Amateur Radio

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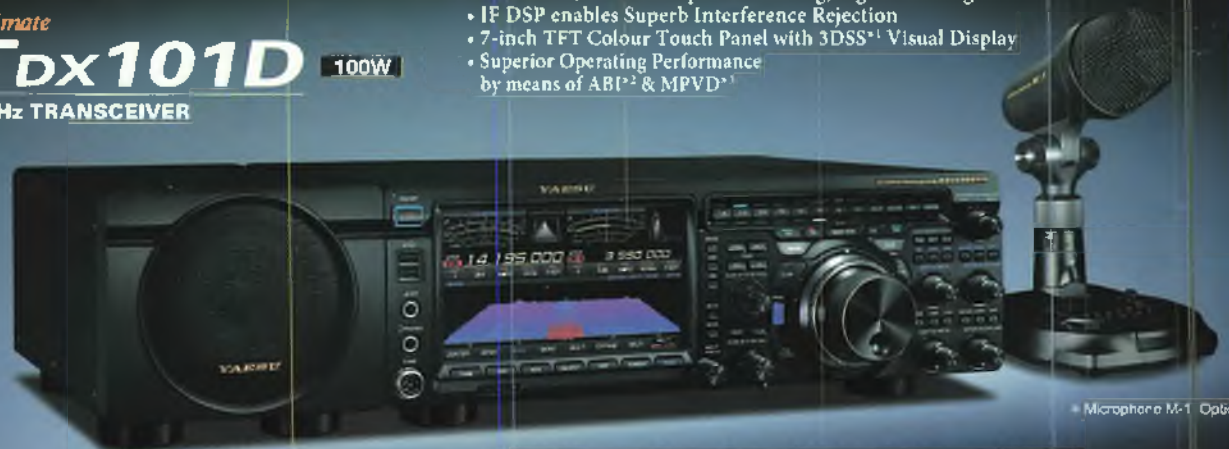

* Microphone M-1: Optiona

* Photo shows the FTDX101MP

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Columns

Technical

This month's cover:
Dog handler Cpl Brodie McIntyre and working dog Kesha providing security to a C-17 Globemaster at RAAF Base Darwin (Photo by AF2021; permission granted by ADF)

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 the Editor.

Back Issues
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Photostat copies
If back issues are unavailable, photocopies of articles are available to members at $2.50 each (plus an additional $2 for each additional issue in which the article appears).

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

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Editorial

Brian Clarke VK2GCE

Strategically, the WIA has at least two masters: its members and pressures from its environment.

From time to time, the WIA carries out surveys to determine what members want. But what members want varies over time – they gain knowledge, skills and abilities that permit them to upgrade and motivate them to seek more sophisticated products and services. Unfortunately, what members want changes, and because the WIA is so scared of Privacy legislation, it does not ask survey respondents to identify themselves. So, we cannot actually tell what changes in demand for products and services there are – all we can do is look at the snap-shots taken at irregular times and guess. The bear of Privacy legislation is not that ferocious if all we ask for is what can easily be observed in the public arena.

What is demanded by environmental pressure, (eg, ACMA, IARU, what is happening in other jurisdictions) we have become more aware of through the recent ACMA Options proposal, reports from our own IARU delegation, and news of other jurisdictions' radio amateur societies and their governments, eg, ARRL, NZART, SARL. There is another side: the WIA is one of the now two bodies asserting representation to the ACMA. And at law, any representation the WIA makes to the ACMA is that of just one client – like you or me. Hopefully, you, as clients, have submitted your votes for the Options. But this alleged consultation process has a fair way to go. There should be more consultation before enactment of laws and regulations.

Who does the WIA represent? In this issue, you will find Marc, VK3OHM's analysis of numbers of Australian radio amateur licence holders. Have a look at the Total / Total column of Table 4 and Figure 1. In these you will see some interesting data:

Foundation licence holder numbers have been rising monotonically from 935 (in 2006) to 2690 (in 2020) at the rate of about 44 per annum, ie, about one new licensee per week.

Standard licence holder numbers rose monotonically from 1856 (in 2005) to 2088 (in 2011) at about 16 per annum and then between 2011 and 2020, wobbled about, varying at a rate of about one licensee per week up and down.

Advanced licence holder numbers have decreased monotonically from 11,461 (in 2005) to 8,909 (in 2020) at about 170 per annum. That is, a loss of about 1.7% per annum.

The average annual death rate in Australia is about 2.5% of the population. So, Australian radio amateur licence holders are doing better than the rest of the population.

Now look at the numbers of WIA members in Table 1:

Table 1. WIA membership over the last four years

Category	2018-04-26	2019-04-14	2020-04-14	2021-04-14
Concessional	895	808	713	673
Family	69	61	52	57
Full	2749	2526	2308	2287
Life	26	24	24	22
Non-AR	79	69	61	54
Overseas	232	20	17	17
Student	29	26	23	24
Total	3870	3534	3198	3134
% of all licencees	28	25	23	23
WIA loss rate, %		9	10	2

Membership = Sum of [newcomers + stable membership – leavers - obit].

Continued on page 4

Board comment

Greg Kelly VK2GPK

Hello, this is Greg, WIA President,

ACMA Five Year Spectrum Outlook 2021 (FYSO): There has been a flurry of activity within the WIA in recent months providing responses to a number of Australian Communications and Media Authority (ACMA) consultation requests and ongoing processes. Last issue (AR Issue 2 -2021) I noted the WIA's response in regard to ACMA consultation on licensing options where the ACMA's preferred option (Option C) is to transition radio amateurs to a "Class Licence" instead of the current apparatus licence. In April, a WIA technical working group led by the WIA Spectrum Committee submitted to the ACMA our input to the ACMA Five Year Spectrum Outlook (FYSO). The FYSO is a 5 year rolling spectrum plan and a 12 month work program that both guides work effort in the ACMA and it informs the radiocommunications sector of the strategic directions and future focus areas of the ACMA. The FYSO is updated annually and our submission provides input to that process in respect of issues that impact on the Amateur Service, as stakeholders in this process.

For the Amateur Service, two key items on ACMA's current FYSO agenda are of special interest to the Amateur Service, specifically the continuing work on the non-assigned Amateur Service licensing review regarding licence classes and also, planned for 2022, is a review of arrangements for Amateur Service that may facilitate operating at increased transmit power levels over 400 Watts.

The WIA has also drawn attention to a number of other key issues for the amateur service both now and in the mid-term, such as AOCP syllabus evolution, the efficacy of the current retrograde examination process and the elaboration of the amateur satellite service application process given that the WIA represents the IARU in Australia for satellite spectrum allocations. These are just a few of the key issues covered in the submission - please refer to the article by the WIA Spectrum Committee in this issue of AR for more detail or read the entire submission PDF on the WIA website.

Zero tolerance for harassment and abuse: A few days ago, an issue was raised with me about an email dialogue between our National Office and a prospective new WIA member. This dialogue started innocuously enough as this prospective member had partially completed the online membership form but was unsure how to finalise the application as they had just gained their AOCP qualification and callsign but were not yet licenced. The National Office, in assisting the applicant through the process, manually entered the details to complete the application but inadvertently set the membership expiration to "today's date" rather than 12 months in the future. On receiving the confirmation of what was showing as a one day membership (an easily rectified manual error), the prospective member rather than asking for this to be resolved responded with what I can only describe as an unhinged, personally abusive email laden with "expletive deleted" swear words directed at our staff member. Not content to stop at personal abuse, they then went on to denigrate the WIA. Whilst the vast majority of email and phone calls received by the WIA from members are civil and respectful, sadly, this type of email escalation into abuse and/or harassment is not rare, and is becoming more common. My assessment is that social media has led to this abusive and or harassing behaviour, usually referred to as "trolling", being viewed as an acceptable response to any form of dissatisfaction.

As WIA President I regularly receive emails that are helpful, constructive suggestions or simply constructive criticism to which I am happy to respond in kind. A lot of suggestions are along the lines of the WIA should "do this or that" – albeit almost universally without an offer an assistance to "do this or that". Remember we are a DIY, volunteer organisation.

But both the WIA National Office and myself as president do receive, not infrequently, what I can best describe as unhelpful hyper-critical emails, often written with extensive use of capitals as a way of shouting their complaint and often laden with personal insults – such emails are a form of harassment or abuse. These are often copied to wide distribution lists for impact. And the authors of these unhelpful emails seem surprised that despite the wide distribution list they usually do not elicit a response from anyone on their distribution list. If a member has a complaint whether real or perceived, the WIA has a formal complaint process. Use it, but keep it civil and balanced. The WIA has a policy position of zero tolerance for all forms of harassment, discrimination or abuse. I personally hope the membership can enshrine this over-arching policy in the WIA constitution in the near future as it is currently silent on these matters.

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Editorial

Continued from page 2

As a total of all licence holders, the WIA has a diminishing percentage. Some may take comfort from the 2% drop in the last year. Whereas, the data show a 22% drop over the last three years.

WIA membership has fallen dramatically over the previous three years at greater than the average and the age-specific death rate. And the fall is not echoed in Marc's data where the average fall-off over the same period is about 1.7% per annum. So, the WIA is losing members, and mainly Advanced licence holders, faster than the annual falls in numbers of all Australian radio amateur licence holders.

There was a surge in newcomers when the then new Foundation Licence was introduced. Have they graduated to Standard or Advanced? Or have they left? Have a look at Marc, VK3OHM's Table 4.

The Standard Licence is an amalgam of what were four or five licence grades, enhanced by dropping the requirement for Morse competence. What encourages them to stay or upgrade?

The Advanced Licence is the previous Full Call without the Morse requirement. What is encouraging them to leave?

The WIA is a non-profit organisation. For income, it depends on membership subscriptions, grants, investment income, advertising and sales. When membership falls, the burden falls on those who remain to accept increases in subscriptions and fewer services, such as the reduction in Head Office services, and the cut in production of the Amateur Radio magazine from 11 issues per annum to 6. With a falling membership base, WIA sustainability is an issue.

What is, or is being, planned to attract newcomers, retain stable members, and debrief intending leavers?

This is an area where all radio clubs, with support from the WIA, can get involved. This was where Chris Jones (SK) was very passionate. Collaboration between the WIA Board and the clubs needs revival.

Not all is doom and gloom. We have some exciting things to come in future issues:

- Tonga DXpedition
- Part 2 of the VK3AQZ digitally-controlled antenna tuner
- Continuation of Lou Destefano's digitally-controlled antenna tuning unit
- The ongoing ACMA saga
- and all the regular columns.

If you have a new project, a continuing project, or special events in your area of expertise or in your club that you would like other readers of *AR* magazine to know about, please email *editor@wia.org.au*.

NOTICE OF 2021 ANNUAL GENERAL MEETING (AGM)

The Wireless Institute of Australia (WIA), a public company limited by member guarantee, wishes to advise all members that the 2021 WIA AGM is scheduled for Saturday morning June 26 at 10:30 am AEST.

This will be an interactive "virtual meeting" conducted entirely online and will also be live streamed. The format will be similar to the prior WIA 2020 AGM.

Details of how to attend and/or view the meeting will be sent to members via MemNet email ahead of the meeting. The AGM will be followed by a 45 minute "Ask us any question" panel session.

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Note: This meeting is conducted as a "virtual meeting" in line with the pandemic related AGM guidelines issued by ASIC on March 29, 2021.

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WIA news

WIA responds to Authority's workplan

In March, the Australian Communications and Media Authority (ACMA) released its latest draft 2021-26 work program for public consultation. The WIA responded by deadline in April, highlighting priorities for amateur radio and identifying additional issues.

One of the ways that the ACMA determines its work program items and priorities is through its rolling 5-year program. Updated every year, the 5-year rolling spectrum outlook – dubbed the 5YSO – provides the radiocommunications industry with a view of what areas the ACMA intends working on for the next 12 months, but also what future issues the ACMA is watching.

For the amateur radio community, two key items on the ACMA's agenda are of special interest: (a) continued work on the amateur licensing review, and (b) review of arrangements for amateur stations operating at transmitter power levels above 400 watts.

The first of these saw the WIA make a major response to the ACMA earlier in April concerning the Class licence for overseas visiting amateurs. The second one is proposed to commence in the second quarter of 2022. The WIA welcomes the opportunity to again explore how Australian amateur licensees can operate with higher transmitter power.

The ACMA has also identified the following bands for further review – namely 2300-2302 MHz and 3300-4200 MHz, both of which will have potential impacts on the 13cm and 9cm amateur bands. The WIA has already been active in attending the ACMA's 3400-3475 MHz Technical Liaison Group meetings and will continue to engage in the TLG discussion groups as other UHF and SHF bands face further changes throughout 2021-22.

In addition, the WIA proposed a new model for managing development of the syllabus for the Amateur Operator Certificate of Proficiency (AOCP) as this is necessary as part of the licensing reforms. Also, the WIA calls for a review of the amateur licence examination system that had all but collapsed during the COVID-19 restrictions across Australia, while other countries saw growth.

Several matters concerning spectrum access related to the 40m and 6m bands are raised in the WIA's submission. The WIA requests that the ACMA conduct a further review of the defined usage of 7100-7200 kHz in the Australian Radio Spectrum Plan and extending access for Standard licensees to 50-52 MHz.

Keep up with what's happening; check out the full submission on the WIA website, at: *www.wia.org.au/newsevents/news/2021/20210428-1/index.php*

Aust-Belgium space station hookup wins big PR for amateur radio

Primary school students at Winmalee Public School in the Blue Mountains and Belgian Army trainees participated in an amateur radio contact with astronauts aboard the

Continued on page 8

Statistical analysis of amateur licence data

Is amateur radio dying, or just asleep at the wheel?

Marc Hillman VK3OHM/VK3IP

This document has been generated in response to a Terms of Reference document created in Jan 2016 which called for an investigation of what analysis could be performed on WIA held data. Initially, this will focus on the RADCOM/SPECTRA data provided by the ACMA.

Data Included

Between the years 2005 and 2014, the WIA was provided with the RADCOM data by the ACMA on CD-ROM. In 2015 there was a transition to the new SPECTRA system, with a significant change of database format. This data includes details of all licences and licence holders. Some years have a complete set of 12 monthly disks, while some years only have about 3 disks.The last available disk from each year has been selected. These have been imported into an MS-Access database for further analysis. Only Year, Callsign, client ID and licence grade have been extracted from the licsing.csv file.

Data Extracted

Note on data presentation

In a change from previous years all counts of amateurs (except for Repeaters/Beacons) are presented as unique individuals, not callsigns. Counting callsigns gives an inflated view of the situation because some radio amateurs hold several callsigns; so, only unique amateurs, determined by ACMA client ID, are presented in the following tables. This means that the data below may differ from previous years.

Licence Grade by Year

Table 2 describes the number of unique amateurs, by grade, by year. If a radio amateur holds multiple licences, potentially at multiple grades, only the highest grade is counted.

Data is shown for Amateurs in Table 2 and Repeaters/Beacons in Table 3.

Joiners, Leavers and Upgraders

An analysis has been performed to determine the number of Joiners, Leavers and Upgraders. For the first year, everyone is a 'joiner', ie, this establishes the baseline.

Joiners are those ACMA clients who did not exist in the previous year.

Leavers are those who disappeared from the SPECTRA data for that year.

Upgraders are those whose grade changed that year. Three types of upgrade are possible:

- Foundation to Standard (F->S)
- Foundation to Advanced (F->A)
- Standard to Advanced (S->A)

There are instances where a licence lapsed, and the amateur rejoined later. These rejoins are counted as a Leave, followed by a Join.

Year	Month
2005	Nov
2006	Nov
2007	Sep
2008	Oct
2009	Dec
2010	Dec
2011	Dec
2012	Dec
2013	Dec
2014	Dec
2015	Jan 2016
2016	Dec
2017	Dec
2018	Jan 2019
2019	1 Jan 2020
2020	1 Jan 2021

Table 1: Month of data snapshot.

Year	Total AMATEURS	Advanced	Foundation	Standard
2005	13325	11461	8	1856
2006	14036	11213	935	1888
2007	14485	11127	1439	1919
2008	14575	10873	1726	1976
2009	14641	10618	1987	2036
2010	14692	10486	2148	2058
2011	14666	10329	2249	2088
2012	14479	10151	2275	2053
2013	14282	9887	2336	2059
2014	14100	9710	2372	2018
2015	14083	9567	2453	2063
2016	13965	9412	2470	2083
2017	13930	9261	2562	2107
2018	13909	9194	2617	2098
2019	13690	8998	2620	2072
2020	13687	8909	2690	2088

Table 2: Grade count by year.

Year	Total CALLSIGNS	Amateur Beacon	Amateur Repeater
2005	373	28	345
2006	377	28	349
2007	395	28	367
2008	419	29	390
2009	436	33	403
2010	451	33	418
2011	455	32	423
2012	471	33	438
2013	470	35	435
2014	484	33	451
2015	478	36	442
2016	476	35	441
2017	496	33	463
2018	516	37	479
2019	519	36	483
2020	516	35	481

Table 3: Beacons and Repeaters by year.

Also shown are the number of Foundation (F never) and Standard (S never) licence holders that have never upgraded.

A note on total counts

In 2019, I suffered a major data loss, and lost all data for the years 2018 and 2019. The data for these two years has had to be reconstructed from secondary sources. These may be a few days different from the original sample dates, so the numbers may vary by a small amount. I suspect the difference is less than 10.

At the same time, I have recognised a potential weakness in the counting of totals. Previously, it was done cumulatively, ie, Total = last year's total + joiners – leavers. In theory this gives the correct answer, but any errors in a particular year will accumulate. To avoid this potential error, this year the totals are calculated explicitly from the current year's data. This may result in some differences in totals in previous reports.

Observations

This analysis provides some data that allows some trends within the radio amateur population to be observed (and there are some interesting trends). Not unexpectedly, this data raises more questions than it answers.

Year	Join/Foundation	Join/Standard	Join/Advanced	Join/Total	Leave/Foundation	Leave/Standard	Leave/Advanced	Leave/Total	Total/Foundation	Total/Standard	Total/Advanced	Total/Total	Upgrade/F->S	Upgrade/F->A	Upgrade/S->A
2005	8	1832	11461	13301	0	0	0	0	8	1856	11461	13325	0	0	0
2006	916	168	320	1404	0	117	586	703	935	1888	11213	14036	1	1	41
2007	622	92	296	1010	56	99	421	576	1439	1919	11127	14485	70	16	49
2008	579	134	268	981	180	128	603	911	1726	1976	10873	14575	100	46	65
2009	557	121	290	968	178	111	615	904	1987	2036	10618	14641	106	43	71
2010	474	100	245	819	229	114	430	773	2148	2058	10486	14692	88	35	69
2011	416	95	237	748	226	93	453	772	2249	2088	10329	14666	82	42	75
2012	353	68	210	631	248	113	456	817	2275	2053	10151	14479	63	51	79
2013	386	88	204	678	254	114	514	882	2336	2059	9887	14282	78	35	70
2014	390	60	214	664	268	113	450	831	2372	2018	9710	14100	74	42	72
2015	399	115	250	764	239	115	468	822	2453	2063	9567	14083	94	53	71
2016	233	71	181	485	171	87	370	628	2470	2083	9412	13965	99	28	66
2017	505	151	344	1000	308	151	572	1031	2562	2107	9261	13930	106	75	92
2018	391	98	248	737	258	113	391	762	2617	2098	9194	13909	81	65	95
2019	292	75	171	538	225	115	404	744	2620	2072	8998	13690	70	46	86
2020	331	94	175	600	208	69	314	591	2690	2088	8909	13687	60	42	90
Totals	6852	3362	15114	25328	3048	1652	7047	11747							
F never	2535														
S never	1157														

Table 4: Joiners and Leavers.

It provides insight into WHAT is happening. Because correlation does not equal causation, it is difficult, if not impossible to determine WHY. We can really only speculate.

One interesting 'anomaly' is that the total number of amateurs declined by only 3, which bucks the historical trend of ~20. I would have expected the numbers to have declined more than they did, but fewer people have left the hobby. The number of joiners is at the low end normal, but the number of leavers is near historical lows. I can only speculate that the control of Seasonal flu and COVID-19 have had a very positive influence.

Marc Hillman
VK3OHM/VK3IP
January 2021

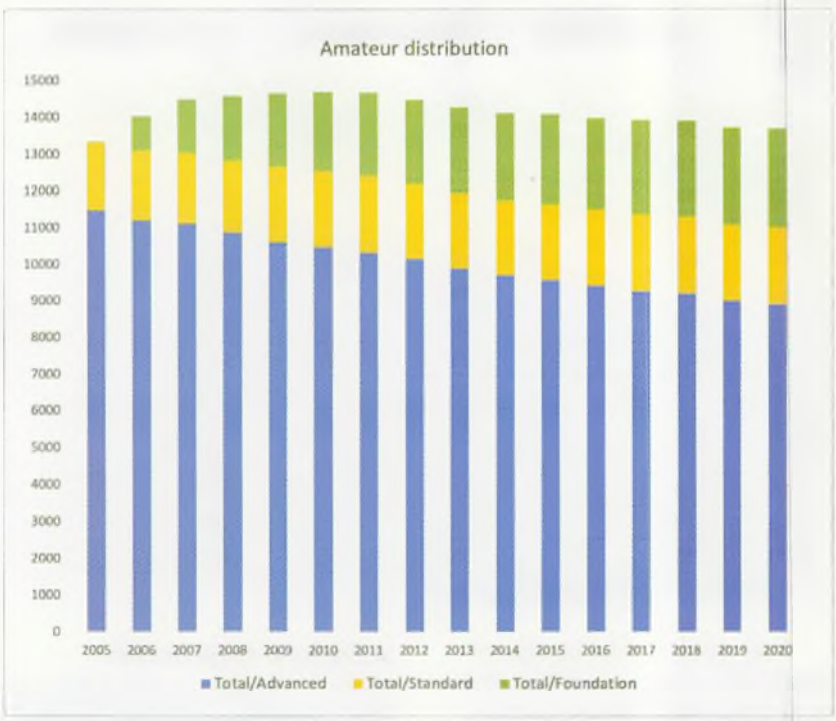

Figure 1: Distribution of amateurs.

WIA news

Continued from page 5

International Space Station in April, scored wide publicity for amateur radio.

The 11-minute call was two years in the making after Winmalee school science teacher Alison Broderick applied to NASA and ARISS International (Amateur Radio on the ISS) to be part of a program that enables students around the globe to speak to an astronaut.

After entering an 'Ask an Astronaut a Question' competition at the Blue Mountains school, eight were chosen to speak directly to space station astronaut Victor Glover, a member of crew 64 and the 2024 Artemis moon mission.

Alberto Campos-Wagner, aged five, was delighted to find out in answer to his question that the crew try to avoid hitting space junk. He said, "I was really excited the day before I got to speak to the astronaut and I liked talking to him."

Winmalee school science teacher Alison Broderick helps 5yo Alberto ask his question.

Thanking their amazing science teacher for organising the call, Ayva Dacey in Year 4 recognised the event as a once-in-a-lifetime experience, while Erin DeBono in Year 5 was amazed there had not been a technology glitch.

Year 6 student Asher Renwick agreed: "I'm still on a massive cloud of happiness. Victor was so nice and his answers were excellent. I realised that most people come home to their family each day and take that for granted, but astronauts can't do that. The whole thing was better than I ever thought it could be."

Winmalee's school community flooded into the school hall to witness the event.

Mrs Broderick said she was relieved and excited that the event had finally happened after the long process of approval. She was just as excited as the students about speaking live to an astronaut.

Channel 9 in Sydney aired a news story about the Winmalee contact that was posted to Facebook. Broadcast station 2GB gave it time on air and on its website.

NSW Minister for Education, Sarah Mitchell, said she was thrilled that the space station could be brought into the classroom and for students to have this rare opportunity.

ARISS team member Jan Poppeliers ON7UX, in Aartselaar, Belgium, used the call sign ON4ISS for the event. A two-way landline telebridge provided audio between Belgium and the Australian end of the contact.

Stefan Dombrowski ON6TI and Luc Vlecken ON4ALV, took advantage of the opportunity to listen in to the direct 145.800 MHz signal from the ISS as a demonstration for their Belgian Army trainees learning about amateur radio.

"We both used the Australian Winmalee Public School ARISS QSO / ISS pass between Victor Glover KI5BKC and the students to demonstrate amateur radio," Dombrowski said. "It was an excellent demonstration of ham radio capabilities and was also a good educational demonstration of antenna polarization and signal weakening with distance."

– NSW Education & ARRL

VI100AF/VK100AF – 100 years centenary of the Australian Air Force

Stuart Birkin VK8NSB - Station Manager VI100AF and VK100AF

The Australian Air Force was formed in Victoria, on 31st March, 1921. So, 31st March, 2021 marked the 100-year anniversary of the Air Force providing service to Australia. On 13th August 1921, His Majesty King George V gave Royal assent, thus creating the Royal Australian Air Force. At that time, administration HQ was at Victoria Barracks, Melbourne, and the only air base was RAAF Base Point Cook.

Over 350,000 have served and over 11,000 have made the ultimate sacrifice for Australia.

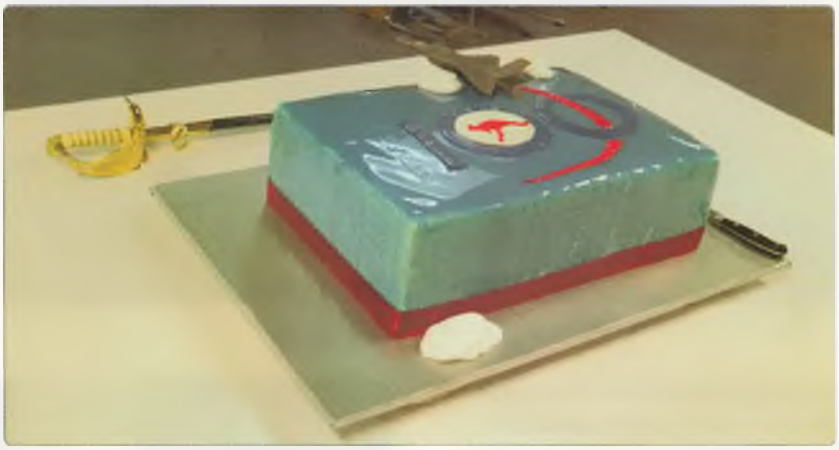

Photo 1: 100th anniversary birthday cake.

This is the story of VI100AF and VK100AF

In September, 2020, I (Stuie, VK8NSB) contacted Lee, VK3GK, the Vice President of the WIA, requesting his assistance in obtaining two special event callsigns to be used in 2021 to celebrate the centenary of the Air Force in Australia. Lee immediately answered my call for assistance and the operation then begun.

After very pro-active discussions between Lee and the ACMA, the ACMA agreed to support the program and authorised the use of the VI100AF callsign for 100 days from 1st March to 29th May, 2021 and VK100AF from 1st March to 31st August, 2021. Great thanks to Lee, VK3GK, for his efforts and communications with the ACMA in obtaining the two special callsigns you now hear on air.

Using social media, work then began on recruiting operators from around Australia to assist with celebrating the centenary of the Air Force's service to Australia. Many ex-Australian Defence Force (ADF) and current serving amateurs are part of the 47-strong team. Many of the team members have nothing to do with the Air Force, but wished to help out a fellow Australian, like the Air Force does for Australia in times of need.

With 47 operators locked in, it was then time to organise a roster for both the VI100AF and VK100AF callsigns for the first three months of planned operations. Thanks go to Theo, VK5IR, for his assistance with up-loading the rosters to an on-line system so that the team could easily access their scheduled

Photo 2: Outside of four-page anniversary QSL card.

Photo 3: VK8NSB at operating desk RAAF Darwin.

operating information. To prevent the operators' getting harassed by amateurs all over the world for skeds, the decision was made that only the operators would have access to the rosters.

The team of operators has been great to work with, donating time out of their very busy lives. They have all supported this operation with 100% effort. For the full list of operators please visit VI100AF on *www.qrz.com*

In the background, I was working very closely with the Air Force 2021 team to obtain media material required for the web pages that Paul, VK2HV, and I had started to build on *www.qrz.com*. Once access was granted for the media material, 100+ photos from the AF2021 archive were selected and placed online by Ian, VK3QL, for the SSTV operators to use during the operation of both callsigns. The photographs would also be used on the web pages and the QSL card.

The QSL manager for this Operation is Tim, M0URX, who is a professional QSL Manager in the world of Amateur Radio and has managed such mega DXpeditions as 4W6A, VK0EK among many other large multi-team operations. Two QSL cards are available, a 4-sided QSL card for those who request directly and a 2-sided QSL card for all QSL Bureau requests.

As many have heard over the last couple of months, VI100AF and VK100AF have been very active on

Photo 4: VK8JG at operating desk RAAF Darwin.

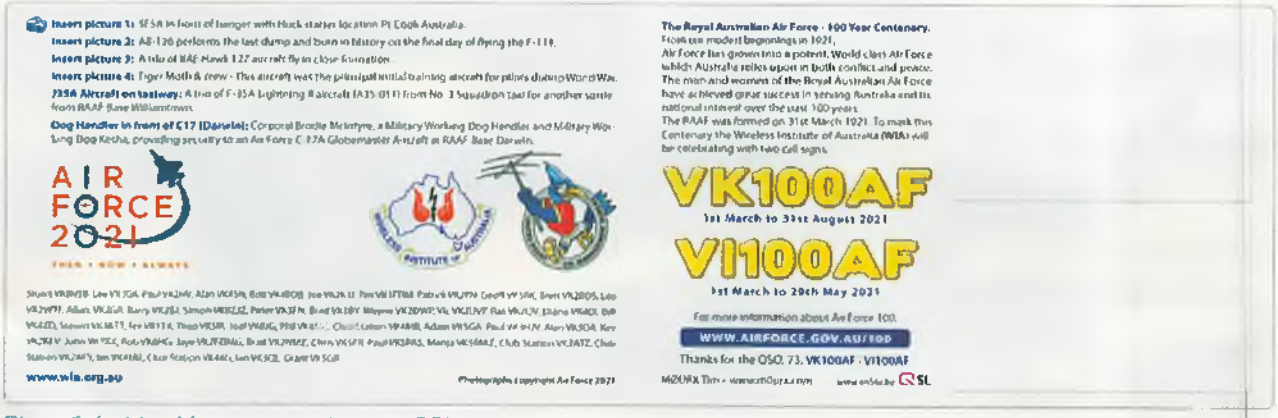

Photo 5: Inside of four-page anniversary QSL card.

all modes and bands. In the first month of operation, the team made 15,429 QSOs into 117 countries.

