Product Review & Short Takes Columns from *QST* Magazine

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Product Reviews

Yaesu FT-8900R Quad Band FM Transceiver
RadioShack HTX-420 Dual-Band Handheld Transceiver
MFJ-890 DX Beacon Monitor

Yaesu FT-8900R Quad Band FM Transceiver

Reviewed by Joe Carcia, NJ1Q
W1AW Station Manager

At first glance, the FT-8900R appears to be a rather simple radio to operate. But looks can be a bit deceiving. Before I first applied power to activate it, I thought reviewing this radio was going to be a piece of cake. After all, since I am often exposed to various manufacturers' radios as W1AW station manager, I felt I sort of developed a sense for getting radios immediately on the air. That wasn't the case with the FT-8900R .

Read the manual! Those words immediately came to mind—after I applied power. A quad-band radio with full duplex operation? No immediate way to set the shift? The MAIN band was on the *right* side, and on 430 MHz? This rig is not something one merely applies power to and begins operating, as I thought I could. You have to read the manual.

An Overview

The neat thing about the FT-8900R is that it's not chock-full of so many little extras one may never use. Yes, it comes with all the basics, plus a few extras, but not so many as to be intimidating.

It's an FM-only transmitter, with full transmit coverage on the 29, 50, 144 and 430 MHz amateur bands. Be careful, though—the '8900R transmits across the entire 10-meter band, but FCC rules limit FM operation to 29-29.7 MHz. The band-edge memories can be set to avoid operation below 29 MHz

The FT-8900R has a simple and sturdy design. The LCD display is clear and bright, with easily readable characters. The function buttons (for controlling power level, VFO or memory modes, home frequency, scanning and menus) on the bottom of the front plate are a bit small, but that doesn't hamper their operation too much, unless you have extremely large fingers. The front panel has four knobs used to control such things as frequency, volume and squelch.

Each band has its own set of function buttons. There is no function sharing here, with the exception of the SET button. What's good about this is that you can quickly change a power level or a home frequency on either band without having to resort to menu shuffling.

The '8900R has an interesting way to change bands. The LEFT and RIGHT bands can be changed by pressing on the dial knob that corresponds to whatever is the MAIN band at the time for at least a half second. However, the frequency on the SUB band can still be changed with its respective dial. The LEFT band, however, is the more versatile of the two, toggling between the 29, 50, 144, 350, 430 and 850 MHz bands. The RIGHT band dial allows you to change between 144 and 430 MHz only.

Tuning steps are 5, 10, 12.5, 20, 25 and 50 kHz. The radio defaults to 5 kHz, but this can be changed via menu 37. By pressing the tuning knob briefly (less than ½ second), you will enable a 1-MHz tuning step, allowing rapid tuning.

The knobs have a smooth feel to them, and are designed with wide knurls to facilitate a good grip. The LEFT and RIGHT knobs (used to control frequency, among other things) are indented. Each one has multiple functions, similar within each band.

Speaking of knobs, I like that there is an actual squelch control! Some of the radios of today have squelch levels that are controlled by menu settings only. This is fine, but what do you do when the noise level rises dramatically (and quickly)? Depending on the noise level, going through a menu function to adjust the squelch—all the while not wanting to lower the volume level because you may be in QSO—can be problematic. So having mechanical control of the squelch is certainly a plus!

Bottom Line

Four bands in one small box make the FT-8900R an attractive choice for the FM operator who wants nearly everything.

Display

As with most LCD displays, the angle plays an important role of how well the characters are viewed. With the '8900R sitting on my desk, the display itself is still readable when I look down at it. Pitch the radio up an appreciable angle, however, and the display almost disappears. This is a consideration when installing the radio.

The display is not busy. A function is displayed only if it's being used. There are no little extras that may distract the viewer. The signal strength level is shown only during actual signal reception (or when the squelch is lowered) and during transmissions. Otherwise, you generally see the two frequencies, the shifts, CTCSS encoding (if activated) and which band is MAIN.

Like most radios, the front panel is detachable, so the "guts" of the radio can be installed elsewhere in a vehicle or home station. To do this, you'd need the YSK-8900 Separation Kit.

The speaker is located atop the radio. Given its small size, the volume is quite good, and without distortion. Even when operating mobile, road noise didn't have too much affect. I merely turned up the volume a bit more.

