How to: Icom Repeater System

by Preston Moore, N5YIZ

March, 2007

Housing/Power Supply kits now available!! (click the pic for more info)

This guide will show you how to construct a repeater system using two Icom IC-F200 series mobile radios.The firmware in these radios can be configured to allow basic repeater control (COS, hang time, etc.) without the need for external hardware. These instructions are written for an in-band VHF or UHF repeater, but a cross band system can be made with slight modification.

You will need the following:

(2) Icom IC-F200 series radios (IC-F210, IC-F211, IC-F221, IC-F210S, IC-F211S, IC-F221S, etc.)
(2) Icom OPC-617 Accessory Cables (clones are available at http://www.prestonmoore.com/opc-617.html)
(2) DB-9 male connector assemblies (connectors and hoods)
(1) 5-conductor cable (6 to 8 inches in length)

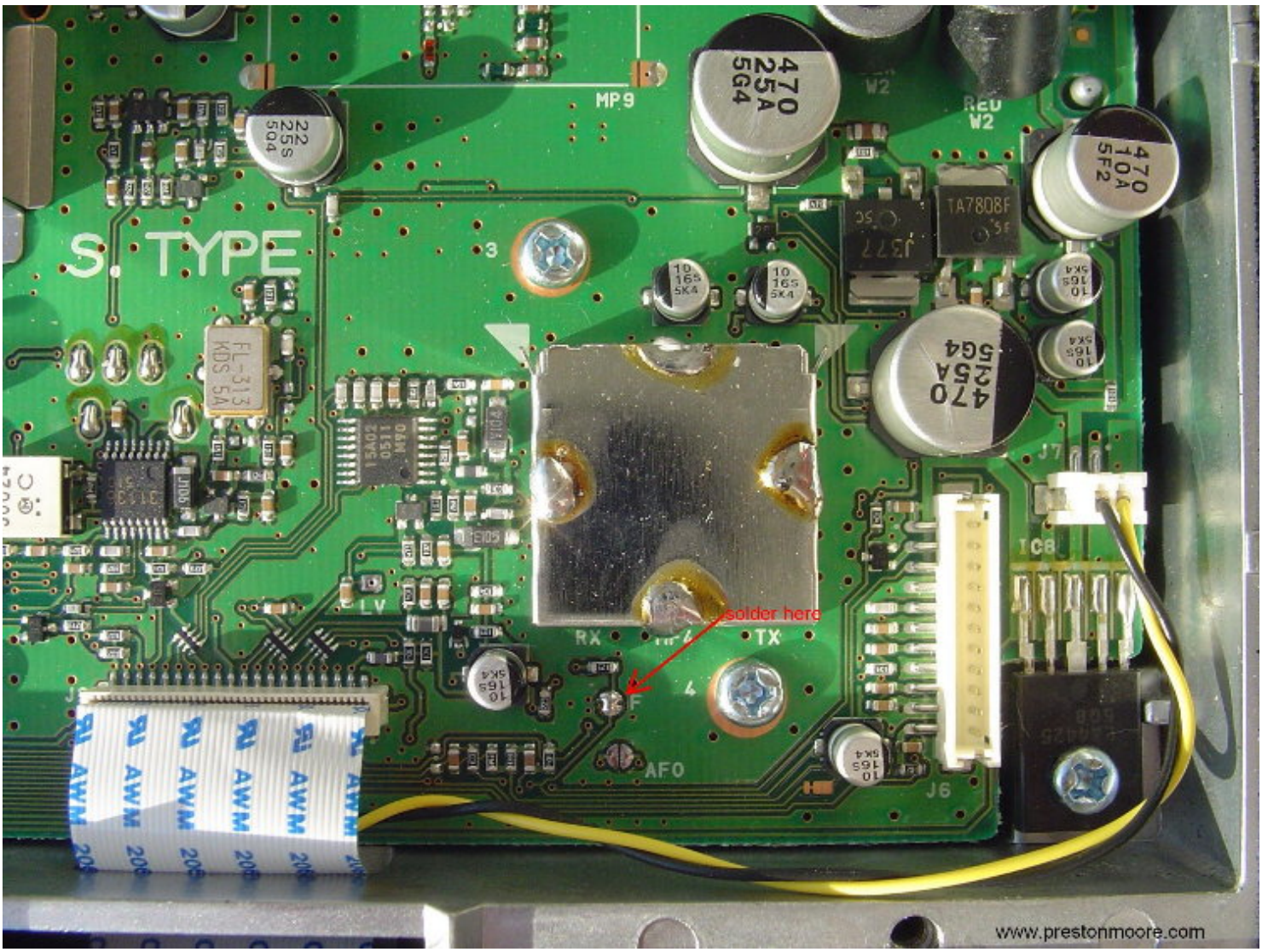
You will also need the appropriate programming software and cable.

STEP ONE:

Prepare by determining which radio will be used for transmit and which one will be used for recieve.

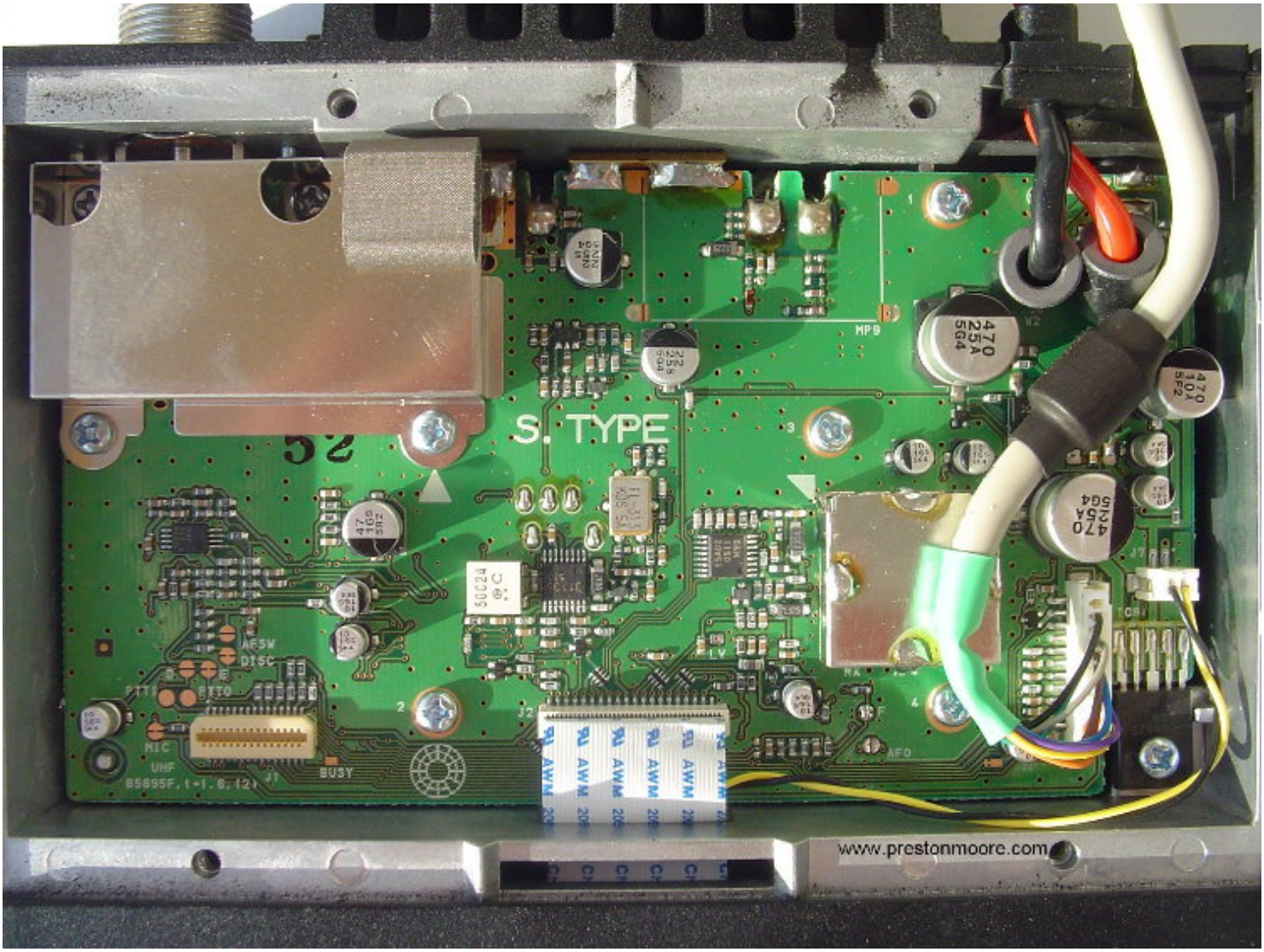
STEP TWO:

Prepare the Transmit radio by first removing the bottom cover. With the front of the radio towards you, locate the jumper location labeled as "F" below the square shielding. Place a solder blob at this location to close the connection.