And as of 10th April, 2021, we have worked 18,680 QSOs into 126 countries. The operators continue to conduct an amazing team effort.

Special activations of the call VI100AF have also been conducted over the month of March, the first being on Sunday 21st March, 2021 with Adam, VK5GA, Chris, VK5FR, Tony, VK5FBIC and Tom, VK5TOM activating VI100AF from the National Military Vehicle Museum in South Australia. The second special activation was conducted by Ray, VK4TPT and David, VK4WP representing club station VK4MB, who activated VI100AF for the weekend of 27th and 28th March, 2021 from ex-Air Force Base Maryborough in Queensland.

The final special activation was a very special operation. After two months of negotiations, I, VK8NSB was able to obtain permission for Joel, VK8JG, Simon, VK8ZJZ, Mal, VK8MT and I to operate from the Truscott Club, RAAF Base Darwin, on the Air Force's Birthday, March 31, 2021.

Listen out for other team members who are planning activations from other historic military locations around Australia over the coming months. Some team members will also be active from summits and Parks on the Air over the next few months.

For more information about Air Force 100 please visit *WWW.AIRFORCE.GOV.AU/100*

Board comment

Continued from page 3

110 years plus: The WIA has a legacy of supporting the rights and aspirations of Australian Radio Amateurs for well over a hundred years. It hasn't always been a smooth journey through time, with various potholes and pitfalls along the way – and the WIA has survived despite massive technology innovation along the way. In 2004, a major change was implemented to move from a state-based federated model to a national organisation model.

Few members are aware that this change to a single national "peak body" was catalysed by a request from the then regulator (ACMA's predecessor) for the WIA to form a single national organisation. This request was precipitated by the regulator's perception that the various state WIA organisations "could never agree on a single outcome". Unfortunately, the ACMA's lack of organisational memory has led them to repeat history by their naive recognition a few years ago of a splinter group as an alternative "peak body" for the Amateur Service and then finding again, that they "could never agree on a single outcome". Déjà vu.

My personal observation about the 2004 implementation of a national WIA is that it was a transition from one sub-optimal model to different sub-optimal model! However, it must be said that there is no one perfect organisational model for any organisation. As a truly democratic organisation it is up to the membership to make it work regardless and keep focus on the outcomes needed to protect the spectrum space we are so privileged to be able to utilise.

WIA 2021 AGM: Check out the AGM notice in this issue for details.

Until next time, this is Greg VK2GPK.

Unravelling the mysteries of connecting radios to antennas

Brian Clarke, VK2GCE
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The transceiver in your radio shack probably came 'off-the-shelf', ready to go. But outside the shack, your HF antenna system and its associated feeder and support arrangements are essentially 'home-brew'. This comprehensive article, presented in four parts, will give you all you need to get your antennas working the way they should. In its first incarnation, this series of articles appeared in *Amateur Radio* in 2005. This reincarnation has been upgraded in light of knowledge gained from colleagues' experience and from antenna modelling software.

Part 1. Antennas and their feed-point impedances

This article is about the practical application of common, and possibly not-so-common, antenna knowledge. Its purpose is to unravel some of the mysteries that surround getting our signals in from and out to our antennas, reliably and efficiently. It started out as a presentation on baluns - but the more I marshalled my ideas, the more questions arose about the things on either side of the balun. There may be some surprises compared with present-day folklore.

This is not an exhaustive treatise on antennas and transmission lines – I discuss those in sufficient detail that you can make an informed decision about where you would use a balun to best effect, and how you could roll-your-own. My guiding point of departure in this article is that you want to use a single antenna on as many bands as possible without having to reconfigure it each time you change band or frequency.

When we use an antenna over a wide frequency range, the impedance it presents dances all over the place. Yet, there are certain components that work most efficiently and require the least maintenance if they are worked at constant impedance. The low-pass filter and balun are but two such components in the path from our transceiver to the antenna to help with impedance matching.

Throughout this series of articles, I refer exclusively to 'antenna coupling' I use this term to cover any device between your LPF and VSWR meter on the input side, and your antenna feedline on the output side. I am well aware that radio amateurs use the term 'antenna tuning'; but in reality, the only way to tune an antenna is with a pair of side-cutters, or, if you get too enthusiastic with your cutters, your soldering or brazing equipment.

The Jacobi theorem

The Jacobi theorem states that we get maximum power transfer when the impedance of the generator matches that of the load. When the impedances of our transmission line plus antenna match the output impedance of our transceiver, we have met the Jacobi principle for maximum transfer of power to our antenna; in other words, our system is at its most efficient and effective. The same theorem applies in reverse, to transfer the received signals from the antenna down to the transceiver.

There are some other considerations (and costs):

- When the voltage and current excursions on our transmission lines are the least (low VSWR, impedances closely matched), it is less likely to suffer from flashover (excess voltage) or melting (excess current) and will require less restorative maintenance. If there is an impedance mismatch and we want to reduce down-stream maintenance, then we can space the feed-line wires to reduce the likelihood of voltage flashover; or increase the gauge of the feed-line wires to withstand the higher current. However, increasing the spacing increases the feedline impedance, increasing the mismatch; increasing the wire gauge may stretch the antenna, pulling it out of resonance. And the wind forces on the larger, heavier feed-line may result in dry joints and even breakages where the feedline meets the antenna.
- When impedance matching is good (low VSWR, small reflected power) our transceiver is less likely to reduce its power output or go into automatic shut-down. Where the transceiver does not have automatic protection against high VSWR, the output stage – valves or transistors - is likely to suffer voltage breakdown effects, and is more likely to require restorative maintenance, thus increasing your cost of ownership.

- When impedance matching is good, we are less likely to generate spurious emissions, which in turn means we are more likely to maintain good relations with our neighbours and other spectrum users.
- And when impedance matching is good (best transfer of received power) we will be able to receive signals of lower level, increasing our enjoyment of the hobby.

However, all is not roses in our gardens.

- We can achieve a very low VSWR if we attach a long length of the correct impedance feedline to our transceiver – and get no signal in or out. This has serious implications for the accuracy of VSWR measuring devices in your transceiver, outside your transceiver or in your bench antenna coupling unit.
- But there is worse: Remember that the Jacobi theorem is a statement in words of a theory. If the 230 Vac mains were distributed to our homes via the Jacobi theorem, at night in a domestic suburb, when all are asleep and few appliances are connected, the mains voltage would rise significantly. If at some stage in the night there was no load, the line pressure would be 460 Vac. A normal 250 kVA 3-ϕ distribution transformer, such as the one feeding your home, producing 230 Vac active-to-neutral, can deliver 362 Aac per phase. That might imply a secondary impedance of 635 mΩ per phase, were it designed according to the Jacobi theorem. In fact, the secondary impedance is closer to 5 mΩ per phase. Why? Should we design our equipment the same way?
- When we follow the Jacobi theorem, though allegedly we get maximum power transfer, in fact both the generator and the load dissipate the same amount of power. So, the maximum efficiency you can ever get out of your communication system is 50%. Could we afford our mains power if, at full load, half the power went to consumers and half was dissipated by the generator?

Spectrum access for radio amateurs

Internationally, radio amateurs have access to the widest frequency spectrum after the military. For the enthusiastic radio amateur, this implies a need to use that spectrum to its fullest. One way we try to achieve economies while enjoying wide spectrum usage, is to try to get our antennas to operate over the maximum frequency spectrum, ie, on as many bands as possible.

Many years ago, when the 'traditional' amateur bands (80 m, 40 m, 20 m, 15 m and 10 m) were being allocated to us, the harmonic relationship of the bands was thought by our benevolent governments to be of good value to radio amateurs and a means of ensuring that any unwanted harmonics would affect only users of those bands.

Unfortunately, because real antennas need to be shortened about 5% from their theoretical length, harmonics don't always fall neatly within the amateur bands. I'm talking here of the harmonics of the antenna, not harmonics of the transceiver. If you strike a bell, it rings at its resonant frequency plus a wide range of its natural harmonics – same for an antenna. So, if you stimulate an antenna off its resonant frequency with a harmonic-laden signal, some of your transceiver's harmonics will be attenuated because they fall off the resonance curve of the antenna but some of the harmonics of the antenna will be radiated.

Let me expand this with an example:

Say we want to set up a horizontal dipole for 40 m (eg, 7.25 MHz), and also use it on 15 m. The required active leg length, when operating at its fundamental frequency, can be calculated from the formula:

$\lambda = v / f$

where

λ = wavelength, m

v = velocity of the wave in our antenna (~300 x 10^6 m/s)

f = our chosen frequency, Hz.

Substituting our chosen values in this formula, we get $\lambda = 41.38$ m

If we use a thin, uninsulated wire in air to create a dipole, the required physical length of each $\lambda/4$ leg will be:

0.95 x 41.38 / 4 = 9.83 m

The factor of 0.95 compensates for end-effects.

What happens when we use this antenna on 15 m, ie, the 3rd harmonic? Now, you might think that 9.83 m corresponds to $3\lambda/4$. But in fact it corresponds to $2.95\lambda/4$, because the end effect applies at the end. Re-arranging the formula gives us a resonant frequency of 22.5 MHz, which is outside the 15 m amateur band. This antenna is too short for amateur operations on the 15 m band, and would be capacitively reactive. Alternately, if we use a slightly longer antenna to resonate on 15 m, it would be too long for our chosen spot on 40 m and inductively reactive there.

We get similar problems with the 'harmonic' relationships between:

- 80 m and 30 m
- 17 m and 6 m
- 2 m and 70 cm.

In the case of a centre-fed vertical dipole, because the lower leg is closer to ground and is therefore more capacitive, it should be shortened even further to counter that effect.

Antenna feed point impedance (Z_{AE}) vs frequency

As we will see, operating our antenna over a wide frequency spectrum has implications for the feed point impedance. This section is not an exhaustive treatment of

all antenna configurations; rather, I will discuss the most popular and economical forms, the horizontal dipole and the vertical quarter-wave ground-plane.

Horizontal dipole

When we operate a horizontal half-wave dipole more than a wavelength above ground, at its fundamental frequency, and fed at its centre, its feed point impedance (Z_{AE}) is resistive and about 72 Ω. If we increase the frequency so that each leg of the dipole corresponds to $(2n+1)\lambda/4$ (an odd number of quarter wavelengths), again we find a fairly low resistive impedance, but greater than 72 Ω. If the frequency is such that the length of each leg of our dipole corresponds to $n\lambda/2$ (an even number of half wavelengths), the impedance is again resistive, but very high — it can be in the order of 5 kΩ. At any other frequency, Z_{AE} is not purely resistive.

If we add parasitic elements, as in an Uda-Yagi antenna, or if we fold our dipole, or make folded sections of different cross sections, the centre-fed Z_{AE} (although resistive) may vary from as low as 5 Ω up to 500 Ω.

Off-centre fed dipole antenna

If we feed a horizontal resonant dipole off centre, Z_{AE} moves from a minimum of 72 Ω when fed at the centre to around 5 kΩ when fed at the end, eg, the Zepp design. Non-resonant off-centre fed (OCF) antennas show a moderately high resistive component, 150 to 200 Ω, but may also have a reactive component. When one section is an odd multiple of $\lambda/4$ and the other section is an even multiple of $\lambda/4$ (the one-third fed version), the antenna will be resonant, but its feed point impedance will be high and unbalanced. When fed at the one quarter point, we have the possibility of the shorter section being $\lambda/4$ and the longer, $3\lambda/4$; this will be a low Z_{AE} antenna, perhaps 100 Ω, and this antenna can only have low impedance on its odd harmonics. Feed the OCF at almost any other fraction of its length and Z_{AE} will be reactive.

Vertical ground-plane

For a vertical ground-plane antenna, the feed point impedance is a little different from that of the horizontal dipole. The antenna feed point impedance is given by:

$$Z_{IN} = Z_{AE} + Z_{GND}$$

where:

Z_{IN} = actual input impedance

Z_{AE} = intrinsic feed-point impedance

Z_{GND} = ground impedance.

If the antenna is a resonant quarter-wave vertical over a horizontal ground plane, at its fundamental frequency Z_{AE} is about 36 Ω resistive. However, Z_{GND} depends on the actual architecture of the ground-plane. Broadcasters and the military like to plant their vertical antennas in salty marshland or employ around 160 radials when the ground plane is kept at ground level. If the ground-plane is lifted above ground by about $\lambda/10$ or so, we can get away with as few as four horizontal radials. This above-ground system is called a counterpoise.

With a ground-plane anything less than those described above, Z_{GND} becomes quite significant; energy fed into it warms the ground a little but does not radiate. We get a similar effect when we use a vertical whip on a vehicle and omit to bond all the panels that could form a good ground-plane. If Z_{GND} can be kept close to zero, the antenna system efficiency is high and almost all the transmitter output power is radiated.

For example, a four-wire radial system deployed at ground level may have a Z_{GND} of about 10Ω, depending on the conductivity of the underlying Earth.

So, $Z_{IN} = 36 + 10 = 46\ \Omega$

For this antenna system, $P_{OUT} = P_{IN} \times 36 / 46$; ie, about 78% of P_{IN}, or nearly 1 dB down.

If the antenna feed point is raised at least $\lambda/2$ above ground, and we slope the ground-plane radials down from 90° (horizontal) to around 135°, Z_{AE} becomes about 50 Ω resistive. This only applies at the fundamental resonance. If we continue to bend the radials down to 180°, we get a vertical dipole with a Z_{AE} of about 72 Ω. So, the included conic angle of the radials alters the impedance. When the feed point of a vertical dipole is higher than about 0.4λ above ground, Z_{AE} stays fairly close to 72 Ω.

Thus, feed point impedance of that $\lambda/4$ vertical you have stuck on the roof or bull-bar of your vehicle is unlikely to be 50 Ω — it'll be more like 36 Ω; so, why use 50 Ω feeder cable?

As with the horizontal dipole, at frequencies that are odd multiples of $\lambda/4$, Z_{AE} of the quarter-wave ground-plane antenna is resistive, but higher than 36 Ω. At frequencies that are exact multiples of $\lambda/2$, Z_{AE} is resistive but very high — possibly several kΩ. At any other frequency, Z_{AE} is complex, ie, not purely resistive.

A few words of warning about radials

At resonance, the ends of the radials remote from the antenna's feed point have very high impedance and are therefore at very high voltage. Good quality ground-planes, or counterpoises, have a large blob of insulating material on the free ends to reduce the likelihood of electric shock or radiation burns. If you make your own counterpoise, insulate the free ends appropriately. If we assume that the free ends have an impedance of say 2.5 kΩ (a conservative estimate) and we feed 400 W into the antenna, what voltage is developed there?

Power law $P = V^2 / R$

Rearranging for V, we get

$V = \sqrt{(P \times R)}$

Putting in our values of 2.5 kΩ and 400 W, we find that 1 kV is developed at the ends of the radials.

Attempting to use the Earth as a ground-plane in Australia is asking for trouble — the Earth's conductivity is, in general, rather too low and is seasonally variable. I have seen a vertical ground-plane antenna where one side of the feed-line was connected to an Earth spike. Full Stop! And the owner / creator wondered why his signal was just about receivable next door, and a VSWR anywhere near 1:1 was unachievable.

I have also seen counterpoises deployed where the free ends were attached to Earth spikes. When the counterpoise length is odd multiples of λ/4 and the free ends are grounded, Z_{AE} becomes very high, along with the VSWR (the quarter-wave transformer effect). When the counterpoise length is any even multiple of λ/4 and the free ends are grounded, Z_{AE} approaches zero along with high VSWR (the impedance of a λ/2 feed-line is the same at each end). Either way, the feed-line gets stressed and little signal gets in or out.

If you feel bound to Earth your ground-plane antenna, say for lightning protection purposes, only do so near the antenna feed point. In fact, you may need quite an array of Earth leads to cope with the tens of kiloamps likely to be carried to Earth if your antenna is struck – so, keep your lightning protection Earth separate from your antenna Earth.

Complex impedance

Whenever the feed point impedance is not purely resistive, to deliver a certain amount of power, we need to feed higher voltage than if the antenna were purely resistive. This is illustrated in Figure 1.

Only the power absorbed by the resistive component of the antenna is radiated. So, we ought to do something about reducing the reactive component of the antenna impedance, preferably to zero — but more on that later.

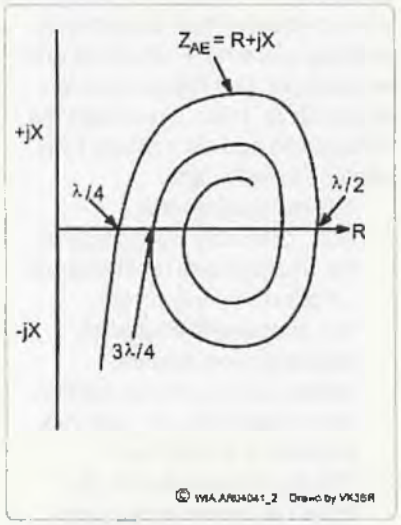

Figure 2: Feed-point impedance of a fixed-length antenna.

Figure 2 shows how the feed point impedance changes as the frequency applied to a fixed-length antenna is varied. Its reactance is positive (+jX, inductive) at some frequencies and negative (-jX, capacitive) at others, but the resistive component (R) is always positive.

If you measure the complex impedance vs frequency of your antenna just after you have erected it, you can generate your very own impedance spiral; such data will be invaluable for future diagnostics and preventative maintenance.

Z_{AE} vs antenna height

In the previous section, we assumed that our antenna was a great distance away from any other disturbing objects. At the lower frequencies (longer wavelengths), for most of us this situation is clearly out of the question. We have to deal with buildings constructed of conducting materials (corrugated iron roofing, steel gutters and downpipes, steel rails on balconies, steel reinforcing in concrete), built on odd-shaped and small blocks of land in suburban, built-up areas. We also have to comply with Building Application and Development Application approvals, and maintain harmonious relations with our spouses and the neighbours.

In the main, our antennas are limited to not more than 10 m above ground in built-up areas. When we operate a resonant, horizontal dipole antenna at less than λ/3 above ground, the feed point impedance is very low, and falls almost linearly to zero as the height reduces to zero. To apply this rule to a resonant λ/4 vertical ground-plane antenna, substitute the height of the feed point for height in the previous sentence.

Antenna height not only affects Z_{AE}, it also affects take-off angle and hence range. See Figure 3.

Why do we worship 50 Ω?

There is nothing magical about 50 Ω. It just happens to be a commercial / military solution to a logistical problem. When coaxial cable was invented, the ideal characteristic impedance for use with a horizontal

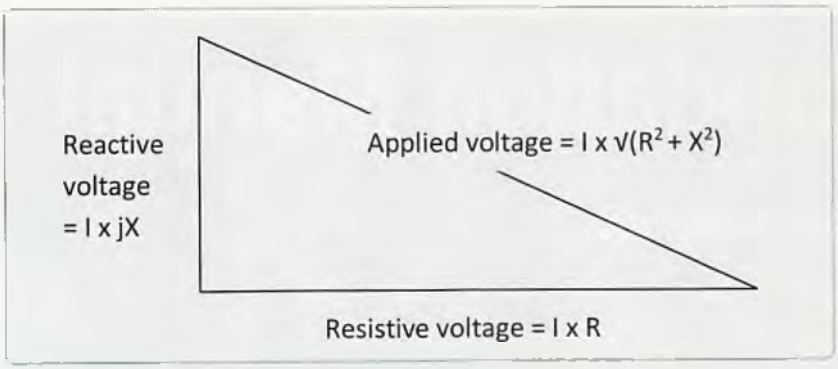

Figure 1: Resistive, reactive and applied voltage.

Antenna height / λ	Take-off angle	Z_{AE} in Ω	Range, day, km	Range, late night, km
1	0º	74+j08	2,250	6,500
0.996	5º	75+j11	1,400	5,400
0.985	10º	85+j13	940	4,500
0.866	30º	77+j28	350	2,300
0.5	60º	72	115	4,050
0.25	75º	85+j44	55	400
0.18	80º	50+j50	35	265
0.1	84º	23+j39	20	160
0	90º	5+j11	NVIS, perhaps 20 km	

Figure 3: Antenna height vs feed-point impedance, take-off angle and range.

dipole was 72 Ω, while that for use with a quarter-wave vertical ground-plane antenna was 36 Ω —and, strangely, they still are. The cable's characteristic impedance can he changed in the factory by altering the ratio of diameters of the inner and outer conductors, although 36 Ω coaxial cable is a bit difficult to manufacture. But in the field, it can be quite difficult to determine what the characteristic impedance of a cable is. The easy way out was to choose a characteristic impedance that gave minimum regret. Now, the geometric mean of the two contenders is √(36 x 72) = 51 Ω. So, if we deploy 51 Ω cable everywhere, the maximum VSWR with resonant horizontal dipoles and vertical whip antennas, would be about 1.4:1 – quite acceptable.

Summary of Part 1

We can't alter the laws of physics that govern the relationships between wave velocity, frequency, wavelength, voltage and current in our antennas. The best we can do is to understand them, then adjust the length of the active legs of our antennas and adjust our methods of feeding them to maximise our $$ effectiveness and enjoyment. We can measure the lengths of the various active parts of our antennas, we can observe their proximity to potential absorbers, reflectors and re-radiators, and make educated adjustments. How to deal with the voltage and current matters, I will come to in later parts.

The main points are:

1. A Z_{AE} of exactly 50 Ω resistive for an antenna is most unusual - it occurs in only a very few specialised situations. Depending on antenna configuration and the position of the feed point, Z_{AE} can vary between 5 Ω and 5 kΩ.
2. The Z_{AE} of any antenna, the length of whose active parts corresponds to a multiple of λ/4, is resistive and resonant. At any other frequency, Z_{AE} is reactive; and the antenna has a lower effectiveness and efficiency — less signal gets in and out, and it costs us more to feed and maintain.
3. When the lengths of the active legs of an antenna correspond to (2n + 1) λ/4, then Z_{AE} is low.
4. When the active leg lengths of an antenna correspond to nλ/2, then Z_{AE} is high.
5. The active leg length calculations for resonance must take end-effects and ground effects into account.
6. Apart from lightning protection, there is really no need to Earth a ground-plane / counterpoise.
7. Antenna height has a significant effect on antenna performance, not just impedance.

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- *ARRL Handbook* — any recent edition should do
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For the purists: only the ARRL mentions antenna tuning units; the others refer to coupling and matching.

Part 2 of this article should appear in a forthcoming issue of *Amateur Radio*.

Amateur TV News

Peter Cossins, VK3BFG

The feature on DATV in *AR* Issue No.1 for 2021 was a welcome fillup for interest in Amateur TV in Australia. However, I would like to correct the record concerning DVB-S, which certainly appeared well before 2017!

If you wish to tell the DATV story, DVB-S was the first and only mode used for many years, dating back to 2000. The Germans and the Dutch were leaders in the development of encoders and modulators for DATV, all DVB-S. Stefan Riemann DG8FAC went on to produce high quality DVB-S and DVB-T Encoders and Modulators and now DVB-S2 and DVB-T2.

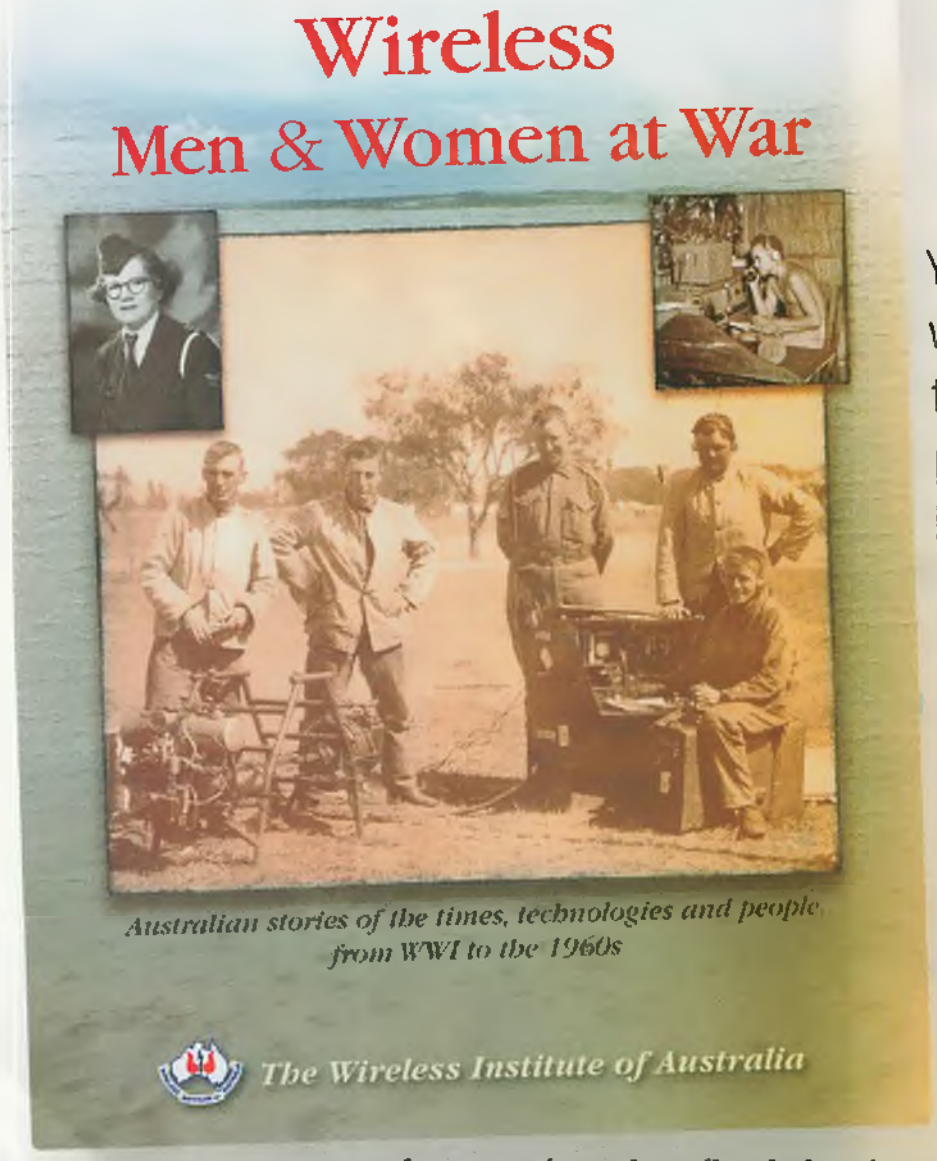
In about 2007, the Brisbane ATV Repeater VK4RMG converted from FM Up on 23 cm and VSB Down on 70 cm to DVB-S Up on 23 cm and DVB-T Down on 70 cm. DVB-S is specifically designed for point-to-point communication and linear amplifiers can be driven harder before the development of objectionable inter-modulation distortion (IMD) compared with DVB-T. DVB-T on the downlink was selected as set-top boxes (STBs) could be used with domestic TV sets.

In 2009, VK3RTV, which had been on the air since 1979, converted to DVB-S Up on 23 cm and a two channel DVB-T multiplexed downlink on 70 cm. VK4RMG followed suit soon after. DVB-S is still widely use in England, Europe and the USA. An early adopter in the USA was the Columbus Ohio Repeater WR8ATV, which used DVB-S in the first instance.

The Sydney DATV Repeaters were all DVB-S Up until recently when they converted to DVB-T2 Up on a cost argument basis, although 'low cost' DVB-S/DS2 options were available.

The VK3RTV antennas are high on the tower at Mount View.

Wireless Men & Women at War



Young men and women who used their skills from a personal interest in radio, made a difference. Read their **amazing stories**. 100 pages, large format. Buy it from the WIA Bookshop at:

www.wia.org.au/members/bookshop/page_data.php?id=258

The 'late comers' such as the author and the Whyalla Group selected DVB-T purely on cost basis as cheap DVB-T encoders were available, developed for TV supply to buildings. (These required an up-converter for operation on 23 cm though.) There is also the 'Hides' DVB-T/T2 range of Receivers and Encoders which very much suit 'appliance operators' providing a bit of a turn-key operation.

There was no focus at all on what system may be better for amateur stations or the linearity required by the RF amplifiers. DVB-T also caught on in the USA that now significantly use 'Hides' equipment. VK3RTV has a DVB-T downlink with ultra-linear FETs manufactured specifically for digital operations. It still required a significant filter at the output to reduce IMD products to an acceptable level. I wonder what the spectrum is like from these operators using DVB/T2?

Relatively cheap DVB-S/S2 modulators are available as Portsdown Software, and DATV Express software can drive SDR's Lime SDR and Pluto as well as the Portsdown Hardware board. Some of this was covered reasonably well in the article.

DATV repeaters and operation happened fairly well together on the east coast of Australia, with Brisbane being first, followed by Melbourne and Sydney, all well before 2017.

VK3RTV is currently converting to DVB/S and DVB/S2 Up on 23 cm and a multiplexed two channel DVB-T2 output on 70 cm. The argument here is that relatively cheap modulators are now available; higher quality modulators are also available for those who wish to be closer to commercial standards. Cheap satellite receivers can receive both DVB/S and DVB/S2 seamlessly. This is not the case for many DVB-T2 STBs that that will not receive DVB-T. The upgrade path for DVB-S/S2 is a strong argument as it allows existing stations to upgrade or not, still enabling both. As well as that there are the technical arguments that still apply. Upgrading an uplink to DVB-T2 will not allow operation on DVB-T.

