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AEA Doctor DX Morse Code Contest Trainer for the Commodore 64 Computer

Yaesu FT-757GX Transceiver

Product Review

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Yaesu FT-757GX Transceiver

The current trend in HF rigs is toward miniaturization, packing a maximum of features into a minimum of space. The Yaesu FT-757GX is one of the more recent contributions to this genre, and is a fine representation of its class of fully solid-state rigs.

The FT-757 is capable of all-mode transmission and reception on all of the HF ham bands (including the WARC-1979 bands), and is equipped with a general-coverage receiver. Powered by 13.5-V dc, the '757 can produce 100 W output on SSB, CW and FM, and 25 W on AM. Full CW break-in operation is possible, and an internal keyer minimizes the need for external attachments. A duct-flow cooling system ensures long life for the discrete components.

It Appears to Be Complex ...

And it is. The front panel has 31 separate knobs and buttons. In addition to the multifunction meter and frequency display, the front-panel controls turn on and off the VOX, MOX, POWER, RF AMP, ATTenuator, speech PROCessor and Noise Blanker. They also select the desired METER scale and AGC speed. The various knobs include the MODE selector, AF and RF gain, main tuning, SHIFT, WIDTH, SQUELch and noise-blanker thresholds, and MICrophone and DRIVE level controls. Ten buttons alter the frequency, VFO in use, scan feature and memories. A CLARifier and dial LOCK are also on the front panel.

The rear-panel provides access to an external PTT line, the ANTenna connector, PATCH/AFSK input, RF OUT, EXT SPeaker, AF OUT, KEY, GND and 13.5 V-dc. Other rear-panel features are:

- the power connector,
- VOX controls,
- data connector,
- LINEAR amplifier select switch,
- speech COMPression LEVEL adjust,
- AM CARrier adjust,
- 25-kHz MARKER generator on/off switch,
- REMOTE Molex connector for interfacing with an external microcomputer,
- FWD-REV switch for the front-panel meter,
- FWD SET for the front-panel meter,
- EXTernal ALC for controlling outboard amplifier, and
- +8-V dc.

The top cover hosts the keying controls. One switch selects full- or semi-break-in, and another activates the internal keyer. A sliding potentiometer adjusts the internal-keyer speed. A built-in speaker is also located on the top cover.

Four hard-rubber feet are mounted on the bottom of the rig, as is a bail for elevating the rig's front. The main tuning knob torque adjustment screw is also accessible from the bottom. One side of the radio has a carrying strap; two flat rubber pads are mounted on the other.

Table 1
Yaesu FT-757GX, Serial No. 3N040531

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive — 500 kHz to 29.9999 MHz; transmit — 1.5-1.99999, 3.5-3.99999, 7.0-7.49999, 10.0-10.49999, 14.0-14.49999, 18.0-18.49999, 21.0-21.49999, 24.5-24.99999, 28.0-29.99999 MHz.	Receive — as specified; transmit — as specified.
Modes of operation: CW, SSB, AM, FM.	As specified.
kHz/turn of knob: Not specified.	10 kHz.
Tuning steps: 10 Hz and 500 kHz.	As specified.
Backlash: Not specified.	Nil.
S meter sensitivity (μV for S9 reading): Not specified.	RF amplifier out/in: 160 m, 220/14.5; 80 m, 220/13.5; 40 m, 220/16; 30 m, 280/25; 20 m, 235/26; 17 m, 220/25; 15 m, 250/30; 12 m, 170/22; 10 m, 220/25.
Transmitter power output: 100 W — SSB/CW/FM; 25-W AM.	110-W, all bands; 25-W, AM
Third-order IMD: Less than −35 dB.	−33 dB.
Spurious suppression: Better than 50 dB.	58 dB.
Receiver sensitivity: (1.5-30 MHz) less than 0.25 μV for 10 dB S+N/N.	Receiver dynamics measured with RF amplifier out/in:

	80 m	*20 m*
Noise floor (MDS) dBm:	−121/−140	−120/−137
Blocking DR (dB):	Noise limited	Noise limited
Two-tone 3rd-order IMD DR (dB):	91/90	91/89
Third-order intercept (dBm):	−5/+15.5	−3.5/+16.5

Receiver recovery time: Not specified. 40 ms.
Color: Gray.
Size (HWD); 3¾ × 9½ × 9½ in (93 × 238 × 238 mm).
Weight: 11.5 lb (5.2 kg).

