

1948

Western Electric

120B AND 120C AMPLIFIERS



INSTRUCTION BULLETIN NO. 1203, ISSUE NO. 1

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Research and design by Bell Telephone Laboratories

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120B AND 120C AMPLIFIERS

The 120 Type Amplifiers are two-stage, fixed gain amplifiers intended for use as pre-mixing or low level amplifiers in sound systems and in speech input equipments for radio broadcasting systems. Both the 120B and the 120C Amplifiers are identical electrically and mechanically with the exception of the input transformers.

Typical Characteristics

<i>120B</i>	<i>120C</i>
<i>Frequency Response</i>	
± 1 db, 50 to 15,000 cycles	± 1 db, 50 to 15,000 cycles
<i>Output Noise</i>	
-82 dbm	-82 dbm
<i>Signal-to-Noise Ratio</i>	
72 db at -10 dbm output level	72 db at -10 dbm output level
<i>Source Impedance</i>	
30, 250 or 600 ohms	30 or 250 ohms
<i>Load Impedance</i>	
600 ohms	600 ohms
<i>Gain</i>	
41 db	44 db

Output Power

+ 16 dbm at 400 cycles, + 12 dbm at 50 and 15,000 cycles, with less than 1% distortion.

Power Required

Filaments 6.3 volts, 0.8 ampere. Plates 275 ± 25% volts d-c, .007 ampere. Power can be obtained from 18- or 20-type Rectifier.

Equipment Characteristics

Panel Size

Approximately 5¼ inches by 10¼ inches. The apparatus extends approximately 4½ inches from the front and 2 inches from the rear of the panel.

Weight

Approximately 6½ pounds.

Mounting

Designed for mounting on a 190 or 206A Mounting Plate. Flexible rubber mountings are furnished. Three 120 Amplifiers may be mounted on one plate, requiring 10½ inches of relay rack space.

Finish

Baked aluminum enamel, on zinc-plated steel.

INSTALLATION

Mounting

Three 120 Amplifiers can be mounted on any of the following Mounting Plates, all of which require 10½ inches of relay rack or equipment cabinet space. A blank front panel of the corresponding type is required for use with these mounting plates. Flexible rubber mountings, nuts and washers are

supplied with the amplifier for fastening it to the mounting plate.

<i>Mounting Plate</i>	<i>Use Panel Type</i>
177A.....	296A
177B.....	296B
190B.....	406A-15 or 406A-3
206A.....	406A-15 or 406A-3

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Mounting Precautions

Avoid exposure to magnetic fields which might induce noise in the equipment.

When equipment such as rectifiers, or amplifiers with self-contained a-c power supplies are mounted on the same bay or equipment cabinet with 120 Amplifiers, it is desirable to have as much separation as possible (minimum 10 inches) between the input transformer of the 120 Amplifier and the power transformer of the a-c operated equipment.

Hum caused by pickup in the input transformer of the 120B Amplifier can be reduced by loosening the clamping ring and rotating the transformer to a position of minimum hum. To avoid damaging the leads, the transformer should not be rotated more than 180 degrees in either direction from its original position.

The 120C Amplifier input transformer has extra shielding against magnetic fields and does not require this special orientation.

External Connections

<i>Terminal Numbers</i>	<i>120B</i>	<i>120C</i>
1 and 2	30 ohm input	
2 and 3	250 ohm input	
1 and 3	600 ohm input	
4	Plate current meter (positive terminal) first stage.	
5	Plate current meter (positive terminal) second stage.	
6 or 13	Ground	Ground
7	+275 volts d-c	+275 volts d-c
8*	-275 volts d-c plate current meter (negative)	
9 and 10	Output 600 ohms	Output 600 ohms
11 and 12	6.3 volts a-c	6.3 volts a-c
1 and 16		250 ohm balanced input (strap 3 and 14)
3 and 14		Center tap for 250 ohm winding.
2 and 15		30 ohm input. (The strap must be removed from ter- minals 3 and 14 for this condition and 2-14 and 3-15 should be strapped.) See Figure 3.

* See section on grounding.

All electrical connections to the amplifier should be made with shielded twisted pair copper wire with insulation over the shields, and all joints should be securely soldered.

The shields should be electrically continuous and should be grounded at the amplifier end by connecting to terminal 6 or 13.

