



## **Product Review & Short Takes Columns from QST Magazine**

**July, 2003**

### **Product Reviews**

ICOM IC-703 HF Transceiver

Alinco DR-620T VHF/UHF FM Transceiver

### **Short Takes**

Electronic Snap Circuits

Buddipole Portable Antenna

# PRODUCT REVIEW

## ICOM IC-703 HF Transceiver

Reviewed by Brennan Price, N4QX  
Assistant Technical Editor

We should establish one thing about the IC-703 right up front. Yes, operating a 10-W radio can be a very satisfying experience. Almost invariably, after we review an HF offering that produces less than 50 W output, we receive correspondence asking whether low-wattage signals really get out. As any QRP enthusiast will tell you, the answer is an enthusiastic yes. Whether one operates low power in order to minimize RF exposure or simply for the challenge of doing more with less, an effective antenna will allow the operator to be heard. As ARRL Laboratory Manager and resident QRP guru Ed Hare, W1RFI, says, "Ten watts is a lot of power."

And 10 W is exactly the lot of power that one gets when operating the IC-703. The radio looks and acts very much like the higher-power ICOM IC-706MkIIIG, reviewed in the July 1999 issue of *QST*. It differs from the MkIIIG in two important respects. The first is its output power; the second is that it lacks VHF and UHF capability. Due to a printing error on the boxes and on the manuals, there is an indication that the '703 has 6-meter capability. This is not the case, and ICOM makes that clear right up front with a note attached to the box. Six meters is available on the recently released IC-703 Plus, however.

### QRP Ready to Go

So what has ICOM included in the '703 in order to make up for the 90 W and three bands it gives up? Quite a bit, actually. Foremost is the standard internal automatic antenna tuner, pictured in Figure 4. I was able to connect the IC-703 directly to the G5RV I have creatively supported on my apartment building's balcony and operate on all bands (except 160 and 30 meters, which are not typically compatible with a G5RV) at the touch of a button. The automatic tuner was put through its paces in the ARRL Lab, using the same methodology used in our January roundup of external antenna tuners. Our criteria for determining whether a match was obtained was whether the SWR indicated on the rig's bar graph meter was 1.5:1 or less, resulting in no output power reduction. While ICOM recommends that



the unmatched antenna should have an SWR of less than 3:1, the internal tuner successfully match loads up to an 8:1 SWR on all bands tested (160, 80, 20, and 10 meters). At an SWR of 10:1, no match was found, and the tuner turned itself off.

Conveniently, the first time the IC-703's tuner matches a particular frequency pair, the tuner settings are memorized. When the user returns to the frequency and the internal tuner is enabled, the proper settings spring to life. The can be overridden after an antenna change either by clearing the tuner memories or forcing the internal tuner to match again.

This feature should be of interest to portable station enthusiasts who seek a complete station in one lightweight box. No external antenna tuners need be carried; an antenna, a power source, and the '703 are all that such an operator will need to go out and have fun. The added weight of the tuner is more than offset by the removal of the 100-W power amplifier and VHF/UHF modules from the old MkIIIG. Even though the two models

have the same dimensions, the '703 weighs in 4.3 pounds, down more than a pound from the latest '706 model.

The '703 is friendlier on batteries than the '706MkIIIG was found to be. The power requirement in Table 1 indicates that less than 3 A is drawn when transmitting at the full 10-W capacity. On the receiver side, typical current draw at maximum audio was 0.58 A, and fell to 0.32 A when power saving options were utilized. This efficiency allows smaller battery packs to be used. In fact, I enjoyed several hours of operation using a very lightweight, rechargeable, 9.6-V battery pack. For portable operation enthusiasts, the IC-703's compact and lightweight stature is very attractive.

### Some Things Stay the Same

But you would expect a radio that looks exactly like the '706MkIIIG to behave very much like the '706MkIIIG. And in most ways, the '703 does. Back in 1999, we complimented the performance of the DSP included standard on the MkIIIG. The same DSP functions, an automatic notch filter and a noise blanker, have found their way into the '703. The ARRL Lab measured a very impressive single-tone noise reduction of 65 dB for the autonotch filter; this measurement is one of the best ever measured in our Lab.

Something that did not change from the MkIIIG is the availability of 1200 and 9600 baud packet operation, and United States users should be aware of this and

### Bottom Line

The IC-703 looks a lot like the IC-706MkIIIG, but trades a capable internal antenna tuner for some bands and 90 W of power. The result is a radio that will turn the heads of low-power and portable operators who yearn for features galore in a lightweight box.

**Table 1**  
**ICOM IC-703, serial number 1801133**

**Manufacturer's Claimed Specifications**

Frequency coverage: Receive, 0.03-30 MHz; transmit, 1.8-2, 3.5-4, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7 MHz.

Power requirement: Receive, 0.45 A (max audio); transmit, 3.0 A (10 W output).

Modes of operation: SSB, CW, AM, FM, RTTY.

**Receiver**

SSB/CW sensitivity, bandwidth not specified, 10 dB S/N: 1.8-30 MHz, <0.16  $\mu$ V.

AM sensitivity, 10 dB S/N: 0.5-1.8 MHz, <13  $\mu$ V; 1.8-30 MHz, <2  $\mu$ V.

