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Yaesu FT-900AT MF/HF Transceiver

Conducted by Mark Wilson, AA2Z
Editor, *QST*

Yaesu FT-900AT MF/HF Transceiver

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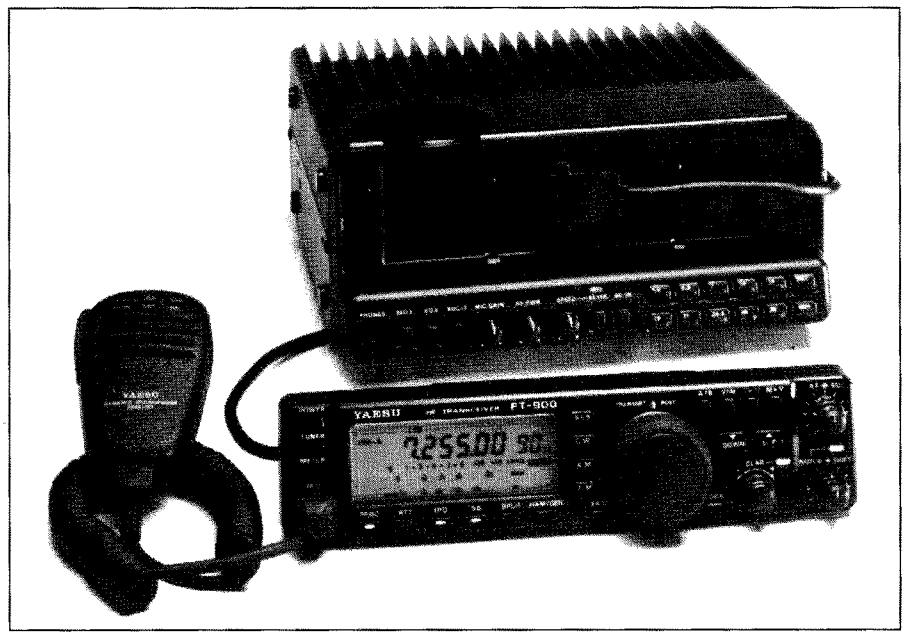


The FT-900AT, Yaesu's latest mid-level addition to their family of MF/HF transceivers, is intended for use as a mobile rig or as a compact fixed-station rig. The FT-900 is, in some ways, similar to the FT-890 (check the review of the FT-890 in September 1992 *QST*). Despite the similarities, the distinctive front panel (a portion of which is removable and remotable) and new control features in the FT-900 make it a completely different radio.

The FT-900AT is well suited for either home or mobile use. The removable front panel option is good for mobile operators, because space for a rig in today's vehicles is at a premium. The "AT" designation for the review radio means it's equipped with an internal automatic antenna tuner (at a list price $200 higher than the stock FT-900).

Features

The FT-900 transmits and receives AM, FM, CW and SSB, from 160 through 10 meters. The rig also has a general-coverage receiver, dual VFOs, 100 memory channels (with band-stacking registers) and flexible scanning. Power output is adjustable from about 2 W up to 100 W on all bands and modes, except on AM, where it offers 25 W (carrier power). Standard filters include a 2.6-kHz ceramic filter for SSB and CW (wide), and a 6-kHz filter for AM. Optional filters include a 2.6-kHz crystal filter for SSB and either a 500 or 250-Hz crystal filter for CW. The rig has a built-in CW keyer with a front-panel speed control, and it offers full break-in (QSK) or manual CW operation.

The front panel of the FT-900 is a busy place (with 9 knobs and 40 buttons). Despite the number of switches and knobs, the front panel is easy to negotiate and logically laid out. A button labeled **IPO** (intercept point optimization) switches an RF receiver preamplifier on and off.

A hand mike (with **UP**, **DOWN** and **FAST** buttons) is included with the radio. Four plugs that mate with jacks on the FT-900 rear panel are included. A fused 9.5-foot dc power cable (and two spare fuses) round out the standard accessories included with the FT-900AT. You need only an antenna, power supply and keyer paddles to get on the air.

Other HF radios currently offered by Yaesu use an LCD display for some functions and a separate analog meter for other functions. In a departure from that format, the FT-900 incorporates everything into a single, multifunction, backlit LCD display, with an orange background and black LCD numerals and indicators.

