# Amateur Radio

Volume 88
Number 6 ▶ 2020
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WIRELESS INSTITUTE OF AUSTRALIA

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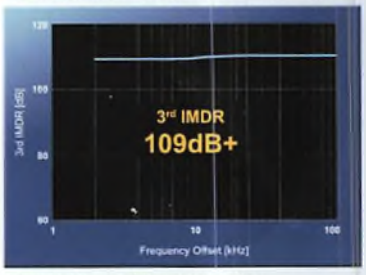


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# Amateur Radio

The Journal of the Wireless Institute of Australia



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## General



## Technical



## Columns



*This month's cover:*

*Radio direction finding (DF) is a captivating sport – get acquainted with it, starting page 7. Monica VK3FFAB and Darian VK3FAST are ready to test their newly assembled DF receivers at an ARDF event (article starts at page 11). Inset photo – secrets of the legendary Collins R-390 are laid bare, from page 23.*

### 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**
Back issues are available directly from the WIA National Office (until stocks are exhausted), at $8.00 each (including postage within Australia) to members.

**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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Representing
*The Australian Amateur Radio Service*
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# Editorial

*Roger Harrison VK2ZRH*

### Season's Greetings!

As I said here back in Issue 2, I have to pay tribute to all those who have striven to-date to maintain the momentum of *AR* production, especially over the uncertain circumstances prevailing this year.

### A hobby, a sport or a service?

While following-up a subject on social media recently, I chanced upon a discussion about the 'nature' of amateur radio – was it a hobby, a sport or a service?

Compared to many "discussions" on social media, this was an intellectual debate, even though it was peppered with the inevitable bold statements of certainty from various participants, strengthened with alarming expletives and free character references.

In bureaucratic circles, as many of you know, the Amateur Service is defined by the *International Telecommunications Union* (ITU) as "a radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest." Further, the amateur-satellite service is "a radiocommunication service using space stations on earth satellites for the same purposes."

"Duly authorized" means *licensed*. Hence, amateur radio exists to meet the needs of people licensed to use the radiofrequency spectrum for their own not-for-profit interests. A hundred years ago, when control of the spectrum was sorted-out by global geopolitical interests, small bands of frequencies were allocated to experimenters (later, the amateur service) so that governments knew who they were and where they were located, with little interest in what they were doing.

If there was little satisfaction to be gained pursuing an interest in radio communications, few people would continue it. If a "hobby" is defined as "an activity done . . . in one's leisure time for pleasure", then clearly, amateur radio is a hobby. The same goes for building and flying model aeroplanes. Hence, we can say that the Amateur Service is a hobby.

Although recognising the ITU definition, the ACMA says on its website: "An amateur apparatus licence is for *hobby radio* and technical experimentation." On that page, it urges readers to subscribe to the ACMA e-bulletin ". . for the latest *amateur service* information". The ACMA appears bipolar about amateur radio as a hobby/service (or, maybe, inclusive?). The AMC, mentions neither.

A dictionary definition of 'sport' says "an activity involving physical exertion and skill in which an individual or team competes against another or others for entertainment." Do amateur radio activities, in any way, fall within this definition? The word 'entertainment' causes a pause, but then, the dictionary says: ". . something affording pleasure, diversion, or amusement".

I am writing this while the 2020 Spring VHF-UHF Field Day is in full-swing. Read that definition of sport, again. Every weekend, month, and year, throughout the world, there is some amateur radio contest underway. Think ARDF, SOTA and WWFF, the CQ World Wide DX Contest, DXCC and so on. All this is amateur radio sport.

A service, a hobby, a sport – ***this*** is amateur radio.

Best wishes to all for 2021.

