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Japan Radio Company JST-245 Transceiver

Conducted by Mark Wilson, AA2Z
Editor, *QST*

Japan Radio Company JST-245 Transceiver

Reviewed by Glenn Swanson, KB1GW
Educational Programs Coordinator

Usually, my contest scores don't attract much attention. Yet when I recently posted a score to the Internet contest reflector, several people immediately fired off e-mail messages to me! Among all of the other data on my contest summary page, they had noticed this single line: "Equipment: JRC JST-245." They all wanted to know the same thing, "What *about* that JST-245?" Since I was working on this review at the time, I couldn't tell them anything. Now that we've put the JST-245 through its paces, the answer is clear: it's a *nice* radio!

After an unfavorable review of the earlier JST-135HP, which *QST* reviewed in March 1992, the Japan Radio Company undertook a massive engineering effort to create the all-new JST-245. Unlike the JST-135HP, which we said "needs work" to qualify as a competitive high-performance radio (see the sidebar "Yeah, But What Does *Newkirk* Think?" by Dave Newkirk, WJ1Z), the JST-245 received plenty of compliments from the hams who used it. With the introduction of the JST-245, JRC has come up with a platform that's *designed from the start* to compete with comparable high-performance, competition-class radios. Its user interface and performance make it a competitive, performance-oriented entry in its price class.

JRC makes the model JST-145 in addition to the JST-245. The JST-145 is similar to the JST-245 with the following exceptions: the JST-145 leaves out 6 meters and a built-in antenna tuner. Also, a stock JST-145 has its "IF bandwidth control" function disabled. To enable the bandwidth control in a JST-145, an optional 2.7-kHz filter—supplied as standard equipment in the JST-245—is required for the radio's 9.455-MHz IF.

The Bottom Line

Loaded with features and offering excellent radio performance, the all-new JST-245 is a serious contender in the shortwave transceiver market. Although JRC is not a "household name" in the amateur world, this radio deserves a close look.

Features

The JST-245 transceives on SSB, CW, AM, FM, and AFSK on 160 through 6 meters, and it has a general-coverage receiver. In addition to the usual MF/HF bands, the JST-245 transmits from 50 to 54 MHz and receives from 30 to 54 MHz.

The JST-245 has a built-in ac power supply. It uses MOSFETs in its final amplifier, the power output of which is adjustable from about 5 W to more than 150 W, on all bands and in all modes (except AM). As shown in Figures 1 and 2, the '245's transmitted IMD performance on HF is outstanding, and its 6-meter performance is competitive with most other radios we've tested.

The JST-245 is a medium-size radio, and the size of its front panel allows for large, well-spaced controls. The large VFO tuning knob operates *very* smoothly. There are two buttons on each side of the VFO knob, **>** (up) and **<** (down), that can be used to tune up or down a band. When the **1MHz** key is pressed, these keys increase the VFO in 1-MHz steps. The large **RIT/XIT** knob is to the right of the VFO, and you select each function via separate **RIT** or **XIT** buttons. Either of these offsets can be reset to zero via a *separate* clear (**CLR**) button, located between the **RIT** and **XIT** buttons. The **RIT/XIT** control is adjustable over a 10-kHz range, and a separate sub-display shows the amount of offset. One of the radio's software switches (more on these later) lets you choose whether or not the main frequency readout displays the offset.

Dual VFOs are standard, as are 200 tunable memory channels. The memory information is backed up by an internal lithium battery that should last "about five years."

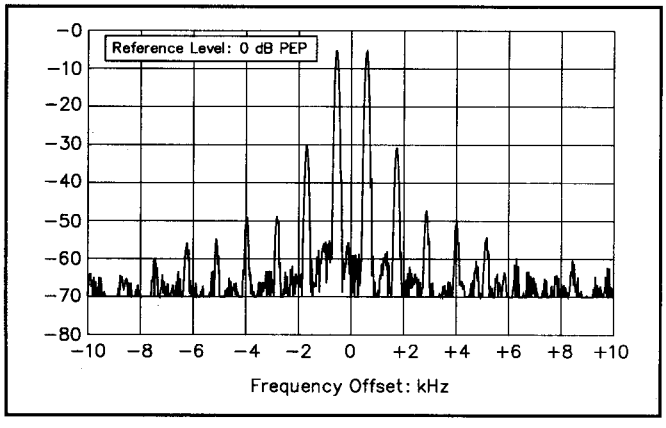

Figure 1—Worst-case spectral display of the JRC JST-245 transmitter during two-tone intermodulation distortion (IMD) testing. Worst-case third-order product is approximately 31 dB below PEP output, and the fifth-order product is approximately 48 dB down. The transceiver was being operated at 150 W PEP output at 52 MHz.

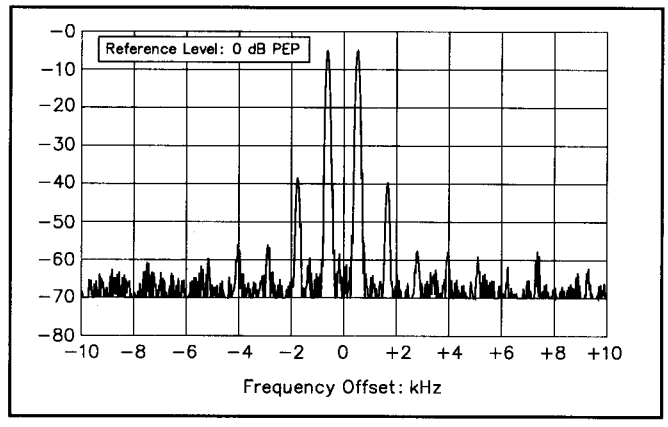

Figure 2—Typical HF spectral display of the JRC JST-245 transmitter during two-tone intermodulation distortion (IMD) testing. Worst-case third-order product is approximately 39 dB below PEP output, and the fifth-order product is approximately 56 dB down. The transceiver was being operated at 150 W PEP output at 14 MHz.

