Clansman PRC-351 - Modification to operate radio on 10m band

Introduction

The Clansman PRC-351 is a man portable radio with a maximum output power of approx. 4W and an operating frequency range of 30.000MHz to 75.975MHz. This frequency range will allow the radio to be operated on the 4m (70MHz) and 6m (50MHz) amateur bands but there are certain useful frequencies slightly outside of this range that the radio can be tweaked to operate on with relatively little technical expertise (and a bit of patience)

Please note that in writing this modification instruction I have simplified the explanation of the workings of the radio to keep the instructions brief and to avoid getting swamped with details that aren't relevant for carrying out the work in hand. Further detailed technical information can be found from EMER F582 (PRC-351/2 Technical description)

Also note that this mod instruction is not entirely applicable to the 351-M which has been modified for data use and is recognised by the letter "M" written on the case with a red label above the first audio socket. The 351-M can be modified for 10m, but due to the additional wiring in situ extra care must be taken when stripping the radio.

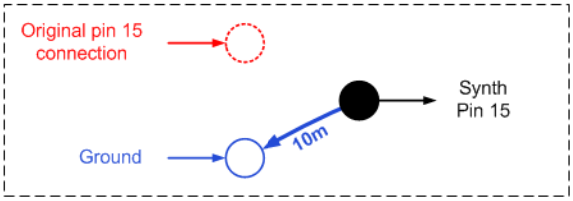
10m band

The UK 10m amateur band allocation is currently between 28.000MHz and 29.700MHz, the FM portion being 29.100-29.200MHz and 29.600-29.700MHz (using 10kHz channels) with a 29.600MHz calling channel. Due to its unique spot in the spectrum, 10 metres can be interesting to work. At peak times of the solar cycle when sunspots appear on the Sun's surface, 10 metres can be alive with extremely long-distance signals, refracting from the F2 layer in the ionosphere.

Technical Overview

The frequency setting switch on the radio provides a series of binary voltages to the synthesiser to indicate what frequency the radio is set to. By interfering with these voltages we can "fool" the radio into thinking a different frequency has been dialled. This modification shorts one of the synth pins to 0V to simulate a 2 on the 10MHz switch instead of a 3. So when 39.6MHz is dialled up, the radio will actually Tx/Rx at 29.6MHz.

The modification is achieved with a simple two way toggle switch that grounds pin 15 of the synth when switched to 10m mode.



Modification instructions

Kit required

Screwdriver type allen key 3.5mm
Small flat point screwdriver
Soldering iron
Desoldering tool
Dual pole mini Toggle switch
3 x Coloured wires – Pink, yellow, purple (30cm)
Heatshrink/Hellerman sleeving
Wire snips
Drill
Bradawl
Snipe nosed pliers

Test the radio

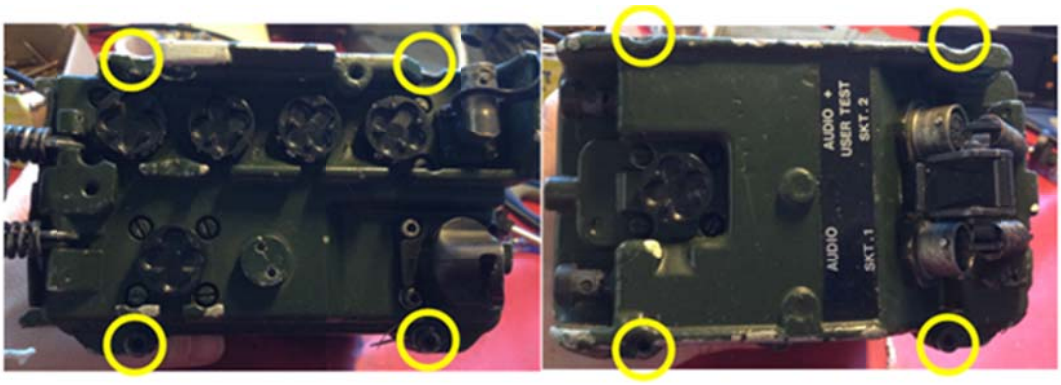
It is highly recommended that the radio is tested before attempting the modification, to ensure that it transmits and receives on both bands correctly at the top and bottom of each band. The two bands are as follows

