

**The Official Newsletter of the
Auckland VHF Group Inc.
Spectrum**



Recent Working Bee to raise the safety level at the Clubrooms

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Auckland VHF Group Inc.

Branch 66 NZART

PO Box 10138, Dominion Rd, Auckland 1446
 Clubrooms: 30 Hazel Ave, Mt Roskill

Office	Name	Call sign	Work / Mobile	E-mail
President	Matthew King	ZL1YOT	022 649 3310	president@aucklandvhf.org
Vice President	Not filled			
Secretary (Acting)	Vaughan Henderson	ZL1VH	021 844 804	secretary@aucklandvhf.org
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	Greg Storz	ZL1GSG	09 849 2878	greg.storz@orcon.net.nz
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Webmaster	Terry Corin	ZL1BPA	027 697 4686	webmaster@aucklandvhf.org
Club Web Page:	http://aucklandvhf.org			

Club News and Net:

The combined Auckland VHF Group and Auckland Regional Branch News and Net are held on 146.625 MHz and 439.875 MHz at 8.15 pm each Sunday or after the ZL6A National Broadcast on the last Sunday of the month.

Club meetings are held at the Clubrooms at Hazel Avenue, on the second Monday of each month at 7.30 pm. For other details, listen to the News and Net each Sunday evening.

SPECTRUM is the official journal of the Auckland VHF Group Inc. Opinions expressed are those of the authors and do not necessarily reflect club points of view. The closing date for SPECTRUM articles is by the 1st of each month. Articles to be submitted to the editor Peter ZL1UKG
spectrum@aucklandvhf.org

Auckland VHF Group (Inc) Branch 66

General Meeting Notice

Monday 12th October 2020 7.30pm

At the Hazel Avenue Club Rooms
(Located on the left at the end of Hazel Avenue)

The Evening's Topic:

"Our guest speaker for October will be Soren Low ZL1SKL. Soren is Business Transformation Manager at KiwiRail and one of his roles is monitoring developments in technology as it applies to railway operations.

Soren's presentation will take a look at how KiwiRail has used radio technology to drive efficiencies and how future technology developments will impact on KiwiRail's operations."

EVERYBODY WELCOME

We look forward to seeing you there

Coming Events:

- 03 October Hamilton ARC Market Day, Gordonton Hall, (SH 1B),
Venue opens at 8 am, Buyers from 10 am
- 03/04 October Microwave Contest
- 07 November Western Suburbs Market Day

Auckland VHF Group Presidents Report October 2020

We have received a report from Peter Mancer that some Klondyke cables have again swung free of the decaying trays and are threatening to damage other cables. So we need a working bee up there on the next day that weather and people allow. Could be a week day. If you are up to a bit of climbing or ground support, please email me and I'll ring around when the weather eases. We can go sort out those cables. We might need to do a temporary job until the replacement trays are procured, which is underway.

We had our committee meeting 'on line' again last week, and it worked out pretty well. Our next General meeting (on the 14th September) will be followed one night later by a construction night. It's time I had a go at making baluns now that my VNA analyser has arrived and I have worked out how to drive it. Still have my 'L' plates on, though.



Cheers Matthew King
 022 6493310

Minutes of the September General Meeting of the Auckland VHF Group Inc.

Held on Monday 14 September 2020 at the Clubrooms, 30 Hazel Avenue, Mt Roskill

Meeting started at: 1955 due some technical issues!

Present – 14 members as per the attendance book, ZL1XXX via Teams.

Apologies: Basil ZL1TOW, Dennis ZL1TAY, John-Henry ZL1JHW
Moved apologies be accepted: ZL1VH Seconded ZL1YOT Carried

Minutes of September General Meeting as published on Page 4 of September Spectrum be approved:

Moved ZL1YOT Seconded ZL1TCI Carried

Matters arising: ZL1VH gave an explanation regarding the brief nature of the minutes.