FM sensitivity, 12 dB SINAD: 28-30 MHz, <0.5  $\mu$ V.

Blocking dynamic range: Not specified.

Two-tone, third-order IMD dynamic range: Not specified.

Third-order intercept: Not specified.

**Measured in the ARRL Lab**

Receive<sup>1</sup> and transmit, as specified.

Receive, 0.58 A;<sup>2</sup> transmit, 2.5 A. Tested at 13.8 V.

As specified.

**Receiver Dynamic Testing**

Noise floor (MDS), 500 Hz filter:

	<i>Preamp off</i>	<i>Preamp on</i>
1.0 MHz	-121 dBm	-129 dBm
3.5 MHz	-133 dBm	-141 dBm
14 MHz	-131 dBm	-141 dBm

10 dB (S+N)/N, 1-kHz tone, 30% modulation:

	<i>Preamp off</i>	<i>Preamp on</i>
1.0 MHz	6.5 $\mu$ V	2.34 $\mu$ V
3.8 MHz	1.5 $\mu$ V	0.537 $\mu$ V

For 12 dB SINAD:

	<i>Preamp off</i>	<i>Preamp on</i>
29 MHz	0.537 $\mu$ V	0.193 $\mu$ V

Blocking dynamic range, 500 Hz filter:

Spacing	<i>Preamp off/on</i>	<i>Preamp off/on</i>
20 kHz	127*/127 dB	95/95 dB
3.5 MHz	121*/122* dB	95/95 dB

Two-tone, third-order IMD dynamic range, 500 Hz filter:

Spacing	<i>Preamp off/on</i>	<i>Preamp off/on</i>
20 kHz	93/93 dB	78/77 dB
3.5 MHz	89/91 dB	76/76 dB

Spacing	<i>Preamp off/on</i>	<i>Preamp off/on</i>
20 kHz	+12/+1.8 dBm	-14/-21 dBm
3.5 MHz	+11/+1.9 dBm	-14/-21 dBm

avoid using this function in most instances. Of the bands found on the '703, 1200 baud packet operation is only permitted in the United States on 10 meters [97.307(f)(4)]. What's more, 9600-baud operation is not permitted at all on HF; users interested in that speed must wait for the 6-meter capability of the '703 Plus [97.307(f)(5)].

Nevertheless, the IC-703 earns high marks for ease of operation and ergonomics, just as the MkIIG did. The controls are identically positioned, with the large VFO knob on the right of the large display, and separate AF and M-CH controls to its left. Backlighting enhances the visibility of the buttons in the dark, and the various menu options are easily toggled by a MENU and three F keys. The control panel is detachable from the radio, allowing for operation from a distance limited only by the length of the remote cable.

Overall, ICOM has added a tuner to the MkIIG in exchange for VHF/UHF capability and some wattage. What remains in the IC-703 is a lightweight station with modest power but all the bells and whistles of the MkIIG. These qualities may be attractive to those who have always been interested in portable, low-power operation but have wanted more features.

**Comparing the Numbers**

Testing in the ARRL lab indicates that the '703 offers slight improvements over the MkIIG in receiver performance. The results are spelled out in Table 1. Let's take a closer look at how the '703 stacks up to the '706 family.

Receiver sensitivity for SSB and CW signals was down slightly, but not significantly from the MkIIG. AM sensitivity was significantly degraded from the MkIIG,

rising from 0.68 to 1.5  $\mu$ V on 3.8 MHz with the preamp off. However, all sensitivity measurements fell well within ICOM's stated specifications, and an argument can be made that an overly sensitive radio during crowded conditions can be a hindrance. With the '703, I cleanly heard all that I wanted to hear.

Pleasantly surprising was the IC-703's dynamic range performance. Across the board, the '703 outperforms the '706 line in both blocking and two-tone, third-order IMD dynamic range at the ARRL standard test spacing of 20 kHz. In the four years that have passed since the MkIIG's arrival on the market, the ARRL Lab has begun dynamic range testing at 5-kHz spacing, and the '703 performs credibly at the new test.

Finally, third-order intercept numbers were uniformly positive at 20-kHz spacing on the '703, an improvement over the

Second-order intercept: Not specified.  
 FM adjacent channel rejection: Not specified.  
 FM two-tone, third-order IMD dynamic range: Not specified.  
 S-meter sensitivity: Not specified.  
 Squelch sensitivity: SSB, 1.8-30 MHz, <5.6  $\mu\text{V}$ ;  
 FM, 28-30 MHz, <0.32  $\mu\text{V}$ .  
 Receiver audio output: 1.0 W at 10% THD into 8  $\Omega$ .  
 IF/audio response: Not specified.

IF and image rejection, 70 dB.

### Transmitter

Power output: SSB, CW, FM, 10 W high, 0.1 W low;  
 AM (carrier), 4 W high, 0.1 W low.  
 Spurious-signal and harmonic suppression: <50 dB  
 SSB carrier suppression: >40 dB.  
 Undesired sideband suppression: >50 dB.  
 Third-order intermodulation distortion (IMD) products: Not specified.  
 CW keyer speed range: Not specified.  
 CW keying characteristics: Not specified.  
 Transmit-receive turn-around time (PTT release to  
 50% audio output): Not specified.  
 Receive-transmit turn-around time (tx delay): Not specified.  
 Composite transmitted noise: Not specified.  
 Size (height, width, depth): 2.3x6.6x7.9 inches; weight, 4.3 pounds.

