

AMERITRON AL-80A

HIGH POWER LINEAR AMPLIFIER

INSTRUCTION MANUAL



The Ameritron AL-80A Linear Amplifier is designed for over 1000 Watts output SSB PEP (850 Watts output on CW) with high efficiency and total reliability. The AL-80A covers the amateur radio bands 160 through 15 meters. It also features wide frequency coverage for MARS and other services authorized to operate at high power.

The AL-80A uses an Eimac 3-500Z high-mu triode in a class AB₂ grounded grid circuit.

A built-in ALC circuit prevents the amplifier output from flat-topping if the exciter gain is inadvertently set too high.

The AL-80A is factory wired for 117V, 50/60 Hz primary line voltage.

AMERITRON

DIVISION OF
PRIME INSTRUMENTS, INC.

9805 Walford Avenue • Cleveland, Ohio 44102

VENTILATION

The AL-80A ventilation system has been designed and tested to maintain tube seal temperatures safely below the tube manufacturer's rating when operated within our guidelines.

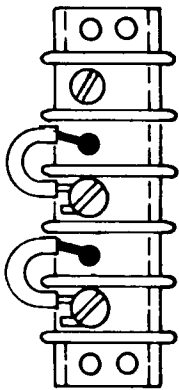
To insure proper ventilation in your installation, observe the following:

1. Do not block or restrict the ventilation holes in the cover.
2. The exhaust air flow is over 50 CFM. Do not "assist" the air flow unless the fan used exceeds the AL-80A blower CFM by a factor of 2:1.
3. Do not mount additional fans on the AL-80A cabinet.
4. The exhaust air will become quite warm at high power levels. Do not place any heat sensitive objects in the exhaust air stream.

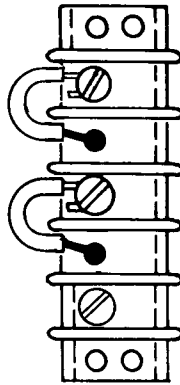
POWER CONNECTIONS

The AL-80A is supplied with a NEMA 5-15P plug for 117 VAC operation. The AL-80A can be modified for 234 VAC operation. If you desire to make this modification, two jumper wires must be moved to new locations on the terminal block. (see illustration below) The terminal block is located on the left side of the rear panel.

The wiring between the fuse box and the amplifier A.C. outlet must be No. 12 gauge or larger in order to supply the current required (15 amperes) without a significant drop in line voltage. The 117V outlet should be fused for 20 amperes.



117 VOLT OPERATION



234 VOLT OPERATION

ALC

Use a shielded audio-type cable to connect the 0-20 volt negative ALC voltage to the transmitter ALC input. Consult the transmitter manual for proper connection details. The amplifier must be properly tuned on CW before adjusting the ALC.

Proper adjustment is achieved as follows:

1. Set the MULTIMETER switch to the PO position.
2. Set the transmitter audio control about 20% higher than normal.
3. Speak into the microphone in a normal tone of voice and observe the reading on the 0-2000 R.F. Watts scale.
4. Adjust the ALC ADJ control on the rear panel until the amplifier is not clipping on an RF scope.
5. If an RF scope is not available, adjust the ALC control so the audio peaks do not exceed the single tone output of 1000 watts.

METERING FUNCTIONS

The AL-80A has two illuminated panel meters. The Grid Current meter provides a continuous reading of grid current. This is an exclusive feature of Ameritron amplifiers. Grid current will indicate proper operation of the amplifier better than any other parameter. Do not exceed 200 mA on this meter during operation of the amplifier. The other meter reads Plate Voltage (HV), Plate Current (Ip), Peak R.F. Watts (PO) and ALC. The functions are explained as follows:

PLATE VOLTAGE (HV): Read D.C. Plate Voltage on the 0-3500 Volt scale. This scale is 100 volts per division. Normal voltages are 3100 volts no load, 2700 volts full load.

PLATE CURRENT (Ip): Read Plate Current on the 0-700 mA scale. This scale is 20 mA per division. The average operating current rating of the 3-500z is 400 mA maximum.

