

SPE Expert 1.3K-FA Solid State Linear Amplifier

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In 2009 we reviewed a new solid-state power amplifier from Italy, the SPE 1K-FA.¹ That amplifier covered 160 through 6 meters with output power typically 1 kW PEP for SSB and 900 W for CW on the HF bands, 700 W at 6 meters, and 500 W (HALF POWER setting) for extended operation using digital or other high duty cycle modes. That compact amplifier weighs 44 pounds. In 2013, we reviewed the SPE 2K-FA. That amplifier had no problem delivering legal-limit output from 160 through 6 meters, and it dropped back to the MID power setting for 1000 – 1100 W output during extended digital operation. It is larger than the 1K-FA but still smaller than typical legal-limit tube-type amplifiers and weighs 55 pounds. Both of these amplifiers are still available.

The subject of this review, SPE's 1.3K-FA, fits between the two older models in power output and price but brings some new technology to the table. The 1.3K-FA covers 160 through 6 meters and operates at reduced power on the 4 meter (70 MHz) band available in other parts of the world. In the MAX power setting, the review unit delivers 1300 to 1500 W on all bands except 6 meters, where output is 1100 W. With the MID setting it delivers 1000 – 1100 W, and 500 – 600 W in LOW. The amplifier automatically switches to a lower power during extended high duty cycle operation (RTTY, for example) or for amplifier protection (high antenna SWR, for example).

The 1.3K-FA uses just one LDMOSFET power transistor rather than the six earlier generation MOSFETs used in the other models. The LDMOSFET offers quite a bit of gain, so amplifiers for the US market include attenuation at the input to comply with the 15 dB gain maximum required by FCC regulations. The review unit typically requires 30 – 35 W for full output and



exhibits higher gain at lower drive levels.

Our amplifier includes a built-in automatic antenna tuner (ATU) that will match SWR of up to 3:1 on HF and 2.5:1 on 6 meters. The 1.3K-FA is also available without the antenna tuner. The amplifier has four antenna connectors, as well as RF input, ALC, transmit-receive relay, and band data connections for two transceivers. A built-in switchmode power supply supplies 50 V for the LDMOSFET. That's reduced to about 40 V for the MID power setting and about 33 V for LOW. The supply works from 100 to 255 V ac, but operation from a standard 15 or 20 A household 120 V line will likely result in reduced output.

The front panel LCD is 5 × 1.5 inches and displays the amplifier's settings, operating conditions, and menus. Backlight brightness and contrast are adjustable. Indicators along the bottom show radio, band and antenna selected, CAT (transceiver interface) setting, output level (MAX, MID, LOW),

Bottom Line

The SPE Expert 1.3K-FA supplies near legal limit power from 160 through 6 meters and includes sophisticated transceiver interfaces and antenna switching. The built-in antenna tuner makes it tolerant of less-than-perfect antennas. For those with well matched antenna systems, the amplifier is available without the tuner at significant cost savings.

SWR on the amplifier side of the ATU, and temperature. The upper portion of the display shows RF output (both bar graph and numerical display) and PA current when the amplifier is ready to operate. A front panel switch changes the upper display to PA voltage, indicators showing that the fans are running, and SWR on the antenna side of the tuner. In standby the LCD shows exciter power (up to 200 W) and SWR on the antenna side of the ATU.

The entire package is compact and weighs just 21 pounds (16.5 pounds without the automatic antenna tuner) — less than half the weight of the 1K-FA and roughly the same size. All that power from such a tiny box is amazing to someone who grew up in the days of tube-type amplifiers that were hard to move around the shack.

Setup

The first step after unpacking the amplifier is reading through the manual, which is supplied in PDF format on a CD-ROM or downloadable from the Expert Linears website. While you could likely get the amplifier set up and running for basic operation without reading the manual, there are quite a few features to learn about.

As with most power amplifiers, the user supplies and installs the ac line plug. In my case I needed a 240 V, 20 A connector to match the outlet in my station. The power supply senses the input voltage automatically, so there are no jumpers or menu settings involved.

Figure 9 shows the (many) rear panel connections. There are separate sets of RF input (SO-239), TR relay (phono), ALC (phono), and transceiver interface/band data (DB-15) connectors for two radios. The 1.3K-FA is capable of interfacing with transceivers from all major brands, including Elecraft, FlexRadio, Icom, Kenwood, TEN-TEC, and Yaesu. Only the RF input and TR relay connections are absolutely required because the amplifier uses a

