Polishing Kenwood's R-1000

—a gem in the rough

Bob Roehrig K9EUI
314 S. Harrison Street
Batavia IL 60510

This is not intended to be a product-report type of article. There are a few improvements that can be made to the R-1000 with a little effort and some are mentioned in the advertising literature. I will say that I think the R-1000 is an outstanding receiver that has excellent stability, sensitivity, and ease of operation. Following are some comments on the suggested changes.

The R-1000 comes supplied with three i-f filters: 12 kHz, 6 kHz, and 2.7 kHz. The advertising literature mentions that the filters can be switched to use the 6 kHz for AM WIDE and the 2.7-kHz filter for AM NARROW. This is not difficult, as the filters are diode-switched and there are no critical circuits involved. Actually, all filters can be used, as will be shown.

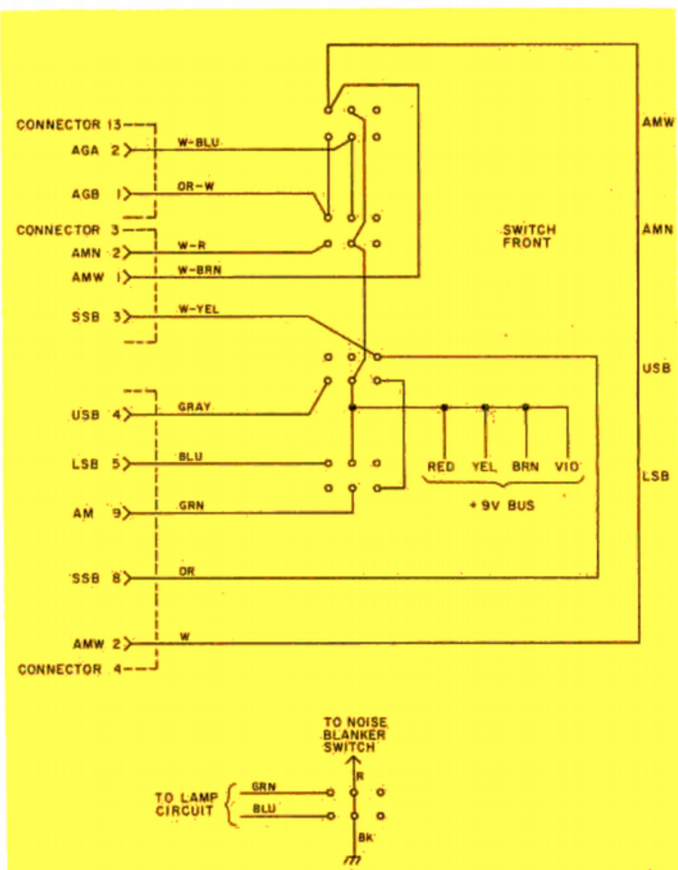

Fig. 1. Original mode switching for the R-1000. Switch at bottom is BRIGHT/DIM display control.

Kenwood goofed on the agc time-constant switching. In fact, both the schematic supplied with the receiver as well as the one in the service manual fail to show the agc switching as it is actually wired. The problem is that the fast agc is used in the SSB mode and the slow agc is used in the AM mode, just the reverse of the way it should be. Further thinking resulted in wanting the agc switched separately from the mode. It is sometimes desirable to switch to fast agc when using an SSB receiver for RTTY.

When using the R-1000 below 2 MHz, I encountered a lot of broadcast signals where they didn't belong. This is due to the fact that a single bandpass filter is used ahead of the rf amplifier for the 200-kHz-to-1-MHz range, and a second one is used for the 1-to-2-MHz range. This allows both harmonics as well as intermod products to be present. Also, while the 1000-Ohm input is probably better for the random-type wire antenna most likely to be used when tuning this range, it is probably still quite far from what the antenna impedance really is. Now for what to do about these items:

Fig. 1 shows the actual wiring of the switches as traced in my receiver. In the AM mode, 9 volts is switched to the appropriate i-f filter switching diode to activate the appropriate filter. In the SSB mode, the 2.7-kHz filter is turned on via SSB gate diodes, D51,52. The AM detector is selected by the normally-closed contacts on the SSB switches. When either AM switch is depressed, AGA and AGB are connected together, resulting in the longer time constant.

Fig. 2 shows some additional circuitry found in the service manual that did not appear in the schematic supplied with the receiver. In the AMW mode, Q47 is turned on, which grounds the negative end of C158. This extends the low-frequency response for hi-fi quality. (It is possible that the earlier R-1000s did not have this circuit, explaining why it was not in the manual. If this is the case, the pin numbers shown for connector 4 may not be as shown in my drawings, but the wire colors are probably the same.)

Some comment on the display is due at this point. I feel that the bright display is too bright. Also, the display and lamps are bound to last longer if operated in the dim mode, especially if you leave the time displayed when not using the receiver. Thus, I decided to use the BRIGHT-DIM switch to switch the agc time constant.

Removing the lamp wires from the switch and taping them up leaves the display in the dim mode. (By the way, you will have to remove the front panel to make the wiring changes. This is done by removing both the top and bottom sections of the receiver case. Then remove the knobs. The bandswitch and tone knobs have hex screws; the others pull off. Remove the two screws holding the analog frequency dial knob. Then the panel screws can be removed. The mode switch is held on the front panel with two screws.)