The display sports $^{5}/_{16}$-inch-tall frequency readout digits and uses several horizontal LCD bar graphs for metering. In receive, a bar graph display shows received signal strength. The S-meter can be set (at power up) to be either an instantaneous or a peak-hold readout. In transmit, the received signal strength display changes into a power output (**PO**) bar graph. In addition, there are three user-selectable metering choices available during transmit: **ALC, SWR**, or no additional metering. Other indicators on the display indicate such things as the currently selected VFO, the current memory channel, and the selected operating mode in use.

The Bottom Line

The FT-900 is a small but full-featured radio with good versatility and solid performance. Its removable front panel and remoting feature appear to be the wave of the future, but if you use this remote feature in your vehicle, don't expect to move the rig easily and quickly between your car and home station.

A press of the **TUNER** button activates the optional ATU-2 internal automatic antenna tuner (or the optional FC-800 external automatic antenna tuner). The ATU-2 will match antennas that have up to a 3:1 SWR. The tuner has 31 memories, which results in a fast match when you return to a previously used frequency/antenna combination.

In addition to the dual VFOs, the FT-900AT offers plenty of ways to get around the MF/HF spectrum. The 12-button, direct-frequency-entry keypad is one way. Direct frequency entry is very easy. For example, to get to 14.175 MHz, you would key in **ENT 1 4 1 7 5 ENT** (with a leading zero for frequencies below 10 MHz). The keypad serves double duty as a bandswitch. Each key on the keypad has two labels, yellow numerals (**1** to **0**) on each key are used for direct frequency entry and white numerals on each key indicate the 1.8 to 29-MHz amateur bands. A key labeled **GEN** can be programmed to switch the receiver to a general coverage frequency.

The 100 tunable memories offer another way to get around. Once you recall a memory you can tune up or down from that frequency without affecting the frequency stored in that memory. I used the memories to store all of the amateur band edges and used the **UP** and **DOWN** keys to get from one band to another. You can check the contents of any memory without leaving the frequency your VFO is on. A short

Table 1

Yaesu FT-900AT MF/HF Transceiver, serial no. 4I030071

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Transmitter: 160 through 10-meter amateur bands. Receiver: 100 kHz to 30 MHz.	As specified. Transmitter range: 1.8-2, 3.5-4, 7-7.5, 10-10.5, 14-14.5, 18-18.5, 21-21.5, 24.5-25, 28-30 MHz.
Modes of operation: LSB, USB, CW, AM, FM.	As specified.
Power requirement: 13.5 V dc, ±10%; 1.5 A on receive, 20 A on transmit.	At 13.8 V dc: 1.4 A on receive (no signal, max volume); 17 A max on transmit.
Receiver	*Receiver Dynamic Testing*
SSB/CW receiver sensitivity (2.4 kHz bandwidth, 10 dB S/N, preamp on): 0.5-1.8 MHz, <1 μV (–107 dBm); 1.8-30 MHz, <0.25 μV (–119 dBm).	Minimum discernible signal (noise floor) with 500-Hz IF filter: *Preamp off* / *Preamp on* 1.0 MHz: –120 dBm / –127 dBm 3.5 MHz: –129 dBm / –138 dBm 14 MHz: –129 dBm / –137 dBm
AM (10 dB S/N, 6-kHz filter, preamp on): 0.5-1.8 MHz, <8 μV; 1.8-30 MHz, <1 μV.	10 dB (S+N)/N (signal 30% modulated with a 1-kHz tone, 6-kHz filter): *Preamp off* / *Preamp on* 1.0 MHz: 3.0 μV / 1.7 μV 3.8 MHz: 1.2 μV / 0.5 μV
FM (preamp on): 28-30 MHz, 0.5 μV for 12 dB SINAD.	At 29 MHz: preamp off: 0.5 μV for 12 dB SINAD; preamp on: 0.2 μV for 12 dB SINAD.
Blocking dynamic range: Not specified.	Blocking dynamic range with 500-Hz IF filter:* *Preamp off* / *Preamp on* 1.0 MHz: 119 dB / 117 dB 3.5 MHz: 121 dB / 120 dB 14 MHz: 122 dB / 124 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range with 500-Hz IF filter:* *Preamp off* / *Preamp on* 1.0 MHz: 85 dB / 82 dB 3.5 MHz: 94 dB / 91 dB 14 MHz: 98 dB / 99 dB
Third-order input intercept: Not specified.	*Preamp off* / *Preamp on* 1.0 MHz: +8 dBm / –5 dBm 3.5 MHz: +16 dBm / +3 dBm 14 MHz: +22 dBm / +13 dBm
Second-order intercept point: Not specified.	+73 dBm preamp on or off.
FM adjacent channel rejection: Not specified.	≥83 dB at 20 kHz channel spacing.
FM two-tone, third-order IMD dynamic range: Not specified.	≥76 dB at 20 kHz channel spacing.
S-meter sensitivity: Not specified.	S9 signal at 14 MHz: preamp off, 432 μV; preamp on, 120 μV.
Squelch sensitivity (preamp on): SSB/CW/AM, <2 μV; FM, <0.32 μV.	At threshold, preamp on: FM, 0.1 μV; SSB/CW/AM, 1.8 μV.
Receiver audio output: At least 1.5 W into 4 Ω with <10% THD.	2.3 W at 2% THD into 4 Ω at max audio output.
IF/audio response: Not specified.	At –6 dB: CW-N, 475-982 Hz (507 Hz); CW-W, 432-1269 Hz (837 Hz); USB, 348-2452 Hz (2104 Hz); LSB, 348-2384 Hz (2036 Hz); AM-N, 150-1300 Hz (1150 Hz); AM-W, 152-2280 Hz (2128 Hz).
Notch filter depth: 30 dB or better.	43 dB.
Image rejection (1.8-30 MHz): 70 dB or better.	≥85 dB.
IF rejection (1.8-30 MHz): 70 dB or better.	≥89 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB, CW, FM adjustable up to 100 W; AM, 25 W carrier.	Maximum power output typically 110 W, minimum power typically 1.5 W; varies slightly from band to band. On AM, typically 21 W maximum, 1.5 W minimum.
Spurious-signal and harmonic suppression: –40 dB spurious radiation; –50 dB harmonic radiation; –40 dB harmonic radiation (10, 18 MHz).	As specified. Worst case, 46 dB at 3.6 MHz. Meets FCC specifications for equipment in its power output class and frequency range.
SSB carrier suppression: 40 dB.	≥55 dB.
Undesired sideband suppression: At least 50 dB.	≥55 dB.
Third-order intermodulation distortion products: –31 dB (typ) at 100 W PEP output at 14.2 MHz.	See Figure 1.
CW keying characteristics: Not specified.	See Figure 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 25 ms.
Composite transmitted noise: Not specified	See the sidebar, "Improved Transmitted Composite-Noise Data Presentation."
Size (height, width, depth): 3.7×9.4×10 inches; weight, 11.7 pounds.	

