If you're looking for an instant-on, no-tune power amplifier for HF and 6 meters, AD5X says Tokyo Hy-Power's HL-1.5KFX should definitely be on your short list...

CQ Reviews:

The Tokyo Hy-Power HL-1.5KFX HF/50-MHz Power Amplifier

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I suspect that many of you at least occasionally wish for more power. Whether it is due to degrading conditions while trying to maintain a QSO, wanting a little more of an edge in contesting and DXing, or even to compensate for an inadequate antenna system, sometimes an amplifier can really make a difference.

If you are considering a power amplifier, you'll find that there are quite a few choices to be made. Amplifiers are available with power output levels from about 600 watts to 1.5 kilowatts; they can be manually tuned, auto-tuned, or no-tuned; and they can have either vacuum-tube or solid-state finals. I only need an amplifier occasionally, but when I do, I want it on-line and operational immediately. Therefore, my preference is a solid-state, no-tune amplifier. Thus, when *CQ* asked me to take a look at the new Tokyo Hy-Power HL-1.5KFX amplifier, distributed exclusively in the U.S. by Ham Radio Outlet[1], I jumped at the opportunity.

While Tokyo Hy-Power (THP) has been in the ham market for many years, it has not marketed products in the U.S. for quite a while. However, many hams have ordered products directly from THP in Japan. Also, if you are a QRPer, you almost certainly are aware of, and may have used, the THP HT-750 40/15/6-meter CW/SSB hand-held transceiver, or the popular THP HL-50B power amplifier. However, now Tokyo Hy-Power has made a formal entry into the U.S. market with the HL-1.5KFX. We will also be seeing the THP HL-1.2KFX, HL-2.5KFX, and probably other amplifiers as soon as they get FCC approval. To complement these amplifiers, by the time this review is published HRO should also be selling the THP HC-1.5KAT full-legal-limit auto antenna tuner. The HC-1.5KAT is designed to provide plug-and-play operation when connected directly to THP amplifiers.

Photo A– The Tokyo Hy-Power HL-1.5KFX provides 1000 watts of power from 1.8–30 MHz and 600 watts on 6 meters.

The Package Arrives

If you have had or have been around HF amplifiers, you'll be pleasantly surprised at the size of the HL-1.5KFX. When UPS delivered the amplifier, my first thought was that HRO had sent the wrong item! After all, how could a 1-KW HF amplifier fit in that small box? As it turns out, the HL-1.5KFX is extremely compact at just 10.7 inches wide, 5.6 inches high, and 14.3 inches deep, including the power supply. This is truly an amplifier that can easily be placed in even compact operating locations. It is pretty hefty, though, weighing in at about 45 pounds. However, this is a manageable weight for most of us.

Besides occupying minimal space in home stations, the small size and reasonable weight also make this amplifier perfect for portable and DX operations.

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The HL-1.5KFX is physically quite attractive as well. Photos A and B are close-ups of the front and inside of the amplifier. As you can see, the appearance and construction are very functional and clean.

Amplifier Details

Before getting into performance details, let's first look at some of the specifications and features of this amplifier. First of all (and probably of most interest) is power output. The HL-1.5KFX uses four power MOSFET2 final devices to generate 1000 watts PEP SSB and 900 watts CW typical output power from 1.8–30 MHz, which is only about 2 dB down from full legal limit. On 6 meters the output power is specified at 600 watts typical. AC power requirements are 20 amps maximum at 120 VAC or 10 amps maximum at 240 VAC. For continuous operation modes such as RTTY, THP recommends that you reduce power 20–30% and use the optional fan kit (HXT-1.5KF). The amplifier comes set up for 240 VAC, as most U.S. homes limit 120 VAC current to 15 amps. However, no AC plug is provided, because, as stated in the manual, "The correct AC plug must be obtained locally due to the AC plug variations worldwide."

