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NEW ZEALAND ASSOCIATION OF RADIO TRANSMITTERS - BRANCH 63 UPPER HUTT
Branch 63 Clubrooms
Park Street, Upper Hutt

ZL2VH Newsletter – July 2025

President's Report

Well, we are now past the shortest (daylight) day of the year and slowly tracking into longer days. While the weather hasn't been the best with the cold and rain at least we are seeing good turn outs on most Friday nights. Trips to Mt Climie are now on hold unless we have an equipment failure until October/November time, when the weather normally improves and access to the site is better. Some work will need doing to the track to remove some of the overgrown shrubs and the like to stop damage to vehicles. So, looking to do this on a trip up the hill later in the year. Some has already been done on each visit but the part from the Emergency Services site to ours requires the most work.

The D-Star G3 Gateway software has been upgraded to the latest version 3.2 by Simon ZL2BRG. This brings the software up to date and provides more resilience to the service. We are hoping that it resolves the issue where from time to time the RF users and Remote Users (DV Dongles, DVAPs, etc) cannot speak to each other. The service must be re-started manually by Simon. So, thank you Simon for the work on this as I know it was not that easy of a task.

Repeater Report

Repeater: Status

Climie KiwiSDR	On Air
10 m Beacon (28.229 MHz)	On Air
3 cm Beacon (10368.275 MHz)	Off Air
1292 (23 cm)	On Air.
D-Star 5425, 860	On Air
730	On Air
395 (6 m)	On Air

VHF Twin Dipole Antenna Combiner and tuning stub for 730 Mount Climie *by John M. Wysocki ZL2TWS*

On Friday 20 June 2025, Gavin ZL2ACT and John ZL2TWS set up for testing two Hi-Tec FDE3-SA dipoles at the Branch 63 clubrooms car park. Gavin used a calibrated portable Vector Network Analyser (VNA) to sweep the dipoles and combiner.

These dipoles were removed from Mount Climie 730 antenna mast during the previous month. The reason for removal was an increased SWR and water evident at the coax feeder cable connector.

Trustee six monthly inspections had showed a performance decline since May 2024 after four years of service.

The dipole combiner unit supplied by Hi-Tec was found to have faulty weather proofing with quality assurance issues. The combiner was disassembled to find that technically it would not work well. A wire link was simply placed between dipole incoming cables, effectively connecting both dipoles feeds together.

This link cavity was filled with silicone rubber.

If the dipoles presented exactly 50-ohms to the combiner, then 25-ohms is seen at the 50-ohm feeder cable. The resulting mismatch gave poor results. Hi-Tec claimed <-14 dB (better than 1.5:1) and this was what we should expect.

When the new Hi-Tec FDE3-SA dipole stack was installed 15 February 2020 the SWR was noticed to be poor at around 1.4:1. (return loss was -15.5 dB). This was better than what Hi-Tec expected as they claimed <-14 dB or better than 1.5:1. So the FDE3-SA worked as advertised.

Hi-Tec were asked about this and replied that no matching section and tuning stub was required for the FDE3-SA.

So why was the SWR high anyway? Answer: The dipoles were resonant at 151 MHz and not 147.6 as requested and therefore the matching section didn't give best results for 730 frequencies.

Both dipoles, were removed from Climie in May 2025 because of poor SWR. They then needed fresh coax cable ends and were cut back 600 mm until clean copper was found. The cables were re-terminated with Huber+Suhner plugs supplied by Intelcom.

At least the dipoles were still usable and can go back into service even if a bit off frequency for the 730 repeater.

Gavin measured the best SWR of 1.025:1 (-38 dB return loss) of one dipole at 151 MHz and the other at 150.6 MHz this shows a -41 dB return loss. At 730 frequencies the SWR was about 1.2:1 (-20 dB). The dipole spacing from the mounting pole had been decreased to 420 mm to achieve this, but we felt more could be done to get even better results at 730 frequencies.

With both dipoles combined an SWR of 2:1 (-9 dB return loss) was measured so a matching section is required.

