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Yaesu FT-1000D MF/HF Transceiver

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Assistant Technical Editor

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Before introducting the FT-1000, Yaesu put forth its biggest engineering effort ever to make a radio that would compete with the likes of ICOM's IC-781 and Kenwood's TS-950S. The market for these radios is surprisingly large, if the calls and letters we receive are indicative of the number of hams who are willing to spend between three and five thousand dollars on Amateur Radio transceivers.

Does the big Yaesu compete on an even field with the other two major Japanese vendors' products? You bet it does—and in fine style.

Standard Features and Options

The FT-1000 has all the standard features you'd expect to find in a radio designed to compete with the market's other high-end offerings. These features include two receivers, an internal power supply, an automatic antenna tuner that remembers 39 sets of settings, full-break-in CW operation, a CW keyer with adjustable weighting, variable CW offset, IF-notch and AF-peak filters, direct digital synthesis (DDS), computer controllability, 99 scannable memories, direct keypad frequency entry for both VFOs, 100 kHz-30 MHz receiving capability, 200 W output on transmit, dual noise blankers and FM-repeater-split capability.

Like Kenwood's TS-950S, the FT-1000 is available in two forms. The basic FT-1000 includes the features listed above; the FT-1000D also has those features, but additionally comes standard with a temperature-compensated crystal oscillator (TCXO), five IF filters that are optional for the FT-1000, and a band-pass filter unit for the sub receiver (discussed later). The only internally installable options for the FT-1000D are a 250-Hz CW filter for the main receiver's 455-kHz IF and a 600-Hz CW filter for the sub receiver's 455-kHz IF. External options (for both versions) include the DVS-2 digital voice recording/playback unit (described later), a level converter for the computer interface, an external speaker with audio filters, a desk microphone and a phone patch.

The FT-1000's 200 watts of RF output is a bunch—and it calls for a hefty power supply. That's part of the reason that this rig weighs 51 pounds, and its lack of a handle makes the radio somewhat difficult to maneuver. The '1000 is rated at 100 W continuous output on CW, SSB, FSK and FM, and 50 W on AM. It can run 200 W output in each mode (except AM) with a 50% duty cycle, as long as key-down CW, FM and RTTY transmissions last three minutes or less. The rig runs slightly warm to the touch, but is well cooled by its massive internal heat sinks and temperature-actuated fan.

A large, easy-to-read fluorescent display shows you the frequencies of the main VFO and sub VFO/receiver (with 10-Hz resolution), RIT/XIT offset (Yaesu calls this function the *clarifier*—this is also shown to 10 Hz), selected memory channel, and the status of several other functions. A really nice touch Yaesu made was including the ability to control display intensity by turning the **CLAR** knob while holding the **FAST** button. The large analog meter to the left of the display shows power output, received-signal strength, SWR, final-amplifier collector current and voltage, and speech-compressor and ALC levels.

The FT-1000's method of receive-antenna selection typifies the straightforwardness of this radio's design. Connect your separate receive antenna to the '1000's **RX ANT** jack on the rear panel, and select it via the front-panel **RX ANT** switch. What could be simpler? The receiving antenna can also be fed to the sub receiver, if you like.

The '1000 has variable CW offset—and the sidetone pitch tracks the offset. The front-panel monitor-gain control allows easy setting of the sidetone level, and a spotting function lets you zero-beat CW stations with ease—just touch the **SPOT** button and tune the receiver so that the desired signal matches the frequency of the spotting oscillator. A nice touch. Another neat touch is the inclusion of the **CW TUNE** LED just to the right of the main display: It shows you when an incoming CW signal is in the passband.

The FT-1000's internal automatic antenna tuner is nearly transparent in operation. To enable it, you poke the **TUNER** button and then hit the **START** button, at which point the tuner adjusts itself and remembers the settings for that frequency. If you simply turn on the tuner and start transmitting, the tuner quickly adjusts itself without any prodding. When you change frequencies, the tuner automatically readjusts itself when you start transmitting. The tuner will match most loads, in my experience, but if for some reason it can't match the load you put on it, the **HI SWR** indicator to the right of the main display tells you so. The tuner operates *very* quickly.

Connecting accessories to the FT-1000 is a snap. Except for the DIN connectors that match Yaesu accessories, and the **RTTY** and **PACKET** DIN jacks, the FT-1000's rear-panel connections are all made via phono and phone jacks. Matching plugs are supplied for all the radio's jacks.

The Sub Receiver

The standard FT-1000 receives from 100 kHz to 30 MHz with both of its receivers. To enable the sub receiver, you press the **DUAL** button on the front panel and dial up the frequency you want to be on, using the large sub-receiver/VFO knob or the keypad. Sub-receiver mode and filter selections are also simple to make: Touch the appropriate filter button above the keypad after hitting the **SUB** key first. When the rig isn't in dual-receive mode, the sub-receiver controls manipulate VFO B.