Because those final amplifier MOSFETs are very expensive, THP does a great job of protecting the amplifier from user mistakes or other potential final-damaging incidents. When the protection circuits operate, they cause the amplifier to go off-line. There are five major protection circuits built in, all of which have front-panel indicators. These include **Over Drive** for when drive power exceeds 100 watts, **Over**

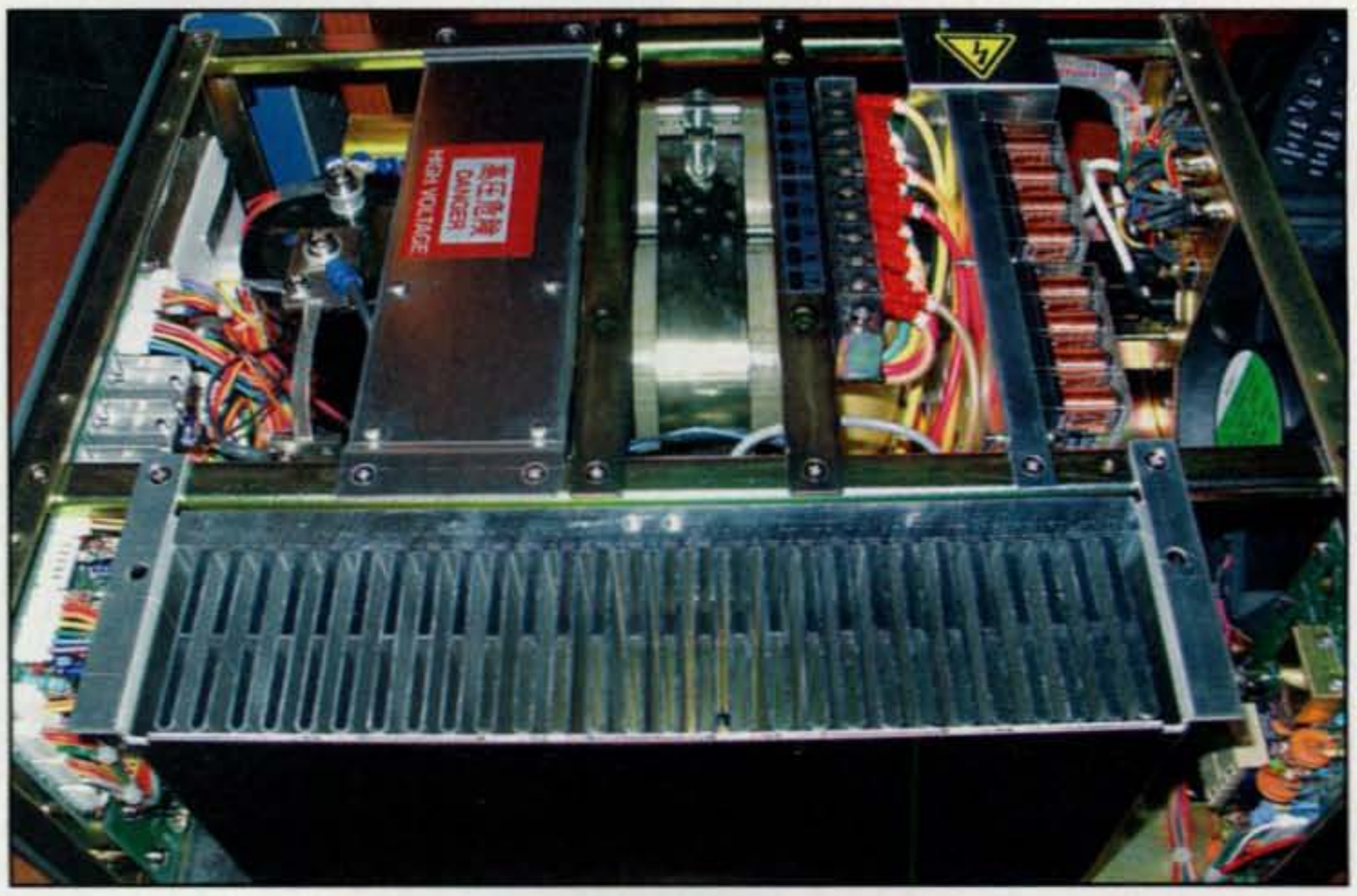

Photo B– Inside view of the amplifier. Note the massive heatsink in the foreground.

Photo C– Full rear view of the amplifier.

Heat if the heat sink or power transformer temperatures exceed safe levels, **Over Voltage** if the final MOSFET drain voltage exceeds a safe level, **FUSE** if either of the two fuses blows, and **PR**, which indicates reflected power has exceeded 80 watts.

