

# CQ REVIEWS:

## The Japan Radio Corp. JST-135HP HF Transceiver

BY LEW McCOY\*, W1ICP

**T**he JST-135HP is manufactured by Japan Radio Corporation, and while the company is not too well known in the amateur market, they make extremely fine equipment for the entire communications field. The JST-135HP is an HF amateur transceiver that is exceptionally well designed and has proven to be an outstanding performer. I had a chance to use the unit for several months and gave it a thorough workout. I was very impressed by its performance.

I really don't like the cliché "bells and whistles," but this unit has them all, as you will see. The receiver provides complete coverage from 100 kHz through 30 MHz continuously and operates all modes, LSB, USB, CW, AM, AFSK, and FM. It employs a variable tuning system, the same as used in their commercial equipment. The receiver provides microprocessor-controlled preselection of the receiver front end, which reduces undesired out-of-band signals. I found that any "birdies" present were not worth mentioning.

Going to the transmit side for a moment, the unit employs a special, heavy-duty heat sink which provides continuous full-power transmission on all bands 160 through 10, including the WARC bands. This means exactly what it says: AMTOR, RTTY, and other key-down continuous-duty modes can be used at full power (150 watts out).

The frequency synthesizer is composed of two phase-locked loops (PLLs) plus two direct-digital-synthesizer (DDS) circuits. These provide true full break-in capabilities (high-speed transmit/receive switching).

The transmitter uses a low-distortion power amplifier which features a large combiner transformer. Its Class A driver stage uses the same transistor as the final stage in order to reduce any third-



The JST-135HP transceiver from Japan Radio Corp.

higher-order intermodulation products. The low-pass filter in the output uses Chebyshev-type filters to suppress harmonics.

The JST-135 CPU offers various methods of frequency control for the user. Dual VFOs are available, as are 200 (!!) memory channels plus advanced scan and frequency sweep functions. Remote control by personal computer is available with an optional RS-232C interface.

I am a firm believer in good selectivity. There is plenty of crowding on the bands these days, and it is going to get worse—no doubt about that. The one item that impressed me the most was the advanced interfering signal rejection techniques used in this transceiver. First, there is a **Bandwidth Control (BWC)** available (front panel) whereby the passband of any selected IF filter can be narrowed by up to 800 Hz in 10 kHz steps. Also, another control is the **PBS (Pass Band Shift)**, where the apparent center fre-

quency of the IF filter can be adjusted up or down in frequency. Also, we have a **Notch Filter** and **Notch Filter Follower**, which is an IF that eliminates beat interference adjacent to a desired signal. The notch filter can also remain locked on an interfering signal during VFO tuning when the notch-filter function is selected via a keypad. When you put all of the above together, there isn't much one can ask for in the way of additional selectivity.

The **Noise Blanker** is designed to eliminate ignition-type noise. It also works well on over-the-horizon radar. I used it extensively for 10 meter operation, and it proved very effective on neighborhood automotive noise.

Another feature is the ECSS (**Exalted Carrier Selectable Sideband**) mode, whereby reception of AM broadcast signals is enhanced. Carrier relation distortion is eliminated or reduced, and selection of either upper or lower sideband of

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### General

#### Transmitter Frequency Range:

1.8	to	2.0	MHz	(160m)
3.5	to	4.0	MHz	(80m)
7.0	to	7.3	MHz	(40m)
10.1	to	10.15	MHz	(30m)
14.0	to	14.35	MHz	(20m)
18.068	to	18.168	MHz	(17m)
21.0	to	21.45	MHz	(15m)
24.89	to	24.99	MHz	(12m)
28.0	to	29.7	MHz	(10m)

Receiver Frequency Range: 100 kHz to 30 MHz

Modes of Operation: LSB, USB, AM, FM, CW, and AFSK

Frequency Stability: Less than  $\pm 0.5$  ppm ( $-20^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ )

Tuning Increments:

SSB, CW and AFSK: 10 Hz, 20 Hz or 100 Hz

AM: 10 Hz, 100 Hz, 1 kHz, 5 kHz, 9 kHz, or 10 kHz

FM: 10 Hz, 100 Hz, 1 kHz, 5 kHz, 10 kHz, 12.5 kHz, 20 kHz or 40 kHz

Memory Capacity: 200 Channels

Antenna Impedance: 50 $\Omega$  (unbalanced)

Input Voltage: 13.8 VDC  $\pm 10\%$ , negative ground

Power Consumption:

Receive: 1.5A

Transmit: 33A (at 150W output)

Dimensions: 330mm W x 130mm H x 280mm D (330mm x 142mm x 391mm, including projections)

Weight: Approx. 8.5 kg

### Transmitter

Power output: 10 to 150W, continuously adjustable

Carrier Suppression: 50 dB or more

Undesired Sideband Suppression: 60 dB or more (at 1.5 kHz modulation)

Intermodulation: 3rd order:  $-38$  dB or less  
Frequency Response: 400 to 2600 Hz (within 6 dB, SSB)

Microphone Impedance: 600 $\Omega$

Modulation System:

SSB, AM, AFSK: Balanced modulation

FM: Reactance modulation

Maximum Frequency Deviation (FM):  $\pm 5$  kHz

### Receiver

Receiving System:

SSB, CW, AM, AFSK: Triple superheterodyne

Intermediate Frequencies:

1st IF: 70.455 MHz

2nd IF: 455 kHz

3rd IF: 98 kHz

Sensitivity:

SSB/CW/AFSK (at 10 dB S/N):

0.1 to 0.5 MHz: 14 dB $\mu$

0.5 to 1.6 MHz: 6 dB $\mu$

1.6 to 30 MHz:  $-10$  dB $\mu$

AM (at 10 dB S/N):

0.1 to 0.5 MHz: 24 dB $\mu$

0.5 to 1.6 MHz: 16 dB $\mu$

1.6 to 30 MHz: 6 dB $\mu$

FM (at 12 dB SINAD):

1.6 to 30 MHz:  $-6$  dB $\mu$

Image Rejection: 70 dB or more

IF Rejection: 70 dB or more

Selectivity:

SSB (INT)/CW, AFSK (WIDE)AM, FM (NAR):

$-6$  dB: 2 kHz or more

$-60$  dB: 6 kHz or less

CW, AFSK (NAR):

$-6$  dB: 1 kHz or more

$-60$  dB: 3 kHz or less

AM, FM (INT):

$-6$  dB: 6 kHz or more

$-40$  dB: 18 kHz or less

AM, FM (WIDE):

$-6$  dB: 12 kHz or more

RIT Range:  $\pm 10$  kHz

PBS Range:  $\pm 1$  kHz

BWC Minimum Bandwidth: Approximately 800 Hz

Notch Filter Attenuation: Approximately 40 dB

AF Output: 1W or more (at 4 $\Omega$  load, less than 10% distortion)

### NBD-520 Power Supply

NBD-520U: 120 VAC  $\pm 10\%$ , 50/60 Hz single phase

NBD-520G: 220 VAC  $\pm 10\%$ , 50/60 Hz single phase

Output: 13.8 VDC, 30A (intermittent)

Dimensions: 180mm W x 130mm H x 273mm D

Weight: Approx. 9 kg

Table I - Specifications of the JST-135HP.

the double sideband AM signal is possible, allowing the user to choose the sideband with the least amount of interference.

Table I shows the specifications for the transceiver, and as one can see from studying the specs, this is strictly a high-performance transceiver. In my lab tests the unit met or exceeded all of the manufactured specifications. One point worth mentioning: I have noticed in the past with some transceivers that their power output ratings for 10 meters sometimes fall a bit short of what they state. The ratings on this transceiver are for 150 watts output on all bands. My careful tests actually showed slightly more out than rated on 10 meters and the lower bands. However, the company rating is for 150 watts out—continuous, key down, condition.

In actual use it takes considerable time to get used to all the controls. The instruction manual is well written and very extensive, including many pages of circuit diagrams, parts layouts, and block diagrams (not that anyone in his right mind would attempt to service such a unit). I might add here that plug-in boards are used extensively throughout the transceiver, making service much simpler. The manual takes the user through careful step-by-step instructions for tuning the receiver and particularly the selectivity functions.

The receiver is triple superheterodyne with IFs at 70.455 MHz, 455 kHz, and 98 kHz for the third IF. The sensitivity figures given in the specs (Table I) were equalled or exceeded in my tests. I carefully checked the receiver through all its

ranges for birdies and found a few, but they were so insignificant that when an antenna was attached, they were difficult to find.