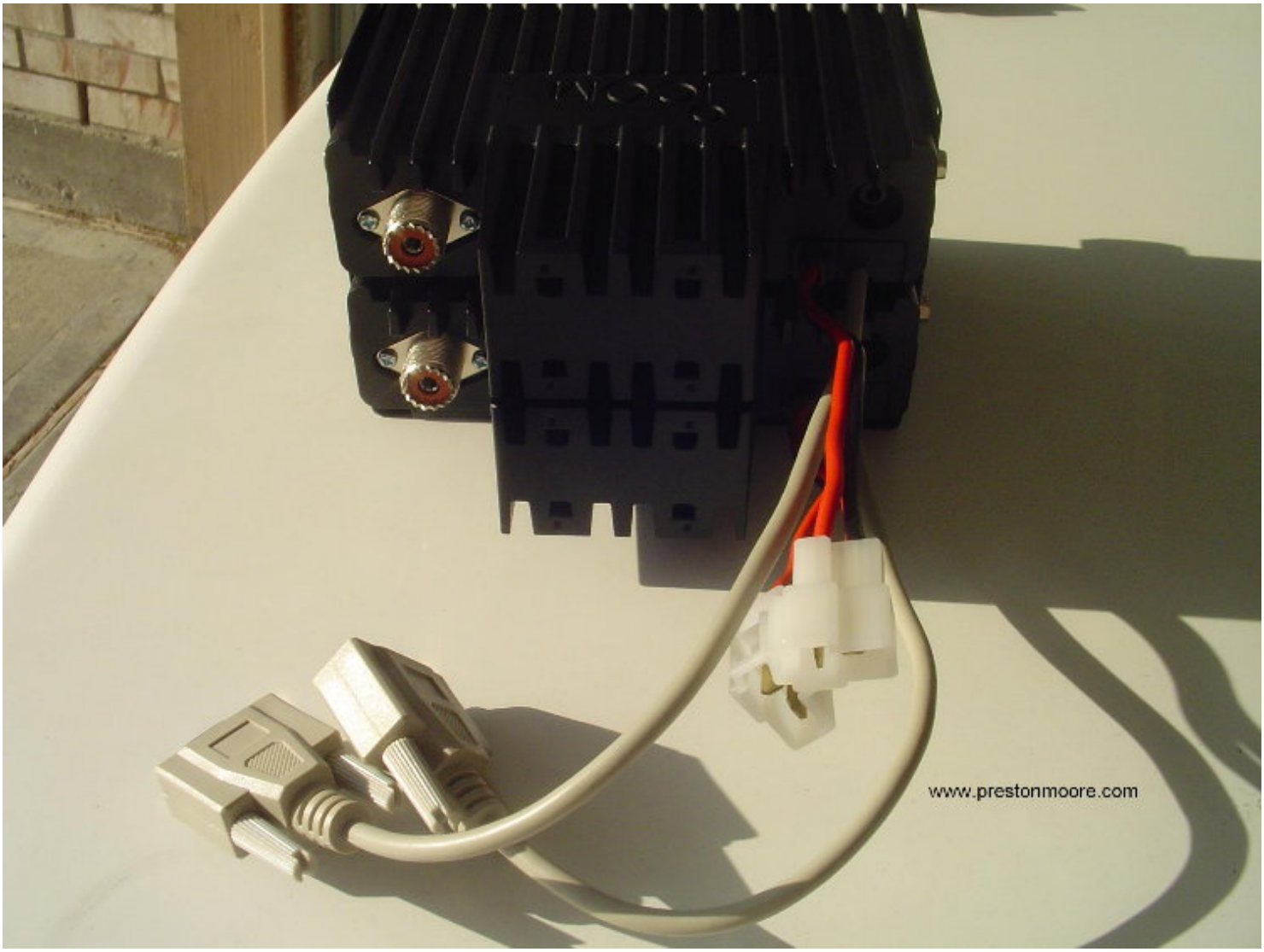
STEP THREE:

Plug an OPC-617 Accessory cable into the connector "J6" and route the wire out the rear of the radio as shown below. You will need to cut the plastic "filler" with a razor knife in order for the cable to exit the radio. The modification to the TX radio is complete. Replace the bottom cover.



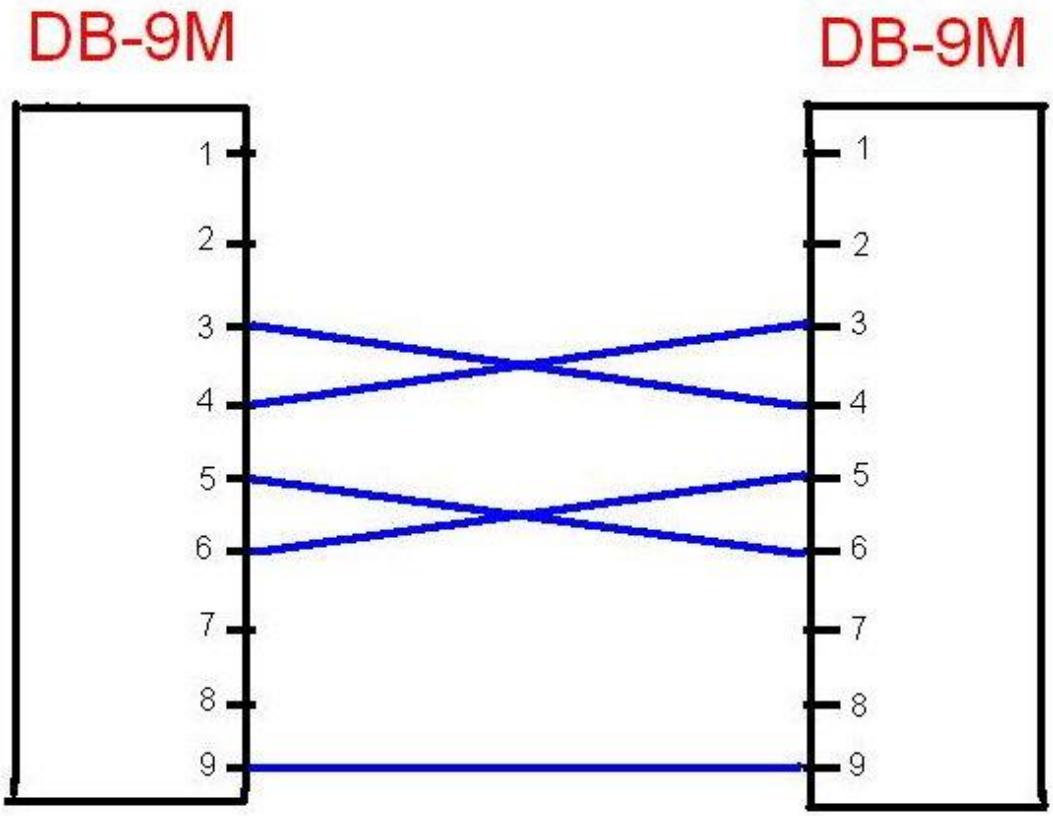
STEP FOUR:

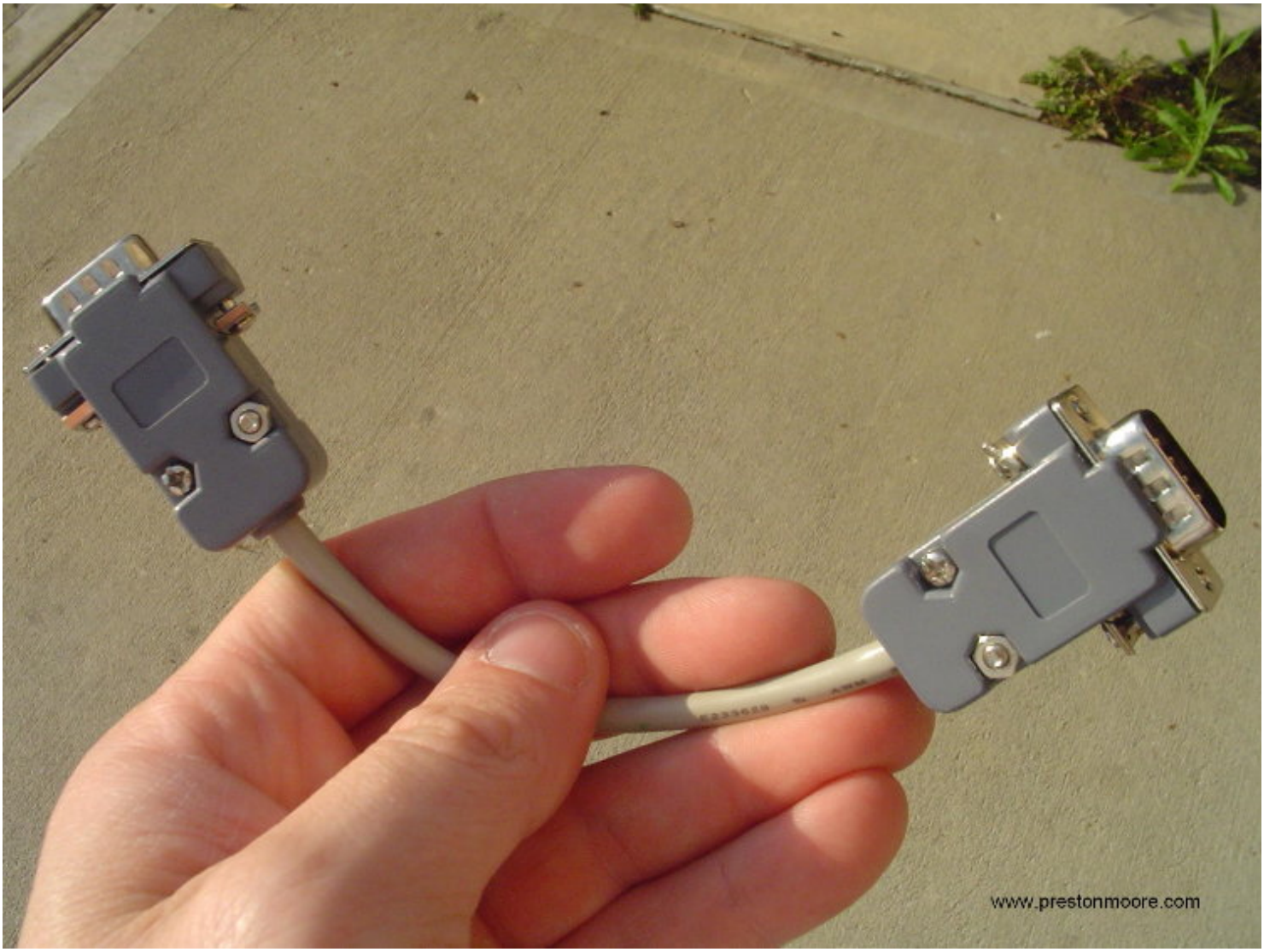
Install an OPC-617 in the RX radio in the same manner as the TX radio. It is not necessary to close solder jumper "F" in the RX radio unless the repeater will be used in a crossband configuration.



STEP FIVE:

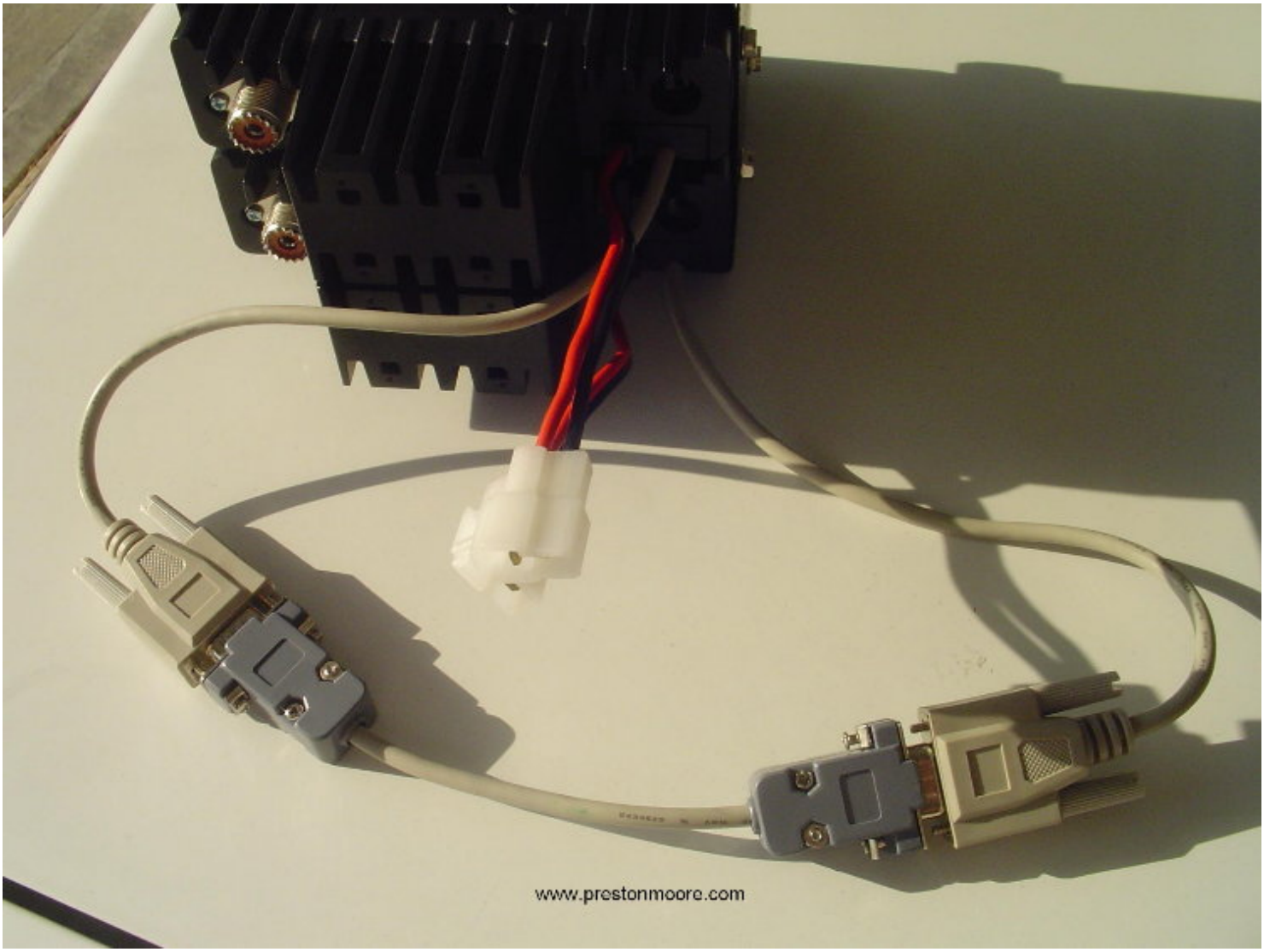
Prepare the repeater interface by connecting the 5-conductor cable to the DB-9M connectors following the diagram below.





STEP SIX:

Plug the two "pigtail" OPC-617 cables into the repeater interface. Power the radios and prepare for programming.

