124-TYPE AMPLIFIERS
TESTS AND ADJUSTMENTS

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1. GENERAL

1.01 This issue replaces issue 1, dated August, 1940.

1.02 This Section outlines the tests and adjustments for 124-type amplifiers to prepare them for service and to check their performance as required to assure satisfactory operation.

1.03 This Section will cover particularly the 124B, 124C and 124D amplifiers, but may be used in so far as it applies for the 124A, 124E, 103C and 103D amplifiers as well.

1.04 For circuit schematics reference may be made to drawing SD-95104 for the 124B amplifier, and to drawing SD-96330-01 for the 124C amplifier. The 124D amplifier is similar to the 124C except for the input circuit arrangements as described in Section 024-104-100.

2. TESTS AND ADJUSTMENTS

(A) Primary Power Voltage

2.01 The 124-type amplifiers are designed to operate directly from a 105-125 volt, 50-60 cycle a-c supply. If the available service is at a higher or lower voltage, a suitable external transformer will be required. Where the power system operates at a different frequency a suitable frequency converter will be required.

2.02 Measure the commercial power supply voltage at the fuse panel or other convenient point between the fuse panel and the amplifier. If the voltage is within the range of 105 to 115 volts, the supply is connected to Terminals L1 and L2 on the terminal strip associated with the power transformer (T3); if it is within the range of 115 to 125 volts, the supply is connected to Terminals L1 and L3.

Caution: In making these measurements proper care should be taken to avoid contact with live terminals.

(B) Power Output Adjustment

2.03 The 124-type amplifiers are normally wired with the two orange leads from the power transformer connected to the plate terminals of vacuum tube socket VS5. Where the circuit order or service order calls for the high power output, remove the orange leads from the plate terminals of VS5, tape the ends securely and move them out of the way. Remove the tape protection from the red leads and connect them to the plate terminals of VS5.

Note: This work should be done with the power turned off.

(C) Vacuum Tubes

Vacuum Tube Tests

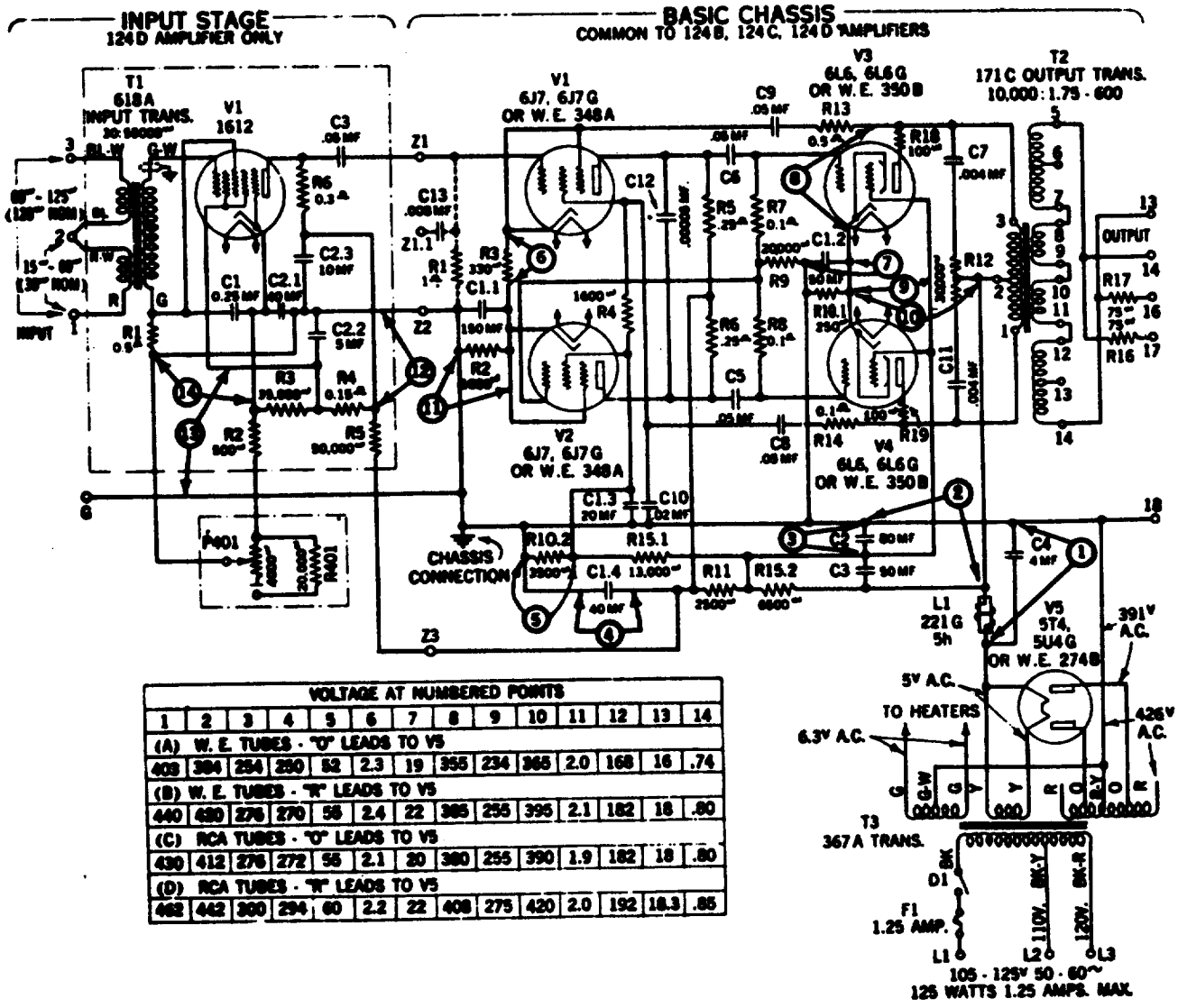
2.04 Test each vacuum tube with a Hickok Model 530B Tube Tester or equivalent in accordance with the information given in the practices covering the test set and in Table 1 for types of tubes not covered by the existing information on the test set. Discard any tubes which fail to meet the requirements as given in the practices on the test set.

