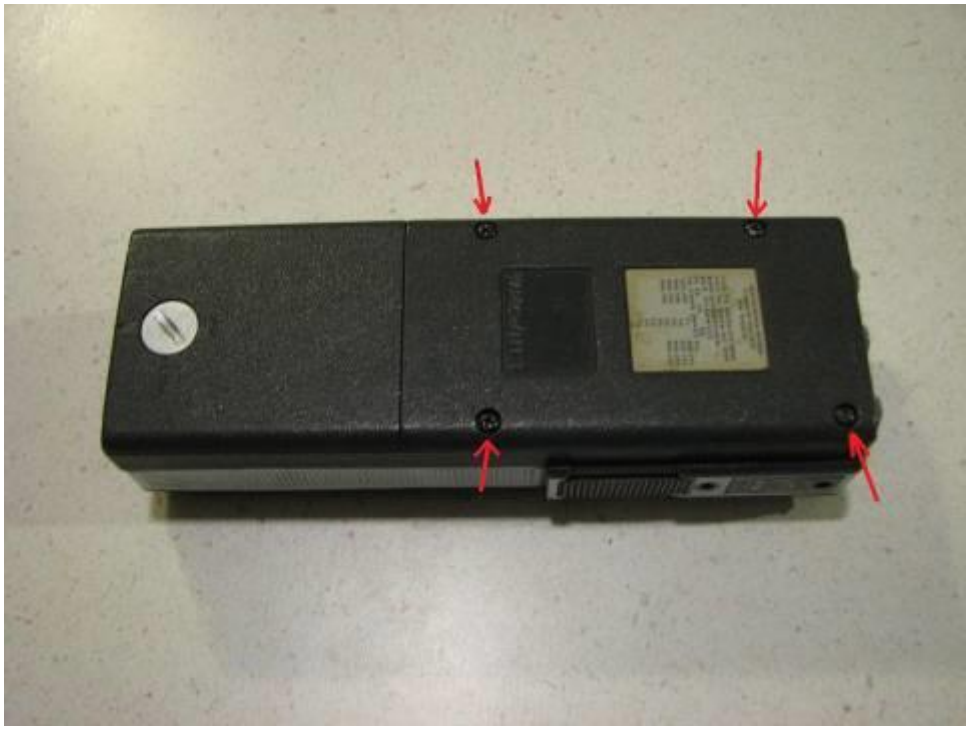
MT-500 Disassembly and Sound Module Installation Guide

This will severely damage a working radio, and it will no longer be able to operate as an MT500 radio if it was working before. This is a one-way conversion to using the sound module!

Open the battery compartment and remove the battery compartment lid.
Next unscrew the 4 Philips head screws and the back cover should lift off.



This will reveal the plastic housing that the back cover was screwed into:

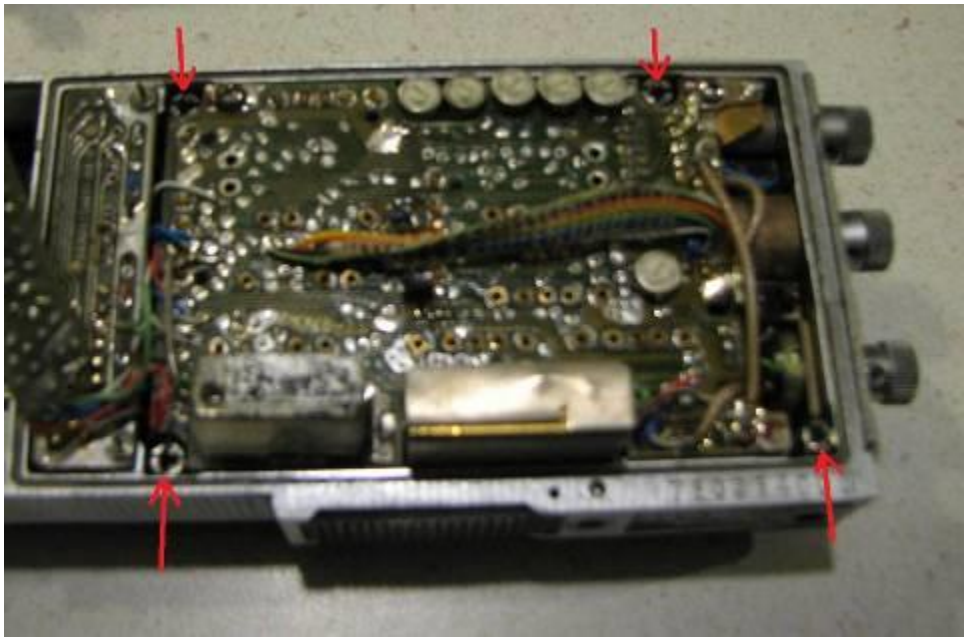


The housing can be removed by lifting the top (closest to the radio controls) first and tilting the housing until the bottom is released. There are friction tabs in the battery compartment and the battery cover clip (metal loop at bottom) may also catch on the housing. If needed, the battery cover clip can be loosened by partially unscrewing the two Philips head screws on the outside base of the radio.

Here is a photo of the housing after it has been removed:



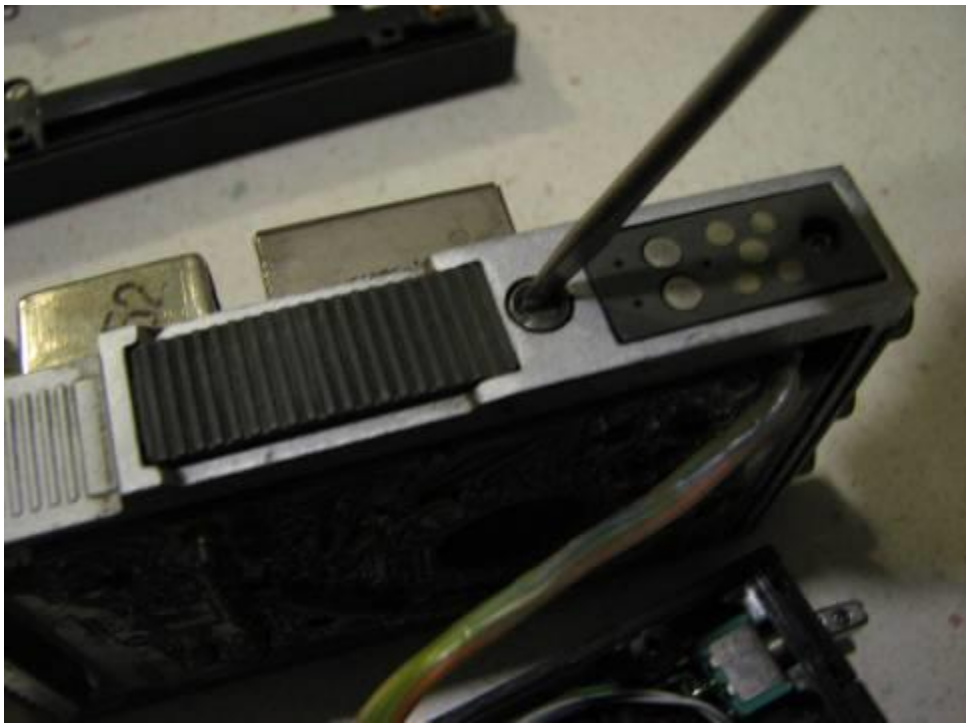
Next unscrew four Philips/flat screws that hold the front cover (with speaker) on. Unscrew them all the way, but they will not need to be removed and will not fall out.



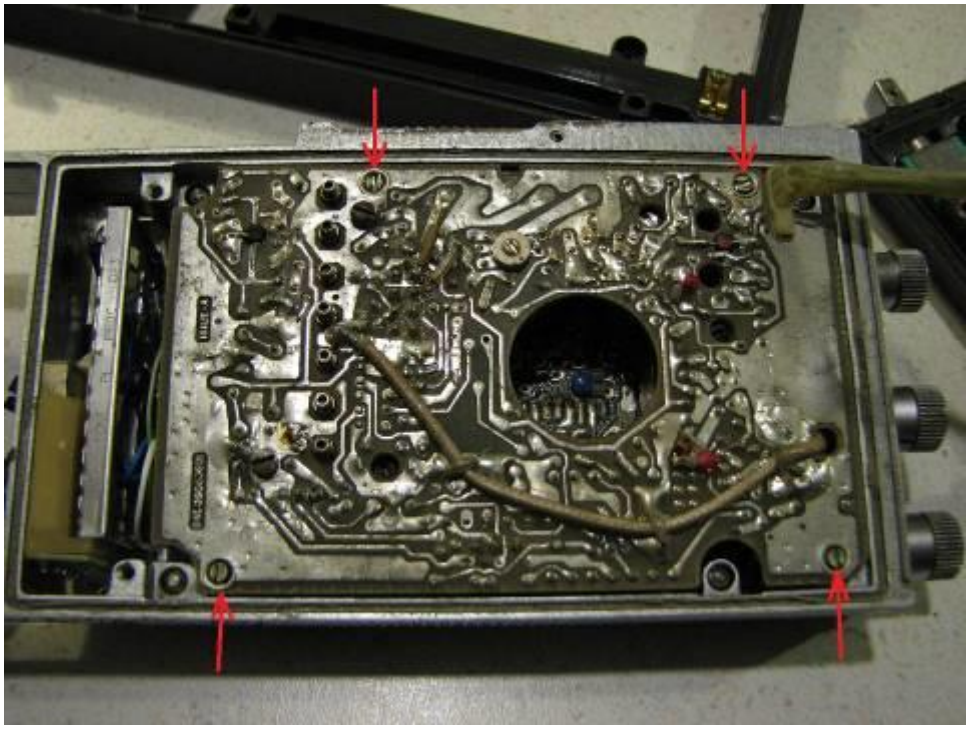
The front cover can now be pulled away from the main body of the radio.



Next, you may need to remove or loosen the screw above the talk button. Some radios need to have this removed to pull out the next circuit board and some don't.

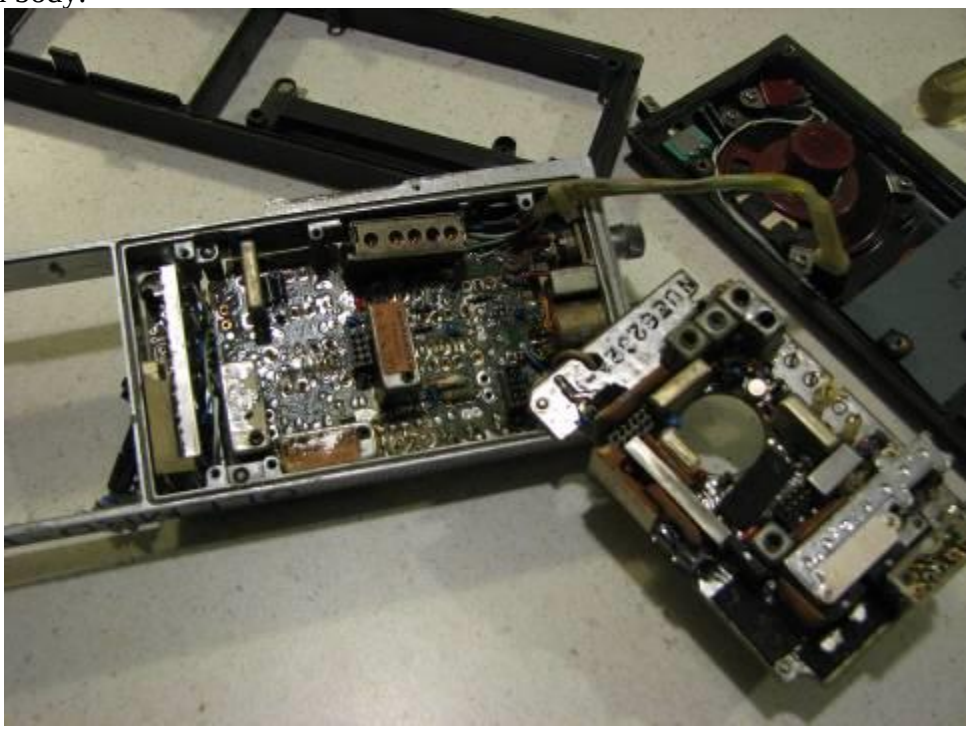


Remove the four small flat head screws from the board that was on the front (speaker side) of the radio. A small screwdriver blade will be needed.



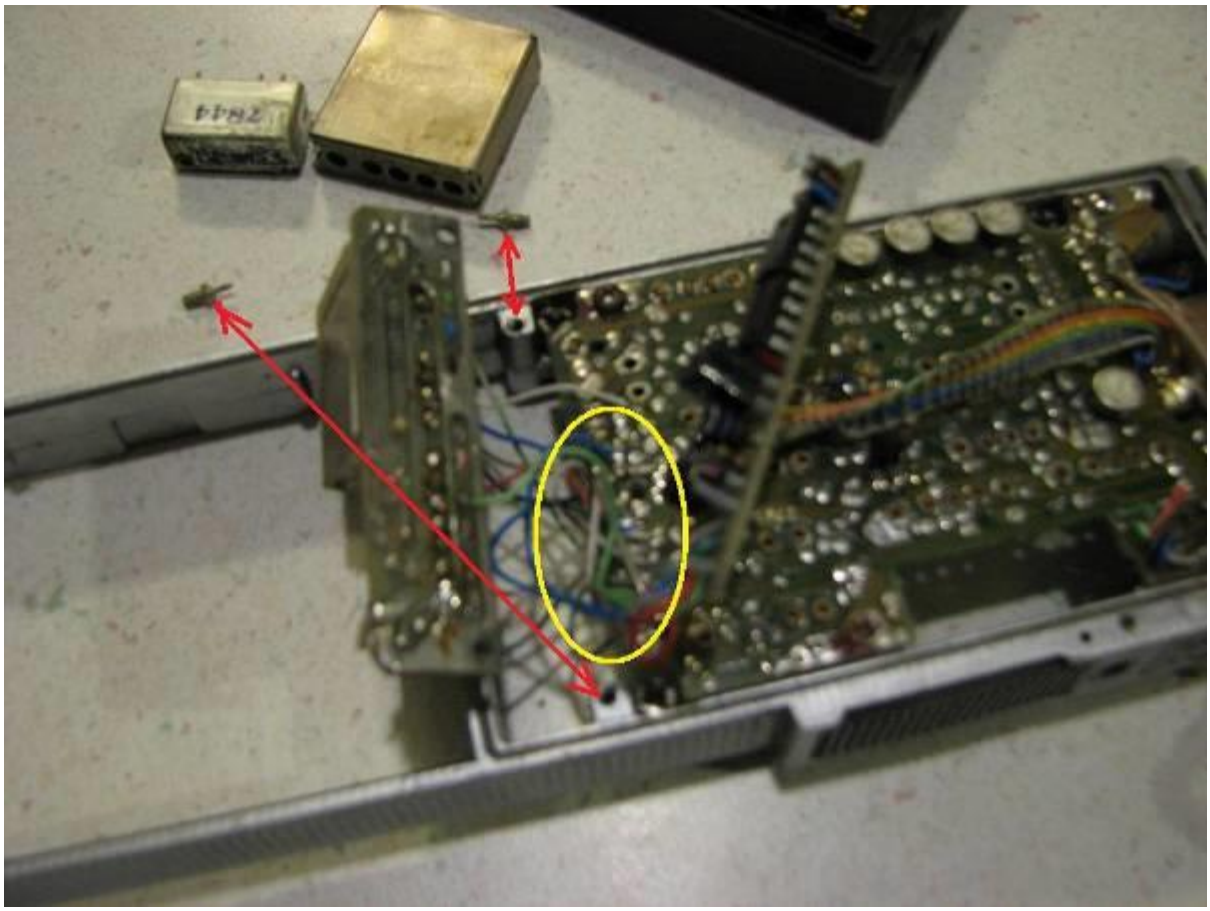
This board is still held in by several sockets on the other board and possibly by the metal part that was held in by a screw above the talk button (we already loosened and possibly removed that screw).

After the screws have been removed, use a flat screwdriver blade and pry this board up and out of the main body.



This front PCB is no longer needed inside this radio. You can also see that the metal part that was held in by a screw above the talk button is not attached to this board. It can be re-attached by screwing in the screw that held it in. If the metal piece is attached to the PCB we just removed, the screw may be glued in, or the part may be removed from the PCB (may require de-soldering connections to the PCB) and re-attached.

