

An NCJ Review: East Meets West in the New ETO 91 β

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The new ETO 91 β is surely one of the most unusual pieces of Amateur Radio equipment in history, and its origins can be traced directly to the breakup of the Soviet Union. Dick Ehrhorn, W4ETO, chairman of Ehrhorn Technological Operations (ETO), is keenly interested in Eastern Europe and has many ham friends in Eastern Block countries. When Yeltsin holed up in the Russian White House, his aides used ETO amps to communicate with the West. Then the iron curtain dropped and the Eastern Block military-industrial complex began to crumble, and formerly state-run electronics manufacturers searched for new markets. Dick saw an opportunity to redirect some of their output toward RF amplifiers for amateur use, and to help some fine companies and people in the process. The result is an amplifier that sets a high standard for price performance.

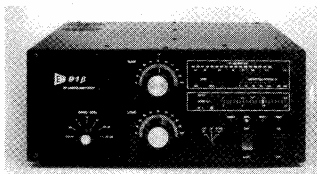
The β project began with the idea that the Bulgarians would clone the Alpha 89. However, the results were unacceptable. ETO then spent a year working on a design that could be manufactured in Bulgaria while still meeting ETO standards of reliability and performance. Considering the inevitable problems of communication and coordination, the delays in the release of this amp are understandable (it was first announced at the 1994 Dayton HamVention).

The 91 β is truly an international product. The tubes are Russian; the ICs, FETs, non-power diodes, and a few other critical parts are made in the US; and the rest is made in Bulgaria. ETO expresses confidence in their Bulgarian partners, stating that the Bulgarians have shown extraordinary craftsmanship in their PC boards, ceramics, transformers, and tuning capacitors. Priced at \$2298, the 91 β costs one-third less than the Alpha 89.

Design Overview

Tubes

Unlike earlier Alphas, which have always used Eimac tubes, the 91 β uses two GU74-B (4CX800A) tubes made by the Russian company *Svetlana* at their monster plant in St Petersburg. Originally designed for military applications, the GU74-B has been around for more than 10 years. It is in current production



and is available from US dealers for less than \$200. These are tetrodes in class AB1 service; the Eimacs are triodes. The use of a tetrode requires a separate regulated screen supply, which adds a bit to the cost and complexity of the amp. However, it eliminates the need for a tuned input. Instead, the exciter sees a 50- Ω , purely resistive load at every MF/HF frequency. This improves power transfer and harmonic distortion—a big plus when using the amp with modern solid-state exciters, many of which are quite sensitive to high SWR.

The plate dissipation of the GU74-B is the same as the 3CX800A7 used in the Alpha 87A—800 W per tube. ETO reports that the GU74-B is very rugged and conservatively rated. The tube is larger than the 3CX800 and the heat radiator is less efficient, so more air must blow through it. However, the noise from the cooling system is only slightly greater than the Alpha 87A and, even in contest operation, the amp runs very cool. This amplifier uses an electronic biasing system that cuts the idle current by 85% during lulls in transmission to further reduce power dissipation and heat.

Protection

Although the GU74-B is undoubtedly a very rugged tube, every aspect of the tube is protected. Foldback circuits on both the screen and control grids make it virtually impossible to damage the tubes in normal operation. In addition, sensing circuits will put the amp in a standby fault condition when voltage or current exceed safe ratings. Unlike in the Alpha 80 series, these protection features are *not* microprocessor controlled.

All tubes are in a constant state of chemical change throughout their life. With coated-cathode tubes, this presents some serious problems. New tubes ionize occasionally as gold transmigrates. The Alpha 76PA had plate

current protection to deal with the problem. Improved circuitry in the 91 β protects the screen supply from plate voltage hitting it during such ionization. The 91 β also has very effective protection against arcing in the loading capacitor. ETO claims that this protection is virtually instantaneous and will prevent formation of carbon paths, which lower capacitors' voltage ratings. The amplifier won't transmit when in the fault mode, but cycling the operate/standby switch on the front panel easily resets it.

Such elaborate protection could be a hassle during tune-up. ETO has addressed this by including a 10-dB trip circuit. Tuning the 91 β amp with less than 25-W drive disables this protection. In service, the amp will fault due to high SWR only when the reflected power exceeds 250 W, so you do not need a perfect match.

ETO has also included two LED tuning indicators that I find useful. A green LED flickers during transmission when the amp is properly adjusted to resonance (it begins to flicker at about 1 mA of control grid current). This is a great aid for search-and-pounce operating. A second LED flickers red when the amp is overdriven.

Power Supply

The power supply of the 91 β is roughly comparable to the Alpha 87A's. It uses a Bulgarian-made, tape-wound, 3000 kVA transformer. Instead of the block diode in the Alpha 87, it uses a bunch of 5-A devices. Power-supply filtering is comparable to the Alpha 87A. The maximum output of both amps is about 2400 W. This allows a conservative rating of 1500 W continuous output.

