FILE COPY

AFTERBURNER

ORDER NO. 420

BASE STATION 115V AC
BI-LATERAL LINEAR AMPLIFIER

INSTALLATION & OPERATION INSTRUCTIONS

AFTERBURNER
Rural Route 3
Lincoln, Nebraska 68505

GENERAL DESCRIPTION:

The Bi-Lateral Amplifier is a precision built, compact amplifier of advanced design. It utilizes an integrated circuit, two tubes, two transistors and three diodes and a grounded grid, tuned plate circuit for amplification of AM, FM, CW, and SSB signals in the 25-54MHz range.

A special feature of the Amplifier is the automatic antenna change over relay which operates without special external connections making it perfect for operation with low power transceivers not having external amplifier control circuits.

Another feature is that this unit amplifies the received signal, utilizing an integrated circuit amplifier.

Variable plate tune and load capacitors offer impedance matching for maximum output to varying antenna loads in the 40-70 ohm range.

The Bi-Lateral Amplifier has been designed and constructed to suppress radiation that may cause television interference. TVI problem has been given full consideration in design and layout of the chassis.

There are, however, some types of TVI that cannot be prevented within the amplifier. This is particularly true in weak signal areas. In such cases, a good commercial low pass filter is recommended.

MECHANICAL SPECIFICATIONS:

Height	4 1/8"
Width	7 1/8"
Depth	10 3/8"
Net Weight	11 Lbs.
Shipping Weight	12 Lbs.
Construction	Lightweight aluminum chassis with rugged steel case

ELECTRICAL SPECIFICATIONS:

Power Requirement	115 V AC, 3 Amp
Frequency Range	25-54 MHz
Types of Emmission	AM, FM, CW, SSB, DSB
Power Output (Slightly less at 50 MHz)	220 Watts PEP, SSB, or DSB; 100 Watts (with 3.5 watts drive)
Amplification of Received Signal	20 db
Drive Requirement to Trigger Antenna Relay	1 Watt
Max Drive (unmodulated carrier)	15 Watts
Odd Order Distortion Products	30 db below peak output
Harmonic Suppression	2nd Harmonic at least 35 db below peak output
Input Impedance (unbalanced)	50 Ohms nominal, less than 2:1 VSWR 25-54 MHz
Output Impedance(unbalanced)	50 Ohms nominal, Adjustable 40-70 ohms, nonreactive
Antenna Switching	Automatic provided by RF sensing network
Tube and Diode Complement	2 Tubes, 2 Transistors, 3 Diodes, 1 Integrated Circuit
Cable Connector Data	Input and Output require MIL PL-259

ASSEMBLY AND INSTALLATION:

( ) Carefully remove the amplifier from the packing carton. Examine it closely for signs of shipping damage. Remove the four screws holding the top cabinet and remove all hold-down tape and packing materials. Check to insure tubes are seated in the sockets. Install the plate caps on the tubes and the fuse in the holder. Inspect for any signs of internal damage.

NOTE

Do not attempt to operate your amplifier until you have read the manual and properly installed the unit.

( ) The location is not critical but consideration must be given to adequate ventilation.
( ) IMPORTANT: Allow at least 4" of clearance on all sides of the cabinet for good air circulation.
( ) The primary power connection on the amplifier is a standard 115V AC line plug.
( ) The fuse holder is provided on the rear panel with a 3 amp, 3 AG fuse. Do not use a larger capacity fuse or amplifier, transformer, and power supply will not be protected.
( ) The unit should be operated with a good ground. Water pipes and other house fixtures are not recommended.
( ) The Bi-Lateral Amplifier will work with the common antenna systems designed for the 25-54 MHz range provided the antenna has a resistive input impedance between 40-70 ohms. The SWR should be kept to a minimum of 2:1 or less.
( ) The output connector provided is an SO-239. For connection of your antenna, you will need a PL—259 plug.

FRONT PANEL CONTROLS AND FUNCTIONS:

ON—OFF Switch	Controls 120V AC power to amplifier.
AM-FM & SSB Switch	Adjust delay constant of automatic antenna relay.
XMT-Stanby Switch	Activates the automatic antenna relay circuit, also supplies power to the receive amplifier circuit.
Receiver Amplifier ON-OFF Switch	Activates the integrated circuit receive amplifier. NOTE: Receive amplifier will only operate when the XMT-Standby switch is in the XMT position.

Front Panel Controls And Functions (con't)

RED Indicator Light .... Visual indication of applied 115 V AC power.

Output Meter .... Visual indication of relative RF power output.

Tune Knob .... Adjusts resonant frequency of amplifier.