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.

\*Measurement was noise-limited at the value indicated.

<sup>1</sup>Receive sensitivity is reduced below 250 kHz.

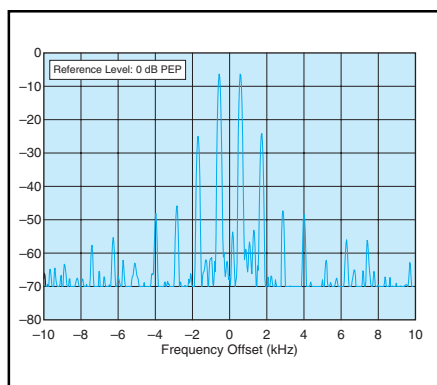
<sup>2</sup>With all power saving options enabled, 320 mA.

Preamp off, +56 dBm; preamp on, +47 dBm.  
 20 kHz channel spacing, preamp on: 29 MHz, 67 dB.  
 20 kHz channel spacing, preamp on: 29 MHz, 73 dB.  
 S9 signal at 14.2 MHz: preamp off, 40.7  $\mu\text{V}$ ; preamp on, 15.1  $\mu\text{V}$ .  
 At threshold, preamp on: SSB, 14 MHz, 4.51  $\mu\text{V}$ ;  
 FM, 29 MHz, 0.186  $\mu\text{V}$ .  
 1.3 W at 10% THD into 8  $\Omega$ .  
 Range at -6 dB points, (bandwidth):  
 CW (500 Hz filter): 326-870 Hz (544 Hz)  
 USB: 414-2920 Hz (2506 Hz)  
 LSB: 85-2532 Hz (2447 Hz)  
 AM: 36-3310 Hz (3274 Hz).

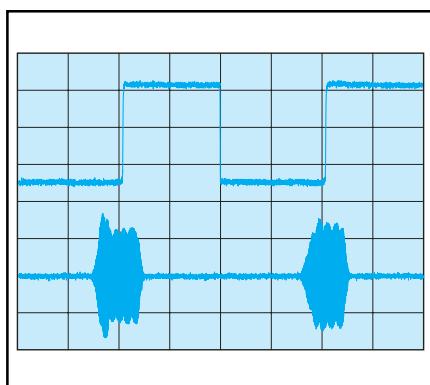
First IF rejection, 116 dB; image rejection, 121 dB.

### Transmitter Dynamic Testing

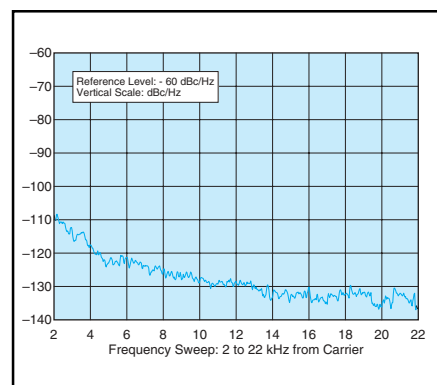
CW, SSB, FM, typically 9 W high, <0.1 W low;  
 AM, typically 2.9 W high, <0.1 W low.  
 54 dB. Meets FCC requirements for spectral purity.  
 58 dB.  
 70 dB.  
 See Figure 1.  
 6 to 52 WPM.  
 See Figure 2.  
 S9 signal, 20 ms. Unit is suitable for use on AMTOR.  
 SSB, 40 ms; FM, 16 ms.  
 See Figure 3.



**Figure 1—Worst-case spectral display of the IC-703 transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 24 dB below PEP output, and the worst-case fifth-order product is down approximately 46 dB. The transmitter was being operated at 10 W PEP output at 7.25 MHz.**