The 91 β amp uses the same full-cabinet forced-air system used successfully in earlier Alphas. The cushioned blower is very quiet, but some vibration is transmitted through the feet to the operating table. I greatly reduced the noise due to this coupling by putting neoprene rubber isolators (available from audio stores) under the chassis.

Comparison to the Alpha 76PA

Many Alpha 76 and 78-series amplifiers are in contest service. The price of the 91 β is about the same price as the Alpha 76PA was ten years ago. How does the 91 β compare?

On 80 meters, the peak power output of the 76PA is only slightly lower, and it easily puts out the legal limit. However, its efficiency declines as the frequency increases. The 91β has no problem with full output on 10 meters, where the 76PA struggles to put out 1200 W. Moreover, the 70-series amps were intended for use with tube-output exciters. They don't have tuned inputs, so unlike the 91β, they are sometimes difficult for modern exciters to drive. The continuous key-down power rating of the 91β is more than 50% greater than the Alpha 76PA.

The Alpha 76 lacks QSK. The 91β uses a vacuum-relay QSK switching design similar to that in the 78 and 77 amps. Jennings or Kilovac relays handle the TR switching. The QSK rating is 50 WPM. The 91β operates on all the WARC-79 bands, whereas the 76PA cannot operate at 12 meters due to a plate-choke resonance on a nearby frequency. The weight of the two amps is almost identical, but the 91β is slightly larger.

Comparison to Alpha 87A and 89

The 87A is a luxury cruiser best known for its microprocessor-controlled, frequency-sensing automatic band-change and tune-up capability. It is undoubtedly the most desirable amp on the market today, but at \$5600, it's out of reach for many contesters.

The 91β lacks the convenience features of the Alpha 87A, but compares very favorably in the basic performance category. Its power output, frequency coverage, metering, finish and appearance are very similar to the 87A. Interior layout, parts complement and basic design are also very similar to the 87A. The 87A and 89 use PIN-diode switching for QSK. Compared to them, the 91β is noisy, but it gets the job done.

Replacement tubes for the 91β are a bargain at half the price of 3CX800A7s or 8874s. These tubes should provide about 10 years of full-output operation in amateur service.

The Alpha 89, which is built to commercial standards at ETO's plant in Colorado Springs and sells for \$3495, provided the design target for the 91β. Currently, it is somewhat redundant in the amateur product line, but it will remain—at least until the 91β proves itself in the market. If you want to take delivery on a manual tune ETO amp right away, it may be your only option.

Operating Impressions

The review 91β arrived a few days before the 1995 ARRL DX CW test. The transformer (shipped separately) weighs in at 40 pounds—five pounds lighter than the steel-core transformer in my 76PA, but with twice the rating. It

even has a handle on it—nice touch. On the inside, the workmanship looks superb, just as I am accustomed to from the Alpha. I could not help noticing the two big Soviet tubes.

The amp came wired for 220 V. You can run the 91β from 120 V, but not at full power on a normal household service. Unlike its older Alpha brothers, the 91β uses an SO-239 connector for the RF input, instead of a phono jack.

I worked 40 meters almost exclusively during the contest. I used the supplied tune and load numbers for my initial settings. Then, I just tweaked the controls for 1500 W and the green LED flickered. If I got too far off my tune-up frequency, the green LED went out. The grid LEDs are really nifty time savers, as well as a quick reference for safe operation. The output network never arced, and the protection circuitry was not fickle. It faulted only when I was on the wrong antenna or when I had the band switch set incorrectly.

The rest of the metering system is excellent, too. The top LED bar monitors RF output. Below that is the reflected-power LED bar and the grid LEDs. A third bar monitors either HV, anode current, or tune condition, all selectable from a front-panel rotary switch. In addition to these front panel features, the amplifier has a standby switch, a power switch, tune and load controls with Drake style knobs, and a band switch. The amp lacks the high/low anode-voltage switch found on older Alphas.

During the contest, the amp performed flawlessly. Except for a slightly louder

transformer, it had the same look, feel, and sound that I have grown accustomed to from the Alpha 87. The amp seemed cool and effortless. Signal reports were excellent. I used it on all bands during the following week, and during the CQWW 160 test. Again, no hiccups.

Ergonomically, this amplifier is a pleasure. It has a good feel, and well-positioned controls. I also like the way it looks. The front panel has a pleasant character. The flat black finish of the 91β matches the Alpha 87A and 89.

Conclusion

Currently, ETO is backordered on the 91β through the Fall of '95. There is some uncertainty associated with their delivery predictions because the production capacity of the Bulgarian plant is untested.

I have no hesitation in recommending this amplifier. Its performance is excellent in every respect that I could evaluate. Moreover, it carries a 30-day money back guarantee and a four-year warranty on workmanship. ETO even guarantees the tubes for two years.

Having had poor experiences with overrated amplifiers, I admire the conservative design philosophy of ETO. Although this raises the initial cost, it has paid off for Alpha owners in their products' excellent performance, reliability, and resale value. It appears that ETO has discovered a way to deliver the same quality and keep the cost down, too. ■