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Product Review

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Assistant Technical Editor

Garant Enterprises GD-8 "Windom" Antenna

Reviewed by Jerry Hall, K1TD

The Garant GD-8 antenna is claimed by its manufacturer to cover all HF Amateur Radio bands with an SWR of 1.5:1 or less—*without an antenna tuner.* Garant offers several models: the GD-3, and the GD-5 through -9. The number in the model designation indicates how many bands the antenna is intended to cover. For example, the GD-9 covers the nine ham bands from 160 through 10 meters.

We purchased the GD-8 for testing. After it arrived, we learned that the GD-8 consists of the GD-6 antenna and a "GD + 2" addition. The GD-6 is intended to cover the 80, 40, 20, 17, 12 and 10-meter bands. Installing the GD + 2 section to the GD-6 adds coverage of the 30- and 15-meter bands.

The price for the GD-8 antenna was $161 in Canadian funds (approximately $136 US) when we bought it. The mailman brought the box with $17.19 postage due.

After paying the postman, we carefully opened the box to inspect this multiband antenna. The contents were not truly impressive for the $153 US (plus change) we had invested. The box contained two coils of no. 14 stranded copper wire, four plastic insulators, a balun transformer in a sealed plastic bag, the instructions in another sealed plastic bag, and some promotional literature.

Although the antenna is offered with a 10-day "no-risk" inspection, the accompanying literature clearly states, "Once you break a seal you have bought the item." In other words, you have 10 days over which to look at four insulators, two coils of wire, two sealed plastic bags and some promotional literature! Based on this inspection, you have to decide if you want to keep the antenna or return it for a refund. Of course, our plan was to keep the antenna for testing anyway.

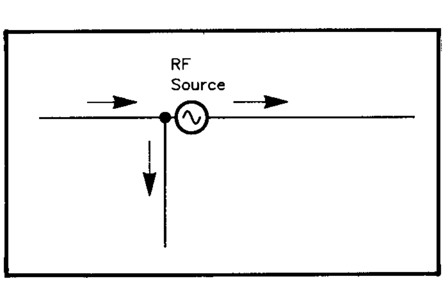


Fig 1—A coax-fed Garant Windom antenna (or even a center-fed dipole) becomes a 3-wire radiating system when current flows on the outside of the coaxial feeder. The coax shield is the third wire, represented as the vertical line in this drawing. Arrows show the direction of current flowing at a particular instant. (To avoid drawing complications, the RF source is shown directly at the antenna terminals, but the resulting antenna currents are no different from when the antenna is fed by a length of transmission line.)

Inside one of the sealed bags, the GD-8 technical data and instructions come on a single 8½ × 14-inch sheet. (If the bottom 3¾ inches of this sheet were lopped off, you'd have instructions for only the GD-6 antenna.) The GD + 2 addition to the basic GD-6 antenna consists of the second, shorter coil of wire, two plastic insulators, and the leg-length information and manufacturer's SWR curves for the additional bands.

Technical Information

The Garant Windom is not a true Windom antenna. Electrically the two antennas are quite different. An honest-to-goodness Windom is an antenna made of a horizontal top section that's half a wavelength long at its lowest frequency, and is fed against ground with a single-wire feed line, at a point 14% from one end.[1] The true Windom behaves pretty much like an inverted-L antenna (assuming the feed wire is more-or-less vertical). At its fundamental resonant frequency, the radiation pattern of a true Windom is virtually identical to that of a center-fed dipole. The Garant Windom, on the other hand, is fed with coaxial line, through a step-up balun transformer 33% from one end. Thus, the Garant Windom is in fact an off-center-fed (OCF) dipole, rather than a Windom. This antenna is horizontally polarized.

Despite the misnomer, the so-called Windom, or OCF dipole, is based on sound theory. The idea behind feeding a half-wave antenna at a point ⅓ of its length from one end is that it will operate with a relatively low feed-point impedance on low-order *even* harmonics of its fundamental frequency, whereas a center-fed half wave operates this way on *odd* harmonics. Many amateurs believe there will always be reactance at the off-center feed point, but this is not the case. As with a center-fed dipole, the reactive component of the impedance goes from capacitive through zero to inductive as the excitation frequency is raised from below to above resonance. In free space, when fed 45⅓ feet from one end, a 136-foot-long OCF dipole exhibits resonance at approximately 3.5, 7.1, 14.3 and 21.1 MHz. The radiation resistance is on the order of 100 to 150 Ω on the three lower frequencies, but is more like 3000 Ω at 21 MHz. This is because, at 21 MHz, the antenna is three wavelengths long and is fed at a voltage loop (maximum), instead of at a current loop. A reasonably good match to 50-Ω line for the lower three bands can be obtained with a step-up transformer.

