

## PRC 320 Modifications – © Martin Ehrenfried – G8JNJ

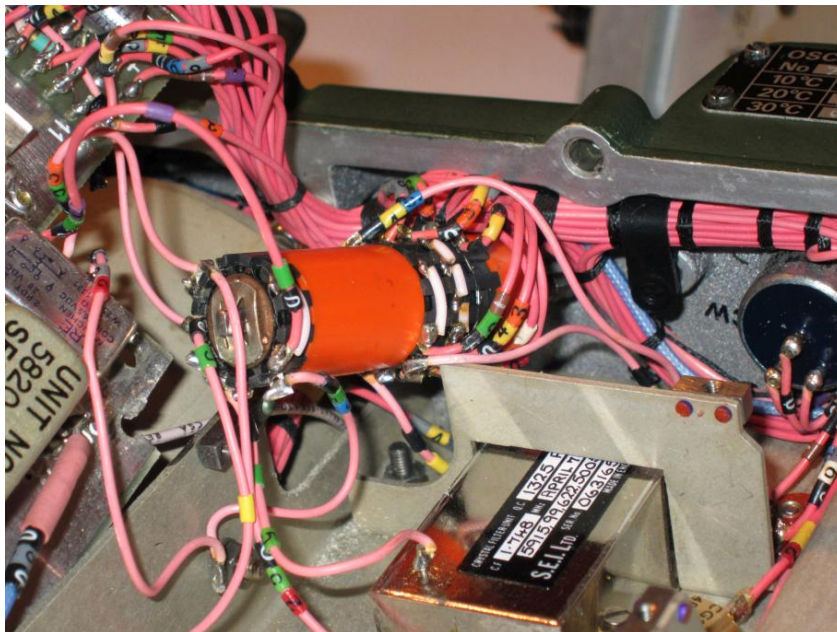
I have deliberately not given specific 'cut wire here' instructions, as the construction of the PRC320 does seem to vary considerably. This especially applies to wiring of the switch assemblies. However if you can follow relatively detailed information, and then translate it via the service manual to wiring inside the unit. You should be able to implement these modifications with little difficulty. I have added cable numbers to the modification diagrams, which may provide some extra guidance. However be aware that the circuit diagrams shown in the service handbook are not 100% correct. So you may need to piece together the actual wiring diagram from multiple drawings.

### Swapping CW (W) for LSB

This requires rewiring the mode selection switch.

The easiest way to do this is.

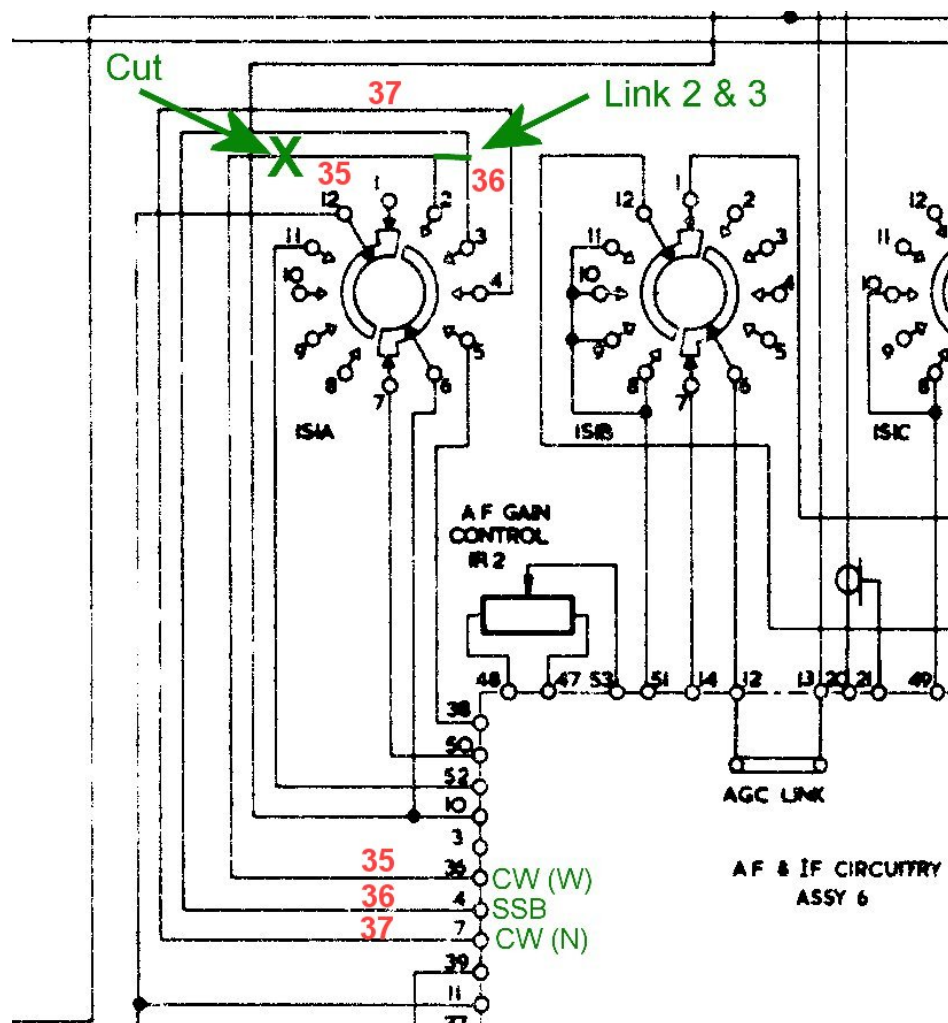
1. Undo and lift out the main PCB assembly (remove screws indicated with a green marker ring).
2. Pull off the mode switch front panel knob
3. Undo the switch fixing nut and remove
4. Undo the screw holding the cable retaining clip on the inside of the front panel
5. Carefully push the switch spindle so that the switch eases away from the front panel
6. Very carefully and slowly ease the switch and cable harness away from the front panel