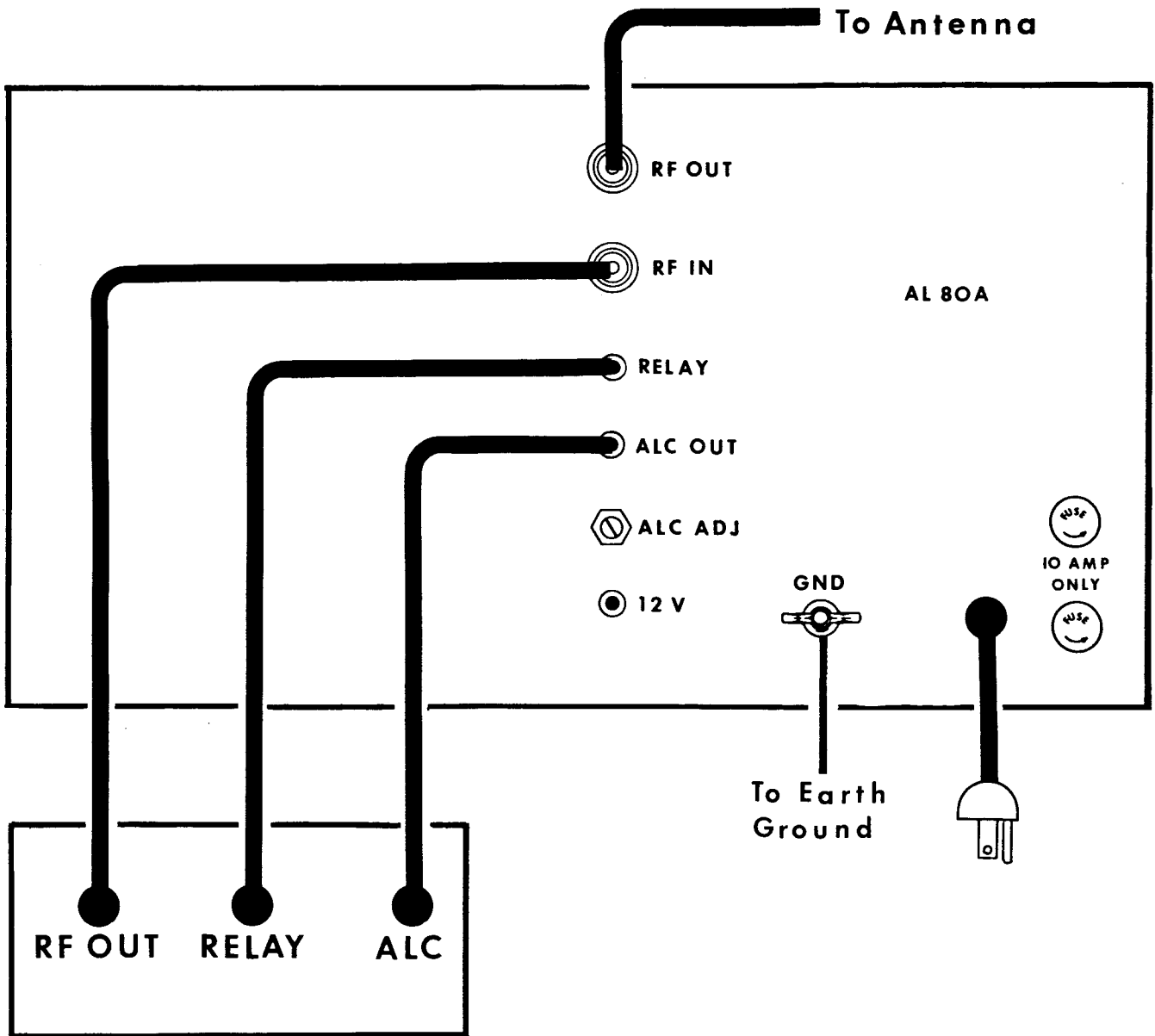
PEAK R.F. WATTS (PO): Read Peak R.F. Watts on the 0-2000 scale. The scale has 50 watt divisions below 1000 watts and 100 watt divisions above 1000 watts.

ALC: In this position the meter indicates the ALC detector voltage. It provides a relative drive level indication of 200 watts full scale. The approximate drive level (average, not PEP) can be estimated by dividing the Peak R.F. Watts scale by 10.

IMPORTANT

Do not make any modifications to the AL-80A circuit before checking with our engineering staff. Improper changes may damage the AL-80A and void the warranty.

