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Heath SA-2060 Transmatch

ICOM IC-25A 2-Meter Transceiver

MFJ-496 Super Keyboard

Product Review

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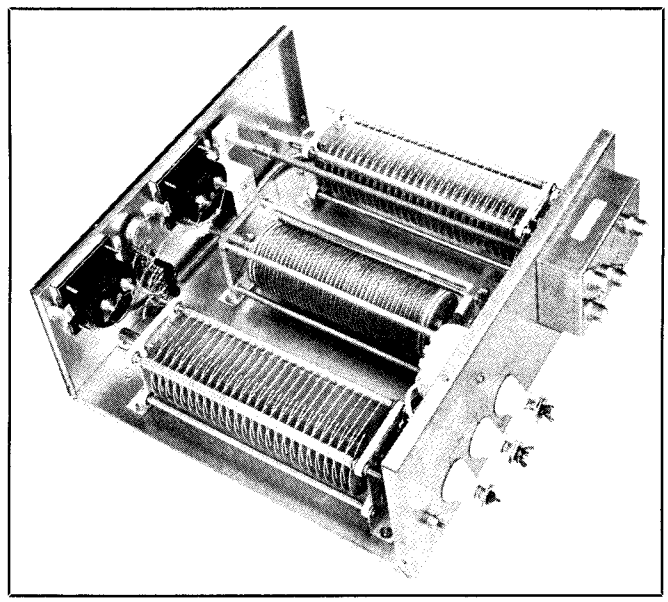
Heath SA-2060 Transmatch

Today, few amateur stations are not equipped with a Transmatch of some type. Whether it is used with open-wire feeders or a coaxial-cable-fed Yagi (for an occasional foray on the *other* mode), the versatile operator soon depends on his or her Transmatch. Most commercial units are one of two types: the T network or the modified T network, known as the Ultimate Transmatch.[1] The Heath SA-2060 is no exception. Heath has chosen the straightforward T network for their top-of-the-line "tuner," and it's an excellent choice. Few circuits can equal the T network in ease of adjustment and matching range.

To enhance the versatility of the unit, Heath has included switching to select one of two coaxial feed lines or a dummy load (bypassing the matching circuit). Also included in the SA-2060 are dual wattmeters for measuring forward and reflected power. An SWR function is also provided; a variable SENSITIVITY control is used to set the reference level, and a calibrated scale allows direct reading of SWR up to 3:1. The metering circuit is of the W. Bruene type,[2] the rf and calibration portion of which is factory assembled and calibrated. This circuit is contained in a shielded enclosure along with the antenna selection switch. Two power ranges are provided (200 W forward/50 W reflected and 2000 W forward/500 W reflected), making the SA-2060 suitable for low-power or "QRO" operation. The first calibration point on the forward power scale is 10 W (100 W on the high range). Below that point, the scale would be very nonlinear and thus is not calibrated. Dial scales on the capacitors (20 divisions) and a three-digit turns counter on the rotary inductor (1/10-turn resolution) round out the operational features.



The T network is designed for unbalanced to unbalanced matching — the case when a coaxial-cable-fed antenna or end-fed wire antenna is used. To accommodate balanced feed lines, a 4:1 toroidal balun is employed. This is an acceptable method, provided the impedance being matched is within the range suitable for the balun (less than 1 kΩ). At high impedance levels, the balun is not capable of providing accurate balance. This could impair the performance of some antenna systems. In practice, open-wire-fed dipoles and inverted Vs, used for casual multiband operation, are not seriously affected by a lack of feed line balance. A 130-ft[3] inverted V, fed with approximately 60 ft of 300-Ω ladder line, was used with the SA-2060 during operation from 80 through 10 meters, with good results. Even with 700 W of rf power applied, the SA-2060 never "voiced" an objection (no arcs, sparks or funny smells). The same antenna was also used on the 160-meter band, both as a dipole and as a top-loaded vertical, with satisfactory results. Output power was limited to 125 W on this band.

