

Product Review Column from QST Magazine

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Yaesu FRG-100 General-Coverage Receiver

MFJ-8100 Shortwave Regenerative Receiver Kit

Heil Pro-Set Headset

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The Yaesu FRG-100 General-Coverage Receiver

Reviewed by David Newkirk, WJ1Z

I suppose that the days of *separates*—matching, transceive-compatible transmitters and receivers—are understandably long-gone and never to return. It's just too logical and cost-effective to build transmit and receive functions into a single box labeled *transceiver*. Some Amateur Radio equipment manufacturers nonetheless continue to build general-coverage receivers—receivers that hams and market-conscious non-ham shortwave listeners, seeking to evaluate the unknown in terms of the known, stretch to characterize as “the receiver part of transceiver X.” Potential buyers of such boxes then pore over reviews of these radios' supposed transceiver progenitors, trying to imagine how receive-only versions might compare.

I'm already on public record as being a receiver enthusiast, so I probably won't surprise you when I admit that Yaesu's FRG-100, a general-coverage AM, CW, SSB and (optionally) FM receiver that tunes from 50 kHz to 30 MHz, revved up my guessing machine in a big way. Keeping my ears open, I found that other hams were also wondering if the FRG-100 is, in this case, “the receiver section of an FT-890.” (I can almost hear the QSTs rustling open to my FT-890 Product Review.) Hmm, maybe I could qualify for a career in writing cheap detective novels if I could engagingly keep you guessing about the answer to that question until the end of this review. (There's that FT-890 write-up—in September 1992.) Let's see . . . I imagine that the first thing you'd do after locating the FT-890 write-up would be to compare the FT-890's receiver-test numbers (Table 1 on page 81 of September 1992 QST—hmm) with the numbers in *this* review's Table 1 (page 74). Then, if your interests are anything like mine, you'd go right to the dynamic-testing numbers for minimum discernible signal, dynamic range . . .

Nahhh! The FRG-100 is *not* an FT-890 spinoff. Among other differences, the FT-890 includes a switchable front-end preamp and the FRG-100 has no preamp; the FT-890's first mixer (the circuit block that can make or break a radio's strong-signal-handling performance) uses four JFETs and the FRG-100's uses two; the FT-890 uses a first intermediate frequency (IF) of 70.455 MHz and the FRG-100 uses 47.21 MHz; the FT-890 includes front-panel IF shift and the FRG-100 doesn't; the FT-890 includes an IF notch filter and the FRG-100 has no notch filter; the FT-890 allows the installa-



tion of optional filters for SSB and CW, while the FRG-100 allows the installation of an optional CW filter only. So that's that (platoons of September 1992 QSTs snap shut), and so much for the FRG-100, right?

Nope. The FRG-100 stands on its own as a serious, lower-priced communication receiver that has already drawn critical acclaim in shortwave-listening circles (the *World Radio TV Handbook's* 1993 Industry Awards named it “Best Communications Receiver 1992”). The SWL community has largely evaluated the FRG-100 in terms of how it receives one-way communication—mainly, AM radiotelephone as embodied by shortwave broadcasts. *This* review evaluates the FRG-100's performance from an Amateur Radio and SWL perspective. To this end, we equipped our FRG-100 with a 500-Hz CW filter, but choose not to install the optional FM Unit-100 narrow-band FM module. The receiver package included the PA-11B ac adapter, which puts out 12 V dc at 1.5 A.

The Basics of the Box

Frequency Agility. A satisfyingly

The Bottom Line

Of special interest to listeners for whom innovatively flexible CW and SSB reception come before hi-fi AM as receiver-performance musts, the compact FRG-100 packs a surprising performance wallop at a price that should make its competition worry.

weighted tuning knob dominates the FRG-100's front-panel controls, tuning the receiver in 10-Hz steps in LSB, USB and CW and 100-Hz steps in AM and FM (**FAST** mode not selected) or 100-Hz steps in LSB, USB and CW and 1-kHz steps in AM and FM (**FAST** mode selected). **UP** and **DOWN** push buttons tune the receiver in 100-kHz or 1-MHz steps.