Note: When the amplifier is operating the vacuum tubes will be too hot to handle. In making vacuum tube tests, therefore, the amplifier should be

TABLE 1

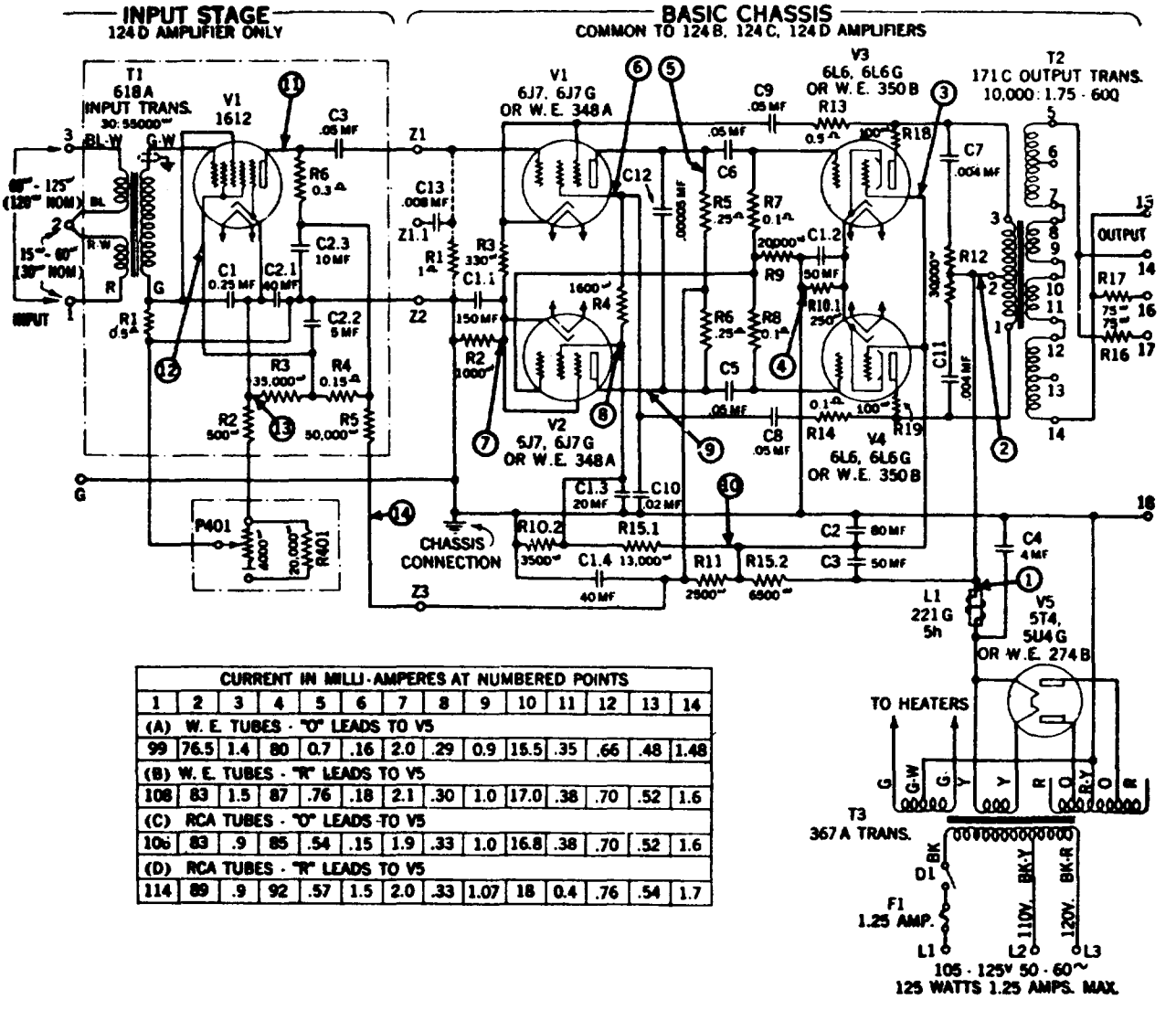
Vacuum Tube Test Data

Tube Type	SELECTOR A	SELECTOR B	SELECTOR FIL	POTENT. L	POTENT. R	Multiply Scale Reading by	Nominal Trans-conduct-ance	Minimum Trans-conduct-ance Fil. Norm	Maximum % Filament Activity	Special Tests
274B	4	11	5	40	0	-	-	-	None	Use GOOD - REPLACE Color Range
	5	11	5	40	0	-	-	-	None	
348A	1	9	6.3	40	25	1	1750	1200	25	
350B	8	5	6.3	76.5	25	5	5000	3500	25	
RCA 1612	1	9	6.3	60	19	1	1100	770	30	Grid on Cap
	8	5	6.3	60	21	1	800	-	None	Osc. Grid



VOLTAGE AT NUMBERED POINTS													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
(A) W. E. TUBES - "O" LEADS TO V5													
408	384	254	250	52	2.3	19	355	234	365	2.0	168	16	.74
(B) W. E. TUBES - "R" LEADS TO V5													
440	430	276	270	56	2.4	22	385	255	395	2.1	182	18	.80
(C) RCA TUBES - "O" LEADS TO V5													
430	412	276	272	56	2.1	20	380	255	390	1.9	182	18	.80
(D) RCA TUBES - "R" LEADS TO V5													
462	442	300	294	60	2.2	22	408	275	420	2.0	192	18.3	.85

Fig. 1



CURRENT IN MILLI-AMPERES AT NUMBERED POINTS													
1	2	3	4	5	6	7	8	9	10	11	12	13	14
(A) W. E. TUBES - "O" LEADS TO V5													
99	76.5	1.4	80	0.7	.16	2.0	.29	0.9	15.5	.35	.66	.48	1.48
(B) W. E. TUBES - "R" LEADS TO V5													
108	83	1.5	87	.76	.18	2.1	.30	1.0	17.0	.38	.70	.52	1.6
(C) RCA TUBES - "O" LEADS TO V5													
106	83	.9	85	.54	.15	1.9	.33	1.0	16.8	.38	.70	.52	1.6
(D) RCA TUBES - "R" LEADS TO V5													
114	89	.9	92	.57	1.5	2.0	.33	1.07	18	0.4	.76	.54	1.7

Fig. 2

turned down sufficiently in advance to allow the tubes to reach a safe handling temperature.

Operating Currents and Voltages