In the standard FT-1000, the sub receiver shouldn't be tuned more than 500 kHz from the main receiver because you start to lose sub-receiver sensitivity once you tune the sub receiver past the edge of the front-end filters it shares with the main receiver. With the optional BPF-1 band-pass filter unit (standard on the '1000D), though, you can tune anywhere in the rig's

Table 1

Yaesu FT-1000D 160-10 Meter Transceiver, Serial no. 0F040157

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive, 0.1-30 MHz; transmit, 1.5-2, 3.5-4, 7-7.5, 10-10.5, 14-14.5, 18-18.5, 21-21.5, 24.5-25, and 28-29.7 MHz.	As specified.
Modes of operation: AFSK, AM, CW, FM, LSB, USB.	As specified.
Power requirement: 100, 110, 120, 200, 220 or 240 V ac. Receive, 95 W max; transmit, 1050 W max.	Not measured.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity (2.4-kHz bandwidth): SSB, and CW, 10 dB S+N/N: 0.1-0.25 MHz, 1.25 μV (−105 dBm); 0.25-0.5 MHz, 1 μV (−107 dBm); 0.5-1.8 MHz, 2 μV (−101 dBm); 1.8-30 MHz, 0.25 μV (−119 dBm).	Minimum discernible signal (noise floor) with 250-Hz second and third IF filters: *Preamp off* / *Preamp On* / *Sub RX (2.4-kHz filter)*: 1.0 MHz −119 dBm / −126 dBm / −121.5 dBm; 3.5 MHz −128 dBm / −136 dBm / −132 dBm; 14.0 MHz −126 dBm / −137 dBm / −132.5 dBm
AM (10 dB S/N): 0.1-0.25 MHz, 10 μV (−87 dBm); 0.25-0.5 MHz, 8 μV (−89 dBm); 0.5-1.8 MHz, 16 μV (−83 dBm); 1.8-30 MHz, 1 μV (−107 dBm).	10 dB S+N/N (6-kHz IF filters, signal 30% modulated with a 1-kHz tone, preamp on): 1 MHz, −112 dBm; 3.8 MHz, −121 dBm; 14.2 MHz, −121 dBm.
FM 12 dB SINAD: 28-30 MHz, 0.5 μV.	12 dB SINAD (preamp on): 0.29 μV.
Receiver dynamic range (500-Hz bandwidth, RF amp off, 50-kHz signal spacing; type not specified): 108 dB.	Blocking dynamic range (250-Hz second and third IF filters)† Preamp off: 3.5 MHz, >138 dB;†† 14 MHz, >143 dB.†† Preamp on: 3.5 MHz, 137 dB; 14 MHz, 154 dB.
	Two-tone, third-order intermodulation distortion dynamic range (250-Hz second and third IF filters):† Preamp off: 3.5 MHz, 98 dB; 14 MHz, 98 dB. Preamp on: 3.5 MHz, 94 dB; 14 MHz, 98 dB.
Third-order input intercept: Not specified.	Preamp off: 3.5 MHz, 19 dBm; 14 MHz, 21 dBm. Preamp on: 3.5 MHz, 5 dBm; 14 MHz, 10 dBm.
S-meter sensitivity (for S9 reading): Not specified.	At 14 MHz: preamp off, 190 μV; preamp on, 60 μV.
CW/SSB squelch sensitivity (1.8-30 MHz): Less than 2 μV.	As specified.
FM squelch sensitivity: Less than 0.32 μV.	As specified.
IF notch filter attenuation: Not specified.	More than 30 dB.‡
Receiver audio output: More than 2 W at 10% distortion with a 4-Ω load.	2.03 W at 10% total harmonic distortion (THD) with a 4-Ω load.
Receiver IF/audio response: Not specified.	At −6 dB: SSB, 239-2520 Hz; CW, 394-629 Hz.
Transmitter	*Transmitter Dynamic Testing*
Transmitter power output: 200 W max on SSB, CW, FSK and FM; 50 W max on AM.	Output power: 191-205 W (CW, SSB, FSK, FM—output is typically more than 195 W and varies slightly from band to band); AM, as specified.
Spurious-signal and harmonic suppression: >40 dB below peak power output.	As specified. See Fig 1.
Third-order intermodulation distortion products: Not specified	See Fig 2.
CW-keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% audio output): 18 ms (signal level not specified).	S1 signal, 22 ms; S9 signal, 22 ms; AGC off, 21 ms.
Composite transmitted noise: Not specified.	See Fig 4.
Antenna-tuner matching range: 16.5-150 Ω.	Not measured.
Size (height, width, depth): 6.8 × 19 × 17 inches; weight, 51 lb.	

†Unless noted otherwise, blocking dynamic range and third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

††Dynamic range at these frequencies is greater than the indicated values. The input signal required to cause blocking exceeds the RF amplifier's safe signal-handling limit. See text.