Citing “a private survey of American world-band listeners . . . undertaken by a private institute” as rating the importance of keypad tuning as 83.5 on a scale of 100, *Passport to World Band Radio* 1994 slams the FRG-100 for its “incredible omission” of this feature, saying that the radio “can't be tuned properly” without it. Well! Keypad frequency entry is certainly a convenience, but with 25 years of shortwave and amateur listening behind me, I can't ascribe it such importance. Ham-equipment manufacturers apparently can't, either: *None* of the low-end MF/HF transceivers offered by the major players—ICOM, Kenwood, Ten-Tec, Yaesu—include keypad tuning. Considering what else the FRG-100 brings to the communication-receiver market for its price, I think the omission of keypad tuning is defensible.

Memories. The FRG-100's 52 memories—01 through 50, Lo and Hi—store frequency and mode. Lo, Hi and 01 contain default information—necessary as jumping-off points when the radio's microprocessor is reset, for instance—but can be reprogrammed at will. Lo and Hi also serve to hold limits for the FRG-100's scanning functions. The memories are tunable—that

Table 1**Yaesu FRG-100 General-Coverage Receiver, Serial No. 3D040176****Manufacturer's Claimed Specifications**

Frequency range: 50 kHz to 30 MHz.

Modes of operation: USB, LSB, CW, AM, FM (optional).

Power consumption: 1.2 A max, 11-14 V.

Sensitivity ("for 10 dB S/N, FM 12 dB SINAD"): SSB/CW (2.4-kHz BW), <4 μ V from 100-250 kHz, <1 μ V from 250-500 kHz, <2 μ V from 0.5-1.8 MHz, 0.25 μ V from 1.8-30 MHz.

AM (6-kHz BW), FM (28-30 MHz, 15-kHz BW): 100-250 kHz, <2 μ V; 250-500 kHz, <4 μ V 0.5-1.8 MHz, <1 μ V, 1.8-30 MHz.

FM (28-30 MHz, 15-kHz BW): <0.5 μ V

Dynamic range: Not specified.

Image rejection: 60 dB or better from 1.8-30 MHz.

Squelch sensitivity: 1.8-30 MHz (CW, SSB, AM): <2.0 μ V; 28-30 MHz (FM): <0.32 μ V.

S-meter calibration (μ V for S9 reading): Not specified.

Receiver IF/audio response: Not specified.

Receiver audio output: at least 1.5 W at <10% distortion with 4- Ω load.

Color: Black and dark gray.

Size (height, width, depth): 3.7 \times 9.4 \times 9.6 inches.

Weight: 6.6 lb.

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

**Measurement was noise-limited at the value shown.

Measured in the ARRL Lab

As specified.

As specified; FM not tested.

0.76 A at 13.8 V.

<i>Minimum discernible signal (noise floor) with 500-Hz filter:</i>	<i>Signal level for 10 dB (S+N)/N, 2.4-kHz BW</i>
1.02 MHz; -130 dBm	-116 dBm (0.35 μ V)
3.52 MHz; -139 dBm	-124 dBm (0.14 μ V)
14.02 MHz; -138 dBm	-124 dBm (0.15 μ V)

Test signal modulated 30% with a 1-kHz tone, AM Wide:

1.02 MHz: -101 dBm (2 μ V)
3.80 MHz: -110 dBm (0.7 μ V)

Not tested.

Blocking dynamic range:*

1.02 MHz: 111 dB**
3.52 MHz: 117 dB**
14.02 MHz: 113 dB**

Two-tone, third-order intermodulation distortion dynamic range:*

1.02 MHz: 98 dB
3.52 MHz: 93 dB
14.02 MHz: 93 dB

Third-order input intercept:

1.02 MHz: + 17 dBm
3.52 MHz: +0.5 dBm
14.02 MHz: +1.5 dBm

Second-IF image rejection: 87 dB at 14.02 MHz (test signal at 14.93 MHz).

14.2 MHz, USB mode: -105 dBm (1.3 μ V) at threshold, -12.5 dBm (53 mV) at maximum; FM not tested.

CW narrow 70 μ V at 14.02 MHz; 120 μ V at 1.02 MHz.