Low Band: 30.000 – 47.975MHz
High Band: 48.000 - 75.975MHz

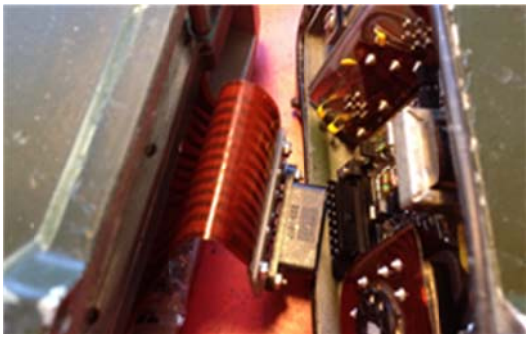
If there are any issues with modulation, sidetone, pilot tone, or basic Tx/Rx then these problems should be fixed first before proceeding with the mod.

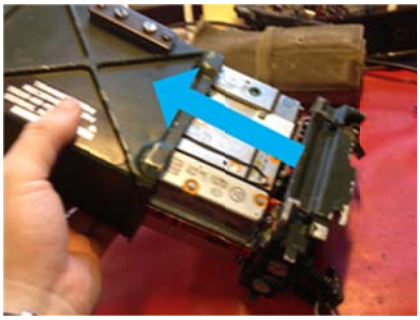
Remove the case

Unscrew the 8 allen bolts on each end of the radio as shown below. They are self-retaining, so don't worry about them falling on the floor and don't try to unscrew them out of the body!



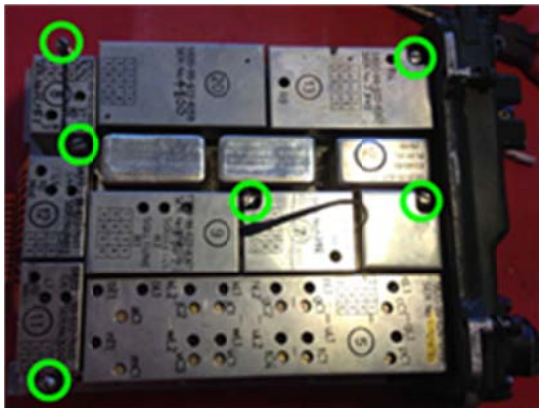
Remove the remote panel by unplugging it from the main body as shown in the picture on the right, then removing the case as shown below.

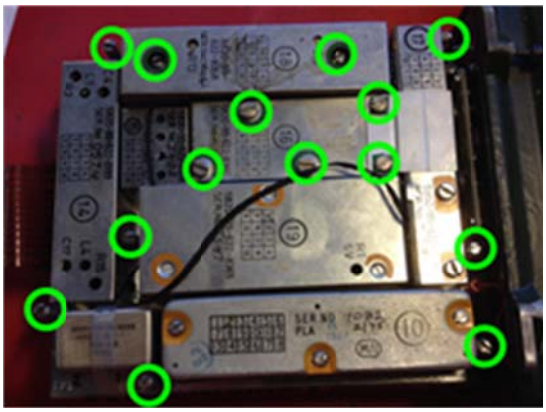




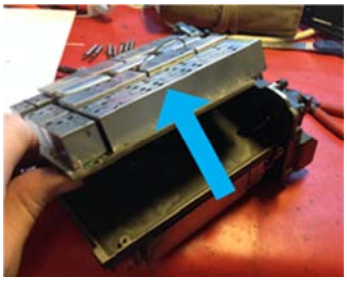
Separate the guts from the frame

Now the main assembly needs to be separated from the frame. Remove all the bolts as shown with the green circles below (they are also circled green on the radio itself)

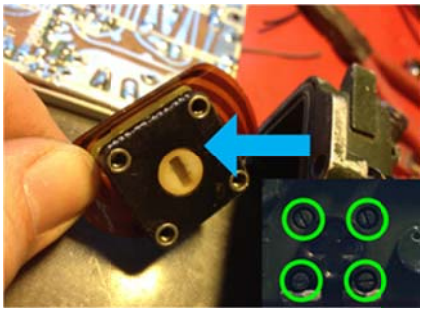


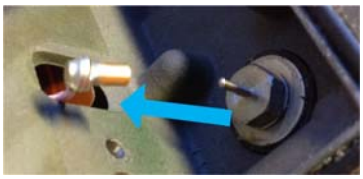


Note that the two bolts within module 18 should remain in place and the 5 screws in module 16 are screws not bolts and the little plate needs to be removed as well.. Note also that the bolt by assembly 17 is longer than the others (below left). Carefully unplug the RF connector linking the two halves as shown below centre, then the top half should fold away from the frame as shown below right.