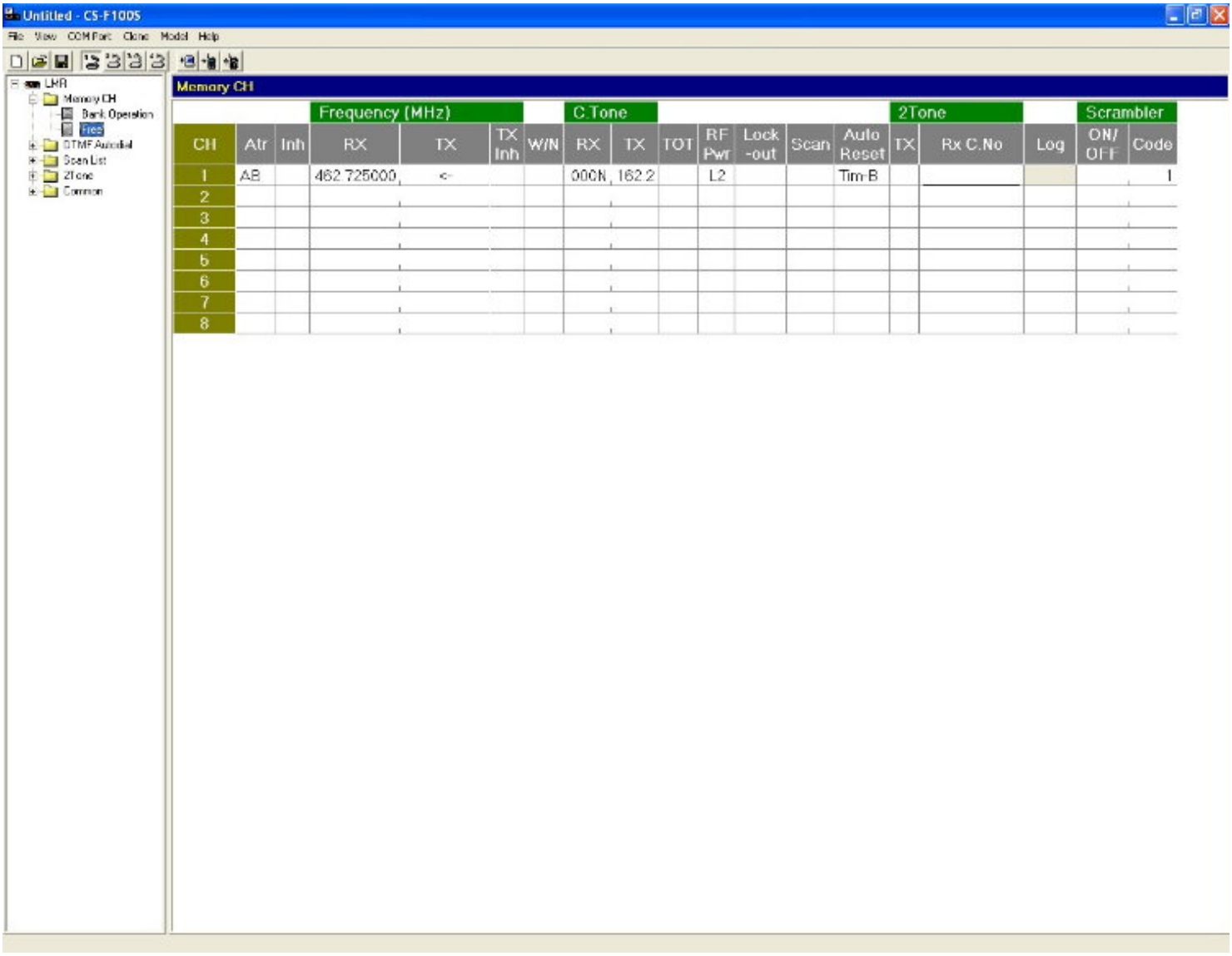


STEP SEVEN:

In this example, we will be setting up a repeater with the following characteristics:

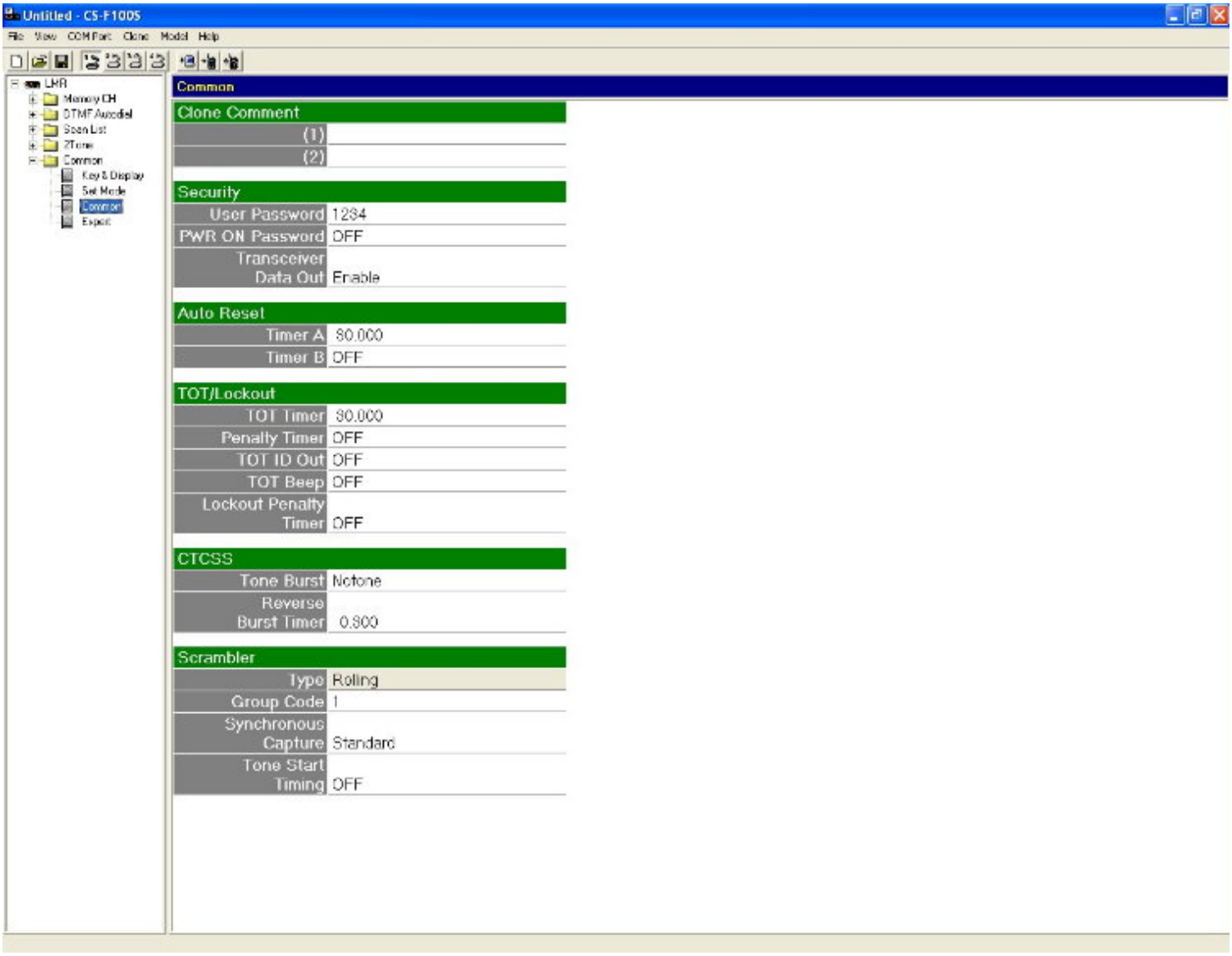
UHF Uni-directional repeater on GMRS Channel 8 (462.725/467.725)
PL tone of 162.2 encode/decode
Repeater "hang-time" of 2 seconds
30 second TOT
25 watt output

We will start by programming the TX radio first. In the "LMR > Memory CH > Free" selection use the following screen shot as a guide and make the appropriate changes:



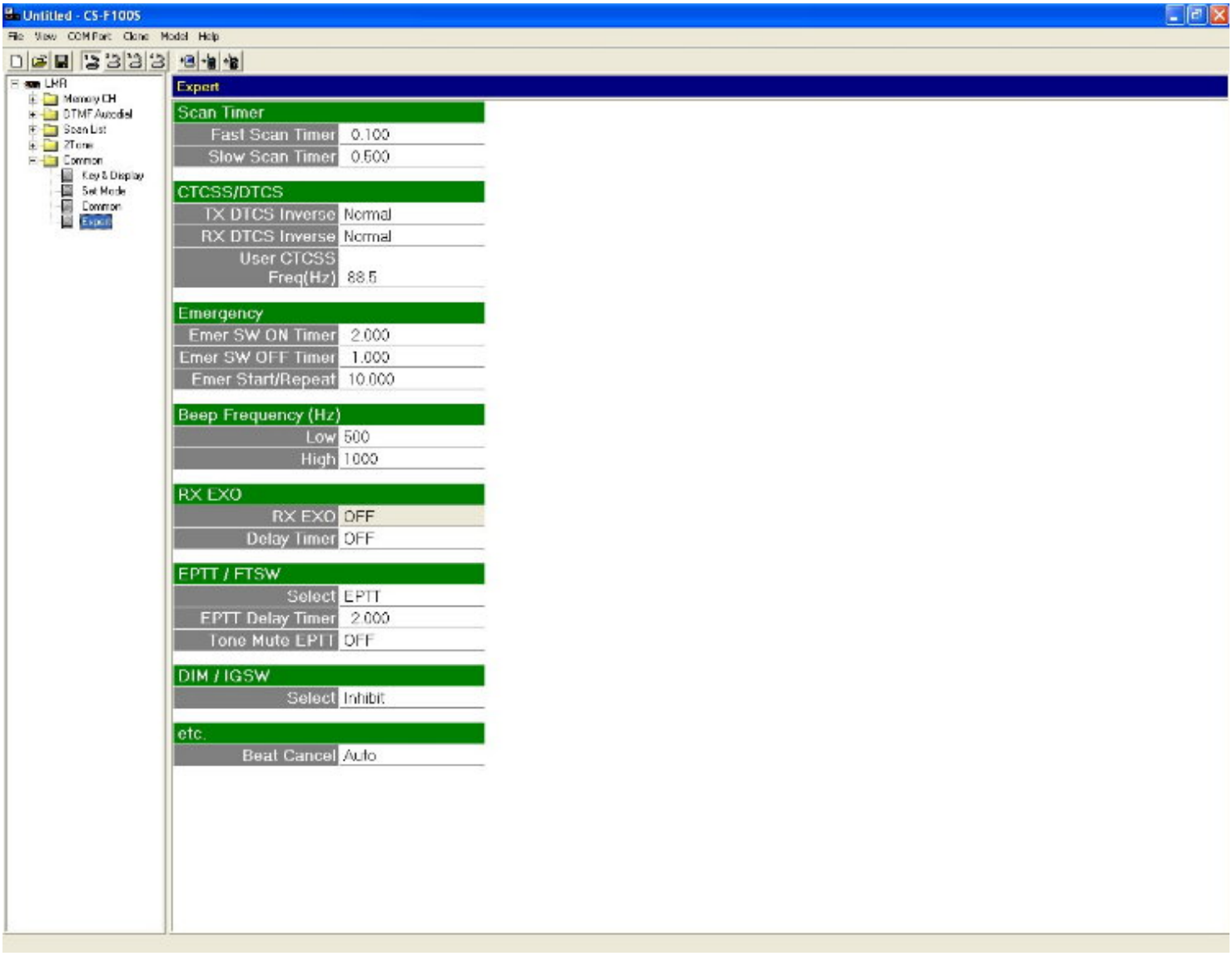
click to enlarge

Move to the "LMR > Common > Common" section and make adjustments as follows:



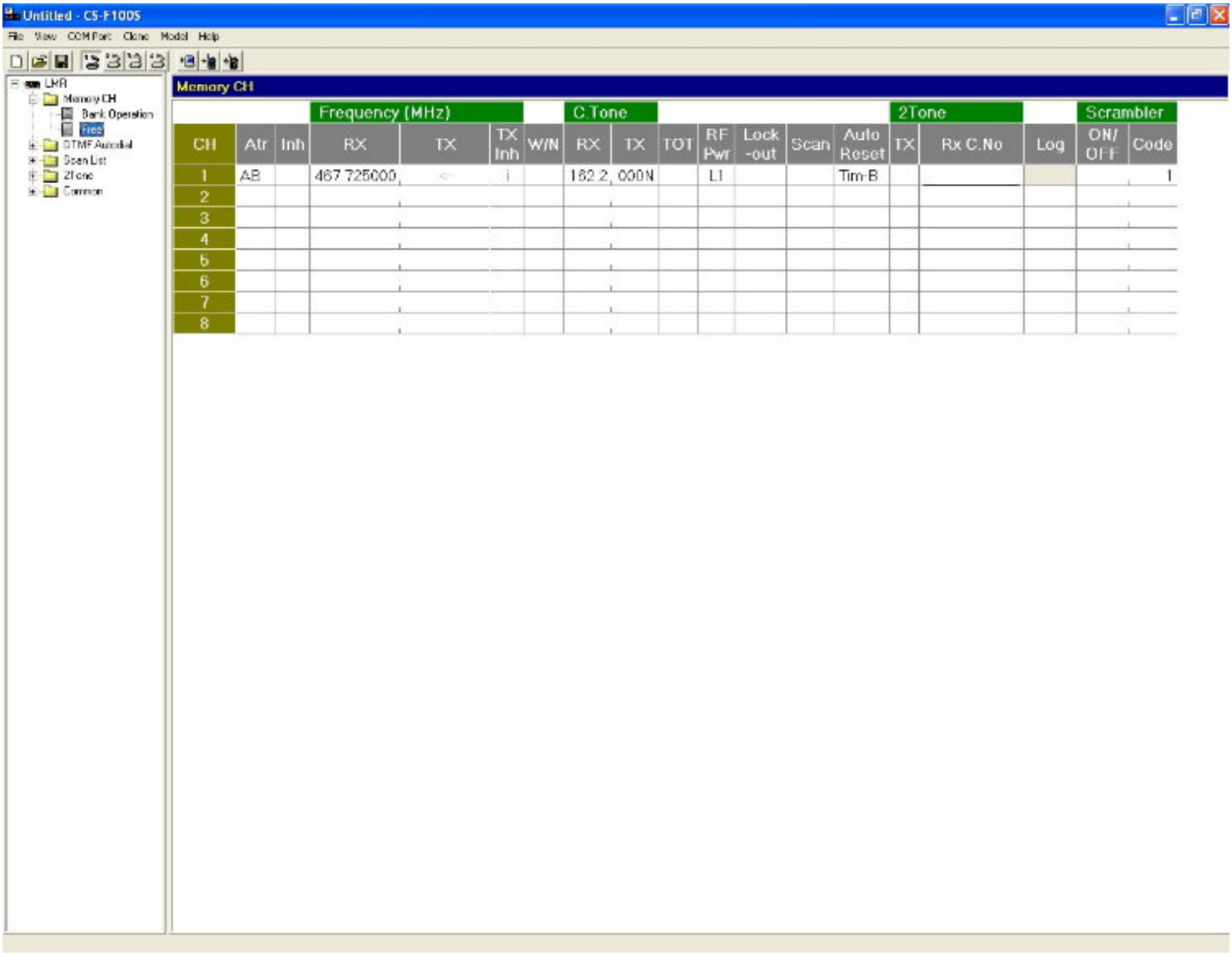
click to enlarge

Move to the "LMR > Common > Expert" section and make the following changes and then write the changes to the radio:



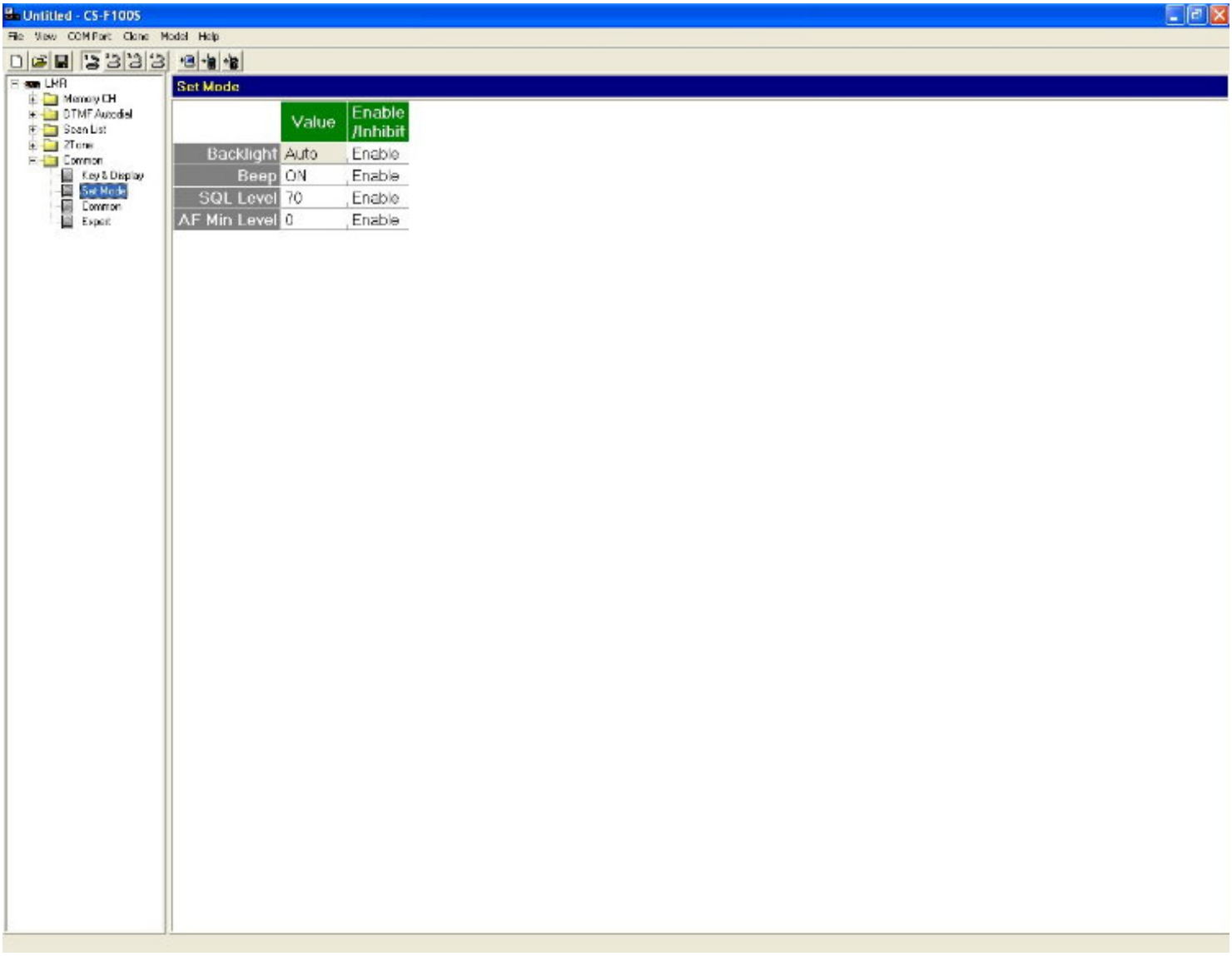
click to enlarge

In the RX radio make the following changes in "LMR > Memory CH > Free" section:



click to enlarge

I change the squelch level in "LMR > Common > Set Mode" to 70 because I feel the factory setting is too high.



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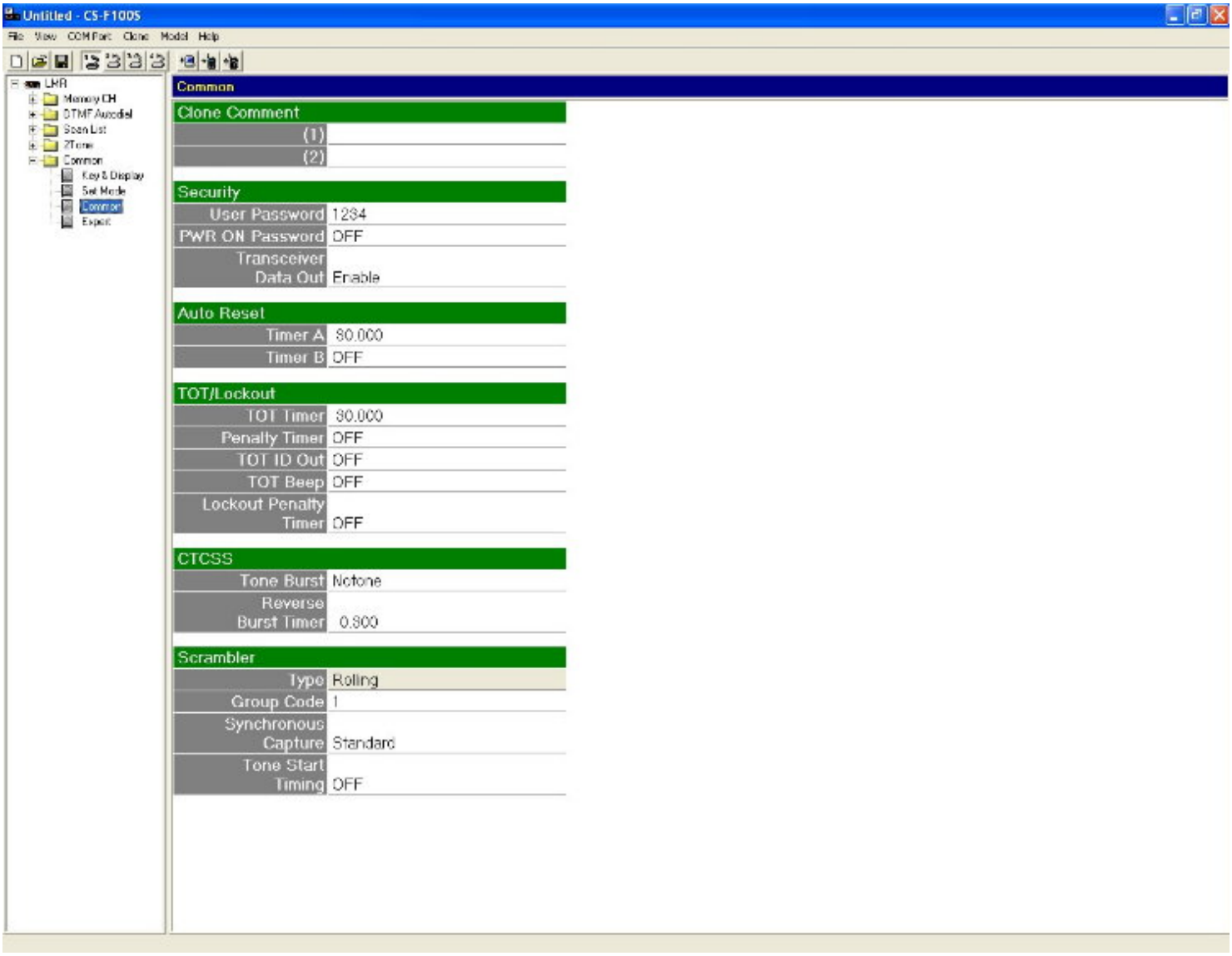
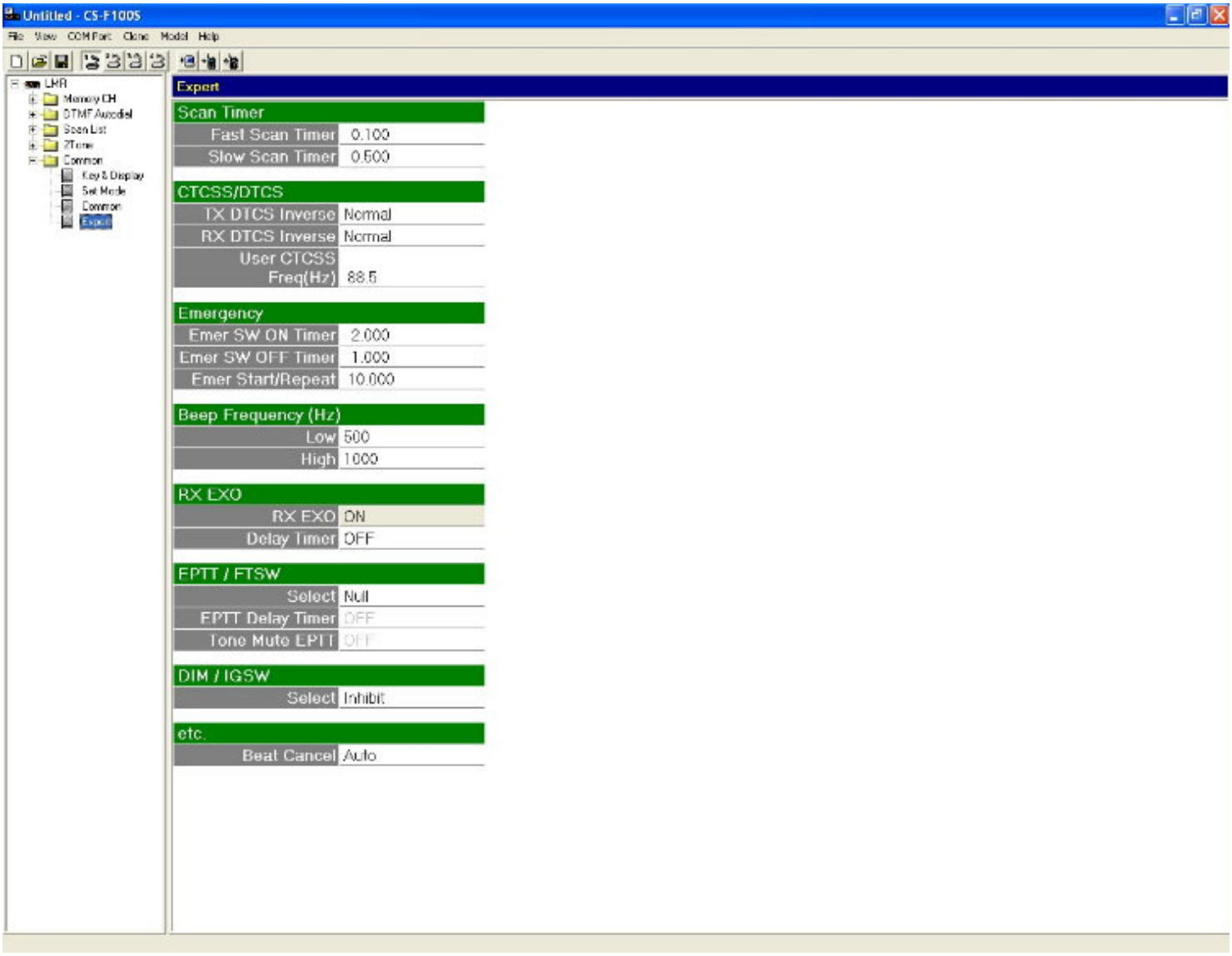
RX radio "LMR > Common > Common" make the following:



click to enlarge

RX radio "LMR > Common > Expert" make the following changes and write to the radio:



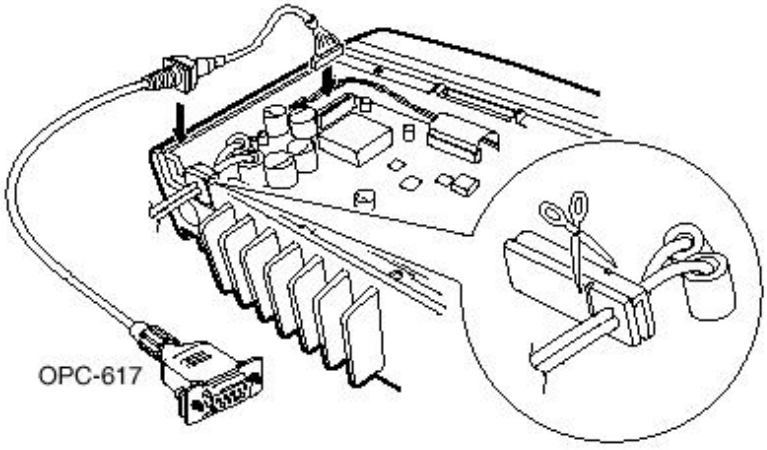
click to enlarge

The repeater is now configured and ready to use!

CAT Repeater controller cables NOW AVAILABLE!

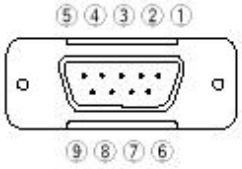
[CLICK HERE FOR INFO]

Install the OPC-617 as shown below.



Cut off the bushing as in the illustration, when you install the optional OPC-617.

OPTIONAL CABLE PIN ASSIGNMENT

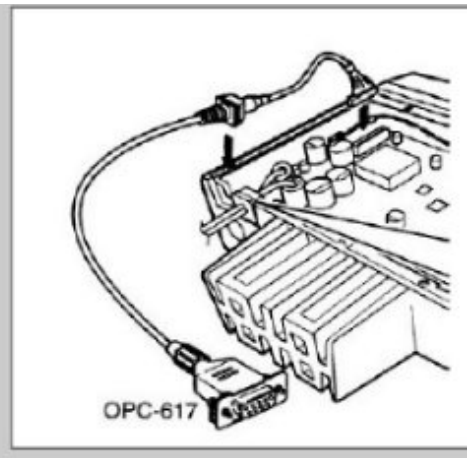


① Dimmer cont. IN or IGSW cont. IN
② AF OUT
③ Det. AF OUT
④ Mod. IN
⑤ PTT control IN or FTSW control IN
⑥ Horn drive cont. OUT
⑦ AF GND
⑧ Det. AF GND
⑨ Mod. GND

TECH CORNER

The OPC-617 Option Cable

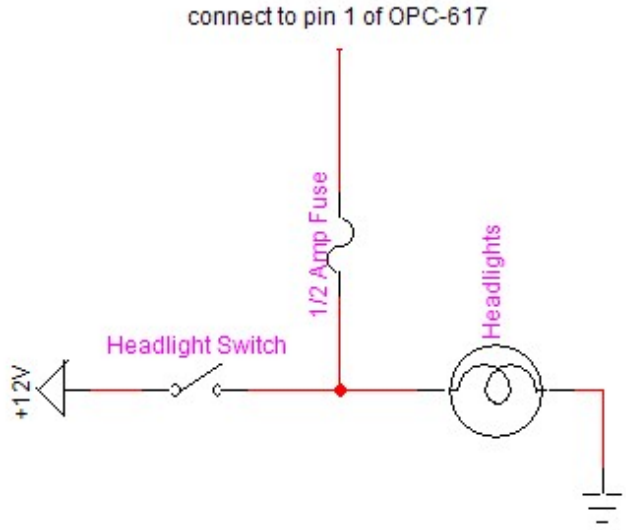
The OPC-617 option cable can be used for most Icom mobile radios. This accessory cable is for external terminal/data connections. Such applications include remote adaptors, horn honking, ignition switch connections, and modems.



Here are some helpful hints for installing the OPC-617 option cable:

- Detect the audio equal's discriminator audio before installation.
- PTT is 5V and then goes to ground.
- For PTT (in some models), you will need to enable EPTT in the software.
- All ground goes to chassis ground.
- AF OUT equals pre-emphasized AUDIO OUT, and this level is controlled by the volume knob.
- Solder bead F for Data.
- Solder bead D for AF IN.
- Pin 1 of the DB9 is used for Ignition Switch connections.
- Pin 6 of the DB9 is the carrier operated relay that is used for horn relays.

Note These are the very basic pin outs available through this cable. For specific applications, please contact landmobile@icomamerica.com.

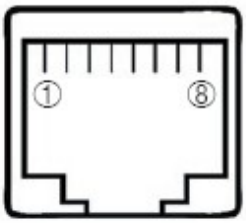


OPC-617 Display Dimmer Control

CLICK HERE FOR IGNITION CONTROL

http://www.repeater-builder.com/icom/icom-kd7sqm.html

CY-F121S / CY-F221S repeaters



① +8 V DC output (Max. 10 mA)
② CLO (output port for PC programming)
③ AFO
④ M PTT (Input port for TX control)
⑤ Microphone ground
⑥ Microphone input
⑦ Ground
⑧ CLI (Input port for PC programming and monitor control)

CLICK HERE FOR THE ICOM IC-F200 SERIES SERVICE MANUAL

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6. This section is for configuring an Icom F221 UHF radio for use with a home station using a KPC-9612 VHF/UHF TNC.

To hookup the Icom F221 UHF radio to the KPC-9612, you will need the accessory cable OPC-617 from Icom. The cable costs about $50. To connect the OPC-617 to the Kantronics 9612, you will need to make a small cable with a DB-9M for the radio side, and a DB-15M for the TNC side. Here's the pinout:

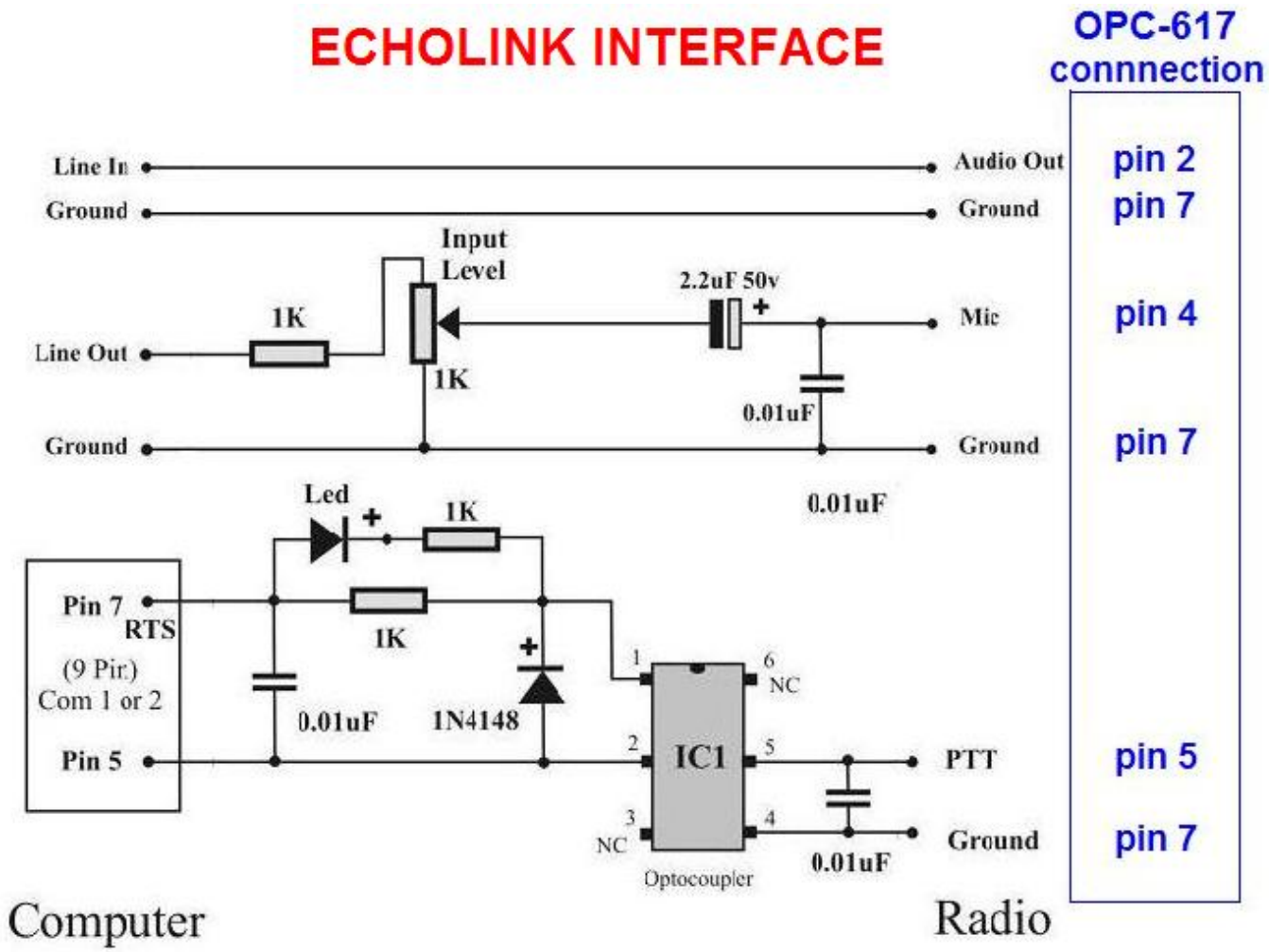
OPC-617 DB-9M-------KPC-9612 TNC

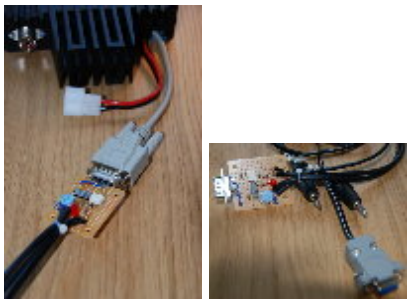
Pin 3 Det. AF output-----RXA Pin 2
Pin 4 Mod input----------TXA Pin 3
Pin 5 PTT----------PTT Pin 1
Pin 8 Det. AF ground----Ground Pin 9,10, or 11

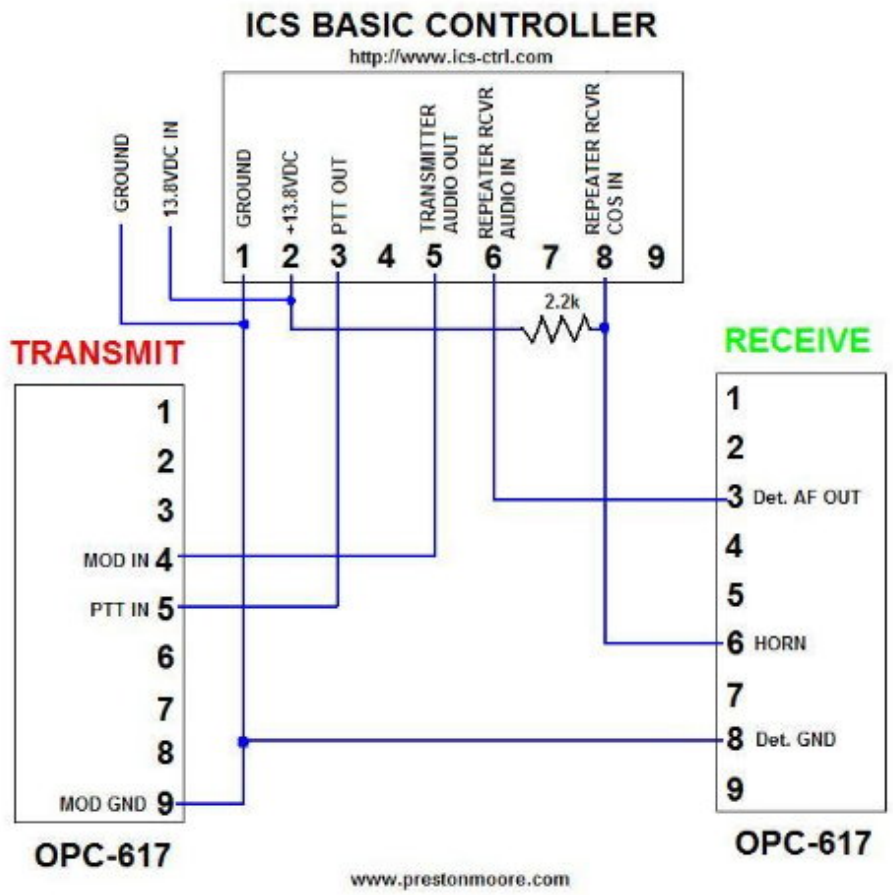
In programming the radio, besides setting the UHF frequency and name, you will need to set external PTT by choosing EPTT instead of the default FTSW.

Get your soldering iron hot and sold BEAD F on the F221, near the OPC-617 connector, which allows data flow.

Source: http://www.nwaprs.info/9600bauduhfaprs.htm

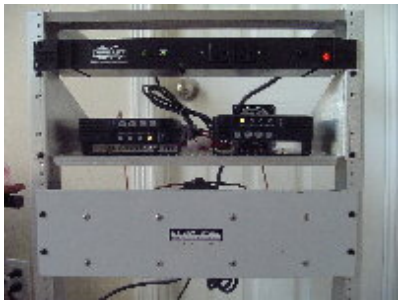
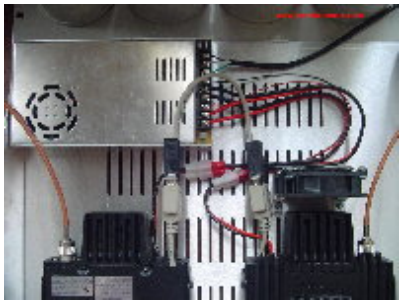


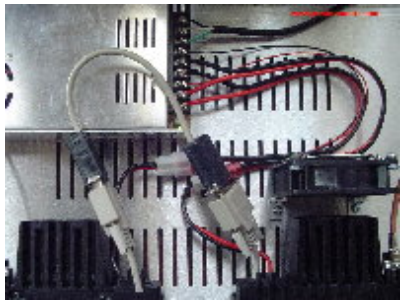




Arcom RC-210				*Icom OPC-617*
9-Pin	RJ-45	Direction	Name/Description	*DB-9*
1	1	----►	**CTCSS Encode** Control OUT	
2	2	◄----	**CTCSS Decoder** Logic IN	
3	3	----►	**TX PTT** radio control OUT	*5*
4	4	----►	**TX Audio** output to radio	*4*
5	5	◄----	**Audio Input** from radio	*3*
6	6	◄----►	Ground	*9*
7	7	◄----	**RX COS** Logic IN	*6*
8	8	◄----►	Ground	
9		◄----►	Ground	

Pin No.	Terminal name	Description	Specification
1	DIM	Backlight control input	+5 to +30 V for dark
2	PAAF	AF output for public address and Ext SP functions	0 to 330 mV rms/ 47 kΩ
3	DISC	AF output for a terminal unit	330 mV rms/100 kΩ
4	IN	AF input for a terminal unit	330 mV rms/1200 bps
5	PTT	PTT control input	0 V for transmit
6	HORN	Grounded when receiving the specified call	Less than 50 mA when grounded
7	PAAF ⊖	Ground for PAAF	—
8	DISC ⊖	Ground for terminal output	—
9	IN ⊖	Ground for terminal input	—



It appears the E.F. Johnson / Transcrypt 7600 series mobile radios are basically the same as the Icom IC-f420 units. I assume the Icom
OPC-617 is equivalent to the Johnson 585-7600-027 cable. Click here to check out the 7600 series service manual to see for yourself.

Icom 520/620 information supplied by David Johnston

After doing some research, I found that in the 520/620 series, to get the mic audio to transfer,

you have to 'blob' point "D" in all radio's which is located just to the right of the accessory connector with the front of the radio towards you.

I have put together both a UHF/UHF VHF/VHF and a UHF/VHF combinations and the system works great.

I have even tryed a UHF/UHF/VHF with VHF in simplex using a mini controler and it even works like a champ.

Hope this also helps you in the future.

HOME PAGE