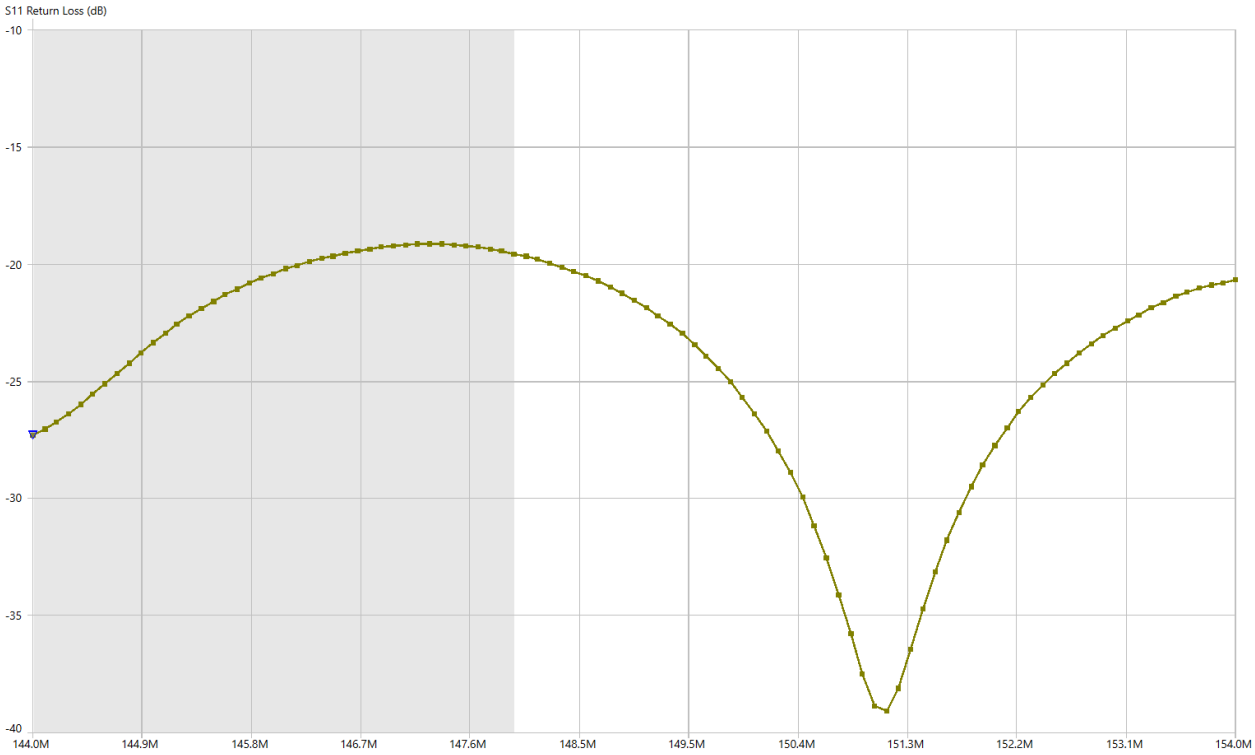


Figure 1: Top Dipole 151 MHz and -38 dB return loss at resonance on the 8 m RG-213 coax feeder cable.