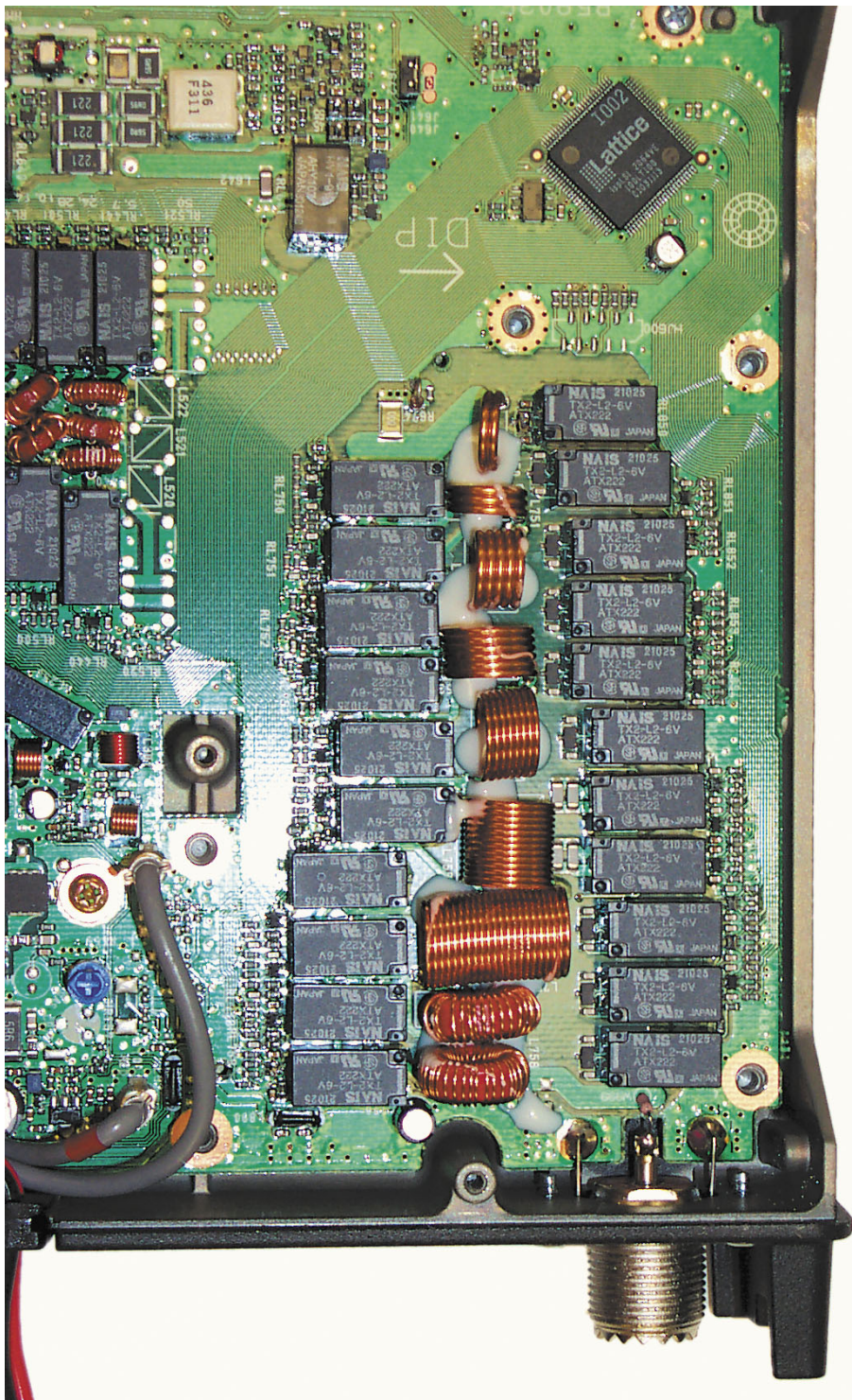


**Figure 2—CW keying waveform for the IC-703 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is approximately 60 wpm. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transmitter was being operated at 10 W output at 14.2 MHz. Note the considerable shortening of both dits.**



**Figure 3—Worst-case spectral display of the IC-703 transmitter output during composite-noise testing. Power output is 10 W at 14.02 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.**





**Figure 4—A peek inside the ICOM IC-703 with the bottom panel removed reveals the automatic antenna matching network that comes standard with the transceiver. This network successfully matched SWRs of up to 8:1 in the ARRL Lab.**

MkIIIG's uniformly negative numbers. Only at the close spacing of 5 kHz does the IP3 fall into the negative numbers, -14 dB with the preamp off and -21 dB with it on.

The IC-703 outperforms its specification for IF and image rejection by a healthy margin. Overall, the '703's receiver performance is on par with its high-

powered cousins, and continues the trend of incremental improvements. The transmitter, however, shows relatively high third-order products during two-tone IMD testing (see Figure 1). The '703 performs about 6 dB worse than the MkIIIG here.

### CW Keying and ALC

In the first two IC-706 models, we

noted some limitations on the CW keying, particularly in full-break-in mode. Dits were shortened in full-break-in keying at speeds of around 30 WPM or above. These shortened dits are once again evident in the IC-703 (see the keying waveform in Figure 2). The dits default to their normal weight in semi-break-in mode, however. High-speed CW operators may wish to take this into consideration.

Also, the leading-edge spike of the CW waveform on our unit of the IC-703 indicates a recurrence of a problem observed to an extent in the 706 series—the failure of the ALC to take hold until a short time into the transmission. While one is unlikely to drive an amplifier with the '703, some '706 users reported that the leading spike would fault amplifiers. The spike had been minimized in the MkIIIG, but was again prominent in our unit.

In fairness, our unit of the IC-703 was one of the first units sold in the United States. ICOM America Chief Engineer John Gibbs, KC7YXD, indicates that the leading spike was remedied prior to the recent release of the 6-meter capable IC-703 Plus, and that this fix has been incorporated into all but the first few IC-703 units sold in the United States. We plan to revisit the CW and ALC issues in a forthcoming review.

### Good Bang for the Buck

ICOM has combined a no-nonsense HF transceiver patterned after its successful IC-706 series with a surprisingly capable antenna tuner in a lightweight, affordable package. As mentioned above, hams who are looking for a lightweight, low-power radio with a number of nice features will find the IC-703 worth a serious look. So will hams in close quarters, such as apartments or condominiums, where RF safety and susceptibility concerns must be considered. And in these tight economic times, the pricetag is attractive, particularly for a starter HF rig for a General class licensee.

