

Product Review Column from *QST* Magazine

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ICOM IC-900 Multiband VHF/UHF FM Mobile Transceiver

Yaesu FT-121RH 2-Meter and FT-712RH 70-cm FM Transceivers

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ICOM IC-900 Multiband VHF/UHF FM Mobile Transceiver

Reviewed by Larry Wolfgang, WA3VIL

The ICOM IC-900 is a modular FM transceiver that is not a kit, yet you assemble its pieces to provide the frequency coverage you need above 28 MHz. You can customize the radio to cover any or all of the following ranges: 28 to 30, 50 to 54, 144 to 148, 220 to 225, 440 to 450 and 1240 to 1300 MHz. Control and interface circuitry can be the same for any radio, so why not make use of one control box and separate RF units for each band? That's exactly what ICOM has done with the IC-900. The review IC-900 included the basic control and interface modules, as well as the UX-29A 2-meter band module and the UX-39A 220-MHz band module. (ICOM calls these modules "units.")

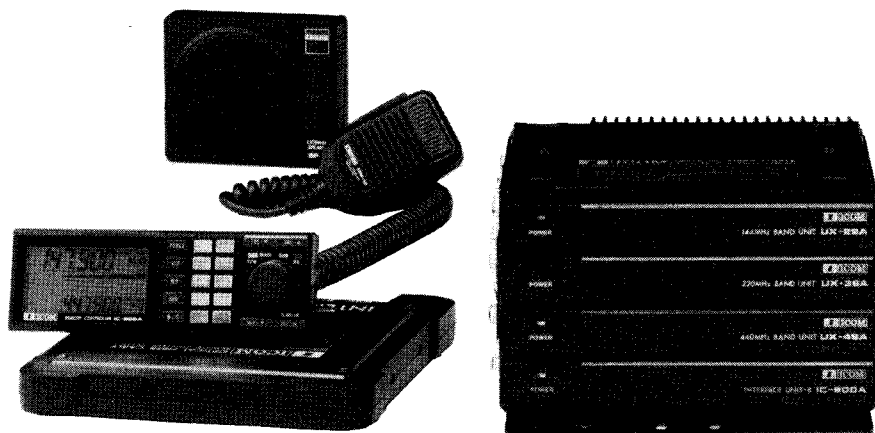
One of the first mobile ham radio installations I ever saw was an old Motorola unit that a friend had converted for use on 2 meters. This large radio had to be mounted in the trunk, with a control cable and small control head mounted under the dash. These days, though, modern VHF/UHF mobile radios are synonymous with compactness: They're small enough to mount under the dash or in another easy-to-reach place, in even the tiniest sub-compact cars.

Now ICOM has come up with a "new" innovation: A radio that can be mounted in the trunk or an out-of-the-way place, with a small remote-control unit that mounts on the dash! While this may seem like a return to an old idea, the IC-900 definitely makes use of the latest technology: It has microprocessor control of the various features, and a fiber-optic cable to carry control signals between the two interface units.

Parts, Parts and More Parts!

The IC-900 modules arrived in several boxes. After emptying them all onto a table, I ended up with: a speaker and microphone, one remote control head, two "interface units" (A and B), a 2-meter band unit and a 220-MHz band unit. In addition to these components, there was a host of other pieces. Here's an overview of the entire system.

After installation, the *remote controller* is the only visible part of the radio—assuming you mount the other modules in the trunk and/or under the seat as described in the instruction manual. Compared to any radio you might mount under the dash of your car, the controller is miniscule. In fact, this module is designed



to mount *on* the dash!

This tiny controller includes a 2¼- by 1¼-inch display and almost all of the operating controls for the radio. The largest operating control is the tuning knob, which measures ¾ inch in diameter. The other controls—20 push buttons and two slide switches—are tightly grouped. Beneath its surface, the remote controller is far more than a display and a bunch of controls, though: It's the brains of the operation! It includes the microprocessor, which accepts input from the control switches and sends the proper control signals to interface unit A, described next.

Interface unit A is designed to fit under a front seat. At seven inches square by an inch high, this box should fit just about anywhere you need it to. To permit you to listen to two band units simultaneously, two audio amplifier sections and two speaker jacks are included in interface unit A. One speaker jack is for the main audio, which includes the sound from both active band units; the other speaker jack is for the secondary band unit (ICOM calls the secondary band the "sub band"). If there is a speaker plugged into the speaker jack for the sub-band unit, each speaker provides audio from only one band.

Interface unit A also serves to send control signals to, and receive feedback from, interface unit B. A microphone extender cable plugs into interface unit A, so the microphone can reach the operator. Interface unit A must be connected to a 12-V source.