Heath SA-2060 Transmatch

Manufacturer's Claimed Specifications	*ARRL Lab Results*
Frequency range: 1.8 to 30 MHz	As specified.
Power-handling capability: Full legal limit.	As specified.
Input impedance: 50 ohms (at matched condition).	As specified.
Output impedance, balanced output: 100 to 1000 ohms; unbalanced output: a maximum SWR of 10:1, or an impedance-matching range of 50 to 500 ohms; single-wire output: 6:1 SWR using an odd-multiple 1/4 wavelength of wire.	
Forward power ranges: Low, 0 to 200 W; high, 0 to 2000 W.	As specified (see text).
Reflected power ranges: Low, 0 to 50 W; high, 0 to 500 W; SWR 1:1 to 1:3.	As specified.
Wattmeter accuracy (full scale): 200 W and 2000 W (fwd); 500 W (ref): ±5% (avg); 50 W (ref): ±7.5% (avg).	Measured at center scale, at 14.10 MHz with 50-ohm load; 200 W (fwd): −5%; 2000 W (fwd): −5%; 500 W (ref): +3%; 50 W (ref): +6%.
Size: 5-3/4 × 14-1/2 × 13-7/8 in. (HWD).	As specified.

Assembly and Operation

As with all Heathkits,® the instruction manual supplied with the SA-2060 is outstanding. Total assembly time, including a careful parts inventory, was approximately 10 hours. Much of that time was required to assemble the two variable capacitors.

After using the unit with a number of different antenna types, I found it to be a highly satisfactory addition to my station. It is versatile and reliable. The dial calibrations and turns counter allow the operator to accurately preset the controls, minimizing QRM - producing on-the-air tuning. The BYPASS jack also aids in this regard.

I have only two criticisms of the unit, both relating to the antenna switching. The particular switching arrangement used in the SA-2060 (see Fig. 1) results in two operational inconveniences. Because the terminal for single-wire antennas is connected directly to the output of the matching network, you must have at least one unused coaxial connector (ant. 1 or ant. 2) available if a wire antenna is to be used. When switching to coaxial line, the wire must be removed. If this is not done, the coaxial-cable-fed antenna and the wire antenna would be in parallel. The same holds true for balanced feed lines, as they are connected to the matching network through a jumper to the wire-antenna terminal. This is of no concern to the operator who uses only coaxial-cable-fed antennas.

The second criticism is of interest to all users. The switching arrangement does not allow the matching circuit to be switched in and out of the system. This forces the use of the Transmatch in situations where it is not really needed. For example, my triband Yagi has a fairly narrow SWR bandwidth when used on 20 meters, and the Transmatch is normally needed. On 10 meters, the bandwidth is such

[1] D. DeMaw, ed., *The Radio Amateur's Handbook*, 57th ed. (Newington: ARRL, 1980), p. 19-8.
[2] W. B. Bruene, "An Inside Picture of Directional Wattmeters," *QST*, April 1959, pp. 24-28.
[3] m = ft × 0.305; mm = in. × 25.4; kg = lb × 0.454.

*Assistant Technical Editor

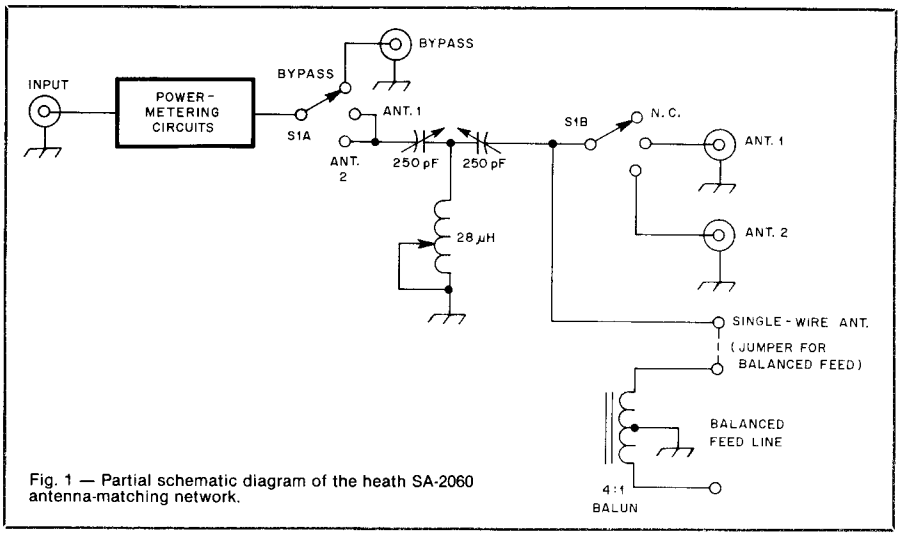


Fig. 1 — Partial schematic diagram of the heath SA-2060 antenna-matching network.