Table 1
Japan Radio Company JST-245D MF/HF/6-Meter Transceiver, serial no. RG-01265

Manufacturer's Claimed Specifications	***Measured in the ARRL Lab***
Frequency coverage: Transmitter range: 1.8-2, 3.5-4, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7 and 50-54 MHz. Receiver: 100 kHz to 54 MHz.	As specified. Transmitter operates a few kilohertz above and below the band edges.
Modes of operation: LSB, USB, CW, AM, FM, AFSK.	As specified.
Power requirement: 85-132 V ac; 90 VA on receive; 900 VA on transmit (max).	As specified. Tested at 120 V ac.
Receiver	*Receiver Dynamic Testing*
SSB/CW receiver sensitivity (bandwidth not specified, 10 dB S/N): 0.1-0.5 MHz, 14 dBμ (–93 dBm); 0.5-1.6 MHz, 6 dBμ (–101 dBm); 1.6-30 and 48-54 MHz, –10 dBμ (–117 dBm).	Minimum discernible signal (noise floor) with 500-Hz IF filter: *Preamp off* / *Preamp on* 1.0 MHz: –128 dBm / –132 dBm 3.5 MHz: –133 dBm / –138 dBm 14 MHz: –131 dBm / –138 dBm 50 MHz: –130 dBm / –140 dBm
AM (10 dB S/N, bandwidth not specified): 0.1-0.5 MHz, 24 dBμ (15.8 μV); 0.5-1.6 MHz, 16 dBμ (6.3 μV); 1.6-30 and 48-54 MHz, 6 dBμ (2 μV).	10 dB (S+N)N (signal 30% modulated with a 1-kHz tone, 6-kHz filter): *Preamp off* / *Preamp on* 1.0 MHz: 5.6 μV / 1.6 μV 3.5 MHz: 3.9 μV / 0.8 μV 50 MHz: 1.7 μV / 0.5 μV
FM (for 12 dB SINAD): 1.6-30 and 48-54 MHz, –6 dBμ (0.5 V).	For 12 dB SINAD: *Preamp off* / *Preamp on* 29 MHz: 0.6 μV / 0.3 μV 50 MHz: 0.8 μV / 0.3 μV
Blocking dynamic range: Not specified.	Blocking dynamic range with 500-Hz IF filter:* *Preamp off* / *Preamp on* 1.0 MHz: 121 dB / 119 dB 3.5 MHz: 127 dB / 123 dB 14 MHz: 128 dB / 126 dB 50 MHz: 125 dB / 118 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range with 500-Hz IF filter:* *Preamp off* / *Preamp on* 1.0 MHz: 93 dB / 95 dB 3.5 MHz: 97 dB / 92 dB 14 MHz: 94 dB / 95 dB 50 MHz: 92 dB / 87 dB
Third-order input intercept: Not specified.	*Preamp off* / *Preamp on* 1.0 MHz: +11.6 dBm / +10.6 dBm 3.5 MHz: +12.3 dBm / +0.2 dBm 14 MHz: +10.1 dBm / +4.6 dBm 50 MHz: +7.8 dBm / –9.5 dBm
Second-order intercept point: Not specified.	+65 dBm, preamp off; +64 dBm, preamp on.
FM adjacent channel rejection: Not specified.	≥66 dB at 20 kHz channel spacing.
FM two-tone, third-order IMD dynamic range: Not specified.	≥71 dB at 20 kHz channel spacing.
S-meter sensitivity: Not specified.	S9 signal at 14 MHz: preamp off, 90 μV; preamp on, 22 μV.
Squelch sensitivity: Not specified.	At threshold, preamp on: FM, 0.3 μV or less; SSB, 1.3 V or less.
Receiver audio output: 1 W or more.	2.1 W at 10% THD into 8 Ω
IF/audio response: Not specified.	At –6 dB: CW-INTER, 527-1055 Hz (528 Hz); CW-W, 94-1673 Hz (1579 Hz); USB-W, 309-2726 Hz (2417 Hz); LSB-W, 186-2533 Hz (2347 Hz); AM-W, 83-2740 Hz (2657 Hz).
Notch filter depth: Approx. 40 dB.	High-pitch tone, ≈30 dB; low-pitch tone, ≈35 dB.
Image rejection: 70 dB or better.	≥85 dB.
IF rejection: 70 dB or better.	≥72 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB, CW, FM adjustable 15 to 150 W, continuously adjustable.	Maximum power output typically 155 W, minimum power typically 5 W; varies slightly from band to band. On AM, typically 30 W maximum, 1 W minimum.
Spurious-signal and harmonic suppression: 40 dB or more.	As specified. Worst case, 58 dB at 1.8 MHz. Meets FCC specifications for equipment in its power output class and frequency range.
SSB carrier suppression: 50 dB or more.	>60 dB.
Undesired sideband suppression: 60 dB or more.	>60 dB.
Third-order intermodulation distortion products: –38 dB or less.	As specified at 1.8-30 MHz. –31 dB at 50 MHz. See Figures 1 and 2.
CW keying characteristics: Not specified.	See Figure 3.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 20 ms.
Composite transmitted noise: Not specified	See Figures 4 and 5.

Size (height, width, depth): 5.1×13.8×12 inches; weight, 26.5 pounds.

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Blocking dynamic range measurements were noise limited at the values shown.

The memories store such things as frequency, mode, IF filter settings, and the AGC setting. In addition, they store the antenna port in use (there are three of them), information on split-frequency operation, and whether the RF preamp was on or off.