Amateur Radio Victoria acquired the lease on a site at Mount View in Melbourne's eastern metropolitan area, with prime tower locations and cables to be available for VK3RTV.

WIA news

VK ZERO

Paul Daniels, usually VK2PAD, is stationed at Australia's Casey Station in Antarctica until at least November. Paul will be operating as VK0PD in his spare time, mostly on weekends. Currently he has a 20/40 m dipole 10 m above ground level and so far he has some contacts on 20 m. QSL via EB7DX.

VK0PD Paul Daniels, Casey Station, Antarctica.

Paul told Amateur Radio Newsline "Somehow this quickly morphed into what feels like being a rare contest station. My usual style is halfway between a quick QSO and a ragchew. I like to get to know people and make friends, so this fast-paced action is not a familiar thing for me."
(Source: Amateur Radio Newsline)

60 m in ZL

NZ amateurs are a step closer to gaining a formal allocation in the international 60m band of 5351.5-5366.5 after the allocation showed up in the NZ register of radio frequencies. Bob Vernall ZL2CA has been in liaison with the *New Zealand Defence Force* to implement the allocation. *New Zealand Association of Radio Transmitters* (NZART) reports it hopes to have it formalised soon.
(Source: NZART)

$9.3 M grant for HAARP HF research

Ionospheric research has gained a boost with the High Frequency Active Auroral Research Program (HAARP) run by University of Alaska Fairbanks (UAF) receiving a $9.3 million grant from the US National Science Foundation in order to expand operations.

Program (HAARP) was built by the US military in the 1990s to conduct ionospheric research related to communications, navigation, surveillance and more. The high power transmitter beams up to 3.6 MW into the ionosphere to explore the national ionospheric processes. In May 2014 the military shut down the project before handing it over in 2015 to the university.

"We can actually look north several hundred miles from Alaska, and we can study the ocean," Program (UAF) Geophysical Institute Director Bob McCoy said. "We can measure sea ice, and we can look for aircraft or ships out in the Arctic Ocean. HAARP can transmit, say, to the north, reflect off the ionosphere down to the sea ice, and you pick up that signal again either with an antenna or a satellite."
(Source: Southgate Amateur Radio Club)

The HAARP antenna array. (University of Alaska Fairbanks)

The VK3AQZ HF antenna tuner project

Part 1 First article

Luigi Destefano VK3AQZ

Many HF antennae have limited bandwidth. A dipole cut for 80m might only work over 50 kHz before the VSWR rises above what most modern transceivers with 'SWR protection' will tolerate before reducing the power. This project enables you to cover more of a band and avoid the problem.

1. Introduction, the processor, and the L-network

1.1 Introduction

Some of my antennae have rather narrow bandwidths. For example, my 80/40 metre trapped-dipole has a bandwidth of only around 50 kHz. Outside that pass band, my rigs reduce their power output because of their internal SWR protection.

At present I only have the one antenna; so, to transmit on any of the other bands, I need an antenna tuning unit between the rig and the dipole. However, my current tuning unit is all manual with variable capacitors and a roller inductor. This means that whenever I want to shift inside a band, or move to another band, I need two hands on the tuner.

A processor-controlled tuning unit can memorise its settings and lets me move around the bands, at the push of a button. In this design I use an Arduino ATmega 2560 to enable parallel control of the variable inductor and capacitor. I use software to select up to four rigs and four antennae.

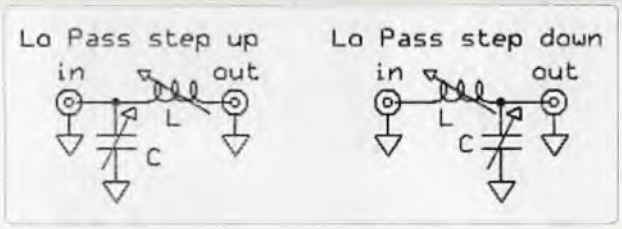


Figure A: Outline schematics of theoretical step-up and step-down L-networks [Ed]

This tuning unit is not automatic. It can be made automatic, but at present it is an L-network matching unit [so-called because its schematic is similar to an upside-down capital L- Ed] whose L and C values are adjusted using a processor controlled by a rotary encoder, a number of push buttons and switches, and memory-stored commands and values.

This project has these components:

- A processor-controlled L-network
- A remotely-controlled rig switch
- A remote antenna switch.

1.2 Block diagram

See **figure A** for a simplified block diagram. [Ed].

The tuning unit is in a homebrew aluminium cabinet. See **Photo A1**.

Photo A1: VK3AQZ tuner front panel

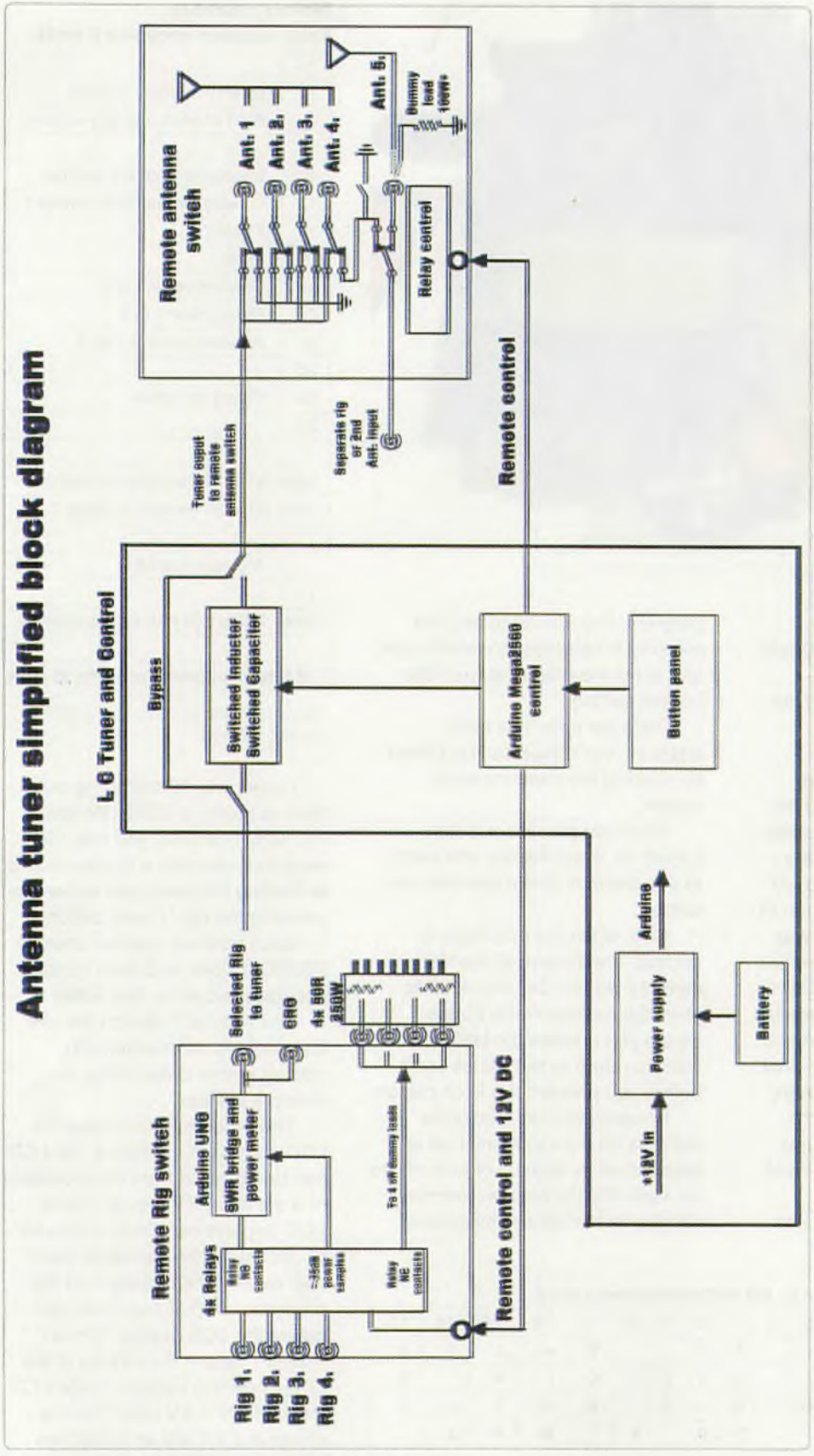


Figure 1: Antenna tuner simplified block diagram.

The tuning unit contains eight relay-switched coils in series, and eight relay-switched capacitors in shunt.

The capacitors can be switched across the transmitter side of the inductor or the antenna side. This allows the tuner to cope with loads greater or less than 50 Ω on the load (antenna) side (**see figure A** and **Bibliography**).

The tuning unit contains a processor to vary the inductance and capacitance of the L-network. A rotary encoder and several push buttons and switches control the processor. EEPROM memory stores the selected values for quick recall when changing bands and antennae.

The tuning unit does not automatically adjust for lowest SWR. It is just a processor-controlled switching unit. However, it is possible to add software to enable automatic tuning.

1.3 The processor

The processor is an Arduino ATmega 2560. See **figure 1** for the connections and controls. **Photo B1** shows the project prototype used for the development and programming. The tuner inductance and capacitance are varied by relays. These relays are controlled by the 2560 processor board. The 2560 is readily available on the web and in electronics shops. Cost starts at around $10 for clones.

By operating a momentary push button and rotating the encoder I can vary the L, C, memory

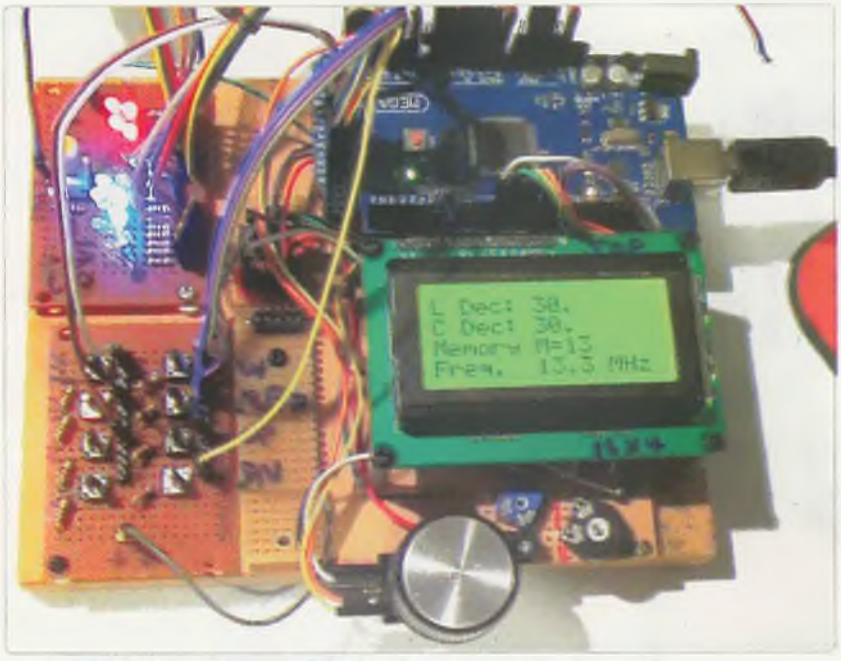


Photo B1: Tuner project out of the box for software development.

functions, remote control, etc.

I use toggle switches to bypass the unit, select L or C for one-handed adjustment, and latch the relays.

A 16x4 LCD displays the variables, such as the L, C, rig number, antenna number, and the frequency relevant to these values. See **Table 1** for the values in the rows and columns. The displayed frequency is purely an indication of the frequency the tuning unit was adjusted for. All of these values are stored in memory. The EEPROM in the processor provides the memory function. Up / Down push buttons select memory numbers, and what the LCD displays. In my program, the tuner does not switch to the displayed memory contents until you push the memory-read button, or turn the rotary encoder.

It is relatively easy to alter the program. You can go to another memory in readiness to switch over, and in the meantime, stay on the current settings.

Once the tuner has been adjusted, the values can be stored by pushing the memory-write button.

When the processor is first turned on, it will display and switch to the contents of the last memory written.

Also, when the processor is latched, it will return to the last memory written. So, you need to push the memory-write button before you operate the latch, if you want to return to the values used before you pressed the latch button.

However, you can modify the software to return a different set of values at either latch up or turn off and on. Generally the last used memory will also be the last one memorised.

Columns e.g. lcd.setCursor(column,row);																
ROWS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	L		D	e	c	:		6	1	.		V	e	r	3	3
1	C		D	e	c	:		2	3	7		C	i	n		0
2	M	=	2			R	I	G	=	1		A	N	T	=	1
3	F	r	e	q	.			2	9	.	3		M	H	z	

Table 1: VK3HOZ Antenna tuning unit 16x4 LCD display contents.

Memory number.
Each variable occupies 2 slots.

0	
1	Display memory number
5	Start of each memory address
10	L value for memory number 1
12	C value for memory number 1
14	FMHz
16	FkHz
18	Cswitch value 1 or 0
20	Rig number 1 to 4
22	Antenna number 1 to 4
23	
To	Empty for future
29	
Slots 30 to 49 memory number 2	
Slots 50 to 69 memory number 3	
↓	
↓	Memory 4 to 18
↓	
Slots 370 to 389 memory number 19	
19 total memories each with 20 slots	

Table 2: ATmega 2560 EEPROM memory usage.

I used only 19 memories but there is plenty of EEPROM space for more. However, you may then need to implement a quicker way of accessing the memories rather than pressing the Up / Down buttons.

Each memory number uses 20 EEPROM slots, and each variable occupies two slots. See **Table 2.**

The Arduino™ sketch file with the '.ino' file name extension contains more detail about the memory system.

The processor also feeds the LCD display. In my circuit, the LCD can be powered from the processor or a separate 5 V supply. Some LCD displays can draw quite a bit of current for the backlight; such may exceed the capability of the processor. In that case, you can power the LCD display from an external supply. Be mindful of the LCD operating voltage. Some LCD displays are 3.3 V only. The one I chose is a 5 V unit and matches the processor data voltages. The

cable connecting the LCD to the processor passes through a couple of toroids as suppressors. These chokes reduced the LCD scanning noise quite a bit - not entirely but enough to make the chokes worthwhile. I imagine better all-round shielding would have helped but because of the tight fit in the case, some unwanted signals get through to the receiver.

The processor board has 2.54 mm header sockets that can accept an ATmega 2560 'prototyping shield'. This is basically a PCB with lots of holes with header pins and sockets that mate with the sockets on the processor. See **Photo B2.** In my design, the shield contains boxed headers and terminals to connect the switches, LCD, input power and regulator, encoder signals etc. The header pins are wired with short thin insulated 'wire wrap' wire to the appropriate solder joints connecting the shield to the processor pins. The shield is a neat way of connecting to the processor. If you need to work on the shield, or replace the processor, it is just a matter of unplugging the shield. See **Photo B2** for the shield and **figure 2** for the shield wiring.

I use a computer connected to the USB port on the Arduino PCB to program the processor. The Arduino system uses a variant of the C and C++ language. A single program interface, an Integrated Development Environment (IDE) is available at no cost from the Arduino website. This IDE contains all the C compiling files and pre-processing, making its use quite simple. In this application you need some additional programs such as the encoder routine, LCD driver, and a special EEPROM handling routine to simplify the memory commands. The IDE adds these when the additional programs are put in a library sub-directory on the PC. My software files have the main '.ino' program, plus the additional files mentioned. You need to consult the Arduino instructions to add these files to your Arduino directory.

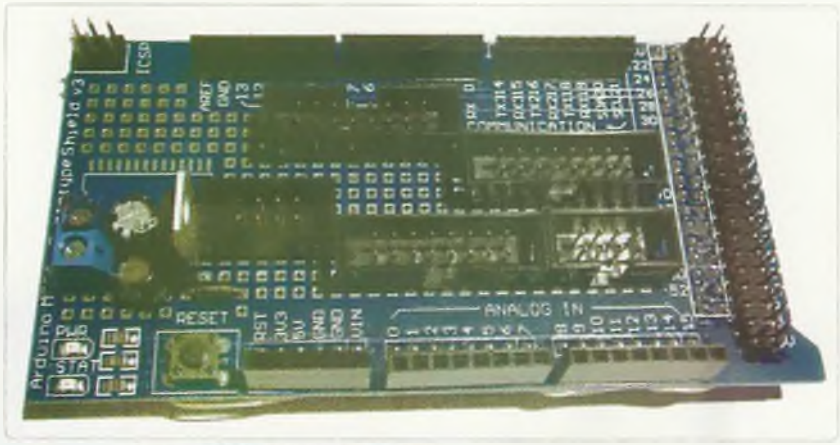


Photo B2: ATmega 2560 prototyping shield.

(See Bibliography)

The antenna tuner 'sketch' or program is titled 'AQZ Antenna tuner.ino'. It will be available for download. I wrote most of the tuner program from scratch. However, the rotary encoder file was written by others, and is open source. If you wish to modify the program, you need to be familiar with C. There are plenty of texts and help available that you can use to bone up on the C language. (See Bibliography)

I have documented much of the software to explain what the various program lines do. My programming skills are only basic and you will no doubt find quite a bit of my program can be improved or refined. As it stands, it works well enough but it is not perfect. When looking at the software, note the various pin declarations. See which pins act as inputs, and which as outputs. The processor inputs and outputs don't take too kindly to voltages higher that 5 V or shorts on the outputs. So I used resistors at inputs and outputs to reduce the stress on the processor in the event of a short or too high an input voltage.

In this design, the coils and capacitor values form a binary sequence. The first value is the smallest, and the next value is twice that. So each successive component has twice the value of the previous one. Each component is switched in or out of the circuit by a relay. The string of coils is the series arm of the L-network between the tuner input and output. When all the coils are shorted out, the input goes directly to the output. When the smallest coil is selected, the inductance is the value of the coil, plus the inductance of tracks and wires going to this coil. In this design, the smallest coil is 0.1 µH and the largest is 12.8 µH.

There are eight coils across the eight relay contacts. The processor connects to the relays via a latch IC, using eight pins that are part of an 8-bit port. I used processor Port C to vary the inductance using the pins, PC0 to PC7. These designations are shown on the data sheet for the Atmel ATmega 2560 data sheet. The data sheet shows which pins go to make up the 8-bit ports. The Atmel IC has around eleven 8-bit ports. When you study the data sheet and other documentation on the web, you can see how each pin is used. (See Bibliography)

Now the important thing about pins that go to make up a port is that a very simple command can activate, or do something, to all the pins in a port.

For example, the command, DDRC=B11111111; sets all the Port C pins as outputs. The next simple command, PORTC = byte(L); puts the decimal value of the variable L, as a binary 8-bit word, on the Port C output pins. This port register addressing is also quite fast. The variable L is a number that was derived by turning the encoder.

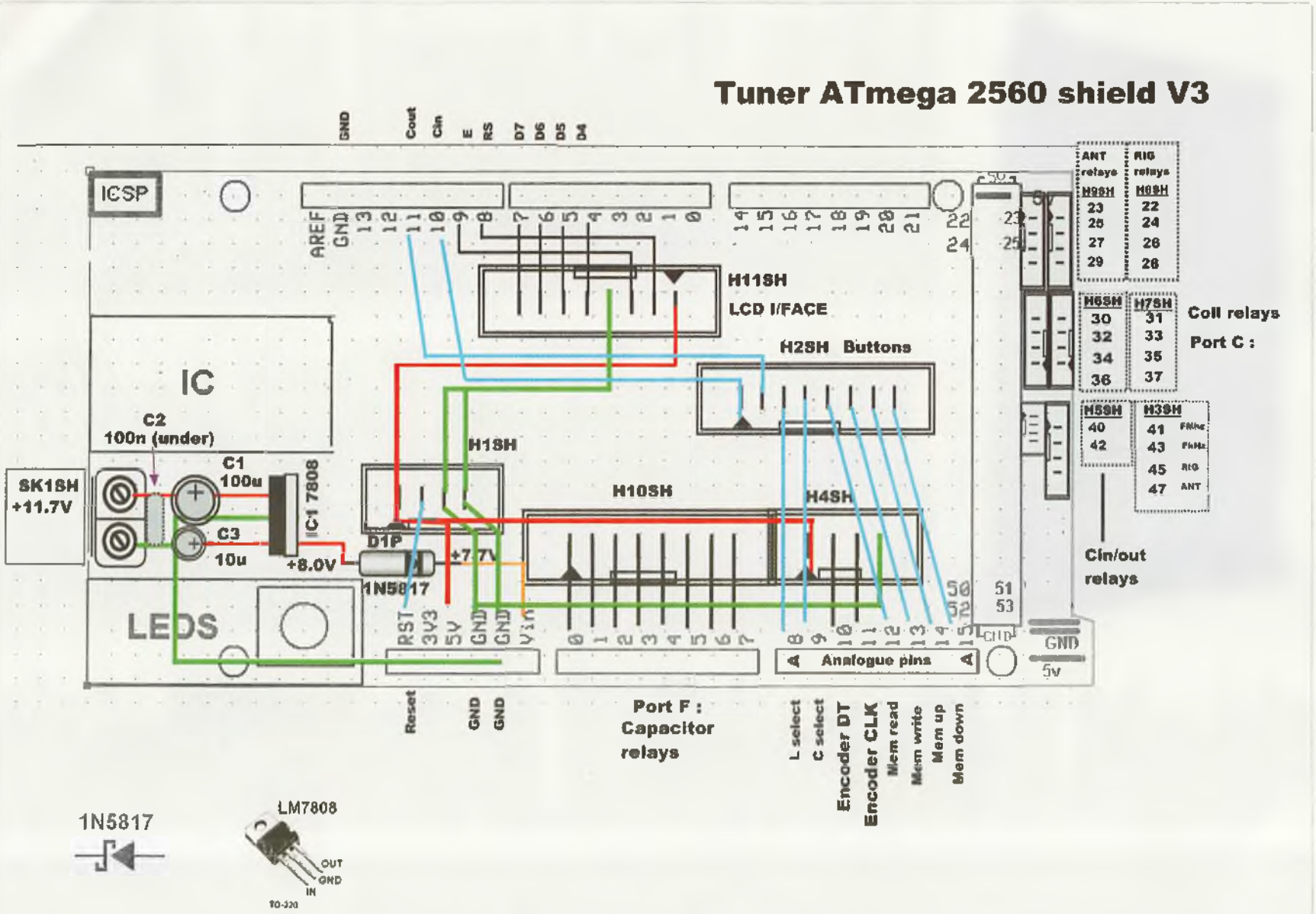


Figure 2: ATmega 2560 shield wiring.

Each encoder pulse increases or decreases the value of L by one. So, if L has the value 1, then binary 00000001 is output to Port C, and that means pin PC0 is now high and the others remain low. This high activates relay 1. When relay 1 is activated by output pin PC0 via the latch IC, the NC relay contacts open and the smallest coil is now in circuit. The other seven coils are still shorted out because pins PC1 to PC7 are still at logic zero.

One more example will illustrate how this binary command works. If the value of L is 3, then Port C has the binary word '00000011' fed to it and pins PC0 and PC1 now go high and that now places coil 1 (0.1 µH) and coil 2 (0.2 µH) in series, giving a total value of 0.3 µH. As L varies from 0 (no relay activated) to 255, the inductance varies from 0.1 µH up to a combined series value of 25.5 µH. That is a total of 255 values of L with a resolution of 0.1 µH. A binary value of 0 means there is no coil in the circuit. However, there is a small value of inductance still present because of the PCB tracks and other wiring. I don't know what that value is but it is the minimum value of L this tuner can achieve. So when the first coil of 0.1 µH is switched in, the actual value of L is higher than 0.1 µH because of the extra lead and PCB track inductance. The 0.1 µH coil is pretty small.

The same logic applies to the variable capacitor section of the tuner. The capacitor bank comprises eight capacitors ranging in value from 5 pF to 640 pF in a binary sequence. Again, eight relays are used to connect each capacitor to ground. The capacitors are in shunt across the tuner input or tuner output. A pair of relays switches the tuner string across the input or output. This allows the tuner to cope with loads greater or less than 50 Ω. The eight capacitors are switched in parallel by relays driven from the processor Port F, pins PF0 to PF7. So, if the value of C is 5, then Port F has the binary word '00000101'; so, pins PF0 and PF2 are set high. You can see how the port command simplifies the software to activate the relays. A single short line is all that is needed to produce any one of 255 values of L or C.

The LCD displays the code value of L. However, that is not the inductance in µH. It is simply a value between 0 and 255 representing an inductance change from no coil to 25.5 µH. It is not difficult to calculate the actual value of inductance using the binary value and adding up the values of L represented by the weight of each bit in the 8-bit word. For instance, if the binary value of L is 0001001, then the value of L is the sum of the first coil and the fourth coil, ie, 0.1 µH plus 0.8 µH = 0.9 µH. You could add some code to the software to give you the actual value of L if you need to know it. The same applies to the capacitor value. You will notice in the software that the LCD Print command will print the decimal value of L or C by default rather than the binary value (unless you specify the binary or HEX print command).

With the boxed headers on the shield, I use two pins for each signal. This improves the reliability and makes it a lot easier to lay out the PC board. Also, boxed headers tend to have double rows that make the connector more robust. Having used these types of headers, I think the polarised KF2510 type connectors are better, and will be my choice in future. Unfortunately, the Arduino uses Dupont connectors; so, you are stuck with them for part of the wiring.

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- For the Atmel data sheet, go to: *https://cdn.sparkfun.com/datasheets/Components/General%20IC/2549S.pdf*

Claude and Ralph got together with Brook and conjured a LoRax

Experiments with LoRa digital transmissions

Dale Hughes, VK1DSH and Dimitrios Tsifakis, VK2COW

This article describes some recent experiments using LoRa (1) devices to determine if the LoRa protocol might be useful for amateurs. Dimitrios, VK2COW and I undertook the experiments in early 2020.

What is LoRa? It is a low-power wide-area network communications protocol developed by Semtech for Internet of Things (IoT) (2) applications; the name LoRa comes from 'Long Range'. The protocol describes the physical layer of a network model; however, complete details of how the protocol actually works have not been made available by Semtech. What information is available has been obtained by studying and reverse engineering the transmitted and received signals and (importantly for amateur use) LoRa is not encrypted.

LoRa is clearly based on spread spectrum modulation techniques derived from chirp spread spectrum technology. The device specifications indicate that LoRa provides a sensitive and robust communications protocol, albeit with a relatively wide transmission bandwidth. The individual LoRa devices can be used as part of a network known as LoRaWAN (3); such networks are being used in industrial and community situations for telemetry, monitoring and remote control. LoRaWAN is encrypted and consequently is not directly suitable for amateur usage. There are two useful documents available from Semtech: *Application Note AN1022.22* and the *LoRa and LoRaWAN: Technical Overview* (4) that provide a lot of additional background on the LoRa protocol and its application.

We built several transceivers using readily available and inexpensive LoRa modules controlled by various Arduino microcontroller boards. The transceivers can be used for two-way keyboard-to-keyboard communication (a bit like RTTY), or as beacons. The LoRa devices we used for these experiments usually operate in the Australian 433.05–434.79 MHz LIPD frequency band (5), also known as an ISM band in some countries; however, they can be easily programmed to operate on other frequencies. So, we performed the experiments in the 70 cm amateur band but not in the LIPD frequency band; we chose a frequency of 432.8 MHz because the WIA band plan (6) currently assigns the 432.625 – 433.000 MHz frequency band for experimental applications. LoRa devices for other frequency ranges are also available.

One interesting aspect of LoRa is that it is an application of the Shannon–Hartley theorem (7) that predicts the maximum rate at which information can be transmitted in a specified bandwidth in the presence of noise. This application is counter-intuitive for most amateur communications; while most new amateur modes try to reduce the necessary bandwidth to a minimum by reducing the amount of information transmitted (eg, WSPR, FT-8), LoRa goes the other way and increases the necessary bandwidth to provide the required data rate in the presence of noise.

The Shannon–Hartley theorem can be stated mathematically as $C = B \log_2 (1 + S/N)$ where C = channel data rate (bit/s), B = channel bandwidth (Hz) and S/N = Signal to Noise Ratio (or SNR) expressed as a linear power ratio,

About LoRa and some mighty mathematicians

The 'long range' meant by the LoRa abbreviation refers to the ability of the technology to enable connection between devices up to 48 km apart in rural areas and to penetrate dense urban or deep indoor environments.

As outlined in the article, LoRa is an application of the Shannon–Hartley theorem, after mathematicians **Claude** Shannon and **Ralph** Hartley. This predicts the maximum rate at which information can be transmitted in a specified bandwidth when noise is present. (*https://en.wikipedia.org/wiki/Shannon–Hartley_theorem*)

As the authors explain, with a little algebra devised by **Brook** Taylor, you can calculate stuff about LoRa signals (*https://en.wikipedia.org/wiki/Taylor_series*).

Roger Harrison VK2ZRH

ie, not as decibels; eg, a S/N of 10 dB is expressed as 0.1. By way of an approximation, if we assume a noise level such that S/N is much less than 1, do some algebra and apply a Taylor's series expansion, the equation simplifies to C/B ≈ S/N or C≈ B * S/N, ie, the data rate is proportional to the bandwidth for a given low S/N ratio.We can confirm this by using the theorem to calculate the bandwidth required for a given theoretical data rate versus the S/N ratio. See Figure 1.

So, assuming a constant transmitter power, LoRa trades bandwidth for the ability to reliably operate at a specified data rate in a poor Signal-to-Noise environment. Because the bandwidth can be relatively wide at UHF, 'reasonable' data rates are possible, typically ~1 kbit/s using a bandwidth of 125 kHz. LoRa is not a high-speed mode but it is sensitive and robust when operating in a poor Signal-to-Noise environment. In fact, calculating the data rate is not straightforward because it depends on the bandwidth (BW), Spreading Factor (SF) and Forward Error Correction Coding Rate (FEC CR) options chosen for the link – and there are many options to choose from.