Bandwidths at -6 dB, measured at external speaker with SSB carrier offsets and CW pitch at factory defaults: CW narrow, 329-863 Hz (534 Hz) CW wide, 216-1719 Hz (1503 Hz) USB, 215-1707 Hz (1492 Hz) LSB, 108-1821 Hz (1713 Hz) AM wide and AM narrow, 72-2100 Hz (2028 Hz)

2.7 W at 10% total harmonic distortion with 4- Ω load.

is, they act like individual VFOs—and selectable by means of a detented, bidirectional **MEM** knob. The usual VFO/memory-button cluster controls memory storage and retrieval, and VFO/memory toggling.

Display. The FRG-100's yellow-backlit liquid-crystal display shows memory-channel number, frequency to the nearest 10 Hz, and annunciators for mode, clock, squelch, computer-control and other functions. The signal meter, also warmly backlit in yellow, spans S1 to 60 dB over S9.

Mode/filter agility. Four push buttons switch the FRG-100 between USB and LSB

(**SSB**), CW wide and CW narrow (**CW/N**), AM wide and AM narrow (**AM/N**) and **FM**. The FRG-100 comes with IF selectivities of 2.4, 4 and 6 kHz as standard. Function keys let you change, on the fly, the IF selectivities assigned to the AM/N and SSB modes—quite useful, for instance, in tuning in AM as SSB: Achieving carrier zero-beat is easy with double-sideband signals if you momentarily switch in the 4- or 6-kHz filter and tune for the slowest possible inter-sideband beat.

Clock/timer. The FRG-100 has two 12/24-hour clocks, one of which can be set to

act as a one-event or sleep timer capable of turning the receiver (and a device connected to relay contacts accessible via the radio's rear-panel **REMOTE** jack) on and off. Both clocks must be set to 12- or 24-hour operation simultaneously; one can't be set to 12-hour operation with the other set to 24.

Scanning. MF/HF scanning is a major yawn for yours truly, but for the record, the FRG-100 can do memory, band (that is, frequency), priority and channel-group scanning. The radio's scanning can be set to resume 2 seconds after a signal vanishes

(carrier-delay mode) or 5 seconds after acquiring a signal (time-delay) mode. You can lock channels out of memory scanning as necessary.

Rear-panel connections. The FRG-100 connects to the outside world via ANTenna connectors (switchable LO-Z [50 Ω, coaxial] and HI-Z/GND [450 Ω, spring terminals]), RECorder, REMote, MUTE, DC12V IN and Computer-Aided Transceiver jacks, and the ever-faithful GROUND post.

RF input attenuators are present—6- and 12-dB jobs selectable separately or together by means of front-panel buttons. The obligatory squawky, top-mounted speaker is present, too.

Programmable functions. The SWL-oriented reviews I've seen give next to no space to FRG-100 features that I think every synthesized, microcontroller-commanded MF/HF radio should include. The FT-890, for instance, glaringly omits user-programmable CW-receive offset and sidetone pitch—you're stuck with 700 Hz, period. Not so with the FRG-100: It allows you to select a CW-receive pitch of 400, 500, 600 (the default) or 700 Hz.

Some operators prefer to listen to their CW in "USB" or "LSB." You have no choice in the FT-890, but the FRG-100 lets you adjust two related settings: You can move the radio's BFO above or below its 455 kHz IF, and you can adjust the FRG-100 to jump between LSB and CW (or USB and CW) without changing the pitch of received signals.

Want to tweak your FRG-100's frequency calibration so it's spot-on with WWV? No problem: The radio lets you set its PLL Offset value—to a different value for each mode (USB, LSB, CW, narrow, AM, AM narrow, FM)—within ±3 kHz of its default value. This feature, in conjunction with the radio's button-press beeper (which, adjustable as it is from 270 to 3520 Hz, can be set equal to the radio's CW-receive pitch for use as a transfer oscillator), can allow you to accurately measure carrier frequencies to the nearest 10 or 20 Hz with the FRG-100.

