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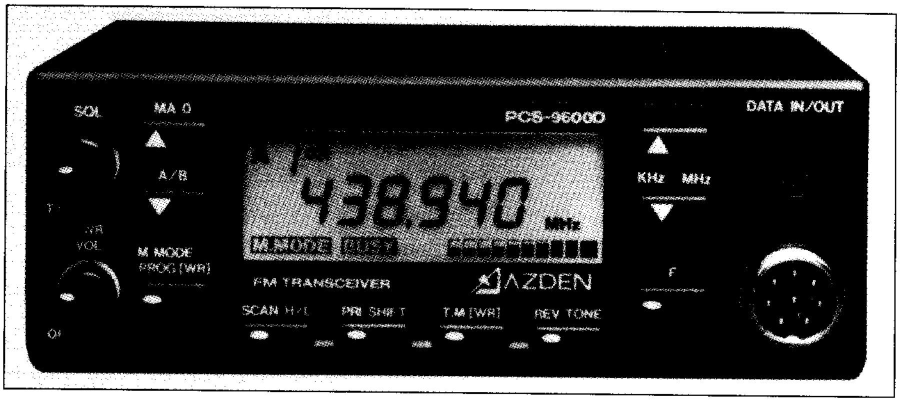
Azden PCS-9600D 440-MHz Voice/Data Transceiver

Reviewed by Steve Ford, WB8IMY
Assistant Managing Editor



Almost any FM voice rig can handle 1200-bit/s packet signals. After all, the circuitry used to send and receive voice signals also does a competent job with 1200-bit/s packet. That's why 1200-bit/s packet is so popular. You simply connect your TNC to the microphone and external speaker jacks and you're on the air.

When you push the throttle up to 9600 bits/s, however, everything changes. Microphone preamplifier stages grossly distort 9600-bit/s transmit signals. And you can't tap into your receive signal at the external speaker jack. The audio stages also chew up the 9600-bit/s signal. That's why you have to bypass the microphone audio stages and inject the 9600-bit/s transmit signal at the modulator—and even then the modulator must be able to handle a 9600-bit/s signal. By the same token, the receive signal must be picked off at the FM discriminator. (See the article by Jon Bloom, KE3Z, "'9600-Ready' Radios—Ready or Not?" elsewhere in this issue.)

This isn't a problem if you don't mind modifying your transceiver. Many high-speed packeteers do, with commercial FM rigs among their favorite candidates. But this is hardly plug and play. It will be a lot easier to get on 9600 bits/s as soon as we have amateur transceivers that will do the job *right*. The good news is that the Azden PCS-9600D is one of those that does the job right!

Features

The Azden PCS-9600D offers excellent voice and data performance in a compact, stylish package. Its large amber LCD display is easy to read under all lighting conditions. Amber lamps are also used to illuminate switches and knobs. This is a big plus when you're operating mobile at night.

The PCS-9600D transmits from 430 to 449.995 MHz, and receives from 416 to 465 MHz. This gives you complete coverage of the 440-MHz voice and data subbands, and even allows you to eavesdrop on 9600-bit/s satellite signals between 435 and 437 MHz. (More about this in a moment.)

The RF amplifier module provides 35 W output on the **HIGH** setting, and 10 W on **LOW**. That's more than enough power for most home or mobile applications. Our PCS-9600D put out a maximum of 28 W when we first got it. We returned the unit to Azden, and they promptly repaired it under warranty, indicating that the problem was a simple internal adjustment. (Note: Azden's standard warranty is *two* years.)

There are two memory banks (A and B) that contain 10 memory channels each. An extra memory channel is also provided to quickly store information on the fly. You can store transmit/receive frequencies in each channel along with CTCSS tone frequencies (transmit or receive). A programmable CTCSS tone encoder is standard equipment in the PCS-9600D.

The first memory channel in bank A is the *priority channel*. When the priority function is active, the PCS-9600D monitors this channel every four seconds. If a signal is detected, a soft beep alerts you.

