Testing the RM Italy, HLA-300V Mobile HF Amplifier.

By Mike Higgins – K6AER

Overview

The reason I am reviewing the amplifier here and not in the new products section is that the detail and the photography included would preclude a posting in the new products section. Many hams I have talked to over the last few months are using this amplifier and are very happy with the results. However, until now, I had not found any definitive testing of the amp. As the saying goes, curiosity got the cat and I bought one just to see what it was made of. Tested specifications are listed below.

Specifications

Frequency Range - 160-10 Meters Including WARC Bands
Wattage Out - 459 Watts PEP, 400 Watts CW (2 min. max) (20 meters test)
Drive Power - 20 Watts PEP or 45 Watts PEP W/Switch Attenuator LED Indicator
Amplifier Gain - 10 or 13 dB switchable (Front Panel)
Band Switching - Auto or Manual, six low pass settings (Front Panel)
Power Display – Seven segment LED bar graph (Front Panel)
Cooling Fans - Dual Speed (3 ea.) - TX sense controlled, noise level <50dB on low and 54dB on high
Keying - SSB drive sense or PTT, switch selectable with LED Indicator
Harmonics - $2^{nd}/3^{rd}/5^{th}$ down >55 dB all bands
DC Input – Red/Black Number 8 Gauge, 18 inches long
Power - 12-14.5 Volts DC (Wattage varies with voltage)
Max Current - 45 amps - At Peak Modulation (14.3 VDC) Tested

Audible Alarm - Over Temp., VSWR, Wrong Band Selector
Fault Indication - LED and Amp Standby upon Fault
On/Off Switch - Front panel W/LED Indicator
Max VSWR Output - 2.5:1
Input/Output Impedance - 50 Ohms
Output Devices – SGS Thompson SD1446 (4ea.)
Connectors - PL259 In/Out
Weight 7.0 Lbs
Size - 17.5"L **x** 7.5"W **x** 3.2"H
Fuse 4 **x**10 Amps Internal (F12AL Type)
Mounting – 4 ea. slot holes in flange heat sink housing.

List price $352 (East Coast), MFG is RM Italy at rm@rmitaly.com

Impressions

I had been considering a number of other manufactures for mobile HF amplifiers when a friend of mine, George K9TRQ, told me about RM Italy amps and said he was using one on the air. He sounded great and the increase from his 100 watt transceiver was a bit over 1.5 S units. I went to their web site and downloaded the manual and schematic. Being a microwave engineer, the schematic was my main focus. As an English speaker, I found the manual lacking in some clarity; never the less the Italian/English could be interpreted. On paper the engineering schematic looked good and followed standard practices in amplifier design.

It is unfortunate among hams in the US, there seems to be an opinion that any amplifier made overseas, or one that is cheaper than conventional products, is inferior. I'm using an Ameritron ALS-500M as my bench mark and decided to determine if there was any justification for this somewhat negative opinion.