Operation

Frequency control: When the radio is turned on for the first time, the default frequency, 7.000.0 MHz, appears on the blue-fluorescent digital display. Two VFOs, A and B, are available to change the operating frequency in either 10-Hz or 500-kHz steps. These can be accessed in a variety of interesting and novel ways, allowing the operator to master almost any frequency demand encountered. To flip between VFOs, press the VFO A/B button. The main tuning dial, which has a recessed finger hole for rapid tuning, tunes the active VFO. Torque, or dial resistance, is adjusted by varying a screw set in the bottom of the radio. The BAND/CH paddle serves two purposes: It moves the active VFO to the next higher or lower ham band, or, if the

*Assistant Technical Editor

500k STEP button has been pressed, the VFO will move in 500-kHz steps up or down from the displayed frequency.

Operating split frequency is easy; press the SPLIT button. The displayed frequency (on the active VFO) stays the same and is your receiver frequency, while the other VFO will control the transmitter frequency. A green SPLT appears to the left of the operating frequency to indicate the rig status.

Memories: The FT-757 has eight programmable memories. A host of variations on the memory theme are easily performed by pressing the memory-selection keys. These allow you to write a specific frequency into one or more of the memories (VFO > M) or cause a memory frequency to become the operating frequency (M > VFO). Another key, VFO <> M, exchanges frequency and mode information between the operating VFO and the most-recently-accessed memory. Pressing it a second time exchanges the information again. If you've changed the memory frequency while it was on the operating VFO, that new frequency will be the one stored in the memory channel.

This function is useful for quickly checking a memory frequency, scanning around that frequency and then returning to the original VFO frequency once your curiosity has been satisfied. There is no indication of which memory channel has been accessed when this feature is used; you must remember the channel from your last operation on that channel.

Pressing the MR/VFO key flips between the operating VFO and the memory channel. This displays the memory frequency while suppressing the former VFO frequency, but, unlike the VFO <> M key, the memory frequency is involatile — spinning the main tuning dial has no effect. The memory-channel number is indicated to the right of the frequency display. In this mode, you're able to scan through the eight memory channels. To do this, press the BAND/CH UP or DWN buttons. Pressing the MR/VFO key again returns the VFO frequency to the display and suppresses the memory. All of the memory keys, plus the SPLIT and VFO A/B keys, cause a "beep" to sound whenever they are pushed.

Variations on the Frequency Theme: Yet another frequency control on the FT-757 is the CLARifier. This is another name for Receiver Incremental Tuning, but in this radio it lets you continuously tune the receive frequency as far away from the transmit frequency as you like. Acting somewhat as a third VFO, the CLAR control works only when a VFO is being used; it won't change a memory frequency that has been called up. Pushing the CLAR button a second time returns the receiver frequency to where it was before CLARification was used.

A programmable memory scan (PMS) can be implemented by pressing the PMS button. Here, the receiver scans from the last selected memory frequency to the frequency in the next higher memory channel, looking for signals strong enough to break the squelch threshold. An interesting feature of the PMS is that if the next highest memory channel holds a frequency below the previously used memory channel, the scan will search from the lower frequency to the higher one, regardless of their order in the two memory channels. This prevents the scan from going "all around the mulberry bush" — all the way through the receiver range until it gets to the memory channel frequency.

The 8-pin microphone plug has provisions for a scanning microphone. Optional microphones, the Yaesu MD-1 B8 (desktop) or MH-1 B8 (hand-held), allow normal and FAST tuning up and down the bands. The D. LOCK button disables the main tuning knob by disengaging the photo-interrupter on the tuning knob shaft. Pressing the D. LOCK also disables the microphone tuning controls.

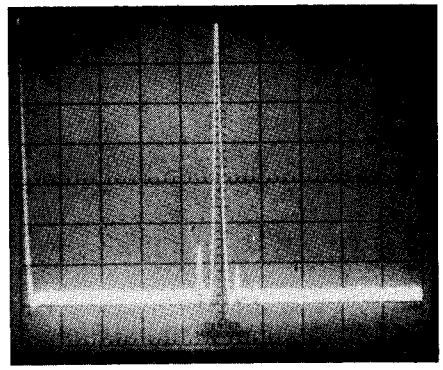


Fig. 1 — Spectral display of the FT-757GX. Vertical divisions are each 10 dB; horizontal divisions are each 5 MHz. Output power is approximately 100 W at a frequency of 24.7 MHz. All spurious emissions are at least 55 dB below peak fundamental output. The FT-757GX complies with current FCC specifications for spectral purity.