Load Knob .... Adjusts coupling of output circuit to antenna.

OPERATION:

This amplifier must be used with a transmitter or transceiver capable of at least one watt output, in the 25-54 MHz range.

TUNING FOR AM USE:

First place the function switch in the AM-FM position. Set the tune control in accordance with the warning on page 3 of the manual. The load control should be positioned so that the capacitor is fully meshed, (dot on knob will then point to the word "load" on the front panel).

Now push the ON-Off switch to ON. The red visual indicator light will light.

After warm-up, push the XMT-Standby to XMT. This will energize the automatic antenna relay control circuitry, and provide power for the integrated circuit receive amplifier.

Apply drive power by keying the exciter (transceiver) microphone and quickly adjust the tune control for maximum deflection on the output meter. Remove drive power after adjustment.

NOTE

Do not apply drive power for more than five seconds without adjusting the tune control or damage to the tubes can result.

Reapply drive power and advance (clockwise) the load control, note the increase in deflection of the output meter. Adjust the load control for maximum output. Remove drive power.

NOTE

Readjustment of the tuning and loading controls several times will produce maximum output.

To provide for the extra power contained in the AM signal modulation it is necessary to "overcouple" the output circuit. This is necessary to insure an undistorted output with a minimum of adjacent channel "bleeding" (spatter).

Reapply drive power and advance the load control until the output meter drops perceptably, (about 15 per cent more rotation). Readjust the tune control for maximum output. The output circuit is now "overcoupled".

If a relative power output indicator is available (SWR bridge on forward, etc.) the output signal can be quickly checked to insure upward modulation. If the meter does not "flick" upward on voice peaks, the load control is improperly set (or the exciter is not capable of 100 per cent modulation or may have "downward modulation"). Also seen on output meter.

Always the last adjustment should be the tune control.

Your amplifier is now tuned and ready for operation.

Automatic antenna change over and amplifier operation is provided for by a special transistorized input sensing circuit. Should you desire to hold the amplifier in a "ready" condition, but not use it until needed, simply place the XMT-Standby in the standby position. The sensing circuit will be disabled and the antenna connected to the exciter (transceiver) at all times.

IMPORTANT

With the XMT–Standby switch in the standby position, the REC AMP switch should be in the OFF position. This will prevent the receive amplifier loading the transceiver output.

TUNING FOR FM:

The amplifier is tuned for FM service in a manner identical to AM except the load and tune controls are set for maximum output.

TUNING FOR SSB & DSB:

Place the function switch in the SSB position. This will connect a delay circuit to the automatic relay control and extend the "drop-out" approximately one second. This will prevent relay "chattering" and erratic operation.

If the exciter (transceiver) is capable of carrier output equal to the peak power of the voice SSB or DSB signal, simply adjust the tune and load controls for maximum deflection of the output meter while applying carrier.

If the exciter (transceiver) cannot supply a carrier equal to the peak power of the voice SSB or DSB signal then the tune and load controls must be set for maximum output while modulating. In this case, a modulation envelope indicator (monitor scope) is the most reliable method for adjustment of the amplifier.

TUNING FOR CW:

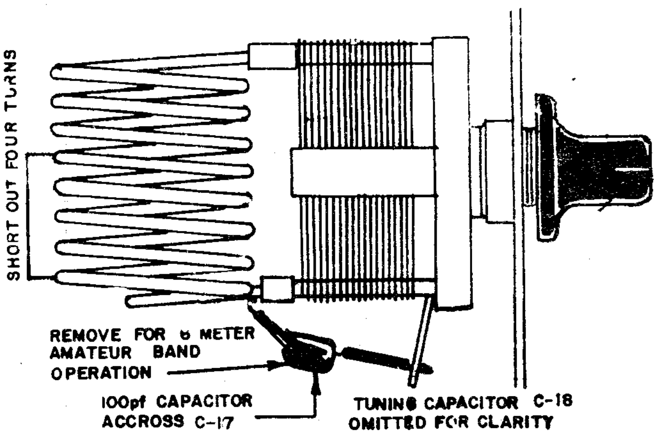
(continuous wave telegraphy)

Place the function switch in the SSB position, apply drive power, and adjust the tune and load controls for maximum output.

The delay circuit for SSB prevents "drop-out" of the automatic antenna relay between characters.

50-54 MHz OPERATION:

For operation on the six meter amateur band it is necessary to short out four turns from the left hand side as viewed from the front panel of the Pi-network output coil, L1. The 100pf silver mica capacitor across C17 load capacitor, must be removed. remove capacitor C7, 50 pf disc ceramic located across the socket of the rear panel.