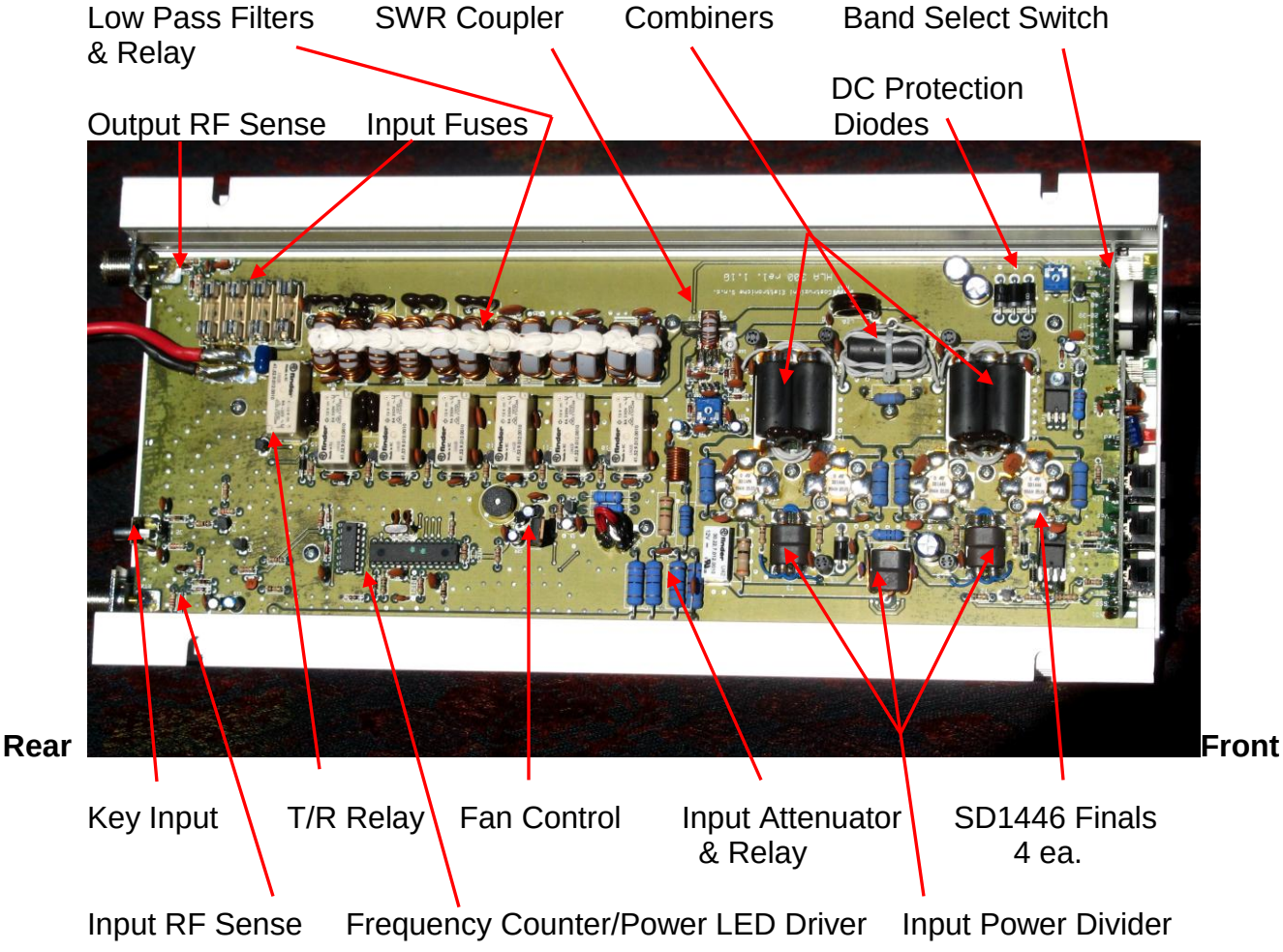
After E-Mailing RM Italy, I received the address and phone number of their local distributor on the East Coast. A phone call and credit card charge later my amplifier was on the way and it arrived in four days in a large well packed box. The specifications of the amplifier are listed above as well as my test results. Naturally as an engineer, I wanted to test everything before installing it in my vehicle; just to be sure all was well. I hate surprises, besides that "smoke smell" would be hard to get out of the truck.

