118A AMPLIFIER

TESTS, ADJUSTMENTS AND REQUIREMENTS

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1. GENERAL

1.01 This section outlines the tests and adjustments for the 118A amplifiers to prepare them for service and to check their performance to assure satisfactory operation.

1.02 There is also included in this section certain information which may be of value when locating trouble in the 118A amplifier.

2. OPERATING ADJUSTMENTS

(A) Primary Power Voltage

2.01 The 118A amplifier is designed to operate directly from the commercial 60-cycle, 110-125 volt, a-c supply, and consumes about 200 watts at 115 volts. Amplifiers for 50-cycle operation are available and are marked "50-60" cycles on the chassis nameplate.

2.02 The voltage of the a-c power supply should be measured at the fuse panel or at the point where the amplifier is located.

Requirements: The voltage should normally be between 110 and 125 volts for satisfactory operation of the amplifier.

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

2.03 The power supply should be fused with a 2.5 ampere Fustat. This fuse is not included as part of 118A amplifiers of early manufacture and therefore must be obtained and installed as a separate unit.

2.04 The switch D1 on the amplifier is connected in series with the a-c power supply and the primary winding of the power transformer. It is used to turn the amplifier off and on.

(B) Power Output Adjustment

2.05 The 118A amplifier is normally operated with four 6L6G type tubes in the output stage. The amplifier is capable of delivering approximately 50 watts of audio power under this condition.

2.06 The maximum power output of the amplifier may be reduced from 50 to 25 watts by removing two of the output tubes (V5 and V6) provided, however, that the line voltage is less than 120 volts. The maximum gain of the amplifier is also reduced by a factor of 3 db. The amplifier consumes about 150 watts under these conditions and should be fused with a 2 ampere Fustat.

2.07 The output impedances of the 118A amplifier are given in Section 024-103-100.

(C) Gain Tests

2.08 The 118A amplifier employs gains and furnishes output levels higher than are usually encountered in the telephone plant. Care should be exercised to insure that the power handling capacity of the transmission measuring equipment used is not exceeded. A 600-ohm attenuator (5A or its equivalent) should be connected between the oscillator output and amplifier input when making gain and gain frequency tests. The loss of the attenuator should be adjusted to approximately the expected amplifier gain.

Note: The attenuator should not be connected to the amplifier output since the maximum power output of the amplifier greatly exceeds the power handling capacity of these units.

2.09 To measure the gain of the 118A amplifier, set the gain control potentiometer (P1) on maximum gain (turn to extreme right) and strap the output transformer for a 500-ohm load impedance as follows: terminals 6 to 7, 8 to 9, and 10 to 11. Connect a 600-ohm measuring set (13A or equivalent) to terminals 5A and 12A of

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the output transformer. Measure the 1000-cycle gain using a 600-ohm source (19C oscillator or equivalent) connected through a suitable attenuator to the amplifier input as discussed in Paragraph 2.08. Either the bridging input connection (terminals 2 and 3) or the high gain connection (terminals 1 and 3) may be used for this test, however, the input should be the same as that used when the amplifier is placed in service.

Requirements: The 1000-cycle gain should be within ± 2.0 db of the value given below for the two input connections.

Input Connection	Gain DB 50 Watt Output	25 Watt Output
Bridging Connection	53	50
High Gain Connection	63	60

(D) Gain Frequency Tests

2.10 Using the equipment arrangement described in Paragraph 2.09 measure the gain at the following frequencies: 50, 100, 300, 1000, 2500, 5000, 8000 cycles per second. If the amplifier is required to transmit up to 15,000 cycles measurements should also be made at 10,000 and 15,000 cycles per second.

Requirements:

(1) The gain at any frequency in the range between 50 and 8000 cycles should not deviate from the gain at 1000 cycles by more than ± 2.0 db.

(2) The gain at any frequency in the range between 50 and 15,000 should not deviate from the 1000-cycle gain by more than ± 5.5 db.

(E) Noise Tests

2.11 The noise level at the amplifier output may be measured with a 2B noise measuring set or its equivalent. The use of this set for noise measurements is covered in other sections of the practices. With the output transformer strapped for a 500-ohm load and the amplifier input terminated in 600 ohms the noise level, program weighting, at the amplifier output (terminals 5A and 12A of the output transformer) should not exceed 50 db above reference noise.