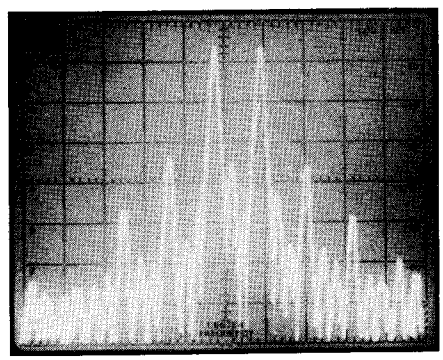


Fig. 2 — Spectral display of the FT-757GX output during transmitter two-tone IMD test. Third-order products are 34 dB below PEP. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was being operated at rated input power on the 20-meter band.

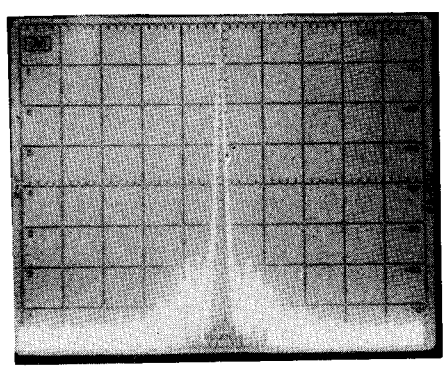


Fig. 3 — Synthesizer noise about the carrier. Vertical divisions are each 10 dB; horizontal divisions are each 20 kHz. The transceiver was being operated at rated input power on the 20-meter band.

Operating frequency can be changed via a microcomputer. Optional microcomputer interface units must be used in this application. Yaesu provides their FIF-65, for interfacing with an Apple®, or the FIF-232C, an EIA RS-232-C connection.

Receiver

A slew of operating aids are built into the '757. These include IF SHIFT and WIDTH controls, SQUELch and a variable noise blanker (NB). The NB control varies the time constant of the noise blanker AGC, changing the width of the blanking pulse. Thus, the noise blanker can be set to eliminate noises of different duration — ignition type noise, lightning or the Woodpecker. The IF WIDTH decreases one side of the receiver passband at a time. By simultaneously manipulating the IF SHIFT and WIDTH controls, the passband can be reduced as required — especially useful for CW reception on a crowded band.

An RF AMPlifier and/or ATTenuator can be placed in line with the receiver front end. The attenuator reduces sensitivity approximately 20 dB. AGC is switchable from slow to AGC-Fast. The meter shows relative signal strength calibrated in S units during reception. A 25-kHz marker generator can be switched on for calibration purposes. The headphone jack will handle both monaural and stereo headphones.

Transmitter

Yaesu has equipped this rig with all the transmission aids considered standard these days, such as VOX and a speech processor. A few extras have been included as well. In addition to SSB and CW transmission, the '757 operates FM and AM. The carrier is adjustable if you run A3E (amplitude modulation). The front-panel meter shows relative power output, ALC level and forward and reverse SWR.

CW Transmission

A feature not seen often enough these days is full break-in, or QSK. The FT-757 has this feature, as well as the more common semi-break-in. A built-in keyer with variable speed control and dot memory rounds out the code complement of this rig — all you have to do is connect a 3-conductor plug to the KEY jack. You can, if you wish, connect a straight key to the KEY jack, or use an outboard keyer through the same input. Sidetone volume is adjustable.

RTTY operation

To operate RTTY, connect the modem output to the rear-panel PATCH jack and switch to LSB, keeping the MIC gain control to reasonable levels. Use the AF OUT jack on the rear panel to provide audio to the modem. Another rear-panel jack, PTT, can be used for automatic switching from receive to transmit. Yaesu recommends using the heavy-duty power supply (FP-757HD) for extended RTTY communications. The switching power supply, FP-757GX, should be used only when RTTY transmissions can be kept under 30 seconds. The squelch control is useful in RTTY reception: If you're tuned to the proper frequency for a Bulletin-Board System (BBS) or a commercial RTTY transmission, you can keep the squelch closed until it is broken by the desired station. This minimizes attempts by the modem to demodulate the ever-present static on the bands.

Frequency Control

The main VFO knob tunes continuously

through the general-coverage receiver frequencies. If you want to jump to a higher or lower ham band, press the appropriate BAND/CH paddle. When the 500k STEP button is depressed, the BAND/CH paddles allow rapid scanning through the high-frequency spectrum.

Antenna Tuner

Yaesu markets a fully automatic antenna-matching network, the FC-757AT, which mates with the FT-757. The "tuner" is approximately the same size as the transceiver, and the two physically complement each other. The FT-757 automatically controls the antenna tuner through a control cable that plugs into the rear panel of each box. The antenna coaxial cable connects to the tuner (which has only SO-239 connectors on the rear panel), and a short cable connects the tuner to the transceiver.