Now remove the smaller PCB next to the battery compartment by removing the screws or pins (unscrewed with needle nose pliers). The screw locations and pins/screws are pointed to by the RED arrows. Sometimes this board is not screwed in and is just held by friction. In this radio there are two small boards, one was held in by pins and the other by friction.



Once the boards are no longer mechanically attached, just cut all of the wires that are connecting these boards to the main board that is still in the radio. We do not need any of these wires so cut them off close to the main board.

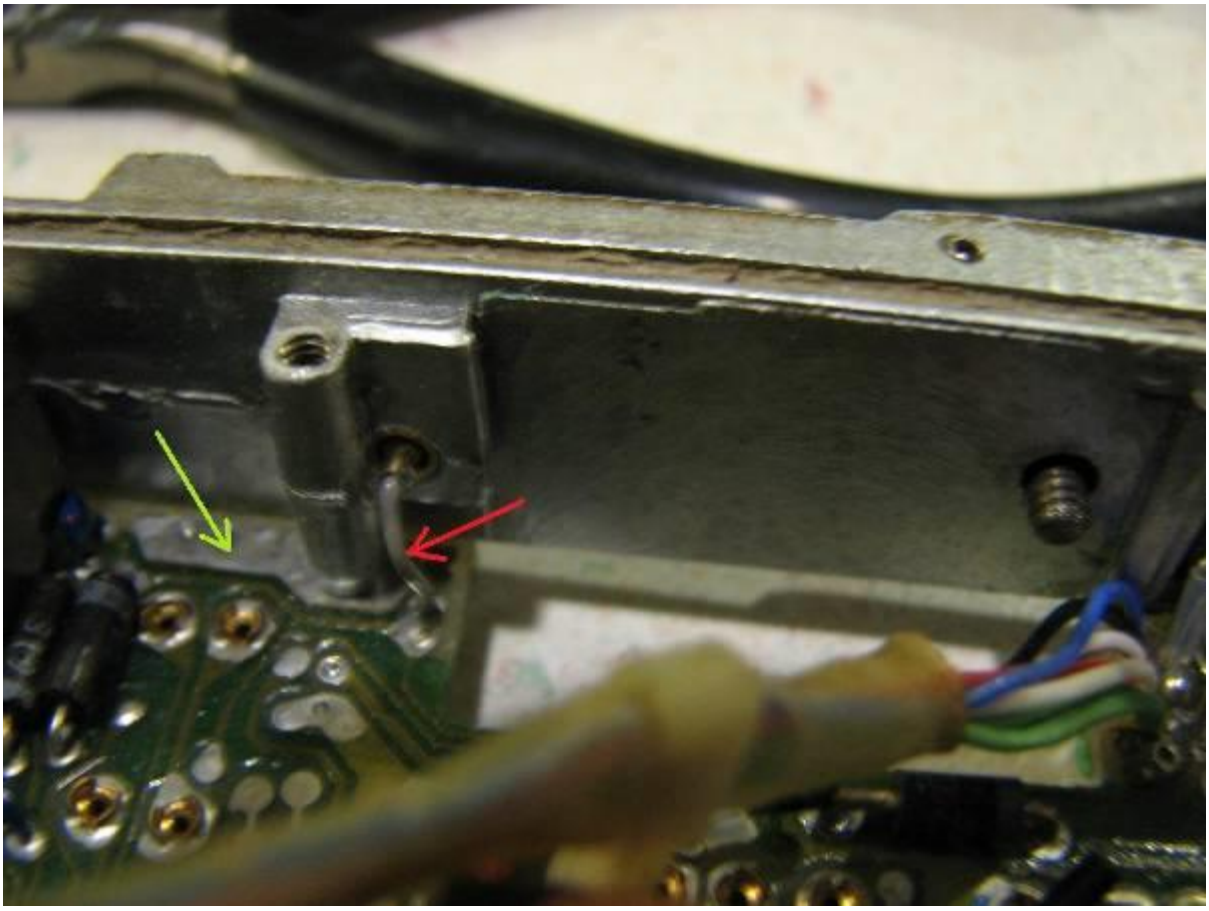
Now we need to cut some other wires. Cut the wires that connect the front speaker panel close to the main board. This should completely detach the front panel (with speaker) from the radio.

We will identify the wires and connection points that need to be attached to the sound module.

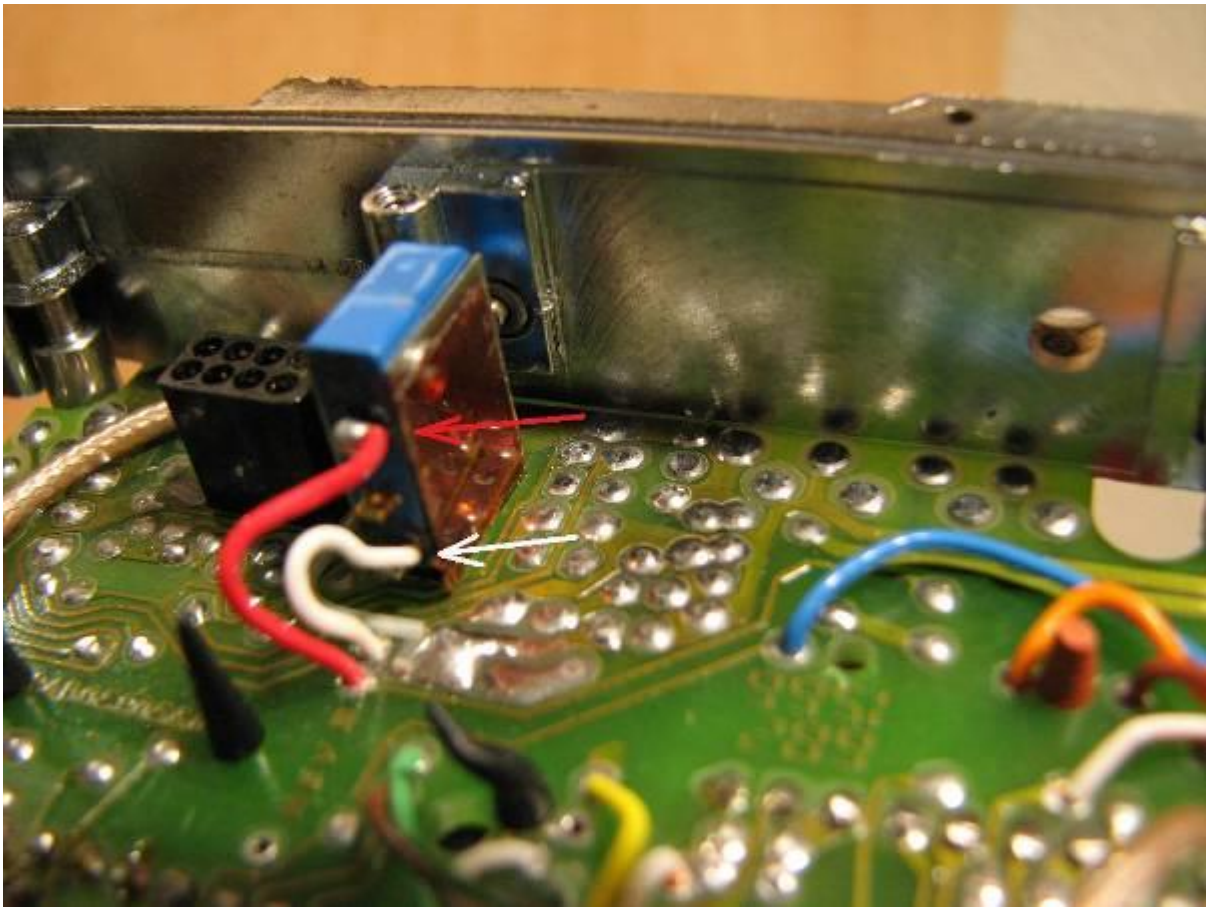
On the front panel, we want to be able to connect to the speaker. The wires are usually color coded so you can look at the speaker and determine which color wires you are going to strip and prepare for connection to the sound module's wire cable.

If you have a DVM or ohmmeter, check the prepared wires and you should be able to measure about 36 ohms of resistance. If you measure something significantly different, the two wires are probably not connected to the speaker.

The other connections are to the talk button. Shown here are the two places you will need to attach to: one to the PCB directly (GREEN arrow) and the other to the gray (in this radio) wire coming from the internal talk switch (RED arrow):

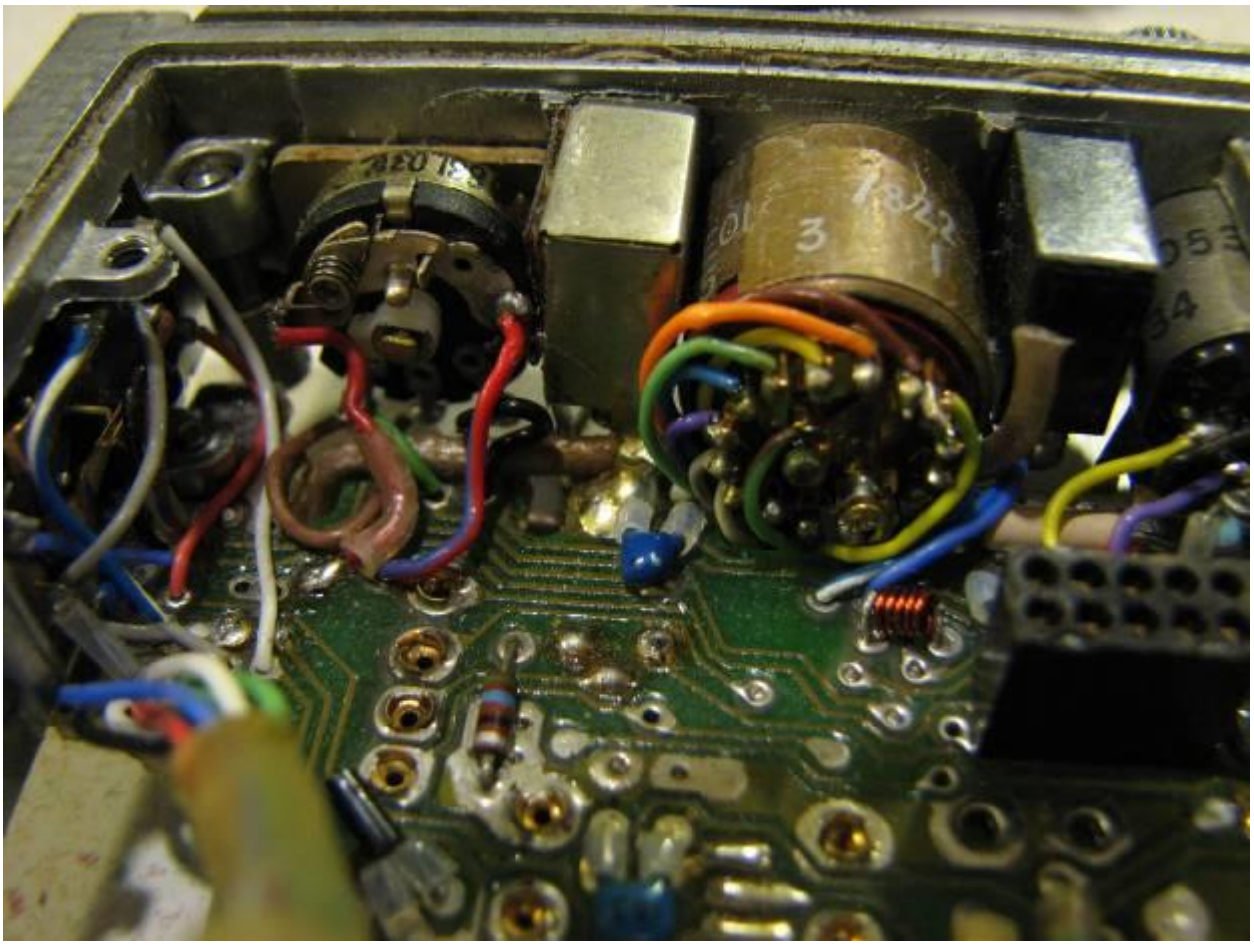


Some boards have a switch mounted to the main board and you would have to attach here, shown by the red and white arrows:



You can cut the wires at the board and then attach the cable wires to these wires or remove the wires completely (soldering iron required to remove the wires) and just attach the cable wires directly to the terminals.

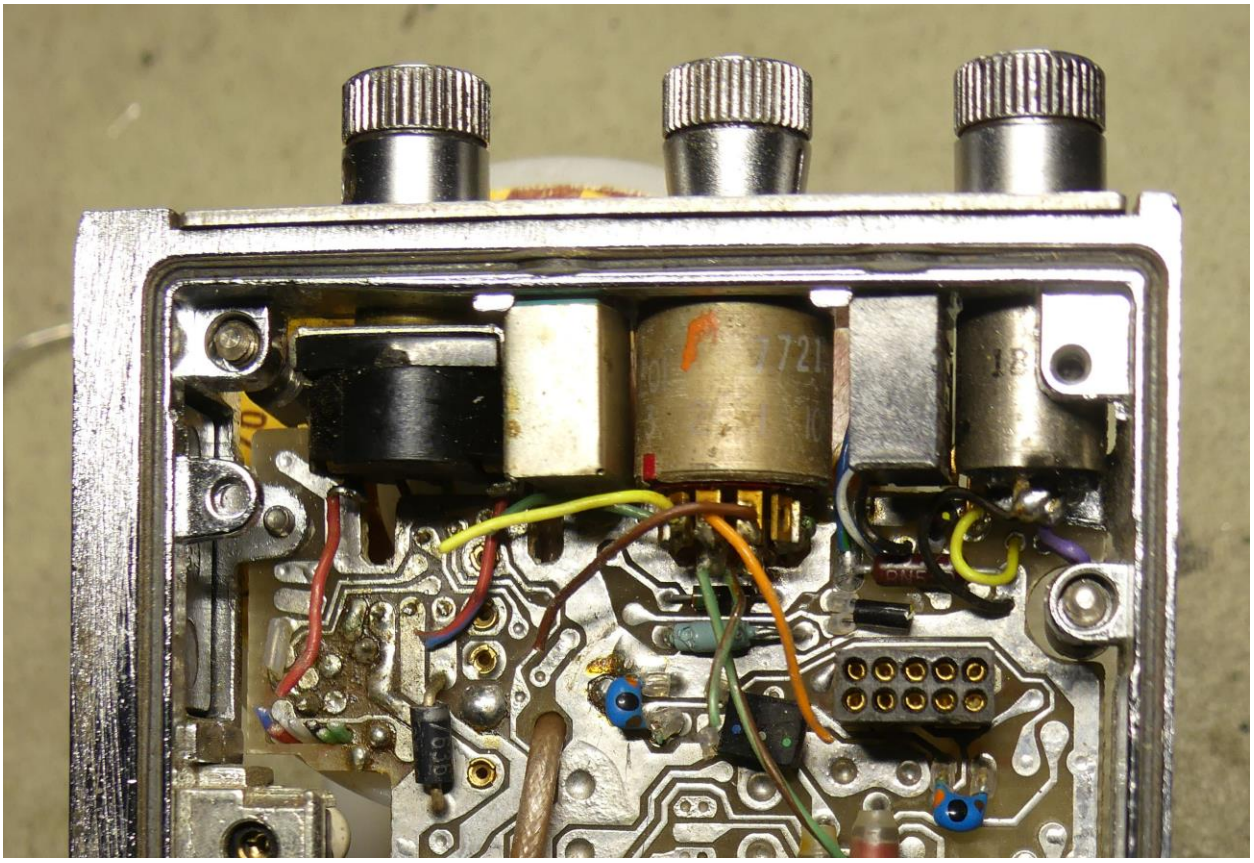
The power and group selection are done by two other sets of connections. Here is what they look like in this radio:

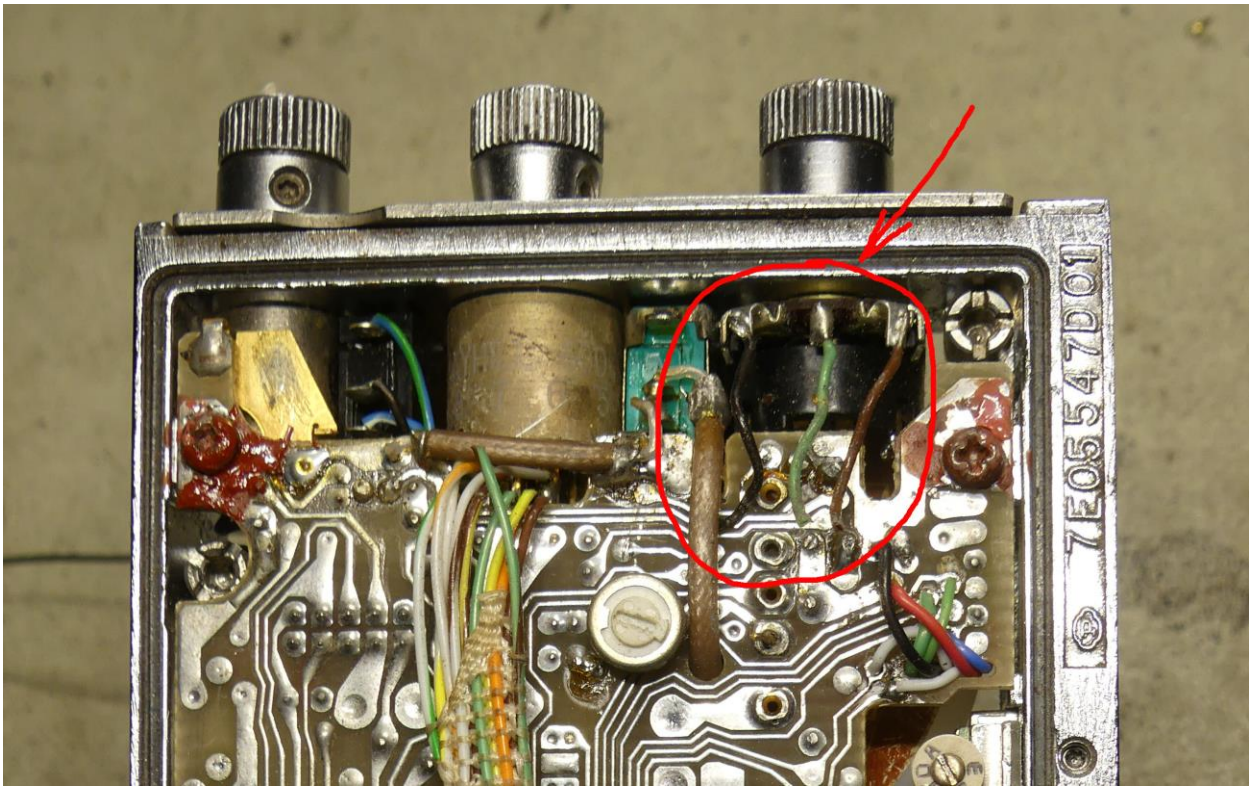


The power connection goes through the switch on the left. This is a rotary switch that is power and was probably also a volume control. The power is controlled by the two red wires on the outside edges of this switch (one all Red and one Red with a blue stripe). You can see how the mechanism opens up this switch in the off position by the white bump on the center shaft of the switch.

The group selection is done by the large rotary switch in the middle of the control panel, seen above on the upper right. This has two sets of 1 of 8 selections. The common pole of the switch is in the center with a Green/Brown stripe wire. And there are 8 outside connections with a Brown wire as selection 1, Orange as selection 2, Yellow as selection 3, etc. for the top half of the switch.

The bottom of the switch on the left has 3 wire connections. These will be used for controlling the volume. This may be accessible from the same side as the other wires, or you may need to flip the radio over and access (and remove) the wires from the other side of the radio as shown in the following images:



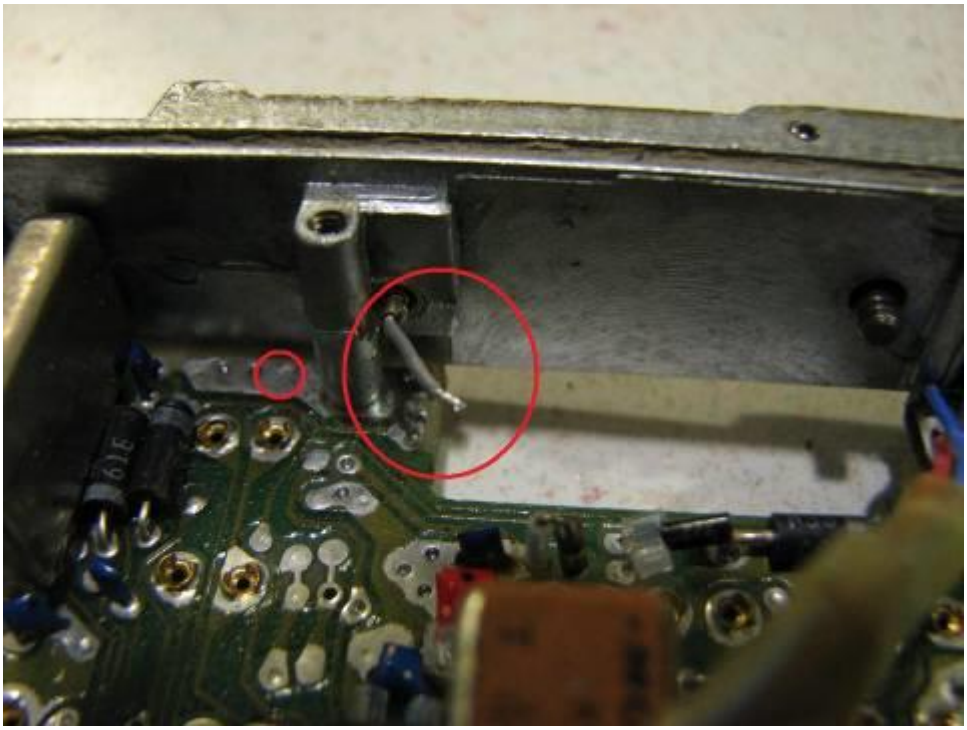

7E05547D01

We want access to these connections so you can cut the wires and either attach the included cables to the wires or remove the wires and attach the cables to the terminals directly.

You may need to cut other wires out of the way to make sure you can access these connections so we can remove the existing wires and attach new wires (preferred) or try and attach to the sire ends and add heat shrink (not included) so the solder joints do not short to anything else.

Here is a photo of the wires cut off and extended so you can see exactly what connection locations are needed:

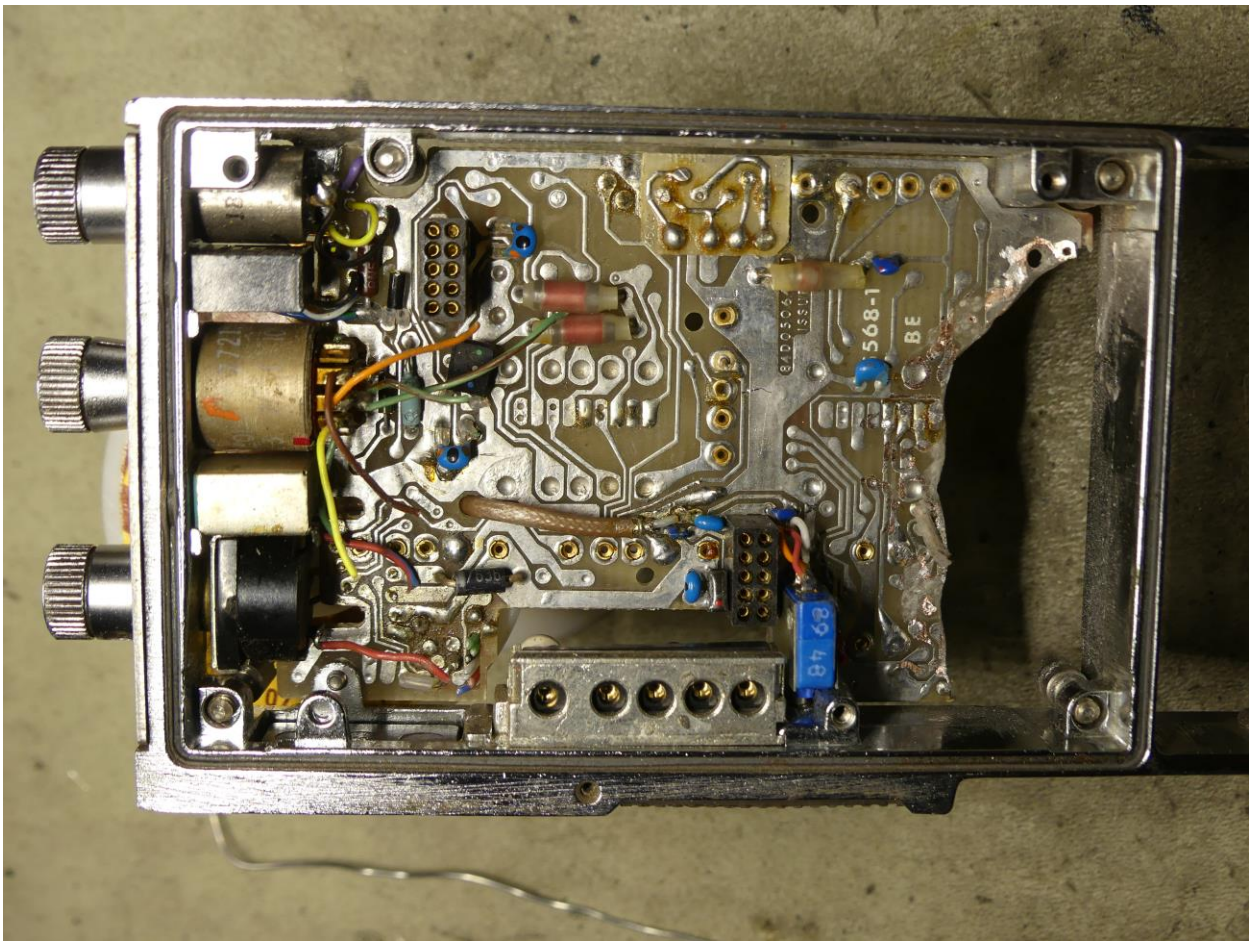
Talk switch (one circuit board area and one wire) where we will be adding new connections:



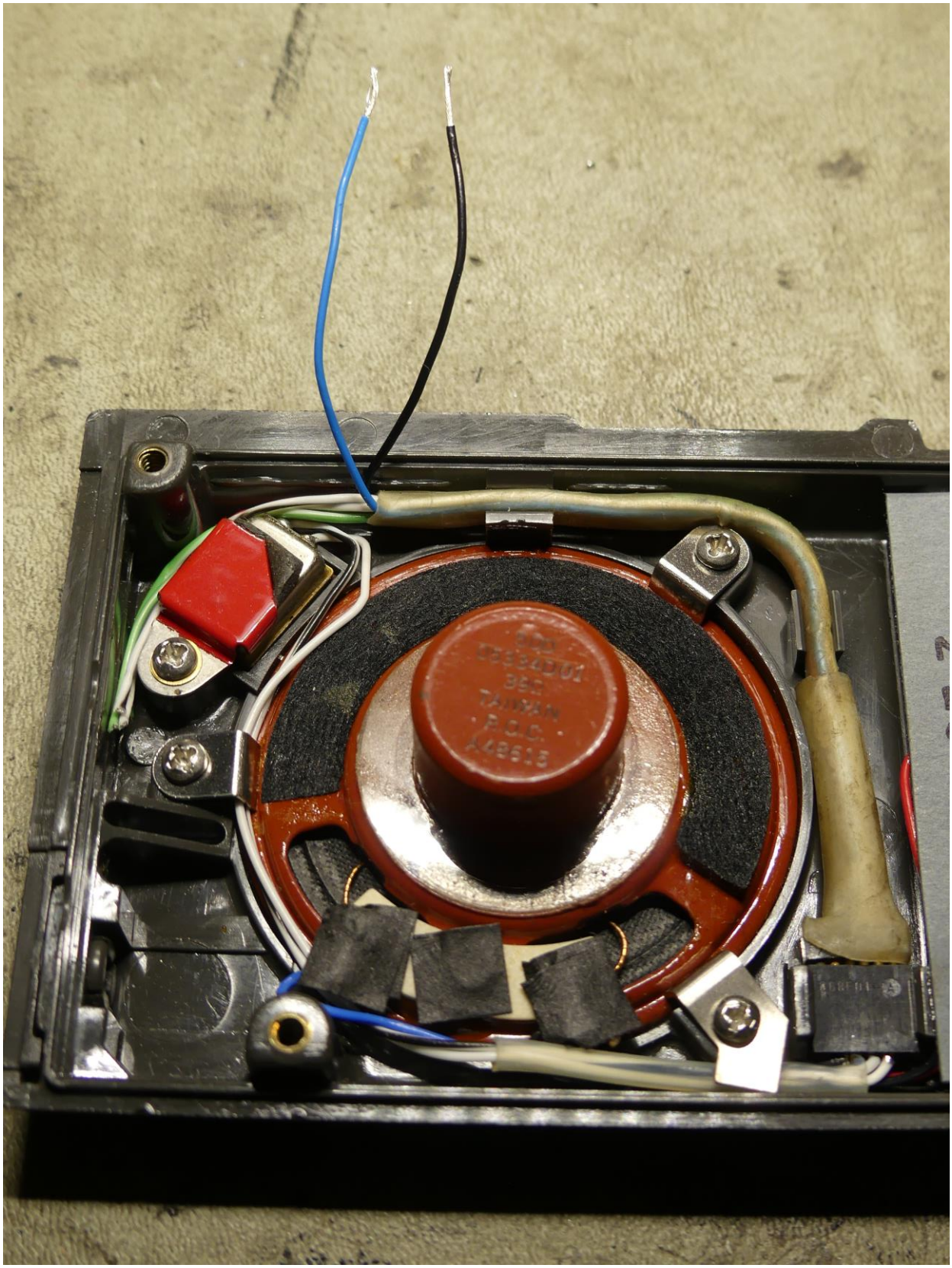
For tall radios, there should be plenty of room to rout wires into the battery compartment.

Unfortunately, the short MT500 radios have the circuit board right up to the frame so you need to cut away portions of the circuit board to be able to get the cables around the board.

