Amateur Radio

Volume 89
Number 4 ▶ 2021
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E-mail: yaesu@vkradio.com.au

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Editorial

Production manager
Dr Brian Clarke VK2GCE

Technical editors
Phil Fitzherbert VK3FF
Alan McPhail, VK2AMC
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Publications committee
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Bruce Kendall VK3WL
Alan McPhail, VK2AMC
Carmel Morris VK2CAR
Jules Perrin, VK3JFP
Simon Rumble VK2VSR

All circulation matters
nationaloffice@wia.org.au

How to submit material
Phil Fitzherbert, VK3FF
philipfitzherbert@wia.org.au

Letters to editor
Simon Rumble, VK2VSR
simon@wia.org.au

Hamads
David Burden, VK3BDX
david@wia.org.au

Advertising
David Burden, VK3BDX
david@wia.org.au

Registered office
Unit 20 11-13 Havelock Road
BAYSWATER VIC 3153
Australia
Phone: 03 9729 0400
Fax: 03 9729 7325

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Columns

Technical

This month's cover:
The four musketeers at MayHam 2021. Photo by permission Ray Robinson, VK2NO.

General

Contributions to Amateur Radio

Amateur Radio is a forum for WIA members' amateur radio experiments, experiences, opinions and news. Manuscripts with drawings and/or photos are welcome and will be considered for publication. Articles attached to email are especially welcome. The WIA cannot be responsible for loss or damage to any material. Information on house style is available from Phil Fitzherbert.

Back Issues
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Photostat copies
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Disclaimer
The opinions expressed in this publication do not necessarily reflect the official view of the WIA and the WIA cannot be held responsible for incorrect information published.

Amateur Radio Service

A radiocommunication service for the purpose of self-training, intercommunication and technical investigation carried out by amateurs; that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest

Wireless Institute of Australia

ABN 56 004 920 745

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Member of the International Amateur Radio Union

Registered Office of the WIA
Andersson House
Unit 20, 11 Havelock Road
Bayswater, Victoria, 3153
Tel: (03) 9729 0400 Fax: (03) 9729 7325
email: *nationaloffice@wia.org.au*
http://www.wia.org.au

All mail to
PO Box 2042 BAYSWATER VIC 3153
Business hours: 10am – 4pm weekdays

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Editorial

Brian Clarke VK2GCE

How often has your credit card account been hacked and serious money stolen? It's annoying because your credit card issuer cancels your card, issues another and then you need to advise all your direct debtors about the new numbers. Sometimes your credit card issuer gets some of your money back.

How often do you receive phone calls allegedly from Telstra Technical Division, or the NBN Service Centre, or Microsoft, to advise there is a problem with your phone line or your operating system, and they will fix the problem for you. You go along with the story, turn on your PC, allow TeamViewer, or similar, and you get presented with what is apparently your home page, and a dialog box tracking all sorts of nasties in your email and bank accounts. Maybe you are a little suspicious because the person has an Indian or Pakistani accent, and speaks and types in the Command box in 19th century English. You ask where the person is – and it's always another State. You ask for a number so you can call back because you have an urgent toilet issue. You try the number on another phone, and the number has been disconnected or not issued.

How often do you receive phone calls allegedly from Amazon Sales, or Coles, or Woolworths, telling you that your account has been debited with a large amount for an item you did not order? And please press 1 to talk with a supervisor. It's always Dorothy or Veronica, but it's a recording. You press 1 and another voice comes on the line asking for your credit card details so the transaction can be reversed.

When did you last get an offer of an inheritance worth thousands of dollars allegedly from a west African bank official or from a rich American Christian widow? To establish you are the intended recipient, there will be a small fee to cover the administrative discovery work involved.

How often do you receive phone calls allegedly from the Australian Tax Office, advising that you are about to be audited and a warrant has been issued for your arrest to ensure compliance?

How often do you receive emails and SMSs allegedly from young, barely-clad, nubile girls or testosterone-enhanced muscular blokes, claiming to live near you, or to be visiting your city for a couple of weeks, who would love to be shown a good time.

You are working away at your PC diligently typing up a report. You decide to import a 20 KB image to reinforce the point you are making. Suddenly, your PC slows to a crawl. You use Ctrl+Alt+Del to open your system manager and you see your CPU and RAM are running to the max. What has happened? It cannot have been that 20 KB image. Your PC has been 'borrowed' to act as a switchboard for transmitting messages to others.

Perhaps you run a business that, because of the COVID-19 stay-at-home regulations, you have moved to on-line trading. You are sitting in front of your PC carrying out all your usual trading activities and suddenly you get a red splash screen with a notice that your PC has been locked down, and you can regain access if you pay a ransom in BitCoin currency. Should you pay?

Continued on page 4

Board comment

Greg Kelly VK2GPK

This is Greg VK2GPK, WIA President.

Lockdowns – *rinse and repeat:* As I am writing, about 12 million people in Australia – almost half the total population - are in pandemic related lockdowns following a series of outbreaks of the virulent "Delta" variant of the SARS-CoV-2 virus. There are now signs of lockdown fatigue leading to compliance complacency as well as an uptick in unhelpful public feuding between the State Premiers and the Federal Government, especially over delays in the vaccination rollout. It is a pity that in the original procurement process of the various types of vaccines, the Federal Government seems not to have had a grasp on the concept of "game theory". Game theory is readily applied to procurement[1] in competitive situations that involve conflicts of interest. Increased on-air activity that was a feature of the lockdowns last year seems to have largely dissipated, despite the important mental health benefits that almost certainly ensued. I issue a challenge to the WIA Affiliated Clubs - see if you can get a few members on air on a regular schedule each week - HF or repeater – and make it a permanent feature of your club's weekly calendar. And don't forget 160 metres as an option as it is so accessible to the younger members (or potential members!) of your club via a five minute tweak to a basic AM radio.

ACMA April 2021 Consultation: The Australian Communications & Media Authority has advised that they received over 800 submissions to their consultation on unassigned licence classes where ACMA proposed a change to a class licence as their preferred option. ACMA also advised that an outcome on this matter is still work-in-progress. No changes were made to Overseas Class Licences re EME. The WIA wishes to thank all members who responded to our "Call to Action" to write to the ACMA supporting the WIA submission.

WIA AGM: The WIA again conducted a virtual AGM this year– although we had to wait until March 29 this year to find out if ASIC (Australian Securities & Investments Commission) would allow public companies[2] to hold virtual meetings. The AGM was held on Saturday June 26, with a good turnout with over 90 members directly participating via videoconference and over 150 members viewing the YouTube livestream. The AGM proceeded with the highlight that the surplus posted during FY2020 fully offsets the deficit posted last year[3] (FY2019). A Special Resolution to reference a Code of Conduct in the WIA constitution was withdrawn by the chairperson, to be re-introduced at a later General Meeting. Peer organisations in other jurisdictions have Codes of Conduct, such as the RSGB[4] (Radio Society of Great Britain). Membership numbers continue to be an area of concern though the membership roll-off which started in 2016 appears to have plateaued in late FY2020. [And with the implementation of the WIA membership benefits card, which offers discounts from participating suppliers that can easily more than offset your cost of membership, we are hoping to see this contribute to an upturn in new members during FY2021.]

Time to pass the baton: I advised at the AGM that it is my intention not to (re-)nominate for the role of president. This is to focus on personal endeavours as I am in the process of repairing infrastructure and building a new house on my rural property, which was extensively damaged in the bushfires last year. The roles of president and vice-president are voted on at the first board meeting held after an AGM.

Retrospective: I have now served two terms of two years as a director, including one year as Vice-President and two years as President. When I first joined the WIA board in mid-2017 it followed a period of toxic destabilisation of the organisation precipitated by a few estranged directors that resulted in the prior entire board

1 The **Chartered Institute of Procurement & Supply** (CIPS) promotes knowledge and use of game theory within the context of business **procurement**. CIPS is a United Kingdom-based global **professional body** working for the purchasing and supply professions. Game theory also has application in economics, project management and Artificial Intelligence.

2 The WIA is incorporated as a public company, limited by member guarantee and is subject to the Corporations Act.

3 The deficit FY2019 largely stemmed from the combined impact of the costs associated with representation at and prior to the ITU (International Telecommunications Union) World Radio Conference (WRC-19) and significant – but unrecoverable under the deed - transition-out costs following the expiration of the ACMA deed for examinations and callsign after 10 years.

4 *https://rsgb.org/main/about-us/rsgb-code-of-conduct/ https://www.iaru-r1.org/on-the-air/code-of-conduct/*

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Editorial

Continued from page 2

A computer geek friend tells you that there are forensic specialists who can probably retrieve all the data on your hard drive(s), for a mere kilobuck each.

These are everyday events. Why am I recounting them, you ask? This is an Amateur Radio magazine, after all.

We all know there is a roaring trade in acquiring and selling contact details. Similarly, there are software developers producing wonderfully erudite grey ware to help the sequential diallers, hackers and scammers. Don't you wish just one would knock on your door so you could offer a quick trip to the dentist, the hospital or the next life?

We use radios connected to antennas. When you needed to pay a licence fee to listen to the radio, there were radio inspectors travelling around in vans who listened for your IF. If you had not paid your licence fee, there would be a knock on your door, with a Please explain. That monopolistic legislative era has passed. However, anyone with a suitably sensitive radio and a small beam antenna can triangulate where you are, within a few metres. I have used an HT with an HB Adcock antenna to locate a caller on 2m who filled the space between legitimate QSOs with sounds of digestive tract upsets.

We have now moved into the digital era. Our radios use digital methods for generating the carrier. Your input, voice or code, can be transformed via Analog-to-Digital Converters to provide digital modulation. You can buy a single board to install in your PC, or you can buy a dongle that plugs into your USB port that contains a Software Defined Radio that can provide reception from DC to daylight. All you need to do is connect an antenna. Your sound card provides the audio interface. And as a real bonus, you get a screen image that looks like a really expensive radio, with all sorts of controls and reports. You can even get a Hepburn display, a waterfall display or a panoramic frequency display showing frequencies in use near the one you are monitoring. If it's really smart, you can get a GPS disciplined oscillator for distributing an accurate and highly stable 10 MHz test signal to all your test equipment. How will you know if someone has introjected a deliberate dither?

Every good security strategy starts with having a security assessment that can answer these fundamental questions (the first three questions are paraphrased from a TI Wi-Fi security webinar):

1. What assets are you trying to protect? Is it identity and keys? Is it sensitive data, like your password, callsign, address or proprietary data? Or is it the code that's actually running in your system?
2. Where are you trying to protect these assets? Is it when they're at rest? Is it at runtime when these things are being manipulated in main memories? Or is it when they're being transferred over a physical interface (landline, cable, internet), or a wireless interface?
3. What are you really trying to protect against? Are you trying to prevent the asset from being stolen, or just the asset being controlled by some unknown and possibly malicious entity, such as for ransom?
4. What kind of protocols and code will you use to protect your assets?

Should we protect ourselves against cyber attacks by purchasing and installing anti-spyware, and paying for regular signature identification? How reliable is the anti-spyware? Does it have a back door through which nefarious operators can interrogate your system or corrupt it? Microsoft has denied the US government access to such – for how long? Should you rely on the advertising blurb on the outside of the packaging, or on the splash screen that appears when you install? These are all after-market, after-design bolt-ons and you will always be playing catch up. As soon as an anti-spyware product becomes available, cyber criminals start work on it to thwart your best intentions. I worked for a really smart software development firm that provided near-custom programs that predicted mains power brown-outs or outages – customised for and sold to generation authorities. The program developers were all Asian; the phone lines and email systems ran red hot at night leaking the latest programs to the highest bidders. These developers all had Ferraris and Lamborghinis.

Have radio manufacturers built in security protocols? Flex Radio tried. Perhaps we need to design cyber security into our radio systems from scratch, rather than buy bolt-ons. Can you buy a bolt-on product for your all bells and whistles JayComWu radio?

There is no TAFE course to help you. In Australia, there is one university that is planning its curriculum for an Electronics and IT engineering course to teach us how to design with security in mind from the start. The course is not available yet.

Your task, should you accept it, is to find out how to design your radios to be secure and start teaching and training your colleagues to become similarly wise. Apologies to *Mission Impossible* and *Oceans 13*.

WIA news

Natural radio signals detected in Venus' atmosphere

During its third fly-by of Venus, NASA's Parker Solar Probe recorded natural radio emissions from within Venus' atmosphere. Gizmodo reports that while the Parker Solar Probe was designed to study the Sun, it has also done important work on Venus as it uses the planet's gravity to move closer to the Sun.

The probe uncovered natural radio emissions while passing through Venus' ionosphere. By measuring the frequency of the emissions, scientists can directly calculate the density of Venus' ionosphere.

https://gizmodo.com/natural-radio-signals-detected-in-venus-s-atmosphere-1846820522

Venus from NASA's Parker Solar Probe taken in July 2020.

The bright rim around the edge of the planet may be nightglow, light emitted by oxygen atoms high in the atmosphere.

Contest University, Hamvention forums and Propagation Summit 2021 videos online

The annual conferences associated with the Dayton Hamvention were run online this year and, to our benefit, that means the videos are all online for our consumption down-under at a convenient time of the day. Contest University covers various aspects of contesting including preparing your station, choosing category and techniques to improve your score. The Propagation Summit looks into the solar cycle and space weather.

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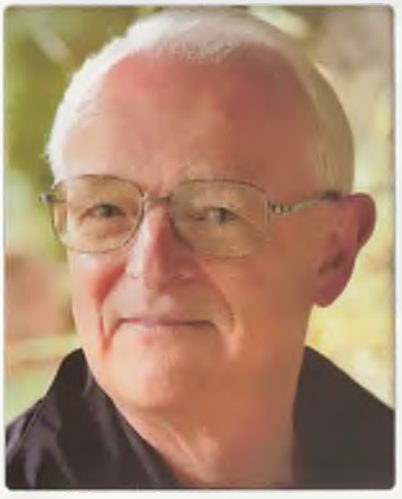
Bill Roper OAM VK3BR

Bruce Bathols VK3UV



Name	Mr William Edward ROPER
Award	Medal of the Order of Australia
Post-Nominal	OAM
Date Granted	14th of June, 2021
State	VIC
Suburb	Mentone
Postcode	3194
Citation	For service to amateur radio.
Announcement Event	The Queen's Birthday 2021 Honours List
Award ID	2009055

I am pleased to report that Bill Roper VK3BR (nee VK3ARZ) has been awarded with the *Order of Australia Medal* (OAM) in the 2021 Queen's Birthday honours list, and I offer him my heartiest congratulations in achieving this award.

Bill is one of the very few amateurs to have been selected for the award, with specific mention of his services to the Amateur Radio Service, and as such gives Amateur Radio a profile boost in the eyes of the public.

I have known Bill since the late 1960s, having had the pleasure of working with him as a staff member in the head office of the then State Savings Bank of Victoria.

He was my mentor in assisting me to obtain my own amateur radio licence, which I achieved in November 1971.

Bill was licenced in 1959, was a prolific 'home brewer', and he was very active in the VK3 VHF group.

Now at 85 years of age, Bill still produces the Radio Amateurs Old Timers Club (RAOTC) bi-annual Club publication, the *OTN Journal*, which usually runs to 60 pages.

He also produces the quarterly *Newsletter* of the State Bank of Victoria Retired Officers' Club.

Here is the list of his activities cited in his OAM testimonial:

Wireless Institute of Australia

- Federal Office Manager 1988-1993
- Editor, Amateur Radio magazine 1972-1976
- Honorary Life Member 2006

Radio Amateurs Old Timers Club Australia Inc

- Committee Member since 2000
- Editor, Old Timer News since late 2002
- Membership Secretary since 2002
- Former President
- Former Secretary
- Life Member

State Bank of Victoria Retired Officers Club

- Newsletter production since 2002
- Member, current
- Honorary Life Member, 2015
- Newsletter Editor, since 2019.

Memories

Tom KE4RHHt

My first QSO in 1954 (67 years ago) was long delayed.

My Hallicrafters S-38C was a good general coverage receiver, but the only selectivity it had was my ability to separate signals using the mostly empty space between my ears. As a result, I had no luck using my Heathkit AT-1 TX and AC-1 antenna coupler connected to a long wire, about 75 feet long, and 35 feet off the ground, making contacts outside of my hometown of Wilson, NC.

Every day after school back then, I would find the 80 meter novice section of the band, 3.700 to 3.750 MC to be a very dense thicket of ham signals. I could not hear anyone replying to my CQs and no one seemed to hear me, when I replied to theirs. I was overwhelmed and after a while totally frustrated.

Then a friend loaned me a BC-348 receiver. Wow! My ham world changed forever. I could now hear novice stations replying to my CQs and stations heard me when I replied to theirs.

So from that point on, ham radio was enjoyable and lots of fun.

Even better, after my Dad saw the success I was having with the BC-348, he gave me a Hallicrafters SX-99. With an even more selective and sensitive RX, I was motivated to get my general license.

And then shortly after my ticket arrived, I built a Heathkit DX-100 TX and connected it to a 3-element 15 meter Yagi antenna, directionally rotated by a TV antenna rotator, and as they say, I was then able to work the world.

To this day I vividly remember many, many QSOs with ZS1AB, in Capetown, South Africa. We talked so often, it was like I had a new friend in a far-away land. Barney Joel's signal would come rolling in every afternoon after school, so loud, that he sounded like he was a hometown station!

Chasing DX back then was fun, and productive. But none of us could ever catch up with the large number of DX worked by John Anthony, K4BFN, who so successfully used a National 183-D and a Johnson Viking II and a 3-element 15 meter Yagi, up about 50 feet from the ground. John worked thousands and thousands of DX stations. Sadly, after graduating from the University of Georgia, John became an Army helicopter pilot, and was killed during the Vietnam War.

A great friend who I will always remember as a great brother from a different mother.

Cheers to all of us and our first QSOs!

Tom KE4RHH (first licensed as KN4ADR, and later K4ADR)

Over to you

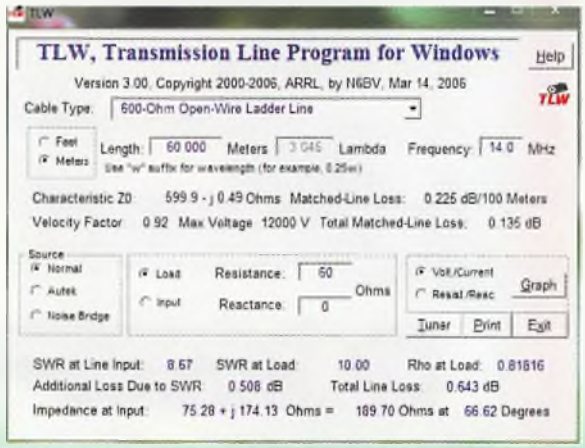
Hi, to all at AR and the WIA,

I would like to raise a minor issue concerning the article *SWR and the meaning of life* by VK5JST in the current *AR* magazine. (no.2, 2021)

On page 24, the article refers to Figure 2, which is a table showing the power lost at various levels of SWR. As far as I can see, it is not stated (but I think should be) that this table is only an example of the power loss in a particular, individual antenna system, NOT a general rule.

To illustrate my point, I ran simulations using the ARRL transmission line application for Windows, *TLW*. Screenshots are attached to this email. For my first example, I specified a 60 m length of RG-58A, operating at 14 MHz, with a 5 Ohm load at the far end, giving an SWR of 10:1. This (very lossy!) configuration shows a total loss of 7.9 dB, of which 4.2 dB is due to the SWR. This latter figure is approximately a 62% loss, so this hypothetical system is very comparable with the table in the *AR* article, so far so good.

For the second simulation, I kept everything the same, except for changing the feedline type to 600 Ohm open wire line. The different characteristic impedance also necessitated changing the load impedance to 60 Ohm to give the same SWR of 10:1. This configuration gives an (almost) negligible total loss of 0.6 dB, of which 0.5 dB is due to the SWR.



0.5 dB is a loss of around 11% - and this is at an SWR of 10:1!

This is obviously an entirely different situation to what is represented by the table in the article under discussion, AND a situation often seen in practice in the the type of antenna commonly known as a Doublet - a dipole (not necessarily resonant) fed with open wire line coupled to a tuner (ideally balanced) for multi band operation.

This antenna arrangement often operates with a high SWR on the feedline with almost no reduction in performance, due to the low loss in feedline. Of course, the balanced tuner transforms whatever impedance is present to 50 Ohm to keep the transmitter happy.

Incidentally, this is an antenna which I am very happy with at my QTH, operating on all bands from 1.8 MHz to 29 MHz.

These two scenarios are indeed two extremes, however not being an expert (especially mathematically) it was the best way I could think of to illustrate my point that the article did not quite give the full picture. However, I'm definitely not intending to detract from a well written and informative article, as was the rest of the issue!

Great work as always.

73, looking forward to another great issue of *AR*,

Stevenson 'Steven' Gawen VK2STG

P.S. Am I correct in thinking that only WIA members can submit articles for publication? Just wondering, Steven.

Letter received 2021-04-19

Reply from Jim

Dear editor *AR* Magazine,

Steven is of course, completely correct, illustrating just how complex the concept of SWR is with his calculations. He also touches on a favourite topic of mine - the use of balanced lines with their inherent low loss and low cost.

My perspective is that his letter is good enough to stand alone, expanding on this complex topic, and generating additional discussion amongst the readership of *AR* magazine.

I also note that if readers wish to further explore this topic, the ARRL has this article: *https://www.arrl.org/files/file/Technology/tis/info/pdf/q1106037.pdf/* which expands greatly on the calculations made, and which would have to be essentially reproduced in order to provide a full reply to Steven.

Best regards, Jim, VK5JST

MayHam 2021

Glenn, VK2GEM and Philip, VK2WPC

This event was run by the Central Coast Amateur Radio Club (CCARC). It replaced the Wyong Field Day that would normally have run in February but, because of the continued uncertainty with COVID-19, was moved to May and renamed, MayHam.

This is the longest running and the biggest Amateur Radio get-together in Australia and in fact, the Southern Hemisphere! On Saturday afternoon three foxhunts were held; these were just the start of the festivities. The great success of the field day is because of the quality of the traders and exhibitors who draw many people through the gates each year. The traders are set up in an air-conditioned marquee, which makes for a much more pleasant experience than in previous years. This year, trader numbers were down because of the COVID-19 lockdown; trader numbers usually fluctuate between 20 and 30. The car-boot sales have taken on a new look in recent years, now being undercover with room for over 60 cars, vans or small trucks, with their owners no longer needing to scramble to cover up when rain fell. Throughout the morning, many excited enthusiasts picked through a ton of 'trash' to find their treasures. As always, the CCARC held its amazing raffle with great prizes; this year, a lucky punter scored an ICOM IC-705.

Each year, a variety of lectures help those who want to keep up to date and challenge the grey matter a little. Prominent academics as well as speakers with an outstanding background in industry or technical development give the lectures. Subjects covered in recent years have included Space Weather, How science works, Satellite communications, Operational amplifiers, Parametric amplifiers, Digital communications, Noise reduction systems, Home theatre systems and Military radios. It's not all technical; there has even been a presentation from the HF Touring Club. AV recordings of these are available on the Internet.

Many people come to share not only in the great radio gear on offer from a variety of sellers, but also for the camaraderie of the radio fraternity, catching up with people whom they only see once a year, chatting at the meet-and-greet on Saturday evening at the Grande hotel in Wyong or on Sunday at the Wyong racecourse over lunch, a coffee or even a beer in the bar. This year, more than 400 people came through the gates; this is somewhat down from the 600 to 700 people who usually attend.

For those who wanted to enter the field of amateur radio or upgrade their licences, training and exams were held over the weekend for Foundation licences and upgrades. Seventeen candidates gained their AOCP this year.

World circum-navigatrix, Jeanne Socrates held a Meet-and-Greet with many hams who had 'virtually' accompanied her by HF on her lonesome journey.

Radio enthusiasts travel from all over Australia and even overseas to take part in this great day, although travelers were limited this year because of the lockdown in Victoria. The MayHam event was once again a great success for the Central Coast Amateur Radio Club. It is looking forward to meeting up again with all its friends who will visit from far and wide next year.

The venue is about an hour's drive north of the Sydney CBD, or about an hour and a half in the comfort of a train that drops you almost at the gate. The tentatively scheduled date is earlier in May, to try to avoid the cold weather. Make a mark in your diary for 2022, now.

Central Coast Field Day | Wyong 30 May 2021

Ray Robinson, VK2NO

The **Central Coast Field Day** is normally held in February. This year it was postponed because of pandemic fears. It was moved to May and called the MAYHAM field day. Everything was the same as the normal field day, except it was a lot cooler.

I left home at 6:30 AM and arrived at about 7:30 just as it was getting light. I drove in the traders entrance and then to the display area. I had Geoff as my helper. We unloaded the car, and then I drove it away to the parking place. We set up and arranged the equipment across the two tables provided. I had ordered four tables, so I found an official, and procured another two tables. Apparently my request had got lost in the mail. As we were setting up, one of the tables collapsed, spilling the heavy B40 receiver onto the concrete floor (57 kilos). It survived, but did not work anymore. The cover was taken off and it appeared that a valve had come loose. This was pushed back into its socket, and it was working again. Not bad for a World War 2 valve receiver. The Historical Radios were displayed at one end of the tables, and the Military radios at the other end of the tables.

There were a lot of people attending, as there was no lockdown, or mask regulations. The weather was cold in the morning but fined up during the day. The commercial radios and equipment were displayed in the marquee, the club displays were inside the building, and the flea market was outside and under cover. There were many second-hand radios and much equipment available. There was not much military or domestic equipment for sale this year, mostly modern amateur radios and test equipment.

We were in the flea market area. I had the Historical Radio Society table. The radios were arranged in order, from the oldest to the youngest. There was an IGRANIC superheterodyne receiver from 1926, with a horn loudspeaker. This is a long breadboard style radio, with three main tuning knobs. It has six valves, and the construction uses individual Bakelite sections, all bolted together. It was designed this way, and sold as a "kit" to avoid paying superheterodyne royalties to the patent holders. On the front were two coils, that could be adjusted to vary the coupling.

Next to this was a JWM cathedral radio, which is in a wooden arched cabinet. This is a Tuned Radio Frequency (TRF) radio that is fitted with distinctive blue glass ARCTURUS valves. The radio was turned ON from time to time, during the day, to listen to the local broadcast station. Being a TRF, the tuning was fairly broad.

Next to this was an AWA wooden mantle receiver, in a square case, using octal valves. This was working well,

JWM Cathedral (left) and IGRANIC (right).

despite the overhead metal roof, and the high level of RF noise at the site. Then there was a smaller Kreisler plastic radio, which was also a superheterodyne, but used miniature valves. This was switched on from time to time, as well.

Kreisler plastic (left) and AWA wooden (right).

The Military table was run by Ray Poularas. It had the heavy radio on it. This was a working Navy B40 receiver, despite the earlier mishap. Next to this an AWA designed and manufactured A510 backpack, that was used in the Malayan campaign post war. It was used later on that day.

B40 receiver (left) and A510 backpack (right).

The next table was the broken one. We had to place a stool under one corner of the table to support the weight. There was a working Hallicrafters S-39 HF receiver. Then a yellow Gibson Girl lifeboat transmitter. This was cranked from time to time, and it automatically sent SOS on 500 kHz. However, there was no antenna connected, so there was no radiation. Certainly no helicopter arrived looking for us. The plastic transistor portable radio was only used for testing. Next to this was an R210 HF receiver. This was normally used with the C11 transmitter, and was fitted to Jeeps and armored vehicles. The Australian Army used these, when they had Centurion tanks in Vietnam. Also fitted to the tanks and other vehicles like Ferrets, was the C42 VHF transceiver, both of English design. This was next on the table.

Hallicrafters S-39, Gibson Girl, R210 receiver, and C42 VHF transceiver (Left to Right).

Then there was an RT-524 VHF transceiver and an R-442 VHF receiver. The RT-524 is an American-designed VHF transceiver and the R-442, the companion guard receiver, also used in Vietnam by the Australian Army. On top, there was a PRT-4 and PRR-9 attached to the helmet. This was a Squad radio, and used by soldiers on the ground.

RT-524 and R-442 American VHF radios. Also PRT-4 and PRR-9 squad radio (on top)

The next item was an ARR-15 HF receiver. This was used with an ART-13 transmitter in RAAF Orion Coastal Patrol aircraft. Next there are two small boxes. They look like aircraft control boxes, but each is actually a 10 W transceiver. One is then an ARC-114 VHF 6 m transceiver, and the other is an ARC-115 VHF 2 m transceiver. These were designed in the USA for military helicopters. Both were working, and were used later that day for the radio nets.

ARR-15 HF receiver (left) and ARC-114 and ARC-115 VHF transceivers (right)

The next item was an AEW1 amenities receiver. This is a New Zealand designed and built short wave receiver, intended as an amenities receiver. This was used by troops in the canteen and in their spare time. It covers the broadcast band and shortwave bands. It runs from 6 V_{DC}, from a vibrator power supply. There was a WS No.62, which functions as a portable radio and also as a backpack (2 man lift). It was designed and built in 1945 in the UK. This one was built in Melbourne. It was working into a whip aerial and also used on the radios nets.

AEW1 amenities receiver (left) and Wireless Set Number 62 (right).