Table 2
SPE Expert 1.3K-FA, serial number 153700175
FCC ID number 2ADK5GC324809

Manufacturer's Specifications	Measured in ARRL Lab
Frequency range: All amateur frequencies in the range of 1.8 to 29.7 MHz, 50 to 54 MHz and 70 to 70.5 MHz.	160, 80, 60, 40, 30, 20, 17, 15, 12, 10, 6 meters.*
Power output: Up to 1500 W, 1300 W typical (Max); 800 W (Mid); 450 W (Low); 600 W (typical) at 70 MHz.	As specified, except 1100 W on 6 meters.*
Driving power required: Not specified.	25 – 35 W typical for 1300 – 1500 W PEP output (1100 W at 6 meters).
Spurious and harmonic suppression: HF, >60 dB; 6 meters, 65 dB.	HF: 57 dB (typical), 49 dB worst case (40 meters); 6 meters, 64 dB. Meets FCC requirements.
Third order intermodulation distortion (IMD): 30 to 35 dB below PEP typical.	3rd/5th/7th/9th (14 MHz, 1300 W PEP): -31/-39/-57/-55 dB.
TR relay switching time: Not specified.	Unkey to key, 13 ms; key to unkey, 5 ms.
Primary power requirements: 100 – 255 V ac, 47 – 63 Hz.	Tested at 240 V ac. Operation from 120 V may result in reduced output power.
Size (height, width, depth): 4.7 × 11 × 15 inches; weight, 21 lbs.	
Price: \$4995 with automatic antenna tuner; \$3795 without automatic antenna tuner.	

*In the US, the legal power limit on 30 meters is 200 W PEP output and on 60 meters it is an ERP of 100 W PEP relative to a half-wave dipole. A 4 meter exciter was not available at the time of testing.



Figure 9 — Rear-panel view of the SPE Expert 1.3K-FA amplifier. The four antenna connectors are at the upper left, while the RF input for two radios and the SO2R connector are at the upper right. Along the bottom are connectors for interfacing two transceivers and USB and serial ports for computer connectivity/remote control.

frequency counter that can sense the RF input when you transmit and adjust accordingly. You can change bands by speaking a syllable or two, or sending a dit or two on CW. Use of the band data cable is “highly recommended,” however, so that the amplifier follows transceiver frequency changes without transmitting.

When we ordered the amplifier, we also ordered transceiver interface cables from Dan Tassel, KC5PCB, who is associated

with the US distributor. One set was for an Icom IC-7100 in the Lab and the other for a Kenwood TS-590S in my station. In my case, one end connected to the CAT1 jack on the back of the amplifier and the other end had connectors for the COM (RS-232) and REMOTE jacks on my transceiver. No other cables were required because TR relay and ALC connections are also available on the amplifier’s CAT connectors. To complete this step, I next went to CAT menu, selected Kenwood and 9600 baud,

and the radio was talking to the amplifier. The instruction manual provides quite a bit of information and helpful diagrams for those who want to make their own cables.

Next I used the menu to set up the amplifier for my antennas. There are four antenna connectors on the rear panel. The ANTENNA menu lists all bands from 160 through 4 meters. You select the proper antenna connector (1 – 4) for each band, or NO if you don’t have an antenna for that band. You can set two antennas for each band and select between them with the front panel ANT switch. When assigning antenna connectors by band, you can also chose whether or not to use the automatic antenna tuner for that band. Note that you can set up two “banks” of antenna settings — A and B — which would come in handy if you use the amplifier in multiple locations.

Antenna Tuner

The internal automatic antenna tuner (ATU) is specified to match loads with an SWR of up to 3:1 (2.5:1 on 6 meters). The manual warns to use antennas having SWR less than 1.5:1 without the ATU. When SWR exceeds 1.7:1, the amplifier protection circuitry gives a HIGH SWR warning and drops the power back to MID. Above 2:1 the amplifier switches to standby.

My antenna system is pretty well matched, but I did need to use the tuner on 160, 40, and 17 meters. Setup is easy. Each band is divided into segments shown in a chart in the manual. For example, 160 meters is divided into 10 kHz segments, 20 meters uses 50 kHz segments, and 10 meters uses 100 kHz segments. Tune the transceiver to the center of the first segment. With the amplifier in standby and the transceiver set to 30 W output or less, press TUNE and transmit briefly. The tuner relays click and typically find a match within a few seconds. Tune to the center of the next segment and repeat the process. Do this for each band and antenna where the SWR is higher than 1.5:1. The display shows SWR on the amplifier and antenna sides of the tuner simultaneously.

If you’re not happy with the match the 1.3K-FA comes up with, you can adjust the inductance and capacitance manually while watching indicators that appear on the display. I didn’t find that necessary.

The only place I could not find a match was the very high end of 160 meters, where my antenna SWR approaches 4:1 and the amplifier flashed a warning that the SWR was too high. I use 450 Ω balanced line and an external tuner for my 80 meter dipole, and in that case turn off the internal tuner. I wasn't able to try this, but the manual indicates that the 1.3K-FA can be connected to the control box of a SteppIR or Ultrabeam antenna to manage tuning of those antennas.

It's a bit tedious, but once the ATU setup is complete you don't have to worry about it again until something changes.