For under \$700, ICOM has provided a nice little radio, patterned very much after the successful IC-706 series. It shares much of its older cousins' limitations, but includes and improves upon much of their features, even while shedding some bands and some power. For the low-power market and the low-price class, this is a commendable effort.

*Manufacturer:* ICOM America, 2380 116th Ave NE, Bellevue, WA 98004, tel 425-454-8155; fax 425-454-1509; [www.icomamerica.com](http://www.icomamerica.com). Price: \$679.95.



# Alinco DR-620T VHF/UHF FM Transceiver

Reviewed by Dan Henderson, N1ND  
ARRL Contest Branch Manager

Not too many years ago, the concept of a dual-band VHF/UHF radio seemed distant. Today it seems that dual-band radios are standard for base station or mobile FM operation. Into this market Alinco introduces the DR-620T, its latest 144/440 MHz FM transceiver.

The DR-620T is packed with pretty much all of the features that today's amateur has come to expect. But these standard features come with lots of bells and whistles that Alinco hopes will attract amateurs who enjoy a wide range of activities on the VHF/UHF bands.

## User-Customizable Appearance

One physical design feature stands out, and offers unprecedented flexibility and convenience for mobile installation and operation. Have you ever had to compromise with how to place a mobile radio in the car so you could still hear the speaker? The DR-620T resolves this by making it possible to detach the front panel and turning it 180° so you can position both the control panel and the speaker to your liking (see Figure 5). The days of choosing between standing on your ear to read the display or listening to a muffled speaker covered by the carpet or dashboard are history. Users can choose the configuration (speaker up or speaker down) that works for them.

Another user-customizable feature is the display color, solving the phenomenon of liking a radio but hating the color of the display backlighting. Alinco gives the DR-620T user the option of three display illuminations: amber (a reddish-orange), yellow or orange. When combined with the 4-setting dimmer feature for adjusting the intensity of the back lighting, the DR-620T should provide a combination easy on the eyes of any operator.

## Running Down the Basics

When it comes to standard FM communication, the DR-620T packs the punch to get the signal through with three power levels. Low power on both 144 and 440 MHz is 5 W, mid-level power is 10 W, and the high-power setting offers 50 W on VHF and 35 W on UHF. The PWR button is located among the array of buttons on the bottom of the front panel, perhaps not in the most conspicuous location but easily accessible once you learn the layout of the function keys.

As do many other modern radios, the '620T includes a power supply voltage display in its package of features. While



activating this display is not intuitive, it is simple: the user presses the SQL and FUNC keys simultaneously, and the voltage is shown in the lower right corner of the display, just beside the frequency. This display terminates when any other key is pressed.

Having previously owned a dual-band mobile that included both bands' audio controls on a single knob, I especially liked having distinct adjustment knobs for the MAIN volume and the SUB band volume controls. This makes it easier for those of us with big fingers. Also especially helpful were the distinctly separated reception indicators. Placing the indicator for each band on opposite sides of the radio allowed me to tell which receiver was active in one glance.

One thing I have always liked about Alinco products has been their relative simplicity. It has always seemed that some mobile radios required you to push button A, then hold button B while pressing button C to get to the controls for the feature you wanted to employ. Alinco again keeps it simple. The '620T user presses the FUNC key to activate the various functional capabilities of the rig.

The radio has plenty of memory capability, with 200 available channels for storing those frequently used repeater pairs or simplex frequencies. There are 80 channels reserved each for VHF and UHF frequency storage, along with 40 channels available for either VHF or UHF. In addition there is also available a

primary CALL channel for both VHF and UHF. One simple push of the V/M key, located in the upper left corner of the front panel, switches the rig between VFO and memory operation.

Programming a channel into memory was relatively easy. All you do is first set up the channel parameters in VHF mode (offset, CTCSS tones, DCS codes, etc). Next push the FUNC key and rotate the main dial to select the desired memory in which to store the information. Once you find the channel, push the V/M key, listen for a beep and you're all set!

Get confused by what repeater is on what frequency? The DR-620T allows you do alphanumeric labeling. Press the H/L Key from the front panel along with the FUNC key and you will see letters appear on the main display. Rotate the main dial until the desired letter comes up. By pressing the BAND key the displayed letter is written into memory, and the next letter space appears. Repeat the process until the alphanumeric designation you desire is displayed (such as "W1AW/R"). Once you have finished, press any key other than BAND or CALL and you are finished. The CALL key can be used during programming to delete all characters already programmed. You won't have to worry if the 146.91 repeater you have keyed in is the one you need for your home tone decoder or the one you programmed in with a different decoder for your recent vacation road trip.

## Menu Options Aboard

In step with modern technology, the Alinco DR-620T has a wide range of user-determined parameters that assist the operator. Ever talked a repeater down (nah, none of us have ever done that)? You can program the time-out-timer for up to 450 seconds. When five seconds

### Bottom Line

The newest dual-band mobile offering from Alinco maintains the brand's ease of use while incorporating digital voice capability.