The hand-held microphone supplied with the IC-900 includes a 16-key dual-tone, multifrequency (DTMF) pad on the back. UP and DN (down) pushbutton switches are conveniently located on the top edge of the

microphone. These buttons are used for changing the operating frequency in the VFO mode, and for stepping through the memory channels when in memory mode. (More on this later.) The buttons also start the scan functions. A small slide switch just above the DTMF keypad turns the UP/DN buttons on and off.

Interface unit B provides the connections to the various band units and is connected to interface unit A by a fiber-optic cable. Interface unit B measures about 7 × 7½ inches and is 1 inch high. The band units stack on top of interface unit B, and this assembly is designed to be mounted in the trunk. Interface unit B also requires a connection to the 12-V supply. Interface unit B, in turn, has a row of rear-panel connectors to provide the power connection to each band unit.

As you build your stack of band units on top of interface B, you must install a 15-wire jumper cable between each unit and interface B. You must remove the front cover from each band unit to install the jumper, but the front cover is easily removable—it is a plastic cap that snaps into place on the metal box. I was surprised that ICOM chose to use 15 individual wires to make these jumpers. A piece of 15-conductor ribbon cable seems a better choice.

The mounting bracket for interface unit B allows one band module to be stacked directly on top of the interface unit. The band units come with a pair of extender brackets that attach to either side of the stack. All of the band units can be secured atop each other with these extenders.

Each band unit has a power cable equipped with a connector that plugs into the strip on the back of interface unit B.

Table 1**ICOM IC-900 VHF/UHF FM Transceiver, Serial no. 654-001349****Manufacturer's Claimed Specifications**

Frequency coverage: UX-29A band unit—transmitter 140.1-150.0 MHz; receiver, 138-174 MHz (specifications guaranteed 144-148 MHz). UX-39A band unit—220-225 MHz.

Mode of operation: FM.

Frequency display: Not specified.

Frequency resolution: 5 kHz.

Power requirements: 13.8 V dc ($\pm 15\%$) at 6 A max on transmit and 600 mA on receive.

Transmitter

Power output: For UX-29A and UX-39A, 25 W high power and 5 W low power.

Spurious signal and harmonic suppression: Better than 60 dB.

Receiver

Receiver sensitivity: Better than 0.18 μV for 12 dB SINAD for UX-29A and UX-39A.

Squelch sensitivity: UX-29A, less than 0.11 μV ; UX-39A, less than 0.13 μV .

Receiver audio output: More than 2.4 W.

Color: Black.

Size (height, width, depth): Remote controller, 2 x 5.9 x 1 inches; interface unit A, 1 x 7 x 7 inches; interface unit B and UX-29A and UX-39A band units, 1 x 7 x 7.6 inches.

Weight (lbs): Remote controller, 0.4; interface unit A, 1.1; interface unit B, 2; UX-29A and UX-39A band units, 2.4.

Measured in the ARRL Lab

As specified, except UX-39A receives 216-236 MHz.

As specified.

LCD, black digits with light background.

As specified.

13.8 V dc at 5.0 A on transmit (high power) and 2.7 A (low power), and 640 mA on receive.

Transmitter Dynamic Testing

UX-29A: high 27.1 W, low 5.4 W.
UX-39A: high 28.4 W, low 6.1 W.

See Figs 1 and 2.

Receiver Dynamic Testing

UX-29A: 0.145 μV for 12 dB SINAD; 0.275 μV for 20 dB quieting.
UX-39A: 0.15 μV for 12 dB SINAD; 0.315 μV for 20 dB quieting.

UX-29A, 0.09 μV min, 0.25 μV max. UX-39A, 0.13 μV min, 0.25 μV max.

2.53 W at 10% total harmonic distortion (THD) with an 8- Ω load

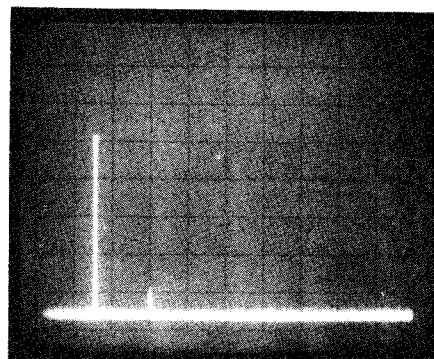


Fig 1—Worst-case spectral display of the ICOM IC-900 using the UX-29A 2-meter band unit. Each horizontal division is 100 MHz; each vertical division is 10 dB. Output power is approximately 27 W at 146 MHz. The fundamental has been reduced by approximately 28 dB with notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 69 dB below peak fundamental output. The IC-900/UX-29A complies with current FCC specifications for spectral purity.