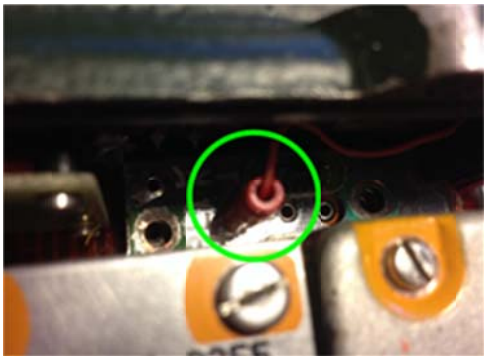


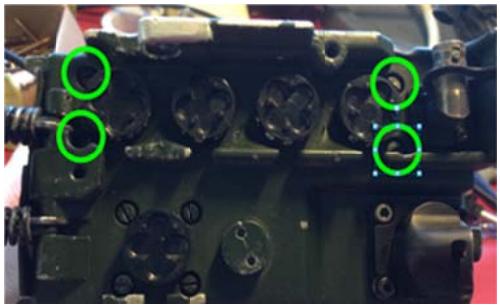
Now remove the flexi behind the On/Off switch as shown on the right, by unscrewing the 4 screws surrounding the switch (they are not self-retaining, so will come out). Unplug the battle antenna wire (below)

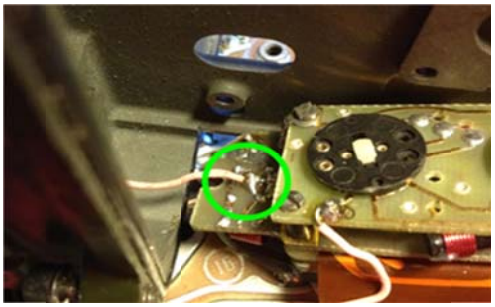




Turn the radio over and remove the power plug (top left below), unsolder the white and black wires from the frequency switch circuit board (top right below) Unscrew the four screws retaining the frequency switch circuit board (bottom left below) and desolder the pink wire (bottom right below)

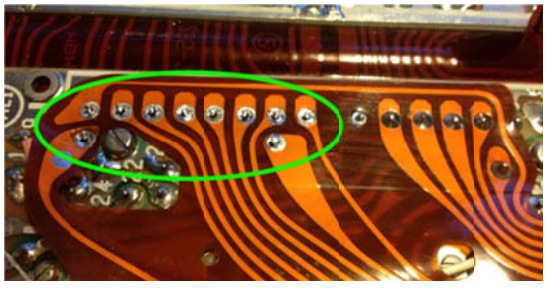


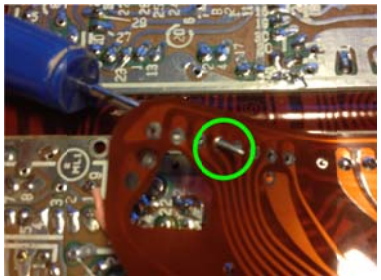




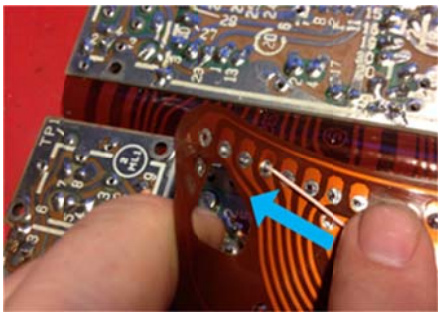
Connect the switch wires

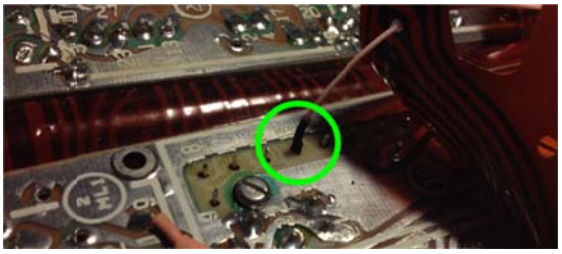
The whole motherboard assembly should now come away from the main body, giving access to the flexi connector. Desolder the left most 10 pins and lift up the left side of the flexi to get at the pins. Poke the bradawl through the 4th hole along the flexi to make the hole a little bigger, but do not destroy the solder ring as you will need this to be intact to solder another wire to.