Here is an image of the board after it has been cut away (with a Dremel and a composite cutting disc) and sanded (with a Dremel using a stone sanding bit) to make sure there are no sharp edges to damage the wires:



For the front panel and speaker, cut the cable bundle as close to the walkie talkie circuit board as possible so that longer wires are left attached to the front panel. Separate out the black and blue wires from the rest of the wires and prepare them so they can be easily soldered to the new cable:



Then break off the spring loading metal pieces in the battery compartment portion of the front panel (with speaker) by bending them up and back a few times:

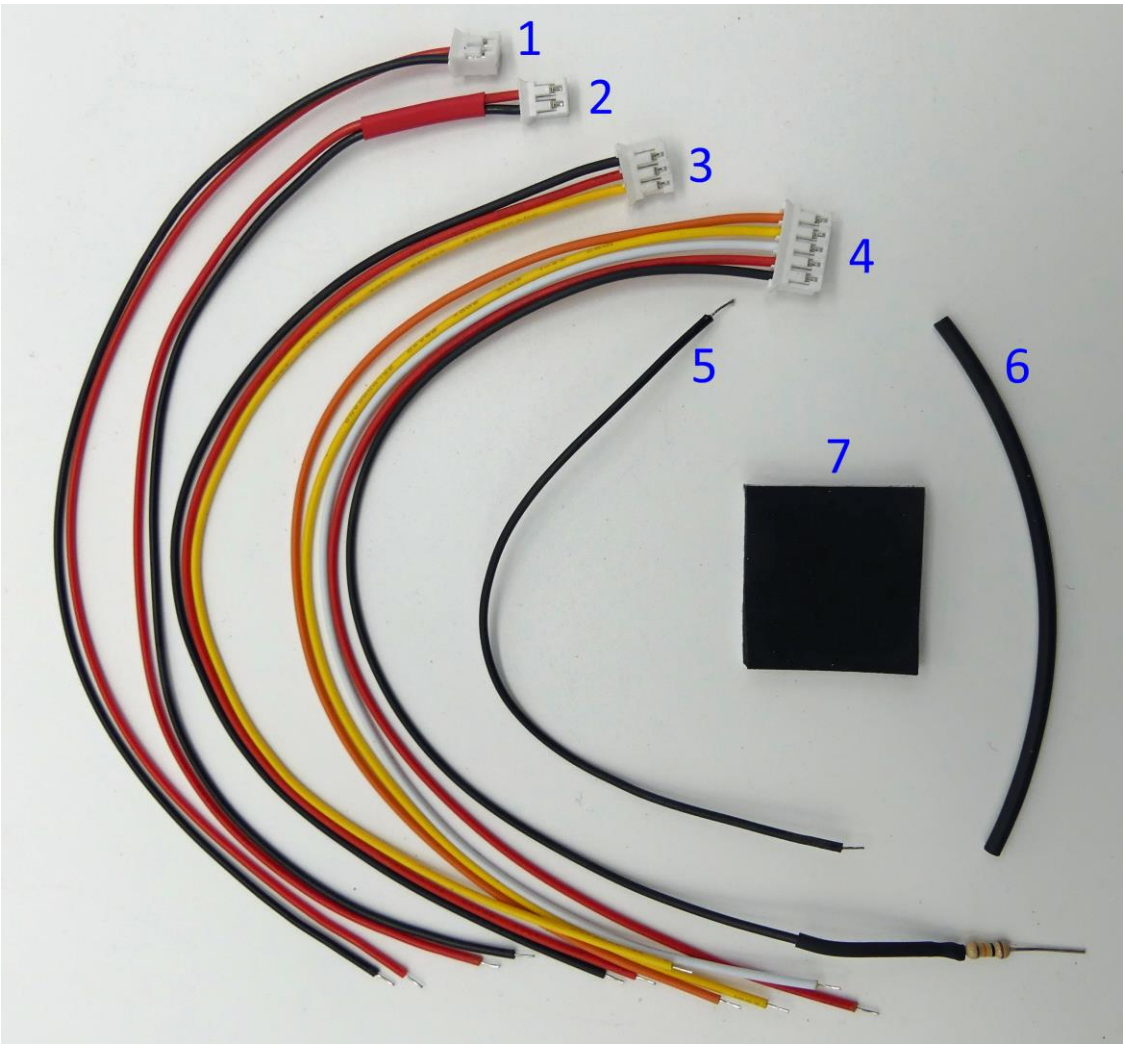


This will easily break off and leave you with a flat surface for mounting the battery and sound board:



Finally, installation of cables after all of the radio prep work!

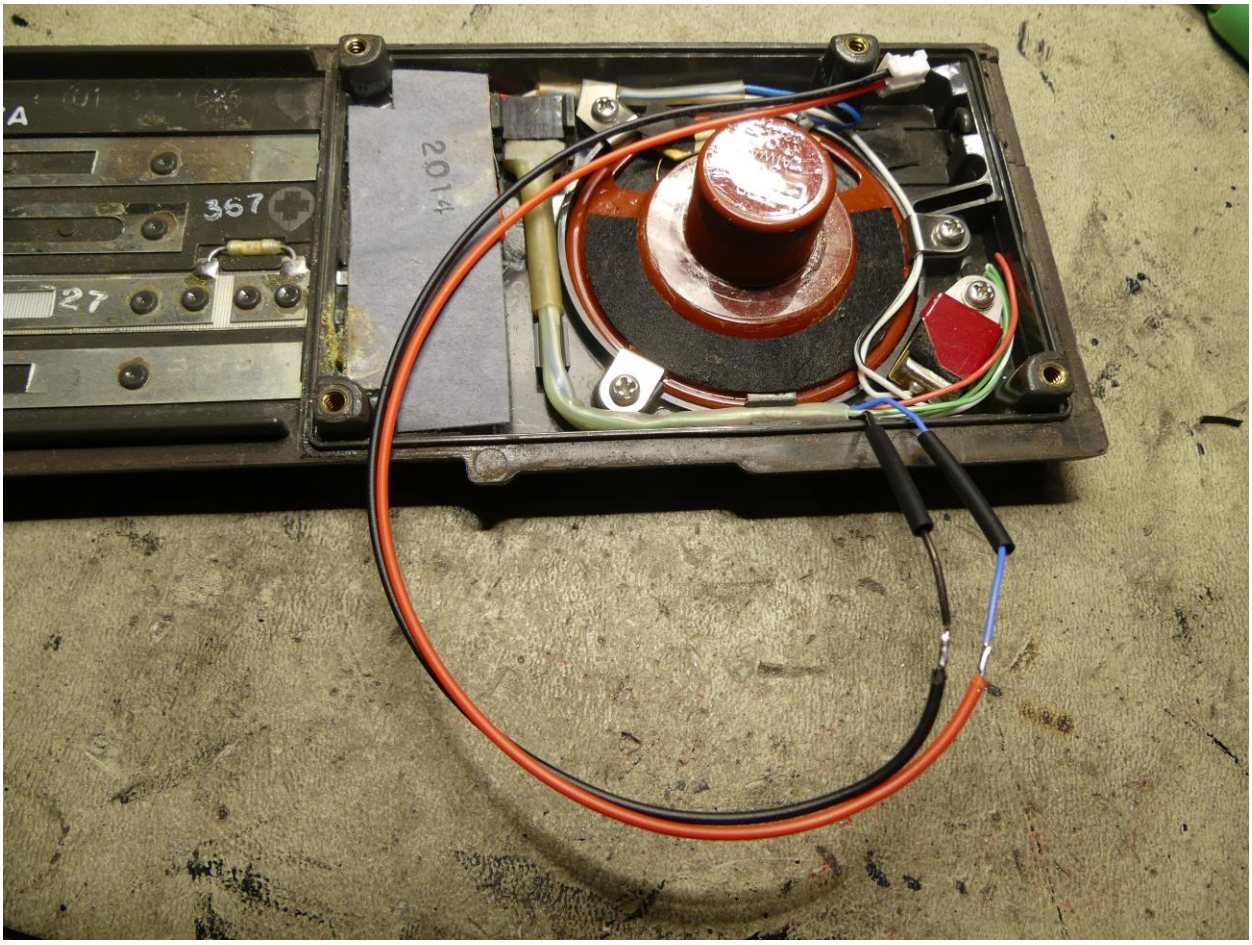
Here are the parts that will be added to the MT500 radio:



#1 2-wire connection to the speaker on the front cover
#2 2-wire connection to the power switch on top left knob (adds a red heat shrink to connector end to differentiate from cable #1.
#3 3-wire connection to the volume control on the top left knob (same knob as power switch)
#4 5-wire connection to the center frequency selection knob (Orange, Yellow and White wires) and the talk switch (Red and Black w/resistor wires) on the MT500
#5 single black wire to go between frequency selection common and the volume ground wire
#6 Heat shrink tubing to cover wire connections from cable #1 to the speaker and possibly the black wire on cable #4.
#7 Foam rubber with adhesive backing to replace the foam on the battery cover.

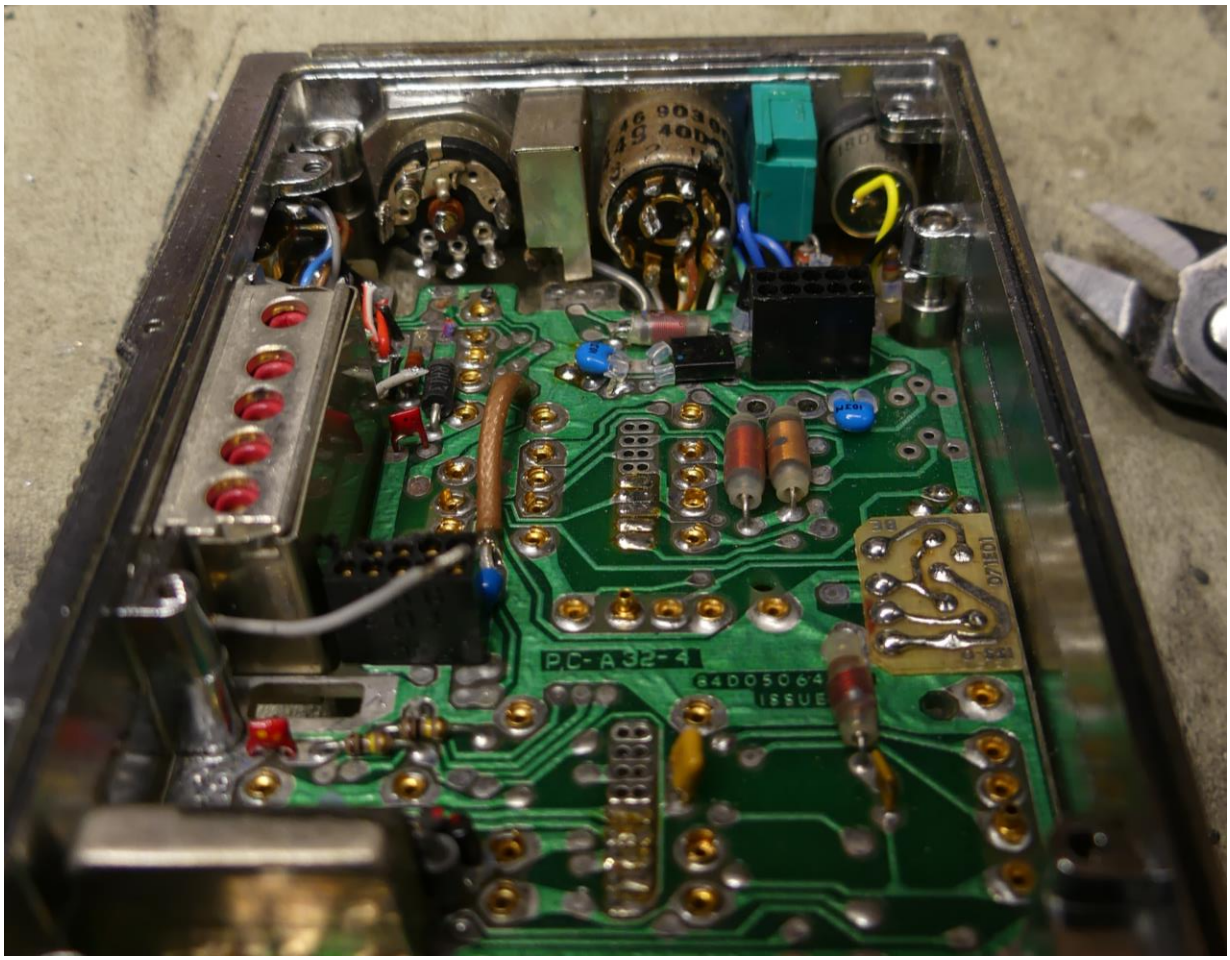
Please verify the color sequence of the cables. I try and verify that, but sometimes the cables are assembled in a different color order. These instructions assume the color matches what is shown in the above photo.

Start by attaching cable #1 to the two speaker wires on the front panel. First cut two sections of the heat shrink tubing (about 1" long each) and slide one over each of the two speaker wires (or over each wire in cable #1). Then solder the ends of the speaker wires to the wires on cable #1. Order does not matter, but I match black to black just because I like that…

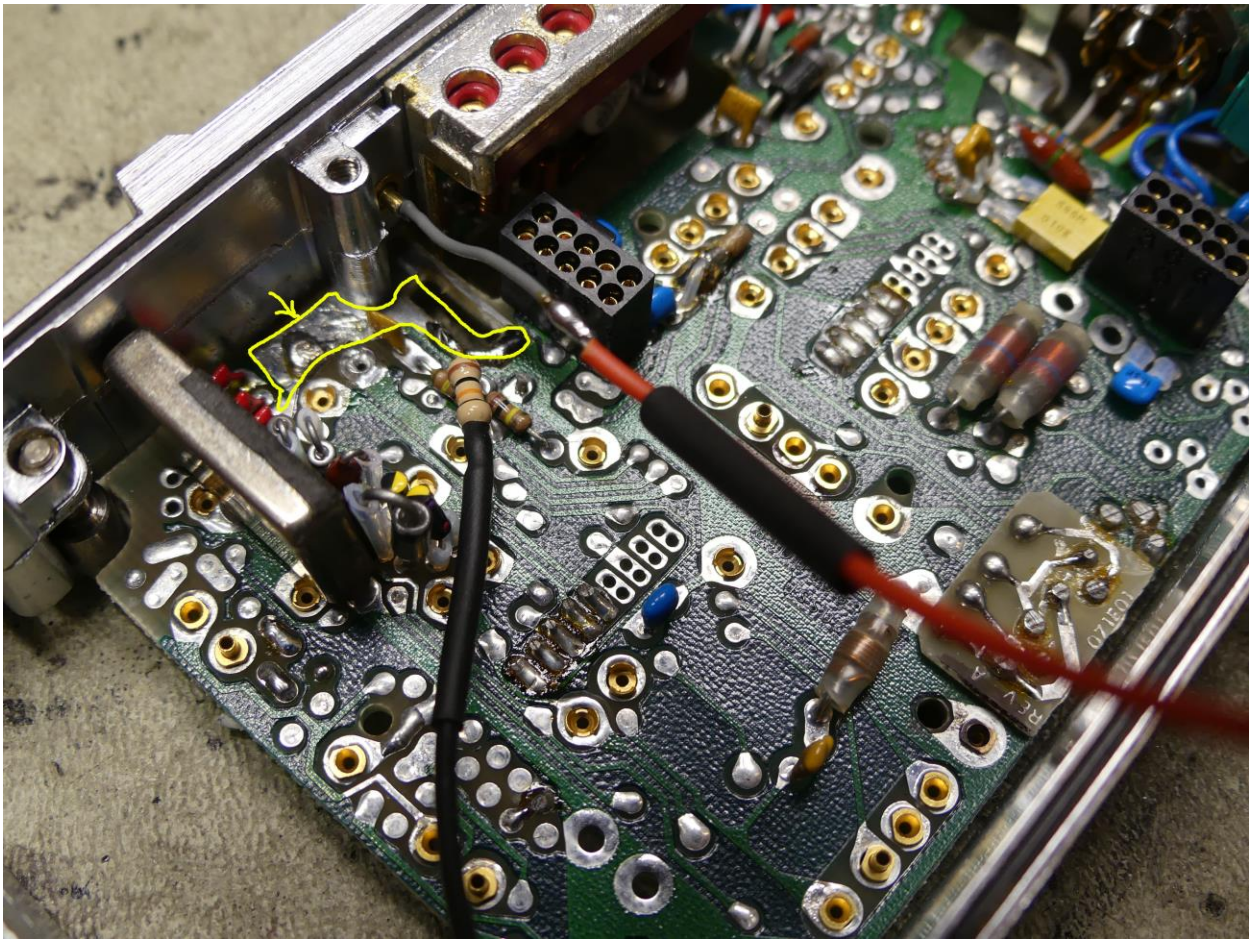


Then slide the heat shrink over the solder joints and heat the tubing so it secures the heat shrink in place. My heat gun is set to 250C, but not sure if it is calibrated or accurate. Just do not heat it so hot the wire insulation melts!