There are three scanning modes, with 10 scanning-speed adjustments made via the **RIT** control (when in a scan mode). The current VFO is selected via the **A** or **B** buttons, to the left of the VFO tuning knob. Below these are the **A=B** button, which sets the second VFO to the frequency of the current VFO. A **SPLIT** button selects split operation, and the display has VFO A and B indicators that show which VFO is being used for receive (RX) and which for transmit (TX). Pressing the large **TF/RF** button causes the radio to display the frequency in the secondary VFO. This is useful when operating split, since you can check the settings of the second VFO, *and* you can tune this VFO while holding the **TF/RF** button in—handy! A large **STEP** button toggles the VFO tuning steps between 100 Hz and 10 Hz. Also, 2-Hz tuning steps can be enabled (via a software switch); however, the frequency readout indicates frequencies only to the nearest 10 Hz. (You can also define a 1-kHz tuning step for FM operation.)

A front-panel attenuator rotary switch (**ATT**) lets you step through 6, 12, or 18 dB of front-end attenuation. A separate **RF AMP** button selects a front-end preamplifier (and lights a green preamp LED). Another button, labeled **AGC**, lets you select either a fast or slow AGC time constant. Furthermore, by holding in the AGC button for a few seconds, you can turn the AGC off. The display has icons that light up to indicate which of the three choices (**Slow, Fast,** or **Off**) is in effect.

The JST-245 includes a number of features for 6- and 10-meter FM. Much like current VHF FM radios, you can program the radio for automatic transmit frequency offsets of up to ±500 kHz, and you can store this information in the memories. The only problem is that some 6-meter repeaters require a 1-MHz offset (JRC is aware of the problem). You can use the dual-VFO feature to operate on repeaters with the 1-MHz offset. If you have the optional CCL-267 Tone Unit installed, the memories will store DTMF or CTCSS information as well! The optional Tone Unit board is required to access FM repeaters that use CTCSS tone squelch.

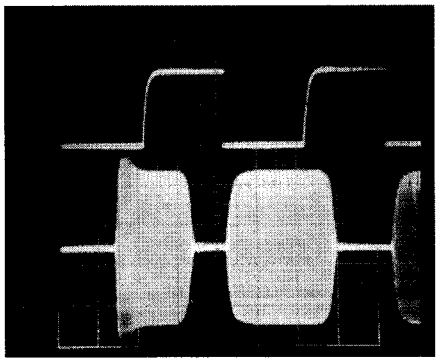

Figure 3—CW keying waveform for the JRC JST-245 in the semi-break-in mode. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 150 W output at 14 MHz. There is a slight shortening of the first transmitted character during semi-break-in operation.

The JST-245's display is colorful! While purists may scoff at such a colorful display—and some have, quite vocally—I felt that it was a joy to look at! There are several colors represented on the display, with various shades of yellows, reds, and blues. The main frequency readout uses large, $^{7}/_{16}$-inch-high yellow digits on a black background, which are easy to see—even from across the room. The display can be dimmed.

The JST-245's metering functions use a multicolor, digital bar-graph display that, in receive, functions as a signal-strength meter. During transmit, the meter's functions can be switched to monitor final stage collector current, power output, SWR, ALC, and RF speech compression level. In the FM mode, the meter can be set as either a signal-strength meter, or a center meter. Transmit metering is selected via the momentary-type **METER** push-button. You can change the metering function only *while you are transmitting* (or when the **XMIT** button is depressed).

Standard filters in the JST-245 include 2.7 kHz for SSB and CW wide, and 6 kHz for AM. JRC offers several optional narrow filters for the second (9.455-MHz) and third (455-kHz) IFs. These include a pair of 500-Hz CW filters and a pair of 1.8-kHz SSB filters; a 300-Hz CW filter is available for the 9.455-MHz IF. The review radio had *all* of these optional filters installed. Pressing one of the three front-panel **FILTER** buttons labeled **NARROW, INTER** (intermediate), or **WIDE** selects them, and display annunciators indicate your selection accordingly.

Installing the JST-245's optional IF filters requires the removal of the radio's top cover, and removal of the power amplifier (PA) unit. After the PA unit is out of the way, the filters are placed on the TX/RX unit, screwed into place and then soldered in. Finally, you must throw the proper DIP switch(s) on the TX/RX board—there's one for each filter. Since this procedure is fairly involved, you *may* want to ask your JRC dealer to do the job for you at purchase time.

Other interference-fighting features include an IF bandwidth control (**BWC**), and a pass-band shift control (**PBS**). Concentric knobs adjust these two features. The **BWC** knob, normally fully counter-clockwise, continuously adjusts the effective bandwidth of the receivers IF—it operates by narrowing the IF width from both sides at once. The **PBS** knob, normally centered, adjusts the passband relative position in 10-Hz steps. When you turn these controls from their normal (wide) settings, small green LEDs light up to show these features are activated.

A push-button labeled **NOTCH** turns this feature on and lights a green LED. The adjacent knob tunes the notch filter. Once you have interference notched, a second press of the **NOTCH** button causes the LED to turn from green to red, and puts the filter into its tracking mode. The notch filter will track the VFO over a ±10 kHz range. In effect, this "notch follow" feature pegs the notch at an absolute point in the frequency spectrum; it is *not* the same as the "auto seek" notching now commonly implemented with digital signal processing.

