

## Spectra-Tac micor receiver (part-2)

by Karl Shoemaker

### Audio Control Module (ACM):

Pretty much everything of this receiver unit works with the ACM. It contains the dual squelch IC, plus the line driver. A medium impedance, 63-ohm speaker was found and works well enough with the line driver. To slightly improve the audio level the speaker is connected to pin 4 of the ACM (instead of the usual 600-ohm output on pins 19 & 20). Later versions will be different.

### Local Squelch:

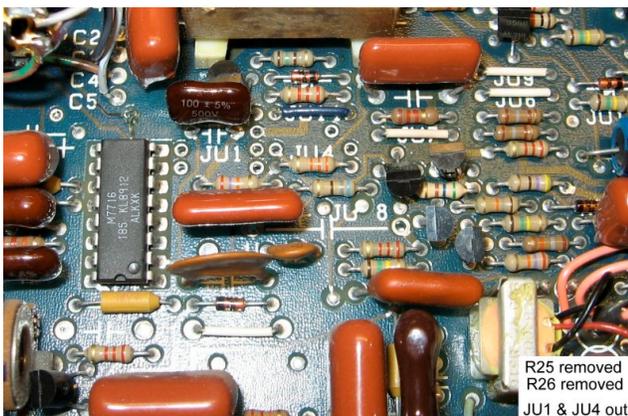
A local squelch and speaker is very useful to listen/verify the squelch setting. Also, for listening for other signals or interference when your attention is turned away for another task at the remote site. OEM circuits put the squelch and audio functions ganged together which is awkward for amateur use. For amateur use, this speaker (function) needs to be on carrier squelch, while not affecting the rest of the station (or its circuits).



To do this, some modifications and jumper settings need to happen to isolate some of these functions from outside of the ACM, such as the SDI and the control logic on pin 8 of U1. Verify JU1 is out, which will put U1's shunts, on carrier squelch. Pin 7 of U1 needs some changes to properly operate the local speaker squelch, Q3 inverter. Since the PLM's output on pin 16 won't be used (or connected) there's no risk of it sending A+ to the cor card's PL "AND" squelch input and false it. The "AND" squelch is a cor buss on the backplane board (pin 11).

When JU4 is in R25 and R26 are in series. To isolate the SDI (PLI) remove both these resistors as shown on the left image. Use a new R26 with a value of 56k (R25 won't be used in this circuit). Install the new R26 with one lead where the old one was and the other lead where the old R25 was, towards the A+ as shown on the right image. Now, pin 7 is isolated from outside the card and operates the local speaker squelch independently with a "safe" pull-up resistor value. "Safe" will be discussed later. JU4 is optional (in or out). Next, remove C37 and verify JU11 is in. CR5 has little, to no effect; so it's (optionally) left in.

The Author believed this would improve the audio switching/response time for the local speaker. Other modifications to the ACM; per the OEM chart; R7 is 22K, C4 is 1500 pf, C7 is 100 pf, R85 is out and C40 is replaced with a jumper, C41 is out, C9 is 470 pf and R8 is 27K. For better monitor audio frequency response the HP filter is disabled with JU2 out and JU3 in. The de-emphasis component C17 is left in.



**COR:** (RUI voltage source)

The ACM has a “dual squelch” IC, which is U1, a M6709, M6179 or M7716. The outputs on pins 7 and 6 provide the squelch switches. Pin 7 is for the local speaker and pin 6 is for the “RUI” which is used for the cor pick-off point to signal the cor board. As mentioned before, they are shunts (to ground) during standby and relax during activity.

