

McIntosh

Laboratory Inc.

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CABLE "MCLAB"

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INSTRUCTION BOOK

20W-2

McINTOSH AMPLIFIER

Pat. No. 2,477,074
and patents pending

INSTRUCTION BOOK FOR

20W-2

McINTOSH AMPLIFIER

DESCRIPTION

The output circuit of the McIntosh Amplifier is the first of its kind and provides 100% coupling between the two primary windings of the output transformer. Almost perfect magnetic coupling is achieved by winding the two primary windings together or bifilarly as if they were one wire. In order to cancel the static magnetic fields due to the flow of direct current through the windings, and, at the same time, arrange that the AC components from the tubes add in-phase, the circuit as shown in the schematic diagram is used. This arrangement provides a "take-turn" primary for the operation of the output tubes in contrast to the conventional "push-pull" circuit where one half of a series winding is used for one tube and the other half of the winding for the other tube. The McINTOSH Circuit, because of the high mutual coupling between windings, from an AC standpoint, utilizes essentially the same coils. This circuit provides a large frequency response advantage over conventional output circuits for the following reason. The impedance between the two tubes has been reduced over the conventional circuit by a factor of 4 to 1 since the turns ratio is reduced by a factor of 2 to 1; a reduction of leakage inductance between primary and secondary of 4 to 1 is achieved because of the relative turn ratio reduction of 2 to 1. These factors in part account for the large advantage over the conventional "push-pull" circuit and are a major contribution to the wide band and low phase shift of the high efficiency McINTOSH Amplifier. It will be further observed that the load is 1/2 in the cathode and 1/2 in the plate for each of the tubes. This arrangement provides directly a feedback factor of approximately 12 db. The remaining feedback is obtained through a balanced loop to the input of the phase inverter.

Considerable care has been given the problem of impulse distortion, and one of the basic reasons for using the bifilar choke input to the final stage, as indicated in the schematic diagram, is to provide a low grid circuit resistance path to DC which circumvents the usual difficulty of excessive bias resulting from transient or impulse program material.

The circuit used permits the maximum possible efficiency of wide band amplifiers, and yet operates at full output with substantially less than 1% harmonic distortion measured at any single frequency from 20 cycles to 20,000 cycles.

ELECTRICAL DESIGN

The circuit consists of two 6V6-GT tubes in the final stage, driven by two 6J5 tubes operated in push pull -- one 12AX7 tube consisting of two triodes for the inverter amplifier stage. This is the basic amplifier and it has a power gain of approximately 40 db requiring a maximum of 2 volts input at the grid of the phase inverter. CAUTION: Avoid excessive grid drive voltages as prolonged excessive voltages will injure the

6V6-G tubes.

PREAMPLIFIER

A preamplifier permits, by merely plugging it in, an additional gain of 30 db. When a preamplifier is used, the input plug is inserted in the "Trans" socket instead of the "Preamp" position as is the case when a preamp is not used.

INPUT TRANSFORMER

The addition of a plug-in input transformer will provide an additional gain of 26 db for the 30-50 winding; 17 db through the 250 ohm winding; and 12 db through the 600 ohm winding. Approximately 2 db gain is realized through the bridging coil. These coils are available in double and triple shielding. The double shielded coil provides 80 db of isolation to noise fields while triple shielding provides 90 db isolation to noise fields.

MECHANICAL DESIGN

The McIntOSH 20W-2 Amplifier consists of one basic unit 8-1/8 by 6-3/4 by 5-1/4 inches. The driver coil, output coil, power transformer and choke coil are potted in a box case and the top of this case serves the double function of being the enclosure for the transformers and the chassis of the amplifier itself. The top unit includes various sockets which are used for tubes, pre-amplifiers, and/or input transformers. The edge formed by the top and bottom pieces of the cases serves as an edge for mounting the units. Either one or two 20W-2 amplifiers may be mounted on a relay rack panel 7 by 19 inches. Wall or shelf mounting brackets and portable covers are also available.