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Blocking dynamic range measurements were noise limited at the values shown. AGC could not be disabled.

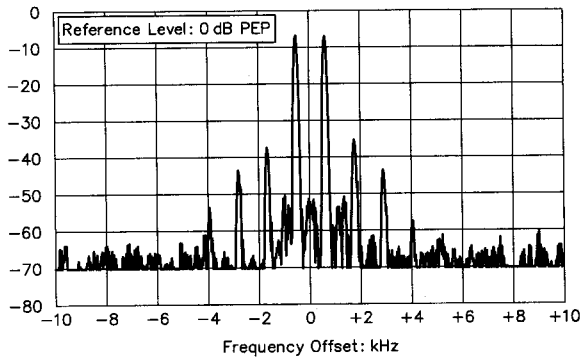
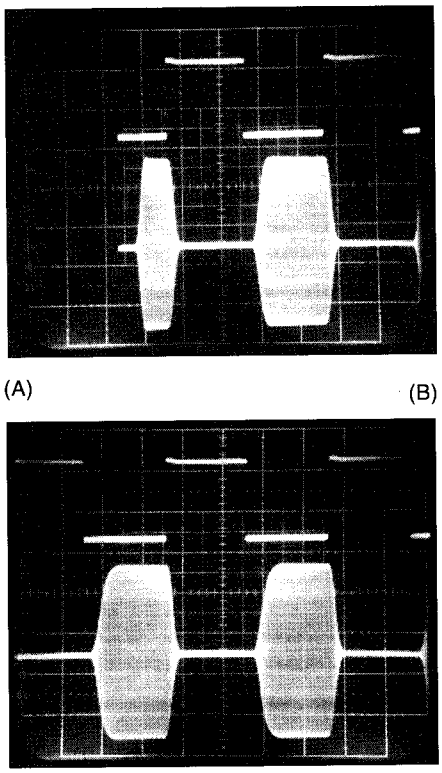


Figure 1—Worst-case spectral display of the Yaesu FT-900AT transmitter during two-tone intermodulation distortion (IMD) testing. Worst-case third-order product is approximately 35 dB below PEP output, and the fifth-order product is approximately 43 dB down. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The transceiver was being operated at 100 W PEP output at 14 MHz.



