The input signal is fed through the relay contact to the preamplifier. The output of the preamplifier is connected through a coupling network to the output amplifier. During the reproduce cycle, the K1 relay also grounds the output of the record channel to prevent interaction between it and the reproduce channel. The relay also disables the oscillator by disconnecting its battery supply.

→ 5.03 An equalizer consisting of a resistor and capacitor is provided in the coupling network between the output of the KS-19220 L2 Amplifier and the input circuit of the KS-19221 L1 Amplifier to boost the low-frequency response and compensate for the recording characteristic. This equalizer is disabled by strapping terminals No. 1 and 2 of terminal board TB3. The amplifier normally is provided with the equalizer in the circuit.

5.04 High-frequency equalization is provided by capacitors to resonate the reproduce head. These capacitors are connected in the circuit by straps on terminal board TB2. The amplifier normally is provided with C4 in the circuit.

The equalization capacitors for various announcement systems are selected in accordance with Note 102 of SD-99723-01.

5.05 During the record cycle, relay K1 is operated by means of an external 48V supply applied to the relay winding. This connects the recording signal to the second stage of the preamplifier and transfers the magnetic head from the reproduce input circuit to the record output circuit. The audio signal at the output of the amplifier is combined with the bias current and is fed to the record head for recording. Operation of the relay removes the ground from the record channel and short circuits the input of the preamplifier. It also energizes the oscillator circuit by connecting its battery supply.

5.06 The oscillator circuit generates a frequency of  $20 \pm 2$  kc and is energized only during the record cycle. The output of the oscillator is used to supply recording bias and also may be used to supply high-frequency erase current to an erase head.

5.07 The output transformer of the amplifier has three secondary windings. One winding supplies signal to the voice-operated relay and the other two windings provide the amplifier output. They may be connected in series for operating into 4-ohm loads or in parallel for operating into 1-ohm loads. The record signal is obtained from the primary of the output transformer.

5.08 In recorder-reproducer machines which use high-frequency erase, the record-reproduce head is arranged to follow the erase head. Simultaneous erasing of the previous message and recording of the new message is accomplished by feeding erase current to the erase head which is connected to the oscillator output. To obtain sufficient current for this condition, the value of the emitter resistor in the oscillator circuit is reduced by strapping terminals 3 and 4 on TB4 as shown on SD-99723-01. The amplifier is normally supplied with this connection made. Machines which make use of the bulk erase method do not require this connection.

5.09 The oscillator battery circuit is completed through a strap between terminals 27 and 28 on TB1. This feature is provided as a safety

precaution against erasing a recorded message by operating the RECORD key accidentally. In those situations where it is desirable to control the oscillator externally, this strap is removed and the battery circuit completed through an external control circuit.

**5.10** The voice-operated relay circuit consists of relay K101, transistors Q102, Q103, Q104, Q105, and associated components. The relay winding is in the collector circuit of Q105. With no signal present, the transistors are biased

to cut off and the relay is unoperated. When a signal of sufficient amplitude to overcome the bias is applied to the input of Q102, the transistor conducts and charges capacitor C106. As the voltage across the capacitor rises, it causes transistors Q103, Q104, and Q105 to conduct, thus operating the relay. When the signal drops below the conduction level of Q102, the diode CR102 becomes back-biased and the capacitor discharges through resistors R112 and R113. In approximately 15 to 50 seconds, depending on the setting of the release control R113, the ca-