CIRCUIT ANALYSIS:

A portion of the incoming circuit is coupled to the base of Q1 sensing transistor. This causes Q1 to conduct and change the bias on Q2, relay transistor. Q2 conducts heavily and closes relay K1.

Relay K1 connects the input signal to the cathodes of V1 and V2, applies plate voltage to V1 and V2, and connects the output circuit to the antenna.

C18 is the Pi-net tune capacitor and sets the operating frequency of the amplifier.

C17 is the Pi-net load capacitor and controls the coupling to the antenna.

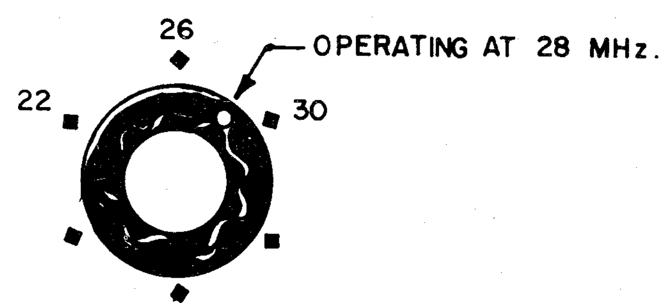
For SSB operation, C22 is added to the relay transistor circuit to extned the "drop out" time.

An integrated circuit amplifier increases the level of the incoming signals from the antenna before it is applied to the transceiver. This amplifier is powered by the XMT-Standby switch and the REC AMP switch. With the XMT-Standby switch in the XMT position the receive amplifier can be switch ON or OFF as required. With the switch in the standby position, the receive amplifier is disabled and the receive amplifier switch should be in the OFF position (see important note).

WARNING

Before applying any RF power to the Linear, pretune the tune control knob to the desired frequency at which you wish to operate. See illustration at right.

For example, if your desired operating frequency is 28 MHz then set the tune knob at midpoint between 26 and 30 as shown.



TUNE CONTROL KNOB

NOTE

For operation on the 50 to 54 MHz band set tune control to the 30 MHz position as shown at right. Then refer to 50 to 54 MHz Operation.

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
C2,29,30,8 28,20	2200 pf 1KV DISC CERAMIC	R8	2200Ω 1/4W RESISTOR
C1	150 pf 1KV DISC CERAMIC	R9	10Ω 1W RESISTOR
C9	56 pf 1KV DISC CERAMIC	RFC1	27 MHZ CHOKE Ƶ 144
C7	50 pf 1KV DISC CERAMIC	RFC2	47μH CHOKE
C14	20 pf 1KV DISC CERAMIC	RFC3	CHOKE Ƶ 144
C12,24,15,16,23	6800 pf 1KV DISC CERAMIC	V1,2	6JU6 VACUUM TUBE
C19	3300 pf 3KV DISC CERAMIC	Q1	MPS 6516 TRANSISTOR
C4,5, 13	1000 pf 1KV DISC CERAMIC	Q2	2N696 TRANSISTOR
C27	100 pf SILVER MICA	RFC4	OHMITE Ƶ-28 CHOKE
C21	10 mf 25-35 WVDC ELECTROLYTIC	L1	TANK COIL
C11,10	40 mf 450V ELECTROLYTIC	L2,3	.56μh COIL
C22,26	500 mf 15V DC ELECTROLYTIC	N1	14V BULB #53
C3	100 pf 1KV DISC CERAMIC	F1	3 AMP FUSE
C17	10.5-315.9 pf AIR VARIABLE	T1	TRANSFORMER
C18	3.2-50 pf AIR VARIABLE	K1	3 PDT 12V DC RELAY
D1,2	1N5054 DIODE	K2	SPDT 12V DC RELAY
D3	1N645 DIODE	S1,2,3	SPST SWITCH 10 AMP
D5,6	1N270 DIODE	S4	DPST SWITCH
D7	6.2V ZE NER DIODE 1N753	1 C 1	INTERGRATED CIRCUIT MC1550/G
R1,2	270KΩ 1W RESISTOR	R10	1.2KΩ 1/4W RESISTOR
R3	510Ω 1/4W RESISTOR	R11	10KΩ 1/2W RESISTOR
R4	1200Ω 1/4W RESISTOR	R12	4.7KΩ 1/2W RESISTOR
R5	330Ω 1/2W RESISTOR	M1	METER, RELATIVE POWER
R6	270Ω 1/4W RESISTOR	D8	1N34 DIODE
R7,13	33Ω 1/4W RESISTOR	C25	.01mfd CAPACITOR 1KV DISC