Other Features

Like the other SPE amplifiers, the 1.3K-FA uses a microprocessor-based protection system that monitors heat sink temperature, input power, PA voltage and current, reflected power and SWR, and RF voltage on the tuner. Problems are classified as simple, serious or fatal and the amplifier handles them in different ways. For simple problems such as excessive input power, the amplifier sounds a warning beep and resets itself. For serious problems, such as excessive heat sink temperature or high SWR, the amplifier switches to standby and an error message with the reason for the fault flashes on the display and is stored in memory so that the operator can find and fix the problem. I tested this protection a few times by inadvertently transmitting on the wrong antenna. For a fatal fault such as a power supply or microprocessor problem, the amplifier power switches off and might be restarted by cycling the power switch on the rear panel. The manual recommends contacting the distributor if a fatal fault occurs.

The 1.3K-FA rear panel has four small fans that come on when the amplifier is turned on and run at low speed. Fan speed increases noticeably when you close the TR switch to transmit and returns to low speed when you switch back to receive. Fan speed in receive automatically increases with heat sink temperature and slows down as the heat sink temperature drops. Some people may find the fan noise at higher speeds bothersome. I wear headphones for nearly all operation so it wasn't an issue for me.

The LCD includes a temperature display that's always visible. According to the

manual, if the temperature reaches 75 °C, the power will drop back to MID or even LOW until the temperature reaches safe levels. During routine operation in my basement location, the temperature tended to stay between around 40 °C. During extended CW and RTTY contest operating periods, it would reach the 60 – 65 °C range. At that point, the fans were running pretty fast on receive as well as transmit.

Full break-in (QSK) is available for CW operation. The amplifier uses mechanical relays, rather than vacuum relays or PIN diodes, and some operators might find the clicking bothersome without the use of headphones.

As with the other models, SPE advertises the 1.3K-FA as being capable of SO2R (single operator, two radio) operation. This technique is used by contest operators to transmit on one band while listening on another, and quickly transmitting on the second band when a needed contact is found. Normally this is accomplished with two transceivers, two amplifiers, bandpass filters, and appropriate switching.

As described previously, the 1.3K-FA has connections for two radios with independent settings for each. There's an SO2R jack on the back of the amplifier for an antenna separate from the main antennas, and this antenna is used only for receiving. The transceiver connected to the active input uses the main antennas and antenna tuner. The other transceiver is connected to the SO2R antenna and can use that antenna for receiving while the active radio is transmitting. The idea is to use the second transceiver and receive-only antenna to find a station on another band that you want to work and then to switch that transceiver to the main transmitting antenna for that band in order to make the call.

As noted in the 2K-FA review, this capability is somewhat useful but it is not as versatile as how SO2R is typically implemented with a switching system that allows one transceiver to use any of the main antennas not being used by the other. My system is quite simple and uses an Array Solutions Six Pak antenna switch (two radios, six antennas) that is operated manually. The 1.3K-FA manual describes SO2R station configurations using the amplifier to control an optional SPE SO2R1 switching unit and BPF1 bandpass filters, but these

units were not available during the review period.

Note that the manual recommends high isolation (physical separation) between the SO2R antenna and main antennas and the use of bandpass filters for receiver protection. It goes on to say, "In this case, SPE is not responsible for any damage caused to equipment."

The 1.3-FA has USB and RS-232 ports on the rear panel that can be used to connect the amplifier to a *Windows* PC to upgrade the firmware or for controlling the amplifier. Terminal and control software is supplied on the CD shipped with the amplifier or available for download from the SPE website. The remote control software displays a replica of the amplifier's front panel LCD and switches for monitoring and control.

Final Thoughts

I enjoyed using the SPE Expert 1.3K-FA at my station for several months, including extended contest operation in the ARRL RTTY Roundup and ARRL International DX Contest. Once I had the amplifier installed and programmed for my station, it performed flawlessly. There is not much to say about using it — band changes instantly follow the transceiver, and the amplifier makes power on the selected band. Temperature stayed within the safe range, even during extended RTTY contest operation. Its low drive requirement allowed my transceiver to run cooler.

SPE calls the 1.3K-FA a "1.3 kW solid state fully automatic amplifier" and it certainly lives up to that billing. Its light weight, built-in antenna tuner and wide-range power supply make it attractive for DXpeditions. Those setting up remote stations will want to explore its remote control and monitoring capabilities.

Manufacturer: SPE (Societa Per L'Elettronica), Via di Monteverde, 33, 00152 Rome, Italy; www.linear-amplifier.com. *US distributor:* Expert Linears America, PO Box 1224, Magnolia, TX 77355; tel 281-259-7877; www.expertlinears.com.

Notes

¹M. Wilson, K1RO, "SPE Expert 1K-FA Linear Amplifier," Product Review, *QST*, Sep 2009, pp 44 – 47.

²D. Sumner, K1ZZ, "SPE Expert 2K-FA Solid State Linear Amplifier," Product Review, *QST*, Nov 2013, pp 54 – 56.