Connection Diagram

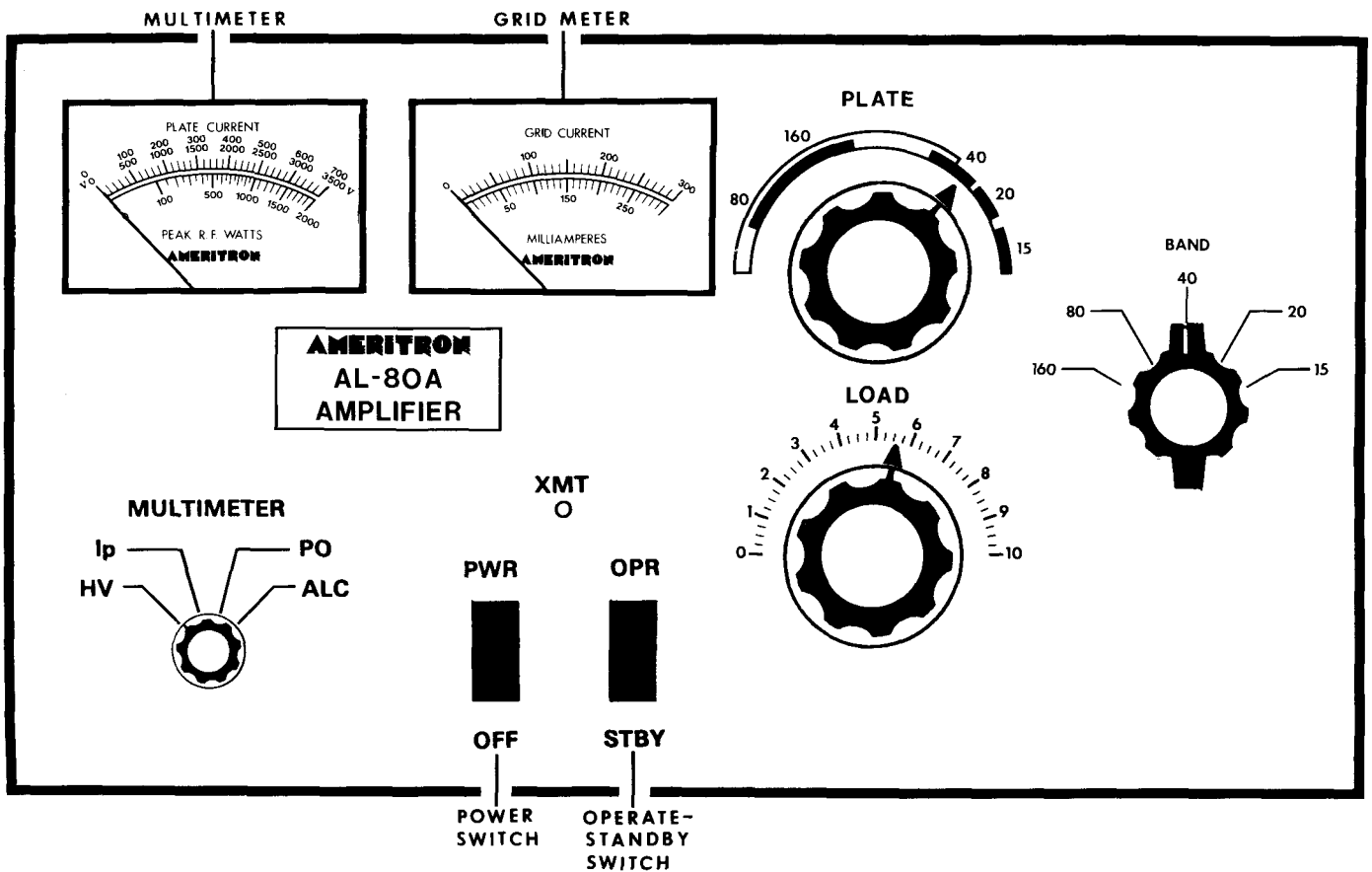


Transmitter or
Transceiver

INSTALLATION

Connect the RF output of the transmitter to the RF IN connector on the rear of the AL-80A with 50 ohm coax. Connect the existing station antenna system to the RF OUT connector on the AL-80A with RG-8 type coax. Connect the RELAY phono jack on the rear of the AL-80A to the normally open terminals of the RELAY jack on the transmitter. The RELAY jack on the AL-80A has positive 12 VDC open circuit and provides 100 MA of current when pulled to ground. Connect as short a ground lead as possible from a good earth ground to the GND terminal.

The 12V connection on the rear panel provides 12 VDC at 100 MA maximum to operate external dial lamps or accessories.



TUNING INSTRUCTIONS

Follow the instructions in numerical order. If the various meter readings are different than indicated in the instructions, check the connections from the exciter to the amplifier and make sure they are correct. Consult the manual for the exciter if necessary.

1. Set the AL-80A front panel switches as follows:
 PWR - OFF to OFF
 OPR - STBY to STBY
 MULTIMETER to HV
2. Plug the A.C. line cord into the proper voltage outlet. The AL-80A is factory wired for 117VAC 50/60 Hz operation.
3. Set the PWR-OFF switch to PWR. The meter lamps should light and the blower should start. Read the 0-3500V scale on the multimeter. It should indicate 3100 volts nominal.
4. With the amplifier still on standby, tune the exciter into the normal 50 ohm load according to the manufacturer's instructions. Turn the exciter drive fully down after tuning.
5. Place the bandswitch on the same band as the exciter, the PLATE tuning control in the dial range for the band selected and the LOAD control at the recommended point for the band in use.
6. With the exciter drive still at zero, place the MULTIMETER switch in the Ip position. Observe the 0-700 mA scale. It should read zero. Place the STBY-OPR switch in the OPR position.