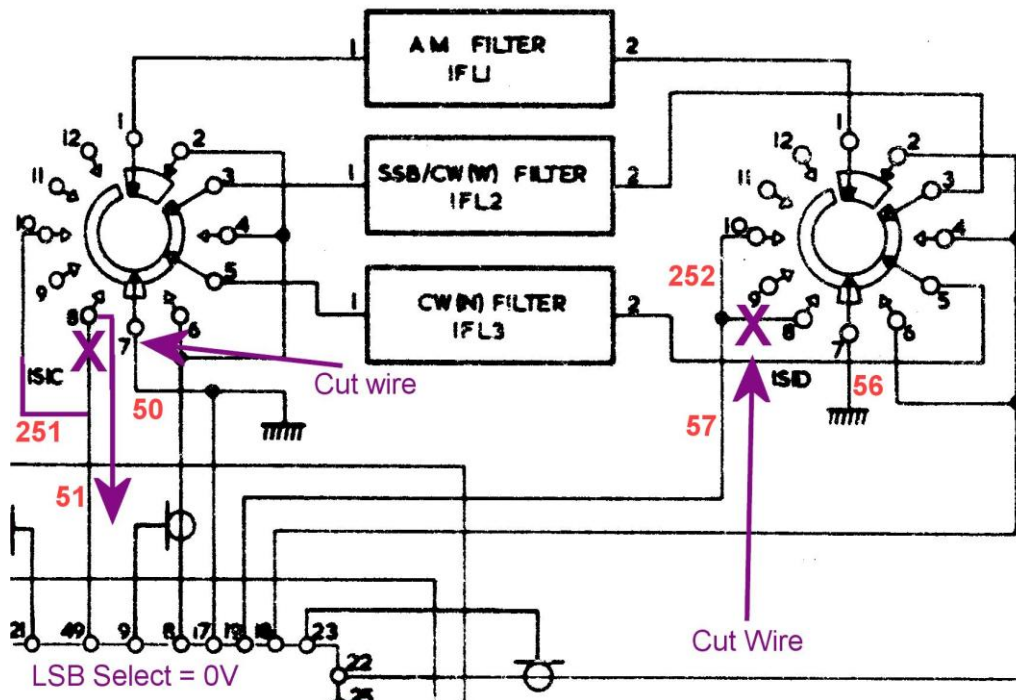
Some detective work is required to identify the various sections of the switch as they are NOT as shown in the service handbook. e.g. the contacts (other than those used for filter switching) are on different halves of different sections.

In order to change the CW (W) position to become LSB, two modifications are required.

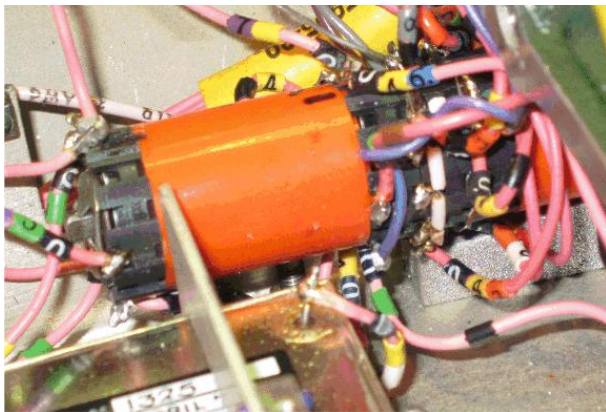
The first is to change the CW (W) switch position to be wired the same as the adjacent USB switch position. This involves removing the CW(W) select wire from the switch and linking the now unused switch position to the USB select switch position.



The second part involves deactivating the CW(W) selection and using the disconnected switch position to obtain a suitable control to activate the LSB oscillator and switching.

