KS-16608 L1 AND
KS-16610 L1 AMPLIFIERS
TRANSMISSION TESTS

CONTENTS PAGE

1. GENERAL

1.01 This practice outlines the transmission tests for the KS-16608 L1 and KS-16610 L1 amplifiers. These are basic amplifiers which have general application in audio frequency systems including paging and announcement systems. The basic amplifiers are designed so plug-in units may be inserted in sockets to provide several input arrangements.

1.02 This section is reissued to add strapping information in 2.06 for testing the amplifier.

1.03 The KS-16607 L1 amplifier (PREAMP), the KS-16611 L1 transformer, and the KS-16612 L1 mixer unit are plug-in units for use with either basic amplifier. Input arrangements are shown in Fig. 10.

1.04 Scheduled or routine tests should not be required on these amplifiers. However, if other work is being performed at the customer's premises, check the audio output power and gain-frequency response as covered in this practice.

1.05 The amplifier tests outlined below should be performed on the service order. These tests except the line voltage test should be made, if possible, at the telephone office. When clearing trouble, all tests should be performed which are necessary to clear the trouble and at the same time insure that the amplifier is performing properly.

1.06 For the purpose of these tests, the input and output connections should be removed from the amplifier. The power connections should remain on terminal board TB3.

2. RECOMMENDED TEST EQUIPMENT

2.01 The following testing equipment is satisfactory for use in making these amplifier tests. If equipment is available which is electrically equivalent to an item in this list, it will be satisfactory for use.

200CD Oscillator (Hewlett-Packard)	RCA Voltohmyst — Model Junior or Senior
201C Oscillator (Hewlett-Packard)	304H DuMont Oscilloscope
21A TMS	400-Type VTVM (Hewlett-Packard)
AC Voltmeter	KS-15560 or KS-15750 Tube Tester
Volt-Ohm-Milliammeter (20K Ohms/Volt) KS-14510	5A Attenuator

2.02 There are two points to keep in mind when making transmission tests. The first is that ***GOOD*** equipment should be used and second, it should be ***CALIBRATED PROPERLY.*** If these two things are observed, you are on your way toward making some good tests. Remember, ***POOR***

TESTS ARE A WASTE OF TIME, EFFORT, AND MONEY.

2.03 All ac-operated test equipment should be allowed to warm up sufficiently. This is important since it has a bearing on the stability of the equipment and accuracy of the test.

2.04 The dc socket voltages should be measured with an RCA voltohmyst so as not to load the circuit down. The grid and plate circuits, in many instances, are high impedance. Hence, if a volt-ohm-milliammeter is used, erroneous reading will be obtained. This is true even with a 20,000 ohms-per-volt meter.

2.05 The frequency response of the 21A transmission measuring set (TMS) should be checked over the range of frequencies it is to be used. The response should meet the requirements set forth in the practice for the test set. This will insure better results when making the gain-frequency test.

2.06 The tests given in this section use the 400-ohm ouput of the amplifier since this output most nearly matches the 600-ohm input of the 21A TMS. When the amplifier is not strapped for 400-ohm output, the strapping must be removed and restrapped for 400 ohms in order to obtain accurate readings when performing the tests.

3. AC LINE VOLTAGE

3.01 The ac line voltage should be measured with a suitable ac voltmeter at the terminals of the amplifier. If possible, the voltage should be measured during the heavy and light power load periods so as to determine the magnitude of the voltage fluctuations.

Requirement: The voltage should measure 120 $\pm$ 10 volts. The ac voltage should be measured at terminal board TB3 of the amplifier as shown in Table A.

TABLE A

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)

4. ELECTRON TUBE TEST

4.01 All electron tubes should be tested using a standard KS tube tester. The tubes should meet all their requirements.

5. GAIN-FREQUENCY TEST

5.01 The KS-16608 L1 and KS-16610 L1 amplifiers have several input arrangements. The amplifier should be tested with the input circuit arrangement used for normal operation. The following procedure pertains to the gain-frequency test for the various input arrangements.

5.02 Figures 1 through 5 show the test setup for measuring the gain-frequency response of the KS-16608 L1 and KS-16610 L1 amplifiers for various input arrangements. CHART 1 OUTLINES THE STEP PROCEDURE FOR MAKING THIS TEST FOR ALL INPUT ARRANGEMENTS.