I gave a talk on the WS No.62 radio at 9:30 AM. I carried a radio on my back to the lecture, and let people wear it. I took the case off, and explained the various parts, how they worked, and the restoration problems that I had had with it. There were about 20 people in the audience, and they asked some good questions. The lecture was recorded and will be on the internet.

Ray A510, Ray WSNo.62, Alex PRC-320, and Luis PRC-320.

Following the lecture, we ran the WW2 net on 3590 kHz AM, and there were 4 operators. At 11:30 Ray used the A510, I used the WS No.62, and Alex and Luis used a PRC-320 each. The base station was another WS No.62 and operated by Geoff. We netted to the correct frequency, then wandered off to various parts of the area, and reported in. It was very noisy, and we had a little trouble getting through at the extreme distance. Alex had a stuck PTT switch on his PRC-320 and was seen hitting it on a iron railing to free it up. Lucky that it was a military radio, and could survive such treatment. The whip on the WS No.62 had three sections fitted, and insisted on falling over, so I shortened it to two, and it was much better.

Ray PRC-77, Ray SEM35, Luis PRC-351, Alex PRC-321, Brian PRC-6, Geoff TRA967.

Alex Yaesu, Luis Kenwood, Ray ARC-115, Ray PRC-113.

After this NET, at 12:30 we ran the Cold War net on 51.00 MHz FM, and there were 6 operators. I used a USA made PRC-77 backpack, Ray had a German SEM35 backpack, both working fine. Luis and Alex used an English PRC-321 radio, Brian used an American PRC-6 hand held, and Geoff had an English RACAL TRA967. The whip was folded over as it was too long. All the radios worked well and they were much better as there was little noise heard at 51 MHz FM.

At 1:30 we ran the Air net on 144.125 MHz AM and there were 4 operators. Alex had a Yaesu hand held, Luis had a Kenwood, Ray used my ARC-115 base station, and I used a PRC-113 backpack.

By this time, most people had gone home. So we packed up, put all the stuff back into the cars, and drove home. The weather was still good and warm. Now to organise what we will be using next year.

WIA Spectrum Committee News

Grant Willis, VK5GR

It has been a busy couple of months for the WIA Spectrum Committee with multiple issues on the table. The most notable was the response prepared for ACMA's Consultation No. 01/2021 'Review of non-assigned amateur and outpost regulatory arrangements'. While the content of the submission has been widely circulated, along with the short form that the members were encouraged to use as a basis for their own responses, I don't want to rehash the content here. However, one of the key things I wish to discuss was the way the submission was constructed.

Your WIA is actively reinvigorating the approach used by the Spectrum Committee in developing these major submissions. In this case, the WIA was able to bring together a team of experts with a wide breadth of experience. That team worked online, through live document sharing platforms and web based video workshops in a way I have not seen attempted in the WIA before. It enabled the best insights to be sifted, sorted, shaped and developed into the final paper members saw presented to the ACMA.

The paper was a product of many minds with a wealth of background knowledge, and that coupled with the very collaborative approach taken by the team, has produced a document we feel is worthy of ACMA's consideration. I must thank all of the team members for their willingness to embrace this new approach and I look forward to continuing to work together in this way in the future.

WIA YouTube Livestream

During the development of the submission, the WIA also attempted several different approaches to communicate with members. One of these was the YouTube Livestream Broadcast produced through Hayden, VK7HH's 'HamRadioDX' channel. Like with anything new, there were always nerves about how it would be received. The feedback however has been very positive. Thank you to everyone who tuned in live or watched the stream later. It is certainly a medium that the WIA will consider using again in the future!

The Amateur Service Class Licence Poll - Results

One of the inputs used by the committee was the poll of members and the general amateur operator community seeking feedback on the ACMA proposals, and direction from the community on a preferred engagement strategy with ACMA. While the poll had some technical teething problems, the data received from the poll were definitive in guiding the WIA's response.

The ACMA nominated three options for consideration, and nominated the preferred option as Option C. The options were:

- Option A: keep the existing apparatus licensing arrangements and licence conditions.
- Option B: simplify the current licensing arrangements and licence conditions by amending the amateur LCD.
- Option C: transition to class licensing arrangements for non-assigned amateur stations. The operation of assigned amateur stations such as repeaters and beacons would continue to be authorised under apparatus licences.

The poll then asked two questions, to which the WIA has received 1690 individual responses. The results were:

Question 1. *Which of the ACMA's three options (as currently proposed) do you believe will best maintain the existing rights of licensed amateur operators and facilitate continuation of the amateur service in Australia into the next decade: (Choose One only)*

- *84% of respondents favoured Option A*
- *9% of respondents favoured Option B*
- *7% of respondents favoured Option C*

Question 2. *Would you support the WIA exploring options of a streamlined amateur service licensing system with the regulator*

that could deliver benefits to both the amateur service and the ACMA?

- *83% of respondents indicated 'Yes'*
- *15% of respondents indicated 'No'*
- *2% of respondents did not respond*

The response was clear; Option C as drafted by ACMA was not supported.

However, the response to Question 2 was equally clear. The members were looking to the WIA to find ways to work with the ACMA on this issue, so that both organisations' objectives can be achieved. This should be seen as a positive sign by the ACMA that a subsequent proposal that satisfactorily addresses the feedback provided should result in a much more favourable response from the amateur service licensees in Australia.

Finally, it is worth mentioning that the WIA is now seeking meetings with the ACMA to discuss the submission and to offer an opportunity to clarify understanding between both organisations of the issues and recommendations made by the WIA.

Overseas Amateurs Visiting Australia Class Licence - ACMA Consultation 06/2021

While the WIA has focused on the main class licence submission, the team has also been monitoring the ACMA consultation pages for other issues that may affect the amateur service.

This year will see a number of major reforms take place, as a result of the passing of the Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020 in December 2020. This prompted a series of consultations to be released by the ACMA relating to equipment rules, accredited persons and changes to a number of existing class licences.

Among the specific instruments being amended was the Overseas Amateurs Visiting Australia Class Licence 2015. This class licence is used today to authorise visiting qualified radio amateurs to operate amateur radio stations within Australia for a period of up to 90 days. It is equivalent to the existing Radiocommunications Licence Conditions (Amateur Licence) Determination 2015 by which domestic amateur licensees are bound.

In the ACMA proposal, it has stated that it will *'require compliance with the general public exposure limits for EME as specified by the Australian Radiation and Nuclear Protection Safety Agency (ARPANSA) in the Radiation Protection Standard for Limiting Exposure to Radiofrequency Fields –100 kHz to 300 GHz (2021) or any instrument that replaces that standard.'*

The ACMA has also stated in the consultation that *'For these class licences, the proposed amendments are designed to ensure that the EME requirements for class-licensed users are harmonised with the requirements for users operating under the corresponding apparatus licence (the earth apparatus licence and the amateur apparatus licence).'*

The WIA felt a response was required because the committee found that the proposed regulatory arrangements are inconsistent with the ACMA harmonisation objective. Further, the committee argued that direct compliance with the ARPANSA standard adds a considerable cost burden to a service such as the amateur service. In its proposal, the ACMA had not retained the distinct Level 1 and Level 2 EME assessment criteria by which domestic amateur licensees are bound.

To address this issue, WIA has proposed to ACMA that either:

- *the relevant sections of the existing 'Radiocommunications Licence Conditions (Apparatus Licence) Determination 2015', in particular the requirements outlined in Part 3 of this determination, be directly included in the Overseas Amateurs Visiting Australia Class Licence, or;*
- *ACMA should convert the existing 'Radiocommunications Licence Conditions (Apparatus Licence) Determination 2015', in particular the requirements outlined in Part 3, into a new standard which is then referenced under the new Section 3A of the proposed Overseas Amateur Visiting Australia Class Licence.*

The net effect of this proposal would be to retain EME management parity between domestic and overseas visiting amateur licensees. The WIA will be watching this issue closely and will follow developments accordingly.

Future ACMA Consultations - ACMA FYSO April 2021

Finally, the WIA Spectrum Committee is, at the time of writing this report, also working on its response to the ACMA's 'Five Year Spectrum Outlook' (FYSO) consultation. This is an ongoing process conducted by ACMA to help shape the year-on-year work program against industry and community expectations and requirements.

Of particular interest to amateur licensees is the announcement that in Q2 of 2022 (April-June), the ACMA will again revisit the issue of higher power limits for amateur radio operators. This is something that many including the WIA have been lobbying the ACMA to revisit for some time.

The WIA welcomes the opportunity to revisit the issue, which was last addressed nearly 10 years ago and will provide that feedback, along with a number of issues, to ACMA as part of the FYSO process.

Until next time

73 de Grant VK5GR on behalf of the WIA Spectrum Committee

Unravelling the mysteries of connecting radios to antennas

Part 2 Transmission lines, filters, baluns and couplers

Brian Clarke, VK2GCE
e *brianclarke01@optusnet.com.au*

Transmission lines

The key learning from part 1 is that when you try to use a fairly simple antenna - a horizontal or vertical dipole or a ground-plane configuration - over several amateur bands, Z_{AE} will vary considerably. It will be resistive at a few frequencies and reactive at all others.

To progress the discussion, I will assume for now that you want to connect your transmission line (or feedline) directly to the feed point of your antenna. You have a choice of transmission lines — balanced or unbalanced.

Balanced transmission lines

A pair of wires of the same dimensions and covering, held apart, so they do not arc at voltage nodes and twisted so that any capacitive and inductive effects of nearby conductors will affect each wire approximately equally, constitutes a parallel, open-wire, balanced transmission line (TL). A simplified equation for the characteristic impedance, Z_0 of this TL is:

$$Z_0 = 276 \log_{10}(2s / d) / \sqrt{\varepsilon}$$

(AF 52-19, 1953:65; Terman, 1943:174)

where:

s = the spacing between the centres of the wires
d = the diameter of the wires
ε = the dielectric coefficient of the insulating material between the wires (=1.00054 for air)

Using round wires held closely together in the air (s = d, ε = 1.0), you could be forgiven for believing that Z_0 becomes 83 Ω. However, the formula above is an approximation, and as 's' approaches 'd', Z_0 approaches zero. If you insulate the wires, s increases a little, and the impedance will rise. When s = 1.075d, Z_0 is very close to 92 Ω.

The practical problem is how you maintain that exact spacing. You can do this by sleeving one of the pair of wires and taking the dielectric coefficient of the sleeve material into account. The trouble here is that most sleeving materials shift the impedance too high. To overcome this, you could cut slots in the sleeve so that the effective dielectric coefficient is lower, but the results from this technique are quite difficult to control. (See Sevick)

If instead of round wires you use oblong cross-section wires, with the longer sides of the oblongs parallel to form a flat strap, you can get a more controllable and lower characteristic impedance:

$$Z_0 = 377 \log_{10}(8w / s) / 2\pi\sqrt{\varepsilon} \rightarrow 54 \log_{10}(w / s) / \sqrt{\varepsilon}$$

(Johnson, 1993:42-10)

where:

w = the width of the wires
s = the spacing between the wires
ε = the dielectric coefficient of the insulating medium between the conductors.

This kind of TL is used on circuit boards, for instance, as micro-strip for UHF and SHF work, and is often found in directional couplers, as in Voltage Standing Wave Ratio (VSWR) meters.

Using this arrangement, you can get a Z_0 as low as 25 Ω quite easily. But a TL of this construction is rather impractical for feeding a dipole whose feed point is several metres above Earth's surface.

Another way of getting a lower Z_0 is by running two sets of parallel open-wire feeders in quadrature, although making the spacers to keep four wires evenly spaced is a nice afternoon's work. This form of TL is less likely to be unbalanced by stray capacitive or inductive effects of nearby conductors.

With greater spacing, practical characteristic impedances of 150 Ω to 1,000 Ω are achievable.

The breakdown voltage of air is about 1 kV per mm; this may fall under high humidity. If you roll your own 600 Ω feedline from bare 14 gauge wire, the spacing between the conductors would be about 125 mm. For a power level of 1 kW, and a perfect VSWR of 1:1, the voltage between the conductors [given by $E = \sqrt{(PR)}$] is 775 V. You could run to a VSWR of 114:1 before voltage flashover occurred, though the cable would have melted because of excess current (~190 A) before that. If you had used a commercially-available off-the-shelf (COTS)

ladder line, the insulation might have melted, and conductors may have shorted.

Unbalanced transmission lines

If you use a pair of parallel conductors, one of which is always exposed to a variety of other conducting objects (for instance, handrails, gutters, down-pipes, reinforcing bar in concrete walls, the Earth and tower uprights), while the other is always kept a fixed distance from the first conductor but not exposed to any other conducting objects, you have a recipe for an unbalanced TL. A readily available form of this is coaxial cable.

A simplified formula for the characteristic impedance of such a TL, where the insulating medium between the conductors is continuous, is given by:

$$Z_0 = 138 \log_{10}(2D / d) / \sqrt{\varepsilon}$$

(AF 52-19, 1953:65; Terman, 1943:174)

where

D = the inside diameter of the outer sheathing conductor

d = the outside diameter of the inner conductor

ε = the dielectric coefficient of the insulating medium between the conductors.

The formula for such coaxial cable as LDF-450, where the internal insulation is discontinuous, is more complex.

Practical values of Z_0 for air-insulated coaxial cables run between 50 and 150 Ω. When polyethylene or poly-tetra-fluoro-ethylene (PTFE) is the dielectric, the most readily available coaxial cables have Z_0 ranging from 50 to 95 Ω. Values outside these ranges are possible but usually quite expensive. Rolling your own is not on.

If you want lower values of Z_0, you can run two coaxial cables in parallel, tying both inner conductors together, and separately, both outer conductors together, at both ends. But the costs and losses will be doubled. It would be better to use an unbalanced-to-unbalanced transformer (unun) to transform the impedance.

At the power levels radio amateurs commonly use, flashover is unlikely under ideal conditions (that is, VSWR = 1:1). Using the formula $E = \sqrt{(PR)}$ and inserting 400 W and 50 Ω, you get $E = 141\ V_{AC}$. If you were to use RG-58 cable with its maximum operating voltage of 1,900 V_{DC}, you could operate at a VSWR up to 9.5:1. However, the maximum current at the current nodes would be 27 A, which could melt the cable, or at the very least, soften the internal insulation.

The closer you operate to the maximum capability of any TL, the less room you have for high VSWR, for instance, during tune-up or when accidents have occurred to your antenna.

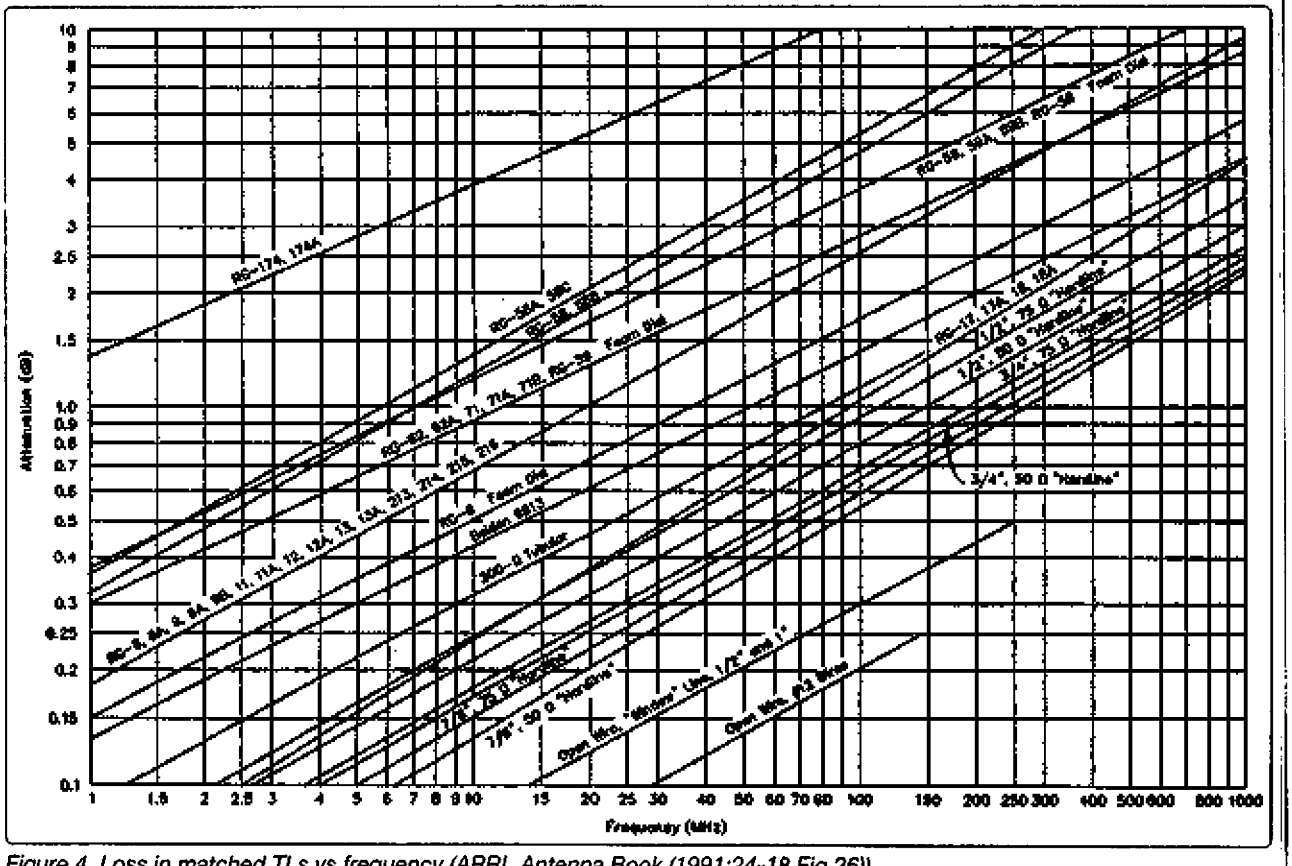


Figure 4. Loss in matched TLs vs frequency (ARRL Antenna Book (1991:24-18 Fig 26))

Using second-hand or even your own sequestered coaxial cable is fraught with danger; unless you have specialised test equipment, you cannot tell whether:

- the cable is full of water, changing the dielectric coefficient
- water incursion has eroded part of the outer conducting braid
- the outer braid under the outer plastic sheath has been flexed to near breaking point
- the conductors have been very warm, softened the insulation, changed the dielectric and internal dimensions, and hence the impedance and/or flashover voltage.

Matched TLs

The Jacobi theorem says that if the transceiver, TL and antenna impedances are the same, there will be no standing waves on the TL. The antenna will absorb all forward power, and none will be reflected to the transceiver. This means that arc-over or instances of melting are unlikely, provided you do not exceed the cable manufacturer's ratings. It also means that the length of the TL is unimportant — true or false?

Not true: there are always losses in any TL — the main ones are heating losses in the resistance of the conductors and dielectric losses. These losses are proportional to length and frequency. Figure 4 shows some losses for typical TLs that radio amateurs might use.

You can find similar curves in Terman (1943:177).

These data are averages: some manufacturers' cables may be slightly different and vary between and within particular batches. Coaxial cables with foam dielectric generally exhibit lower dielectric losses than those with solid dielectric.

You may wish to calculate the losses of your cable using the calculator at the URL:

http://www.benelec.com.au/cables/cables.htm. [This is not a live link; copy and paste it into your browser]

Enter frequency in MHz, click on the 'Calculate' button, and attenuation will be calculated for you.

Just as an example, say you choose RG-58 coaxial cable for operation in the 10 m band. The matched-line loss is about 2.6 dB per 100 feet, that is, around 45% of the input power is lost as heating over that length. If you change to RG-8, the loss over 100 feet is about 1.3 dB, or around 35% heating loss. Compare this performance with an open-wire feedline where the loss over 100 feet is about 0.1 dB, or approximately 2.3% — negligible.

Where do the losses go? They go into heating the cable. Over a long period, especially when operated near their upper power limits, the conductors in coaxial cables may wander, leading to changes in local characteristic impedance, a rise in VSWR and exceeding a flashover threshold. Over time, coaxial cables can degrade, especially when exposed to sun, rain and ice.

Unmatched TLs

Generally, you should aim for a VSWR of about 1:1. You achieve this when the antenna feedpoint impedance matches the characteristic impedance of the TL, that is, $Z_{AE} = Z_0$. In all other cases, some of the transmitter power is reflected at the impedance mismatch and travels back down the TL. This reflected power interacts with the forward power to create standing waves of voltage and current along the TL.

VSWR gives a simple measure of the magnitude of the reflected wave and is, therefore, a measure of the inefficiency of the transmission system. A VSWR of:

- 1:1 has zero reflected power
- 1.6:1 gives 4% reflected power
- 2:1 gives 11% reflected power, and so on.

When VSWR exceeds 1:1, you experience losses in addition to those described in the previous section; the higher the VSWR, the higher the losses. Higher VSWR also increases the risk of flashover and cable melting. Where does the increased power loss go? Into heating the TL and its environment.

For more detail on the increased loss you experience when your TL is not matched, see 'Unmatched Line Loss' in the *ARRL Antenna Book* (1991:24-13) and Witt (2002:Appendix 1).

In summary, you can see that coaxial cables are more lossy than open-wire TLs, cost more to purchase, are very difficult to inspect for damage, and can withstand lower VSWR. The main advantages of coaxial cable are that it is readily available and easy to install – even if incorrectly.

How should you connect your transceiver to your antenna?

Let's have a look at each of the system components:

- Low-pass filter (LPF)
- Balun / unun
- Antenna coupling unit (ACU)
- Transmission line (TL).

The low-pass filter

All transceivers have non-linearities. Transceiver manufacturers often quote a figure of merit claiming how low (in dB below the carrier, that is, dBC) any spurious emissions will be. The ACMA's LCD states the maximum permitted levels of spurious emissions.

When your antenna is resonant, its response follows the usual Q curve of any LC device; so, frequencies away from resonance will be attenuated. However, antennas exhibit multiple resonances corresponding to near-multiples of $\lambda/4$ (refresh yourself in Part 1 of this series; also see Witt). If your antenna is non-resonant, or worse, resonant at spurious frequencies, then these unwanted signals will be radiated and received.

Most LPFs are symmetrical. This means:

- they reduce harmonics escaping from your transceiver
- they reduce spurious antenna resonances being received
- their input and output impedances are usually the same.

Therefore, the best place for your LPF is between your transceiver and your ACU.

A few words of warning about LPFs

If you operate an LPF in a circuit where the VSWR is high, components inside the LPF can easily be damaged. For instance, in an LPF designed for 500 W on a 50 Ω TL, the capacitors would be chosen to withstand 158 V_{RMS}, that is, about 224 V_{PEAK}, plus a safety factor of 15%, say 258 V. Say the manufacturer's design engineer (read *accountant*) has mandated capacitors rated at 300 V_{PEAK}, what is the maximum VSWR your LPF can safely tolerate when you operate at the legal limit of 400 W?

400 W produces 141 V_{RMS} in a 50 Ω TL, corresponding to 200 V_{PEAK}. The 300 V limit is reached at a VSWR of 300 / 200 = 1.5:1. If you tune up at 100 W (70.7 V_{RMS}, or 100 V_{PEAK}), the VSWR **sustainable** is 300 / 100 = 3:1. To minimise the possibility of damage to your LPF, tune up at much-reduced power and do the final tuning at full power only when the VSWR is safely below 1.5:1.

Knowing this limitation, you may decide to increase the voltage rating of the capacitors in your LPF. This would allow you to operate at a higher VSWR, but now the current-carrying capacity of the inductors may be exceeded. If the inductors are wound on ferrite cores, operating beyond the design current may cause core saturation, reduce their inductance and create non-linearity in the inductors; and this will both permit passage of, and generate, harmonics in the transmitted signal.

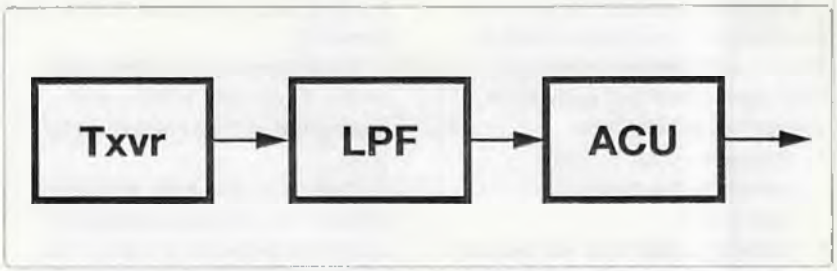


Figure 5: Where to place the LPF.

Suppose you damage the capacitors in the LPF. In that case, there may be no visible or sniffable sign, and you may keep operating — but now, the final inductor in the LPF is part of the TL and will make the adjustment of any antenna coupler more difficult.

Next problem — how far can you wander from the frequency on which you have tuned up before you exceed a VSWR of 1.5:1? That depends on the impedance spiral of your antenna-plus-TL (see Figure 2 in Part 1 of this series of articles, and see Witt) and whether you have an automatic antenna coupler.

If your transceiver has a built-in automatic antenna coupler, putting an LPF in the output line from the transceiver exposes the LPF to considerable stress, particularly if the automatic coupler does its 'tuning' at full power. It is claimed that some built-in antenna couplers will suppress harmonics; so, you might think you could operate without an external LPF. But usually, the coupler is only in circuit when transmitting; so, you:

- forgo protection from spurious antenna signals when receiving
- increase your receiver's noise floor
- reduce the signal-to-noise ratio
- possibly lose weaker signals.

The Balun/Unun

Why would you want a balun or unun? The main reasons are:

- to provide impedance transformation — both the unun and balun can do this
- to provide a balanced input to an antenna when all you have from a transceiver is an unbalanced output — only a balun does this
- to prevent unbalanced currents from flowing in your TL — again, only a balun does this.

On this last point, see the article by Lloyd Butler, VK5HR on unbalanced feed in *Amateur Radio* magazine, May 2004.

When you power up a piece of equipment designed to run on 60 Hz mains on our 50 Hz supply, the transformer runs very hot. Why is that? The inductive reactance of the primary winding, at 50 Hz, is nearly 17% lower than it needs to be. So, the magnetising current is too high and tends to saturate the core, increasing the magnetising losses.

When you power up a piece of equipment designed to run on 220 V mains (for instance, European appliances) on our so-called 230 V supply, the transformer runs quite hot. Why is that? Again, the transformer core tends to saturate because the magnetising current is too high, this time because the higher voltage pushes more current through the primary winding.

If the core gets sufficiently hot, it loses its permeability; so, the inductance falls.

Another major effect of core saturation is waveform distortion, with the generation of harmonics.

If you insert the unun or balun after the ACU, you may be asking the unun or balun to handle a wider range of voltages and currents than those for which it was designed. If you run the unun or balun in a reactive circuit, even though the power level may be within specification, the voltage or current could be much higher than

expected (see Figure 1 in Part 1 of this series of articles) and exceed its design limits.

So, you need to run a balun or unun within its designed frequency, impedance and power ranges.

If you have a resonant antenna and therefore choose not to use an ACU, you may be able to use a balun or unun fitted at the antenna's feed point. This is fine. As mentioned earlier, the losses in coaxial cable are a good deal greater than in an open wire line. So, you may face a problem if your transceiver is designed only to feed coaxial cable. In this case, use a very short length of cable, say to a balun on the outside of your radio shack, then use open wire feedline from the balun to the antenna feed point.

A multi-frequency example

Suppose you have an antenna whose feed point is elevated 29 m (~95') because you want it to be at 0.18 λ above ground for operation on 160 m, giving you the 50 Ω feed-point impedance you expected from reading the *ARRL Antenna Book*. You use a simple 1:1 balun at the antenna feed point, fed by 100' of RG-58 cable as your feedline. Say you had a VSWR meter just after the LPF; on 160 m the VSWR meter may read very close to 1.2:1: why not 1:1? Go back to Figure 3 in Part 1 of this series; at 0.18 λ above ground, the impedance is 50 +j50 Ω, not the pure 50 Ω you expected from reading the *ARRL Antenna Book*. That 50 +j50 Ω should give you a VSWR of 1.4:1, but the losses in that 100' of RG-58 give you a more optimistic (that is, lower) reading.

Now consider operation at the lower end of the 10 m band. The first effect is that the feed point impedance is likely to be closer to 72 Ω, but slightly reactive because it is a bit over an odd number of quarter wavelengths long. So, you would expect the VSWR to be a bit higher than 1.6:1. Now, recall the earlier example where you used 100' of RG-58 to feed your multi-frequency antenna. The effect of the cable losses will be much higher on 10 m than on 160 m. Because of these losses, the VSWR meter will read much less than 1.4:1, and you will think that all is OK.

Next, say you decide to operate a bit higher in the 10m band, for instance, 28.8 MHz. The antenna is now an even number of quarter wavelengths long, and the impedance becomes very high. But, because of the losses in the coaxial TL, your VSWR meter will give a more optimistic VSWR reading than is actually the case. And the balun will be very unhappy indeed. Why? You may have constructed your balun according to Sevick's Guanella principles because the tests of his baluns showed a quite broad-band response; but, he tested his baluns into a dummy load, not a real antenna.

What to do? The best solution is to use an open-wire TL from the antenna feed point down to an ACU that has a balanced output. Alternatively, fit an automatic or remotely controlled ACU (with balanced output) at the antenna feed point and run RG-58, RG-8, RG-213, Belden 9913, LDF-450 or ½" hard-line from the LPF to the ACU. These alternative cables are listed in order of increasing cost and decreasing loss.