7. Key the exciter (no drive) and observe the plate current on the 0-700 mA scale. Plate current should now read between 50 mA and 100 mA.
8. Apply only enough drive to indicate a grid current of 50 mA or an Ip of no more than 200 mA. Tune the PLATE control for maximum grid current. It is normal for the plate current to dip at this point. If the grid current goes over 100 mA reduce the drive at once. Unkey the exciter.
9. Place the MULTIMETER switch in the PO position and observe the 0-2000 peak R.F. watts scale. Apply the same drive again and adjust the LOAD and PLATE controls for maximum output on the 0-2000 scale.
10. Increase the drive until 125mA of grid current is indicated. Adjust the LOAD and PLATE controls again for maximum output. The grid current will be lower now.
11. Advance the drive to 200 mA of grid current. Adjust the LOAD and PLATE controls for maximum output power. (Repeat this step twice.) The output should be around 1000 watts now with 100 watts of exciter power.
12. Apply enough drive to indicate either 1000 watts of output power or 200 mA of grid current. Re-peak the LOAD and PLATE controls. The grid current must not be over 200 mA, the plate current over 550mA or the output over 1200 watts.
13. In CW operation the drive power should be reduced until the plate current is 400 mA or less. For SSB operation the modulation crest should not exceed 400 mA plate current, 100 mA grid current or 1200 watts PEP output.

TUNING CHART (Typical)