# Board comment

*Greg Kelly VK2GPK*

With the end of this eventful year fast approaching on this turn around the sun, there appears to be good reason to be optimistic now about the ongoing management of the pandemic in Australia. Specifically, I congratulate Victorians and particularly Melbournians on staying the very difficult course and achieving such a world leading outcome. Of course the virus has not been eliminated, as significant risk from those returning from overseas continues but comparisons with overseas jurisdictions such as the US and UK are in stark contrast to the current situation in Australia and New Zealand.

**Director Election 2021:** The WIA will soon be calling for nominations for the 2021 half-board election. Directors are elected for a two-year term and hence each year approximately half the board positions are up for nominations. The nomination process closes late January each new year. Forms and instructions will be on the website, plus you will need another member to support your nomination. If you believe you can add value to the WIA particularly in any one of the areas of marketing, finance / accounting, strategy, commercial management or governance plus have a passion for the future of amateur radio, then we would like you to seriously consider nominating. To continue the now 110 year legacy of the WIA, the WIA needs you! Also if you know someone that has these or similar attributes, maybe apply some gentle persuasion!

**Foundation Exam Syllabus:** The ACMA (Australian Communications and Media Authority) has released an updated syllabus (Version 10) for the Foundation Licence qualification which can be found on the AMC (Australian Marine College) website. The intent of this update was to revise the syllabus to bring it into line with the recent changes to licence conditions. These changes stem from the ACMA Syllabus Review Panel which was constituted early this year (2020). The WIA put forward a very highly qualified volunteer syllabus team comprised of Cameron McKay, David Uzzell and Dr Steve Beveridge. Other members included by the ACMA in the panel included their own staff, one AMC staff member plus a number of others who have operated as "technical advisors" to AMC.

Unfortunately, the panel was dissolved by the ACMA some months later due to, as was advised, its' inability to reach full agreement on the syllabus - a classic case of "too many cooks in the kitchen". More unfortunate, however, is that the revised Version 10 syllabus documents as posted on the AMC website is riddled with errors, some minor typos but also other significant errors. These errors extent in the exposure drafts were identified and rectified in the WIA Syllabus team's submission to the review panel – but the published version seems to have regressed to an earlier version that resembles closely the single submission that the AMC-linked panel representatives had made as a group. As an example, starting right at the beginning Section 1.1 of Version 10 on the "Nature of Amateur Radio" it states: "Recall that Amateur radio is intended to facilitate the hobby of Radiocommunications." This isn't even close to the proper definition of the Radio Amateur Service as defined in the LCD (Licence Conditions) and the ITU (International Telecommunications Union) Radio Regulations (RRs). *"Self-training is an important purpose of the amateur services, as articulated in the definition of the amateur service in No. 1.56 of the RR. Radio amateurs have made significant technical contributions to the fields of radio propagation, high frequency single sideband radiotelephone, HF data communications, packet radio protocols and communication satellite design"*. See: *https://life.itu.int/radioclub/ars.htm*

I remind readers that the WIA has an update PDF that can be downloaded from the WIA website for the WIA Foundation Manual that incorporates the LCD changes and harmonises it with the new syllabus – so you can continue to use the manual for exam study with confidence. Also don't forget the WIA has a online trial foundation exam, also on our website, to help candidates in their study.