Correspondence:

June 2020 Branch Circular from NZART

ASB Bank accounts to Treasurer
North Shore Radio Club newsletter
Papakura Radio Club newsletter

Reports:

AREC – ZL1TIA spoke on the current state of the Club's AREC Group. He apologised for the lack of activity due to health issues. He advised the George ZL1TUX had accepted the position of Deputy Group Leader. Recommended that everyone interested in AREC activities should read the AREC.INFO blog. Dave will be trying to get more activity going in the coming months. He noted that AREC were involved in the search for a missing person in the Waitakere Ranges, and that person was still missing.

General Business:

1. NZART Remit. This was published on Page 30 of the March/April issue of Break-In. Secretary ZL1VH advised that according to the information supplied by NZART HQ, we had nine members present who were eligible to vote on the remit. A show of hands confirmed this.

President Matthew ZL1YOT introduced the remit and read it out to the meeting. He invited discussion on the remit.

The remit was put to the vote:

Result: 9 in favour, Against: 0, Abstaining: 0

Appointment of a Delegate to the NZART AGM on 5 September in Wellington:

Moved ZL1TIA, seconded ZL1TCI that Vaughan Henderson ZL1VH be appointed delegate for Branch 66 and granted power of discretion.

2. ZL1YOT reminded members that we were going to hold a construction night at the club rooms tomorrow night, Tuesday 11 August. Anyone wanting help with a project or assistance with anything technical was welcome to come along.
3. ZL1TIA advised that he had ordered and received a VNA from China and was looking forward to learning how to use it.
4. Used Test Equipment – ZL1VH advised that the club had received a donation of a quantity of test equipment. Most of it was not in working condition and members were welcome to make a gold coin donation for any items they wanted to take away.
5. Club Email Address – ZL1VH reported that the club had a new general email address and members had all been "joined" to this address: aucklandvhf@googlegroups.com. Our intention was to use this address to keep members informed of what was happening in the club and it was also open for members to post any questions or information which might be of interest to other members of the Group. Anyone not wanting to be a member of this email reflector should let the Secretary ZL1VH know.

The meeting closed at 20:20 and was followed by Microsoft Teams sharing helping members to present a Show & Tell of their recent projects.

Show and Tell Presentations

Dennis ZL1UET showed a number of completed PC boards from Mini-Kits Australia which when completed will make up a 23cm transverter. He has the low phase noise Butler oscillator board which has an output frequency of 500 MHz, a doubler from 500 MHz to 1152 MHz to provide the local oscillator for the transverter board and the Mini-Kits transverter board which has a fixed frequency range of 1240 to 1300 MHz and transverts down to 2m. His next activity is to connect the board and align to get a complete transverter. More information on Dennis's project can be found on the Mini-Kits Australia web site: <https://www.minikits.com.au/electronic-kits/transverters/eme227-23cm>

VHF Group Trailer with Clark Mast – somehow this got into the presentation! ZL1VH described the background and how we obtained the trailer with mast. It is currently stored at Matthew ZL1YOT's QTH in Kumeu and a working be will be organised to do some more work to get it fully operational. Wheels and brakes need attention, the Clark Mast needs new seals (on hand) fitted. ZL1UET advised he had a service manual for the mast.

Dave ZL1TIA showed a digital clock app with large digits which he was using with a \$50 "old" smartphone. Uses WiFi to keep time synchronised. He was finding the large digits and ease of reading at a distance extremely helpful. The app he chose came from Light Dot Net because it also displays seconds. Has a choice of six different colours. You can find the apps on the Play Store: https://play.google.com/store/apps/developer?id=Light+Dot+Net&hl=en_NZ

John ZL1YAK showed his new Icom IC-705 transceiver. He admitted to just getting back into amateur radio and still needed to get an aerial or aerials to use with the rig and learn how to use all it's features. The Icom 705 is available from the New Zealand Icom agents, RWB Communications: <https://rwb.co.nz/amateur>