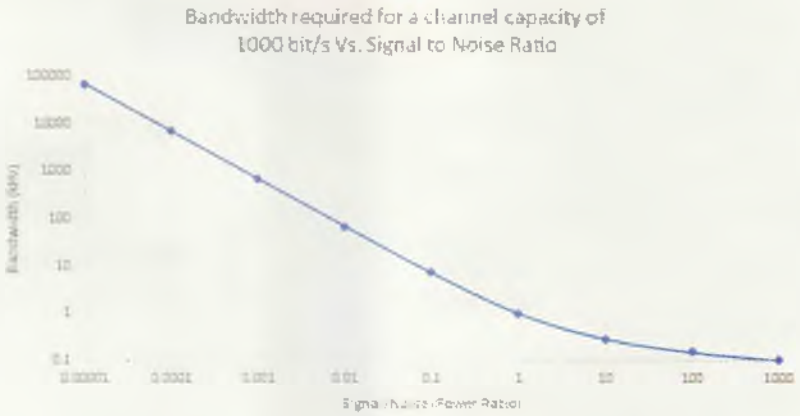

Figure 1: A plot of bandwidths calculated by the Shannon-Hartley theorem for a theoretical 1,000 bits/s link in the presence of noise. The bandwidth required for a given data rate is inversely related to the Signal to Noise Ratio (SNR) below about 1 (SNR = 0 dB). The chart shows that data at 1,000 bits could, theoretically, be transmitted in a bandwidth of about 100 kHz at a SNR of less than 0.01 (SNR = -20 dB) and this demonstrates the fundamental idea of the LoRa protocol.

Because of the nature of the protocol, a more useful indicator of performance is the 'Time-on-air' (the amount of time required to send a specified number of bytes); a useful LoRa calculator (8) can

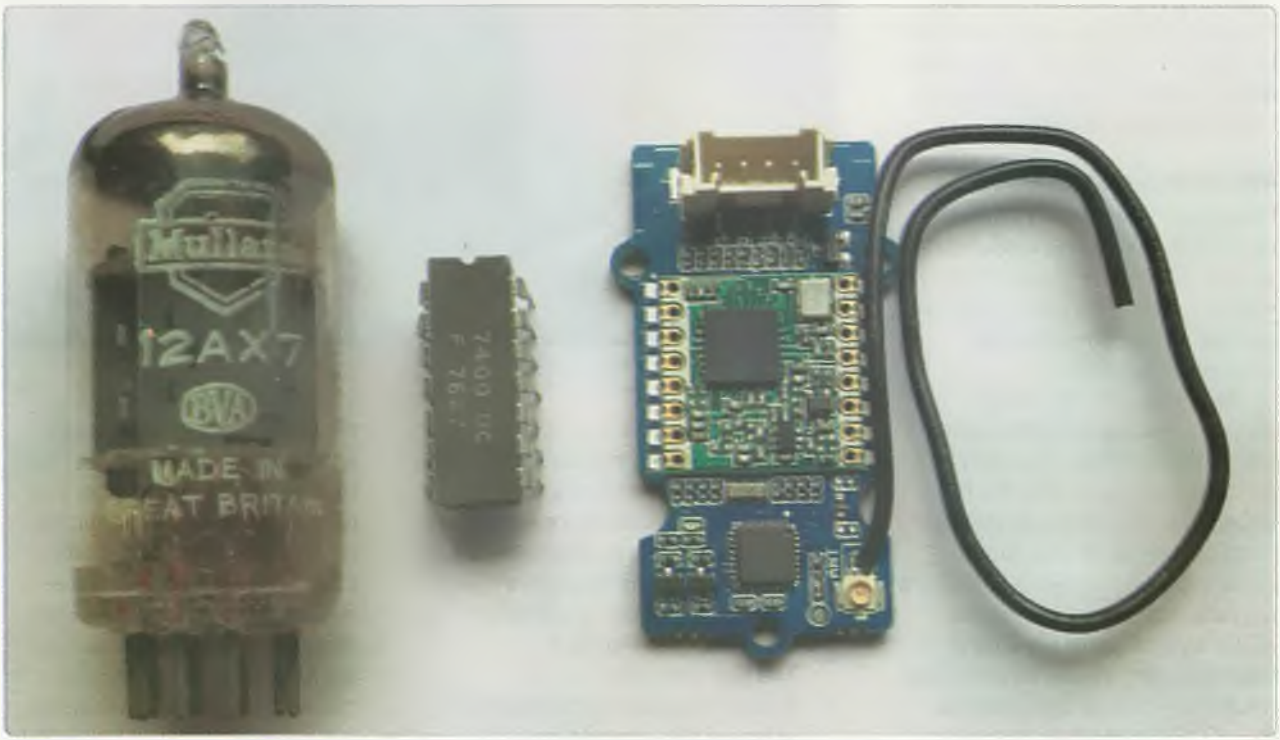

Figure 2: A LoRa module (right-hand side) shown alongside some antiquities of the electronic age for scale (both physical size and complexity). It's interesting to contemplate building a LoRa module using vacuum tubes or even TTL logic ... The wire extending to the right of the LoRa module is the supplied antenna. For use in the experiments described in this article, we removed the antenna wire and connected the antenna or amplifier to the small UFL connector at the bottom right of the LoRa module.

be downloaded from the Semtech website (click on Datasheets and Resources).The calculator lets you explore various options for BW, SF and CR for your particular application. Note however that some options require much greater frequency stability (including the use of TCXOs) and so may not work on the low-cost modules; we found this to be the case during our bench testing of the modules.

For the experiments we describe in this article, the chosen LoRa parameters were: BW = 125 kHz, SF = 2^7 = 128 and CR= 4/5. These parameters seemed to be a reasonable compromise and good general-purpose settings.

For amateurs, another advantage of LoRa is that the payload data packet is unstructured and can contain any bytes for any purpose; so, implementing a character-based keyboard-to-keyboard mode is simple. You can also easily implement such other applications as remote control, telemetry, and position reporting. The size of the payload packet can be from 1 to 256 bytes, depending on a number of setup options and software library limitations.

VK1DSH hardware

I purchased two Seeed Studio Grove 433 MHz LoRa modules (9) from the IOT Store (10) in Perth; Figure 2 shows the LoRa module against some once-common electronics devices.

The Seeed Studio Grove modules use the RFM95 module that is based on the Semtech SX1276 core containing the RF transceiver, frequency synthesiser and LoRa modem. The Grove LoRa module also has an on-board microcontroller that takes care of the various Serial Peripheral Interface (SPI), Digital Input/Output (DIO) and interrupt connections to the RFM95 module; so, you can connect the LoRa module directly to the serial port of the Arduino microprocessor. Doing this simplifies the software and

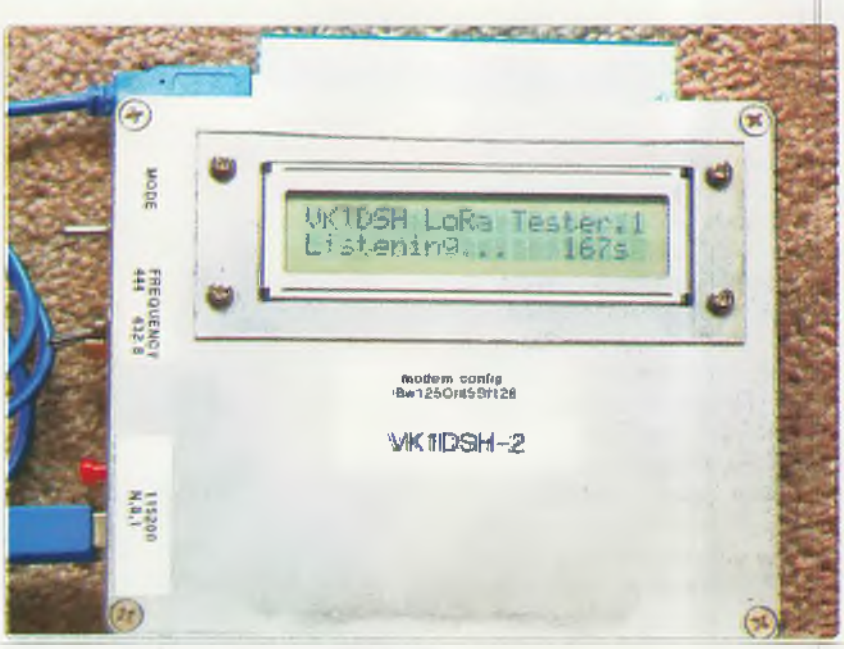

Figure 3a: The low-power beacon/test unit.

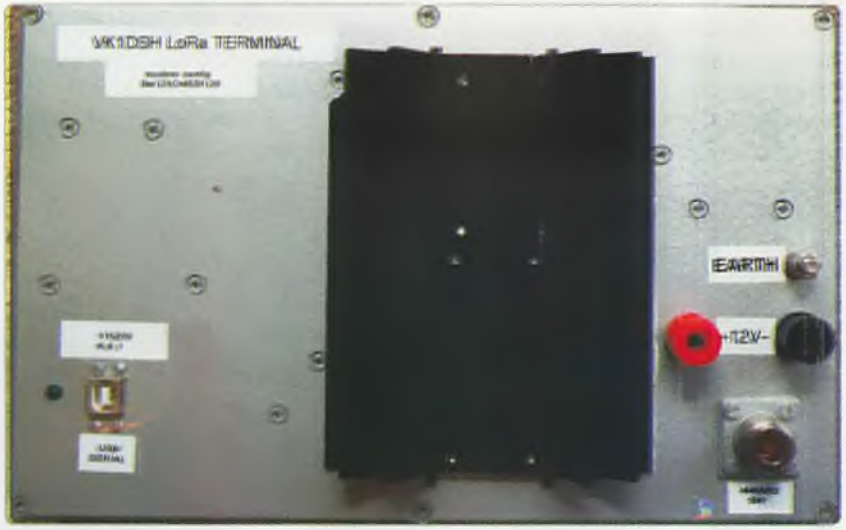

Figure 3b: The main transceiver.

hardware. While this is a very simple connection, the downside is that some of the functionality of the modem is lost; however, the important LoRa functionality is maintained. Using the Grove LoRa modules, I built two different transceivers - see Figure 3.

The two units are:

- A basic standalone transceiver using a LoRa module, an Arduino Uno and a liquid crystal display, which could act as a beacon or could 'echo' received data packets. This unit used the LoRa module without any additional amplification; so, the RF output power was about 50 mW. This transceiver could be powered by a 5 V USB battery pack; it has a reasonably low current consumption. The main purpose of the module was to act as a test unit for another more sophisticated transceiver.
- A more sophisticated transceiver with additional RF filtering, power amplification and an Arduino Mega module. The software for this unit provided

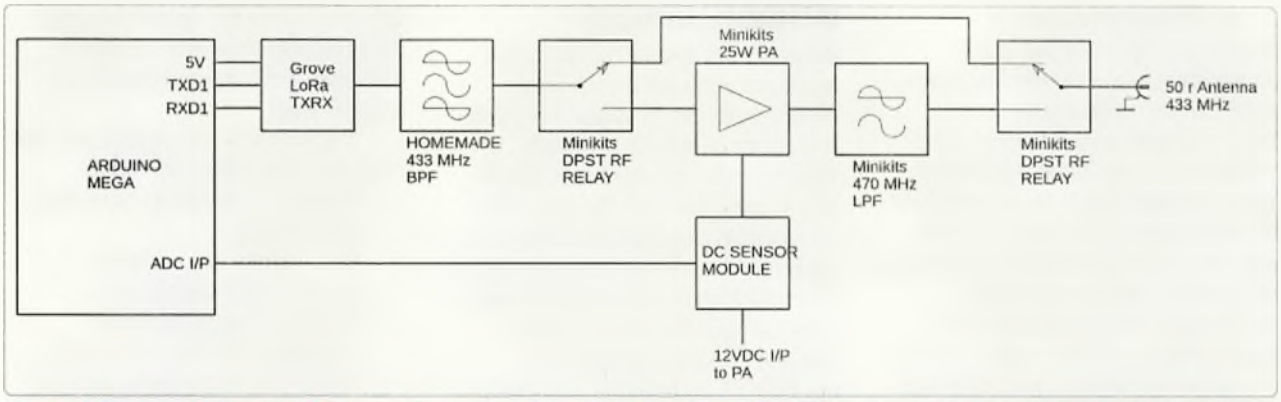

Figure 4: The block diagram of the main transceiver. I home-brewed the 433 MHz band-pass filter from two tuned circuits spaced slightly apart on a small piece of circuit board material.

many facilities for test and communication use that required the additional memory of an Arduino Mega module. This unit provided much greater communications capability because of its 25 W RF output and PC interface. Additional band-pass and low-pass filters, T/R switching, and power amplifier (PA) DC current measurement facilities made it a much more capable transceiver. This unit was powered from a 12 V_{DC} supply because the PA peak current consumption was about 7 A when running at full 25 W RF output; when transmitting I measured the PA current using a Jaycar DC current sensing module (11). I purchased the 70 cm power amplifier, LPF7-450M low-pass filter and HF353 RF relay kits from Minikits (12). Figure 4 is the block diagram of the transceiver with main modules shown.

I have not provided detailed schematic diagrams because you will want to make your own arrangements depending on your needs – see Figure 5 for the general construction of the transceiver.

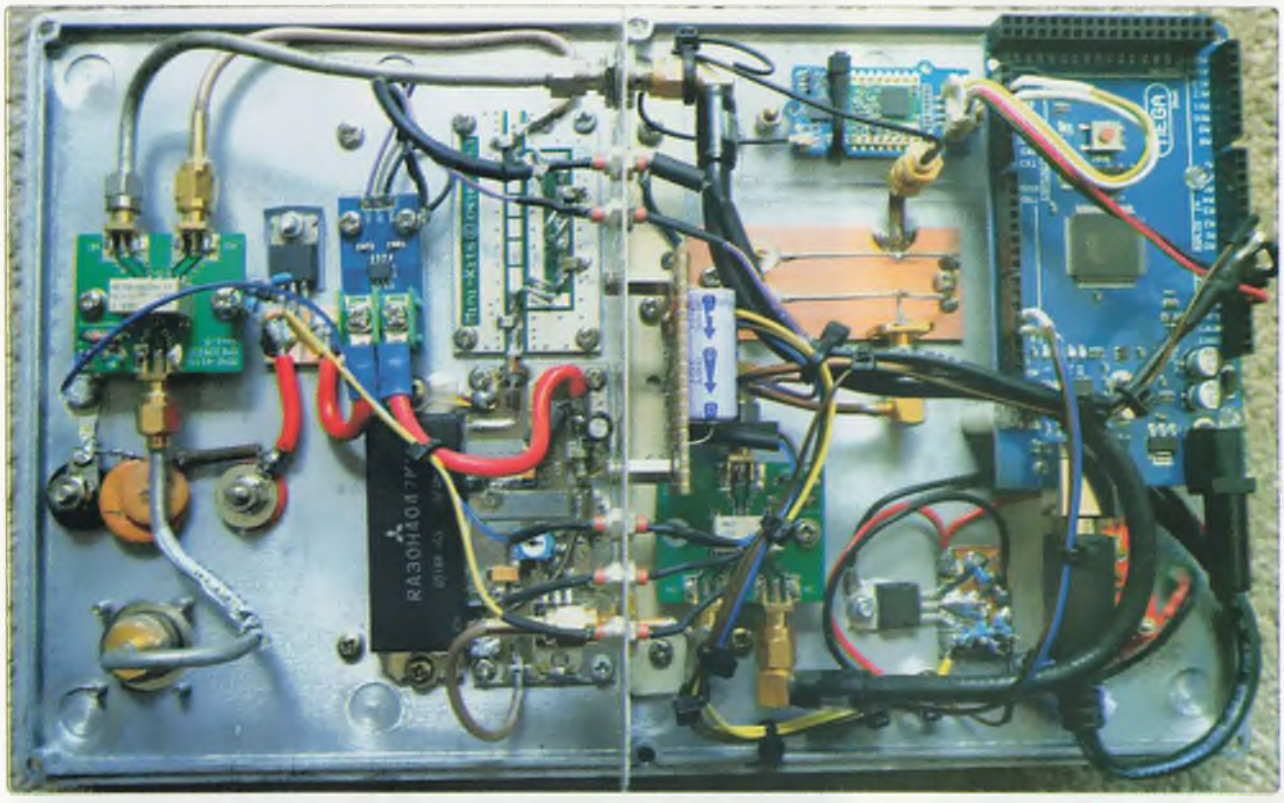

Figure 5: Internal construction of the high-power LoRa transceiver. The LoRa module, 433 MHz band-pass filter, Arduino Mega and RF relay are on the right-hand side; the RF PA, low-pass filter, RF antenna relay and amplifier DC current sensing module are on the left-hand side. The RF relays are fitted so that the antenna is connected to the LoRa module during receive; they also allow the LoRa module to be directly connected to the antenna if the PA stage is not required.

An interesting aspect of the project was measuring the transmitter output power because each packet transmission is very short, typically only a few hundred milliseconds; my usual transmitter power measuring device is a Bird 43 RF Wattmeter, and it did not work well with such short transmissions. My solution was to use a 50 Ω dummy load, diode detector and oscilloscope so that I could observe the packet envelope, and amplitude measured. The brief PA current pulse was easily measured with the current sensing module.The measured PA current is reported for each transmitted packet.

VK2COW hardware

Dimitrios, VK2COW used different modules; his implementation of the LoRa transceiver for amateur radio applications consisted of an Arduino Uno and two different Semtech SX1278-based modules. These modules have an advertised frequency range of 137 MHz to 525 MHz, covering two amateur bands. However, it is not advisable to operate LoRa on the 2m band because of the lack of appropriate spectrum in the band.

The first module was an AI Thinker RA02 (13) on a breakout board that Dimitrios purchased via eBay. There are at least two versions of this module on the market; the one that works best has all the DIO pins available for connection to the microcontroller. The advertised output power is 100 mW; the measured power (using a spectrum analyser) was close to that. It requires seven 5 V-compatible DIO and SPI pins for the communications; this is easily implemented on the Arduino platform.

The second module he used was an EBYTE E19 433M30S (14) that uses the same protocols to communicate with the microcontroller plus one extra IO line to change it from transmit to receive mode. The main difference is that this module produces 1 W of output power.

VK1DSH's software

Because the Seeed Studio LoRa modules use a serial interface, control software is straightforward. A number of different Arduino libraries exist; the library I used for this experiment was the RH_RF95 library (15) because that is the one used in the code examples provided on the Seeed Studio website. Note however that the various LoRa Arduino libraries appear to be not directly compatible with each other; so, using a single library among a group of experimenters may eliminate some difficult-to-diagnose problems. In particular, the RH_RF95 packet structure sets aside the first four bytes of the data packet for LoRaWAN network applications while some other LoRa libraries do not. For the experiments described here, I modified the RH_RF95 Arduino library to remove the unwanted 4-byte network header; that resolved one incompatibility issue we encountered during our experiments.

The software for the beacon/test unit provided these functions:

- Displays LoRa packets as they are received.
- Retransmits any received packets with appended Received Signal Strength Indication (RRSI); that is very useful for testing links between any two individual transceivers.
- Responds to 'ping' requests that were uniquely addressed to a particular transceiver. This would be useful if a network of LoRa devices were established.
- Frequency selection by means of a two-way switch that could select one of two pre-programed operating frequencies.

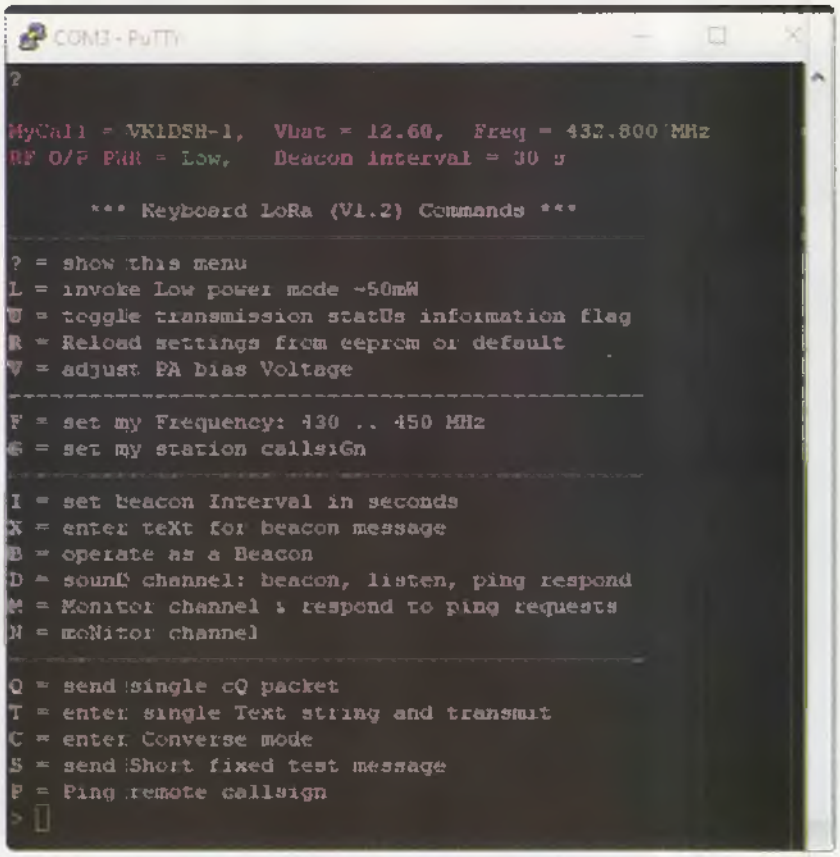

Figure 6: A screen capture of the LoRa transceiver main menu. All of the operational commands are shown here; configuration details such as transmission Bandwidth and Spreading Factor are configured in the Arduino sketch.

Software for the main transceiver unit is much more sophisticated; you can adjust many parameters and select from several test and operating functions via an attached serial terminal. I used a light-weight laptop PC as the serial terminal running the PuTTY (16) terminal emulator. See Figure 6.

VK2COW's software

Dimitrios developed his software in a different way; he used an Arduino library called RadioLib (17). He wrote a simple interface that let him receive and transmit using a serial connection between the Arduino and a PC running the Minicom (18) terminal emulator; however, any serial terminal emulator will work well. For this experiment I hard-coded the LoRa parameter configuration (including BW, SF, CR, preamble length), as well as the frequency of operation, in the Arduino sketch.

Some RF concerns and measurements

A local amateur expressed some concern that the LoRa modules were relatively 'dirty' and that spurious emissions might be a problem, especially if an amplifier were used to increase the RF output power. The limit for spurious emissions is given in our *Radiocommunications Licence Conditions (Amateur Licence) 2015 Determination (LCD)* (19); the relevant clause is:

7A Spurious emission limits for an amateur station

(1) The licensee must not operate an amateur station if the emissions of the station include spurious emissions that are not attenuated below the power of the wanted emission supplied to the antenna transmission line by:

(a) for frequencies less than 30 MHz — the lesser of:

(i) 43 + 10 log (PEP) dB; and

(ii) 50 dB; or

(b) for frequencies equal to or greater than 30MHz — the lesser of:

(i) 43 + 10 log (P) dB; and

(ii) 70dB.

To assess compliance with our licence conditions we made some measurements with the LoRa transmitter operating thus: 25 W O/P into a 50 Ω attenuator, a beacon every 5 s, LoRa packet length ~ 200 ms. Not having a suitable spectrum analyser,we used an IC-9700 receiver to observe the transmitter output via suitable attenuators. The receiver settings were: AGC=fast, preamp = off, mode=USB, FIL 2. With this configuration we found that the receiver did not suffer from gain compression and the front panel 'OVF' indicator did not come on, indicating that the receiver was operating in a linear manner. We used USB mode because it is more sensitive than FM.

Here is how we carried out the test:

- **Calibrate the IC-9700 S-meter** using a signal generator and appropriate attenuators. This showed that the IC-9700 S-meter readings from S9 to S9+60 dB were correct, ie, a 10 dB increase in signal strength corresponded to a 10 dB increase in the S-meter reading. Below S9, it appears that each S point corresponded to a ~2.5 dB signal strength increment. The IC-9700 is remarkably linear for signal levels from S9 to S9+60 dB and tracks the step attenuator increments precisely.
- **Tune the IC-9700 to 432.800 MHz**; with the LoRa transmitter connected to the IC-9700 receiver via fixed and step attenuators, adjust transmitter attenuation so that the IC-9700 S-meter reads as close to S9+60dB as possible (it was S9+64 in my case) on the LoRa beacon packets. This gave a linear measurement range of approximately 60 dB.
- **Tune, in small frequency increments, across the frequency band** 432.000 to 433.600 MHz and record the S-meter readings for several LoRa packets; determine average signal strength at each frequency. The frequency increment was 100 kHz, decreasing to 50 kHz across the 125 kHz transmission bandwidth. The measurement uncertainty for each S-meter reading was estimated to be ~2 dB.

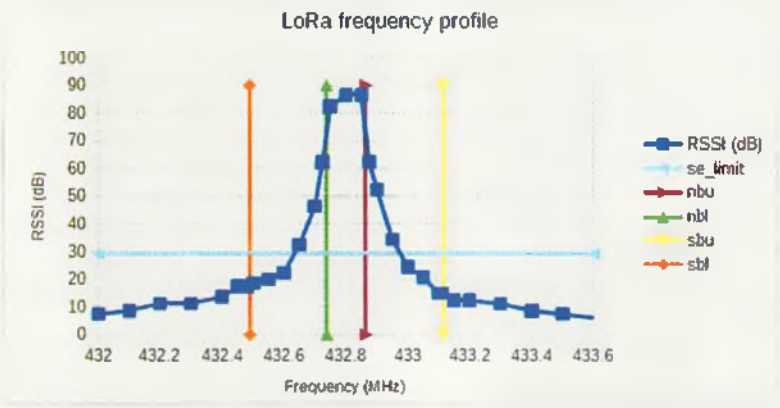

*Figure 7: Spurious emission measurements. The vertical lines indicate various domain boundaries: **nbu** and **nbl** are the upper and lower necessary bandwidth boundaries; **sbu** and **sbl** are the spurious domain boundaries beyond which the transmitter must comply with the licence condition limits given by the line **se_limit**. The transceiver exceeds the regulatory requirements with a margin of approximately 12dB and so, is acceptable for use on the 70 cm amateur band.*

- **Plot the frequency vs S-meter readings**, noting that values up to S9 are 2.5 dB/S-point, directly add the dB above S9 to get the signal strength, eg, S9 + 40 dB = 2.5*9 + 40 dB = 62.5dB.
- The spurious domain is defined in Appendix 3 of the *ITU Radio Regulations* (20) as 2.5 times the necessary bandwidth of the transmission from the transmission centre frequency. For the LoRa mode used in the transceiver, the necessary bandwidth is 125 kHz; so, the upper and lower boundaries are 432.8 +/- 2.5 * 0.125 MHz = 432.4875 and 433.1125 MHz. Beyond these boundaries, to comply with the LCD, the transmitter spurious emissions must be less than 43+10 log (Tx Power) = 57 dBC (dB below the carrier signal strength at 432.800 MHz). Measurements indicated that this was true, with a margin of about 12 dB. See Figure 7.

To assess the effect that LoRa transmissions might have on the reception of weak SSB and FM signals we performed a qualitative experiment:

- We combined an attenuated signal from a LoRa transmitter ('unwanted signal') on 432.800 MHz with a signal from an RF generator ('wanted signal') on 432.801 MHz in a 3 dB hybrid combiner. We connected the combined signals to the antenna input of the IC-9700 receiver tuned to 432.800 MHz with the receiver RF preamplifier off.
- We set the level of the wanted signal to S2 on the IC-9700 S-meter. We adjusted the unwanted signal level from less than S1 to more than S9+50 dB using a step attenuator.

While the unwanted LoRa signal could be heard as a brief burst of white noise, it did not, in general, adversely affect the wanted signal; and I suspect that if the wanted signal were a voice signal rather than a single tone, then the unwanted LoRa signal would not be noticed. The exception to this situation was that if the receiver was set to SSB and the AGC time constant was 'long', a very strong LoRa signal (S9+) could cause the receiver AGC to reduce the gain sufficiently to lose the wanted signal until the AGC system returned to normal operation. This problem was not apparent for any sort of FM signal. Shifting the LoRa signal off-frequency by 100 kHz eliminated the problem except for LoRa signals greater than S9.

These tests indicate that:

- spurious emissions from LoRa transmitters comply with the regulatory limits of our LCD
- co-channel operation of LoRa data, SSB voice and FM voice is possible *if necessary*, and any interference is brief and probably not noticeable under normal operating conditions, unless the LoRa signal is very strong.

However, it would be preferable to keep any LoRa transmissions away from weak-signal frequency ranges to avoid any interference problems.

Operational tests, results, and observations

We then undertook several one-way and two-way tests to determine how sensitive and useful the LoRa devices and protocols might be. One test involved driving around with a LoRa receiver in the car with a LoRa beacon operating at home. Over a number of tests, we found that packets could be easily received in an urban environment (Canberra) over at least a 17 km range; the main issues were typical topographical UHF propagation problems where signals can be lost because of obstructions.

A test with Dimitrios, VK2COW using the conversational keyboard-to-keyboard mode was undertaken over a ~30 km path from central Canberra to rural New South Wales. For this test, we used short Yagi antennas (6 and 7 elements) and the link worked perfectly, even at a power level of 50 mW; so, 25 W was not needed for the link. Signal strength indications given by the LoRa receiver showed that there was still a 30 dB margin; so, the distance between stations could be much greater. Figure 8 shows the path details.