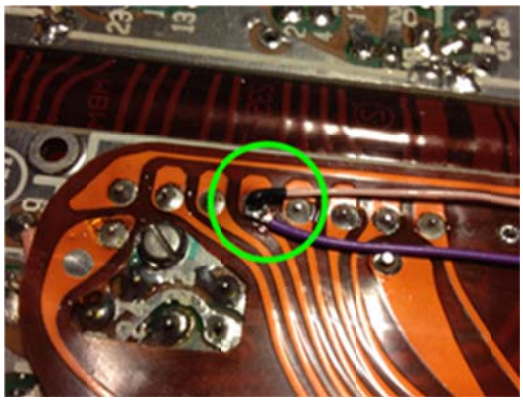


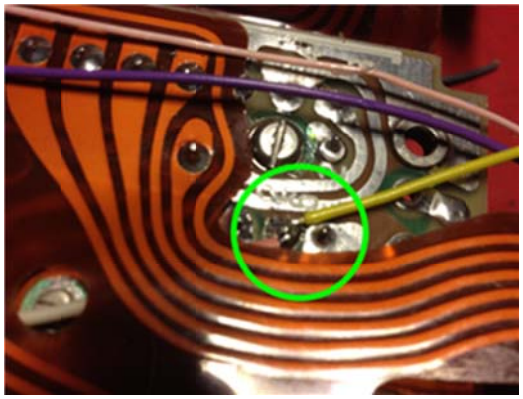
Poke the pink wire through the hole and solder it to pin 15, ensuring minimal thickness, so that a thin heat shrink can be put over it as shown below.



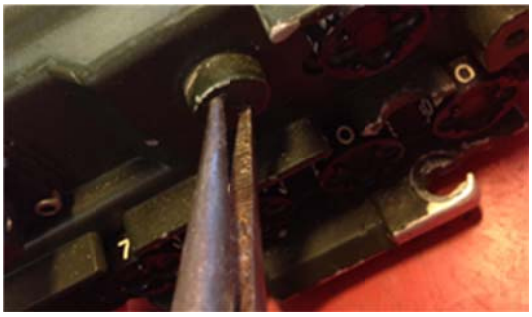


Place the flexi down back in position and solder the remaining 9 pins back in. Then solder the purple wire to the outer ring of the flexi that used to connect to pin 15. The flexi should be insulated from the pin (check this with an ohm meter). Now solder the yellow wire to a suitable earth point.. the one shown below is the shield from a short RF cable on the motherboard. (When the 10m switch is in the "normal" position, the pink and purple wires will be connected as if the flexi was still soldered to the pin and when the switch is in the 10m position, pin 15 (pink wire) will be shorted to earth.)



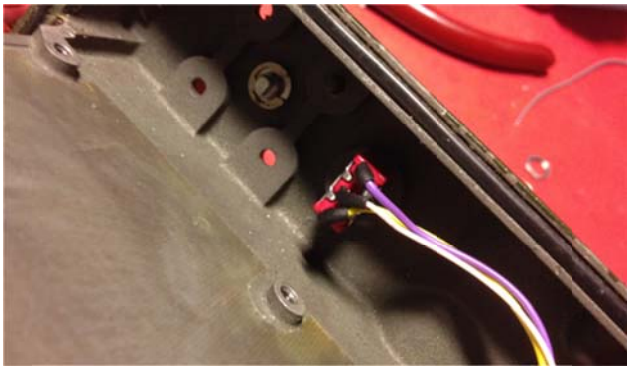


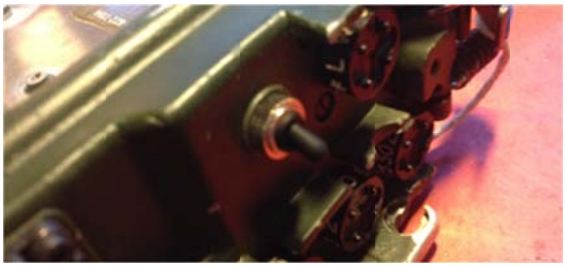
Now you should have three wires all neatly together running flat along the motherboard. These need to be fed to the other side of the frame, through the hole shown in the photo on the right, as you put the module board back on. Take care to ensure that the wires all stay out of the way of where the bolts go. Place the frequency switch circuit board near to where it should go, then place the pink battle antenna socket back through the same hole and re-solder the pink wire. Carefully place the board back into position, putting the 25kHz switch end in first. Gently wiggle it around until the board locates with the 25kHz switch and can be clicked through. Then do the same to the next three switches in turn until they are all in place and the screws can be replaced. Re-solder the white and black wires and put the red power plug back in position. Now screw one or two bolts in the module board to keep it in place.