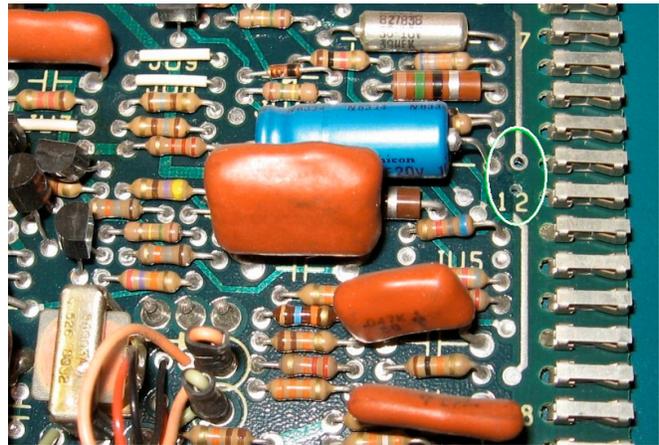
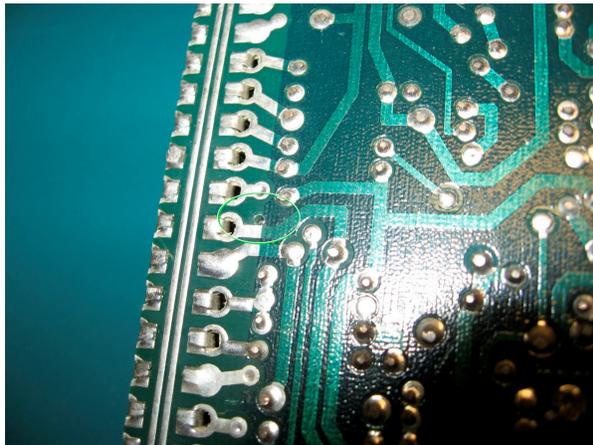
**“Safe”:**

Previously was mentioned “safe” values for the shunt pull-ups. In the past it was believed these shunts were transistor collectors therefore, 10K resistors were used as a pull-up for one of the shunts to generate the cor (RUI) signal. There was a minor symptom noticed that one of the relaxed shunts never pulled up to A+ (probably from R10). Information was not found during those years therefore, the shunts were put in service with no apparent problems since 1998 for the mobile and base (compa) versions.

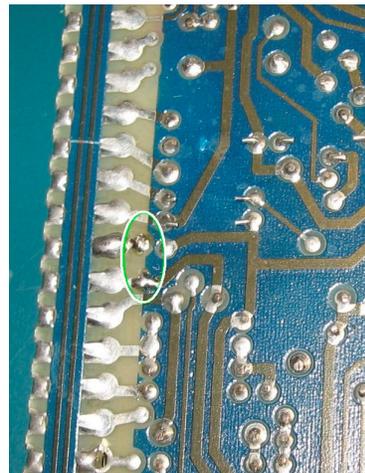
In 2018 revealed (by good source) these shunts are emitters and they should not have more than 4 volts on each one otherwise, excessive “bias” may cause them to be dysfunctional and eventually fail. OEM has the RUI voltage obtained from another card on the control shelf of the compa version station such as the squelch or line driver modules, or both. It’s OEM voltage appears to be somewhat over the 4 volt warning, however. There’s more discussion on this with another document called Micor squelch theory on SRG’s web site.

Since SRG’s application does not do this, the pull-up resistor needs to be installed here, on the ACM (instead of elsewhere). The new R25 resistor will be used for this SRG modification.

There’s a good spot for this near the ACM’s edge. There’s already one eyelet connected to pin 11 of the card edge. The A+ runs right by this area. Drill a small hole next to the A+ run as shown here.