A friend of mine, Rick Cook, AB4U, once

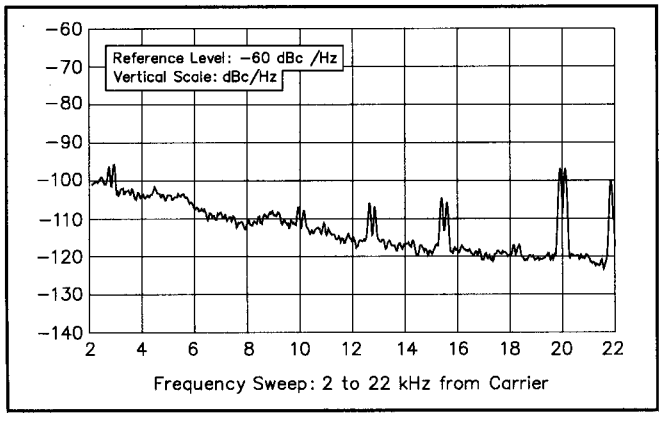

Figure 4—Spectral display of the JRC JST-245 transmitter output during composite-noise testing. Power output is 150 W at 50 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

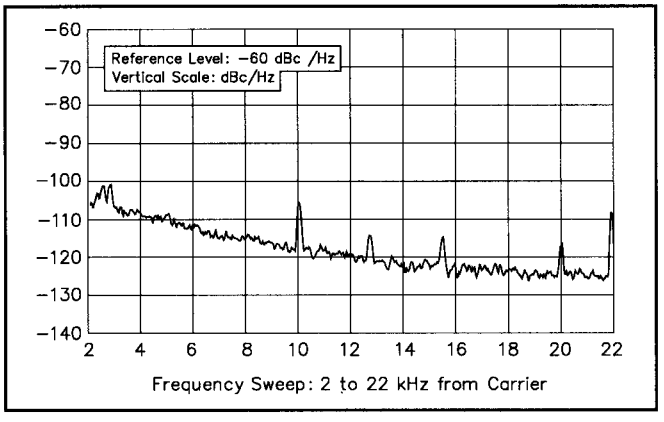

Figure 5—Spectral display of the JRC JST-245 transmitter output during composite-noise testing. Power output is 150 W at 14 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

used these words to describe the various features of his new MF/HF transceiver: "It's like a computer wrapped around a radio." This analogy is useful when describing the rear panel of the JST-245. In this case, however, the back panel of the JST-*245 looks* like (the back of) a computer. In addition to the cooling fan, with its chrome grill, you'll find several ports that use computer-type connectors. These include a DB9 connector (external **Antenna Tuner**), a DB15 (**Linear Amp**), and two DB25s (**RS-232** and **Accessory**). The necessary 25 and 15-pin shielded connectors are supplied with the radio. The **RS-232** port provides access to the *built-in* personal computer interface. This is a nice feature—it means there's one less accessory to buy (and provide power for) if you wish to connect your JST-245 to a personal computer!

Front-panel **ANTENNA** buttons (**1**, **2** and **3**), select the '245's three antenna connectors. The radio can be programmed to deactivate one or two, of the jacks (say, when only one or two antennas are connected), or to select the antenna jack last used on a band and recall the correct connector when you return to that band. Display indicators show which port is in use.

In addition to the antenna ports, other items found on the rear panel include such things as the ground-lug, 1/4-inch key jack, the speaker jack (phono), the power plug, and a fuse-holder. The rear panel also holds the electronic keyer on/off switch (more about the keyer later), the antivox control, and two phono jacks labeled **RX ANT**, **OUT** and **IN**. The **RX OUT** (receiver output) jack is handy if you intend to use an external receiver, and the **RX IN** (receiver input) port is useful when feeding the output of a receive antenna into the JST-245. Finally, there is the phono jack labeled **EXCTR OUT**. This exciter output jack provides low-level RF output during transmit. This output, which is useful for driving such things as an external transverter, works on all bands. Measured power output into a 50-W load varied from about 50 mW at 14 MHz to 12 mW at 50 MHz.

CW ops will probably like the JST-245 a lot. The radio has a built-in CW keyer with a front-panel **SPEED** control that's fairly linear throughout its range. Confusingly, the *Instruction Manual* says "The speed range is 30 and 150ms of dot." Huh? Since hams don't judge CW speed by "milliseconds of dot," we calculated the speed, and found it to be over the range of 8 to 40 wpm. A rear-panel jack accepts a 1/4-inch phone plug, and the internal keyer is turned on via a rear-panel **ELECTRONIC KEYER** switch. You can set the electronic keyer dot:dash ratio to any value between 1:2.5 and 1:4.5, via software switches. The factory default setting is the correct value of 1:3.

Full break-in (QSK) or semi-break-in are available. One of two display indicators, **SBK** for "semi break-in," or **FBK** for "full break-in," light up to indicate which mode you're in. The JST-245 includes a CW *reverse* mode, which allows you to choose which "sideband" you're receiving CW in. If a signal interferes with you on one sideband, you can switch to the other sideband just by pressing the **SHIFT/REV** key. A front-panel **PITCH** control simultaneously changes the CW offset *and* the sidetone, with them tracking each other, as you turn the pitch control knob.

The JST-245 offers two ways to spot a CW signal. You can turn the VOX off and key the transmitter's sidetone, then tune until the sidetone matches that of the received signal. Or you can press and hold in the **METER** button, which sets the BFO to 455 kHz, and tune until you zero-beat the VFO with the received signal. (This spotting method will work with *any* offset frequency that you have dialed in via the pitch control.)

The radio has VOX for SSB, and the VOX gain and delay controls are on the front panel (only the antivox control is located on the rear panel). The JST-245 has a SSB speech monitor on/off button and volume control on the front panel—but you'll need to purchase and install the optional CMF-144 Monitor Unit board to make these controls operational. Even without the speech monitor option installed, the monitor volume (**MONI**) control functions as the CW sidetone level control. A front-panel **TONE** control lets you tailor the '245's receiver sound.

