

Programming the Kenwood TK-941 / TK-931

Part 2 – program the radio to work repeaters

We're continuing with the second part of our two-part series on programming the inexpensive Kenwood TK-931 and TK-940 series of commercial radios for Amateur 33cm (902mhz) frequencies.

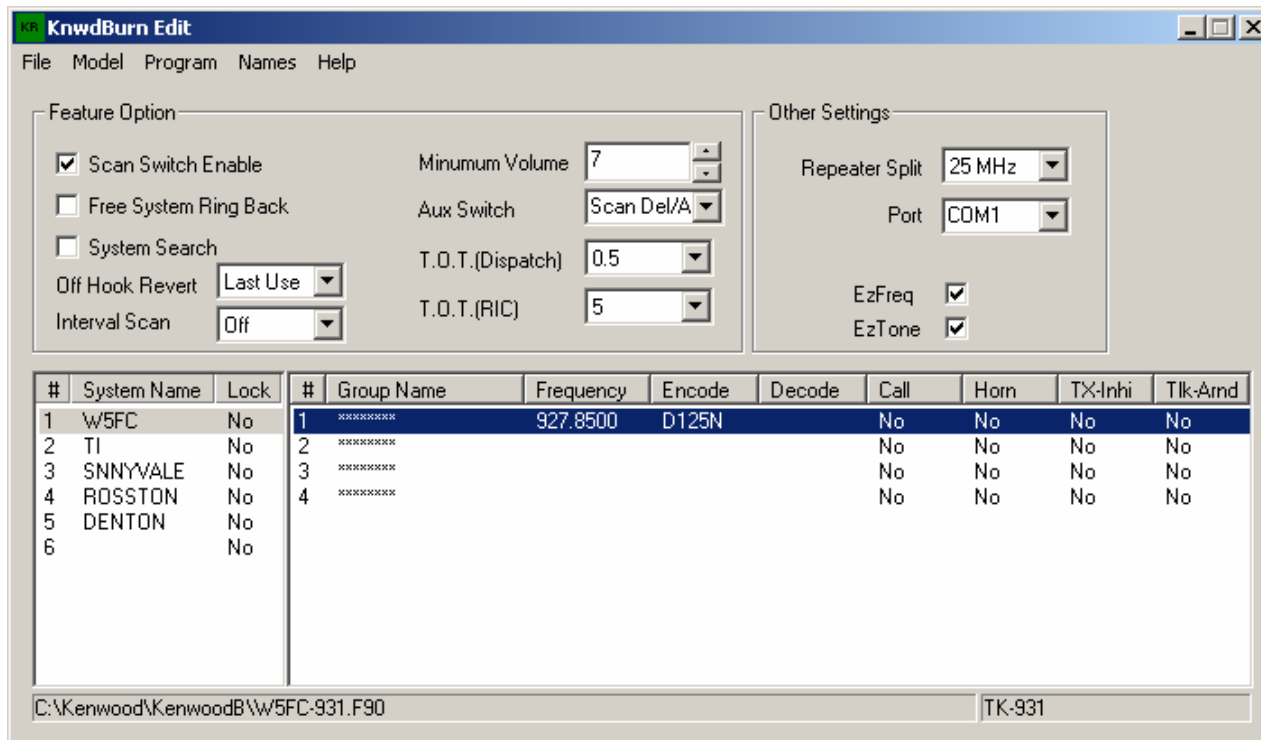
Last month, a home-brew cable is presented – an easy to build project that costs about \$5. This is in keeping with the theme that we can repurpose or recycle Kenwood TK-941 and TK-931 commercial radios that are now becoming widely available as commercial users move elsewhere.

First let's take the TK-931 radio, which is easy to program thanks to the work of Steve Zingman (N4IRS), who has created his own windows program which can set the radio's repeater offset to 25mhz for Amateur use. The TK-931 is a 15 watt radio (drawing 7 amps at 13.8V). Some models (D) and (HD) may have an alphanumeric display – if it does, the 'SYSTEM' Name will show up in the display.



You can use the Kenwood Programming software for the TK-931 radio, which is a DOS application named KPG5D.EXE. With this tool, you can setup 6 separate 'Systems', each with 4 'Groups', for a total of 24 Simplex frequencies.

But the N4IRS's tool is much better, in that it can set a proper Amateur Radio repeater offset to -25mhz, and repeaters are setup by providing their output frequency, just as you would a modern radio with programmable memories:



In this case, each repeater is given a 'System' name and in the first 'Group', provide the Output frequency (picked from a dropdown list, and optional Encode / Decode (also from drop-down lists). Do not set any of the other options (Call / Horn / Tx-Inhi / Tlk-Around).