In even the most expensive Amateur Radio transceivers, circuit alignment and IF-filter asymmetry generally cause received band noise, and the audio of identical and opposite sidebands, to sound different in USB and LSB. The FRG-100's SSB Carrier Offset features lets you minimize this effect and tailor the radio's SSB audio response by setting the BFO-to-IF offset independently in LSB and USB. In both modes, you can swing the BFO, on the fly, from 452 to 458 kHz in 10-Hz steps—just what you need, for instance, to tailor the FRG-100's audio response for best operation with a digital modem. (Despite what the *Operating Manual* says, you can do this

without affecting the pitch of received signals—so this feature can successfully serve as a precise IF-shift control in SSB.)

Additional user-programmable features, some executable on the fly and some only at power up, include microprocessor reset, scanning defaults, memory-channel lock-out and more. The radio's computer-control command/response suite includes something of possible use to those interested in doing automated bandscans: access to digitized S-meter data.

Documentation. The FRG-100 *Operating Manual* continues Yaesu's tradition of excellent instruction books. As if the manual wasn't enough, the FRG-100 comes with a plastic command-summary/time-chart card that slips neatly into a holder on the receiver's bottom cover. Smooth!

The FRG-100 in Action

As Table 1 shows, ARRL Lab testing found that our FRG-100 meets or exceeds all of its specifications. Even though the radio doesn't include an RF preamp, its sensitivity is more than adequate. I was disappointed (but not surprised) to see the FRG-100 radio's blocking-dynamic-range numbers come up *noise-limited*. This indicates that the radio's frequency synthesizer is significantly phase noisy, which can cause a superimposed-hiss effect that's most noticeable when you try to receive weak signals adjacent to very strong ones. Considering the FRG-100's price class, though, this is forgivable. The radio's two-tone, third-order intermodulation distortion dynamic range numbers—in the low 90s—are good for its price class.

On the air, the FRG-100's behaves as our lab findings suggest it should. Its AGC-attack response is acceptably good, even when set to **FAST** while receiving my transmitter through transmit-receive-switch leakage. (The FRG-100's **SLOW** AGC response sounds like other radios' **SLOW** AGC, but **FAST** behaves more like **MEDIUM** in radios that give you that choice.)

As with every noise blanker I've ever used, the FRG-100's blanker knocked down some impulse noises and didn't touch others.

The FRG-100's S meter is there, looks nice and moves when signals come in, change strength or go away. (Sorry, I just can't take MF/HF signal meters seriously unless they're calibrated in dBμV or some other meaningful unit.)

If there's one FRG-100 trait worth crabbing about, it's what I call Heavy-Handed AF Rolloff. And the FRG-100 does it with a vengeance. Look at Table 1's AF/IF audio bandwidth numbers. The radio's upper -6-dB audio-bandwidth limits in AM wide (6-kHz IF filter) and AM narrow (4-kHz IF filter)—2100 Hz in both in-

stances—are so low that the audio sounds muffled and boomy. You can barely tell whether you've chosen AM narrow or quality AM wide! Although rolloff this severe can work to enhance weak-signal CW copy, it's too much for AM and even somewhat muffles SSB audio.

Tuning away from strong signals during CW reception, I can hear high-pitched *filter blowby* with the narrow filter in line. Okay, this is something that audio rolloff can legitimately mask. But then I read the FRG-100 review in *Passport to World Band Radio 1994*: "The '100 sounds good to the ear, too, and our lab tests confirm better-than-average audio." This, after taking the radio to task for its overwide 4- and 6-kHz filtering, through which "heterodynes from adjacent stations, like werewolves baying at the moon, sneak in to spoil the listening experience"! Eh? Can we be talking about the same radio? Our FRG-100 sounds like it's smothering under a blanket during AM reception! (According to Yaesu, the 4-kHz filter performance has been improved in the latest production models.)

Despite *Passport 1994*'s remarks predicting inaction, Yaesu apparently *did* modify the FRG-100's IF/AF response in answer to complaints like *Passport*'s. The fix seems to have been—sigh—heavy-handed AF rolloff. Oh, well. Somewhat higher-fi audio is available at the radio's **REC** jack. If you know your stuff, you could even—gasp—modify the FRG-100's circuitry for better sound by changing a capacitor or two.