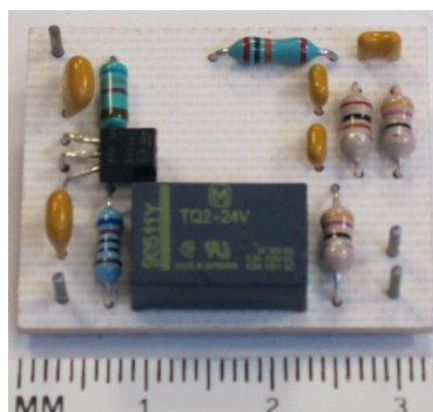
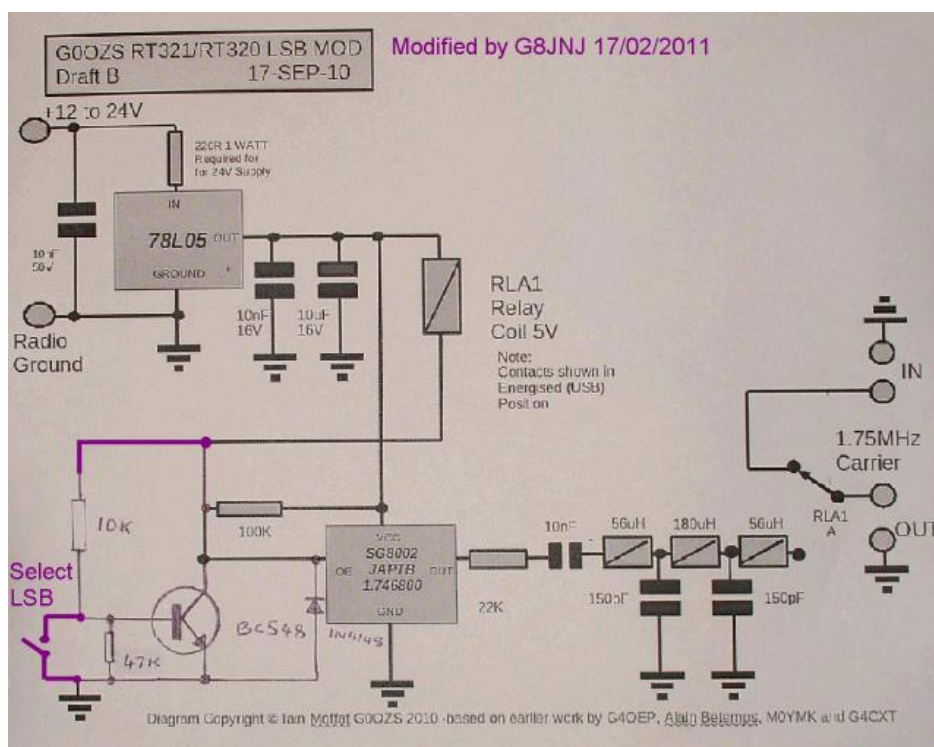


The new wire is pulled down to 0v when the switch is moved to the old CW (W) (now SSB) position. This can be used to activate whatever LSB oscillator switching circuit you have chosen to use.



Note that there is a small amount of 1.75MHz leakage from the reference oscillator which creates a 1.5KHz beat note on receive when LSB is selected. It is not easy to reduce this, because a lot of signals are carried on unscreened cable within the PRC320. It is possible to mute the 1.75MHz USB injection signal. But most of the leakage seems to be emanating directly from the synthesiser unit. So using the mute line does not completely resolve this problem. In practise the tone is not particularly noticable on the LF bands where LSB is most likely to be used, as the background noise level tends to mask it quite effectively.

But this would require the switching signal to be inverted using a circuit similar to that as suggested by Ian, G0TJH in the files section of the clansman\_larkspur Yahoo group.

