

RP-2000 D-Star Repeater at Mt. Climie: Overload & QRN Solution

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The Mount Climie ICOM D-Star installation consists of an ID-RP-2000V - 145.425 MHz, an ID-RP-4000V - 438.600 MHz repeater and the ID-RP2 Controller.

Co-sited is the analogue **Climie 730** 45 Watt FM T800 Repeater. After the ICOM RP-2000 was installed problems were obvious from first switch on.

Problem #1: Overload

The VHF RP-2000 was overloaded each time the 730 repeater was triggered. D-Star crashed and conversations terminated every time.

The first thought to resolve the issue was to remove the Wacom WP-639 duplexer and have it network analyser checked and re-tuned (if required). It was uncertain when the last time this had taken place possibly some twenty years ago. The duplexer was re-tuned and returned to service. After re-tuning the overload with the ICOM repeater was still a problem.

This overload was not evident with a Tait T800II Slim-Line Analogue FM repeater used for test purposes. (The Slim-Line FM repeater is used by the club as maintenance spare. Its frequency can be changed very easily on site with the use of small dip switches between 147.300 or 145.425 MHz)

The ICOM RP-2000 is very sensitive to overload desense. Compared to the Tait T800 it was a poor performer.

Frequency separation between 147.300 MHz transmit and 144.825 MHz (RP-2000 input) should have been sufficient as both repeaters are using Wacom WP-639 duplexers.

Both repeater antenna systems are identical using 4 dipole stacks with a horizontal spacing of approximately 40 metres. (There is no real physical vertical separation between each stack and this does not help the situation.)

Antenna cable and connectors were checked and noise was detected on the 4 dipole stack used on the RP-2000. A test dipole was then used in attempt to eliminate the antenna noise and possible overload being generated within the system. The same overload existed to the RP-2000 using the test dipole so it was the selectivity of the RP-2000 that was the problem.

Problem #2: 730 has desense and noise on weaker signals when 5425 is on air

Every time 5425 D-Star was on air back ground noise could be heard on weaker signals and stations using hand held radios especially could be killed off with at least 10dB of signal desense.

This was traced to the very noisy broadband output of the RP-2000 transmitter. The noise was evident +/-5 MHz from the fundamental carrier frequency.

ICOM New Zealand and Australia were contacted about both problems and quickly

dismissed our claims. ICOM told us that the problems must be the Branch 63 repeater site poor quality installation. The RF earth was sub-standard.

The shared site has been fitted with RF earths at each antenna mast and internal earthing bars for coaxial cables before connection to repeaters.

Branch 63 has done all that was commercially possible to ensure a good installation.

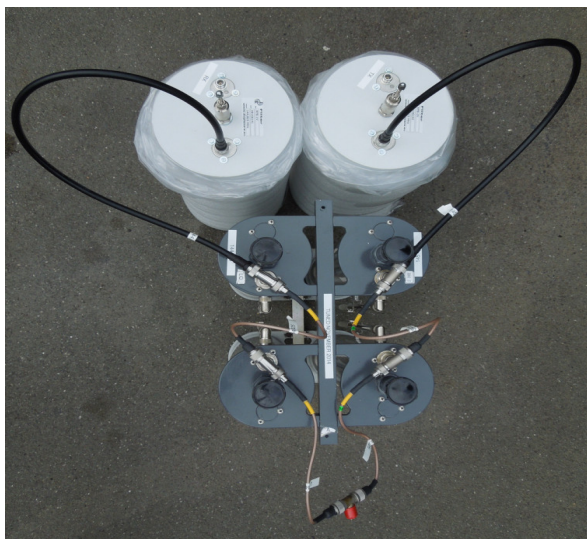
Solution: Add Two high Q 8 inch diameter Pass Cavities

Branch 63 had purchased duplexers from www.duplexers.eu and turned to this company for expert help to solve our problems.