You can scan through either memory bank individually, or both at once. The PCS-9600D also offers programmable band scanning. You can even adjust the length of the hold and delay times during a scan.

A multifunction microphone is included with the PCS-9600D. You can use the microphone keypad to send DTMF tones (for autopatch use or other applications), as well as to change frequencies or memory channels. A button labeled **MAO** allows you to quickly switch to your priority channel. (Another handy feature when you're on the road!)

Packet Performance

The PCS-9600D impressed me as a data transceiver before I even powered it up. When I took it out of the box, my eyes went right to the 6-pin miniature DIN connector on the front panel—*a dedicated data jack.* Next to the jack there is a small LED indicator that warns you if the audio level from your TNC is too low. Nice!

Azden thoughtfully provides a mini-DIN plug with the rig. The manual offers a wiring diagram for the plug, but it's unclear from the drawing whether you're looking at the plug or the jack. I guessed wrong and wound up wiring my plug backward the first time. No harm done, though. (For your information, the wiring diagram in the manual shows the rear view of the panel-mounted connector.)

Two detector outputs are available at the data jack: One for 1200 bits/s and the other for 9600-bit/s signals. If you're running 9600 bits/s, use the pin labeled GMSK to grab audio directly from the discriminator chip.

The transmit data signal is applied to a 45-MHz VXO. The output of the VXO is mixed with the (unmodulated) synthesizer output to produce the operating-frequency signal. This scheme provides first-rate transmitter frequency response. When you're transmitting voice, the VXO is left unmodulated and the synthesizer is modulated directly.

My version of the packet acid test is to hook up my 9600-bit/s TNC and fire up the rig while crudely adjusting the transmit audio by ear with a separate receiver. When you consider that 9600-bit/s packet sounds like little more than bursts of white noise, this is crude indeed! Even so, I was swapping data on the Connecticut TCP/IP network within 15 minutes after I applied power to the radio. This is as close to plug and play as you can get.

Since the PCS-9600D can tune down to 430 MHz, I couldn't resist trying it on the 9600-bit/s packet satellites. Using a jury-rigged beam antenna in the attic (no receive preamplifier), I obtained a respectable S5

The Bottom Line

The Azden PCS-9600D offers the best of both worlds. It's a capable 440-MHz voice rig and a true "9600-baud ready" packet transceiver.

Table 1

Azden PCS-9600D, serial no. B441020

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive, 416-465 MHz; transmit, 430-450 MHz.	As specified.
Power requirements: 13.8 V dc, ±15%; 0.3 A (receive); 9 A max (transmit).	At 13.8 V dc: 0.5 A max (receive); 6.8 A max (transmit).
Size (height, width, depth): 2×5.5×7.25 inches; weight, 3 lb.	
Receiver	*Receiver Dynamic Testing*
Sensitivity: Better than 0.19 µV for 12 dB SINAD.	0.17 µV for 12 dB SINAD.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 440 MHz, 67 dB; 10 MHz offset from 440 MHz, 76 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset from 440 MHz, 45 dB.
IF rejection: Not specified.	≥96 dB.
Image rejection: Not specified.	≥85 dB.
Squelch sensitivity: <0.12 µV at threshold.	0.05 µV at threshold.
Audio output: >2 W at 10% distortion (8 Ω).	2.9 W at 10% THD into 8 Ω.
Transmitter	*Transmitter Dynamic Testing*
Power output: High, 35 W; low, 10 W.	High, 33 W; low, 12 W.
Spurious signal and harmonic suppression: Better than −60 dB.	As specified. The PCS-9600D meets FCC requirements for spectral purity for transmitters in its power class and frequency range.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on or off, 250 ms (voice mode); 120 ms (data mode).
Data Mode	
Bit-error rate (BER): Not specified.	Receiver: 12-dB SINAD level, −113 dBm; BER @ 12-dB SINAD, 2.8 × 10^{-4}; BER @ 16-dB SINAD, <1 × 10^{-5}. Transmitter: BER @ 12-dB SINAD, 5.9 × 10^{-4}; BER @ 12-dB SINAD + 30 dB, <1 × 10^{-5}.

