

Loudenboomer Mark IIA Amplifier

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Introduction

Southern Oklahoma's Lake Texoma hamfest always seems more of a social event to me than a particularly good place to find the unusual. Nonetheless, since it's less than an hour and a half from my home, I make the trip more often than not. One fall, as I walked briskly past the wobbly tables, dropped tailgates and gaping trunks; I caught a glimpse of something that caused me to quickly break my stride. It was a Loudenboomer Mark IIA. Having never seen one in person before I had to stop for a little touch 'n' feel. Although I didn't need another amplifier, I could not resist the Loudenboomer's uncommon charm and a transaction ensued. Collecting dust in the 'to-be-restored'

group became the cleverly named newcomer's occupation until a recent move of equipment from my primary shack to a new, secondary shack resulted in shelf space and an application for the Loudenboomer. Accordingly, the dust collection ceased and restoration began.

History

While I would like to provide details of the Loudenboomer's development and the background of its Kansas City, Kansas based manufacturer, Radio Industries, Inc., to date I have been unable to gather information toward that end. All I have been able to ascertain is that Radio Industries introduced the Loudenboomer Mark II (not the Mark

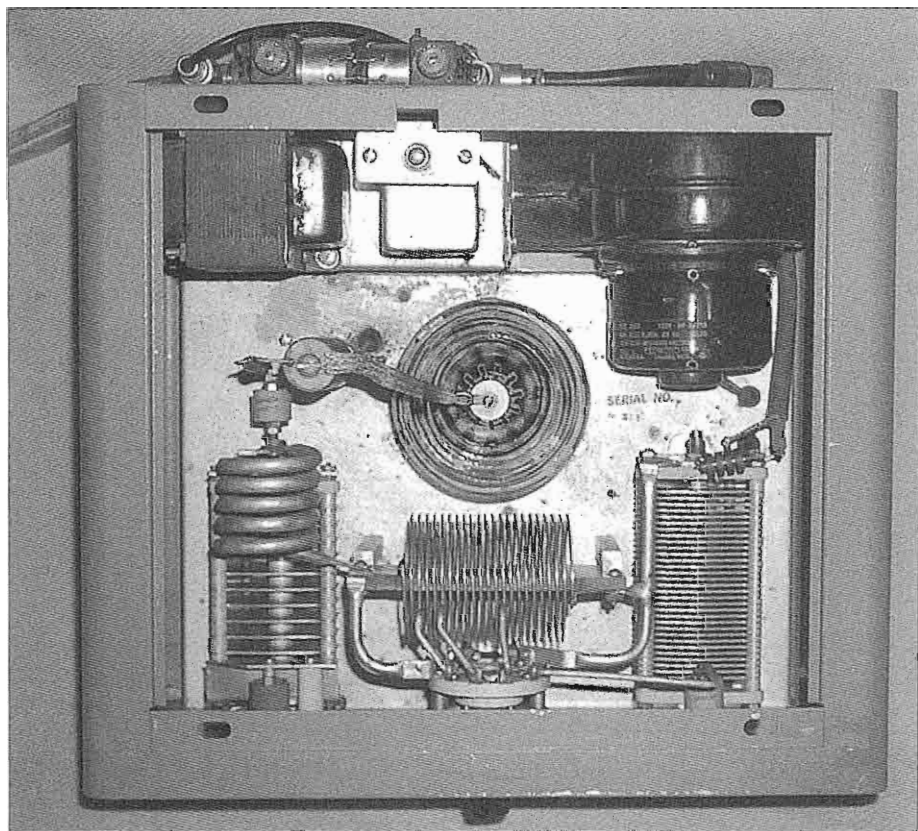


Here is the author's Radio Industries Loudenboomer Mark IIA as it looked after restoration was completed. Notice that the front panel is properly marked in "MEGACYCLES!"

IIA) in 1962 and the company was a subsidiary of Hallicrafters by 1963. Unfortunately the Hallicrafters' family of today is apparently reluctant to share information concerning the company's business dealings so it may be difficult, if not impossible, to ever learn more.

It is well known that Hallicrafters repackaged the Loudenboomer as the HT-45 but before this happened at least three versions of the amplifier were produced. The Mark II photographed for the manual has a lid with a circle full of perforations directly above the final tube. This lid wraps down around the sides of the cabinet and attaches

with screws. In contrast, the cabinet of my Mark IIA wraps up and over the sides and the almost totally perforated lid is held in place with four plastic fasteners that lock with 1/4 turn. The silk-screened emblem on my Mark IIA's front panel is purely one of Radio Industries, which makes me think it was produced prior to the Hallicrafters acquisition. A third version, the one depicted in the Mark IIA manual, has an emblem that is a combination of the logos of Radio Industries and Hallicrafters. The Loudenboomer production volume is unknown to me but mine is serial #311 and I know of #324. Considering these serial numbers and



Here's a bird-eye view of the top of the Loudenboomer, looking directly down at the 3-400Z power amplifier. The plate tank components are along the front of the chassis, and along the rear is the blower motor and the filament choke.

infrequent Loudenboomer hamfest sightings, I would classify them as uncommon rather than rare.

