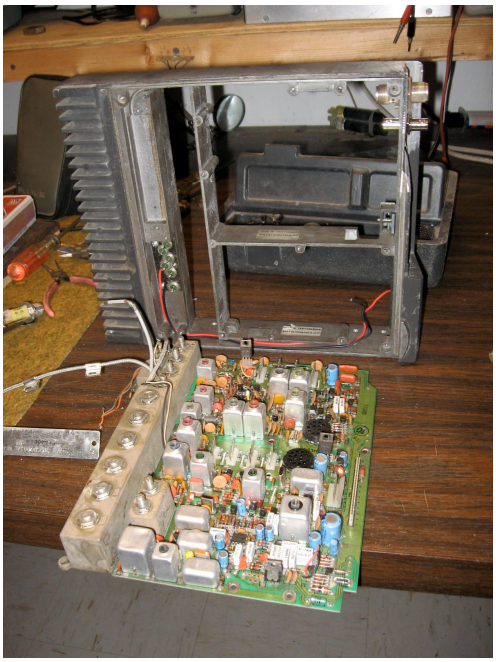
Motorola Mitrek RF port supplement
by Karl Shoemaker

Introduction:

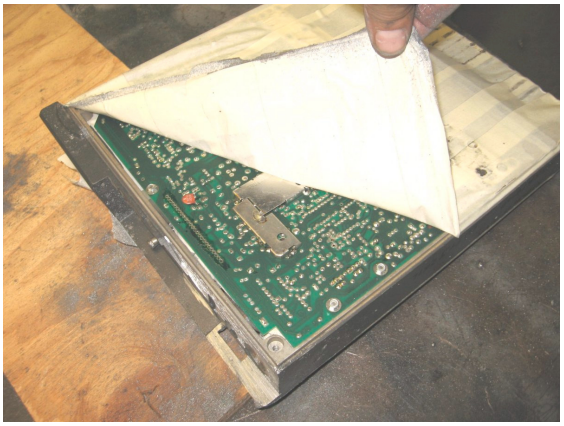
This document is a supplement to the conversion document found on SRG's web site. It discusses the coaxial RF connections for the radio for duplex operation in detail.

The RF I/O connections**: The big cut:**

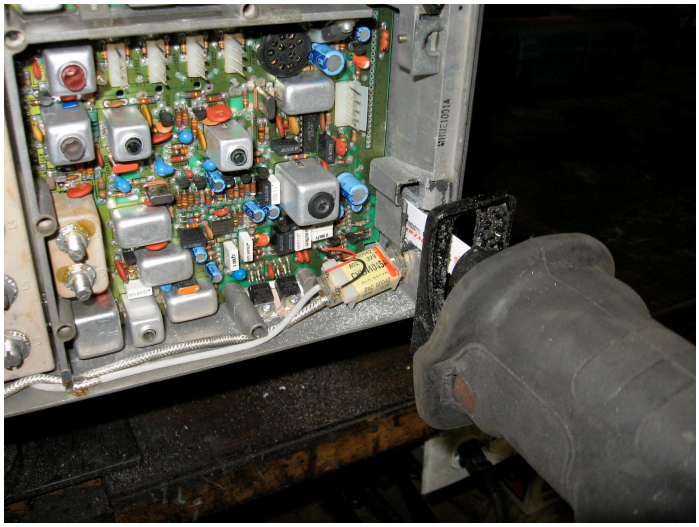
The stock Motorola Mitrek UHF radio uses one (UHF type) RF connector for Tx-Rx functions. For the radio to properly duplex you need separate Tx and Rx RF connectors for the coax runs to the duplexer (or two antennas). With the mounting of the radio on it's "right side", now making the old "front" the new "left" side, with the antenna ports. This leaves the new "rear" side give good clearance for smaller enclosures. Type N connector was chosen for the Tx port, while a BNC for the receiver. The hole for the old single connector is the correct size for the Tx port, plus, the hole for the 2135 key tumbler is also the correct size for the Rx port. The first major modification is the mechanical / chassis. Remove the T-R relay, 2135 core/tumbler and handle parts. These and the mobile mounting plate are discarded. This allows the cor board to be mounted in place of the stock PL deck.



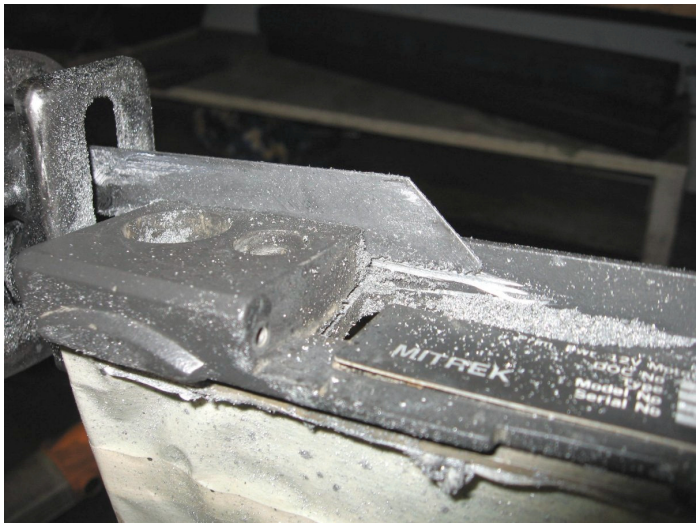
The only problem is the sloping surface makes it impossible to mount these connectors. To solve this problem the front needs to be cut straight and thin enough for most RF connectors. You could remove the electronics to prevent metal contamination, or you could "seal" off them as discussed here. By using masking tape to completely cover the main board and using a reciprocating saw carefully you can do this with a high probability of success.