signal from KITSAT-OSCAR 25. The PCS-9600D passed the signals perfectly and data flowed across my monitor. The radio would make an excellent downlink receiver if it weren't for the fact that its smallest tuning-step size is 5 kHz. Every time I toggled the frequency **UP/DOWN** buttons to compensate for Doppler shift, I lost a substantial amount of data. Of course, the PCS-9600D wasn't designed to be a satellite receiver, but with a modification to reduce the minimum step to, say, 10 Hz or 100 Hz, the Azden folks could add yet another item to the radio's list of benefits.

Overall, the PCS-9600D is a beauty as a data transceiver. The ARRL Lab verified my findings with their bit-error-rate (BER) tests. When Azden says this radio is 9600 ready, they mean it! (Some hams even report using the PCS-9600D at 19.2 kbaud without modifications.)

It's a Voice Rig, Too

You get so wrapped up in the data performance of the PCS-9600D, it's easy to forget that this is an excellent voice radio, too. After using the scan features to explore the band, I was able to access local repeaters with ease. Receive audio quality was good, and I received outstanding reports on my transmit audio. Judging from its performance with OSCAR 25, the PCS-9600D receiver appears to be quite sensitive.

It's worth noting that the PCS-9600D transmitter gives priority to the signals from your TNC. In other words, if your TNC is transmitting, the audio from your microphone is blocked. This is a nice feature that prevents voice audio from corrupting your data signal.

Rather than providing a knob to control frequency selection, the PCS-9600D relies on a set of **UP/DOWN** buttons on the front panel. (A similar arrangement appears on the microphone.) For hams accustomed to spinning a VFO knob, this may feel a little awkward at first.

The number of front-panel buttons is kept to a minimum. Several serve multiple functions through the use of the **F** (function) button. Programming the PCS-9600D is very straightforward. The PCS-9600D responds with a beep every time you press a key. The only nit I would pick is the fact that you're required to turn off the radio each time you finish memory programming. Otherwise, the information is *not* stored.

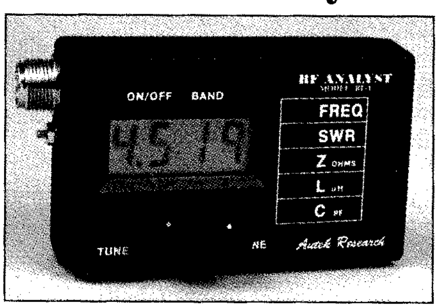
Conclusion

Putting it simply, the PCS-9600D is an outstanding transceiver. In fact, it is the only single-mode base/mobile rig that we've tested that is *truly* 9600-bit/s ready. The PCS-9600D also does an admirable job as a voice radio for home or mobile use. This performance comes at a price, though: The PCS-9600D sells for about $200 more than Azden's PCS-7300H 440-MHz voice-only radio. But when you consider the digital-mode performance advantages, the extra money may be well spent if you're serious about 9600-bit/s packet. Now if only all the other "9600-ready" rigs were really this "ready!"

Manufacturer's suggested retail price: $649. Manufacturer: Azden Corporation, 147 New Hyde Park Rd, Franklin Square, NY 11010, tel 516-328-7501.

Autek Research Model RF-1 RF Analyst

Reviewed by Bill Kennamer, K5FUV
DXCC Manager



Let's face it: There's one common thread that holds all active amateur radio operators together—antennas. If you don't have one, you won't be talking to anyone, at least not on your radio.

