Following is a list of modifications for the Kenwood R-5000 general coverage shortwave receiver, which I recently submitted to the MODS Database.
-- Eric Roskos

Kenwood R5000 Modification Notes
By E. Roskos

The following describes some option jumpers and other features I have found in the Kenwood R-5000 receiver.

The R5000 is fairly delicate internally, so you should not undertake these modifications if you are not fairly confident of your ability to work with delicate electronics (or to repair it if necessary). In particular, the receiver's numerous circuit boards are connected together with wire harnesses made of relatively fine and delicate wires. Also, some of the boards (particularly the IF board) have small "daughter boards" containing small surface mount parts vertically attached to the main board. These are also fairly fragile, and caution is required in handling them.

EXPANSION FEATURES

The R5000 has six "Expansion Feature" options which are not documented in the user manuals. These are controlled by jumpers (actually diodes) on the CPU board, which is attached to the back of the receiver's front control panel, underneath a metal RF shield. Unfortunately, you must completely remove the receiver's covers, and unfasten the front panel, in order to access these.

Gaining Access to the Jumpers

To access the jumpers, remove the top and bottom covers of the receiver by removing the eight silver screws which hold each cover in place. Use caution at this point, since the radio will be sitting only on its internal chassis, and delicate parts will be exposed.

Next, remove the four flat silver screws which were *under* the covers (NOT the black screws that are visible with the covers on) which hold the front panel onto the main chassis. Be sure the receiver is sitting on a solid table so that the front panel will not fall off when you do this, since there are a large number of wire harnesses connecting to the CPU board. Very carefully pull the front panel forward and rotate it so that you can get access to the back of the front panel.

Loosen the five small metal screws (two at the top, three at the bottom) which hold the RF shield in place over the CPU board. The holes in the shield the screws go into are slots, which allow you to slide the shield off without removing the screws completely. This is fortunate since the screws are fairly small. Remove the RF shield.

Changing The Options

Locate the row of approximately eight small, vertically-mounted option diodes on the CPU board. They are labelled D65 through D72, and are located near and perpendicular to six-pin inline connectors 54 and 55, and parallel (and directly adjacent to) eight-pin connector 53. Behind

connector 53, you may see another row of option jumpers; in my R5000, most of the diodes in this row were not installed. They are numbered D73-D79. Note that D65-D72, D73-D79, and connector 53 (which goes to the front panel keyboard matrix) are all read by IC53, an 82C55 PIO, which strobes the cathodes of one of the three rows of diodes and then reads the anode side of each diode in the row in parallel; it is pulled up by resistor pack R850 unless the diode is connected, in which it is pulled down by the (negative-going) strobe.

You enable one of the options by cutting the top loop of the wire coming out of the anode end of the diode (remember that these are vertically mounted diodes, so the end which is sticking up forms a loop). It is suggested that you just cut through the wire carefully, and bend it slightly to one side; then if you want to disable the option in the future, you can carefully re-solder the connection without having to solder a new diode onto the board.

The jumpers we are concerned with are D65-D72. Note that the other row of diodes (D73-D79) are also option jumpers, but they are not documented in the R5000's technical manual; the manual's parts list simply says that D73 is installed in Australia, and D74-D76 are installed in Europe. Only one of these (I think D79) was installed in my receiver; and the parts list doesn't say what it is for. I'm interested in hearing from anyone who may know what these undocumented jumpers do.

The meaning of each jumper is as follows:

D65: Selects whether the display will show in 10 Hz increments (diode present) or in 100 Hz increments (diode absent). As shipped, the diode is present, which is probably what you'll want since it gives a higher resolution to the display. I don't know if it affects tuning; the radio does tune in 10 Hz increments with the diode installed.

D66: Controls whether the mode buttons will generate a morse-code letter through the speaker when depressed (diode present) or will simply beep when depressed (diode absent). As shipped, the diode is present, and morse-code letters are generated through the speaker.

D67: Controls whether FM mode will step in 2.5 kHz increments (present) or 500 Hz increments (absent), when you have the front-panel step switch "on" (STEP displayed on the display). This applies to HF-band FM; VHF-band FM (with the VC20 installed) already stepped in 500 Hz increments. As shipped, the diode is present, and steps are in 2.5 KHz increments.

D68: Controls the "BUSY STOP" feature. With the diode present, scanning will stop when the BUSY light comes on only in AM and FM modes. With the diode absent, scanning will stop when the BUSY light comes on in all modes. Note that this is the modification some radio stores sell as an extra feature, by connecting the "dimmer" switch to the option diode so that you can turn this on or off from the front panel.