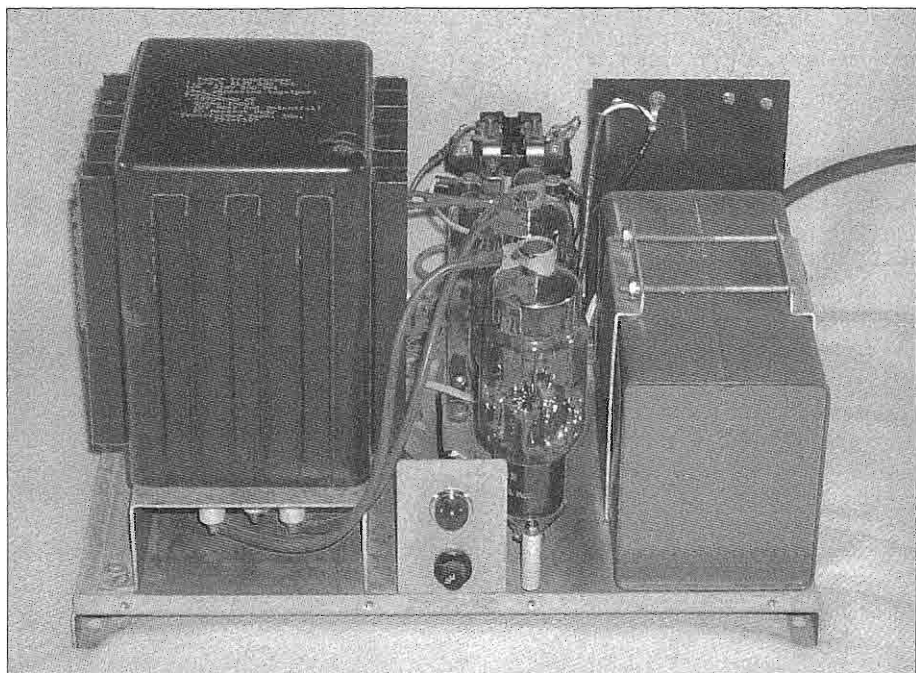
Optional power supplies were available for the Mark II and the Mark IIA but it was clear in both their manuals that Radio Industries expected some Loudenboomer buyers to build their own. Actually, the Mark II manual says, "Since the amplifier is designed for the amateur who would like to build his own power supply or possibly use an existing power supply from an AM or CW transmitter, the schematic and parts list as shown are the minimum requirements." No doubt many purchasers chose the homebrew path so don't be surprised or disappointed if you find a Loudenboomer without the original power supply. While far from a scientific sample, the power supply serial numbers known to me (#206 and #220)

hint there might have been approximately three amplifiers sold for every two power supplies.

Physical Description

One of several commendable aspects of the Loudenboomer is its cabinet. While it is proportioned similar to S-Line receivers and transmitters, if Collins trim rings had been made of 0.125" thick aluminum like the Loudenboomer's there would not be so many Collins collectors scrambling to find replacements for their marred trim rings. The aluminum cabinet measures 15" wide, 13" deep and 8" high and is painted a light grey, à la S-Line however, the paint has a texture that is neither wrinkle nor crackle. Lacking a better description, it appears to have small, thin splashes of matching paint over an original smooth coat.

Mounted on the top of the larger of



Once removed from the cabinet, the power supply chassis reveals a compact, well thought out design. The main power transformer is mounted on the left, rectifiers in the center, and to the right are the filter condensers.

the two inner chassis are the single final tube, the pi network components, and the RF choke. A smaller chassis that holds the filament and RF input transformers is mounted at the rear of the larger chassis. Cooling air from the quiet 50 cfm squirrel cage blower passes through the two pressurized chassis and up between the final and its H.S. Martin & Son chimney. The amplifier weighs just 25 pounds.

At the bottom of the darker, flat grey front panel, from left to right, are toggle switches for filament and plate voltage control, a knob for meter selection and red and green jeweled lamps for plate and filament voltage indication. Immediately above these controls, also left to right, are the tuning control, the meter, and the loading control. Above the meter and centered in the panel is the bandswitch. Concentrically mounted with the plate tuning control is a lever for a switch whose function will be discussed later. On the back panel is an SO-239 connector (RF Out), an RCA phone jack (RF In), a fuse holder, a two contact terminal strip, a grounding lug and a 6' multi-conductor cable for connection to the power supply.