(A) (B)

Figure 2—CW keying waveform for the Yaesu FT-900AT in the semi-break-in mode. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14 MHz. The photo at A shows noticeable shortening of the first transmitted character during semi-break-in operation; the photo at B shows the CW waveform with the radio locked in transmit.

press of the **M/V** button brings up a blinking **M CK** icon on the display. You have three seconds to use the **UP** or **DOWN** keys to scroll through the memory channels. Ten memories (labeled **P1** to **P0**) can be used to set upper and lower frequency limits for the programmable scan function of the radio.

In receive, the clarifier (or RIT) can be used for excursions of up to ±9.99 kHz. You may select (at power up) whether or not clarifier adjustments change the displayed frequency, and any of three clarifier tuning resolutions (2.5, 5 or 10 Hz). The clarifier offset can be cleared by turning the clarifier off .

Other ways to navigate around the spectrum include tools such as the **UP, DOWN** and **FAST** keys on the hand mike and the memory scanning features—*and* you can use your computer to control the FT-900 (via the optional FIF-232C computer interface).

The FT-900 includes all of the user-definable features that the FT-890 has, and adds to the list. Some features are selected at the time of power-on, while other features are selected by pressing **FAST** and another button. You can display or hide the clarifier offset, select the clarifier tuning steps, reverse the CW sideband, and select the CW offset and (tracking) sidetone. In all, there are 22 of these user-definable functions. It's nice to see Yaesu offering more of these firmware switches.

On the Air

The review FT-900 really got a workout. It was used to make a couple of hundred SSB contest QSOs, some casual CW QSOs and a handful of RTTY contacts. I used it briefly on AM and spent some time using it on FM simplex.

The FT-900 uses an 8-pin modular connector for the mike. That type of plug is difficult for the average ham to install without special tools, and not many of the audio/mike accessory manufacturers have caught up with the modular-plug trend yet. So watch for this as a potential problem in integrating a new FT-900 into your station if you have a mike or other accessory you want to use with this radio. The good news is that Radio Shack stocks 8-pin modular plugs and the necessary installation tool for making connections to the plug.

I found the stock SSB filtering was fine for my casual contest efforts. The **SHIFT** control came in handy for reducing QRM, and only rarely did I feel that the optional crystal SSB filter would have been required. The adjustable notch filter and IF shift helped to pull signals through QRM.

Because the FT-900 shares a high degree of commonality with the FT-890, it shares one of the FT-890's problems, that of installation of optional filters. Installation of the optional SSB filter is an onerous task, since you must unsolder and remove the existing filter to install the optional filter. Similarly, installation of the 500-Hz CW filter requires the partial removal of a PC board, and soldering the new filter in place. It would be best to buy the optional filters you expect to need at the time you buy your rig, and let your Yaesu dealer install them at the time of purchase. Yaesu got the filter installation process right in the FT-650 and the FT-840, but because of the commonality of the FT-900 with the earlier FT-890, the FT-900 missed that particular improvement.

CW ops will find that there is a lot to like about the FT-900. The standard CW (wide) filter was fine for general tuning in the CW portions of the bands. Pressing the **CW** mode button a second time selects the optional 500-Hz CW filter. The built-in CW keyer works well and the **SPEED** control is adjustable from about 4 to 50 wpm.

CW ops will also enjoy the ability to choose which "sideband" to receive CW on. If an signal interferes with you on one sideband, you can switch to the other sideband simply by holding in the **FAST** button and pressing the **CW** button. This is a nice feature, when operating under crowded band conditions.

I found that the 2.5-Hz tuning resolution worked well for RTTY as I tuned around on 20 meters one Saturday afternoon during a RTTY contest. The 2.5-Hz resolution allowed a KAM all-mode controller to lock onto RTTY signals with ease. For long periods of continuous duty cycle operation, such as RTTY or FM, Yaesu recommends that the output power be reduced to 50 W or less, to preserve the life of components. The manual suggests that such transmissions be kept to "three minutes or less." I used full output power for short RTTY (and FM) transmissions without any complaint from the radio. Once in a while the quiet fan came on to keep things cool. The slight noise made by the cooling fan was noticeable (but not distracting).

One area in need of improvement is the implementation of filter selection. While the operating manual does spell out how you can set up the radio to use narrow filtering when operating the FT-900 in digital modes, it's a daunting task. (Here's yet another radio that doesn't allow us to use its narrow CW filter in SSB!) It would be really nice, if instead, you could use any filter combination, in any mode, with just a push of a filter button. This would be one

refinement welcomed by operators who use digital modes.