A note about the speaker: as with my Yaesu FT-90R, when I mounted it in my truck, I found I needed an external

Brennan Price, N4QX ♦ Assistant Technical Editor ♦ n4qx@arrl.org

Table 1
Yaesu FT-8900R, serial number 2H020415

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 28-29.7, 50-54, 108-180, 320-480, 700-985 MHz (cell blocked); transmit, 28-29.7, 50-54, 144-148, 430-450 MHz.	Receive and transmit, as specified.
Power requirement: Receive, 0.5 A (max audio); transmit, 8.5 A (high power).	Receive, 0.34 A; transmit, 7.2 A. Tested at 13.8 V.
Modes of operation: FM.	As specified.
Receiver	***Receiver Dynamic Testing***
FM sensitivity, 12 dB SINAD: < 0.2 μV.	For 12 dB SINAD, 29 MHz, 0.16 μV; 50, 144, 430 MHz, 0.18 μV.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 29 MHz, 65 dB; 52 MHz, 62 dB; 146 MHz, 58 dB; 440 MHz, 57 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 29 MHz, 65 dB*; 52 MHz, 62 dB*; 146 MHz, 58 dB*; 440 MHz, 57 dB*. 10 MHz channel spacing: 52 MHz, 80 dB; 146 MHz, 92 dB; 440 MHz, 79 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	108 dB.
S-meter sensitivity: Not specified.	S9 indication: 29 MHz, 8.7 μV; 52 MHz, 7.1 μV; 146 MHz, 7.6 μV; 440 MHz, 5.0 μV.
Squelch sensitivity: < 0.16 μV.	At threshold: 29 MHz, 0.06 μV; 52 MHz, 0.05 μV; 146 MHz, 0.04 μV; 440 MHz, 0.05 μV.
Receiver audio output: 2.0 W at 10% THD into 8 Ω.	2.2 W at 10% THD into 8 Ω.
Spurious and image rejection: Not specified.	First IF rejection, 29 MHz, 56 dB; 52 MHz, 20 dB; 146 MHz, 103 dB; 440 MHz, 100 dB; Image rejection, 29 MHz, 123 dB; 52 MHz, 112 dB; 146 MHz, 96 dB; 440 MHz, 71 dB.
Transmitter	***Transmitter Dynamic Testing***
Power output (H/M/ML/L), 29, 50, 144 MHz: 50/20/10/5 W; 430 MHz, 35/20/10/5 W.	29 MHz, 47 / 18.5 / 8.9 / 4.3 W; 52 MHz, 46 / 17 / 7.3 / 3.3 W; 146 MHz, 51 / 19 / 9.4 / 4.2 W; 440 MHz, 30 / 18 / 9.8 / 4.4 W.
Spurious-signal and harmonic suppression: 29 MHz, ≥50 dB; 50, 144, 430 MHz, ≥50 dB.	65 dB. Meets FCC requirements for spectral purity.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 29, 52 MHz, 110 ms; 146, 440 MHz, 200 ms.
Receive-transmit turn-around time (tx delay): Not specified.	110 ms.
Size (height, width, depth): 1.6×5.5×6.6 inches; weight, 2.2 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.

speaker, since this particular radio's speaker is also located atop it. When I temporarily mounted the '8900R in my truck, I found that given the mounting method I used, the speaker was blocked, so the audio was muted. If mounting this radio in a vehicle, consideration has to be given to the speaker's location. Otherwise, you will find it necessary to add an external speaker. But if you do, you'll also find there is certainly enough punch to the audio (2 W) to drive the speaker!

The microphone (a stock MH-48) performed as expected. Since this particular microphone can be programmed, the non-numeric keys on it are not labeled with a function. Rather, they are labeled P1, P2, P3 and P4. The manual gives an explanation of each key's default function. Programming these keys, like so many other features, is a function of the menu system. Each key has its own menu setting. The microphone also has the standard back light function, UP and DOWN keys and LOCK switch. (The LOCK switch controls the function keys, not the keypad or PTT switch.)

If one decides to go with one of the other Yaesu microphones, you have to select within the '8900R the type used. This is another function set via the menu system (item number 23).

The rear of the radio has a single SO-239 UHF connector. So unless you have a diplexer or dual-band antenna (usually 2 meters/70 cm), you'll have to use a multiple antenna switch if you want to use this radio on all four bands and don't feel like playing the connector shuffle.

Power is supplied via a pigtail (out the back of the radio) that terminates to a 2-pin standard locking power plug. Next to the power line is a standard mini-DIN connector (6-pin) that is used for the data (1200/9600 baud packet) and cloning features. The pinout for these functions is described in the manual. A CT-39A Packet Interface Cable is also available as an option for those who are uncomfortable making their own.

The fan is mounted on the final heat sink (located on the back of the radio) and is activated each time one transmits. Unlike some radios that allow you to vary fan activation times, the '8900R does not have this feature. The fan is extremely quiet, so having it running at each transmission is

not a problem. Depending on the transmit time, the fan may run a bit longer since it's thermostatically controlled.