The '245's internal automatic antenna tuner covers 160 through 10 meters (*not* 6 meters), and can match unbalanced loads between 17 and 150 Ω. When the tuner is selected via the front-panel **TUNE** button, a green LED on that button begins to flash, the radio automatically switches to the CW mode, and the tuner searches for a match. If the tuner finds a match, the radio beeps, and the **TUNE** LED stops blinking and stays lit. If a match can't be achieved, the LED in the **TUNE** button will *blink during transmit*. This indicates an SWR condition that the tuner cannot handle, and the radio's power output will be reduced.

Most automatic antenna tuners in current ham transceivers use relay-switched inductors in conjunction with motor-driven variable capacitors (with maybe a *few* switched capacitors on lower-frequency bands). The JST-245's tuner doesn't contain a variable capacitor; it uses many relay-switched fixed-value capacitors instead. As a result, the JST-245's tuner sounds much busier than what many of us are used to, its relays clicking and clacking until the radio finds a match. The racket can be quite distracting when you're tuning up for the first time! According to Paul Lannuier, N2HIE, president of Gilfer Shortwave (from whom we purchased the review radio), the use of relays is "a design trade-off, which sacrifices range for speed, and the tuner in the JST-245 was designed to be *fast*." To set the tuner up, you need to dial through each band, stopping to press the **THRU** button, then the **TUNE** button, every so often as you tune. The tuner divides the HF spectrum into many sub-ranges and memorizes the settings (and the antenna port in use) for each sub-range. It returns to these presets when you next return to that portion of a band. As designed, the internal tuner is useful for tuning a near-resonant antenna. The *Instruction Manual* advises that you should use JRC's NFG-230 External Antenna Tuner when using an antenna, such as a long-wire, with an impedance outside the range of the tuner. When the internal antenna tuner isn't required, you can press the **THRU** button to take the tuner off-line.

The way the SWR meter operates when you're using the internal antenna tuner is worth noting. The SWR meter *always* indicates the SWR as measured *at the antenna connector*. The SWR meter will *not* show the SWR while the antenna tuner is doing its job. During most transmissions, I found that the best way to monitor what was happening was to watch the power output. Anything under 150 W of output indicated that the radio had throttled-back its power output in response to the SWR it was sensing at the time.

Additional optional equipment offered by JRC (but not reviewed here), include such things as two hand mikes (there is no mike packaged with the radio), a desk mike, headphones, a high-stability crystal kit, and two external speakers (one of which has audio filtering). JRC also offers the 1-kW JRL-2000 HF linear amplifier.

Frequency Agility

Besides the dual VFOs, you can enter a frequency, or hop to a band, via the front-panel keypad. The keys on the pad have band numerals on them, so to go, say, from 3.5 MHz to 14 MHz, you simply press the **14** key. The radio will return to the settings that were in effect when you last used that band (including the settings for frequency, mode, antenna port, IF filter, AGC, antenna switch, split, FM frequency shift, tone squelch, CTCSS and preamp).

The numerals 1 through 0 are above and to the left of each key, along with a period/star (**./***) key. To directly enter a frequency, begin with the **ENT/kHz** key, press the keys below each numeral and end with the **ENT/kHz** key. For example, to get to say, 14200.5 kHz, you'd press **ENT/kHz 1 4 2 0 0 . 5 ENT/kHz**. The frequency can also be entered in MHz, by pressing **ENT/kHz 1 4 . 2 0 0 5 MHz**, and you're done. If you make an error as you're going along, you can use the clear (**CLR**) button to erase an entry. (The keys on the keypad can serve a *third* function. If you have JRC's linear amplifier hooked up and working with your JST-245, pressing the function key and the keys that have **A1**, **A2**, etc., printed above them will operate certain amplifier functions.)

Other ways to get around the bands include the ability to press the **1MHz** key and then the < left or right > arrow keys to step through the spectrum 1 MHz at a time. Or you can use the 200 memory channels to go places. Simply press the memory (**MEMO**) key and the memory channel number will be shown on the display. Rotate the **MEMORY** knob until you reach the memory you are seeking. The memories are tunable, and will retain stored data even if you tune away or change any of the parameters stored. If a particular memory is empty, the channel display fills with dashed lines (- - - -) and the receiver mutes. *Storing* information in a memory

channel is much less intuitive. In this case, you must first press the **FUNC** button, then press the **MEMO** button, then use the rotary memo knob to select a memory channel number, and finally, press the **ENT** button. Of this process, one of our JST-245 testers said, "This method requires a lot of hand waving when compared to some other radios."

Software Switches

The JST-245 offers a total of 26 "User Definitions," or software switch settings. Some of these let you turn off the keypress beeper, set the frequency shift for AFSK, and enable or disable, one or two of the antenna ports. You can change the meter display from a bar-graph type of display to a needle-type indicator, specify the electronic keyer's dot-to-dash ratio, and whether or not the antenna port in use will be stored with along with other memory channel information. Unfortunately, you can't increase the RIT tuning step size—a feature that would be a most welcome addition; the '245's RIT rate is, according to one of our testers, "excruciatingly slow at 0.25 kHz per revolution."

You enter the setup mode simply by pressing the **FUNC** key (a display icon lights whenever you press this key), and then the **ENT/kHz** key. The functions are numbered and when you begin, a **1** lights up on the display. You dial through each of the 26 functions with the **MEMORY** knob. To change the way a function works, simply rotate the **RIT/XIT** knob to dial through the options for each definition. When you're done, you can press the **CLR** key, or turn the radio off, or wait 10 seconds before using any of the controls, and the selecting settings will be in effect.

Computer Control

If you have the proper software, the JST-245 offers you the ability to operate several of the radio's functions from your station's personal computer. An RS-232 interface is built-in, so you won't have to purchase, or provide power for, an external interface. To interface the JST-245 to your PC, you need only to plug one end of a standard 25-pin serial cable into the jack on the back of the radio. Then, plug the other end of the cable into one of your PC's serial ports, and you're done!