Garant does not supply technical data for their balun transformer, although their ads indicate it is not a 1:4 transformer. Tests in the ARRL laboratory with a spectrum analyzer and a network analyzer were inconclusive because the balun's transformation ratio is not constant across the HF spectrum. In the 12- to 20-MHz range, the supplied transformer presents about a 1:6 transformation ratio. The transformer introduces some inductive reactance into the transformed load, but this is normal for a ferrite-core transformer.

The Garant balun transformer is a voltage balun, rather than a current balun.[2] This means that *voltages* of equal magnitude (but opposite polarity) will be applied to the two wires of the antenna from the balun's terminals. But because the RF impedance paths of the two wires at the feed point are likely unequal, the resulting antenna currents flowing in the two wires will likely be unequal. This also means that antenna current can flow on the *outside* of the coaxial feeder. How much current flows there depends on the impedance of the RF current path down the outside of the feed line. With such current flowing, the feeder radiates, and therefore becomes part of the antenna system. It's as if the antenna consists of three wires, rather than two. The resulting radiating system is shown in Fig 1.

The existence of RF current on the outside of the coax was indicated at my station by changing SWR readings as I moved my hand close to or away from my reflectometer SWR indicator (this was not the instrument used to measure the SWR values presented in the curves of Figs 2-5).

Other Garant Windom owners have reported trouble using their antennas on certain bands when they bury a portion of the coax running to the shack. This is a sure sign of antenna current flowing on the feed line. Other sure signs of this are SWR values that change as you move the feed line or as you alter the line length. (SWR readings that vary with line length can also be caused by an improperly designed or defective SWR-measuring instrument.) In the antenna of Fig 1, the antenna's feed-point impedance is unpredictable because of the unknown effects of the unwanted vertical radiator.

The presence of RF current on the outside of the GD-6 feeder was proved with a simple test. First, I took SWR readings with the balun transformer that Garant supplied. Then I placed a W2DU-type current (bead)

[1] L. G. Windom, "Notes on Ethereal Adornments," *QST*, Sep 1929, pp 19-22, 84.

[2] R. W. Lewallen, "Baluns: What They Do and How They Do It," *The ARRL Antenna Compendium, Volume 1* (Newington: ARRL, 1985), pp 157-164.

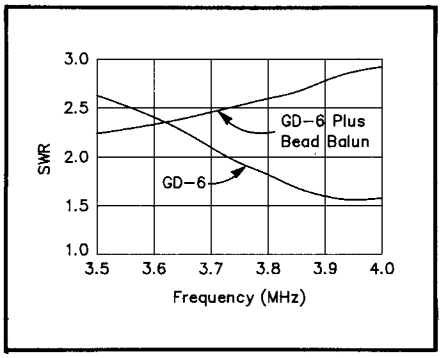


Fig 2—SWR versus frequency for the GD-6 antenna installed as an inverted V. The GD-6 curve was obtained with the Garant-supplied balun transformer only. The second curve was obtained with a bead balun directly beneath the Garant balun (see text and Note 2). These totally different curves indicate that the Garant balun allows current to flow on the outside of the coaxial feed line. The coax therefore becomes a part of the radiating system, as illustrated in Fig 1.

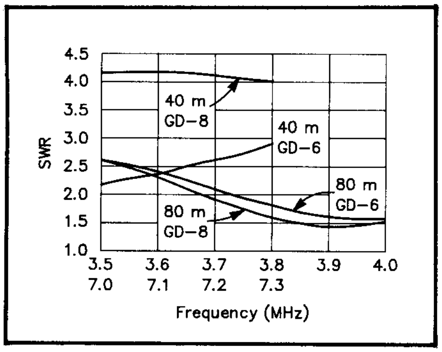


Fig 3—GD-6 and GD-8 SWR curves for the 80- and 40-meter bands with the antennas installed in inverted-V arrangements. The SWR values for Figs 2 through 5 were computed from forward and reflected power readings taken with a Bird 43 RF wattmeter at the transmitter end of a 98-foot RG-8X feed line. The plotted values are not corrected for line loss, so all SWR curves in this review show somewhat lower values than the actual feed-point SWRs.

balun[3] just below the Garant balun and repeated the SWR measurements. The bead balun forces equal currents to flow in the two antenna wires, preventing RF-source current from flowing on the outside of the coax feeder. With respect to the antenna in Fig 1, adding a current balun to the Garant antenna has the same effect as disconnecting the vertical wire at the junction point just to the left of the RF source.