A Multitude of Menus

It wasn't readily apparent that many of the settings just to get the radio to operate on the local 2-meter repeater were buried inside a menu someplace. But what's a simple menu? Well, unless I miscounted, there are 46 menus associated with the radio's functions. Now, if this sort of thing doesn't worry you, then the first step would be to tune to your local repeater and give it a whirl!

But what if your local repeater requires a CTCSS tone? Then it's off to menu setting 40, where you select the appropriate CTCSS tone that corresponds to the repeater. It's not as simple as that, however. As with most of the menu functions, you'll use the Main [whatever VFO is active is considered Main] band dial knob for selecting the menu number. This is only after you engage the menu function with the SET button. This same knob is also used for selecting options within each menu. When selecting a CTCSS tone, you'll be depressing this knob at least three times (in addition to rotating it) before you can pick the tone you need.

The point here is that there are some menu levels you need to descend before you get to the desired function. This is generally the case with most of the radio's other functions. Gone are the days where you depress one or two buttons to obtain a CTCSS tone (or any other function for that matter).

Operating

The FT-8900R has general coverage FM and, where applicable, AM reception on the entire 10 and 6-meter bands; 108 to 180 MHz; 320 to 480 MHz; and 700 to 985 MHz (with cellular blocked).

Transmit capabilities are on the entire 28, 50, 144 and 430 MHz amateur bands using only FM. The power output levels on 28, 50 and 144 MHz are 5, 10, 20 and 50 W, and are adjustable via the front panel LOW button. Power levels on 430 MHz are 5, 10, 20 and 35 W.

The reception of either strong or weak signals was as expected. Received signal reports indicated that the audio was generally clean and clear. Users in high-intermod areas will be pleased with the FT-8900R's quietness on 2 meters. In ARRL Lab tests, the two-tone, third-order IMD dynamic range was measured at a very respectable 92 dB at 146 MHz and 10-MHz spacing. This test is indicative of performance in the presence of nearby business or paging transmitters around 155 MHz, and the 92-dB figure is at the high end of multi-band FM mobile rigs.

Back at home, I was pleased when I heard a 10-meter FM repeater out of Fort Worth, Texas, when the radio was attached to my outdoor 2-meter ground plane. Being the adventurous type, I quickly tuned up my homebrew G5RV antenna to 10 meters (after I attached it to the '8900R). Since the Fort Worth machine was almost full quieting, I felt I would have no difficulty bringing up that repeater.

A quick click to the PTT switch, and I heard the courtesy tone of the repeater. I was in! However, that was the extent of it. Signal reports from a few of the stations also active on this machine indicated that my audio level was low and they had a difficult time hearing me. Given the machine was nearly full quieting and the stations were copyable, I felt this couldn't be right. Be that as it may, it wasn't until I raised my voice considerably that the stations finally heard me.

To see if there was some basis to this, I switched to my Kenwood TS-440S (with just a dummy load attached) and monitored my 10-meter signal. The audio level was a tad bit low, but not that much. However, when I went to the local 10-meter repeater, signal reports indicated my audio level was fine, and, I didn't have to scream into the microphone. That was a relief.

Thanks for the Memories!

Eight hundred and sixteen total, to be exact! There are 799 standard memories, 5 sets of band-edge memories, 6 home memories and 6 hyper memories (selected via buttons on the front panel). The hyper memory function allows storing of up to 6 channels right there on the front panel. This comes in handy if you have repeaters or frequencies you operate on a regular basis. Your favorite frequencies can be just a push button away.

This radio has a variety of features, including ARTS (the Auto Range Transponder System) with a CWID feature, Internet connection feature (as part of the Vertex Standard Wide-Coverage Internet Repeater Enhanced System), CTCSS encoding/decoding, DCS code inversion and DTMF auto dial. But the one feature most every user will certainly use is the memory system.

Programming memories is not that bad, assuming of course you read through the steps a few times. In this instance, the SET button is used a lot, in conjunction with the MAIN dial knob. Be forewarned—depending on the function, the SET button has to be depressed just momentarily, or, as the manual indicates, ½ second. There does appear to be a difference! Until you get the feel of it, you may find yourself jumping in and out of settings simply because the button was held down a little longer than "momentarily."

After the frequency, CTCSS tone, and so on, are read into a memory channel, you can assign an alphanumeric tag of up to 6 characters to that memory. The complete alphabet (all upper case), numeric set and special characters are included. Character selections are done either with the MAIN dial knob or the UP/DOWN keys on the microphone.