Antennas can be simple or elaborate, big or small, inexpensive or *very* expensive. They're usually the first thing that a new ham experiments with, and the experienced ham may spend many hours thinking about and constructing the antennas of his dreams. So the accessory manufacturers found a sure winner with the various antenna analyzers that began to hit the market a few years back. Freed from the need to return to the shack for a new reading every time an adjustment is made, these little boxes have provided convenience and improved accuracy for the ham antenna ex-

Table 2
Autek Research RF-1 RF Analyst

Manufacturer's claimed specifications	*Measured in ARRL Lab*
Frequency range: 1.2 to 35 MHz.	1.1 to 37.6 MHz
Warm-up drift: Not specified.	–32 kHz after 15 minutes from a cold start at 75 °F room temperature at 14 MHz.
Frequency drift with temperature: Not specified.	After adjustment to 14.0 MHz at 75 °F room temperature, the RF-1 moved to: 14.033 MHz at 40 °F; 13.930 MHz at 90 °F
SWR accuracy: Generally accurate to 10% below 3:1 and 15% up to 9:1.	See Table 3.
Impedance accuracy: Better than 3% at 150 Ω; better than 6% from 20 to 900 Ω; degrades rapidly below 20 Ω and above 900 Ω.	See Table 4.
Capacitance range: 1 to 9999 pF.	See Table 5.
Inductance range: 0.04 to 300 µH.	See Table 6.
Output power: Not specified.	1.6 mW at 37 MHz (max).
Power requirements: 6.5 to 15 V dc.	84 mA max with 9 V battery.

Size: (height, width, depth) 2.5×4×1.5 inches; weight, 7 oz (including battery)

Table 3
SWR Accuracy of Autek RF-1

Load	*Freq. (MHz)*	*Measured SWR*
50 Ω resistive	3.5	1:1
(Calculated SWR 1:1)	28	1:1
25 Ω resistive	3.5	2.2:1
(Calculated SWR 2:1)	28	2.2:1
100 Ω resistive	3.5	2:1
(Calculated SWR 2:1)	28	2:1
Reactive, nominal	3.5 (2.5:1)*	2.6:1
50 Ω – *j*50	14 (2.8:1)*	2.9:1
(nominal SWR 2.62:1)	28 (2.5:1)*	2.6:1
Reactive, nominal	3.5 (2.6:1)*	2.6:1
50 Ω + *j*50	14 (2.5:1)*	2.5:1
(nominal SWR 2.62:1)	28 (2.6:1)*	2.5:1

*Actual value of test load measured with an HP-8753C network analyzer.

Table 4
Impedance (Z) Measurement Accuracy of Autek RF-1 Compared to HP-8753C

Frequency (MHz)	*Load (Ω)*	*RF-1 Z (Ω)*	*HP-8753C Z (Ω)*
3.5	5	5	5
	50	49	50
	200	195	201
	1000	968	980
	50 Ω – *j*50	70	68
	50 Ω + *j*50	76	72
14	5	5	5
	50	49	50
	200	189	190
	1000	666	785
	50 Ω – *j*50	70	71
	50 Ω + *j*50	81	74
28	5	7	5
	50	49	50
	200	175	180
	1000	406	503
	50 Ω – *j*50	62	70
	50 Ω + *j*50	81	70

Table 5
Capacitance (C) Measurement Accuracy of Autek RF-1 Compared to HP-8753C

Frequency (MHz)	*Load (pF)*	*RF-1 C (pF)*	*HP-8753C C (pF)*
2	1000	977*	1004
10	1000	1585*	1022
14	100	107	98
28	24	27	24

*The large variation in measured capacitance is consistent with information in the manual that shows that large values of capacitance should be measured at low frequencies.

Table 6
Inductance (L) Measurement Accuracy of Autek RF-1 Compared to HP-8753C

Frequency (MHz)	*Load (µH)*	*RF-1 L (µH)*	*HP-8753C L (µH)*
2	100	98	93
2	10	9.6	9.1
10	10	10.2	9.6
28	1	1.08	0.94

perimenter, which includes almost all of us at some point.