Operation is simple: Make sure the antenna tuner is turned on, and change bands on the transceiver. A yellow WAIT LED will light, and you'll hear a clicking and whirring as the tuner's 8-bit microprocessor looks for the best impedance match. You can watch the SWR increase and decrease on the built-in meter as the tuner goes through its search. After several seconds (never more than 20 for the rhombic antenna I matched; a dipole took slightly longer), the noises stop and the green READY LED lights up.

You can use the manual TUNE and LOAD controls to match an antenna yourself, but I always found the automatic matching satisfactory. Together with the band-pass or no-tune-up feature of the FT-757, I had a great time on 80 and 160 meters, not being limited to repeated tuning procedures of any sort as I moved up and down the band. Occasionally, when I began to transmit after tuning around, the WAIT LED would go on, and I would wait, as directed. Adjusting the sensitivity control minimizes these WAIT periods. After a few seconds the READY LED would turn on and I could proceed.

Other Interesting Features

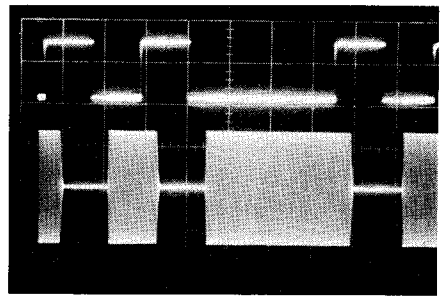
Yaesu uses a "Duct-Flow Cooling" system to force air through the transceiver. The resulting thermodynamic efficiency of this design results in a smaller-sized transceiver. Air flows in the bottom and middle rear of the rig, drawn by the fan mounted directly behind the front panel. The air flowing to the fan cools the Local Oscillator and RF boards, and the air flowing from the fan, at a higher pressure, flows past the PA unit and heat sink. The fan isn't always on, cycling in response to the radio's internal temperature.

Ten-meter FM repeaters can be accessed using the two VFOs in a SPLIT configuration in the FM mode.

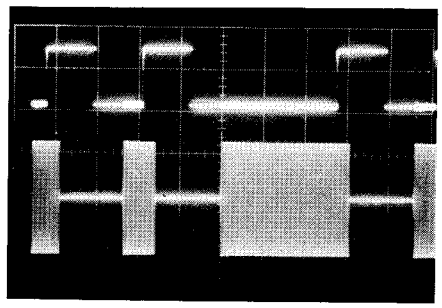
The general-coverage receiver works well, and is an enjoyable plus to my everyday hamming. I was easily able to pick up parts of conversations made over local cordless phones on the frequencies below 2 MHz.

The AF gain control is mounted to the lower left of the main tuning dial, an excellent location for mobile use — close to the driver's right hand. The front-panel controls are sufficiently far away from each other that I never inadvertently hit a wrong control. I'd prefer the CLARifier to be on the right side of the VFO knob, but only because I'm right-handed and found that feature to be an oft-used one.

The final-output transistors are protected against antenna mismatch — when the SWR is 3:1, only 75% of the rated output power is available. The LOCK button is a helpful addition, especially during CW operation. A lithium battery with an estimated life of five years backs up the memory channel information and ensures that the operating frequency isn't lost when you turn the rig off and on. Small LCD letters to the left or right of the operating frequency indicate when the PMS, LOCK, SPLIT or memory channels are used.



(A)



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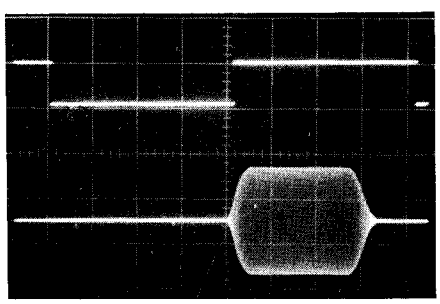


(C)

Fig. 4 — CW keying waveforms of the FT-757GX. In all cases, the upper trace is the key closure; lower trace is the RF envelope. Horizontal divisions in A and B are each 50 ms; in C, 5 ms. An external keyer was used to key the transceiver. For A, semi-break-in was being used; full break-in was used for B. Note the decreased weighting effect of full break-in operation. Except for break-in method selection, all other control settings at A and B are equal. The 20 ms delay between key down and generation of the RF output waveform, and the continuation of the RF waveform after key up can be seen in A and B, but is more readily noticed in photo C.

