

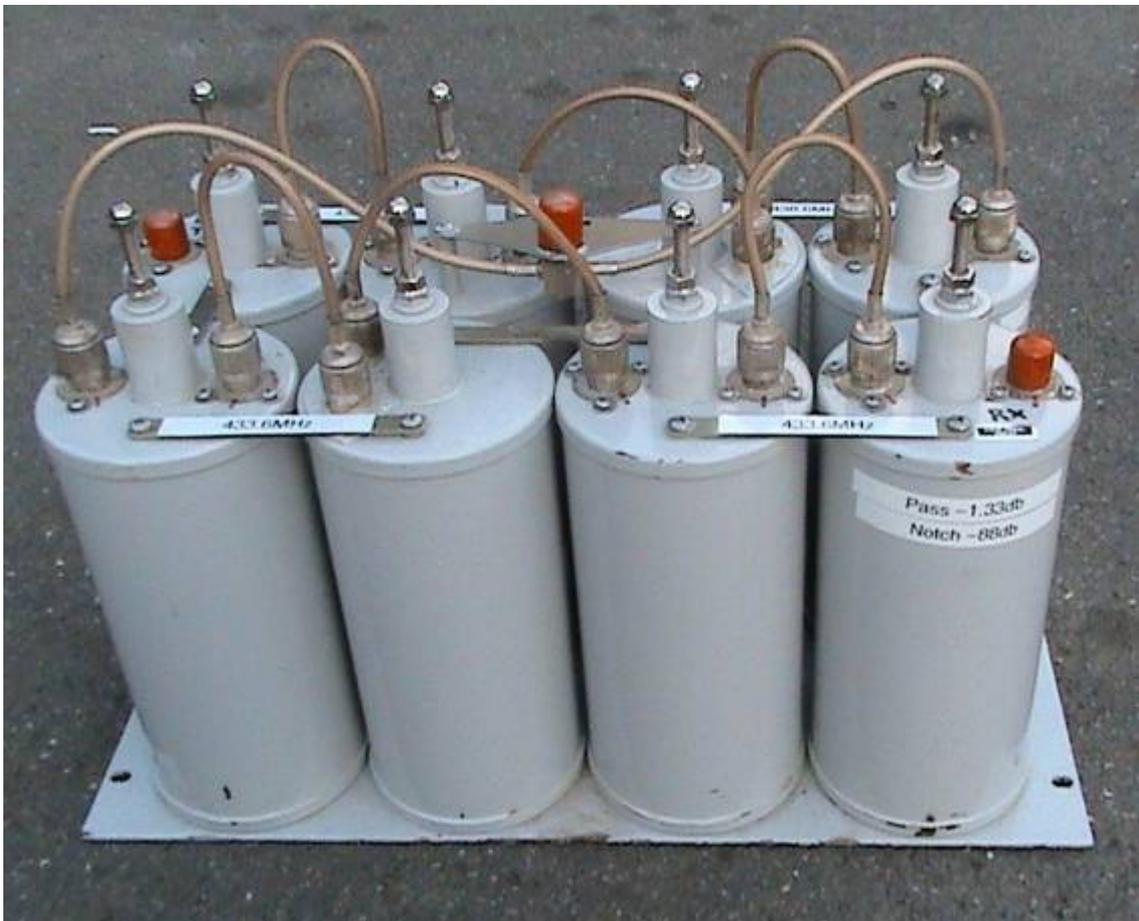
ICOM ID RP-4000V D-Star Repeater Quality 8 Cavity Duplexer

