KS-16617-L1 AMPLIFIER
TRANSMISSION TESTS

CONTENTS

1. GENERAL

1.01 The purpose of this practice is to outline the transmission tests to be performed on the KS-16617, L1 Amplifier. This amplifier is designed for use in central offices to provide 2-way communication between the local test desk or cable test desk and the main distributing frame.

1.02 The transmission tests outlined in this practice should be performed on the service order. Routine or scheduled transmission tests should not normally be required.

1.03 It is assumed for the purpose of these tests that the external input and output connections to the amplifier are removed. 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 readings will be obtained. This is true even with a 20,000 ohms per volt meter.

2.05 The frequency response of the oscillator 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 oscillator. This will insure better results when making the gain-frequency test.

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. ***REQUIREMENTS:*** The voltage should measure 120 ± 10 volts. The ac voltage should be measured at terminal board TB3 of the amplifier.

3.02 The grounded side of the power should be connected to terminal board TB3 of the amplifier as shown in Table I. The other side (hot side) should be connected to the terminal designated AC-COM (or terminal 17) of TB3.

TABLE I

TERMINAL DESIGNATION	AC VOLTAGE RANGE
115V — AC or 18	110 to 120
125V — AC or 19	120 to 130

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. HIGH-LEVEL CHANNEL

(A) Gain-Frequency Test

5.01 The test setup for measuring the high-level channel is shown in Fig. 1. Chart I outlines the step procedure to be followed when making the test. The oscillator output in Step 6 of the procedure is measured to insure that the amplifier will deliver the proper output with the minimum input voltage requirement. The procedure may vary slightly depending on the testing equipment used.

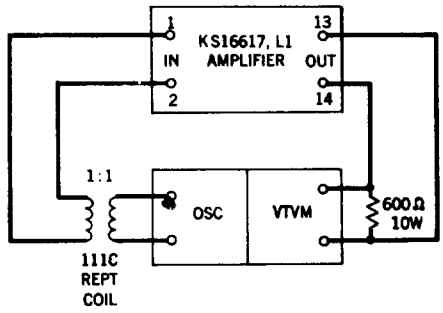

Fig. 1 — Test Setup for High-Level Channel Gain-Frequency Test

CHART I

STEP	PROCEDURE	REMARKS
1	Connect VTVM, OSC and amplifier to ac power.	
2	Connect circuit as shown in Fig. 1.	
3	Set OSC to 1 kc.	
4	Turn HIGH-LEVEL GAIN control of amplifier to maximum.	
5	Adjust OSC output level until VTVM reads +30 dbm.	
6	With OSC setting same as in Step 5 above, patch OSC to VTVM and read meter.	***Requirement:*** −22.5 ± 2 dbm.
7	Reconnect circuit as shown in Fig. 1.	Don't change OSC output.
8	Adjust OSC for 50 and 10,000 cycles. Record VTVM readings.	***Requirements:*** See Table II.

TABLE II

FREQUENCY	VTVM READING (dbm)
50 cycles	$+30 \pm 2$
10,000 cycles	$+30 \pm {}^{0}_{3}$

(B) Noise Test

5.02 The noise test on the high-level channel should be made in accordance with the test setup shown in Fig. 2. A DET (TMS) or a VTVM is used to measure the unweighted noise instead of the 2B or 3A Noise Measuring Set for the sake of convenience. The readings are arbitrary readings and are not true noise levels since these test sets are not direct replacements for a noise measuring set. Chart II outlines the step procedure for making the test.

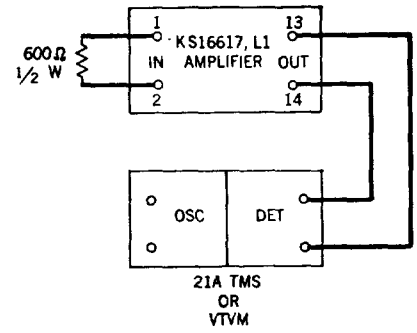

Fig. 2 – Test Setup for Measuring Noise of High-Level Channel

(C) Distortion Test

5.03 The distortion test should be made using the test setup shown in Fig. 3. Chart III outlines the step procedure to be followed for the test.