Throughout the review period, the FT-900 handled all of the demanding tasks it was handed without missing a beat, but it fell victim to an infant mortality problem shortly after we bought it. I was using the FT-900 in a phone contest when it happened. The radio had been on for about 30 minutes (and had made about *75* QSOs in that time). After I gave my portion of the exchange to the next station in line, I let up on the foot switch, to switch to receive. My ears were assaulted with white noise—the receiver had gone dead. The following week, the FT-900 was shipped off to Yaesu for in-warranty repair. The invoice Yaesu returned with the repaired radio shows that they had the rig for only eight days. They located and replaced two defective diodes in the receiver front end. The review FT-900 has performed flawlessly ever since.

While using the FT-900 on SSB, I found that the radio offered two ways to add more punch to my transmitted SSB signal. One is a speech compressor and the other is something Yaesu calls the "frequency shifted processor" (or FSP for short). This feature lets you adjust your transmitted SSB signal (by shifting the IF passband) to any value between –300 Hz and +500 Hz. According to the owners manual, this (transmit IF shift) allows you to "customize your signal for your own voice characteristics." The FSP feature works very well and I found that adjusting this for +200 Hz added enough highs to make either the stock hand mike or the optional MD-1 desktop microphone sound better. Both of these mikes seem to enhance low-frequency speech components a bit, and the FSP system helps to brighten up the audio very nicely.

I do have a suggestion for Yaesu (and other manufacturers) regarding adjustable speech compressors: add a SSB speech monitor! While experimenting with the settings for the speech compressor (and the transmit IF shift), I was able to find a combination that sounded pleasing to a local

Improved Transmitted Composite-Noise Data Presentation

During the past year, you may have noticed some evolutionary changes in the way we show the results of transmitter composite-noise testing. In the April 1994 issue, we switched from photographs to plots. Starting this month, we've used some features on our recently acquired Hewlett Packard 8563E spectrum analyzer to bring you plots that are easier to interpret.

The old composite-noise photos, such as the one in Figure A, were made with an HP 141T spectrum analyzer. Notice that spikes, waveform irregularities and high peak-to-peak variations (some in excess of 30 dB) tend to mask the *average* noise level (as indicated by the solid line). The average noise is usually about halfway between the maximum and minimum peaks, but the jagged and irregular nature of the trace envelope make the average difficult to determine.

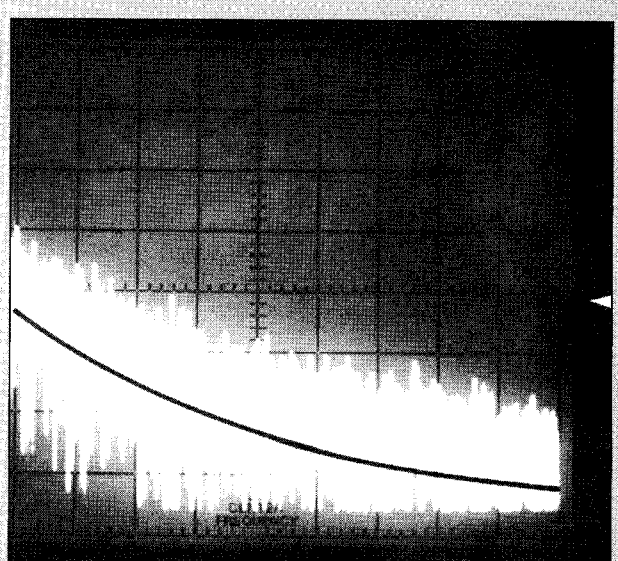


Figure A—Old-style spectral display of the Yaesu FT-900AT transmitter output during composite-noise testing. Power output is 100 W at 14 MHz. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The log reference level (the top horizontal line on the scale) represents –60 dBc/Hz and the baseline is 140 dBc/Hz. The carrier, off the left edge of the plot, is not shown. This photo shows composite transmitted noise 2 to 20 kHz from the carrier. The solid line shows the average composite noise, as displayed in Figure B.

Since noise is random by nature, no two composite-noise sweeps are ever exactly the same. A noise spike or spikes may appear on one photo but not the next. Other variations between sweeps are also possible. In the past, we've had to make several sweeps for each photo to ensure the final results were "typical."

The HP 8563E's computer interface, video filtering and ability to average noise during multiple sweeps make the presentation shown in Figure B possible. The new spectrum analyzer is a digital device, and it interfaces with the Lab's computer to store the final plots in a digital form that is compatible with our page composition equipment. Plots provide excellent trace definition, eliminating the focus and exposure problems associated with photographs.