Other Functions

This radio, like so many others, incorporates an automatic repeater shift. This system uses the generally standard offsets for each band. For example, on 2 meters, the standard offset is ± 600 kHz. Just tune to a particular frequency, and the radio determines the most common offset (if any). Of course, ARS has to be activated (menu 2) for this to function properly.

Ten and 6 meters are the exceptions. I found that although I had ARS on, I could not get the radio to display a shift unless I changed the default shift (menu 36). And even then, I could not get the radio to remember that ARS was activated for as soon as I changed frequency—even if it were only 5 kHz—the offset icon would disappear, and I had to set the offset (+,–, simplex) all over again. In my view, if I have ARS on and the shift set in menu 33 (100 kHz for 10 meters and the regional preference for 6 meters), then the radio should maintain these settings. The user should have the option of changing the shift when changing frequency within a band.

Granted, some may argue that the offset can vary on 6 meters, so having to set it each time is just keeping in line with an accepted standard. However, the manual states that ARS has been configured at the factory to include these customary shifts. If this is not going to be the case with 10 and 6 meters, then this should be noted as such in the manual.

Scanning can be done either with the VFO or the memories. If there are just a few memories you wish to scan, then you can incorporate the preferential memory scan function, in which you pick the memory channels you want to receive—kind of an inverse lock-out function. For those who prefer the lock-out function, that's included too.

Like most radios, you can also set the band limits for scanning. This keeps you from scanning, say, the entire 108 to 180 MHz band, and just limiting it to your favorite segments.

The time-out timer feature is adjustable from 1 to 30 minutes. The default is 6 minutes. This is a good feature, especially if you're a long talker and you wish to avoid timing out the repeater.

Automatic power-off is included as well. This function is found in almost every new radio today. The time is adjustable from 1 to 12 hours, in ½ hour increments. Set this, and you may not need to worry about that vehicle battery dying if the radio is left on too long.

Overall thoughts

It's great that Yaesu packed four bands into this small package. Despite the fact there are quite a few menus, overall I liked the way the system is accessed and selections made. It's a one-button (SET) procedure to activate. Yes, you may need to take it a couple of steps depending on a particular function, but that's just the nature of the beast.

Manufacturer: Vertex Standard, 10900 Walker St, Cypress CA 90630; tel 714-827-9100; fax 714-827-9100; **www.vxstdusa.com**. $449.95.

RadioShack HTX-420 Dual-Band Handheld Transceiver

Reviewed by Dan Henderson, N1ND
ARRL Contest Branch Manager

Remember back to your first handheld FM transceiver? My first foray into the world of VHF/UHF was with something that many would have sworn came straight off a World War II movie set. It was large, heavy, crystal controlled and required a lot of effort just to carry portable into the field. Add that to the relatively high cost of being the first on your block to own one, and it made portable VHF/UHF operation a frontier into which few hams crossed in the early days.

Thanks to microcircuits and modern technology, manufacturers have come a long way in making VHF/UHF operation accessible and affordable to the general amateur population. Among the newest entries into this market is the RadioShack HTX-420 2-Meter/70-cm Dual Band FM Amateur transceiver. RadioShack says the HTX-420 has "high power capability, quality construction and small size make this handheld an excellent choice for the new or seasoned Ham radio operator." But does it deliver?

First Looks

Size-wise, at just over 11 ounces and standing only 4½ inches tall (excluding the antenna), the HTX-420 is a convenient size. Whether you are using it to help supply communications support for a local charity walk or you have stored it in your backpack in case you need emergency communications while on the overnight hike on the Appalachian Trail, bulk won't be an issue.

The HTX-420 may be operated from the lithium-ion rechargeable battery pack that is supplied with the radio or from an external 12-V regulated dc power supply that will deliver a minimum of 2 A (connector cable not supplied with radio). You may also use four AA alkaline batteries (utilizing the battery holder also supplied). If you plan on using the radio for a daylong communication event, have an extra battery pack charged and available. One little quirk to remember: The battery pack slides in and has a latch that snaps to hold it in place. To remove the battery pack, you need a coin or some other object to pop the tab up. If you have them and care about them, don't try to use your manicured nails, as it's a tight fit.

The HTX-420 comes equipped with a dual-band flexible antenna. I was able to access several local repeaters, but we all know that a better antenna means better performance. This handheld utilizes an SMA plug antenna connector.

Bottom Line

The HTX-420 is an easy-to-use, competitive entry into the dual-band handheld market.

At the top left of the front keypad, you will find the PWR button (bright orange), and a group Universal Type Keys. This five-key group is used to control many of the radio's operating features. Prominent on the front is the display screen. The display is the key to navigating your way through setting up and using the many features of the radio. The FUNCTION button is located on the left side of the radio (not on the front panel) directly beneath the PTT button.