Another HF example

Perhaps 160 m is not feasible for those of us on 1/5-acre blocks. Many local authorities allow a tower or mast that does not exceed 10 m in height. This is pretty good for a 40 m horizontal dipole.

Say you connect a balun at the centre feed point and choose to use RG-58 as your TL. So, if you install a 1.5:1 balun designed to operate at 50 Ω on the TL side and 75 Ω on the antenna side, the antenna will work well on 40 m.

What happens when you try to operate on the other amateur bands? Now, there may be only 15 m of TL from the transceiver or ACU up to the antenna; so, the losses, even in the 6 m band, will be less than 0.5 dB. Such an antenna will present a very high input impedance on 20 m and 10 m, perhaps as high as 5 kΩ; and neither the balun nor the TL will be very happy, even if an ACU is used just after the LPF. This is what you must expect when operating on the even harmonics.

What to do? Once again, the best solution is to use an open-wire TL from the antenna feed point down to an ACU that has a balanced output. Alternately, fit an automatic or remotely controlled ACU (with balanced output) at the antenna feed point and run unbalanced coaxial cable from the ACU down to the LPF.

What about working on the odd harmonics, that is, 30 m, 15 m and possibly 6 m? For 30 m, the antenna length is very nearly resonant, but the height is now 0.33 λ, and so

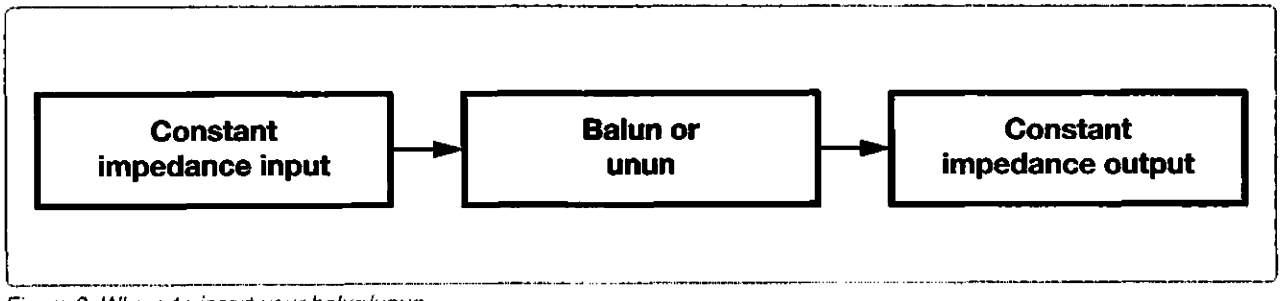


Figure 6: Where to insert your balun/unun.

the antenna feed-point impedance is around 96 +j100 Ω. For 15 m, antenna length is about right, but the height is 0.66 λ, so the antenna impedance is around 45 +j75Ω. For 6 m, the antenna length is about right, but the height is 1.67 λ, and so the antenna impedance is around 70 Ω. In these cases, the balun is not being presented with the correct antenna impedance, and so the TL will have standing waves on it. But the maximum VSWR you read may be ~1.3:1 that you believe your RG-58 TL can handle. Your transceiver may even accept that degree of mismatch, and then an ACU would not be required.

The best place for a balun or unun is where there are constant impedances each side. This is likely to be before the antenna coupling unit or directly into a single frequency, resonant antenna (see Figure 6).

The antenna coupling unit (ACU)

To minimise the losses in your system, particularly desirable if you are operating on very low power, the best place for the ACU is as close to the antenna feed point as possible. (Some might say the best place is way outside the system.) However, you are trying to operate on as many frequencies as possible; so some form of ACU is necessary.

The ACU performs two major functions:

- it provides a conjugate impedance
- it transforms the impedance between the input and output.

What is conjugate impedance? Say your antenna presents a feed point impedance of 150 + j65 Ω. The ACU can be adjusted to provide −j65 Ω to cancel out the inductive +j65 Ω component. What now remains is 150 Ω, that is, a resistive load. The ACU can now be further adjusted to provide an impedance transformation so that the input can be fed with 50 Ω coaxial cable. In practice, you make both adjustments incrementally.

Most automatic or remotely-controlled ACUs are so large and heavy that they would not be suitable for attachment to the centre of an antenna strung between two end supports. However, if the antenna feed-point is on a support, as with an inverted-V, this is a good place for the remote-controlled or self-contained, fully automatic ACU. If your ACU requires you to operate the controls manually, then you will need it at the station or operating end of your TL.

If you are using an ACU at the antenna feed-point and choose to measure VSWR at the input of the TL, coaxial feed line losses may present a problem. Your fully automatic ACU will have its own in-built VSWR sensing. So, a measurement of VSWR at the lower end of the TL, in this case can only be of academic value. Record these measurements anyway, as they could have diagnostic value when your automatic ACU, or its power supply, fails. When using a remote-controlled ACU, measuring the VSWR at the input end of the TL may not give optimum ACU settings because losses in the TL will cause optimistic VSWR readings.

There are several types of ACU designs available, either as COTS or roll-your-own. Roll-your-own designs are to be found in most antenna books. You can choose:

- input — balanced or unbalanced
- output — balanced or unbalanced
- the range of compensation and transformation.

The advantage of a **balanced input** is that losses in the ACU and in the TL feeding the ACU are minimised. Balanced input is slightly more complex than unbalanced, and you are less likely to find a COTS item.

The advantage of the **unbalanced input** is that relatively simple components can be used for a roll-your-own device. There are several designs in the *ARRL Antenna Handbook*.

The advantage of a **balanced output** is direct connection to the antenna feed-point or connection to a low-loss, open-wire, balanced TL. As with balanced input, balanced output is slightly more complex than unbalanced. But there is an even chance of finding a COTS unit; watch out, though, for items that use a built-in balun on the output to achieve their balanced output.

The advantages of **unbalanced output** are that you can:

- use it with inherently unbalanced antennas, such as the ¼ λ ground-plane antenna, or G5RV
- use relatively simple components to construct a roll-your-own device.

A good ACU can compensate for a wide range of resistive and reactive impedances presented to its output: say 30 Ω to 5 kΩ resistive and 0 Ω to ± j5 kΩ reactive. With an unbalanced input and output, you do not need a unun; with an unbalanced input and a balanced output, you do not need a balun.

There will be more detail on the design of ACUs in later parts of this series.

The transmission line (TL)

If your ACU has unbalanced input and balanced output, the unbalanced TL (coaxial cable) runs from the LPF to the input of the ACU, and the balanced output runs via a balanced TL to the antenna feed-point. This is the usual configuration when you use a manually-operated ACU (see Figure 7a). Consequently, as the unbalanced TL is fairly short, even if the balanced TL is quite long, the system losses are small.

If the ACU is an automatic or remotely-controlled one, with balanced input and output, and the antenna is balanced, you need a balun at the output of the LPF (most LPFs are unbalanced); the main balanced TL runs from the balun to the ACU (see Figure 7b). The system losses are small.

Suppose the ACU is an automatic or remotely-controlled

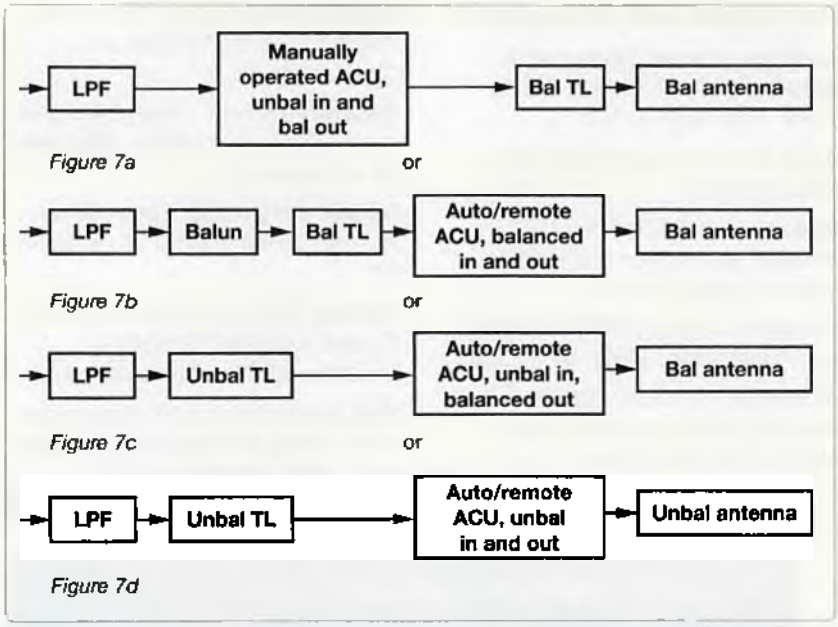


Figure 7: Where to place the ACU (a) Manual ACU: (b) Balanced feeder and balanced antenna; (c) Unbalanced feeder and balanced antenna; (d) Unbalanced feeder and unbalanced antenna.

one with unbalanced input and is connected right at the antenna feed-point. In that case, the main unbalanced TL runs between the LPF and the input of the ACU, and short lengths of wire connect the ACU output to the antenna feed-point. The long (unbalanced) TL will have significant losses (see Figure 7c).

If the ACU is unbalanced to unbalanced and the antenna is balanced, then you need a balun between the ACU output and the antenna feed point, typically, with a very short piece of TL each side of the balun. However, this is not a desirable architecture because the impedances on either side of the balun will change as you change operating frequency.

Figure 7d shows the system arrangement for feeding an unbalanced antenna, for instance, a vertical dipole in a fixed or mobile application, or a G5RV.

In general, the TL suffers less power loss when it is operated at its characteristic impedance, that is, with a VSWR of 1:1.

High VSWR has these main effects:

- increased losses on the TL
- undesirably high and possibly damaging voltages and currents

both of which will shorten the life of your TL.

If there is a likelihood that you will operate your TL at other than its characteristic impedance, consider crafting an open-wire feedline, where losses resulting from high VSWR and the likelihood of flashover are significantly less. You may still need to consider the gauge of your open wires to mitigate against melt-down.

Bearing in mind the experimental work of Lloyd Butler, VK5BR (*Amateur Radio* May 2004), it is better to feed balanced to balanced and unbalanced to unbalanced. Any mixing, for instance, unbalanced to balanced, can result in:

- unbalanced currents on your TL
- possible interference complaints from neighbours, or even your own spouse and offspring
- tingling sensations when you PTT
- an unpredictable radiation pattern from your antenna.

A home-brewed open-wire TL is much cheaper than coaxial cable. The spacers can be made from old toothbrush handles – a good recycling technique. The only drawback with an open-wire TL is that it may need more maintenance, particularly in high wind or ice build-up areas.

Summary of Part 2

1. Using two-wire balanced TLs, you can achieve Z_0 between 83 Ω and 1 kΩ. You can achieve lower values of Z_0 using stripline or four-wire TL techniques.
2. Unbalanced TLs, such as coaxial cables, cannot be home-brewed. And only a few Z_0 values between 50 Ω and 150 Ω are COTS.
3. Using second-hand coaxial cable is risky. Without expensive test equipment, it is quite difficult to discover what damage it has sustained.
4. For the impedances and power levels radio amateurs use, VSWR-generated flashover in open-wire TLs is far less likely than meltdown. The converse is true for coaxial TLs.
5. Heating of the conductors in a coaxial TL may permanently alter the architecture of the cable, thus affecting Z_0 and local VSWR.
6. All TLs have losses.
   - Coaxial cables' losses are at least two orders of magnitude greater than in open-wire TLs.
   - Unmatched TLs have higher losses than matched TLs.
7. Where should the various components of your antenna feed system go?
   - Always connect the LPF immediately following the transmitter; if the transmitter has its own in-built ACU, omit the LPF.
   - If the Tx has its own in-built ACU, feeding its output directly into a fixed impedance TL is quite unwise; feeding the output into a VSWR meter will give meaningless readings.

- Match the type of TL to the type of feed, that is, balanced to balanced, or unbalanced to unbalanced.
- Use a balun to convert from balanced to unbalanced, or vice versa.
- Always use baluns and ununs at their design impedances.
- Watch out for gimmicky ACUs that contain a balun on the output.
- Try to get the ACU as close to the antenna as possible, matching the type of ACU to its input and output feeds.

References and bibliography

Air Force Manual 52-19 (1953) *Antenna systems*, Dept of the Air Force, Washington, DC

ARRL Antenna Book (1991) ARRL, Newington, CT

Butler, Lloyd (2004) *The EH Antenna*, in *Amateur Radio*, May, Victoria. Pages 18 to 22

Kuecken, John A (1996) *Antennas and Transmission Lines*, MFJ, USA

Johnston, Richard C (1993) *Antenna Engineering Handbook*, McGraw-Hill, New York

Radio Communications Handbook, (1982) RSGB, Potters Bar, UK. Chapter 11

Shrader, Robert L (1985) *Electronic Communication*, McGraw-Hill, New York. Chapter 20

Sevick, Jerry (1990) *Transmission line transformers*, ARRL, Newington, CT

Terman, Frederick Emmons (1943) *Radio Engineers' Handbook*, McGraw-Hill, New York. Section 3

Witt, Frank (2002) *SWR Bandwidth*, in *The ARRL Antenna compendium*, Vol 7, ARRL, Newington, CT. Appendices

GippsTech 2021

The annual **GippsTech** conference is coming. With a reputation as a premier amateur radio technical conference, **GippsTech** focusses primarily on techniques applicable in the VHF, UHF and microwave bands, especially for weak-signal contacts.

EZARC is planning to hold **GippsTech 2021** on the weekend of **6** and **7 November**, at Federation University Australia Gippsland Campus in Churchill, Victoria, about 170 km east of Melbourne. Plans may change due to COVID regulations!

Call for papers

Anyone wishing to share information with others is invited to submit a title and brief summary of your planned presentation to the Conference Chair Peter VK3PF as soon as possible. Please be sure to indicate your expected length of presentation: it could be a short 10 minute item through to a detailed presentation of up to an hour. We look forward to seeing you at GippsTech in **November**.

Further details will be available from the Eastern Zone Amateur Radio Club website: http://www.vk3bez.org/

Plan ahead

Operate within the band plans: *http://www.wia.org.au/members/bandplans/about/*

Continued from page 5

Videos are online at the Contest University site: *https://contestuniversity.com/*

BitX goes SDR

Ashhar Farhan, the creator of the famous BITX40 cheap but modern HF radio kit, has demonstrated a way to turn your homebrew radio into an open source Software Defined Radio (SDR) for less than $100. Dubbed the sBITX, the hybrid architecture uses a Raspberry Pi inside the radio to make exploring the world of SDR possible with homebrew equipment and code.

Ashhar presented his design at the QRP Amateur Radio Club's Four Days in May conference along with an accompanying paper: *https://www.youtube.com/watch?v=9mFxyS6_2t8*

The prototype sBITX interface

New cubesat to flash through the sky for hams

NASA has selected an Arizona State University-designed spacecraft to fly as an auxiliary payload aboard a rocket launching between 2022 and 2025. The satellite, about the size of a toaster, has a unique payload that will flash a bright xenon flash bulb when triggered by transmissions from hams on the ground. Visit: *https://lightcube.space*

Pride Radio Group helps new hams to get started

Getting a licence in Australia is quite expensive, with new hams having to shell out for equipment before they get on air. Pride Radio Group, set up to celebrate and support diversity in the ham radio hobby, has help for new hams.

A kit has been assembled to take new Australian hams from licensed to on air and experimenting quickly and easily. Qualifying hams will receive a handheld radio, test and construction tools, an SDR receiver and the connectors to put them all together. If you know of a new ham who could qualify, get in touch with the Pride Radio Group: *https://prideradio.group/*

LightCube Principal Investigator Jaime Sanchez de la Vega with an early prototype of LightCube and a handheld radio and antenna.

3Y0J Bouvet 2023 cancelled

The pandemic has hit another DXpedition with the Intrepid DX Group expedition announcing that the charter vessel they were planning to use, the RV Braveheart, is to be sold. 'At this time, we are cancelling the 3Y0J Dxpedition. We have ceased accepting donations and we will begin refunding 100% of the donations using the same method they were received', the group says in a statement on its site.

A kit available for qualifying new amateur licensees from Pride Radio Group.

Streaming Video over Internet Protocol for Amateur Radio

Murray Green, K3BEQ

What started out as a two-man operation an ocean apart, telescoped into a digital video system enjoyed by more than 260 hams in 46 countries on 6 of the 7 continents. Ham Cam International (HCI), a dot com group of amateur radio operators who enjoy communicating with each other using: Streaming Video over Internet Protocol, (SVOIP).

Introduction

The intent of the Group is to provide communications for those amateurs who have antenna or financial restrictions and to expand the use of amateur radio streaming video communications using the Internet. COVID-19 has placed more emphasis on the use of this technology.

Employing the well known JITSI streaming video system, these dedicated amateurs have the better of two worlds. They not only communicate with each other by voice but also have the added benefit of video, and that makes a big difference in bonding with each other. They not only talk to each other, but by adding video they can sit comfortably in each other's radio shacks, ride along in the passenger seats of their vehicles and join them as they visit and tour interesting places within their countries. It is a cultural experience that you cannot obtain by audio alone.

The Beginning

The amateur radio operator is a truck driver (KK6OKI), hauling material between Los Angeles, California and the Mojave Desert six days a week from dawn till noon. Since a good portion of the route runs through the bleak, windswept and barren roads of the desert, the drive can be monotonous, boring and at times perilous. Communications from the truck comprised several amateur and public voice protocol systems. Although the area is flat and barren for miles, smart phone coverage was available through cell towers reachable along the truck route but not visible.

During this time, KK6OKI struck up an association with a ham in Europe using the Allstar VOIP and RF WIN and UKHUbNET systems and eventually homed in on the digital voice system, Peanut for Amateur Radio operators. (See K3BEQ Peanut article in the August 2020 issue of the US *CQ Magazine*.)

During these long drives, the two decided to enhance their voice communications by experimenting with video. This would also give other amateurs the opportunity to see the truck route through Los Angeles and the desert.

Photo 1: Interior of KK6OKI's cab with amateur radio and commercial communications gear.

Initially, they used the ZOOM video system, but it was too restrictive; so, they turned to a no-cost video system called JITSI. As an added attraction, they also employed the APRS system for tracking the truck; it also served as a safety net if the truck broke down along the desolate desert roads.

The Interest Grows

In a relatively short period of time, HCI became popular as amateurs around the world joined in from the Africa, Australia, Austria, Denmark, Japan, Thailand, the United Kingdom, the US and others. It is a friendly bunch of hams and growing. The access requirements are simple. There are no codes, no dues, no downloads (except for a smart phone app) no registration and access can be done in a few minutes.

Amateurs may be seen driving through small towns in their particular state or country and at their home computers, backyard antenna systems or ham shacks. Everything is full duplex, so you do not have to say 'over' during exchanges. You just have to be alert to audio doubling although it has not been a problem. All stations have the option of muting their audio or other connected station audio so they can choose to whom they listen.

Photo 2: Ham Cam International Video transmitted from KK6OKI's cab to members throughout the amateur community as he drives through the desolate Mojave Desert. Internet connection usable via cell sites not visible but reachable

Enhanced Video

As the amateur participation grew into regulars, it was decided to enhance the video experience with live mobile and foot tours of famous tourist attractions around the world. It began with a live mobile streaming video tour of Washington DC that included: African American Museum, Arlington National Cemetery, The Capitol Building, Pentagon, Post Office Museum, Smithsonian Museums, Union (train) Station, US Air Force Memorial, and others. Because of the ongoing protesting in DC at the time, law enforcement presence was very high, especially around the White House.

At the Pentagon, the tour included the memorial to those occupants who lost their lives during 911 when one of the planes crashed into the side of the building. It was also noted that Amateur Radio operators were some of the first responders.

Additional live streaming video tours of embassies in Washington DC and the Old Airport Beach Park in Hawaii were conducted by K3BEQ and AH6GT, respectively and gave hams outside the US the opportunity to see their countries' embassies. Shortly thereafter, the streaming video took on a tour of the Vietnamese, Korean and World War II memorials.

At the Korean memorial that contained bronze statues of solders walking through the rice paddy fields of Korea, video close-ups were shown of the radio operator and his 'walkie talkie handheld'. Looking at the antenna, hams in the United Kingdom and the US made estimates of the frequency based on the size of the antenna. After research, they were correct; somewhere in the frequency range of 3 - 5 MHz.

Photo 3: Bob, AH6GT, conducting a live video tour of an historical site on the 'big' island of Hawaii, transmitting streaming video to HCI amateur radio operators in 46 DXCC countries.

Photo 4: HCI live video tour of the Korean War Memorial, Washington DC, transmitted to members via Streaming Video over Internet Protocol (SVOIP.

Extraordinary surge of new members

During the next several months the number of hams requesting to join the Group exploded from the initial 25 members to over 260, representing 43 countries on 6 of the 7 continents. This was attributed to a vigorous membership recruiting program that included establishment of a subsidiary Face Book page, a Podcast with member participation for airing on various amateur radio media outlets, articles in the (USA) CQ *Magazine*, QRZ.COM, Forums and most importantly, word-of-mouth and an energetic recruiting coordinator, Alan, M3GCA who is one of our most proactive recruiters.

Photo 5: BC-611, actual walkie talkie used by US military troops during the war.

Expansion to accommodate Oceania members

Because of the 12-hour time zone difference, it was inconvenient for Oceania members to join in with members from Africa / Europe / Mid East / US who shared more compatible time zones. As a result, it was agreed to establish an 'HCI Oceania Region' for members in their time zone to use one of the Ham Cam rooms when others had retired for the evening. The goal was eventually to have a 'round the clock' operation, with Harry, VK6DOC, and Eddy, VK6EDY, head of this Group.

Connecting to the site – easy as 1 2 3

HCI maintains four video communications 'rooms' provided by the JITSI system, Ham Cams 1, 2, 3 and HCI Event room. Ham Cam 1 is password protected and exclusively for licensed amateur radio operators. Ham Cams 2 and 3 do not require a password and are open for potential member familiarization, and overflow. The Event room is just that, for special events such as ham-related videos, guest speakers, group participation on specific ham topics such as satellites, DXing, EMC.

Additionally, Ham Cam 2 will be used by the Ham Cam International Oceana Region to provide a space to mentor new and aspiring hams in the technology and society of amateur radio. It may also be used for mentoring, training and the provision of specialized presentations on specific and interesting aspects of amateur radio.

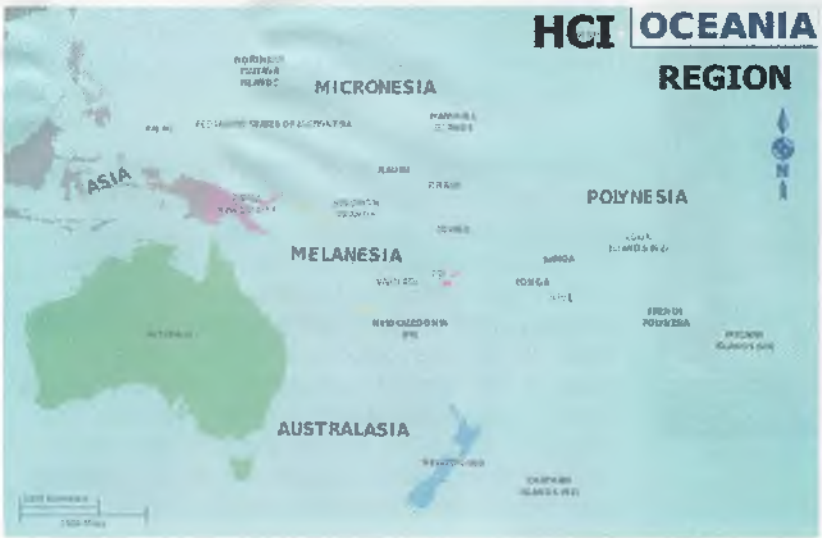
Windows 7-10

1. Go to *https://meet.jit.si/hamcam1* (or 2, 3 as appropriate)
2. Enter your call sign and first name in the box above JOIN MEETING. Write over any information in the box.
3. Click on JOIN MEETING. (If connecting to Ham Cam 1 you will be asked to enter the password* then click on OK.)

* Passwords are provided after joining.

Smart Phones

1. Download the app JITSI MEET.
2. Enter the room name hamcam1 (or 2 or 3)
3. Follow the procedure above for Windows 7-10 starting with step 2.



What you will see and hear

After connecting to Ham Cam 1 you will see all of the stations connected. Each station is shown in a square or round block. If the operator's video camera is muted the box will show only callsign and first name, or it may show a letter and number or two letters, eg, MK, G4. The MK, for example stands for Murray, K3BEQ or G4 for a United Kingdom call. Click on the box to enlarge the frame and the name and full callsign of the connected station.

There are 49 Ham Cam International members in the Oceania Region Group, of whom 18 are Australian VK members.

Photo 6: A screen shot of amateur radio operators from some of the 46 DXCC member countries enjoying QSOs using digital voice and video during a typical day.

If a callsign and name is not entered when connecting, the name in the box will show *'Fellow Jister'* and that alerts core group members to a possible intruder especially in Ham Cam 1. To protect the integrity of the room, the user will be asked several times to identify and if no reply is received, the user will be temporarily removed from the room until the user re-enters with a callsign/name.

Some comments about amateur radio communications

The internet has opened up new avenues of communications that are being used by hams on a daily basis such as Echo Link, IRLP, VOIP, SVOIP, Peanut, DSTAR, Fusion, M17. Incorporating different communications systems into our radio shacks has always been an integral part of amateur radio, reinforcing our operating skills and enjoyment. Additionally, they provide the means of communications for those of the amateur community who cannot install a station because of antenna restrictions and / or financial considerations.

I believe we have to rethink what amateur radio is all about. For generations, it was RF only and correctly so because there was nothing else to compare it with. The evolution of modern technology has changed that and provides us with a diversity of communications modes to use at our convenience.

Experimentation is an integral part of the worldwide amateur radio services. It could be said that 'Voice communications is the soul of our hobby; add video and you have the body.'

HCI contacts

To join HCI, send an email request containing your name, callsign and email to the HCI membership coordinators at: *m1eak@btinternet.com*. There are no dues, no registration, no codes and no downloads except for smartphones.

For information about Australian amateur radio mentoring classes and / or the hours of operation of Oceania members in Ham Cam 2, send an email to *vk6ybz@harg.org.au.*

To join the HCI Face Book page go to *https://www.facebook.com/groups/3685877891464623* and send a Request to Join located on the front page. Include your name, callsign and email address. The page is private for HCI members only and keeps members informed of current and future operations.

Acknowledgements

I wish to thank Harry, VK6DOC and Eddy, VK6EDY, for their supportive efforts in establishing the HCI Oceania Region Group and in the preparation and editing of this article. It could not have been done without their contributions. We also thank the Editors of this magazine for publishing the article.

Note: Portions of this article first appeared in the February 2021 issue of the USA *CQ Magazine*. It has been updated for *Amateur Radio Magazine*.

Murray has been licensed in the amateur radio service for 70 years. He holds the highest US amateur radio Extra class licence and has been instrumental in the formation of Ham Cam International. He has worked all countries on the ARRL DXCC list and recently became interested in digital communications. He is retired from the U.S. Department of Defense after a 36 year career in telecommunications and is a veteran of the US Army having served during the Korean War. He also enjoys landscaping with his granddaughter.

Photo 7: Murray Green, K3BEQ, with his great granddaughter, Dana.

How does the Tandem Match / Stockton Bridge work?

J S Tregellis, VK5JST

The Stockton Bridge is a very useful circuit for measuring reflection coefficient, SWR, and power. It has a long history of development and has evolved from work first done in the 1920s on hybrid transformer networks for telephone systems. It is probably the gold standard for SWR bridges. Its development can be traced through the 1950s (Bruene, Collins Radio), Douma (US patent 2734169A etc), and others until the late 1970s (Grebenkember) and early 1980s (Stockton). All of these people have claimed originality through patents, workarounds, or published articles. It is not a simple circuit to understand (quoted from the Stockton article) and almost no maths explaining its operation has been published. The maths that is around, typically analyses its operation using the concepts of forward and reflected travelling waves, an approach that, in my opinion, massively overcomplicates the understanding of circuit operation. My analysis uses standard circuit theory and assumes the use of ideal transformers with these implications:

- Any current flow through L3 is very very much less than the current flow through Z_L.
- The ac voltage drop occurring across L_1 from input to output is negligible.
- The ac voltage drop across L_4 while current feeding R_1 and R_2 is negligible.
- Transformer L1/L2 is a current transformer while transformer L3/L4 is a voltage transformer.

Also note the phase reversal occurring across and when these two resistors are partially fed from the voltage source. There is no phase reversal when these same two resistors are simultaneously partially fed from the current source. Sum and difference signals resulting from the measured network voltage and current thus appear across these two output resistors, allowing measurement of the network SWR or reflection coefficient.