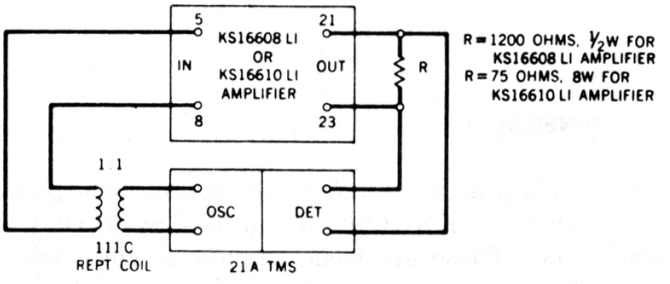


Fig. 1—Test Setup for Gain-Frequency Test—High Impedance Input

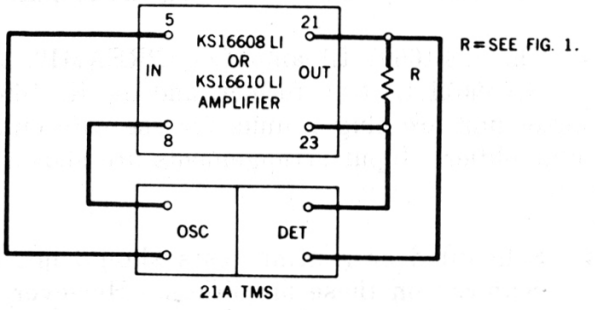


Fig. 2—Test Setup for Gain-Frequency Test—Transformer Input

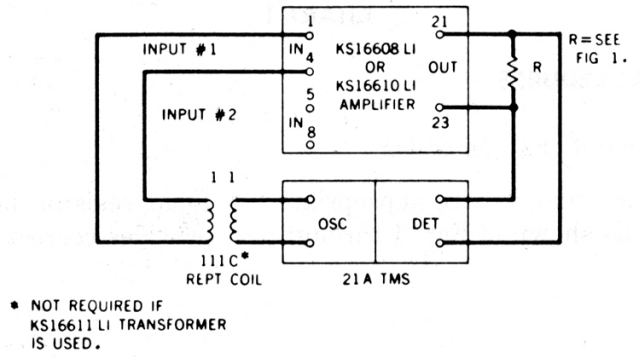


Fig. 3—Test Setup for Gain-Frequency Test—Dual Input

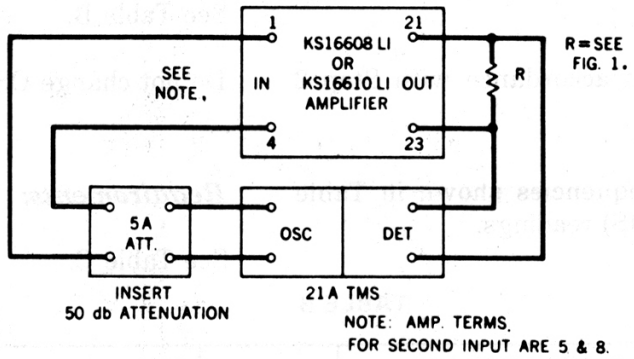


Fig. 4—Test Setup for Gain-Frequency Test—Equipped With PREAMP, Transformer, and Mixer

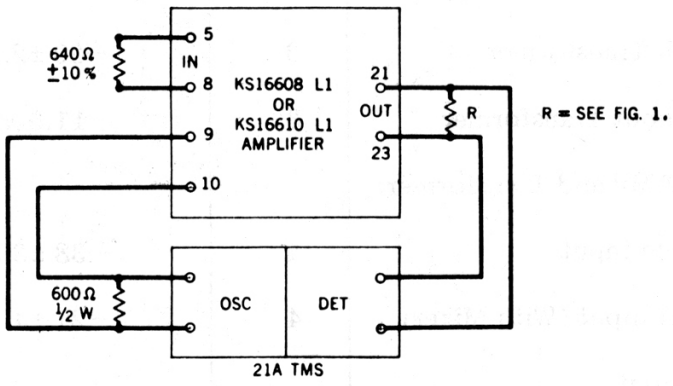


Fig. 5—Test Setup for Gain-Frequency Test—Bridging Input

CHART 1

STEP	PROCEDURES	REMARKS
1	Connect 21A and amplifier to ac power.	
2	Connect circuit in accordance with appropriate input arrangement as shown in Fig. 1 through 5.	Load resistor R in parallel with DET (TMS) provides correct amplifier load impedance.
3	Adjust OSC for 1 kc.	
4	Turn GAIN control or controls of amplifier to maximum.	
5	Adjust OSC output until DET (TMS) reads +28 dB.	
6	With OSC setting same as in Step 5 above, patch OSC OUT jacks to DET IN jacks. Read DET (TMS).	***Requirements:*** See Table B.
7	Reconnect circuit in accordance with Step 2 above.	Do not change OSC output.
8	Adjust OSC for frequencies shown in Table C. Record DET (TMS) readings.	***Requirements:*** See Table C.