Ian ZL1AOX showed some new satellite tracking hardware he had purchased. An Arduino with an interface to his Yaesu azimuth rotator and Kenwood elevation rotator. Using it in conjunction with his 9700 to automatically track satellites. The control interface to the Arduino was a Nextion 3.5" touch screen and he was modifying the K3NG software as used by VK4GHZ. In response to a question, Ian described his antenna setup for 2m, 70cm and higher bands. Lots of good information on the VK4GHZ web site: <https://vk4ghz.com/>

Simon ZL1THH showed a 2m/70cm antenna based on the DK7ZB design, but implemented using copper tape stuck onto core-flute. This had the advantage of being light weight and by making a fold in the core-flute sheet, could be folded up making it very compact. He planned to use it for communicating through the new cross-band repeater on the ISS. Using the antenna, he had heard signals from the ISS but so far had not been able to access it. For his next project, Simon is considering a LPY antenna constructed using the same materials which could be used as a test or reference antenna for antenna testing. The DK7ZB web site has some interesting other antenna designs – worth a look: <https://www.qsl.net/dk7zb/start1.htm> We will try and persuade Simon to write up his experiences for a future issue of Spectrum.

Vaughan ZL1VH showed a 250W dummy load built on the heatsink and enclosure of an old 24V to 12V DC converter. The dummy load used a Johanson 50 Ohm 250W RF power resistor which has a frequency response from 0 to 3 GHz. So far, in testing it, he reported good results on 2m, 70cm and 23cm but needed a bigger power amplifier to test it at 250W. This generated some discussion on the availability of low cost 50 Ohm resistors recovered from equipment and could be sourced from the usual Chinese on-line suppliers. A drawback with the used power resistors was that the length of the stripline connector tab was very short and did not allow for much thermal expansion and contraction.

John Henry ZL1JHW showed a small USB charger module he had bought from his electrical wholesaler. Costing about \$26.00, these operate off 230V AC and output about 4 amps at 5V. The module fits into several of the standard electrical switchplates from Clipsal, HPM and others so you can have a USB charging outlet built in to your wallplate and don't need to have a separate external charger. Question was asked if these generated any RFI not known. <https://www.pdl.co.nz/products/detail?CatNo=30USBCM&tab-document-1=0&itemno=30USBCM> is one such type. Also available from Clipsal.

Brendon ZL1XXX posed a question to the meeting as to why his FM radio receiver received buzz, buzz, buzz type noises during daylight hours when his solar panel and regulator was active. He showed how the solar panel, battery and distribution switchboard was wired. This question generated some good discussion, and helpful advice on how to solve the problem by altering the wiring and ultimately disposing of the cheap Chinese made solar panel regulator and getting a better "brand name" model which did not generate the noise.

The "show and tell" session concluded at 2115. Vaughan ZL1VH thanked all those who made presentations and Brendon ZL1XXX for setting up the Teams session.

E. & O.E. ZL1VH

Working Bee at Clubrooms 05 September 2020

Many thanks to the workers who turned out today to make the Clubrooms Working Bee a success.

Thanks to Simon ZL1THH, Darryl ZL1TCI, Matthew ZL1YOT and Merv ZL1SK, we got quite a lot done. The new handrails on each side of the entry-way steps were completed. Darryl ZL1TCI sorted sorted out some broken louver windows and replaced an old curtain. Matthew ZL1YOT got in a painting mood, so the inside wall of the clubrooms at the back has had a second (final) coat of paint and the wall inside the radio rooms is now painted. Some unpainted plywood behind the toilet door also got a coat of paint. Merv ZL1SK was busy with the catering, fixed a magnetic latch on one of the cupboards in the kitchen, did a fine job with the vacuum cleaner and generally assisted Simon ZL1THH and Vaughan ZL1VH outside with the new handrails.

Simon ZL1THH also built a timber ladder rest alongside the tower so we no longer need to rest the ladder on the plastic gutter.

Once the timber dries out a bit we will paint the handrails and fit new door latches to securely hold the doors open when required. Still to be done - bolts through the handrail posts onto the step stringer and some grab handles on the inside of the doors.

