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Author: J. Alan Biggs, W3ZP

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Some HW-12 Modifications

Added Conveniences for Heath Single-Band Transceivers

BY J. ALAN BIGGS,* W3ZP

OVER the considerable period I've been using a Heath HW-12 80-meter transceiver, I've made several modifications which may be of interest to others using units in the HW series. None of these changes involves much work.

S.W.R. Indicator

With the mode switch in the TUNE position, the meter is in an r.f.-voltmeter circuit which indicates relative power output. It takes only a d.p.d.t. slide switch, a piece of RG-58/U coax cable, and a short length of Formvar-coated wire to convert to a Monimatch circuit which will monitor the s.w.r. on the transmission line without sacrificing the relative-power-output indication.

A 27½-inch length of RG-58/U is prepared as shown in Fig. 1A. The outer insulating jacket is removed, exposing the braided outer conductor. The braid is unraveled a distance of 3½ inches from one end, and 1¼ inches from the other end, and the braid twisted into a pigtail. The inner insulation is cut back at each end to expose ½ inch of the inner conductor.

The No. 24 Formvar wire is cut to a length of 22 inches and is carefully fed in between the braid and insulation of the coax for a distance of 18 inches between the points indicated in the sketch.

Now form the coax into a coil of 3 turns, about 2 inches in diameter; hold it in this shape with tape. Check with an ohmmeter to make sure that there is no short between the Formvar wire and the braid.

Fig. 1B shows the schematic of the Monimatch, and Fig. 1C shows where it is connected into the HW-12 circuitry. Resistors R_{61} and R_{62} , the diode CR_{60} and the capacitor C_{69} should be removed, as indicated by the dotted outlines. The diode and capacitor will be used again, but the two resistors will not. Remove the wire connected to Terminal 5 on the antenna relay, leaving Hole C open. The holes indicated by C and D should be drilled out

The modifications described here provide an s.w.r. indicator, crystal control, reduction of front-end overloading when using a large antenna, and improved audio-frequency response.

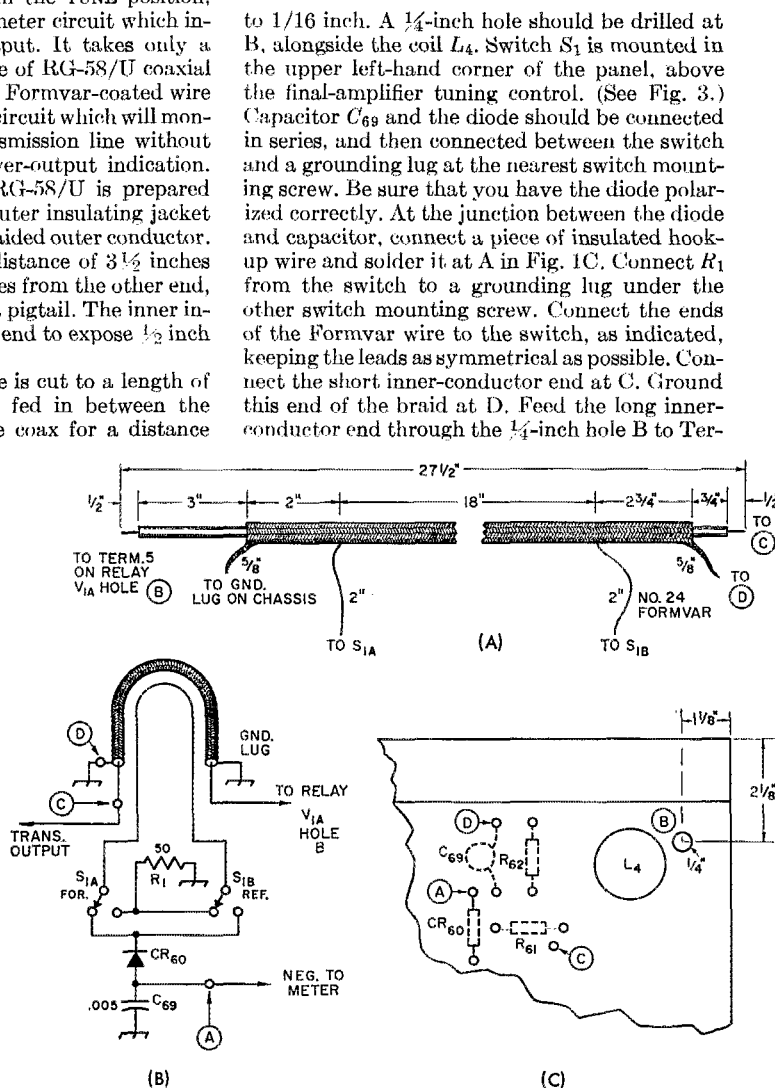


Fig. 1—S.w.r.-indicator connections. A shows how the RG-58/U coax cable should be prepared. B is the schematic, and C (a top-rear view) indicates where the Monimatch is connected into the HW-12 circuitry. Equivalent points in the sketches and diagram are lettered similarly. S_1 is a d.p.d.t. slide switch. R_1 should be selected as described in the text.