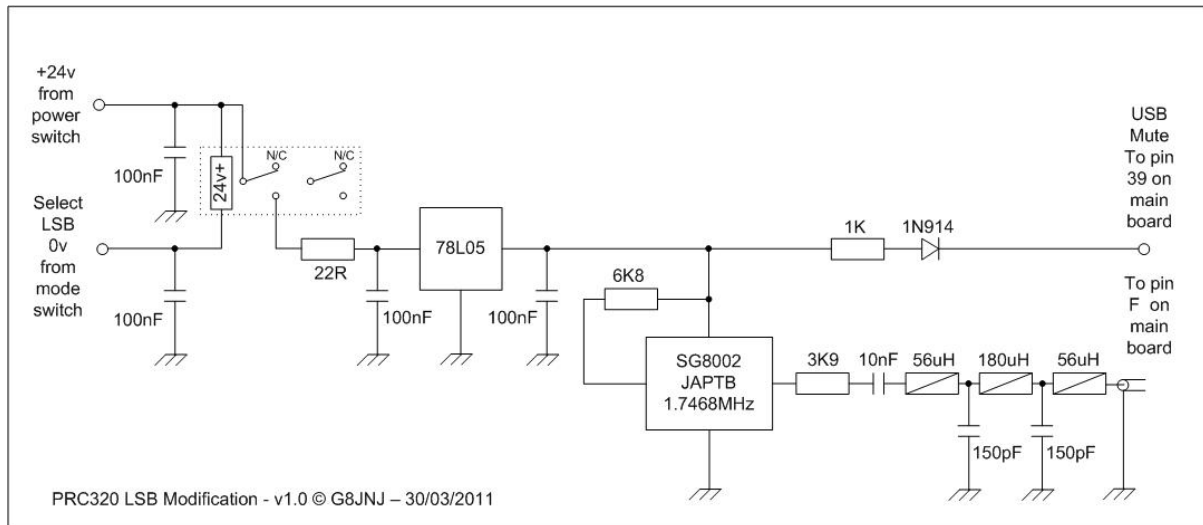




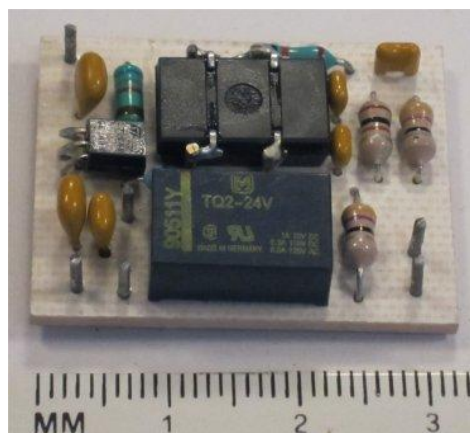
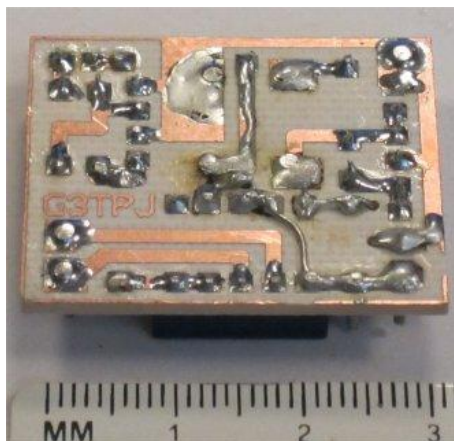
Which I modified so that I could use the switched 0v line from the mode switch to select LSB.

I also avoided cutting the PRC320 main board PCB track, by using an existing USB mute line, to disable USB when LSB was selected. This slightly improves the level of background whistle which is present when using the relay to switch 1.75MHz carrier signal. As the relay only provides about 20dB isolation at these frequencies.

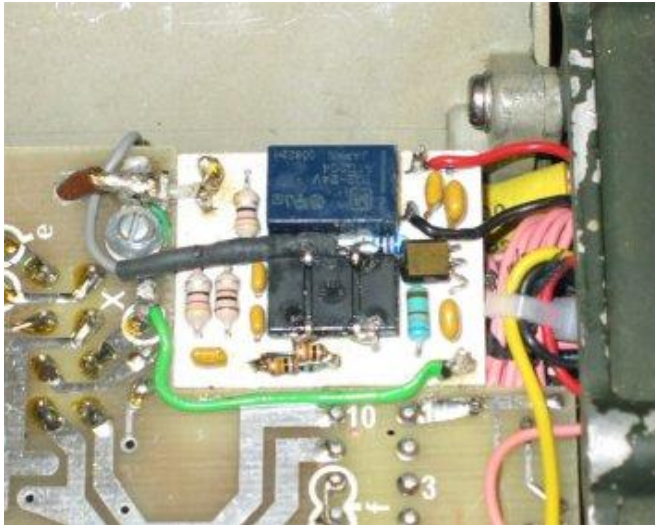
The LSB carrier feed is simply connected in parallel with the existing USB feed. This hardly changes the level of USB carrier injection, but the series resistor on the output of the LSB oscillator chip has to be reduced to about 3K9 in order to ensure the drive level is high enough.



In addition to modifying the G3TPJ by adding wire links, I also mounted the Oscillator chip upside down on the top side of the board, by drilling through the PCB and fitting some PCB pins through the holes.



By doing this modification it is possible to mount the PCB quite neatly alongside the main board in the PRC320.

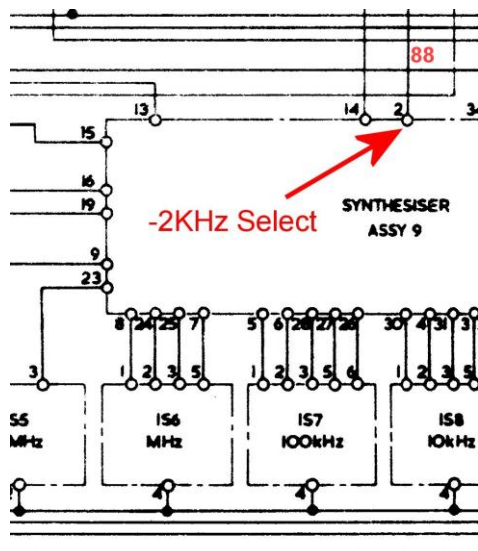


This switching arrangement works very well. It may also be possible to avoid having to use a relay and voltage regulator. This could be achieved by using a transistor stage to switch the existing 6V supply rail to the oscillator and USB mute line. The transistor (with an extra silicon diode in series with the feed to the oscillator) should provide a 1.2V drop which would provide 4.8V at the oscillator chip.