Inspection

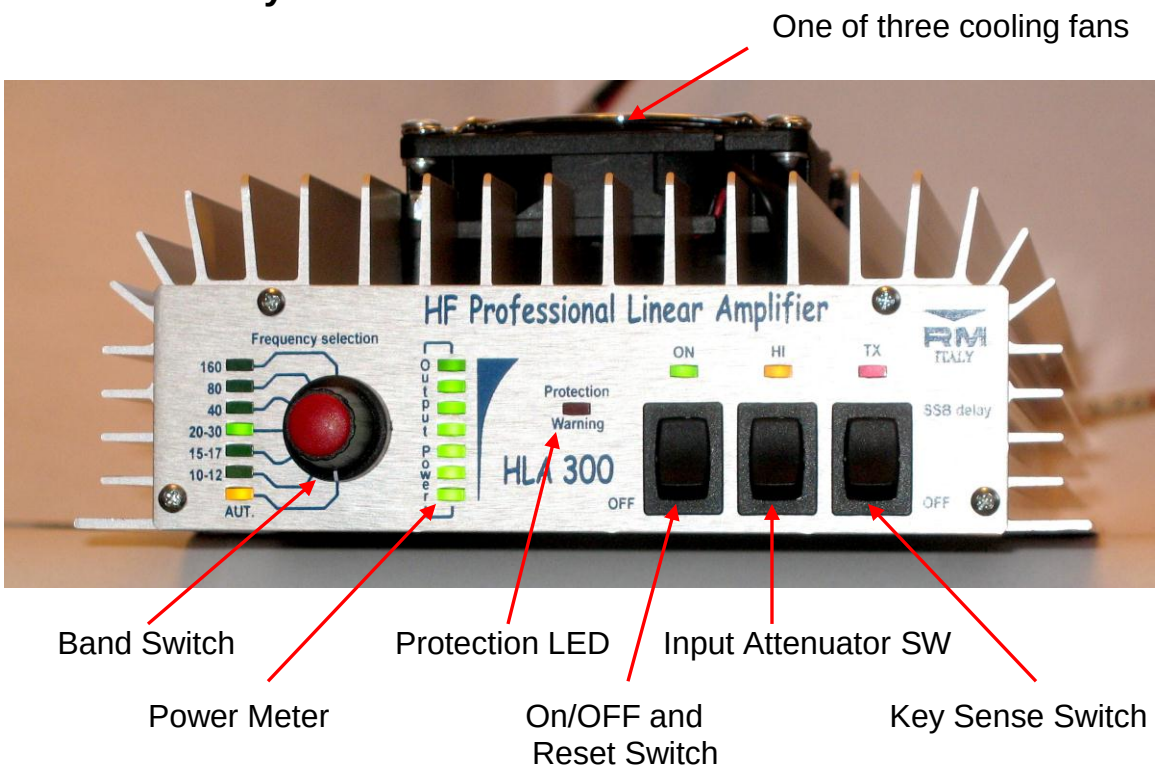
I had the bottom cover off 3 minutes after removing the amplifier from the box. (*A habit I developed looking for loose screws from other hi power amplifier manufacturer's products). T*he board layout is on a G10 Double-sided epoxy (Green) PCB. In/Out connectors, power and keying are located on one end and

the readouts and switches are located on the other end of the amplifier housing. From the connector side of the amplifier the sense circuitry follows down the bottom of the PCB to the amplifier section, to the splitters, and then to the final devices. It continues to the combiners, VSWR Bridge, monitoring circuitry, then on back out the top through the low pass filter relays to the output connector and power sense circuitry. The components are top grade with good flow soldering and only the final devices looked to be hand-soldered (*normal procedure*). No miniature surface-mounted devices were found and all holes are through plated with well thought out PCB component placement. No wire jumpers or after thought mods could be found. I would have been proud to have designed this personally.

The following areas are identified on the PCB layout



Front Panel Layout



Testing

For testing I used my trusty TS-570 S/G as a driver. It has a very precise power control and is tolerant of load impedances, indicating precise power and VSWR. Its harmonic output is quite good and would not be a major contributing factor in harmonic readings. The output power was measured using an Alpha 4510 peak-reading watt meter (2% accuracy) into a custom 2 KW dummy load with a calibrated monitoring port (-50dB). The monitoring port was connected to an HP8953E spectrum analyzer (.1% Accuracy). I not only to wanted to examine amplifier stability and harmonics, but also wanted to verify the PEP reading of the Alpha 4510 watt meter. The power supply was a DuraComm 55 amp switcher with a parallel 100 amp AGM battery set to 14.3 Volts DC. Current and voltage readings were made with Fluke meters and a clamp-on current probe.

A “stiff” power supply is very important when testing solid state amplifiers, since a voltage drop as little as one volt can make a difference of 20% on output readings. This is also true in your mobile installation. So it is especially important

to use large-fine-stranded-wire when you install the amplifier whether connected to the vehicle battery or to a home DC supply.

With power applied and the unit turned off, the amplifier draws no current. Turn on the power switch and the idle current is about 350 mA which is used for LEDs and three low-speed fans. The amplifier can be keyed by an external key jack (RCA type) or with the SSB sense, switched on. The SSB keying delay is about one second and works down to as little as 5 watts input. For manual keying you can ground the key line (.4 ma at 5 VDC), or provide a positive voltage on the key input. There is a jumper by the key input to set the key condition. Bias on the transistors is switched on with the key line so no amplifier transistor current is drawn until the amplifier is placed in TX operation via the key line.