Regards
Vaughan ZL1VH

Putting it all together



The finished railings



Sign up for New Zealand ShakeOut 2020

We now have over 400,000 people signed up for this year's New Zealand ShakeOut, our national earthquake drill and tsunami hīkoi.

On 15 October at 9:30am, New Zealand will have the opportunity to learn and practise the correct actions to take during an earthquake and tsunami by participating in ShakeOut drill day.

Wherever you are during New Zealand ShakeOut, you can take part in the drill. Just Drop, Cover and Hold for up to one minute, and if you are in a coastal area practise your tsunami hīkoi.

<https://getready.govt.nz/involved/shakeout/sign-up/>



Pizza Hut is going Hi-Tech

You may have seen the recent adverts on TV. The impressive Interior of the delivery van was set up with help from some of the VHF Group equipment room on loan.



50 Years Ago in Spectrum – Notes from the October 1970 edition:

President Morris ZL1TAQ's column noted that the club needed more members. And that Spectrum needed more support. He challenged members to give some thought to the future of amateur radio and increase their enjoyment by introducing someone new to the hobby.

Band conditions for the month were reported as average. Of note was ZL1TAZ operating "railway mobile" while travelling south on the Express train.

Bernie ZL4IS reported from Dunedin on the establishment of a new 2m repeater on a site on the Otago Peninsular giving a commanding view of the city and suburbs including Green Island, Port Chalmers and Portobello. He reported that the first weekend of operation was marked by an unexpected equipment failure that would only be found in a rural area – a horse with a mis-placed and miss-directed appetite ate the feedline, thus disabling the repeater!

The Matamata Radio Club had held another mobile rally with 8 cars taking part: ZL1QI, ZL1UX, ZL1AIB, ZL1BKZ, ZL1MQ, ZL1ACL, ZL1TFR and ZL1AZP. The rally was well supported by home stations: ZL1RF, ZL1BCL, ZL1FE, ZL1JK, ZL1BJL, ZL1TLF, ZL1THI and ZL1TAA. Winner was Eddie ZL1ACL with 122 points. Marion ZL1BKZ and Cliff ZL1MQ tied for second place with 114 points.

A full page advert for the 1971 VHF Convention to be held in Wellington over Easter weekend. The programme had an informal get-together on Friday 9th; on Saturday 10th a transmitter hunt followed by lunch, then lectures for the men and demonstrations for the ladies. In the evening a dinner and dance was to take place at one of best cabarets in Wellington. On Sunday 11th the morning was given over to the Forum and after lunch a mobile rally. Sunday evening was an informal social plus prize giving. On Monday 12th, trading tables were open and shack visits completed the weekend.

A number of stations had taken part in a recent VHF Contest and Spectrum reports on notes from several of these stations. Of note was a report from Bill ZL2CD who wrote "The contest finished with a screaming halt for me when I received an emergency call from Murray ZL2THW who had set up portable on Hawkins hill, Wellington. At 9.35pm Murray reported seeing a red flare out to sea for about 30 seconds, on a line from Hawkins hill to the Kaikouras. He had his co-operator were certain it was a distress flare. He immediately called me and I phoned the police. And harbour board officials who wanted to know whether we could get a more accurate fix. It appeared that there were two fishing boats in trouble out there and ours was the only direction-finding information they could get. Eventually the fishing boats were located and towed back to port, thanks to our help. Quite an exciting evening, apart from the contest!"

The Hamilton Radio Club were promoting an upcoming 2-day Mobile Rally event with a transmitter hunt on the Saturday afternoon (giving people time to arrive), a social, dinner and dance on the Saturday evening. On the Sunday morning the 70 mile mobile rally was scheduled to start at 11am, a break for lunch from 12 to 1pm, and the rally finishing with afternoon tea at 3pm.