For you CW types, the HL-1.5KFX operates full QSK (break-in keying) using fast miniature power relays for T/R switching. These relays have a typical enable time of 5 ms, which is actually slightly faster than many vacuum relays. I was really pleased to see this, as I am primarily a CW operator and I find QSK almost a necessity when working DX pile-ups. The 5-ms relay switching time is faster than the amplifier keying-to-RF-output delay of most transceivers. As an example, I measured this delay at 8–10 ms on an IC-7000, and 12–15 ms for the IC-706MkIIG. Thus, any CW character shortening will be due to your transceiver, not the HL-1.5KFX. If your transceiver has an adjustable output delay, you should set this to something greater than 5 ms to ensure you never hot-switch your transceiver or amplifier.

Finally, the HL-1.5KFX is capable of automatic band changing when connected to most relatively recent transceivers. Cables are included to interface band-data information with many higher end ICOM, Kenwood, and Yaesu transceivers. You will need to provide your own ALC and amplifier keying cables (typically RCA cables). The user manual also provides information relative to interfacing with the Ten-Tec Orion, and states that you can request information on interfacing your specific radio directly from THP. While you can manually change bands from a front-panel switch, automatic band-changing is very convenient. THP also recommends automatic band changing, and the manual states that amplifier damage can occur if you accidentally transmit full power with the band set incorrectly.

Connecting the Amplifier

Connecting the HL-1.5KFX is easy, although it may not always be a trivial effort, depending on your transceiver. First you must purchase an appropriate AC plug from your local home-improvement store (240 VAC: "hot" leads are black and white, and "ground" is green. 120 VAC: "hot" is black, "neutral" is white, and "ground" is green). THP recommends that you actually measure your line voltage and then verify that the amplifier is strapped for the correct AC voltage, as incorrect strapping could result in damage to the amplifier. ***Be careful*** when measuring the AC line voltage, and while the HL-1.5KFX has an internal AC interlock that operates when the cover is removed, you should ***never*** remove the cover unless the amplifier is unplugged. Finally, verify that the 115/220-VAC switch on the bottom of the amplifier is set correctly.

As mentioned earlier, the HL-1.5KFX comes with the necessary cables for interfacing with the band-data output of popular higher end transceivers. You can see the RF in/out and well-marked ICOM, Kenwood, and Yaesu connectors in photos C and D.

However, my IC-706MkIIG is not directly supported by the supplied cables. While I planned on using my Yaesu FT-1000MP MkV for many of my tests, I needed the IC-706MkIIG to test the amplifier on 6 meters. In the HL-1.5KFX manual it states that you must construct your own cable for the IC-706 and IC-7000, utilizing the accessory cable assembly that ICOM supplies with these transceivers. See "Interfacing the

Photo D– Close-up of the well-marked transceiver interface connectors. All cables are supplied for directly interfacing band-data information from many ICOM, Kenwood, and Yaesu transceivers.

IC-706/IC-7000" for my approach to connecting this rig.

Performance

For my first series of tests, I measured the amplifier power output into a legal-limit dummy load, and I checked the amplifier's internal power metering against an external peak-hold wattmeter, which I observed being calibrated with NIST3-traceable test equipment. The ALC control on the amplifier was set fully clockwise so that the output of the amplifier was related solely to the transceiver drive applied. I measured key-down power on both the HL-1.5KFX internal power meter and the external wattmeter, as well as CW and SSB power with the external wattmeter. For the CW power measurement, I sent a string of "dits" while using a medium peak-hold setting on the external wattmeter. I used a long peak-hold setting for measuring peak SSB power while I called CQ (into the dummy load, of course). As you can see in Table I, the HL-1.5KFX does a nice job of meeting its typical power-output specifications. You'll note that I ignored 60 and 30 meters, as output power on these bands is limited to 50 watts ERP and 200 watts, respectively.

Band	Drive	Key Down Amp Meter	Key Down Ext. Meter	CW "Dits" Ext. Meter	Peak SSB Ext. Meter
160m	100 watts	875 watts	800 watts	920 watts	1000 watts
80m	100 watts	900 watts	840 watts	920 watts	1010 watts
40m	100 watts	800 watts	780 watts	865 watts	950 watts
20m	100 watts	800 watts	800 watts	890 watts	975 watts
17m	100 watts	740 watts	760 watts	850 watts	940 watts
15m	100 watts	850 watts	880 watts	960 watts	1025 watts
12m	100 watts	700 watts	760 watts	880 watts	975 watts
10m	90 watts	800 watts	870 watts	960 watts	1020 watts
6m	90 watts	700 watts	690 watts	760 watts	820 watts

Table I– Amplifier power-output measurements.