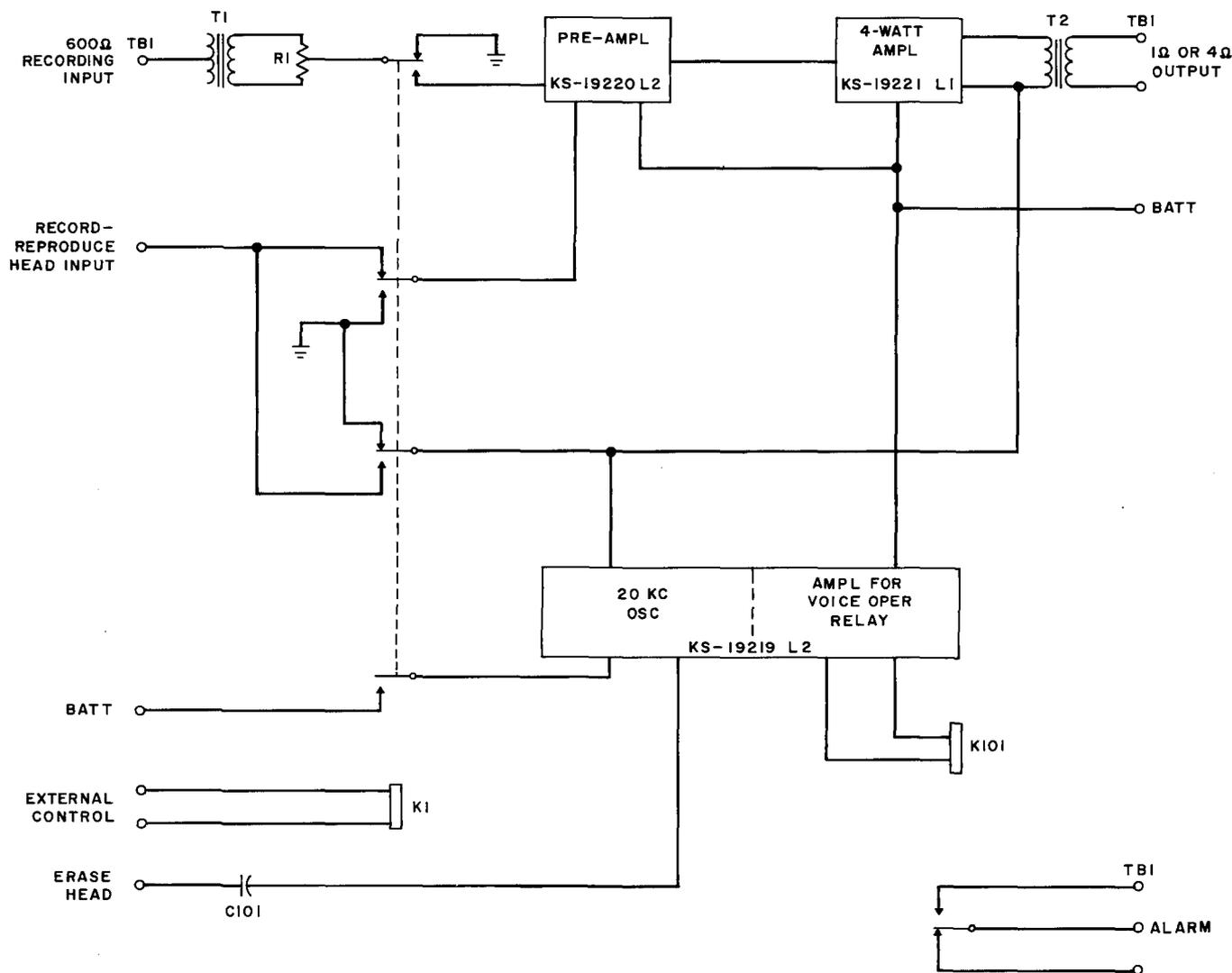


Fig. 3 — Simplified Schematic of Amplifier

capacitor voltage drops below the value required to keep Q103 conducting and the relay releases. The setting of the operate control R109 determines the signal level required to operate the relay.

## 6. EXTERNAL CONNECTIONS

**6.01** All external connections are made to terminal strip TB1. The connections are shown in Table I.

TERM. NUMBER	EXTERNAL CONNECTION
11 and 12	600-ohm Record Input
13, 14, and 35	Ground
15	Amplifier Output T or T2
16 and 17	Amplifier Output Center Taps
18	Amplifier Output R or R2
19 and 20	Not furnished
21	K101 Relay Normally Open
22	K101 Relay Common
23	K101 Relay Normally Closed
24	Ground
25	48 Volt (+)
26	48 Volt (-)
27 and 28	Oscillator Control (Normally Strapped)
29 and 30	Not Furnished
31 and 32	Erase Control Shielded Pair, Shield connected to term. 31
33 and 34	Recorder Input Shielded Pair, Shield connected to term. 33
36	Voice-Operated Relay D
37	External Control +48V
38	External Control -48V

**6.02** The external connections to TB1 are made by wrapping wires on the terminal leads at the rear. It is not necessary to remove the protective coverplate.

**6.03** The output connections are strapped on TB1 as shown in Table II.

CONDITION	STRAP TERMINALS
4-ohm Output	16 and 17
1-ohm Output	15 and 16 17 and 18

**6.04** Low capacitance shielded twisted pair cable is used for magnetic head and erase head connections. The total capacitance of the cable to the head should not exceed 500 mmf.

**6.05** The following internal connections in the amplifier should be checked in order to assure that the amplifier will operate properly:

(1) When low-frequency boost is not required, the low-frequency equalizer is removed from the circuit by strapping terminals 1 and 2 of TB3 located on the wiring side of the chassis.

(2) The amplifier is normally supplied with the 4700 mmf capacitor C4 connected for resonating the reproduce head. Check SD-99723-01, Note 102, for the strapping to be used for a specific system.

(3) For use with record-reproduce machines employing high-frequency erase heads, terminals 3 and 4 on TB4 are strapped in accordance with SD-99723-01, Note 102. The amplifier normally is supplied with strap connected. When lower output levels are required from the oscillator, this strap is removed.

(4) For use with record-reproduce machines requiring low audio recording head current, the short-circuiting strap between terminals 1 and 2 on TB4 are removed, leaving R5 in the circuit in accordance with SD-99723-01, Note 102.