Clansman PRC-320 - Modification to add LSB mode

Introduction

The PRC-320 is a mobile HF radio covering a frequency range of roughly 2-30MHz. Operating modes are AM, CW and SSB. SSB is actually USB only, therefore this modification is to add LSB mode for use under 10MHz when required by protocol.

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 F592 (Technical description) or from the many forums on the internet such as VMARS and the Yahoo groups.

Technical Overview

An LSB oscillator is added into circuit to replace the USB one, to enable use of the lower sideband. When in USB mode, the new oscillator is muted. When in LSB mode the existing USB oscillator is muted.
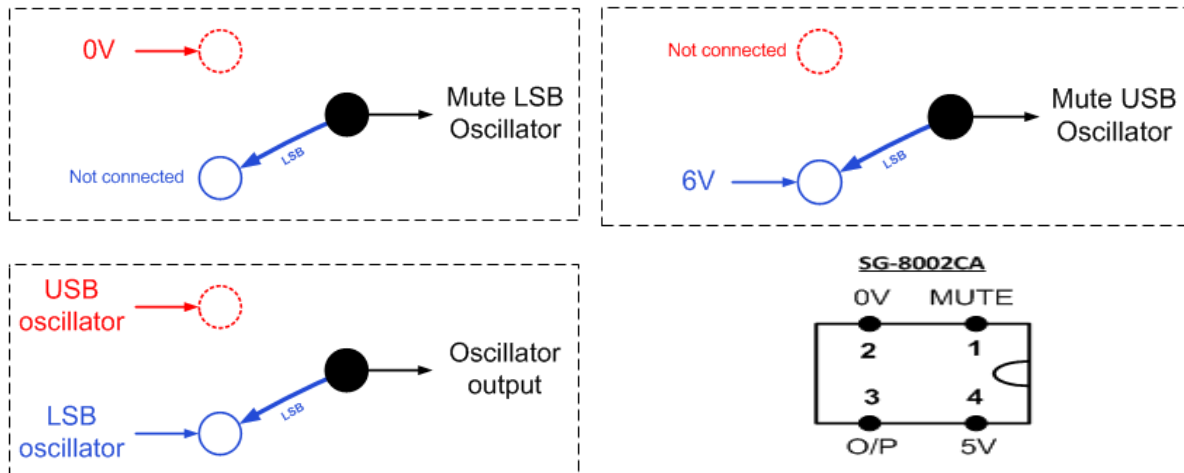
Note that there are no capacitors/tuned circuits etc included in this modification, just a couple of resistors and a diode. Many people prefer to put these components in situ, but their necessity is a matter of debate! Standard 7/0.2mm wire is used, no screened wiring is required.

There are many ways to incorporate switching into the radio, including invisible magnetic reed switches or utilisation of battery check or CW switch positions. My personal preference is to have a visible up/down toggle switch on the front panel. True, it makes it look less "authentic" but it is easier to see which mode the radio is in at a glance and the modification itself is a lot simpler to perform.

Modification instructions

Kit required

Allen key **3mm**, Flat head screw driver, wire snips/strippers
Heat gun and heat shrink
Coloured wires 7/0.2mm:
15cm black, grey, brown; **25cm** green, red, orange; **40cm** purple, pink, white, yellow
Soldering iron
Triple pole Toggle switch SW318 on/off (9 solder tabs)
Switch cover SW453
Drill **6.5mm**
Small cable ties, insulating tape
22kΩ Resistor, **4.7kΩ** Resistor, **1N4148** Diode
SG-8002CA 5V PLL Oscillator (1.7468MHz) (some kits have a **EPSON 2-D2521**, same spec/pins)