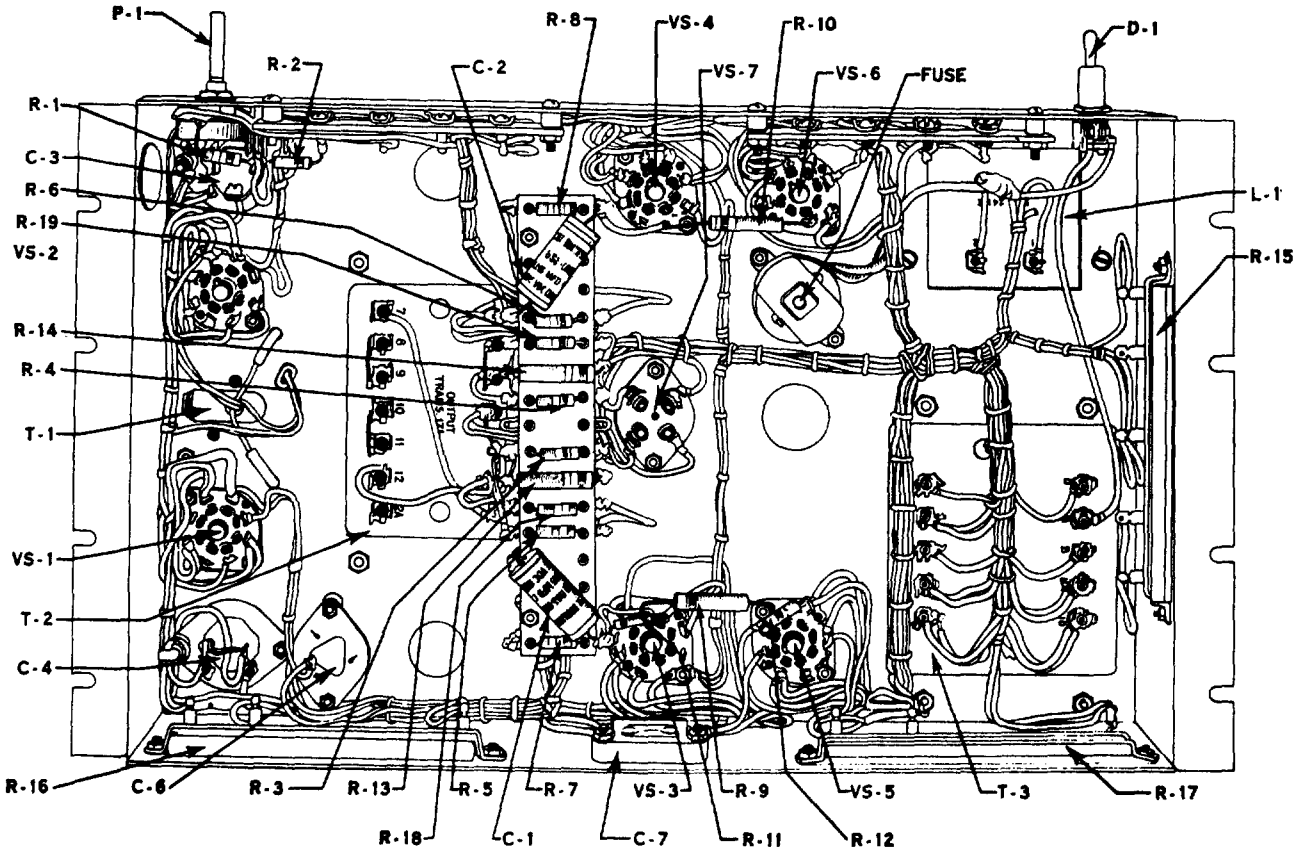


Fig. 1 - Bottom View of 118A Amplifier

(F) Electrolytic Condensers

2.12 The 118A amplifier employs a number of electrolytic condensers for filtering and by-passing purposes. Basically these condensers consist of two electrodes placed in a suitable electrolyte. These electrodes are covered with a thin dielectric film which conducts current more readily in one direction than in the other. The dielectric film surrounding the electrodes will deteriorate slowly if no voltage is impressed on the condenser terminals. Accordingly, if an amplifier has long periods of non-use (2 months or more) it will be necessary to re-form the film. This can be done by applying the a-c power to the amplifier for about 1/2 minute, then turning it off for about 5 minutes. This cycle should be repeated two or three times before turning on the amplifier for continuous service.