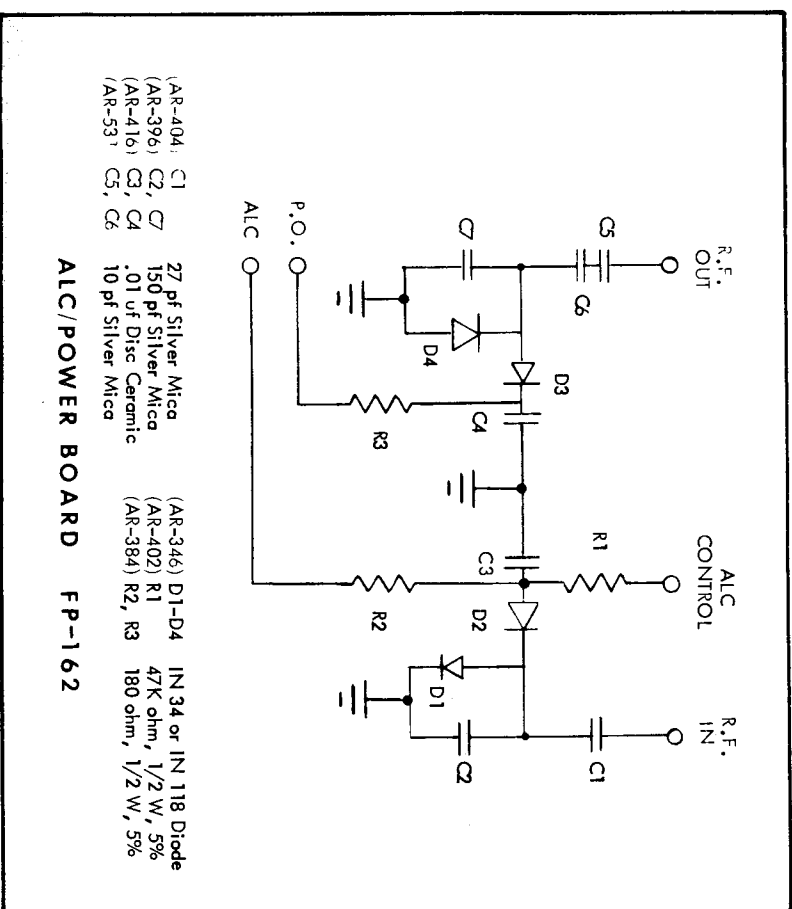
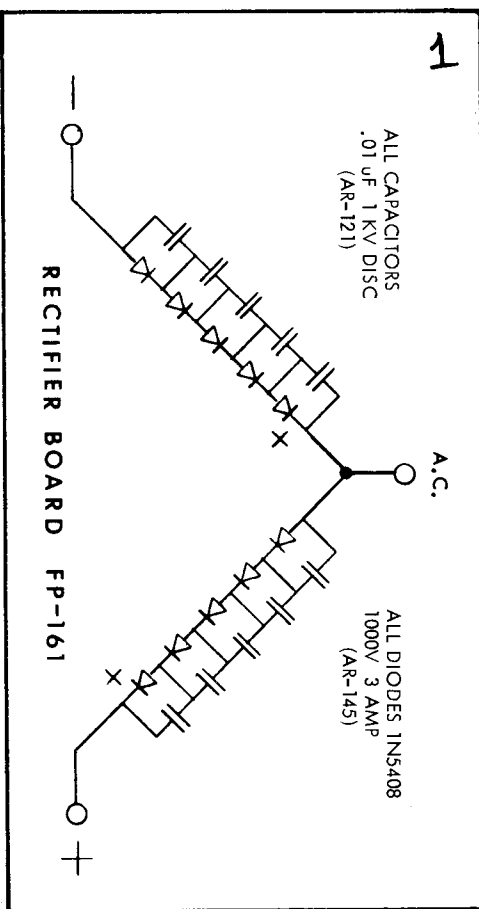
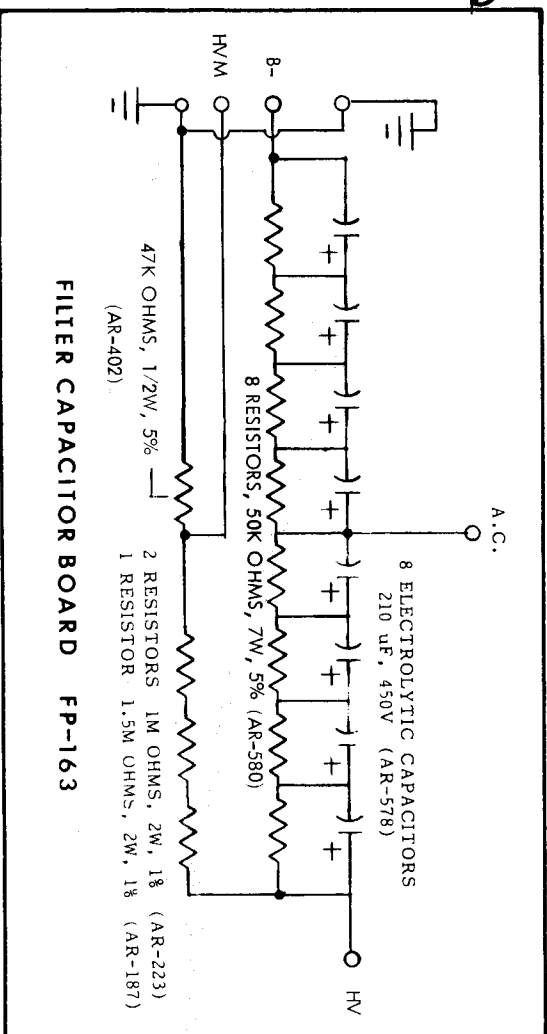
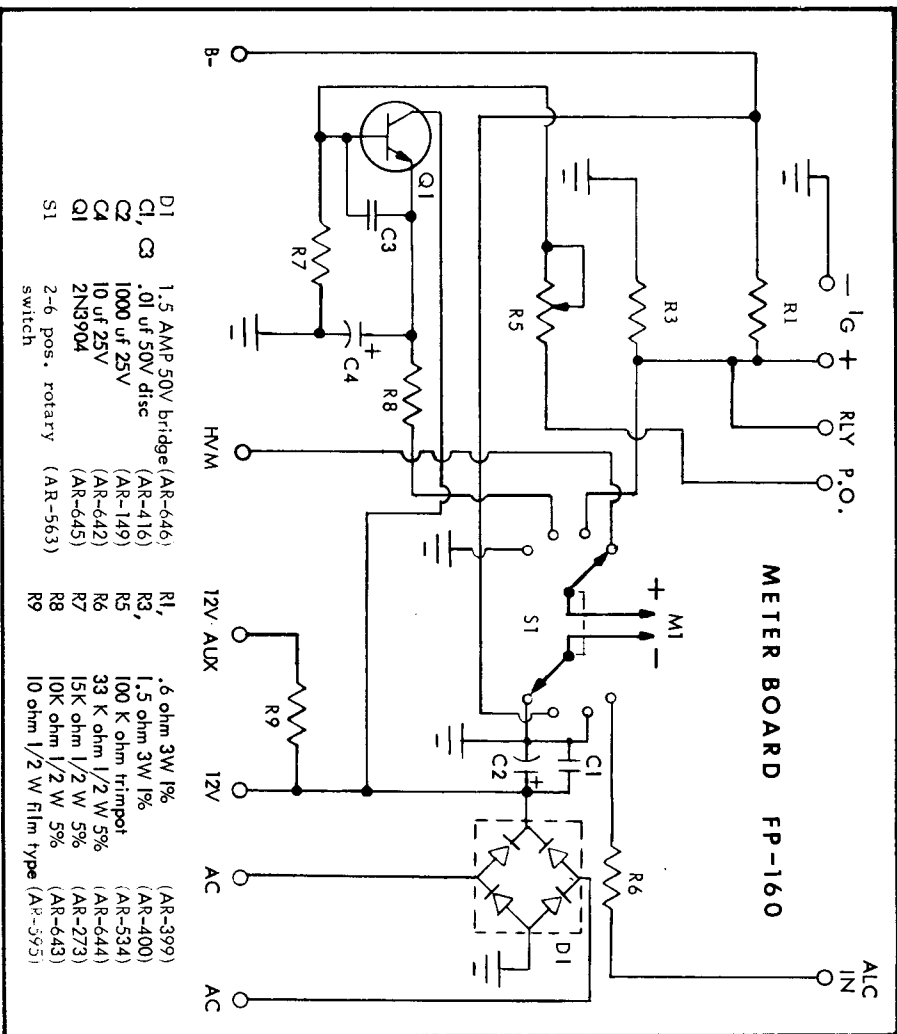
FREQUENCY	BANDSWITCH	PLATE CONTROL	LOAD CONTROL
1.85	160	160	4
3.5	80	80	1½
3.8	80	80	3½
7.2	40	40	5
14.2	20	20	5½
21.2	15	15	7½
*24.5	10	20	7
*28.7	10	15	8