2.05 In connection with locating troubles within the amplifier the operating currents and voltages of various parts of the circuit can be checked in accordance with the information included in Figs. 1 and 2. These tests should be made with a volt-ohmmeter having a resistance of at least 1,000 ohms per volt.

Caution: In making these tests care should be taken to avoid contact with live terminals since the normal operating voltages at various points in the amplifier may be as high as 460 volts.

(D) Gain Tests

2.06 The 124-type amplifiers, under some of the various input arrangements, employ gains higher than usually encountered in the telephone plant. Care should be exercised that the power handling capacity of the transmission measuring sets used is not exceeded. This may involve the use of an auxiliary external pad connected between the source of testing power and the amplifier, but located as close to the amplifier input as practicable to minimize noise pick-up in the testing circuit.

2.07 The gain tests described below cover all of the various input arrangements available with the 124-type amplifiers. In a particular case the test need be made only for the input arrangement actually used. All

tests may be made with the 600-ohm amplifier output and a 600-ohm transmission measuring set.

124B Amplifier

2.08 Set the gain control on Step 20. Measure the 1000-cycle gain, using a 600-ohm source. Under these conditions the gain should be within ± 2 db of the values given in Table 2 for the various input arrangements.

TABLE 2

Input Arrangement	Gain - db
SD-95104, Fig. A	66
B	60
C	45
D	45
E	39

2.09 With the same testing setup used for the test described in Paragraph 2.08, operate the gain control to Step 19 and measure the gain. The reduction in gain should be 2.0 ± 0.5 db. Repeat for each step on the gain control. The change in gain between any two successive steps should be 2.0 ± 0.5 db.