CHART II

STEP	PROCEDURE	REMARKS
1	Connect 21A or VTVM and amplifier to ac power.	
2	Connect equipment as shown in Fig. 2.	If VTVM is used, it should be terminated in a 600Ω, 1/2W resistor.
3	Turn the HIGH-LEVEL GAIN control of amplifier to maximum.	
4	Read DET (TMS) or VTVM.	*Requirement:* −34 dbm max.

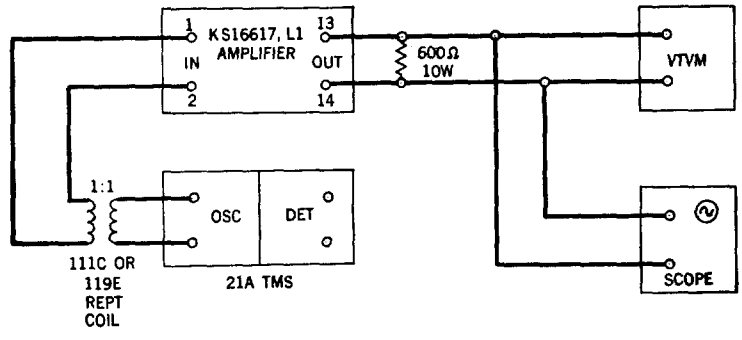

Fig. 3 – Test Setup for Observing Distortion of High-Level Channel

CHART III

STEP	PROCEDURE	REMARKS
1	Connect amplifier and test equipment to ac power.	
2	Connect circuit as shown in Fig. 3.	
3	Adjust OSC for 1 kc.	
4	Turn HIGH-LEVEL GAIN control of amplifier to maximum.	
5	Adjust OSC output for 70 volts on VTVM.	
6	Observe output waveshape.	*Requirements:* Output waveshape shall appear the same as input wave except for amplitude. See Fig. 4.

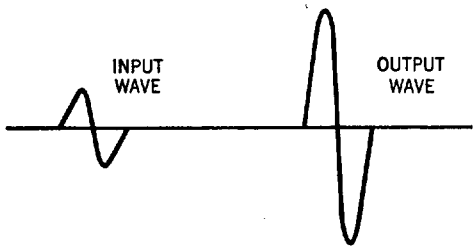

Fig. 4 – Comparison of Input and Output Waveshape (Distortion)

6. LOW-LEVEL CHANNEL

(A) Gain-Frequency Test

6.01 The test setup for measuring the low-level channel is shown in Fig. 5. Chart IV outlines the step procedure to be followed when making the test. The oscillator level is measured for the reason mentioned previously. The procedure may vary slightly depending on the testing equipment used.

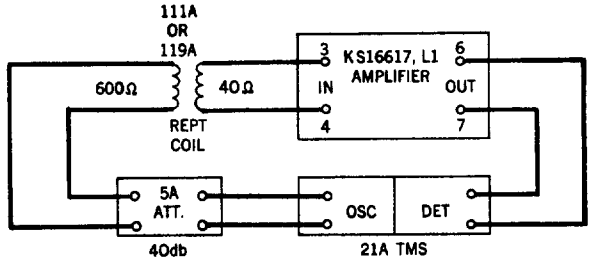

Fig. 5 – Test Setup for Low-Level Channel Gain-Frequency Test

CHART IV

STEP	PROCEDURE	REMARKS
1	Connect the 21A and amplifier to ac power.	
2	Connect circuit as shown in Fig. 5.	
3	Set OSC to 1 kc.	
4	Turn LOW-LEVEL gain control of amplifier to maximum.	
5	Insert 40 db loss in 5A attenuator.	
6	Adjust OSC output until DET (TMS) reads −10 dbm.	

CHART IV (Cont)

STEP	PROCEDURE	REMARKS
7	With OSC setting same as in Step 6 above, patch OSC OUT jacks to DET IN jacks of 21A. Read DET (TMS).	*Requirement:* −38 ± 2 dbm.
8	Reconnect circuit as shown in Fig. 5.	Don't change OSC output.
9	Adjust OSC for 100 and 5000 cycles. Record DET (TMS) readings.	*Requirements:* −13 ± 2 dbm for both frequencies.