The technical content was not ignored with "A case for Band Planning" by ZL1HV; winding ferrite tube chokes for frequencies between 20 MHz and 150 MHz by Brian ZL2BDD; a 2 meter QQE06/40 linear amplifier design giving about 20dB of power gain for a few hundred milliwatts of drive by Brian ZL2TIA; a ½ Watt Audio System using the TAA300 to drive a loudspeaker or function as a modulator in a QRP rig designed by Ian ZL1TAT; Graham ZL1AHQ reported on polar plots taken from five aerials which had been written up in the previous issue of Spectrum, and ZL1TFE presented a comprehensive design for a 2m Log Periodic Yagi antenna. Terry ZL1TFC rounded out the issue with some thoughts on 2 metre converter design and presented a design for the RF pre-amp section of the converter.



Amateur Radio Emergency Communication.

**Volunteers in radio communications.
Using our resources to help the community.**

INFORMATION

The Auckland VHF Group has an AREC Group that works closely with Auckland Council Emergency Management. They provide advice, resources and manpower to assist in times of need.

The AREC section is headed by Group Leader David Dingley ZL1TIA.

From time to time the VHF Group has training sessions and exercises. Members also assist with sports events, parades and other community activities. For further information about AREC please see the NZART web site: <http://www.nzart.org.nz/arec/>

JOIN BRANCH 66 AREC

All members of the Auckland VHF Group are encouraged to join the AREC section. Your contribution, large or small is appreciated by all involved. For further information about joining Branch 66 AREC contact the Group Leader:

David Dingley ZL1TIA

828 9394 mardayak@gmail.com

George Raffles ZL1TUX

021 735 361 z11tux@xtra.co.nz

AREC News:



AUCKLAND VHF GROUP (INC)

SUPPORT THE EFFORTS OF THE VHF GROUP THROUGH YOUR
SUBSCRIPTION

SUBSCRIPTIONS FOR 2020

THE SUBS GO TOWARDS;

- Maintenance and on-going improvements to beacons, repeaters and linking systems for the national system, including the Klondyke repeater site.
- Providing on-time and free access to spectrum magazine as soon as it is available.
- Providing facilities for good speakers and lecturers at our general meetings.
- Discounted access to our trading table goodies.
- Access to test equipment and technical help when needed.

FULL MEMBERSHIP **\$55.00**

ASSOCIATE MEMBERSHIP **\$50.00**

FAMILY MEMBERSHIP ADDITIONAL **\$20:00**

SEE ATTACHED MEMBERSHIP RENEWAL FORM (next page)

**REMEMBER TO KEEP US INFORMED OF YOUR EMAIL
ADDRESS!**

OTHERWISE WE CANNOT SEND YOU SPECTRUM!



Thought for the month:

“The most difficult thing is the decision to act. The rest is merely tenacity.”

NAME	Mr/Mrs/Miss/Ms	Christian or given	Surname
Address			
		Phone: (home)	
		Phone: (work)	
		Phone (Cell)	
		Email	
Occupation:		Callsign	
NZART Member		Branch assigned	
AREC Member		Branch assigned	
Category			To pay
Membership	Full	\$55:00	\$
New/Renewal/ Change	Associate	\$50:00	\$
Receipt #	Family Add	\$20:00	\$
Donations	Auckland/Klondyke		\$
	Brynderwyn		\$
	Data/D-Star		\$
	IRLP		\$
	Other		
	Beacon / Repeater / Links / Licence donations		\$
		Total	\$
Payment			
Circle one -->	Cash	Cheque	Internet deposit
Invoice/Statement re- quired	Please Advise Treasurer		
Internet	<p>To account ASB 12-3011-0830580-00. Account name is: Auckland VHF Group Inc. Include your Name/Callsign and Sub or RepeatDon etc in particulars field, for us to track. To sponsor a specific repeater, nominate the repeater and a backup repeater for the donation, in case the initial choice has been taken. The sponsorship is a minimum of \$50.00 which covers the licence for a year. Note: Please return the Form to the email or postal address given below to allow us to update our records. (Please Note the Account Number and email may have changed from last year) Email to: treasurer@aucklandvhfgroup.org.nz</p>		
Post	The Treasurer, Auckland VHF Group Inc., PO Box 10138, Dominion Road, Auckland 1446.		
In Person	Bring this form and payment to the next club meeting, 2 nd Monday of the month or to the Committee meeting last Monday of the month.		