The next page will illustrate the process of cutting the front panels. Since the radio chassis is aluminum it's practical to use a reciprocating saw blade. There is room for the blade without cutting the circuit board.

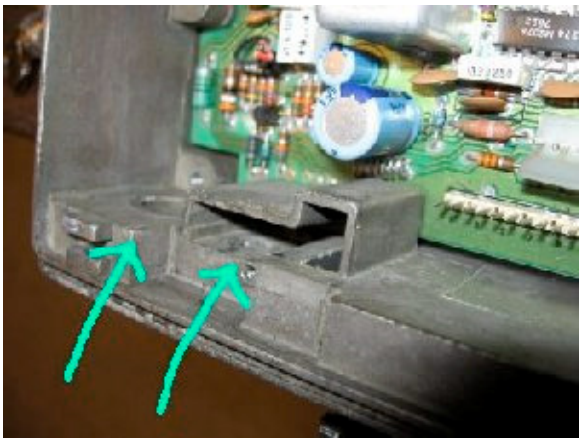


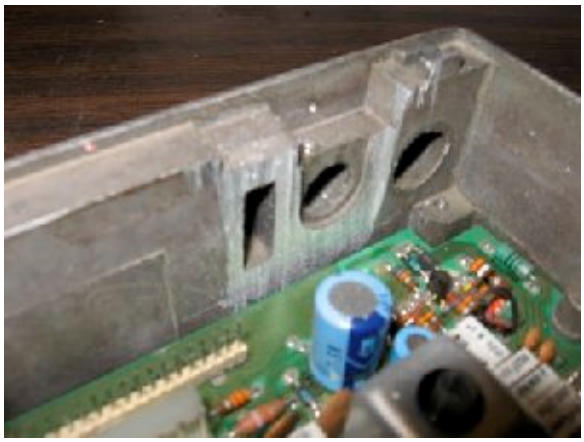

MITREK

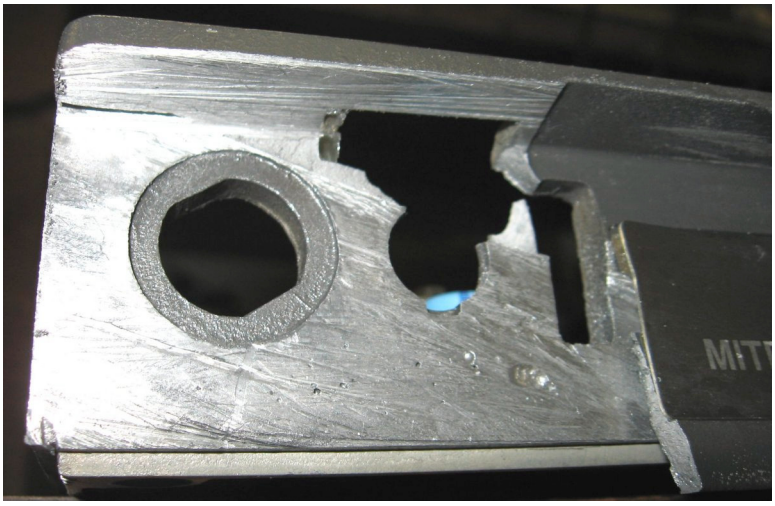

MITREK

As mentioned earlier, if you choose to remove the circuit board remove all the main board screws, unsolder the wires at the feed through caps in the rear, and lift out the main board and RF front-end chassis. There may be some miscellaneous straps to unsolder as well. If you choose to leave the board in, and take very special care, you can run the blade between the chassis and board.

Place the radio in a vice, using the radio's heat sink, as not to damage the chassis. For this critical task, make the top cut, just under the lip of the radio. Then make the other cut starting with the blade up against the outside part of the little gasket "trench" of the edge. Blade placement is important to produce the correct metal thickness for the connectors. Next, pry up the cut part; it will break away at the proper spot. The pictures on the previous page show which way the cut was made, by observing the surfaces where the metal was. Any slight debris can be blown away with an air nozzle. In early (prototype) versions the cutting was done this way. Some of the pictures point out the areas of this task, cutting it and afterwards, with the board in place. You will have to gain a “feel” for doing this and several radios.







The last area to cut is on the inside where the key parts where located. Make the cut for this as well.
The right picture shows the finished cut; cleaned up and ready for connector install.