Another big advantage of our new analyzer is its ability to average multiple sweeps. We now take 10 composite-noise noise sweeps and average them together. A 10-Hz video filter bandwidth reduces maximum peak deviations during each sweep. The final result is a greatly averaged display trace that is easier to read and interpret.—*Mike Gruber, WA1SVF, ARRL Laboratory Engineer*

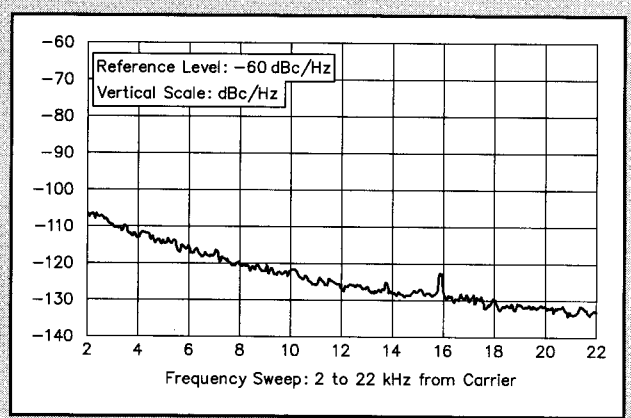


Figure B—New-style spectral display of the Yaesu FT-900AT transmitter output during composite-noise testing. Power output is 100 W at 14 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

op. This op spends more time using the digital modes, than he does on phone. Therein lies the catch. Now I was sure of the settings required for a casual QSO but what if I wanted to tailor my signal for some DXing or contesting? Sure, I *could* do a lot more on-the-air testing but I would *prefer* to have the ability to make my own judgments about my transmitted signal.

Overall, the FT-900AT was a fun radio to have around. It was neat to operate mobile, with the small remote front panel lying on the passenger seat beside me (more on this later). Yet, features like the direct frequency entry keypad were nice to have in the shack. For me it was a toss-up; I enjoyed using the radio both at home and in the car.

Computer Control

With the use of the optional FIF-232C computer interface box, I was able to control the FT-900 with my (IBM clone) PC. Two different logging programs were used with success. Each time data is exchanged between the FT-900 and the PC, a **CAT** indicator lights up on the FT-900 display. It was fun to grab a packet spot from my local DX PacketCluster node and watch as both the radio and the logging program responded. A few keystrokes on the PC keyboard causes the program to place the DX call sign in the log entry field, change the logged band and switch the rig to the proper frequency and mode. Another keystroke or two configures the logging program and the rig to the way they were before you began the process. Neat stuff!

Remote Control

A portion of the front panel is "remotable." That is, FT-900 owners can remove the upper two-thirds of the front panel and use the optional YSK-900 remote mount kit to transform it to a remote control head. The cable in the remote mount kit is 23.6 feet long and about 1/2 inch in diameter. The separation kit includes a small (2×4-inch) plastic bracket that can be attached to a flat space large enough to accommodate the control head. The kit also includes two metal brackets (and hardware) that can be used to secure the RF deck of the radio to the floor of a car trunk or other suitable location. The separation kit does *not* include the adjustable stand (for the control head) visible in some FT-900 ads. This appears to be an automotive cellular telephone stand; it is *not* an option offered by Yaesu.

When the control head is used to operate the FT-900, the controls that are on the bottom third of the front panel stay with the main chassis when you remove the control head. This includes everything to the right of the headphone jack, including the keypad at the opposite end of the rig. There are enough controls on the remote control head to effectively operate the radio. For instance, the **UP/DOWN** keys and memories easily take the place of the direct frequency/band selection keypad. Mobile users who wish to have *all* of the front panel controls available to them can use the optional MMB-20 mobile mount bracket to mount the entire radio in a suitable location.

The cable included in the YSK-900 kit was used to operate the rig via the (2 1/8×9 1/8-inch) control panel. I made several 20-meter phone QSOs from my car, and here are some general impressions I noted.

The hand mike fit comfortably in my hand and was easy to use. On a couple of occasions, before I even asked about my transmitted audio, other ops reported that the rig had good audio. (I still had the FSP adjusted +200 Hz and feel this helped when using the hand mike.) I found that the noise blanker (**NB**) did a good job of minimizing the noise generated by my car's ignition system. The backlit LCD display was easy to read in bright sunlight or in total darkness. At night, the front-panel labels totally disappeared in the darkness. Only the display (and several indicator lights associated with several switches) remained visible. It would take a bit of experience before most ops would be comfortable with using very many functions in total darkness.