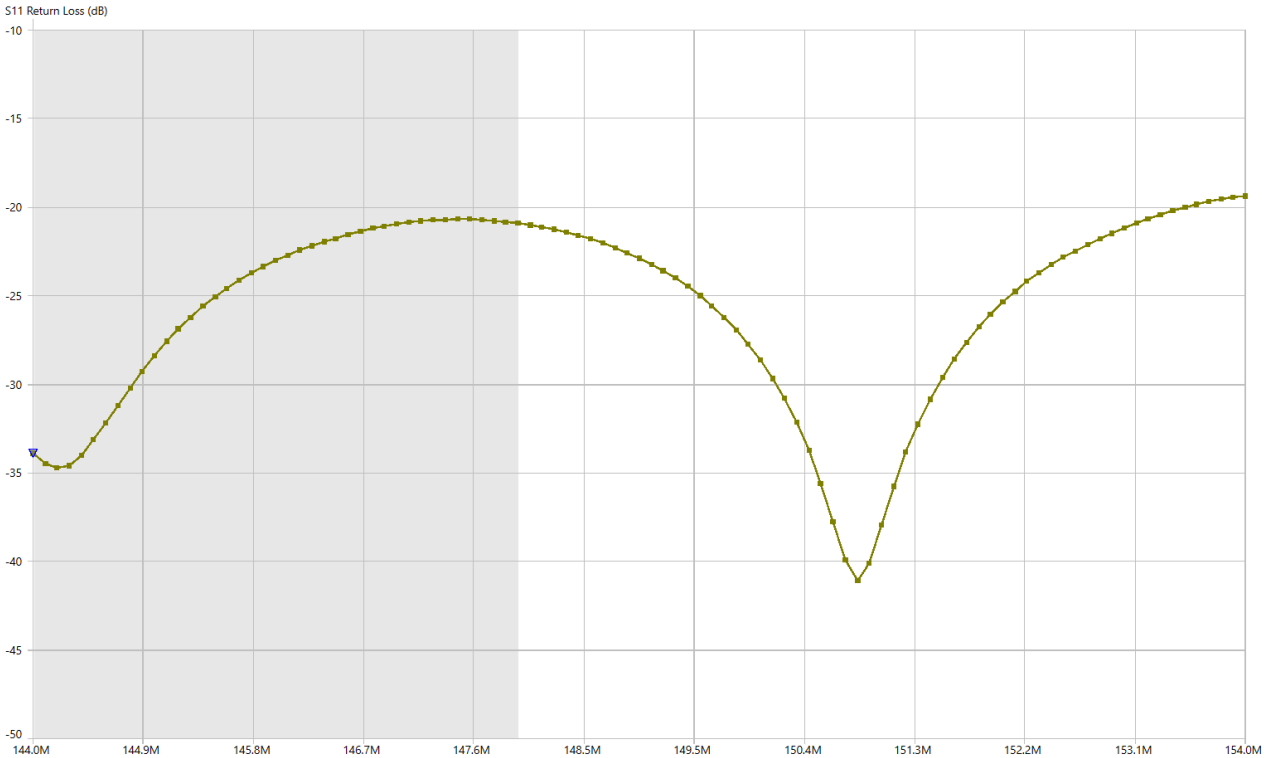


Figure 2: Bottom dipole 150.6 MHz and -40 dB return loss at resonance on the 8m RG-213 coax feeder cable

The search for a combiner solution

Branch 63 was offered a new version of the Hi-Tec combiner including an assurance from Hi-Tec that
the new combiner would be filled with epoxy resin, and not silicon rubber to seal it.

Branch 63 has decided to not trust this design of the combiner as technically it didn't seem to be right based on previous experienced technical sources and enquiries.

Note: We also heard from reliable sources that other overseas commercial suppliers, who export to New Zealand, have also had dipole antenna and combiner production quality control issues.

The original Sky Mast antenna stacks from UK purchased for 5425 and 860 are still running well after ten years of
service. They use four dipoles that match evenly back to 50-ohms and don’t need a stub tuner.

The shipping costs, over recent years, persuaded us to support local manufacturers and we ended up with a water leak.

The Hi-Tec FDE3-SA was a connector less harness system that leaked water. Branch 63 has now returned to a "home brew" all connector harness, that we hope will not leak, but probably more repairable in the future.

The solution

In 2005 John ZL2TWS with help from Terry ZL2BAC built a twin dipole matching harness for the 700 Lower Hutt repeater. This was based on a March 1987 *Break-In* article written by Terry where he used the same combiner harness to combine two satellite VHF 50-ohm antenna. (*Reference 1*)

This article points out that the antenna cables present 50-ohms to the combiner (25-ohms combined). The 123 mm matching section (connector tip to tip) and stub then transform the impedance back up to 50-ohms. The matching section and stub coax is high quality RG-213. The open circuit stub

coax length from open end to the centre solder pin of the elbow connector is 105 mm.

Keep in mind that the remainder of the connector also forms part of the stub.

The Hi-Tec FDE3-SA dipole design uses a coaxial transformer match inside one arm of the folded dipole. This has been a commercial practice for many years instead of the Amateur radio traditional 4 to 1 coaxial balun as detailed in the March 1987 article.

