AWA RT85 CTCSS conversion for 91.5Hz

The AWA RT85 radios are well known as solid dependable commercial two way radios that have good audio, a bomb proof front end and suffer few if any problems at all. Many repeaters in Australia now use CTCSS access tones but trying to set up the RT85 to work with all tones in use in Australia will reveal a problem when it comes to 91.5Hz.

The CTCSS boards most often used in the RT85 are the Sigtec C1105 and C1109. There are others that can be used but these are the most prevalent. The standard configuration for the Sigtec tone boards is to have tone groups A and B selected. This selection covers 31 different CTCSS tones but does not include 91.5Hz which is a group C tone. The selection of tone groups is normally done by cutting tracks or jumpers on the tone boards. In short, the RT85 in its standard configuration cannot produce 91.5Hz as well as other more "popular" tones without intervention. Pins 17 and 22 of U1 on the tone boards control the selection of tone groups. These two pins are designated F and Y in the programming table. Depending on the state of these two lines, the tone board can produce a mixture of A, B and C tones. Unfortunately none of the four combinations of F & Y will allow us to use all the tones in use in Australia.

A check of the programming table shows that the 110.9Hz and 91.5Hz tones use the same binary code (23) and luckily for us 110.9Hz is not currently in use anywhere in Australia. With a little bit of logic we can control the state of the Y line and make the boards produce all tones in the A and B groups except for 110.9Hz which we will convert to 91.5Hz. If we can recognize code 23 at the input of the tone board and toggle the Y line high the tone board will then generate 91.5Hz instead of 110.9Hz. All other tones will leave Y=0. As it turns out this is easy to achieve with two TTL chips.
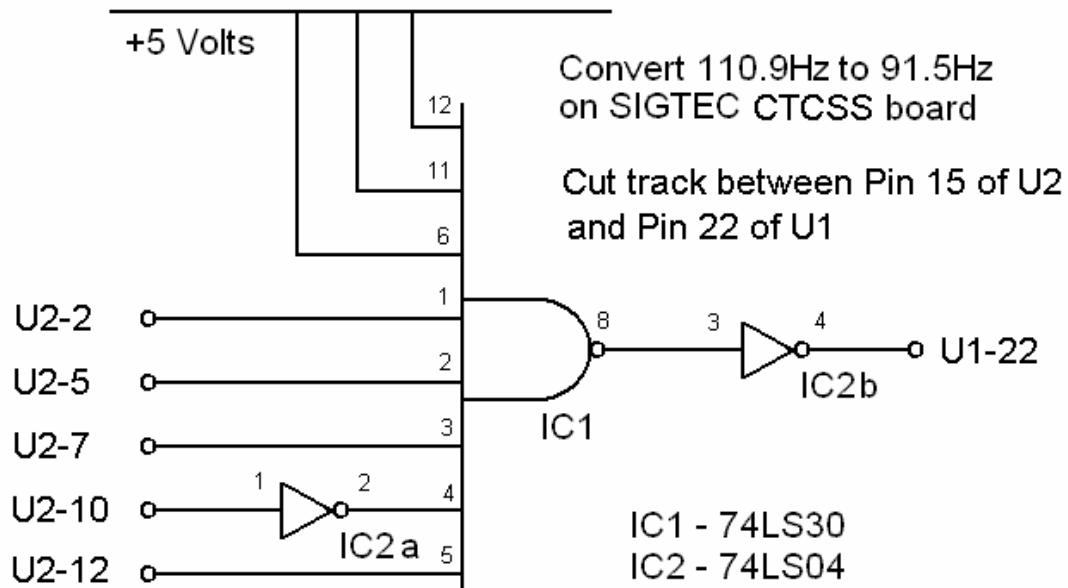
Referring to the circuit diagram IC1 is an 8 Input NAND gate. When all inputs are high the output will be low. The three unused inputs on the gate are tied high and IC2a inverts the low data bit in code 23. When the code 23 is issued by the radio the output of IC1 goes low and is subsequently inverted by IC2b which controls the Y input of the tone board.

The complete circuit is built on a small piece of vero board and attached to the CTCSS board by one of its mounting screws. Flying leads are soldered directly from the board to the pins of U1 and U2 on the tone board.

All that remains is to program the radio for 110.9Hz where ever a 91.5Hz CTCSS tone is required.

110.9Hz detector for the Sigtec CTCSS boards

You must cut the track between Pin 15 of U2 and Pin 22 of U1 on the CTCSS board before you implement this modification.

+5 Volts

Convert 110.9Hz to 91.5Hz on SIGTEC CTCSS board

Cut track between Pin 15 of U2 and Pin 22 of U1

U2-2
U2-5
U2-7
U2-10
U2-12

IC2a

IC1

IC2b

U1-22

IC1 - 74LS30
IC2 - 74LS04

Programming table for the Sigtec CTCSS boards.

Code	Y=0 F=1	Y=1 F=1	Y=0 F=0	Y=1 F=0	U2-2	U2-5	U2-7	U2-10	U2-12
0					0	0	0	0	0
1	241.8 (B)		71.9 (B)	77.0 (A)	1	0	0	0	0
2	233.6 (A)		79.7 (C)	85.4 (C)	0	1	0	0	0
3	225.7 (B)		82.5 (B)	88.5 (A)	1	1	0	0	0
4	218.1 (A)		91.5 (C)	97.4 (C)	0	0	1	0	0
5	210.7 (B)		94.8 (B)	100.0 (A)	1	0	1	0	0
6	203.5 (A)		103.5 (B)	110.9 (B)	0	1	1	0	0
7	192.8 (B)		107.2 (A)	114.8 (A)	1	1	1	0	0
8	186.2 (A)		118.8 (B)	127.3 (B)	0	0	0	1	0
9	179.9 (B)		123.0 (A)	131.8 (A)	1	0	0	1	0
10	173.8 (A)		136.5 (B)	146.2 (B)	0	1	0	1	0
11	167.9 (B)		141.3 (A)	151.4 (A)	1	1	0	1	0
12	162.2 (A)		156.7 (B)	167.9 (B)	0	0	1	1	0
13	156.7 (B)		162.2 (A)	173.8 (A)	1	0	1	1	0
14	151.4 (A)		179.9 (B)	192.8 (B)	0	1	1	1	0
15	146.2 (B)		186.2 (A)	203.5 (A)	1	1	1	1	0
16	141.3 (A)		210.7 (B)	225.7 (B)	0	0	0	0	1
17	136.5 (B)		218.1 (A)	233.6 (A)	1	0	0	0	1
18	131.8 (A)		241.8 (B)		0	1	0	0	1
19	127.3 (B)		250.3 (A)		1	1	0	0	1
20	123.0 (A)				0	0	1	0	1
21	118.8 (B)	97.4 (C)			1	0	1	0	1
22	114.8 (A)				0	1	1	0	1
23	110.9 (B)	91.5 (C)			1	1	1	0	1
24	107.2 (A)				0	0	0	1	1
25	103.5 (B)	85.4 (C)			1	0	0	1	1
26	100.0 (A)				0	1	0	1	1
27	94.8 (B)	79.7 (C)			1	1	0	1	1
28	88.5 (A)				0	0	1	1	1
29	82.5 (B)	74.4 (C)			1	0	1	1	1
30	77.0 (A)				0	1	1	1	1
31	71.9 (B)	67.0 (C)			1	1	1	1	1

CTCSS tones in use around Australia as of July 2009 are as follows,

88.5Hz, 91.5Hz, 118.8Hz, 123Hz, 141.3Hz and 179.9Hz

Lou Blasco – VK3ALB   12/07/2009