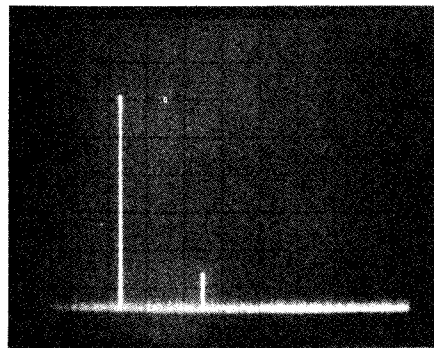


Fig 2—Worst-case spectral display of the ICOM IC-900 using the UX-39A 220-MHz band unit. Each horizontal division is 100 MHz; each vertical division is 10 dB. Output power is approximately 28 W at 222 MHz. The fundamental has been reduced by approximately 18 dB with notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 66 dB below peak fundamental output. The IC-900/UX-39A complies with current FCC specifications for spectral purity.

In addition, each band unit has a coax pigtail fitted with a female UHF connector at one end. Each of these connects to an appropriate antenna for the frequency range covered by that band unit.

The instruction manual indicates that a heavier power cable and a cooling fan for interface B are available options. These are required if you plan to use the 45-W 2-meter band unit (UX-29H). The manual suggests using the heavy duty power cable to reduce the voltage drop in the line and recommends the fan, especially to cool the radio in hot summer weather or during long transmissions. I did not have either of these accessories with the review unit, but I experienced no heat problems—even during a summer when the outside temperature soared into the 90s for more than 30 days in a row.

Installation

The lead photo for this review shows a complete IC-900 partially assembled. See what I mean about all the pieces? Assembling the IC-900 system isn't as overwhelming as it sounds once you have all the units in your hands. The instruction manual gives detailed directions for making the interconnections, and there are lots of clear diagrams showing how all the pieces go together.

I spent about an hour planning how to run the required cables and where to locate

the various boxes before I began to actually install the IC-900 in my car. I wasn't anxious to drill holes in the floor or trunk for the sheet metal screws included with the kit to attach the mounting brackets. That's when I realized that my car's carpet looked just like the loops on a strip of Velcro®! Several strips of adhesive-backed Velcro were included in the package, so I put some of them on the corners of the mounting brackets. Interface unit A was quickly secured under the front passenger seat, and interface unit B was stuck to the carpet in the floor of the trunk. I used some of the double-sided tape included with the kit to attach the remote control unit to the dash.

It didn't take long to find a hole through the firewall suitable for connecting the power cables to the battery. By removing a few screws, I was able to lift molding strips along the sides and floor, and I ran the power cable and fiber-optic control cable under these molding strips. Figs 3 and 4 show the remote controller and the interface unit B/band unit stack mounted in my car.

Instruction Manual

The IC-900 instruction manual is a 40-page document that provides detailed installation and operating information. It does not include a description of the circuit theory of operation, nor an extensive troubleshooting section. There is a one-

page block diagram, but no schematic diagram of the various modules.

Each band unit comes with a small booklet showing how to unpack and install that band unit to the interface unit B stack. There is also a 12- by 27-inch sheet of paper that includes a complete schematic diagram of the band unit and a block diagram showing how the other units interconnect with it.

The instruction manual gives clear, step-by-step instructions for assembling the pieces of the radio and installing them in a vehicle. It also provides detailed instructions covering every aspect of operating the radio to take the most advantage of its many characteristics. There may be a few typos, and there are certainly some instruc-



Fig 3—IC-900 remote controller attached to the car dashboard.

tions that could be stated more clearly. The manual is very good overall, however, and I was able to find (and understand) all of the information I needed to enjoy operating the IC-900.

Programming the Radio

The IC-900 is a versatile radio. The remote control unit can address two band units at once. This means you can receive signals on two separate bands, with both signals coming through the same speaker, or with a separate speaker for each band. The remote control unit stores complete operating conditions in each of 10 memories for both bands. This means you can program just about any transmit offset into any memory channel. You can also program a subaudible tone frequency or set the radio to skip over certain channels in the scan mode.

