

# TE Systems 1410G 2 Meter Linear Amplifier

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Ever since my review of the Elecraft internal 2 meter transverter for the K3, I have been on the lookout for an amplifier that would boost its 10 W PEP output up to a level corresponding to its excellent (0.5 dB noise figure) receiver.<sup>6,7</sup> In every VHF contest I participated in, I was frustrated at hearing many hams who couldn't hear me. I was the opposite of an "alligator" (all mouth and no ears) — perhaps an elephant or a rabbit?

## What It's All About

The TE Systems 1410G 2 meter linear amplifier appears to be a well made "brick" type of amplifier. This model is rated for 160 to 200 W output for a drive level of 4 to 10 W. It is designed for 13.8 V dc power, although some of their amplifiers are for use with 28 V supplies, a good option if you have the power available. The dc connections are via Anderson Powerpole connectors on the rear panel, a good choice in my view. Their website ([www.tesystems.com](http://www.tesystems.com)) lists no fewer than 22 different models of 2 meter amplifiers with power outputs ranging from 50 to 600 W, so whether you are looking to boost the output of a 1 W handheld or an 80 W transceiver, chances are they have a model that fits. They offer a similar range of amplifiers for 6 meters through 70 cm.

This amplifier includes a preamp, which I wasn't looking for, but it can be switched off if not needed. Alternately, the preamp can be used without the power amplifier as they are separately controlled. The whole top of the amplifier is a heat sink with no fan (or noise) apparent while on the air — a real blessing. The amplifier has a thermal sensing protection circuit to shut down if there is excessive heat. We didn't experience any shutdowns or indications of thermal issues — it didn't even get warm during CW/SSB mode contesting. A fan kit is an option for those who will be operating in heavier duty modes, as are continuous duty rack mounted versions.

Transmit-receive (TR) control, often an issue with amplifiers, is available either through RF sensing or by use of contacts available on an accessory connector — a modular RJ-45 type. A front panel MODE switch selects between FM and SSB/CW. The TR delay in the SSB/CW position is



adjustable from the minimum to about  $\frac{1}{10}$  of a second via a rear panel screwdriver adjust control. This can be set to allow thinking between syllables during SSB without switchover, if desired. I found just above minimum suitable for semi break-in CW. If the switch is turned to FM the minimum delay is provided. Thus you can have two delay positions available, selectable from the front panel. I found that the RF sensing worked flawlessly without any noticeable TR delay either with SSB or CW.

If you use the accessory contacts for TR switching, the RF sensing is still engaged unless you clip a capacitor on the PC board. If it were my amplifier, I would probably do that, but it wasn't, so I didn't. In my experience semi break-in is sufficient for most CW operation on VHF, but you may think otherwise. The RF connectors are UHF type, although you can special order with type N if desired.

## On the Air

I received the amplifier just in time for the September 2011 ARRL VHF QSO Party event. I was now able to operate with 100 W PEP or more output on both 6 and 2 meters. In addition, we had our 6 meter Yagi add-on running, so we could aim both our 6 and 2 meter signals — what a concept!<sup>8</sup> I hooked the supplied Powerpole pigtail lead to the terminals of my compact 25 A switching supply that I use for vacations and was ready to go.

## Bottom Line

This is a very nice amplifier in terms of construction and operation. There is some room for further optimization of its preamp configuration and transmit IMD levels.

The amplifier worked flawlessly and seamlessly, although as noted below, I had to throttle back the power output to the minimum (about 4 W) from my K3 with K144XV transverter to avoid overdrive. With this amplifier, if I heard them, they heard me too — much better!

The only negative I observed was that in CW operation, the noise of the TR relay closures was quite noticeable. By extending the delay just a tad, it didn't drop out as often during exchanges and was not bothersome. Because of its design, the amplifier doesn't really need to be on the operating desk where I had mine, so it might be easily moved out of earshot. I tried moving it and the power supply to the other side of my basement adjacent to the antenna feed-through panel, and I never knew it was there — except now I had another  $\frac{1}{2}$  dB of power going to the antenna because of the shorter feed line! If you feel the need to keep track of things from the shack, the REM-10 remote control kit is available with a duplicate of the front panel controls and indicators. It includes a 12 foot cable with RJ-45 plug to match the REMOTE connector on the amplifier. We didn't have one to test, but I would expect to be able to extend it using computer networking cable.

## A Bit of History

I became aware of the TE Systems 1410G 2 meter linear amplifier early last year. It seemed a good candidate with an input drive power requirement of 4-10 W and an output of up to 160 W. We ordered one for lab testing. Unfortunately, our first sample had a second harmonic that was higher than FCC specs, so we returned it for repair. It came back and did meet the

<sup>6</sup>J. Hallas, W1ZR, "Elecraft K144XV 2 Meter Transverter for the K3," Product Review, QST, Aug 2010, pp 48-51.

<sup>7</sup>J. Hallas, W1ZR, "A Pair or Mirage 2 Meter Amplifiers," Product Review, QST, Aug 2010, pp 52-53.

<sup>8</sup>J. Hallas, W1ZR, "Add 6 Meters to Your Tribander," QST, Sep 2011, p 36.