The main radio body connections should be cleared of previous wires and look like this as we start to add the wires #1, 2, 3, 4 and 5:

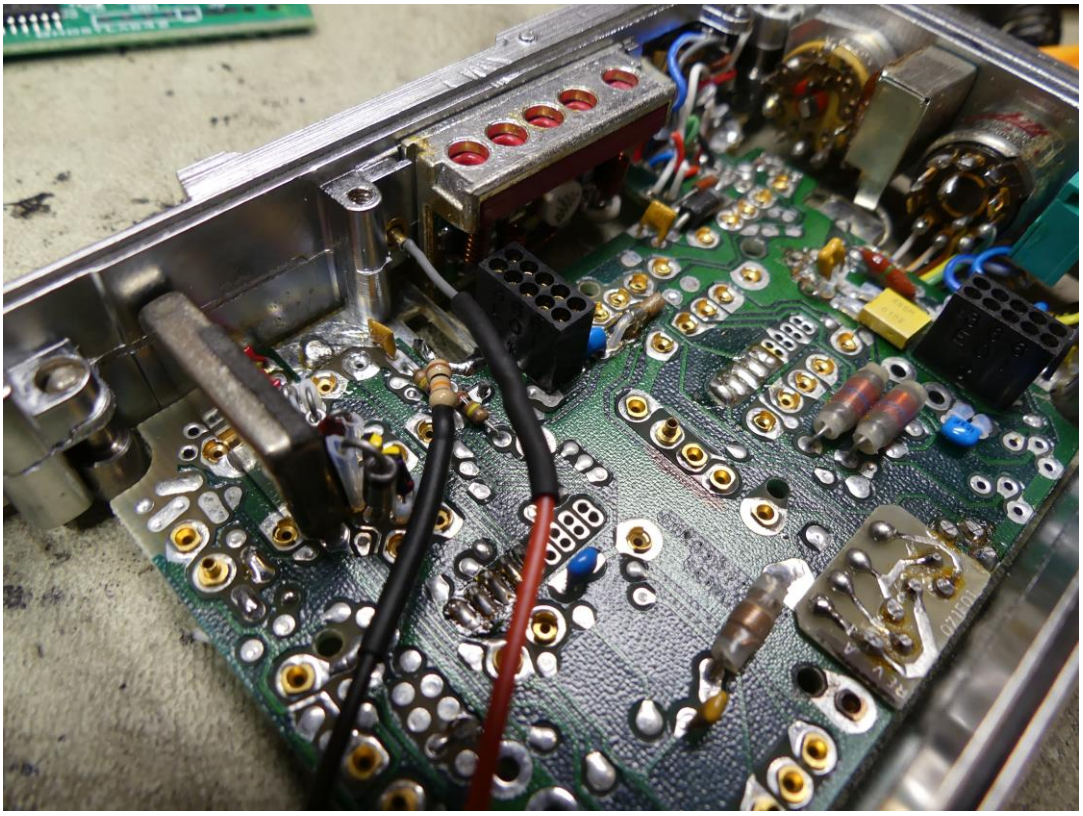


Start by attaching the Black and Red wires of cable #4 to the talk pushbutton. If your radio is like the above, the red wire will be attached to the wire coming out of the switch (the grey wire in the above image) and the resistor on the end of the black wire will need to be attached to the circuit board which should make contact to the metal frame. This contact with the frame is necessary and also makes it more difficult to solder since it acts as a heat sink and takes more heat from your soldering iron's tip than all of the other soldering to be done.

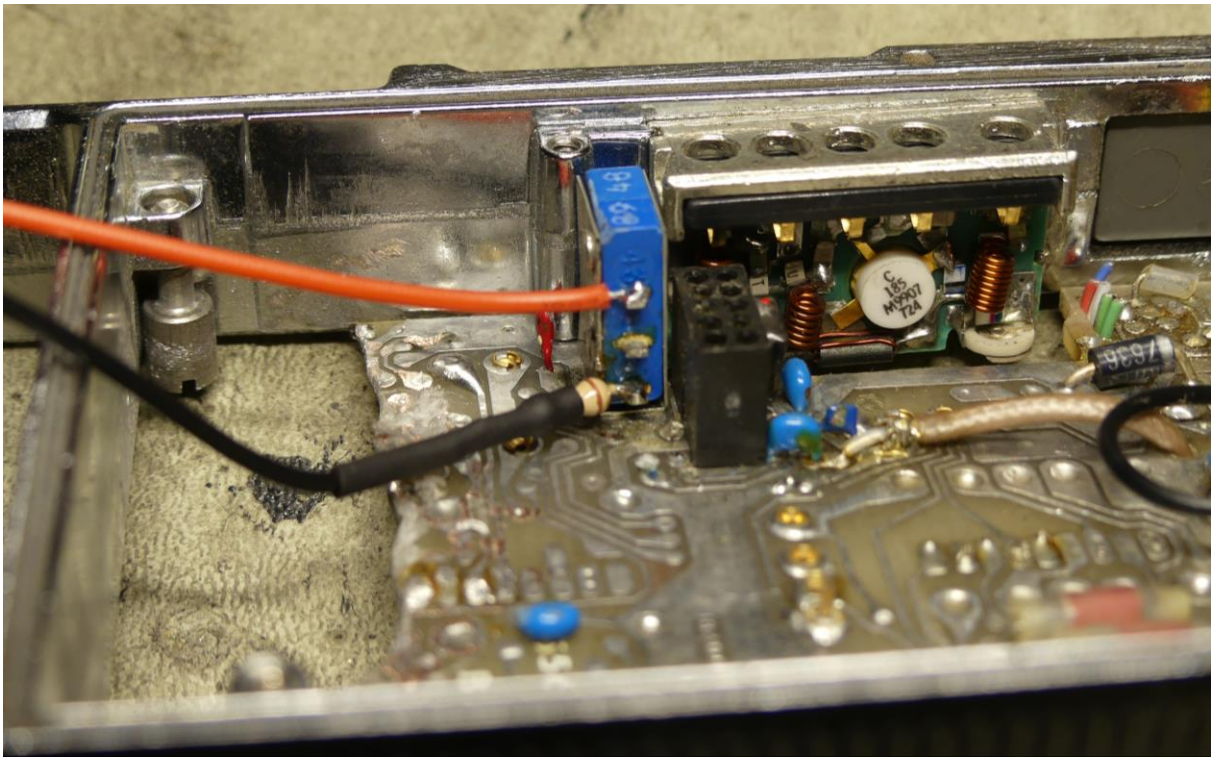


Anywhere in the yellow area shown is where the end of resistor on the black wire can be soldered. I first tried near the case (you can see the blob of solder there), but found it was much easier to solder farther from the edge of the case where the solder area was narrower.

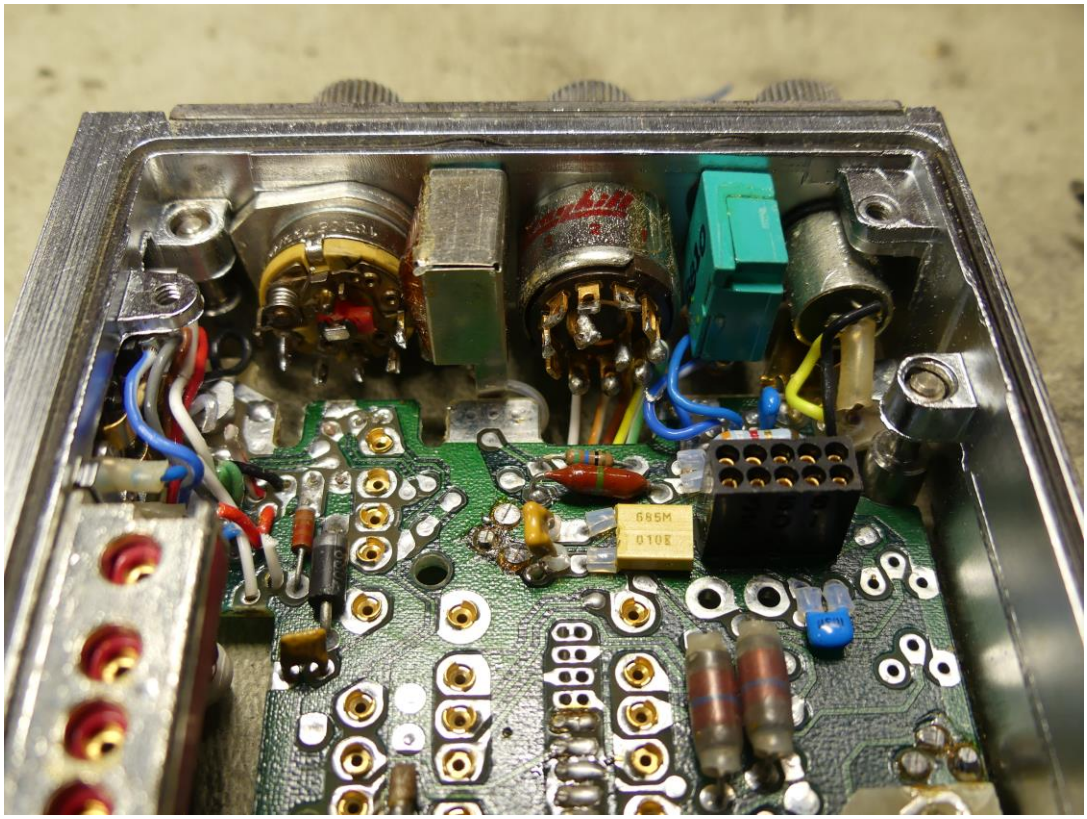
Before soldering the red wire on, slide the remaining heat shrink tubing (about an inch long) over the red wire. Then solder the red wire to the grey wire as shown above. Then slide the heat shrink over the solder joint and heat so the heat shrink will stay in place. When completed it looks like this:



If you have the talk button that has a separate switch mounted on the circuit board, the wires are attached directly to the switch like this:



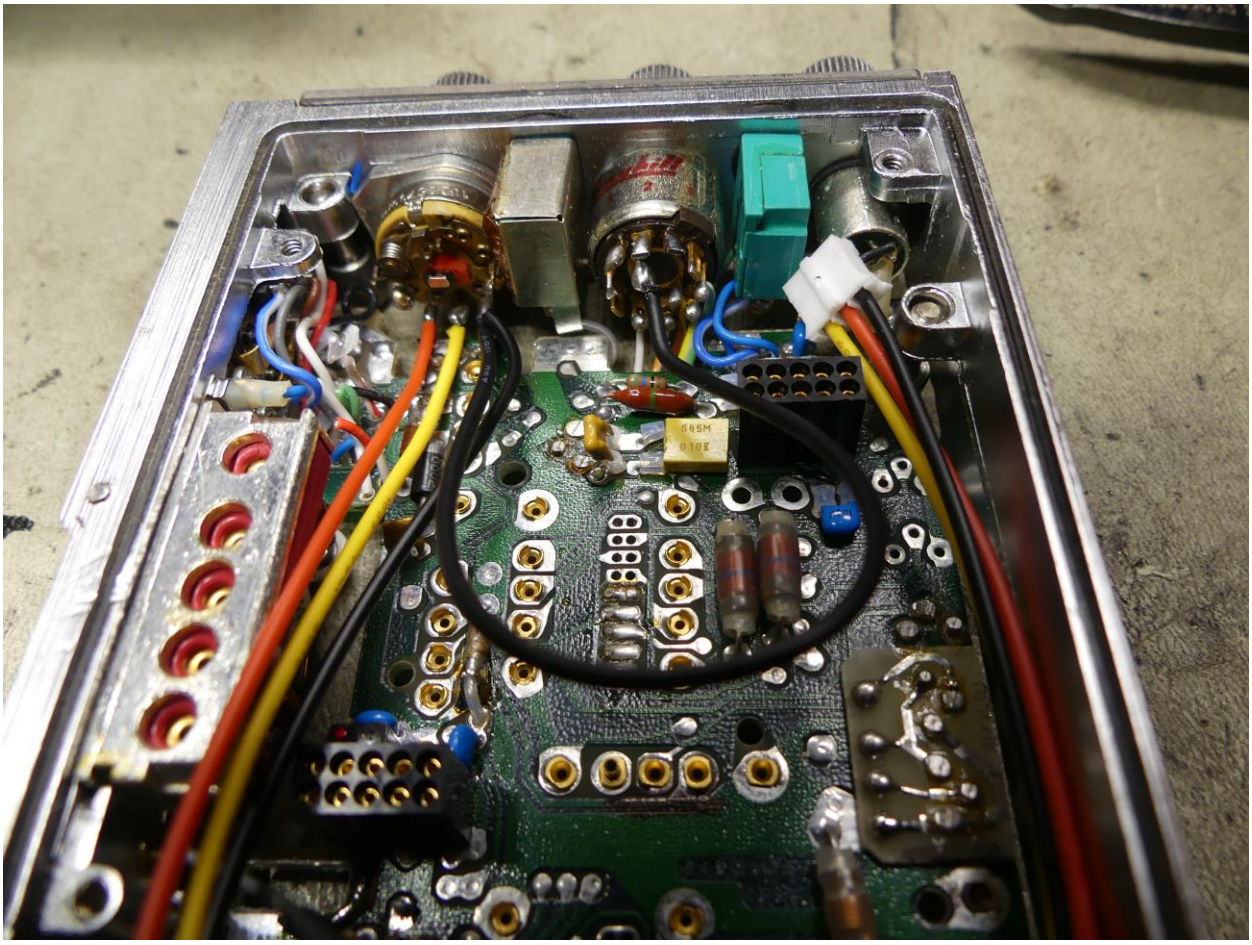
Next, we work on the two control knobs at the top of the radio, shown here after the wires have been removed:



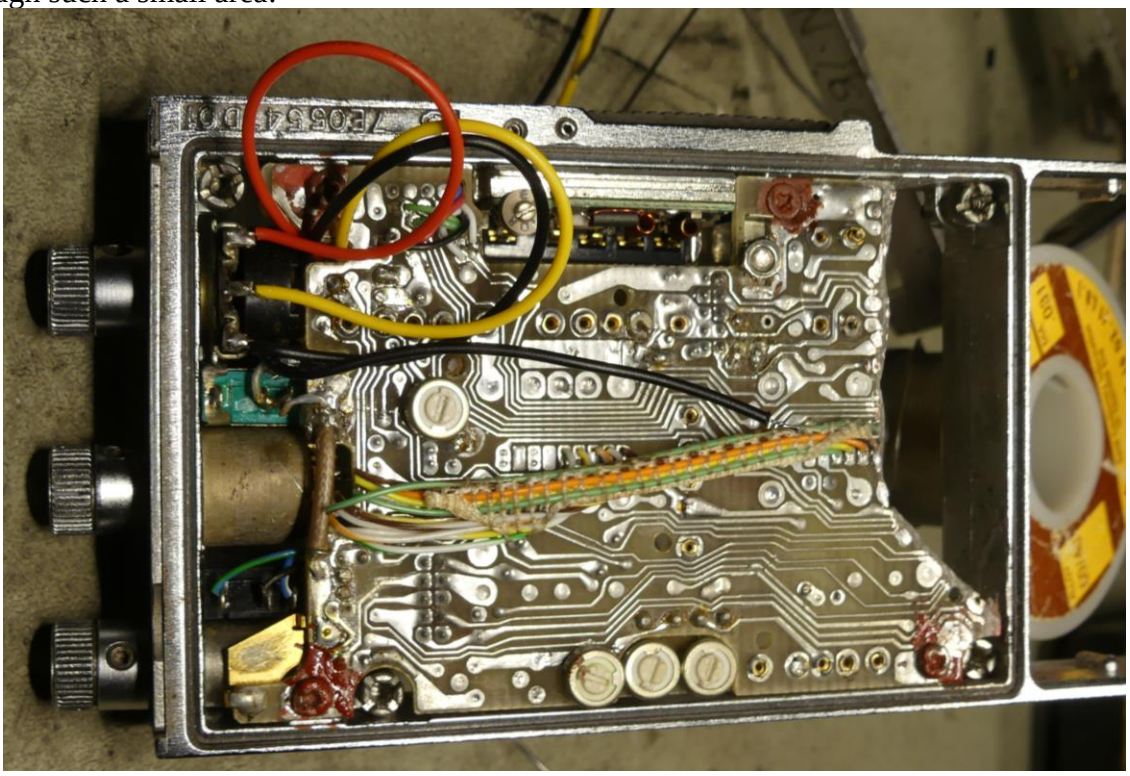
I like to start with the 3-wire cable #3 and the black wire #5. Black wire #5 is connected to the black wire on cable #3 and then goes over to the center post on the frequency selector switch. I usually twist the ends of the two black wires first and then solder them together before attaching any of these wires to the radio.

The color coding is essential and must be in the same order as shown in the following picture. If the order is not followed the volume control may be backwards, or worse can short out the battery at some volume setting.