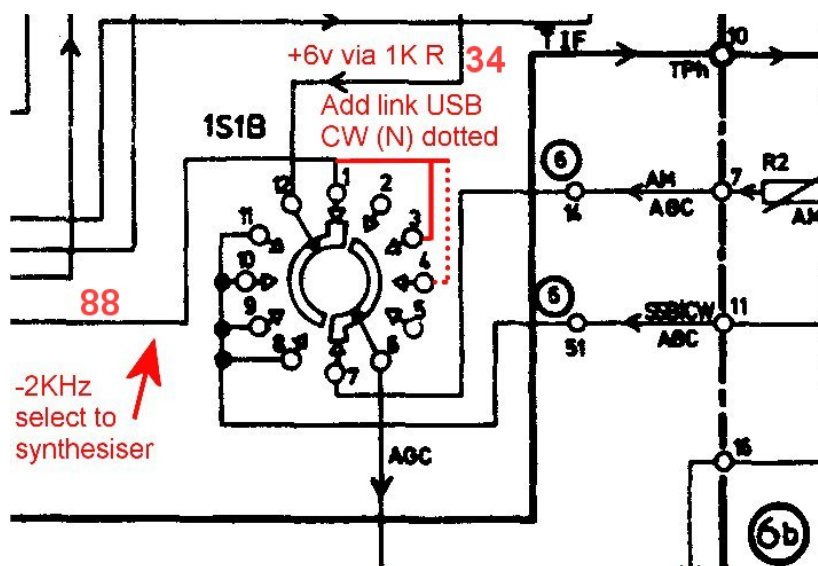
## -2KHz offset

One of the problems associated with Amateur operation of the PRC 320 is the 2KHz frequency difference between the displayed dial frequency and the actual carrier frequency when using USB. This is even more of a nuisance when the LSB modification is added as this requires an additional (but different) offset value to be added to the dial frequency to give the true LSB carrier frequency.

The PRC 320 actually has a -2KHz offset adjustment, which is used when AM is selected. However for some reason it is not used in other modes.



This can be corrected by adding one (or two) wire links to one of the switch positions. Note that this only corrects the frequency offset for USB and CW(N) (if required). It should not be used for LSB as it will make the frequency error worse. When this modification has been implemented the carrier frequencies for AM, USB and CW(N) (if required) will be as shown by the dial setting. LSB will still be approximately 1KHz off frequency.



## S meter modification

This modification was originally developed by Ian, M0TJH, and can be found in the files section of the clansman\_larkspur Yahoo group.

*How to add a simple "S" meter to a RT320.*

*This is a quick and easy mod to do.*

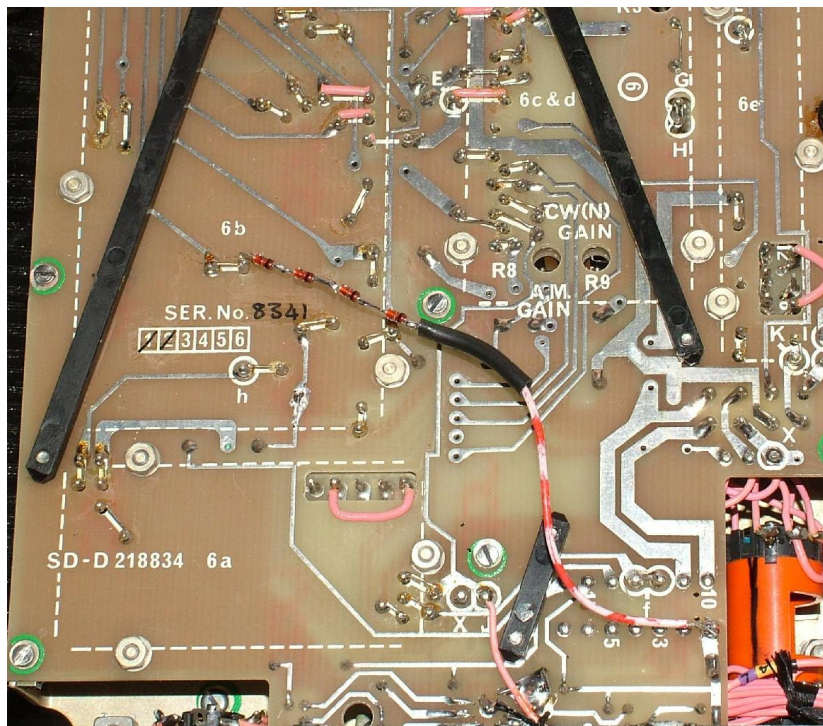
*First take the set apart as per the no side tone mod.*