Power Output Test

I set the drive level at 20 watts SSB measured at drive transceiver and checked power out. Note this is the maximum drive level setting in the high gain switch position. The amplifier starts to go into compression at about 18 watts input.

Meters	PEP Output Power
160	438
80	455
40	389
20	416
17	341
15	323
10	314

The same power-output was produced with 45 watts driven and with the input attenuator placed in the low gain position. This allows the output power to be reduced or for the operator to drive the amplifier with higher power without overdriving the amplifier. The four Thompson SD1446 bipolar devices can safely handle a total of 32 watts input power. While this does not include the input resistive attenuators, I would limit the drive power to fewer than 20 watts in the high gain position. Be aware, overdriving the amplifier will produce splatter, increased harmonics and will eventually burn out the base/collector junctions. I found the power a bit low on 17 meters but engaging the transceiver antenna tuner brought the power up to 390 watts. Apparently the amplifier input impedance is not quite 50 ohms on 17 meters. As with all amplifiers the power drops off as you go higher in frequency. The bar graph power display is some what exponential with 50 watts lighting the first 4 LEDs and the last LED lightning displayed at the 400-450 watt level. No matter, it gives you an indication when you have reached maximum power out.

The fan noise is very low at idle and in transmit the fan speed increases along with fan noise which is not objectionable. Low speed fan noise is under 50dB and the high speed fan sound level is at 55 dB. These readings were taken at a distance of 18 inches with a sound-level meter.

You can set the band switch manually to one of six band ranges or chose the automatic setting and let the amplifier select the proper low pass filter. The auto band selection is instantaneous and only requires a single click of the transceiver PTT to select the proper low pass filter. Should you manually select the wrong filter and key the amplifier the unit will fault and give you a coded beep to let you know something is wrong. Should you have a fault condition, simply recycle the power-on-switch to reset the amplifier. Different coded beeps are sounded for band select to low, band select to high and high temp.

Speaking of high temp, I ran the amplifier for 3 minutes at 400 watts CW and the heat sink never exceeded 133 degrees F. after the key down test. After 3 minutes the power dropped off to 280 watts but this is expected given this type of design. Another continuous test was run with 400 watts SSB. After 25 minutes the amplifier shut off from over-temp. I reset the on/off switch and the amplifier came back on line.

The components on the PCB showed no excess heat but the combiner toroids did get too hot to touch. This was checked with my trusty finger in the amplifier after the continuous transmit test. I would not recommend running the amplifier in the continuous carrier position for much more than a couple of minutes. The component side amplifier area has no air movement and the combiner transformers can get quite hot.

Conclusions

I found the amplifier to be well built. According to the manufacturer the listed power output is 550 Watts PEP at 14 VDC. However you never achieved this with a quad of SD1446 transistors. This doesn't matter because no one will notice the difference between 450 watts and 550 watts PEP when running mobile. Workmanship is very good and consistent with sound engineering practice. Even with the manual written in Italian/English you can, with patience, figure out what needs to be done.

Panel layout is good and displays are very vivid and easy to see in bright sunlight. Set the power level properly and do not overdrive the amplifier and your signal will be clean with the harmonics well below required FCC specs. The amplifier is not yet certificated by the FCC but as with all amateur equipment, it is up to the individual operator to make sure his equipment, whether commercially manufactured or home built, meets FCC guidelines. This amplifier in my opinion is a winner and will serve the operator well for mobile use, and in portable (field

day) or medium power applications. The price is right and cost-averages out to about 77 cents per watt. This is not an amplifier for CW or RTTY contesting but is a great mobile or portable amp for general SSB and CW applications. I would love to see this amplifier with 2SC2789 transistors. For the increase cost of $30 the amplifier would out put REAL 550 watts.

I have talked with several hams that have been running this amplifier for over a year. They have had no problems and are quite happy with the product. They all felt the amplifier was a “great bang for the buck”. Hams I had spoken with said there usage had been split 50/50 between mobile and base operation. I expect to see more of these overseas products making their way into the American market place.

73,

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