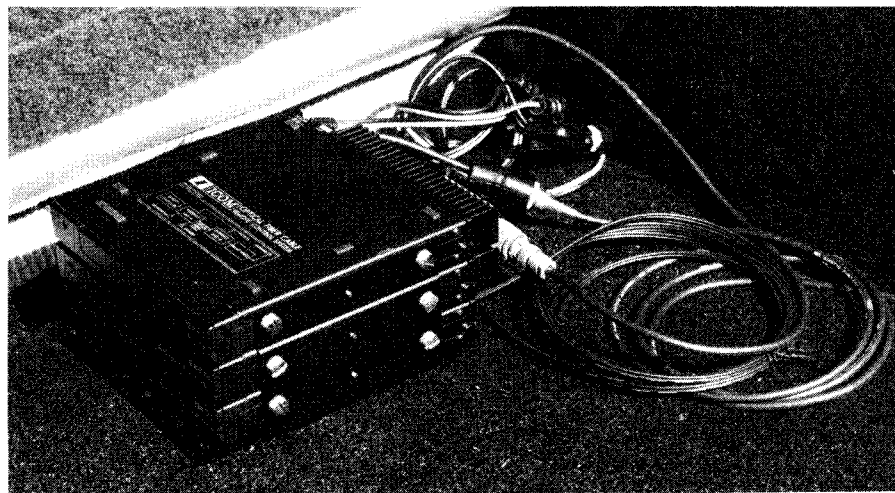


Fig 4—Interface Unit B and the 2-meter and 220-MHz band units make a neat stack in the cargo area of the car.

This radio is complicated enough that I had to read the instruction manual to learn how to program the memories. In fact, I had to read through the process a couple of times and practice the maneuvers before I was able to remember how to do it on my own. Most of the labels on the control buttons are self-explanatory, but there are a few that are not immediately obvious. You'll want to study the manual to become familiar with the operation of all the control buttons.

When you press the SET button, the radio begins a special sequence that allows you to program various operating conditions. First is the tuning step. Allowable steps depend on the band unit you are using at the time, but for most band units you can select steps of 5, 10, 15, 20 or 25 kHz. You also select the transmit offset and subaudible tone frequency.

The next two steps in the SET sequence allow you to specify the limits for the programmed scan feature. If you have more than two band units connected to interface unit B, you will also be given the chance to select which two you want to have active. There are some additional steps in this sequence if you have certain options installed. Some band units provide RIT, so you can select the tuning step for this feature. Two optional squelch units are available: a digital code squelch unit and a tone squelch unit. These allow selective calling (in which either a certain digital code or a specific tone must be received to open the squelch and activate the receiver). The SET sequence allows you to activate or deactivate these squelch units.

I mentioned that each band unit has 10 memories, but I discovered that I could program 12 different frequencies into the IC-900! In addition to the memories, there is a CALL channel. This frequency can be accessed at any time by pressing the CALL button. Repeater offset, subaudible tone and other operating conditions can be

programmed into this channel. The last "memory" channel is the VFO. After you have programmed the 10 memory channels and the CALL channel, you can set up the VFO with still another set of operating conditions.

Operating Impressions

For such a small piece of equipment, the remote control unit sure does a lot! Nearly half of its width is taken up with the display, and another 1½ inches are for the tuning knob and the squelch and volume buttons. The 12 buttons that provide nearly all of the control features are packed into a 1½-inch-wide space. Each of those buttons is about ½ inch wide and ¼ inch high. Although the buttons are small, I had little trouble operating them with my somewhat clumsy fingers.

Several people have commented, after looking at the IC-900, that they would rather have rotary controls for the squelch and volume controls. I found that having two buttons to increase and decrease squelch and two more to control the volume was quite convenient. Once I learned where those buttons were, it was a very simple matter to reach over and tap a button to change the volume while driving. Even at night, I can easily find the right button. (The volume-up button is at the bottom right edge and the volume-down button is just to the left of that. The squelch buttons are along the top right side of the remote control unit.)

There are two seldom-used slide switches along the right end rather than on the front panel with all the other controls. One switch changes the background illumination of the display. The other locks the microprocessor (to keep you from making accidental changes to the radio's operating conditions). With the microprocessor locked, you can still change the squelch and volume levels, switch between high and low power and turn off the audio from the sub band.

What is the sub band? The remote control unit can access two band units at once. You can only transmit on one band at a time, however. That band is called the main band. The other band, then, is called the sub band. By pressing the SUB button, you can tune this second band, program its memories, or do anything else except transmit. When you want to transmit with the sub band, you use the M/S button to swap the main- and sub-band frequencies.

Listening to the audio from the sub band while you are trying to carry on a conversation (or even listen to one) on the main band can be quite distracting. Pressing the button labeled S.MUTE once turns off the sub band audio, and pressing it again turns the audio back on. Turning the power to the radio off and back on also turns the sub band audio on again.