3. MAINTENANCE

(A) Routine Maintenance Tests

3.01 In Table 1 is suggested a schedule for routine maintenance tests on 118A amplifiers which may be followed in the absence of other testing intervals authorized by local instructions.

TABLE 1

Test	See Part	Interval
Primary Power Voltage	2(A)	Initial Test
Power Output	2(B)	Initial Test
Gain Test	2(C)	Service Adjustment
Gain Frequency Test	2(D)	Service Adjustment
Noise	2(E)	Initial Test
Observed Noise and Quality		Service Adjustment
Vacuum Tubes		2 Months

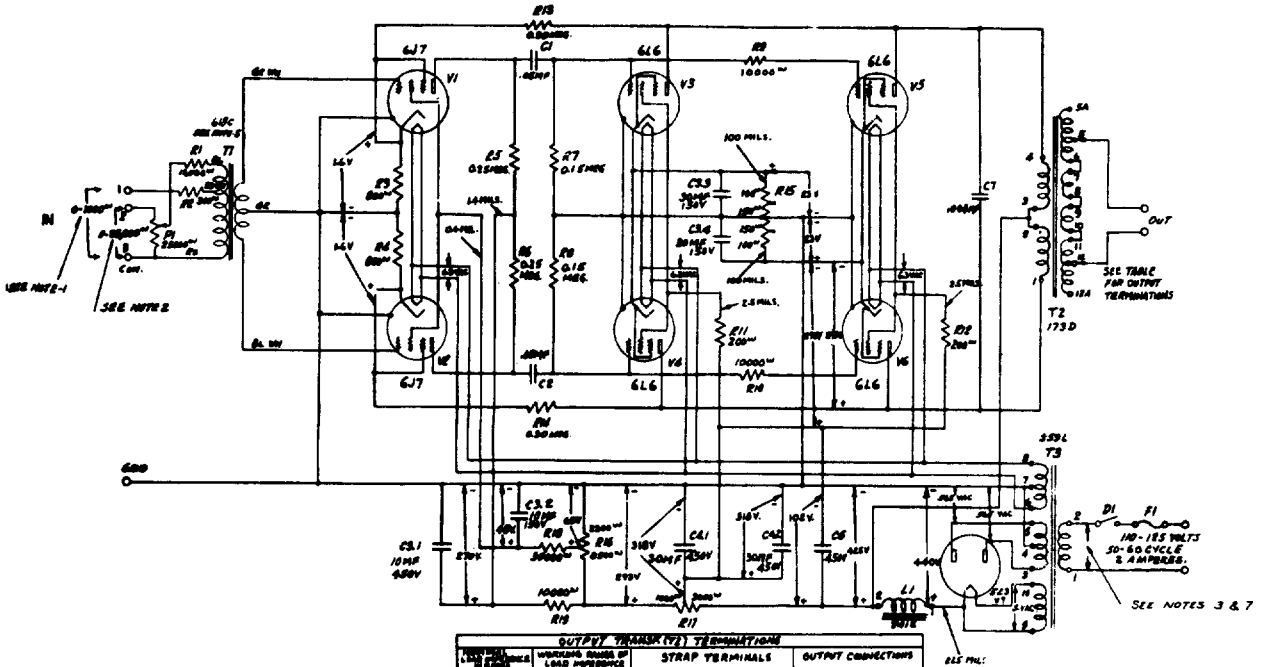
(B) Testing Equipment

3.02 A Hickok model 530B Tube Tester or equivalent should be used to test the vacuum tubes of the amplifier. Information covering the operation and use of the tube test set is given in the Practices on that set.

3.03 A volt-ohm-milliammeter having a resistance of at least 1000 ohms per volt should be used when checking the currents and voltages of various parts of the amplifier.