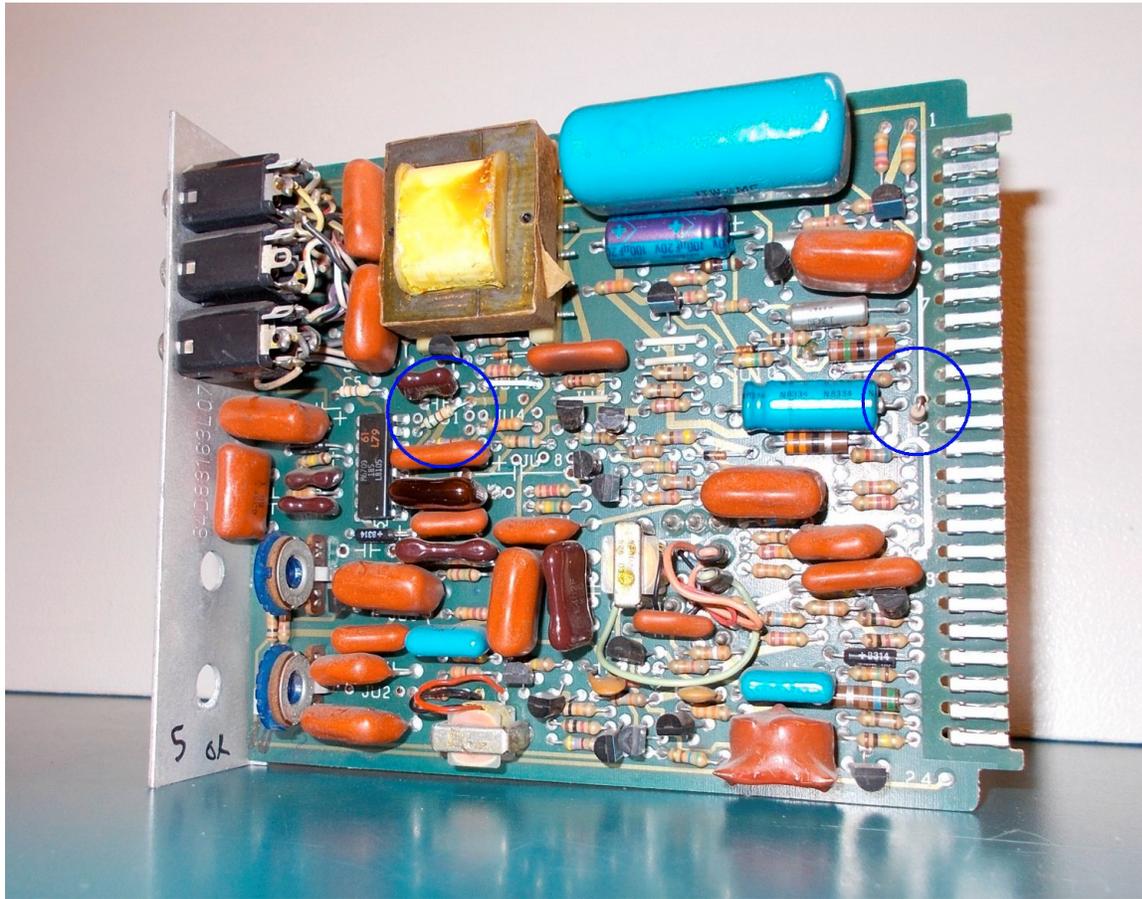


Next, install the new R25 as a 150K, in these holes. As shown, this is the equivalent of U1 pin 6 to A+ as shown on the right image.



This prevents inadvertent activation of the cor card’s PTT-1 output if the ACM is pulled hot, for testing, etc. The cor card has its own pull-down resistor to further prevent this.

Here's an overall view of the ACM. The two areas of interest are circled in teal color. The left is the new R26's location and the right is the new R25's location. During production several were modified and tested with it's own "serial number" for maintenance tracking.



When the new value is installed the relaxed (high) voltage on pin 6 of U1 is now 2.319. If the cor card is pulled (for testing) the shunt relaxed voltage goes up to 3.144. All of this is within the "safe" voltage and still is plenty to activate the cor card. Set VR1 bias (reference) to 2.0 v on the cor card.

To recap, the cor voltage now comes from U1 pin 6 relaxing during activity, sending this signal to the output on pin 11 of the ACM going to the cor buss (pin 11), then to cor card pin 11.