INSTALLATION

To install amplifier proceed as follows:

- 1) As a precaution against overload of amplifier or load device such as speaker or cutter head, set volume control of amplifier unit to zero, extreme clock-counter-clockwise position.
- 2) Put all tubes into sockets as indicated on diagram and as marked on amplifier and power supply units.
- 3) If an input transformer is used, plug into socket marked "TRANS".
- 4) If type ACF-1 preamplifier is used, insert a 12AX7 tube in this unit and insert in socket marked "PRE-AMP".
- 5) Connect "Input" Plug. The input plug has a connector between Terminal 1 and metal shield of plug while "output" plug does not. A shielded input lead preferably of low capacity should be connected between Terminals 1 and 2 with the shield grounded on Terminal 1. Other connections on input plug apply when input trans-

former is used, as shown in charts on schematic diagram. Insert Input Plug into socket as shown on pictorial diagram.

NOTE: If the McINTOSH AE-2A Amplifier-Equalizer is used, no input plug connector is required as this plug is furnished with the AE-2A unit. It is only necessary to insert this plug into socket marked "PRE-AMP" on amplifier unit.

6) Connect output plug as explained on the schematic diagram for the proper output impedance. Provision is made for 4, 8, 16, 32, and 600 ohm output impedances. The 600 ohm winding must not be grounded on either side as the midpoint of this winding is grounded.

7) Insert the A.C. line plug into available wall or convenience outlet.

8) Install fused plug in socket marked "SW-FUSE". This plug acts as the switch when no panel is used. When panel is used, the plug from the panel is inserted in the receptacle marked "SW-FUSE" and then the switch on the panel may be used to turn set on and off.

9) The amplifier is now ready to operate and the volume control marked "VC" can be advanced cautiously to insure no unusually large signals are placed on the load and amplifier.

10) If either the ACF-1 Pre-Amplifier or the AE-2A Amplifier-Equalizer is used, the A.C. hum level is affected by the adjustment of the control marked "HUM. ADJ."

ELECTRICAL AND MECHANICAL

SPECIFICATIONS

Power Supply	117/125 volts at 60 cycles .
Power Consumption	90 watts at 20-watt output. 55 watts at zero signal output.
Power Output	20 watts continuous. 40 watts instantaneous peak.
Efficiency	60% at 20 watts.
Gain	Minimum, 40 db; maximum, 95 db. (Maximum gain available with Pre-Amp and Transformer.)
Frequency Range	20 to 20,000 cycles \pm .1 db; 10 to 100,000 cycles \pm 3 db.
Distortion	Less than 1% at 20 watts output 20 to 20,000 cycles.
Intermodulation Distortion RMS	1% or less if instantaneous peak power is below 40 watts.

Impulse Distortion	Negligible .
Noise Level	85 db below rated output; 70 db with Pre-Amp.
Damping Factor	10 or better for 4, 8, 16 and 32 ohm output windings and approximately 17 for 600 ohm winding.
Input Impedance	100,000 ohms from 20 cycles to 40 KC; with input transformer, 50, 250, or 600 ohms or bridging (20,000 ohms).
Output Impedance	4, 8, 16, 32 or (600 ohms balanced.)
Tube Complement	Rectifier: 5Z4, 5Y3GT Pre-Amp: 12AX7 Phase Inverter: 12AX7 Drivers: 2 -- 6J5 Power Output: 2 -- 6V6-GT

GUARANTEE

We guarantee the performance of this equipment and the mechanical and electrical workmanship to be free of serious defects for a period of 90 days with the exception that we do not guarantee the tubes or filter condensers beyond that of their manufacturers.