*Then make up as neat as you can 5x IN4148 diodes in series and pop them in some sleeving. Now i say four but this is a select on test job and in your set it work better with five or six. My one works with no signal i get a reading on the first marker on the meter and a local puts it almost on the end !*

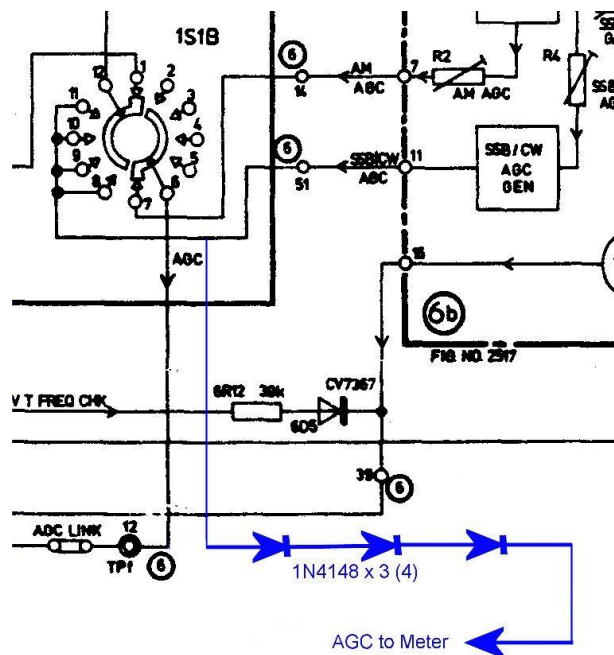
*Put the diodes between the tracks shown with the negative end of the diode chain going the agc test link.*

*With this simple mod don't expect too much .... but i am pleased with it.*

*Ian G0TJH*







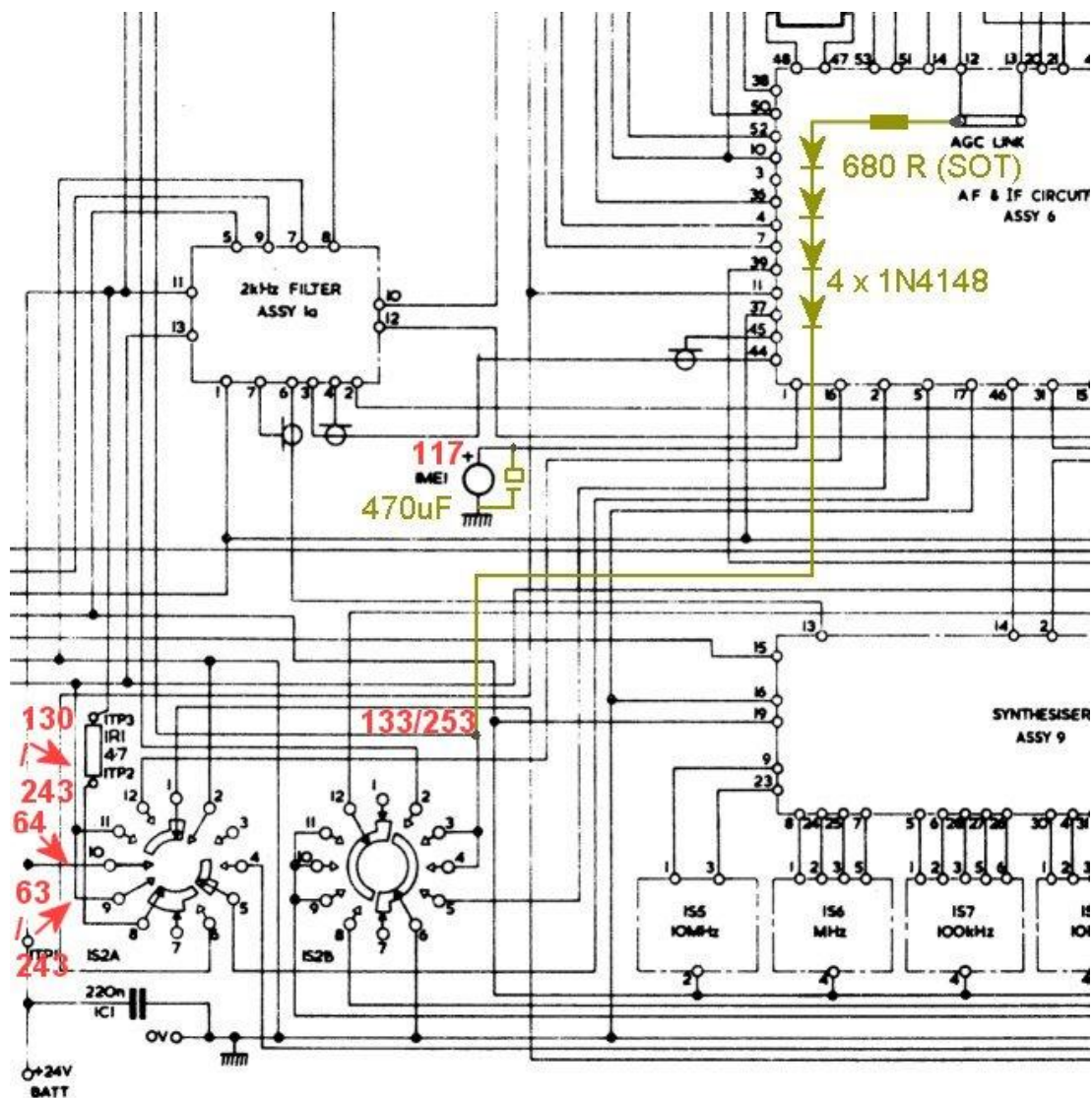
The scale range can be adjusted by adding more (or less) diodes and varying the SSB RX AGC control.