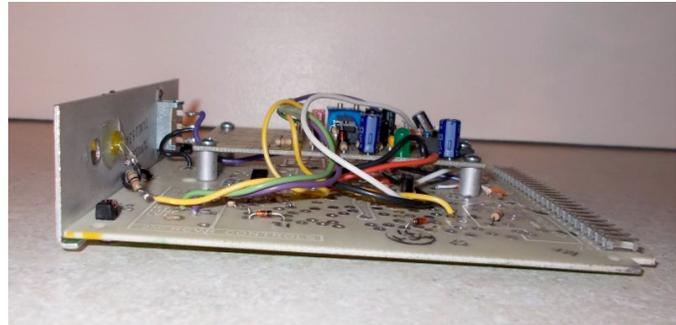
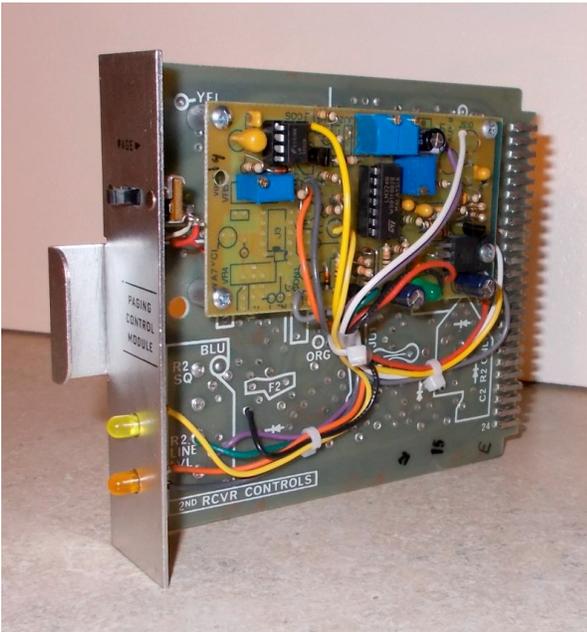
**COR Card:**

The cor audio board takes in the COR / RUI active going high voltage from pin 11 of the buss. Version 5.4 is used for the Spectra-Tac project. There's no place to mount this board. The Paging Control Module (PCM) was the best choice found however, only a few were found in 2017~2018.



Here shown is a stripped down PCM.

The card has a "page" slide switch that can be used for a monitor function. It's the prototype and has a ground pin jack for testing however, the final design has it elsewhere. The board is mounted on the PCM with four standoffs. Enough PCB runs were found, analyzed and used to interface to the system board (backplane). It was verified the runs clear the standoffs. Therefore, this now becomes the "new" cor card, which plugs into position four of the control shelf. Currently, there are two indicators, yellow for cor output active. orange is cor over-activity, AKA timed-out.



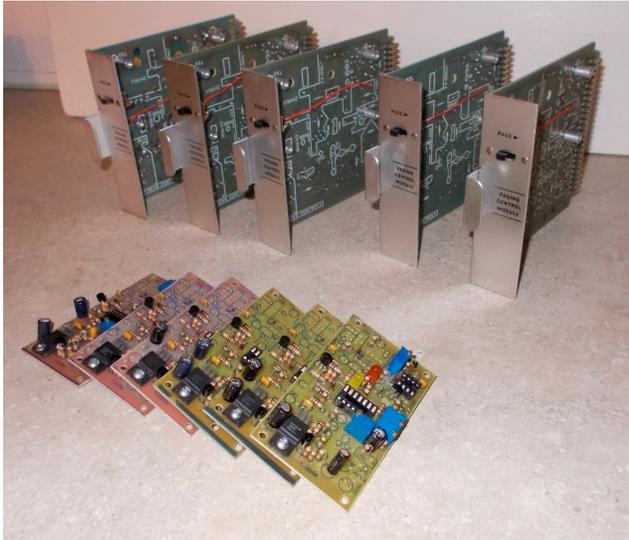
For best clearance, use 3/8" (.375"), round standoffs for the board as shown below.