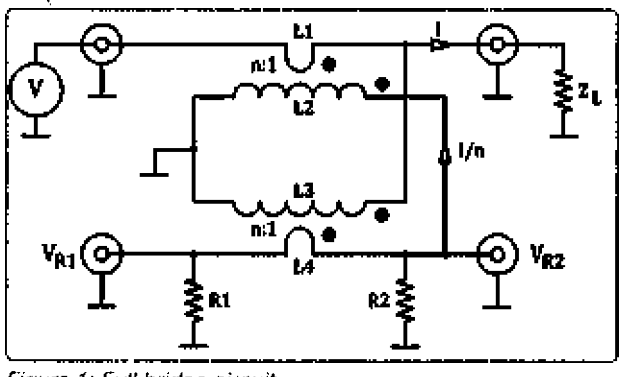


Figure 1: Full bridge circuit.

$$I = \frac{V}{Z_L} \qquad \text{(equation 1)}$$

Using superposition theorem to sum partial voltages resulting from network voltage and current:

$$V_{R1} = -\frac{V}{2n} - \frac{I}{n} * \frac{R_1}{2} \qquad \text{(equation 2)} **$$

**Identical values of R_1 and R_2 are assumed, leading to a halving of V/n and I/n across each resistor.

$$V_{R2} = \frac{V}{2n} - \frac{I}{n} * \frac{R_2}{2} \qquad \text{(equation 3)}$$

Substituting for I from (equation 1) into (equation 2):

$$V_{R1} = -\frac{V}{2n} - \frac{V}{Z_L} * \frac{R_1}{2n}$$

$$V_{R1} = \frac{-VZ_L - VR_1}{2nZ_L}$$

$$V_{R1} = \frac{-V(Z_L + R_1)}{2nZ_L} \qquad \text{(equation 4)}$$

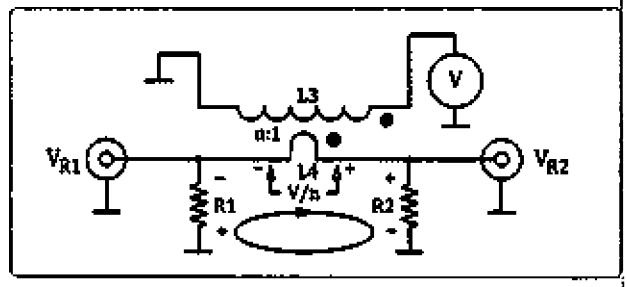


Figure 2: Section of bridge acting as a voltage source.

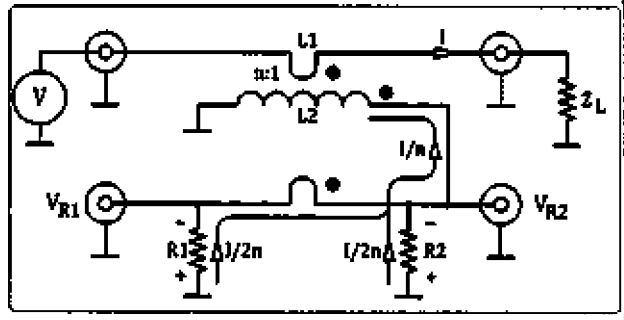


Figure 3: Section of bridge acting as a current source.

Substituting for I from (equation 1) into (equation 3):

$$V_{R2} = \frac{V}{2n} - \frac{IR_2}{2n}$$

$$V_{R2} = \frac{V}{2n} - \frac{VR_2}{2nZ_L}$$

$$V_{R2} = \frac{VZ_L - VR_2}{2nZ_L}$$

$$V_{R2} = \frac{V(Z_L - R_2)}{2nZ_L}$$

Rearranging:

$$V = \frac{V_{R2}\, 2n\, Z_L}{Z_L - R_2} \qquad \text{(equation 5)}$$

Substituting (equation 5) into (equation 4) to eliminate V:

$$V_{R1} = \frac{-V_{R2}\, 2nZ_L}{Z_L - R_2} * \frac{Z_L + R_1}{2nZ_L}$$

$$V_{R1} = -V_{R2}\left(\frac{Z_L + R_1}{Z_L - R_2}\right)$$

But in the circuit, $R_1 = R_2 = R$; so:

$$V_{R1} = -V_{R2}\left(\frac{Z_L + R}{Z_L - R}\right)$$

Restating:

$$V_{R2} = -V_{R1}\left(\frac{Z_L - R}{Z_L + R}\right) \qquad \text{(equation 6)}$$

Now $\left(\frac{Z_L - R}{Z_L + R}\right)$ is the reflection coefficient in any transmission line system and is given the symbol Γ and so:

$$V_{R2} = -\Gamma\, V_{R1} \qquad \text{(equation 7)}$$

The minus sign simply shows the two voltages are 180 degrees out of phase. The equation can be rewritten as:

$$|\Gamma| = \frac{V_{R2}}{V_{R1}}$$

And a general definition of SWR is:

$$SWR = \frac{1 + |\Gamma|}{1 - |\Gamma|}$$

$$SWR = \frac{1 + \frac{V_{R2}}{V_{R1}}}{1 - \frac{V_{R2}}{V_{R1}}}$$

which simplifies to:

$$SWR = \frac{V_{R1} + V_{R2}}{V_{R1} - V_{R2}} \qquad \text{(equation 8)}$$

Digital SWR and power meters use this equation and the rectified result of the ac voltages appearing across R_1 and R_2 and for calculation.

Notes

a) This circuit simply compares the size of the load to the value of the two equal terminating resistors by comparing the phase between the load voltage and current.

b) The terminating resistors R_1 and R_2 and used should match the characteristic impedance of the network being tested.

c) If $Z = R_1 = R_2$ then $V_{R2} = 0$ and $V_{R1} = \frac{IR_1}{n}$ (equation 9) which is a useful design equation derived from equation 2.

d) If the system SWR is very low, the voltage across R_1 can also be used to indicate power being dissipated in Z_L.

Equation 8 can be further expanded:

$$V_{R1} + V_{R2} = (SWR)V_{R1} - (SWR)V_{R2}$$

$$V_{R2}\,(SWR) + V_{R2} = V_{R1}(SWR) - V_{R1}$$

$$V_{R2}(SWR + 1) = V_{R1}(SWR - 1)$$

$$V_{R2} = \frac{(SWR - 1)}{(SWR + 1)}\, V_{R1} \qquad \text{(equation 10)}$$

Equation 10 can be used to produce an SWR scale on an analog SWR and power meter. It also explains why the meter must be set to full scale using V_{R1} before SWR can be read.

Picking your toroids

Typical ferrite toroids have saturation flux densities of around 0.2 Tesla (2000 Gauss) while powdered iron toroids are somewhat better at about 0.5 Tesla (5000 Gauss). However, in typical RF applications, overheating of the toroid through losses occurs long before these core flux densities are reached. Amidon Associates (one of the big makers) publishes these figures for flux density as a guide.
(http://www.amidoncorp.com/product_images/specifications/1-35.pdf)

Note Amidon stresses that these are guide figures only and that the right toroid can only be selected after extensive practical testing. The maximum temperature of a ferrite toroid should never exceed the Curie temperature of 130°C (at which point the ferrite's magnetic properties disappear) and typically the temperature rise should never exceed 40°C.

A worked example is probably the best way of illustrating the design procedure; I have used the selection of toroids for the Antenna Switch article (*AR* volume 88 No.5 2020). As the switch has a 400 W power rating into 50 Ω, the current flowing through L_1 is 2.828 A_{RMS}. The secondary current in L_2 is thus 128.6 mA (turns ratio of 22) producing 6.43 V_{RMS} worst case across the 50 Ω load, which is the largest voltage that can be used without overheating this resistance while simultaneously giving greatest detector linearity.

These figures can be checked using the standard transformer equation:

$$N = \frac{10^6 E}{4.44 f B A}$$

where:

N is the number of turns
E is in volts
f is in Hertz
B is in Tesla
A is in mm^2.

Transposing for B gives

$$B = \frac{6.43*10^6}{4.44*1.6*10^6*22*13.3} = 3.09 * 10^{-3} \text{ Tesla (30.9}$$

Gauss) at 1.6 MHz when an FT-50-43 toroid with its cross sectional area of 13.3 mm^2 is selected.

So, at the lowest frequency of use where the flux density is maximum, this parameter is well within the Amidon allowances and the result is a core that runs cold at continuous power levels of 400 W. These calculations are more easily done by using an on-line calculator such as: *http://people.physics.anu.edu.au/~dxt103/calculators/toroid.php.*

Note that in this example, the secondary turns are fixed by considerations of power dissipation in the 50 Ω bridge load, and so the only items that can be traded against each other are the power level and toroid cross sectional area, allowing easy selection of an appropriate toroid.

AMSAT-VK

AMSAT Co-ordinator
Paul Paradigm VK2TXT
email: ***coordinator@amsat-vk.org***

Group Moderator
Judy Williams VK2TJU
email: ***secretary@amsat-vk.org***

Website:
www.amsat-vk.org

Group site:
group.amsat-vk.org

About AMSAT-VK

AMSAT-VK is a group of Australian amateur radio operators who share a common interest in building, launching and communicating with each other through non-commercial amateur radio satellites. Many of our members also have an interest in other space based communications, including listening to and communicating with the International Space Station, Earth-Moon-Earth (EME), monitoring weather (WX) satellites and other spacecraft. AMSAT-VK is the primary point of contact for those interested in becoming involved in amateur radio satellite operations. If you are interested in learning more about satellite operations or just wish to become a member of AMSAT-Australia, please see our website.

AMSAT-VK monthly net

Australian National Satellite net

The Australian National Satellite Net is held on the second Tuesday of the month (except January) at 8.30 pm eastern, that's either 9.30 or 10.30Z depending on daylight saving. Please note we will be taking check-ins from 8.20pm-ish. Check-in starts 10 minutes prior to the start time. The AMSAT-VK net has been running for many years with the aim of allowing amateur radio operators who are operating or have an interest in working in the satellite mode, to make contact with others in order to share their experiences and to catch up on pertinent news. The format also facilitates other aspects like making 'skeds' and for a general 'off-bird' chat. Operators may join the net via EchoLink by connecting to either the "AMSAT" or "VK3JED" conferences. Past experience has shown that the VK3JED server offers clearer audio. The net is also available via IRLP reflector number 9558. In addition to the EchoLink conference, the net will also be available via RF on the following repeaters and links.

In New South Wales
VK2RBM Blue Mountains repeater on 147.050 MHz

In Queensland
VK4RRC Redcliffe 146.925 MHz -ve offset IRLP node 6404 EchoLink 44666

In South Australia
VK5TRM, Loxton on 147.175 MHz
VK5RSC, Mt Terrible on 439.825 MHz IRLP node 6276,
EchoLink node 399996

In Tasmania
VK7RTV 2 m. Repeater Stowport 146.775 MHz. IRLP 6616

In the Northern Territory
VK8MA, Katherine on 146.750, CTCSS 91.5, IRLP Node 6800

We are keen to have the net carried by other EchoLink or IRLP enabled repeaters and links in order to improve coverage. If you are interested in carrying our net on your system, please contact Paul via email. Frequencies and nodes can change without much notice. Details are put on the AMSAT-VK group site.

Become involved

Amateur satellite operating is one of the most interesting and rewarding modes in our hobby. The birds are relatively easy to access and require very little hardware investment to get started. You can gain access to the FM 'repeaters in the sky' with just a dual band handheld operating on 2 m and 70 cm. These easy-to-use and popular FM satellites will give hams national communications and handheld access into New Zealand at various times through the day and night. Currently only SO-50 is available.

Should you wish to join AMSAT-VK, details are available on the web site or sign-up at our group site as above. Membership is free and you will be made very welcome.

Board comment

Continued from page 3

standing down in the best interests of the WIA. Many of the assertions made by the estranged directors in 2016 and early 2017 about the prior board were quite serious accusations of alleged malfeasance or alleged mismanagement. The new board, which consisted of 6 new and one prior director, adopted an open-minded approach to the situation we had inherited. The board engaged external auditors to conduct an audit review of the prior year accounts. The auditors found **nothing material** to corroborate the unhelpful allegations, mis-information and assertions. The loss of the examination and callsign deed in 2019 to an organisation that has no-affiliation with amateur community has had severe – and compounding - impacts on the future of amateur radio. This is due to an almost 50% drop in new

Silent Key

Helene Mary Dowd VK7HD

My sister, Helene VK7HD died in her sleep during the night of the 25th April 2021. She was 83.

Helene and her husband Peter VK7PR were well known in amateur radio circles in Australia. They were both licensed in the early 1970's as novice calls, graduating to full calls as they gained more experience, mastered CW and felt confident to sit for the full theory exam as it was then known. Helene got her novice licence 24/8/78 and full licence 7/10/80.

Helene was by profession a chemist who worked in pharmacies around Tasmania until she and Peter moved to Queensland in their sixties, where she continued to work on a part time or casual basis until well into her seventies.

They were both keen caravaners and each year from 1999/2000 would head off somewhere in Australia to avoid the cold of winter.

They were both very active on HF in particular but their vehicles were equipped for 2 metre repeaters and at one time they had a high power base station operating at their home to make communications easier when one or other of them was on the road.

In 1978 a long overseas trip beckoned whereby many amateurs whom they had spoken to on air were met with happy times remembered for life and contact continued through on air scheds after their return.

Helene was a very active member of ALARA, was National President for three years (1983-1986) before leaving for Queensland and life on the caravan trail.

She and Peter returned to live in Tasmania several years ago to be closer to their daughters as both of them had deteriorating health.

She spent her last two years of her life living in Glenara Lakes a pleasant, independent and caring retirement home in the southern part of Launceston. This enabled them to live independently but when necessary, increasing levels of care were available.

Although of recent times ill health curtailed her on air activities Helene's eyes would light up when she saw a ham shack and as late as New Years Day this year, we chatted about the fact that she and Peter had a handheld radio which was still used to keep in touch with what was going on in amateur circles in Launceston.

After moving to Launceston, Helene and Peter attended many radio-related functions, and often joined a group at the home of Joe VK7JG (SK) for Thursday night drinks. As well, they attended social functions provided by NTARC, the Northern Tasmanian Amateur Radio Club. They were able to rekindle friendships with amateurs old and new, some of whom they had only previously met on air.

Helene leaves her husband Peter, three children, five grandchildren and one great grandchild of whom she was immensely proud.

The last photograph taken of Helene was on 24 April and showed her reading a book. Can anyone think of a better way to go than to finish a good "who done it", go to bed, be kissed goodnight by your husband and not wake the next morning?

I conclude with the comments made by a female cousin who wrote on hearing of her passing:

"I have fond memories of Helene, as a beautiful woman with poise and dignity, who is a great role model for us younger cousins. I am sure we went to University following in her footsteps. There were not many female pharmacists when she graduated".

Similar sentiments have been expressed by all who knew Helene, a loving sister, wife, mother, grandmother and great grandmother.

Brian Morgan VK7RR

Board comment

Continued from page 30

licence qualifications, particularly foundation licences. I believe that the regulator cannot continue to ignore this issue or abdicate it's responsibility. The loss of the deed is almost certainly largely due to WIA brand damage inflicted by what is now a splinter group. The moral of the story is that "knocking the WIA" may be seen as sport by some, but it always unhelpful and has serious potential consequences to the WIA brand that affects ALL amateurs, not just members – maybe not immediately but definitely over time.

Observations: A personal wish list based on the past four years' experience as a director:

i) *Increase board size to 9 directors – this will improve board cohesion and stability. (Note: same number as ARNSW, prior WIA NSW Division).*

ii) *Move to a 3 year term in conjunction with i) above – this will improve organisational memory and director contribution as the first 6 -12 months is a "ramp-up" period.*

iii) *Include more material in the magazine targeting Foundation Licensees and YOTA*

iv) *Introduce pro-active policies to encourage female board representation.*

v) *Create a framework to allow 160 WIA Affiliated clubs to participate in a regional representation model, similar to RSGB*

vi) *Limit directors from any one state or territory to 3 board positions – for obvious reasons.*

vii) *Introduce a Secretariat for board secretary and company secretary roles. Eliminate single point exposures.*

The Future: I firmly believe the WIA, now 111 years young, will be able to continue to re-invent itself as it has done over many decades – but only if the membership understand that it is ***their*** WIA. The WIA needs the goodwill and continued support of its members to survive. The WIA is a democratic organisation that needs volunteers passionate about a bright future for amateur radio. The WIA has a vital role to play in the future of amateur radio, but it can not do that without you!

73

Greg VK2GPK

The VK3AQZ HF antenna tuner project

Part 1 Second article of Lou's ATU project

Luigi Destefano VK3AQZ

1.4 The latch circuit

The outputs of the processor feed the L, C, and other circuits via several 74HC573s, 8-bit latches.

You can hear the LCD scanning and the processor clock on some frequencies. Turning the processor off removes the annoying signals. Latches maintain your settings when you turn the processor off. The latch circuit is in **figure 3**. **Photo C1** shows the latch board alongside the shield on a sub assembly. The latch is activated by placing a logic low on the latch enable pin (14) of the 74HC573 IC. The relays I used are 12 V 10 A types, readily available on the web or for around $1 each on eBay. These same relays are used with Arduino projects; hence, their easy availability. The cost of the latch ICs is also very low. The latch is turned on by a DPDT toggle switch. One pole enables the latch and the second pole removes power to the processor.

In my unit, I mounted the latch ICs on a piece of Veroboard®. The 74HC573 has its input and output pins on opposite sides of the DIP package and that makes it easy to use strip board. The output logic level from the 7HC573 is around 3.5 V, and the supply rail is a maximum of 5 V.

There are four ICs: one each for the L and C relays, one for the eight signals controlling the rig and antenna selection, and two inputs of a fourth one for controlling the relays switching the capacitors across the input (CIN) or the output (COUT). The remaining pins of the fourth IC are grounded.

1.5 Power supply and switch panel

1.5.1 Power supply

The power section is at the rear of the case. The 12 V_{DC} supply and a backup battery connect via 2.1 mm DC sockets. A heavy duty Schottky dual diode isolates the two sources and provides reverse polarity protection. The Schottky diodes have a smaller forward drop (0.3 V) than normal silicon power diodes (0.7 V).

The battery ensures the tuning unit remains activated and in circuit if there is an unexpected 12 V_{DC} power supply failure. Without battery backup, the unit will default to bypass, and you could end up transmitting into an un-tuned antenna. A small 2 A, M205 glass fuse protects the rest of the circuits.

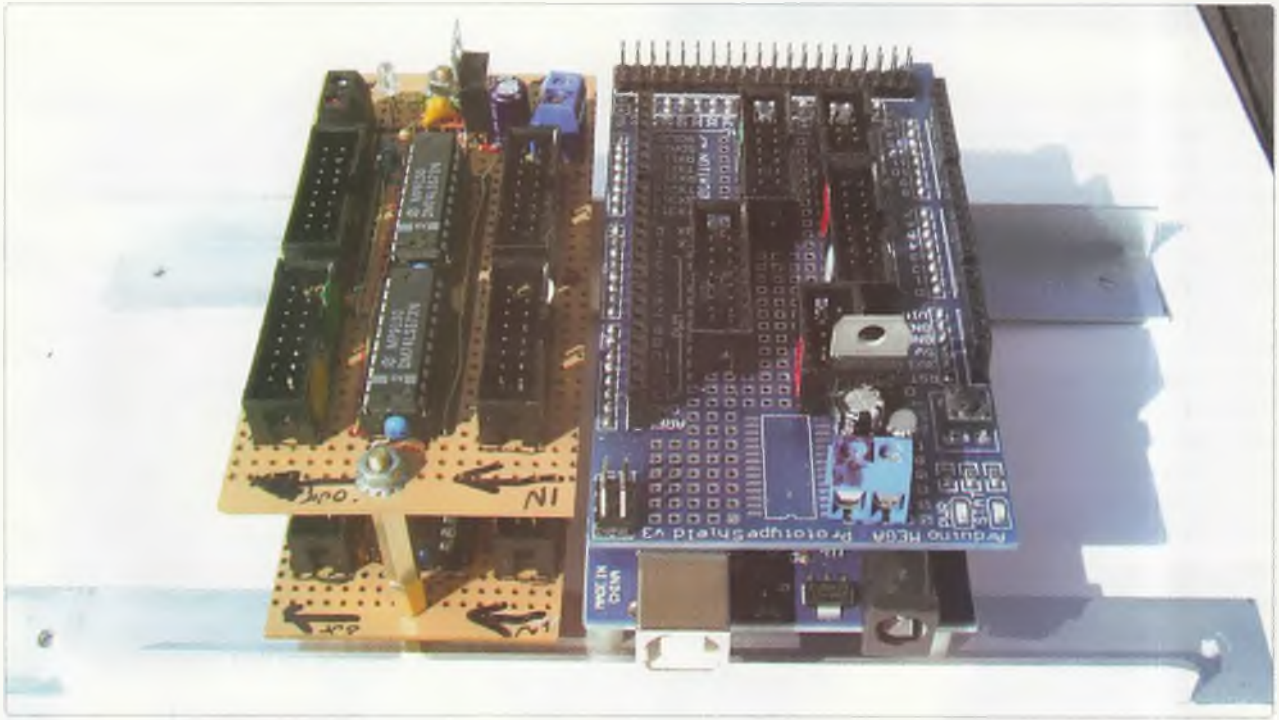


Photo C1: Circuit board containing latch ICs.

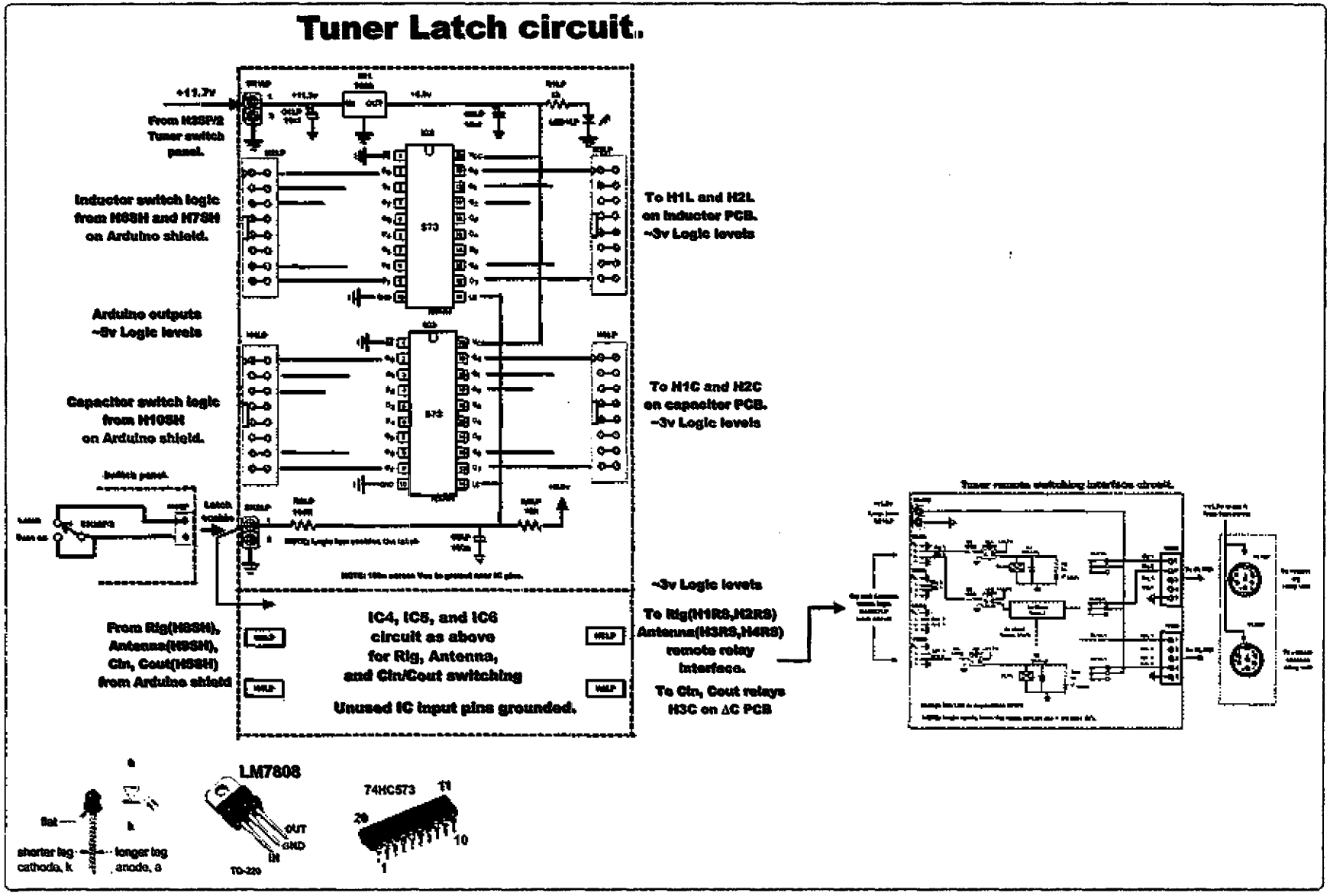


Figure 3: Latch circuit using 74HC573.

It is accessible through a small panel underneath the case.

When running from a battery, you can reduce the power consumption by switching off the processor. The logic signals feeding the relays go via latches. Latching the relays and turning the processor off removes the unwanted processing signals. With the relays latched on, they became inaudible. The relay coils draw around 26 mA each; so, if all relays are activated, the current drawn would be around 500 mA. The rest of the current will be drawn by the remaining items such as the LCD, latch ICs, LEDs, and the processors. **Figure 4** contains the power supply circuit to the left. **Photo D3** shows the rear panel with the power supply components.

Figure 4 also shows a small pre-punched board with several 3-pin headers on it. This board distributes power to the L and C power input pins. It is inside the L and C enclosure. Reversing the plug makes no difference to the polarity. The centre pin is ground or 0 V, and the two outer pins are hot.

Photo D3: Rear panel with power supply components.

1.5.2 Switch panel

Small toggle switches control some of the functions. See **figure 4**. **Photos D1** and **D2** show the switch and button panels. These are mounted on a small PCB that is held in place behind the front panel using the toggle switch mounting shafts and nuts. Header pins and connectors connect to the various circuits. I have arranged the headers carrying power so that turning the header plug through 180 degrees makes no difference to the supply polarity. The function of each switch is shown on the drawing. The switch labelled ΔL and ΔC is a 3-position, centre-off switch. This switch puts a logic low on the processor pins that determine whether L or C is varied by the rotary encoder. Using this switch enables the variation of L and C using one hand only. There are also two momentary buttons that you can hold down while turning the encoder; but I found that not so user-friendly. The reason for the centre-off position is because of the processor pin being held high by an internal pull up resistor. One pole of the switch turns the LEDs on.

1.6 Variable inductor

The variable inductor circuit is in **figure 5**. The circuit shows the relays and connections. Each relay is driven by an opto-coupler that

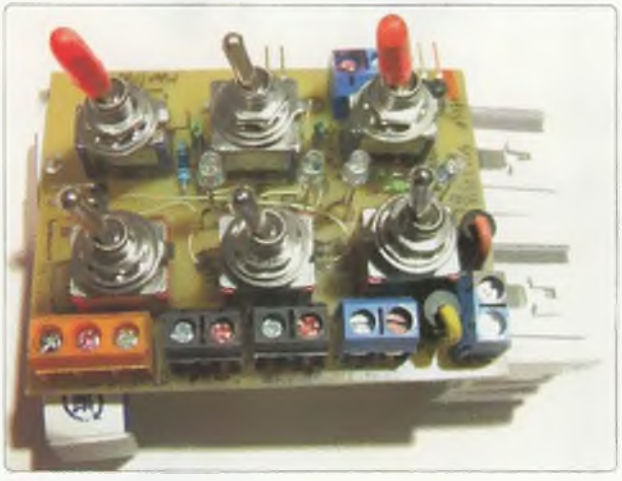


Photo D1: Switches panel.

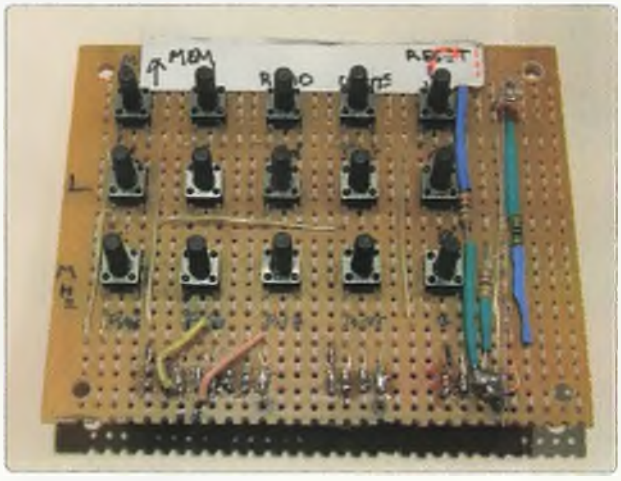


Photo D2: Buttons panel.