Preparation: Wire the toggle switch loom

Firstly, wire up the toggle switch and components as shown. The neater you do this bit, the easier the rest of the mod will be to perform and the lesser risk of short circuits. The lower the profile of the solder tags the better - I have soldered my wires horizontally with no insulation, as the extra height of hellerman sleeving or heat shrink has caused problems in the past.   Another option to reduce the height of the switch profile is to cut the tips off the switch solder tags to make them shorter. Care must be taken when doing this so as not to damage the main body of the switch. Also take care not to hold the iron on the tabs for too long as some switches don't handle heat well.
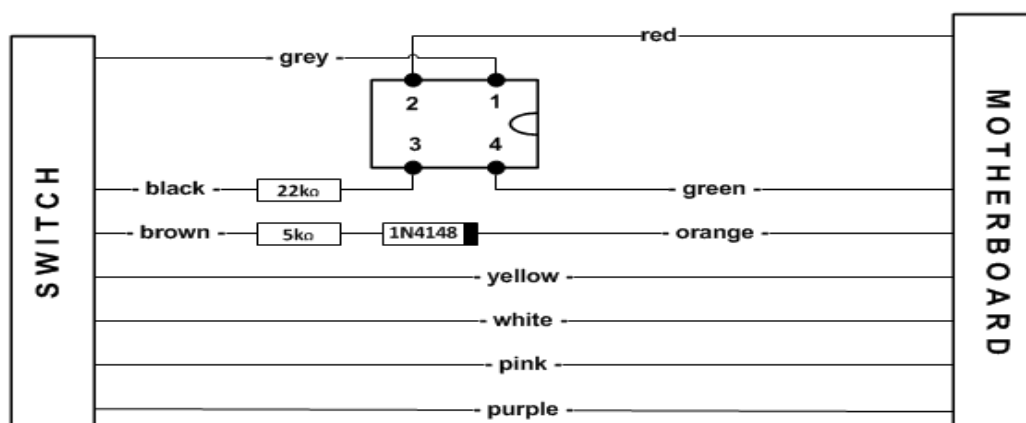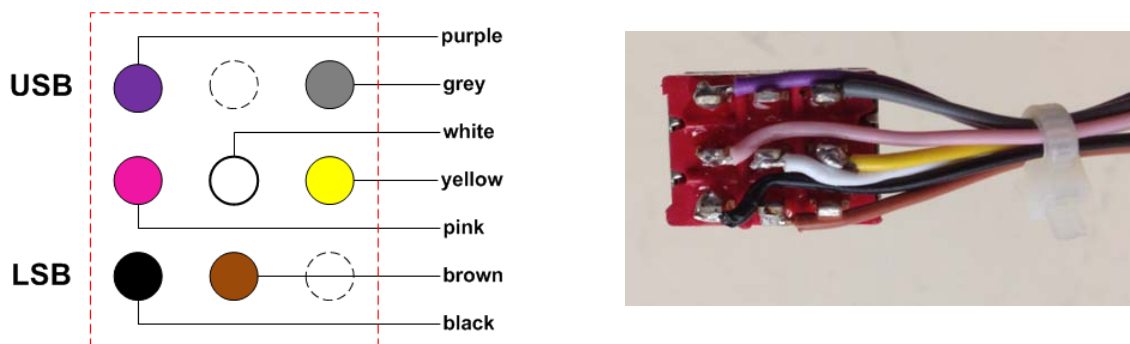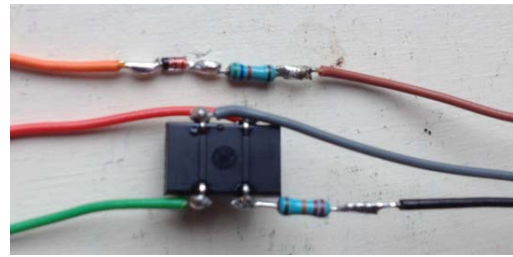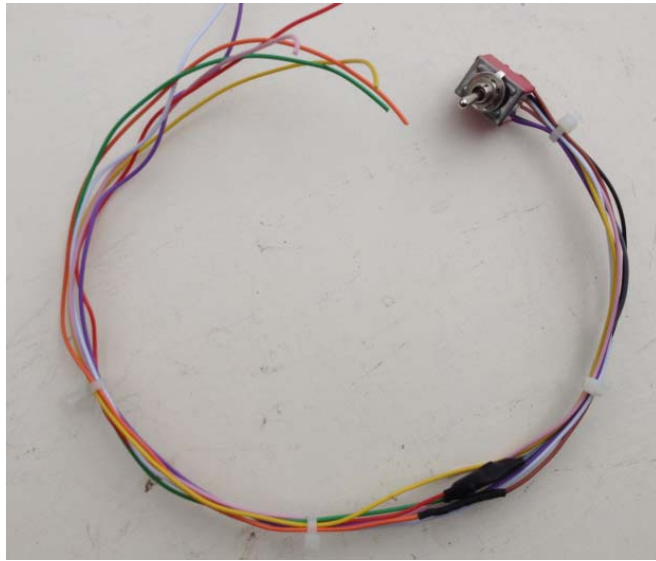
(Underside view of switch)
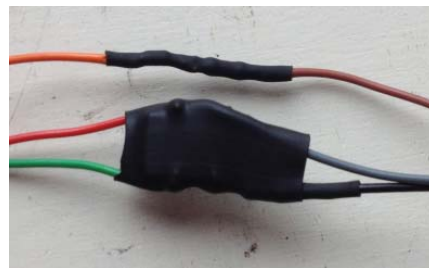
Preparation: Test the radio