‡Test-equipment limitations inhibit ARRL Lab measurement of notches deeper than about 30 dB.

range with either receiver. The main advantage of this is that it allows you to use the '1000 for frequency-diversity reception, even with different antennas and separate RF-attenuator settings, if you like. Unlike any other transceiver I'm aware of, the FT-1000 has separate RF and IF stages for the sub receiver. It's therefore possible to use separate modes and different IF bandwidths in the two receivers. It's quite interesting, for instance, to listen to BBC's World Service on 12095 kHz USB and 9915 kHz LSB simultaneously, or to check for activity on bands (and modes) other than the one you're operating on.

The '1000 gives you a choice of stereo (separate signals in each ear from the two receivers) or mixed audio via a switch under a top-cover panel. Controlling the level and balance of these signals is easy via the front-panel **AF**-gain and **RX MIX** controls.

Yaesu has made the FT-1000's dual-receive capability extremely valuable by making it flexible and easy to control, and by providing for an optional CW IF filter. ARRL Lab tests showed that the '1000's sub receiver is on a performance par with the main receiver.

Memory and Scan Operation

The FT-1000 has 99 memories that store frequency, mode, IF-filter selections and RIT/XIT offsets. Storing information in the memories is straightforward: Dial up your selections, use the **MEM** knob to choose the memory channel into which you

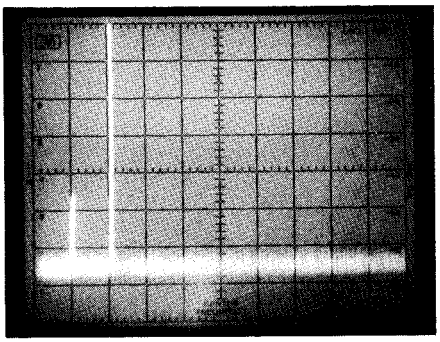


Fig 1—Yaesu FT-1000D worst-case spectral display. Horizontal divisions are 10 MHz; vertical divisions are 10 dB. Output power is approximately 194 W at 21.1 MHz. All harmonics and spurious emissions are at least 45 dB below peak fundamental output. The FT-1000D complies with current FCC specifications for spectral purity for equipment in this power-output class and frequency range.

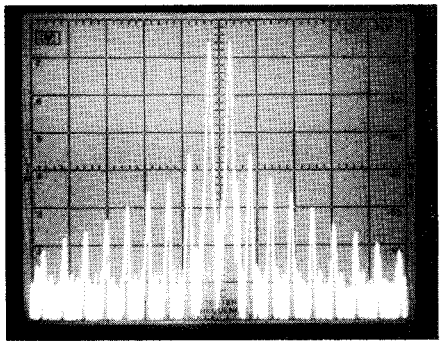


Fig 2—Worst-case spectral display of the FT-1000D transmitter during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 36 dB below PEP output, and fifth-order products are approximately 42 dB down. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The transceiver was being operated at 200 W PEP output on 3.9 MHz.

want to write this information, press the **VFO-A ► M** key and wait for the '1000 to sound a double beep through its internal speaker.

Once you've programmed some information into the memories, taking a spin through them is as simple as twisting the **MEM** knob. The sub-receiver/VFO display shows you the stored information and flashes to let you know you're in memory-preview mode. To place the information stored in a memory channel into VFO A, press the **M ► VFO-A** key. Pressing the **VFO/MEM** key temporarily brings the stored memory information into VFO A, where you can tune memories. In this mode, memory channels are essentially VFOs. The FT-1000's memory-system flexibility and simplicity make it an often-used feature.

You can scan the FT-1000's memories, but this feature works only when the squelch is closed. Any of the memory channels can be scanned; those with nothing stored in them are skipped automatically, and you can program the rig to skip others. You can also hide memory channels: This option makes it easy to dial through only a particular set of channels once you've stored information in many of them.

The Manual

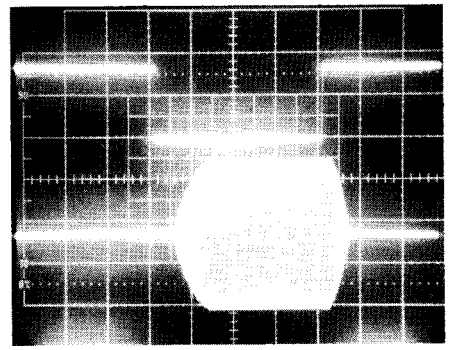
The FT-1000's nicely done *Operating Manual* is a departure from Yaesu's older manuals. This book was obviously prepared by people who aren't just *familiar* with the radio's operation, but who know what hams look for in instruction manuals. As such, it's clearly written and complete, and includes a complete set of schematics and many high-quality photos. Diagrams, like those describing IF width and shift, and one showing signal paths through the standard and optional IF filters, also supplement the text. Several sidebars are sprinkled throughout the manual to cover subjects of interest, such as "Special Tips for CW Reception: Pitch Setting and Spotting" and "Optional DVS-2 Digital Voice Recorder." The section on option installation relies on step-by-step instructions and lots of illustrations. The manual is well organized and the table of contents lists all the book's major divisions so that, even though there's no index, you won't have trouble finding anything you go looking for.

