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Heath SB-1400 MF/HF Transceiver

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The SB-1400 MF/HF transceiver is, in a way, a departure from Heath's traditional Amateur Radio offerings—at least in their MF/HF transceiver line. Although most of Heath's previous ham-radio equipment was designed by Heath®, the '1400 is custom manufactured for Heath by Yaesu, after Yaesu's popular entry-level FT-747GX transceiver. In addition to the SB-1000 linear amplifier and VHF/UHF transceivers that are made for Heath by other companies, we can expect more products of this type from Heath in the future—including, perhaps, a high-performance shortwave receiver.

First Impressions

The SB-1400 arrived at ARRL HQ in two boxes. One box contained a 100%-duty-cycle power supply. It's nearly as large as the rig, and it weighs a lot more. That struck me as kind of funny—a massive, super-duty power supply doesn't seem to go with a lightweight, compact transceiver. A smaller, lighter-duty power supply is not offered with the '1400. You certainly don't need to worry about power-supply failure, though!

Setting up the SB-1400 and its supply is a snap. After connecting the power supply to the rig via its 4-pin connector and plugging the supply into a power strip, there's not much left to do, other than connecting a suitable antenna. Microphone and headphone connectors are located on the front panel. The power supply has a built-in speaker. The '1400 is obviously designed for ease of use. This isn't surprising: According to Heath, a lot of effort went into the layout of the front and back panels. It shows.

After quickly reading the SB-1400's operation manual, I turned on the supply and the radio (in that order, as suggested in the manual). Everything worked fine.

Operating Impressions

Because the SB-1400 is a close cousin of the Yaesu FT-747GX, you can get a detailed description of most of the SB-1400's features from Dave Newkirk's August 1989 *QST* review of the FT-747GX.[1] In addition to having a different front-panel layout than the FT-747GX, the SB-1400 allows selection of AGC-decay time, independently of mode, via a front-panel switch. (The FT-747GX's AGC-decay times are unalterably related to mode, with one exception: An internal switch allows selection of fast or slow AGC decay for CW reception.) The SB-1400's display is slightly different than the '747's, and somewhat different tuning-speed selections are available in the AM and FM modes.[2]

Table 1

SB-1400 Tuning-Step Size v Mode

Mode	*FAST on*	*FAST off*
SSB/CW	2.5 kHz	25 Hz
AM	1 kHz	100 Hz
FM†	12.5 kHz	5 kHz
FM††	10 kHz	5 kHz

†with optional FM board (not tested).
††with optional FM board, and selected by the control sequence described in the SB-1400 operating manual.

Overall, I am pleased with the performance of the '1400. It packs a lot of versatility into a very compact enclosure. My first contact with the rig was with a ham on Pitcairn Island (VR6) on 10 meters. As soon as I heard her calling CQ, I started frantically trying to extricate the microphone from its plastic bag. I quickly set the mike gain to an appropriately low level, and was surprised when she came back to my 10- or 20-W signal. That contact turned out to be a good omen: It was the first of my many DX and stateside QSOs with the '1400.

The SB-1400 doesn't have provisions for metering automatic level control (ALC) voltage or SWR, and its RF-output meter only indicates *relative* output. Because there's no ALC metering, tuning up the rig on SSB involves setting the mike gain so the meter needle deflects only to a certain point—akin to many rigs of early-'70s vintage. This method of tuning up on SSB is potentially less accurate than using an ALC indicator. There is no built-in speech processor; maybe that's why the '1400 received such good audio-quality reports from many of the stations I worked!

The SB-1400's noise blanker doesn't work well on power-line noise, and it works only marginally well on automotive ignition noise. The rig's tuning rates (see Table 1) also took some getting used to. The fast rate is *really* fast. You can zip right out of the ham band before you know it! The fast rate is great for quickly jumping to another part of the band, but it's not appropriate for tuning a subband. The slow rate, used for most tuning, I found to be too slow. A spinner post or finger hole in the knob would be a welcome addition; in the absence of one, I turned the tuning knob by thumbing the knob rim.

Like the FT-747GX, the review SB-1400 exhibits considerable high-end audio rolloff on receive. The overall SSB receive bandwidth of the unmodified SB-1400 was just *1100 Hz* at −6 dB—with a 2.5-kHz-wide IF filter in line! Likewise, the SB-1400's AM-receive audio is muddy. Fortunately, the receive-audio "demuddification" fix described in the August FT-747GX review also works for the SB-1400: Removing a capacitor from the SB-1400's audio-amplifier circuit moved the rig's high-end,

[1]D. Newkirk, "Yaesu FT-747GX MF/HF Transceiver," Product Review, *QST*, Aug 1989, pp 33-36, 52.