My bleatings on audio response aside, what you should know about the FRG-100 is this: It receives CW and SSB signals very well—with none of the weak-CW-signal graininess exhibited even by some mid-priced MF/HF receivers and transceivers of the previous equipment generation—and AM passably well. Within the constraints imposed by heavy-handed AF rolloff, its excellent reception of AM as SSB confirms that its AGC response and SSB-width IF filtering are above reproach for a receiver in its price class. The FRG-100 brings 10-Hz-step tuning and 10-Hz frequency display to the consumer-communications-receiver market at an industry-low price. It's lightweight, quite frequency-stable, and well-laid out mechanically and ergonomically. I want one!

But now my guessing machine is revving: What about a transceiver spin-off of the FRG-100?

Manufacturer: Yaesu USA, Inc, 17210 Edwards Rd, Cerritos, CA 90701, tel 310-404-2700. Suggested retail prices: FRG-100, \$669; FM Unit-100, \$47; XF-E 500-Hz filter, \$149; XF-F 250-Hz filter, \$159; TCXO-4 high-stability crystal, \$102.

The MFJ-8100 Shortwave Regenerative Receiver Kit

Reviewed by David Newkirk, WJIZ

The feeling comes without warning: You're in a five-star restaurant and you have carte-blanche ability to pay. The menu bewitches, the wine list beckons, the sky's the limit . . . and suddenly you realize that the food you *need* is a sweet string bean snapped straight off the vine.

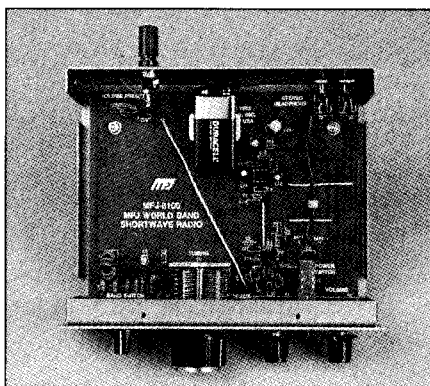
The radio-hobby equivalent to that feeling—which, for the sake of discussion, I'll refer to as Finally Getting The Joke—is the sudden suspicion that using the feature-studded, kilobuck-plus, RS-232-compatible electrobox in front of you may sometimes be an elaborate exercise in Almost, But Not Entirely, Missing the Point.

In the restaurant example, the appropriate response is to find that fresh string bean and eat it. In radio hobbyism, the best way to reset your microprocessor is to spend a little time *failing* to miss the point—to get a little R&R by reconnecting with and enjoying radio with a minimum of hardware between you and radio itself.

That's where MFJ's MFJ-8100 Shortwave Regenerative Receiver kit comes in. Until I built and used the MFJ-8100, I'd yet to hear a solid-state regen that did any justice at all to what a regenerative receiver can do. *Sure* you can equip any oscillator, tube or solid-state, with an antenna jack, ac-couple its output to an audio amplifier and hear signals, but unless you do it right, your lash-up will work about as poorly as today's Very Serious Hams *think* regens worked. Such is not the case with the MFJ-8100K.

What you get in the MFJ-8100K box is a set of parts, an enclosure, a circuit board and a lively, literate Heathkit-like manual that treats you and the job at hand with respect. (You supply a 9-V battery, antenna wire and low-impedance headphones separately.) *Of course* you should end up with a receiver that works the first time if you follow the manual's check-the-boxes instructions; so enjoyable is the manual that you end up with more: a radio and a source of this-way-to-the-fun inspiration. I estimate that unhurried constructors will tend to finish the job in two to three hours, including normal domestic interruptions.

The MFJ-8100's active devices comprise three J310 JFETs (one as an untuned, grounded-gate RF amplifier, two as a Butler-oscillator regenerative detector) and an LM386 audio-power-amplifier IC. Amazingly (to me), MFJ's choice of encapsulated RF chokes do a more-than-reasonable job as three out of the four coils in the detector's tuned circuit (for its highest band, you wind a toroidal inductor yourself). A wide-spaced capacitor with built-in reduction drive (ratio, about 6:1) tunes the receiver well—from about 3.5 to 22 MHz. Final tweaks involve adjusting set-and-forget regeneration and tuning trim-



mers after you install the circuit board in the enclosure, and then you're ready to cruise the bands. With all of its screws in place, the enclosure makes a solid package, indeed.