TABLE B

INPUT ARRANGEMENTS FOR KS-16608 L1 OR KS-16610 L1 AMPLIFIER	FIG. NO.	OSCILLATOR OUTPUT (dBm) (STEP 6 OF PROCEDURE)
High Impedance	1	−23.5 ±1.5
Transformer	2	−41 ±2
Dual Input:		
(a) With Transformer	3	−30 ±2.5
(b) Without Transformer	3	−11.5 ±2
With PREAMP and Transformer:		
(a) Single Input	4	−38 ±3.5
(b) Dual Input (With Mixer)	4	−27 ±4
Bridging Input:		
(a) Single Transformer Input	5	−11 ±3
(b) Dual Transformer Input (With Mixer)	5	0 ±3.5

TABLE C

INPUT ARRANGEMENTS FOR KS-16608 L1 OR KS-16610 L1 AMPLIFIER	TEST FREQUENCIES FOR INPUT ARRANGEMENTS AND REQUIREMENTS (dB) (STEP 8 OF PROCEDURE)			
	50 CYCLES	200 CYCLES	7,000 CYCLES	10,000 CYCLES
High Impedance	+28 ±1	—	—	+28 ±1
Transformer	+28 ±2	—	—	+28 ±2
Dual Input:				
(a) With Transformer	+28 ±2	—	—	+28 ±2
(b) Without Transformer	+28 ±1	—	—	+28 ±1
With PREAMP and Transformer:				
(a) Single Input	—	+25.5 ±1	+28 ±1	—
(b) Dual Input (With Mixer)	—	+25.5 ±1	+28 ±1	—
Bridging Input:				
(a) Single Transformer Input	+28 ±2	—	—	+28 ±2
(b) Dual Transformer Input (With Mixer)	+28 ±2	—	—	+28 ±2

CHART 2

STEP	PROCEDURES	REMARKS
1	Connect 21A and amplifier to ac power.	
2	Connect the circuit as shown in Fig. 6.	
3	Turn GAIN control of KS-16608 L1 or KS-16610 L1 amplifier to maximum. If KS-16607 L1 PREAMP is used, turn its GAIN control to maximum also.	
4	Read noise on DET (TMS).	***Requirements:*** See Table D.

6. NOISE TEST

6.01 Measure the unweighted amplifier noise as shown in Fig. 6. The 21A TMS is used to measure the noise since some of the noise levels are out of range of the 2B or 3A noise measuring set due to the high amplifier gain. The readings obtained are arbitrary readings and are not true noise levels since a DET (TMS) is not a direct replacement for a noise measuring set. Chart 2 outlines the step procedure for this test.

7. DISTORTION TEST

7.01 The distortion of the amplifier should be observed in accordance with the test setup shown in Fig. 7. Chart 3 outlines the step procedure for this test.

TABLE D

INPUT ARRANGEMENT	REQUIREMENTS	
	METER READING (dB)	CORRECTED METER READING (dBm)
KS-16608 L1 AMPL Only	—40	—38
KS-16610 L1 AMPL Only	—30	—20
KS-16608 L1 AMPL With KS-16607 L1 PREAMP	+1	+3
KS-16610 L1 AMPL With KS-16607 L1 PREAMP	+9	+19