The Autek Research RF-1 RF Analyst, is a fairly new entry into the antenna analyzer market. It is packaged in a small box made of ABS plastic. Powered by a 9-V battery, it's easy to get into your pocket for a trip up the tower if necessary, and the large LCD display is easy to read outside in the bright sunlight. The frequency range of the unit tested was 1.1 to 37.6 MHz, easily covering the 160 through 10-meter amateur bands. Its operation is straightforward.

Frequency accuracy is specified as within 1 kHz on frequencies below 10 MHz. We found it to be within 500 Hz at 3.5 MHz, and within 5 kHz at 28.0 MHz. The accuracy of SWR measurements is shown in Table 3.

A Versatile Instrument

As usual, the desire to evaluate the Autek RF-1 came about because of the need to build a new antenna. The RF-1 appeared to have all of the features needed to make the necessary measurements. Knowing that the measurements were going to be made a few feet up the tower without a feed line attached, the small size was a consideration. After taking the unit home and reading the instructions, it quickly became apparent that there would be many more chores this little device could perform in addition to a mere SWR check. In fact, I used the RF-1 for many projects that I'd delayed until there was time to set up other pieces of equipment.

The unit is turned on by tapping the **ON/OFF** button. The display will quickly flash the version of the program code used by that particular unit. The unit we tested used code PC 2.2. A standard 9-V battery (which is not installed, as delivered) powers the unit. According to the instructions, battery life is about 12 hours with intermittent use. There is an automatic battery-saver that shuts down the unit if no button is pushed within 20 minutes, but this feature can be disabled by turning the unit on while depressing the **FREQ** button. (If this is done, the PC2.2 indicator won't be displayed on start-up.)

The unit comes up in the frequency mode, in which the **TUNE** knob will change the frequency, and the **FINE** knob will provide fine tuning of the frequency. As far as adjustment of the unit goes, that's it. However, because of the lack of a vernier tuning knob, it is necessary to tune carefully. It is easy to tune so quickly that you can miss the resonant frequency.

The selection of frequency and mode—**FREQ**, **SWR**, **Z** (Ω), **L** (µH), and **C** (pF)—is made by tapping momentary pushbuttons. If you press any two mode buttons simultaneously, the RF-1's display will cycle between those modes.

Tuning an Antenna

Using the unit as an SWR indicator is simple: Just turn it on, push the **SWR** button, tune to minimum SWR, push the **FREQ** button and read the frequency. The instructions specify that SWR is measured relative to 50 Ω, and is generally accurate to within 10% below 3:1 SWR, 15% up to 9:1 and 20% between 9:1 and 15:1.

Also mentioned in the manual is a "suckout" effect, caused by diode drops, that causes inaccuracies at SWRs below 1.2:1. This is not unusual, and is often found in other units as well. If you really need to measure your SWR down to perfection, measure the impedance (Z) and use the formula SWR ≐ Z/50 or 50/Z, whichever is greater. (A 1:2:1 SWR indicates a very well-matched antenna, and there is really no effective improvement in antenna performance by trying to further reduce the SWR.)

In use, it's easy to measure the SWR. The first project for the RF-1 was to install an 80-meter antenna based on an article by Tom Russell, N4KG, in June 1994 *QST*. Tom's article describes how to feed a short grounded tower with an elevated radial system to make an effective DX antenna.

I connected the RF-1 to the tower and one wire of the elevated radial system (before the rest were installed). Next, I found the frequency where the SWR bottomed out, then adjusted the radial to the desired frequency by using the formula given in the instruction sheet (desired length = actual length × actual frequency ÷ desired frequency). After final adjustment of the length of the first radial, I cut the other three radials to the same length. This resulted in a minimum SWR of 3.4:1 at 3.521 MHz. Switching to the Z mode gave a reading of 14 Ω, about what would be expected for an antenna of this size. Rather than making a matching network to further reduce the SWR, I decided to let the antenna tuner in the transceiver handle this mismatch.