There is a button labeled CHECK. While you hold this button in, the receiver

monitors the transmit frequency. This helps you determine if a station that you are listening to on a repeater is in simplex range. You will not be able to transmit on the normal receive frequency by holding in this button, however. (Some radios do this; with them, you can call another station on the repeater output frequency without going through the repeater.)

Another button that I find quite useful is the MHz button. Press it once and the tuning knob changes the operating frequency in 1-MHz steps. Press the button again to change back to the programmed tuning step.

Depending on how you mount the remote-control unit, you may find it a bit difficult to read the labels on some of the buttons. In my car, the radio is mounted on the dash, just to the right of the instrument panel. This part of the dash is tilted slightly. It seems nearly ideal to slant the control panel toward my eyes. Because the remote controller is a bit to my right, however, I do not look straight at the panel. The buttons are silver colored, with the letters cut out of the surface to form the labels. This gives the appearance of black lettering on the silver surface during the day. Depending on how the buttons reflect the light, they can be difficult to read—unless I lean over to look straight at the control panel. When the power is on, the labels are backlit. This isn't very noticeable during the day, but at night it does make them easier to read. (I have seen control panels that are easier to read even at night, though.)

The wide tuning range of the UX-29A 2-meter band unit provided some interesting listening. I especially enjoyed being able to program the local National Weather Service channel into one of the memories. This is especially handy for traveling, since it is a simple matter to dial up a local channel and listen to the latest weather info.

I should mention a few concerns that I have about the IC-900. The first is the cable that goes between the remote control unit and interface unit A. It consists of a very thin wire (read "delicate and easily broken") that reminds me of the wires used on the popular lightweight personal stereo headphones. With a miniature stereo plug on both ends, this wire is, I think, likely to be damaged rather easily. Before I installed the IC-900, several people commented that the remote-control cable wouldn't last a week. For them, it probably wouldn't! When I installed the radio, I carefully placed the remote-control cable under some trim moldings to protect it and keep it out of the way. Still, portions of the cable must be in the open, and if it gets caught on something and is stretched or pulled, I think it could break easily.

Another item of concern is the fiber-optic link between interface units A and B. The instruction manual cautions you against bending the cable in a radius of less

than 25 mm (about an inch) and against bending it side to side or cutting it. I'm left to wonder how much of a nick in the outer covering would damage the cable, or how much side-to-side flexing the cable will withstand. How quickly will it break if a bend becomes too sharp, making a corner with less than a 1-inch radius?

I didn't have any trouble with either of these concerns. I suggest you be as careful as I was to hide the wires and fiber-optic cable behind moldings and under carpets to protect them from damage.

Summary

Only one problem occurred with the IC-900 during the review period. During initial testing, intermittent connection in

interface unit A caused the rig to transmit unexpectedly. Interface unit A was returned to the dealer and repaired promptly.

Otherwise, the IC-900 performed flawlessly. It offers a lot of features, yet can be operated after just a little study. If you are interested in operating on several of the popular VHF and UHF bands from your car, but don't know how you could fit several radios under the dash, the IC-900 may be the radio for you.

Manufacturer: ICOM America, Inc, 2380 116th Ave NE, Bellevue, WA 98004, tel 206-454-7619. Price class: IC-900 interface units and remote control unit, \$639; UX-29A 2-meter band unit, \$299; UX-39A 220-MHz band unit, \$349.

YAESU FT-212RH 2-METER AND FT-712RH 70-cm FM TRANSCEIVERS

Reviewed by Jay Mabey, NU0X, and Kirk Kleinschmidt, NT0Z

The controls of Yaesu's new mini-mobile FM transceivers are identical (only the frequency coverage and power output differ), so we decided to review them together. The FT-212RH covers 140 to 174 MHz on receive and 140 to 150 MHz on transmit. The FT-712RH covers 430 to 450 MHz. Both rigs offer a solid lineup of standard features—and a few not-so-standard ones, such as an optional built-in digital voice recording module that doubles as an answering machine for you and your friends.

The first thing you will notice about the radios is their size—they are quite small, measuring approximately $1.75 \times 5.5 \times 6.5$ inches (height, width, depth). That's about the size of a thick paperback book with a three-inch-thick heat sink attached to the spine. The '212 and '712 should be easy to install in almost any mobile installation. A sturdy mounting bracket is included with the rigs, and the three (and only three) rear-panel connectors (a power cable, a cable-mounted RF output connector and an external speaker jack) add to the rig's ease of installation.