On most bands, the SWR curves for the two feed arrangements differed significantly. Comparative curves for the 80-meter band are shown in Fig 2. The drastically different SWR responses across the band give indisputable evidence that the terminating load seen by the coaxial line (that is, the antenna's feed-point impedance) indeed changed considerably with the addition of the bead balun. And yet the only thing that had been done was to "disconnect the third wire" with a current balun. If no RF-source current had originally flowed on the outside of the coax with the Garant balun alone, the two SWR curves would be the same.[4]

Installation and Operation

The two wire coils that Garant supplied were marked as 150 feet and 50 feet, respectively. By measurement, the lengths turned out to be 144 feet 2 inches and 54 feet, respectively, so the markings appear to be only approximate indications used by Garant in making up their antenna shipments. The lengths were adequate to construct the antenna according to the dimensions on the instruction sheet, with a few feet to spare on each coil.

The Garant antenna includes no feed line; you supply your own. You also construct the antenna yourself, by measuring, cutting and soldering the wire according to dimensions given on the instruction sheet. Garant provides plastic insulators for the outside ends of the antenna wires. At the feed point, the antenna wires are attached to the plastic case of the balun transformer. Crimp-type spade lugs are provided for the electrical wire connections to the transformer, but I soldered the lugs instead of crimping them to avoid the possibility of corrosion developing at the joints.

The instruction sheet indicates the antenna can be installed as a flattop or in an inverted-**V** arrangement, but also states that the SWR values for the inverted-**V** arrangement may not be the same as those appearing on the instruction sheet. I live on a small lot, and had to use the inverted-**V** arrangement at K1TD. The center of the antenna was suspended at 55 feet, the end of the short leg at approximately 16 feet, and the end of the long leg at approximately 8 feet. The coax feeder hung loosely from the off-center feed point to a point on the supporting tower, 20 feet below the antenna apex. From there, the feeder went down the tower and into the shack. I first installed just the GD-6 antenna, which is approximately 136 feet long. Later I added the GD + 2 portion, which is a shorter OCF dipole approximately 46 feet long, connected in parallel at the feed point with the GD-6 antenna.

The results of SWR measurements for the GD-6 and GD-8 antennas using Garant's voltage balun are plotted in Figs 3 through 5. A Bird 43 RF wattmeter was used to determine these SWR values. (This instrument did not respond to changes in hand capacitance, as did the reflectometer mentioned earlier.) The GD-6 yielded higher-than-expected SWR values on four of the six bands (based on the literature provided with the antenna), but the SWR was less than 3:1 over each band. Literature sealed with the instructions encourages the user to experiment with the wire positions to bring the SWR down, but my property limitations prevented that.

With the GD + 2 addition, the SWR values increased by a fair amount on 40

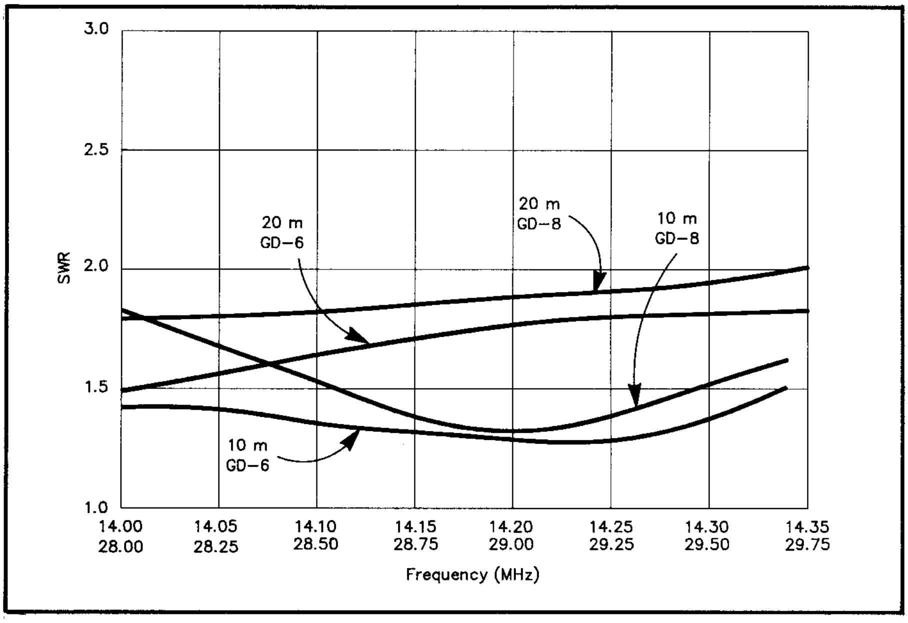


Fig 4—GD-6 and GD-8 SWR responses for the 20- and 10-meter bands with the antennas installed in inverted-**V** arrangements.

[3] W. Maxwell, "Some Aspects of the Balun Problem," *QST*, Mar 1983, pp 38-40. The bead balun I used consists of 50 Amidon no. FB73-2401 ferrite beads slipped over a 1-foot length of RG-58 coax with PL-259 connectors at each end. The beads fit nicely over the outer jacket of the coax, and occupy 9½ inches of the coax.