Other Uses

The RF-1 can also be used to cut $^1/_4$ and $^1/_2$ λ line sections for matching networks or phasing lines. To find the frequency at which a feed line is an exact half-wavelength, connect one end of the line directly to the RF-1, and short the opposite end. Switch to the **Z** mode and tune the RF-1 from the lowest frequency while monitoring the impedance. The impedance will begin to dip sharply, coming down to a few ohms, or possibly to zero, at the frequency where the feed line is exactly one-half wavelength. Continuing to tune, additional minimum-impedance points will indicate the frequencies at which the feed line is a multiple of one-half wavelength. By tuning for minimum impedance with the end of the feed line open, you can determine the length of a $^1/_4$-λ line.

You can use the RF-1 to find the velocity factor of coaxial cable by the formula VF = frequency ($^1/_2$ λ) × cable length ÷ 492. If you need to cut cables to specific electrical wavelengths for a critical project, it is better to compute the actual velocity of your cable rather than use the manufacturer's specifications. The velocity factor may vary from one batch of cable to another.

A little time spent with the unit and the rather complete instruction sheet will suggest even further uses. The loss in a feed line may be measured by either opening or shorting the line, then finding the minimum value of Z (Z_{MIN}). The cable loss (in dB) at a given frequency (for any line impedance) may be calculated from the following: loss = 8.69 × Z_{MIN}) ÷ cable impedance.

Other tests that can be performed with the RF-1 include determining cable impedance, checking baluns and other transformers, measuring antenna impedance, checking the effect of radials on a vertical antenna, and measuring the values of inductors and capacitors.

Checking the radial system of a vertical is easy. Just connect the RF-1 to the base of the vertical and measure the impedance. A $^1/_4$-λ vertical has a theoretical impedance of 38 to 40 Ω with a good ground system. If the antenna measures near this, it's working at good efficiency.

Baluns or other transformers can be checked by connecting a resistor of the characteristic impedance across the output side (for example, a 50-Ω resistor across the output of a 1:1 balun) and checking the impedance over the frequency range of interest. The impedance should be a fairly constant value over that range.

The value of inductors and capacitors may also be measured. The manual goes into quite a bit of detail about the accuracy of these measurements at various frequencies. Also included is information on compensating for component lead length. Tables 5 and 6 show some comparions between measurements made with the RF-1 and with an HP-8753C network analyzer.

Included with the RF-1 are some extra connectors for use in connecting other components. Using these, a 10-meter coil from an SB-220 was connected across the input of the RF-1. It measured 0.96 µH at 2.5 MHz. The same inductor measured 0.93 µH on the ARRL Lab's HP Q meter. That's well within the tolerance specified. A benefit of using the RF-1 is that the approximate capacitance for resonance at that frequency may be estimated merely by reading the RF-1 in the **C** position.

An old junk-box variable was measured to find its range. The RF-1 indicated that its range was 30 to 150 pF. The RF-1 obviously could be put to good use to determine the values of used components at hamfests.

One other use that may be made of the RF-1 is tracking down bad traps or loading coils in an antenna. By connecting a coil or trap in series with the RF-1, a check for resonance may be made by finding the frequency at which minimum impedance occurs. By comparing traps, it will be easy to spot a bad one, because the resonant frequency will be different from the rest.

Conclusion

The Autek RF-1 works well as an antenna analyzer. It performs measurements with sufficient accuracy for amateur use, and will save many walks from the antenna to the shack to make tests. It is versatile, and capable of many more tasks in the ham shack. The RF-1 represents good value for the price.

Manufacturer's suggested retail price: $130. Manufacturer: Autek Research, PO Box 8772, Maderia Beach, FL 33738, tel 813-886-9515.

MFJ-432 Voice Memory Keyer

Reviewed by Glenn Swanson, KB1GW
Educational Programs Coordinator

Operating in a phone contest for up to 48 hours can be rough on your vocal cords. That was a lesson I learned while living in central Virginia where I had the opportunity to operate at the multi-multi station of Bob Morris, W4MYA. We always had lots of fun (and great food!), but by the end of the weekend, a sore throat would sometimes spoil the fun. Anything that promised to do the talking for me ("CQ contest, CQ contest"), would be welcome indeed! Enter the MFJ-432 voice keyer.