*MR No. 2, Doylestown, Penna.

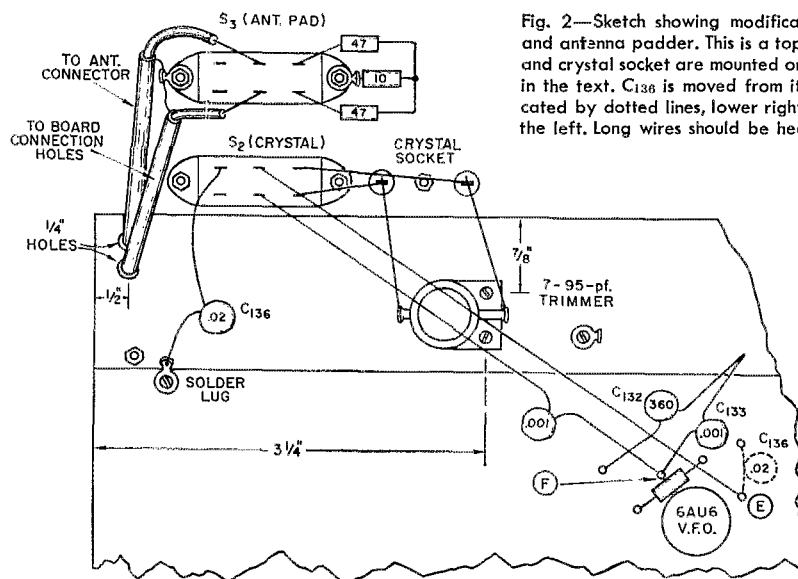


Fig. 2—Sketch showing modifications for crystal control and antenna padder. This is a top-rear view. The switches and crystal socket are mounted on the panel as described in the text. C_{136} is moved from its original position, indicated by dotted lines, lower right, to the new location at the left. Long wires should be heavy enough to be rigid.

terminal 5 on the relay. Ground the braid at this end at the lug under the pi-network capacitor.

R_1 should have a value such that the reflected-power indication goes to zero when the transmitter is working into a 50-ohm dummy load. In my case, the value turned out to be 50 ohms, $\frac{1}{2}$ watt. The dummy load I used in making this adjustment consisted of two 100-ohm 2-watt resistors in parallel. This proved to be adequate for the few seconds required to make a check.

You may wonder about the apparent lack of a sensitivity control. This function is provided by the TUNE-LEVEL control at the back of the chassis. The length of the sensing section is quite long compared to that in the usual Monimatch. However, even so, it will probably be impossible to obtain a full-scale forward indication because of the relatively intensive (1-ma.) meter in the Heath unit. This is of little consequence, however, since it is the null reading that counts in s.w.r. adjustment, and there should be adequate deflection to show when the transmitter is adjusted for maximum output. When the HW-12 is used in a plane with a trailing-wire antenna, the switch is set in the REFLECTED position, and wire is simply let out until the meter goes to zero.

Crystal Control

I find that most of my operating time is spent on one or two specific frequencies where I know I will find my friends. Even with a 100-ke. marker, it is difficult to preset the transceiver to a specific frequency with sufficient accuracy for s.s.b. After discussing the idea of applying crystal control with several others, Jack Brown, W3SHY, came up with a method which is simple to apply, works perfectly, and has the advantage that the tuning dial can be used to pull the crystal frequency slightly to assure on-the-nose accuracy.

In this arrangement, a d.p.d.t. switch connects

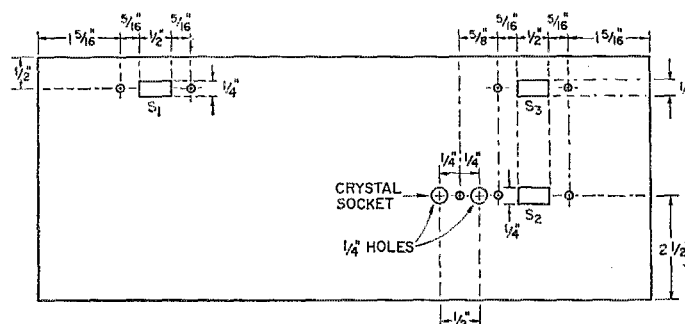
a crystal from plate to grid of the 6AU6 v.f.o. tube, at the same time disconnecting the 0.02- μ f. capacitor C_{136} , which normally grounds the plate for r.f. This change results in a Pierce crystal circuit with which the v.f.o. will lock in when tuned near the crystal frequency. In my case, tuning the v.f.o. circuit will pull the frequency of the crystal minus 200 cycles, or plus 600 cycles, relative to a mid-frequency determined by a ceramic trimmer across the crystal.