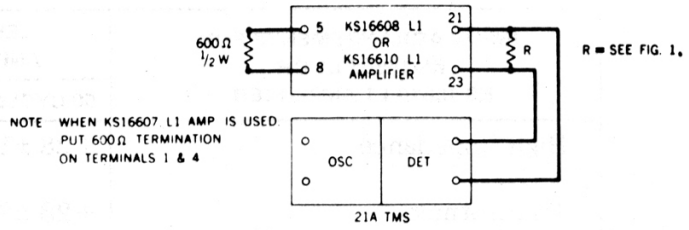


Fig. 6—Test Setup for Measuring Noise

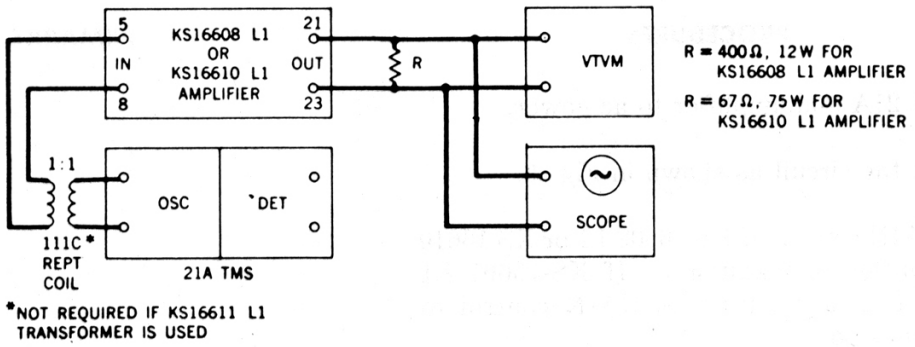


Fig. 7—Test Setup for Observing Distortion

CHART 3

STEP	PROCEDURES	REMARKS
1	Connect amplifier and test equipment to ac power.	
2	Connect circuit as shown in Fig. 7.	

CHART 3 (CONT)

STEP	PROCEDURES	REMARKS
3	Adjust OSC for 1 kc.	
4	Turn GAIN control or controls of amplifier to maximum.	
5	Adjust OSC output for 70 volts on VTVM.	
6	Observe waveshape on oscilloscope.	***Requirement:*** The output wave shall appear to be the same as the input wave except for amplitude. See Fig. 8.

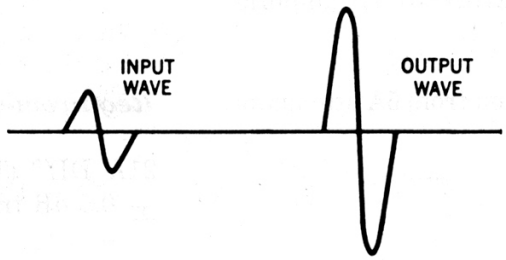


Fig. 8—Comparison of Input and Output Waveshapes (Distortion)

8. LIMITER TEST

8.01 When a KS-16608 L1 or KS-16610 L1 amplifier is equipped with a KS-16607 L1 amplifier, the automatic output level control of the KS-16607 L1 amplifier should be tested as outlined in Chart 4. The test setup is shown in Fig. 9.

CHART 4

STEP	PROCEDURES	REMARKS
1	Connect the 21A, amplifier, and voltohmyst to ac power.	
2	Patch OSC OUT jacks to DET IN jacks.	
3	Adjust OSC for 1 kc.	
4	Adjust OSC output for −38 dBm.	
5	Connect circuit as shown in Fig. 9.	
6	Adjust GAIN control of PREAMP (KS-16607 L1) to maximum.	
7	Adjust 5A attenuator for 50 dB of loss.	

CHART 4 (CONT)

STEP	PROCEDURES	REMARKS
8	Adjust GAIN control of KS-16608 L1 or KS-16610 L1 amplifier until DET (TMS) reads −2 dB.	
9	Connect high impedance dc meter to test jacks of KS-16607 L1 amplifier. Observe polarity of test leads.	Use an RCA voltohmyst or equivalent.
10	Adjust voltage scale switch of voltohmyst for about 5V full scale.	
11	Increase OSC output until meter ***JUST STARTS*** to indicate on voltohmyst.	Read 21A DET (TMS) and record reading.
12	Remove dc meter from KS-16607 L1 amplifier test jacks.	
13	Remove 20 dB of attenuation from 5A attenuator.	***Requirement:*** 21A DET (TMS) reading should increase 3.5 ± 0.5 dB from value in Step 10.