For the 1995 phone ARRL International DX Contest, I had the chance to operate

Table 7

MFJ-432 Voice Keyer

Manufacturer's Claimed Specifications	Measured in ARRL Lab
Input range: Not specified.	Approximately 2 to 20 mV; 5.6 kΩ.
Audio output power: Not specified.	At audio out jack: 35 mW at 10% THD into 8 Ω with 20 µV input signal.
	At mike connector output (600 Ω load): 74 mV at 0.7% THD with 5 mV input. 96 mV at 3.5% THD with 20 mV input.
	At mike connector output (50 kΩ load): 295 mV at 0.8% THD with 5 mV input. 380 mV at 3% THD with 20 mV input.
Signal-to-noise ratio: Not specified.	33 dB with 50 kΩ load.
Frequency response: Not specified.	Approximately 90 Hz to 2.9 kHz at –6 dB points.
Power requirements: Not specified.	58 mA max at 13.8 V dc.
Size: (height, width, depth) 2.3×6.3×5.9 inches; weight, 1.8 lb.	

from the multi-multi station of Tom Frenaye, K1KI, here in Connecticut. I took the MFJ-432 along, since this 48-hour event would provide an opportunity to find out how it performed under extreme conditions. So how did the MFJ-432 hold up? With the exception of a minor problem that cropped up prior to the contest, it did quite well, and I still have a voice! (The minor problem was that the internal speaker came loose during shipment; we quickly repaired it with some epoxy glue.)

At the heart of the MFJ-432 is an ISD 1020A analog IC. For a discussion of this device, see the sidebar "New Technology, New Chip" in the article "Chip Talker" by Joe Jarrett, K5FOG, on page 20 of December 1991 *QST*. We powered the unit with the optional MFJ-1312B ac adapter, which provides 12 V dc at 300 mA, via a rear-panel coaxial-type jack. The MFJ-432 can also be powered by an internal 9-V battery.

Four red (momentary contact) push-buttons are used to record and play back your audio. The (soft-sectored) memory area in the voice keyer stores a total of 20 seconds of audio. Since the total amount of memory is in one large block, the first message button can be used for, say, a 10-second-long CQ message, leaving the remaining 10 seconds of memory to be divided among any, or all, of the three remaining message buttons. I used the first memory (**MSG 1**) to hold our "CQ contest" message at K1KI, and the other three for such things as the contest exchange ("59 Connecticut"). In addition, the first memory can be set to repeat over and over by pressing the **REPEAT MSG 1** button on the front panel. A recessed control located on the rear panel lets you adjust the time delay between each repeat of the first message.

There's one snag: You can't interrupt an outgoing message. This problem is most likely to occur when you're tired. Imagine that it's 3 AM and that you're half-asleep, when you inadvertently send a CQ message just a millisecond after someone answers your previous CQ. You can hit the VOX button on your rig to kill the transmitted signal, but short of turning the MFJ-432 off, there's no way to stop the outgoing message or override it with audio from your microphone. You must wait until it's over and hope the caller is still there! We found this to be a minor, yet sometimes annoying, design choice.

Five buttons along the bottom of the front panel include the red on/off button. The four remaining (black) push-buttons act as toggle switches. One button allows you to choose between record or playback modes. A green LED lights up to indicate the playback mode, and a red LED lights up when you're in the record mode. An internal microphone (recessed behind the front panel) can be switched in-line (**INT. MIC**), or use your own microphone by toggling this button to **EXT. MIC**. A button labeled **XMIT** allows you to have the unit key the PTT line in your transmitter when a message is fired.

