1750hz Toneburst Repeater Access Enhancement for RC-210

Doug Hutchinson GM7SVK and Jon Richardson G7PFT

Introduction

This document outlines how to adapt an RC-210 repeater controller to allow a toneburst decoder to be used for repeater access. In Europe this is a legacy method of repeater access however many repeaters choose to support both toneburst and CTCSS access methods since many repeater users don't have CTCSS encode available on their (legacy) radios.

Method

The toneburst decoder provides a "pulse" decode when a 1750hz tone is received and decoded. We use this pulse to trigger an alarm event to the RC-210 which disables subsequent toneburst decoders, and runs a macro to turn the RC-210 into carrier detect mode. This then enables another alarm which watches the PTT line (controlled by the RC-210 hangtime) and re-sets the controller to CTCSS only access when the PTT drops allowing CTCSS or toneburst access once again.

Prerequisites

- RC-210 Firmware v4.67+
- Active-low PTT line from radio

Interface Circuits

The RC-210 cannot decode 1750hz tones itself, instead this needs to be performed on an external circuit based around an NE567. The schematic is shown below and it can be built on an inch square piece of veroboard which can be easily accommodated inside the RC-210 rackmount enclosure.

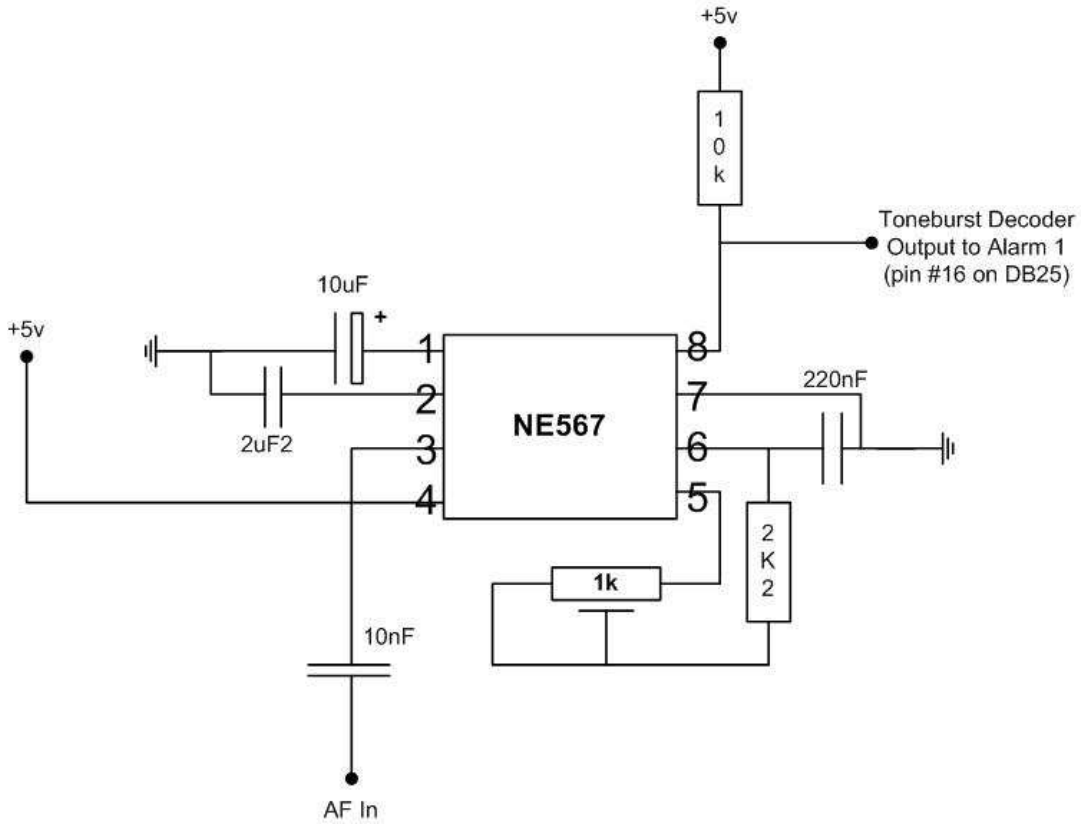

Figure 1: NE567 Toneburst detect circuit

The resistors can be any 0.25w metal or carbon type but should be of reasonable quality. The capacitors I used were monolithic resin dipped ceramics available from Maplin Electronics in the UK.

The 5v supply can be taken from the LM340 device on the RC-210 board if mounted internally as power consumption of the NE567 device is only approx 10-15ma.

The AF input can be taken from the controller board (I used the alternate pins for the RJ45 mounting to take pin 5 (RX audio) to the NE567.