Unfortunately, the computer interface does not use any of the existing schemes (or "standards") set by other manufacturers, so you won't be able to just "plug-and-play" if you intend to use this radio with your favorite software package. The good news, however, is that at least one popular software program now supports the JST-245. Dave Pruett, K8CC, has recently announced that as of version 9.22, his *NA* contest logging software now supports the JST-245. We can only hope that the authors of other software packages won't be far behind in offering support for this radio.

Lab Testing

The accompanying table and figures show the results of ARRL Lab testing. Receiver sensitivity and dynamic range are good and are competitive with other transceivers on the market in this price range. Of particular interest is the wide-range IF/audio response, which results in the hi-fi audio noted elsewhere in the review.

The transmitter provides a solid 150 W on all bands and is exceptionally clean (Figures 1 and 2). CW shaping (Figure 3) is excellent, and the CW note sounds good on the air. As shown in Figures 4 and 5, transmitted composite noise is okay, but it is about 5 to 8 dB worse than other radios we've tested recently. The composite-noise plots also show more discrete spurs than normal. We found a number of low-level spurs and birdies during receiver testing, and some reviewers commented that the JST-245 has more audible spurs than other radios we've reviewed recently. These spurs are more of a minor annoyance than a problem during on-the-air operation.

Lab testing uncovered a few problems with the review radio: Six-meter spectral purity was about 5 dB worse than allowed under FCC rules; transmit IMD missed JRC's specification by about 4 dB on some bands; and the image rejection fell far short of spec. We returned the radio to our dealer, Gilfer Shortwave, for prompt repair. (According to JRC, Gilfer Shortwave and Universal Radio are its servicing dealers in the US.) It turned out that these were alignment problems specific to our radio. We also noted that the TR turnaround time was 40 ms—too long for some AMTOR paths; JRC was already aware of the problem and was fixing it in production. They provided us with an upgraded EPROM which shortened the turnaround to an acceptable 20 ms.

On the Air

We really gave this rig a workout! Numerous hams in several locations used our test JST-245. We carried it by hand, dispatched it via truck, and hauled it around on the back seats of our cars. We used the JST-245 for casual CW and RTTY operating, some DXing, and both HF and VHF contest action. Overall, there weren't many days when someone, somewhere, wasn't using this radio. So, how did it hold up? The JST-245 took it all in stride—leaving pleasantly surprised users in its wake!

One big reason why the JST-245 charmed those who used it is that the receive audio must be heard to be believed—it won unanimous, unsolicited praise: "The audio was deep, rich and very easy to listen to. On AM broadcast stations, the audio is superb!" And, "The SSB audio is about the best I've heard from a radio—it sounds almost as good as broadcast AM!"

There is *no trace* of high-frequency hiss when you use headphones with the JST-245—even with the RF gain turned down. Why is the issue of high-frequency audio hiss important? For one thing, when you're wearing headphones for hours at a time, as you would in a contest, constant high-frequency hiss can be tiring and distracting even when it's masked by other audio. The JST-245 includes the obligatory squawky, top-firing internal speaker. Quality headphones or a high-quality external speaker lets you hear the full fidelity this radio offers.

We also used JST-245 to make some casual RTTY contacts, and it worked fine. Although the front-panel button for this mode is labeled **FSK**, the radio actually uses AFSK (as supplied by many multi-mode processors) and not direct FSK. All of the radio's IF filters are selectable during **FSK** operation—something we wish other manufacturers would build in ASAP.

One Saturday during the IARU HF Contest, I used the JST-245 to make over 500 phone QSOs in seven hours. When using my Heil ProSet headset and MFJ-432 voice keyer with the JST-245, I had no problems on transmit, or on receive. And, when I tried a Yaesu MD-1 desk mike with the JST-245, all of the mike's functions except the "fast" button worked as expected. (JRC uses the same mike wiring as Yaesu.)

Whenever I asked for transmit audio reports, "good audio" was the reply. My on-the-air tests revealed that the speech processor offered plenty of range, and I never needed to turn the **COMP** control past the nine o'clock position. The ops I checked with felt that the processor wasn't needed when using my Heil headset, which is equipped with an HC-4 "DX" mike element. During most SSB transmissions, the quiet, rear-mounted cooling fan came on to keep the radio cool.

During most of the contest, I operated with the cascaded 1.8-kHz SSB filters in line. This seemed to offer the right amount of bandwidth on bands that were busy with contest action. At other times, I set the IF filtering to wide and used the bandwidth control or the IF shift control. The variable bandwidth (**BWC**) feature was effective—especially in conjunction with the IF shift (**PBS**). These controls were useful when using wide filtering, since narrowing the bandwidth could often eliminate some interference by itself. The **BWC** control did not seem to have any effect when either the intermediate or the narrow IF filters were in use.

One user felt that it was easier and faster to use the **BWC** and **PBS** controls to fight interference than to switch in the narrow IF filters. Another felt the opposite was true. He thought it was easier to select the IF filtering via the **FILTER** keys, but agreed that the bandwidth and passband tuning controls would be useful if you had no narrow filters installed.

The notch filter works well, but most hams who used this feature felt that a wide-range, automatic-seek notch would be much more useful.

One feature I missed was a built-in means of propping up the JST-245's front. A flip-down bail or adjustable front feet would be a handy addition.

When the JST-245 was used on CW with the switchable narrow IF filters engaged, there was no evidence of ringing. The full break-in mode worked smoothly, as did semi-break-in with the VOX delay set to a comfortable hang time. The CW **PITCH** control brought plenty of compliments. We mea-

Yeah, But What Does *Newkirk* Think?