The Auckland VHF Group Inc Branch 66 NZART

gratefully acknowledges the sponsorship of Branch 66 Beacons, Repeaters and Fixed Links licence fees and the Group's repeater operations by the following radio amateurs and NZART Branches for 2020

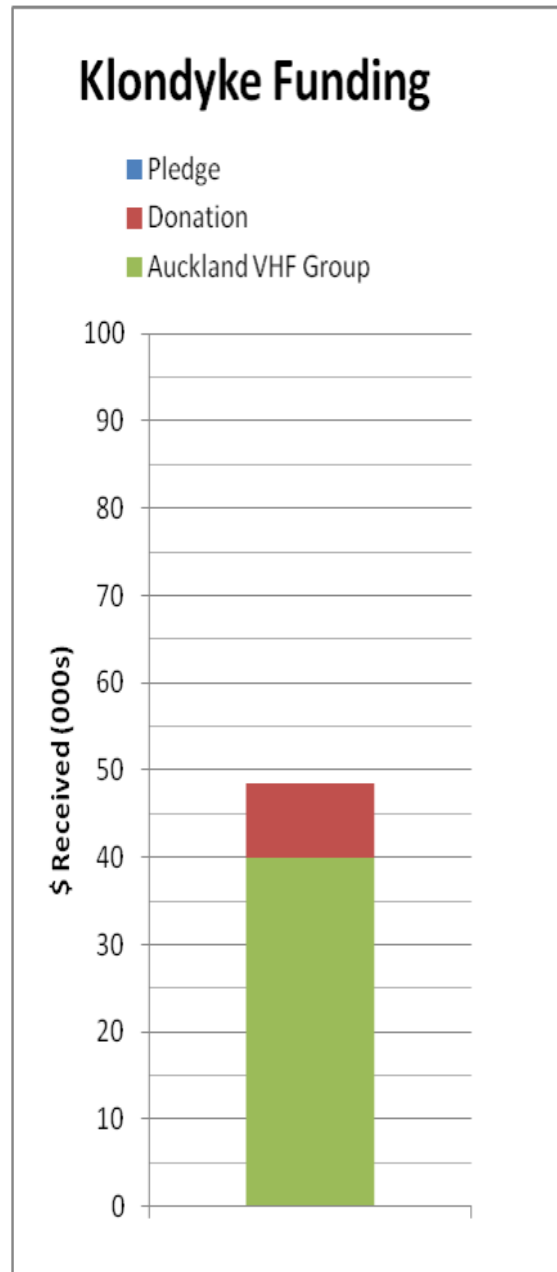
<u>Repeater frequency</u> and name	Repeater location	Sponsorship advised for 2020	Amount paid
53.725 Repeater	Klondyke Road	Gwynne Rowe	\$50
144.253 Beacon	Nihotupu	Stability testing	
145.625 Data Rptr	Klondyke Road	Not operating	
145.650 D-Star repeater	Klondyke Road	Laurie/Marlene Mathews	\$50
146.625 Repeater	Klondyke Road		
146.700 Repeater	Ruaotuhenua	Dennis Thorton	\$50
146.900 Repeater	Mt Puketutu Radio	David Wilkins	\$50
432.253 Beacon	Nihotupu	Stability testing	
438.175 D-Star repeater	Klondyke Road	Laurie/Marlene Mathews	\$50
438.500 Repeater	North Head	Not operating	
439.850 Link Tx to Kaimai	Klondyke Road	Franklin Radio Club	\$50
439.875 Ak Nat Sys Rptr	Klondyke Road	Franklin Radio Club	\$50
439.900 Link Tx to Egmont	Klondyke Road	Franklin Radio Club	\$50
439.950 Link Tx to Brynderwyn	Klondyke Road	Franklin Radio Club	\$50
1291.900 Repeater	217 Glenfield Rd	Soren Low	\$50
		Total Sponsorship	\$500
NZART Inc: Branch/Personal donations			
Papakura Radio Club			\$500
Auckland Branch			\$100
Manukau Radio Club			\$100
George Marr, ZL1TUJ			\$50
Kylie Peterson, ZL1KM			\$50
	Donations		\$1300
Current as at 25/08/2020			