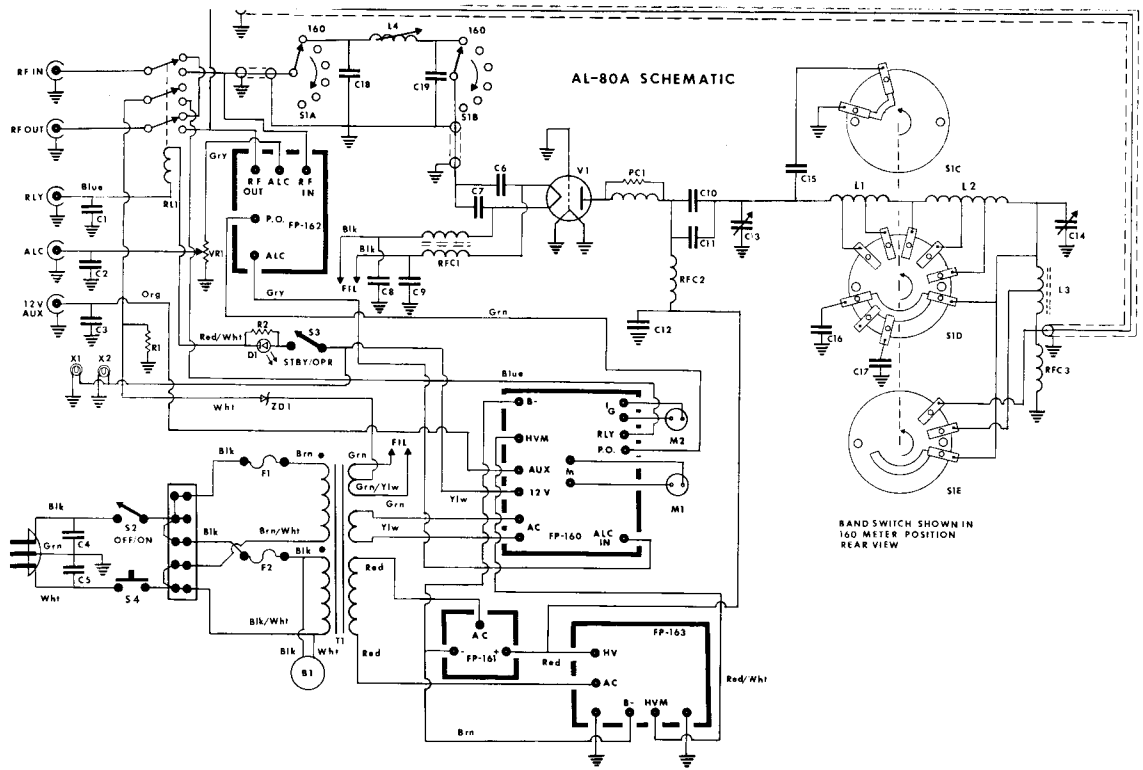
* AL-80AX (export model)

The AL-80A will operate with full output on all WARC bands except 24.5 MHz. The AL-80AX (export model) will operate with full output on all WARC bands.