It is highly advisable to fully test the radio prior to disassembly and also with the main case off, just to make sure the radio is functional prior to working on it. This way, if the radio does not work after the mod is complete, you know it was something you did that messed it up!

Remove the case

Remove the 28 allen bolts front and rear with a 3mm screwdriver style allen key. Gently remove the rear panel and the case and rest the main assembly on its front.
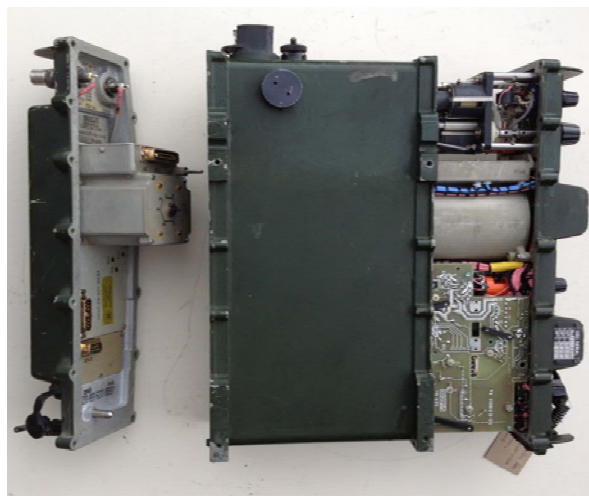
Remove band turret

Remove the five flat head screws holding the band turret in place and gently pull the turret away from the front panel. Also remove the screw that holds the loom in place under the turret. Be very careful not to disturb the locating disc - if it does slip off, it doesn't matter too much, it's just a bit fiddly to put back on.
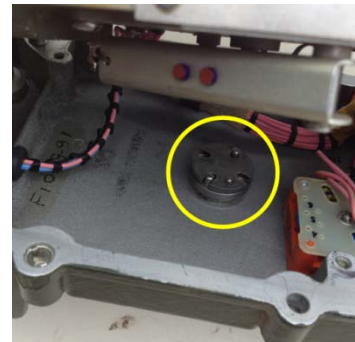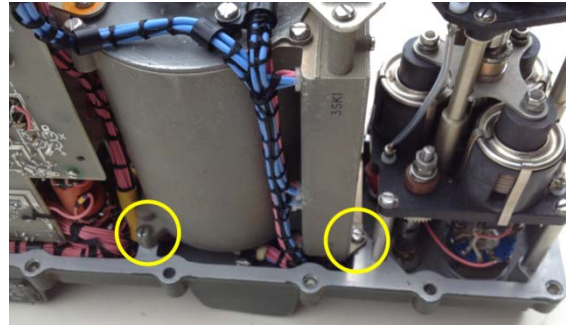
Drill hole and insert switch