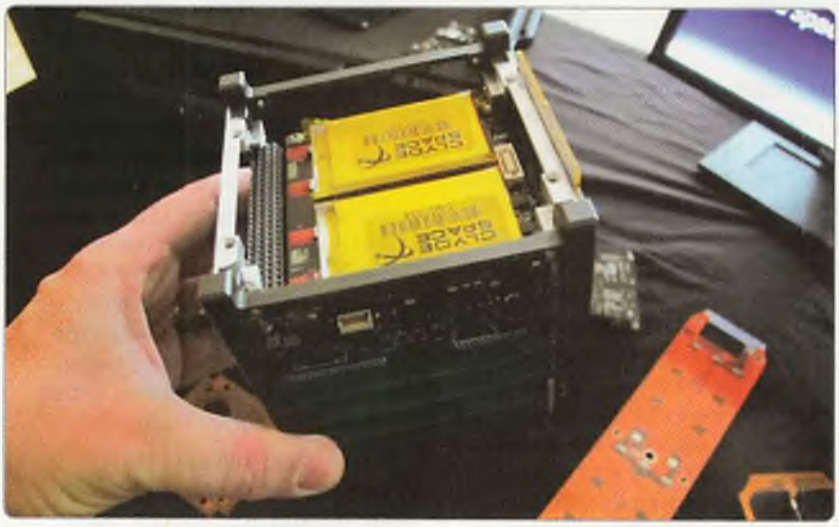
**Déjà vu and 100 year US Commercial Radio anniversary:** On Tuesday, November 3, 2020 commercial radio in the USA celebrated its 100th Anniversary. On that day in 1920, KDKA Pittsburgh broadcast the US Presidential Election results during the vote counting. This was done to demonstrate the capability of the broadcast medium to the US public. Ironically, there is a 1918 pandemic link to this election as the incumbent US President Woodrow Wilson contracted the Spanish Influenza virus during 1919 and was considered to be too ill to be nominated as a candidate for the 1920 election. Historian and author Tevi Troy wrote, citing the Wilson administration's response to the 1918 pandemic, that *"The federal response to the influenza outbreak in 1918 can best be described as neglectful. Hundreds of thousands of Americans died without President Wilson saying anything or mobilizing non-military components of the U.S. government to help the civilian population"*. Déjà vu perhaps?

**In closing:** The WIA today, more than 110 years since it was founded, exists entirely due to the continuing contribution of many volunteers over many generations - consider becoming one of these volunteers and contribute, even in a small way, to the future of this great hobby.

73

Greg VK2GPK, *WIA President.*

# WIA news



## 31 Dec – last day to reply on draft satellite policy

The WIA Board has published a draft policy on satellites, seeking feedback from the amateur radio community. Submissions close on 31 December 2020.

From time to time, the WIA receives requests to support *CubeSat* projects that wish to use amateur radio frequencies for operations.

A CubeSat is a type of miniaturized satellite for space research that is made up of one or more units measuring 10 × 10 × 10 centimetres. CubeSats have a mass of no more than 1.33 kilograms per unit, and often use commercial off-the-shelf components for their electronics and structure.

The purpose of the draft policy document is to provide some guidance to the WIA on making decisions when approached by organisations seeking WIA support or endorsement for their satellite mission and agreement for the use of amateur service frequency allocations for operation of satellites and associated ground control stations.

The draft policy was put together by Dale Hughes VK1DSH, a member of the WIA Spectrum Strategy Committee, active user of amateur satellites, homebrewer and author.

Submissions can be made by email to: *NationalOffice@wia.org.au.*

To download the draft policy document t, visit: *www.wia.org.au/newsevents/news/2020/20201121-1/index.php*

## IARU coordinates frequencies for six satellites

During the month of October, the International Amateur Radio Union (IARU) coordinated frequencies for six upcoming amateur radio satellites.

**OreSat0** (Portland State Aerospace Society at Portland State University, USA) is a one unit (1U) CubeSat.

The mission is to provide flight heritage to the "OreSat bus", an open source card-cage based system that is ideally suited for education CubeSat projects involving interdisciplinary teams of students.

Downlinks on UHF using CW beacon, 9k6 G3RUH AX25/APRS packet beacon and a 96k GMSK engineering downlink. Also, downlink on S Band (2-4 GHz) using amateur 802.11b DPSK with 11M chip/sec spread and 1 Mbps data rate for bulk mission data.

Downlinks on 436.500 MHz and 2425.00 MHz have been coordinated. Planning a launch with Momentus Space from Cape Canaveral in February 2021 into a 450 km polar orbit. More info at: *http://oresat.org/ and https://github.com/oresat.*

**TartanArtibeus-1** (Carnegie Mellon University, USA) is a 1P PocketQube.

The Amateur Radio community globally will be provided with a delay ping-back service, allowing amateurs to send messages, with replies from the satellite transmitted later. A UHF downlink using 3 kbps FSK compatible with RadioHead library.