[4] Note, however, that even with a current balun in use, there may *still* be radiation from the feed line. This is because the line is asymmetrically coupled to the two antenna wires; the current induced on the feeder from the short antenna leg probably will not equal the opposing current induced from the long leg. The two currents therefore will not cancel completely, and feed-line radiation—although not nearly as much as with the initial configuration—will result.

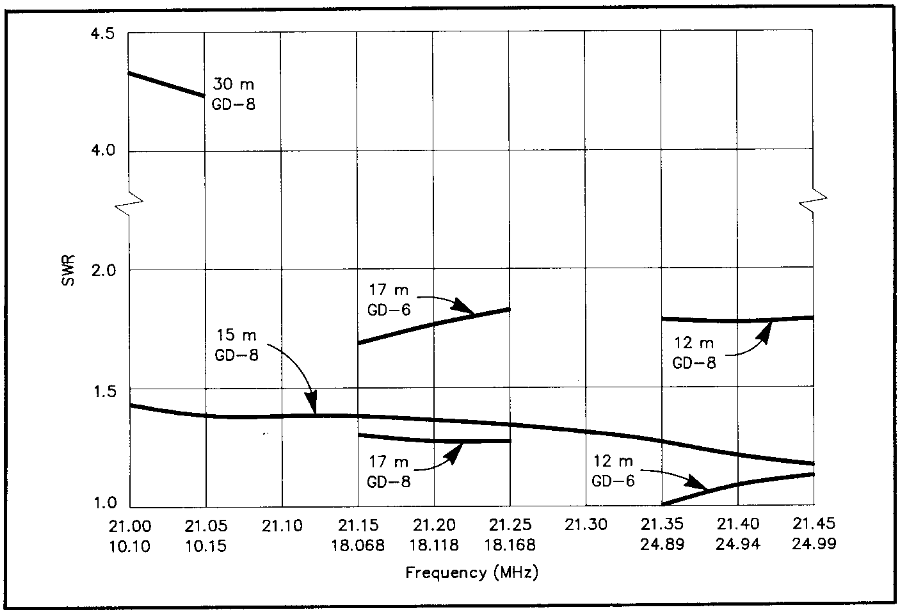


Fig 5—GD-6 and GD-8 SWR curves for the 30, 17, 15 and 12-meter bands with the antennas installed in inverted-**V** arrangements.

meters—to more than 4:1 across the band. SWR values across the added 30-meter band were also above 4:1. Even so, I could tune and load my tube-type transmitter (with a π-network output tank circuit) for full output power and make contacts as usual on 40 meters. (I didn't make any contacts with that rig on 30 meters, as it doesn't cover that band.) Without an antenna tuner in the line, most modern solid-state transceivers, with their SWR-protection circuits, provide little or no output power under the SWR conditions I encountered on these two bands.

In QSOs, the signal reports I received on all bands were generally consistent with those I was giving (for comparable power levels.) I was not able to crack pileups on 20 meters with 100 watts on CW—nor did I expect to.

How much does the SWR of the Garant antenna suffer with the inverted-**V** configuration? Not as much as it does with changes in the placement and length of the coaxial feed line. For comparison of the SWR responses between this arrangement and a flattop OCF dipole, my colleagues (and coworkers) Ed Hare, KA1CV, and Mike Gruber, WA1SVF, helped me make further tests. We installed the GD-6 and the GD-8 as a flattop at the ARRL HQ laboratory station, W1INF. The antenna was located in a clear area with each end at a height of 36 feet, and fed with about 30 feet of RG-58 coax. The installation was done "by the book," exactly as the Garant instructions recommended, with a 100° angle between the legs of the shorter GD + 2 antenna section.

In the flattop configuration the SWR values were not significantly different than those I found in the inverted-**V** arrangement, except that those on 40 meters were generally better. However, because we found that the radio used for those tests was hot with RF (ouch!), we grounded the transceiver chassis via a short wire to a 4-foot ground rod near the radio, and installed a bead balun just below the Garant balun. Upon doing these things, the SWRs on 80 and 40 meters rose to no less than 2.6:1 on 80 meters and no less than 2.2:1 on 40 meters. The SWRs on all other bands except 15 meters were also slightly worse with the transceiver chassis grounded.

If you want to experiment with wire positions to bring the SWR down, you may also need to change the length and positioning of the feeder. An alternative is to install a current balun at the feed point in addition to the Garant-supplied balun transformer.