I almost dropped my teeth when ARRL Lab Supervisor Ed Hare, KA1CV, said he wanted to do sensitivity and dynamic-range testing on the 8100K. The radio really isn't optimized for 50- Ω input, the impedance level at which all of our test equipment operates. (Nor does the 8100K need much of an antenna, such as whatever might be connected to the non-station end of a coaxial feed line, to haul in the world entertainingly—10 to 20 feet of wire is sufficient.) For the record, though:

- The MFJ-8100K's RF sensitivity (in this case, what we term *minimum discernible signal*—a 3-dB signal-plus-noise to noise ratio) is, just above critical regeneration, -105 dBm at 4 MHz and 10 MHz. At 20 MHz, Ed had to turn down the set's **RF GAIN** control, a variable resistor in series with its antenna-input line, to a point at which test-equipment loading didn't make the 8100K's detector stop oscillating. At

that point, the radio's MDS was -90 dBm.

- The MFJ-8100K was not stable enough for us to measure its blocking dynamic range. With 100-kHz tone spacing, however, increasing the test signal to a level 85 dB above MDS made the received signal abruptly disappear.

- The MFJ-8100K's two-tone, third-order dynamic range measured as 70 dB with 100-kHz tone spacing.

- With an 8- Ω load, the MFJ-8100K's audio amplifier operated at 45 milliwatts with 20% total harmonic distortion. That's plenty of headphone audio.

Pretty crummy numbers compared to a "real radio," eh? But statements like that lead directly to Missing the Point, which (I opine) a radio like the MFJ-8100K can keep you from doing. The point of radio is getting the message across, and the fact is that hams and pros alike did just that for decades with receivers that worked as well as the MFJ-8100K. Speaking from experience, I can tell you that the MFJ-8100K needs no apologies as ham-built regens go. Made just a bit more capable of dealing with variable signal levels through the addition of an external 5-k Ω antenna-input pot (one terminal to chassis, one terminal to the 8100K's **ANTENNA** post, wiper to the antenna), the MFJ-8100K comes as close to equaling a good ham-built regen of yesteryear as a few transistors and an LM386 are likely to come.

The next time your nine-band, full-break-in, kilobuck-plus marvel starts to feel like overkill, the antidote just might be an evening spent building an MFJ-8100K.

Manufacturer: MFJ Enterprises, Box 494, Mississippi State, MS 39762, tel 601-323-5869, fax 601-323-6551. MFJ-8100K regenerative receiver kit, \$59.95; MFJ-8100W wired and tested regenerative receiver, \$79.95.

Heil Pro-Set Headset

Reviewed by Mark J. Wilson, AA2Z

The previous two reviews were written by a self-proclaimed receiver snob [er...enthusiast—sorry, Dave]. Before you read this review, you should know that I'm a *headphone* snob. I've gone through a *lot* of headphones—either they're too tight, or too loose, or they hurt my ears, or they sound muffled, or... Maybe I was dropped on my head as a baby or something, but I've always had a problem finding headphones that are comfortable after extended wear.

About 10 years ago, Clarke Greene, K1JX, introduced me to Beyer DT-550 stereo headphones that sound great and are comfortable to wear for a full weekend of contesting. What they don't have is a boom microphone, so I gravitated toward a Heil BM-10 headset for phone operation after reviewing one for February 1992 *QST*. In that review I praised the BM-10's audio quality and comfort, but voiced some reservations about the headset's durability. The review also noted that the BM-10's personal-stereo-type on-ear headphones did little to block external noise.

Apparently others felt the same way, because a common question among the contest crowd at the 1993 Dayton HamVention was "did you see the new Heil headset?" Indeed, Heil had introduced a new headset—the Pro-Set—that maintained the traits we liked in the BM-10 but addressed the concerns about the physical package.