STANDARD FREQUENCY COVERAGE

AL-80A		AL-80AX	
160 meters	1.8-2.0 MHz	160 meters	1.8-2.0 MHz
80 meters	3.3-4.4 MHz	80 meters	3.3-4.4 MHz
40 meters	6.3-8.3 MHz	40 meters	6.3-8.3 MHz
20 meters	9.5-15.5 MHz	20 meters	9.5-15.5 MHz
15 meters	15.5-21.5 MHz	15 meters	15.5-21.5 MHz
		10 meters	24-29 MHz





AL-80A Tuned Input Chart

Band	Input		Output	
	C 18 pf	L 4	C 19 pf	
160	3300 (AR-690)	28t. (FP-149)	2700 (AR-689)	
80	1000 (AR-176)	21t. (FP-150)	820 (AR-381)	
40	500 (AR-691)	14½t. (FP-151)	360 (AR-688)	
20	220 (AR-175)	9½t. (FP-152)	120 (AR-606)	
15	150 (AR-396)	5½t. (FP-153)	68 (AR-395)	
10*	100 (AR-174)	3½t. (FP-154)	27 (AR-404)	

*Export models only

PARTS LIST

- | | | | |
|------------|---|-------|--|
| B 1 | TA-450s Fan #A30390-10 (AR-138) | L 3 | "L" coil T 200-2 toroidal core (FP-165) |
| C 1,2,3 | .01 uf 50V disc (AR-416) | L 4 | See input chart |
| C 4,5 | .01 uf 1.4 KV disc (AR-122) | M 1 | Multimeter, 0-1 mA 420 ohm (AR-692) |
| C 6,7,8,9 | .01 uf 1 KV disc (AR-121) | M 2 | Grid meter, 0-1 mA 450 ohm (AR-693) |
| C 10,11,12 | .001 uf 7.5 KV disc (AR-224) | PC 1 | Parasitic choke and plate cap assembly (FP-11) |
| C 13 | Plate tuning 250 pf .075" spacing variable (AR-112) | R 1 | 47K ohm, ½ watt carbon (AR-402) |
| C 14 | Loading 800 pf 1.2 KV variable (AR-573) | R 2 | 33 ohm, ½ watt carbon (AR-403) |
| C 15,17 | 170 pf N750,850 series doorknob (AR-559) | RFC 1 | Filament choke (FP-115) |
| C 16 | 500 pf, 850 series doorknob (AR-412) | RFC 2 | Plate Choke (FP-139) |
| C 18,19 | See input chart | RFC 3 | Safety choke (AR-162) |
| D 1 | Green L.E.D. (AR-523) | RL 1 | 3 PDT 10A relay, 12 VDC (AR-139) |
| F 1,2 | 10 amp fuse 3AG (AR-150) | S 1 | Bandswitch (AR-136-2) |
| FP-160 | Meter board assembly | S 2,3 | Rocker switch (AR-147) |
| FP-161 | H.V. rectifier board assembly | S 4 | Interlock switch (AR-247) |
| FP-162 | P.O./ALC detector board assembly | T 1 | Power transformer (AR-109-2) |
| FP-163 | H.V. filter capacitor board assembly | V 1 | 3-500Z tube (AR-167) |
| L 1 | H.F. coil 8 ga. tin plated (FP-164) | VR 1 | 100K ohm, ½ watt ALC control (AR-274) |
| L 2 | L.F. coil 2" I.D. #12 airdux (AR-669) | X 1,2 | 12V wire lead meter lamps (AR-164) |
| | | ZD 1 | 7.5V 10 watt anode to case (AR-604) |

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**SYMBOL OF ENGINEERING INTEGRITY . . . QUALITY
WORKMANSHIP . . . RELIABLE LONG-LIFE PERFORMANCE**

TECHNICAL SPECIFICATIONS AL-80A

Input

circuit type: Pi-network
maximum VSWR at resonance: 1.3:1 or less
minimum 2:1 VSWR bandwidth: 20% or greater
maximum drive power permissible: 100 w
typical drive for full power output: 85 w

Output

circuit type: Pi-L network
½ hour continuous carrier: 500 watts
30 second continuous carrier: 850 watts
½ hour PEP two-tone test: 850 watts
30 second PEP two-tone test: 1000 watts

Power Supply

circuit type: voltage doubler
no load voltage: 3000
full load voltage: 2700
full load current: .450 amp
regulation: 10%
transformer: 22 lbs.
capacitors: computer grade, 26 mfd total
maximum draw at rated output: 12 amps at 120 v 50/60 Hz

Tube

type: 3-500Z

continuous dissipation: 500 w

warm-up time: 10 seconds

estimated life: 20,000 hours

factory cost: \$90.00

Metering: dual meters; plate volts, plate current, grid current,
power output PEP

ALC: adjustable, 0-20 v, negative going, phono jack

Efficiency CW: $\approx 70\%$

Efficiency SSB (envelope crest): $\approx 70\%$

MARS/WARC: yes, set to nearest amateur band

Keying: requires contact closure or sink of +12 VDC at 100 mA, phono
jack

RF Connectors: SO239

Line Connector: NEMA 5-15P, standard 120 v three wire

Dimensions: 15½" D. x 14½" W. x 8" H.

Weight: 60 lbs.

