COMMON SYSTEMS
KS-16617 AMPLIFIER CIRCUIT
SPECIAL PURPOSE AMPLIFIER
FOR USE IN
MDF LOUDSPEAKER TELEPHONE SYSTEM

CHANGES

D. Description of Changes

D.1 The rating of this circuit is changed from AT&TCo Std to Mfr Disc.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 3353-WF-AB

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SPECIAL PURPOSE AMPLIFIER
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SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

The purpose of this circuit is to provide amplification of audio frequency signals. It is intended for use in a 2-way communication system between the local test desk or cable test desk and the main distributing frame in telephone central offices.

2. GENERAL METHOD OF OPERATION

This circuit provides two independent channels of amplification, a high-level channel for driving loudspeakers at the main distributing frame from a head telephone set transmitter at the test desk and a low-level channel for driving a head telephone set receiver at the test desk from low-level microphones at the main distributing frame. A voice-operated relay circuit provides means for reducing the sidetone at the test desk receiver when signals above a predetermined level appear at the output of the high-level channel. A common power supply operating from 115 volts ac furnishes all power for this circuit.

SECTION II - DETAILED DESCRIPTION

1. AMPLIFIER CHARACTERISTICS (TYPICAL)

1.1 Power Consumption:

70 watts (nominal) at 115 volts 60 cycles.

1.2 High-level Channel

(a) Power Output:

8 watts into rated resistive load with less than 5 per cent harmonic distortion, 100 to 4000 cycles.

(b) Output Circuit:

Leads T and R - nominal rated load, 4 ohms; internal output impedance, approximately 1 ohm.

Leads T5 and R5 - nominal rated load, 1 ohm; internal output impedance, approximately 0.3 ohm.

Leads T2 and R2 - nominal rated load, 600 ohms or 70.7-volt distribution line; internal output impedance, approximately 150 ohms.

(c) Input Circuit:

Leads T1 and R1 - unbalanced, high impedance; input impedance, 0.25 megohm.

(d) Gain:

53 db (approximately) from 600-ohm source.

(e) Frequency Response:

Within ±2 db of the 1000-cycle value at 50 cycles and within 0 to -3 db of the 1000-cycle value at 10,000 cycles.

(f) Output Noise:

-35 dbm maximum.

1.3 Low-level Channel

(a) Power Output:

+6 dbm into 600-ohm resistive load with less than 5 per cent harmonic distortion, 100 to 5000 cycles.

(b) Output Circuit:

Without sidetone reduction feature - Leads T4 and R4B - nominal rated load, 600 ohms.

With sidetone reduction feature - Leads T4, R4A, and R4B - nominal rated load, 600 ohms across T4 and R4A with external resistor as required across R4A and R4B.

(c) Input Circuit:

Leads T3 and R3 - source impedance, 50 ohms nominal.

(d) Gain:

70 db (approximately) at output levels below point at which limiting starts (approximately -3 dbm). At higher input levels gain is automatically reduced to limit the output level. Within limiting range, compression ratio is approximately 5 to 1.

(e) Frequency Response:

Within -3 db (approximately) of the 1000-cycle value between 100 and 5000 cycles.

(f) Output Noise:

-50 dbm maximum.

2. HIGH-LEVEL CHANNEL

The high-level channel employs five stages of amplification with negative feedback from a separate winding on output transformer T3 applied to the cathode of the first stage. The two sections of electron tube V3 are direct-coupled and serve as the first and second stages. Electron tube V4 is resistance-capacitance coupled to V3 and serves as an amplifier and split-load phase inverter for driving the push-pull power output stage composed of V5 and V6. The input signal is applied at leads T1 and R1 and the amplified signal appears across the output leads T, R, T2, and R2.

3. LOW-LEVEL CHANNEL

The low-level channel consists of two stages of amplification with automatic output level control. The amplifier is composed of input transformer T1, LOW LEVEL GAIN control R2, and electron tubes V1 and V2A. V1 is resistance-capacitance coupled to V2A which serves as the output stage. The input signal is applied at leads T3 and R3 and the amplified signal appears across the output leads T4 and R4B. In addition, the high side of the output connects through a break contact on the voice-operated relay K1 to lead R4A. V2B serves as a diode bridged across the output to provide negative dc voltage proportional to the amplifier output to control the gain of V1. The point at which output limiting starts is determined by a positive bias applied to the cathode of V2B. This bias voltage is obtained from the dc plate supply through resistors R11 and R12.

4. VOICE-OPERATED RELAY CIRCUIT

The voice-operated relay circuit consists of relay K1, electron tube V7, and associated circuit components. One section of V7 is connected as an amplifier with the winding of relay K1 in its plate circuit. The operating range of relay K1 is determined by the setting of RELEASE control R36 and OPERATE control R38.

With no signal being delivered by the high-level channel, the plate current of V7 is adjusted to a value less than the release current of relay K1 by means of the RELEASE control R36. When the high-level channel is operating, signal voltage is applied from the G-BK, BK winding of output transformer T3 through the OPERATE control R38 to the grid of V7. The output of the amplifier section of V7 is rectified by the second section which is connected as a diode and develops a dc potential of the proper polarity to drive the grid of the amplifier section in a positive direction, thus increasing the plate current and causing relay K1 to operate. The output level at which K1 operates is dependent upon the setting of OPERATE control R38.

When relay K1 operates, a resistor, which is provided across leads R4A and R4B in the connecting circuit, is placed in series with the output from the low-level channel. This reduces the sidetone at the test desk receiver resulting from pickup of the loudspeaker signal by the low-level microphones. When the signal at the output of the high-level channel is removed, relay K1 releases to short out the external resistor.

5. POWER SUPPLY CIRCUIT

The power supply circuit consists of transformer T4, rectifier tube V8, and a resistance-capacitance filter for the dc circuits. The electron tube heaters are supplied from a 6.3-volt secondary winding on T4. The primary winding of T4 is tapped for nominal ac line voltages of 115 and 125 volts.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

None.

2. FUNCTIONS

This circuit provides:

(a) A high-level channel of amplification for driving loudspeakers at the main distributing frame from a transmitter at the test desk.

(b) A low-level channel of amplification for driving a receiver at the test desk from low-level microphones located at the main distributing frame.

(c) A voice-operated relay circuit arranged to connect an external resistor in series with the low-level channel output to reduce sidetone at the test desk receiver when the output of the high-level channel exceeds a predetermined value.

3. CONNECTING CIRCUITS

When this circuit is listed on a key sheet, the information thereon is to be followed. The following is a typical connecting circuit:

(a) Telephone Circuit - SD-96471-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5161-HJB-RAM