General Operation

Since Jay's arrival in Connecticut from North Dakota, he hasn't been actively involved in the 2-meter FM mobile scene. Aside from a little traffic handling, Jay's had very little experience with metropolitan repeaters. When he was asked to review the FT-212RH, he was excited at the idea of having a radio in the car again!

The setup in Jay's car uses a Larsen through-the-windshield antenna, with the radio mounted on the rear of the center console. This system is aesthetically pleasing, but it's extremely difficult to see the radio's controls. The FT-212RH front panel design is so clean and open, though, that this lack of visibility is not a serious problem. Some

other multifunction radios are more cumbersome—you accidentally push three buttons when you mean to push one!

The front panel has 13 controls. Most buttons have a primary and an alternate function, much like a scientific pocket calculator. Primary functions are indicated by white labels on the front panel; secondary functions are labeled in blue. For example, momentarily pressing the F/WRITE button (used as a function key as well as for programming frequencies into the unit's memories) and then pressing the REV button allows the user to select the rig's tuning rate (by rotating the main tuning knob, which is normally used to change the operating frequency!). Getting used to these multiple functions can be confusing, but the result is that the tiny front panel is relatively uncluttered.

The '212 and '712 incorporate a system of high- and low-pitched musical notes to indicate all selected functions, making the transceiver appropriate for visually impaired operators. For those who cringe at the thought of a beeping radio, the beep volume is controlled by the main volume control, and the tones may be disabled by pressing the front-panel BEEP button.

Other Features

We must first compliment Yaesu on the excellent operating manual included with the rigs. A schematic diagram and a quick reference card are also included. (Only the hardiest of hams will look forward to repairing or modifying these radios, however. The insides look like a VLSI modern-art masterpiece—it's fascinating to look at, but most hams would not want to tackle a do-it-yourself repair job.) After unpacking a new radio, it's a good idea to read the manual from cover to cover. This manual is both interesting and informative. Each of the different functions and options is described in detail, and examples are given to assist the owner with the unit's many features.

The FT-212RH features a selectable 5- or 45-watt RF output. The 70-cm



FT-712RH puts out 3 or 35 watts. The use of surface-mount components, modular circuit construction, and a compartmentalized, die-cast chassis make the transceivers both reliable and rugged (as proven by the trial by fire on Connecticut roads).

The liquid-crystal display (LCD), which includes a power/S meter and frequency readout, also shows some 20 other operating parameters. As with many LCDs, the display is somewhat difficult to read in very high ambient light levels—even though Yaesu has included an ambient light sensor to control the legibility of the display. Front-panel controls (with the notable exception of the main power switch and the high/low power switch) are backlit for ease of viewing at night.

For high ambient noise level installations, several optional external speakers (Yaesu SP-3, SP-4 and SP-55) are available for placement near the operator position.

You can also purchase the optional lightweight headset/minature boom microphone (YH-1) for hands-free operation.

The '212 and '712 have 18 general-purpose memories for storing programmable (+ or -) repeater shifts or independent transmit/receive frequencies. There are also three special memories, including C for call channel memory and L and U memories, which are used only in the programmable memory scan mode for storing upper and lower scanning limits (more on this later). One-touch repeater reverse and priority channel monitoring are very easy to set from the front panel.

For those interested in packet radio, the Yaesu transceivers are easily modified to provide microphone jack connections for most popular TNCs. One minor inconvenience: For packet operation, the connection for the tone-burst button on the microphone must be removed and a jumper

must be added to extend the squelch line to the microphone jack. The radio must be partially disassembled, and some soldering is required to perform these modifications. (These mods are easy to perform.) The microphone jack also has connections for controlling the transceiver from an external personal computer.

The test rigs were not equipped with Yaesu's optional digital voice system (DVS), but DVS appears to be an interesting option—one worthy of consideration. The DVS unit allows user-programmable recording and playback of messages—either locally or remotely—by use of dual-tone multifrequency (DTMF) control codes. Messages are stored in RAM, and the memory may be used as a single block or divided into four or eight segments. Incoming messages can be recorded by stations having access to your private station ID number.

Operation

After turning on the main power switch, the first order of business is to tune in your favorite repeater. This can be accomplished by turning the large rotary tuning knob, or by pressing the up/down pushbuttons on the hand microphone. Selectable tuning rates are 5, 10, 12.5, 20 or 25 kHz per step. Scanning functions are also activated by pressing (and holding for a short time) the microphone up/down buttons. If the radio is in "dial mode," the entire band, or a portion thereof, will be scanned. If "memory mode" is selected, the memory channels will be scanned.