Although this mod works quite well, I was not happy with the AGC line derived voltage being applied to the meter in parallel with other signals. So I decided to use the meter switch to minimise any interaction.

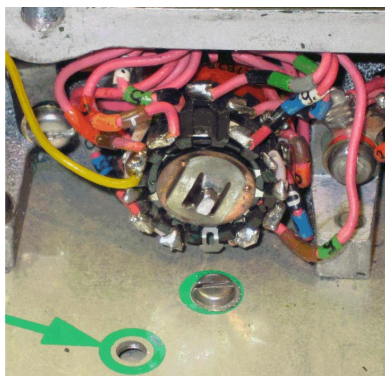
After this modification the S meter will only indicate when the meter switch is in either the HP or LP position. Because the AGC voltage is taken from a different test point to the original modification, it will also indicate on AM signal strength.

As before the range can be adjusted by adding more (or less) diodes, changing the SOT resistor value and varying the SSB and AM RX AGC controls. By careful selection of devices and settings it is possible to obtain quite a good meter range.

Meter reading	Signal strength Volts	Signal strength dBm	Difference from 0 dB
0	~ 2uV	-100	0
1	~15uV	-86	+14
2	~ 30uV	-78	+22
3	~200uV	-63	+37
4	~ 1mV	-47	+53
5	~ 20mV	-23	+77



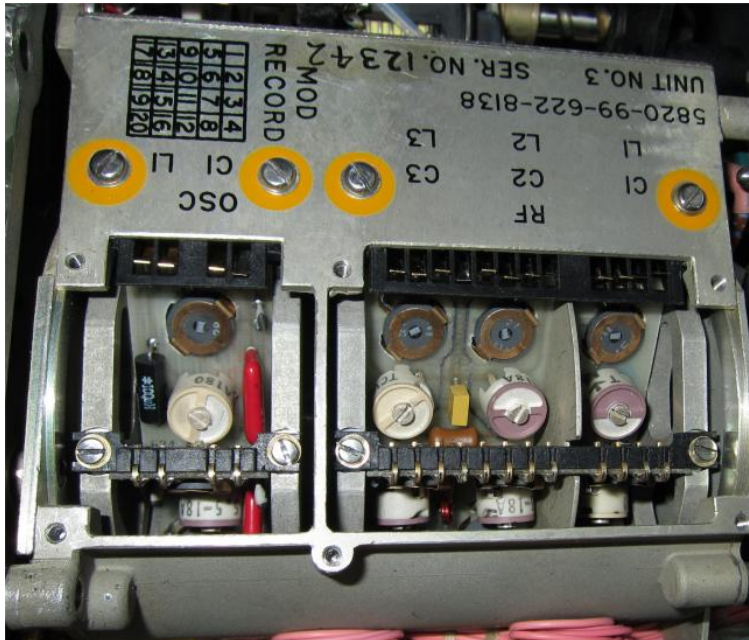
New S meter wire (yellow) added to meter switch.



Adding a 470uF capacitor across the meter helps to dampen the movement without excessively degrading the response time of the meter.

