

Amateur Radio Station



VK3KBC

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## Motorola Spectra (Range 1) UHF VCO Modification for operation to 440 Mhz

Sunday 10th June, 2012 22:30

### Background

A large number of Motorola Spectra UHF transceivers have recently become available to Australian Radio Amateurs after the South Australian Police Department disposed of their fleet via Public Auction.

Most of these radios were fully functional post decommissioning and only needed to be reprogrammed for Amateur use. The Spectra radios are capable of both Analog and APCO P25 operation on the 70cm band, making them ideal for digital experimentation.

In the United States, many hams consider APCO P25 radios a digital mode alternative to DSTAR and following in the same trend, a number of P25 repeaters are now operational in VK also.

Whilst most ex-SA Police Range-1 (403-433 Mhz) radios operate perfectly to 440 Mhz, some radio VCO's unfortunately cut out at around 435 to 437 Mhz, making them useless for Amateur Repeater operation on the 70cm band in VK.

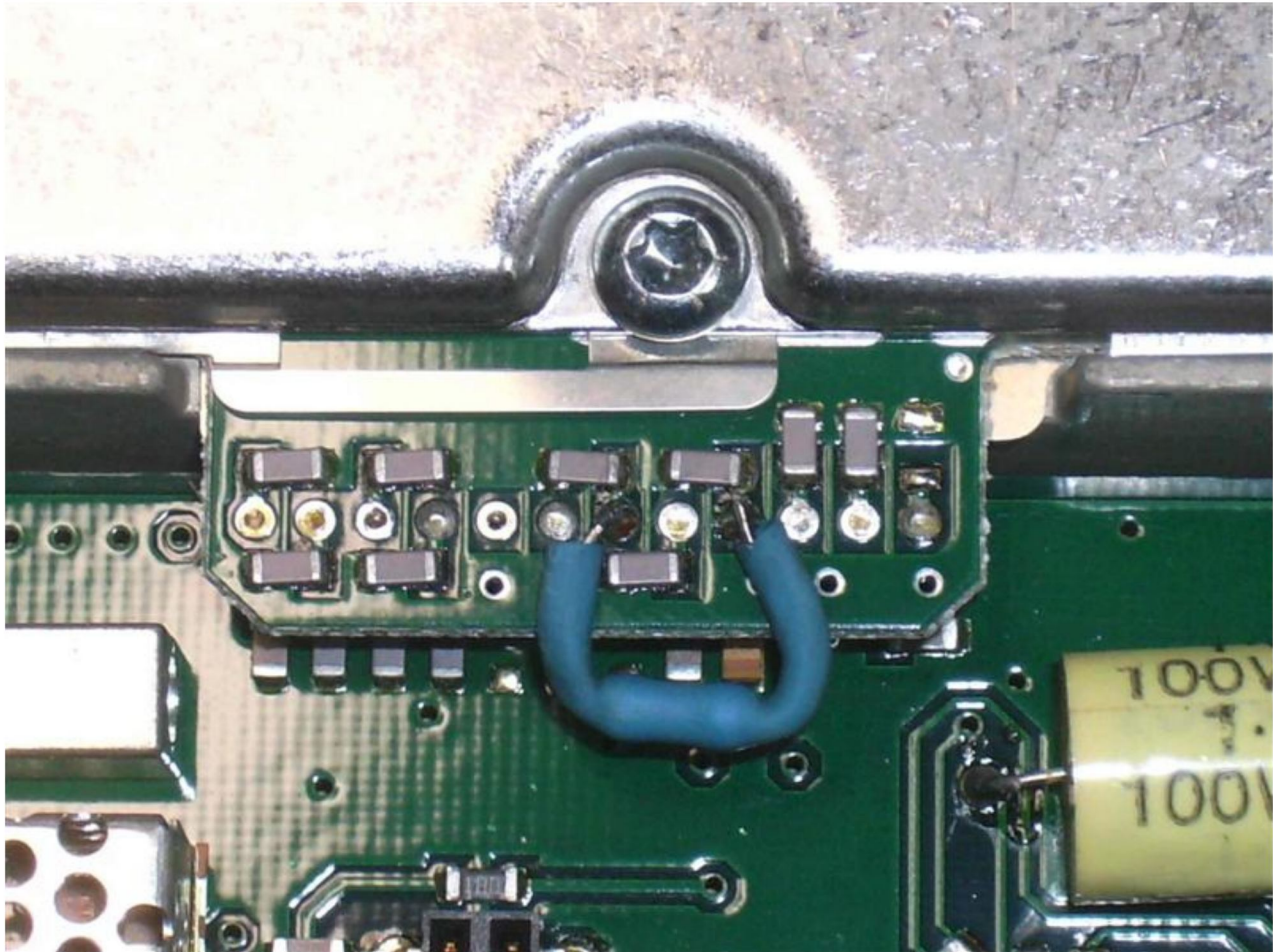
After hearing that a few amateurs had attempted different methods to extend the VCO range with varying success, a group of local amateurs including VK3CSS, VK3DPM and VK3KBC examined the radios and found that a simple modification to the VCO steering lines would remedy the problem, thereby allowing any radios with limited VCO range to be quickly and easily modified to perform satisfactorily to 440 Mhz +.