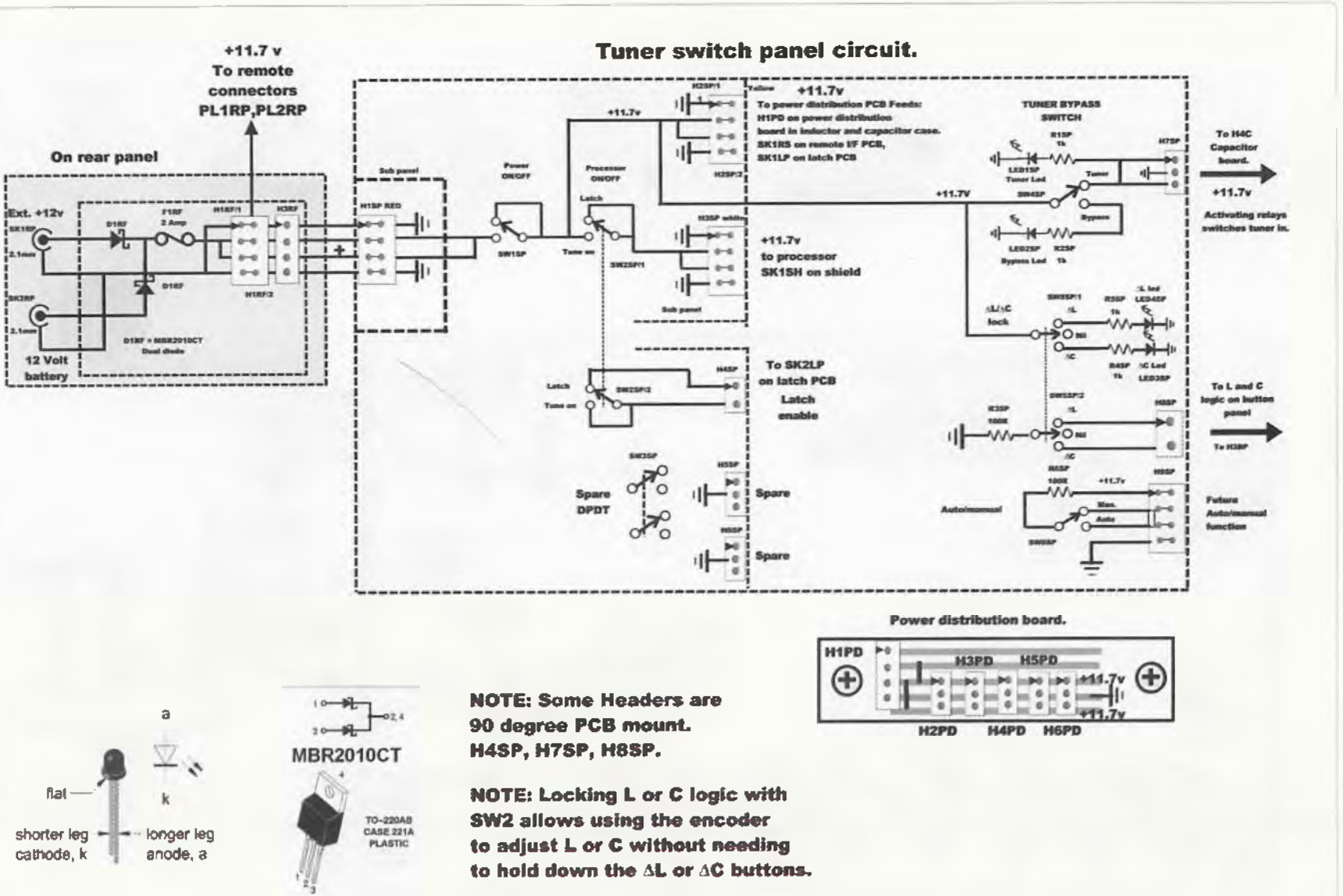


Figure 4: Power supply and Tuner switch panel circuit.

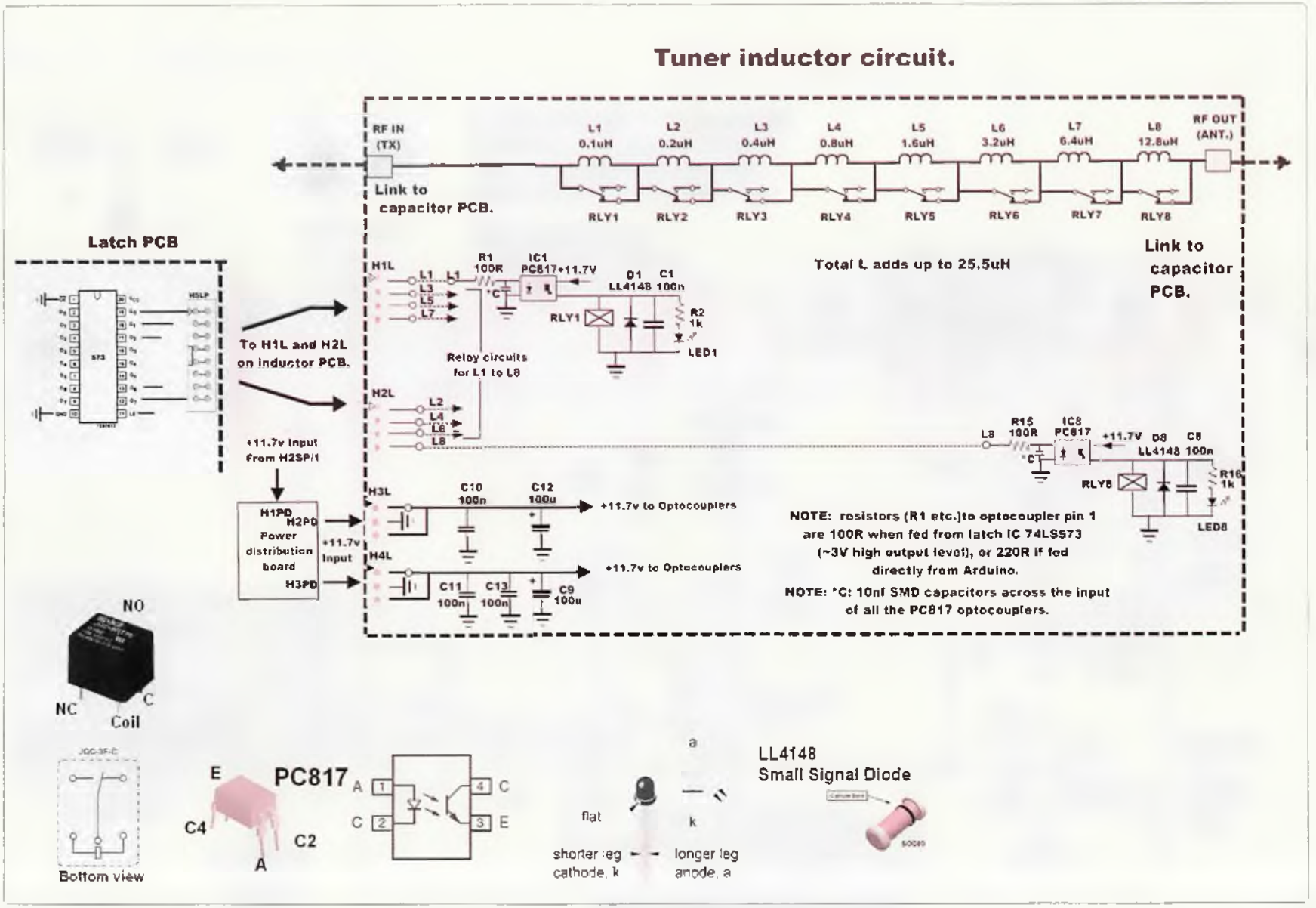


Figure 5: Variable inductor circuit.

in turn is driven by the latch circuit. The opto-coupler overcomes the problem of only having 3 V logic levels from the latch ICs. The LEDs across the relay coils are very helpful when testing the board. It is not easy to detect which relay is switching on and off with a binary sequence.

After testing, I found that the relays started randomly activating when the RF power approached 100 W. Putting 10 nF SMD capacitors across the opto-coupler inputs stopped this problem.

The coils are all air wound; the details are in **Table 3** and **photo E2**.

Coil	Value	Turns	Diameter	Material	Length
1	0.1uH	2 turns	12mm	Delrin	Spread 10mm
2	0.2uH	3 turns	12mm	Delrin	Closewound
3	0.4uH	5.5 turns	12mm	Delrin	Closewound
4	0.8uH	10.5 turns	12mm	Delrin	Closewound
5	1.6uH	8.5 turns	22mm	Conduit	Closewound
6	3.2uH	16.5 turns	22mm	Conduit	Closewound
7	6.4uH	21.5 turns	22mm	Conduit	Closewound
8	12.8uH	23 turns	31mm	Conduit	Closewound

All coils wound with 1mm enammelled copper wire

Table 3: Coil winding data.

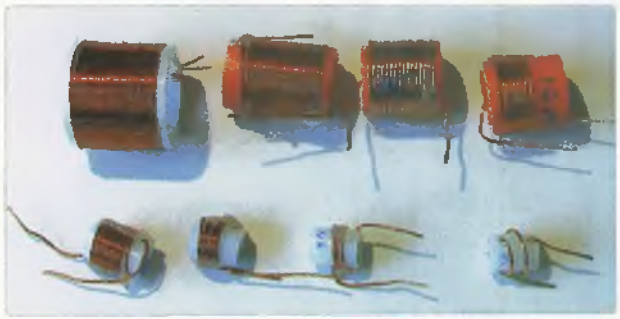


Photo E2: Wound coils.

Photo E1: Coil layout on circuit board.

I placed the coils on the PCB in a U-shape; this produces a square board with the shortest track lengths between input and output. I chose the location of each coil and its orientation to minimise mutual coupling between coils. See **photo E1**.

I have steered clear of using toroids in order to minimise core losses and heating. Using air-cored coils also means there is no need to purchase the toroids. I don't know the power handling ability of these coils but so far I have not noticed any significant heating in the enclosure with a steady 100 W signal while matching my 80/40 dipole on 20 m. However, that is only one test with one set of conditions; your mileage may vary.

I fabricated the coil board enclosure from double-sided PCB material. The enclosure is about the size of a typical personal computer power supply. The capacitor board is in the same enclosure upside-down beneath the coil board. The connections between the two boards are at the same end of each board making for very short leads. All the panels making up the enclosure are removable; this gives access to both boards. Each board can be removed easily giving access to the underside of each board.

Power to the coil and capacitor boards is via 3-way headers. Logic from the latch circuits is fed in via 4-pin double-boxed headers. The eight logic signals are split to reduce the complexity of the PCB tracks. All the logic and power feeds have 100 nF SMD bypass capacitors near the headers and other parts of the board.

1.7 Variable capacitor

See **figure 6** for the variable capacitor circuit. Many of the comments in the inductor section apply to the variable capacitor. The 5 pF and 10 pF capacitors are made out of 1.6 mm double-sided PCB with the copper filed back at the edges on both sides to achieve a high breakdown voltage rating. The rating should be at least 500 V if the unit is to handle peaks over 100 W. The peak-to-peak RF voltage at 100 W is around 200 V into a load of 50 Ω. An antenna tuning unit may be transforming a load different from 50 Ω; so, the actual RF voltages and currents in the tuner may be higher or lower, and this is sometimes overlooked. The rig final amplifier and power supply will attempt to limit the current while adjusting the tuner, but it might be high enough for a short period to damage the unit.

The capacitor values form a binary sequence. The lowest value is 5 pF and the highest is 640 pF making a total possible value of 1275 pF. There are 255 values in 5 pF steps. There will also be some stray capacitance that will add to all values. See **Table 4** for capacitor values. I have used a mixture of capacitors. Some values are made up of two or more capacitors in series or parallel. I left enough space on the PCB to allow for two series capacitors. The 20 pF capacitor is a 500 V, 40 pF, mica trimmer adjusted to 20 pF. The 40 pF and 80 pF capacitors are unencapsulated mica units I salvaged from an RF amplifier.

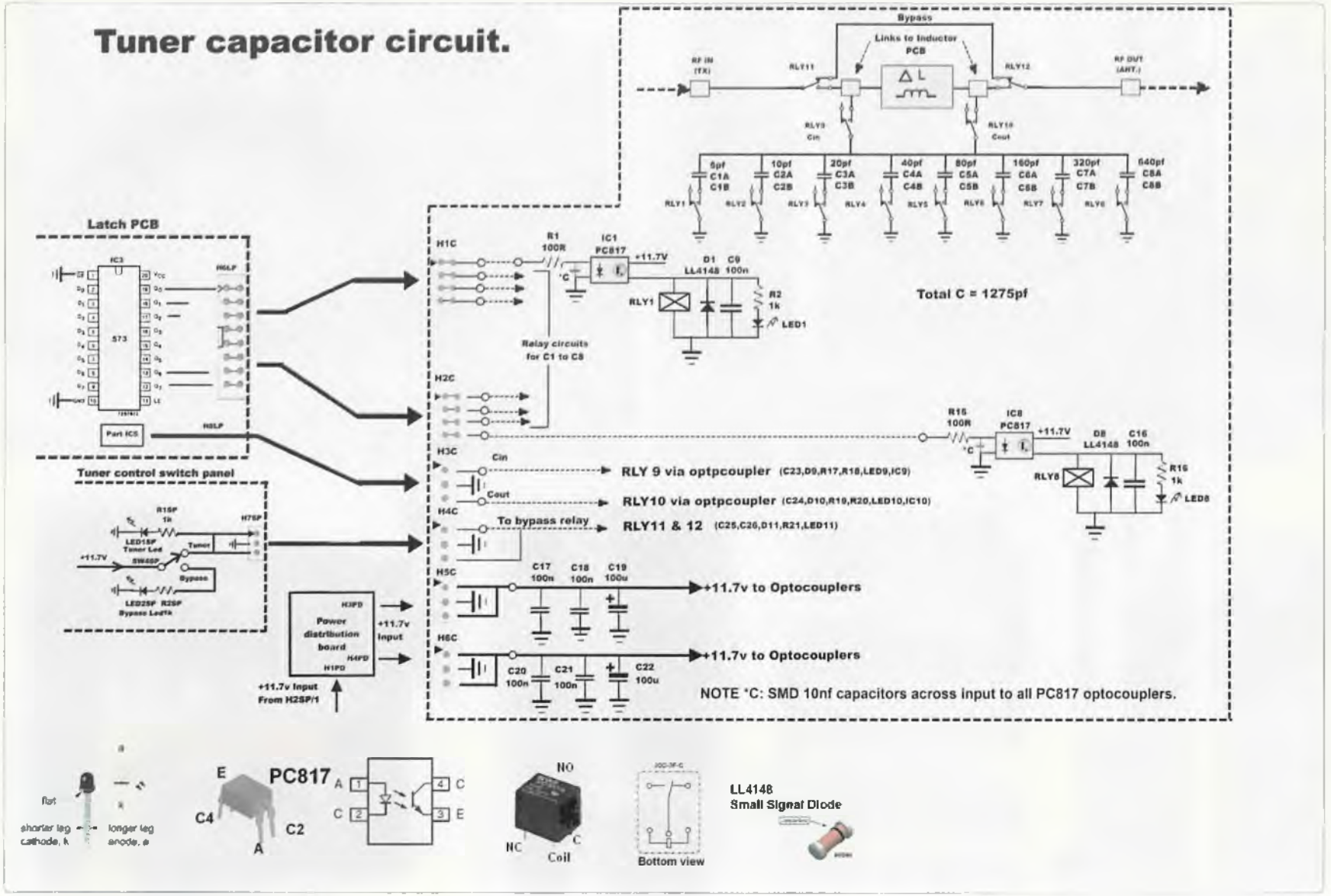


Figure 6: Variable capacitor circuit.

Tuner Capacitor details		
Capacitor	Value	Type
1	5pf	PCB 1 sq cm
2	10pf	PCB 2 sq cm
3	20pf	Mica trimmer
4	40pf	Mica RF
5	80pf	Mica RF
6	160pf	Ceramic HV
7	320pf	Mica + Ceramic HV
8	640pf	Mica + Ceramic HV
All capacitors rated at 500 volts		
Ceramic capcitors capable of high RF current.		

Table 4: Capacitor values for variable capacitor.

The capacitor PCB contains the bypass relays and the C_{IN}/C_{OUT} relays. See **photo F1**. The capacitor PCB is also mounted in the L and C enclosure upside-down below the inductor board. The capacitors are also positioned in a U-shape with the common track down the centre. This makes for a short, fat track and short connecting wires. Each relay coil has an LED across it for testing. Plenty of 100 nF SMD capacitors are wired across the logic, power, and opto-coupler connections.

The enclosure has SO-239 transmitter and antenna sockets on the rear of the enclosure panel. The L and C enclosure is designed to be removed from the case in one piece by unplugging the logic and power connectors. This makes it easy to test on the bench by using a simple power supply and logic switches. It can be used as a standalone tuner controlled by some rather simple switching such as HEX thumbwheels, or a clock driving a few BCD up/down counter and latch chips.

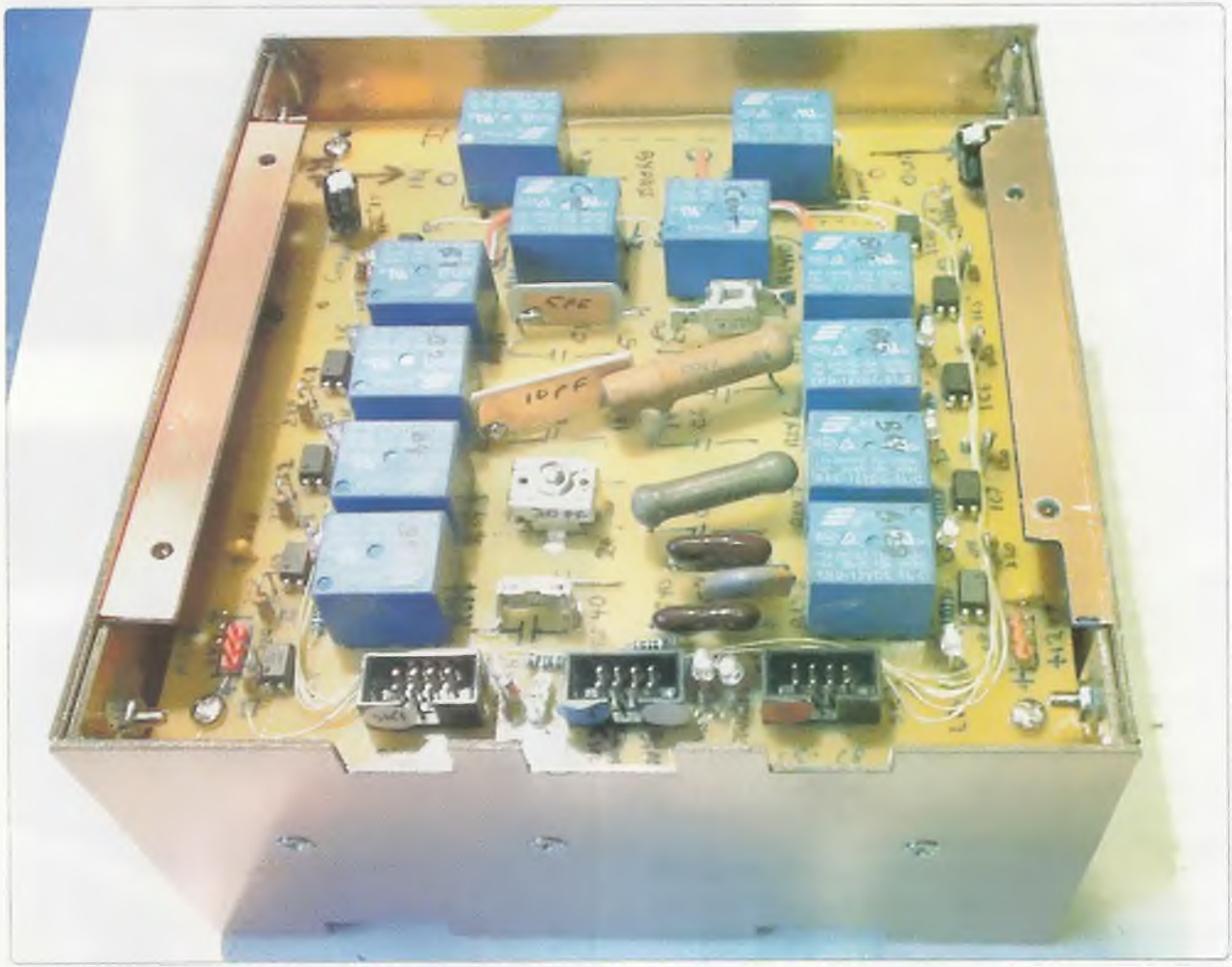


Photo F1: Capacitor board with switching relays.

Brisbane VHF Group mixes it up

Presented at Gippstech 2019 by Peter Schrader (VK4EA / KQ4PS) – vk4ea@wia.org.au – on behalf of the Brisbane VHF Group – vk4if@qsl.net

The Brisbane VHF Group has been in existence for nearly half a century and has been evolving from purely VHF activity and FM repeaters to its current focus on the microwave bands.

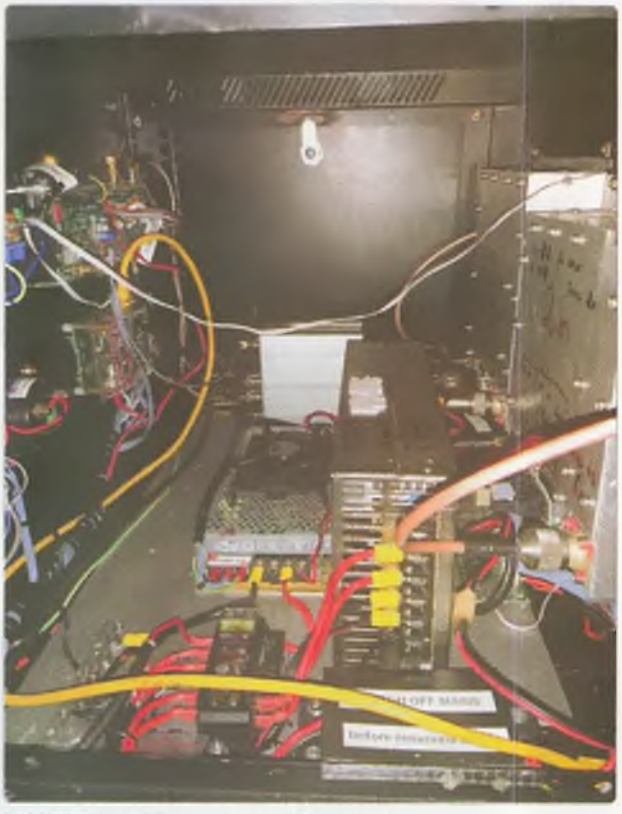
VK4RTT Front View

Upgrading and moving VK4RTT

The VK4RTT beacon station, located at Mt Mowbullan in the Bunya Mountains north-west of Brisbane, was upgraded a few years ago thanks to Adam Maurer, VK4GHZ, based on an FM828 chassis and a microchip based controller. The transmitter ended up not being all that stable given it is a 30+ year old crystal-locked design. The 2 m beacon tended to drift quite considerably and was turned off when it started to generate spurious artefacts. The ex-Channel 0 tower supporting the antenna was also due for demolition. Time to move and update. A combined effort from a number of skilled constructors has created a new 6 m / 2 m beacon station using modern componentry.

The new beacon is based on two ZL2BKC ZL-PLL blocks with JT65, JT4 and CW idents coordinated using a ZL2BKC beacon controller. The 6 m Power Amplifier (PA) brick produces 100 W while the 2 m PA brick produces 75 W. Both PA bricks are capable of much more power but we've wound down the drive levels to ensure longevity. Thanks to George McLucas VK4AMG for enhancing the beacon box which to now include remote control ability, upgraded PA pallets and driver amplifiers running well below maximum output to ensure spectral purity and service longevity.

The planned location of VK4RTT was to be Broadcast Park, Mt Coot-tha, located near the main broadcast site for Greater Brisbane. At the time of writing, we have yet to gain access to the site. Hopefully, by the time this



VK4RTT Side View – Covers Removed.

VK4RTT beacons

Grid: QG62lm
QTH: Mt Coot-tha
GPS frequency and time locked

Band	Frequency, MHz	Modes/ID	Power, W	Antenna
6 m	50.285	Carrier, CW, JT65a	100	Crossed dipole
2 m	144.440	Carrier, CW, JT4d	75	Dipole

article is published we can share the confirmed location.

VK4RBB gets an upgrade

VK4RBB was in the Brisbane suburb of Murarrie near the Gateway Bridge and operated on 70, 23, 13, and 3 cm giving years of service for amateurs in the area. It used old technology with traditional mixer stages on 432, 1296, 2403 and 10368 MHz, all crystal locked with some resulting frequency drift over time.

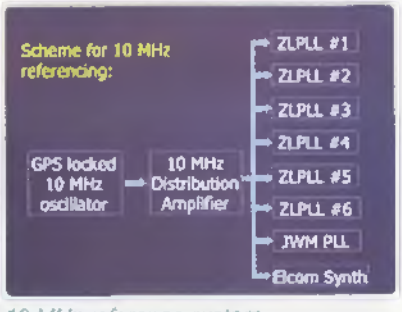
The old array was a collection of slot antennas next to a set of 70 cm crossed dipoles. All RF was generated at

VK4RBB old versus new location.

VK4NEF's home QTH – Previous Antenna Array.

ground level and antennas fed with appropriate grades of coaxial cable.

Thanks to our ever-enthusiastic president Doug Friend, VK4OE the Brisbane UHF and microwave beacon chain has had a significant upgrade. The ever-reliable ZL-PLLs were employed to provide a number of base frequencies that are

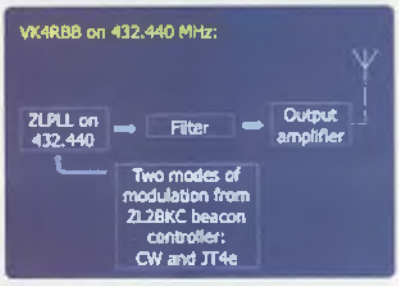


10 MHz reference system.

mixed, multiplied and massaged into 432.440, 1296.440, 2403.440, 3398.440, 5760.440, 10368.440 and 24048.440 MHz outputs.

There is some clever stuff happening to rationalise the number of local oscillators and incorporating Wayne Knowles VL2BKC's ZL-Beacon Controller to coordinate the frequency locking and modulation.

Eight signal sources are frequency disciplined by a single 10 MHz source, distributed amplifier. The JWN and Elcom synths

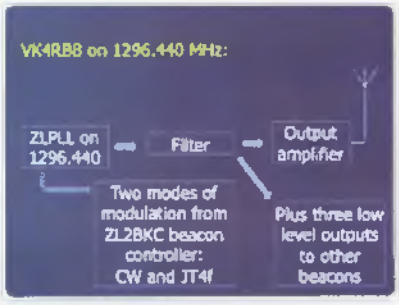


VK4RBB – 432.440 MHz Block.

are used for the 10 and 24 GHz beacons.

Not shown on these slides is the ZL1BKC Beacon Controller that also uses the GPS for time to ensure that the transmit windows and the time stamps sent with the JT TX windows are accurate.

The simplest block is a direct

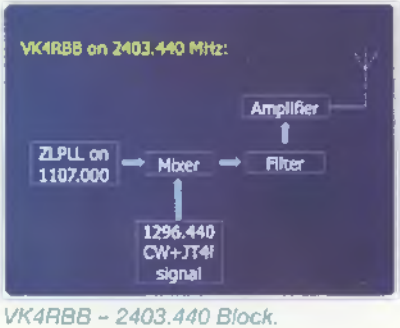


VK4RBB – 1296.440 MHz Block.

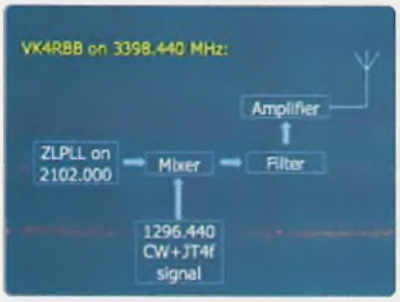
output from a ZL-PLL into an amplifier via a low pass filter.

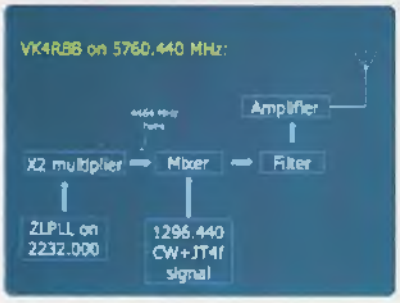
This is where it starts to get interesting, Doug got clever by using the output from the filter to mixers for the 2403, 3398 and 5760 MHz frequencies.

For the 2403, 3398 and 5760 MHz stages, the 1296.440 MHz artefact is mixed with two more ZL-PLLs on 1107, 2102 and 2232 MHz



VK4RBB – 2403.440 Block.

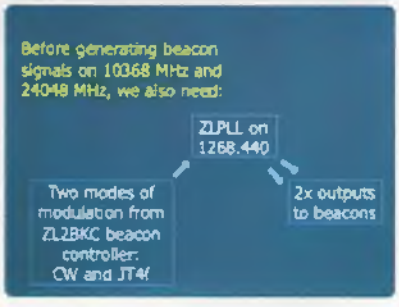




VK4RBB – 3398.440 and 5760.440 MHz Blocks.

to produce the 2403.440, 3398.440 and 5760.440 MHz outputs.

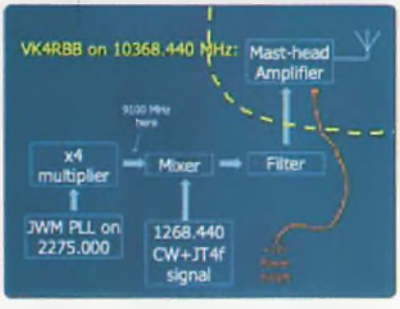
Using three ZL-PLLs and one 1296.440 MHz source, there are three new frequencies produced that are not available for direct synthesis.