D69: "Memory search" feature. This is (in my opinion) the best of the extended options. The diode is shipped present; as shipped, the memory search feature is disabled. If you remove the diode, you enable the feature. With the feature enabled, when you press the orange M.IN key the first time (to allow you to select which memory you want to store a

frequency in), the silver "1MHz Down/Up" buttons on the front panel allow you to step through the set of *unused* memory positions. This lets you select a memory to store in without having to scan through all the ones you've already stored into. The front panel knob still scans the whole set of memories, so you don't lose any functionality when you enable this feature. Also, when you are in the memory mode (i.e., the mode in which M.CH is displayed on the display) and not storing into memory (normal operating mode), the Down/Up buttons step through the set of *used* memories, skipping any unused ones.

D70-71: These jumpers are currently unused (according to the manual).

D72: I have not tried this option. According to the manual, if you remove the jumper, you are prevented from storing into a memory channel which has a frequency stored into it. I don't know whether this completely disables all M.IN operations, or just the attempts to modify used channels; or whether there is a way to get around this (e.g., whether the CLEAR button still works).

That's all the options that are documented. I've tried all except D65 and D72; I didn't want to take the radio apart multiple times to try those, since they didn't sound like particularly desirable features. If anybody tries them (particularly D72) and finds details of how they work, let me know and I'll update the description.

OTHER NOTES

Note that the Serial Port option, which is fairly expensive, actually consists simply of two readily-available ICs: an 8251 (the manual lists a uPD8251AFC), and a 4040. The 8251 UART plugs into the IC54 socket on the CPU board (which you access as described above); the 4040 plugs in to the IC55 socket next to it. Another IC to know about in connection with this option is IC56, a 7404 inverter, which is what drives the serial port socket in back of the radio. According to the manual, the pin assignment on this socket is as follows:

3 - RXD (in)
4 - TXD (out)
5 - CTS (in)
6 - RTS (out)

I haven't actually tried these to verify them. Also, there is a CMOS 82C51 available, and an NMOS 8251. According to the manual, the NMOS 8251 is used; although most of the other parts on the board are CMOS. I don't know whether the IC kits they provide actually supply the CMOS or NMOS version.

In addition to these IC kits, to connect to an RS232 interface on a computer you have to have an external converter to convert from the TTL voltage levels coming out of (and going into) the socket, to the RS232 levels. That is the other part of the serial port kit (the "IF232"). Don't connect an RS232 port directly to the serial port socket on the back of the radio! You will (at least) damage IC56.

Note that there are two potentiometers (VR2 and VR3) mounted on top of a

small PC board attached to the top of the control panel (accessible when you remove the top cover). VR3 controls how long it takes for scan to resume after the BUSY light goes off, and VR2 controls the scan speed. From the design, it looks like maybe the person who designed the receiver intended for these to be external controls, and then they put them inside when they packaged the receiver.

What's interesting about these controls is that they, and the IF shift control (and another control used in aligning the receiver) are read through an A/D converter. They actually serve as digital inputs to the microprocessor. It's unfortunate that they didn't use one of the channels on the A/D converter to read the signal strength meter (so you could find the signal strength (AGC level) through the serial port) instead of using them for these relatively minor functions. EEB in Vienna sells a modification for the R5000 which allows their CRIS computer interface to read the AGC level, but I don't know how it works.

One other thing to note involves installing the optional filters. First, I found that the AM filter which came with the radio introduced a whistle into most AM signals. I replaced it with the optional AM filter, and it eliminated the whistle (and gave a "fuller" sound to the AM).

Also, note that if you install other filters, you have to install them "in order" -- in other words, the narrowest has to go in the N position, the next narrowest in the M1 position. Note that the M2 position is already occupied (as shipped) by a high-quality SSB filter. The reason they have to be in order is that as you select narrower and narrower filters, the wider filters remain in the circuit, so if you put a narrower filter in M1 than you have in N, it will stay enabled even when you select the wider filter, causing the wider filter to have no effect.

It's a little unfortunate that it works that way, since the M1 filter is only enabled by the switch (not in AUTO mode), which would be ideal for the very-narrow YK88CN filter. I have identified a modification to make M1 be selected only when the switch is in the M1 position; it involves disconnecting 1/2 of a dual diode and soldering a diode between two points in the filter selection circuit, but I haven't tested it since I don't have that many filters in my radio.

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Note that the YK88CN filter is very useful if you are an RTTY enthusiast; it is a worthwhile option. You can use it to receive VFT on a PK232 (so you don't have to pay $1000 for an M7000), and it helps in tuning AMTOR when there is a lot of adjacent channel activity. The IF shift shifts the frequency of the FSK tone produced in this mode, which is necessary to get it tuned properly for the PK232.

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