Each of the keys on the 16-button standard keypad located on the front bottom of the HTX-420 serves dual functions. If the FUNCTION key on the side is depressed, pressing each button will allow you to access the function that key controls (the abbreviations are clearly marked above the button. Without the FUNCTION button pushed, the buttons serve as a standard tone and direct frequency entry pad.

Getting started is simple: Screw on the antenna, attach a fully charged battery back, and you're set. To turn the radio on, simply depress the orange PWR button and the radio should be operational.

Putting the HTX-420 to Use

On top of the radio is a large TUNING knob. This may also be used to adjust the various settings for the radio's functions. A secondary dial is located around the base of this main knob and controls the radio's volume.

The HTX-420 allows operation on both the amateur 144 MHz and 420 MHz bands. In addition, it also serves as a receiver for the 108-136 aviation band and

Table 2
RadioShack HTX-420 Dual-Band Handheld Transceiver

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency Coverage: Receive, 136-174, 420-512 MHz; transmit, 144-148 MHz; 430-450 MHz.	Receive and transmit, as specified.
Power requirements: 5.0-13.8 V dc; receive, not specified; transmit, 1.5 A.	Receive, 0.29 A (max volume, no signal); transmit, 1.4 A, tested at 13.8 V.
Size (height, width, depth): 4.5x2.4x1.2; weight, 11.5 ounces.	
Receiver	***Receiver Dynamic Testing***
Sensitivity: 12 dB SINAD, 0.2 μV.	For 12 dB SINAD: 146, 440 MHz, 0.14 μV.
Adjacent-channel rejection: Not specified.	20 kHz offset, 146 MHz, 58 dB; 440 MHz, 59 dB.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, 146 MHz, 50 dB; 440 MHz, 56 dB; 10 MHz offset, 146 MHz, 73 dB; 440 MHz, 65 dB.
Two-tone, second-order IMD dynamic range: Not specified.	65 dB.
Spurious and image rejection: Not specified.	IF rejection, 146 MHz, 36 dB dB; 440 MHz, 107 dB; image rejection, 146 MHz, 80 dB; 440 MHz, 34 dB.
Squelch sensitivity: Not specified.	146, 440 MHz, 0.13 μV at threshold.
Audio output: 300 mW at 10% THD into 8 Ω.	980 mW at 10% THD into 8Ω.
Transmitter	***Transmitter Dynamic Testing***
Power Output: 4 W high, mid and low not specified.	146 MHz, 4.4 / 2.0 / 1.1 W; 440 MHz, 5.2 / 2.3 / 1.3 W.
Spurious signal and harmonic suppression: Not specified.	146 MHz, 50 dB; 440 MHz, 69 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, 230 ms.[1]
Receive-transmit turnaround time ("tx delay"): Not specified.	94 ms.

Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.
[1]Turn-around with squelch off was about 100 ms.

seven NOAA weather frequencies. Use the round button in the middle of the Universal Type Key cluster to select where you wish the radio to operate. Each time you depress the button you will change bands. The radio sequences them in the following order: VHF, UHF, aviation and weather.

The LEFT and RIGHT arrow buttons in the Universal Type Keys are used to select operational features for the band you have selected. You use these buttons to select: squelch, repeater offset and receive and transmit CTCSS tones, as well as to designate a commonly used DTMF sequence and the apporpriate *same* area code and *same* on/off setting (both for the weather alert function).

The UP and DOWN arrow buttons in the Universal Type Keys are the ones that allow you to set the variables for each of the features you select from the LEFT and RIGHT menus. Let's look at an example of how the Universal Type Keys work together to allow you to operate the radio.

You wish to access a local UHF repeater that uses 442.400 MHz as the output frequency and uses 447.400 MHz as the input frequency. It uses an input tone of 77.0 to access the repeater. After you have turned the HTX-420 on, you would push the round Universal Type Key until the display shows that you are on the UHF frequency band. Next, you should push the UP and DOWN keys until the frequency display shows 442.400 MHz. (You may also change the frequency by turning the large tuning knob on top of the radio or by keying it directly into the keypad.)

Once you have tuned the radio to the desired frequency, you next push the RIGHT arrow button until the display shows the UHF offset screen. You then would adjust the offset to show 5.000 on the display.

The next step is to set the CTCSS to read 77.0. Again, you would push the RIGHT arrow button until the display reads TX TONE. (Note: this is one place I made an initial error. I set the CTCSS one on the RX TONE screen instead of the TX TONE screen. It took me several unsuccessful attempts at trying to access a very close repeater before I rechecked my set-up and caught my mistake.) You then set the CTCSS for the 77.0 tone. Once this is done, you may the press the round Universal Type Key to return to the main UHF frequency display screen.