Next I checked the point where the SWR protection shutdown occurred and found it to be right at 80 watts reflected power as specified. Since the HL-1.5KFX shuts down with 80 watts reflected power (a 2:1 SWR at 900 watts output), you can operate into a higher SWR if needed simply by reducing your output power. However, you really should address the high-SWR issue (another reason to look at the HC-1.5KAT auto tuner).

On the Air

All the basic testing is great. But how about actual use and on-the-air performance? My first on-the-air experience with the HL-1.5KFX was on 6 meters using my IC-706MkIIG as the driver and just an east/west-oriented 6-meter dipole mounted on my chimney. There was a nice opening one evening, and I was able to work a number of stations on both coasts, on CW and on SSB. When operating QSK on CW, I could hear the amplifier's T/R relays. However, the relay noise is not objectionable and is really no louder than the relays in the IC-706MkIIG. When operating SSB, one of my Florida contacts told me I was readable but noisy. I flipped on the amplifier and he said, "It sounds like you just moved in next door."

Most of my operating was on 160, 80, 40, 30, and 20 meters using my Yaesu MkV. One of the THP-supplied band-data cables interfaced directly with the MkV, so all I had to do was connect this supplied cable and two RCA cables (ALC and amplifier keying) and set the front-panel Band Select control to Yaesu. In all cases, operation was smooth and easy. It is great to change bands on your transceiver and have the amplifier automatically follow. It also is extremely nice not to have to worry about tuning your amplifier when you change bands or frequencies. Just hit the key (or press the PTT on your mic) and transmit. I did tend to notice the QSK relay switching noise more, as the relays in the MkV are very quiet. Again, however, the amplifier relay noise was not objectionable. The continuously running two-speed HL-1.5KFX fan was also very quiet—much quieter than the fan in my MkV.

One Last Comment on Band-Data Interfacing

When ordering the amplifier from HRO, ask them if your transceiver is supported by the supplied band-data cables. If not, ask HRO for its recommendation for cables and/or an interface if you don't want to build your own cables. Again, remember that cables for ALC and amplifier keying are not supplied with the amplifier.

Conclusion

The Tokyo Hy-Power HL-1.5KFX is a quality solid-state amplifier that is certainly worth considering. Its compact size easily lends itself to installation in even the most space-efficient stations, as well as portable and DXpedition applications. Also, the no-tune, instant-on, band-following features make this an amplifier that is especially easy to use—so much so that flipping on and operating the amplifier as conditions warrant becomes an almost thoughtfree process. The only issue I have is that when someone asks me what amplifier I'm running, it takes a long time to say "HL-1.5KFX" in Morse code!

Notes

1. <www.hamradio.com>
2. For the acronym-impaired, MOSFET is short for Metal-Oxide Semiconductor Field Effect Transistor. (Aren't you glad you asked?)
3. National Institute of Standards and Technology

Interfacing the IC-706/IC-7000

It is necessary to build your own interface cable to connect the HL-1.5FKX amplifier to ICOM IC-706 and IC-7000 transceivers. For IC-706 series radios, you can use either the DC analog band-data output or the CI-V remote-control output on the transceiver. Both are supported by the HL-1.5KFX. If you are using an IC-7000, you should use the CI-V interface, as analog band data is not available unless the radio is modified (modification information is in the IC-7000 user's manual). For the IC-706/IC-7000 Send, ALC, and Band Data interface, the necessary connector wiring is as follows:

ICOM ACC Pin/Desc.	HL-1.5KFX connector
Pin 2/GND (RED)	Common ground to all connectors
Pin 3/HSEND (ORG)	SEND/RCA Jack
Pin 5/BAND (GRN)	ICOM/RCA Jack (not necessary if CI-V cable is used)
Pin 6/ALC (BLU)	ALC/RCA Jack
CI-V/3.5-mm mono jack	CI-V/3.5-mm mono jack (cable supplied with HL-1.5KFX)