More than few readers—including, according to highly reliable reports, the powers that be at JRC—found my March 1992 *QST* review of the JST-245's predecessor, the JST-135HP, so frank that it bordered on the brutal:

> Does the JST-135HP qualify as a competitive, high-performance radio that offers good value for its price? In my opinion, no. . . I think the basic JST-135 platform needs work: Its entire front panel and user interface need rethinking and redesign . . . its basic and not-so-basic radio performance (QSK, blocking dynamic range, composite noise, IF filtering, AGC attack and RF attenuation) need improvement to put them on par with other radios, even in the price class represented by a stripped-down JST-135

—a conclusion I defended in my response to a letter in May 1992 *QST*'s correspondence column:

> I reviewed the rig for buyers who intend to use it to do what its price and marketing imply it can do. For its price, and compared to its competition, I can't recommend the JST-135HP for such [high-performance DXing and contest] service on the basis of what we found in lab testing and on the air . . . I don't recommend the rig as a sound buying decision for radio amateurs looking for good value in a radio that won't be used demandingly, because buyers can get solid value in a radio designed for that kind of performance for 1/3 to 1/2 the price of the JST-135HP.

It's deceptively easy to glad-hand the *QST* Product Review process when so many—that is to say, most—of the products it covers are so ready for prime time that they *define* prime time. But because *QST* isn't a scandal sheet, tackling a major product that *doesn't* meet its promise pushes the entire ProdRev process to its limits. How *dare* we call a spade a spade, anyway?

That's exactly what happened when I—actually *we*, for at least three other reviewers took part in that particular review—evaluated the JST-135HP and found it strikingly, provably lacking. Some readers were outraged at our candor; others were glad to rediscover that we had guts. But what happened next was beyond our wildest hopes as reporters on modern Amateur Radio gear: JRC *listened*. JRC *cared*. JRC blanched, blushed, found facts, asked the right questions of the right people, and went back to the drawing board. JRC didn't just *fix* the radio—JRC *reinvented* the radio. And so the JST-245 *isn't* a fixed-up JST-135HP—it's an inspiring about-face on par with Yaesu's reinvention of its MF/HF-transceiver line with its introduction of the FT-1000D.

Glenn Swanson's JST-245 review speaks for itself, but I can't resist adding and amplifying a few points. As you read them, keep in mind that I'm a receiver snob who believes that since we spend so much time *listening* to our radios, how their receivers sound is a major-big deal:

The JST-245 uses an audio output IC with very low residual hiss—a great contrast to some current rigs, which sound like distant waterfalls even with **AF GAIN** turned all the way down. Listening to via headphones, the JST-245 has the cleanest and highest-fi receive-audio sound I've heard yet in an amateur shortwave transceiver. Its SSB receive audio is terrific—especially if you turn its **TONE** control down to shave off high-frequency energy—even under the challenging conditions typified
by 75-meter SSB during regional thunderstorm activity—fast or slow AGC notwithstanding, and even with **RF GAIN** up all the way. (The JST-245's SSB-receive sound is excellent on full-carrier AM signals, too; you can keypad jump from listening to a weak Chinese regional broadcaster near 8 MHz to a local 50-kW AM station and hear *no distortion* when the AM local hits, and *still no distortion* on the local's modulation peaks.)

What really frosts the cake is the audio available via **LINE OUT**—it's a revelation. There is essentially *no* distortion on AGC onsets and signal and noise peaks in the **LINE OUT** audio, even when listening to strong 75-meter SSB stations amidst strong static with the **RF GAIN** full up and AGC on **FAST**! This is a major achievement whether or not you know that brain-frying AGC pops were a significant flaw in the JST-135HP. The '245's AM-detection sound is a bit boomy—but who needs envelope detection when you can tune in a carrier to within 1 Hz of zero beat in SSB mode (2-Hz tuning steps mean a maximum tuning error of 1 Hz) and switch in a 6-kHz filter?

The JST-245's CW receive audio is also fine—none of the weak-signal graininess we're forced to take for granted in more than a few current transceivers. The radio's tracking sidetone and offset are just what the doctor ordered; the ability to reverse the CW-receiving "sideband" with a front-panel button is a treat.

That the JST-245's **EXCTR OUT** feature works even at 6 meters (some rigs of old with exciter output jacks put out exciter energy only at 10 meters), affords the possibility of using *50 MHz* as a transverter IF in addition to 28 MHz. (Assuming a given target transverter image rejection/spur spec, this would let us push a given transverter technology that works well with a 28-MHz IF to just about twice whatever operating frequency is now the max for that technology—or it would let us get much better image/spur rejection at the operating frequencies to which we now transvert with 28-MHz IFs.)

JRC deserves praise on making the radio's memories remember so much of the radio's finer detail: antenna, selectivity, AGC, RF amp on/off, CW reverse—*I* can't remember the whole list. It's almost disconcerting not to have to readjust stuff when you change memories and VFOs.

Finally, the JST-245 is so pretty—*really* pretty—that one of our users groused that it looks like "a jukebox." Praise be! If this aesthetic is where ham hardware is heading, sign me up!

So what *does* Newkirk think? He thinks the JST-245 is a triumph—a new heavyweight contender for buyer dollars in the shortwave-transceiver market—and proof that *QST*'s Product Review program *really works*.—*David Newkirk, WJ1Z*

sured its range as 400 to 1200 Hz. When it in its normal position (centered), the sidetone was 785 Hz.

Some operators like AGC that allows weak signals to sound weak, and loud signals to sound loud—AGC that isn't too "flat." Other ops prefer AGC that flattens out the signals in the passband so they're all at the same level, and like to see S-meter activity on band noise. If you belong to the latter group, and like flat AGC, then you'll love this radio's AGC design. Just above the AGC threshold, further signal-strength increases result in essentially no increase in audio output level. (Signals still have to rise above the radio's noise floor somewhat before the S meter indicates anything, however.) One user who put the radio through its paces on CW heard AGC popping at the onset of strong signals and found this distracting, but noted that this was only noticeable at high audio volume settings, and undetectable on SSB.