(C) Trouble Location

3.04 When the 118A amplifier is in trouble and the cause of the trouble is not immediately apparent, the amplifier should first



OUTPUT TRANSFORMER (T2) TERMINATIONS			
		STRAP TERMINALS	OUTPUT CONNECTIONS
500	350 TO 1000	6T9T 8T9 10T11	5A AND 12A
125	62 TO 250	6T9T 10T11 8T9 8T10	5A AND 12A
30	20 TO 62	6T9T 8T9 10T10	5 AND 12
17	10 TO 20	7T8 8T10 6T9T 10T11	5 AND 12
7.5	4 TO 10	6T9T 10T11 8T9T 8T9	5 AND 12
2	1 TO 4	5T9T 7T8 5T11 6T9T 8T9T 8T12	5 AND 12

NOTES:

1. Maximum Gain Connection, Source Impedance 0 to 1000 ohms.
2. Bridging Connection, Source Impedance 0 to 25,000 ohms.
3. The voltage and current values shown are for a 60 cycle line voltage of 117.5 volts and a line current of 1.66 amperes.
4. Output connections shown on Table.
5. The 6180 Input Transformer replaces the 6000 Input Transformer previously specified. The 0.15 Meg. Resistors R7 and R8 replace the 0.25 Meg. Resistors. It is important that R7 and R8 have the same value.
6. The values of current, voltage and resistance shown are average values and are intended only as an aid in servicing the amplifier. Readings should be taken with the equivalent of a "Volt-Ohmmeter" whose resistance is at least 1000 ohms per volt.
7. This amplifier is good for 60 cycle operation only when so marked on the nameplate on the front of the chassis.

Fig. 2 - Schematic of 118A Amplifier

be checked (with a-c power turned off) for loose connections or broken wires involving the input circuit, output circuit, a-c supply, or internal amplifier wiring.

3.05 If the trouble is not located by this visual inspection all of the vacuum tubes should be replaced with tubes that are known to be in good condition. The replaced tubes may then be tested with the Vacuum Tube Test Set and the defective tubes discarded.

> Caution: When the amplifier is operating the vacuum tubes will be too hot to handle safely. Before making any tube changes the amplifier should be turned off and the tubes allowed to cool to a safe handling temperature.

3.06 If the procedures outlined above fail to clear the trouble it will be necessary to make a thorough electrical check of the operating voltages and currents. The benefits derived from an orderly procedure in making these tests cannot be over-emphasized. Fig. 2 is a schematic drawing of the amplifier circuit showing the voltages and currents in various parts of the circuit. The following suggested procedure will facilitate the voltage testing.

3.07 Many of the voltages indicated on Fig. 2 are between the various circuit elements and ground. Since these are most readily obtained it is suggested that all of the voltages to ground be measured beginning at the output of the power rectifier tube and working through the circuit to the elements of the several tubes. The data thus obtained should provide an indication of the location of any trouble in the power supply and voltage distribution circuits of the amplifier.

3.08 If, in connection with tests to determine the cause of poor quality on speech circuits employing 118A amplifiers, it is desirable to determine the amplifier power overload point this may be done as follows:

(a) Connect a 19A oscillator or equivalent through a suitable attenuator (5A or equivalent) to the amplifier input.

(b) Strap the output transformer for 500-ohm load and terminate the "out" punching on rear of amplifier in a 500-ohm, 75 watt resistor. Other values of terminating resistance may be used by making the required connections on the output transformer.

(c) Adjust the loss in the attenuator to 70 db and set the oscillator frequency to 1000 cycles and its output to 1 milliwatt.

(d) Connect a suitable a-c voltmeter across the load resistance. (The use of 2-type noise sets for special tests is outlined in other sections of practices.)

(e) Measure the output voltage as the input is increased in steps of 5 db until a voltage equivalent to 50 watts in the load resistance is reached.

> Results: The output voltage increases directly with input power until overloading occurs. The overload point occurs at approximately 50 watts output.
>
> Note: If a cathode ray oscilloscope is available the overload point may be observed when the trace of output voltage departs from its normal sinusoidal shape.

3.09 Distortion originating in the 118A amplifier may be due to

1. Defective vacuum tubes
2. Leakage in coupling condensers C1 and C2.
3. Failure of biasing resistors or bypass condensers.
4. Failure or partial failure of output transformer.