I have personally built many of these 4:1 coaxial baluns with always excellent results. They are harder to seal up and require more work than the commercial internal coaxial 1/4 wave transformer. The commercial transformer does not always give 50-ohms and is often closer to 70-ohms impedance.

To compensate for this variable wavelength spacing from the mounting pole is used, depending on pole diameter.

Gavin and I found that moving the dipole pole spacing from ½ a wavelength of around 1000 mm to around 420 mm, changing the dipole return loss from -17 dB (at 1000 mm spacing) to -28 dB (at 550 mm spacing) to -38 dB (at 420 mm spacing). The closer the spacing from 420 mm the return loss went the wrong way again.

The 420 mm past the *Goldilocks* test. This means optimal spacing was found for best SWR.

It is also known that distance spacing between dipoles is important to achieve optimal radiation pattern and to prevent interaction between the dipole pair. This is recommended to be between 1500 mm and 1700 mm. Our tests settled on 1600 mm where there was no interaction, and the return loss stayed at -22 dB for the combined dipoles at 730 frequencies.

With both dipoles on the combiner without the matching section and stub the return loss was very bad at 2:1 or -9 dB return loss as mentioned on the first page.

With the matching section and stub we got 1.17:1 or -22 dB return loss. 8 metres of RG-213 feeder cable was used for all tests.

Please note that neither dipole was on exact frequency with one resonate at 150.6 MHz and the other at 151 MHz
so, the combined impedance will never be ideal, but the matching section and stub makes this a better tuned antenna.

Unfortunately, the resonance of the dipoles is too high and if they were lower the combined result would be closer to SWR 1.1:1 -26 dB return loss, so we got as close as we will get.

One thing is for sure that the matched dipole result is better than the original Hi-Tec supplied combiner.
When we installed back at Climie, additional tests can be done, and fine tuning carried out if the above positions need trimming.