Digital Voice Recorder Option

The DVS-2 Digital Voice Recorder is an external option that allows recording two 8-second voice messages or four 4-second messages for use in transmitting repetitive information, like contest exchanges and CQs. Unlike other commercial products made for this application, though, the DVS-2 also has a main-receiver-recording function that acts like an 18-second-long endless tape loop. This is particularly useful when you're working (or trying to work) someone—on any mode—and you miss something he or she said. (This can happen when you're paying more attention to the sub receiver than the main receiver, for instance). When that happens, you can easily play back all or part of the last 18 seconds of received audio—mixed with real-time audio, if you like. It's quite useful. The DVS-2's one drawback is that its rather high transmit-monitor level isn't affected by the radio's **MONI**tor-gain control.

Operation

Although the FT-1000 is complicated, it doesn't take long to learn to use it. Some operators who used the radio during the review period indicated that they were a bit overwhelmed initially (see the sidebar), but that's not surprising considering all this radio can do. It's like learning a new piece of software: If it can do a lot, it takes some time. On the other hand, once you've spent an hour or so using this rig, you don't need to keep the manual handy while you're



(A)

(B)

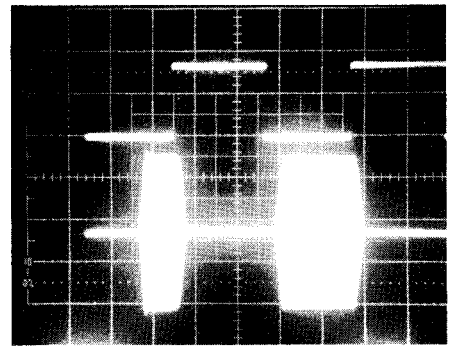
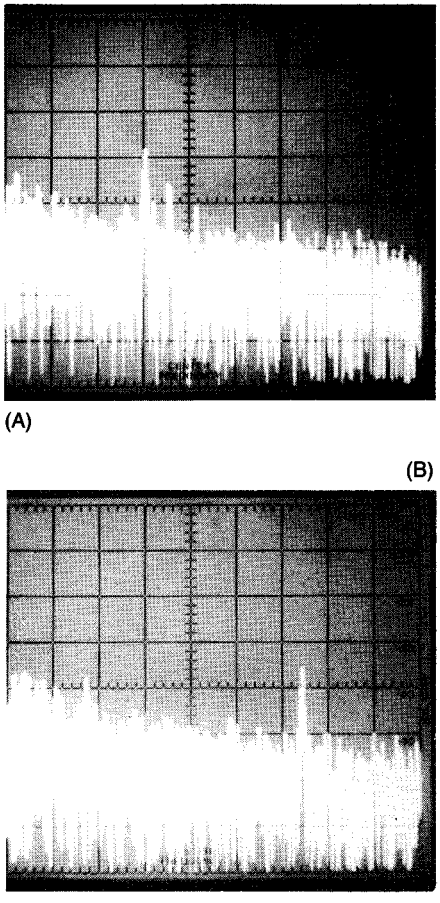


Fig 3—CW-keying waveforms for the Yaesu FT-1000D in the semi-break-in mode (A) and the full-QSK mode (B). The upper traces are the actual key closures; the lower traces are the RF envelopes. Horizontal divisions are 5 ms. The transceiver was being operated at 200 W output on 14.1 MHz. The FT-1000D's CW keying shaping is very good, but the first keyed element is shortened and a bit clicky in full-break-in mode.

operating; the control and switch labels and functions are intuitive. I've spent a lot of time using high-end transceivers made by all the major manufacturers, and I found the FT-1000 easier to learn and use than any other radio in its class. Still, to wring the last ounce of performance out of this rig, you'll need to spend some time learning to use it—with the manual nearby.

In QSK CW operation, the rig has well-shaped and -weighted keying. The only drawback is shortening of, and a bit of click on, the first keyed element in this mode. (See Fig 3.) On the air, this is noticeable and becomes more annoying at higher speeds. In semi-break-in mode, though, the FT-1000's keying is exemplary. CW operation with the internal keyer is a breeze, and its speed control is smooth, linear and well placed on the front panel.

