

Kenwood TS-790A Multimode Transceiver

This tri-band multimode radio has been on the market for over a year now, but favorable exchange rates and its appearance on the used equipment market brings it within reach of many more hams.

By Gordon West, WB6NOA*

The Kenwood TS-790A is an all-mode, tri-band VHF/UHF transceiver in which 2 meters and 70 centimeters come standard from the factory, and the 1270 MHz band can be added by simply plugging in an optional band module. I've been operating the 790 for over a year, having bought it new for around \$2,300. That included the base station microphone, as well as the UT-10, the 10-watt plug-in module for 1.2 GHz. The 790 was recently seen selling new for \$1,599, minus a \$200 Kenwood coupon, plus \$549 for the 1.2 GHz module.

What has prompted this one-year review of the 790 is its rock-solid performance, and the appearance of this equipment at flea markets selling for \$1,000 (with some used units even including the 1.2-GHz module to boot!). I saw three on the selling block at the Dayton Hamvention™, and most everyone mistook them for some sort of HF transceiver. Nope—the Kenwood 790A covers only 2 meters, 70 centimeters, and the 1.2-GHz band, multimode. No high frequency. The equipment is designed for satellite work as well as weak signal VHF/UHF DXing.

A Heavyweight Champion

The 790 is one heavyweight VHF/UHF transceiver! With a 1.2-band unit installed, it tips the scale at 23 pounds. Luckily, Kenwood supplies a carrying handle along with the radio. And while this heavyweight equipment may *seem* like it has an AC transformer built in for



The massive (23-pound) Kenwood TS-790A on the test bench. No, it's not intended as a mobile rig even though it runs on 12 volts DC. It's built for home or portable operation where its excellent receiver can really be appreciated. (Photos by the author)

base station use (it's so heavy, it must!), *it doesn't!* The equipment plugs into the common 6-pin power cord, and runs *only* on 13.8 volts DC. If you want to run it from house power, choose a power supply from Kenwood or an after-market supply supplier, such as Astron.

Power output on 2 meters is a modest 40 watts, and a little less—around 35 watts—for whistling up a peak reading wattmeter on 70 centimeters. On 1.2 GHz, power output is 10 watts. All of these power outputs were measured on a Bird peak reading wattmeter, and the word “FFFOOOUUURRR” was spoken to see how much juice we were going to get out of the three individual antenna

connectors. On 1.2 GHz, Kenwood employs an N-receptacle, and on 2 meters and 440, each band its own SO-239 “UHF” connector.

So right now you're probably wondering why anyone might spend a kilo-buck for a used 790...in fact, why would anyone want to spend this kind of money, new or used, for a massive radio that's so heavy it has absolutely no place in a mobile installation? Why?

Why? I'll Tell You...

I'll tell you: this radio is not designed for under your dash, but rather for your field day or home station operating

* Gordon West is Senior Contributing Editor of CQ VHF.

desk—and where the radio turns into one big heavyweight performer is in the receiver. It's great!

You see, I'm addicted to mountaintop weak-signal operation and I need a VHF/UHF radio that can take the hammering of out-of-band repeaters, powerful paging transmitters, and other nearby ham stations operating slightly higher or lower in frequency, and still let me hear those weak signals I want. Much of the 790's weight is from copper compartments within the band units and the PA (power amplifier) to keep this equipment as tight as possible on the desired frequency. If you look over the specifications, single conversion is used for the 2-meter band on CW and upper sideband (USB), with dual conversion on the 70-centimeter band for CW and USB. Up on the 1.2-GHz band, triple conversion heterodyne is employed on both CW and USB. Kenwood also chose an intermediate frequency (IF) complement that would add to the capabilities of the receiver to function under strong out-of-band and in-band interference situations (see Table).

When I took the 790 up to several repeater sites where intermod is at an all-time high, it was outstanding on 2 meters, 430 MHz, and 1296 MHz where we had amps and pre-amps running on each output jack. There's enough shielding and RF isolation within each compartment in the 790 that intermodulation from out-of-band signals was just about zero.

Sensitivity Training

Sensitivity was listed in the specifications as a nominal 0.16 microvolts, but actually measured much better—0.09 microvolts on all three bands (at 10 dB, S+N/N). These measurements were for weak-signal work using USB and CW. Yes, the transceiver works quite nicely on FM; but, if I want FM, I'll use my small mobile unit or handheld.

Receiver sensitivity beyond the ham bands remains *very good* until you approach 1 MHz from the receiver band edges, where the voltage controlled oscillator (VCO) drops out. Sorry, no AM aircraft reception, but plenty of good public safety and marine band VHF reception above and below the 2-meter band. On UHF, I heard plenty of police calls up at 460 MHz, and, up at 1.2 GHz, I was beginning to hear some incoming satellite datagrams just outside of the 1.2-GHz band edges. Remarkable! When dialing around on FM, you'll probably prefer to put the



The frequency readouts are bright and colorful...as long as you're inside and the room isn't too brightly lit! You'll need to whip up some sort of sun screen for operating outdoors.

big channel knob in the click-click-click position (more on that later).