A downlink on 437.170 MHz has been coordinated. Planned SpaceX launch from KSC in December 2020 into a 550 km SSO.

**SATLLA-2** (Ariel University, Israel) is a 2P picosat that will take low-resolution photos and will broadcast the photos on amateur bands with its position in orbit and data from its sensors. UHF and S Band (2-4 GHz) downlinks using LORA from 476bps to 9k6 bps.

Downlinks on 437.250 MHz and 2401.000 MHz have been coordinated. Planned SpaceX launch into a 410 km 52 degree orbit in December 2020.

**CSIROSat-1** (University of South Australia & CSIRO) is a 3U CubeSat mission that will perform hyperspectral infrared imaging of the Earth for scientific research purposes.

An experimental two-way link for amateurs to exchange short messages through a 'ping-pong' arrangement of data exchange is among the several communications experiments.

Proposing a 9k6 FSK downlink. A downlink on 437.315 MHz has been coordinated. Planning a launch from Cape Canaveral in March 2021 into an ISS orbit.

**PyCubed-1** (Carnegie Mellon University, USA) is a 1P PocketQube that will test a novel 3-axis attitude control system based on magnetic torque coils.

In addition, it will test new low-power LoRa radios in low-Earth orbit which will be of interest to many other amateur radio small satellite operators.

Continued on page 6

**The Wireless Institute of Australia**
ACN 004 920 745

# Election of Directors - Call for Nominations

Pursuant to clause 14.1 (c) of the Constitution the WIA Board has determined that the election of directors shall be conducted by postal ballot.

Three directors retire at the conclusion of the next Annual General Meeting which will be held in May 2021, namely Greg Kelly VK2GPK, Peter Clee VK8ZZ and Scott Williams VK3KJ.
Each retiring director is eligible for re-election.

Nominations are called for from persons seeking election as a director of the WIA.

A director must be a voting member of the WIA and must hold an Australian amateur radio license.

**Any person wishing to nominate as a candidate for election as director of the WIA must deliver or cause to be delivered to the Returning Officer by not later than 31 January 2021:**

*A statement signed by the candidate signifying their willingness to be a candidate for election as a director together with; the full name, age, occupation, membership number and callsign of the candidate, and such other biographical details or other information as the candidate wishes to accompany the ballot papers, but in all not exceeding 250 words.*

A nomination form is available on the WIA web site.

Delivery to the Returning Officer may be made by hand when the WIA national office is open at:

Unit 20
11-13 Havelock Road
Bayswater
Victoria 3153

or by mail to:
PO Box 2042
Bayswater
Victoria 3153

Nominations received by facsimile or by electronic means cannot be accepted.

**John Marshall**

WIA Returning Officer

 Continued from page 4

Proposing a 3 kbps UHF downlink. A downlink on 437.290 MHz has been coordinated. Packets are standard LoRa format and are compatible with the RadioHead library. Planned SpaceX launch from KSC into a 550 km SSO in December 2020.

**Grizu-263A** (Zonguldak Bülent Ecevit University, Turkey) is a pocketcube satellite with a digipeater mode that will allow forwarding of received messages back to Earth to support communication between amateurs.

Proposing a UHF downlink using 4k8 FSK. A downlink on 437.190 MHz has been coordinated. Planned SpaceX launch from Vandenberg into a 500-600 km Sun synchronous orbit (SSO) in December 2020.

Information on these and other upcoming satellites can be found at: *www.amsat.org.uk/iaru/*

## ARRL defends amateur microwave bands

In submissions to a special committee of the US Federal Communications Commission (FCC), the American Radio Relay League (ARRL) strongly defended the 9cm and 3cm Amateur Service allocations.