For the 'Feature Options', if it's not already set, select Repeater Split to '25 Mhz' from the drop-down list. Optionally, you can set the Time Out Timers (T.O.T.) for TX and RX timeouts, and a minimum volume level – which should be set on power up. You may have to experiment with this Volume setting to get a 'startup' volume level you like.

The TK-931 also comes in an 'HD' model with a 30 watt output (drawing 12 amps at 13.8V). It has 10 'SYSTEM's each with 10 'GROUP's each, for a total of 100 Simplex frequencies.

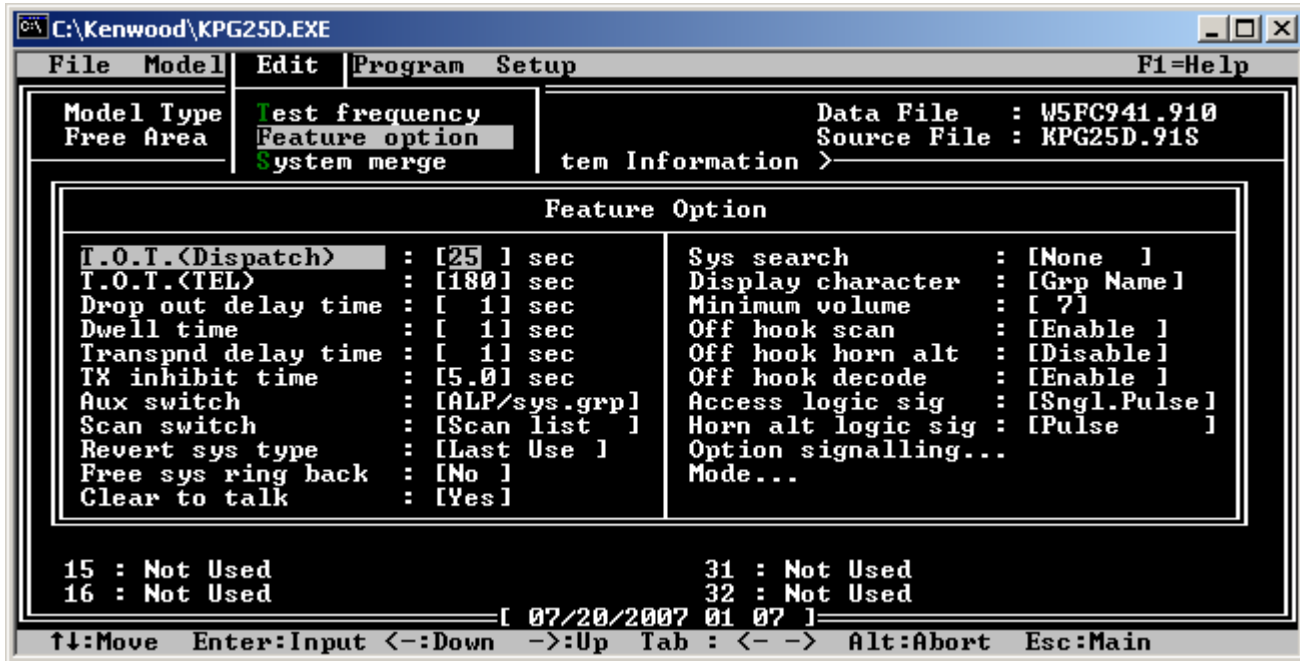
The TK-941, is a less desirable, but possibly cheaper (when found) radio. The repeater offset cannot be changed to 25mhz – it is hard wired into the computer. It's 15 watts of power (drawing 7 amps at 13.8V), and has an alphanumeric display. It still can be made useful on Amateur 33cm frequencies, but the programming system is not as pretty.



The TK-941 is also setup for the 'SYSTEM' and 'GROUP' arrangement. You must use the 'official' Kenwood DOS program, named KPG25D.EXE, to program it. The procedure to program it for use on Amateur 33cm repeaters is quite a bit more complex, but is as follows:

First, starting with an 'empty' program, the most important things to set first are:

1. REVERT SYS TYPE – Last Use – this allows us to 'fake' the 25mhz offset for repeaters
2. SCAN SWITCH – set this to SCAN LIST
3. DISPLAY CHARACTER – set this to 'GRP NAME' – this allows your repeater name to show up in the alphanumeric display.
4. Drop Out Delay and Dwell Time – both to the minimum: 1.
5. Optionally – set the minimum volume, Time Out Timers (T.O.T.).