Technical Support

Garant Windom antennas are warranted for three years of "normal use" against defects in materials and workmanship. Basically this warranty covers the balun transformer, as wire and plastic insulators seldom go bad in normal use. Garant does *not* offer free technical support to help you solve problems with their antennas. Information accompanying the instructions indicates that you'll get no help at all by telephone. Instead, you are to submit your request for help in writing, and enclose a cashier's check, certified check or money order for $38 US (or $45 Canadian) for this service. You can send a personal check, but that will delay your reply by four weeks while Garant waits for your check to clear the bank. Fortunately, we had no need for technical support during the review period!

Garant antennas are available from Garant Enterprises, 227 County Blvd, Thunder Bay, ON P7A 7M8, tel 807-767-3888. Price class: GD-8, $161 Canadian.

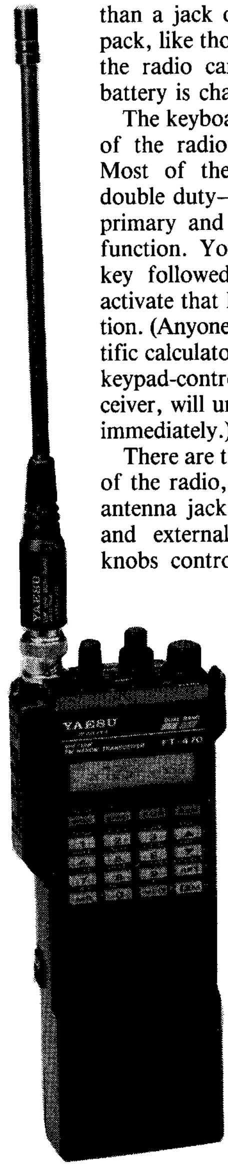
YAESU FT-470 DUAL-BAND HAND-HELD VHF/UHF TRANSCEIVER

Reviewed by Bruce S. Hale, KB1MW/7

When I agreed to review the Yaesu FT-470, I expected a complex, difficult-to-use box with too many features to learn and use. I was wrong. The FT-470 is no more complex than most single-band hand-held transceivers I've used, and it's actually *easier* to use than many of them.

First Impressions

Like other Yaesu hand-held transceivers, the FT-470 is solid. The case is metal and the radio feels comfortably heavy in your hands. The antenna jack is a BNC connector, so adding a feed line for an external antenna is easy. The battery charger connects to a jack on the back of the battery (much better than a jack on the bottom of the pack, like those on some rigs), and the radio can be used while the battery is charging.



The keyboard handles almost all of the radio's control functions. Most of the keypad keys serve double duty—each key has both a primary and a secondary control function. You must press the **FM** key followed by another key to activate that key's secondary function. (Anyone who has used a scientific calculator, or another modern keypad-controlled hand-held transceiver, will understand this feature immediately.)

There are three knobs on the top of the radio, along with the BNC antenna jack and the microphone and external-speaker jacks. The knobs control the **VOL** (AF-gain) and **SQL** (squelch) functions, and the **VOL** control also has an outer dial, **BAL**, that sets the balance (the relative levels of audio ouput on each band when the FT-470 is simultaneously receiving on 144 and 440 MHz). The third knob on top of the radio is the **DIAL** control. Depending on the radio's operating mode, this control serves either as a tuning knob or memory-channel selector.

People who like keyboard beepers will love the FT-470. With the beep enabled, each key on the keypad produces a different tone, rising in pitch as you go across the rows from left to right and from top to bottom. Two beeps