Using the memories is simple. To store a set of parameters in memory simply press the F/WRITE button, hold for a half-second, select the memory number and press F/WRITE again. The displayed frequency and selected repeater split are now stored in memory. To recall memories, simply press the D/MR button (a toggle between dial and memory tuning) and

Table 2

Yaesu FT-212RH 2-meter FM Transceiver, Serial no. 7N050451

Manufacturer's Claimed Specifications

Frequency coverage: 144 to 148 MHz.

Mode of operation: FM.

Frequency display: Not specified.

Frequency resolution: 5 kHz.

Power requirements: 13.8 V dc ($\pm 10\%$) at 10 A max on transmit and 500 mA on receive.

Transmitter

Power output: Low, 5 W; high, 45 W.

Spurious signal and harmonic suppression: Better than 60 dB.

Receiver

Receiver sensitivity: Better than 0.18 μ V for 12 dB SINAD.

Squelch sensitivity: Not specified.

Receiver audio output: At least 1.5 W at 5% total harmonic distortion (THD) with an 8- Ω load.

Color: Black.

Size (height, width, depth): 1.75 x 5.5 x 6.5 inches.

Weight: 2.8 lbs.

Measured in the ARRL Lab

Transmitter: 140.0 to 150.0 MHz; receiver: 140.0 to 174.0 MHz.

As specified.

6-digit LCD, black digits with white background.

As specified.

13.8 V dc at 7.75 A on transmit high power) and 2.75 A (low power), and 460 mA on receive.

Transmitter Dynamic Testing

Low, 5 W; high, 47 W.

See Fig 5.

Receiver Dynamic Testing

0.18 μ V for 12 dB SINAD.

0.27 μ V for 20 dB quieting.

0.13 μ V min, 0.34 μ V max

1.95 W at 10% THD with an 8- Ω load.

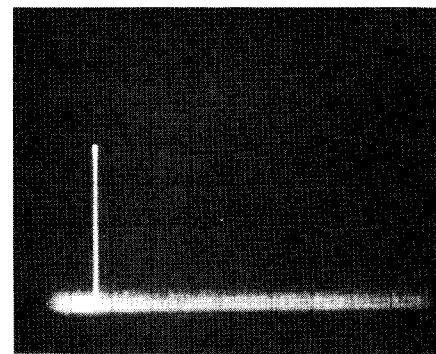
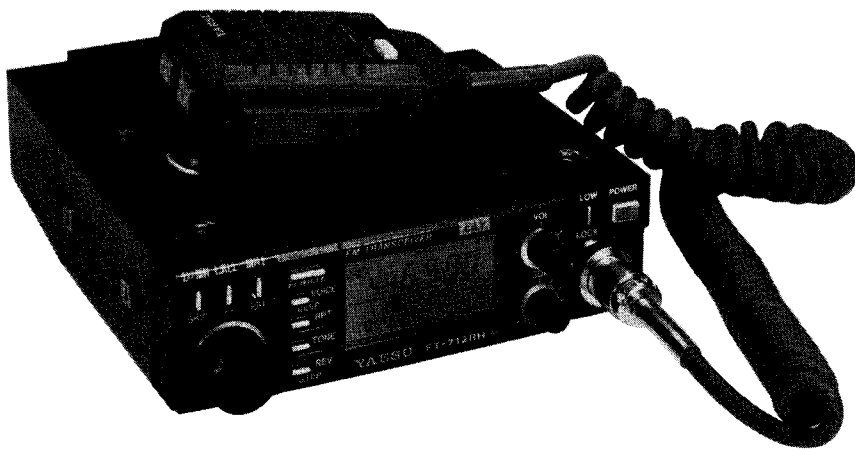


Fig 5—Worst-case spectral display of the Yaesu FT-212RH. Each horizontal division is 100 MHz; each vertical division is 10 dB. Output power is approximately 45 W at 146 MHz. The fundamental has been reduced by approximately 30 dB with notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 70 dB below peak fundamental output. The FT-212RH complies with current FCC specifications for spectral purity.



rotate the main tuning knob to select the desired memory. The '212 and '712 also have memory scanning, with the ability to skip certain memories if desired (for example, to keep the transceiver from constantly stopping on a busy local repeater).

As mentioned previously, the U and L memories work together to form the upper and lower limits of a programmable sub-band. The C memory, or call channel, can be recalled instantly via a front-panel push-button and is helpful for storing an often-used frequency, such as a local repeater or simplex channel. Priority channel monitoring is also included. This feature is fairly standard, and allows the monitoring (every five seconds) of a particular selected frequency while the transceiver is operating on a different frequency.