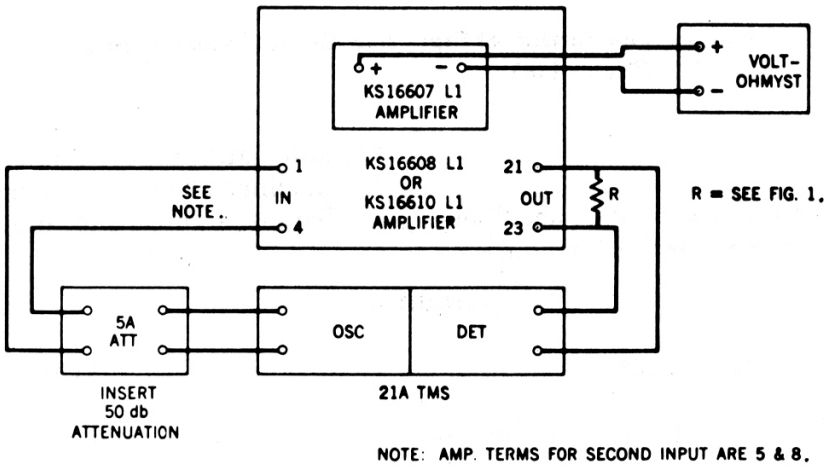
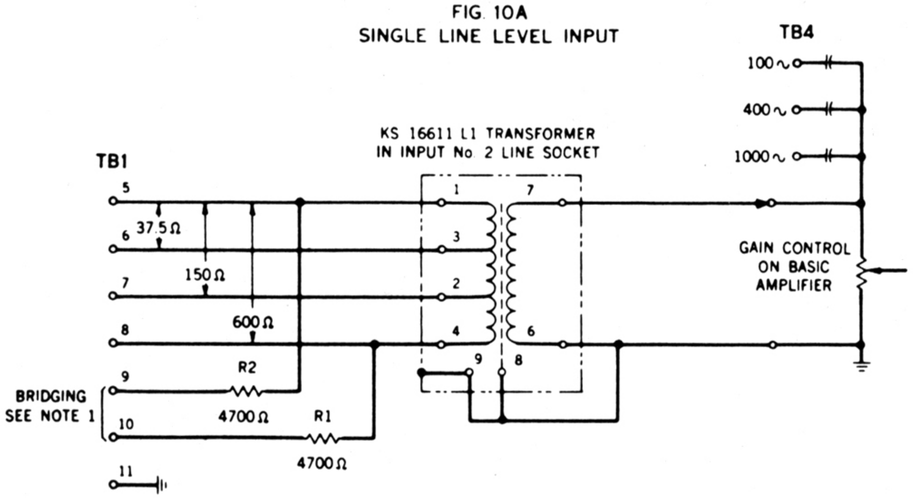