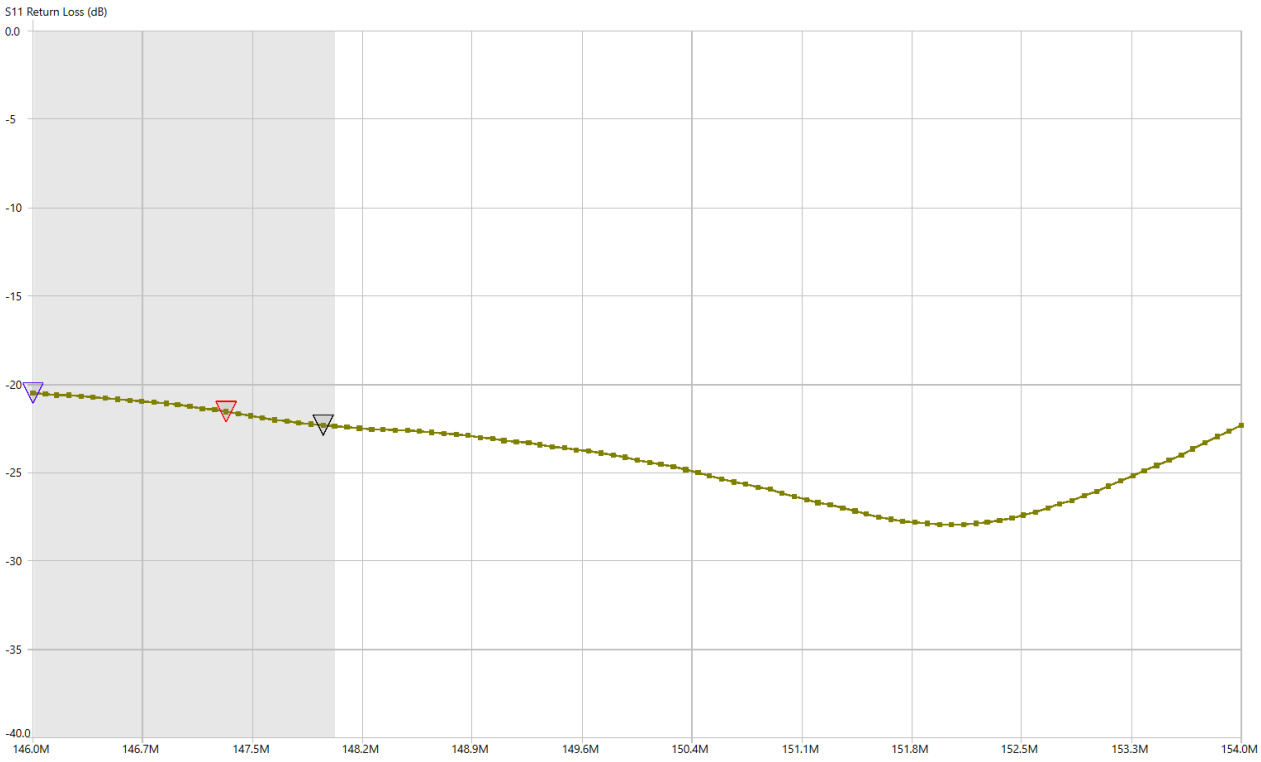


Figure 3: Final tuned result at 147.3 MHz and 147.9 MHz and a compromise managing to get SWR 1.17:1 -22 dB return loss

The following pictures below show the dipole test tripod and separation/spacing when combined. A picture of the combiner and stub tuner ready for installation at Climie. Reference 1) Shows the matching section and tuned stub details.

In free space Dipoles combined on tripod. 123 mm matching section and side mounted 105 mm stub.

Note: Stub length depends on connector choice.

A Phasing Harness for Circular Polarisation

by **TERRY OSBORNE**, ZL2BAC

Having bought a crossed yagi antenna for 2 m I was faced with the problem of designing a phasing harness for circular polarisation for use on OSCAR Satellites.

The Satellite Experimenters' Handbook gives various methods of achieving this but they all use lengths of 75 Ω cable and soldered joints that are very difficult to weatherproof. I decided to use 50 Ω cable and standard connectors (about 3 m of RG213/U cable is required) and standard connectors as detailed below:

UHF series	N series
2 f/f/f Ts	2 f/f/f Ts
5 PL259 plugs	4 straight plugs
	1 elbow plug

It is also possible to use RG58/U or IEC 50 and BNC connectors.

BNC series
2 f/f/m Ts
4 male cord plugs
2 female cord plugs

The harness conists of two baluns and a 1:1 splitter.

Constructing the Baluns

1. Using a sharp Stanley knife cut two 800 mm lengths of cable and remove the outer jacket 57 mm back from each end. Remove the braid and dielectric. Cut off another 3 mm of outer jacket and braid from each end. Cut off yet another 3 mm of outer jacket from each end and tin the exposed braid. You should now have two lengths as per Figure 1.

2. Cut one 685 mm length and one 343 mm length of cable. Terminate one

A close-up photograph of the prepared coaxial cable.

end of each length with a plug from the chosen series.

From the other end of the cables remove 25 mm of jacket, braid and dielectric. Remove 3 mm of jacket and braid, and 3 mm of jacket as done for the loops. Tin exposed braid (see Figure 2).

These balun feeds are of different lengths to obtain the 90 degree phase shift needed for circular polarisation.

3. Bend the loops in half and tape a feed to each one. Bind the braids with tinned copper (fuse) wire and solder, taking care not to melt the dielectric. Bend the inner from the feed around one of the loop inners, solder and trim as per Figure 3.

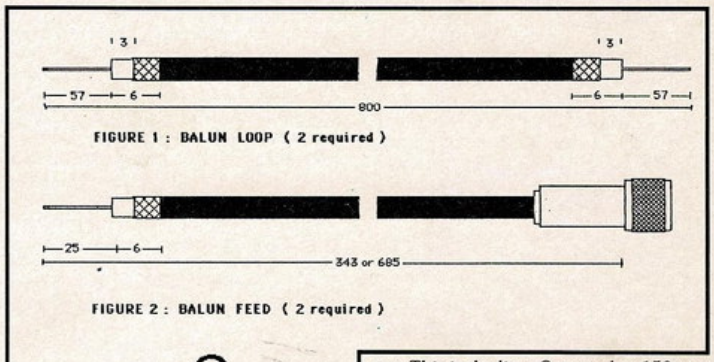


FIGURE 1 : BALUN LOOP (2 required)

FIGURE 2 : BALUN FEED (2 required)