124C Amplifier

2.10 Measure the 1000-cycle gain, using input terminals 1-2, with the gain control set for maximum gain employing a sending source of 50 ohms. Under these conditions the gain should be 58 ± 2 db. Turn the gain control to Position 5. The gain should then be 20 ± 4 db lower than the maximum gain previously measured.

2.11 Measure the 1000-cycle gain using input terminals 1-3 with a 600-ohm sending source with the gain control set at maximum. The gain should be 51 ± 2 db.

124D Amplifier

2.12 Measure the 1000-cycle gain, using input terminals 1-2 and a 30-ohm source, or terminals 1-3 and a 120-ohm source, with the gain control set for maximum gain. Under either of these conditions the gain should be 107 ± 2 db. Turn the gain control to Position 5. The gain should then be 20 ± 6 db lower than the maximum gain previously measured.

(E) Gain Frequency Tests

124B Amplifier

2.13 Measure the gain with any of the input arrangements from a 600-ohm source, with the gain control set on Step 20, at frequencies of 35, 100, 1000, 5000, 8000 and if practicable 10000 cycles. The deviation from the 1000-cycle value should not exceed ± 1.6 db at any of these frequencies.

124C Amplifier

2.14 Measure the gain using input terminals 1-2 and a 50-ohm source, with the gain control set for maximum gain, at frequencies of 100, 300, 1000 and 5000 cycles. The deviation in gain from the 1000-cycle value should be

Frequency	Deviation in Gain
100	-10.0 ± 2.0 db
300	- 2.5 ± 1.0 db
5000	+ 1.5 ± 1.0 db

2.15 Measure the gain, using input terminals 1-3 and a 600-ohm source, with the gain control set at maximum, at frequencies of 100, 300, 1000 and 5000 cycles. The deviation in gain from the 1000-cycle value should be

Frequency	Deviation in Gain
100	0 ± 1.0 db
300	0 ± 1.0 db
5000	+1.0 ± 1.0 db

124D Amplifier

2.16 Measure the gain, using input terminals 1-2 and a 30-ohm source, or terminals 1-3 and a 120-ohm source, with the gain control set for maximum gain, at frequencies of 100, 300, 1000 and 5000 cycles. The deviation in the gain at any frequency from that at 1000 cycles should not exceed ± 1.0 db.

(F) Noise

2.17 Measure the noise of the amplifier at the 600-ohm output with both program weighting and flat weighting and gain control set for maximum gain, using the 2B noise measuring set or equivalent. For these tests the input of the amplifier should be terminated, depending on the input arrangements used, as follows:

Condition	Termination
124B Amplifier	
All input arrangements	600 ohms
124C Amplifier	
Term. 1-2	50 ohms
1-3	600 ohms
124D Amplifier	
Term. 1-2	30 ohms
1-3	120 ohms

2.18 Under the conditions outlined in the preceding paragraph the noise of the amplifier should not exceed the following values:

Amplifier	Noise - db above Reference Noise	
	Program	Flat
124B	45	60
124C	45	60
124D	76	85

(G) Electrolytic Condensers

2.19 The dielectric film of the electrolytic condensers will deteriorate slowly if there is no voltage impressed on the condenser terminals. Accordingly, if an amplifier has long periods of non-use (2 months or more), it will be necessary to reform the condenser film. This can be done by applying power initially for about 1/2 minute, then turning it off for about 5 minutes, repeating this cycle two or three times before turning up the amplifier continuously for service.

2.20 The condition of the electrolytic condensers can be checked by measuring the amplifier noise as described above. Where this test is made on an amplifier which has been idle for some time (2 months or more), the amplifier should be operated as described in Paragraph 2.19 before proceeding with the test. If the noise exceeds the maximum permissible value, and can not be reduced with new vacuum tubes, the condensers should be replaced.

3. ROUTINE MAINTENANCE

3.01 This Part suggests in Table 3 a schedule for routine maintenance tests on 124-type amplifiers which may be followed in the absence of other testing intervals authorized by local instructions.

TABLE 3

Test	For Method See Part	Interval
Primary Power Voltage	2(A)	Initial Test
Power Output	2(B)	Initial Test
Vacuum Tubes		
W.E. Co. Type	2(C)	3 M
Commercial Types	2(C)	2 M
Gain	2(D)	Service Adjustment
Gain-Frequency	2(E)	Service Adjustment
Noise	2(F)	Initial Test
Electrolytic Condensers	2(G)	A

A = Annually
M = Months