[2]To see the differences, compare Table 1 in this article to Table 1 in August's FT-747GX review.

Table 2

Heath SB-1400 Transceiver, Serial No. 8K020058

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receiver, 100 kHz to 29.9999 MHz; transmitter, 1.5-1.9999, 3.5-3.9999, 7.0-7.4999 10.0-10.4999, 14.0-14.4999, 18.0-18.4999, 21.0-21.4999, 24.5-24.9999, 28.0-29.9999 MHz.	Receiver, 100 kHz to 29.999975 MHz; transmitter as specified, plus an additional 75 Hz at the upper end of each range.
Modes of operation: LSB, USB, CW, AM, FM†	As specified.
Frequency display: Not specified.	6-digit, green-backlit LCD.
Frequency resolution: Not specified.	Display, 100 Hz. Actual tuning resolution varies with mode and tuning speed as shown in Table 1.
Power requirement: 13.5 V dc ±10%, 19 A max at 100 W output.	At 13.5 V dc and 14.1 MHz, 17 A for 111 W output and 1.08 A during receive at full audio output.
Transmitter	*Transmitter Dynamic Testing*
Transmitter output power: SSB, CW, and FM†: 100 W PEP/DC; AM: 25 W, carrier.	CW, 106 to 111 W PEP, depending on band; SSB, 110 to 115 W PEP, depending on band, AM, as specified; FM not tested.
Spurious signal and harmonic suppression: Harmonic, better than 50 dB; non-harmonic, better than 40 dB.	See Fig 1.
Third-order intermodulation-distortion products: Better than −25 dB at 100 W PEP output.	See Fig 2.
CW-keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% audio output with an S9 signal): Not specified.	17 ms.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: SSB and CW: (CW bandwidth not specified) for a 10-dB (S+N)/N ratio, 0.5 μV from 0.5-1.5 MHz (0.1-0.5 MHz not specified) and 0.25 μV above 1.5 MHz.	Minimum discernible signal (noise floor) with "CW narrow" filter: 1.0 MHz, −135.5 dBm; 3.5 MHz, −135.5 dBm; 14 MHz, −136.0 dBm.
AM: (bandwidth not specified) for a 10-dB (S+N)/N ratio, 2 μV from 0.5-1.5 MHz (0.1-0.5 MHz not specified) and 1.0 μV above 1.5 MHz.	"AM wide" filter, with test signal 30% modulated with a 1-kHz tone: 1.0 MHz, −119.5 dBm (0.24 μV); 3.8 MHz, −119.0 dBm (0.26 μV); 14 MHz, −121.5 dBm (0.19 μV).
FM†: 0.7 μV for 12 dB SINAD above 28 MHz	Not tested.
Receiver dynamic range: Not specified.	Blocking dynamic range††: 3.5 MHz, 112.5 dB; 14 MHz, 112.5 dB. Two-tone, third-order intermodulation distortion dynamic range††: 3.5 MHz, noise limited at 91.0 dB; 14 MHz, noise limited at 92.0 dB. Third-order input intercept: 3.5 MHz, +1 dBm (based on the noise-limited 3.5-MHz, 3rd-order-IMD dynamic-range measurement above); 14 MHz, +2 dBm (based on the noise-limited 14 MHz, 3rd-order-IMD dynamic-range measurement above).
S-meter sensitivity (μV for S-9 reading): Not specified.	30 μV at 1 MHz, 30 μV at 14.2 MHz, 39 μV at 29 MHz.
Squelch sensitivity: SSB/CW/AM: 4.0 μV from 0.5-1.5 MHz, 2.0 μV above 1.5 MHz; FM†: 0.32 μV.	At 14.2 MHz: Min, 2.1 μV; max, 2800 μV; FM not tested.
Receiver audio output; more than 2.5 W at 10% total harmonic distortion (THD) into an 8-Ω load.	2.15 W into 8 Ω at 10% THD
Color: Gray.	
Size (height, width, depth): 3-11/16 × 9-3/8 × 9-3/8 inches.	
Weight: 7.25 lb.	

†Requires installation of optional FM board.