## Full coverage of 160m

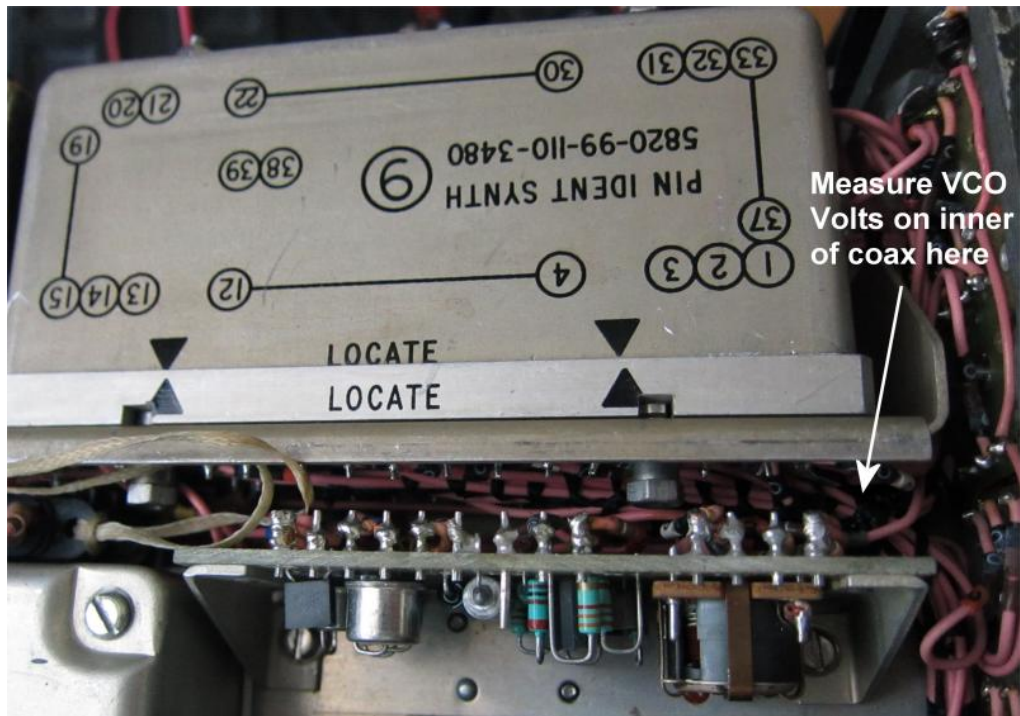
It is possible to get the PRC 320 to tune correctly over the full 160m band without sacrificing any performance. It simply requires minor retuning of some components in the turret assembly.



RANGE	TEST FREQUENCY MHz	ADJUST VARICAP VOLTS	VARICAP DIODE VOLTAGE	ADJUST FOR MAX SIGNAL
1	2.99	3jC1	61.30V +/- 500mV	3b C1/C2/C3
2 - 3.1	2.11	3jL1	9.67V +/- 500mV	3b L1/L2/L3
<b>1</b> <b>1.8 - 3.1</b>	<b>3.1</b> <b>1.8</b>	<b>3jC1</b> <b>3jL1</b>	<b>90.00V +/- 500mV</b> <b>5.5V +/- 50mV</b>	<b>3b C1/C2/C3</b> <b>3b L1/L2/L3</b>
2	4.72	3kC1	60.8V +/- 500mV	3c C1/C2/C3
3.1 - 4.9	3.28	3kL1	8.86V +/- 50mV	3c L1/L2/L3
3	7.42	3lC1	61.00V +/- 500mV	3d C1/C2/C3
4.9 - 7.7	5.18	3lL1	9.10V +/- 50mV	3d L1/L2/L3
4	11.75	3mC1	60.80V +/- 500mV	3e C1/C2/C3
7.7 - 12.2	8.15	3mL1	8.77V +/- 50mV	3e L1/L2/L3
5	18.41	3nC1	61.00V +/- 500mV	3f C1/C2/C3
12.2 - 19.1	12.89	3nL1	9.25V +/- 50mV	3f L1/L2/L3
6	26.91	3pC1	61.00V +/- 500mV	3g C1/C2/C3
19.1 - 30.0	20.19	3pL1	9.12V +/- 50mV	3g L1/L2/L3

In order to do this properly you need to be able to measure the VCO tuning volts. The easiest place to monitor this is on the rear of the synthesiser assembly (Unit 9 ). It may be necessary to undo and move the 1KHz filter board in order to do this more easily. Note – Take great care not to short the

VCO volts to chassis when making this measurement. It can easily damage either the synthesiser or power supply modules.



The trick is to adjust the variable capacitors and inductors in the appropriate tuning section. So that the VCO voltage tracks over a much larger range than that specified in the original alignment instructions. The original ranges were set up with plenty of 'slack' so that even if the PRC320 got knocked about a lot in service it would still work throughout the specified operating frequency range.

Before you start check that the 110v DC supply rail is working correctly. The power supply module is one of the weakest parts of the PRC 320, and needs to be working properly before this mod is attempted.

You may also wish to take this opportunity to check the VCO volts and tuning on the other bands, just in case some of the capacitors or inductors have changed value significantly since the last time the radio was serviced.

Adjusting the inductors is a little bit tricky unless you have the correct 'tweaking' tool. You can make one by soldering two suitably sized sewing pins together, side by side. So that the points will fit either side of the tuning tab on the inductors.

First select band 1, then set the VCO volts to the specified voltage at the frequencies shown in the chart (new values for the first range are shown in red). You may have to adjust the capacitor and then the inductor a few times in order to get the correct voltages at each end of the frequency range. Once this is done adjust the capacitors and inductors in the RF section of the turret for maximum received signal at each of the test frequencies. Once again you may have to adjust the capacitors and then the inductors a few times in order to get the best results. You can do this by ear. But I found it was better to use a signal generator( at a very low RF output level) in conjunction with the S-Meter modification (If you have performed it).



## Reducing hiss on receive

I got fed up listening to high frequency hiss when using the headphone.

Adding this very simple CR network to the earphone, reduced the unwanted noise quite considerably.

You can experiment with the values to get the desired HF roll off.