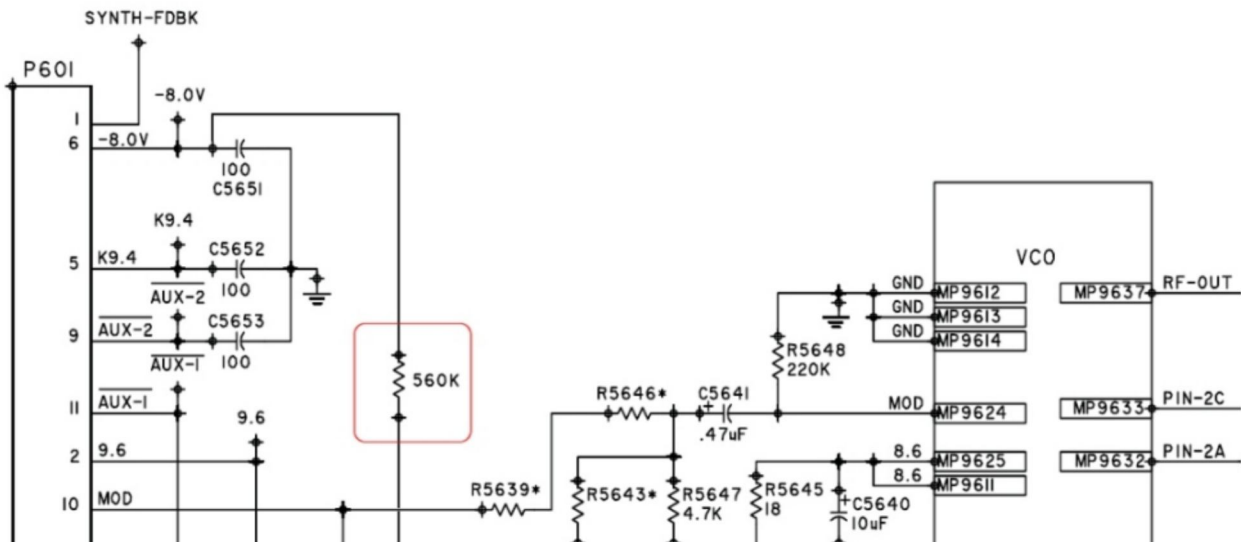


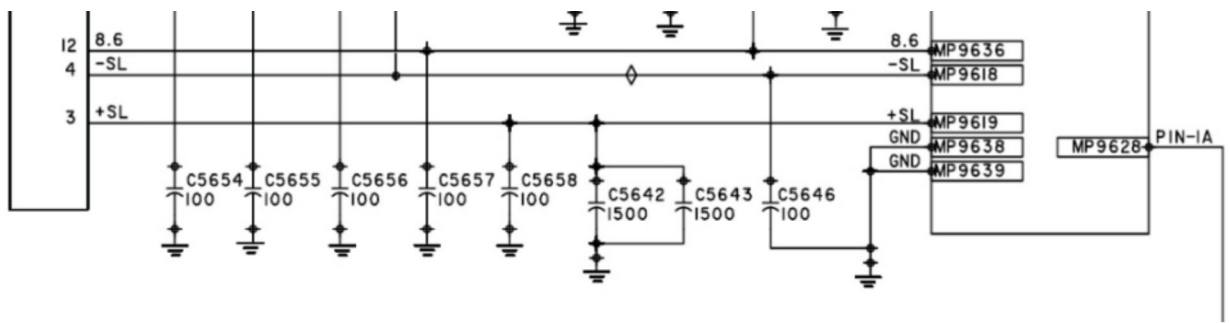
### VCO Steering Voltage Modification





The following schematic diagram details the simple mod





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times since June 2008.

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The Motorola Spectra VCO is controlled via a negative fixed rail DC voltage along with a positive rail voltage which raises and lowers the frequency of operation. Both of these abilities can be pushed to their limits and so at their own risk.

Further investigations revealed that the negative VCO control rail varied from between -2.5V TO -4.5V on different boards and this caused some problems. It does require a certain level of technical competence to modify the negative VCO control line especially if you will be using the VCO to operate at 440 Mhz. If you will need to enlist the assistance of someone who is, in order to perform this upgrade.

In order to modify the Spectra to operate to 440 Mhz, there is no requirement to remove or modify or trim the VCO. The Motorola Spectra is extremely sensitive to static and the 80C Mhz version of the Spectra is prone to damage in high static fields. It is important to follow safe ESD practices and ensure that you are working in a fully static safe environment. It is also difficult to access the 560 K Ohm 1/2 Watt point to point resistor on Pin 8 on the header of the VCO PCB. The recommended resistor is a 560 K Ohm 1/2 Watt point to point resistor. A length of heatshrink tubing in order to insulate it from the surrounding circuitry.

Whilst these modifications have been performed successfully without incident, I cannot be held responsible if you do not follow the instructions or the modification does not work out for you, or you damage your radio in the process. This information is provided as-is. If you choose to use this information, then the risk is entirely yours.

Good luck, hope to hear you on APCO P25 soon.

73's and regards

Ben  
VK3KBC

## Update (15/6/2012)

I've been advised by different sources that the ex-South Australian Police Motorola Spectra's have a number of different variants of the VCO Printed Circuit Boards and that the components may vary in value and the board layout may be different in appearance.

The method described above should still be applicable to the different versions of VCO Board however you may need to experiment with the resistor value to compensate if your board differs from the one I had access to.

If you find the values for your board are different and want the information posted here, email me with the details and I'll update this page.

I have received confirmation that the modification works on 'A' Series boards.

*P.S. In accordance with the A.C.M.A. Regulations, when operating APCO P25 on the Ham Bands, please ensure that your **APCO P25 Unit ID** is set to your Amateur Radio **License Number**. By complying, you are properly identifying yourself when operating in APCO P25 digital mode in Australia.*