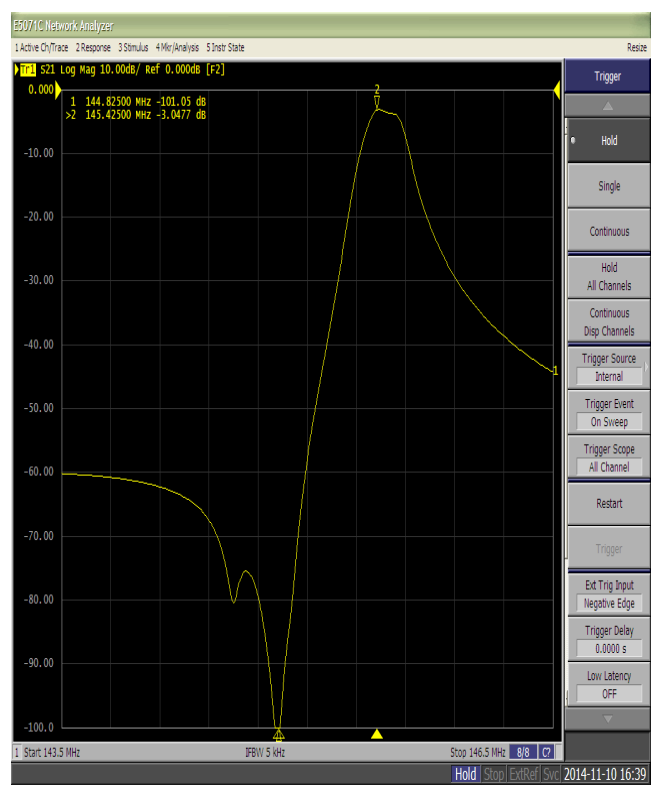
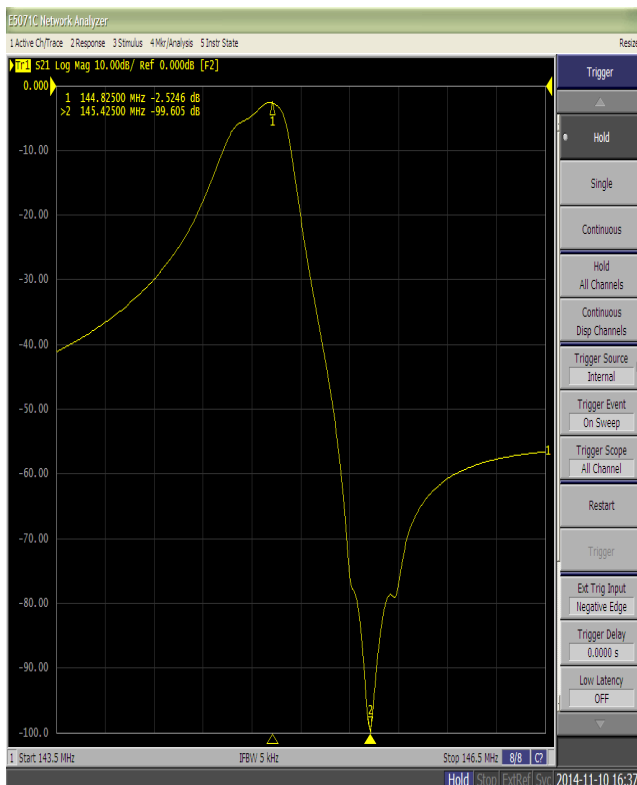
Quickly a solution was found with the addition of two 8 inch high Q cavity filters added to the TX and RX ports between the duplexer and the repeater.

WP-639 duplexer was also stripped down for cleaning. The finger stock was found to be badly worn out and silver plating missing at the critical tuning positions. The duplexer was disassembled and re-plated. New finger stock was sourced by JAG electronics in Canada.

The following pictures below show the completed duplexer and additional cavity filters.



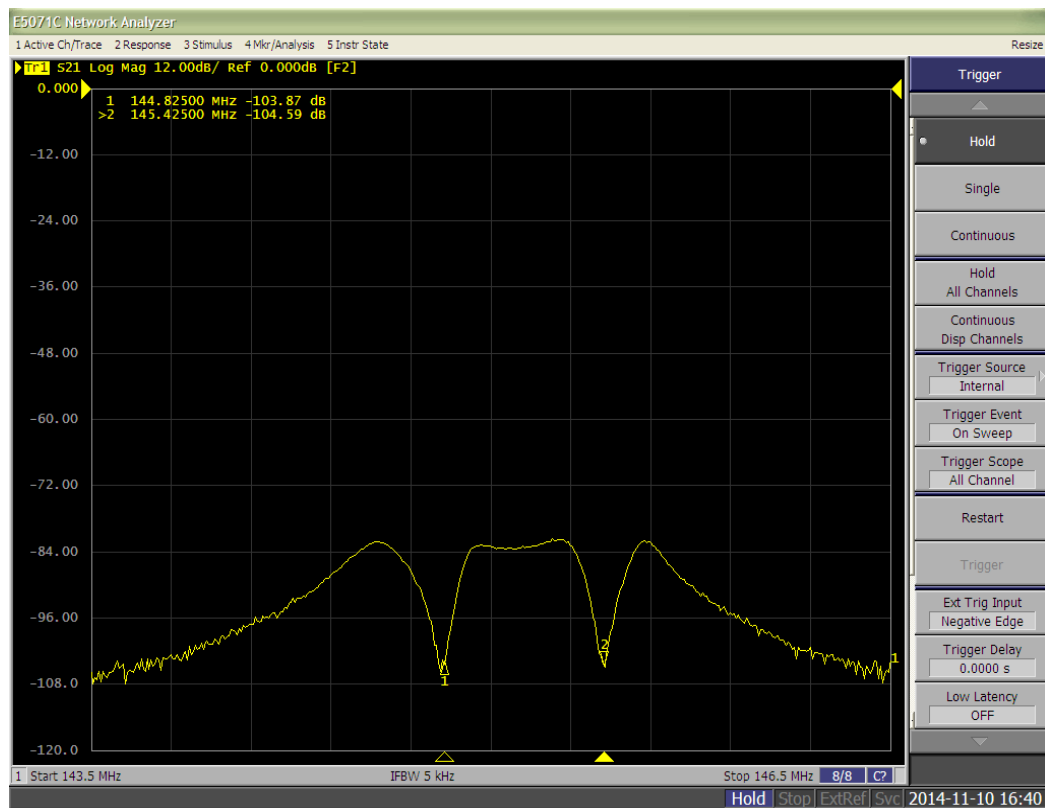
These pictures show the completed duplexer tune performance. -100dB notches.



The following picture shows the excellent rejection of out of band signals. -108dB lower than 143 MHz and higher than 147 MHz.

This was a perfect result allowing both 730 and 5425 to share the band without any QRM to each other.

ES band repeaters are also unaffected by the amateur repeaters.



Any club wanting to use ICOM RP-2000 or RP-4000 repeaters will need to use quality duplexers to ensure trouble free D-Star service.

For information regarding the RP-4000 duplexer used at Mt.Climie go to this URL

www.zl2vh.org.nz/repeaters/ and download the following document.

RP-4000 D-Star Repeater at Mt.Climie: 8 Cavity Duplexer