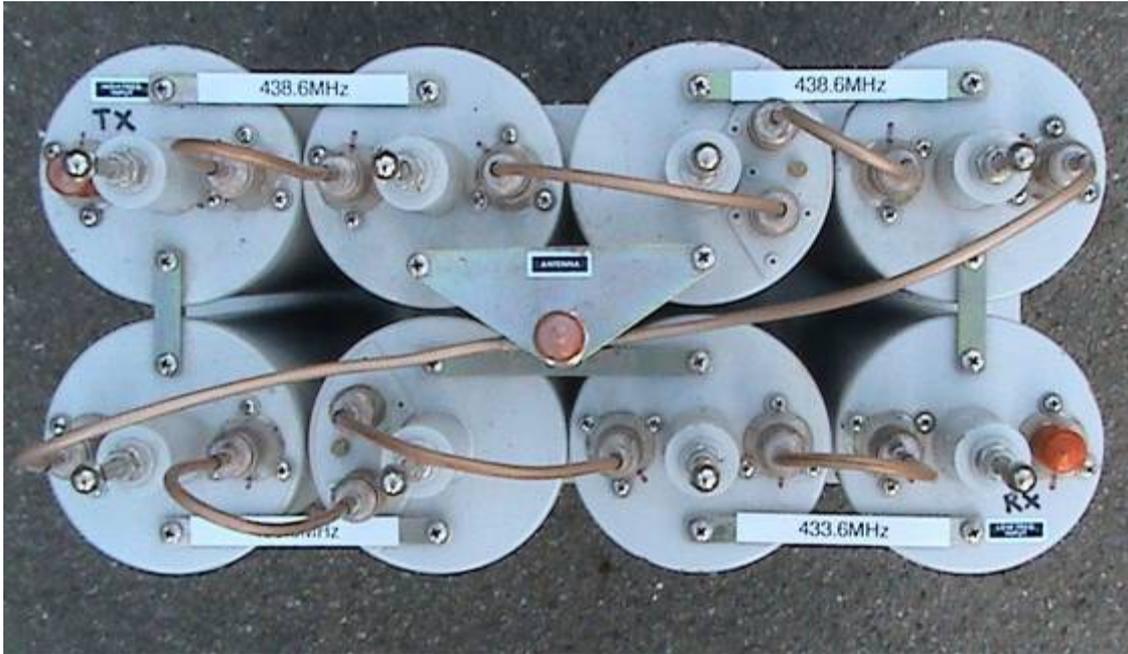
Author: John M Wysocki ZL2TWS. July 2012.

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.

The RP-4000 repeater has a good sensitivity but poor overload and out of band rejection of strong signals. Other D-Star operators have been plagued with overload issues that could only be resolved with a good quality duplexer.

The duplexer uses a hybrid combination of 3 pass cavities with one notch cavity in the series. The commercial equivalent 4 cavity version, using this type of design, is the Wacom WP-665 type. The duplexer for RP-4000 D-Star has one of these WP-665 notch type and 3 pass types on each port.





The 8 cavities are arranged for 19 inch rack mounting and connected to the RP-4000 via Andrew ¼ Inch Heliax cables.

The following pictures are plots taken at a professional duplexer tuning facility. The sharpness of the skirts resulting in out of band attenuation was the key to solving any overload issues. The insertion loss of -1.3db and notches of 85 to 88dB is very satisfactory when operating a 25 watt repeater like the RP-4000.

The return loss of better than -24db ensured a good match to both RX and TX..

I hope that the following duplexer plots assist others to get their RP-4000 or other UHF repeater working well. The repeater has used a 4 cavity duplexer of the Band Pass with internal notches also with satisfactory results. While using the 4 cavity duplexer users suspected that from time to time out of band signals were possibly overloading the repeater. Due to the known overload issues discussed between D-Star RP-4000 operators it was decided to use this 8 cavity duplexer.