Table 1

Yaesu FT-470 Dual-Band VHF/UHF FM Hand-Held Transceiver, Serial no. 90090350

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receiver, 144-148 MHz; 430-450 MHz; transmitter, 144-148 MHz, 430-450 MHz.	Receiver, 130-180 MHz and 430-450 MHz. Transmitter, as specified.
Mode of operation: FM.	As specified.
Current requirement: Receive, 150 mA; transmit (5 W), 1.3 A (VHF), 1.6 A (UHF).	Minimum audio output, 70 mA; maximum audio output, 140 mA; transmit with 7.2-V supply, 0.83 A (VHF), 1.0 A (UHF); transmit with 12-V supply, 1.35 A (VHF), 1.39 A (UHF).
Transmitter	*Transmitter Dynamic Testing*
Power output, VHF and UHF, 2.3 W with 7.2-V battery (supplied), 5 W with 12-V battery or external 12-V supply.	High: 7.2-V supply, 2.3 W (VHF), 1.8 W (UHF); 12-V supply, 5.6 W (VHF), 5.5 W (UHF). Low: 7.2-V and 12-V supplies, 0.7 W (VHF); 0.5 W (UHF).
Spurious signal and harmonic suppression: Better than 60 dB.	As specified; see Figs 6 and 7.
Transmit-receive turnaround (PTT release to 90% of full audio output): Not specified.	Squelch on, approx 250 ms; squelch off, approx 150 ms.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: Better than 0.158 µV for 12 dB SINAD.	146 MHz: 0.14 µV (−124 dBm) for 12 dB SINAD; 0.29 µV (−118 dBm) for 20 dB quieting. 430 MHz: 0.14 µV (−124 dBm) for 12 dB SINAD; 0.42 µV (−114.5 dBm) for 20 dB quieting.
Two-tone third-order IMD dynamic range: Better than 65 dB (offset not specified).	Offsets from 146 MHz: +15 kHz, 48 dB; −15 kHz, 48 dB; +20 kHz, 54 dB; −20 kHz, 53 dB; Offsets from 440 MHz: +15 kHz, 51 dB; −15 kHz, 61 dB; +20 kHz, 58 dB; −20 kHz, 66 dB.
Adjacent-channel selectivity: Better than 60 dB.	Offsets from 146 MHz: +15 kHz, 63 dB; −15 kHz, 53 dB; +20 kHz, 65 dB; −20 kHz, 65 dB. Offsets from 440 MHz: +15 kHz, 60 dB; −15 kHz, 56.5 dB; +20 kHz, 63 dB; −20 kHz, 62 dB.
Squelch sensitivity: Not specified.	146 MHz: Minimum, 0.04 µV; maximum, 0.20 µV. 440 MHz: Minimum, 0.03 µV; maximum, 0.19 µV.
Receiver audio output: 500 mW at 5% distortion (8-Ω load).	7.2-V supply: 195 mW at 5% total harmonic distortion (THD) with an 8-Ω load. 12-V supply: 660 mW at 5% THD with an 8-Ω load.
Other	
Size (H × W × D): 6.45 × 2.16 × 1.26 in. with FNB-10 battery pack; weight (with FNB-10), 0.93 lb. Color: Dark gray.	

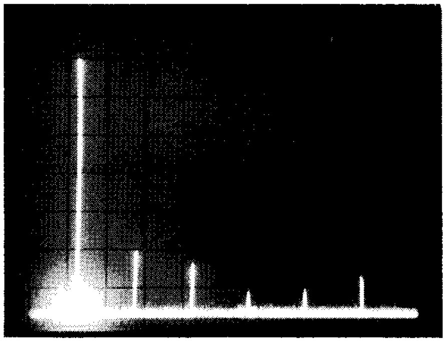


Fig 6—Worst-case spectral display of the Yaesu FT-470 operating in the 144-MHz band. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. The reference (top horizontal line on the grid) represents −20 dBc, and the fundamental has been notched by 30 dB to prevent spectrum-analyzer overload. Output power is approximately 2.2 W at 146 MHz. All harmonics and spurious emissions are at least 80 dB below peak fundamental output. The FT-470 complies with current FCC specifications for spectral purity.

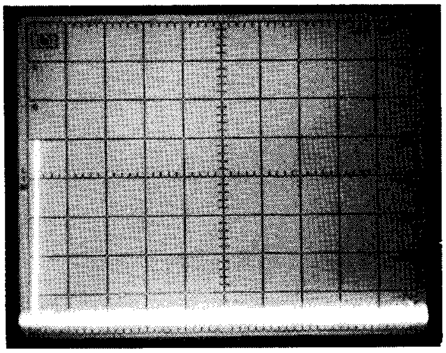


Fig 7—Worst-case spectral display of the Yaesu FT-470 operating in the 420-MHz band. Horizontal divisions are each 100 MHz; vertical divisions are each 10 dB. The fundamental has been notched by 30 dB to prevent spectrum-analyzer overload. Output power is approximately 1.8 W at 445 MHz. All harmonics and spurious emissions are at least 74 dB below peak fundamental output. The FT-470 complies with current FCC specifications for spectral purity.

sound when you start scanning; low beep-high beep when you scan up, and high beep-low beep when you scan down. The radio beeps when it stops scanning, and beeps again when the scan resumes. In fact, it beeps when just about anything happens! The beeps might be handy when you are using the transceiver in the dark, but when you are scanning they can be very annoying. Fortunately, you can easily disable the beeper with a keypad command.

The push-to-talk button is located on the left side of the radio. Just above the **PTT** switch is a smaller switch that momentarily opens the squelch. (On the European version of the '470, this switch activates a 1750-Hz tone encoder for "tone-burst" repeater access.) Above the **PTT** and squelch-release switches is a small lamp-activation button that, when pressed, causes both the keypad and display to be illuminated.

Display Functions

Yaesu fit an incredible amount of display information onto the small LCD in the '470. Some of the lettering is rather small, but it's all easily readable. Just above the LCD on the front panel is a small LED that glows green when the squelch is open, red when you are transmitting, and orange when you are transmitting on the primary band *and* the squelch is open on the secondary band.