The remote front panel is easy to remove from its bracket. This makes it easy to "hide" the rig when you're out of your vehicle. Simply pop the remote head off the bracket and toss it into the glove compartment or your briefcase.

If you wish to remote the radio, you should not plan to take the radio in and out of the vehicle a lot. The installation of the main chassis involves quite a few pieces of small (read "easily lost and difficult to replace"!) hardware. If you want to switch the rig back and forth between the home station and the mobile, then it would be advisable to install the rig in the vehicle as a single-piece radio, rather than to use the control head with a remotely mounted main unit.

You should be aware that there are safety issues involved when you mount any type of radio in a car or truck. Installing a radio in front of an air bag can be dangerous. Anyone contemplating the installation of a radio in the passenger compartment of a modern motor vehicle should read the article "Don't Get Blown Away by Your Mobile Rig" by Brian Battles, WS1O, in April 1993 *QST*.

All things considered, I think the remote control option for the FT-900 makes it a very flexible radio. Great features like direct frequency/band entry are available when you use the rig in the shack and then you have the option of using the remote control sub-panel if you want to take the rig mobile.

Documentation

Yaesu continues to do an outstanding job with their operating manuals, and the 48-page manual for the FT-900 is no exception. The table of contents always led me right to the information I was looking for. The manual is logically laid out and is chock-full of tables, graphics and pictures that make the subject at hand easy to comprehend. The manual is clearly written and points you to other areas when more information is needed.

The manual includes a separate insert titled "Important Advice on Mobile Installation and Operation," which offers several tips for mobile operators. Five separate pages of schematic diagrams, a warranty card (for the 12-month limited warranty) and a radio amateurs' world map complete the package.

Conclusions

The FT-900AT grows on you. It offers the casual operator a lot of nice features as standard equipment. I got the feeling that this rig was designed by people who really use ham radios. This is evident when you see features like the multifunction keypad, the CW offset with tracking sidetone, and the user-definable features built into the FT-900AT. The radio offers a lot of functionality for the money. Yaesu has done a nice job of balancing the needs of mobile operators with those who are looking for a compact, feature-packed radio.

My thanks to the following hams for their contributions to this review: Larry Wolfgang, WR1B; Dave Newkirk, WJ1Z; Jon Bloom, KE3Z; Tom Hogerty, KC1J; Peter Budnik, KB1HY; and, last but not least, the guys in the ARRL Lab.

Manufacturer's suggested retail prices: FT-900AT, $1699; YF-110C 500-Hz CW filter, $170; YSK-900 remote mounting kit, $59; FIF-232 computer interface, $119. Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90703, tel 310-404-2700; fax 310-404-1210.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from 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. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

AEA SWR-121 HF Antenna Analyst with SWR.COM software (sold as a package only; see Product Review, November 1994 *QST*). Minimum bid: $256.

Alinco DR-130T 2-meter FM transceiver (see Product Review, January 1995 *QST*). Minimum bid: $202.

Azden PCS-7000H 2-meter FM transceiver (see Product Review, January 1995 *QST*). Minimum bid: $218.

Down East Microwave SHF-2400B Mode S downconverter (see Product Review, February 1994 *QST*). Minimum bid: $100.

ICOM IC-W21AT dual-band H-T with HM-75 speaker/mike, CP-13 dc cable and BP-130 battery case (sold as a package only; see Product Review, March 1994 *QST*). Minimum bid: $325.

JPS SSTV-1 DSP filter (see Product Review, November 1994 *QST*). Minimum bid: $109.

Kenwood TH-78A dual-band H-T with SMC-33 speaker/mike, PG-2W dc cable and BT-8 battery case (sold as a package only; see Product Review, March 1994 *QST*). Minimum bid: $250.

Kenwood TM-241A 2-meter FM transceiver (see Product Review, January 1995 *QST*). Minimum bid: $225.

R. L. Drake SW8 general coverage receiver (see Product Review, October 1994 *QST*). Minimum bid: $398.

Timewave DSP-9+ DSP filter (see Product Review, October 1994 *QST*). Minimum bid: $140.

Timewave DSP-59+ DSP filter (see Product Review, October 1994 *QST*). Minimum bid: $190.

Watkins-Johnson HF-1000 general coverage receiver (see Product Review, October 1994 *QST*). Minimum bid: $2523.

Yaesu FT-2200 2-meter FM transceiver (see Product Review, January 1995 *QST*). Minimum bid: $238.