**Table 2**  
**TE Systems 1410G, serial number C1388**

<b>Manufacturer's Specifications</b>	<b>Measured in ARRL Lab</b>
Frequency range: 144 – 148 MHz.	As specified.
Power requirements: 13.8 V dc, 22 A nominal.	Transmit, 22 A (at 160 W out); receive, preamp off, 28 mA, preamp on, 100 mA at 13.8 V dc.
Driving power required: 4-10 W.	0.3-10 W; corresponding power output, 35-183 W.
Spurious and harmonic suppression: Not specified.	68 dB. Meets FCC requirements.
Transmit intermodulation distortion: Not specified.	3rd/5th/7th/9th order: -17/-29/-37/-44 dB.
Receive preamp gain: 15 dB.	144 MHz, 7.4 dB; 147 MHz, 10.8 dB.
Receive preamp noise figure: Not specified.	144 MHz, 1.9 dB; 147 MHz, 1.7 dB.
Size (HWD): 3.0 × 5.8 × 10.5 inches (including protrusions).	
Weight, 4.15 pounds.	
Price: \$496.	

intermodulation distortion (IMD) products are higher than we'd like to see and could interfere with nearby stations.

The preamp was more of a disappointment. The TE Systems website noted that the device used could realize a 0.5 dB noise figure (NF) and 18 dB third order intercept. In real life, the NF of the device itself is degraded to some extent by associated circuitry, particularly the TR relays included in the amplifier. Although preamp performance is in line with other VHF/UHF brick amplifiers, I was hoping for better. A preamp of this order would be a great addition for a station with an older or lower performing receiver, or one with a tower mounted amplifier arrangement and a long transmission line run to the station. With the amplifier located at or near the K3 it offered no benefit because the K3 has an excellent NF.

### Documentation

The unit is supplied with a 24 page half sheet instruction manual. It was quite complete, covering setup, operation, cautions and even a schematic and parts list. Unfortunately, it was for the 1412 series amplifier not our 1410 (the 1412 is similar, but requires 25-50 W input). Our manual also had drawings that were too faint to read.

*Manufacturer:* TE Systems, PO Box 25845, Los Angeles, CA 90025; tel 310-478-0591; [www.tesystems.com](http://www.tesystems.com).

spec, but the power transistors failed during subsequent testing. There was some delay in getting it repaired, reportedly due to lack of availability of the devices.

The unit that was returned worked fine, but had 3 dB more gain than the first — reaching 160 W output with 3.5 W drive and saturation with just 5 W of drive. This was workable with my Elecraft K3 transceiver, which I could just throttle back to that output level. Fortunately, TE Systems offers amplifiers at multiple power levels — both

in terms of drive and output power, so you can pick one that fits your needs. This is important because the manual cautions that overdriving the amplifier will destroy the first amplifier stage devices.

### Lab Testing Results

Table 2 shows the results of our lab tests. As noted, the amplifier operates at a somewhat different power range than was expected. Still, it met my requirements and didn't challenge my 25 A power supply. At full output, transmit

# The Sixth Annual ARRL On-Line Auction

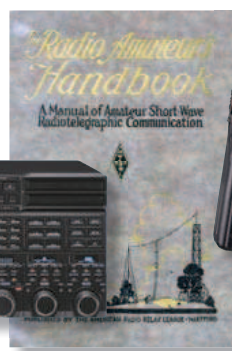
*This annual event drew hundreds of bids on almost 200 items.*

**S. Khrystyne Keane, K1SFA**

**A**fter a week of frenzied bidding, the Sixth Annual ARRL On-Line Auction ended with a bang on October 26. The 2011 running of the auction featured almost 200 items, ranging from high-end Product Review equipment to a great assortment of antique books. In addition to bidders from the US, the auction saw winning bids from Canada, Italy, Japan, China and Brazil. According to Auction Coordinator Deb Jahnke, K1DAJ, bidding was fierce for the Yaesu FT-DX 5000D HF/6 meter transceiver that ultimately went to a bidder in China who placed a winning bid of \$4925. This rig was featured in the December 2010 issue of *QST* as a Product Review item.

"The Sixth Annual ARRL On-Line Auction was a great success," Jahnke said. "In the end, all of the items that were up for bid were sold. Not only did we have a lot of new bidders this year, we also had many repeat bidders from the past several years."

Jahnke said that she is always amazed at the interest that the On-Line



Auction draws each year: "Bidders are not just interested in the many pieces of Amateur Radio gear that we have, but also in our tremendous selection of vintage books. All of the books in the auction received high bids, but the one that topped the list was a copy of the 1927 ARRL *Radio Amateur's Handbook*. Originally offered in 1927 for only \$1, a lucky ham in China walked away with this historical book with a winning bid of \$220."

Once results were tallied, the Sixth Annual ARRL On-Line Auction offered 180 items, attracting a total of 1230 bids and 94 winning bidders, many of whom had winning bids on multiple items. "We have certainly grown since we held the First Annual ARRL On-Line Auction in 2006," Jahnke said. "Back then, we only had 109 items for bid. Even though the auction is closed for 2011, you can still view all items that were up for bid and the results at [www.arrl.org/auction](http://www.arrl.org/auction). If you missed out this year, make sure to place your bids in 2012 when we'll do it all over again!"