In SSB operation, the FT-1000 is easy to adjust and use, partly because of its built-in RF-derived, all-mode monitor. The front-panel **MONI**tor-gain control lets you set its level for maximum comfort, and you can use the monitor to help you adjust the microphone gain and speech-processing controls. The processor adds quite a bit of punch to SSB signals; hams I worked on



(A)

(B)

Fig 4—Spectral display of the FT-1000D transmitter output during composite-noise testing. Power output is 200 W at 3.52 MHz (A) and 200 W at 14.02 MHz (B). Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Composite-noise levels between −60 and −140 dBc/Hz may be read directly from the photographs. The carrier, off the left edge of the photographs, is not shown. These photographs show composite transmitted noise at frequencies 2 to 20 kHz offset from the carrier. The FT-1000's composite transmitted noise is composed mostly of broadband amplifier noise, not phase noise.

SSB with the FT-1000 gave me good audio-quality reports. Split-frequency operation is simple and flexible: The radio continuously shows you where both VFOs are tuned, which VFO is active for receive and which has control in transmit. It also lets you tune either VFO at any time.

RTTY and packet-radio operation with the '1000 are straightforward. Separate rear-panel connectors are provided for packet and RTTY modems, and you can select any filter you like in these modes. In packet operation, the display shows the center frequency; in RTTY modes, it shows the mark frequency. To invert RTTY tones, simply press the front-panel **RTTY** key after initially selecting that mode. The '1000's digitally synthesized AFSK generator allows RTTY shifts of 170, 450 and 850 Hz by means of DIP switches located under a hatch on the top panel. The rig can do 300-baud packet on all bands and 1200-baud packet on 29-MHz FM. (Note: 1200-baud packet operation on 29 MHz is illegal in the US; this feature would be useful if you use the FT-1000 with a VHF/UHF transverter.) The *FT-1000 Operation Manual* gives many useful tips for packet and RTTY operation.

The FT-1000's front-panel **FRONT END** switch gives you a choice of five settings: **NOR** (preamp on), **IPO** (preamp off), **6**, **12** and **18** (the latter are the three attenuator settings, in decibels). This combination is useful for setting receiver sensitivity for virtually all situations. The rig's three-speed AGC also provides useful range. I found the **MED**ium decay speed to be best for SSB contesting, and I use the **FAST** position for CW work. Casual SSB operation and SWLing is best done with the AGC in its **SLOW** mode.

Both receivers have two sets of VFOs per band. For instance, when you hit the **14** key on the keypad, the main receiver goes to the last 20-meter frequency you were on with the same mode, filter, clarifier and noise-blanker selections you had made. Touching the **14** key again lets you choose another 20-meter frequency, mode, filter and noise-blanker selection. Hitting **14** a third time brings you back to the first 20-meter frequency/mode/filter/noise-blanker setting. This sounds a lot more complicated than it is; the practical value of having this capability is being able to quickly hop between two spots on the same band, unrestricted by mode and filter choices.

Getting information into the sub receiver (or second VFO) is as easy as pressing the **A ► B** button below the main-tuning knob. This writes all the settings of the main receiver, including frequency, mode, filter, and RIT/XIT offset, if any, into the second VFO. Swapping the information between the main and sub receivers (or the two VFOs) is just as simple: Hit the **A ⇆ B** button. Swapping information between VFO A and the currently selected memory channel requires only hitting the **VFO-A ► M** or **M ► VFO-A** key.

Each tuning knob has its own **LOCK** button. Another button, **FAST**, located just to the lower left of the main-tuning knob, controls the fast-tuning function. Both tuning knobs have a default rate of 10 kHz per revolution. Holding **FAST** while turning either knob speeds up the main-tuning knob to 200 kHz per revolution and the sub receiver/VFO to half that. It's handy to operate the **FAST** switch with one finger of your left hand and tune the main receiver with another. Two large buttons labeled **UP** and **DOWN** allow quick 100-kHz frequency transitions (1 MHz when the **FAST** button is held down).

To interface the FT-1000 with a computer, you need the optional FIF-232C level converter. (Like most computer-controllable radios, the '1000 has a TTL-level serial port and requires such an interface when used with an EIA-232-D [aka RS-232-C] serial port.) Good news: Rumor has it that Ken Wolff, K1EA, is adding FT-1000 support to his popular *CT* contest software for MS-DOS computers. I'm certain that that addition will increase the demand for the FIF-232C—and the FT-1000!

Contesting with the FT-1000

During the review period, I used the FT-1000D in several contests, including Worked All Europe CW, CQWW DX SSB and CW, and November Sweepstakes CW. All told, those contests represent about 4900 QSOs, mostly on CW. In the Northeast, receiver weaknesses become most evident on 40 and 80 meters in the evenings, when the European broadcast stations and incredibly strong domestic signals surround you as you're trying to work relatively weak European hams. Between its IF-bandwidth controls and sharp filters, the FT-1000D handles these situations with aplomb. In such operation, I was *always* able to keep interfering signals at bay, and receiver phase noise was never a problem.