Based on the tests and experiments described here, the LoRa protocol and low-cost modules can provide data links that operate over a useful range at a reasonable data rate. The LoRa modules are well documented and easy to use. There is also good software support that makes the module interesting for amateur experimentation, provided you take care to avoid interference to other band users. External amplifiers are not necessary, and if you do consider one, then it should only be a few W. While the units comply with our LCD, the spurious emissions are somewhat greater than a standard commercial amateur transceiver produces.

Possibly the biggest challenge for amateur use of LoRa is packet collision, because the LoRa packets may be inaudible in normal use; so, it is difficult to determine if a channel is in use. But because the transmission time is very short, usually less than 1 s, there might not be a problem for a number of simultaneous users.

While we carried out our experiments on 432.800 MHz, it might be better to find a small amount of spectrum away from the weak signal and FM segments for LoRa experiments.

Conclusions

LoRa is certainly an interesting and a potentially fruitful mode for amateur experimentation and investigation. With some further development of the user interface, some useful amateur applications could evolve. Dimitrios and I both enjoyed the development work and testing of the LoRa stations.

The Arduino source code used for the experiments is available for anyone interested.

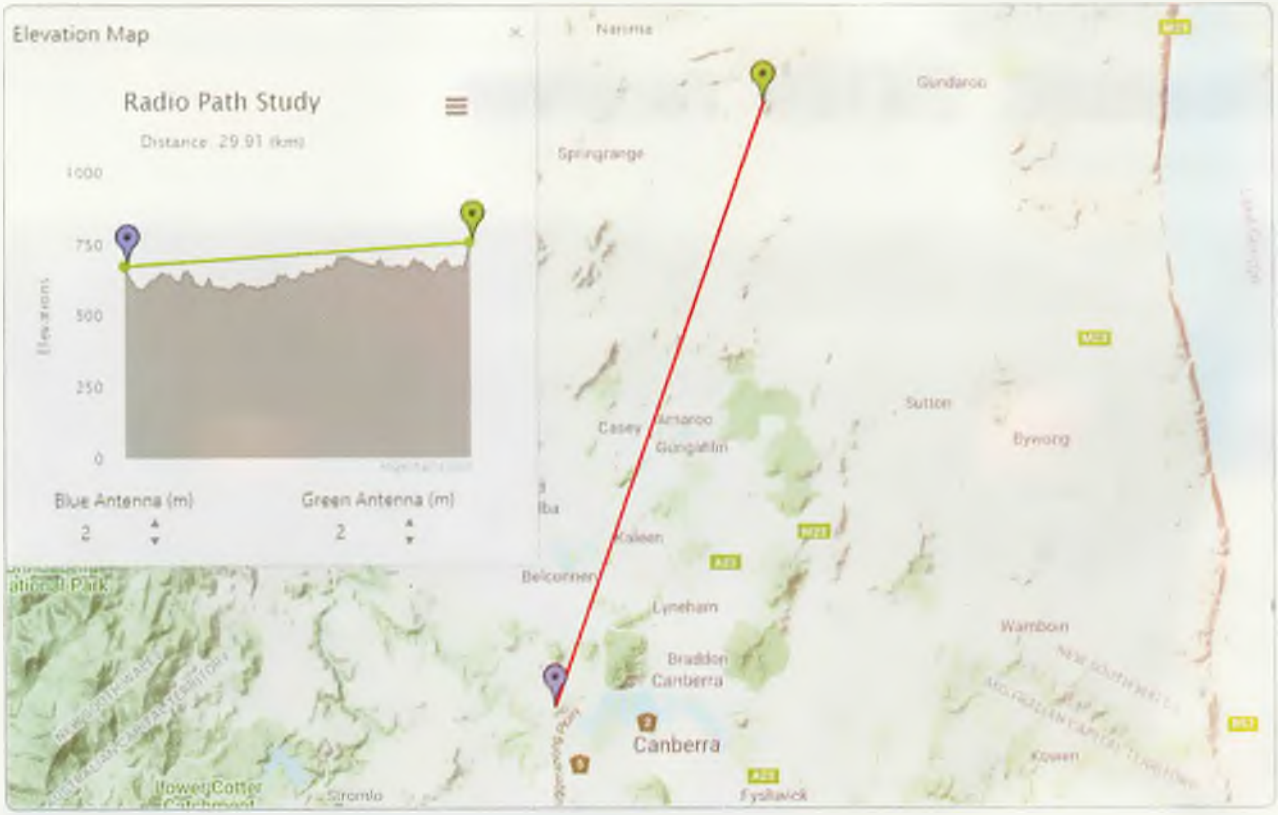

Figure 8: The path for the two-way LoRa test. The path and map were obtained using the RF line-of-sight application on the scadacore (21) website.

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RetroReview
Realistic DX160 receiver

Ray Robinson VK2NO

Photo 1: Front view.

Introduction

The Realistic DX160 is a short wave general coverage receiver, covering 150 kHz to 30 MHz. It is completely solid state and was made for Tandy in Japan in about 1975. It weighs 15 pounds and cost about $160 when purchased. It can run from 240 VAC or 12 VDC. This is a SWL receiver for first time users.

Mechanical design

The cabinet is made from pressed sheet steel which has been plated. The back has a thin wooden panel over it. Inside there are two main printed wiring boards (PWB). One PWB has the RF components on it, next to the tuning capacitor. The other PWB contains the IF and audio components. There is a ferrite rod for local reception, located along the back, behind the wooden panel. The dial stringing and scale pointer cords look complicated. The power transformer is located on the chassis corner. There is some corrosion near the transformer.

The front panel has a long linear dial across the front. There are five horizontal frequency scales, and one band-logging scale. They are different colours. There is a small diamond on each scale, at the amateur radio bands. When the main tuning is set to a diamond, the band spread tuning can be used, and is calibrated in frequency. When tuning the main control, ensure that the band spread is set to the extreme right hand end of the scale, so that the main frequency scale is correct. There are six band-spread scales, for 3.5, 7, 10, 14, 21 MHz and a CB band. There are other notations on the dial, denoting WWV, Aircraft, Maritime, and Government bands. There is a separate tuning capacitor for the band spread. At the left is the window for the band tuning scale. At the right is the S-Meter.

Below this are four small slide switches. At the left is the noise limiter (ANL) on and off switch. Next is the MODE switch that can select AM or SSB/CW. Next is the AVC on and off switch. At the right is the OPERATE switch which selects RECEIVE or STANDBY.

All the controls are along the bottom of the front panel. At the left is the Phones jack, and then the BANDSPREAD knob, which is a large knob. The next five knobs are small. There is the BFO pitch, the AF gain, the ANTENNA trimmer, the five-position BAND switch, and the RF gain knob. At the extreme right is the large MAIN TUNING knob.

On the back of the receiver, are three terminals for a balanced antenna and Earth. There is the mains entry cord and a fuse. Then there is a speaker output jack, and a 12 VDC input socket. At the end is a standby socket.

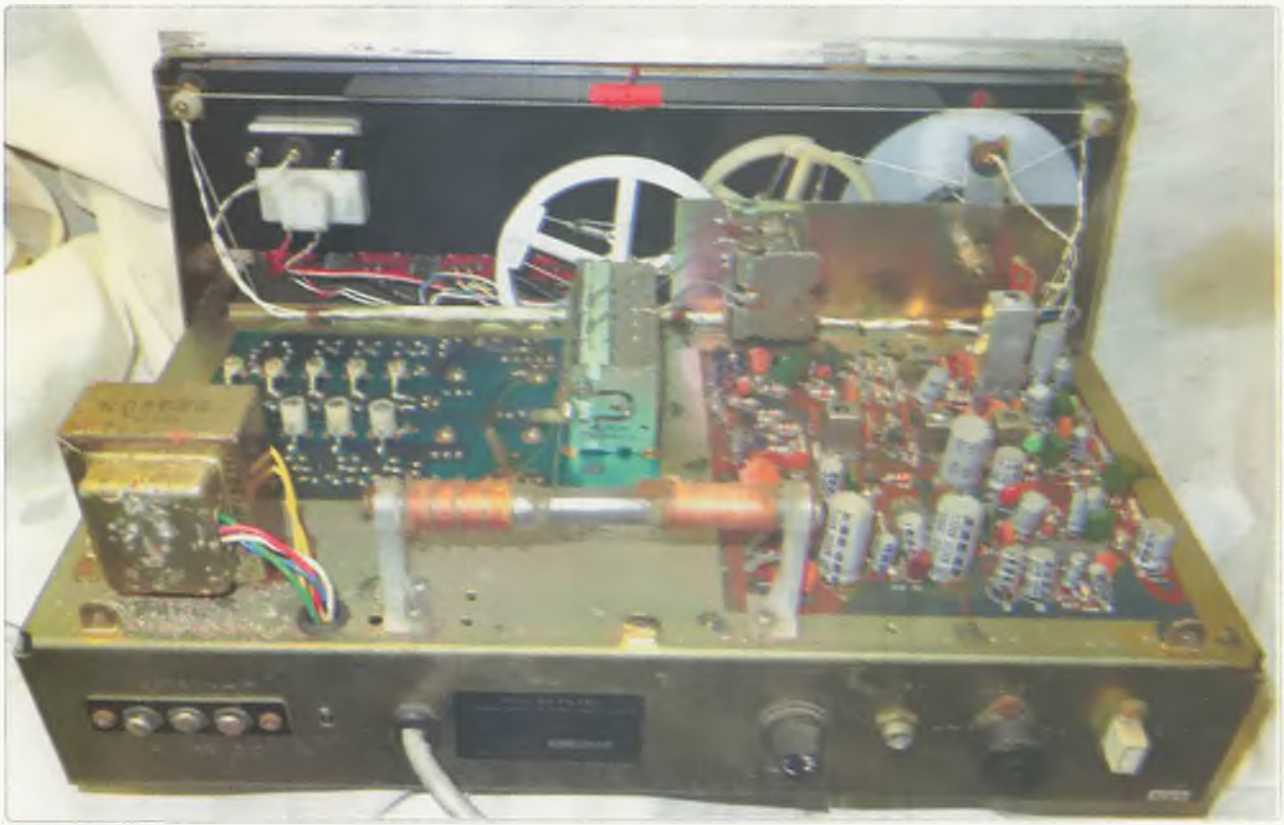


Photo 2: Internal view.

Electrical design

The radio uses one integrated circuit (IC), five field-effect transistors (FETs), six bipolar junction transistors (BJTs), and fifteen diodes, located on two PWBs.

The antenna uses a tuned RF transformer to connect to the RF amplifier. This uses a FET with a BJT in the drain to control the RF amplification. The RF gain control adjusts the amount of AVC going to this FET. Reducing the RF gain also reduces the antenna input. The SOURCE has a FET to connect it to the mixer, which is also a FET. The FET RF oscillator output is injected into the mixer drain. The mixer output goes to the IF amplifier.

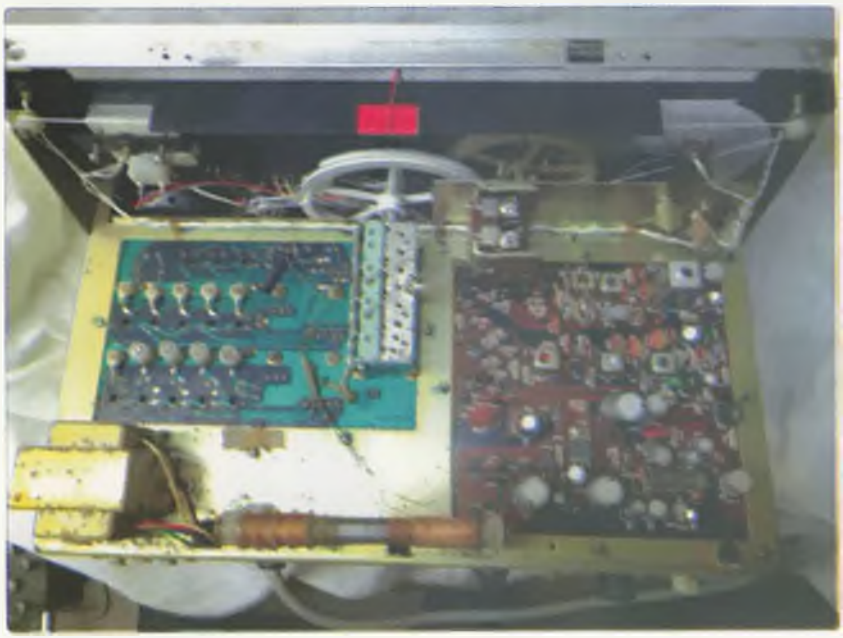


Photo 3: Top view.

The IF amplifier uses two BJTs, and a narrow filter. The first BJT has AVC on its base. The output drives the AM modulator and the AVC amplifier. When switched to SSB and CW, the BFO is turned on, and a balanced modulator is used. This is followed by a BJT amplifier.

There is an IC to drive the speaker and headphones. When switched to AM, the audio comes from a diode in the S-meter and Noise Limiter circuit.

The power supply has a mains transformer, and a diode full-wave rectifier, to produce 12 VDC. This is active all the time that the receiver is plugged into a mains supply.

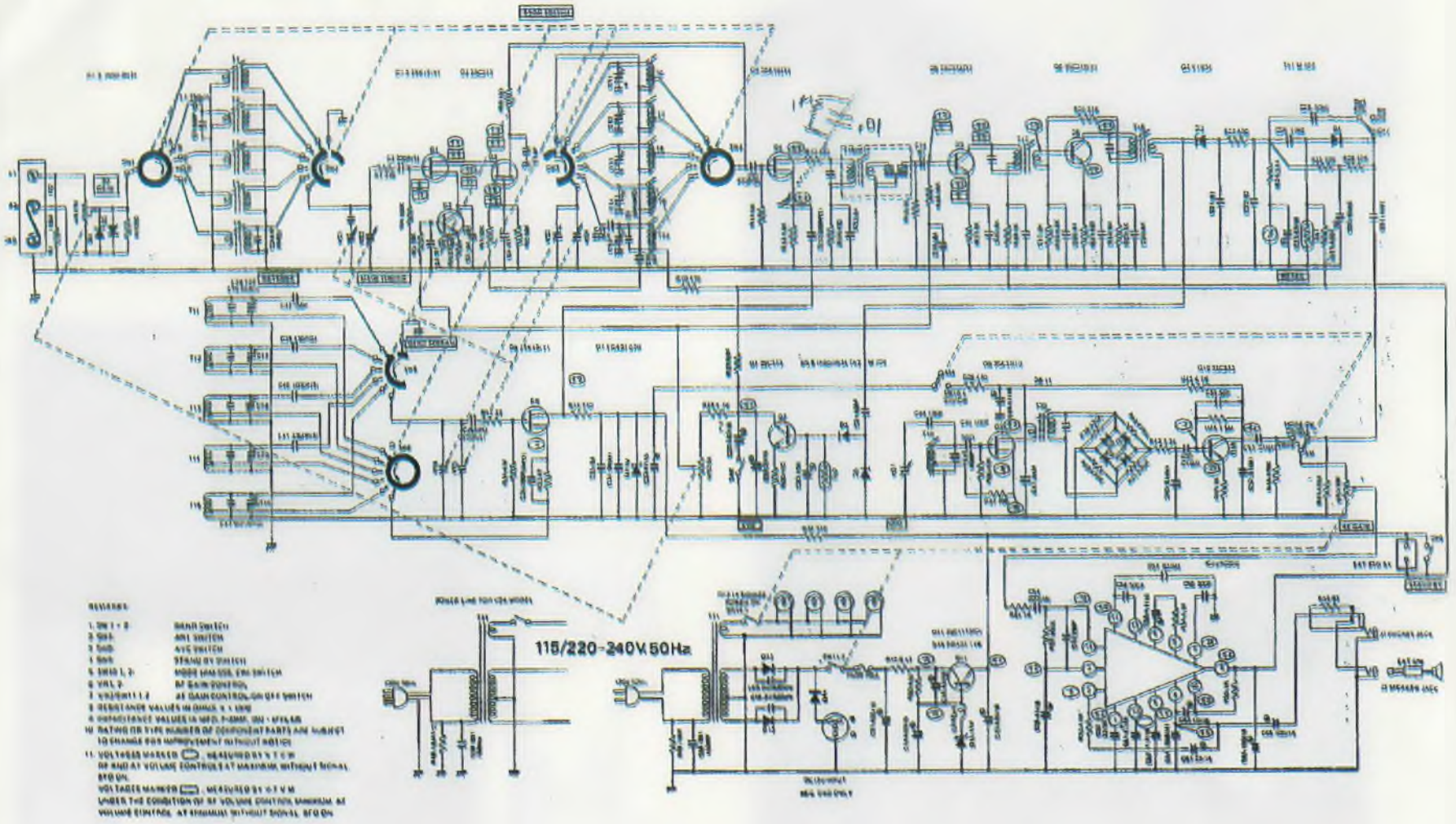


Figure 1. Circuit.

The 12 V external supply can be connected here. The AF gain control has two switches, one turns the DC on and off, and the other turns the AC operated dial lights on and off. The DC goes to a series regulator BJT, to supply regulated DC to the receiver.

Manual

The manual is intended for first time users. It explains the use of the receiver controls. It explains short wave propagation. It has explanations of various signals that may be heard, such as, Government, Aircraft and Maritime. It explains how to tune in CW and SSB stations. It has a list of Morse code signals. It has a list of overseas countries and short wave radio stations. It has a list of Code 10 signals, used by the Police and Fire authorities. It explains the 24-hour clock and World Time Zones. It explains how to convert frequency from MegaHertz to meters. It explains how to build an antenna.

Performance

This receiver works very well. For a 10 dB signal to noise ratio, the sensitivities are:

Photo 4: Speaker.

Band	Frequency range, Hz	Sensitivity, µV
A	150-400 k	0.7
B	535-1600 k	2
C	1.55-4.5 M	0.1
D	4.5-13 M	0.4
E	13-30 M	0.6

Conclusion

When I acquired this, I thought it was a low quality receiver. I powered it up, connected an aerial, and was surprised with the sensitivity. I tuned around a little, used the BFO to resolve some sideband signals, and used the band-spread control. It tuned very easily, the band spread making it better. The S-meter worked well. I expected it to be unstable, so I tuned in a CW signal, but it drifted from cold only a little. I guess there is nothing to heat up. As a further test, I banged the top of the case with my fist. It did not drift or shift off frequency. This was surprising.

It feels light and cheap, but appears to work well. I do not like the little plastic slide switches; they are stiff and seem flimsy. I would prefer toggle switches. The screen-printed labeling has worn off around the switches. The placement of the AF gain control and aerial trimmer are not where I would like them; I always have to search for them. The band-spread and main tuning are not precise. The external speaker is very loud. The rear wooden panel looks cheap, but this is necessary to allow the ferrite rod to work.

Summary

It is a good entry-level receiver.

Photo 6: Rear view.

The world of QSL management

Charles Wilmott, M0OXO

As is the norm, I think the role of the QSL manager is always a task that is available to any eager or new member of any radio club, as the experienced members soon find it to be a chore rather than a pleasure and are happy to pass the role on to others. After retiring from 25 years' service as a police officer in the UK, I found that I had much more spare time to devote to Amateur Radio.

I started the obsession of QSL manager back in 1998 when I was a young member of my local radio club. It began by processing QSL cards for the local club, then a few of its members, and then to other individuals outside of the club environment.

Initially, there was extraordinarily little support for a QSL manager and the software available at the time was of the type only available packaged with the major amateur radio logging programs. The applications were extremely limited in what they offered and at that stage the basic 'one QSO per label' was about all most programs could manage, so along with the occasional handwriting of QSL cards, this was the main tool available. This, however, was still a good step forward and felt that I was heading in the right direction. QSL management was indeed a chore at that time of my life, and certainly working in my former occupation at the time.

After finding my feet and steadily improving my facilities at home, I was approached by a great guy (and mentor) Neville, G3NUG (SK). Neville was the team leader of the Five Star DX Association's (FSDXA) 2013 T32C DXpedition to St Christmas Island (East Kiribati), and he asked if I would be part of the QSL team. Apprehensive at what was going to be a huge job with a log of almost 214,000 QSOs, I tentatively agreed to help and to be a part of what would be my first taste of 'real' QSL management for a 'real' DXpedition team.

Back in 2013, that team was using logging software by the name of Star Software, developed by John Linford, G3WGV (*ww.g3wgv.com, www.qsl.net/vk9ml/2002/equipment.htm#logging*). Star Software consists of a central server (StarServer), which can be duplicated for resilience, together with a wide range of clients that between them provide complete DXpedition management 'from the first QSO to the last QSL'.

StarLog is the workhorse of the software suite. It was the way that literally hundreds of thousands of QSOs could be quickly, safely, and efficiently logged. StarLog could be used in a standalone configuration, or it could be networked via StarServer with up to 99 other logging stations located anywhere in the world. The ability to network using the Internet made it easy to train operators before they arrived at the DXpedition site and doubled as software for the QSL process. This was a huge leap forward in DXpedition management.

The StarQSL software was installed on individual computers at home QTHs, and dedicated printers were supplied as we were printing 'direct to card' without the use of labels. Not long after this, the first of several huge sacks arrived at my door. I had personally dealt with the direct QSLs from Japan before taking on the entire QSL work for T32C in the following years. The QSL management for T32C went faultlessly thanks to the efficiency of the software we used.

In the years that followed, I took on many other DXpeditions, IOTA activations, as well as individual radio amateurs that found they could not be successful in amateur radio DXpeditioning and successfully manage QSL management after the event. I like to help these people. These are genuine, hardworking people who put a lot back into amateur radio. Having QSL management hanging over them like the 'Sword of Damocles' is no solution to dealing with this matter at the end of an operation. I am always incredibly happy to help them out and to provide them with a good QSL service.

One of my first major clients was Robert, 3B9FR. There cannot be many serious DXers who did not work Robert on Rodrigues Island as he was the only licensed amateur radio operator on this DXCC and IOTA listed location. Robert had previously had some issues with other QSL managers and was looking for help. Again, Neville, G3NUG (SK) had already met Robert when the FSDXA did its 2004 DXpedition to Rodrigues Island, so he told me what to expect and of course I spoke to Robert who, at that time, was still using a paper logging system. Robert was very active! He was on the air every single time I looked at the DX cluster and every few days he would send me paper log extracts with 500-2000 QSOs several times each week.

I would receive his logs, type them into my PC logging software, which could easily take a full day at least, and sometimes not be completed before his next consignment of logs arrived. After several months (and manually adding over 100,000 QSOs from paper logbooks to my PC Log) I could not cope anymore, and I was finding the work impossible to complete in a timely manner. I approached Robert about using a

Figure 1: OQRS Log Search.

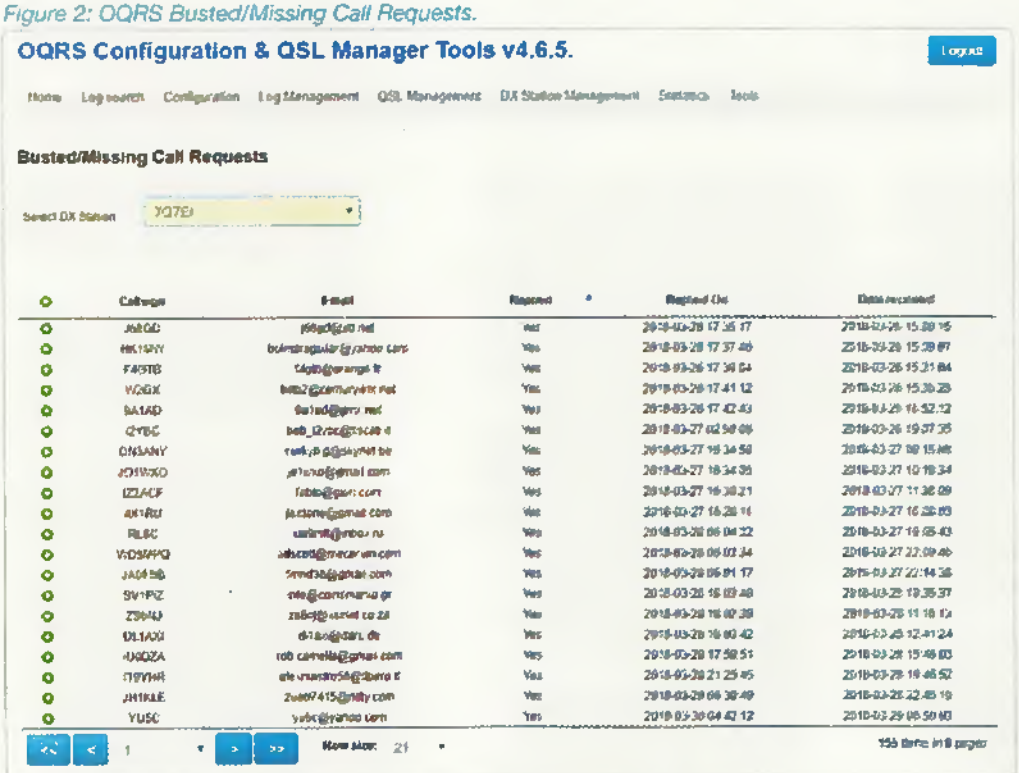
PC logging application at his QTH on Rodrigues Island. He was not too keen at first; however, eventually he started to use a basic system and life again was manageable. Of course, we had a few logs that went wrong or got deleted but overall, the system was working well after about 12 months. When the HF bands were in good shape, Robert would do several thousand QSOs each week. He barely slept and must have been one of the most active radio amateurs on the bands. Sadly, Robert decided to pull the plug and went permanently QRT in 2019. (I am hopeful he will one day return to amateur radio, if only to furnish new guys and girls in the amateur radio service with information about his time as 3B9FR.)

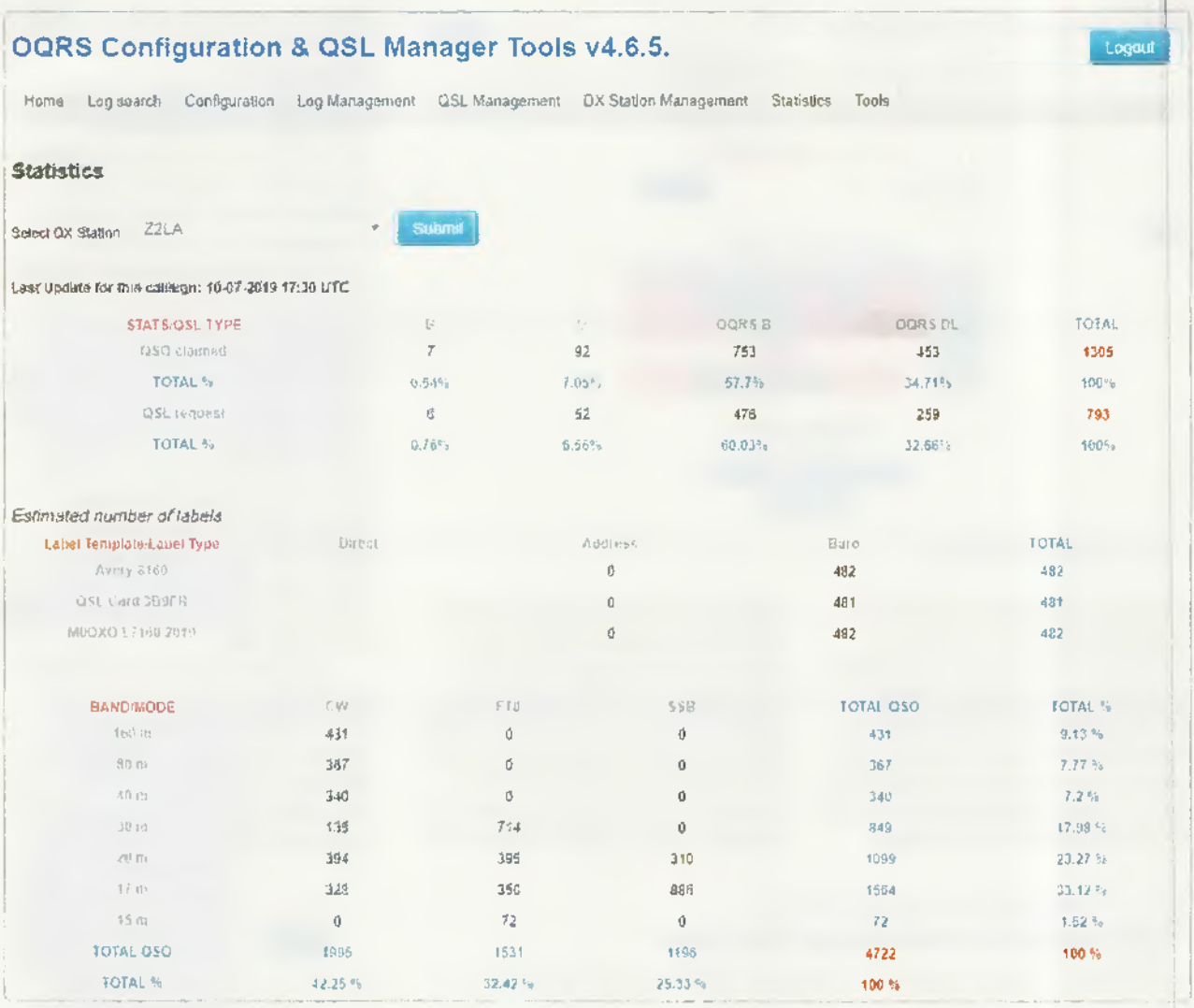
In 2007-2008, Clublog (clublog.org/loginform.php) started to become a feature in amateur radio and by 2010 I started to use its software to make the whole QSL management process efficient. Although Clublog was amazing and a huge leap forward, it still did not give me all the tools I needed as a QSL manager to continue to be efficient. DXpedition teams were still using a range of methods to provide a QSL service and improvements were still needed. I must add here that both Michael, G7VJR and Marios, 5B4WN were extremely helpful with the Clublog support they could offer. Sadly however, I needed a solution swiftly and had to look elsewhere.