Frequency Coverage: all amateur bands from 1.8 to 21 MHz, including
WARC and most MARS

Third Order IMD at Rated Output: -35 dB

AMERITRON

AL-80A

UNPACKING INSTRUCTIONS

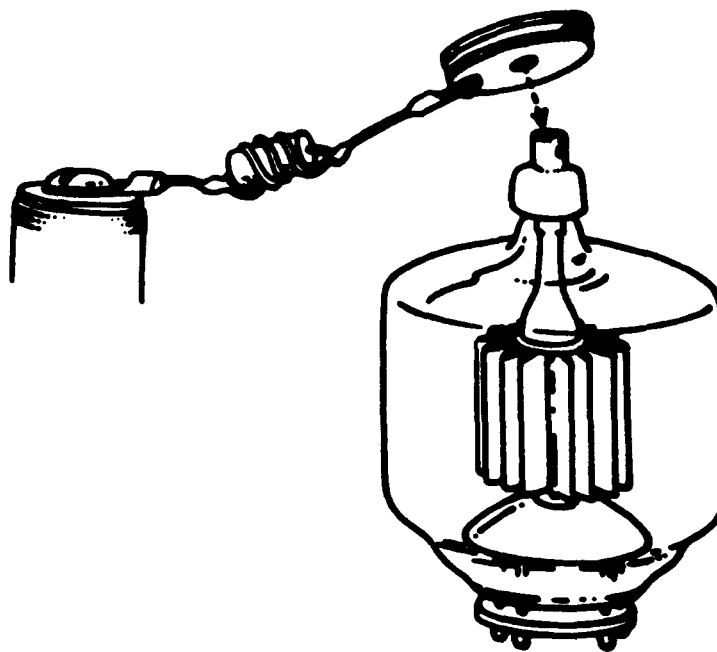
Carefully lift the amplifier out of the packing material. Examine it for visible damage. If the amplifier has been damaged in shipment, notify the transportation company.

Remove the Phillips screws holding the cover on. Slide the cover back and remove it from the amplifier.

Remove the packing material from the plate cap assembly.

TUBE INSTALLATION

Insert the 3-500Z tube into the socket on the amplifier chassis. Install the plate cap connector on the tube cap and secure it in place with the screw provided. **BE SURE** the solder lug is on the underside of the connector - see illustration. **DO NOT** over-tighten the screw. Replace the amplifier cover and the 13 screws that secure it. The additional screws are attached to these instructions.



IMPORTANT

Save all the hardware and packing materials in case you ever need to return your AL-80A for factory service. Any units returned without proper packing may be damaged and shipping claims cannot be made.

Never ship the amplifier with the tube installed.

AR109-2B

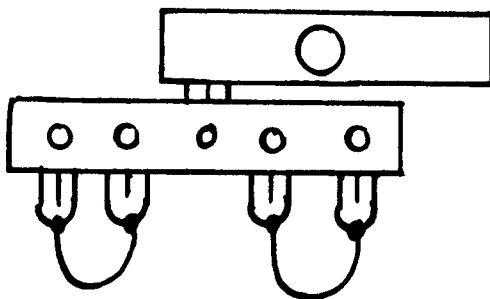
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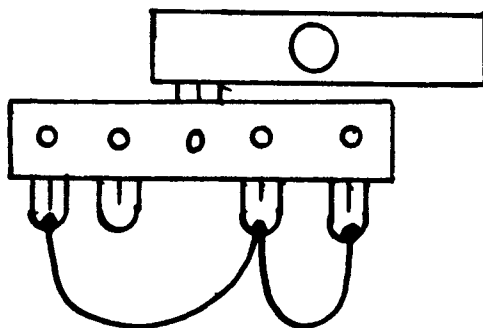
THIS AMPLIFIER HAS AN OPTIONAL MULTI-VOLTAGE TRANSFORMER.

FOR OPERATION ON VOLTAGES OTHER THAN THE DESIGN CENTER THE BUCK-
BOOST WINDING CAN BE USED TO IMPROVE PERFORMANCE.

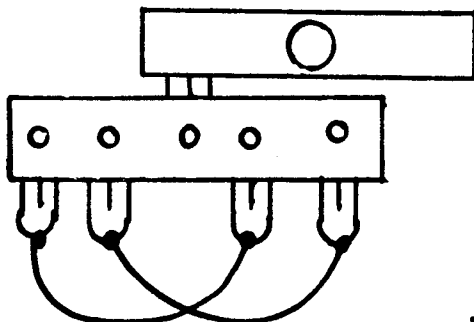
DO NOT EXCEED 3200 VOLTS HIGH VOLTAGE!



A. VOLTAGE 120/240



B. VOLTAGE 115/235



C. VOLTAGE 110/230

FREQUENCY 60 Hz / 50 Hz
all / "B and
"C"

K4XL's **BAMA**

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