Another thing that struck me as I used the '1000 is how seamlessly integrated its features are. There are no annoying surprises; everything works exactly the way I expected it to. This is one well-thought-out radio!

Strong Points

Arguably the most important performance aspects of any transceiver are ease of use and basic receiver performance. The FT-1000 excels at both. As shown in Table 1, this rig has a very strong receiver; it has the best overall performance (in terms of sensitivity and dynamic range) and *the highest* third-order input intercept of any commercial radio ever tested in the ARRL Lab.

This radio also has several extremely well-implemented interference-fighting features. The FT-1000's IF filters give excellent selectivity and the detented **IF SHIFT** control works *very* well. Turning this knob one or two of its small detents either side of IF center completely eliminates all but the strongest off-tuned CW signals. (It's also quite effective on SSB.) The IF **WIDTH** control usefully tightens bandwidth on all modes, and the notch filter is easily adjusted and effective at getting rid of interfering carriers.

One of the FT-1000's most useful controls for digging out weak CW signals is the active, tunable, audio-peak filter (APF). Once you've tuned the APF's center frequency to match your CW offset, you simply poke the **APF** button to enable the peak filter—and marvel at how effective this filter is. In side-by-side comparisons with other modern rigs (applying the same signals to both radios), the weakest CW signals, often barely audible in the other radios, become room-filling, Q5 signals

with the help of the FT-1000's APF. I found this filter's slight ringing to be no problem.

I was somewhere between impressed and awestruck the first time I used the **IF SHIFT**, **WIDTH** and **APF** controls in concert to pull out a weak signal in the midst of other junk. The FT-1000D's receiver is more refined than anything else I've ever used, and it's nearly bulletproof. In fact, the receiver section is so strong that ARRL Lab Engineer Ed Hare, KA1CV, commented in his test-results report, "I was unable to measure the true blocking dynamic range of the FT-1000D with the preamp turned off because it takes so much signal [more than 100 mW] to make the receiver block; I was concerned that putting more than 100 mW into the receiver would damage it. I didn't want measurement of the FT-1000's receiver dynamic range to be limited by the destruction of its front end!" Thus, the rig's blocking-dynamic-range performance is listed in Table 1 as >138 dB on 3.5 MHz and >143 dB on 14 MHz with the preamp off; it's safe to say that the FT-1000's true preamp-off dynamic range is at least as good as its preamp-on performance.

The FT-1000's receiver audio completely lacks high-frequency junk and other distortion products that plague some other receivers. When you've "dialed in" the controls for single-signal CW reception, there's nothing else in the audio to distract you. That's one reason why this rig is less fatiguing to use for long periods than most other radios.

In terms of ease of use, the FT-1000 also shines. The front panel is well laid out. Controls are grouped together by function and all the controls and switches exude quality. Front-panel LEDs indicate what mode and filter selections you've made, which VFOs are in use for transmitting and receiving, and to show whether the speech processor, transmit monitor, noise blankers, IF notch, APF, keyer and tuning-knob-lock functions are on or off.

A nice touch is the magnetic closure on the top-panel hatch that gives you access to relatively seldom-used controls; no fingernail-breaking catch here! Another nice touch: The '1000 has CW **KEY** jacks on both the front and rear panels.

It's assuring to see that Yaesu takes FT-1000 servicing seriously. At one point during the review, I had a problem with the FT-1000: It generated an S9 noise internally after being left connected to an antenna overnight when there were thunderstorms in the area (oops!). I shipped it back to Yaesu with a letter explaining the problem, and two weeks later I got a postcard stating that they had received the radio for repair. The very next day, the rig arrived. (Now *that's* service!) Yaesu replaced three transistors, a capacitor and a small relay. It operated flawlessly for the remainder of the review period.

Rough Spots

Amateur Radio transceivers are so complicated these days that not a single one is flawless, but the FT-1000 has only a few minor drawbacks. That's amazing, considering all this rig can do.

The FT-1000 design team decided not to include provisions for connecting an external VHF/UHF/microwave transverter. To use a transverter with this radio, you need to either modify the transceiver or build an external interface. This exclusion stings because the rig's excellent receiver performance would be a great asset in the VHF-and-higher spectrum. (Of course, you can connect a transverter's 28-MHz IF output to the FT-1000's **RX ANT** jack, but there's no rear-panel source of low-level transmitter RF.)

A minor inconvenience is the placement of key controls inside the radio. These include two switches: One enables the noisy internal amplifier-keying relay, and the other selects the source of the sub-receiver signal (it can come from the main-receiver's antenna input or its own separate input—if you have the D-suffix model or if you've installed the BPF-1 option). To operate these switches, you have to take off the radio's bottom cover. If this rig was mine, one of the first things I'd do is wire external switches in parallel with these. You may not use them too often, but having to disconnect everything from the FT-1000 and remove its bottom cover is a nuisance when you do.