Frequency Entry

You can enter an operating frequency directly from the keypad—the radio assumes the 100-MHz digit (a *1* on 2 meters and a *4* on 440 MHz). Once you enter the frequency, you can step up or down either with the rotary dial on top of the transceiver or with the up and down arrow keys on the keypad.

Holding the up or down arrow key for a few seconds causes the radio to start scanning in the indicated direction. The step size (amount of frequency change per dial click or arrow-key press) can be set with the **STEP** control on the keypad. You can select 5, 10, 12.5, 20 or 25-kHz steps. Pressing the **FM** key followed by the up or down arrow key increases or decreases the operating frequency in 1-MHz steps.

Like most modern transceivers, the '470 uses a digitally controlled frequency synthesizer. The transceiver stores the synthesizer operating frequency in four special memory channels. Two tunable memories are available on each band—Yaesu calls these memories "VFO A" and "VFO B"—you can select between these "VFOs" with the keypad **VFO** switch.

Dual-Band Operation

You can use the FT-470 as a single-band transceiver on either band, 144 or 440 MHz, with the other band disabled. In this mode, the keypad **BAND** switch toggles the transceiver between 144 and 440 MHz. You can also enable both bands at once. With both bands active, the display shows the primary-band information in larger digits than the secondary-band data. The keypad controls the primary band, and the **BAL** control determines the relative levels of received signals on the primary and secondary bands. For example, you might set the secondary band to a 2-meter repeater where you were expecting a call, set the balance control so that you could hear both bands, and then operate normally on 440.

Each band is fully independent. The keypad controls only the primary band, however. In multitasking computer terminology, the secondary band is "in the background." You can still hear signals on the "background" band if the **BAL** control is set appropriately, but you must switch the secondary band to the "foreground" (with the **BAND** switch) before you can control it with the keypad. If you start scanning the primary band and then switch bands, the scan continues on the secondary band.

Memories

The FT-470 has 21 memory channels for each band. Each memory can store separate transmit and receive frequencies (or a receive frequency and a repeater offset) and CTCSS (continuous tone-coded squelch system) data. In addition to their standard uses, three of the 21 memories have special functions. The *C* memory is used for a call feature—the frequencies stored in this memory can be instantly recalled by pressing the **CALL** button on the keypad. Two more memories are used for what Yaesu calls "Programmable Memory Scanning." When this feature is activated, the radio scans repeatedly between the frequency stored in the *L* (lower) memory and the frequency in the *U* (upper) memory.

Memory frequencies can be recalled by pressing the **MR** key followed by the memory number. Once a memory has been recalled, you can use either the **DIAL** knob or the up/down arrow keys to step through the memory channels. Pressing the **VFO** key returns the transceiver to the most-recently selected VFO memory.

Scanning

In addition to the Programmable Memory Scanning mentioned earlier, the FT-470 has two other scanning modes. I've reviewed several other VHF and UHF hand-helds, and I could never decide whether I preferred a scanning radio to stop on a channel as long as the channel was active, or resume scanning after a set amount of time even if the channel was still active. Both modes have their uses (and some people prefer one or the other, I'm sure). The FT-470 implements *both* modes. You can select either "pause" mode (where the radio does not resume scanning until the channel is clear) or "five-second duration" mode (the radio resumes scanning after five seconds, even if the channel is still active).

In both single-band and dual-band modes, the radio can scan each band individually. In dual-band mode, the secondary band can be scanned while you scan or operate on the primary band. You cannot stop scanning or operate on the secondary band without changing bands, however. The '470 also has an "alternate band" mode—in this mode, the radio first scans memory 1 on 2 meters, then memory 1 on 440 MHz, then memory 2 on 2 meters and memory 2 on 440, etc. A detailed chart in the user's manual shows how a dual-band scan proceeds if an odd number of memories are programmed.

You can lock out a memory so that it won't be scanned. You would probably do this with NOAA weather-radio frequencies or a very active repeater, for example. Locked-out memories can be recalled from the keypad or with the rotary dial, but they are skipped during scanning.

Priority Channel Monitoring

Priority monitoring allows you to check a specific memory channel every five seconds. If you are scanning through the memory channels, channel 1 is the priority channel. If you are using a VFO, you can use any memory channel as the priority channel. When activity on this frequency is detected, the radio switches to the priority channel and stays there either for five seconds (in five-second mode) or until the priority channel is clear (pause mode).

Repeater Offsets

The FT-470 has an Automatic Repeater Shift feature. When this feature is activated, the radio's programming selects the appropriate repeater offset (according to currently accepted band plans) as you tune through a band. This means that if you tune to a repeater output frequency and that repeater is using a standard offset, the FT-470 will automatically set itself to the proper input frequency when you transmit.