VK4RBB – 1268 MHz intermediate block.

For 10368 and 24048 MHz, we need another LO frequency.

A separate ZL-PLL generates



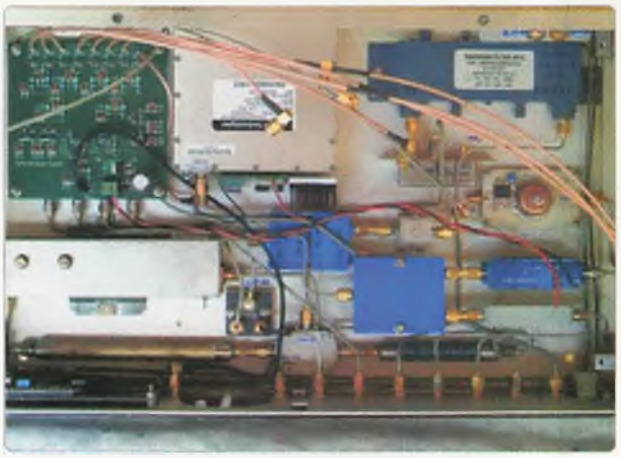
VK4RBB – 10368.440 MHz block.

1268.440 for use by the 10 and 24 GHz stages.

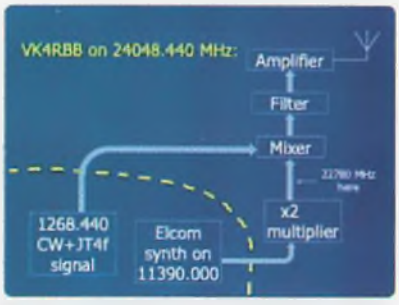
The 10 GHz masthead amplifier power is fed into low loss coaxial feed.

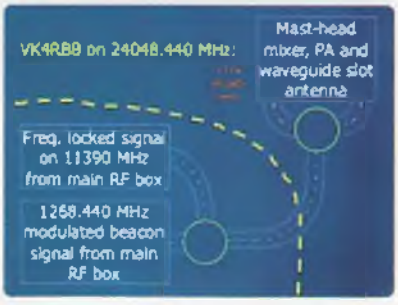
Similarly, as per the 10 GHz stage, the 1268.440 MHz carrier is mixed with the doubled output of the Elcom synth to produce 24048.440 MHz. Compared to the 10 GHz beacon, the final mixing and amplification is done at the antenna to avoid the substantial coaxial cable losses at 24 GHz.

Power requirements for the masthead



Top view of the VK4RBB Control Box.





VK4RBB – 24048.440 MHz block.

mixer and PA are supplied via the coax.

Now some wiring and layout

porn, Doug has done a beautiful job.

The photos above show the main box containing the 10 MHz distribution, Elcom synthesiser and all of the ground level mixing stages. The LCD is connected to the ZL2BKC beacon controller. The SMA flyleads connect to the ZL-PLLs and JWN synthesisers mounted on a plate that is normally on top of the pictured assembly.

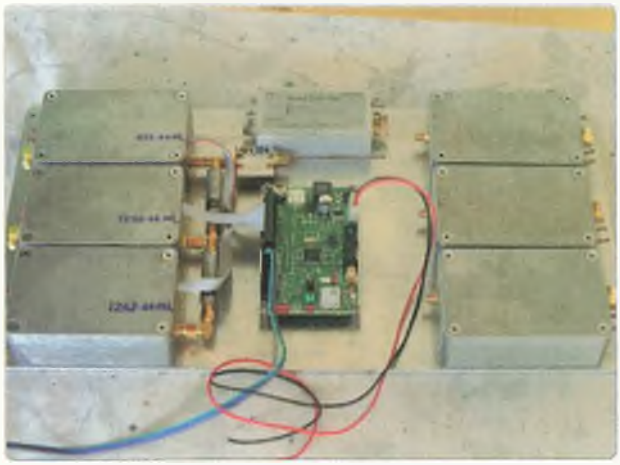
Separate 2RU boxes contain the power amplifier stages at ground level. Performance to date has exceeded expectations with good reports from microwave enthusiasts

VK4RBB beacons

Grid: QG62nh

QTH: Eden's Landing

GPS frequency and time locked



ZL-PLLs in enclosures and the ZL Beacon Controller board.

Band, cm	Frequency, MHz	Modes/ID	Power, W	Antenna
70	432.440	Carrier, CW, JT4d	10	Crossed dipole
23	1296.440	Carrier, CW, JT4f	10	Afford Slot
13	2403.440	Carrier, CW, JT4f	3	Slotted waveguide
9	3398.440	Carrier, CW, JT4f	5	Slotted waveguide
6	5760.440	Carrier, CW, JT4f	5	Slotted waveguide
3	10368.440	Carrier, CW, JT4f	1	Slotted waveguide
1.2	24048.440	Carrier, CW, JT4f	0.5	Slotted waveguide

Close-up photo of the 24 GHz PA and slot antenna.

in Northern NSW and South East Queensland.

Rob, VK4ZDX kindly provides room on his One-Man Tower, allowing easy access for any maintenance or upgrade activities. Thanks to Rob for hosting the beacons at his QTH.

Complete array of antennas located below Rob's 2 m and 70 cm Ucia Yagi antennas.

The Brisbane VHF Group gratefully accepts donations to keep the beacon chain going. Please send any reports to *vkspotter.com*.

References

ZL2BKC Multi Beacon Controller: *https://zl2bkc.com/2015/02/24/multi-beacon-controller-update/*

ZLPLL: *https://zl2bkc.com/category/zlpll/*

Brisbane VHF Group: *http://brisbanevhfgroup.com/*

VK4RTT beacon upgrade: *https://www.youtube.com/watch?v=F4oXsJSpwb8*

Due dates for publication

Dates for submission can be found at the bottom of the page:

http://www.wia.org.au/members/armag/contributing/

All articles, columns, hamads and advertising booking for the next issue by **7 August 2021.**

WIA Awards

Marc Hillman VK3OHM/VK3IP

Below are listed all New awards issued from 2021-02-15 to 2021-06-14

Go to *http://www.wia.org.au/members/wiadxawards/about/* to use the online award system.

New awards

DXCC Multi-band (3)

#	Call	Name	Mode	Band	Count
195	VK6WX	Wesley Beck	Digital	40-20-17m	330
196	DM1HR	Hans-Rainer Langner	Digital	20-17-15m	333
197	DM1HR	Hans-Rainer Langner	Open	20-17-15m	344
198	VK2NN	Peter Garoufalis	Open	40-20-15m	436
199	VK3FZ	Roger Stafford	Digital	30-20-17m	366
200	VK2IO	Gerard Hill	Open	40-30-20m	362

DXCC Multi-band (5)

#	Call	Name	Mode	Band	Count
141	JL1JVT	Koike Toshiya	Digital	40-30-20-17-15m	644
142	VK2PW	Adam McCarthy	Digital	40-30-20-17-15m	678
143	VK3MB	Philip White	Digital	40-30-20-17-15m	617
144	VK3FZ	Roger Stafford	Digital	40-30-20-17-15m	574

DXCC Multi-band (7)

#	Call	Name	Mode	Band	Count
68	VK5SFA	Steve Adler	Open	80-40-30-20-17-15-10m	859
69	VK3IK	Christopher Bellmont	Open	40-30-20-17-15-12-10m	1101
70	VK6WX	Wesley Beck	Open	80-40-30-20-17-15-10m	1176
71	DL1SVA	Ralph Neumann	Open	80-40-20-17-15-12-10m	1226
72	DD0VU	Jens Knoepchen	Open	80-40-30-20-17-15-10m	1105
73	VK2PW	Adam McCarthy	Open	80-40-30-20-17-15-12m	971

DXCC Multi-band (8)

#	Call	Name	Mode	Band	Count
33	VK3EW	David McAulay	Digital	80-40-30-20-17-15-12-10m	1527
34	OH8LXT	Veikko Pennala	Digital	80-40-30-20-17-15-12-10m	1501
35	OH8LXT	Veikko Pennala	Open	80-40-30-20-17-15-12-10m	1879
36	VK4CAG	Graeme Dowse	Digital	80-40-30-20-17-15-12-10m	1214
37	VK5SFA	Steve Adler	Open	80-40-30-20-17-15-12-10m	1040

DXCC Multi-band (9)

#	Call	Name	Mode	Band	Count
33	SQ5EBM	Maciej Muszalski	Open	160-80-40-30-20-17-15-12-10m	1297
34	IU0LFQ	Alessio Bravi	Digital	160-80-40-30-20-17-15-12-10m	1414

DXCC Multi-mode (Digital)

#	Call	Name	Count
131	VK3FNJ	Stephen Charlesworth	113
132	VK2VEL	Edwin Lowe	104
133	JL1JVT	Koike Toshiya	202
134	VK2AZ	Hilary Bridel	112
135	VK2AGB	Anthony Garton	100
136	VK3SWK	Benjamin Carthew	100
137	VK3FCBR	Paul Starkey	122
138	DL1SVA	Ralph Neumann	119
139	VK1DI	Ian Sinclair	110

DXCC Multi-mode (Open)

#	Call	Name	Count
513	VK2AGB	Anthony Garton	100
514	VK3SWK	Benjamin Carthew	101
515	VK3FCBR	Paul Starkey	122
516	VK1DI	Ian Sinclair	111
517	VK5UW	Brian WILSON	103
518	VK3NX	Charlie Kahwagi	113

DXCC Multi-mode (Phone)

#	Call	Name	Count
643	VK2PW	Adam McCarthy	111
644	DD0VU	Jens Knoepchen	117
645	VK3NX	Charlie Kahwagi	102

DXCC Multi-mode (Triple Play)

#	Call	Name	Count
17	IU0LFQ	Alessio Bravi	101
18	VK3IK	Christopher Bellmont	101
19	OH8LXT	Veikko Pennala	236
20	VK6DU	Lance Martin	275

DXCC Single-band

#	Call	Name	Mode	Band	Count
856	VK5PAS	Paul Simmonds	Open	15m	159
857	VK5PAS	Paul Simmonds	Open	10m	152
858	VK5PAS	Paul Simmonds	Phone	15m	157
859	VK5PAS	Paul Simmonds	Phone	10m	152
860	VK3MH	Brendan Bryant	Open	80m	105
861	VK3MH	Brendan Bryant	Digital	80m	104
862	VK6MIT	Brian Mitchell	Open	40m	100
863	VK6WX	Wesley Beck	Digital	17m	100
864	VK2BY	Bradley Devon	Phone	40m	110
865	VK2PW	Adam McCarthy	Digital	15m	105
866	DM1HR	Hans-Rainer Langner	Digital	15m	106
867	DM1HR	Hans-Rainer Langner	Digital	17m	114
868	DM1HR	Hans-Rainer Langner	Digital	20m	113
869	VK2NN	Peter Garoufalis	Open	40m	100
870	VK6MIT	Brian Mitchell	Digital	40m	101
871	VK3MB	Philip White	Digital	15m	100

DXCC Single-band

#	Call	Name	Mode	Band	Count
872	VK3FZ	Roger Stafford	Digital	20m	119
873	VK3FZ	Roger Stafford	Digital	17m	109
874	VK3IK	Christopher Bellmont	Open	12m	103
875	VK3IK	Christopher Bellmont	Open	10m	104
876	VK6APK	Aleksandar Petkovic	CW	17m	100
877	VK2PW	Adam McCarthy	Open	12m	102
878	VK2IO	Gerard Hill	Open	30m	104
879	VK2IO	Gerard Hill	Digital	40m	106
880	VK2IO	Gerard Hill	Digital	20m	115
881	VK3DRH	David Heathcote	Open	20m	101
882	VK3DRH	David Heathcote	Digital	20m	100
883	VK6WX	Wesley Beck	Open	80m	101
884	VK3OM	Michael Andrews	Open	20m	103
885	VK3OM	Michael Andrews	Digital	20m	103
886	VK3EW	David McAulay	Digital	10m	100
887	VK3DRH	David Heathcote	Open	30m	100
888	VK6DU	Lance Martin	Triple Play	20m	153
889	VK6DU	Lance Martin	Triple Play	15m	103
890	DL1SVA	Ralph Neumann	Open	80m	107
891	DL1SVA	Ralph Neumann	Open	40m	116
892	DL1SVA	Ralph Neumann	CW	40m	112
893	DL1SVA	Ralph Neumann	CW	10m	155
894	DL1SVA	Ralph Neumann	CW	12m	164
895	DL1SVA	Ralph Neumann	CW	17m	216
896	DL1SVA	Ralph Neumann	CW	20m	230
897	DL1SVA	Ralph Neumann	Open	10m	161
898	DL1SVA	Ralph Neumann	Open	12m	166
899	DL1SVA	Ralph Neumann	Open	17m	217
900	DL1SVA	Ralph Neumann	Open	20m	236
901	VK4CAG	Graeme Dowse	Digital	10m	100
902	DD0VU	Jens Knoepchen	Open	80m	152
903	DD0VU	Jens Knoepchen	Open	30m	164
904	DD0VU	Jens Knoepchen	Open	10m	100
905	DD0VU	Jens Knoepchen	Open	15m	148
906	DD0VU	Jens Knoepchen	Open	17m	166
907	DD0VU	Jens Knoepchen	Open	20m	179
908	VK2PW	Adam McCarthy	Open	80m	103
909	IU0LFQ	Alessio Bravi	Digital	160m	102
910	DM1HR	Hans-Rainer Langner	Open	15m	107
911	VK3FZ	Roger Stafford	Digital	15m	108
912	VK3FZ	Roger Stafford	Digital	40m	100
913	VK3BDX	David Burden	CW	20m	100

Islands of Australia

#	Call	Name	Count
17	VK5BC	Brian Cleland	21

VHF Century Club

#	Call	Name	Mode	Band
163	VK3MH	Brendan Bryant	Open	6m
164	VK2AZ	Hilary Bridel	Open	6m

DXer of the Year

#	Call	Name	Category	Place	Grade	Year
119	VK2BY	Bradley Devon	Grid	2	All Grades	2020
120	VK2BY	Bradley Devon	Open	2	All Grades	2020
121	VK2BY	Bradley Devon	Phone	1	All Grades	2020
122	VK2BY	Bradley Devon	Digital	2	All Grades	2020
123	VK2BY	Bradley Devon	DXCC	3	All Grades	2020
124	VK2DX	Nikola Hacko	Grid	1	All Grades	2020
125	VK2DX	Nikola Hacko	Open	3	All Grades	2020
126	VK2DX	Nikola Hacko	Triple Play	2	All Grades	2020
127	VK2PW	Adam McCarthy	Phone	2	All Grades	2020
128	VK2PW	Adam McCarthy	Triple Play	3	All Grades	2020
129	VK3BDX	David Burden	Grid	3	All Grades	2020
130	VK3BDX	David Burden	Open	1	All Grades	2020
131	VK3BDX	David Burden	Digital	1	All Grades	2020
132	VK3BDX	David Burden	DXCC	2	All Grades	2020
133	VK5GR	Grant Willis	Phone	3	All Grades	2020
134	VK5GR	Grant Willis	CW	2	All Grades	2020
135	VK6WX	Wesley Beck	CW	1	All Grades	2020
136	VK6WX	Wesley Beck	Triple Play	1	All Grades	2020
137	VK6IR	Stephen Chamberlain	Digital	3	All Grades	2020
138	VK3GA	Graham Alston	DXCC	1	All Grades	2020
139	VK3TZ	Tony Burt	CW	3	All Grades	2020
140	VK3FCBR	Paul Starkey	Grid	1	Foundation	2020
141	VK3FCBR	Paul Starkey	Open	1	Foundation	2020
142	VK3FCBR	Paul Starkey	Digital	1	Foundation	2020
143	VK3FCBR	Paul Starkey	DXCC	1	Foundation	2020
144	VK6BMA	Brian McAndrew	Grid	2	Foundation	2020
145	VK6BMA	Brian McAndrew	Open	2	Foundation	2020
146	VK6BMA	Brian McAndrew	Digital	2	Foundation	2020
147	VK6BMA	Brian McAndrew	DXCC	2	Foundation	2020

Grid Square

#	Call	Name	Mode	Band	Count
540	VK3MH	Brendan Bryant	Open	6m	54
541	JL1JVT	Koike Toshiya	Digital	HF	1242
542	VK3MH	Brendan Bryant	Digital	6m	52
543	WQ2H	James Poulette	Open	HF	263
544	WQ2H	James Poulette	Digital	HF	263
545	SQ5EBM	Maciej Muszalski	Open	HF	1458
546	SQ5EBM	Maciej Muszalski	Open	6m	94
547	VK2IO	Gerard Hill	Phone	HF	222
548	VK2IO	Gerard Hill	CW	HF	237
549	VK2IO	Gerard Hill	Digital	HF	716
550	VK3PUB	anthony Lance	Digital	HF	280
551	VK3PUB	anthony Lance	Open	HF	333
552	VK4CUZ	Gary Crothers	Open	HF	451
553	DL1SVA	Ralph Neumann	Phone	HF	312
554	DL1SVA	Ralph Neumann	CW	HF	902
555	VK2BY	Bradley Devon	CW	HF	103
556	VK2PW	Adam McCarthy	Phone	HF	417

Oceania

#	Call	Name	Count
57	VK5PAS	Paul Simmonds	49
58	VK2AZ	Hilary Bridel	37
59	JL1JVT	Koike Toshiya	40
60	SQ5EBM	Maciej Muszalski	37
61	VK2BYI	Christopher Fredericks	47
62	DK3UA	Reinhard Michaelis	41
63	OH8LXT	Veikko Pennala	56
64	VK3QI	Peter Forbes	60

Worked All States VHF

#	Call	Name	Mode	Band
235	VK2AZ	Hilary Bridel	Open	6m
236	VK2AZ	Hilary Bridel	Digital	6m
237	VK3FZ	Roger Stafford	Open	6m
238	VK3FZ	Roger Stafford	Digital	6m
239	VK1DI	Ian Sinclair	Open	6m
240	VK1DI	Ian Sinclair	Digital	6m

Worked All VK Call Areas HF

#	Call	Name	Mode
2424	VK3MH	Brendan Bryant	Digital
2425	JL1JVT	Koike Toshiya	Digital
2426	VK5PAS	Paul Simmonds	Open
2427	OH8LXT	Veikko Pennala	Open

DXer of the Year

Marc Hillman VK3OHM

In May 2021 the winners of the DX leaderboard for 2020 were declared. First, second and third in all categories receive a certificate. First place getters receive a glass trophy sponsored by Future Systems. From next year Standard licences will have their own category. Congratulations to all the winners, and to everyone who took part.

The results of the WIA DX Leaderboard for 2020 have been declared, and we have 5 different winners in the 7 categories. Category scores were generally a little higher than 2019, perhaps reflecting the slightly improved conditions. All 1st, 2nd and 3rd place getters will receive a certificate, and first place getters will receive a plaque courtesy of our sponsors - Future Systems.

New for 2020 was the Triple Play category, i.e. count of DXCC worked on CW, Phone & Digital modes. Starting in 2021, The leaderboard will have separate tables for Foundation, Foundation+Standard, and All Grades.

Year: 2020 QSL: Verified

Places in category are coloured First Second Third

All Grades DX Leader Board for 2020 (Top 30/89): Verified QSO only

Call	Name	DXCC	Triple	Open	Phone	CW	Digital	Grid	Score
VK2BY	Bradley Devon	207	49	1011	351	97	940	1353	5.652
VK2DX	Nikola Hacko	206	57	998	93	254	857	1451	5.357
VK2PW	Adam McCarthy	194	55	824	164	252	729	1044	4.997
VK3BDX	David Burden	214	32	1121	114	75	1109	1344	4.911
VK5GR	Grant Willis	189	49	764	124	265	689	892	4.601
VK6WX	Wesley Beck	167	60	601	116	383	358	573	4.310
VK9IR	Stephen Chamberlain	183	15	887	57	57	876	1281	3.921
VK2QV	Rasika Liyanage	183	0	804	44	0	797	1124	3.132
VK3KTT	Steven Barr	178	29	542	102	87	481	618	3.118
VK3GA	Graham Alston	230	5	652	28	101	574	607	2.944
VK3BH	Brendan Bryant	170	9	670	74	16	654	698	2.810
VK6APK	Aleksandar Petkovic	156	6	607	24	50	584	866	2.642
VK5BC	Brian Cleland	167	0	520	12	5	617	881	2.490
VK3MB	Philip White	175	1	544	65	2	535	503	2.282
VK3SIM	Simon Keane	173	0	563	8	12	551	530	2.171
VK3IK	Christopher Bellmont	176	0	498	35	7	486	567	2.156
VK6DW	Ian Cook	112	9	444	40	23	434	712	2.089
VK3TZ	Tony Burt	107	0	383	116	264	0	483	2.088
VK4SN	Alan Shannon	89	15	238	35	149	198	743	2.029
VK6MT	Brian Mitchell	135	0	341	10	0	336	1012	1.920
VK5SFA	Steve Adler	142	3	525	71	16	501	0	1.832
VK3BOY	Phillip Vis	137	0	425	0	0	425	582	1.759
VK3OM	Michael Andrews	107	0	317	7	0	315	876	1.656
VK5SA	Chris Levingston	128	3	348	19	35	332	333	1.591
VK2IO	Gerard Hill	114	5	291	19	31	280	520	1.584
VK3WE	Rhett Donnan	125	3	318	15	12	311	479	1.562
VK5SJ	Stephen Kennedy	108	8	265	51	21	245	417	1.548
VK4CAG	Graeme Dowse	153	1	458	1	6	454	4	1.521
VK3FCBR	Paul Stanley	115	0	185	4	0	183	912	1.470
VK3FZ	Roger Stafford	113	0	322	0	0	322	545	1.445

Foundation DX Leader Board for 2020 (Top 5/2): Verified QSO only

Call	Name	DXCC	Triple	Open	Phone	CW	Digital	Grid	Score
VK3FCBR	Paul Stanley	115	0	195	4	0	183	912	5.000
VK5BMA	Brian McAndrew	30	0	35	0	0	35	159	0.816

Over to you

RPL or Not RPL? That is the question.

I recently applied for an Australian Advanced Amateur Radio licence using the established and prescribed pathway. What I encountered along the way was a bizarre experience mirroring a synthesis of Yes Minister, Fawlty Towers, and Monty Python. This is my story.

Where is Amateur Radio today? In our current environment we battle declining interest and membership, in-fighting, apathy, and an ongoing struggle to remain relevant resulting largely from a lack of understanding by the non-radio amateur population, and at the administrative and political levels. The excitement of speaking with fellow enthusiasts on the other side of the world utilising one's own Amateur Radio station where global communications are the norm, and self-reliance and experimentation in radio, has been somewhat superseded by emojis, Tik Toc and the online lifestyle.

Yet when the chips are down, Amateur Radio comes to the fore, especially during times of emergency such as Cyclone Tracey in 1974, the Australian bush fires in 2019/2020, et al. Despite these ongoing challenges, and while demonstrating a sense of self-reliance and independence, Australian radio amateurs have remained committed to honing our craft, serving our communities, encouraging people to join in, and take an active role in the Amateur Radio Service.

Regulation of the Amateur Radio Service has become an increasing challenge. With a statutory body (Australian Communications & Media Authority (ACMA)) that appears to be less invested in the future of the Amateur Radio Service today than it and its predecessor 'departments' were in earlier times, it has demonstrated a willingness to outsource some of its obligations, accountabilities, and surprisingly policy decisions to a commercial agency (Australian Maritime College (AMC)).The Amateur Radio community is almost viewed as a vagrant squatting on a diamond mine. No longer are amateurs viewed as being at the forefront of technology, but instead as occupiers of radio frequency spectrum that has commercial revenue value.

Not content with the commercial revenue generated through its contracted arrangement with ACMA, the agency also now seeks to stamp its authority on the Amateur Radio Service itself, seemingly unaware that regular infusion of new blood is essential to the survival of the Amateur Radio Service. Working under a Deed from ACMA, the agency seeks to implement its own subjective processes and standards where independence can become difficult to discern, but its continued consolidation of influence is readily apparent.

If we as a community allow one commercial organisation to operate with impunity, to shape and limit the future cohort of radio amateurs via subjective, opaque, and arbitrary standards, then are we not beggars to our own demise? Will the Amateur Radio Service survive the elitist putsch of those currently empowered? For this is what is happening amongst us now as the AMC has seen fit to introduce a new requirement for an 'interview' prior to granting Recognition of Prior Learning (RPL) for the issue of an Australian Amateur Radio credentials to applicants with foreign qualifications:

> *Before arriving at a final decision, the appointed assessor may require the applicant to undergo an oral interview on all aspects of amateur radio theory, regulations and practical as part of the process of arriving at a formal determination.*
> (AMC-RPL-Process-Advanced-Instructions-19.5.21.pdf)

An interview (oral examination by stealth) that is a "conversational" telephone call of 15-20 minutes, where the applicant is asked questions (of the examiner's choosing), from a custom syllabus (chosen from the entire Amateur Radio body of knowledge) with no apparent oversight, and no recourse for the applicant to dispute the assessor's subjective findings as has recently occurred:

> *"I note that you have a Foundation Certificate, have passed Regulations, and have an FCC Extra Class licence. To be granted RPL you are required to have a telephone interview with an assessor to determine your eligibility for granting you an Advanced certificate. This interview should be no longer then (sic) 15 to 20 minutes. You will be asked a few questions, in a conversational manner, from a current Advanced theory paper in order to demonstrate your eligibility to be granted RPL for an AOCP(A)."*
> (AMC Assessor 17/6/2021)

To find a person officially installed in an almost king-maker role in these circumstances is unusual and not indicative of best practice or due process.

Accepted assessment practice is to be fair, equitable, objective, evidence based, adherence to published relevant standards/competencies, with a record made of the applicant's responses. Does the new requirement from AMC meet this norm; is it mandated by ACMA; is it published in the public domain?

I venture to say no. An objective person would say that AMC's new approach to RPL assessments does not meet the above. In reality, it does not even meet its own standards as documented in AMC's own publication:

> *"Under the Standards for Registered Training Organisations 2015, it is required that assessment processes are valid, reliable, flexible and fair. If you are not satisfied with the assessment process or your assessment result, you may appeal the decision."*
> (AMC Student Handbook 2020)

The ability to appeal an AMC decision does not seem to extend in full to the services provided to the Amateur Radio Service. As one who has recently run afoul of AMC's surreptitious changing of its own processes and ACMA's standards, and applying a new unpublished and arbitrary standard mid assessment, I can attest that the ability to lodge an appeal, let alone a formal complaint, can be challenging.

The application of this oral examination is certainly a point of contention, but its future impact on what should be the default recognition of existing and valid amateur radio qualifications is more concerning. For decades, a framework for foreign Amateur Radio licence recognition has existed. The extant position is available on the ACMA www site.

> *"Table A: We have an arrangement with these countries or regions. We accept these amateur licences and qualifications because we have an arrangement with the country or region."*
> (www.acma.gov.au/overseas-amateurs-visiting-australia).

Australia, as a member state of the International Telecommunications Union (ITU) and signatory to numerous ITU treaties, has obligations and responsibilities such as:

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"The authorization (or licence) granted to a station operator is thus the legal act guaranteeing that the commitment between States is formally extended so as to become a commitment between operators. RR Article 18, which obliges States to grant a licence to any transmitting station to be operated by any private person or enterprise, is therefore the basic link between the national and international levels of spectrum management."
(ITU-R SM2093-4 (06/2021), p.21, s.2.2.3 Authorizations (or licences))

In my case, I possess an Australian Amateur Operator's Certificate of Proficiency (Foundation) and an ACMA recognised qualification and licence issued by an overseas regulator. Referring to Table A at the above ACMA www page, my qualifications translate to an equivalent of the Australian Advanced licence.

There is no mention of any supplementary assessments, nor the need to pass a local regulations assessment. It is my understanding that there has never been such a requirement here in Australia, nor in any foreign country. It is known that in countries where the Amateur Radio Service is more stringently controlled (e.g. Singapore) a local licence will be issued on the basis of a suitable Australian AOCP sans any further assessment. NB: Amateur Radio Service regulations largely emanate from the ITU, are universal, and adopted by ACMA. A small percentage are locally derived to suit domestic conditions globally.

When a subjective oral examination is added to what would normally be a formality in recognising the equivalency of an ACMA issued Advanced licence and an ACMA recognised qualification and licence issued by an overseas regulator, then the objectiveness of the framework begins to unravel and puts pressure on the reciprocation arrangements already in place with other countries.

Will Australian amateurs be asked to undergo an oral examination when attending foreign countries, and before our Advanced licences are recognised? Will DX operations need to pass arbitrary and subjective examinations on their arrival in far-flung locations before their Amateur Radio qualifications are recognised and the DXpeditionis authorised to proceed?

There is an established equivalency framework for Amateur Radio licences and up to now it has been equitable, fair, prescribed, objective, and universally recognised. The imposition of arbitrary oral examinations under the guise of an 'interview' to determine a person's knowledge (that has already been demonstrated through their holding of a recognised and equivalent licence or certificate of proficiency) does not serve to further Amateur Radio in Australia specifically, or the Amateur Radio Service more broadly.