U. S. Patent No. 2477074 -- Other Patents Pending
Printed in U. S. A.

McINTOSH LABORATORY, INC

PARTS LIST FOR 20W-2 AMPLIFIER

R1	100K potentiometer
R2, R3	560K, 1/2 watt
R4, R5	1000 ohm + 1% 1/2 watt
R6	15K + 1% 1/2 watt
R7	30K + 1% 1/2 watt
R8, R9	100K 1/2 watt
R10, R11	560K 1/2 Watt
R12	1200 ohm 1/2 watt
R13, R14	68K + 1% 1/2 watt
R15	100K 1 watt
R16, R17	56K 1 watt
R18, R19	2200 ohm 1 watt
R20, R21	3300 ohm 1/2 watt
R22	22K 1/2 watt
R23, R24	560K 1/2 watt
R25	470 ohm 1/2 watt
R26, R27	100K 1/2 watt
R28	22K 1/2 watt
R29	1800 ohm 1/2 watt
R30	4700 ohm 1/2 watt
R31, R32	10K 1/2 watt
R33	100 - 1000 ohm potentiometer
C1	.5 mf 200V
C2, C3, C4	.05 mf 200V
C5, C6	20-20-20-20 mf 450V
C7	20-20-20 mf 150V
C8, C9, C10	.03 mf 200V