You can also set the repeater offset manually. The **RPT** key on the keypad selects plus (+), minus (−) or no offset. For nonstandard-offset repeaters, you can specify separate transmit and receive frequencies, or change the standard offset (useful if many repeaters in your area use the same nonstandard offset).

DTMF Features

The FT-470 provides a dual-tone multifrequency (DTMF) keypad that includes **A**, **B**, **C**, **D**, **#** and ***** keys. In addition, the FT-470 has 10 memories for storing DTMF information; each of these memories can store a DTMF sequence of up to 15 tones. This allows you to store frequently used phone-patch telephone numbers or repeater-control sequences for easy recall.

CTCSS

A CTCSS encoder and decoder are standard features on the FT-470. The encoder is programmed with 38 standard CTCSS tones, and each memory channel can store CTCSS information. In my area, several 440-MHz repeaters use CTCSS access, and it was easy for me to program the CTCSS information into the FT-470 as I programmed the memories.

The FT-470 can also decode CTCSS tones on receive. This allows you to use a quiet simplex channel where you will hear calls only from a transmitter that sends the proper CTCSS tones. This will usually not work on a repeater frequency—most repeaters filter out CTCSS tones.

You can also activate a "pager" feature using the CTCSS function. This sounds an alert tone and flashes a small bell icon on the LCD when the radio receives a CTCSS-encoded call. The bell continues to flash after the call, so you can tell if the radio received a call when you were not present.

Extended Receiver Coverage

As Yaesu ships the FT-470 in the US, it covers 144-148 and 430-450 MHz on both transmit and receive. It is possible to extend the VHF receive coverage to 130-180 MHz, although the user's manual does not document this feature. To implement extended receiver coverage, turn the radio off and then hold down both the up and down arrows while turning it back on. (This is a toggle function—you don't have to do it every time you turn on the radio.)

The '470 performs fairly well receiving outside the 2-meter ham band. I used the radio to scan local 150-MHz public-service frequencies and to receive 162-MHz NOAA weather transmissions.

Battery Power

The '470 comes with the FNB-10 7.2-V, 600-mAh NiCd battery pack. An overnight NiCd charger for the supplied battery pack is provided with the radio, and a quick charger is available. Refer to Table 1 for details on transmitter and receiver specifications and performance.

At Yaesu's claimed maximum-audio-output receiver current drain (150 mA), the FT-470's standard battery pack lasts for a maximum of four hours of receive-only operation. Fortunately, the '470 has two battery-saving features that extend operation time. Like most modern, full-featured hand-held transceivers, the '470 has a "sleep" mode. When this function is activated, the radio periodically checks for receiver activity. The radio listens for 30 milliseconds; if no activity is found, the radio sleeps to conserve battery power. The interval between checks can be set (from the keypad) anywhere from 30 ms to 1 second. According to Yaesu, average current consumption in sleep mode varies from 25.5 mA with 30-ms sleep periods to only about 8 mA with one-second sleep periods. Battery saving is automatically disabled when the radio is scanning, and you must also disable it during packet operation, as the radio may miss the beginnings of some packets during sleep periods.

The '470 also has an Auto Power Off

feature. This turns the radio off automatically if no keypad activity has occurred for 10 minutes, which is useful if you leave the radio unattended. This feature can also be disabled.

Accessories and Documentation

The full range of standard accessories is available for the '470. The radio comes with one NiCd battery pack, an overnight charger and a leather case. The leather case has a clear plastic window for the display and keypad (you must press the keys through the plastic, but the keypad is protected from the weather). A small hole in the back of the case allows connection of the overnight charger, so the battery can be charged with the radio in the case. The case must be removed to replace the battery pack, however.

The manual is well-written, with only a few typos, and it includes a section called "In Case of Problems" that covers common troubles and solutions. This section should be a bit more comprehensive, however (it's just one page long).

Conclusion

I enjoyed using the FT-470. It's small enough to be convenient, but not so small that it is difficult to use the keypad or read the display. The keypad functions are logically laid out, making it easy to learn how to operate the radio in a short time.

Manufacturer's suggested retail price: FT-470, $576. Manufacturer: Yaesu USA, Inc, 17210 Edwards Rd, Cerritos, CA 90701, tel 800-999-2070.

Strays

I would like to get in touch with...

☐ anyone with a manual, schematic, or information on a Hallicrafters S-38C receiver. Jon Book, KBØEDE, 1704 N Pine St, Davenport, IA 52804.

☐ anyone who has any information on a Pride 150 bilinear amplifier and 10-meter Squalo antennas. Keith Schneider, N9HLS, 5027 W National Ave #308, Milwaukee, WI 53214.

☐ anyone using a Johnson Thunderbolt amplifier with a modern transceiver. Bert Kuschner, W4GRP, 3340 Turtlemound Rd, Melbourne, FL 32934.