Sealed bids must be submitted by mail and must be postmarked on or before February 27, 1995. 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 bidder.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone with a confirmation by mail. No other notifications will be made, and no information will be given to anyone other than successful bidders regarding final price or identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494. QST

New Books

RADIO RECEIVER PROJECTS YOU CAN BUILD

By Homer L. Davidson

TAB Books, Division of McGraw-Hill Inc, Blue Ridge Summit, PA 17294; tel 717-794-2191; fax 717-794-2103. First edition, 1994, hardcover (softcover also printed), 7½×9½ inches, 312 pp, $18.95.

Reviewed By Kirk Kleinschmidt, NTØZ

Like many hams who got started in ham radio when I did (and before), I walked out of my school library one day with a bunch of books that would change my life in ways I could hardly have imagined. No, the volumes weren't *War and Peace* or the *Constitution of the United States*—nothing quite so stuffy. The books were, as I recall, *A Boy's First Book of Radio* and *Twelve Transistor Radios You Can Build.*

A couple of pages into the books and I was hooked—I couldn't get enough "radio"! These books and later, others like them, took me step by step into the magic of wireless. It started with a simple diode detector and a small crystal earpiece I appropriated from my Panasonic "ball" radio. Next came a shortwave set that Dad brought home from an auction. Finally, at age 13 or so, I got my Novice ticket. Those were my "magical days" of radio: scavenging parts from TVs and radios, struggling to make sense of circuit diagrams and finally, hearing overseas stations from a receiver I built myself—whoa!

In the intervening years, few books have allowed me to recapture the feelings I had as a youngster just starting to explore radio. Thanks to the efforts of Homer Davidson, however, *Radio Receiver Projects*...did just that!

Oh, it's far from a perfect introduction for today's youngsters—but it's worthwhile just the same and it's especially fun to read (and build things from) for more experienced radio buffs who want to recapture some of their own earlier triumphs and fascination with radio.

In 300+ pages and nine chapters, Davidson takes you from simple crystal sets to TRF receivers, regeneratives, direct conversion circuits and on to superhets, with tubes, transistors, ICs—even interesting hybrids! There are 33 projects in all.

Receivers for the domestic AM broadcast bands dominate, but there are plenty of shortwave and ham band circuits. And Davidson uses some of my favorite devices, too: the venerable NE-602 oscillator/mixer; its high-performance cousin, the TDA-7000; and Ferranti's nifty ZN-414 and ZN-416E—complete AM receiver subsystem chips with AGC, all in a 3-pin (8 pins for the '416E) transistor-like package! (*Pop quiz:* What has three legs, 72-dB gain, AGC, excellent audio quality, works on 1.5 V and needs no alignment? *Answer:* a ZN-414!)

So, what's the problem? Well, along with all of the interesting projects, there are a few monkey wrenches in the gears.

The most annoying part of *Radio Receiver Projects*...is its schematics—they're awful! If you *tried* to design a more confusing and hard-to-follow symbol set, you couldn't! This is an annoyance for experienced builders, but a major setback for beginners. As a veteran builder, I had to look long and hard at some circuit diagrams to figure out what was going on.

From a raw recruit's point of view, Davidson probably doesn't do enough hand-holding and explaining in the beginning. Jumping into radio and electronics topics is confusing enough for beginners. On the other hand, the book is already 300+ pages, so adding the extra material may have forced the publisher to cut some projects.

There are a few questionable practices recommended by the author. For example, on page 25, in a section on building an ac-powered 12-V supply, the author encourages his readers to switch only the low-voltage secondary of the power transformer. The primary is connected directly to the ac mains—without a switch or a fuse! He's trying to protect his readers by keeping them away from 120-V ac, but Mr Spock would certainly raise an eyebrow or two at the suggestion!

On page 159, the author shows a simple shortwave set that tunes between 15 and 18 MHz using a Ferranti ZN-414! My ZN-414 data sheet shows an upper frequency limit of only 3 MHz. Does the author know something Ferranti doesn't—or has there been a cover-up all these years? By the way, if the ZN-414 works at 18 MHz, run to your nearest supplier and pick up a few. To satisfy my curiosity, I'll have to build the author's circuit to see for myself....

So what's the bottom line? Problems and typos aside, this is a fun book for more experienced builders and an okay book for beginners (with a few caveats, of course). If you're an Elmer, it's an excellent book to give a youngster who wants to get started in building radio sets. With *your* help, *Radio Receiver Projects*...*is* an excellent book for that special beginner. QST