There is one final thing to check before being able to use the radio in our example. You must be sure that the radio is transmitting with a + offset instead of a – offset. On the top line of the display, you should see a + or – sign indicating the current offset. To change the offset, press the FUNCTION key and while holding it down, press the 9 button, which in this configuration serves to change the ± offset, until you see the + sign on the display. Release the FUNCTION key and you're ready to transmit.

The HTX-420 has a large memory capability. Up to 100 standard memories may be stored for easy retrieval by the user. Depressing the FUNCTION key along with MW keypad button will locate the lowest available vacant memory. Pressing the MW button again will store the frequency (including any CTCSS and offsets programmed for it) into the selected memory.

Scanning your stored memories is simple with the HTX-420. Press the SC button on the keypad while the radio is in memory mode, and the radio will scan any memories you have programmed. You may also program the scanner function to skip channels you have selected in the menu.

When It's Raining and Where You're Going

As with almost all of the modern handhelds on the market, a certain number of bells and whistles are built into the HTX-420. A power save feature helps conserve battery power. When no signal is present, power is turned off to the receiver. Every eight seconds the receiver briefly powers up to check for a signal. When a signal is detected, power is restored. Another power saving feature is the automatic power shutoff system. When activated, this feature automatically turns off the radio after a selected time period (30, 60, 90 or 120 minutes). The radio also has the capability to monitor a frequency for activity while receiving on another frequency. This could come in handy while waiting for a friend on one repeater while talking to someone on another.

The HTX-420 has a built-in time out timer. This timer is user programmable and may be used to automatically stop the radio from transmitting when the limit (up to 20 minutes) is reached. Another feature that could be useful is an electronic compass. A simple 60-second calibration allows you to use your handheld to help find compass headings at five-degree increments.

The HTX-420 can be set to transmit on one amateur band and receive on the other, although it cannot repeat. Cross-band operation is easily accomplished by using the FUNCTION key and XBO option on the keypad. After you select the desired transmit and receive frequencies, it's as simple as push-to-talk.

One final feature of that makes this radio attractive is that it is compatible with the NOAA weather broadcast SAME (Specific Area Message Encoding) Alert system. This allows you to program the radio to automatically identify NOAA alerts that affect your specific geographic area. If your radio is on, when the SAME Alert system code you have programmed in is detected, the display will show what type of alert has been issued: WARN (warning), WATCH, STMT (statement) or TEST. You can find your location's SAME code at **www.nws.noaa.gov/nwr/indexnw.htm**.

At times, it was easy to overlook something in the owner's manual. For instance, the instructions for changing the power level of the radio are found on page 41—following almost all other instructions. There is also no troubleshooting section, which would be helpful in finding some of the simple solutions to user-caused problems. It was also easy to overlook some of the sidebar comments, many of which contained some important information.

Conclusion

All things considered, the HTX-420 seems to be a solid entry into the competitive Amateur Radio dual-band handheld transceiver market. Once I became familiar with the various buttons and procedures for setting up the radio's functions, I was able to negotiate the radio with relative ease. That's a plus for someone like me, whose current handheld still has thumbwheels for dialing in the frequency, no CTCSS or programmable memories, and uses a slide switch to adjust power levels.

Manufacturer: RadioShack Corp, 100 Throckmorton St, Fort Worth, TX 76102; tel 800-843-7422; fax 817-415-2303; **www.radioshack.com**. $269.99.

MFJ-890 DX Beacon Monitor

Reviewed by Brennan Price, N4QX
Assistant Technical Editor

One might expect a "DX Beacon Monitor" to, well, monitor DX Beacons. That is certainly what *QST* had in mind when announcing the MFJ-890 in the "New Products" section. We wrote:

> Want up-to-the-minute information about worldwide band conditions on 20 through 10 meters? [The MFJ-890] can do just that, thanks to its ability to listen to transmitted information from the … IARU International Beacon Network.[1]

The second sentence is in error. In fairness, the error was *QST*'s. A careful reading of MFJ's publicity and advertising for the '890 clearly indicates that the 5¼×6¾×3-inch (HWD) unit "is not a beacon receiver that receives beacons directly."[2] The unit is used in conjunction with your transceiver, which must be tuned to one of the five frequencies used by the network. Once the '890 is synchronized to the 60-kHz standard time signal of WWVB, it will indicate which beacon is transmitting at a given time. If you hear something on your radio, that something is the beacon indicated on the LED-dotted world map of the little black box.