As one might expect, the Mark IIA power supply is larger and heavier than the amplifier. Measuring 12" x 14.5" x 14", it weighs a substantial 58 pounds. The components mount on top of a simple steel chassis and a glossy dark grey steel cover that is perforated on two sides and the top provides protection from dangerous voltages. The finned plate transformer has bottom-side terminals and mounts vertically on a small sub-chassis. A phenolic board containing the bleeder resistors and a spark gap for the choke mounts in the vertical plane on the two terminals of a large oil filled capacitor that is laid horizontally. The AC power relay sits on top of the rectifiers' filament transformer. Although there are no

controls on the power supply, the front panel has a fuse holder and a lamp. Access to the female Millen high voltage connector and the 10 contact terminal strip is via a small cutout at the bottom left of the cover's backside.

Electrical Description

Eimac's lesser known 3-400Z is the foundation for the Loudenboomer's grounded grid design. Provided this triode's plate voltage is 3KV or less, zero bias operation is possible without exceeding the 400-Watt dissipation of the 3-500Z's little brother. To reduce the plate dissipation during standby periods, a 150-Ohm resistor in the cathode return creates sufficient negative bias to reduce the idling current from 120 mA to 40 mA. This resistor must be shorted during operation with a jumper or relay via the terminal strip on the rear panel.

A broadband balun wound in trifilar-fashion on a 'ferramic' core transforms the unbalanced input from the exciter to the balanced output required to drive the 3-400Z's cathode. While adding to the cost of the design, this transformer contributes to increased efficiency compared to amplifiers with simple resistive loading.

Output impedance matching comes via a pi network with an edge-wound coil that is used on all bands except 10 meters, where coil of 1/4" aluminum tubing is utilized. The proper tank inductance is selected by a 5-position ceramic bandswitch. Plate tuning and loading is accomplished with air variables of 14-101 and 30-1000 pF, respectively. The extra 100 pF of tuning capacitance required on 80 meters is added by activating the switch lever mentioned earlier and an additional 1000 pF of loading capacitance is always present in the 3.5 Mc meter position. Should the .001 plate coupling capacitor short or leak, a 2.5 mH RF choke from the pi network output to ground prevents high voltage DC from

reaching the antenna.

Unlike many amplifiers, the Loudenboomer has a four-function multimeter that allows monitoring of the plate voltage, grid current, plate current and RF output voltage. The rotary switch on the front panel selects these functions. The manufacturer wisely included an interlock to remove AC power from power supply when the cabinet lid is not in place.

According to the manuals, the Mark II and Mark IIA differ in that the Mark II does not have the 150-Ohm current limiting resistor, and the Mark II grid current is sensed by the voltage drop across a grid resistor rather than a similar resistor in the cathode circuit of the Mark IIA.

Although my power supply came with a pair of 3B28's, the original rectifiers were 866A's. The husky plate transformer has a center-tapped secondary and a primary capable of 115V or 230V operation. A double pole, single throw relay with an 115VAC coil sits between the transformer primary and the AC line. A single fuse of 8A or 15A, depending on the line voltage chosen, protects the power supply. The full wave rectified DC is smoothed with a single choke input filter consisting of a 4-16 Hy, 350 mA swinging choke and an 8-uF oil filled capacitor. An NE-51 neon bulb paralleled with a 10K wirewound at the bottom of the bleeder chain signals the presence of high voltage rather than when AC is applied to the high voltage transformer. The spark gap mentioned earlier is made with a pair of solder lugs and, while the gap was adjusted much larger than the 1/16 inch recommended in the manual, evidence of at least one arc can be seen on the phenolic board directly under these lugs. According to the manual, the Mark II supply did not support 230V operation and lacked the NE-51 lamp and the remotely controlled plate relay.

Restoration

As one should expect of a well designed and well built vintage amplifier that has experienced reasonable care through its years, my Loudenboomer did not require much work to bring it back to reliable operation. Apart from lubrication of the blower motor and a serious cleaning, only three minor repairs were required.

The first and simplest was replacement of a strain relief for the interconnecting cable where it exits the power supply.