Selectivity is -60 dB at 4.8 kHz, -6 dB at 2.1 kHz for upper sideband. When you switch in the narrow CW filter, selectivity improves to -50 dB at 2 kHz, -6 dB at 500 Hz.

The venerable 790 also allows for intermediate frequency shift, with adjustments of ± 1 kHz. There's also receiver incremental tuning, which is important for satellite work, with an adjustment of ± 2 kHz.

Squelch Flexibility

The squelch circuit features fast-attack and slow-delay, which is important while monitoring for distant beacons coming in at the bottom of each band. When tropospheric ducting kicks in, you want your receiver to unsquelch when the signal begins to appear out of the noise. The squelch action is *good* with the 790, but unfortunately not half as good as the squelch found in Kenwood's mobile TR-751. On the 751 hooked up to a big long-boom Yagi, you'll regularly hear wisps of noise open up the squelch, and the squelch slowly decay after about 2 seconds remaining in the noise—perfect for monitoring for a band opening.

On the 790, I measured squelch sensitivity at .3 microvolts, which means the signal needs to be well out of the noise before it's going to open up the squelch circuit. Plus, the 790's squelch stays open

for about 1 second after a signal disappears, and I'd rather have seen it stay open for 2 or 3 seconds—slow hysteresis—and I imagine there's probably a capacitor on the inside of the squelch circuit that I could change to make this possible. But the 790 squelch is much more sensitive and, thankfully, slower-closing than some of the squelch circuits found on other brand multimode transceivers. So, overall, I'm happy.

Get Out the Sunscreen

So how does the unit work? *Great* inside your Field Day tent, but if you plan to operate the equipment out in direct sunlight, better rig up some sort of sunshield that will let you see the blue digits used for the main frequency readout. And you're *really* going to need a sunshade for the subband receive (sub-RX) readout because the same blue letters appear to have a yellow filter on them, further reducing their contrast out in the open. But, if you have some shade, you're all set after you have positioned the equipment so that the very reflective front plastic doesn't catch light coming in from behind you.

The main frequency readout has resolution to 100 Hz on all three bands. For instance, the 2-meter band might read out 144.240.0. The equipment actually tunes down to 20 Hz; and, if you listen real carefully, you can hear five distinct changes in an incoming CW signal when you

slowly rotate the main dial. The 100-Hz display readout is just right for me, though, and there are few weak-signal operators who would ever need any more precise tuning than this. What the heck—most weak-signal operators usually position themselves right on the even kilohertz, not even the 1/10th of a kilohertz that the display will read out.

Cool Controls

There are some unique controls on the front panel that make it easier for you to tune around the bands. One is called **CH Q**. It pulls in a mechanism to give the big VFO tuning knob distinctive FM channel changing “clicks.” This is handy if you’re operating FM simplex and someone wants you to go up or down 10 kHz. You can do it by the clicks. But for tuning upper sideband or CW, push the button again to get out of the click-type VFO to a smooth-spinning knob. There’s no mistaking when you go into the click mode: there’s a big “clunk.”

The **MHz** switch is handy to let you zoom around the ham band that you’ve dialed up, including receive-only capabilities on the following frequencies without modification:

- 135 MHz–172.0 MHz
- 422 MHz–462 MHz
- 1220 MHz–1305 MHz

The built-in keyboard is great for not only key-entering frequencies into the 59 memory channels, but also for setting standard and non-standard splits as well as the built-in CTCSS encoder. To decode tone, you’ll need to purchase and install the optional TSU-5 board, and I’m having a hard time trying to find one because this equipment has been out for a couple of years.

Other things you might do with a keypad would be to set FM tuning steps at 5, 10, 12.5, 20, 25, or 50 kHz. Each band has its own step register, so you might select 5-kHz steps for the 2-meter FM band, and 25-kHz steps for the 440- and 1270-MHz band. Keep in mind that the step mode is for FM, not CW/USB weak-signal work for which the radio is truly designed.

The **signal strength (“S”) meter** is a conventional needle movement, and I somehow prefer this over the new LCD displays found on much modern equipment. But what a shame there isn’t the capability to run this meter into the discriminator so you can use it on FM for



The big tuning knob can be switched between free-spinning for USB/CW contacts or satellite work to a “stepped” control, complete with clicks, for FM operation.

analyzing incoming frequency errors. The discriminator meter is my favorite on my multimode Yaesu base station, and it’s sorely missing on the 790.

Subband (Dive!)