Plate Meter Connections

The plate currents of the vacuum tubes may be measured by wiring terminals 4 and 5 to an external selector switch which is connected to the positive terminal of the plate current meter. The negative terminal of the meter should be connected to terminal 8 of the 120 Amplifier. The KS-10003 Meter is recommended for this purpose, but if this meter is not available, a 0.2 full-scale milliammeter with a series resistor of such value that the total resistance of the meter and the resistor is 1000 ohms, may be used. In this event, the meter reading should be multiplied by 10 to obtain the plate current of the first stage vacuum tube, and by 200 to obtain the plate current of the second stage vacuum tube.

Grounding

The negative side of the 120 Amplifier plate supply should be grounded by connecting terminal 8 to terminal 6. When several amplifiers obtain plate power from a com-

mon source the ground should be applied at only one point in the system. The center tap of the transformer filament winding should also be grounded.

It is sometimes desirable to operate the 120 Amplifier with one side of the output grounded. In all cases where the output is grounded, terminal 10 should be connected to the ground side of the circuit.

Installation of Tubes

WARNING—The tube shields are locked to the panel by screw threads at the bottom of the shields and can only be removed without damage by rotating the shields counter-clockwise.

After the connections outlined above have been made, a 1603 Vacuum Tube should be inserted in the first stage socket and a Western Electric 348A Vacuum Tube in the second stage socket. The flexible grid leads should be attached to the tube caps and the tube shields should be replaced over the tubes.

OPERATION

A period of approximately one minute should be allowed for the vacuum tube cathodes to reach their operating temperatures after the power has been applied. The vacuum tube plate currents may then be measured and should be 0.75 ± 0.1 milliampere for the first stage and 5.6 ± 0.8 milliampere for the second stage.

The response of the 120B Amplifier operated from 30 or 250 ohms is essentially flat over the range from 30 to 15,000 cycles except for a slight droop (approximately 0.5 db) at the low end for any of the input impedance ranges indicated and at the high end (approximately 1.3 db) only when operated from 600 ohms. The high end response for the 600 ohm input can be made essentially flat by disconnecting condenser C7. The 120C Amplifier is similar to the 120B at the low end. Condenser C7 is selected at the time of manufacture to maintain the frequency response of the amplifier at

the high end within the close tolerances required for either 30 or 250 ohms source impedance.

Associated Parts

The following vacuum tubes are required for operation and must be ordered separately:

- 11-16-50 as 1603 tubes are becoming unavailable
1 1603 Vacuum Tube 1620 or Syln. 1273
1 Western Electric 348A Vacuum Tube may be used,

In an emergency, if these tubes are not available, the following may be used:

6C6 or 77 in place of 1603

6J7 or 1620 in place of 348A

The following accessory equipment is recommended:

KS-10003 Meter (for measuring plate currents of vacuum tubes)
 Western Electric 177A or B, 190B or 206A Type Mounting Plate (one mounts three 120B or 120C Amplifiers) with corresponding blank panel (See "Installation" — Paragraph on Mounting)

Servicing

Should the amplifier fail to operate properly the trouble can be traced through the use of the schematic diagrams, Figures 1 and 3, and the wiring diagrams, Figures 2 and 4. If replacement parts are required, they may be procured through the nearest distributor.