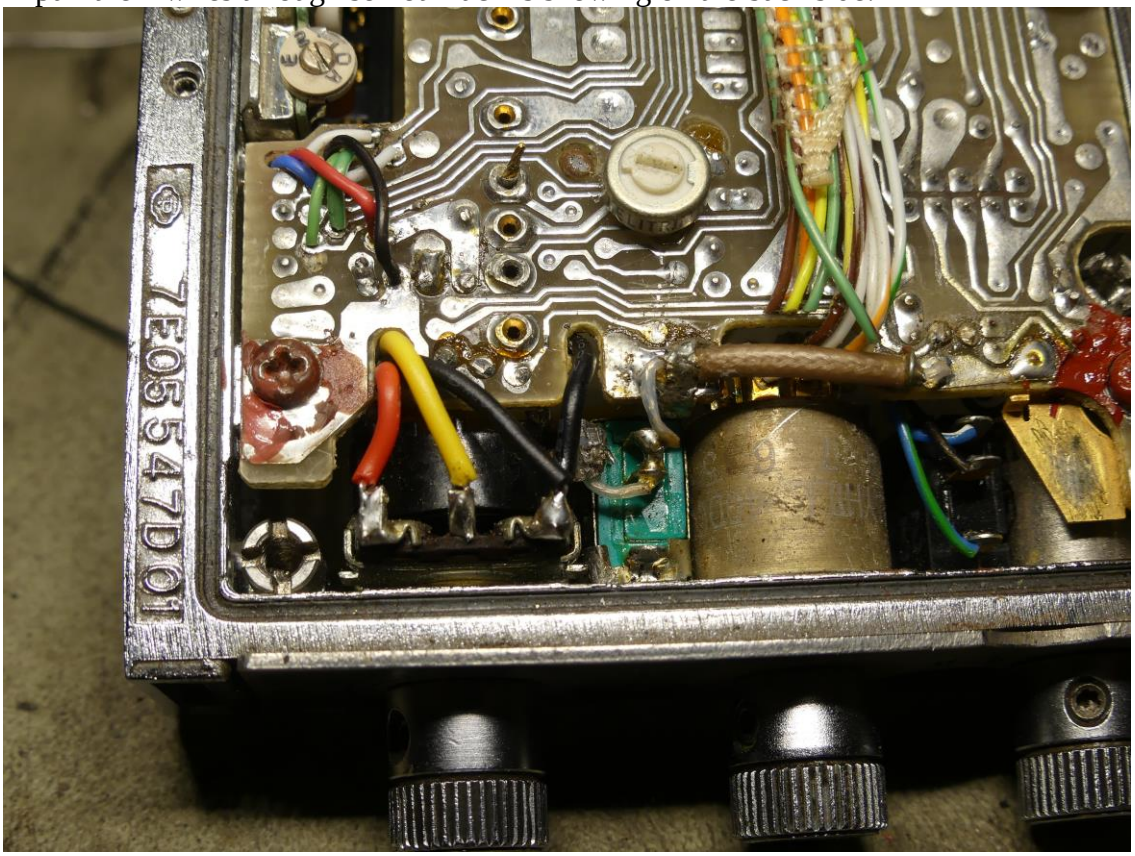
If you can reach the three connections on the bottom of the volume control potentiometer then it looks like this after the wires are soldered in place:



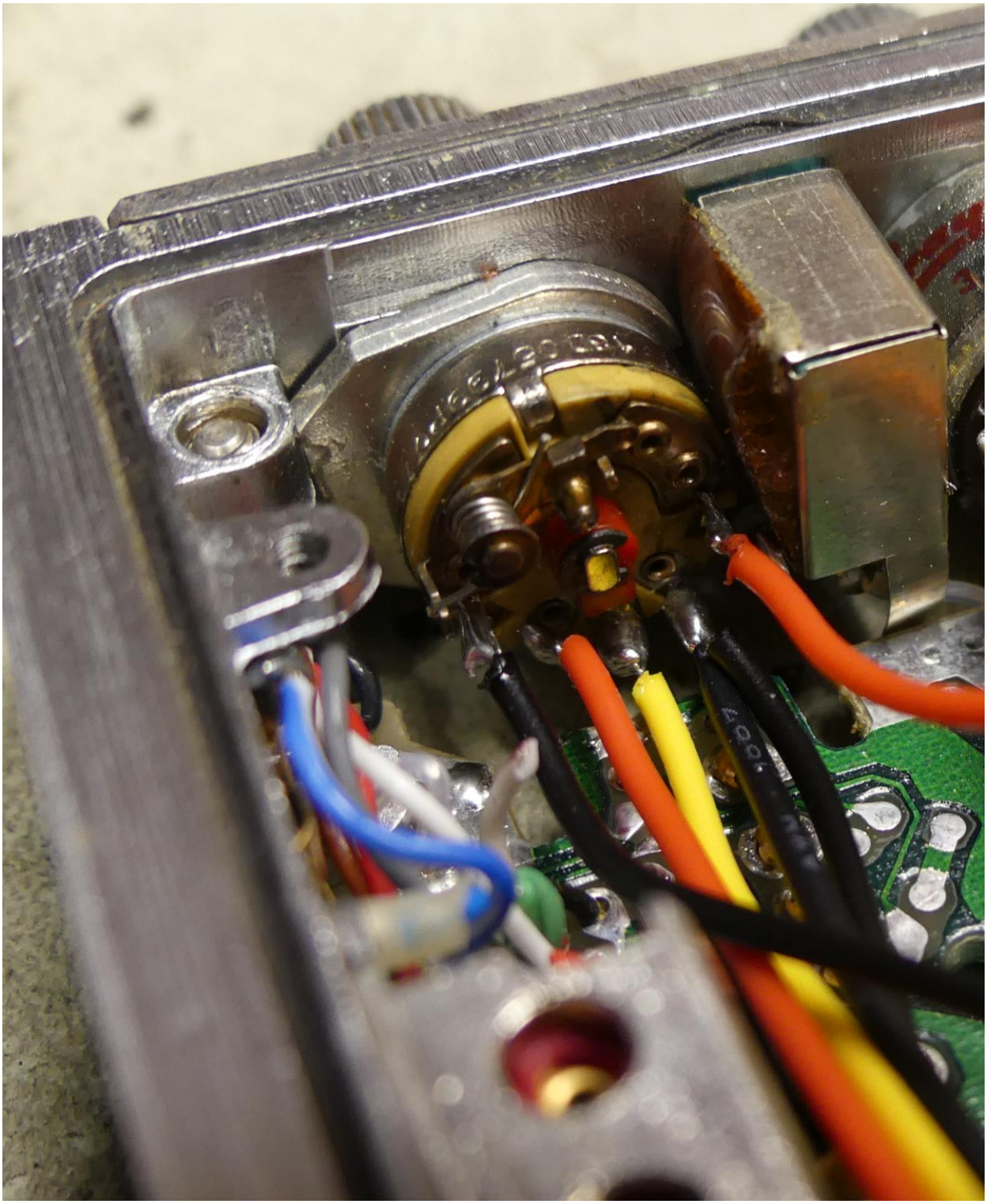
If you cannot reach those three terminals, here is what the connections look like from the other side of the board. I thread the wires through first since the connector on the other end will not fit through such a small area:



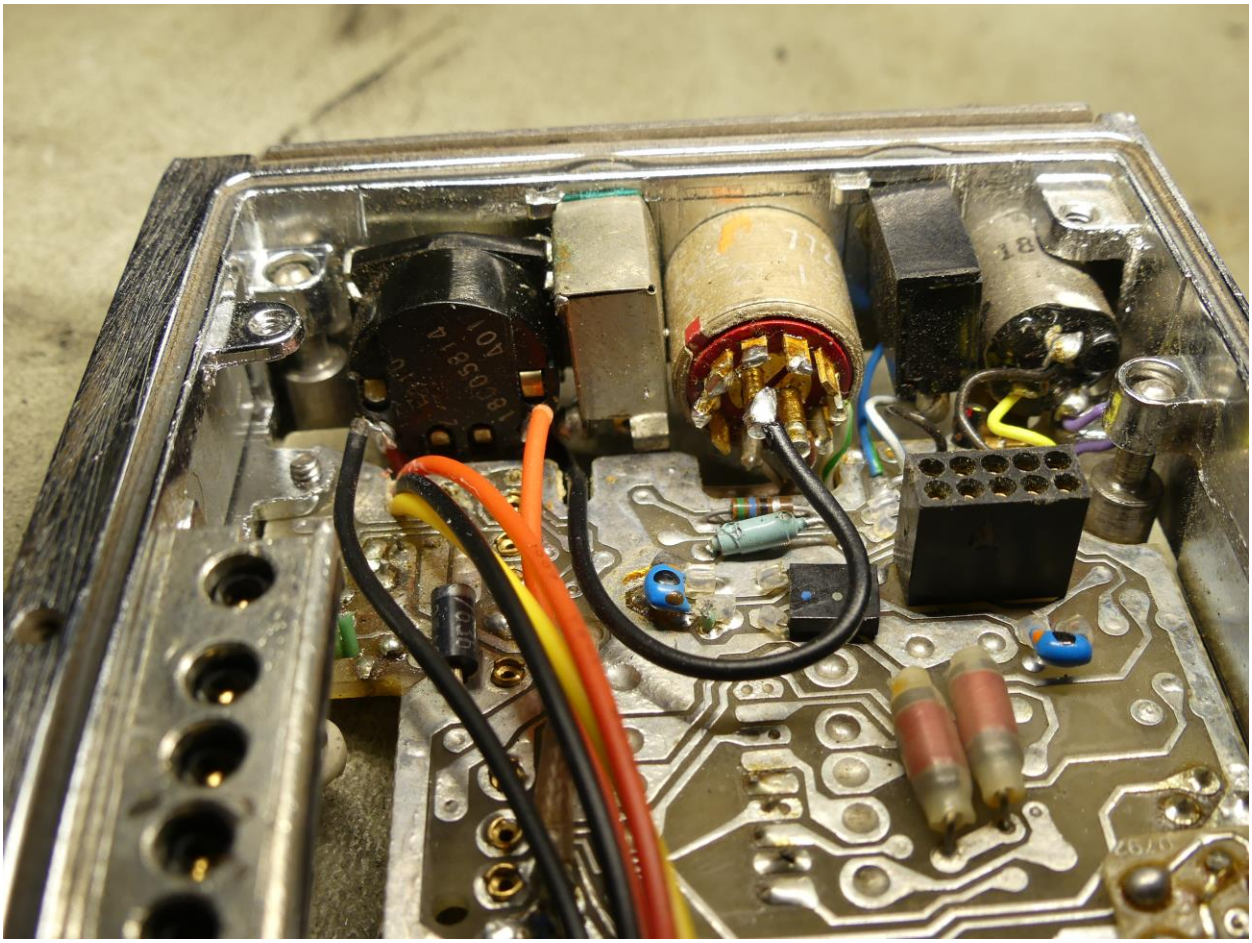
Then I pull the 4 wires through so not much is showing on the back side:



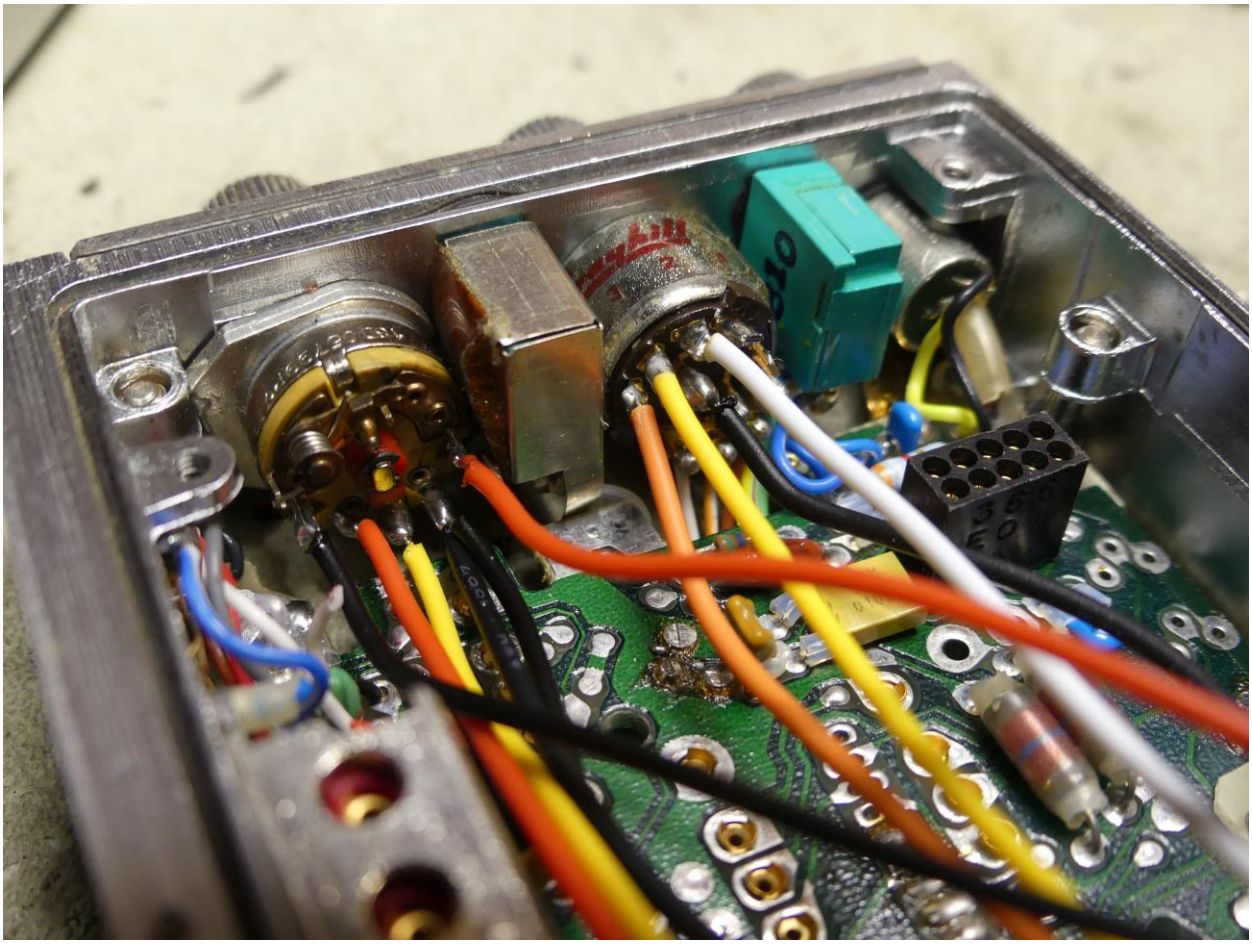
Next, we connect cable #2 to the power switch contacts on the volume control potentiometer. Since soldering can heat up the connections, it is best to center the volume control before soldering. Otherwise, it is possible to heat up the contacts enough to make the on/off switch unreliable by melting the plastic piece on the shaft that opens and closes the power contacts.