**Table 2**  
**Alinco DR-620T, serial number M000558**

**Manufacturer's Claimed Specifications**

**Measured in the ARRL Lab**

Frequency coverage: Receive, 87.5-174,<sup>1</sup>  
335-480 MHz; transmit, 144-148, 430-450 MHz.

Receive and transmit, as specified.

Power requirement: Receive, 0.6 A (max audio);  
transmit, 11 A (high power).

Receive, 0.68 A; transmit, 8.2 A. Tested at 13.8 V.

Modes of operation: FM, AM (receive only).

As specified.

**Receiver**

**Receiver Dynamic Testing**

AM sensitivity: Not specified.

AM, 10 dB S+N/N: 120 MHz, 12.3  $\mu$ V.

FM sensitivity, 12 dB SINAD: 0.2  $\mu$ V.

For 12 dB SINAD, 144 MHz, 0.18  $\mu$ V;  
430 MHz, 0.15  $\mu$ V;

FM adjacent channel rejection: Not specified.

20 kHz channel spacing: 146 MHz, 64 dB;  
440 MHz, 61 dB.

FM two-tone, third-order IMD dynamic range: Not specified.

20 kHz channel spacing: 146 MHz, 57 dB;  
440 MHz, 56 dB; 10 MHz channel  
spacing: 146 MHz, 68 dB; 440 MHz, 66 dB.

FM two-tone, second-order IMD dynamic range: Not specified.

78 dB.

S-meter sensitivity: Not specified.

S9 indication: 146 MHz, 4.6  $\mu$ V; 440 MHz, 3.6  $\mu$ V.

Squelch sensitivity: < 0.126  $\mu$ V.

At threshold: 146 MHz, 0.11  $\mu$ V; 440 MHz, 0.068  $\mu$ V.

Receiver audio output: 2 W at 10% THD into 8  $\Omega$ .

2.7 W at 10% THD into 8  $\Omega$ .

Spurious and image rejection: 70 dB.

First IF rejection, 146 MHz, 126 dB; 440 MHz, 142 dB;  
Image rejection, 146 MHz, 95 dB; 440 MHz, 113 dB.

**Transmitter**

**Transmitter Dynamic Testing**

Power output (H/M/L), 144 MHz: 50/10/5 W;  
430 MHz, 35/10/5 W.

146 MHz, 55/9.2/4.3 W; 440 MHz,  
35/10.2/5.4 W.

Spurious-signal and harmonic suppression: 60 dB.

VHF, 60 dB; UHF, 70 dB. Meets FCC requirements  
for spectral purity.

Transmit-receive turnaround time (PTT release to  
50% audio output): Not specified.

S9 signal, 146 MHz, 198 ms; 440 MHz, 106 ms.

Receive-transmit turnaround time (tx delay): Not specified.

146, 440 MHz, 136 ms.

Size (height, width, depth): main unit, 1.6x5.5x7.3 inches; weight, 2.2 pounds.

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.

<sup>1</sup>WFM only for 87.5-108 MHz and AM only for 108-136 MHz.

remain, the user gets an audible beep as a warning. When you surpass the programmed time, the radio automatically stops transmitting and returns to receive, just in time for you to hear the laughter of your friends! Release the PTT and press it again to return to normal transceiver operation.

When tuning in the VHF mode, this radio allows you to select between 10 different sized step intervals for tuning, from 5 kHz to 100 kHz. The default step is the smallest, 5 kHz. Another popular feature is the automatic power off function, which, when activated, will turn off the radio after there has been 30 minutes of inactivity.

Sure to be popular is the DR-620T's adaptability to use in packet operation and APRS. Users can automatically program their call sign (up to six characters) while operating in the packet communications mode. You can also easily select between 1200 and 9600 baud for setting the transmission speed, although 9600

baud capability requires an additional module. When operating APRS, there are seven settings to enable regular beacon transmissions, from a half minute up to 30 minutes apart.

**Groovin'**

Like to sometimes slip away from the wonders of Amateur Radio and kick back to jam with your favorite FM broadcast station? When the radio is in the VFO mode, holding the FUNC key and then pressing the CALL key will move the radio to the FM broadcasting band. Probably of more interest is the ability of the DR-620T to receive AM. Note that the radio will still transmit FM if it is in the AM receiver mode. Also, if narrow-band FM is used in your areas, the DR-620T includes a narrow-band mode feature, that lowers the microphone gain and modulation during transmission as well as the demodulation on the receiver side of the operation.

The DR-620T includes a theft alarm system that can be interfaced between the radio and your automobile. An optional digital voice communications module, the EJ-47U, enables digital voice transmission in the 10F3 digital mode. This is not compatible with the 20F3 digital modulation scheme used by the EJ-43U module reviewed with the DJ-596T handheld in June 2002. The EJ-47U module is compatible with other Alinco transceivers currently sold only in Japan—the DR-135MkII mobile and the DJ-596MkII and DJ-593MkII handhelds. The radio may be interfaced with a personal computer, and Classic Business Technologies released a software package to download settings to the DR-620T during Hamvention 2003.