PCMs are getting hard to find in 2018. The F1 control module card was found as a substitute. It has a lot of components. It's over an hour painstaking task of removing of all the components. An alternative is to just cut them out which takes about 10 minutes. Some board cleanup may be needed at this point. There's no (monitor) slide switch so a push button was installed; shown here in completed form. A future version will have a third indicator in red for the CON-1 input.



On the left is another view of production of several cards in production:

On the right shows using a paging control module.



### Monitor:

A new service tool created is the “monitor” switch located on the cor card. When used it puts a “low” on pin 9 of the backplane. With the SRG jumpers this goes to pin 9 of the ACM. It does not affect the main squelch or PTT output. This can be handy to check for noise without disturbing the squelch setting.

This “low” on the ACM turns on a diode, CR2. However, there may be too much voltage drop through it, causing low monitor audio (Q4 does not turn off completely). Therefore, it’s removed and replaced with a jumper.

Note: It was found the cor line should not have any capacitance added. This was discovered during a RF protection attempt; a .1 uf capacitor was added on this line at the cor board end, causing an oscillation around 20 KHz. This confused the associate circuitry on the cor card, so the cap was removed.

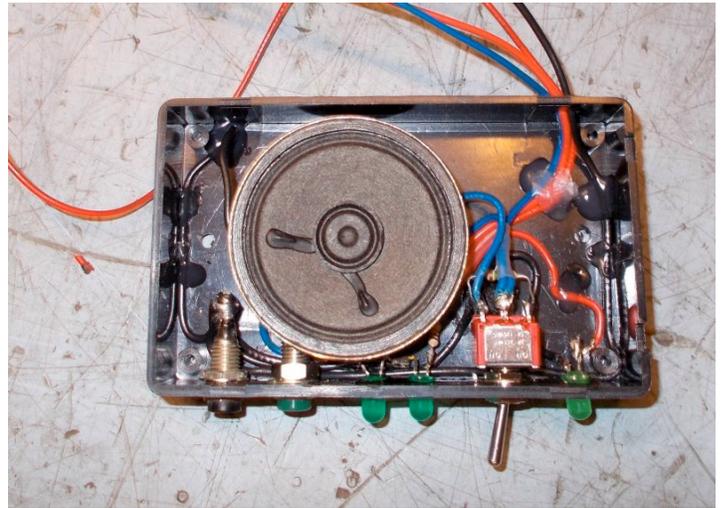
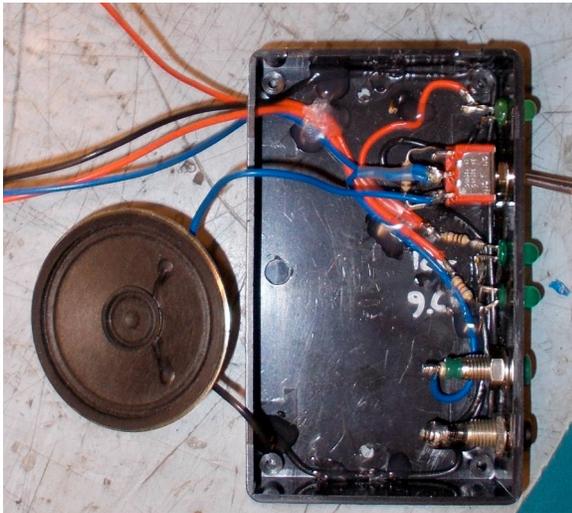
For maintenance tracking each card is serialized. The TO and AF level & response was measured and plotted as a reference record therefore, is ready for deployment (service). Alignment and setup for the cor card is covered on a separate document on SRG’s web site.