Fig. 3 shows the change in the switch wiring I made in my R-1000. Rewiring the switches as shown not only allows use of the 2.7-kHz filter on AM, but also allows use of all three filters in both modes. This is possible due to the mechanical construction of the 4-section mode switch. It is possible to release all the buttons by pressing one in only as far as necessary to release one that is latched. It is also possible to have more than one depressed at a time. With all switches released, the receiver is in AM with the 2.7-kHz filter selected. (The 2.7-kHz filter is now switched directly with 9 volts instead of via the SSB gate diodes.) AMW and AMN are the same as before. When either USB or LSB is depressed, both AM switches are released, resulting in the 2.7-kHz filter being selected. If you desire wider bandwidth in SSB, press either LSB or USB and at the same time press AMN for 6 kHz or AMW for 12 kHz. Pressing another button will release both latched switches.

The AGA and AGB leads are wired to the normally-open contacts of the dimmer switch. Now, fast agc occurs with the switch released and slow when the switch is depressed. The strap across the common terminals is left alone. The red and black wires that go to the center switch terminals are removed and soldered together so the red lead going to the noise blanker switch is still grounded.

It occurred to me that with the 12-kHz filter in the receiver, an FM detector could be added for those who want to listen to the FM activity on the high end of 10 meters. A simple 565 PLL circuit can be added to provide this; however, it would be necessary to add a switch somewhere and also dig into the main circuit board itself to switch the audio.

For those wanting a little better selectivity for RTTY, it is possible to obtain a 1.5-kHz filter from Murata. It will be necessary to remove the main receiver board to change filters (probably best to change the 12-kHz one).

Low-frequency performance of the R-1000 can be improved with an outboard tuner. The tuner can be used with a whip, wire, or coaxially-fed antenna. It will perform impedance transformation from 50 Ohms to 1000 Ohms. A whip or short wire (most any ham antenna used as a single wire looks short at these frequencies) looks like a capacitive load. This type

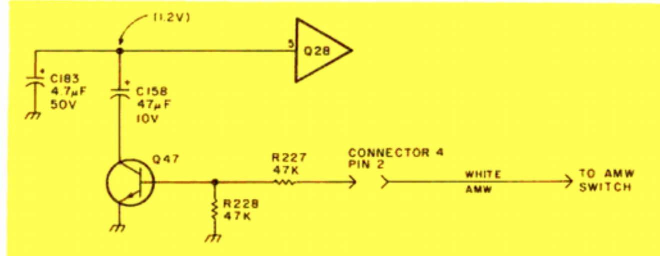

Fig. 2. Additional circuit on Q28 shown in service manual. This extends low-frequency response on AM wide.

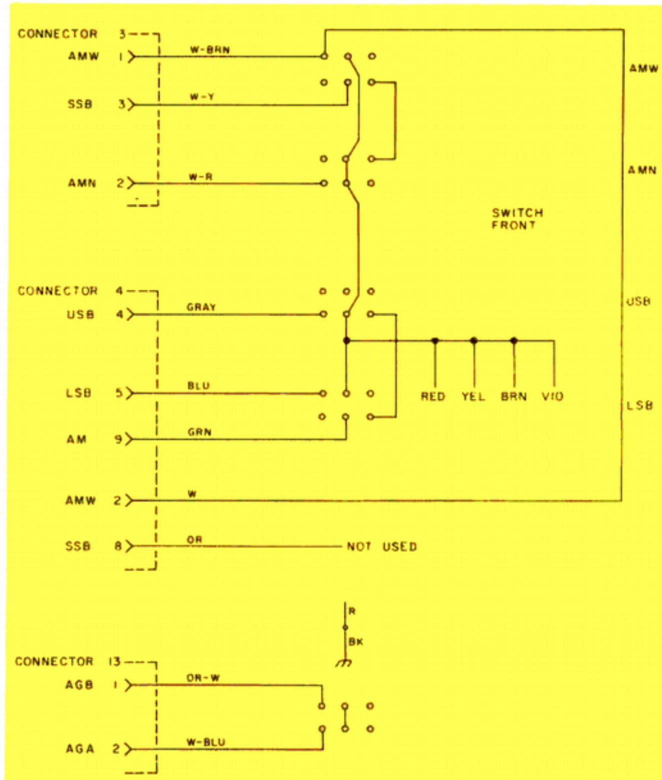

Fig. 3. Modified mode switching to provide fast and slow agc.

of antenna is best connected right to the "high" end of the tuned circuit. Fig. 4 shows a suggested tuner.

While my tuner includes several coils for three frequency ranges, I only show one here. You may wish to use ferrite rods or slug-tuned coils, but the link-winding turns should remain about the same. If your antenna has a high capacity to ground, the high frequency end will not extend as far as you may wish. This may be cured by adding about 100 to 200 pF in series with the wire antenna input on the higher frequency range. Some values are shown in Table 1.