Here is what the other type of volume control looks like when cable #2 is also attached:

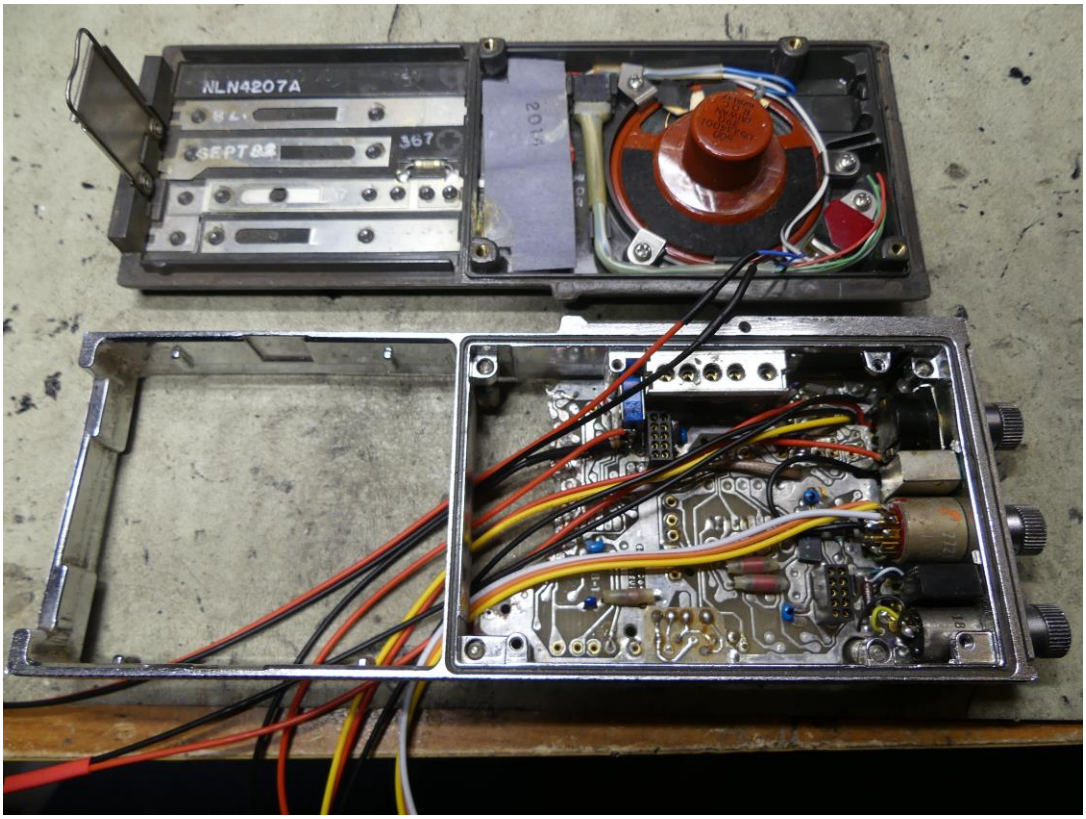


Lastly the 3 leftover wires from cable #4 (White, Yellow and Orange) are attaches to the frequency selector contacts:

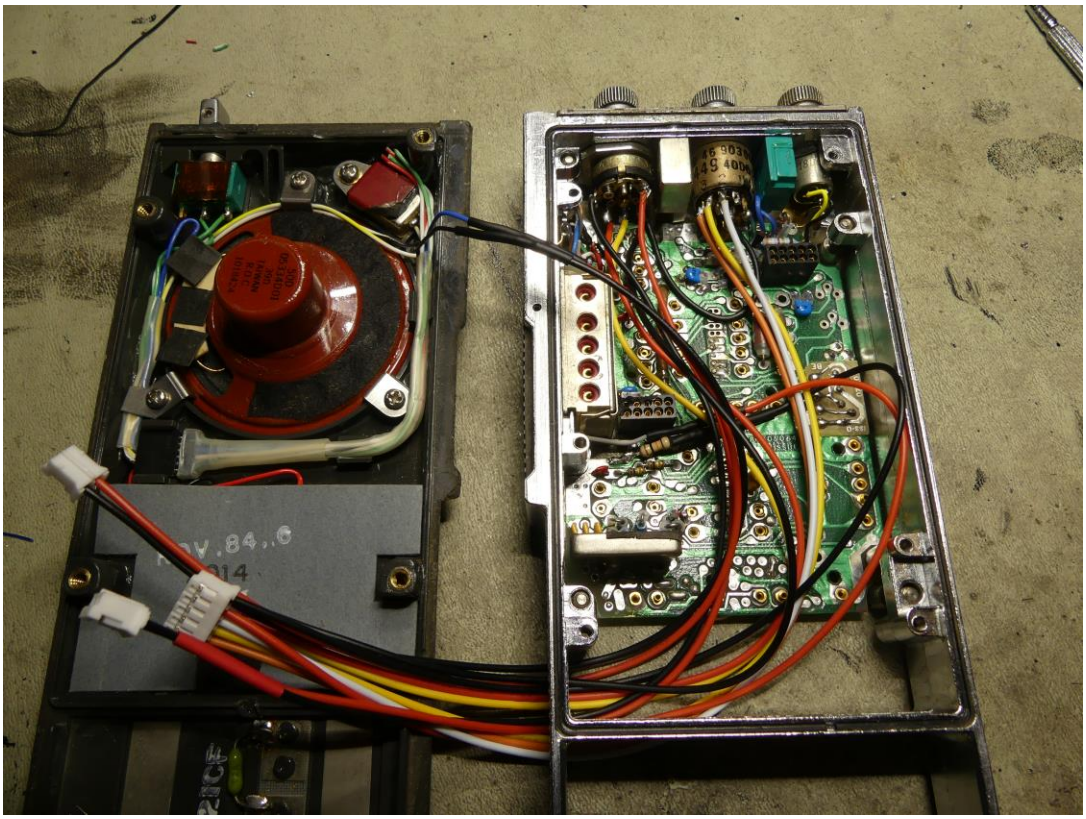


Contact #1 is left unconnected.
Contact #2 connects to the White wire.
Contact #3 connects to the Yellow wire.
Contact #4 connects to the Orange wire.

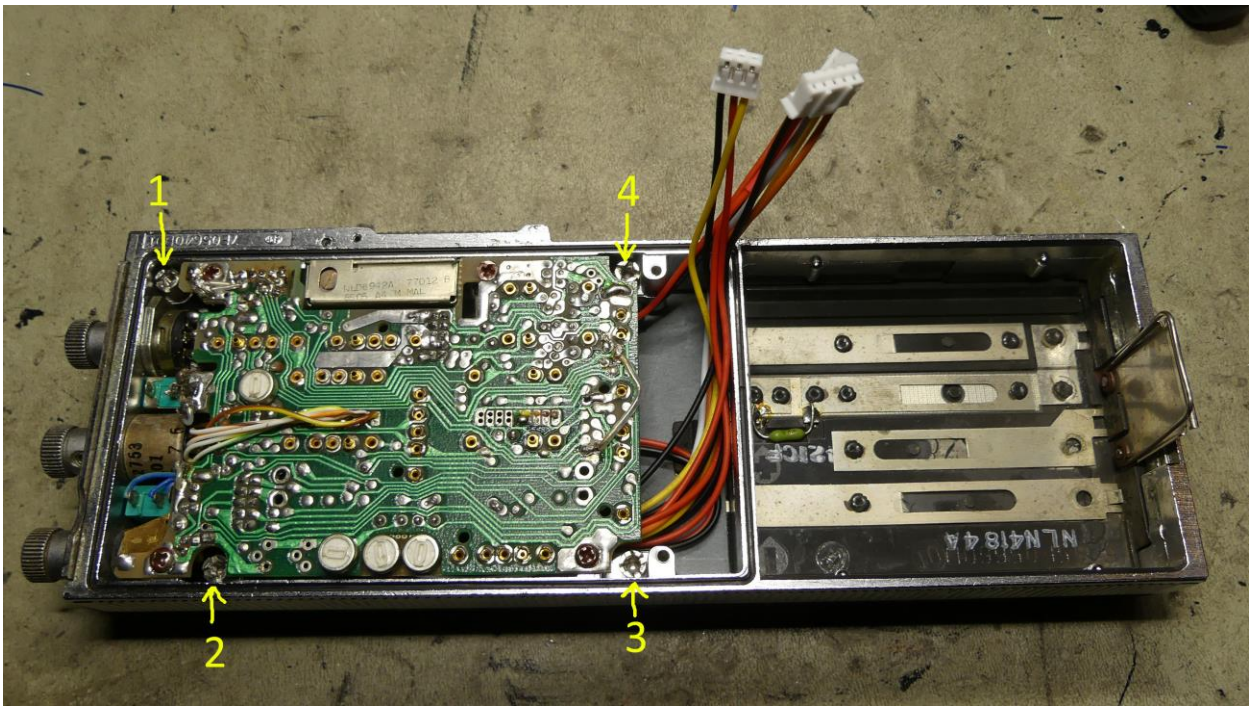
Set the front cover next to the body and dress all the wires through so they can be later accessed in the battery compartment. It should look like this on a short MT500:



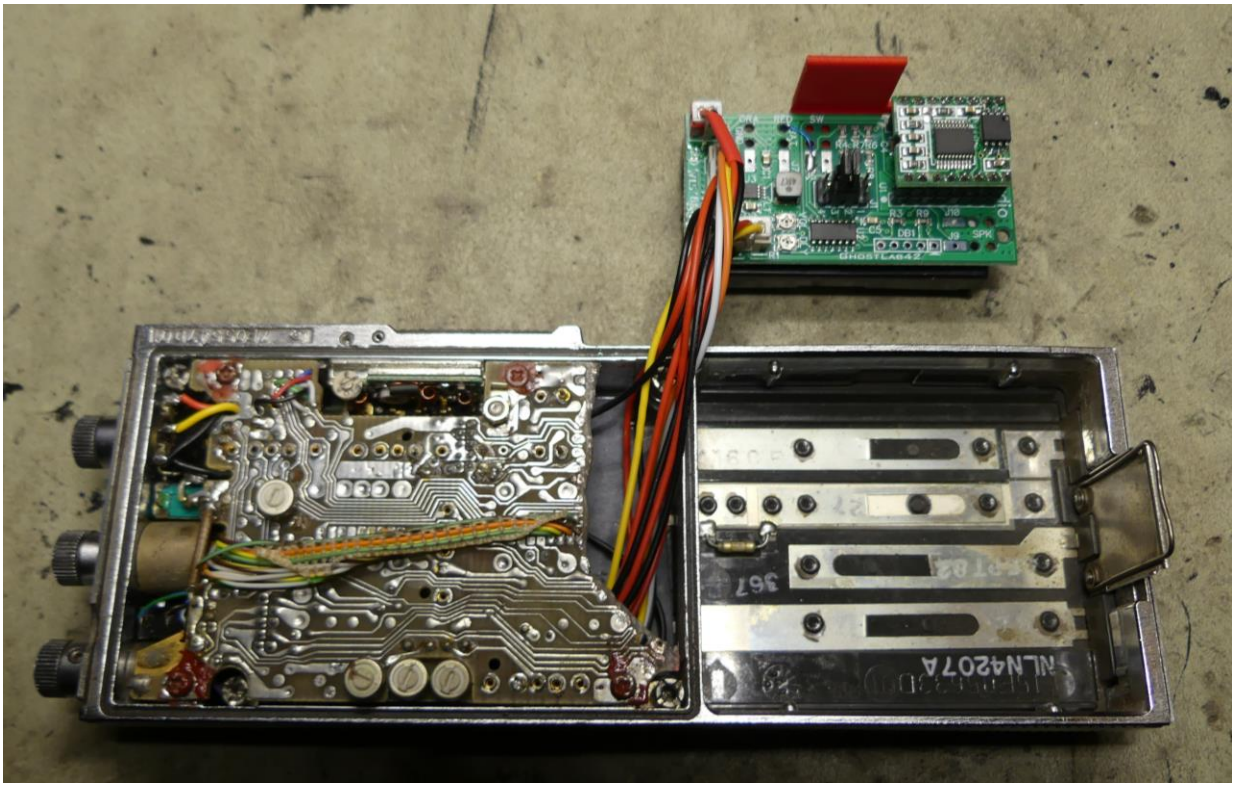
And like this on a tall MT500:



Next flip the speaker cover over and attach it to the frame with the 4 screws. Be sure to check all of the wires and make sure they are not caught between the cover and the frame, so they get squished (and damaged) when tightening the four screws.



Now is a good time to test the installation by plugging in the wires to the sound module assembly:



Turn the volume knob all of the way OFF so power is not going to be connected.
Set the frequency selector to “1” (no selection connections)

Plug in all 4 cables connections.
2-wire with red heat shrink (power) to the red 2-pin connector.
2-wire connector (no heat shrink marking, from the speaker) into the white only 2-pin connector
3-wire (volume) into the 3-wire connector
5-wire (switches) into the 5 wires connector

Place 2 AA batteries in the battery holder. Make sure the polarity of the batteries matches the markings in the battery holder.

Make sure there are two jumpers on the J1 pins across from J1-2 and J1-3. This indicates a test mode.

The “VOL” control potentiometer on the sound board must be set to a mid-volume (halfway between min and max) or bad things can happen. It is set to a mid-volume in my testing, so this should be fine. If it is set to min or max, when you adjust the volume on the MT500 you can short the battery out and possibly damage some wires.

Turn the volume knob on to cause the sound board to start talking. It defaults to very quiet, so this should be done in a quiet environment. If you need it louder, turn the volume control to

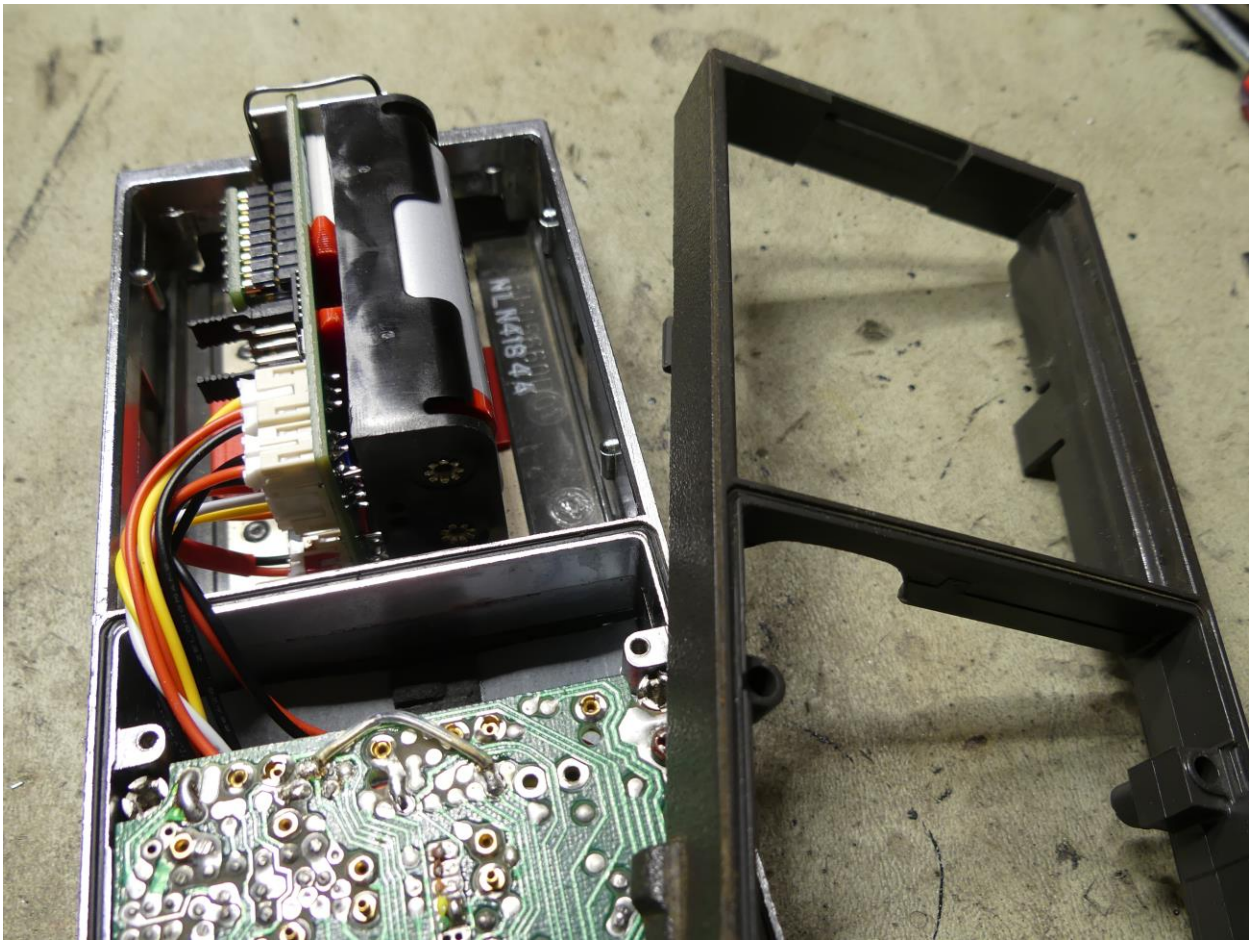
OFF, and then unplug the 3 wire volume connections. The board will now default to a mid-volume level when you turn it back on.

It should say test and then a firmware version number and then start announcing the switches that it detects as being active. With the jumper installed on J1-2 and J1-3 it should keep repeating "2" "3". Remove the jumpers and it should be silent.