### Service Module:

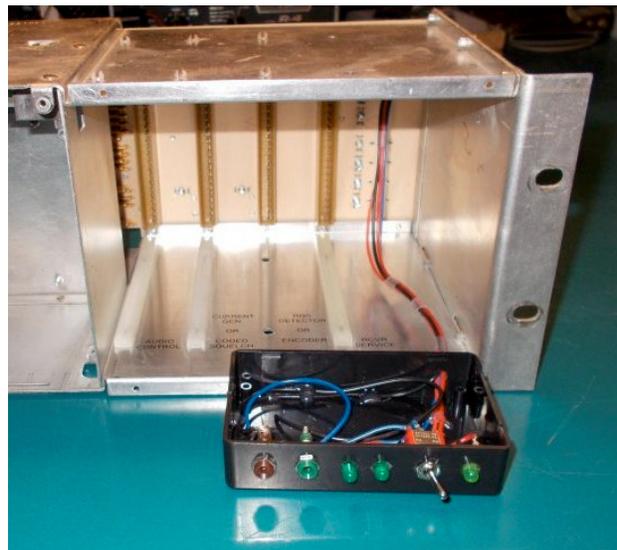
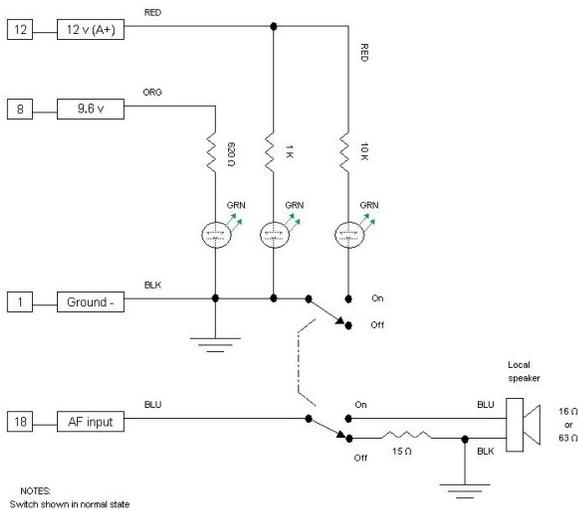
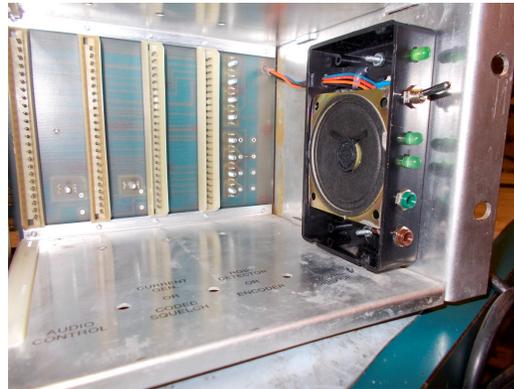
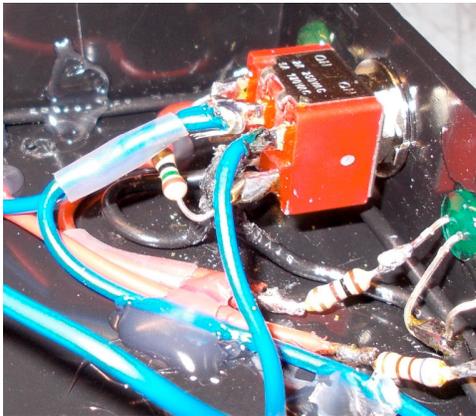
There is no place to install a physical speaker on the chassis (like there is on the compa & mobile versions). Therefore, a new “service module” (SM) is created and mounted on the far right wall of the control shelf, next to the cor card (phantom position 5). The local speaker is built-in as part of this module along with other functions, such as pin jacks; line out and ground. It can be used to measure sensitivity at the de-emped point. There’s a green flashing reminder that the local speaker is turned on (to turn it off when leaving the site). The part number of “KH-20” was used from a (now) unknown vender. The box’s dimensions were listed as 100mm x 60mm x 23mm, not including the cover.