On the right-hand side of the 790 is a smaller frequency display for the subband. This will come into play when you are working a satellite, or just want to keep track of signals coming in on one band while you’re operating on another. It’s also handy for comparing conditions on different bands. For example, when I’m monitoring the distant Hawaiian propagation beacon coming in on 2 meters and 440, I can listen to (and almost watch) two simultaneous signals on two bands, dispelling the myth that tropospheric ducting may sometimes improve on higher bands while fading away on lower bands. In all my monitoring of

long-range VHF/UHF beacons, they both go up, and they both go down in signal strength in unison. On the subband receive display, signal strength is illustrated by a horizontal electronic bar that shows S0 to S9 in white, and any reading over S9 in red. The subband only displays when you have taken the main band and put it on a completely different ham band than the subband. The subband has neither RIT nor pass-band tuning. Keep this in mind when thinking about satellite communications with the 790.

Satellite Operation

The TS-790A is capable of allowing the uplink and downlink frequencies to track simultaneously in the main and subbands by storing the sum of the two frequencies in memory. Memory channels 0, 1, and 2 are programmed by the factory for offsets corresponding with satel-

Table. TS-790 Intermediate Frequency Complement

Band	1st IF (MHz)	2nd IF (MHz)	3rd IF (MHz)
2 meters	10.695		
70 cm	75.925	10.695	
23 cm (1.2 GHz)	287.175	41.415	10.695

Table. Arrangement of the TS-790’s intermediate frequency (IF) complement, designed to help minimize interference from undesired signals.

lites FO-12 and AO-10. But what's set for AO-10 won't necessarily get you up on an instant duplex with AMRAD-Oscar 27, nor many of the Russian satellites. Here's where you will use the remaining memories to quickly set up on the satellite up and down frequencies.

One way of programming your favorite satellite uplink and downlink frequency is to add the two frequencies together and place the sum in the satellite memory channel. You would then recall the desired satellite memory channel, select the sub-function, and use the tuning knob to select the desired downlink receive frequency. Next press the satellite key. The main display will shift to the correct uplink frequency.

Each time you change the sub-frequency, press the SAT key twice in order to update the main display. The first time the SAT key is pressed, the transceiver goes out of the satellite mode. The second time it's pressed, the transceiver goes back into the satellite mode and updates the main display. I prefer to do the alternate method and press and hold the satellite key while going into the satellite mode. This allows the tuning knob to be rotated and both displays will track simultaneously. This is the way I operate so I can simultaneously lock in on a juicy CQ and double-check that my transmit frequency is clear of other stations. After awhile, you'll get the hang of working satellites with this transceiver.

So...Should I?

I checked with several large ham radio dealers who indicated that there are still new 790s on their shelves, and they still have access to bringing in the 1200-MHz module, too. But, chances are, you're going to pay top dollar for a piece of equipment that is now three years old in technology, and may soon be outdated by new dual-and tri-band multimode units. But you very well might spot one of these sets out on a swap table; and if you do, see what you might put together. I strongly recommend the 1200-MHz module as part of the package. There is plenty of satellite work up here, plus plenty of weak-signal operation, too. But if you buy it used without the 1200-MHz module, you'll pay top dollar for a new module, and the chances are next to none you will ever find a module by itself selling used.

And you must *feel* the 790 to really appreciate just what a rock-solid rig this

"...when I'm monitoring the distant Hawaiian propagation beacon coming in on 2 meters and 440, I can listen to...two simultaneous signals on two bands, dispelling the myth that tropospheric ducting may sometimes improve on higher bands while fading away on lower bands."

is. Weighing in at over 20 pounds, every single thing you turn or adjust has a positive feel behind it. Just be prepared for the big CLUNK when you snap in and out of the VFO smooth-tuning or click-click-click mode!

Manuals and More

I checked on the Kenwood home page on the World Wide Web, and the 790 instruction manual is now available for downloading. Both Leo and Raul at Kenwood Tech-nical Service are posting new equipment owner's manuals on their Web site, and they told me they recently finished scanning in the TS-790A manual. If you're interested in looking at that or any other new Kenwood equipment manuals, check out the Kenwood home page (see "Resources"). You'll need an Adobe Acrobat reader to view the files.

Oh yes—right now I am wiring up the new Kenwood VC-H1 visual communicator to the 790A, and I hope to be first to send slow-scan pictures from here to Hawaii and receive their pictures with the Kenwood VC-H1, all on the 2-meter band during the California/Hawaii tropo duct that forms up every August and September. If we're able to make the contact, you'll see the pictures here first in *CQ VHF*.

So keep your eyes open for a 790 out on the swap table—it's a big radio with heavyweight features that you must hear and feel to appreciate. ■

Resources

For more information on the TS-790, see your favorite Kenwood dealer or contact Kenwood Amateur Products Group, P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745; Phone: (310) 639-5300; Internet: <<http://www.kenwood.net>>.



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