The second repair was replacement of the lamp socket that was missing from the power supply. While replacing the socket I pondered why it was missing. The original wiring remained and had been black-taped to avoid problems. With another socket and a new NE-51 in place, I connected my Variac and brought the high voltage up without issue. With 120V input and the high voltage cable disconnected from the amplifier, the voltage was very close to 4KV, a level that I was uncomfortable with given the 3KV rating of the filter capacitor. When I shut off the power supply I noticed that the NE-51 remained lit for nearly 10 seconds, about ten times longer than it should take for 210K Ohms to discharge an 8-uF capacitor. I immediately suspected the 10K wirewound at the bottom of the bleeder chain was open. Do you remember those warnings about not trusting bleeder resistors? Believe them! This one had a minor blowout that I hadn't noticed earlier as it was on the side facing the phenolic board. Indeed the resistor was open. Without this resistor, the only bleeder current flowing was through the overloaded NE-51, thus causing the long discharge time. If you think about it, when a previous NE-51 under these conditions gave up (and it quickly would), the full plate voltage would have been present at the lamp socket. Neither the socket nor the

lamp was designed for anywhere near 3KV. No doubt the bulb/socket combination let a previous owner know about the situation with arcing or, even worse, a serious shock if bulb replacement was attempted while high voltage was present. Either way, why the lamp socket was missing is no longer a mystery.

With the third repair complete (replacement of the open bleeder), the NE-51 extinguishes in about one second when the plate supply is de-energized.

Performance

As I was curious about the amplifier's broadband input transformer, I first measured the amplifier's input impedance. For this task I used an MFJ-259B antenna analyzer. If you don't already have one of these handy instruments you might consider getting one as they can be used for much more than just antenna analysis. With the filament on I started the measurement process at 3.5 Mc, where the impedance was a $47+j3$ ohm. The impedance remained slightly inductive and there were no bumps as the frequency was increased to 29.7 Mc, where the impedance peaked at $58+j6$ ohm. These readings, which were not effected by the positions of the bandswitch or the tuning and loading capacitors, represent an SWR of 1.2:1 or less, therefore any exciter should be comfortable driving the Loudenboomer.

I was also interested to know what power level would be required to drive the amplifier to a given output, so I inserted a Drake W-4 wattmeter between the amplifier input and a Yaesu FT-707 transceiver chosen as a driver because of its frequency and output power agility. A Waters Model 334 Dummy Load / Wattmeter would absorb and measure the output power.

In order to facilitate easy bypassing of the amplifier, a previous owner of my Loudenboomer neatly installed an

aluminum plate on the rear of the cabinet. On this plate are two Dow coax relays, both of which have extra contacts. One of the contact pairs is used to short the plate current limiting resistor mentioned earlier. Before applying the high voltage, I elected to disconnect this contact pair so the limiting resistor would be in line. With the plate voltage applied, I was pleased to see the standby plate current settle safely at 40 mA, but I was surprised to see the plate glowing a dark orange. The next step was to check the idling current, so I reconnected the contact pair. Again, the amplifier behaved as it should, with 120 mA of idle current, but now the plate glowed a medium to light orange. Although I was not particularly comfortable with the plate's color, I was comfortable with the plate currents so it was time to introduce excitation.

Following the tune-up procedure detailed in the manual, which calls for a plate current of 333 mA and a grid current of 150 mA (maximum 200 mA), the Loudenboomer managed 550 watts output on 80 meters with 45 watts of drive. The power output on 10 meters dropped to 450 Watts with the same level of drive. Performance on 40, 20 and 15 meters was similar to that on 80 meters. Knowing the amplifier's input was truly broadband; I wanted to know if it would work on the WARC bands. Unfortunately I was unable to obtain any significant power output on 12 meters using either the 10 or 15-meter settings. With a kilowatt DC input on 17 meters the Loudenboomer managed but 300 watts in the 15-meter position. No doubt the non-ideal pi network Q caused the much-reduced efficiency. If one were to use a Loudenboomer on this band it would be advisable to run less than maximum power to avoid excessive tank coil heating. Conversely, performance on 30 meters was a surprising 500 watts output in the 40-meter

position.

Since I wanted to use the Loudenboomer with a Viking Ranger II/HQ-170A pair, it was crucial to know what input power would be required to achieve the recommended AM plate current of 200 mA. This exercise revealed the drive power required was 12-15 watts on all bands and the power output was 165-175 watts, except on 10 meters, where it dropped to 150 watts. This input power requirement was nearly ideal as I had a spare 6 dB attenuator available to reduce the Ranger's 40-50 watt output.

Conclusion

Considering the input power requirements, the Loudenboomer seems better suited for SSB/CW operation, as such transmitters usually have easily adjustable power output levels but it is certainly usable in the AM linear mode

provided you supply the correct drive level. The only potential difficulty I see with the Loudenboomer, other than finding one, is the 3-400Z final. While these are not yet unavailable, they are not abundant like the 3-500Z. That said, according to the Eimac data sheet, there appears to be room within the Loudenboomer to install a 3-500Z should the need arise. In order to better understand the Loudenboomer production volume I would appreciate hearing from any owners.



Now in it's new home, the Loudenboomer is paired with the Johnson Ranger transmitter and Hammarlund HQ-170A receiver in a classic setting. The Shure 55 microphone finishes out this classic station at WA5UEK.