On 6 meters, the JST-245 gives the competition something to aim for. During the ARRL June VHF QSO Party, I used the JST-245 to make over 140 SSB contacts on 6 meters. With its 150 W PEP output on 6 meters, the JST-245 is ready to help you make contacts on the popular propagation modes. This radio was neat to use during some casual operating on 6 meters, too. On occasion, the band would suddenly open, and I found myself having a blast working other hams and logging new grid squares!

After using the JST-245 on 6 meters during some great openings to Europe (and during ARRL Field Day, on a wide-open 10-meter band), *QST*'s "World Above 50 MHz" columnist, Emil Pocock, W3EP, said "This is undoubtedly the best 6-meter transceiver I have operated, including both 6-meter-only

types, and HF-plus-6-meter radios. That the JST-245 tunes down to at least 48 MHz is helpful, since the 48 to 50-MHz segment contains European low-band TV video signals, which are useful for monitoring transatlantic Maximum Usable Frequency (MUF) conditions."

Instruction Manual

The JST-245's 84-page *Instruction Manual* also applies to the JST-145. Presented in 12 sections, the manual includes a section titled "Notes on Operation," which includes a handy flow chart designed to help you locate and cure common RFI problems. There's a short troubleshooting section, and two pages about accessory and optional equipment. A two-page block diagram and 23 pages of circuit diagrams round out the book. Although we were able to eventually find everything we were looking for, the manual would greatly benefit from an index. Furthermore, the instructions are not always clear, and the manual comes across as a zestless Japanese-to-English translation. Between the rockiness of the translation, lack of overall clarity, and the information scattering, we sometimes had to struggle to find and understand some of the radio's functions, operations and connections. The other major transceiver manufacturers are doing better in this regard.

Conclusions

While JRC is a relative newcomer to the Amateur Radio market, they've been active in the professional, military and commercial-radio arena since 1915—and they've obviously put a tremendous effort and investment into the design of the JST-245. The '245's interference-fighting features operate very smoothly, the colorful display is neat, and the radio is straightforward and easy to operate.

Does the JST-245 represent a high-performance radio that offers good value for the money? Yes. Sure, its manual needs work, and we sometimes found ourselves wishing that JRC had magically been able to read our minds and make the '245 do *exactly* what each of us individually want! But if you're in the market for a competition-class radio, the JST-245 deserves your serious attention. If you're willing to stray from the beaten path to try something a little bit different, the JST-245 may just be the radio for you.

Thanks go to the following hams for their contributions to this review; Dave Newkirk, WJ1Z; Emil Pocock, W3EP; Dean Straw, N6BV; Larry Wolfgang, WR1B; Dr. Ulrich Rohde, KA2WEU; and Mike Gruber, WA1SVF.

Manufacturer's suggested retail prices: JST-245, $2990; NVT-58 Hand mike, $40; CMF-144 Monitor Unit, $123; CGD-135 High-Stability Crystal Kit, $87; IF filters, $154 (except the 1.8-kHz 2nd IF filter, $118); CCL-267 Tone Unit, $132; NVA-319 external speaker, $210. Manufacturer: Japan Radio Company, 430 Park Ave, New York, NY 10022; tel 212-355-1180, fax 212-319-5227. QST

W1AW schedule

Pacific	Mtn	Cent	East	Sun	Mon	Tue	Wed	Thu	Fri	Sat
6 am	7 am	8 am	9 am			Fast Code	Slow Code	Fast Code	Slow Code	
7 am	8 am	9 am	10 am			Code Bulletin				
8 am	9 am	10 am	11 am			Teleprinter Bulletin				
9 am	10 am	11 am	noon							
10 am	11 am	noon	1 pm		Visiting Operator Time					
11 am	noon	1 pm	2 pm							
noon	1 pm	2 pm	3 pm							
1 pm	2 pm	3 pm	4 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
2 pm	3 pm	4 pm	5 pm	Code Bulletin						
3 pm	4 pm	5 pm	6 pm	Teleprinter Bulletin						
4 pm	5 pm	6 pm	7 pm	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
5 pm	6 pm	7 pm	8 pm	Code Bulletin						
6 pm	7 pm	8 pm	9 pm	Teleprinter Bulletin						
6:45 pm	7:45 pm	8:45 pm	9:45 pm	Voice Bulletin						
7 pm	8 pm	9 pm	10 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
8 pm	9 pm	10 pm	11 pm	Code Bulletin						
9 pm	10 pm	11 pm	Mdnte	Teleprinter Bulletin						
9:45 pm	10:45 pm	11:45 pm	12:45 am	Voice Bulletin						

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

❑ ***Morse code transmissions:***

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 1992 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 wpm.

W1AW qualifying runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted on approximately 3.590 MHz by W6OWP, with W6ZRJ and AB6YR as alternates. At the beginning of each code practice session, the schedule for the next qualifying run is presented. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Send a 9×12-inch SASE for a certificate, or a business-size SASE for an endorsement.

❑ ***Teleprinter transmissions:***

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Saturdays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

❑ ***Voice transmissions:***

Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

❑ ***Miscellanea:***

On Fridays, UTC, a DX bulletin replaces the regular bulletins.

W1AW is open to visitors during normal operating hours: from 1 PM until 1 AM on Mondays, 9 AM until 1 AM Tuesday through Friday, from 1 PM to 1 AM on Saturdays, and from 3:30 PM to 1 AM on Sundays. FCC licensed amateurs may operate the station from 1 to 4 PM Monday through Saturday. Be sure to bring your current FCC amateur license or a photocopy.

In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

Headquarters and W1AW are closed on New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day. On the first Thursday of September, Headquarters and W1AW will be closed during the afternoon.