**Another Good Effort**

I found the DR-620T to be relatively simple to set up for basic dual-band operation. Over the weekend I used the ra-




Figure 5—(Top) Is this a defect? Did Alinco manufacture this unit of the DR-620T upside down? No, not at all. Alinco allows the user to decide whether she wants the speaker facing up or facing down by rotating the front panel 180 degrees. (Right) As you can see, in this configuration, the speaker is at the bottom of the radio, ideal for mounting just under a shelf or dashboard.

dio, I temporarily installed it in my car and was able to make several QSOs on several local VHF or UHF repeaters. After programming in several repeater pairs, I was able to control the radio easily from the included microphone. The quality of the audio was good, and while tuned to my favorite FM radio station, I was able

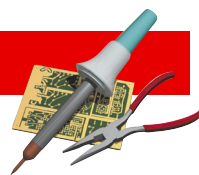
to rock with the sounds of the oldies.

Over the years Alinco has provided good quality products with substantial bang for the buck. Once again, they have provided a good quality radio at a good price that provides decent value. It will be a welcome addition to many amateur stations.

*Manufacturer:* Alinco Inc, Shin Dai

Building 8F, 1-2-6 Doujimahama, Kitaku, Osaka 530-0004 Japan. Alinco's US distributor is ATOC Distributing LLC, 23 S High St, Covington, OH 45318; tel 937-473-2840; fax 937-473-2862; [www.alinco.com](http://www.alinco.com). Price: \$339.95; EJ-47U digital voice board: \$169.95; EJ-50U TNC board: \$119.95. 





## Electronic Snap Circuits

By Fred "Sparks" Blechman, K6UGT  
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fblechman@juno.com

Finally, here's a simple way to learn basic electronics without soldering or pushing wires and tiny components into a multi-hole "breadboard." Elenco's Electronic Snap Circuits is intended for those who are eager to learn the mysteries of how simple electronic parts can be snapped together to do completely different things. This is ideal for children, with small and inexperienced hands, to have an introduction to electronics in a fun way.

If you're reading *QST*, you probably are too advanced to need much coaching in basic electronics—and maybe too advanced to teach it to someone else. But how about getting your children or grandchildren interested in electronics and hamming? This could be the door opener.

These days it's difficult for a child—or even an adult—to learn the basics of electronics. In the "old days," the basic electronic components were resistors, capacitors (we called them "condensers" then), inductors and vacuum tubes. Then selenium and silicon rectifiers came along. But today, with the advent of a bewildering array of transistors, integrated circuits, microprocessors and microcontrollers, it is more a matter of properly arranging and interconnecting modular parts to form complete devices.

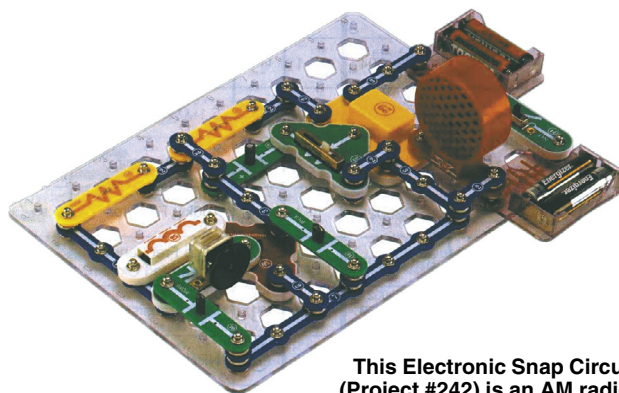
While various breadboard devices allow circuits to be assembled, they require the use of individual components, some of which are very small and difficult to handle. Jumper wires have to be cut and the insulation trimmed from the ends. Sometimes soldering is involved.

### The Snap Solution

And so it is not surprising that Electronic Snap Circuits have now become available. These kits use building blocks that snap onto a plastic base and then snap together to form complete electrical and electronic circuits. No tools are needed, and no soldering is involved. Each block has a switch, resistor, capacitor, inductor, diode, transistor, integrated circuit, lamp socket, microphone, motor or speaker—or may be a jumper for connecting between parts. The blocks are in different colors and have numbers on them so they are easily identified. The connecting blocks come in different lengths. Some circuits use supplied alligator-clip jumper wires to make unusual connections.

An included large clear plastic base grid has evenly spaced posts for the different blocks to snap onto. To help in assembly, the base has rows labeled A-G, and columns labeled 1-20, to agree with the clear, colored diagrams provided for each project. The diagrams also indicate at which "level" a block is placed, since blocks can snap above each other. Level 1 blocks go on the grid first, then Level 2 parts snap onto Level 1 parts, then Level 3, etc. It's really very simple and easy to follow from the excellent project diagrams. Two AA batteries power each project.

For example, Project #1 when snapped together shows how electricity is turned on and off with a switch. The clear illus-



This Electronic Snap Circuit (Project #242) is an AM radio.

trations in the manual show the grid locations, the identifying number of each block, and the sequence of assembly onto the plastic grid. Small children who can read letters and numbers can snap these parts together correctly after very little help.


In this project, Number 19 Battery Holder, Number 18 Lamp Socket, Number 14 Switch and Number 3 Snap Conductor are snapped onto the grid first. Then four Number 2 Snap Conductors are snapped on the already installed parts, and the circuit is complete. Add the batteries in the holder, screw the supplied bulb into the lamp socket and close the switch. Current flows from the batteries through the switch and the bulb in this "closed" circuit, and the bulb lights. Turn the switch off and the light goes off because the circuit is now "open."