The FCC made draft recommendations to the FCC's World Radiocommunication Conference Advisory Committee (WAC) in October concerning World Radiocommunication Conference 2023 (WRC-23) Agenda Item (AI) 1.2, which identifies frequencies in the 3.3 – 3.4 GHz (9cm) and 10.0 – 10.5 GHz (3cm) bands "for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis."

The ARRL urged no change to the 3.3 – 3.4 GHz international secondary allocation to the Amateur Service in ITU Regions 2 (the Americas) and 3 (Oceania), and no change to the 10.0 – 10.5 GHz worldwide secondary amateur and amateur-satellite allocation.

The ARRL said it wanted to reaffirm that these secondary allocations continue to be important and useful and that WRC-23 should not consider changing either secondary allocation.

"Radio amateurs make substantial use of both bands," ARRL said in its comments. "They have conducted experiments and designed systems that protect primary users. The lack of interference complaints is evidence that they have been successful in doing so. In this manner, new spectrum horizons are explored and new techniques are developed that put spectrum to productive use that otherwise would represent lost opportunities and waste of the natural resource."

Read the full ARRL story at: *www.arrl.org/news/arrl-comments-on-fcc-draft-world-radiocommunication-conference-recommendations*

## We cry for thee, Arecibo

The world-famous 305m-diameter dish at Arecibo, Puerto Rico, is to be decommissioned following two successive cable failures that threaten the stability and safety of the whole structure. The Arecibo Observatory is a facility of the US National Science Foundation (NSF) and is managed by the University of Central Florida (UCF).

A 900-ton instrument and antenna platform is suspended 137 metres above the spherical dish, which is nestled in a natural depression in the local karst landscape. Three towers support the heavy platform with cables, based on a patented architecture.

On 10 August, one cable slipped from its socket in one of the towers and fell, leaving a 30m gash in the dish surface below. On 6 November, while engineers were still deciding on repairs and establishing its integrity, a main cable connected to the same tower broke unexpectedly.

On 19 November, the NSF decided it would decommission the observatory as the damage had made the facility too dangerous to repair.

For 57 years, the Arecibo Observatory has served as a world-class resource for atmospheric and ionospheric science, radio astronomy, planetary, solar system, and geospace research.

It became famous in the amateur radio community when amateurs who worked at the facility organised to use it for moonbounce on the 70cm and 2m bands. The earliest – legendary – attempts were in 1964, a year after it was commissioned, causing a sensation among VHF-UHF enthusiasts. More recently, in April 2010, Joe Taylor K1JT, Angel Vazquez WP3R, and Jim Breakall WA3FET, organised an EME weekend on 70cm, logging hundreds of contacts across the world. Visit: *https://physics.princeton.edu/pulsar/K1JT/Moonbounce_at_Arecibo.pdf*

The NSF account and reports can be found at: *www.nsf.gov/news/news_summ.jsp?cntn_id=301674&org=NSF&from=news*

# Amateur radio direction finding

## Sporty. Different. Exciting!

*Edited by Roger Harrison VK2ZRH*

Amateur radio direction finding (ARDF) – also known radio orienteering, radio fox-hunting and radiosport – is an amateur radio activity that combines the exciting aspects of radio direction finding (DF) with the map and compass skills of orienteering. Generally, ARDF activities are open to anyone who can safely navigate in the bush by themselves. A ham radio license is not required.

Essentially, an ARDF event is a timed race in which individual competitors use a topographic map, a magnetic compass and a radio direction finding receiver and antenna to navigate a course through the chosen terrain while searching for a series of radio transmitters, one after the other, within a given time limit.

Some events are of short duration – 15 minutes – and known as "sprints". Longer events may be up to an hour, or even 90 minutes. While generally a daytime activity, sometimes ARDF events are held at night, to make it more interesting or challenging.