Carefully drill a hole in the position shown (roughly centered on the number 15), large enough to take the shaft of the switch (mine is 6mm). Ensure all swarf and filings are removed and that there are no burrs on the edges, then insert the switch and wiring loom. Be very careful how you tuck the wires away as there is a moving part very close to the switch underneath the turret assembly. It is advisable to put some insulation over the switch tags - be aware tape may not be sufficient to stop a short circuit (as I am painfully aware), so you may want to wedge some paper or cardboard on top as well. A cut piece of margarine tub is also very good as an insulator. Ensure that the switch is flush to the front panel, no washers or nuts in situ (apart from the one securing the switch on the front)
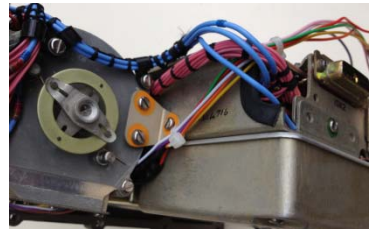Note that the switch is at a slight angle – this is to make best use of the space available. It is possible to move the switch further to the right so it can toggle completely vertically, but the wires could snag on the band selector latch, so be careful! An alternative space can be found to the bottom right of the band switch, if preferred, there is more space on this side.
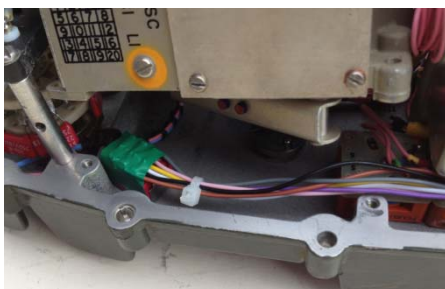
## Replace turret assembly and thread wiring loom
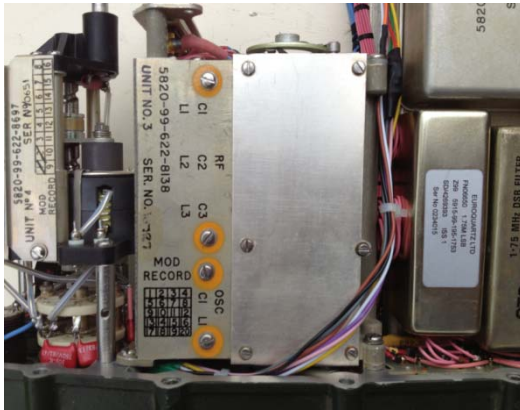
Very carefully replace the turret, try and ensure it is flush with the front panel on all four corners, (note this may not be possible in the position where the switch is, depending on the model of your radio), ensure the metal disc is in place, the rotary band switch is located correctly and there are no trapped wires. Check the turret is located by turning the band switch clockwise, then replace all five screws and thread the wiring loom as shown up past the PSU and tuck it out of the way