Some operators have complained about the '1000's noisy blower. How obtrusive this is depends on how the radio is installed (ie, under a shelf and not too close to a wall, or on a hard surface and close to a wall or other reflecting surface). When you're listening with headphones, or when an amplifier or computer is running in the same room, the fan isn't a bother, but it can be under quieter conditions.

QST Assistant Technical Editor and receiver guru Dave Newkirk, WJ1Z, observes that the FT-1000's receiver audio seems to suffer a bit from intermodulation distortion. He hears what he considers to be annoyingly perceptible intermodulation products when two or more CW signals are present in the FT-1000D's passband. As a mainly-CW operator I'm picky about such things, and I didn't even notice this characteristic until Dave mentioned it to me. The audio amplifier is generally quiet and free of high-frequency hiss.

Dave also finds the FT-1000's receiver AGC overshoot[1] to be annoying. On very strong SSB signals (including shortwave broadcast signals received as SSB), the FT-1000's AGC seems to allow detector (or audio-system) overdrive at the onset of voice peaks. (This condition may be related to or exacerbated by audio IMD.) Dave's solution: Turn down the FT-1000's RF gain to the point where the resultant audio harshness disappears.

The FT-1000 has a rather unusual method of selecting CW offset: a bank of eight DIP switches under a panel on top of the rig. This turned out to be no problem, although I initially thought it would be awkward. I almost never changed the offset once I'd set it to 400 Hz (its range is 400 to 800 Hz, in 100-Hz steps). Unfortunately, you need to refer to a chart in the user's manual to set the offset—there's no way to sight-read the offset from the DIP-switch settings.

A minor annoyance: The FT-1000's speaker emits an annoying pop when you

[1]AGC overshoot describes what occurs when a receiver's AGC takes a perceptible period of time to adjust receiver gain in response to strong received signals.

K1ZZ Reports on the FT-1000

I used the FT-1000 for about 100 non-contest CW QSOs on 160 through 10 meters, and for a lot of general listening. Compared to my regular rig, the FT-1000's selectivity was a revelation and made a real difference, especially on 160 meters and working long-path JAs on 40.

I was worried about inadvertently overdriving my amplifier, but the power control is very stable from band to band so this turned out to be a non-problem. QRP operation is possible down to less than 2 W output, again with no adjustment required to maintain the desired power level when switching bands.

The DIP-switch scheme for selecting the CW offset is okay in principle (though not as useful as a front-panel control, particularly for a multi-operator station) but doesn't allow a low enough offset to suit me (I like to copy CW at a pitch of less than 300 Hz). Calling a station more than 100 Hz from the frequency he's listening on is a good way to reduce the chances he'll respond, so I had to use the clarifier to compensate. Having the clarifier offset read out to 10 Hz is very useful.

Being able to recall two frequency/mode/filter combinations per band using just the band keys is a nice touch, as is the front-panel push button to select a separate receiving antenna. The latter was enough to motivate me to hook up a long-neglected Beverage antenna, and I was glad I did.

Despite having more than a week to play with this radio, I was only able to scratch the surface of the FT-1000's capabilities. Would I like to keep it longer? You bet! But I'd have to spend a lot of time training on it before using it in a serious contest: The layout and function of many of the controls are different from what I'm used to. Of course, the same would be true of any complex rig. Maybe that's the next step: user-programmable panel layout!—*David Sumner, K1ZZ*

turn off the radio. (Unplug your headphones before turning off the rig!)

All Things Considered

As good as this radio is, there's some room for improvement. Yaesu could enhance the FT-1000 by quieting the blower and TR-switching relays, including a transverter interface, refining the AGC and audio, and moving the two most-often-used switches inside the radio to some more-accessible place. Otherwise, the FT-1000 needs little for me to consider it the ultimate contesting and DXing machine available today; it already is an *excellent* all-around radio. Yaesu has every reason to be proud of this achievement.

Several hams contributed to this review, and I owe them thanks: Dave Newkirk, WJ1Z; Dave Sumner, K1ZZ; Mark Wilson, AA2Z; Chet Slabinski, N8RA; Pete Chamalian, W1RM; Vince Sgroi, K1RM; and Jim Kearman, KR1S.

Manufacturer's suggested retail prices: FT-1000, $3399; FT-1000D, $4055; BPF-1, $159; TCXO-1, $229; DVS-2, $299; FIF-232C, $95; XF-C, -D and -E crystal filters, $149 each; XF-F 250-Hz third-IF filter and XF-455MC sub-receiver filter, $159 each. Manufacturer: Yaesu USA, Inc, 17210 Edwards Rd, Cerritos, CA 90701, tel 800-999-2070.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from Amateur Radio dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Quoted minimum acceptable bids are discounted from the purchase prices.

AEA AT-300 antenna tuner (see Product Review, August 1990 *QST*). Minimum bid: $98.