I tried the software still available by DF3CB for a time, but in 2014 Pista, HA5AO and Gene, K5GS began discussing an OQRS/QSL Management Platform (Online QSL Requests (OQRS)) (*clublog.freshdesk.com/support/solutions/articles/54921-oqrs-online-qsl-requests*) specifically designed for the QSL manager. The complexities of handling tens of thousands of QSL cards, emails, 'Not In Log/Busted Call' enquiries, returned post mail, and a host of other tasks that had been performed manually for so many years, had to change. In 2015, the TX3X DXpedition started a unique partnership with both Tim, M0URX and me, Charles, M0OXO.

We began to use a platform with features that would drastically reduce the amount of time we were spending on

Figure 2: OQRS Busted/Missing Call Requests.





OQRS Configuration & QSL Manager Tools v4.6.5.

Logout

Home | Log search | Configuration | Log Management | QSL Management | DX Station Management | Statistics | Tools

Statistics

Select DX Station: Z2LA — Submit

Last Update for this callsign: 10-07-2019 17:30 UTC

STATS/QSL TYPE	E	[illegible]	OQRS B	OQRS DL	TOTAL
QSO claimed	7	92	753	453	1305
TOTAL %	0.54%	7.05%	57.7%	34.71%	100%
QSL request	6	52	476	259	793
TOTAL %	0.76%	6.56%	60.03%	32.66%	100%

Estimated number of labels

Label Template-Label Type	Direct	Address	Euro	TOTAL
Avery 3160		0	482	482
QSL Card 3697 R		0	481	481
MOOXO 17160 2019		0	482	482

BAND/MODE	CW	FT8	SSB	TOTAL QSO	TOTAL %
160 m	431	0	0	431	9.13 %
80 m	367	0	0	367	7.77 %
40 m	340	0	0	340	7.2 %
30 m	135	714	0	849	17.98 %
20 m	394	395	310	1099	23.27 %
17 m	328	350	886	1564	33.12 %
15 m	0	72	0	72	1.52 %
TOTAL QSO	1996	1531	1196	4722	100 %
TOTAL %	42.25 %	32.42 %	25.33 %	100 %	

Figure 3. OQRS Statistics.

QSL management. As features were added, we were managing the QSLs for millions of QSOs, all spinning around in 'the Cloud'. Both Tim and I could access each other's logs when necessary and I could handle, and most importantly access, them from anywhere in the world. For example, Busted and Missing Calls can be dealt with in North America and New Zealand whilst QSL labels and cards can be printed in the UK, making special benefit of a reduced-cost postal system that we use.

Other features include pre-donations, which triggers a free QSL card system and/or an early Logbook of the World (LOTW)(*www.arrl.org/logbook-of-the-world*)

upload. We also have a fantastic tool for dealing with Missing or Busted Calls. When DXers cannot find their call in the system, they will complete an integrated form that is sent to the QSL manager's work queue. Only one form is accepted per callsign thus eliminating repetitive requests to research the same missing QSO over and again from the same individual, and of course the resulting and depressing email queue every morning.

Included in our system is:

- Audit/verification processes, especially for donor management.
- Security and database/log backup facilities to ensure integrity and preservation.
- Search results displaying status for QSL, LOTW, print queue and QSL received/sent status and dates.
- Detailed statistics for duplicates (callsign of operator and how many duplicates are made), operator, country, band, mode, et al.

We also have the now familiar OQRS bureau card request function, eliminating the need for DXers to send us their cards via the QSL Bureau network, saving more time, cost, and paper. Even though we still accept QSL Bureau cards, I am sure everyone knows we do not need or want your card via the Bureau; they all end up in the recycle bin, which is a waste of

everyone's money. To be clear, we (and most DXpeditions) do provide free Bureau cards, but we prefer you to use OQRS to request it.

We can also use product features to determine: donations; print label customisation; QSL manager information; logsearch criteria; PayPal integration; and more.

Recent operations using this system have been FW5JG, 5V7EI, 7P8LB, 7Q7EI, J79U, 9N7EI, A25UK, 6O60, T88KO, 9G2DX, 3C7A, D44TWO, XT2AW, KP4/EI9FBB, DU1UD/8, 4E8T, J79TA, TN5E, YJ0AG, Z2LA, Z6/EI5GM, ZL7DX, et al.

This system has dramatically reduced our workload by at least 50% and I encourage any DXpedition team or DX operators who need a QSL manager to contact me and discuss options.

I think the future (certainly in the short term) of the traditional paper QSL card is still secure and the demand for cards is high. LOTW, Clublog/IOTA matching and indeed the COVID-19 pandemic have certainly had an impact on this; however, as we embrace change in amateur radio, I do not see any major changes on the horizon in this regard.

Of course, as you read this, many will be aware that the Intrepid DX Club announced me as its QSL manager for the planned 3Y0J DXpedition to Bouvet in January 2023. At number two in most wanted countries lists, this will be the biggest DXpedition I have dealt with to date and I am really looking forward to the challenge.

The 3B7C DXpedition gave me not only the break I needed, but

it also made me aware that this was indeed a role I would like to continue with in the amateur radio service. Without the mentoring and support of Neville, G3NUG (SK), maybe I would not be in the position that I currently hold, and without doubt I will always be indebted to Neville as indeed I am to my XYL Debbie for her continued support. QSL management for me is now a full-time job that I love, and I see no reason to change that.

The M0OXO QSL Management Database (*www.m0oxo.com*) currently hosts over 600 separate logbooks, containing just under five million QSOs.

Charles, M0OXO, was born in the 1960s and has lived all of his life in the coal mining town of Barnsley in South Yorkshire, Northern England. His parents were all from this area of Yorkshire and his father worked in the main local industry as a face worker in the collieries. He has been married to wife Debbie for 35+ years and they have two children, and two grandchildren.

Charles has been licensed for some 20 years after his interest was re-kindled when he retired from his role as a police officer with the South Yorkshire Police Force. The latter few years were spent as a radio operator in the Force Operations Control Room at Sheffield before his retirement.

IOTA chasing is (and always has been) his real passion, as climbing the ladder to reach Honour Roll status was always his main aim. The 1000 Islands Trophy is still out of his reach; however, he is heading in the right direction to achieve this. He is currently a board member of Islands On The Air Ltd and the Island Radio Expedition Foundation.

In his free time, he is a keen photographer of wildlife, aviation, (anything really) but the QSL manager role is his main passion within the amateur radio service.

Memories

Gene Smar, AD3F

Today is the 55th anniversary of my first QSO. I was 14 at the time.

It was Easter Monday 1966 and I had spent all weekend trying to get a silly antenna from Pop Electronics working on 80 and 40 m. The antenna was two sections of EMT mechanically coupled together (that was the first problem) and then connecting to two sets of guy wires at the top that were supposed to bring the array into resonance on 80 and 40 m. I think I used a Coke bottle (remember them?) as a base insulator but used a heavy cardboard mailing tube to 'insulate' the first couple of feet of EMT from the mounting bracket that was lag bolted into the back yard wooden fence. I tried to solder the coax center conductor to the base of the EMT (second big problem.) I also bolted the twisted coax shield to an aluminum clothes line prop (not sure how many of you even know what that is) that I had 'borrowed' from my mother and driven into the dirt inside of the Coke bottle.

I won't bore you with details of my first two pages of logbook entries. Suffice it to say that they were filled with identical entries of 'CQ' followed by 'NO QSO', all on the same 7 MHz freq of my sole 40 m Novice band crystal.

On that Monday morning (a school holiday) I decided to reconfigure the antenna materials into a single 40 m dipole. As our house lot was about 70 feet deep, it fit perfectly North-to-South. I used the EMT to support the 'hot' end of the dipole but the shield-connected end of the insulated house wire had to touch the peak of the roof and lie on the asphalt shingles.

This is important.

I managed to jump the four feet off the roof onto the front porch roof and into my bedroom window safely and ran down to the kitchen where I had set up my Knight-Kit T-60/R55A station. I tuned up the T-60 (no SWR bridge yet so I was hoping I could get the thing to load properly) and started to call 'CQ' again. In between transmit attempts I tuned around my crystal freq with the R-55A, listening for replies.

After the third 'CQ' (I logged every one of them), I heard my callsign coming back to me. Due to my excitement I missed the callsign of the other station so I sent 'QRZ?' (not bad for a Novice!) and heard my callsign coming back again. This time I heard 'DE VE2AOU K.' I am quite sure I stopped breathing for a few seconds before I shouted, to anyone and to no one in particular, "I'M TALKING TO CANADA!"

I continued with the QSO, shakily copying what information I could from this obviously experienced and kind foreign Ham who deigned to talk with an American Novice and sent him my street address and town so I could make it easier for him to send his QSL card. (*QRZ.COM* was just a glimmer in N7IKQ's eyes at the time, I'm quite sure. And the Callbook was something I'd have to save up for for quite a long time.)

Remember that wire draped over our roof shingles? At this point in the QSO I heard my mother, who had been cleaning in our second floor bedrooms, yell down to me, "What are you doing down there?" Obviously, I couldn't disrupt my contact with a foreign Ham; I kept asking for his mailing address at about 5 WPM. That's when the power to my station failed and the equipment panels went dark. My mother had come into my shack (her kitchen) and literally pulled the plug on my first QSO. Apparently my 60 W of Novice-frequency RF was finding its way into the second floor light fixture from the antenna wire only feet away on the other side of the ceiling and causing the 10-W bulb to blink on and off with my Morse transmissions.

If I recall her words correctly, I believe she said something like, "You're gonna blow up the house."

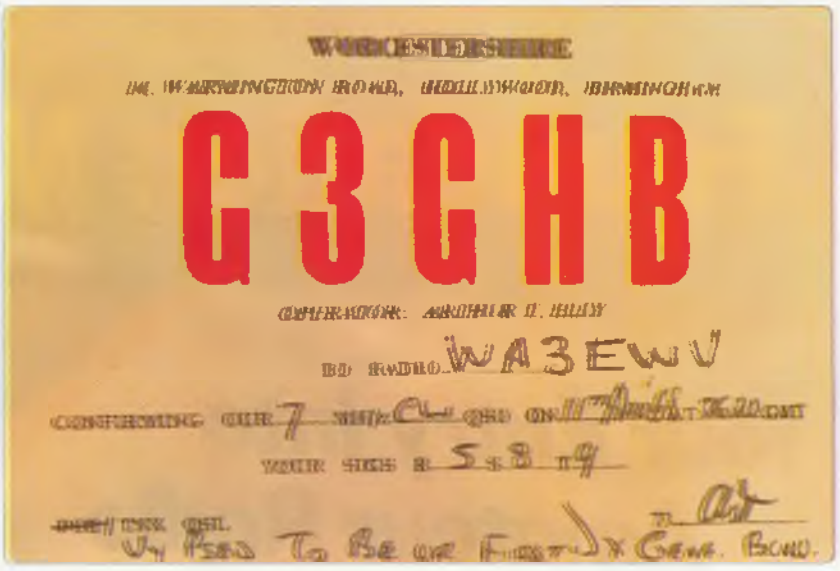
I explained to her that it was just me sending signals to my first Ham contact - he was in CANADA, Mom!

I told her I could fix the problem (I had hoped.) I found a 25 W bulb and installed it in place of the 10-W one.

I replugged my station into the wall outlet and did a quick 'VVV VVV VVV DE WN3EWV' to prove to my mother - and to myself - that my theory of 'the antenna wires are too close to the bulb' was correct.

A Happy Ending: About a week later I received a QSL card from Ron Trew VE2AOU. It included my full Novice callsign but misspelled first name, a '?' for the surname and no house number in the address. It took me only two seconds to realize that one of my Elmer's (and I've forgotten his callsign after all these years) had worked at the local post office (18218) and recognized me as the likely Novice. He made sure I got the card.

I added dipole wires for 80 m and 20 m to that initial 40 m set and had a blast on the bands from home for a few years until I went away to college.



(My first DX was on that 20 m wire - G3GHB.) Four years later I graduated from college with a BSEE and continued my Hamming with my first Drake station (TR-3CW.) Since then I've enjoyed many, but certainly not all, aspects that our fine hobby has to offer. I've made friends along the way and learned quite a bit of esoterica that has helped me professionally.

(Like sunspots can wreak havoc with the electric grid or that 900 MHz and 2.7 GHz signals ordinarily don't travel very far.)

73 de Gene Smar, AD3F
Rockville, MD

WIA news

Canadian ham copies Mars orbiting satellite

As reported on *Spaceweather.com*, Canadian radio amateur Scott Tilley, VE7TIL, has snagged another signal from deep space. His latest conquest has been to copy the signal from China's *Tianwen-1* (pronounced "tee-EN-ven") probe, which went into orbit around Mars on February 10. Tilley told Spaceweather.com that the probe's X-band signal was "loud and audible."

Launched last July, *Tianwen-1* represents China's first Mars mission. It consists of an orbiter and a rover, which will land on the Martian surface in May or June 2021. It is able to photograph the planet's surface while in orbit.

Finding signals from deep space is a sub-hobby for Tilley, who seeks what he calls "zombie satellites" among other signal sources.

In 2020, he tracked and identified signals from the experimental UHF military communication satellite LES-5. Tilley said he found the satellite in what he called a geostationary "graveyard" orbit after noting a modulated carrier on 236.7487 MHz. Launched in 1967, LES-5 was supposed to shut down in 1972, but it continues to operate as long as its solar panels are facing the sun, Tilley explained.

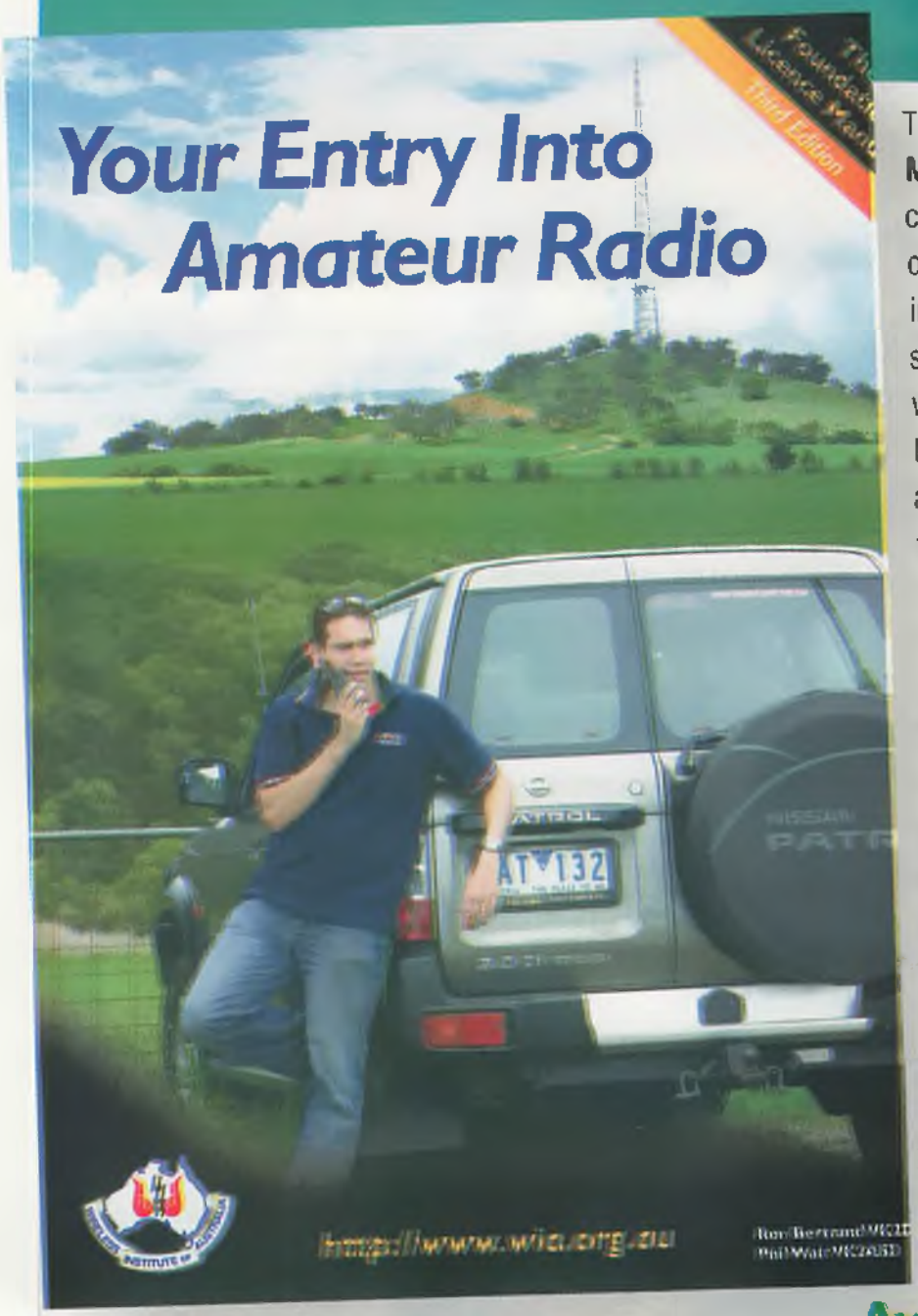
Radio amateurs have been listening for signals from space since the 1957 launch of Sputnik 1, which transmitted at around 20 MHz. *(Source: ARRL News)*

Scott Tilley, VE7TIL, received the Chinese satellite on this dish.

Japanese amateur numbers on the rise

For the first time in 27 years Japan's national association for radio amateurs, the *Japan Amateur Radio League* (JARL), has seen a year-on-year increase in membership. The rise follows a range of activities to promote membership and comes in spite of COVID-19 causing the cancellation of various in-person events such as hamfests. *(Source: Southgate Amateur Radio Club)*

Foundation Manual



The **WIA Foundation Manual** 3rd editon, is a full color publication consisting of 108 pages of relevant information for those studying, or those who would just like a reference book for Foundation licence activities.

The Manual contains all the relevant information you will need to know to successfully complete a training course to obtain a Foundation licence. It also contains a wealth of information a Foundation licence operator will need. Items like Band Plans, Electrical Safety information, operating procedures such as the Q code, how to contact you local radio club, the WIA and much more.

Available now!

http://www.wia.org.au/members/bookshop/page_data.php?id=113

DX Talk

Steve Barr VK3KTT
vk3ktt@gmail.com

Well the pace has certainly picked up with a slather of excitement on the bands. I worked ATNO in JX2US - Jan Mayen in both CW and FT8 (I believe that this is the first time it has been activated since 2009).

There have been some small-scale DX-peditions to St. Martin, Cocos Keeling Islands, Botswana, Mozambique, the Maldives, the Seychelles and with band openings to the Caribbean and South America, the pile-up lovers have been able to satisfy themselves with a little 'happiness fix' even if only short lived.

As for the higher bands, implying 10 and 12m, things have been somewhat soft; in contrast however, 15m and below have in fact been quite productive all in all, with band openings to EU in all three of the key Amateur Radio modes.

With winter approaching and sporadic Es quickly fading, we start scanning the lower bands for openings to EU. DX openings can be readily found in SSB by following the grey line contour. Late news at grey line tonight: a large group of VKs from VK 2, 3, 4 and 5 worked Peter, ZD7FT on 20m SSB; it was great to hear Peter again. The last time I worked ZD7 in SSB was 2016. Also keep an eye out for ZD7MY in FT8; he can be found on the bands.

Hexbeam fans are probably well aware and saddened by the passing of Waldi (SP7IDX) who went 'Silent Key' earlier this month. The famous antenna designer sadly and abruptly passed away as a result of a heart attack while recovering from the novel COVID-19 virus.

Big news from the Intrepid DX group; they are planning a large DX-pedition to Bouvet as 3Y0J in Jan/Feb of 2023. Those involved are a top-tier DX group and should get there no problem. The ship is the Braveheart and is led by Ken Opskar, LA7GIA and Paul, N6PSE along with an All Star team. More information can be found at *www.3y0j.com*.

Also the Rebel DX Group has indicated that it is on-track for 3Y0I by the end of the year. Dom 3Z9DX and a few others are currently in Fiji (3D2) for quarantine and plan to activate 3D2-C Conway Reef again, Rotuma and some rare IOTAs.

Take, JG8NQJ/JD1, is back on Minami Torishima weather station till mid-May. He is a CW operator, but generally a good signal.

Tom, NL7RR, is back on Wake Island, KH9 till mid-May. Expect SSB, not too strong, but if you are keen he is generally workable.

Johannes, ZS6JSI/TY, is active from Benin mainly on 20m and typically throws his call in the 'search' feature of DX Summit to give a clue for his schedule. Benin is pretty rare and well worth chasing.

A35JP: Masa, JA0RQV from Tonga is a regular from May through October. QSL via club log and LoTW.

Gabriele, D2EB, is still in Angola, he is on Club Log for OQRS.

Look for rare IOTA Activation EU 123 Bass Rock by team MS0INT on April 17-18. The pile-ups will be huge, but if you are an IOTA chaser, it will be well worth the hunt. They should keep a keen ear out for VK.

Paul, VK0PD /VK2PAD, is active from Casey Station, Antarctica. He has a very good signal and can be worked easily by 100 W wire antenna stations in VK. He is mainly on SSB; however, he is trying to organise himself for some Digital Modes. QSL via EB7DX OQRS. Also, Paul is an active Parks and SOTA guy. Casey station is in VKFF 0571. He will be sending logs to Paul, VK5PAS.

Other Antarctic stations active:

LU3HRS/Z from Belfrano 2 base for the season, mainly 20m FT4, FT8, JT65; QSL vi LU4AA.

DT8A is DS4NMJ from King Se-Jong base, South Shetland Islands; he has already been worked by a few VKs.

8J1RL from Showa Research Base, Queen Maud L and IOTA AN-015, op, JG3PLH; QSL via Bureau or JG2MLI for direct.

RI0IANT: Alexey, RX6A is active from Vostok Station until the end of May; QSL via RX6A.

Don't forget the facebook group for all VK DX chasers; come and join us and get the inside oil. Please note: this group is DX only; no politics, only DX.

VK DX chasers: lots of live spots so you know where the action is. This group is a way that we get VKs to call the DX at a similar time and the DX then pays attention to us. The hardest thing we find is 99% of the time the antennas are pointed the wrong way; so, once we get their attention they are happy to work us and they know we don't mind paying for QSLs :)

It appears we are getting out of the doldrums. YAY! Catch you in the pile-ups.

73 de Steve, VK3TT

More bands and modes for the JS80 receiver

*Peter Parker, VK3YE**

Figure 1: Direct Conversion HF Digital Modes Receiver

In *AR* Issue 1, Vol 88 January / February 2020 I described a simple direct conversion receiver for receiving JS8 transmissions on 80 metres. The project was a happy coincidence as the 80m JS8 frequency was very close to cheaply available 3.58 MHz crystals. This allowed me to build a stable receiver with few parts.

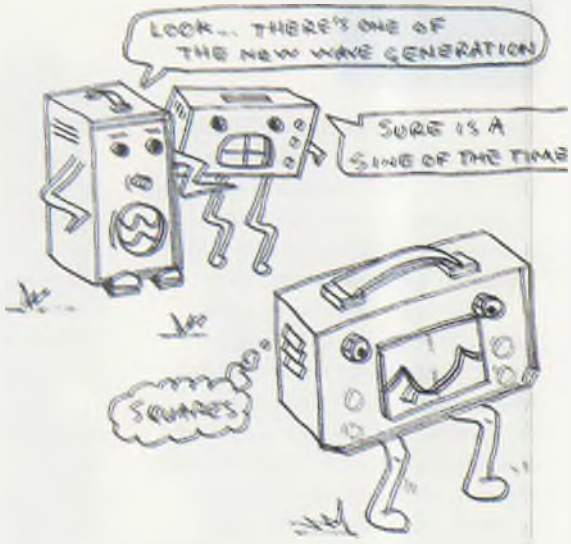
Use with crystals on other bands

Since then, thanks to the worldwide interest in building simple receivers and transmitters for digital modes, a set of six crystals has become available through eBay for $US12 excluding delivery. The set covers WSPR, FT8 and JS8 frequencies for 7 and 14 MHz, making it ideal for builders. The seller, W6OUT, sent me some to review. Video demonstrations appear on my YouTube channel. (*www.youtube.com/channel/UCPhfct0hwCpv_q6_BVSFsRA/videos*)

Because it had a broadband front-end, the receiver needed only the new crystals to be inserted to work. Because they are made for the exact frequency required, just a single crystal was needed instead of the three in parallel used previously. The series inductors could also be removed, improving frequency stability. Slight frequency differences (likely to be only a few hundred Hertz) can be corrected by adjusting the variable capacitor.

I built a second receiver to try this idea. Figure 1 shows the revised circuit for a single frequency. A key change is the lowered values for some of the capacitors in the crystal oscillator stage. This was required to allow oscillation on the correct frequency.

My first experiments were on 7 MHz. Signals were decoded on all three modes attempted. These included FT8 and WSPR (using the WSJT-X software) and JS8 (using JS8Call). As the computer in use was online, reception reports were uploaded to either pskreporter.



info or wsprnet.org. Because of the popularity of the mode, most signals were detected on FT8, some from many thousands of kilometres away.

14 MHz was the next experiment. I was sceptical that this would work as there was no receiver pre-amplifier. In fact the only gain, apart from the computer's sound card, is from a single transistor audio amplifier. FT8 was again highly successful with stations from

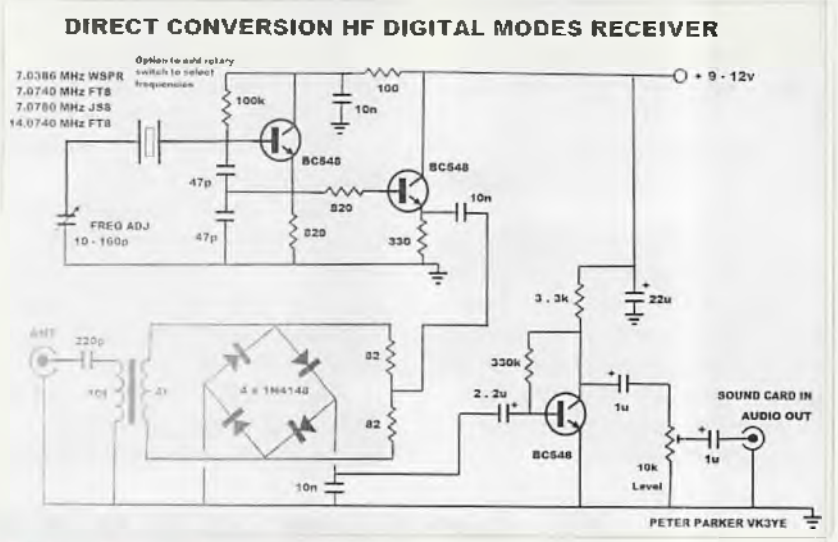


Photo 1: Digital Modes Receiver.

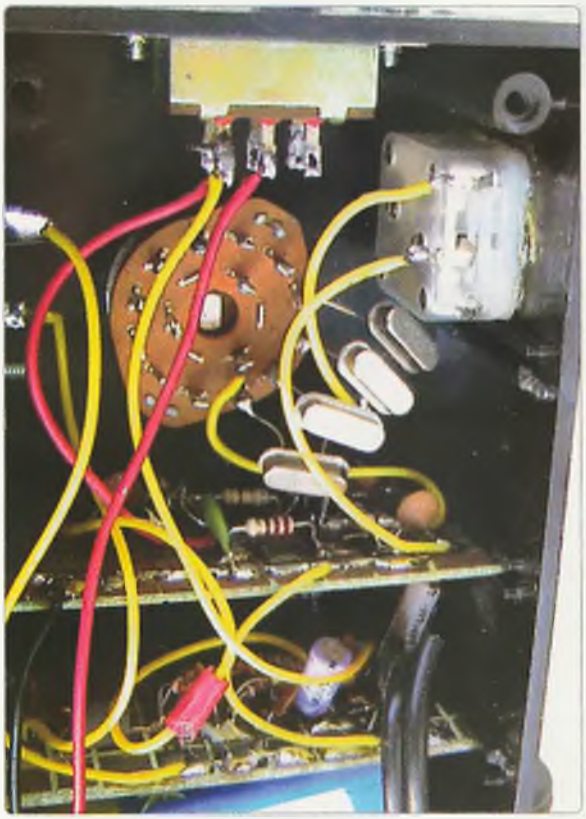


Photo 2: Construction showing PCB and point-to-point assembly method.

around the world decoded.

Encouraged by this success, I used a four-position rotary switch, switching four crystals to provide a selection of bands and modes as per the photos. Those I chose included 7.0386 MHz (WSPR), 7.074 MHz (FT8), 7.078 MHz (JS8) and 14.074 MHz (FT8). I kept the one variable capacitor in series with them all. I found that one setting of the variable capacitor was near enough for all switch positions. However, if you wanted to be exactly on frequency in each switch position then you could install trimmer capacitors in series with each crystal instead.

Use with a 7 MHz ceramic resonator

If you are more interested in CW and SSB rather than digital modes, you might prefer to use a 7.16 MHz ceramic resonator such as available from *minikits.com.au*. This is a three legged device. One end leg (doesn't matter which one) goes to the base of the oscillator transistor. The middle leg goes to ground (i.e. the negative rail). The remaining end leg is wired to the non-grounded side of the variable capacitor.

This arrangement gives a wide tuning range; I obtained about 7.015 to 7.145 MHz. This covers all digital mode frequencies and some CW and SSB activity. You could vary the range slightly by changing the feedback capacitors in the oscillator. For example, more of the CW segment could be covered if you increased the values from 47 pF to say 100 pF. A larger value variable capacitor (or connecting two sections in parallel) may also help but you will lose some top end coverage.