Comments

Though the QSK is a step in the right direction, as is the built-in keyer, both have limitations that decrease their effectiveness. The break-in stops working at higher keying speeds; the receiver AGC just doesn't recover fast enough to receive signals between the dots. The weighting on the built-in keyer is unfortunately not adjustable, and the fixed dot/dash ratio is a hindrance at higher speeds. The keyer also has a very nonlinear speed adjustment. When the slide potentiometer is advanced, the CW speed jumps suddenly from about 16 WPM to 28 WPM — careful adjustment is needed to get the speeds in between.

I was surprised to find the CW NARROW position uses a 600-Hz filter. Although the CW passband can be reduced through manipulations of the WIDTH and SHIFT controls, 600 Hz is not enough selectivity for today's crowded HF bands. In addition, there's enough leakage around the filter ("blowby") to be annoying. The WIDTH and SHIFT controls help to some extent, but their use reduces audio fidelity. The AM filter, too, is uncomfortably broad. I had to use upper or lower sideband to tune in any desired signals while scanning through the broadcast bands.

The cooling fan has a habit of turning on and off with keying, whenever a high SWR is present. While I admire the ducted-cooling system, one of the results is that the guts of the rig are open to the outside through fairly large spaces — large enough for a paper-clip to fall inside and short out something.

Two steps are needed to stop the PMS (memory scan). Not only does the SQUELCH control level have to be decreased, but also the M > VFO button has to be pushed. If the M > VFO is not pressed, the transceiver stays locked on the last scanned frequency. Also, there is no function to scan through the eight memory channels. When entering information into the memory channels, you have to remember what the last memory channel was or enter one of the memory modes to get the channel indicator to the right of the frequency display. Though it saves front-panel space to incorporate the memory channel selector as a secondary function of the BAND UP/DWN paddles, the loss of a constant indication of the latent memory channel is significant.

Another result of the limited front-panel space is the positioning of several crucial controls on the rear panel. These include the VOX GAIN, TRIP and DELAY. Other oft-used, but hard-to-reach, controls include the speech processor COMP LEVEL, the FWD-REV FWD-SET switches for the built-in SWR meter and the 25-kHz MARKER switch.

While the unit was being tested in the ARRL Lab, an interesting anomaly was noticed: When the RF AMP is put in line in the receiver, the transmitter output power drops almost 3 dB when the rig is tuned to 40 or 30 meters; this is somewhat less noticeable on other bands. This power output decrease can be compensated for by increasing the drive level.

The switching power supply is not without its glitches. When the transceiver is in receive, severe radio-frequency interference (RFI) occurs. Cordless telephones in the same house are wiped out, as is Channel 3 on a black-and-white television set, which experienced a high degree of diagonal cross-hatching, rendering the screen unreadable. The TV was plugged into the same outlet as the rig. If you have a computer in your ham shack, for example, and it uses a television monitor, you may be out of luck. Channel 8 on the same TV showed minor cross-hatching.

The Manual

While satisfactorily describing the rig's features, the manual lets the reader down where explanations are most needed. The directions for use of the frequency and memory controls, especially important considering their complexity, are confusing. An uninformative

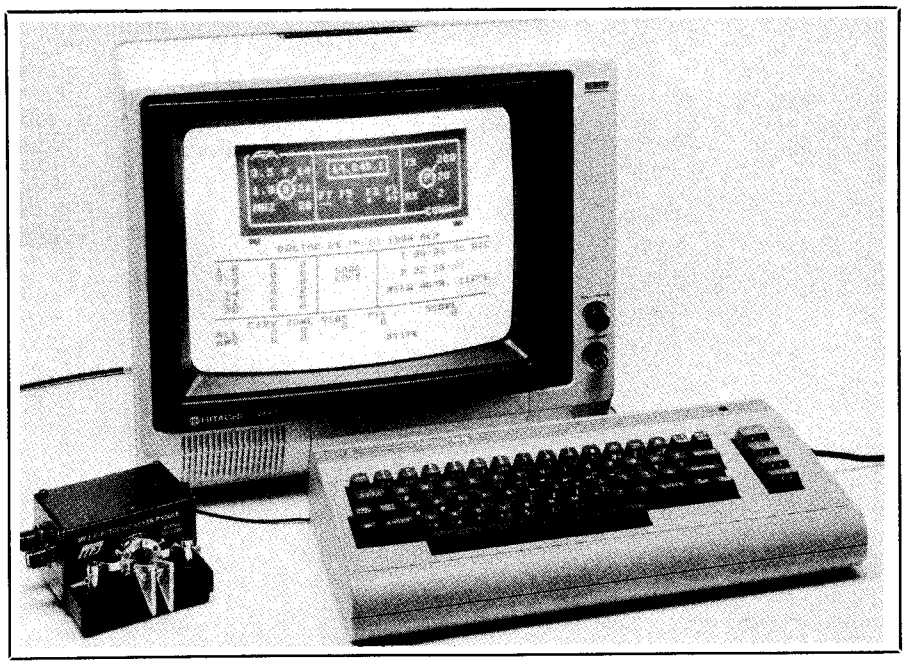
diagram illustrates the relationship between the VFOs and memory channels. Use of the memory options is explained through a series of five examples, each of which proposes a typical operating situation and then shows how the memory features aid and enhance that situation. The section on installing the FT-757 in a mobile setting is inadequate; no explanation is given on actually mounting the rig, although good detail is given in the section on power requirements.