The Auckland VHF Group, Branch 66, would like to thank all those who came forward to sponsor the licence fee for our Beacons, Repeaters or Fixed Links for the year 2020 or donate towards the Group's repeater Operations.

**Klondyke Tower
Donations towards Maintenance**

Target 100,000

Name	Donation	Pledge	Tower	63,245.00	Other	27,268.25
			GST	9,486.75		
Donations 2018 - 2019	6550.00					
			Total	72,731.75	Total	27,268.25
Charles Graves	15.00					
Ian Ashley ZL1AOX	500.00		Auckland VHF Group	40,000.00	40.00	
Keith Dix ZL1BQE	50.00					
Margaret Dingley ZL1AYV	100.00					
David Dingley ZL1TIA	100.00					
Jenny Dingley ZL1TDB	100.00					
Russell King ZL1WITT	20.00					
Basil Orr ZL1TOW	500.00					
Raffle - Meter	339.00					
Martyn Seay ZL3CK	100.00					
Brian Faithfull	50.00					
Mark Howe	20.00					
George Marr ZL1YUJ	50.00					



Total	8494.00	-
Percent	8.49	0.00

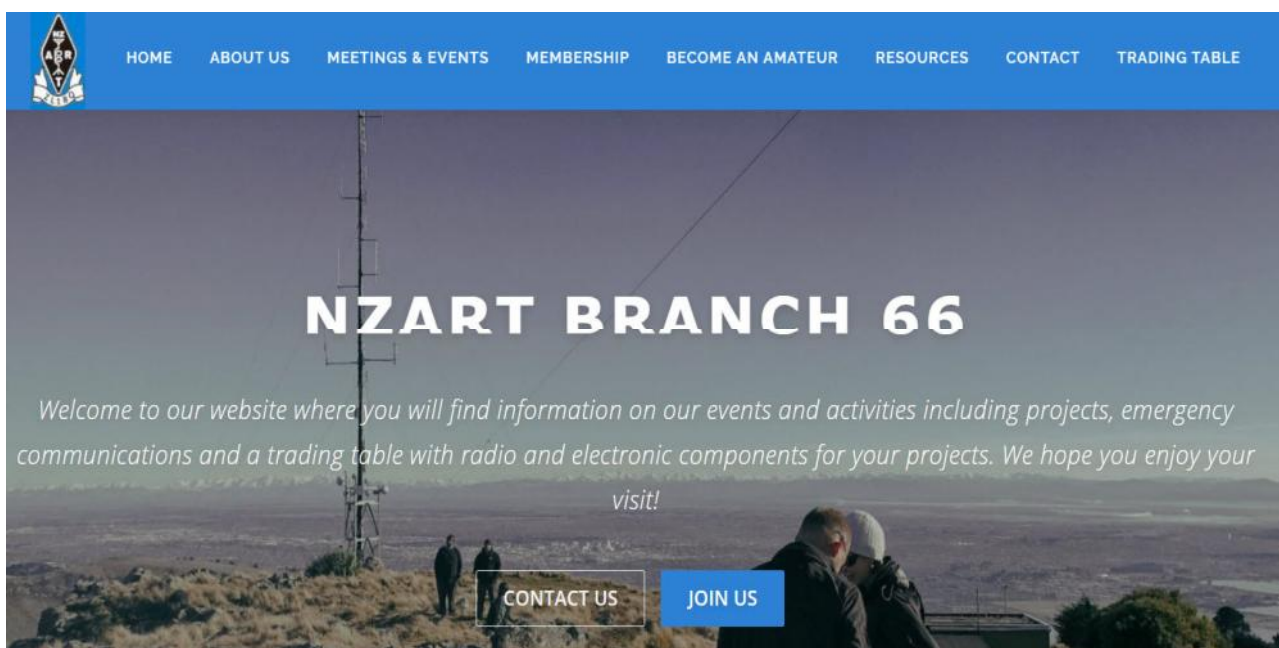
TRADING TABLE

Currently our Trading Table is only open on meeting nights but wait, there's more!

Trading Table is now on line. Navigate your way to our new look web site at <https://aucklandvhf.org/> and click on TRADING TABLE (the most right hand tab).

Wait a few seconds and the on-line version of the Trading Table will pop up. From here you can browse the various sections, dig deeper to look at what's available and even place your order online.

If you prefer to just look at the Trading Table List, just hover your mouse pointer over the TRADING TABLE and a pull down list will appear. From this you can access the full trading Table list and download it in .PDF form.



Recent Additions to our Trading Table Stock

Electrolytic Capacitors SMD	(Packed in bags of 10 for 50c):	
10uF 16V electrolytic	47uF 16V electrolytic	100uF 16V electrolytic
Resistors:		
50 Ohm 0.4W +/-1% tolerance.		10 for 50c