††Blocking dynamic range and third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

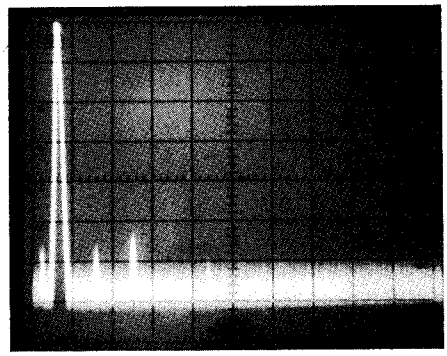


Fig 1—Worst-case spectral display of the Heath SB-1400. Horizontal divisions are each 2 MHz; vertical divisions are each 10 dB. Output power is approximately 105 W at 1.8 MHz. All harmonics and spurious emissions are at least 53 dB below peak fundamental output. The SB-1400 complies with current FCC specifications for spectral purity.

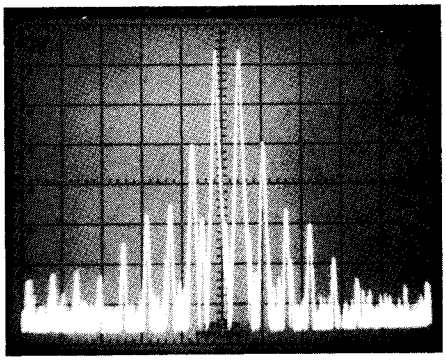


Fig 2—Spectral display of the Heath SB-1400 during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 30 dB below PEP output, and fifth-order products are approximately 44 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 110 W PEP output on 14.2 MHz.

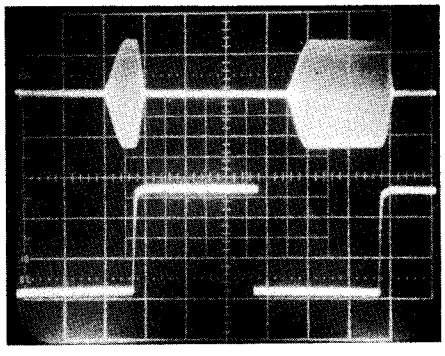


Fig 3—CW-keying waveforms for the Heath SB-1400 in the semi-break-in mode. The upper trace is the RF envelope; the lower trace is the actual key closure. Each horizontal division is 10 ms. Note that the first transmitted dot (immediately after key closure) is shortened to less than half of normal length.

6-dB rolloff point to between 2000 and 2100 Hz. Result: Crisp, communications-quality audio.

Fortunately, Heath has acted quickly to help SB-1400 owners make this fix to their rigs. If you're an SB-1400 user, contact Heath and request a copy of the *Bandwidth Modification for the Heath HF Transceiver Model SB-1400.* This five-page document clearly shows the steps you'll need to take to remove the problem capacitor from the audio-amplifier circuit. In typical Heath-documentation style, this bulletin takes you through the modification step by step, starting with a list of tools you'll need, and has several excellent diagrams showing how to undertake the modification. Heath has also promised to include this document—complete with a piece of desoldering braid—with all the SB-1400s that are currently in stock. After current stock is depleted, new SB-1400s will come from Heath without the culprit capacitor.

Here are some of the things I *like* about the SB-1400: It's physically small, so it doesn't take up too much space on my operating table; it's *extremely* easy to use (perfect for first-time transceiver users); it has dual VFOs, easy-to-use programmable memories, general-coverage receiver, computer-interface capability, and more; solid receiver performance; a built-in CW filter; and—importantly—a very reasonable price tag.

Once I got used to the radio's quirks, I had a blast with the SB-1400. I worked lots of DX, especially on 80 and 40 meters. And, the rig never gave me a bit of trouble.

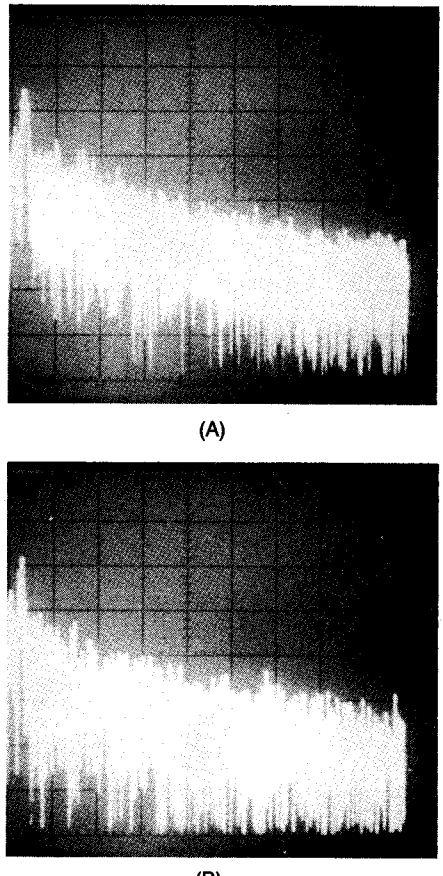
The SB-1400 should appeal to those who need a capable-yet-portable transceiver. You can easily pick up the '1400 with one hand; it's about the same as picking up a large hardcover book. Shuttling the rig between the car and the shack should pose no problems.