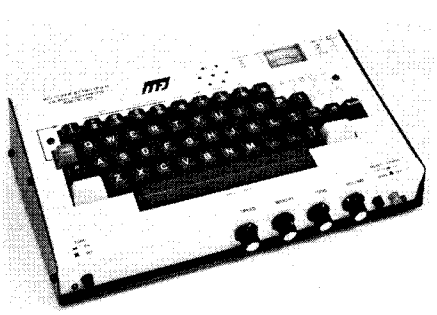
that the Transmatch is seldom required, but, because no "through" position is provided, I must readjust the SA-2060 when switching between these bands. The only option is to remove the feed line and attach it to the BYPASS jack normally used for the dummy load. I found that to be less convenient than readjusting the Transmatch. Considering the overall quality and usefulness of the SA-2060, I would classify both of these criticisms as minor.

Styled in the new Heathkit black and gray colors, the SA-2060 is both attractive and functional. Price class of the unit is $255. For additional information, contact Heath Co., Benton Harbor, MI 49022 — *George Collins, KC1V*

MFJ-496 SUPER KEYBOARD

☐ Wow! Since I became a ham back in the mid '70s, the technology of electronic keyboards used for amateur communications (cw and RTTY) has changed dramatically. Do you remember those keyboard circuits using toroid cores (as pulse input transformers), or large diode matrices? How about the boards that included only a few characters of buffer or storage memory? Today the microprocessor (μP) is firmly established in the amateur marketplace, and one use for the μP is the generation of cw and RTTY signals — hence the new rash of computerized keyboards on the market.

The MFJ-496 uses a microcomputer, which contains the μP, the random-access memory (RAM) for buffer/memory storage, and the read-only memory (ROM) to hold the control program — all on one chip! Curtis Electro Devices manufactures the component, called a "Keyboard on a chip." Since it is an easy task to generate cw and RTTY signals, the '496 uses the microcomputer to perform all kinds of functions.



Features

Morse, Baudot and ASCII are the standard codes available from the '496. The Morse speed range is 5 to 100 wpm; Baudot speed is 60 wpm; and ASCII is 110 baud. Two-hundred fifty-six characters of buffer and storage memory are available. The storage memory is unique in that it is soft partitioned into four sections. This means the operator may determine how many characters of memory are allocated to each of the four sections — as long as the total number of characters does not exceed 256. The keyboard speed and the relative buffer fullness can be monitored by means of a front-panel meter. A group of special automatic messages are programmed into the board. By programming your call into one of the four memories, for example, you may send any one of the following messages by simply pressing a key — CQ CQ DE (call), CQ TEST DE (call), DE (call) or QRZ (call). For contest operators, an incremental serial number generator is built in, with a range of 0 to 9999. For those learning the Morse code, the keyboard offers a training mode, which sends random code groups or pseudo-random five-character groups. The manual contains a list of the pseudo-random groups to check copy. Keyboard power requirements are 9 to 18V dc at 400 mA, or 117-V ac with the MFJ wall-plug transformer adapter. A paddle input is available for those who get tired of sending with the keys, and its operation is fully iambic, with dot and dash memories. For European users, several special characters are generated: Á, Å, É, Ó, Ü, Ñ and CH.