The 63-ohm speakers were very hard to find. For the 2026 build some 16-ohm speakers were found at the cost of low service audio. One alternative is to plug in a headset especially for noisy sites. Also, the local audio point in 2026 was changed from pin 4 to pin 18 on the back plane board to bring the monitoring audio as high as possible.

Here's the SM version for 2026 (earlier builds had a slight difference). From the images on the left, top to bottom, is the local speaker status, local speaker switch, indicators for 12v (A+) and 9.6v and the pin jacks.

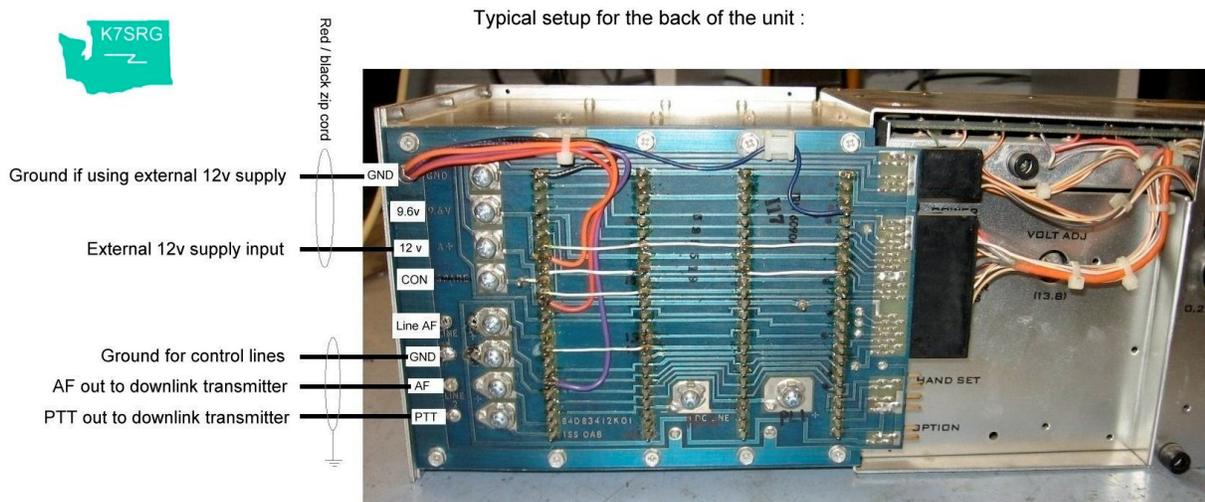


Shown on the left is the load resistor for the local audio feeding the test pin jacks. When the switch is thrown to the test and monitor position that resistor has to be the same as the speaker's DC resistance (not AC impedance) as not to change the level at the jacks during test and measurements. Also, leave some extra cable in the event you need to work on the SM as shown in the lower right.



Shown below is the rear with the eight jumpers and four wires. Drill a 3/16" hole in the upper left of the PCB for wire entry.

Optionally, you can install heat shrink around the hole area. The PCB already has (silk screen) markings for most of the terminal screws however, clear labels are better as shown here. In later versions hot glue (blobs) are used instead of the plastic mounts. Shown here is the rear with all the needed jumpers for connecting to the cards. The four wires are for ground, 12 power, 9.6 power and local speaker audio in black, red, orange and blue wires, respectively. Note this image is old, showing the blue wire on (previously) pin 4.



Shown here is the completed unit with the card but less the shield and outer covers. For remote carrier squelch receivers the PL module (PLM) is not used.

Another note is the RF-IF board is already in a good ("L") band. Even though it's marked "132-142" it can be used (as-is) in most cases, for the amateur 2-meter sub-band of 144~145 MHz. Future boards will be converted to the next higher ("M") band of 142 ~ 150 MHz which is ideal for operation anywhere in the band.



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