

Build a repeater from TYT- TH9000 Mobile Transceivers

Part 1 – Modifying the TYT-TH9000(D)

It all started when the Twin Cities Repeater Club's aging 220 repeater on 224.540 MHz failed due to what appeared to be audio problems. This repeater had served the club and the ham radio community for many years and was built from **Spectrum Communications Corporation** (SCC) modules mounted in a **VHF Engineering** enclosure. When it was working, this repeater was probably the best performing 220 repeater in the Twin Cities area due to its excellent location and 80 watts of RF power.

Back "*in the day*" you could obtain boards, modules or entire 220 band repeaters from companies such as **SCC** and **VHF Engineering**. The story is very different today with the only choice available being **Hamtronics, Inc.** [hamtronics.com] who sell VHF FM exciter and receiver boards. The two boards alone would cost \$490.00 and would only be a starting point for a repeater.

While pondering this dilemma, an innovative idea was suggested by KD0TLS (Todd). He suggested that we consider building a 220 repeater from two TYT-TH9000 mobile transceivers! Oh my.... I had to overcome the perception that these were "*cheap Chinese radios*" and the concept would not be feasible due to technical or quality issues. Trying to keep an open mind, I realized that most of what we purchase in the way of electronics (including amateur gear) is probably manufactured in China anyhow, so I investigated further.

Internet research leads me to a web site hosted by our neighbors to the north. The *Saint Lawrence Valley Repeater Council* (SLVRC) or *Comité de Coordination de Fréquences de la Vallée du St-Laurent* enlightened me when I clicked their [Notes on the 222 MHz Band](#) link.

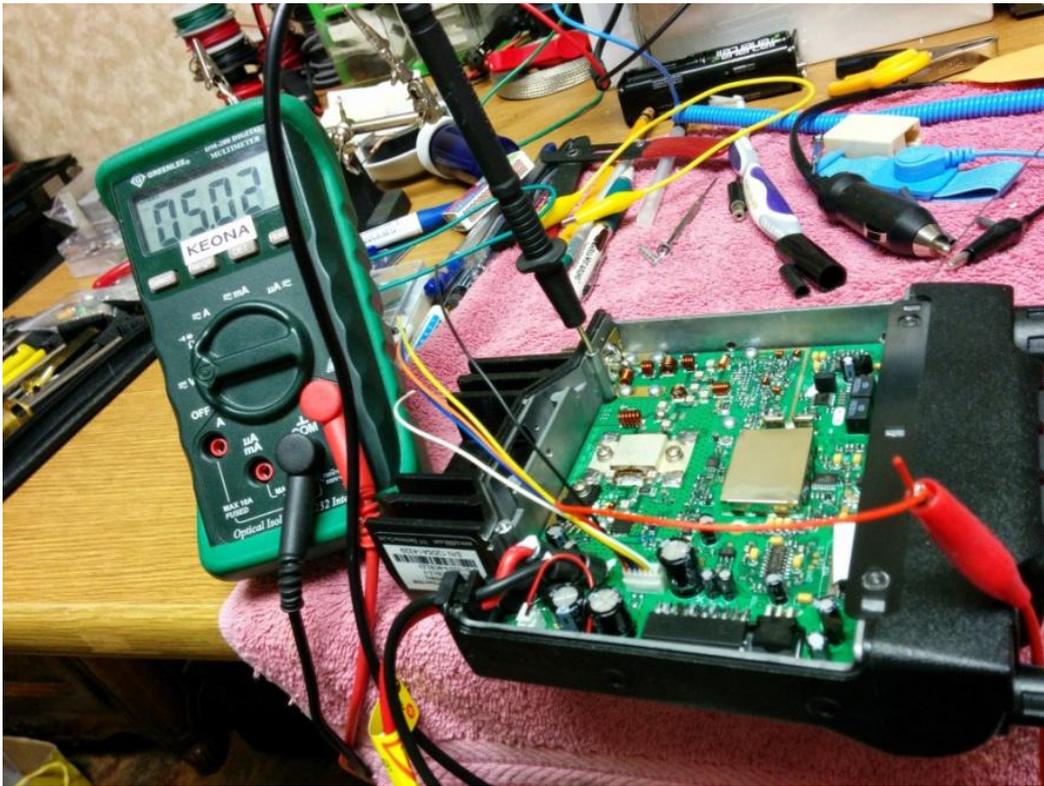
They reflected on what we already know, that the 220 Amateur radio band is being poached (they too lost 220 to 222 MHz to commercial interests) and warned, "*Use it or lose it!*". The shortage of equipment is discussed and they provide a list of what is available, including the previously referenced **Hamtronics** boards. But what caught my eye was at the bottom of the page. Dan (VA3OT) provided information about the TYT-TH9000, what he found was that "*all the necessary connections needed to make a functioning repeater*" was present on a 6-Pin board mounted socket:

<u>Pin</u>	<u>Function</u>
1	Ground
2	Tx Audio
3	COS
4	Rcv Audio
5	PTT
6	+ 5 Vdc

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Dan went on to state *“The TYT TH9000 has a plastic cover hiding a machined opening to fit a 9 pin serial port , complete with 2 threaded holes to mount a serial port”*. With this information in hand, I put out a request that I **would build the repeater, if someone donated the radios**. To my delight, Todd (KD0TLS) and Matt (N0YNT) came forward with the offer of two radios. Matt gave me his TYT-TH9000 and Todd ordered **the newer TYT-TH9000D (see his article)**.

Using the Digi-Key part number (A100196-ND) from the SLVRC posting, I ordered the cables and DE-9 connectors from Digi-Key, which arrived a few days later:

It was now time to take a look “under the hood”. After getting the first TYT-TH9000 open (a bit of a challenge due to the use of small Torx™ head screws), I notice that the six pin socket was not labeled. By plugging the new cable into the socket and checking with my digital volt meter, I was able to figure it out by checking for five volts.

According to the pinout diagram provided by the SLVRC, this meant that the pin closest to the back of the radio was #6, therefore pin numbering ran 1 through 6 from the front to the back of the radio.

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Now it was a simple matter to peel off the sticker covering the 9-pin serial port cut-out and solder the wires to the DE-9 connector that I had just ordered:

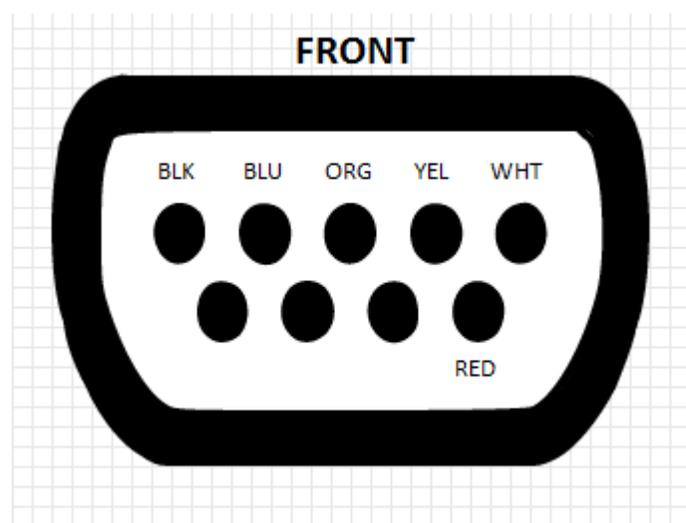


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To secure the connector using the threaded holes, I “borrowed” two of the four Torx™ head screws that held the cover - a perfect fit!

Here is the wiring as viewed from the front of the DE-9 serial connector:



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PC Board	Wire Color	SIGNAL	DE-9 Pin Number
1	BLK	Ground	1
2	BLU	TX Audio	2
3	ORG	COS	3
4	YEL	RCV Audio	4
5	WHT	PTT	5
6	RED	5 Volts	9

So there you have it, the TYT-TH9000 has been modified to bring out the signals you need to build a repeater or to use the radio for other purposes, like Echo-Link.

In the next series of articles, I will describe how I mounted two TYT-TH9000(D) radios in a 19 inch rack shelf, built a common repeater controller interface, added supplementary cooling to the transmitter and tested the complete repeater with two different controllers.

73 for now,

Dave – KE0NA

I added these tables to show the various connections.

	Allstar DMK-URI DB25 Male	IRLP DB9 female	Alinco DB9 male	
COS	8	7	1	
RX Audio	21	8	4	
GND	19,20	6	5	
PTT	1	2	7	Jumper pin 2 to pin 3 IRLP end
TX Audio	22	9	9	

Connectors and Connections shown are on the cable ends. The DMK-URI and Alinco have mating female connectors. It would be consistent to use a DB9 female on the TYT mod and wire it the same way as the Alinco.

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This table shows the 6 pin inline circuit board connector pinout to URI connections for Allstar. The radio's back panel DB9 connector can be wired the same as the inline pin numbers or as shown in the chart above using the Alinco pinout. The Alinco wiring is preferred as the same radio to URI cable would work on both the TYT and Alinco radios.

6 pin inline	URI DB25
1 (gnd)	19 & 20 (gnd)
2 (Tx Audio)	22 (left ac)
3 (COS)	8 (COR Det)
4 (Rx Audio)	21 (mic ac)
5 (PTT)	1 (PTT)
6 (+5VDC)	NC (Not Connected)

WA3DSP