*Photo 1: A study in concentration. With her map, compass and 80m direction finding receiver in hand, this competitor focuses on the course in front of her.*

### International rules

The rules of the sport and international competitions are organized by the International Amateur Radio Union (IARU). The sport has a popular following in Australia, across Europe and North America, in Russia, South and South East Asia, Japan, Korea, and China where it has been used in schools' physical education programs.

The very low power transmitters used are on either of two amateur radio bands – 3.5 MHz, known as "80 metres" (80m), in the high frequency (HF) band, or 144 MHz, known as "two metres" (2m), in the very high frequency (VHF) band.

These two bands were chosen because of their universal availability to amateur radio licensees across the globe. In the UK, events with somewhat different rules are also run on the 160 metre band (1.8 MHz).

The radio equipment carried by competitors on a course must be capable of receiving the signal being transmitted by the various transmitters used on a course and useful for radio direction finding. This includes a radio receiver, a directional antenna, and an attenuator to vary the signal level. Most equipment designs have adopted the philosophy of integrating all three components into one handheld device.

Events are organised for

competitors to enter in a suitable category, which may be gender and age based; the rules may include particular provisions for youth competitions. These are restricted to competitors aged fifteen years or younger. The course lengths are shorter, the transmitters may be located closer to the start of a course, and a course setter may require that fewer transmitters be located across the course.

## History of the sport

The sport originated in Northern Europe and Eastern Europe in the late 1950s. Amateur radio was widely promoted in the schools of Northern and Eastern Europe as a modern scientific and technical activity. Most medium-to-large cities hosted one or more amateur radio clubs at which members could gather and learn about the technology and operation of radio equipment.

One of the activities that schools and radio clubs promoted was radio direction finding, an activity that had important civil defense applications during the Cold War. As few individuals in Europe had personal vehicles at the time, most of this radio direction finding activity took place on foot, in parks, natural areas, or school campuses.

The sport of orienteering, popular across Scandinavia where it originated, had begun to spread to more and more countries throughout Europe during the 1950s, including the nations of the Eastern Bloc. As orienteering became more popular and orienteering maps became more widely available, it was only natural to combine the two activities and hold radio direction finding events based on orienteering maps.

Interest in this kind of on-foot radio direction finding activity using detailed topographic maps for navigation spread throughout Scandinavia, Eastern and Central Europe, the Soviet Union, and the People's Republic of China.

Formal rules for the sport were first proposed in England and Denmark in the 1950s. The first European Championship in the sport was held in 1961 in Stockholm, Sweden. Four additional international championships were held in Europe in the 1960s, and three more were held in the 1970s.

The first World Championship was held in 1980 in Cetniewo, Poland, where competitors from eleven European and Asian


*Photo 2: On the run. This young man, wearing his country's colours, makes his way through a forest in an international competition.*

countries participated. World Championships have been generally held in even-numbered years since 1984, although there was no World Championship in 1996, while there was a World Championship in 1997.

Asian nations began sending national teams to international events in 1980, and teams from nations in Oceania and North America began competing in the 1990s. Enthusiasts from 26 nations attended the 2000 World Championship in Nanjing, China – the first to be held outside of Europe.

As the sport grew over the 1960s and 70s, each nation devised its own set of rules and regulations. The need for more clearly defined and consistent rules for international competitions led to the formation of an ARDF working group by the International Amateur Radio Union (IARU) in the late 1970s.

## Standardization of rules

The first ARDF event to use the new standardized rules was the 1980 World Championship. These rules have been revised and updated over the years, increasing the number of gender and age categories into which competitors are classified, as well as formalizing the start- and finish-line procedures. While some variations exist, these standardized rules have since been used worldwide for ARDF competitions, and the IARU has become the principal international organization promoting the sport.

*Photo 4: Ewen VK3OW competing in an event in the 19th ARDF World Championships in Korea in 2018.*


*Photo 3: Caution at the start line. Competitors get their bearings (from the 8th Region 3 ARDF Championships, Maldon, Victoria 2011).*

The IARU divides the world into three regions for administrative purposes. These regions correspond with the three regions used by the International Telecommunications Union (ITU) for its regulatory purposes, but the IARU has also used these regions for sports administration.