Operation

Testing keyboards is a lot of fun! I "hang out" around 7035 kHz on the weekends and, as most users of the band know, this is where the high-speed folks are. Comments about the on-the-air sound of the keyboard were varied — some operators said the Morse weighting was too heavy, and others said the sound was fine — it depended on the sending speed of the board. At high speeds, many operators prefer the cw signal weighting to be lighter than the standard 1:3:1 dot-dash-space ratio. Unfortunately, the '496 cannot be set for a lighter weight than the standard ratio. This makes copy difficult at speeds above 50 wpm. To test the memory and keyboard special functions, I used it in conjunction with a paddle, during the November Sweepstakes contest. The incremental number generator was a great help, and each of the special functions performed as specified. To check the RTTY modes, I fed the keyboard TTL output into another piece of RTTY equipment. What was typed in, was typed out! During each keyboard test, the station receiver was checked carefully for signs of RFI from the computer. MFJ must have done its homework in that regard, as no interference was noted through 144 MHz. Several accessories are available to complement the standard features of the board. These are a real-time clock, an afsk/fsk RTTY generator and a high-voltage loop-keying circuit. Each of these is on a separate plug-in board, which can be mounted inside the '496 cabinet.

Conclusion

As an operator who enjoys high-speed cw, I found the '496 a breeze to operate. Each of the special functions, including memory loading and dumping, requires only a few simple key strokes. The lack of an element-weighting adjustment disappointed me, as other keyboards on the market offer this feature. Overall, the MFJ-496 provided good service; it would be a worthwhile addition to the modern hamshack. The '496 is available from MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762. Price class is $340. — *Gerry Hull, AK4L*

ICOM IC-25A 2-METER TRANSCEIVER

☐ This transceiver could have been made to order for James Bond. At least you'll feel like a secret agent when you hide one of these units in your car. It's small — I have seen one IC-25A hidden in the ash tray of a luxury car! This could be a major buying point if you live in a street-crime area and want to keep your mobile electronics out of sight of passing strangers.

Options

Small size does not mean that anything was left out. The panel is functional. Often-used controls are prominent. Less-often-used controls are accessible, but are best used when the vehicle is parked. "Set-and-forget" controls are internal. As the transceiver comes with all you could ask for built in, the choice of options is thereby limited, primarily, to microphones. Here you have a choice of a standard push-to-talk (IC-HM7), a tone pad (IC-HM8) or a frequency up-down mike (IC-HM10).

The basic transceiver comes in two models designated by an A/E suffix. This simply designates the transceiver for American or

ICOM IC-25A 2-Meter FM Transceiver

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 143.800 to 148.195 MHz.	143.800 to 148.195 MHz.
Mode of operation: FM.	As specified.
Frequency readout: 4-digit, red LED display.	Three 0.34-inch digits; One 0.16 inch digit.
kHz/turn of knob: Not specified.	250 kHz/turn VFO A; 750 kHz/ turn VFO B.
S-meter sensitivity: Not specified.	S1, 0.93 μV; S9, 3 μV; S9 + 20 dB, 3.4 μV.
Receiver sensitivity: Less than 0.6 μV for 20 dB quieting.	0.15 μV for 20 dB quieting.
Transmitter power output: 25 W/1 W.	32 W/0.9 W.
Size: (HWD) 2 × 5-1/2 × 7 in.	
Weight: 3.3 lb.	
Power supply requirements at 13.8 V dc: Approximately 4.8 A at high power.	4.3 A at 32 W output.

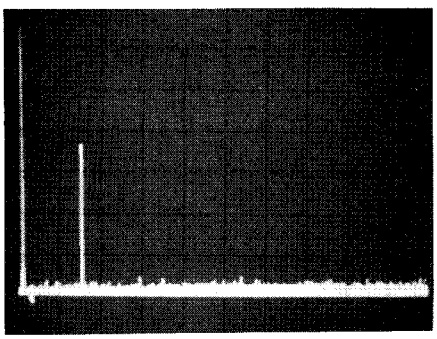


Fig. 2 — Spectral display of the IC-25A. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. Output power is approximately 32 watts at 146 MHz. The fundamental has been reduced in amplitude approximately 33 dB by means of notch cavities; this prevents analyzer overload. All spurious emissions and harmonics are greater than 65 dB below peak fundamental output. The IC-25A complies with current FCC specifications for spectral purity.

European Frequency Plan.

The E model has a 1750-Hz tone-access generator, and the A model provides room to install one if needed. The A model synthesizer steps are 5 kHz/15 kHz; with the E model, these become 5 kHz/25 kHz. Other than that, there are no substantial differences between the two units.