Operation

Operating the FT-757, once the frequency controls are mastered, is a pleasant experience. I took the rig, power supply and antenna tuner with me to the 1984 Field Day operation at N3KZ. Even with four transmitters on constantly within 500 feet of each other, no disturbing intermodulation occurred as long as the attenuator was placed in line. The automatic antenna tuner was the final touch to a no-tune-up rig, and the gentle whirring and clicking of the internal components was comforting during the early A.M. The lightweight power supply proved adequate for all my uses, both at home and during FD.

The speech processor does its job well, and the scanning microphone is a boon to mobile and armchair operation. Having an RIT with unlimited tuning range and "automatic cancel" is an excellent aid, too.

The Yaesu FT-757 is a pleasant rig, and works well in all but the most demanding amateur applications. Enhanced with many useful features, this tiny transceiver is excellent for the ham who can't often use a permanent station. The Yaesu FT-757 is available from Yaesu Electronics Corporation, 6851 Walthall Way, Paramount, CA 90723, tel. 213-633-4007. Price classes: FT-757, $860; FP-757GX, $170; FP-757HD, $200; FC-757AT, $260. — *Leo D. Kluger, WB2TRN*



AEA DOCTOR DX™ MORSE CODE CONTEST TRAINER FOR THE COMMODORE 64™ COMPUTER

When the rotators have been greased and the radio equipment readied for action, what more can a contester do to prepare for the fall/winter contest season? What does it take to get prepared for the QRM on 40 meters, the cutthroat multiplier chases on 20 and the high-speed CW ops on the low ends of the bands? As you might imagine, there are several avid contesters who work at ARRL Hq., among them, Mark Wilson (AA2Z), Bob Halprin (K1XA), Mike Kaczynski (W1OD) and myself. Until recently, we thought the only way to train operators for contests was to have them work real contests, on the air. Then we saw Doctor DX — a program for the Commodore 64 that simulates the CQ Worldwide CW contest. Boy, does it simulate! An hour after Doctor DX was delivered to the lab for testing, K1XA was "running" JAs at 190 QSOs per hour from a "QTH" somewhere in the Caribbean. This review draws from comments and observations made by many CW operators who tried Doctor DX while it was here.[1]

Doctor DX comes with a read-only memory (ROM) program cartridge for the C64, a cable to connect between your keyer and the cartridge and 30 pages of documentation. To use Doctor DX, you must plug the cartridge into the C64 and plug your keyer into the phono jack on the back of the cartridge. When you turn on the C64, Doctor DX starts automatically. If you use a TV set as a monitor with your C64, Doctor DX will send audio to the TV speaker. If you use a video monitor that does not have a speaker, you will have to make a cable to carry audio from the C64 to a speaker. The documentation that comes with Doctor DX gives complete directions for audio hookup. Even if you have to make an audio cable, you should have Doctor DX running in well under an hour.

When the program starts, you see a transceiver front panel on the screen, and you will hear noise coming from your speaker. Before you can begin "contesting," you have to tell Doctor DX your latitude and longitude, the length of time you wish to operate and the time (UTC) you wish to begin operation. In the Doctor DX documentation, there is a list of latitudes and longitudes for DXCC countries and a page of listings for U.S. cities. Using this list, you should be able to correctly set your QTH anywhere from Botswana to Winston-Salem, North Carolina. One of the advantages of Doctor DX is that contests no longer have to be a taxing 24 or 30 hours long. You can select any duration for your simulated contest, from one hour to 24 hours. Once you have selected a QTH and a duration, you must set a starting time, in UTC. Then press the return key, and you are "on the air."