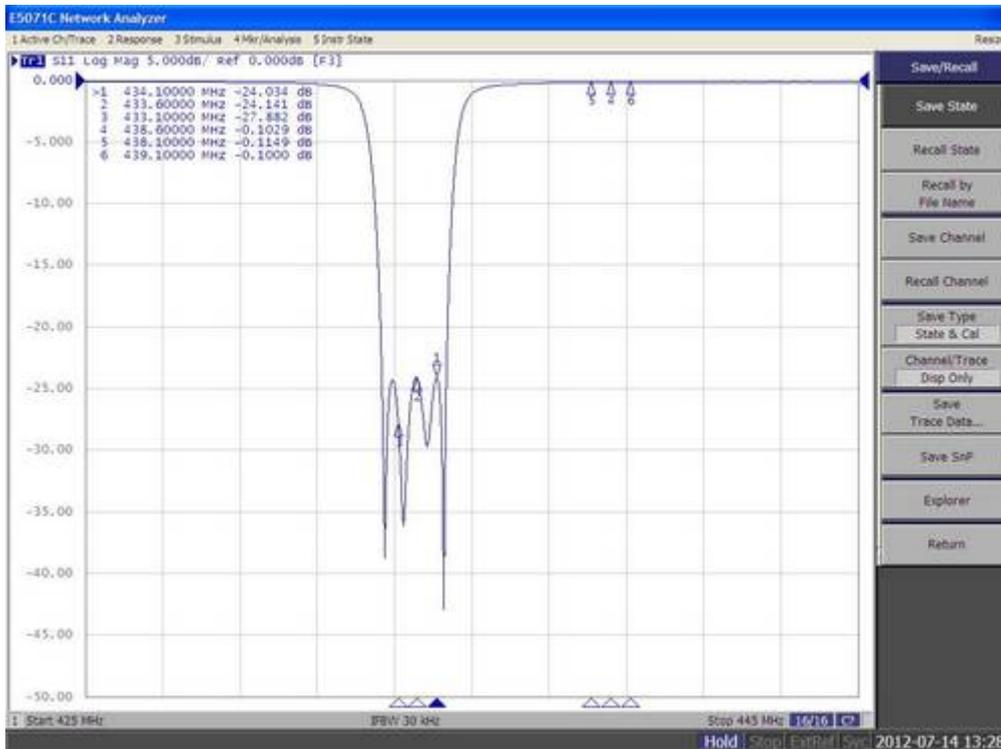
The RP-4000 has also been known to suffer from degraded receiver sensitivity as reported already on various D-Star forums. The 8 cavity duplexer gives the repeater receiver the best chance of working as designed.

The following plots have a description above each one. The return loss plots show how well the RP-4000 RX and TX is effectively matched. Due to known receiver overload issues we ensured the RX had a good match to the duplexer. The RX match is often overlooked as the TX power match is primarily concentrated on in order to prevent power fold back or over heating.

RX pass 433.6 MHz with insertion loss -1.32 db. TX notch 438.6 MHz -85 db.



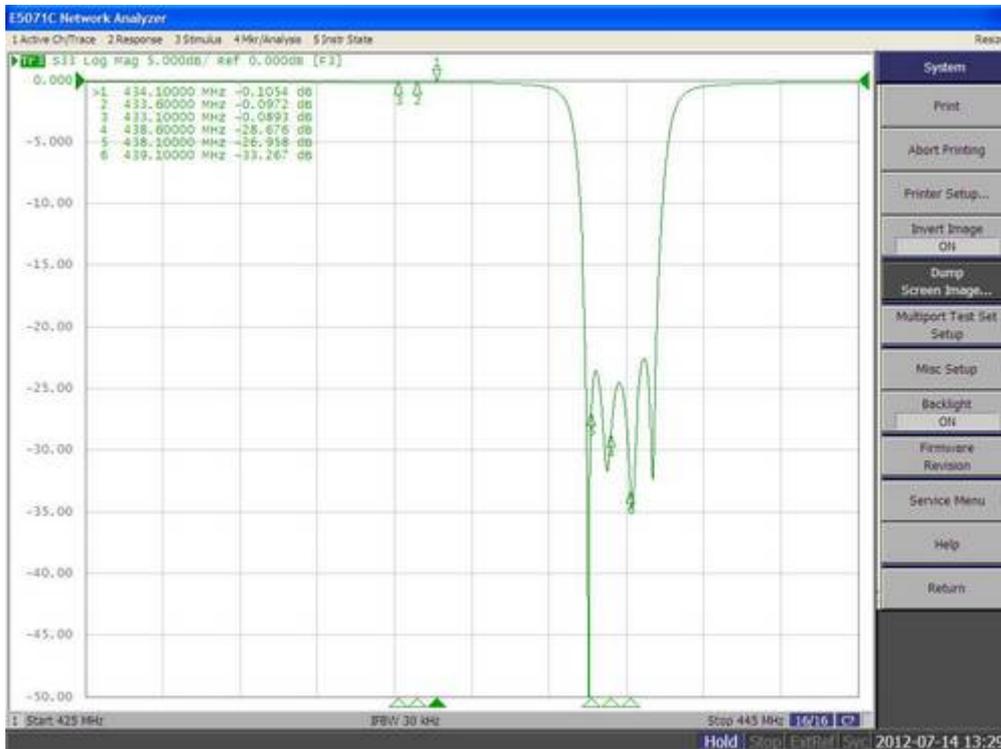
RX pass 433.6 MHz return loss (SWR) -24 db.