Test and align the 1K pot externally prior to connection to the RC-210 and double check your work to ensure no faults in construction don't destroy your RC-210 controller!

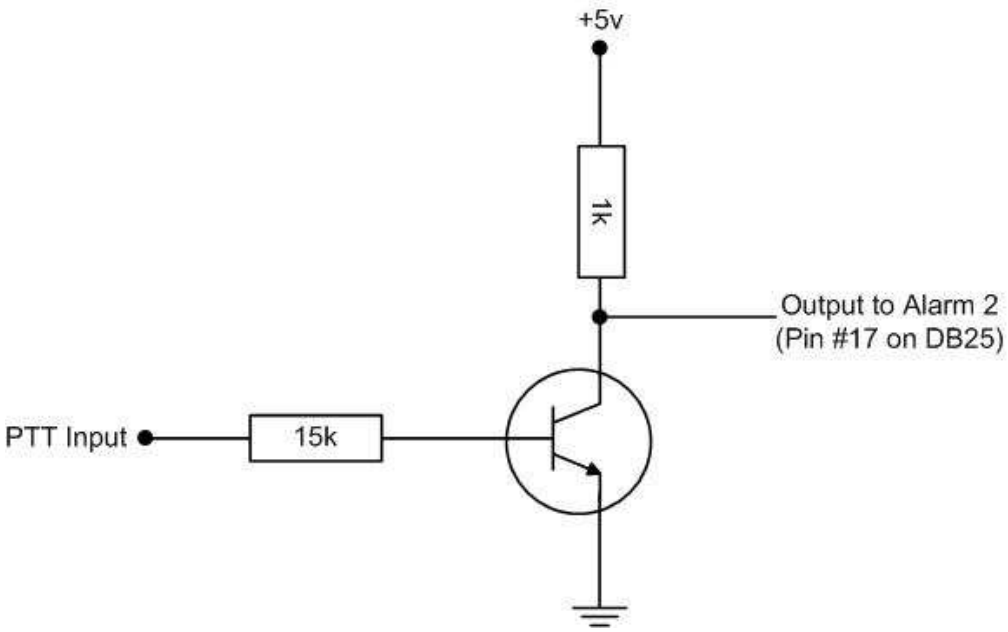

Figure 2: PTT inverter

The PTT inverter does exactly what the name suggests, it inverts the polarity of the PTT line (active low) to +5v. Now that the line is in a state that the RC-210 can read alarm events this is used as an event to watch for the repeater TX shutdown to occur indicating that the repeater should be re-set back to CTCSS and toneburst access.

The transistor is an 2N2222A or similar. The PTT input can be taken from the RC-210 PTT output for that port in the same manner as the toneburst decoder audio input. PTT can be found on pin 3 of the RC-210 radio port connectors.

Macros:

Once these circuits have been connected to the RC-210 as described, you need to program the RC-210 using RCP to make it all work.

If you have existing macros then you may need to renumber these new macros to take account of them. If you do this ensure you follow this new numbering in the alarm triggers!

Create macro 9:
228 162 004 157 153
(macro priority high, speech out port 1, port 1 carrier access, alarm 1 off, alarm 2 on)

Create macro 10:
228 162 001 152
(macro priority high, speech out port 1, port 1 CTCSS access, alarm 1 on)

Then in the “Alarms/R. Base/Aux Audio” tab:

Alarm 1	High-to-Low Macro To Use:	9
	Low-to-High Macro To Use:	10
Alarm 2	High-to-Low Macro To Use:	10
	Low-to-High Macro To Use:	9

On the “Port Switches” tab make sure that the access mode is set to “CTCSS only” for the port you wish to use the toneburst access on.

(don’t forget to hit apply on each page as you go)

Upload your changed config to the RC-210.

Testing:

Firstly try a carrier to the repeater RX and observe the COS light is active but the repeater should not open.

Next introduce a 1750hz toneburst and you should see the repeater go into talkthrough mode, presenting CT tones and other normal characteristics. After the repeater hangtime has expired, and PTT dropped try the first test again with carrier access only – the repeater should not open.

Then try 1750hz toneburst access to access the repeater, then key up with carrier only access. The repeater should remain open for subsequent carrier only accesses.

Now access the repeater using CTCSS, and observe that subsequent carrier only transmissions keep the repeater open and present CT tones after de-key etc. Also try this the other way around, opening with toneburst and subsequent transmissions using CTCSS access.

If all these are successful then everything is ok, if any one of these steps fail then it is likely to be either a fault in the circuits used or in the macro programming so walk through the detection stages and macro events adding audible debug to help.

Jon Richardson G7PFT
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jon@richardson.net