In this area AMC acts on behalf of ACMA. ACMA has demonstrated little will or appetite to be involved in such petty discussions around equity, procedural fairness, or maintaining current norms of licence equivalence as demonstrated in its response when queried on AMC's new oral examination. In fact, its response is to simply reference "the Deed".

"While the Deed requires the AMC, in considering an application for RPL, to take into account certain matters, including the Tables of Equivalent Qualifications and Licences available on the ACMA website, the Deed does not prescribe the process by which RPL is assessed."
(ACMA Manager 21/6/2021)

ACMA's response appears to demonstrate a lack of understanding of its own requirements. This matter is nothing to do with process, and everything to do with standards.

Process: a series of actions that you take in order to achieve a result.

Standard: a level of quality or attainment; something used as a measure, norm, or model in comparative evaluations.

The process to apply for RPL, licences and callsigns is articulated on the AMC www site. The standards for local recognition of foreign amateur radio qualifications are conveyed on the ACMA www site. Neither states a need for further assessment.

When the AMC is challenged on itsself-initiated change to the established RPL process, its response is to also to conflate process with standards:

"AMC has been granted considerable discretion by the ACMA in the discharge of its responsibilities with regards to the maintenance of the quality and integrity of the RPL process."
(AMC Manager 24/6/2021)

NB: AMC makes no mention of standards, only process, the latter of which is not in question. ACMA has established the standards for AMC or any other contractor to apply, in the same way a Registered Training Organisation (RTO) applies standards' competencies when assessing persons for the issue of qualifications within the Australian Qualification Framework (AQF). The AQF does not dictate process to an RTO, only standards.

What a fantastic vehicle for operational management, objective oversight, and true accountability "the Deed" is. Whenever articles of arrangement such as "the Deed" are used to shield stakeholders from all accountabilities, then greater investigation is warranted into what exactly this Deed does and does not empower, its intent, its value, and whether it is fit for purpose as an instrument to maintain compliance with Australia's ITU obligations while also furthering the Amateur Radio Service within Australia. From cursory examination it seems to be a mechanism to outsource an accountability, except that one can only delegateone's responsibilities (the doing) and not aorogate one's accountabilities (the ownership).

Amateur Radio has so much to offer from research, experimentation, community service, hobby interests, lifelong friends and mateship. Yet it has never been more challenged than it is today about how its future is determined by a disengaged statutory body content with outsourcing its statutory obligations to a commercial entity that has no vested interest in Amateur Radio. Nor does it have a history involved in same, or a source of advice from independent, arm's length persons sans an agenda, only commercial gain. I would ask all readers to reflect on the above and honestly answer the question: is this the Amateur Radio Service you would want to leave as a legacy to future generations?

Make no mistake, if the current situation persists and we as a community don't seek greater accountability and consistency from regulatory bodies and commercial entities such that we can drive our own destiny in a positive direction, then there will be no material adoption by future generations, and Amateur Radio will fade into obscurity, destined to be a shell of its former self and viewed by future generations as a curio of the past.

(Name withheld at author's request. The opinions expressed in this article are those of the author and do not necessarily align with those of the WIA. NB: The WIA has verified the veracity of the facts presented in the article and is in possession of the evidenced communications.)

ALARA

Jenny Wardrop VK3WQ

Austine Henry VK3YL.

ALARA is donating two plaques to the Oceania DX Contest Committee in honour of two notable lady amateurs. I have included the profiles of the two amateurs, Austine Henry VK3YL and Florence McKenzie VK2GA, in this issue.

Austine Henry (nee Marshall) VK3YL

An Australian lady amateur who became well known worldwide was Austine Henry (nee Marshall) VK3YL. She was born Mary Austine on 11 June 1913 in Brighton, Victoria. Austine received her first radio (a crystal set) as a small child, and promptly pulled it apart to see how it worked! She later graduated to building valve sets.

After tutoring by her then boyfriend, and later husband, Bill Henry, Austine passed her experimental licence exam and was issued with an Amateur Operator's Certificate of Proficiency number 619, dated 14 May 1930, and allocated callsign VK3YL. She was only the third woman to obtain an amateur licence in Australia at that time. She became an active VK3 operator and a great ambassador for amateur radio world-wide. Austine continued to build much of her own equipment, including a large, high-power, crystal-controlled transmitter, which won first prize in its class at the Victorian Wireless Institute of Australia's public display in the Melbourne Lower Town Hall in 1933.

On 6 September 1933, Austine became the first woman admitted to the Royal Australian Air Force Wireless Reserve and was enrolled as *No.R.20 AC2 Marshall MA* in the Wireless Section. She was terribly upset that the RAAF would not send her to a war zone as a radio operator, just because she was a woman! Despite her official commitments during WWII, she spent


YASME
Award

For outstanding achievement in Amateur Radio DX
PRESENTED TO

Austine Henry VK 3 YL

The YASME DX-Peditions, starting in 1984, were the first in the world to go forth on a continuing year after year DX operation. The YASME Foundation was founded in 1981 to sponsor YASME DX-Peditions and other activities connected with Amateur Radio DX Operations.

We congratulate you on your accomplishments in the field of Amateur Radio DX.

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Austine's prestigious Yasme Award from the WIA Archive.

a lot of her spare time at the WIA (Wireless Institute of Australia), on a voluntary basis, teaching Morse code to service personnel and others.

Austine was a member of the WIA for 54 years (in 1985), having the distinction of holding the longest duration YL membership to that date. Other notable achievements included being a foundation member of the YASME Foundation and winning certificate No. 7 in the prestigious YASME Award. She was made a life member of the Society of Wireless Pioneers, and her entry into the DXCC Honour Roll was as the first Australian YL using CW. She was the first to gain the WAC-YL and certificate number 22 for the YL-DXCC from Canada (hand printed in gold) and the first VK YL to gain the Australian Ladies Amateur Radio Association (ALARA) award. Austine held these memberships:

- Joined ARRL on 14 April 1930
- More than 30 years in the Radio Society of Great Britain (RSGB)
- New Zealand Amateur Radio Transmitters (NZART)
- Radio Amateur Old Timers' Club (Australia)
- Radio Amateurs Old Timers Club (USA)
- Young Ladies Relay League (YLRL USA)
- Young Ladies International SSB net (YLISSB)
- Women Amateur Radio Operators (WARO NZ)
- ALARA.

Austine died unexpectedly at the age of 81 on 9 September 1994. The words Silent Key being most fitting for this internationally known YL ambassador.

Florence Violet McKenzie OBE (nee Wallace) A2GA/ VK2FV/VK2GA

Florence McKenzie A2GA/VK2FV/VK2GA from the Australasian Wireless Review Jan 1923.

Probably the best-known lady amateur operator in Australia is Florence McKenzie (nee Wallace). Born in 1891, she became Australia's first tertiary-educated female electrical engineer, and opened a wireless / electrical shop in the Royal Arcade, Sydney in 1921. In 1925, Florence obtained her amateur licence and the callsign A2GA, our first known licensed lady amateur.

During 1922, Florence was involved in starting the *Wireless Weekly* magazine, along with three other people. This magazine later morphed into *Radio and Hobbies* and then later it became *Electronics Australia*. The 1948 call book lists her as VK2FV, which lapsed circa 1959. Regaining interest in amateur radio in 1979, Florence again became 2GA, this time VK2GA, which she held until her death in 1982. In the mid 1930s, Florence established the *Electrical Association for Women*, which appears to have been formed mainly to teach women how to use electrical appliances in the home; she also wrote a cookery book for electric stoves, when none was available.

When Florence realised that war was imminent, *Mrs. Mac* as she was fondly known, became acutely aware of the need for radio communications as part of our defence, and the need for people trained in Morse code. She established a no-charge training school in a loft near her shop. Her students were predominantly women initially, and the school became known as the *Women's Emergency Signaling Corps. (WESC)*. During 1940, in response to a newspaper advertisement by the Royal Australian Navy appealing for trained amateurs to enlist as telegraphists, Florence offered her trainees. The Naval Director of Signals and Communications recommended to the Naval Board that they be employed at shore establishments and 14 selected applicants took up their duties at the Harman Wireless Station in Canberra. From this beginning, the *Women's Royal Australian Naval Service (WRANS)* was established in 1941. It grew to a peak of 105 officers and 2518 ratings during WWII.

Mrs Mac trained the women to teach the thousands of men who wanted a skill to offer the services. She could also see that if there were women in the services who were competent in communications, it would free the men for other duties. In her valediction published in *Ditty Box*, the ex-WRANS magazine for June 1982, she was reported as being 'eventually responsible for training more than 12,000 servicemen'! American servicemen who were based in Australia were sent to Mrs Mac for refresher courses. Initially skeptical, they were soon won over by her training methods. Continuing after the war, she trained many QANTAS aircrews in Morse code.

Florence McKenzie was awarded an OBE in 1950 and became a SK in 1982.

Silent Keys

Sadly, this month we report the passing of two long-time and hard working ALARA members, Helene Dowd, VK7HD and Maria McLeod, VK5BMT

Abridged obituary for Helene Dowd, VK7HD

Elsewhere in the magazine you will find a full tribute to Helene, VK7HD, by her brother Brian, VK7RR. These are just a few notes on her involvement with ALARA.

Helene VK7HD 'Captains' the 'MV Loyalty' at the Mildura Get-Together 1984.

Helene obtained her Novice Licence as VK7NHD in 1977 and joined ALARA in the same year. She obtained her Full (Advanced) Licence, VK7HD, in 1978.

She was the State Representative for Tasmania from November 1978 - 1985 and May 1989 – 2001. She was ALARA President from August 1983 - 1986.

In August 1982, the Townsville Amateur Radio Club suggested offering a trophy to commemorate the work of Mrs Florence McKenzie, VK2FV. Mrs McKenzie was the first licensed Australian YL amateur operator whose wartime Morse code coaching for servicemen and servicewomen had won wide acclaim. The ALARA Committee thanked the Townsville ARC and indicated that the award could be incorporated in our contest.

On a trip to Queensland in June 1984, Helene, as ALARA President, along with OM Peter, VK7PR, was invited to the Townsville ARC and the Mrs McKenzie Trophy was officially handed over. September 1984 saw the first ALARA National Get-Together at Mildura, organised by Marilyn, VK3DMS; it was at this gathering that the trophy was officially displayed.

In February 1986, listeners to ABC broadcast stations heard a segment of the program *Airwaves* present three ALARA members recorded off the air as they spoke on 40 m. This segment was entitled *Radio for Fun*.

The program began with an interview, and then included Helene in a QSO with Austine, VK3YL and Marilyn, VK3DMS. Austine, the senior partner, having held a license for over 20 years, spoke with considerable emphasis on the early days of home-constructed CW-only equipment, while Helene and Marilyn revealed the later developments in world-wide communication. All three combined to present a clear picture of amateur radio procedure and the varied activities within the hobby to the ABC audience.

In 1986, Helene received a plaque for outstanding service to ALARA. She was also a member of ALARA until 2017. She was sponsored into the British Young Ladies Amateur Radio Association (BYLARA) by Angelika (Angie) Voss, G0CCI.

Maria McLeod VK5BMT.

Our sympathies go to her husband Peter, VK7PR, her brother Brian, VK7RR and other members of Helene's family.

Maria McLeod VK5BMT. 20 May 1944 – 21 April 2021

'Maria VK5BMT whose efficient and careful organisational skills ensured that everything went without a hitch.' This was said of Maria when she organised most of the Dubbo ALARA meet from Adelaide in 1990.

Before that, in September 1987, a second national ALARA gathering, the first to be called 'ALARAMEET' was organised by Meg, VK5AOV (now VK5YG) with Maria, VK5BMT, was held in Adelaide.

Maria was:

- VK5 state representative from 1987 to 1991
- Vice President from 1988 to 1991
- President from May 1991 to 1994
- Sponsorship Secretary from 2001 to 2014.

In August 1986, she was one of a group who ran a portable station at the Marion Civic Library in Adelaide, as part of their centenary celebrations. In October she helped operate a station at the Grand Prix when it was still in Adelaide. Both stations used the Jubilee 150 callsign VI5JSA.

During the Australia Bicentennial year 1988, many ALARA members held special callsigns and ALARA can also be proud of the work done by Maria in acting as QSL manager for the VI88WIA stations throughout Australia. Altogether 3230 contacts were made, and Maria sent our almost 1000 QSL cards all over the World.

Maria attended the International YL 2000 Meet in Hamilton New Zealand, and the Seoul YL International Meet in 2004.

Her husband, Keith, VK5MT, passed away several years ago. They are survived by two daughters, Wendy and Mary, and grandchildren Dale and Juliette to whom we pass on our sympathies.

Vale Helene and Maria.

Calling all DX-ers!

Tina, VK5TMC, our hard-working secretary and editor, recently received the following email:

'Permit us to introduce ourselves: We are Dione, 9H5BZ, and Joe, 9H5JO, two Maltese radio amateur enthusiasts who frequently operate on 14.268 + or – QRM. We are QRV from 0530 UTC onwards, and would like to meet with your members, long-path over Central America. We have already spoken to many Australians over this long path.

Joe, 9H5JO is also QRV on 7.173 MHz + or – QRM from about 0400 hours or earlier until 0530 when he switches over to 20 m (14.268).

We would like to get this email to the attention of your members, please.

Thank you and best 73s de Dione, 9H5BZ and Joe 9H5JO.'

Unfortunately, we have just received news of the passing of another of our much loved, long-time, members, Poppy VK6YF. I will bring you a report of Poppy's wartime and amateur radio activities in the next issue.

DXTalk

Steve Kennedy VK6SJ

Cocos (Keeling) Islands DXpedition, March 2021

I'm a member of the Northern Corridor Radio Group (VK6ANC) which is a very active and vibrant club in Perth, Western Australia. One of our club members, Wayne, VK6EH has been to Cocos-Keeling Islands a number of times to visit friends there. We've often talked about Wayne taking some radio gear out there because a couple of us needed VK9C confirmed. This also led to a bit of a pipe dream about a few of us going there and doing it a bit more seriously, and giving a few more hams ATNO, but talk about it was as far as it went.

Late last year, Zeljko, VK6VY and I had started talking about a DXpedition out to either Cocos or Christmas Island and so we caught up with Wayne so we could quiz him a bit more on the islands and facilities, etc. Wayne got all excited about it and before we knew it, we had 10 candidates and accommodation and a group airfare booking had been made. Zeljko and I decided to continue with our plans for a separate trip later in the year as we had a slightly different approach, but I decided I'd like to do both.

Participants were Steve, VK6SJ, Wayne, VK6EH, Stu, VK6SSB, Gerald, VK6XI, Chris, VK6LOL, Brian, VK6BMA, Tim, VK6EI, Alex, VK6KCC, John, VK6NU and Brian, VK6MIT. With ten of us going, we booked a four- bedroom house called the 'Manager's House' at Cocos Beach Motel. The house was about 50 m from the ocean, had a large lounge room with two office desks and we scrounged up a bunch of extra beds (and one of the team booked his own accommodation). Luckily we are all good friends!

With 10 of us travelling, we got a great deal from Virgin for the airfares (around $800 each return). Splitting the house between us all, had the trip costing just under $1200 each. We added a few hundred each on top of that which paid for car hire and most of our meals. The house also had a bar fridge for the beer, and big chest freezer for all the fish Tim was going to catch!

The team left to right (front row): John, VK6NU, Stu, VK6SSB, Wayne, VK6EH, Gerald, VK6XI, Tim, VK6EI, (back row): Chris, VK6LOL, Steve, VK6SJ, Alex, VK6KCC, Brian, VK6BMA, Brian. VK6MIT.

Our approach from the start was always going to be 'vacation style' DXing. We didn't want to spend four days of the seven putting up HF Uda-Yagis etc. We also wanted to bring everything with us on the plane, and we didn't want the cost or the management of the trip to go through the roof. This meant that Uda-Yagis and the like were all out of the question. In the end, we took an Ultrabeam Vertical (UB-V40), a Cushcraft R7 vertical and a bunch of squid poles to support an end-fed wire antenna cut for 80m.

Most of the team really just wanted to go for a bit of fun and because we are all friends, just to enjoy the company of each other and work a few stations. So this was never going to be something that would make the Cordell guys shake in their shoes and beat them to the next Bouvet Island gig. And no one would hear us with only verticals anyway, right?

Initially we had a fair amount of discussion on whether we were going to do hard-copy QSL cards or not. We didn't want to look like we were out to make a profit on what was essentially a holiday, and we also didn't want to feel obligated to do anything in particular. We also assumed that we wouldn't be able to do electronic confirmations until after six months or so to drive people towards the paper QSL, so we thought, "Let's just do electronic confirmations only". This caused a big ruckus, and three QSL managers emailed us offering their services. We went with David, EB7DX so we are now doing hard-copy direct and bureau cards.

In the week or two leading up to the trip, we had many requests to focus on different bands and modes. We did get asked if we were doing Fox and Hound on FT8 (never heard of it at that time). We had a ham in Portugal who wanted to send some EME 10 GHz gear across, and a lot of requests for 6 m capability. One of our team is into EME but the time frame left would not have been enough to do this. For 6 m, we figured we could use the Ultrabeam.

So, the day arrives and we head out to the airport in Perth.

First question we are asked while in check-in; "Which bag is your priority bag that has to arrive with you, sir?" I had four bags plus the radomes for the Ultrabeam vertical. So I said, "Well, that would be all my bags, Ma'am". It is OK, explains the Check-in lady; the rest should arrive on the Friday flight (three days later). In the end, all our gear arrived with us but we didn't know that until we landed on Cocos.

Tuesday night after stopping at the Cocos club for a few cold ones and dinner, we assembled the Cushcraft vertical and by about 9 pm we were making contacts on 40 m FT8.

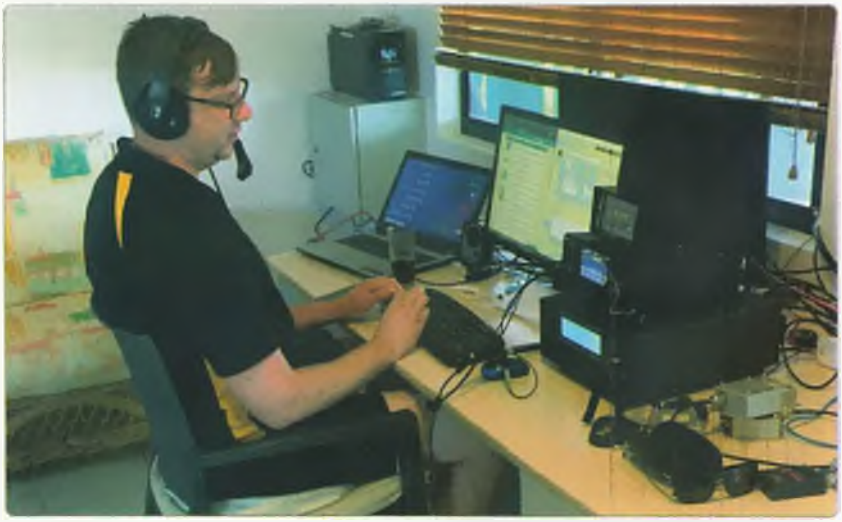
Next morning, we hooked into the rest of the station. We had two IC-7300s running, each with an SPE Solid State Amplifier (throttled down to 400W PEP of course). Each had a PC running, but only one submitting log entries to eQSL, Clublog and QRZ in real time. The other we copied into the FT8 station log manually each day and uploaded to eQSL etc. The Ultrabeam vertical worked well with about seven radials of random length attached. The end-fed was also erected and we were on all bands from 80 to 10 m from two stations. One station was for FT8 and SSB, and the other for CW and SSB. Unfortunately the Ultrabeam didn't tune up on 6 m in the end, and the 80 m end-fed loop wasn't quite good enough for 160 m operation.

So on to FT8 we go and were immediately surprised by the response. Only a few of us use FT8 at home much; so, we had a few teething issues. Leaving the PC to its own devices was slow and frustrating; so, we stopped that pretty quickly (we did leave it on while we had dinner, which I thought was preferable to not operating at all). Then we moved to FT4 to get the run rate up a bit, and to get off the normal FT8 frequencies that I knew we were completely submerging.

On SSB, we were also very surprised by the performance. We had a near 24/7 pile-up to Japan (almost half our contacts were from Japan over the course of the week). I guess being 50 m or so from the ocean on one side and less than a km from the other side, on a flat island makes a big difference. The Japanese pile-ups were reasonably easy to manage. They are very polite and we were quickly working three to four stations a minute. Then we had openings to Europe on 40 m – 12 m. As I've had a reasonable amount of experience in contesting, I have been on the receiving end of the EU zoo before, but this was on a different level again. Everyone just called constantly. Often we would answer a station and the called station would just keep calling. We'd respond to a station but the called station would be drowned out by the pile-up and wouldn't get logged. Our run rate with EU was around one to two minutes per contact. We quickly worked out the reason for split frequency then. It doesn't help us, except that it helps the pile-up here when we answer them. We could have gotten away with simplex for the JA pileups, but not EU. Even with listening 5-10 kHz up, we struggled. I think we needed 5-20 kHz up instead. I did always wonder what the point of working split was and now I know! We did have to use a different strategy for the Zoo. Instead of ignoring the stations that called over the top of everyone, I figured it would be quicker to accept that no-one cares about the station I'm calling and just logs any station I can hear a response from. That improved the run rate a bit but I have to say, it was the least pleasurable part of the operation. EU stations should really have a think about their conduct in a pile-up.

So, after about 3 days of working FT8 in normal mode, we start getting 'a wailing and gnashing of teeth' from the masses, (some constructive, some not so).Problem was, we were so busy working as many stations as we could, we didn't want to put the brakes on to work out what this 'Fox and Hound' thing was. In the end, Grant Willis, VK5GR messaged me and offered to help us get it sorted. He had done a similar thing in Tonga not long before; so, knew what we were going through. We stopped for about 20 minutes and got our heads around it. Had a quick video conference with Grant (thanks mate!) and we were away. Now we were doing between one and five contacts a minute on FT8.

During the first day, we found that we could still only run one station at a time, even with band pass filters between the radios and amplifiers. We increased the spacing between the two vertical



Chris VK6LOL operating the FT-8/SSB station.

antennas by about 30 m, and this gave us just enough isolation to work both stations at once most of the time. Next time we will definitely be putting more effort into better filtering, and earthing.

By day four, we were in the groove and starting to think about how we might maximise coverage into the Americas, which is traditionally a hard thing in VK6. We don't get much into South America from Perth, but we normally have good paths into North America at the start and end of each day. It was similar on Cocos, but our openings into South America were actually much better than North America. Our SSB contacts into North America were pretty weak and didn't happen often. We had good runs early in the morning on 40 m and 30 m FT8 into the USA but that was about our only regular openings. It was great to be able to work all over South America though.

We also got to meet the only resident ham on the Islands, Abedin, VK9FCAN. He had problems with an old TS-430 so we managed to get an FT-77 donated which we brought up to him, and I am in the process of assembling a small Uda-Yagi and all the accessories for the FT-77 I was also given for him, but didn't have the room to bring along.

So, in the end, we made 10,295 contacts from the evening of the 16th of March to just after 1300 local time on the 23rd March.

Some statistics that may interest you include;

- 4862 contacts with Japan
- 669 contacts with the USA
- 442 contacts with Australia
- 2956 contacts on SSB
- 451 contacts on CW
- 6900 contacts on digital modes (FT8 and FT4)
- worked 113 countries
- caught two sharks
- drank a lot of beer and various whiskies.

What would we do better next time around (which I suspect there will be)?

- Better preparation of equipment prior to mobilisation
- Ship gear in earlier rather than relying on excess baggage; that was a serious risk to the operation which luckily didn't happen
- More planning of propagation paths for various regions; maybe plan it out a bit like the CQWW so that our audience had a better idea on when we would be on various bands
- Split 5-20 kHz for SSB pile-ups (is that allowed or done?)
- I suspect a better receiver would be good for that as well as we had a lot of trouble separating stations spread across just 5 kHz (or maybe we need to learn to drive the radios better)
- Verticals were good – particularly for the low bands, but I think a Uda-Yagi for 20-10 m is something I'd seriously consider next time
- Better filtering solutions between the two stations
- A common earth point for all gear may have assisted in isolation of the two stations
- Better fishing gear needed.

Overall; we had a ball – which was aim #1. We learnt lots of things about running an operation like this, had fun on the radios. So, we consider this operation a complete success (despite being called 'Dumb-asses' etc (luckily, we have broad shoulders :)). We need to get better at fishing. We had to buy dinner too many times!

The operational analysis

	All Bands	10 m	12 m	15 m	17 m	20 m	30 m	40 m	80 m
Japan	4862	322	546	1287	657	1274	95	560	121
USA	669	1	1	8	8	149	60	435	7
Australia	442	0	30	94	47	139	19	97	16
DXCC worked	*111	13	50	73	44	89	58	76	42
DXCC SSB	*82	12	13	32	33	66	0	41	1
DXCC CW	*34	1	1	7	2	32	4	10	4
DXCC Digital	*102	7	47	70	24	75	57	70	41
SSB	2956	73	209	579	415	1205	0	470	5
CW	451	1	7	98	5	284	23	20	13
FT8	6140	160	578	1335	532	1607	275	1333	320
FT4	760	137	20	273	0	134	145	51	0
North America	732	1	1	10	8	156	65	483	8
Oceania	813	17	44	171	61	208	27	252	33
South America	145	0	0	6	3	9	9	116	2
Asia	5658	350	609	1545	737	1479	128	674	136
Europe	2897	2	152	540	142	1360	211	337	153
Africa	50	1	7	11	1	12	3	11	4
	10295	371	813	2283	952	3224	443	1873	336

*Note: * These figures denote the number of DXCC entities worked and not total contacts.*

Australia is quintuple winner of Commonmonwealth Contest

Steve Ireland, VK6VZ

Great news – Australia has taken out the Radio Society of Great Britain's Commonwealth Contest team competition for the fifth time in a row.

Our Team 1 came first with 38,114 points, while Team 2 finished third with 24,996 points. Only the Canadian #1 team finishing second with 36,270 points prevented our taking out the top two places!

The CW-only Commonwealth Contest 2021 ran from 10:00 UTC on 13 March until 10:00 UTC on 14 March. The contest is one of the oldest in existence, having been first run back in 1931 when it was known as British Empire Radio Week and lasted for six days!

With virtually no solar activity, the conditions on the 15 m and 10 m bands were very poor, 20 m was below average while 40 m provided most of the activity – see Graph 1 from Bob G3PJT. As this graph shows, 80 m proved to be useful, for both Australian and New Zealand contacts, and DX as far away as the United Kingdom, the Caribbean and eastern Canada.

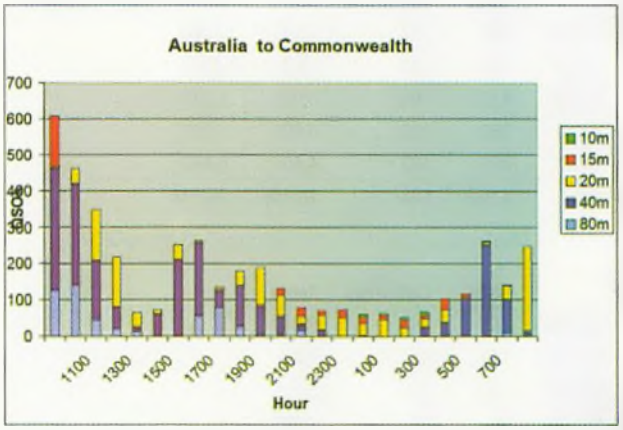
To make matters sweeter for Australia this year, Brian, VK3MI, captain of Australia Team 2, took out the Commonwealth Contest's Junior Rose Bowl for winning the Restricted Unassisted section of the contest. In 2020, Brian came second in this category, which was a great achievement in itself.

Other highlights included our highest points scorer Kevin, VK6LW, finishing fifth in the Open Unassisted category and Barry, VK2BJ, our second highest points scorer, finishing second in the Open Assisted category.

To put Kevin's and Barry's results into context, if the latitude factor that applied in the team contest had been applied to their scores, they would have finished respectively first and third overall in the Commonwealth Contest 2021.

These amazing results could not have been achieved without the support of our WIA State Headquarters stations:

- VK1WIA (operated by Andrew, VK1DA who travelled to a site near Canberra to operate in the contest)
- VK2WIA (operated by Tommy, VK2IR and David, VK2WQ)
- VK3WIA (operated by Lee, VK3GK, Chris, VK3FY and Bo Li, BD6QD)
- VK4WIA (operated by Keith, VK4TT)
- VK5WIA (operated by Grant, VK5GR)
- VK6WIA (operated by Peter, VK6RZ)
- VK7WIA (operated by Martin, VK7GN).



Graph 1: Contacts (UTC time) by Australian stations over the duration of the 2021Commonwealth Contest. Compiled by Bob, G3PJT.

A huge thanks to all the HQ operators and to Allan, VK2GR, who coordinated and led the HQ stations, as well as leading our overall effort. Allan also compiled the results tables.

The only state / territory that missed out on having a WIA HQ station was the Northern Territory; it would be great to rectify this for 2022. If there is a keen VK8 CW operator who would like to take on this role next year, please email Allan at: *allan.vk2gr@gmail.com*.