The Pro-Set combines a set of conventional stereo over-the-ear headphones with a boom mike attached to one side. Its simple-but-elegant design easily adapts to heads of all shapes and sizes without a lot of fuss, making it extremely comfortable to wear for extended periods. I knew at once that the Pro-Set felt "right" but didn't give it much thought until I read a review of this product by Bob Wilson, N6TV, in the November/December *National Contest Journal*. As Bob explains, "The removable cushions are supported by a lightweight plastic dish which attaches to the overhead support with a unique ball joint attachment. This ingenious arrangement allows each headphone to pivot independently several degrees in any direction, letting the phones conform to the shape of your head instead of the other way around." Bob goes on to note that the padded headband has detents on each side so that you can adjust the headphones independently over a range of about 1.5 inches. Oh, *that's* why...

The microphone boom swivels up and down, and when it's up for storage, you don't even know it's there. The boom is extremely flexible, and you can adjust the microphone position in three dimensions so that it's just right. According to our postal scale, the headset weighs 10.3 ounces (including cable and connectors).

The Pro-Set's cabling is an improvement over the BM-10. The BM-10 had



separate mike and headphone cables, which often ended up a tangled mess. In the Pro-Set, the lines for the headphone and microphone connections are bundled together in a single 90-inch-long cord with strain reliefs at each end. The headphone cable terminates in a standard 1/4-inch stereo phone plug.

The mike cable terminates in a standard two-conductor 1/8-inch phone plug. A 1/8-inch phone plug? Yes. One of life's little frustrations is that the 8-pin mike connectors on today's transceivers all look the same, but they're wired differently. Heil gets around this problem by offering adapter cables to connect the Pro-Set to a variety of transceivers. The adapter cables are about 12 inches long. On one end is a 1/8-inch phone jack to match the Pro-Set's mike plug and a 1/4-inch phone jack for an external PTT switch (Heil sells optional foot switches and hand-held PTT switches.) On the other end is an 8-pin mike connector wired correctly for the transceiver of your choice. The adapters are even color coded (blue for ICOM, yellow for Yaesu, and so on). You get one adapter—your choice—with the headset, and you can buy additional adapters separately.

Like the BM-10, Heil offers the Pro-Set with a choice of microphone elements. Both elements are proven designs that have been in the Heil lineup for some time. The HC-5 element, designed to provide good audio for everyday operating, is rated at 350-4000 Hz with a 6-dB rise at 2400 Hz. The HC-4, designed for more "punch" for contest and DX work, rolls off the low end sooner—at 500 Hz—and has a 10-dB peak at 2100 Hz. The review unit had an HC-4 element. On-the-air reports with the Pro-Set were similar to reports I've gotten with other mikes using the HC-4 element. Listeners liked and commented on the clean, crisp and punchy audio—no surprises here!

The Pro-Set headphones are a big improvement over the BM-10. We loved the way the BM-10 headphones sounded, but didn't like the fact that they did little to block external noise. The Pro-Set head-

phones sound great, too, and their over-the-ear design is a lot more effective at muting fan noise, people talking in the background, and so on.

Heil's latest headset offers the impeccable audio of the popular BM-10 and adds a number of worthwhile improvements to the physical design. Finally, I can return my trusty Beyers to the stereo cabinet.

Manufacturer: Heil Sound Ltd, 2 Heil Dr, Marissa, IL 62257; tel 618-295-3000, fax 618-295-3030. Manufacturer's suggested retail price: Pro-Set headset, \$135; AD-1 adapter cables, \$13.

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.

AEA DSP-2232 multimode data controller (see Product Review, April 1993 *QST*). Minimum bid: \$600.

Hal Communications PCI-4000 CLOVER II data controller, s/n 0148 (see Product Review, April 1993 *QST*). Minimum bid: \$550.

Hal Communications PCI-4000 CLOVER II data controller, s/n 0149 (see Product Review, April 1993 *QST*). Minimum bid: \$550.

MFJ-207 SWR Analyzer (see Product Review, November 1993 *QST*). Minimum bid: \$53.

MFJ-249 SWR Analyzer (see Product Review, November 1993 *QST*). Minimum bid: \$132.

SGC-230 Smartuner automatic antenna tuner (see Product Review, November 1993 *QST*). Minimum bid: \$324.

Tejas Technology Backpacker II 40-meter CW QRP transceiver (see Product Review, November 1993 *QST*). Minimum bid: \$132.

Sealed bids must be submitted by mail and must be postmarked on or before January 27, 1994. 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.

QST