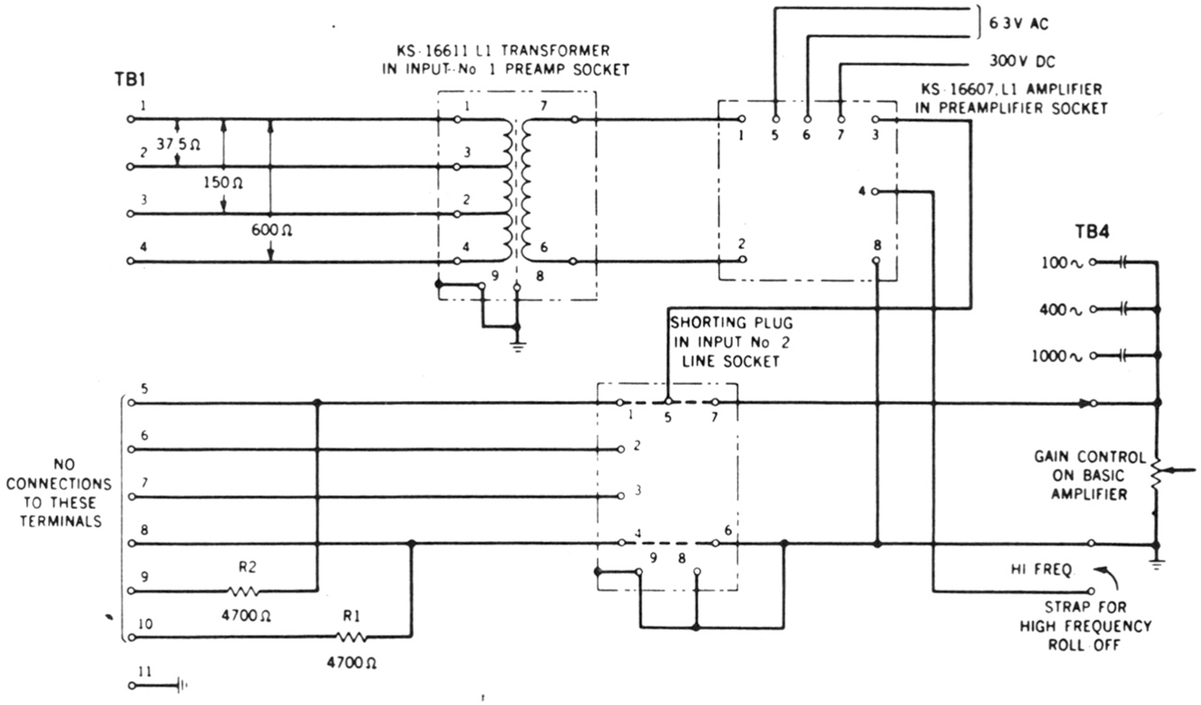
Fig. 9—Test Setup for Limiter Test

FIG. 10A
SINGLE LINE LEVEL INPUT



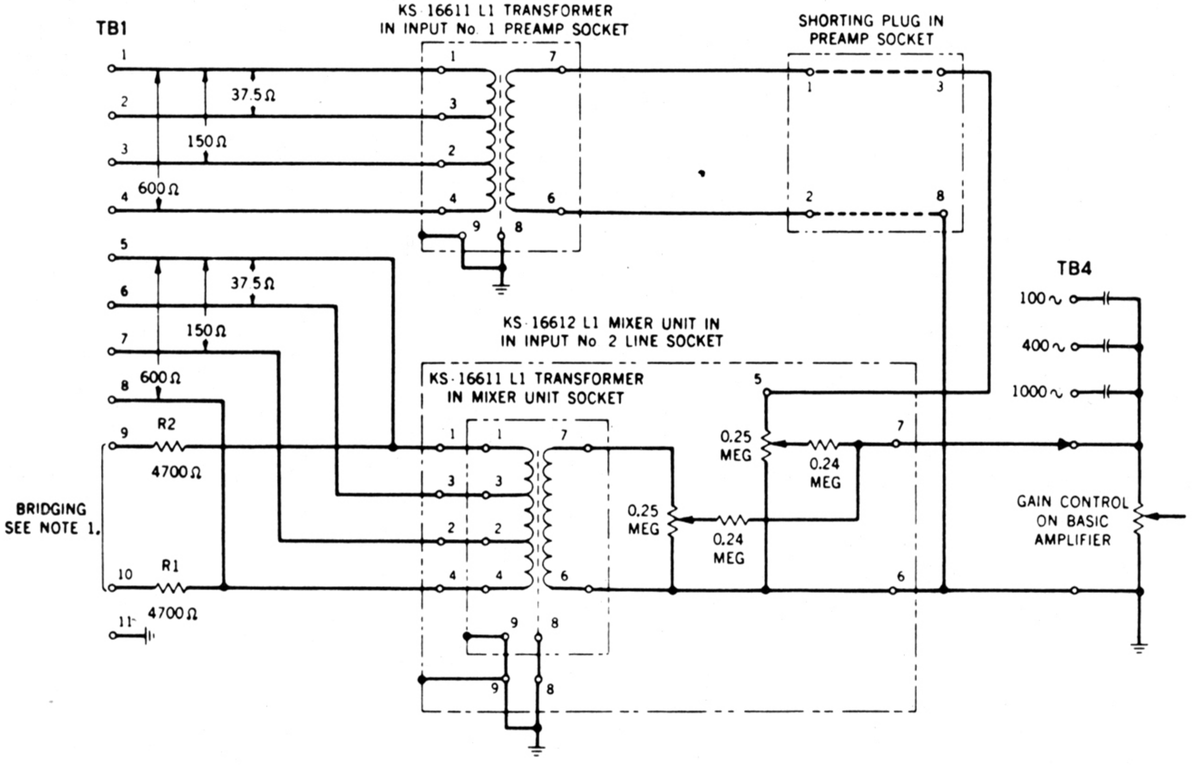
NOTES:
1. WHEN BRIDGING INPUT IS USED CONNECT 640Ω ± 10% RESISTOR BETWEEN TERMS 5 AND 8.
2. FOR HIGH IMPEDANCE INPUT SUBSTITUTE SHORTING PLUG FOR KS-16611, L 1, TRANSFORMER INPUT TO TERMS 5 AND 8.