Now: Layout ALL of the Repeater TX frequencies (your output to the repeater input) in the FIRST GROUP – setup EACH repeater RECEIVE frequency (repeater OUTPUT, your receive) in a separate SYSTEM (2... n), in GROUP 1 of each system. The arrangement will be as follows:

	SYSTEM 1	SYSTEM 2	SYSTEM 3	SYSTEM 4	...
GROUP 1	W5FC TX	W5FC RX	TI RX	DENTN RX	...etc
GROUP 2	TI TX				
GROUP 3	DENTN TX				
GROUP 4	SNYVL TX				

Now it's time to actually calculate the codes that go into the frequency slots. For whatever reason, Kenwood uses a coding system here to define the frequencies. When you fill in your repeater name, the frequency is initially set to a code of **200** which represents a frequency of **937.5000**. But we'll need a frequency for each TX and RX frequency to each repeater. These are calculated with a separate program called **Kenwood3.exe**. You enter your desired frequency and it returns a hexadecimal number: 08 9B would correspond to 200 or 937.500. You can pre-calculate these before hand for convenience. I keep them in an Excel spreadsheet so I don't have to look them up every time I setup a program.

Exit the KPG25.EXE program. You'll have to edit your program file with a HEX EDITOR. One is provided in the Zip file that contains the KPG25 program. Use it to change each instance of **08 9B** – replace each instance with your calculated Hex value for your frequency.

When you're done, you can reload KPG25 and load your file. You'll see in each location a 'weird' number. Highlighted below is W5FC, which shows a value of **-2572** which the program interprets as **902.85.00 Mhz**. It's an ugly process but when it's done you'll have something that looks like this:

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C:\Kenwood\KPG25D.EXE
File Model Edit Program Setup F1=Help
Model Type : TK-941[900MHz] Data File : W5FC941.910
Free Area : 5510 bytes Source File : KPG25D.91S

System No. : 1 Format : Conventional

F Grp FCC -12.5 Encode Decode Grp-Name Call Horn OptSig TXInh Bsy TlkArnd
1 -2572 *** D125N W5FC TX No No No No No No Yes
2 -2562 *** 110.9 DENTN TX No No No No No No Yes
3 -2595 *** 123.0 N6LXX TX No No No No No No Yes
4 -2636 *** 110.9 SNYUL TX No No No No No No Yes
5 -2631 *** D432N II TX No No No No No No Yes
6 -2600 *** TEMPL TX No No No No No No Yes
7 -632 *** SMPLX TX No No No No No No Yes
8
9
10
< FCC Grp.1 : 902.8500 MHz >

14 : Not Used 30 : Not Used
15 : Not Used 31 : Not Used
16 : Not Used 32 : Not Used

[ 07/20/2007 01 22 ]
Arrows:Move Enter:Input F9:Sys Data Alt:Abort Esc:Main
  
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For ALL the TX Frequencies – SET the option: TLKAROUND

For ALL the RX Frequencies – SET the option: TXInh – you won't want to transmit.

Program the radio using the 'Program' Menu (and your home-brew or commercial cable).

Now we take advantage of our layout to 'fake' or get around the fixed repeater offset. ALL of our frequencies are simplex. First: Set your radio to your repeater TX frequency. This is what you'll transmit on. Hit the 'SCAN' button. The radio goes into scan mode. When you hit PTT, the radio stops on your 'LAST USED' frequency (remember from above!). Release PTT and the radio will wait for a second (DWELL TIME, as above) and return to scanning. When someone replies on the repeater, the SCAN stops on the repeater RX frequency. When the talker is done, SCAN continues and so on... The two factors that allow this are 'LAST USED' frequency – which returns to where you were when you hit 'SCAN', and the arrangement of frequencies (TX in SYSTEM 1, RX each in subsequent SYSTEMS, each in GROUP 1).

To make it easier to start, I'll upload all TK-941 and TK-931 'clone' images to the W5FC website, in the members-only area. In addition, there are hardware improvements (filter changes, etc), but this should give the amateur a start on enjoying the new W5FC 900mhz repeater and others on 33cm.

Links:

Find KNWDBURN program (zipped) - <http://www.qsl.net/kb9mwr/projects/900mhz/>

TK-941 Programming and mods, KPG25D program, read the paragraph: "Programming Kenwood TK-941 by W7UVH" for details on how to do the 'hex' editing part - http://www.ad5jn.com/900_mhz.htm

The popular 900mhz Yahoo group - <http://groups.yahoo.com/group/AR902Mhz/>