"1" Jumper J1-1 (random sequence selection) only on the sound board.
"2" Jumper J1-2 (GB1 quotes) or Frequency selector position 2
"3" Jumper J1-3 (GB2 quotes) or Frequency selector position 3
"4" Jumper J1-4 (TVG quotes) or Frequency selector position 4
"5" talk pushbutton selected

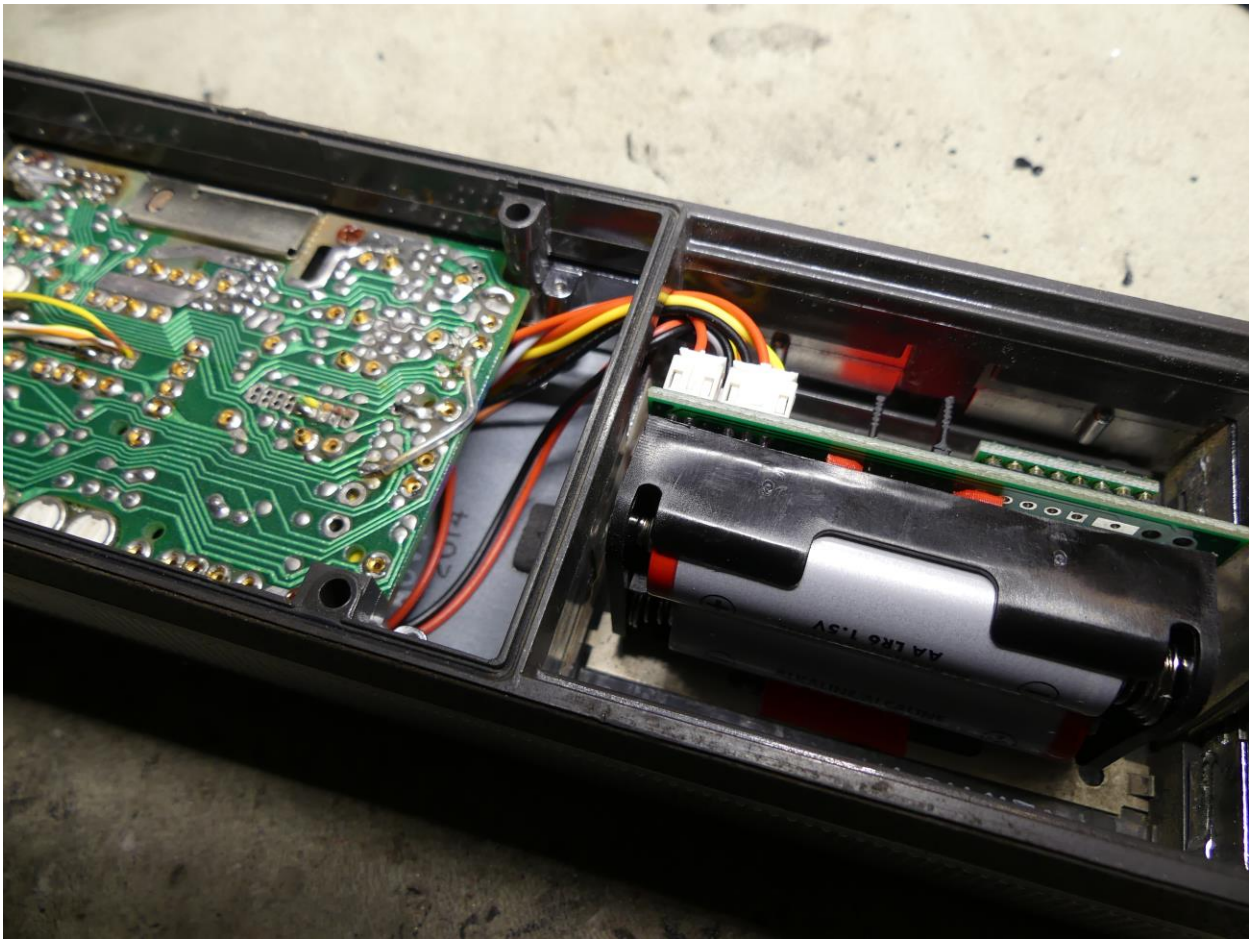
Verify that the frequency selector and talk pushbutton cause the appropriate responses.

The plastic frame needs to be modified so that the newly added wires can pass into the battery compartment.



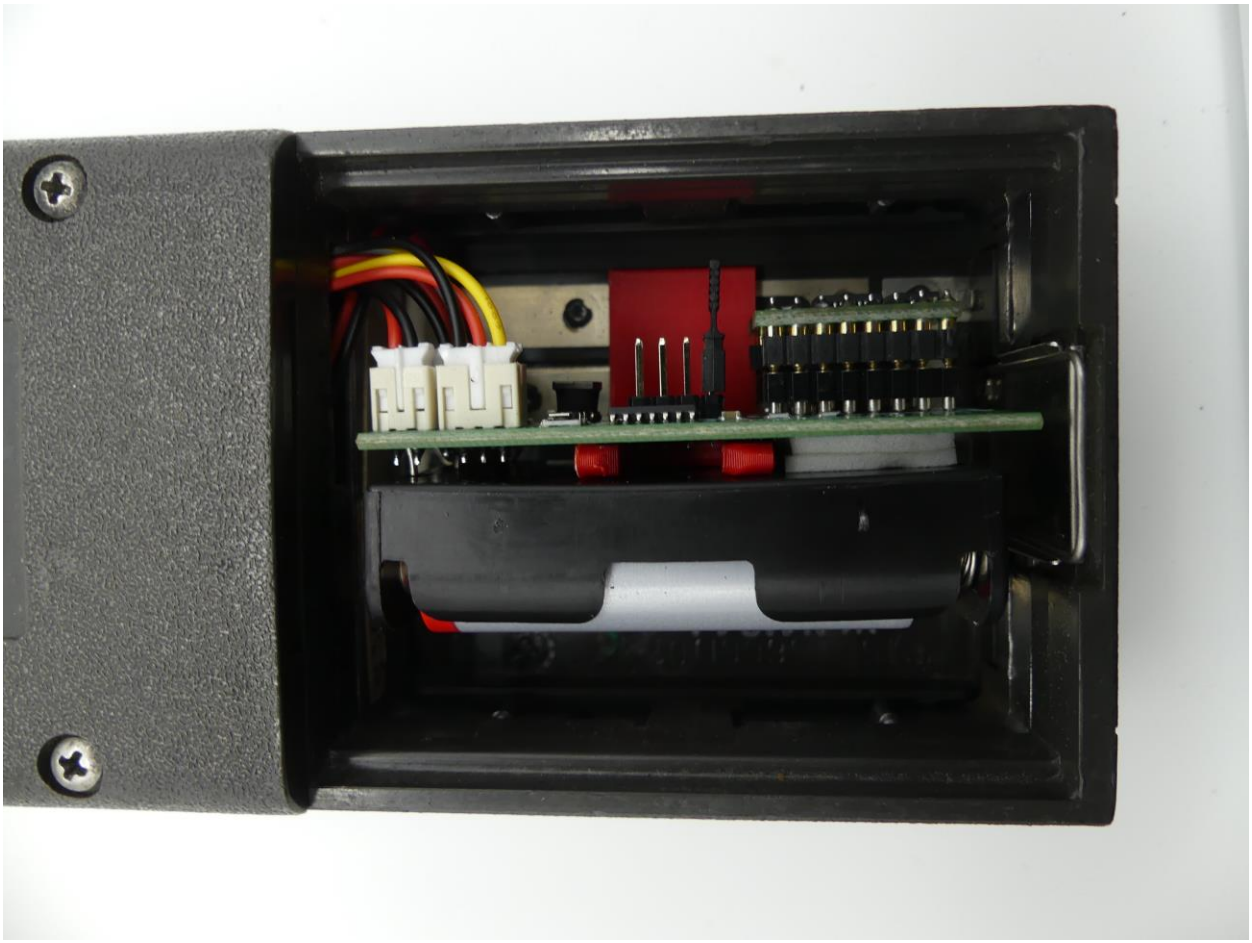
I use a grinding wheel on the Dremel and remove about half the height of the cross member as seen in the photo above. The width is more than is needed but makes it easy to move the wires around later when changing the batteries. It could be much smaller than what is shown. I also make sure there are no sharp edges to harm any wires.

With the plastic frame in place, it looks like this:



Make sure the wires move freely and are not caught between the metal and plastic frame, then attach the back cover with the four screws.

The red mounting structure is designed to fit between the side plastic parts and sit flat on the electrical contacts that were modified to make a flat area:



The sound module should not be resting on the bottom as some room is needed between the circuit board and the wire loop that is used to secure the battery cover in place.

The last piece to add is the rubber pad to the battery cover so that it holds the sound module assembly in place when the battery cover is installed.



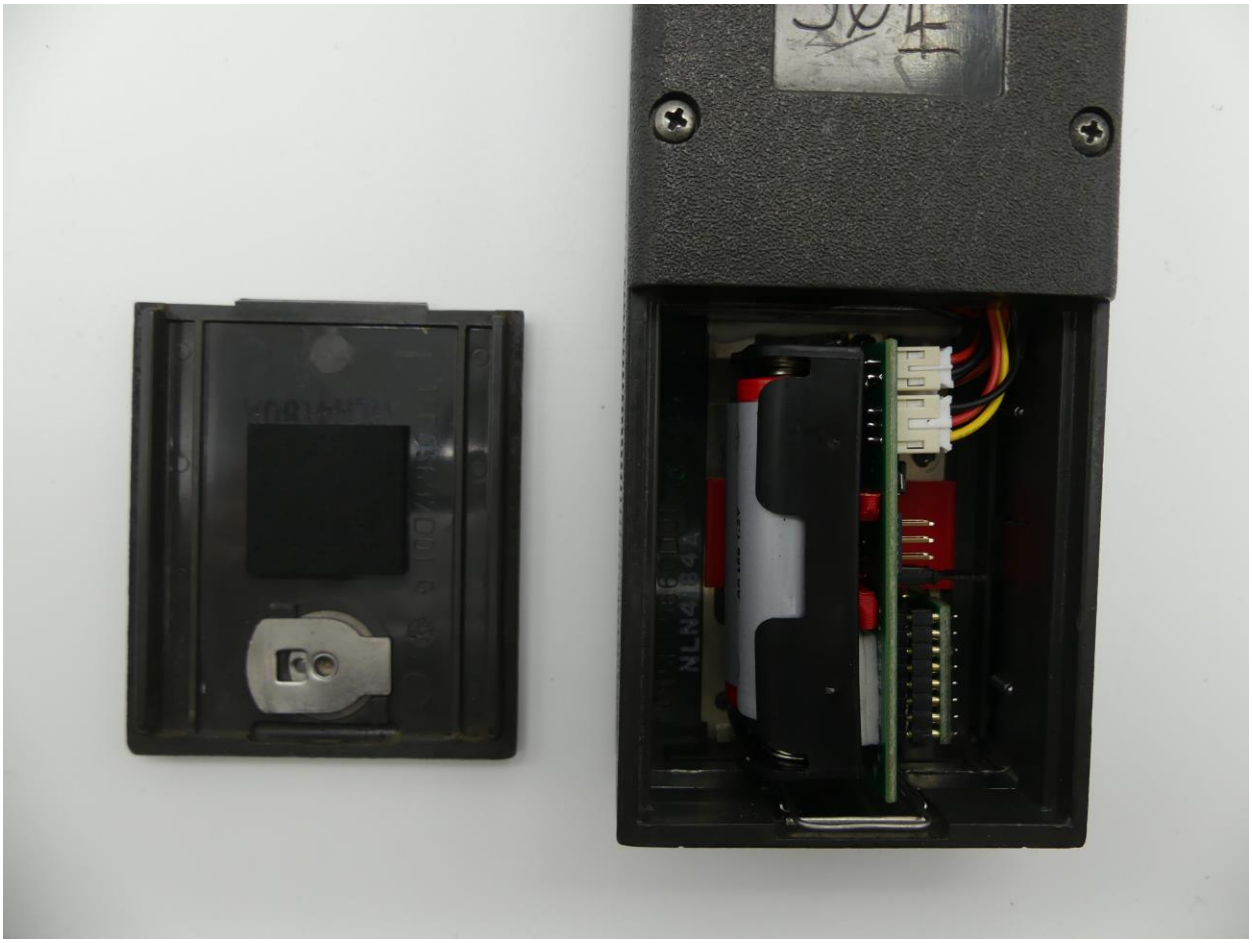
I scraped the decaying pad out with a flat screwdriver:





Cleaned it up a bit, peeled off the white adhesive protective cover and placed the new foam in the center of the cover:



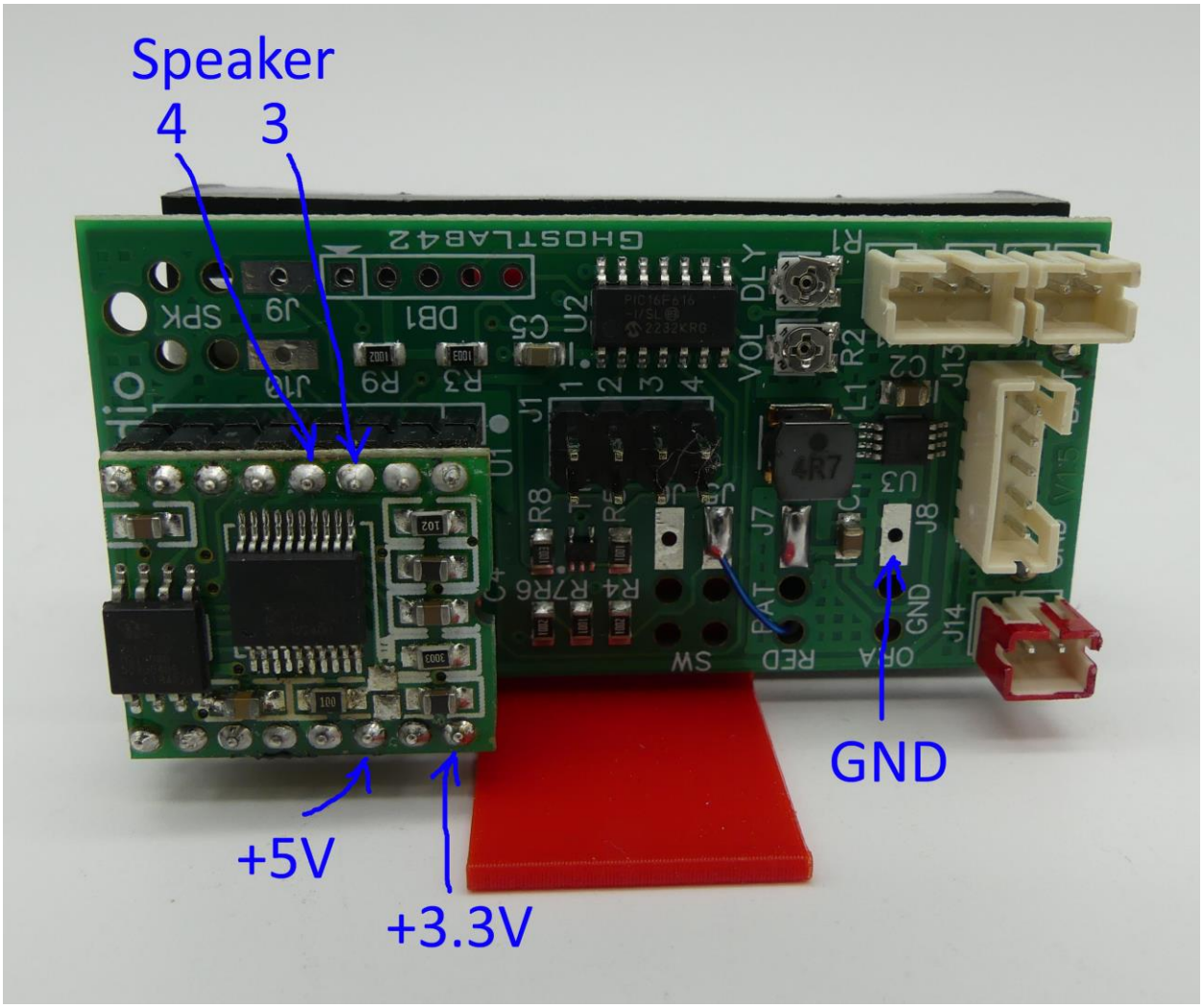


Troubleshooting:

As long as the sound module is not in test mode (you can remove both jumpers to make sure) then after you turn on the power with the volume knob, continuing to turn the volume knob up and down on the radio should cause a “static” sound that changes with the volume setting.

Verify the batteries are oriented properly. If you have a voltmeter or DVM, measure the DC voltage of the battery when the power is turned on and see if it is greater than 2VDC. Measure across the tow battery terminals on the side of the battery holder closest to the 16 pin sound module mounted to the circuit board.

When the volume control is turned on and the wires are connected, verify that the voltage regulators are providing about 3.3VDC and 5VDC to the sound module: measure DC Volts between the “GND“ and “+3.3V” and the “GND” and “+5V” points on the assembly:



You can also check that the speaker is connected by turning off the power and then measuring the resistance between pins 3 and 4 on the smaller circuit board. The resistance should be between 45 and 25 ohms.