Use a full-sized antenna such as a dipole, G5RV or similar as the receive antenna has little gain. My first test was with an old pair of 2000 Ω high impedance headphones from a crystal set. CW and SSB stations were comfortably received, though not loud. A substitute, especially for CW reception, could be a piezo transducer. This is quite sensitive but not so good for SSB because of its poor low frequency response. A computer speaker with its own audio amplifier is another possibility.

Low impedance headphones are unsuitable unless signals are strong. Selectivity will not be very good as there is little filtering, but radio amateurs up to approximately 1000 km distance should easily be copied, provided you are not close to a broadcast station. If such overloads the desired signals, you could add a band pass or high pass filter between the antenna and receiver.

What about digital modes? These require better frequency stability than you can get away with for CW or SSB. WSPR proved unsuccessful, probably because it takes two minutes to receive a single transmission and there would be some frequency drift over that period. FT8 on the other hand did work, with signals from far and wide received. However, adjusting to be spot on 7.074 MHz was tricky and requires another receiver known to be accurately calibrated. Hence, I would use the crystal-controlled version for digital modes and the ceramic resonator type for CW and SSB. Fortunately the circuit is so simple and inexpensive, you could build one for each.

* *vk3ye.com*

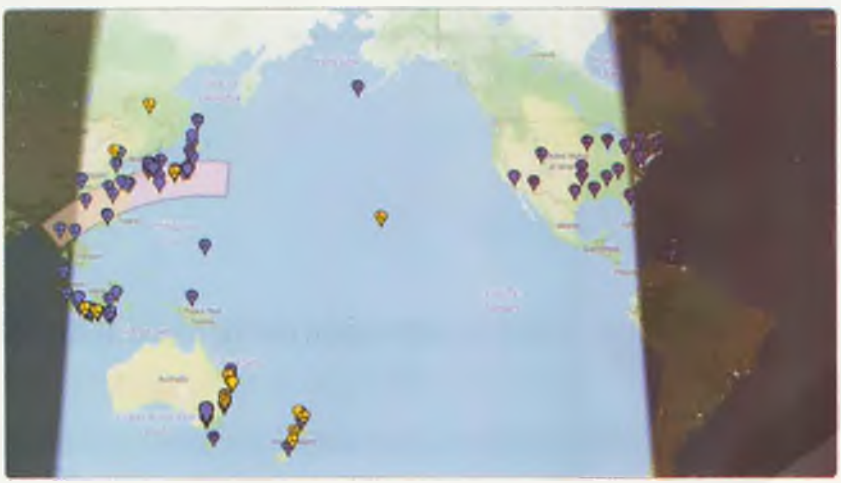


Figure 2: Stations received on 7 and 14 MHz with no receiver pre-amplifier.

Simple POWER ON Indicators

Jim Tregellas VK5JST/VK5TR

I wonder how many of us remember replacing 6 V pilot lamps that burned out? And when we started building stuff, we wired in a pilot lamp to run off the 6 V heater winding on the transformer. That consumed nearly 2 W. Some of us used a neon lamp with a 100 kΩ series resistor to show when the power was on; that circuit consumed about a ¼ W. But eventually, the inside of the neon bulb blackened and needed to be replaced. Jim has provided a simple system to replace that dimming neon and be independent of any power transformer.

Here are a couple of circuits that you can retrofit to items such as DIY equipment and switch mode power supplies to indicate 'power on'. Such items will have no transformer secondary from which power can be safely derived.

Both circuits can be constructed in space and hung from the terminals at the rear of the mains switch. I recommend that you use 5 mm diameter LEDs because of their large amounts of insulation.

Because both circuits are current fed via two resistors, the PIV rating of the diodes is very low (< 5 V) and so, you can use any old diode (I used 1N4148s). Two series resistors are used to limit the power dissipation in each resistor, and, VERY much more importantly, to limit the voltage drop across each resistor to a safe 120 VRMS. (The resistive film moves and thins in some places when high voltages are applied and the resistor goes open circuit). Note that both circuits can drive a series string of LEDs (dial lights??). LED current is about 2.5 mA for the bridge circuit, and half this for the half-wave circuit.

These circuits are lethal; you have been warned!! Use only excellent 230 V mains practice, working on the project only when you are sure that the equipment is definitely unplugged and no mains power is present. [When you finish, you could encase the whole circuit in heat-shrink sleeving to improve safety. While you are at it, consider enclosing all wiring to the mains switch in heat shrink, too. – Ed]

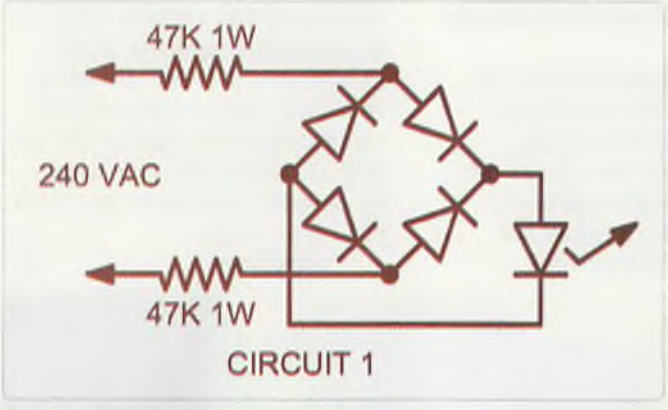


Figure 1: Full-wave bridge diode design.

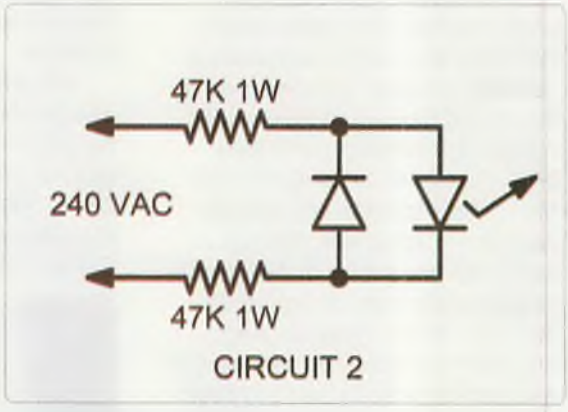


Figure 2: Half-wave diode design.

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 **16 June 2021.**

How to turn an oscilloscope into a TDR for cable fault-finding

Nigel Dudley, VK6NI

Here is a simple way to turn your Digital Storage Oscilloscope (DSO) into a Time Domain Reflectometer (TDR) in order to locate line faults.

Recently, our local golf club had a failure in the reticulation system on one of the fairways. A bit of sleuthing and testing discovered a faulty power cable of around 50 m in length between two pits and it was quickly bypassed to keep watering going. New cable had to be ordered and that got me to thinking: why can't we fix the existing one? So I stepped in and, using the method below, quickly established the fault was 23 m from one end and about 24.9 m from the other, giving an overlap length of about 3 m.

Time domain reflectometry (TDR) is a well-known technique for fault-finding in coaxial cables or cables with two conductors so I started looking on the web for a possible simple solution. I quickly found a video on Hackaday showing a very easy technique using a battery and a Digital Storage Oscilloscope (DSO) which can be seen here, *https://bit.ly/3d7826T*.

The method showed how to use a 9 V battery to send a single pulse into the cable under test to get a time-delayed echo. While the procedure was somewhat inelegant, you could make it easier by adding a momentary switch to send the pulse. See Figure 1 for a setup diagram. Make sure all sources of power to the cable under test are disconnected before you connect to your DSO.

While the method appeared to work, tapping a wire on a battery seemed a little inelegant to me. Why not use a pulse generation circuit and sync the DSO to it?

Now the DSO that I have (Keysight DSOX1102G) happens to have a built-in wave generator; so, that seemed to be the elegant solution I was after. As shown in Figure 2, a simple lash up of a BNC T-piece connected to the vertical input with one side going to the wave generator via a 50 Ω resistor for nominal impedance matching and the other side connected to a partially-used roll of RG-58 produced immediate results.

Using square waves at 100 kHz, as shown in Figure 3, a clear reflected signal is obvious, occurring 436 ns after the start of the square wave. The trace is similar to that seen in the Hackaday video.

[Most oscilloscopes – Heathkit, HP-Agilent, Kenwood, Tektronix – have a square-wave oscillator on board for probe calibration –Ed]

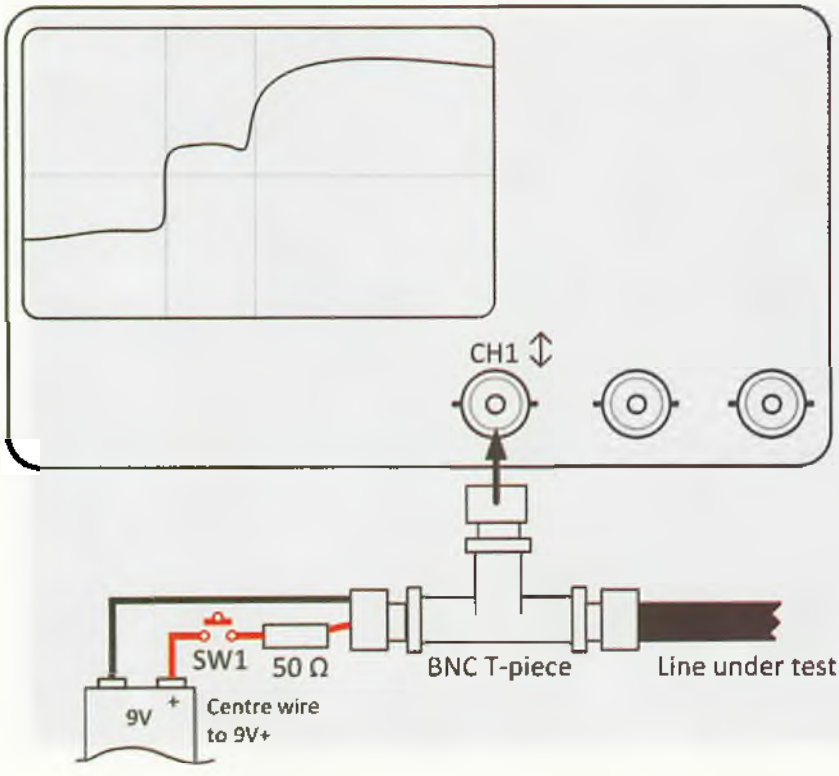


Figure 1: If your DSO does not have a function generator, use a 9 volt battery to generate a pulse for a time-delayed result. Connect to your scope's CH1 (vert) BNC socket using a T-piece which is connected to the line under test. Connect the other end using a BNC to twin-lead adaptor, or a cut BNC/RG-58 lead with the leads exposed. Solder a 50 Ω resistor to the centre conductor. Solder a battery clip and a momentary switch (SW1) to make it more convenient.

Calculate the distance

Determining the distance requires a small calculation based on a high school physics equation:

Distance = velocity x time

As this is a reflection, the calculated distance using the time of return displayed must be halved. If we use the known speed of light in

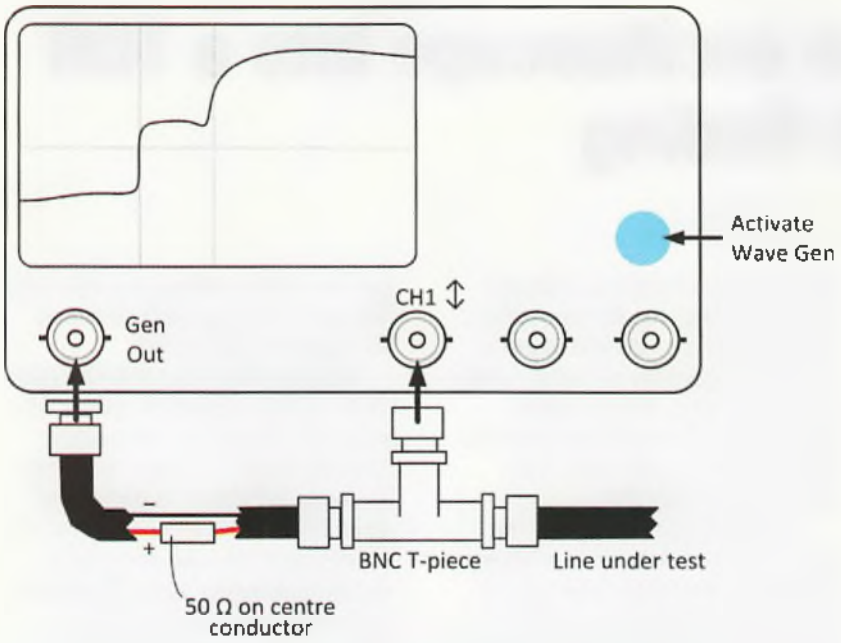


Figure 2: Using the wave generator on a DSO that has an inbuilt function generator is a more convenient way to measure the time delay, eliminating the need for a battery and messy wires. For the wave gen, use a short RG-58 patch lead. Simply strip off a small piece of coax sleeve, separate the braid and open the centre sleeve enough to solder in-line a 50 Ω resistor on the centre conductor. Insulate the centre from the braid and make it neat by sealing with heat shrink sleeving. [You may want to label this altered and sleeved cable to find it easily in future - Ed]

a vacuum of 2.998 x 10^8 m/s a correction will have to be made for the velocity factor of the conductor. This brings us to an equation of:

Distance = (speed of light x time x velocity factor)/2

For the partially-used roll of RG-58 cable with a velocity factor of 0.66:

Length of the cable = (2.998x10^8 x 436x10^{-9} x 0.66)/2 = 43 m

The equation can be more simply stated as:

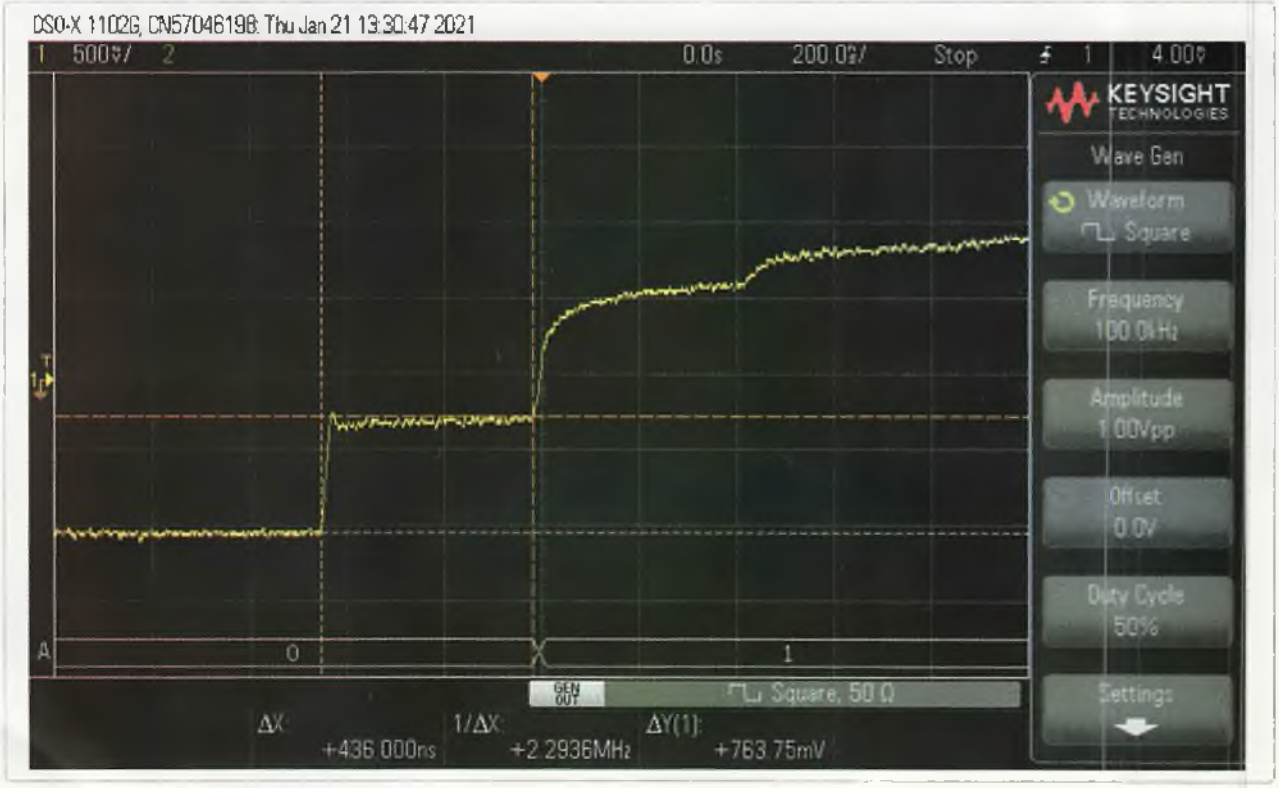
Length = (0.2998 x time (nanoseconds) x velocity factor)/2

[or ~0.15 x time(ns) x VF – Ed]

thus making an easy calculation.

As I was not about to unroll the cable to check the distance, I tested another reel of RG-58 that had distance markers on it.

Figure 3: Screen grab from the DSO for an unknown length of RG-58. An outgoing pulse is injected and both the outgoing and return pulses are displayed as a stair-step time delay using a 100 kHz square wave. You may need to adjust your scope speed to get a decent resolution.



My calculated length of 73 m was found with a marked distance of 72 m. That was spot-on after including the test leads. Hence, it is an easy way to calculate the length of that partially-used roll of coax, or the distance to a fault on an antenna lead. Running 100 kHz square waves, it is possible to test out to 300 m, assuming attenuation does not become a problem. Lowering the frequency will allow you to measure even greater distances.

So, what about the irrigation power cable on the golf course? What velocity factor do you use for twin parallel cable? The actual cable was similar to 10 A mains building cable but had only two conductors and heavy red plastic armouring. I settled on testing known lengths of mains cable that I had and came up with a velocity factor of 0.55. As there was an overlap in the measurements it was likely the cable did not go directly between the pits. Unfortunately, when it came to digging up the cable, the contractor dug a trench directly between the two pits, missing the old cable completely and I could not verify the fault location!

Still, the technique is equally valid for cables and useful for finding faults in buried control cables and other twin leads. Just remember to disconnect all possible sources of power to the cable under test before you connect up your treasured DSO.

[If you cannot tell whether the cable is powered up, add a 100 nF capacitor in series with the end of the cable under test nearest your oscilloscope, with a 1 MΩ shunt to the other wire (in case the cable has stored an ESD, eg, from a recent lightning strike) – Ed]

Ross Hull Memorial VHF–UHF Contest results

Contest Manager - Rob Heyer, VK2XIC

I was impressed with the number of new contestants, in particular the good showing of the Tasmanians, VK7. Perhaps the other states and even DX stations will become involved next year.

Once again, the overall first place of the Ross Hull Memorial VHF-UHF Contest was won by Ted Thrift VK2ARA. Ted's winning Total Combined Score was 2702 points.

The overall second place was won by Brian Farrar VK2AH who gained a Total Combined Score of 2008 points.

I would like to make special mention of the very skilled operator, Jason Dickens, VK2FLJD. David holds a Foundation License and achieved an overall fourth place with a Total Combined Score of 1239 points. The high skill demonstrated by Jason is very encouraging and impressive, considering that Jason only had access to the 2 m and 70 cm bands.

Thank you to the four digital stations who sent in their logs. It was encouraging to have your participation.

General remarks

It would be good if more digital stations could submit a log next year. For those who decide to submit a digital section log, please ensure the log is in keeping with the contest Rules. A simple 'copy and paste' of a computer screens' data list, does not meet the requirements of the rules. Please ensure all the required elements are clearly presented in the log.

For those who achieved lower scores, I encourage you to participate again in January 2022. It is the efforts of all who returned logs that help us to develop our radio operator skills and grow in understanding of the sciences involved with antenna design and propagation. Further to this, operators can also use other

Results Summary

First place holders

Callsign	Category	Operator	Contacts	Score
VK2ARA	Open	Ted Thrift	104	2702
VK2FLJD	Foundation	Jason Dickens	205	1275
VK7ZBX	Digital	Richard Howlett	22	939

Section A: Best of 7 days, analog modes

Call	Name	6m	2m	70cm	23cm	13cm	9cm	3cm	Total
VK2AH	Brian Farrar	548	201	355	40				1144
VK2ARA	Ted Thrift	220	393	160	80	120			973
VK2XIC	Rob Heyer	250	213	240	64	30	20		817
VK2FLJD	Jason Dickens		375	330					705
VK2FDSD	Daniel Demaagd		54	135					189
VK7PD	Peter Dowde	102	18	30	24				174
VK2KQB	Keith Bradshaw	14	33	45	40	20			152

Section B: Best of 7 days, digital modes

Call	Name	6m	2m	70cm	23cm	13cm	9cm	3cm	Total
VK4CLG	Robert Garland	896							896
VK3MH	Brendan Bryant	882							882
VK7DW	Andrew de Water	672	63		16				751

contests, such as the Summer, Winter and Spring VHF-UHF Field Days and the John Moyle Field Day, which has a VHF-UHF component, as practice to help them to achieve a higher score in the Ross Hull Memorial VHF-UHF Contest.

To all those operators of stations who exchanged numbers with those contestants and didn't submit a log, can I say on the behalf of those who submitted their logs, thank you and well done for your selfless participation. Next year in January 2022, no matter where you are in the world, VK, ZL, YB (Indonesia), E51 (Cook Islands), 3D2 (Fiji), FK8 (New Caledonia), JA (Japan) and WO7 (Arizona USA), I will be happy to process your log.

It is good to see continued interest in the area of VHF and UHF and particularly the stations working DX. There is no doubt about it, the numbers of contestants are fewer compared with previous years but there was a small rise in the number of contestants for this year. This small rise in numbers will make it a challenge for 2022.

I have had software issues with the generating of the certificates, and I would like to thank the contestants for their patience, as once again the certificates have been issued later than planned.

Hopefully we will see a rise in numbers of participating stations in all VK and DX like ZL, FK, H44 as well as our VK9 and VK0 stations.

Section C:		Best of 2 days, analog modes							
Call	Name	6m	2m	70cm	23cm	13cm	9cm	3cm	Total
VK3MH	Brendan Bryant	134	189	130	64				517
VK2AH	Brian Farrar	440	24	30					494
VK2FLJD	Jason Dickens		147	240					387
VK2ARA	Ted Thrift	42	219	45	16	20			342
VK2XIC	Rob Heyer	100	87	145	8				340
VK7ZBX	Richard Howlett	16	30	45	136		10		237
VK7DW	Andrew de Water		81	45	80				206
VK2KQB	Keith Bradshaw	12	30	40	32	20			134
VK7TW	Justin Giles-Clark	8	9	20	104				141
VK2FDSD	Daniel Demaagd		12	55					67
VK7GD	Garry Duence	2	3	5	16				26
VK7PL	Peter Ralph		3	5	8				16
VK7HW	Herman Westerhof		6	10					16

Section D:		Best of 2 days, digital modes							
Call	Name	6m	2m	70cm	23cm	13cm	9cm	3cm	Total
VK7ZBX	Richard Howlett	876						53	939
VK4CLG	Robert Garland	896							896
VK3MH	Brendan Bryant	882							882
VK7DW	Andrew de Water	672	63		16				751

Total number of contacts non-participants worked over the January 2021 of the Ross Hull Memorial VHF / UHF Contest.

VK1	VK2	VK3	VK4	VK5	VK6	VK7	VK8	ZL	JA	3D2	FK	E51	YB	WO7	Total
3	1000	135	27	18	1	62	1	47	4	4	3	2	2	1	1310

WIA news

Two DX groups eye Bouvet Island DXpedition

The *Rebel DX Group* is hoping to leave Cape Town, South Africa to activate #2 DXCC most wanted entity Bouvet Island (3Y0I) 2,600 km South West of South Africa in the South Atlantic Ocean. The team said it is as ready as ever, following the cancellation of its 2019 DXpedition when it was within sight of the remote island and turned back during a cyclone for safety reasons.

Bouvet Island on a previous DXpedition by rebeldxgroup.com

The team of eight, led by Polish DXpeditioner Dom, 3Z9DX, expects to be on Bouvet for as many as 30 days and will operate eight stations on 160 through 6 metres, using CW, SSB, FT4/FT8, RTTY and operations through the Qatar-Oscar 100 satellite. The team has continued to appeal for donations to meet its remaining need for $32,000.

Meanwhile, the *Intrepid-DX Group* has announced that it will be activating the island as well using the call sign Three Y Zero Jay (3Y0J). Its 20-day stay on the island is set for January 2023. The team's immediate goal is to continue fundraising to meet its budget of $764,000 before its planned trip aboard the MV Braveheart.

(Source: Amateur Radio Newsline)

SOTA and Parks

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

Tenth Keith Roget Memorial National Parks Award (KRMNPA) activation weekend

2020 KRMNPA weekend (7 and 8 November) was cancelled because of the then COVID-19 situation in VK3. Between Park closures and COVID-19 restrictions the majority of activators were not able to get out in November, so it was rescheduled to April 2021.

The annual KRMNPA activation weekend is designed to encourage portable activities in Victoria's 45 National Parks. Postponing turned out to be the right decision this year. It was rescheduled to weekend of 10/11 April 2021. We had a full weekend of activations in VK3 with twice as many activations from interstate with WWFF activations joining the P2P frenzy.

Normally held in Spring, this time in Autumn (bringing the wetter / colder weather resulting in at least one activator being 'chased' out of a park on Saturday by the rain and temp) there were still activations aplenty to be had including P2P opportunity with VK0. Most activity has been on 40m SSB with some CW on 80m, 40m and 20m and one activation using JS8call.

We were expecting around 20 KRMNPA activations and ended up with 48 unique activations. There were 110 WWFF activations (inc VK0!) from Friday to Monday. Of those there were 50 odd activations for 29 unique parks that qualify for KRMNPA.

Leading Activator for the weekend was Peter VK3PF with an incredible 13 activations right across the state.

Well known but shy (?) activator in a KRMNPA site.

Date	Callsign	Location
9/4/21	VK3PF	Lake Eildon National Park
9/4/21	VK3XV	Kara Kara National Park
9/4/21	VK3PF	Chiltern-Mount Pilot National Park
10/4/21	VK3BYD	Chiltern-Mount Pilot National Park
10/4/21	VK5PAS	Murray-Sunset National Park
10/4/21	VK3PF	Warby Ovens National Park
10/4/21	VK3YV	Baw Baw National Park
10/4/21	VK3UAO	Organ Pipes National Park
10/4/21	VK2AWJ	Hattah-Kulkyne National Park
10/4/21	VK4AAC	Lower Goulburn National Park
10/4/21	VK3XV	Greater Bendigo National Park
10/4/21	VK3SRC	Point Nepean National Park
10/4/21	VK3LF	Yarra Ranges National Park
10/4/21	VK3TKK	Organ Pipes National Park
10/4/21	VK3XCI	Wyperfeld National Park
10/4/21	VK3PF	Barmah National Park
10/4/21	VK3ARH	Terrick Terrick National Park
10/4/21	VK3PF	Lower Goulburn National Park
10/4/21	VK3ARH	Gunbower National Park
10/4/21	VK3CWF	Brisbane Ranges National Park
10/4/21	VK3YV	Morwell National Park
10/4/21	VK3PF	Gunbower National Park
10/4/21	VK3XV	Heathcote-Graytown National Park
10/4/21	VK3PF	Terrick Terrick National Park
10/4/21	VK3PF	Greater Bendigo National Park
10/4/21	VK3PF	Heathcote-Graytown National Park
10/4/21	VK3SRC	Mornington Peninsula National Park
10/4/21	VK5AV	Lower Glenelg National Park
11/4/21	VK5AV	Lower Glenelg National Park
11/4/21	VK5PAS	Hattah-Kulkyne National Park
11/4/21	VK3SRC	Mornington Peninsula National Park
11/4/21	VK3PF	Organ Pipes National Park
11/4/21	VK3LF	Morwell National Park
11/4/21	VK5MAZ	Hattah-Kulkyne National Park
11/4/21	VK5AV	Cobboboonee National Park
11/4/21	VK3ARH	Barmah National Park
11/4/21	VK3YV	Wilsons Promontory National Park
11/4/21	VK3PF	Churchill National Park
11/4/21	VK3SRC	Churchill National Park
11/4/21	VK3MCA	Kara Kara National Park
11/4/21	VK5AV	Budj Bim National Park
11/4/21	VK3XV	Chiltern-Mount Pilot National Park
11/4/21	VK3LF	Tarra-Bulga National Park
11/4/21	VK3ZPF	Tarra-Bulga National Park
11/4/21	VK3PF	Dandenong Ranges National Park
11/4/21	VK3JBM	Grampians National Park
11/4/21	VK5AV	Mount Richmond National Park
11/4/21	VK3GP	Grampians National Park
11/4/21	VK3PF	Morwell National Park

Thanks goes to Tony VK3XV for organising it and to everyone for getting out there and braving the weather. Great signals from all. Nice to hear so many chasers on the air, without chasers it would be a very quiet weekend.

For more information and details of upcoming weekends (November 2021 still on the agenda.) join the KRMNPA email list at *krmnpa@groups.io* or visit *https://www.amateurradio.com.au/awards*

WWFF VK0

Paul VK0PD (VK2PAD) is currently at Casey Station, Antarctica. This is a WWFF site, VKFF-0571. Potentially another site, Wilkes Station VKFF-0572 may be activated.

During the KRMNPA weekend, Paul, VK0PD came up and was giving space for portable operators to call. This alone is a great reason to get out and activate a park as a P2P with VK0 will be highly prized. More details in the VK0PD page at *qrz.com*

VKFF 2020 Results

Each year the WWFF Australia (VKFF) program offers certificates to the Top 10 VKFF Activators, Top 10 VKFF Hunters, Top 10 VKFF Foundation Activators, and the Top 10 VKFF Foundation Hunters.