Read the Instructions

At first, you may be tempted to scan through the manual quickly, chuckle over the cumbersome phrasing and put it away, assuming you can figure it out all by yourself. It won't take more than a few minutes of experimenting to realize that the old saying "when all else fails read the instructions" was never so true. The manual is complete and accurate. Following each functional description to the letter will indeed allow you to fully enjoy the IC-25 A/E.

If the transceiver has a "fault," it would be that it offers so much. For some operators, two or three channels for local repeaters are plenty. This unit, with its microprocessor-controlled memory scan, frequency split, invert normal-access frequency, simplex-duplex and alternate VFOs with transfer write control, may be a bit more than needed. But for the guy or spy on the go, this little rig could put extra pleasure into long automobile trips and family vacation tours.

A suggestion for the new owner: Use the unit at home on an ac supply for several nights to become familiar with the various functions before installing it in your car. Roaring down the highway at 55 mph is not a condition under which to take your mind off the road and try to figure out what your ICOM 25 just did for you — or to you!

Construction

Construction appears to be quite solid. Most of the circuit is contained on one printed-circuit card that is mounted by means of four corner posts. This allowed for some bowing in the review unit pc board, but no intermittents were noticed in two months of mobile operation.

Disconnecting the power connector causes a memory loss. A third wire is brought out of the radio for memory "keep-alive." Though the manual does not specify that an accessory battery pack is available, ICOM offers a BU-1 battery backup for $38.75.

Performance

If you operate the unit into a high VSWR, as I did (about 2:1), for more than a few short transmissions at the high power level, the unit will shut down to protect itself. In the 1-watt position, it ran without any shut-down. Finally, you should be aware that if you program an odd-ball split all frequencies stored in memory will take on the modified split. The first time that happened to me, I was sure the local gang was ignoring me. But slowly it came to me: Check the readout when you talk, and be sure you're where you're supposed to be. Price class: $349 with HM-8; available from ICOM East, Inc., 3331 Towerwood Dr., Suite 307, Dallas TX 75234. — *Phil Accardi, AJ1N*

New Products

INLINE COMPONENTS DIP HEADERS

☐ One product of possible interest to amateur experimenters is the DIP header series manufactured by Inline Components Company. A DIP header is a component holder that looks similar to an IC socket, but contains tie points to which components may be attached. The headers come in standard 0.100 × 0.300-inch (mm = in. × 25.4) package, designed to mate with 14- or 16-pin dual-in-line IC sockets. One practical use I found for the headers was in the construction of a repeater identifier, which used a diode matrix for programming. The diode matrix for any call sign can be placed on the header, and call signs altered by simply changing this "custom" IC.

Inline offers the headers in two kits. Each kit contains a set of five 14- or 16-pin headers, and 10 assorted covers. An option offered in the kits is the header width. Kit A headers have a 0.400-inch width, and Kit B headers have a 0.495-inch width, to accept larger components. Special orders for any number of pins or spacing are available on request. For more information on these components contact Inline Components Company, 250 17th, Suite 1, Costa Mesa, CA 92627. Price class is $8.50 per kit. — *Gerry Hull, AK4L*

ZENITH FIXED-VALUE AND VARIABLE INDUCTORS

☐ The Zenith Radio Corporation has announced the availability of fixed-value and variable inductors in single-lot quantity. This should be of interest to the home-builder who has witnessed the widespread availability of these components dwindle in recent years. The inductors are manufactured in a broad range of values from 42 nH to 390 μH, and the experimenter can select from various values and current ratings. Zenith part numbers include the series 20-3849, 20-3907 through 20-3907-31, 20-3935 through 20-3938 and 20-3946. Prices range from 59¢ to $2.06 for the single-lot quantity. The components may be obtained from any of the 17,000 Zenith dealers or distributors, worldwide. Further information may be obtained from Terry C. Agpawa, Parts Sales Engineering, Components and Accessories Division, Zenith Sales Company, 11000 Seymour Ave., Franklin Park, IL 60131. — *Dennis Lusis, W1LJ*