There are other troubles which may produce distortion in the output, however, those listed above are representative of the more obvious types. The tests described in Paragraphs 3.04 through 3.07 will facilitate the clearance of those troubles.

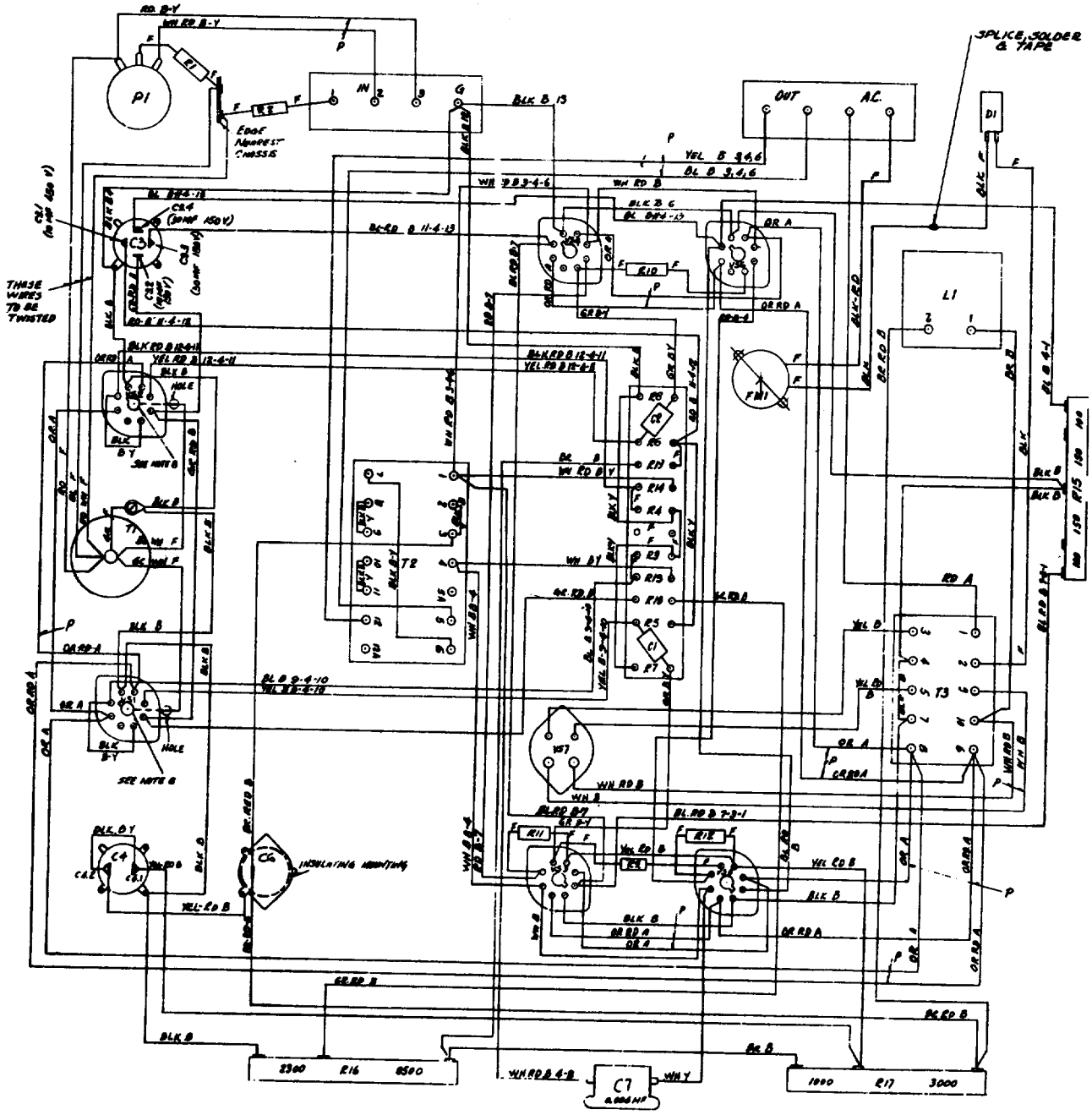


Fig. 3 - Wiring Diagram of 118A Amplifier