What will you find when you start tuning up and down the bands (with the C64 function keys)? You will hear realistic band noise — more on the lower bands than on the higher ones. There will be stations calling CQ, and stations working each other. If you listen to any station for a long time, that station will work others, just as it would in a real contest. Occasionally, you will hear a DX station working a station you can't hear, a station within your skip zone. Doctor DX simulates the propagation that you might find at your selected location and time, on a day at the peak of the sunspot cycle. (After all, who would want to simulate the propagation that we have to endure this year?)

There's a lot of DX to be heard. The documentation states that "prefixes are weighted according to population density, with the guarantee that for each of the 304 countries, there is at least one station represented." Even with this guarantee, we were unable to work all of the DXCC countries, but some more persistent person might. If you work a long contest, or try several different times of day from the same QTH, propagation will change as you would expect it to.

Contest Training

Working stations with Doctor DX follows the format used during the CQWW CW contest: you must exchange calls, signal reports and CQ zones. A list of CQ zones is provided, along with the latitude and longitude list in the documentation. You must send the zone number that matches your latitude and longitude, or else you will not be credited for your contacts. Your score will be computed after each station is worked, and it will be posted, along with other statistics, on the display. After 15 minutes of operation, your QSO rate, in contacts per hour, will also be shown.

Doctor DX is a well-constructed simulation. Most CW operators would be unable to distinguish between a tape recording of Doctor DX and the real thing. We have been told that Doctor DX, disguised as a transceiver, fooled a lot of good operators at the Dayton Hamvention. Doctor DX has the flavor of real contesting: Fast stations are at the low end of the band, slow stations at the high end; each station is on a slightly different frequency, and signals vary in tone and strength depending on propagation; if you stay on one frequency for a while, another station will try to steal "your" frequency; if you are persistent, he may go away.

The only ways you might begin to tell Doctor DX from the real thing are if (1) you don't recognize any of the calls, (2) you hear countries you know are not on the air and (3) you feel that conditions are a little too good. But this is a smart program — each contact is different from the one before. Within the limits of what is realistic for contests, you will hear many

[1]For other observations on Doctor DX, see October 1984 How's DX?

operating styles as you tune around the bands. In order to be an effective training tool, a simulation must be realistic, and Doctor DX is.

Doctor DX is a great aid for breaking-in the neophyte contest operator, and warming-up the experienced operator who may be out of shape. If you call CQ, stations will come back with regularity. If propagation is in your favor, and you have not worked all the stations on the band, you will get into a full-fledged "run." It is quite possible to work 150 (or more) stations per hour. This gives valuable training in how to work under pressure, how to log quickly, how to get fills and how to do two or three things at once. The stations on Doctor DX use common CW abbreviations, and getting used to these abbreviations before the contest can be helpful to new operators. What do you do when someone tries to steal "your" frequency? A few hours with Doctor DX, and you will have some idea when to fight, and when to switch. Doctor DX will increase the level of competition found in CW contests.

Unfortunately, you can "cheat" with Doctor DX, and such cheating will detract from the training value of the simulation. You need only to answer a station with two correct letters from the suffix of his call. This may be realistic, but, unless you force yourself to use complete calls, you can increase your QSO rate artificially. And, if you are working lots of stations on one frequency, you seldom have to send your call. This is a time-saving measure that might not work so well in a real contest. Another thing about Doctor DX that is not realistic is that the other operators are all very good. If you send correctly, they copy, and they always send correctly. We don't expect the program to simulate "lids," but newcomers should be aware that there are those who miss reports no matter how well you send them! Despite these minor flaws, if you force yourself to play clean and keep a log sheet, Doctor DX will certainly prepare you for contesting, and will probably increase your scores.

As a CW Trainer

Does Doctor DX have anything to offer those who are not interested in contesting? If you want to increase your CW proficiency, the answer is "yes." While not designed specifically for that purpose, Doctor DX is a great CW trainer, with an endless supply of new calls and contacts. If you need some slow CW, you can tune to the high end of any band to find stations sending below 13 WPM. As your copying ability increases, you can tune down the band, and work faster and faster stations. Unfortunately, the only way to check your copy is to see if the other station comes back to you, and this means only that you got at least two letters in his suffix correct. But as you learn the code, you know when you have copied something wrong, and you know at which speed you feel comfortable, so this is not a great problem.

Doctor DX is good for teaching CW sending. Characters must be well formed, or stations will keep asking for repeats. You will learn quickly that a "5" must have 5 dots and not 4 or 6.

Doctor DX is a CW teacher that never gets tired and doesn't repeat itself. It is a tool for increasing the speed at which you copy CW, while simultaneously getting training in operating practices and precise sending.