SB.COM: Computer-Control Software for the SB-1400

Heath has introduced software for IBM® PC and compatible computers that allows control of most of the SB-1400's functions.[3] The software also supports Heath's HV-2000 Voice Card (see Product Review, Dec 1987 *QST*), works with the Yaesu FT-747GX transceiver, and can be made memory-resident, allowing you to run another application—such as a packet-radio terminal program or logging program—at the same time, popping up SB.COM whenever you like.

The software is supplied on a 360-kbyte, 5¼-inch floppy disk that contains several files: the program itself, a documentation file and printing utility, and a program called DRAWME.COM, which writes a schematic of a suitable radio-to-computer interface circuit on the screen. The review software was also supplied with an optional hardware interface that I installed inside the SB-1400 in about five minutes. The software is available by itself, or bundled with the interface board and a serial cable for the PC-to-radio connection.

[3]Excluded are AF gain, squelch, drive and mike gain.



(A)

(B)

Fig 4—Spectral display of the SB-1400 transmitter output during composite-noise testing. Power output is 110 W at 3.5 MHz (A) and 110 W at 14 MHz (B). Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale in the photos) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Composite-noise levels between −60 and −140 dBc/Hz may be read directly from the photographs. The carrier, which would be off the left edge of the photographs, is not shown. These photographs show noise at frequencies 2 to 20 kHz offset from the carrier.

The Screen

The upper part of SB.COM's screen display shows the date and time, current frequency, operating mode, filter bandwidth and selected VFO or memory channel. This segment of the display closely resembles the SB-1400's readout—but is larger. The program's large frequency-display numerals are easy to see. The bottom two-thirds of the screen shows the frequencies and modes stored in the SB-1400's 20 memory channels. Receive and transmit frequencies are displayed for split-frequency operation, and each memory can be labeled with a description of its contents. This is quite useful for keeping track of shortwave-broadcast stations or utility frequencies. The extreme bottom of the screen displays the function keys and their associated functions.

General Operating Information

The software features two basic operating modes—one for changing frequencies, VFOs and memory selection, the other for changing modes and filter bandwidths. There are two ways to change frequency: via the arrow keys, to manipulate the screen's frequency display digit by digit; and by using the numeric keypad to enter a desired frequency.

In sum, I found the software to be quite functional and fun to use. Some of the program's control sequences seem somewhat clumsy, such as its two methods of changing operating frequencies. Part of the problem may be that I'm so used to speedily rotating knobs and pushing buttons on the rig itself that, when I use the computer interface, something as simple as fine-tuning a station requires more effort than simply turning the radio's tuning knob. This feeling would likely go away after a period of using *only* the interface software to control the rig.

I found the software useful for manipulating the SB-1400's memory channels. It's a snap to switch among different memory-channel banks, because the program allows you to store the information on disk and retrieve it later. The program effectively expands the SB-1400's memory-channel capability to several hundred or more—the maximum number is limited only by disk space! If you're interested in taking advantage of the SB-1400's computer-interface capability, the software package's $40 price (without the serial cable and hardware interface) seems reasonable for the utility it provides.

Summary

If you're in the market for an inexpensive, competent rig that's lightweight and compact, the SB-1400 is an excellent choice. Heath's nationwide network of retail outlets—and their reputation for service—should bring them long-term success with equipment such as the SB-1400.

Thanks to Dave Newkirk, AK7M, for contributing to this review.

Price class: SB-1400 with SBA-1400-4 heavy-duty power supply, $900 (when ordered as a package from Heath as model SBS-1400-1); SBA-1400-7 software package, $40; SBA-1400-8 cable and interface package (available in mid-November), $50. Manufacturer: Heath, Benton Harbor, MI 49022, tel 616-982-3200.