The details of this modification are shown in the sketch of Fig. 2. C_{136} is removed and set aside for future use. The terminal of C_{133} near the 6AU6 v.f.o. tube is lifted out of Hole F while the hole is enlarged to $\frac{1}{16}$ inch. Then the capacitor lead is replaced in the hole along with one terminal lead of a 0.001- μ f. disk capacitor. The other lead of this capacitor is extended, using a piece of No. 18 wire, to S_1 , a d.p.d.t. slide switch mounted on the panel below the meter switch. The miniature crystal socket is mounted on the panel to the left of this switch. The ceramic trimmer capacitor is mounted on the chassis apron, below the crystal socket. C_{136} is now connected from the switch to a soldering lug secured by one of the mounting screws of the printed-circuit board. The remaining connections are shown in Fig. 2. The long wire running from Hole E to the switch should also be of No. 18 wire.

After these changes have been made, the crystal is inserted in the socket, and S_1 is placed in the crystal position. The HW-12 is now crystal-controlled for both receiving and transmitting on the same frequency. As mentioned earlier, frequency can be adjusted over a limited range by adjustment of the ceramic trimmer and the HW-12 tuning dial. Placing S_1 in its other position returns the circuit to normal for v.f.o. operation.

When selecting a crystal for a desired output frequency from the HW-12, it should be remem-

Fig. 3—Sketch showing the location of panel cutouts and screw holes. Unless indicated otherwise, screw holes are clearance for 6-32 screws (No. 28 drill).



bered that the crystal frequency should be the operating frequency minus 2306.7 kc. Most crystal manufacturers can supply crystals ground to specified frequencies. I got mine from Northern Engineering Labs, Burlington, Wisconsin, at \$6.00 each. Be sure to specify that the crystals are to work into a 30-pf. load.

Receiver Attenuator

Much of my mobile work is carried on from a plane, where the antenna is the quarter-wave trailing wire mentioned earlier. This antenna is quite large compared to the usual mobile antenna for which the input circuit of the receiving section of the HW-12 is designed. The strong signals picked up on this antenna when flying over well-populated areas often result in cross modulation so severe that reception is practically impossible.

An attenuating pad in the receiver antenna lead is a good solution this problem. To install this pad, the short section of coax running from the receiver-input jack and Holes E and F (Pictorial 13 in the HW-12 instruction book) on the circuit board is removed. A longer length of coax is connected to the jack and dressed around the edge of the chassis to the $\frac{1}{4}$ -inch hole shown closest to the panel in Fig. 2. Another length of coax is run from Holes E and F to the other $\frac{1}{4}$ -inch hole, dressing it around the edge of the chassis, parallel to the first length of coax.

The pad can be cut out by switch S_3 in Fig. 2. This switch is mounted on the panel above the meter, and the padding resistors are soldered to the switch terminals as shown.

This pad provides an attenuation of only 20 db, or so, but it is most helpful in reducing cross modulation by strong signals.

Improving Low-Frequency Audio Response

Many of those using the HW-12 have commented on the apparent "thinness" of the audio quality on both receiving and transmitting. At the suggestion of W2CFT, we tried shifting the carrier-oscillator frequency a couple of hundred cycles closer to the pass band of the crystal filter. The result was a pleasant increase in the lower audio frequencies, with no noticeable deterioration in rejection of the unwanted sideband.¹ The

¹ Some caution should be used in this adjustment, since it will tend to reduce carrier suppression if carried too far.

frequency shift was accomplished by soldering a capacitor having a value of between 20 and 30 pf. across the carrier crystal-socket terminals. With this modification, it will be noticed that the signal available in the "tune" condition is greater.

Mechanical Operations

The panel should be removed from the unit while the holes are cut and drilled. This can be done by taking off the knobs, and removing the two screws holding the meter switch. Leave the switch hanging on its leads. Remove the leads to the meter, separating them so that they will not become reversed when reconnecting the meter. Then remove the meter.

The drilling dimensions are shown in Fig. 3. The rectangular holes can be drilled out and smoothed up with a small square file. Before replacing the panel, drill the holes required in the chassis. If decals are to be added it will be easier to do them at this time, rather than to wait until after the panel has been remounted.

Strays



How's this for a sharp looking club station! W8TO, club station of the Columbus Amateur Radio Association, was dedicated in the new Center of Science and Industry last spring. Shown above are K8DJM, station manager; K8HRR, vice president, CARA; and WA8AXB, president, CARA.