FIG. 10B
HIGH-GAIN INPUT



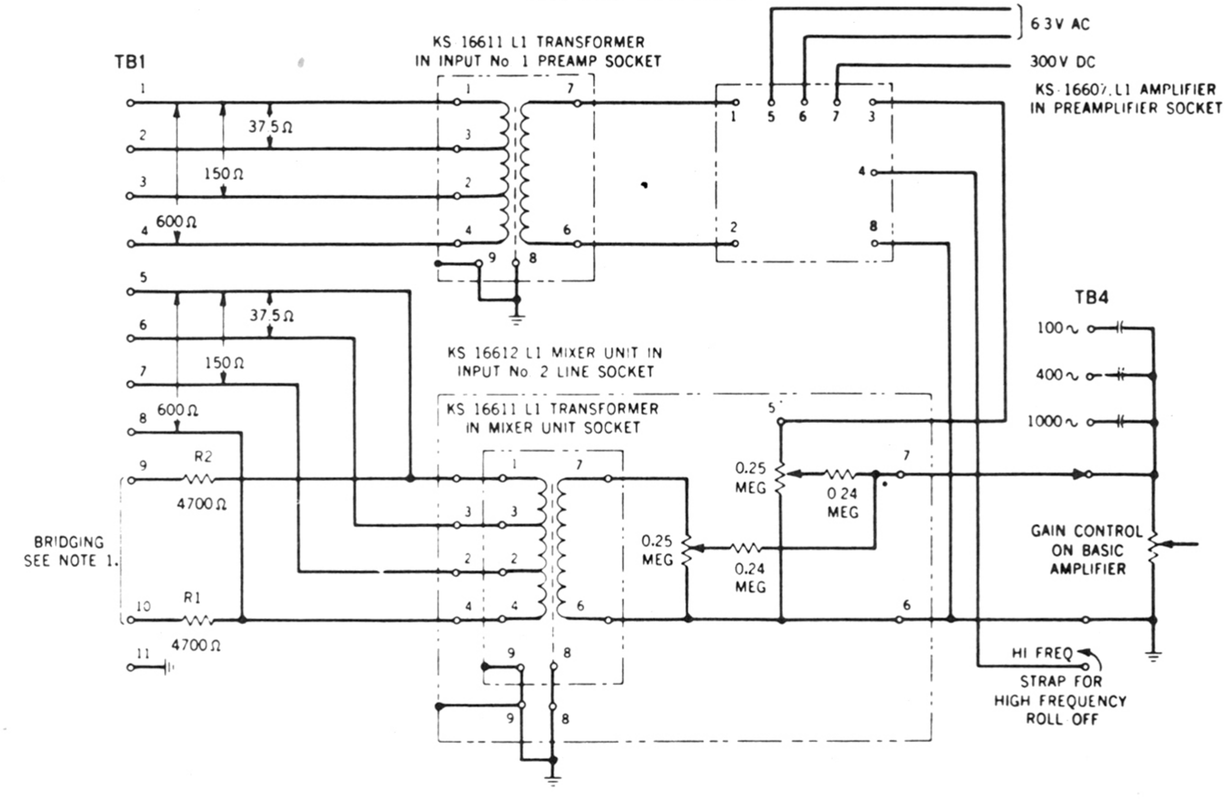
NOTES:
1. FOR HIGH IMPEDANCE INPUT SUBSTITUTE SHORTING PLUG FOR KS-16611 L 1 TRANSFORMER INPUT TO TERMS 1 AND 11.

FIG. 10C
TWO LINE LEVEL INPUTS



NOTES:
1. WHEN BRIDGING INPUT IS USED CONNECT 640Ω ± 10% RESISTOR BETWEEN TERMS 5 AND 8.
2. FOR HIGH IMPEDANCE INPUTS SUBSTITUTE SHORTING PLUG FOR KS-16611, L 1, TRANSFORMERS. INPUT NO. 1 TO TERMS 1 AND 4. INPUT NO. 2 TO TERMS 5 AND 8.

FIG. 10D
ONE LINE LEVEL INPUT
ONE HIGH-GAIN INPUT



NOTES:
1. WHEN BRIDGING INPUT IS USED CONNECT 640Ω ± 10% RESISTOR BETWEEN TERMS 5 AND 8.
2. FOR HIGH IMPEDANCE INPUTS SUBSTITUTE SHORTING PLUGS FOR KS 16611 L 1 TRANSFORMERS. HIGH GAIN INPUT TO TERMS 1 AND 11. LINE LEVEL INPUT TO TERMS 5 AND 8.

Fig. 10—Input Arrangements