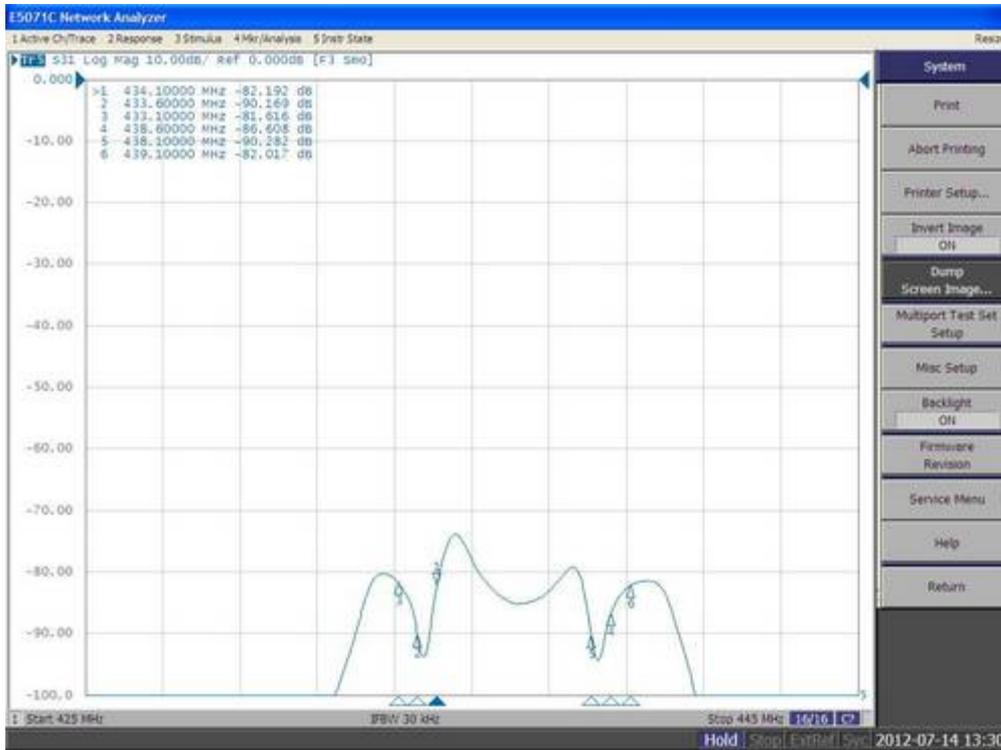
TX pass 438.6 MHz insertion loss -1.24 db. RX notch 433.6 MHz -88 db.



TX pass 438.6 MHz return loss (SWR) -28 db.



Isolation between each TX and RX port. -86 to -90db.



Overlay of all plots shows the combined performance.