A more proper name for the MFJ-890 would be a DX Beacon *Indicator*. How does it go about indicating what beacons are transmitting?

Timing is Everything

The 18 stations in the NCDXF/IARU Beacon Network transmit in a three-minute cycle, precisely synchronized to GPS time signals.[3] 4U1UN at the United Nations in New York City begins the cycle at the top of the hour, transmitting a 10-second CW sequence on 14.100 MHz. The sequence consists of the call sign at 22.22 WPM, followed by four long dashes, at powers of 100, 10, 1 and 0.1 W.

Every 10 seconds, the next beacon in line starts transmitting on 20 meters, while previously transmitting beacons step up one band, to 18.110, 21.150, 24.930 and 28.200 MHz. After 50 seconds of transmitting, a beacon has cycled through all five bands, and remains silent for 130 seconds. At multiples of three minutes past the hour, all 18 stations have completed the 20-meter transmission, and 4U1UN starts another cycle.

Bottom Line

Although it does not receive beacon signals directly, the MFJ-890 can assist a ham in identifying the 18 stations in the NCDXF/IARU Beacon Network.

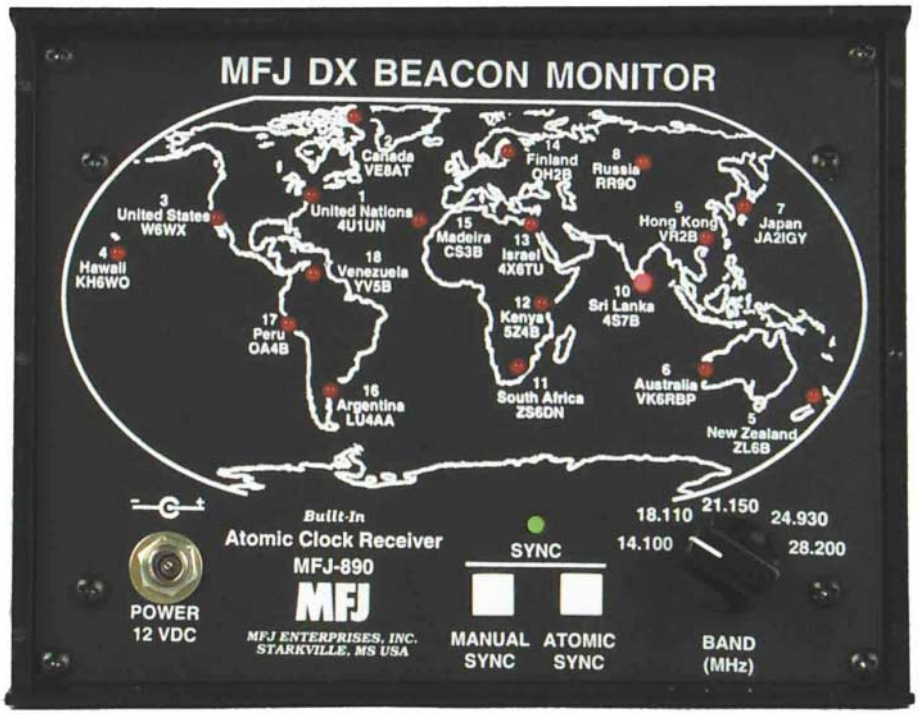
The '890 includes a receiver and microprocessor to interpret signals from WWVB, the 60-kHz standard time and frequency station in Fort Collins, Colorado.[4] The LEDs synchronize with WWVB on a daily basis, and our unit kept accurate time and accurately indicated active beacons between synchronizations. The same technology is used in a number of commercially available "atomic" clocks; in fact, the front panel of the '890 touts a "Built-In Atomic Clock Receiver."

So the MFJ-890 is, essentially, a very accurate clock with a unique display. We set out to see how it fared as an operating aid.

It Syncs at Night

Power may be applied through an internal 9-V battery or through a 12-V external power supply (cable included, but power supply not included). The power supply panel connects to the front panel, which is somewhat awkward. The front panel has to be unscrewed to change the battery.