An 8-pin mike connector on the front panel lets you plug in your favorite microphone. We used the MFJ-432 with a variety of microphones and they all worked well with the keyer. A 45-inch-long microphone cable exits the rear panel. This cable comes pre-wired with a female 8-pin mike connector at its end, so as to mate with the 8-pin connectors found on most transceivers. Six internal jumpers allow you to configure the internal mike and PTT lines of the unit for operation with Kenwood, ICOM or Yaesu transceivers. Although the manual says "The MFJ-432 is set for Kenwood at the factory," ours was set for use with ICOM radios. The jumpers are easy to reconfigure. Simply remove the aluminum housing's top cover (secured with two screws), and move the six internal jumpers to line up with the **Y**s (for Yaesu), **I**s (for ICOM) or **K**s (for Kenwood), that are silk-screened onto the circuit board. Replace the cover, and you're done—all in less than five minutes.

A front-panel volume-control knob allows you to adjust the volume if you wish to listen to the contents of the memories via a built-in speaker. The 2-inch internal speaker sounds fine, but you won't fill a room with its output.

The rear panel has two auxiliary jacks, an **AUDIO OUT** port and an **AUDIO INPUT** port. Both are 1/8-inch phone jacks. In addition to the **REPEAT DELAY** potentiometer mentioned earlier, another pot, labeled **OUTPUT LEVEL CONTROL**, is on the rear panel. It is used to adjust the audio level sent by the voice keyer to your transmitter's microphone input jack.

A rear panel accessory port provides several pin-outs and the manual includes instructions that tell you how you can use this port to "remote" the MFJ-432 by using separate momentary push-buttons. An interface to allow a connection to a personal computer would be nice. That way you could have your favorite contest program fire the memories via the function keys of your PC's keyboard—and you'd have one less box to deal with during the contest!

Conclusions

During a weekend of heavy-duty use, the MFJ-432 voice keyer held up well and, in a room full of legal-limit amplifiers, it seemed to be impervious to RF. We found that using the unit was an intuitive process. By the end of the contest there were several voices recorded in the memories: the other operators had figured out how to use the keyer on their own—without the aid of the manual!

The playback audio was natural-sounding, as it should be. It was nice to have the MFJ-432 call "CQ" for us, *and* it helped us to preserve our voices! If you don't need a keyer with a PC interface, then the MFJ-432 will be a handy station accessory to have around.

Manufacturer's suggested retail prices: MFJ-432 Voice Memory Keyer, $100; MFJ-1312B ac adapter, $13. Manufacturer: MFJ Enterprises, Inc., PO Box 494, Mississippi State, MS 39762; tel. 601-323-5869.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

Azden AZ-61 6-meter FM hand-held transceiver (see Product Review, March 1995 *QST*). Minimum bid: $250.

ICOM IC-736 MF/HF/6-meter transceiver with FL-100 and FL-52A 500-Hz CW filters (sold as a package only; see Product Review, April 1995 *QST*). Minimum bid: $1327.

ICOM IC-738 MF/HF transceiver with FL-100 and FL-52A 500-Hz CW filters (sold as a package only; see Product Review, April 1995 *QST*). Minimum bid: $1149.

ICOM IC-820H 144/430-MHz multimode transceiver with FL-132 500-Hz CW filter (sold as a package only; see Product Review, March 1995 *QST*). Minimum bid: $1113.

JPS SSTV-1 DSP filter (see Product Review, November 1994 *QST*). Minimum bid: $75.

Kenwood TM-732A 144/440-MHz dual-band FM transceiver (see Product Review, June 1993 *QST*). Minimum bid: $288.

Kenwood TH-28A 2-meter FM handheld transceiver (see Product Review, October 1992 *QST*). Minimum bid: $153.

PacComm TNC/NB-96 1200/9600-bit/s packet TNC (see Product Review, September 1994 *QST*). Minimum bid: $150.

Sealed bids must be submitted by mail and must be postmarked on or before May 27, 1995. 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.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone with a confirmation by mail. No other notifications will be made, and no information will be given to anyone other than successful bidders regarding final price or identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494.