For those who are feeling adventurous, in a post-COVID-19 world, operating from one of the VK9 territories in the contest as an HQ station would be amazing!

Andrew VK1DA operating as VK1WIA. Photo: VK1DA.

Being an HQ station is a lot of fun and a good opportunity to increase your country count, as stations from all over the Commonwealth will be seeking a QSO with you because you are worth bonus points! Stations regularly active include ones from 6Y5 (Jamaica), 9J2 (Zambia), V5 (Namibia), 5Z4 (Kenya) and ZF2 (Cayman Islands).

All the teams and HQ stations hope to see you in Commonwealth Contest 2022. Hopefully there will be better solar activity, so 15 m and 10 m can open up and provide greater opportunities for working the DX.

Results

	QSOs	Call Areas	Score	Latitude Adjusted Score
VK6LW	482	129	5,945	8,680
VK2BJ	413	124	5,636	8,227
VK2GR	417	105	5,025	7,337
VK6VZ	359	122	5,005	7,307
VK4CT	292	103	4,495	6,563
Total	**1,963**	**583**	**26,106**	**38,114**

Table 1: Team Australia 1 Scores (compiled by VK2GR)

	QSOs	Call Areas	Score	Latitude Adjusted Score
VK3MI	329	116	5,085	7,424
VK4SN	186	88	3,580	5,227
VK7BO	181	86	3,465	5,059
VK2PN	215	77	3,230	4,716
VK6HG	77	54	1,760	2,570
Total	**988**	**421**	**17,120**	**24,996**

Table 2: Team Australia 2 Scores (compiled by VK2GR)

	QSOs	Call Areas	Score
VK7WIA	155	69	2,910
VK5WIA	135	57	2,275
VK6WIA	105	55	2,115
VK4WIA	86	56	1,965
VK3WIA	118	41	1,885
VK2WIA	83	49	1,845
VK1WIA	53	27	1,045
Total	**871**	**311**	**14,585**

Table 3: Australian HQ Stations (compiled by VK2GR)

	QSOs	BCA	Score
VK2IG	105	37	1,620
VK4XY	72	40	1,545
VK6IT	79	42	1,450
VK2AYD	44	31	1,020
VK5GG	30	18	700
VK6DW	24	21	585
VK2IO	18	13	435
VK7GH	13	11	310
VK6WX	10	7	205

Table 4: Other Australian Stations (compiled by VK2GR)

The VK1WIA multi-band inverted-vee dipole antenna. Photo: VK1DA.

WIA Contest Website

To keep up to date with all of the major Australian contests, including rules and results, check WIA Contest Website at:

www.wia.org.au/members/contests/about

VK6news Peel Amateur Radio Group

Geoff Hart-Davies, VK6GHD and Mark Bosma, VK6QI / VK2KI

As reported in *AR Magazine*, Vol 89, Issue 3, the Amateur Community lost one of its longest-term and most well respected members - Lance Rock, VK6LR, who became a silent key on February 27th. Lance was Founding President of the Peel Amateur Radio Group and was a very active member of its community. Our thoughts and wishes go to Hazel and Lance's family.

Since PARG last made it to *AR Magazine*, PARG has held two Slow CW Contests, several VKFF / SOTA Field Days, numerous monthly TechTalk nights and ourbiggest event, the PARG Mandurah Swap Meet.

PARG Swap Meet

Following a full year without any swap meets or hamfests anywhere in Australia, the PARG committee decided to host its annual Swap Meet on Saturday March 6th. We tried a larger venue this year - the huge hall of the Mandurah Bowling Club. In the end, there were over 30 tables and well over 100 visitors coming from far and wide to spend their COVID-19 pocket money and sweep-up the bargains.

Congratulations to the door-prize winners:

- The full uBITX QRP HF Transceiver Kit went to Richard, VK6FBOS
- A $100 voucher, generously donated by TET-Emtron, went to Kevin, VK6AB
- The latest Baofeng waterproof handheld VHF/UHF radio went to Gavin, VK6GMP
- 9 m Squid pole went to Keith, VK6KB.

Many thanks also to Keith, VK6QA for his generous donation of a shed-load of bits and pieces for sale by PARG.

TechTalks

The Group has been entertained by many TechTalks on the third Tuesday of the month:

Paul VK6LL, Martin VK6MJ, Bruce VK6CX, Terry VK6TTF, Maurice VK6HLY, David VK6FAAZ and Tony VK6DQ comparing purchases after the PARG Swap Meet.

- Maurice, VK6HLY, Tony, VK6DQ, Chris, VK6XH, Terry, VK6TTF, Geoff, VK6GHD and Mark, VK2KI / VK6QI all contributed to a workshop on the MFJ-1026 and VK5TM HF phasing noise cancellers
- Miguel, VK3CPU shared his deep knowledge on Magnetic Loop antenna design with a talk about his design software
- Paul, VK5PAS gave a comprehensive presentation on the VKFF Parks activities
- Sue, VK5AYL demonstrated the iParksnpeaks iPhone App that she developed
- Tony, VK6DQ gave a talk on CW (which must have worked with a large proportion of the Group now learning or re-learning the art of the Code)
- Martin, VK6MJ gave a talk about amateur radio on the International Space Station (Martin provides one of the Telebridge ground stations for schools around the world to chat to ISS astronauts)
- Geoff, VK6GHD and Mark, VK2KI / VK6QI kicked off a discussion on stealth antennas for urban homes
- Baz, VK6MU fascinated the audience with a presentation on restoration of antique radios
- Peter, VK3ZPF stepped members through installing and setting-up his VK-Port-a-Log App on their phones for both Parks and Peaks and for general Log-keeping.

Ahead

Coming up, PARG will be:

- holding its annual all-band Birthday Bash on August 7th
- heading to both Guilderton and the North Mole lighthouses for the International Lighthouses and Lightships Weekend on August 21st and 22nd (GMT)
- holding another Parks / SOTA Field Day in September.

We'll email advice to other WA Groups and NewsWest closer to the dates, or keep an eye on *www.parg.org.au/whats-new* for details. PARG meetings and gatherings are held at 1900 hours WA time on Tuesdays – see www.parg.org.au for details, or for more information, email *parg.secretary@gmail.com.*

Meteor Scatter Report

Dr Kevin Johnston VK4UH

This Month: On-line Meteor Scatter (MS) video presentation, new digital interface option, Current software options, hearing meteors perhaps, forthcoming events and showers, Meteor Scatter activity schedules.

It is always worthwhile trying something new. A recent approach to the author from the Amateur Radio Experimenters Group, based in Adelaide, led to a ZOOM-based introductory presentation on VHF Meteor Scatter for members of that group, from my station here in Brisbane. This was actually the first time that I had ever given a PowerPoint presentation remotely via video link to recipients whom I was not actually standing in front of. This was an interesting experience in itself. I discovered on the night that the presentation was also to be streamed live for other viewers in several other states and indeed other countries.

VK4UH at operating table.

The presentation was specifically aimed at amateurs with minimal or no previous experience of this mode of propagation. The basic physics, geometry and astronomy of meteor scatter were covered. The paths and distances that can and cannot be achieved, requirements for an effective MS station, operating protocols and activity sessions were described, the effects of operating frequency band were covered as were the amazing possibilities during meteor showers.

This made for a very successful group Webinar, with a lively and productive period of Questions and Answers at the end of the presentation.

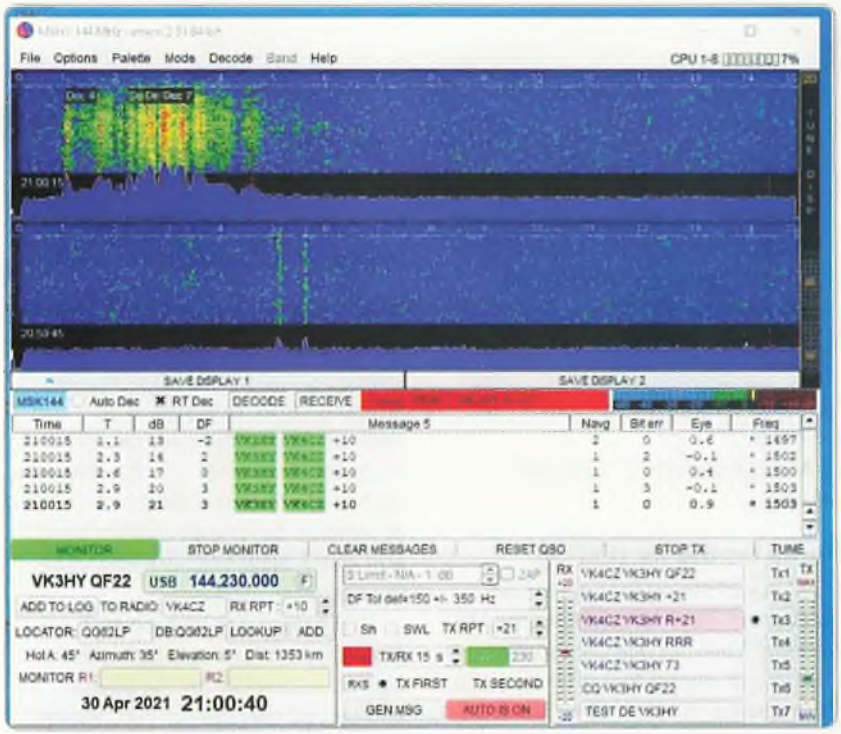
The entire event was then made available as a YouTube video via the HRDX website. The YouTube video can still be viewed direct from YouTube or from the HRDX website from the archive of presentations maintained by Hayden, VK7HH covering a very wide range of current topics in the hobby.

A large number of very interesting questions was posed by viewers participating in the event and subsequently. Many gratifying comments and positive feedback were also received, complimenting the introductory talk on Meteor Scatter propagation, which the presenter was grateful to receive. Some of the questions asked will be addressed in forthcoming columns.

Meteor showers

There have been two significant major meteor showers since the last column. The first was the Lyrids shower that peaked around the 22nd April 2021. This shower occurs as the orbit of the earth around the Sun takes it through the track of debris remaining from the passage of Comet Thatcher across our solar system. Although the Lyrids shower only had a very modest predicted Zenith Hourly Rate (ZHR) of 18 meteors/hour, this shower often has a very wide window of enhancement extending for several days either side of the peak. This was indeed the case this year. The peak of the shower actually occurred during the working week this year when there are usually no formal, organised activity sessions. Enhancement of MS propagation, however, occurred for several days on either side of the optimum date and extended across the normal weekend Sat-Sun morning activity sessions this year. Many stations from VK4 down to the Southern call-areas reported frequent and sustained meteor reflections evident on both 2m and 6m.

The second recent shower was the Eta Aquarids, a major shower that peaked around the 6th May. This shower results from the aftermath of passage of Halley's Comet across the solar system. This shower was predicted to have a ZHR of 70 meteors/hour; this has resulted in spectacular activity in previous years. However, this year the level of enhancement of MS propagation was disappointing. Many experienced operators have described a significant decline in enhancement from the Eta Aquarids over the last few years in VK. Perhaps this could be because of dispersion of the Halley Tract or more likely the Earth's orbit is now through less dense areas of the tract compared with previous years. Perhaps



Example of 2m burn from VK3HY to VK4CZ, extending for over 5 seconds, several days after the peak of the Lyrids Meteor Shower in April 2021.

next year the situation may revert; there is no way of predicting this with any accuracy.

New digital hardware option

In the last few months, a new digital interface has become available. Marketed under the Digirig label, this remarkable little interface, designed by K0TX, can provide full digital audio (Rx and Tx) management and full CAT transceiver control for such rigs as the Yaesu FT-857 FT-100, FT-817, FT-857, FT-897, Baofeng and Xiegu G90 models. These radios already provide for a wide range of digital modes across many amateur bands, not just those used for VHF Meteor Scatter. The device is marketed from the USA with a landed price tag 'well south' of AU$100.

New software versions

New versions of both of the commonly used software platforms have recently been announced. The latest General Release of WSJT-x is version 2.4.0. The latest release of MSHV is version 2.56. Both of these recent upgrades have fully implemented the new Q-56 digital mode. The new Q-65 mode itself may not be of immediate interest for meteor scatter. Preliminary testing here however, indicates that MSK144 mode, which is of MS interest, is fully functional after the rewrite.

As always, it is strongly recommended that users read through the Release Notes before employing the new software on-air.

Forthcoming meteor showers

The next few showers of interest will be the Delta Aquarids peaking around 30 July (predicted ZHR 16/ meteors/hour). The parent body for this shower is unclear and this shower is unlikely to be a major event even here in the southern hemisphere.

This will be followed by the Perseids shower, peaking around 13th August. This is a major shower with a predicated ZHR of 100 meteors/hour and is a result of the passage of comet 109/P Swift-Tuttle across the solar system. In the northern hemisphere, the Perseids shower is the major event of the year for meteor Scatter operators. Here in VK-ZL however, the constellation itself and the zenith of the shower are far in the northern sky; MS enhancement is very limited even for stations in VK4. Stations in southern call areas often report little or no enhancement at all on the usual north-south paths.

Weekend activity sessions

The weekend MS activity sessions run on Saturday and Sunday mornings from before dawn (around 20:00 UTC or earlier) until propagation fails.

Focus frequencies: 2m - 144.230 MHz, 6m - 50.230 MHz

Current Preferred Mode: MSK144 Version 2.0 running 15 second periods.

In VK we have a well-established protocol for which call areas use which transmission period during these weekend activity periods:

- Southerly stations (VK1,3,5,7) ALWAYS run 1st period beaming north
- Northerly stations (VK4) ALWAYS run 2nd period beaming south
- Stations in the middle call areas (VK2 and VK1) change period depending on the day, that is, Saturdays run 2nd period beaming south, Sundays run 1st period beaming north.

Register with VK-ZL Meteor Scatter Facebook Page (Closed group of AR operators) for up-to-the-minute advice and information.

Contributions for this column are always welcome. Please email to *vk4uh@wia.org.au*

References

- *Bouncing signals off rocks in space? What is Meteor Scatter by Kevin VK4UH - YouTube: https://www.youtube.com/watch?v=1s9YRfrGY9o*
- Digirig interface: *https://digirig.net*
- *WSJT-x updates and software: https://physics.princeton.edu/pulsar/k1jt/wsjtx.html*
- MSHV updates and software: *http://Lz2hv.org/mshv*

SOTA and Parks

Allen Harvie VK3ARH
e *vk3arh@wia.org.au*

Programs aplenty

Recent months have seen new programs for portable operation commence in VK and ZL. These new programs supplement the existing awards—SOTA, WWFF, IOTA, Shires—bringing more opportunities to the table for activators and chasers alike. Offering different programs encourages diversity as not everyone can or wants to climb to the top of a summit and send CW in the rain or can travel to a remote site; however, a day trip onto regional areas (via the local bakery of course) for a silo or off to the local beach will be of interest.

Before you go off cutting dipoles and charging the batteries, check the offerings to find a program that works for you with sites of interest. The programs have common criteria for a valid qualification:

- Sites: Each award has sites from which the activation is conducted. These sites are defined typically with Lat/Lon. Each site will have an activation zone within which all equipment must be contained. This is normally within 25 m of the peak (SOTA, HEMA) or within the perimeters of the park, hut or beach (WWFF, POTA, ZLOTA or BOTA) or up to 1 km (SiOTA).
- Operating within the conditions of your licence (bands, power)
- Valid contacts: To be valid a contact between a chaser and activator typically involves the exchange of callsigns, signal reports and site ID. Contacts via any 'relay' including satellites, repeaters, the internet, Echolink, etc, are typically not allowed. FT8 is also an option here. Check your setup to ensure you are declaring the site correctly.
- Minimum contacts: This ranges from 1 to 44. Some awards allow multiple visits to the site across unique days. If you don't get enough the first time, come back and have another go.

There are differences and you need to review the rules to ensure a valid activation.

A quick summary of the new offerings:

Parks on the air (POTA)

POTA as an award that grew from an event in 2016 to celebrate the US National Park Service centennial. It is now an award that attracts international chasers. Most VK and ZL parks qualify for POTA. There is a lot of interest from US for VK and ZL sites so pick your frequencies and spot accordingly. Visit: *https://parksontheair.com/*

PnP Status: *https://parksnpeaks.org/showAward.php?award=POTA*

HuMPs excluding Marilyns (HEMA)

HEMA is a program for activation of Marilyns - summits with a prominence of at least 100 m, but less than 150 m. This fills a niche left by SOTA. The general rules are the same: activations must take place within the activation zone and be a portable operation, the equipment and operator arrive at the activation zone by traditional means (walking, cycling, etc) and powered by a portable energy source (battery, solar panel etc). Both the activator and hunter submit logs to the HEMA database.

The summit is considered to have been 'activated' with four successful QSOs where the QSOs are with different stations and operators. The use of multiple callsigns from the same operator is not supported. See: *http://hema.org.uk/awardsWebsite.jsp*

PnP Status: *https://parksnpeaks.org/showAward.php?award=HEMA*

Beaches on the air (BOTA)

BOTA is an award scheme for radio amateurs that promotes portable operation from beaches. It is different from other awards as it does not have a set site list. You can participate from any beach, coastal or regional as long as there is sand and water. New sites are added as they get activated.

BOTA does not impose any restriction on how you get to the activation point or on the power source you can use for your station. This program is a great excuse to get out and operate from a beach, be it near the sea or inland by a river. Don't forget to take shade. Visit: *https://www.beachesontheair.com/*

PnP Status: *https://parksnpeaks.org/showAward.php?award=BOTA*

Silos on the air (SiOTA)

SiOTA is a program promoting the activation of iconic Australian infrastructure: Silos. Over 700 sites have been identified across Australia. To qualify a silo you need three contacts, at least one of which must be on HF. You can operate portable or mobile. You must also be within 1 km of the silo and not encroach on private land without permission. There are no awards, but a list of top activators and chasers will be shown. Like the parks program, only activators need to submit a log.

- Three valid contacts with one on HF
- The activation zone is within 1 km of the silo.

https://www.silosontheair.com/

PnP Status: *https://parksnpeaks.org/showAward.php?award=SiOTA*

New Zealand on the Air (ZLOTA)

Matt ZL4NVW has brought together over 7,350 sites across ZL to form ZLOTA

There are several different classes of sites across ZL:

- Lakes: there are over 1,154 lakes covered by the NZART Lakeside Award
- Huts: New Zealand has over 950 public backcountry huts
- Parks: there are 3,849 sites with the majority of these also qualifying for ZLFF and POTA
- Islands: the lakes and inshore waters of NZ host 1,511 named islands.

The rules are simple with an emphasis on promoting and activating remote locations with portable, low-power equipment:

- single contact from a Park, Island or Hut is all that is required to 'bag' one
- two contacts within 500 m of a lake to 'bag' the Lake
- repeater operation permitted.

https://ontheair.nz/

PnP Status: *https://parksnpeaks.org/showAward.php?award=ZLOTA*

Simultaneous activations of multiple references

Whilst there will be no overlap between SOTA and BOTA, you could be on a SOTA or HEMA summit, within a WWFF, POTA or ZLOTA park enclosed by a shire. Well, what can I say? Well done and keep your logs straight.

You can operate from a park, near a silo, on a beach or from a summit. It does not matter if you are mobile (/m) or can deploy a portable (/p) station, there is a program for you so get out of the house and start operating. Remember when you're out there, take photos, operate within the spirit of the award and keep in mind that you're an ambassador for ham radio.

VK3CAT and VK3ARH activating VK3/VE024 a SOTA site within Alpine Shire Council.

Parks and SOTA in the Grampians

National Park on the weekend of 2nd and 3rd October

Plans are afoot for a SOTA and Park event based around the Grampians National Park (Gariwerd) on the weekend of 2nd and 3rd October. This will be an event for SOTA and Park activator alike with 60 summits and 20 odd parks within 60 km. More details as plans are verified; so, stay tuned.

Silos on the air (SiOTA)

Marc Hillman, VK3OHM and Megan Woods, VK3TIN

Don't enjoy hiking to the top of a cold and wind-swept summit? Don't enjoy hacking your way through the undergrowth to get to a remote park? Then we have a new program for you – Silos on the air (SiOTA).

The idea of Megan Woods, (VK3TIN), this new program offers excellent opportunities for an interesting day trip, taking in some relics of Australia's agricultural heritage. Easy travel by road is involved, and most silos have a nearby café.

Silos have a prominent place in the agricultural development of Australia. Situated throughout the wheatbelt stretching from Qld, NSW, Vic, SA and to WA, they remind us of an age when the only way to get grain to market was to deliver to the local silo in town and have it transported to port.

This grain collection network still exists, but often grain is stored in bags or trenches and gets transported by road. The rail map shows the distribution of silos throughout the wheatbelt.

We have focussed on the traditional cylindrical cement (tower) silo as these are probably worth a visit and a photo. Modern bulkhead, bag and trench silos are not included as they lack any visual interest. Many of the tower silos are still in use, and in city areas, many have been converted into hotels or apartments.

As you are no doubt aware, 44 silos, at last count, have had giant murals painted on them. There is a map at the SiOTA site identifying all qualifying silos, and those with murals are indicated by a different coloured pin.

Many of the silos are worthy of a visit in their own right, but the town they are in often has other attractions on offer. Murtoa, Vic is home to the famous stick shed. This is not a silo, but a 'temporary' structure built in 1941 for grain storage. It is an amazing cathedral of timber poles and is open 10 am to 2 pm each day. Each town has similar interesting features other than its silo.

To qualify a silo, you need three contacts, at least one of which must be on HF. You must also be within 1 km of the silo and not go on private land without permission. There are no awards, but a list of top activators and chasers will be shown. Like the parks program, only activators need to submit a log.

Kimba silo art. Photo: Marc Hillman.

How did we find the silos?

We have currently identified 739 silos in Australia. It was not easy. I think we have most of them, but we may have missed a few.

Firstly, Megan constructed a silo editor, and this made the task of adding a silo to the

database easy. All you had to do was click on the silo location, and it automatically recorded the coordinates, locality and state, and also auto-generated the silo code.

The **first** insight to finding them was recognising that they were all serviced by a railway. Marc downloaded spatial data from data.gov.au and constructed a KML overlay. This all displayed in Google Maps, and it was a 'simple' task of following all the railways and spotting the silos.

We immediately ran into two problems:

- there are an awful lot of railways
- the railway data were incomplete.

The railway data contained operational and abandoned railways but missed many dismantled ones; so, a more sophisticated technique was required.

The **second** insight was that there is a fantastic resource called OpenStreetMap. This is a user-contributed map and has a fantastic level of detail. It was possible to query it and request details of all entities marked as 'silo'. Unfortunately, often each individual silo tower in a combined structure was marked as a silo, and in the Barossa there were 'silo farms' containing 250+ 'silos' at a single site.

These were the bulk storage for a winery. These multi-silos were consolidated into a single silo before analysis. There were also numerous water tanks classed as silos. There was no option but to work through the list and, using the Google Maps satellite view, rule them in or out.

Third, there are several collections of silo photos, particularly covering NSW and Vic. These were incomplete, but nevertheless identified a few we had missed. Finally, we looked for gaps in the strings of silos. There should be one about every 60 km. Looking for gaps identified a few more.

No doubt we have missed a few. If so, please contact us with the details.

Megan has developed the www.silosontheair.com website. The silo program is designed to encourage leisurely road trips passing through many beautiful areas of the wheatbelt.

Visit: *www.silosontheair.com* for full program details.

Silent Key

William 'Bill' Jones VK3DQS

On 23rd of April 2021 William 'Bill' Jones (Ex-VK3NQS and VK3DQS) sadly tapped the morse key for the last time and became a Silent Key.

Bill was a well-known operator in Melbourne, living in the Dandenong area from the 1980s thru to the Early 2000s

Bill got hooked on radio when his son Colin (formerly VK3NQS and now VK3DQS) bought him a CB radio in the 1970's.

In 1977 Bill, along with other future amateurs, decided to take the plunge and go for his Novice Licence which he passed and received the callsign, VK3NQS. During that time at his Dandenong home, he set up a Nally Tower with a Yagi and with that was able to spend time chatting to people around the world. During this time he slowly started to go blind, so then became a White Cane operator.

During the late 1970s and early 1980s, Bill was a member of the Gippsland Gate Radio and Electronics Club and remained a member up until his worsening ill health forced him to put the microphone down.

In the late 1980s Bill passed his full call exam and was given VK3DQS, or as Bill had said, his call was VK3's Dandenong's Quality Station.

In 1990 Bill's son Colin attained his novice licence and got Bill's old call sign VK3NQS. Bill was proud to have his son gain his licence.

With Bill being from the UK he was well known in Europe, talking to stations on 20 m, especially people from the UK. I have been told this personally by some amateurs in England. They knew VK was coming in on the 20 m band when they could hear VK3DQS on the air. Being a White Cane operator, he was prolific on CW here as well.

Sadly in 2000 his wife Maureen passed away and being blind, Bill had to move from his Dandenong Location to live with his son and daughter-in-law in Pakenham. This move was temporary as he moved into a retirement village which meant he could no longer have HF facilities where he lived. However he was active on 2 m and 70 cm where he enjoyed chatting to the friends he made through WICEN. He helped out at many WICEN events over the years in amateur radio.

In 2006, Bill received a surprise call on the radio from new Foundation licensee VK3FNQS, in which he did not know that this was his grandson Jason who had passed his foundation Licence! This turned into a three-way conversation with Colin joining in as well. Bill was really delighted that three generations were into amateur radio, which I believe was the first time three generations were licenced on amateur radio bands in Australia.

Sadly over time Bill's Memory was not functioning so well and he was diagnosed with Dementia. The eventual decision was made to pack up his equipment and move Bill into a nursing home in Pakenham. He remained there for eight years before his passing this year.

Before Bill's passing, Colin and his son Jason decided to take over Bill's callsigns of VK3DQS and VK3NQS. Bill was very happy to hear that his callsigns are still being used in the family.

Bill's family would like to thank the amateurs who have contacted the family to share their condolences with them.

73 Bill, Dad and Pappa. Keep pressing that microphone button in Heaven.

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Foundation Manual

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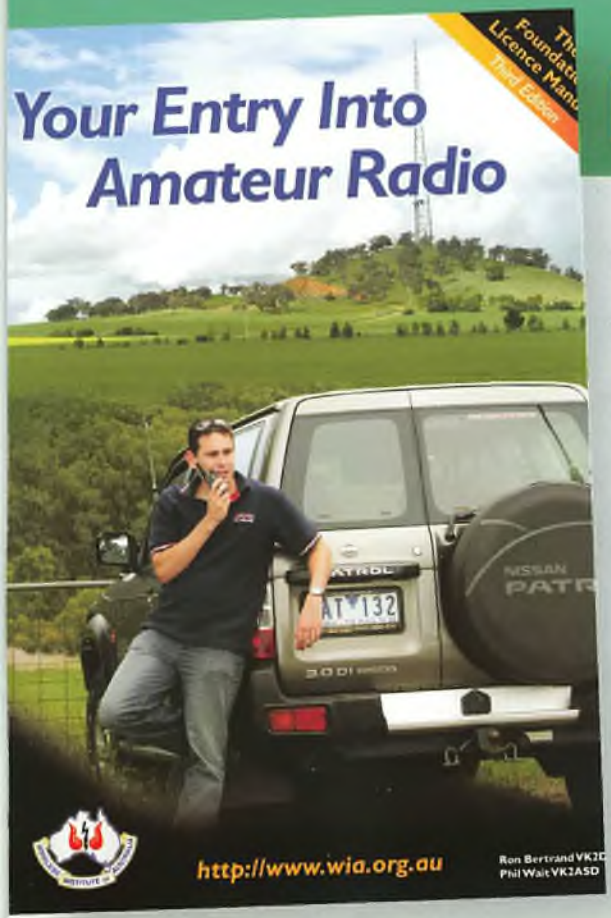

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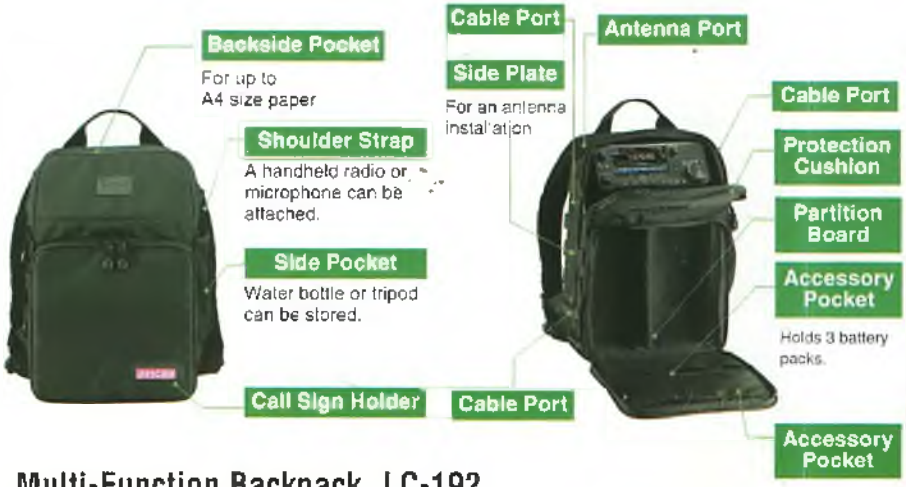

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