TYPICAL CUSTOMER'S APPARATUS LIST

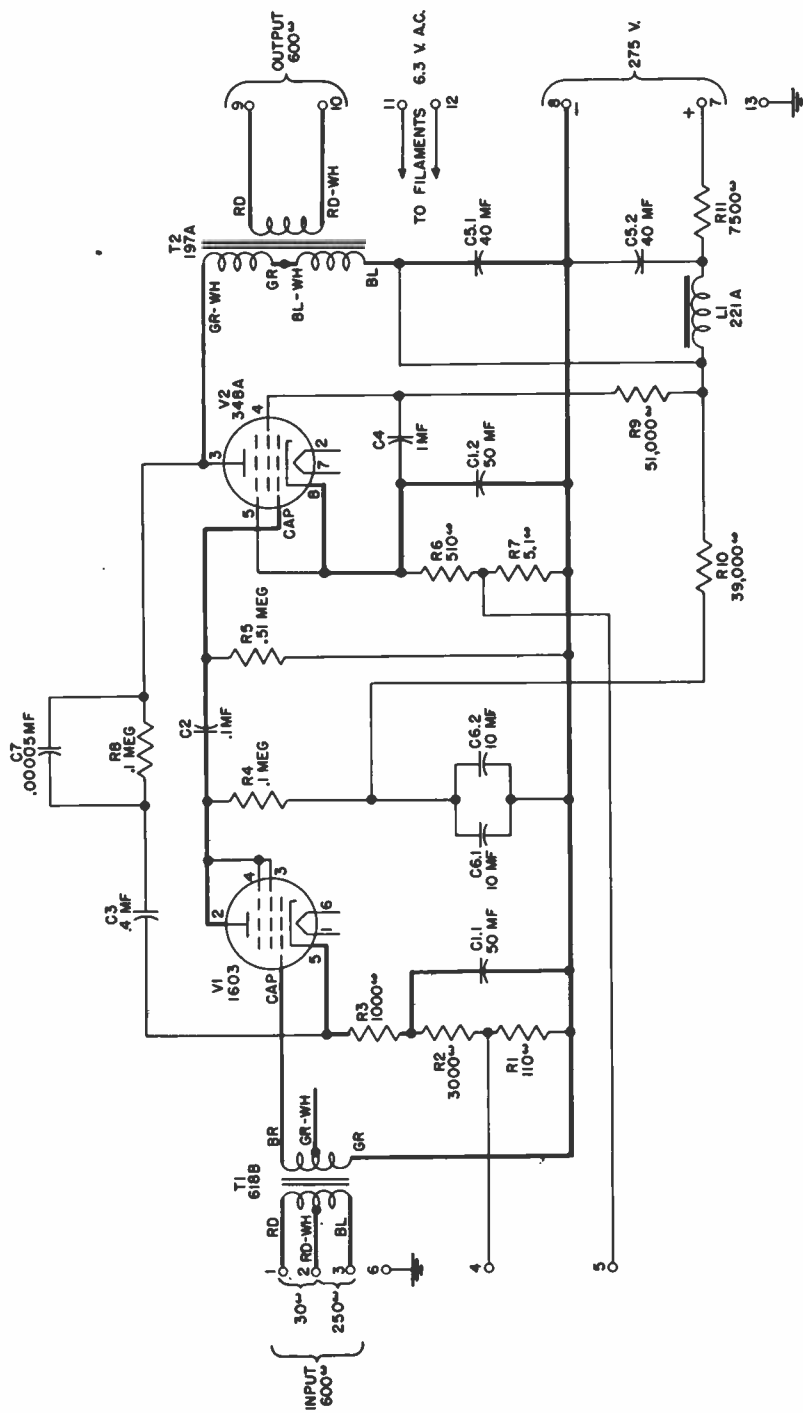
<i>Designation No.</i>	<i>Apparatus</i>
T1	{ 618B Input Transformer (120B Amplifier only) 285R Input Transformer (120C Amplifier only)
T2	197A Output Transformer
L1	221A Retardation Coil
C1.1, C1.2	Mallory Type FPD 214 Electrolytic Condenser, 50-50 MF 150 Volts d-c Working Voltage or Sprague Type FP Equivalent
C2	234C Condenser, 0.1 MF
C3	230A Condenser, 0.4 MF
C4	229C Condenser, 1.0 MF
C5.1, C5.2	Mallory Type FPD 238 Electrolytic Condenser, 40-40 MF 450 Volts d-c Working Voltage or Sprague Type FP Equivalent
C6.1, C6.2	Mallory Type FPD 231 Electrolytic Condenser, 10-10 MF 450 Volts d-c Working Voltage or Sprague Type FP Equivalent
	International Resistance Company Type BW-1 Resistances, Resistance Values as Specified $\pm 5\%$
R1	110 ohms
R2	3100 ohms
R3	1000 ohms
R6	500 ohms
R7	5 ohms

All apparatus is Western Electric unless otherwise specified.

TYPICAL CUSTOMER'S APPARATUS LIST
(Continued)

<i>Designation No.</i>	<i>Apparatus</i>
	International Resistance Company Type BT-1 Resistances, Resistance Values as Specified $\pm 5\%$
R5	0.51 megohm
R8	0.1 megohm
R9	51,000 ohms
R10	39,000 ohms
R11	7,500 ohms
R4	International Resistance Company Type WW-3 Resistance with Lug Terminals, 100,000 ohms
VS1	Eby Type 33-1-C Vacuum Tube Socket per KS-7741
VS2	Vacuum Tube Socket per KS-13364 List 1
C7	0.00005 mf, Type 5R, Cornell-Dubilier Condenser <i>(See schematic, Figure 3)</i>
Shields for V1, V2	Vacuum Tube Cover per ESO-677879-3

All apparatus is Western Electric unless otherwise specified.