Going down in frequency, the sensitivity rapidly drops off below 200 kHz. (The specs say 200 kHz is the bottom end of the useful range.) Above this frequency the sensitivity runs

Frequency Range	L1	L2 (turns)	Tap (turns)
1-2 MHz	40 µH	20	5
0.5-1 MHz	150 µH	20	5
200-500 kHz	1 mH	30	6
80-200 kHz	6 mH	40	8

Table 1. Approximate values for R-1000 antenna tuner.

about 1.2 µV. At 150 kHz, sensitivity is down 16 dB, and at 100 kHz it is down 37 dB.

Being a low-frequency addict, I wondered if the low-frequency range could be extended. I felt that the filter consisting of L1, L2, L3, C7, and C8 was the limiting area. Connecting the signal generator to the junction of L4 and C9 confirmed this. It looked worthwhile to bypass the filter components, and this can be done without removing the circuit board if you are careful.

Cut the anode lead of D1 close to the board. Then cut the lead of C8 that connects to L3. Cut this lead close to the body of the capacitor. Strap the anode of D1 to this wire that went to the capacitor. Now the sensitivity is 2 µV at 150 kHz and 3 µV at 100 kHz. At 50 kHz, the sensitivity is 20 µV, where it originally was 18000 µV! This modification does not seem to increase the broadcast interference noticeably. In either case, an external tuner is needed if you are near any broadcast stations.

Kenwood sells a kit for operating the R-1000 on 12 volts dc. Why this is not included in the receiver is anybody's guess, but this feature can be easily added. There is no reason that a connector is needed on the power supply board. A pair of wires for the +12 and ground connections can just be soldered directly to the board. The power supply board is easily removed by unsoldering the wires from the power transformer. There is a blank plate on the rear panel of the receiver where the dc power connector is intended to go. A connector of your choice can be installed here. I recommend fusing the dc input with a 1-Amp, slow-blow fuse.

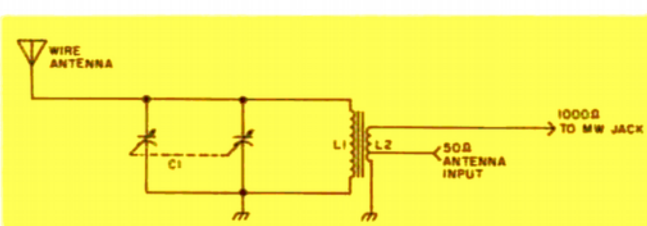

Fig. 4. Antenna tuner for the R-1000 (2 MHz and lower). C1 is a dual broadcast variable, about 730 pF.

The receiver cannot be powered by nicad batteries for very long as the current is typically around 700 mA. It draws 25 mA with the receiver off. Having the display on DIM reduces the drain by about 20 mA. Looking at the voltage readings on the drawing reveals that the audio output stage draws about 140 mA. It is evident that this stage (Q28) is inefficient because the heat sink runs quite warm.

I don't believe that there is a better device that is pin-for-pin compatible, but it still may be worth investigating replacing Q28 with something else. Also, if extended battery operation is anticipated, it might be smart to switch the displays with a momentary pushbutton switch. I estimate the displays draw 60 to 100 mA.

I did a quick check on the audio-frequency response (in the SSB mode) to see how bad it might be for RTTY. It is desirable, of course, to have a flat response at the mark and space frequencies. I originally thought that the bfo frequencies could be changed to favor RTTY operation so I did adjust the trimmers to move the bfo frequencies further from 455 kHz. They wound up at a maximum of 1700 Hz above and below 455 kHz. With the bfo readjusted like this, the response, relative to 2125 Hz, is −0.5 dB at 2295 Hz, −1 dB at 1550 Hz, and −1.5 dB at 2975 Hz. I consider this pretty good. The high-frequency response is better at the speaker output than at the record output, which was a surprise.

I hope I have not painted a dim picture of the R-1000. I think a lot of thought was put into the design. An engineer who designs equipment for the military told me that the basic rf design (synthesizer and upconverter front end with a high-frequency i-f) is the way most of the new precision communication receivers are designed. It is a fine choice for hams and SWLs alike. ■

Author's Note

Between the time I originally submitted this article and when I received the proof copy, more experiments were done on the R-1000 receiver. There have been a lot of complaints about the agc time constant being too long. I agree and therefore changed mine so the time constant compares with that of the 820 transceiver. To decrease the "fast" agc time constant, remove capacitor C217. To decrease the "slow" agc time constant, either replace C138 with a 1.5-uF capacitor or install a 2-uF capacitor in series with the AGA or AGB lead at the switch. Note that the present C138 is polarized, so if you use a polarized capacitor, connect it correctly.

To improve the high frequency response in the SSB mode for better RTTY characteristics, change C159 from .047 uF to .015 uF. This will not noticeably change anything by ear, but will produce mark and space tones of equal amplitude.

R-1000 receivers with serial numbers 009001 or higher have a jumper plug which will permit use of the 2.7- or 6-kHz filters in the AM mode. If you want to be able to use any of the three filters in either SSB or AM mode, my previous switch wiring modifications still apply.

Thanks to Ken WB9FRV for suggestions and help with the additional changes.