ICOM IC-765 transceiver with optional 250-Hz IF filters (see Product Review, December 1990 *QST*). Sold as a package only. Minimum bid: $1950.

Kenwood TS-950SD transceiver (see Product Review, January 1991 *QST*). Minimum bid: $2685.

Kenwood SM-230 monitor scope (see Product Review, January 1991 *QST*). Minimum bid: $645.

SSB Electronics 2304-MHz transverter (SLO 13 local oscillator, SRM 13 receive mixer, STM 13 transmit mixer; 144 MHz IF, 0.5 W output).* Interconnecting cabling and TR relays not included. Sold as a package only. Minimum bid: $250.

SSB Electronics SLA 13 2304-MHz solid-state amplifier (0.5 W in, 5 W out).* Cabling and TR relays not included. Minimum bid: $200.

Sealed bids must be submitted by mail and must be postmarked on or before March 27, 1991. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bid.

In your bid, please clearly identify the item you are bidding on, using the manufacturer's name, model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail. No other notifications will be made, and no information will be given to anyone regarding final prices or identities of successful bidders.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111.

*This product was superseded by a newer model before the review was completed; a review was not published in *QST*. A substantial discount from the purchase price is reflected in the minimum bid price.

Strays

1990 *QST* COVER PLAQUE AWARD WINNERS

January—Circularly Polarized Quagi Antennas for Space Communications, by Gene Marcus, W3PM/GM4YRE.

February—A Simple and Accurate QRP Directional Wattmeter, by Roy Lewallen, W7EL.

March—Practical Radio Aurora, by Emil Pocock, W3EP.

April—Practical Battery-Back-Up Power for Amateur Radio Stations—*Part 2*, by George L. Thurston III, W4MLE.

May—The Grouch, by Bruce Vaughan, NR5Q

June—903-MHz Linear Amplifiers—*Part 1*, by Dave Mascaro, WA3JUF.

July—Antenna Switchers—*Part 2*, by Raymond P. Bintliff, K1YDG.

August—A Triband Microwave Dish Feed, by Tom Hill, WA3RMX.

September—Simple Coaxial-Cable Measurements, by Chet Smith, K1CCL.

October—A Single-Board Bilateral 5760-MHz Transverter, by Rick Campbell, KK7B.

November—The CMOS Super Keyer II, by Jeff Russell, KCØQ and Bud Southard, NØII.

December— A Portable QRP CW Transceiver—*Part 1*, by Gary Breed, K9AY.

NOMINATIONS SOUGHT FOR ATLANTIC DIVISION AWARDS

☐ Nominations are now being sought for awards to be presented at the 1991 ARRL Atlantic Division Convention, held May 17-19, in conjunction with the Rochester, New York, hamfest.

Amateur of the Year nominees should be outstanding "all-around" amateurs from the Atlantic Division with a strong record of service to the amateur community.

An award for lifetime service to Amateur Radio, the *Grand Ole Ham,* is open to Atlantic Division OMs and YLs who have been licensed for at least 30 years or are at least 50 years of age.

New for 1991 is the Atlantic Division *Technical Achievement* award. It may be presented to an individual or to a group.

Complete information is available from Richard Goslee, K2VCZ, 24 Elaine Dr, Rochester, NY 14623. The deadline for nominations is April 10, 1991.

SAREX FLIES AGAIN

☐ On April 8, space shuttle *Atlantis* is scheduled to fly shuttle mission STS-37 with Shuttle Amateur Radio EXperiment (SAREX) operations as a secondary payload. *The entire crew is made up of licensed hams*: Lt Col Kenneth D. Cameron, KB5AWP (pilot); Mission Specialist Jay Apt, N5QWL; Mission Specialist Linda M. Godwin, N5RAX; Col Steven R. Nagel, N5RAW (commander); and Lt Col Jerry L. Ross, KB5OHL (mission specialist); who just upgraded to Technician and is waiting for a new call sign.

You can help local kids and schools participate in shuttle QSOs, get publicity for Amateur Radio and introduce science and Amateur Radio to young people. Start now by writing to the ARRL Educational Activities Department for information on the scheduled packet and slow-scan television operations. Several classroom voice contacts have been set up and, as another first for SAREX, fast-scan television will be uplinked by many stations.

The ARRL offers a teacher's package that contains resource materials, lesson plans, student games and more, and we've designed a lesson that can be taught from the shuttle and transmitted into hundreds of schools via NASA Select video. Join in the fun of taking part in SAREX!—*WA1STO*

SOVIET SCIENTISTS SEEK STATE-SIDE SKED

☐ The Leningrad Nuclear Physics Institute has a group of radio enthusiasts interested in contacting a similar group in the US. Contact Stanislav Shevyakov, RA1CR, Leningrad Nuclear Physics Institute, Gatchina, 188350, Leningrad Region, USSR.