### Increasing Challenge Levels

Of course, the projects get more complex and more interesting. Project #3 produces a sound activated switch. A Music IC plays music through the speaker when the Whistle Chip is tapped or activated by sound. Project #10 is a space war alarm combo. This combines the sounds from the Space War IC and the Alarm IC. Project #47 is an OR digital logic circuit. Just by following the colorful diagrams in the instruction manuals you can build an AM radio, various types of alarms and motorized toys, flashing lights, doorbells, logic circuits, games and much more.

Although no schematics of the circuits are provided, each project illustration shows the parts almost like a schematic. There is some "mystery" about how the solid-state integrated circuit blocks work, since no functions are described for the various snap points. Also, the explanations of circuit operation are brief.

Children and adults age 8 to 108 can enjoy hours of educational fun while learning about basic electricity and electronics. Electronic Snap Circuits could become important tools in the ARRL Education and Technology Program to attract new, young, amateurs. Clubs and individual Elmers can make good use of these kits as well.

*Manufacturer: Elenco Electronics, distributed by C&S Sales, 150 W Carpenter Ave, Wheeling, IL 60090; tel 800-292-7711; [www.cs-sales.com](http://www.cs-sales.com). A kit of 30 parts (Model SC-100) with an instruction manual to build over 100 projects sells for \$29.95. A larger kit, with 60 parts (Model SC-300) and two instruction manuals for 300 projects sells for \$59.95. *

## Buddipole Portable Antenna

Among the portable HF/VHF antennas I've seen to date, the Buddipole by W3FF Antennas is one of the classiest by far. This is apparent from the moment you open the package. Everything is extraordinarily well crafted, right down to the 22-inch-long rip-stop "quiver" that holds the disassembled antenna components.

The Buddipole is an inductively loaded, limited-space dipole designed to operate on 40 through 2 meters. This antenna isn't intended for permanent installations. On the contrary, the Buddipole's strength is its compact size, light weight and rapid assembly. These aspects make the Buddipole ideal for outdoor operating while camping, hiking, or as a temporary antenna for any application.

### Assembly and Tuning

The basic Buddipole arrives in a black plastic tube (with a screw-on cap) for long-term storage. Inside you find a polypropylene T connector with a 1/2-inch plumbing thread, two 22-inch inner dipole arms, two 1 3/4-inch diameter coils, two stainless-steel telescoping whips, the soft nylon bag and a matching section that contains 12 feet of coax with a BNC connector. For this review, we also ordered the collapsible Buddipole Mast that extends from 22 inches to more than 8 feet in a series of locking sections. The mast fits comfortably into the bag as well. The entire antenna weighs only 2 pounds.

I started my stopwatch and began the assembly by setting the mast into a tripod and screwing on the T connector. Following that, I attached the inner dipole arms, the coils and the telescoping whips. The coaxial cable plugged into the T

and I was finished. Total assembly time: 11 minutes. Not bad for the first time out.

Studying the instructions, I attached the coil taps at the color-coded points and extended the whips for operation on 20 meters. The total length of the dipole was just under 16 feet.

I "cheated" at this stage because I had an antenna analyzer, which makes it much easier to tune an antenna of this type. By sweeping with the analyzer I instantly knew that I needed to shorten the telescoping whips somewhat to achieve a match. The result was an SWR of about 1.5:1. In my installation, the tuning seemed rather sharp, but I'd prefer sharp tuning to the flat, across-the-band SWR of an antenna that behaved like an air-cooled dummy load. As you'd expect, the 2:1 SWR bandwidth was narrowest on 40 meters and became broader as the frequency increased.

### How Does it Play?

The answer is "remarkably well." Was the Buddipole as good as my full-size wire antenna? No, but the difference on most bands amounted to between one and three S units. With the Buddipole I made phone and digital contacts on 40 through 10 meters using from 5 to 100 W (the Buddipole is rated at a maximum of 250 W). Six meters didn't favor me with an opening while I had the antenna, so I didn't have an opportunity to test the Buddipole on that band. Local performance on 2-meter SSB and FM met expectations.

It is important to keep in mind that the Buddipole is a compromise antenna. It attempts to strike a balance between the need for manageable size and weight vs the desire for the best possible performance. The performance compromise was most noticeable on 40 and 20 meters where the Buddipole is only about 1/8 and 1/4 wavelength respectively, but above 20 meters the antenna seemed to compare favorably to a dipole at the same height.

Like most well-made things, the Buddipole is not inexpensive. But if you enjoy Amateur Radio in the great outdoors and need a rugged, portable antenna that can be set up anywhere without needing a support (such as a tree), the Buddipole is worth the cost.

*Manufacturer: W3FF Antennas, 2390 Templeton Dr, Redding, CA 96002; tel 530-226-8446; [www.buddipole.com](http://www.buddipole.com). Standard Buddipole: \$195. Buddipole Mast: \$40. Tripod: \$70.*

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The Buddipole set up in my back yard and tuned for 20 meters.