(B) Limiter Test

6.02 The test setup for this test is the same as in Fig. 5 except for the 5A attenuator settings. Chart V outlines the test procedure to be followed in making this test.

(C) Noise Test

6.03 The noise test for the LOW-LEVEL channel should be made in accordance with the test setup shown in Fig. 6. Chart VI outlines the step procedure to be followed in making this test.

CHART V

STEP	PROCEDURE	REMARKS
1	Repeat Steps 1 through 8 of Chart IV.	
2	Remove 10 db from 5A attenuator. Read DET (TMS).	*Requirement:* −2 ± 1.5 dbm.
3	Remove an additional 20 db from 5A attenuator. Read DET (TMS).	*Requirement:* Output shall increase 4.5 ± 0.6 db from reading of Step 2.

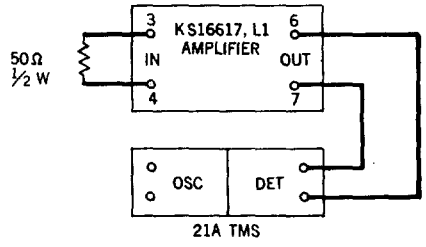

Fig. 6 – Test Setup for Measuring Noise of Low-Level Channel

CHART VI

STEP	PROCEDURE	REMARKS
1	Connect 21A and amplifier to ac power.	
2	Connect circuit as shown in Fig. 6.	
3	Turn LOW-LEVEL gain control of amplifier to maximum.	
4	Read DET (TMS).	*Requirement:* −45 dbm maximum.

7. ADJUSTMENT OF VOICE-OPERATED CIRCUIT

7.01 The voice-operated relay circuit is adjusted by means of the OPERATE and RELEASE controls on the apparatus side of the chassis. These controls should be adjusted with the amplifier in the same position it would be when mounted in the bay since its position has a bearing on the relay operate and release currents. The test setup is shown in Fig. 7. Chart VII outlines the step procedure to be followed in making the test. This is a performance test. The OPERATE and RELEASE controls may require readjustment in order to meet the announcement system requirements.

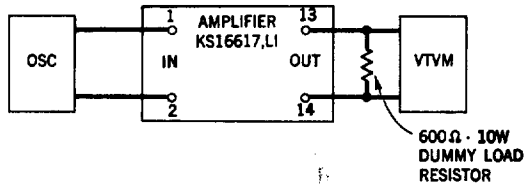

Fig. 7 – Test Setup for Adjusting Voice-Operated Relay Circuit

CHART VII

STEP	PROCEDURE	REMARKS
1	Connect test equipment and amplifier to ac power.	
2	Connect circuit as shown in Fig. 7.	
3	Adjust OSC to 1 kc.	
4	Turn HIGH-LEVEL GAIN control of amplifier to maximum.	
5	Turn OPERATE control of amplifier to minimum.	
6	Turn RELEASE control of amplifier to maximum.	
7	Increase OSC output until VTVM reads 70 volts (+ 39 dbm).	Relay K1 should operate.
8	Connect Volt-ohm-milliammeter to terminals 5 and 7 of amplifier.	
9	Adjust switches of meter to read OHMS.	Meter should indicate an open circuit.
10	Connect OSC to VTVM and record meter reading in dbm.	Don't change OSC output.
11	With same OSC setting, reconnect circuit as shown in Fig. 7.	Adjust VTVM to read 70 volts, again.
12	Adjust switches of Volt-ohm-milliammeter to read dc volts.	
13	Connect Volt-ohm-milliammeter to terminals 2B and 5T of relay K1.	
14	Adjust RELEASE control of amplifier until meter reads 3.5 ± 1 volt.	
15	Connect Volt-ohm-milliammeter to terminals 5 and 7 of amplifier.	

CHART VII (Cont)

STEP	PROCEDURE	REMARKS
16	Adjust switches of meter to read OHMS.	Meter should indicate a short circuit.
17	Turn OPERATE control of amplifier slowly until relay K1 ***JUST OPERATES.***	
18	Connect OSC to VTVM and reduce input signal from Step 10 by 9 db.	
19	Without changing OSC output setting, reconnect circuit as shown in Fig. 7.	
20	Observe Volt-ohm-milliammeter.	Meter should indicate a short circuit.