This will appear messy, but once cleaned up this will make the proper mount for the connectors. Use a spray bottle with alcohol and a high pressured air nozzle to wash away the aluminum shavings. Then you can peel off the masking tape. Then clean or check for any debris.

The whole process does look like a scary task and there is a real possibility of destroying a radio if you are not skilled with metalworking. Out of the 12 radios modified by the Author only one was damage in a minor manner, but still usable. In addition, this was due to impatience, where the cut was not complete and while breaking away the cut piece, it tore into the Rx port area, somewhat. Shown here with the shavings cleaned off. Even though this would hold the connector the Author discarded the chassis and installed the electronics in another good one. There were many radios available to the Author, and in various conditions (some not working or with problems) so swapping good parts made a line of quality products.

Shown here are the completed connectors; in and outside views. The rear “shoulder” of the BNC connector should fit nicely in the little “ridge” in the inside of the radio. However, you will need to shave down the top half (or so) of the connector’s shoulder as shown in the right picture.

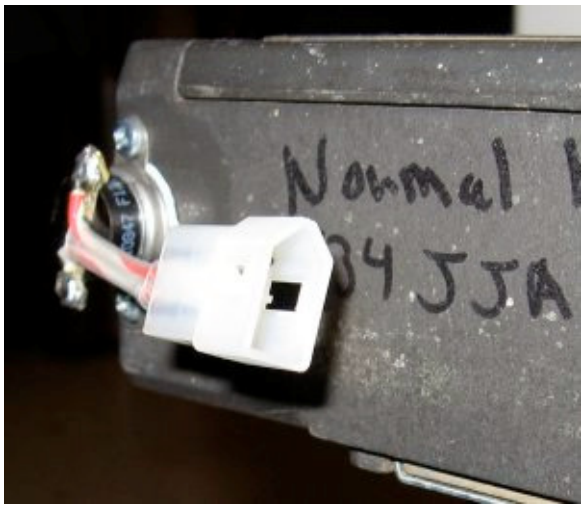
By using different connector types it's improbable to connect the coax cables backwards, thus preventing radio damage. A special type of semi-ridged coax (RG-405) was used for the Tx connection. Loss of this cable was acceptable. Beldon’s equivalent is T-1767 (old number) or 167A (current number).

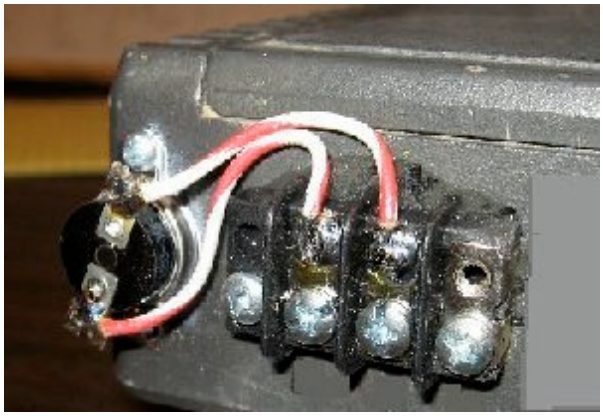
Thermo switch:

Another problematic area was the heat sink thermo switch which tells the cooling fan to activate when needed. A quick way to disconnect the wires going to the fan unit was needed for radio servicing. The original way had a couple of "spade" type female slip-ons crimped/soldered to the fan wires as shown in the left image. While moving, packing or transporting this left the issue of this device catching on a seat, clothing, etc and pulling off.

Another improvement was to use a "pigtail" for the disconnect. That gives it some flexibility should it catch on outside objects. Later, it was decided to install the molex "shell" so the pins stay together. Doing this also improves the reliability, so that one wire does not come loose by itself and unplug. The fan wires were now the mating end. It was undecided which connector sex to use. This is reasonably secure and still can be quickly unplugged.

Here shows an improved version by shortening the original tabs and soldering the quick disconnect pins to them. However, this still presented some problem of catching and pulling on outside objects.





Shown on the left is the compound used to transfer the heat to the switches.

Finally it was decided to use what's been around for about 100 years, which is a terminal barrier block. Therefore, a 2-position 140 series block was mounted on the (new) backside of the unit, as shown in the right picture.

Since the thermostat is mounted about 7mm back from the edge, mount the block a little further back. Drill two pilot holes, starting with 28mm OC from the edge for the left mount and about 57mm OC for the right mount of the block. Arrange these holes so the block is centered, vertically. Once you've verified the holes are centered, Use a 7/64" drill to enlarge them, then tap for an 8-32 x 1/2" machine screw. Epoxy glue was also added behind the block. This now is called "TB2". Simple spade lugs can be used to make the wire connection to the FCU (Fan Cooling Unit).

Note: TB2, the FCU and most other circuits and wiring is low voltage to prevent a shock hazard while working inside the equipment cabinet. There was some (internet) discussions about the reliability of high voltage (AC) fans however, the Author prioritizes safety as first. Also, The Author's design calls for FCUs to run only when needed, instead of the 24/7 mode like so many companies choose to run their equipment. This also reduces dust contamination and (annoying) site noise level for the technicians working there.