

~~AFTERBURNER~~

ORDER NO.

INSTALLATION & OPERATION INSTRUCTIONS

**MOBILE STATION 12V DC
BI-LATERAL LINEAR AMPLIFIER**

419

AFTERBURNER

Rural Route 3

Lincoln, Nebraska 68505

GENERAL DESCRIPTION:

This Bi-Lateral Amplifier is precision built, compact amplifier of advanced design. It utilizes an integrated circuit, two tubes, four transistors and four diodes and a grounded grid, tuned plate circuit for amplification for AM, FM, CW, and SSB signals in the 25-54 MHz 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	5 Lbs.
Shipping Weight	8 Lbs.
Construction	Lightweight aluminum chassis with rugged steel case

ELECTRICAL SPECIFICATIONS:

Power Requirement	+12-14V DC 15 Amp
Frequency Range	25-54 MHz
Types of Emission	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 4 Transistors, 4 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

The unit is made to operate on negative ground systems only. 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 the +12V DC terminal on the rear panel.

() The fuse holder is provided on the hookup cable with a 20 amp fuse. Do not use a larger capacity fuse or amplifier, transformer, and power supply will not be protected.

() The unit will not operate without grounding. It is recommended that a No. 12 or heavier wire be run from the ground terminal on the amplifier to the ground terminal on the battery.

() 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 +12V DC power to amplifier

AM-FM & SSB Switch

Adjust delay constant of automatic antenna relay

XMT-Standby Switch Activates the automatic antenna relay circuit, also supplies power to the receive amplifier circuit.

Receive 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 and the REC AMP switch is ON.

RED Indicator Light Visual indication of applied +12V DC 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.

The amplifier can be mounted either under the dash using the bracket provided or in the trunk as desired.

When the unit is dash mounted, a fused primary connection to the battery or fuse block must be provided.

If trunk mounted, a remote switch must be used, and can be purchased through your local dealer. Mount the remote switch on the dash where it is convenient. Remote switch mounting must be grounded to the vehicle chassis or the indicator light will be inoperative.

IMPORTANT

Remember the front panel and remote switches are series connected. The amplifier will not operate if either switch is in the OFF position.

NOTE

Before beginning installation, it is recommended that the positive lead of the battery be disconnected to prevent accidental grounds and electrical system damage.

Connect the fuse hookup cable to the positive terminal of the battery or fuse block. The other lead should run under the seats and carpets in the protected location to the amplifier primary power connection. A length of RG 58/U should be installed between the transceiver and amplifier. Connect a nominal 50 ohm antenna to the amplifier,

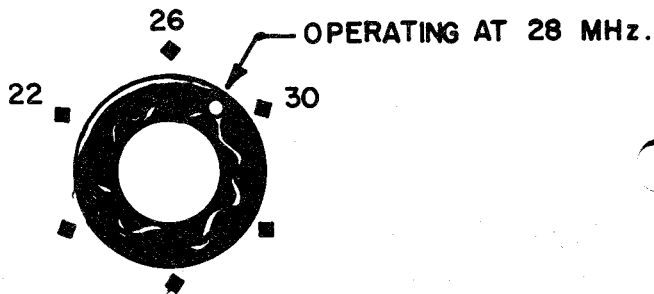
Connect the ground stud on the amplifier to the negative battery connection.

Before applying power, make one final check on all wiring and connections.

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 on this page.

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 above. Then refer to the 50 to 54 MHz Operation.

OPERATION:

It is assumed that the bi-lateral amplifier has been properly installed as called for above. Make sure that all the various connections have been made.

The following paragraphs are intended to provide the operator with the basic knowledge needed to operate the amplifier at maximum performance.

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 this page 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 reading 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 reading of the output meter. Adjust the load control for maximum reading of the output meter. Now go back to the tune control and reset for maximum output. Remove drive power.

NOTE

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

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 perceptibly, (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)

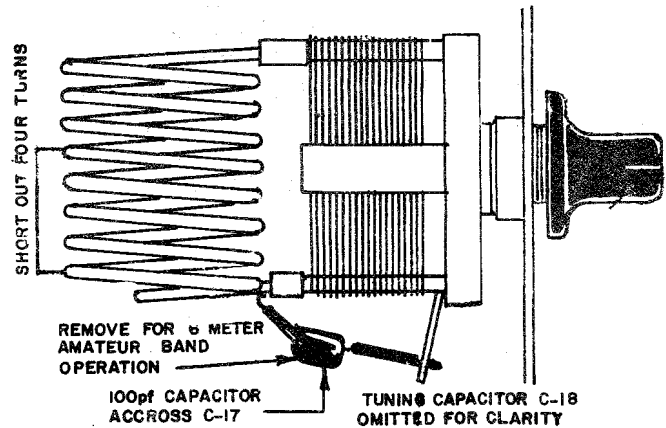
Place the function switch in the SSB position, apply drive power,

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. Also remove capacitor C7, 50pf disc ceramic located across the input 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 extend 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 switched 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).

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
C1	150 μ F 1KV DISC CERAMIC	Q3-4	2 N1522 TRANSISTOR
C2,4,5,8,28,20	2200 μ F 1KV DISC CERAMIC	R1-2	270 Ω 1W RESISTOR
C9	56 μ F 1KV DISC CERAMIC	R3	510 Ω 1/4W RESISTOR
C13	20 μ F 1KV DISC CERAMIC	R4	1200 Ω 1/4W RESISTOR
C10, 11	10 μ F 500 WVDC ELECTROLYTIC	R5	330 Ω 1/2W RESISTOR
C26	100 μ F 25 WVDC ELECTROLYTIC	R6	270 Ω 1/4W RESISTOR
C23, 24	6800 μ F 1KV DISC CERAMIC	R7, R13	33 Ω 1/4W RESISTOR
C14	1000 μ F 1KV DISC CERAMIC	R8	50 Ω 10W WIREWOUND RESISTOR
C19, 15	3300 μ F 3KV DISC CERAMIC	R9	3 Ω 8W WIREWOUND RESISTOR
C16	.01 μ F 1KV DISC CERAMIC	RFC 3	CHOKE Z144
C17	10.5-313.9 μ F AIR VARIABLE	RFC 2	47 μ h CHOKE
C18	3.2-50 μ F AIR VARIABLE	C7	50 pf 1KV DISC CERAMIC
C21, 25	10 μ F 25-35V DC ELECTROLYTIC	RFC 4	OHMITE Z-28
C22	500 μ F 15WVDC ELECTROLYTIC	S1,4	DPST SWITCH
C27	100 μ F 1KV SILVER MICA	S2-3	SPST SWITCH
D1,2,3,4	1N 5054 DIODE	T1	12V TO 800V TOROID
D5-6	1N 270 DIODE	V1-2	6JU6 VACUUM TUBE
D7	1N753 ZENER DIODE	1 C 1	MC 1550GIC AMPLIFIER
F1	SFE 20 AMP FUSE	C3	100 pf 1KV DISC
K1	3PDT 12V DC RELAY	D8	1N34 DIODE
K2	1PDT 12V DC RELAY	RFC 1	100 μ h CHOKE
L1	TANK COIL	R10	1.2K 1/4W RESISTOR
L2-3	.56 μ h COIL	R11	10K 1/2W RESISTOR
N1	14V BULB #53	R12	4.7K 1/2W RESISTOR
Q1	MPS 6516 TRANSISTOR	M1	METER RELATIVE POWER
Q2	2N696 TRANSISTOR	C29	100 μ F 25V DC CAPACITOR