TUBES

V1, V2	6V6-GT
V3, V4	6J5
V5, V6	12AX7
V7	5Z4, 5Z4-GT, 5Y3, 5Y3-GT

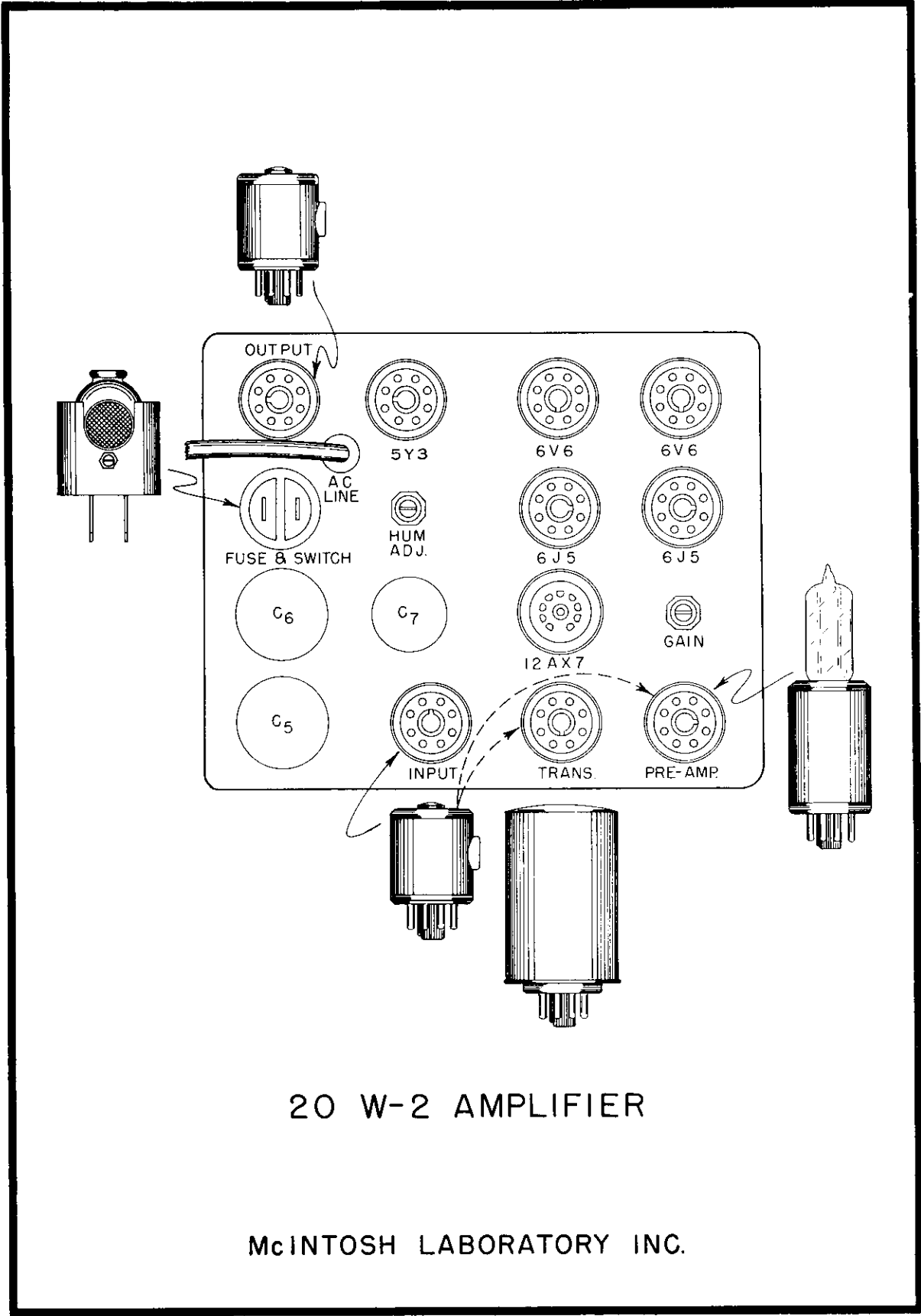
TRANSFORMERS

L1	20W-2 Choke
T1	20W-2 Power Trans.
T2	20W-2 Driver Trans.
T3	20W-2 Output Trans.
SE-101 Selenium Rectifier	40MA - 5 Plate

ACCESSORIES

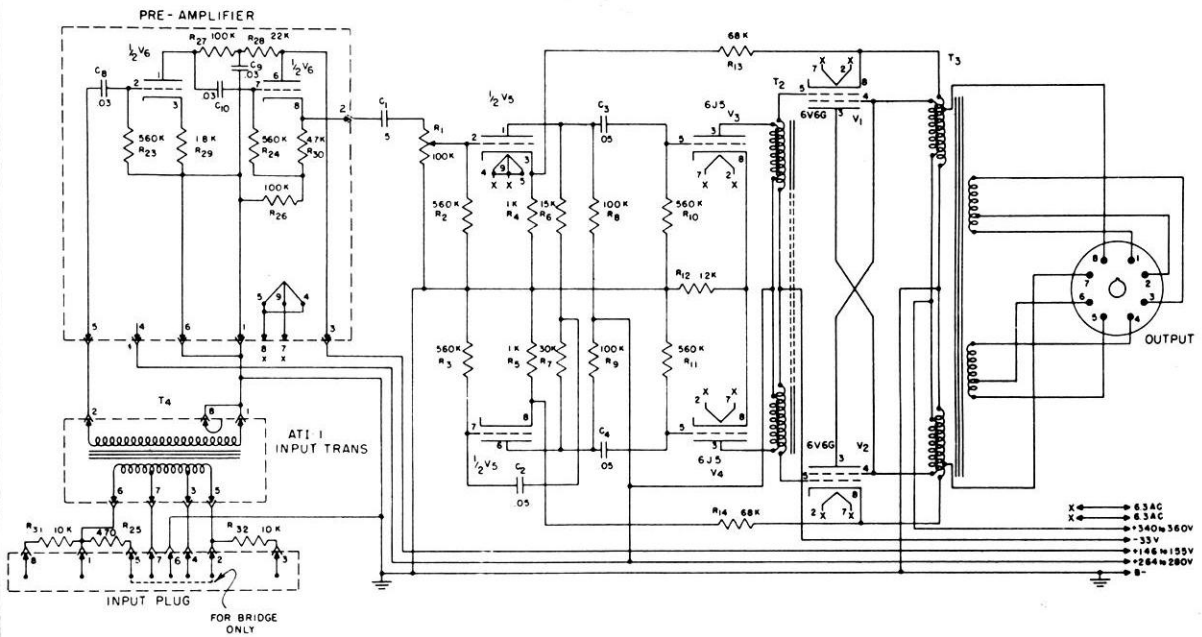
Part Number

ATI-1	30-50, 250, 600 ohm Input Transformer, Double Shielded
ATI-1A	30-50, 250, 600 ohm Input Transformer, Triple Shielded
ATI-2	Bridging Transformer
ATI-3	50-60, 200-250 ohm Input Transformer, Double Shielded
ACF-1	Plug-in Pre-Amp -- Gain 30 db.
NAB-2	Plug-in Amplifier-Equalizer (NAB standard) -- Gain 15 db at 20 KC
538-20	Relay Rack Mount Panel 7 x 19 inches, for one amplifier.
538-50	" " " " 7 x 19 inches, for two amplifiers.
MB-1	Wall or shelf mounting brackets.
672	Portable cover.