NOTES:

THE RESISTANCES AND VOLTAGES SHOWN ARE TYPICAL AVERAGE VALUES OBTAINED USING A 1000 OHMS PER VOLT VOLTOHMETER WITH NO SIGNAL INPUT AND CONNECTED TO POWER SUPPLIES INDICATED. VOLTAGES ARE MEASURED FROM POINT SHOWN TO TERMINAL 6.

Fig. 1—120B Amplifier Schematic

6-9-55
 Input conn. as follows: Red-T, GR-Rd-16, 3 x 14 strapped.

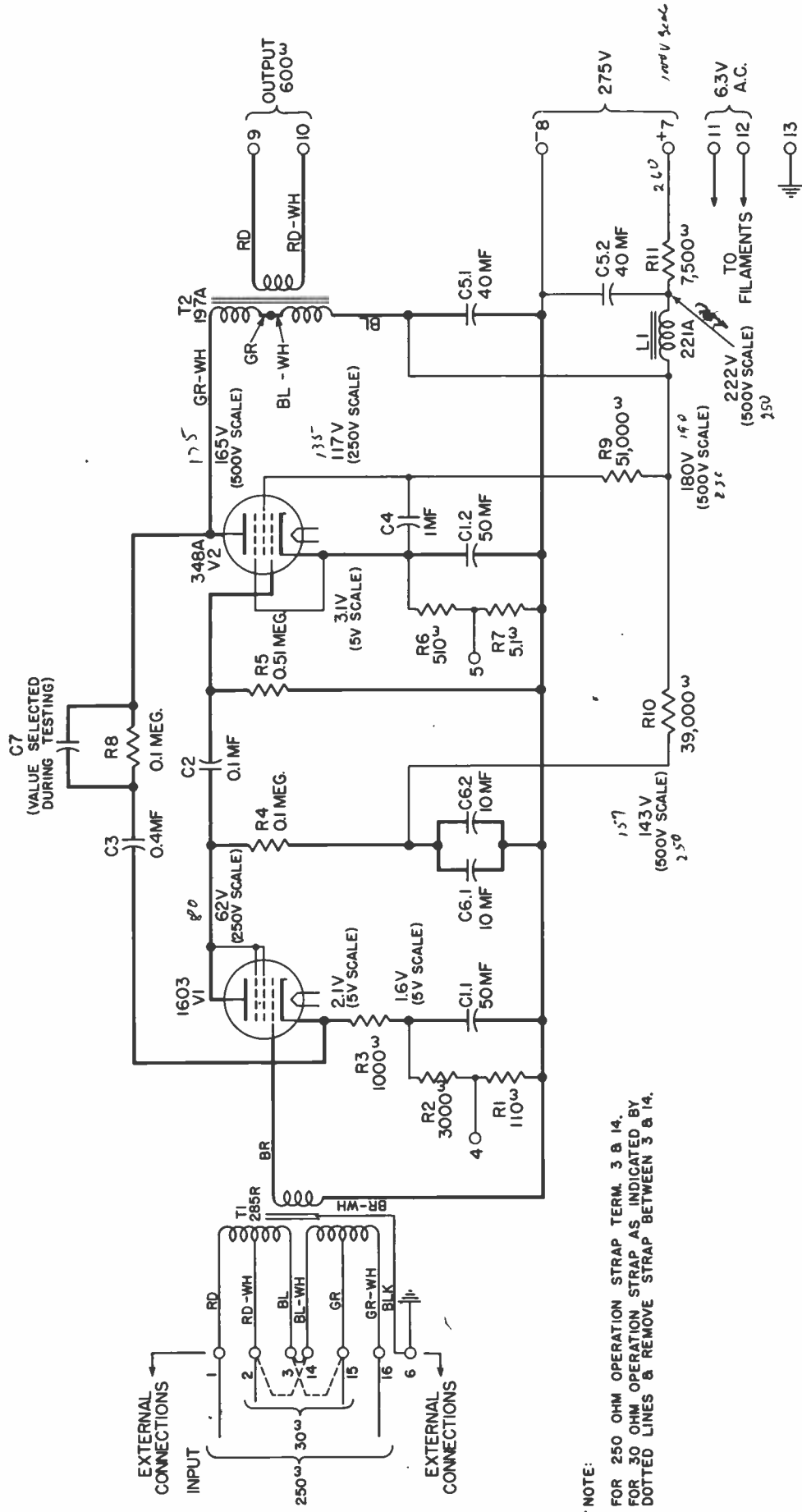


Fig. 3—120C Amplifier Schematic

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