Summary

The FT-212RH and FT-712RH are very easy to operate and remarkably simple, despite their bells and whistles. Audio quality is good in all but very noisy environments. The impressive 45 watts of RF output (35 watts for the '712) is also an asset, especially for mobile operation. The units

are designed to be removed easily from the mobile mounting bracket, which is conducive to both base/mobile operation and theft protection.

These mini-mobiles are representative of the current crop of compact FM mobile transceivers, and warrant consideration if you are looking for a small, versatile and easy-to-use radio. Overall, Yaesu has come up with two well-built, flexible, transceivers in the '212 and the '712.

Price class: FT-212RH, \$460; FT-712RH, \$500. Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90701, tel 213-404-2700.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment "off-the-shelf" from Amateur Radio dealers. ARRL receives no remuneration for items presented in the Product Review or New Products columns.—Ed.]

The following ARRL-purchased Product Review equipment is for sale to the highest

bidder. Prices quoted are minimum acceptable bids and reflect a discount from the purchase price.

Sealed bids must be submitted by mail and be postmarked on or before December 27, 1988. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

Please clearly identify the item you wish to bid on, using the manufacturer's name, model number, or other identification number if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by the successful bidder, FOB Newington. The successful bidder will be advised by mail of the successful bid. No other notifications will be made, and no information will be given by telephone to anyone regarding final price or identity of the successful bidder.

Please send your bids to Kathy McGrath, Product Bids, ARRL, 225 Main St, Newington, CT 06111.

ICOM IC-761 160- to 10-meter transceiver, serial no. 01440, with SM-10 desk microphone (sold as a package only; see Product Review, September 1988 *QST*). Minimum bid \$1506.

Kenwood TS-680S 160- to 6-meter transceiver, serial no. 8111053, with YG-455C-1 500-Hz CW filter, VOX-4 VOX unit, IF-10C computer interface and PS-430 power supply (sold as a package only; see Product Review, October 1988 *QST*). Minimum bid \$825.

Kenwood AT-250 automatic antenna tuner, serial no. 7100135 (see Product Review, October 1988 *QST*). Minimum bid \$238.

ICOM IC-575A 10- and 6-meter multimode transceiver, serial no. 01012 (see Product Review, October 1988 *QST*). Minimum bid \$789.

Table 3

Yaesu FT-712RH 70-cm FM Transceiver, Serial no. 8C050021

Manufacturer's Claimed Specifications

Frequency coverage: 430 to 450 MHz.
Mode of operation: FM.
Frequency display: Not specified.

Frequency resolution: 5 kHz.
Power requirements: 13.8 V dc ($\pm 10\%$) at 10 A max on transmit and 500 mA on receive.

Transmitter

Power output: Low, 3 W; high, 35 W.
Spurious signal and harmonic suppression: Better than 60 dB.

Receiver

Receiver sensitivity: Better than 0.18 μV for 12 dB SINAD.
Squelch sensitivity: Not specified.
Receiver audio output: At least 1.5 W at 5% total harmonic distortion (THD) with an 8- Ω load.
Color: Black.
Size (height, width, depth): 1.75 x 5.5 x 6.5 inches.
Weight: 2.8 lbs.

Measured in the ARRL Lab

As specified.
As specified.
6-digit LCD, black digits with white background.
As specified.
13.8 V dc at 8 A on transmit (high power) and 2.75 A (low power), and 490 mA on receive.

Transmitter Dynamic Testing

Low, 4.7 W; high, 40.3 W.
See Fig 6.

Receiver Dynamic Testing

0.17 μV for 12 dB SINAD.
0.27 μV for 20 dB quieting.
0.12 μV min, 0.34 μV max
2.14 W at 10% THD with an 8- Ω load.

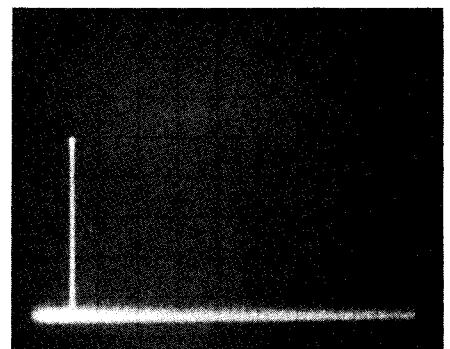


Fig 6—Worst-case spectral display of the Yaesu FT-712RH. Each horizontal division is 100 MHz; each vertical division is 10 dB. Output power is approximately 40 W at 440 MHz. The fundamental has been reduced by approximately 30 dB with notch cavities to prevent analyzer overload. All harmonics and spurious emissions are at least 72 dB below peak fundamental output. The FT-712RH complies with current FCC specifications for spectral purity.