0.25 Ohm 5W wire wound		
0.27 Ohm 3W Wire wound vertical pcb mount		
Siemens Gas Surge Voltage Protection Tubes:		
SVP Tube type B13-A230. 230V D.C. minimum strike voltage.		\$1.00 for 10
2-electrode type with wire leads, pre-bent for 10mm hole spacing.		
ETAL P1200 600:600 Ohm line matching transformer		\$3.00 each
Quartz Crystal: 6.000 MHz HC49SMD package marked CQ6.0000		\$1.00 each
BNC plugs 50 ohm R/Angle for RG58 coax (solder/clamp type)		\$2.50 each
Relays:		
12V coil, DPDT 1A non-latching (EB2-12NU) SMD package		\$2.00 each
12V coil, DPDT 1A 2-coil latching (EB2-12TNU) SMD package		\$2.00 each
LED Holder panel mount 5mm Kingbright nylon in bags of 50		\$3.00 per bag
Lacing Twine black plastic, in 10m rolls.		\$1.00 each
Ceramic feed-thru insulators, 500V rating, solder in.		50c bag of 10
Semiconductors:		
RURP30120	1200V 30A ultrafast switching diode	\$1.00 each
1SS55	Silicon switching diode. 70V 100mA DO-35	10/\$1.00
2N5777	NPN Light detector, Photo-darlington 45V TO-92	\$0.50 each
2N6027	Programmable Unijunction Transistor 40V 300mW	\$0.10 each
2N6122	NPN TO220 60V 4A 40W GP amplifier	\$0.50 each
2N6292	NPN TO220 70V 40W GP amplifier	\$0.50 each
2N6609	PNP TO3 140V 16A 150W audio/driver	\$1.00 each
BUK457-500B	Power MOSFET 500V 9A 150W TO-220	\$2.00 each
SGP15N60	NPN IGBT 15A 600V fast switch TO-220	\$1.00 each
SGP20N60	NPN IGBT 20A 600V fast switch TO-220	\$1.00 each
UDN2965W-2	Dual high power stepper motor driver. 20 to 50V out at 4A SIP package.	\$1.00 each
LM3909N	LED driver/flasher. 8-pin plastic DIL package.	\$0.5each
LM3911N	Temperature Controller IC. 8-pin plastic DIL package.	\$10 .00 each
LM3914N	LED Bar-graph driver. 18-pin DIP plastic package.	\$5.00 each
PIC16C54B	8-Bit CMOS Microcontroller. 18 pin SOIC SMD package Limited quantity	\$2.00 each