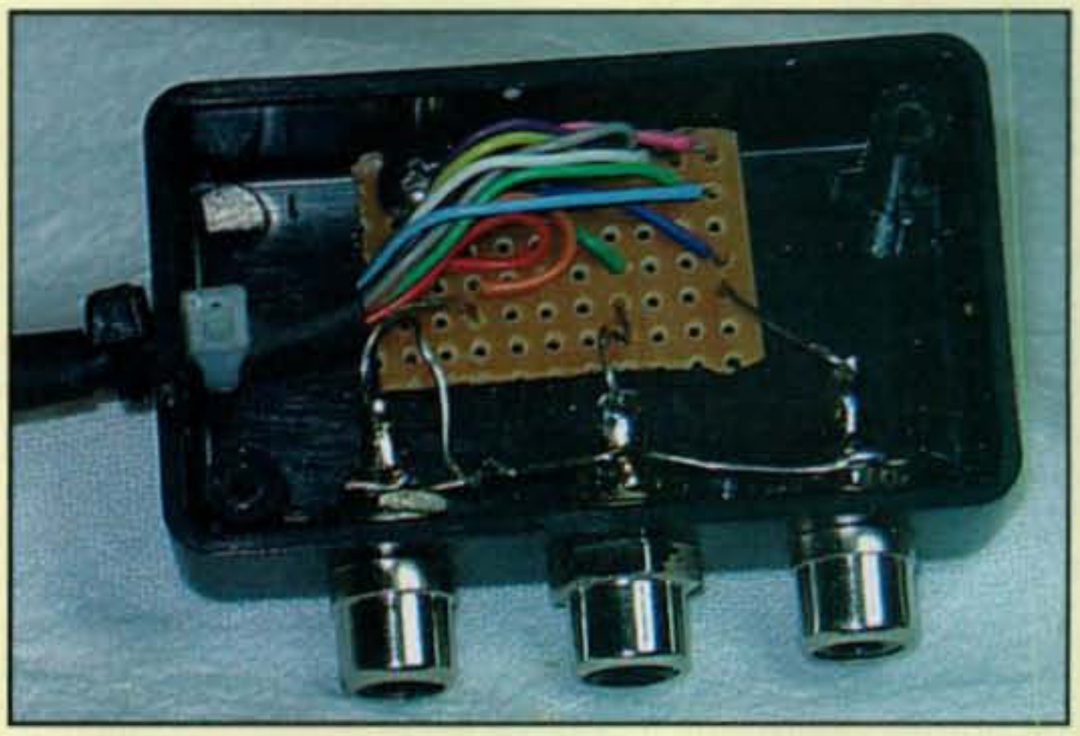

Photo E– Inside wiring of the IC-706MkIIG interface.

The HL-1.5KFX requires less than 1 ma of keying current, so there is no problem interfacing directly with the HSEND keying output of the IC-706/7000. Also, when using the CI-V interface, you need to set various parameters in your transceiver as described in both the HL-1.5KFX and transceiver user manuals.

Rather than trying to solder RCA plug-terminated cables to the tiny wires on the ICOM accessory plug, I terminated the wires on a small piece of All Electronics (www.allelectronics.com) PC-1 perfboard mounted in an All Electronics 1551HBK 2.4" × 1.4" × 0.8" plastic box. I also mounted three All Electronics RCMJ RCA jacks on the plastic box (only two are required if the CI-V interface is used). This permitted me to use a component video-cable set (All Electronics CB-271) for interfacing between this plastic box and the HL-1.5KFX. Photo E shows the internal wiring of my IC-706MkIIG interface box, and photo F shows the outside of the closed and labeled interface box.

Now all that is necessary is to set the amplifier's front-panel Band Select switch to "ICOM" and the rear Band Decode switch to "DC Voltage Band Data" or "CI-V" as required. For those who don't want to build an interface cable, you can purchase an Ameritron ARB-704 Amplifier Interface Buffer with the PNP-13D interface cable. This gives you the ALC and amplifier keying outputs from the accessory connector on the IC-706/7000. For the band data, you would use the CI-V cable supplied with the HL-1.5KFX amplifier. The ARB-704 may also provide a solution for many other transceivers, as numerous interface cables are available.

Photo F– Outside view of the IC-706MkIIG interface.