Motherboard connections

Scrape the track off the motherboard with a sharp knife as indicated (this is the oscillator input connection) Connect the other wires as shown, being careful not to solder nearby pins or tracks and making sure the wires are cut to the correct length and as tidy as possible.
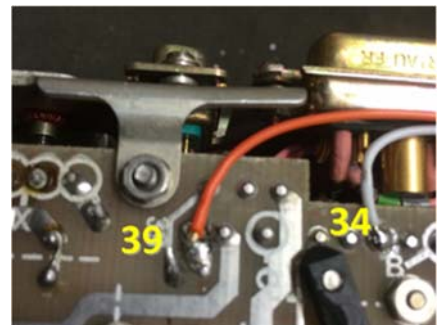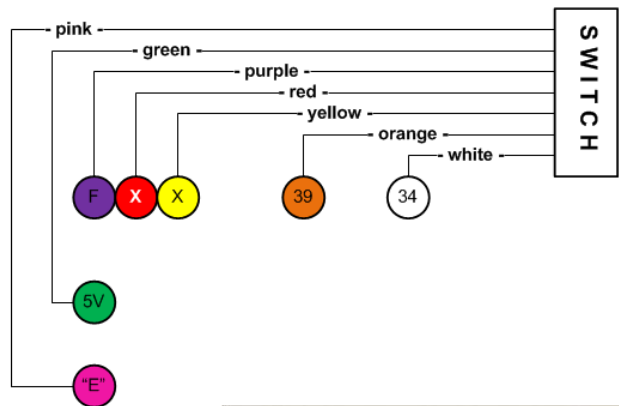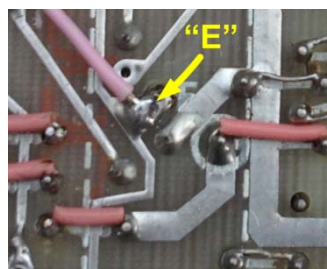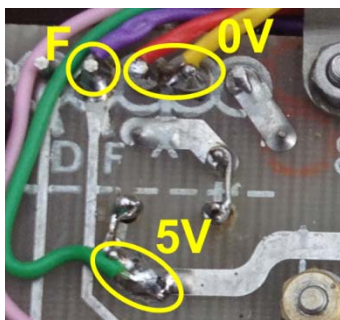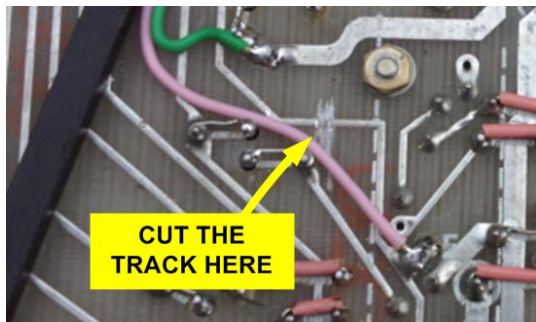
Fit rear module

Carefully replace the rear module, ensuring the band selection on the front panel matches with the orientation on the rear. It is easiest to do this by selecting the lowest band as shown below and turning the plastic bit on the rear module. When fitting the rear module ensure all three D connectors mate correctly - it is easiest to start with the two small ones.

Test the radio - no case

Due to the size of the toggle switch and the very limited space available, one of the most common problems is where one of the solder tags shorts to earth. Therefore it is advisable to replace the rear module without the main case, so that you can power up and test the radio with it opened up and visible.

Switch on and leave for a while to ensure nothing is smoking or heating up. Do the standard tests, paying particular attention to the ATU tuning - permanent FSD on tune is a dead giveaway for a TX fault caused by a stray wire shorting out! (as I am painfully aware) Also check to make sure no washers are floating around as they could obviously cause problems later.

Test the radio - with case

Now it is time to fully re-assemble the radio. Pay particular attention when replacing the case not to trap any stray wires, as these could also cause a nasty short that may only be noticeable when you screw the very last bolt in (as I am painfully aware)

Operating on LSB

To operate in LSB mode simply switch the toggle switch to the down position. Be aware that the frequency as dialled on the PRC-320 is the centre of the upper sideband, not the carrier frequency, so you must dial 2kHz higher to get the correct frequency as read by standard modern rigs. In LSB mode the dialled frequency is 1.2kHz lower than the carrier.

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 40 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

This modification has been put together with able assistance from:

Ian Underwood (M0YMK)
Iain Moffatt (G0OZS)
Peter Best (G8BLS)
Mike Burgess (G7HID)

Many Thanks!

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