Remove (and dispose of) the drying and sealing plug as shown on the left, with a pair of snipe nosed pliers. You will probably need to drill through the hole for the toggle switch to fit through (I use a 6.5mm drill bit) As you drill, you may find the whole thread comes out or disintegrates, or stays in place.. As long as your toggle switch fits through with enough thread to screw the retaining nut on, that is fine.

Terminate the three wires on the switch and put some hellerman sleeving or heatshrink over them to insulate them as it is a bit tight in there when the modules go back in. The pink wire goes in the middle. If the purple one goes on top as shown, then when the 10m switch is in the up position, that will be 10m, when it is down (as shown below) it will be normal operation. If you prefer it the other way round, simply reverse the colours

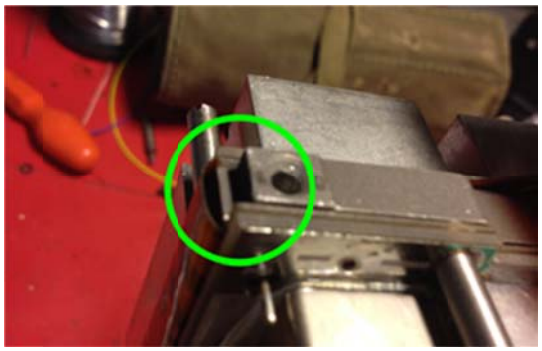




Now replace the on/off switch flexi board and fold back the rest of the module assembly into place. Ensure the RF plug gets plugged back in and screw a couple of bolts back into place.

If you have a battery extension lead or a test rig, you can now test the radio to ensure all is as it should be before putting it all back together. If you don't, then you will just have to put it all back together and hope for the best when you test it out with the battery and whip connected..

Ensure all bolts are back in place and remember where the longer bolt goes. Check that nothing has come unstuck (i.e. everything is soldered back on, power plug connected, RF plug connected, battle antenna plug connected) and slide the main case back on. You will notice there is a lug on one part of the case (shown below left) Sometimes this has snapped off, so look for a rough bit of metal instead. This should marry up with the slot on the radio body (shown below right) Plug the remote panel back in and screw the 8 allen bolts back into position.



Operating instructions

Normal operation

To operate radio normally, the toggle switch should be set to the off position (i.e. down) and radio will work as normal.

10m operation

1. Dial up 39.600MHz
2. Flick the toggle switch to the 10m position
3. You will now Tx/Rx at 29.600MHz

*note that the radio should go as low as around 28.500MHz without going out of lock, which gives you a fair amount of breathing space as the FM allocation is above 29MHz.

**the 10m allocation currently advises that the channels to be used between 29.100MHz - 29.200MHz and 29.600Mhz – 29.700MHz have 10kHz spacing. Due to the fact that the Clansman range of radios use 25kHz steps instead, this means that some channels aren't available for use. Usable channels are 29.100, 29.150, 29.200, 29.650, 29.700 and the 29.600Mhz calling channel. This allocation may change in the future, so please check your local licensing conditions.

Disclaimer

When performed correctly this modification should cause no problems to the normal operation of the radio set, however damage can be caused if care is not taken when installing the switch and connecting/disconnecting the wires. The Clansman range of radios are getting on a bit, some are over 30 years old, and consequently solder joints etc could have deteriorated and if disturbed, could cause faults unrelated to the changes made with this modification. The author cannot be held responsible for any resultant fault or damage caused to the radio when performing this modification.

Credit

Thanks goes to Ian Foord (GØTJH) for originating this modification a few years ago, I just had the pleasure of writing it up (eventually).. Good luck and 73's

Steve Slack
MØSLK/9H4SS

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www.clansman-radio.co.uk