20 W-2 AMPLIFIER

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ATI-1 INPUT PLUG CONNECTIONS

IMPEDANCE	CONNECT TO
50 Ω	7 - 1
250 Ω	4 - 1
500 Ω	2 - 1
20,000 Ω BRIDGE	3 - 8, JUMPER 5-2

ATI-3 INPUT PLUG CONNECTIONS

IMPEDANCE	JUMPER	CONNECT TO
50-52.5 Ω	1-2, 4-7	4-1
200-250 Ω	7-2	4-1

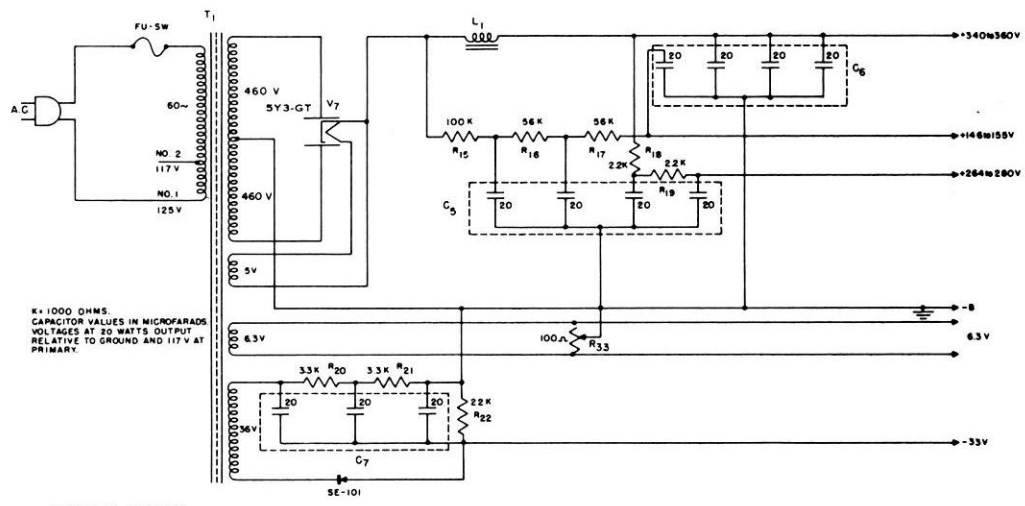
OUTPUT PLUG CONNECTIONS

IMPEDANCE	CONNECT TO	JUMPER PIN NUMBERS
4 Ω	1 - 6	1-5, 3-6
8 Ω	1 - 4	1-5, 3-4
16 Ω	1 - 6	2-5
32 Ω	1 - 4	3-5
500 Ω	7 - 8	

ATI-2 INPUT PLUG CONNECTIONS
CONNECT TO PINS 1 & 2 OF INPUT PLUG

NOTE
FOR HIGH IMPEDANCE INPUT, DIRECT TO PRE-AMPLIFIER OR INVERTER AMPLIFIER, CONNECT TO TERMINALS 2 & 1, 1-GROUND.

- X → 6.3 AC
- X → 6.3 AC
- X → +340m360V
- -33V
- +146m155V
- +264m280V
- G



K = 1000 OHMS.
CAPACITOR VALUES IN MICROFARADS
VOLTAGES AT 20 WATTS OUTPUT
RELATIVE TO GROUND AND 117 V AT
PRIMARY.

PATENT NO. 2,477,074
OTHER PATENTS PENDING

20 W-2 AMPLIFIER

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