The Hardware

Doctor DX is not simply a ROM cartridge. The plug-in unit also contains the circuit needed for Doctor DX to read your keyer. After about a week of heavy use, our copy of Doctor DX went permanently key-down. It is very likely that a loose wire in a keyer put 12-V dc on the input to Doctor DX. When we opened up the cartridge to replace the blown IC, we were suprised to find that the numbers had been filed off the ICs, and the ICs had been painted for identification. Since we could not identify the blown chip, we could not fix the unit. It is unfortunate that pirates have forced AEA to take such protective measures. People who make unauthorized copies of products have now made it impossible for the rest of us to maintain our own equipment. Fortunately, AEA was happy to exchange our damaged Doctor DX for a new one. The replacement is still operating in the ARRL laboratory.

Conclusion

Doctor DX is not flawless, but it is a well-executed, revolutionary training aid. The highest praise should go to the programmer or programming team that brought us this software. There are other features, like the switchable power levels, multicolored display and variable sidetone pitch, that ensure that it will be a long time before anyone gets tired of Doctor DX. It would be nice if the authors had included a mode in which you would be forced to answer each station with its complete, correct call. But as it stands, Doctor DX is one of the first Amateur Radio products to really take advantage of a home computer. If you have worked all of the bugs out of your contest station, you will want to "work out with Doctor DX" to improve the most important piece of equipment in your shack — the operator.

Doctor DX is available from Advanced Electronic Applications, Inc., P.O. Box C-2160, Lynnwood, WA 98036, tel. 206-775-7373. Price class: $150. — *Jeff Ward, K8KA*

New Products

DX ENTERPRISES DX-1/DX-2 SOFTWARE

☐ These programs are designed to aid you in optimizing your DX operating conditions. To use them, you need an Apple II, II+ or //e computer with 64 kbytes of RAM and one disk drive. If you have a printer, you'll be able to obtain hard copy of the results. These programs enable you to forecast with reasonable accuracy: base sunrise/sunset times; target minimum, average and maximum sunrise/sunset times; long-/short-path great-circle bearings; long-/short-path beam heading; sunspot number; quality factor of the path; MUF; FOT; and the grayline sunrise/sunset (DX-1 only) times. Printed output of the grayline (DX-1 only) and a printout of the screen are also available.

The grayline is the twilight zone covering some part of the earth at any given time. The condition favors communications paths where stations at both ends of the zone are within a few minutes of local sunrise and sunset. Enhanced DX operating conditions often occur at sunrise and sunset.

The programs contain a data base of 433 unique radio locations. Their presence is meant to eliminate the need to know the latitude and longitude of a specific target country to extract the information you're seeking. If you enter a country name, the program responds by selecting the closest match between your input and its list of 433 countries. Unfortunately, there's no listing of the 433 countries in the manual, so you'll have to discover what they are through use of the program.

An instruction manual accompanies the software. It measures 5¼ × 5½ inches (133 × 140 mm) and is 19 pages long. The manual contains several example program runs to help you get the feel of using the program. (A useful instruction it does lack is mention of how to get out of the program!) There are brief descriptions of the DX parameters calculated by the program, and how to use WWV to obtain certain information (such as the solar flux number) required as operator-entered data.

The DX-1 disk I used is copy protected and can't even be CATALOGed. In fact, the protection scheme extends so far as to not allow any means of exiting the program by keyboard command; you have to remove the disk from the drive and boot your next disk.

While the software will automatically recognize that you're using an Apple //e and place the computer in 80-column mode, the screen format is obviously configured for the 40-column screen — when in 80-column mode, the information appears at the left-hand side of the display; it isn't centered.

Program loading time is protracted; the manual warns you of this. There are two program-loading phases. The first consumes approximately one minute, the second phase takes about two minutes. If you have two disk drives, the second is accessed momentarily during the program-loading phases; the manual contains no explanation of why this occurs. Data entry required is minimal, and the input routines have built-in error-detection routines to exclude out-of-range data. The program offers no way to save information to disk. If you're going to calculate grayline data, there's a five-minute wait.

Also, should you decide to dump the information to the printer, you'll have a 12-25 second pause before "all systems are go." "DXing by Computer," *Ham Radio,* Aug. 1984, was written by the program authors. Refer to this article for more information.

The DX-1 and DX-2 are available from DX Enterprises, 5861 Bridle Way, San Jose, CA 95123. Price classes: DX-1, $40; DX-2, $20. Add $2.50 for shipping and handling charges. California residents must add 6.5% sales tax. — *Paul K. Pagel, N1FB*