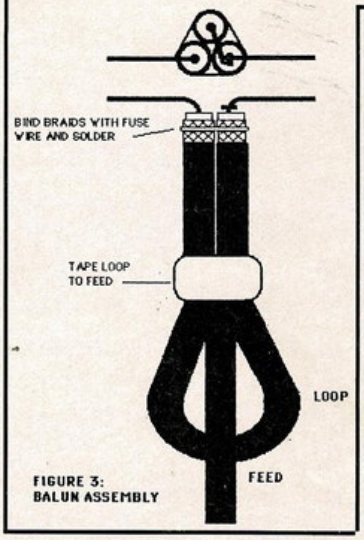


FIGURE 3: BALUN ASSEMBLY

To weatherproof this assembly mount it in a suitable plastic jar and pot in Araldite. Connect the baluns as per Figure 4 and check the VSWR.

Constructing the Splitter

4. Cut a 150 mm length of cable and terminate both ends to make a cable 123 mm long from connector to connector. This is the line. Cut another 150 mm of cable on the remaining plug to make the stub.

5. Connect the splitter as shown in Figure 4 (see next page).

6. Connect a 2 m transmitter and trim the stub for best VSWR (118 mm long for my one).

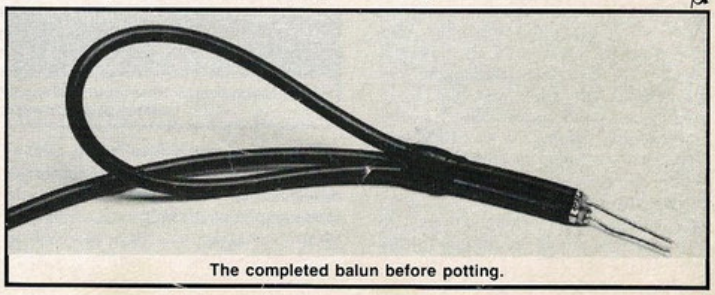
Testing

7. Check for received signal on OSCAR-10. If no signal is found then you have left hand circular polarisation or a faulty antennae. Disconnect the splitter and connect each antenna to the main feeder in turn. If the antennae are okay then reverse the balun connections to one antenna dipole. This reverses the sense of the circular polarisation. The signal should now be 3 dB stronger than when one antenna was connected to the main feeder.

This feed systm will work with well designed antennae that are already matched to 50Ω. If a good match in step 6 cannot be obtained this indicates a poor antenna match.

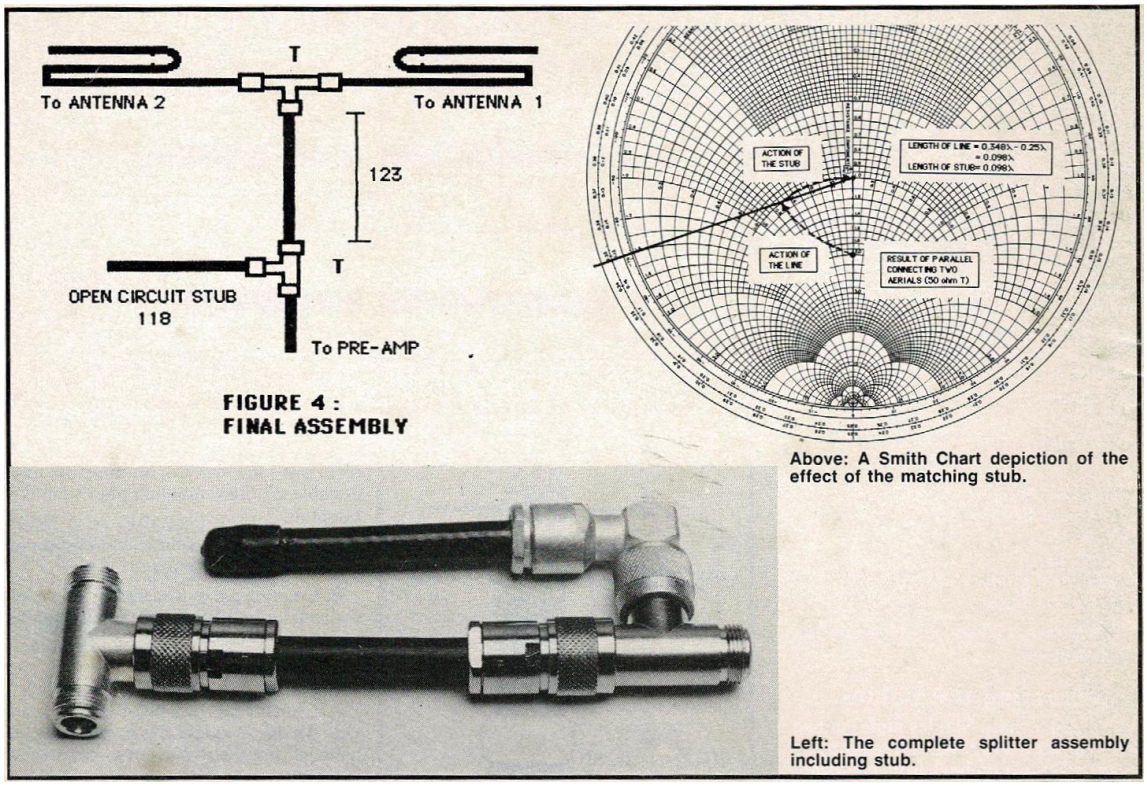
If you wish to make use of existing baluns which have identical length feeds construct a line 337 mm long as in step 4 and add this between the end of one feed and one splitter outlet. An f/f barrel connector will be needed. Carry out the test in step 7. If the wrong sense of polarisation has been produced swap the 337 mm line to the other balun feed.