The winner of the 2020 Top VKFF Activator award was Gerard VK2IO who activated a total of 69 different VKFF references (parks). Marty VK4KC was 2nd with 47, Adam VK2YK at 3rd with 41, David VK5DG in 4th with 35, Peter VK3PF in 5th spot with 30, Tony VK3YV and Ian VK1DI in 6th spot with 24, Nick VK3ANL in 7th with 21, Peter VK3ZPF in 8th spot with 20, Andrew VK1DA Malcolm VK3OAK & Peter VK3TKK in equal 9th spot with 19 each, and Paul VK5PAS with 16.

The winner of the 2020 Top VKFF Hunter award was Peter VK3PF who worked (hunted) 385 different VKFF references. In 2nd position was Gerard VK2IO with 373, third Allen VK3ARH with 240, fourth Geoff VK3SQ with 39, fifth Paul Vk5PAS with 231, sixth John VK4TJ with 224, seventh Andrei ZL1TM with 223, eighth John VK5HAA with 195, ninth Scott VK4CZ with 193, and in tenth spot Nick VK3ANL with 185 VKFF references.

The winner of the 2020 Top VKFF Foundation Activator was Marija VK5FMAZ (now VK5MAZ) who activated 11 VKFF references. Brett VK3FLCS (now VK3MCA) and Matthew VK2FMJC (now VK4MJC) shared 2nd place with 5 references, while Pete VK2FPAR and Angela VK7FAMP shared 3rd spot with 3 references activated.

The winner of the 2020 Top VKFF Foundation Hunter was Deryck VK4FDJL who worked 183 VKFF references. In second place was Glen with 103, third place Adrian VK5FANA with 93, fourth place Marija VK5FMAZ with 78, fifth place Pete VK2FPAR with 53, and sixth place Ian VK3FIMD with 45 VKFF references.

Upcoming

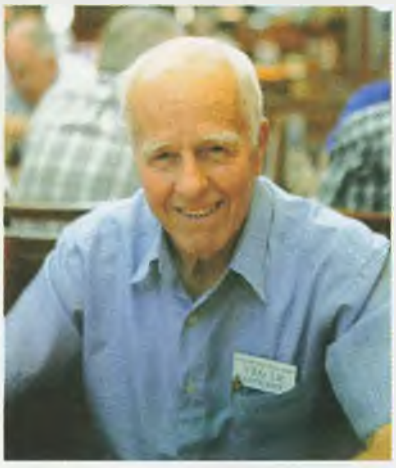
SOTA and Parks in the Grampians National Park on the weekend of 2nd and 3rd October

Plans are afoot for a SOTA and Parks event based around the Grampians National Park (Gariwerd). This will be an event for SOTA and Park activators alike with 60 summits and 20 odd parks within 60 km. More details as plans are verified so stay tunned. *https://parksnpeaks.org/getClose.php?myLat=-37.2932&myLong=142.6009&myDist=60*

73 & 44,
Allen VK3ARH

Silent Key

Lance. G. Rock VK6LR



Lance Rock was a very well respected long-term member of the Amateur Radio community in Western Australia. Lance used to tell us stories of his early working life as an apprentice technician, then running a shop in Wellington Street and moving on to owning a Retravision store in Mandurah. He became a Director of both the Retravision Board and a Western Australian TV and radio broadcasting network. He was the Founding President of the Peel Amateur Radio Group, a founding member of WA Amateur Radio News, an avid Rotarian, old-time foxhunter and a regular at the weekly VK6 Prawnheads lunches.

Lance settled in Mandurah, and he and his wife Hazel raised four children. Their house, on the foreshore of the estuary on the Halls Head side of Mandurah was unmistakably that of a radio amateur - sporting a huge HF log periodic antenna. Until very recently Lance continued as a very active Life Member of the Peel Amateur Radio Group. Another passion that Lance had was sailing, and we heard many tales of his exploits in club and international sailing races.

Founder and life member of many organisations, Lance was a very active man in the Mandurah Community. A devoted husband, father, grandfather and great businessman, yachtsman, Rotarian, the list goes on - Lance touched the lives of so many in the Peel community. Knowledgeable and always the first to volunteer when there was work to be done – whether it was shimmying up a tower, or supporting the Mount William and Mount Saddleback 2m Repeaters - Lance will be remembered as a great friend and as one member put it - 'a Grand Old Man of Amateur Radio'.

Lance passed away peacefully on Saturday 27th February 2021 leaving behind his wife Hazel and four sons - Stephen, Neil, David and Ian. On behalf of the Amateur Radio community, we express deepest sympathy to Hazel and the family.

From your many friends with sadness and deep respect, 73 Lance VK6LR, now silent key.

Vale Lance Rock VK6LR.

Contributed by Tony Boddy, VK6DQ on behalf of the members of the Peel Amateur Radio Group, Bob Bristow VK6POP on behalf of NewsWest and Mac McDonald VK6MM on behalf of the WA Repeater Group.

WIA Awards

Marc Hillman VK3OHM/VK3IP

2020 was an exceptional year

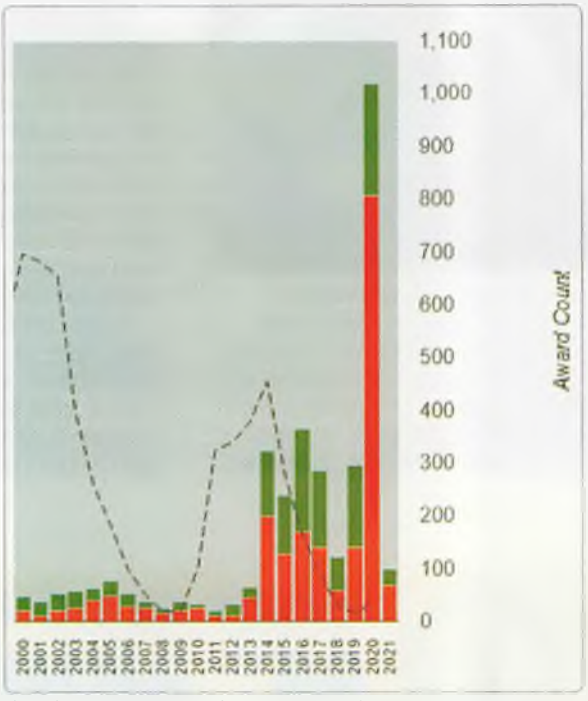
In many ways, 2020 was an exceptional year. The number of awards issued by the WIA online awards system has gone through the roof. The chart shows the number of awards granted since 2000. There was an obvious uptick in 2014 when the online system was introduced. The increased ease with which one could apply for an award was reflected in a significant increase in the number of awards being requested.

The second noticeable uptick in awards occurred in 2020 when there was a change to the rule that only allowed a one-band award on a single band. The policy was changed to allow a one-band award for any number of bands and naturally, there was a tsunami of one-band awards issued.

In total, approximately 600 one-band awards were issued, where normally it would be approximately 100. The change to the one-band rule explains an additional 500 awards. Even without this rule change, we still have 500 awards issued in 2020, which is exceptional, and nearly double the normal figure.

There have also been other changes in 2020 that increased the award count. The introduction of the Oceania (52), 5-band Elite (8) and DXCC Triple Play (16) awards, did increase the number, but not significantly.

So, the only influence I can see to explain the increase in awards is COVID-19, and the associated lockdown. It would seem that amateurs around the world, while stuck indoors, resorted to using the radio to amuse themselves.



Red bars represent VK users, and Green bars represent DX users.

With Australia currently having no lockdown, and fingers crossed we won't have another, I suspect that 2021 will return to more normal levels.

Marc HILLMAN
VK3OHM

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

ALARA

Jenny Wardrop VK3WQ

It all started with an email conversation between our President Linda, VK7QP and Paul, VK5PAS about an Award certificate that the Young Ladies Radio League (YLRL USA) is offering this year re National Parks.

It got Paul thinking that VK Flora and Fauna (VKFF) could also run a special event for Ladies during 2021. So with the blessing of the members of the VKFF Team, here are details of the *2021 VKFF Ladies Award* that is already underway. There is one Award for the ladies who activate, and one for those who work the ladies.

There are also three levels.

- Bronze - activate/hunt 5 VKFF references
- Silver - activate/hunt 10 VKFF references
- Gold - activate/hunt 15 VKFF references

Paul, VK5PAS VKFF passes on his 73 and 44 to all and wishes us happy Activating and Hunting. Just co-incidentally, Paul's partner Marija, has recently gained her licence and become an ALARA member. We welcome you Marija and hope that your time with ALARA will be a long and happy one

41st Alara Contest 2021

Another firmly established Australian YL event is not too far off and we should be starting to plan for it now. This could not only include organising the station and shack, but perhaps also a weekend away for the kids with the OM, or even organising cooking classes for him. Well, we can all dream can't we?

This year there has been a change to the rules to include Scouts and Girl Guides working from their groups' club rooms. We hope to encourage more of the Young Ladies, in particular, and give them a taste of amateur radio.

So here are the rules and conditions for our 41st ALARA CONTEST from our Contest Manager Sue, VK5AYL:

ELIGIBILITY: All licensed operators throughout the world are invited to participate.

Scout and Girl Guide groups are encouraged to participate using their Club's equipment and callsign. (Overseen by a licenced amateur)

OBJECT: Participation: YLs work everyone, OMs work YLs only.

CONTEST: Combined phone and CW runs over 24 hours:

STARTS: Saturday 28th August 2021 at 0600 hours UTC

ENDS: Sunday 29th August 2021 at 0559 hours UTC

Suggested Frequencies: All HF bands except 160 m and WARC Bands. Echolink contacts will also be accepted.

Operation

- YLs operate with their own callsigns
- YLs from Scout and Girl Guides groups use their Club's equipment/callsign with a licensed Amateur present.
- Second operators. If a YL is operating as a 2nd operator, her husband/partner **cannot** participate in the contest.
- Every individual phone or CW

Photo 1: VKFF Ladies Activator Certificate.

Photo 2: VKFF Ladies Hunter Certificate.

contact may be counted.
- There must be an interval of greater than 1 hour between contacts with any one station on any one band and in the same mode.
- All contacts must be made in accordance with operator and station licence regulations.

Procedure

Phone: call 'CQ ALARA CONTEST'
CW: YLs call 'CQ TEST ALARA'
OMs call 'CQ YL'

Exchanges

ALARA member: RS or RST, serial no. starting at 001, ALARA member, name.

YL non-member, OM: RS or RST, serial no. starting at 001, name and whether YL or OM.

OMs work YLs only.

Scoring

Phone: 5 points for ALARA member logged

4 points for YL non-member logged or Scout and Guide groups (YLs)

3 points for OM logged including from Scout groups (OMs)

CW: All contacts made on CW earn double points

OM or Scout group (OMs):

5 points for ALARA member logged

4 points for YL non-member logged or Scout and Guide groups (YLs)

Logs

Single log entry. Logs must show date, UTC time, band, mode, call sign worked, report and serial number sent, report and serial number received, first name of operator of station worked and points claimed.
- Scout and Girl Guide clubs should also include their patrol name.
- Please note in mode if contact is on Echolink.
- Paper logs or electronic logs are both welcome.
- LOGS MUST show full name, call sign and address of operator, and show final score (points claimed).
- ELECTRONIC LOGS MUST BE IN A FORMAT WHICH CAN BE PRINTED BY MICROSOFT WORD OR MICROSOFT EXCEL.
- Logs must be legible. No logs will be returned. Decision of the Contest Manager will be final and no correspondence will be entered into.

Logs must be received by the Contest Manager by: 30th September, 2021.

Contest Manager
Mrs Sue Southcott VK5AYL
PO Box 708
Goolwa, SA 5214, AUSTRALIA
OR: *alaracontest@wia.org.au*

Certificates will be awarded for the following:
- Top score YL overall
- Top score YL phone only
- Top score YL Echolink
- Top score Australian YL CW
- Top score DX YL CW
- Top score DX YL
- Top score ALARA member in each country and VK call area
- Top score OM in each continent and VK call area
- Top score VK YL Foundation Licence holder

A trophy will be awarded for:
- Top scoring Australian YL
- Top scoring Foundation Licence ALARA member

The top scoring VK non-ALARA lady member will be awarded 1 year's subscription membership to ALARA.

The VK3 Report from Jean, VK3VIP

On the 27th March we had our second ALARA lunch for the year at the Castello's Foresters Arms Hotel, Oakleigh. It was good to catch up with ALARA members and their OMs. There was much chatter as many members had not seen each other for nearly a year. We had 19 attend and I would like to thank Cheryl, VK3FCYL and Charlie, VK3ZD, who organized the venue and the cakes [not good for the

Photo 3: VK3 ALARA Lunch, March 2021. Back row: left to right. Judy VK3FJAG, Cheryl VK3FCYL, Jean VK3VIP, Carla, Pam VK3NK, Pat VK3OZ, Susan VK3SZY. Front Row: Robyn VK3WX, Elsie, Margaret VK3FMAB, and Cristina VK3FCRS. And here is yet another YL sponsored aspect to a well-known International Contest.

waist line but we all enjoyed them!]

Pat, VK3OZ is going to organize our next lunch which will be on May 29th. If anybody from interstate is visiting Melbourne please let me know, you will be most welcome to join us.

Pat,VK3OZ is also shaving her hair for the Leukemia Foundation so we hope all goes well for her and she raises a lot of money; a very worthy charity to support.

Margaret, VK3FMAB is waiting to go in to hospital for a knee operation and we wish her all the best.

A message from Robyn, VK3WX: 'My YL friend Alma Wills, ZL1WA became a Silent-Key 6 years ago but I am still in touch with her daughter Jacky (formerly ZL1TZW). During the lock down last year Jacky studied for and passed her Morse code test. Congratulations Jacky, and she now is the proud owner of her late mother's call sign ZL1WA.'

Jacky also became a Grandmother last November when her daughter Coralie gave birth to a daughter, Aurey Mae. Congratulations to Robyn on becoming an Honorary 'Auntie Robyn'.

A few months ago, ALARA decided it should sponsor a plaque for the winner of a certain section of the Oceania DX Contest. After some discussions by the ALARA Committee, it was decided to purchase two plaques for which the OCDX Contest Committee is very supportive.

The Plaques read:

Florence McKenzie Memorial Plaque
Awarded to the YL (Young Lady) Single Operator entrant **from Oceania** with the highest combined score in the Phone and CW sections

Sponsor: Australian Ladies Amateur Radio Association

Austine Henry Memorial Plaque
Awarded to the YL (Young Lady) Single Operator entrant **from outside Oceania** with the highest combined score in the Phone and CW sections

Sponsor: Australian Ladies Amateur Radio Association

ALARA's Committee is also considering the possibility of providing online certificates for the 2nd and 3rd places in addition to the plaques for the winners. These certificates and the plaques are proposed to include photographs of notable Australian YL amateurs, Florence McKenzie and Austine Henry. There would be no cost for the certificates. (More about these extraordinary ladies in the next issue.)

We are currently working with Brian Miller, VK3MI, ZL1AZE, of the Oceania DX Contest Committee to finalise the details of the awards.

To finish, here's something that came my way a couple of days ago.

I caught my son chewing on electrical cords.

So I had to ground him.

He's doing better currently.

And now conducting himself properly at ohm!

33 Jen, VK3WQ.

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 6278,
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.

VK7news

Justin Giles-Clark VK7TW
e *vk7tw@wia.org.au*
w *https://groups.io/g/vk7anews*

Photo 1: The Sewing Circle Trophy.

Photo 2: Graham, VK7GS and previous trophy holder Ross, VK7ALH.

Meet the Voice, 2021

Meet the Voice (MTV) is hosted by the Sewing Circle Net that takes place every night on 3.640 MHz at 1800 AEDST in summer and 1700 AEST in winter. The Sewing Circle Net has been running for 59 years, starting in 1962. Background on the Net can be found on the Meet the Voice website – meetthevoice.org/

The goal of Meet the Voice is a social gathering where amateurs who talk with each other on air can physically meet the person behind the voice in a casual, social environment.

In 2021, it was held on Sunday 21st March and saw over 25 amateurs and partners gather. Since 2006, the MTV event has been held at Ross near the Ross Caravan Park on the banks of the Macquarie River, within sight of the historic Ross Bridge with its convict carvings. Ross provides a central location within Tasmania where amateurs can gather from all over the state.

At around 1100, Ross, VK7ALH, the current holder of the impressive Huon pine Sewing Circle Trophy (originally made by Max, VK7KY (SK)) presented the trophy to Graham, VK7GS who is the 2021 recipient. Graham has recently re-entered amateur radio and is active on the lower HF and MF bands. Graham was surprised and grateful at being the 2021 recipient of the award.

The weekend usually coincides with the John Moyle Memorial Field Day Contest (JMMFDC). There were amateurs from all over the state and many who stayed overnight and longer at Ross. Some operated from Ross in the JMMFDC and this included the author, and Eric, VK7EV.

After the trophy presentation, the author, who is a member of the WIA Spectrum Strategy Committee, outlined the ACMA Class Licence Proposal and the importance of making a submission by the deadline. There was a 'question and answer' session with many great

Photo 3: Panorama of some of those gathered at the MTV 2021 event.

questions showing there is much interest in this important licencing change.

Many retired to the BBQ facilities to cook lunch before setting off back to their homes or over to the Jazz music playing at the Man O'Ross Pub.

It was a great day, and the weather was perfect. Further details and photos of the day can be found on the Meet the Voice website.

Thanks to the Sewing Circle Net for hosting this event and all who made it a great day!

Training and Assessment

Foundation Training Videos

The Radio and Electronics Association of Southern Tasmania (*www.reast.asn.au*) has made available through its YouTube Channel (*www.youtube.com/c/ReastHobart/*) a series of ten Foundation Licence training videos.

These videos follow the latest Syllabus V.10, which includes all the recent changes to the licencing conditions for Foundation Licence holders and reflect the changes recently made to the Foundation Licence Syllabus.

The videos can be found in the REAST Training and Assessment playlist; they follow the syllabus structure:

1. Introduction
2. Nature of Amateur Radio
3. Licence conditions
4. Technical basics
5. Transmitters and receivers
6. Transmission lines and antennas
7. Propagation
8. Interference
9. Safety
10. Practical

The total length of the playlist is three hours and five minutes.

We recommend that the videos be used in conjunction with the Foundation Manual – *Your Entry Into Amateur Radio*, which can be found online at the WIA Bookshop. (*www.wia.org.au/licenses/foundation/foundationmanual/*)

We also recommend that you use the WIA Foundation Licence assessment tool. (*www.wia.org.au/licenses/foundation/onlineexams/foundation.php*)

Feedback can be provided below the YouTube videos in the comments section.

73, Justin, VK7TW

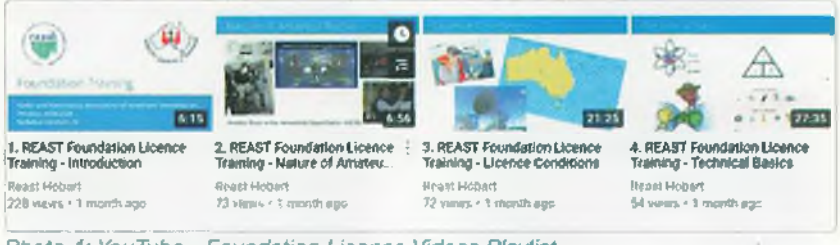


Photo 4: YouTube - Foundation Licence Videos Playlist.

Silent Key

Don Edwards VK2NV

It is with great sadness that I share the news that Donald Edwards, VK2NV, a 40 year member of the St George Amateur Radio Society (SGARS) became a silent key on 8 March 2021, 2 months short of his 88th birthday.

Don was born in May 1933 in Stanmore, Sydney, being the second child to his father George and mother Nellie having an older sister Marjorie. Don was particularly close to his parents, in particular his father, with whom he shared interests in cars, shooting and going bush – generally anything that involved being outdoors. Unfortunately, by the age of 38, Don had seen the passing of both his parents and it saddened him that they had missed out on seeing his own children grow up.

Don rarely spoke of his schooling – preferring to discuss golf. By age 15, he was one of the best junior golfers in the state and runner up in the 1948 NSW Schoolboys' Championships. He would late tell endless stories to his grandchildren of his miss-spent youth – much involving golf whether it be:

- Jumping fences or diving lakes to recover balls to sell to golfers
- Caddying – morning and night to earn pocket money
- Playing a course in reverse hole order to avoid paying green fees.

Many of the tributes that the family received regarding Don referred to him as being a 'true gentleman' or even the 'last of the true gentlemen'. To anyone who came into contact with Don. I'm sure those words ring true. Always polite, friendly and respectful of others, he was quiet and reserved by nature but always true and steadfast in his convictions. Always willing to lend a hand to anyone who needed it, he had a generosity of spirit that led to many lifetime friendships.

Most of Don's working life was spent behind the wheel of a taxi as his own boss. He was happiest working his own hours and had a strong work ethic (ultimately driving an estimated 1 million miles over 32 years until his retirement in 1988) – as well as a few stories to tell post-retirement. Don always had an interest in cars but most often it was his first car that would come up in conversation – a 2nd hand 10-4 Morris Roadstar. Picture this – a tall, dark-haired, good looking lad in the late 40s/early 50s driving a 2 door soft top convertible complete with dickie seat for the mates, the girls or the golf clubs – he thought he was the king of the world (and rightly so…)

1953 and aged 20, Don did his National Service, like so many others of the time. He ended up a Corporal in the Royal Australian Electrical and Mechanical Engineers – an achievement he was proud of. Out of the service and back to doing what the lads did best – dance! 2 to 4 nights a week -right across Sydney with Don and his mates giving that car of his a workout. And so it was in 1955 at one such dance at the Rockdale Town Hall that he met the love of his life and future wife, Faye. In 1958 Don and Faye married and together they were a formidable team (except when it came to golf).

For Don, golf was a passion and he was good at it. In fact, he was better than 'good' – he was a 'scratch golfer' (for those that aren't aware – this meant he could play any course or any rating with a zero handicap, and it is estimated that less than 1% of the golfing population, including professionals, are 'scratch' golfers or better). He continued to play 2 rounds a week from the date of his retirement (33 years ago) until late last year. Don was a member of the St Michaels Golf Club for 70 years as well as overlapping at both Botany for 10 years and Randwick for 20 years (we did say golf was a passion, didn't we?)

However, if there was one thing Don was more passionate about – it was family. A proud father to three children (Mark, Julie and Karen) with annual family holidays usually involving a seaside location and a proud grandfather to his six grandchildren – Craig, Ashleigh, Shannon, Liam, Nicholas and Christopher – with each of the grandchildren spending countless hours in Don's Radio room, learning Morse code – often being able to key in Morse code before they could write or otherwise talking to other operators overseas. Don taught his family chess, which many of the them could 'hold their own' at – however it perplexed the grandchildren that they were never allowed to move the piece on the board in the radio room – until it was explained that it was a game in progress against a regular radio contact of Don's in America and, as such, was one of the slowest games they ever witnessed, taking weeks to play.

Don first visited SGARS in October 1980 and became a member shortly thereafter in the January of 1981. He completed his studies and AOCP assessments in late 1983 and shortly thereafter became VK2CDG. Once licensed, he installed a 2m mobile rig in the taxi and with Faye in the vehicle proceeded to demonstrate his new interest. Unfortunately, his CQ was responded to by one of the more infamous and notorious operators lurking around Sydney at the time, with Don receiving a barrage of vitriol, cussing and general abuse. Shocked to have subjected his wife to this, and being concerned at her thoughts on the type of individuals he might now be associating with, Don decided that instead of giving up amateur radio entirely he would prevent Faye from hearing such disgusting behaviour and turned his hand to CW (almost exclusively). Don became an incredibly proficient CW operator, contesting in the early days and earning recognition globally. In the latter years, he continued his scheduled contacts with his overseas friends and co-controlled various CW nets. In 1990, Don became VK2NV, obtaining the callsign from another SGARS member on that member becoming a Silent Key.

To the members of SGARS, Don was always quietly encouraging the use of CW and willing to assist anyone who wanted to either learn Morse code or improve their operating skill and speed. [Don was very patient in helping me get to 18 wpm for my Full Call –Ed]

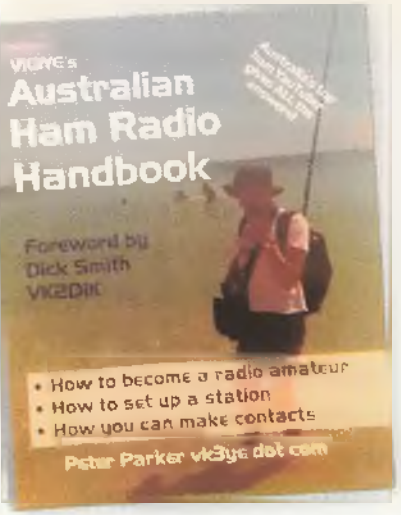
For those who ever visited a SGARS meeting, you might remember the availability of AA and AAA batteries. Don and Faye recognised many years ago that his cardiologist would throw these away after using them in heart monitoring devices for only a short period of time. Don knew that they would be handy for all sorts of purposes to amateurs, so he and Faye would head up to the cardiologist every month, collect the used batteries and make them available for anyone who wanted them at club meetings.

The memorial service celebrating Don's life was held at the South Chapel of the Eastern Suburbs Crematorium / Botany Cemetery on the 22nd of March 2021.

Vale Don Edwards – VK2NV(SK)

(7 May 1933 – 8 March 2021)

Prepared by Cameron McKay – VK2RA, President SGARS with the assistance of Don's family.



The Australian Ham Radio Handbook

Roger Harrison VK2ZRH

We all have to start somewhere. The worlds of art, science, business, and sport are peppered with such truisms. That's right, folks. Every endeavour ranging across art, science, technology and – yes, even tomfoolery – has a beginning. Inevitably, newbies turn to any publications they can lay their hands on, to devour all they can learn on the topic of their interest, to ingest its lingua franca, and soak up the zeitgeist.

When I started out on my lifelong interest in electronics and amateur radio, I spent my meagre pocket money on publications such as '101 Ways to Use Your Oscilloscope', 'Hobbies Illustrated Annual', and 'Things to Make and Do', often bought second-hand from school stalls at school fundraisers. It wasn't until I reached my mid-teens that a neighbour's mate recommended The ARRL Handbook; I'd never heard of it. But, I bought one, new, from a technical bookshop.

It is in this general vein, I guess, of providing grist for newbies to amateur radio, that Peter Parker VK3YE compiled and published the Australian Ham Radio Handbook.

In my past career as a technical journalist, editor and publisher (to jog your memories, that was with Electronics Today International - ETI, Australian Electronics Monthly - AEM, Sound & Image, etc) I've had a lot of experience in compiling, editing, publishing, and marketing technical books covering a wide variety of electronics, home computing, and amateur radio. In the course of that, I also gained considerable experience reviewing and evaluating what other authors and publishers had produced. So, it is clear to me that Peter Parker VK3YE has targeted his tome at the newest newbies.

That said, it cannot be compared against other handbooks that target radio amateurs, such as the *Radio Theory Handbook* by Ron Bertrand VK2DQ, the *Radio Theory Handbook for Amateur Operators* by Fred Swainston VK3DAC, or the WIA's *Foundation Manual* – Your Entry into Amateur Radio. All of these titles address a much broader scope of topics in more depth.

Peter Parker promotes his handbook thus: *The Australian Ham Radio Handbook will help you become a radio amateur, set up a station and make contacts on air. Written for Australian conditions it covers practical topics that existing licence study and theory books miss. For beginning and experienced hams alike, it's an ideal read for anyone interested in taking up, continuing in or returning to amateur radio.*

That reads like a pretty big 'call'. However, when I viewed it in the context of hyperventilated marketing in the Dick Smith vein, that sets it straight. In terms of imparting essential basic information, the book will certainly appeal to the newest newbies. We all have to start somewhere. As your interest accrues, you'll find that you have to add larger handbooks to your library.

Curiously, although styled as a 'Handbook' and running to 146 pages (including the blanks), no table of contents is included. There is a rousing Foreword by Dick Smith VK2DIK, and these 17 chapters follow:

1. Introduction
2. Amateur Radio – what is it?
3. Amateur Radio – what you can do
4. Having a taste
5. Joining us – getting a licence
6. What's in an amateur radio station
7. Antennas
8. Equipment and equipment supplies – people can enjoy amateur radio with a little or a lot
9. Making contacts on the air
10. Amateur bands – what they're like
11. Amateur radio operating activities
12. Amateur radio technical activities
13. Advanced station additions
14. EMR and interference
15. Amateur radio clubs and associations
16. Reference information
17. Finding things out

The publication is available in hardcopy and PDF (online download); it is sold in Jaycar stores, through Amazon, and from the author via VK3YE Books (*https://books.vk3ye.com/handbook.htm*).

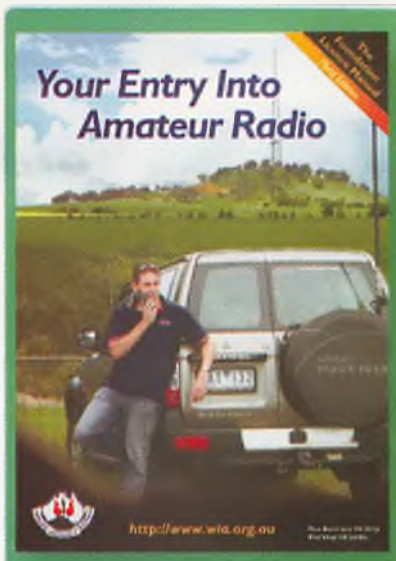
Contributions to *Amateur Radio*

AR is a forum for WIA members' amateur radio experiments, experiences, opinions and news.

Your contribution and feedback is welcomed.

Guidelines for contributors can be found in the AR section of the WIA website, at *http://www.wia.org.au/members/armag/contributing/*

Email the Secretary: *armag@wia.org.au*



Foundation Manual

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The **WIA Foundation Manual** 3rd editon, is a full color publication consisting of 108 pages of relevant information for those studying, or those who would just like a reference book for Foundation licence activities.

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