There are three tuning steps available particularly for use with SSB, CW, and AFSK. These are not actually steps, but rather the rate at which the tuning can be set. They are 10 Hz, 20 Hz, and 100 Hz. With the excellent selectivity that is available, the 10 Hz tuning rate is quickly appreciated. Likewise with the 100 Hz rate when you want to move quickly from one end to another. Keep in mind that this is a general-coverage receiver, so additional rates can be set for AM or FM. These include rates 10 Hz through 10 kHz for AM and 10 Hz through 40 kHz for FM. More on this feature in a moment.

The built-in computer and one set of controls do bear describing in some detail. At the upper right-hand corner of the transceiver are three switches: **Freq** (frequency), **Channel**, and **Func/Ham**. These are used in conjunction with the keypad immediately below plus the tuning dial. For example, to set the various tuning rates, first set the Func/Ham switch to **ON**, and then press **8/Step** on the keypad. Next set the desired mode. The current step rate will be displayed on the LED display panel. The rate can then be changed by turning the tuning knob. Once selected, it is entered via the keypad and will remain that way until changed.

These same three switches and keypad are used to set a multitude of functions. For example, there are 200 memory channels that can be entered and set via the keypad—not only entered, but recalled. The keypad and switches are used to set up the various scan operations such as channel start and end numbers. The front-panel **P.Level** control is used to set the pause level of the scan operation. The transceiver can be set to stop on the desired level of signal strength.

The display also includes the meter, which has a straight-line fluorescent scale and can check six different functions. In the **FM** mode, the meter is of the center type, deflecting to the right when the center frequency of the received signal is higher, and to the left when it is lower. As an S-meter it is scaled from S1 to S9 + 50 dB. When desired, the meter can be switched to show the collector current of the final power amplifier transistors. In the **SWR** mode it shows relative reflected power, and in the **PO** mode it shows relative power output. Last, in the **ALC** position it shows ALC voltage during output.

The display also indicates **Mode**, **Bandwidth (Narrow, Intermediate, or Wide)**, **Scan Start and End**, **Sweep Start and Sweep End**, **AGC** (indicating current AGC setting), and **TR1** and **TR2** (indicating split transceive operation). Also shown are **TSQ** (tone squelch in operations), **Shift** (indicating the transceiver is in the shift mode for repeater operation), and **Re-**

**mote** (showing the transceiver is being controlled by a computer). Still more are **F1** and **F2** (indicates which of the dual VFOs is in operation), **R.F1** and **R.F2** (indicates the frequency of either VFO in operation), **MR** (memory channel in operation), **ATT** (indicating 20 dB attenuator in use), and last, **XMIT** (showing transmission).

The power supply, NBD-520, is a separate unit (but included with the basic transceiver package). As with the transceiver, it is extremely well constructed, best described as top commercial grade.

It would also be pointless to show the circuit diagrams, simply because they are so extensive. The one conclusion or recommendation I would make here is that anyone seriously interested in this transceiver should call the company and purchase one of the instruction manuals to study. The transceiver represents an appreciable investment. Don't misunderstand. I feel it is well worth the money, and then some, but it is impossible here to do justice to the equipment in a couple of pages.

There are many options available with the JST-135HP. (I did not test any of these, but I feel the reader would be interested in the specs.)

First is the automatic antenna tuner NFG-230, which handles 200 watts and will match from any load from 5 to 1000 ohms to an SWR of less than 1.5 to 1. It will do this in 2 to 4 seconds (1.8 to 30 MHz).


Another item that might interest many amateurs is their HF linear amplifier, the JRL-1000. This has a frequency range of 1.8 through 30 MHz, rated input is 2000 watts DC, and it uses three RCA 8122s.

On the receiving side, four additional crystal filters are available. They are listed as 300 Hz, 500 Hz, 1.8 kHz, and 2.4 kHz (6 dB bandwidth).

I mentioned computer use with an RS-232 interface. They show an RS-232C, the CMH-74, which can be used to interface your personal computer.

The transceiver power requirements are 1.5 amps receiver, 33 amps transmit at 13.8 VDC. The dimensions of the transceiver are 350 mm wide by 130 mm high by 280 mm deep.

I used the transceiver extensively on every mode, including SSB, CW, RTTY, AMTOR FM (10 meters), and even AM (on 10). I even went to another amateur's house while a friend operated my station so I could check the actual audio quality and speech compression mode for myself. I was much impressed by the speech quality and the compression action. It is obvious that I like the transceiver. (I must admit I miss it after returning it to the company.)

List price of the transceiver is \$3500. The unit is manufactured by Japan Radio Company, Ltd., 430 Park Avenue, New York, NY 10022 (212-355-1180). 



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