Once power is applied, the MFJ-890 immediately attempts to synchronize to WWVB. During daylight hours, this is



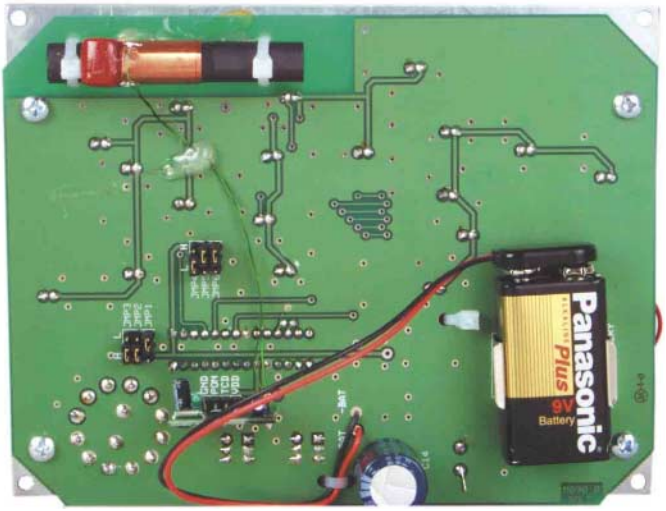


Figure 1—The rear panel of the MFJ-890's circuit board. The WWVB antenna, which should face Fort Collins, Colorado, is at top left, and leads to the receiver and microprocessor (behind the battery leads at lower left). Between the antenna and the receiver are two blocks of jumpers, which must be adjusted for the user's time zone and standby mode preference.

not a simple task in much of North America. The LF signal of WWVB propagates best at night. In and around Hartford, Connecticut, the '890 was unable to synchronize until around 10 PM.[5] This is consistent with MFJ's documentation, which suggests synchronization overnight. It is also desirable for the front or rear panel of the '890 to face Fort Collins, as the internal antenna is directional.

The unit will attempt to sync every hour until it is successful. Success is indicated by a solid green LED above the two buttons. The user can force a synchronization by pressing the ATOMIC SYNC button. One can also press the MANUAL SYNC button upon a time signal from an HF time signal station, such as WWV, WWVH or CHU. If you press this button at the top of the hour or at the start of a minute that is a multiple of three, the unit resets to the start of a cycle. We found that the '890 would only indicate 4U1UN on 20 meters for 8.5 seconds after MANUAL SYNC was pressed, but kept faithful time thereafter. This was not a problem, as the beacon transmission is complete within 8.5 seconds, and each transmission heard fell entirely within the time the corresponding LED was lit.

We found that accuracy between synchronizations was well within the specified ±1.7 seconds per day. The unit attempts resynchronization at 3 AM local time, with further attempts at 4, 5 and 6 AM if unsuccessful. The user indicates his or her time zone by arranging a block of jumpers on the circuit board. This inconvenient procedure is also used to designate when and how the unit can go into standby mode.

Most of the time, the LEDs (but not the internal clock) may be turned off by holding the ATOMIC SYNC button for 5 seconds (not the 4 that the manual indicates). This obscure operation will not work when the '890 is attempting to synchronize with WWVB; if you want to turn the unit off mid-sync, you have to disconnect all sources of power. A clearly labeled, independent on/off switch would have been very welcome. The procedure to choose bands is much simpler; the user merely turns the knob.

No High-Speed CW? No Problem!

In spite of its confusing name, the MFJ-890, when synchronized, does serve a purpose. Morse code at 22.22 WPM can be difficult to copy, and even those who can decipher CW at that speed may not immediately remember that 4S7B is in Sri Lanka. Also, the very nature of propagation will make observed signals weak, faded or fluttery. During the Northern Lights, you might *hear* VE8AT in Eureka, Nunavut, on 28.200, but you might have a hard time *telling* that it's VE8AT.

When the MFJ-890 is used in conjunction with a transceiver, the user can be confident that the beacon he or she hears is the beacon displayed on the attractive world map. There is no need for the user to try to copy fast or faded CW in order to positively identify the beacon and gain some understanding of propagation conditions to the beacon's part of the world. This does have a value, and amateurs may find the value sufficient to warrant the MFJ-890's pricetag.

Manufacturer: MFJ Enterprises, 300 Industrial Park Rd, Starkville, MS 39759; tel 662-323-5869; fax 662-323-6551; **www.mfjenterprises.com**. Suggested retail price: $99.95.

Notes

[1]New Products, "MFJ's 'DX Beacon' Real-Time Propagation Monitor," *QST*, Nov 2002, p 38.

[2]Advertisement, "MFJ DX Beacon Monitor," *QST*, Nov 2002, p 129.

[3]A description of the Beacon Network, as well as a transmitting schedule, is available on the Northern California DX Foundation's Web site, **www.ncdxf.org/beacon.html**.

[4]The facilities and operation of WWVB are documented at the station's Web site, **www.boulder.nist.gov/timefreq/stations/wwvb.htm**.

[5]Typical WWVB coverage maps at various times of day may be viewed at **www.boulder.nist.gov/timefreq/stationswwvbcoverage.htm**. KL7s should take note: According to these maps, WWVB does not propagate at any hour to most of Alaska. QST