The Wellington VHF Group has stocks of most of the connectors needed for this feed system.



The completed balun before potting.

Reference 1) Page-1



Reference 1) Page-2

Reference:

1) NZART *Break-In* Magazine. March 1987 "Phasing Harness for Circular Polarisation" by Terry Osborne ZL2BAC

Mt Climie: 2 June 2025

John ZL2TWS/Mark ZL2UFI/Ben ZL2BDG/Warren ZL2AJ

SDR Receiver is now online again and working well. Ben installed the new feedline and balun for the antenna. This should see us through the winter months, and the installation will be review in the summer to see how it's going.

Warren was at the NZART Conference and had requested to come along to activate Mt Climie as a SOTA location.

Mt Climie: 9 June 2025

John ZL2TWS/Mark ZL2UFI

Repaired high power 730 back on site. John ZL2TWS sourced and replaced the power block. The repeater will give a few more years of service but a replacement will need to be considered at some point. Until the single dipole antenna is replaced with repaired two dipole stack then no repeater will be purchased. The current Tait T800II repeater is estimated to be at least 25 years old.

The Slimline Tait T800II repeater was removed off site and the fault with the programming of it was identified. A small crack in one of the circuit boards on the back of the repeater caused the programming of the repeater to fail. John ZL2TWS has repaired the issue, and it can now be programmed via the PC software.

395 Repeater MKII was replaced as it was noising up after extended usage. The replacement MKI appears not suffer this issue. Further testing will be required to identify the issue casing this. 395 is on the air and working well however the beacon has been turned off to extend the life of the switching relays used in that repeater. The MKII has solid state switching.

EME Newsletters

Latest EME Newsletters for May 2025:

https://eme.radio/images/newsletter/pdf/2025-06-vol-54-06.pdf

Update: Hamvention 2026

To ensure accommodation is available I have booked via https://www.booking.com/ at Wingate by Wyndham Dayton. Cost wasn't too bad, and being in Dayton allows easy access to the Airforce Museum as well. You can stay where you like but you may want to stay here as well, up to you.

Wingate by Wyndham Dayton - Fairborn ★★★ Genius

Check-in
Thu 14 May 2026
from 15:00

Check-out
Mon 18 May 2026
until 11:00

Change dates

Booking details
2 adults - 4 nights, 1 room

Address
3055 Presidential Drive, Fairborn, OH 45324, United States

Travel time to Xenia for Hamvention is about 25 minutes by car. You need a rental car in the USA to get to most places.

The latest Air New Zealand deals to the USA only run to the 31 March 2026, so will advise when the next round of deals are up.

Contact me if interested: mark@foxtrot.co.nz