The first IARU Region 1 (Europe, Africa, the Middle East, and ex-USSR) Championship was held in 1993 in Chtelnica, Slovakia. The first IARU Region 3 (Asia and Oceania) Championship was held in 1993 in Beijing, China, while the first IARU Region 2 (North and South America) Championship was held in 1999 in Portland, Oregon, USA. In addition to participation in international events, most nations with active ARDF organizations hold annual national championships using the IARU rules.

International events attract hundreds of competitors, often from more than 25 countries worldwide.

## First, a sport – next, the Olympics!

Organized ARDF competitions can be found in almost every European country and in all the nations of northern and eastern Asia. ARDF activity is also found in Thailand, Australia, New Zealand, Canada, and the United States.

Although they represent a broad range of amateur radio interests in their nations today, several member societies of the IARU were originally formed for the promotion and organization of the sport and continue to use the term radiosport in their society name. These include the Federation of Radiosport of the

Republic of Armenia (FRRA), the Belarusian Federation of Radioamateurs and Radiosportsmen (BFRR), the Chinese Radio Sports Association (CRSA) and the Mongolian Radio Sport Federation (MRSF).

To promote the sport, the IARU has delegated individuals as ARDF Coordinators for each IARU region to help educate and organize national radio societies and other ARDF groups, especially in nations without prior activity in the sport.

The 20th ARDF World Championships, scheduled for 2020, have been postponed until 2021 because of the coronavirus pandemic.

New event dates are:

### ARDF World Cup

Aug 24th – Aug 29th 2021.

### 20th ARDF World Championships

Aug 29th – Sept. 4th 2021.

*https://ardf2020.org/*

### Local resources

Victorian Amateur Radio Direction Finding Group Inc.
*http://www.ardf.org.au*

# 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 Temble on 439.825 MHz IRLP node 6278,
EchoLink node 399995

**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.

# *Pages from the Past*

*From the minutes of The Amateur Wireless Society of Victoria,*
*General Meeting December 1st, 1912*

On this occasion the membership tickets were given out and various new members elected.

A very interesting paper titled "A train stopped by Wireless" was read to the members and was very much appreciated.

Mr F. Baker (of Watson and Sons) gave a very interesting lecture entitled "Induction Coils". This was very instructive and was demonstrated. ¶

# Review: A competition-grade ARDF receiver kit

*John Bramham VK3WWW, ARDF Coordinator*

For 80m Amateur Radio Direction Finding (ARDF) I've been using a receiver designed in the early 1990s by Ian Stirling VK3MZ. Ian's design incorporated a very common bidirectional ferrite rod antenna. This type of antenna has two peaks and two very deep nulls. The signal from a short 'sense' antenna (vertical 'whip") is combined with the signal from the rod antenna to 'null-out' one of the peaks and produce a unidirectional, or *cardioid*, pattern which is ideal for direction finding. See **Figure 1**.

While attending events locally and overseas I saw a variety of 80m ARDF receivers. From observing what other competitors were using, it soon became apparent that there was another option to the "ferrite rod and sense whip" combination. This design uses a shielded loop rather than a ferrite rod. Good ferrite rod material is getting harder to source, so I changed one of my older receivers to a shielded loop and was very happy with the results.

Consequently, I decided to look for a complete receiver using a shielded loop antenna. It did not take long to decide on the 80m ARDF receiver design by Nicholas Roethe DF1FO, a kit dubbed the "FJRX85". From the kit assembly manual, here are some of the standout features:

- User Interface is a rotary encoder and LCD display.
- Frequency controlled by processor.
- Stores up to four frequencies.
- Stores parameters for up to six different event types.
- Automatic attenuation.
- Estimates distance to fox.
- Shows current fox, time left for this fox, warns 10 secs before end of transmission.

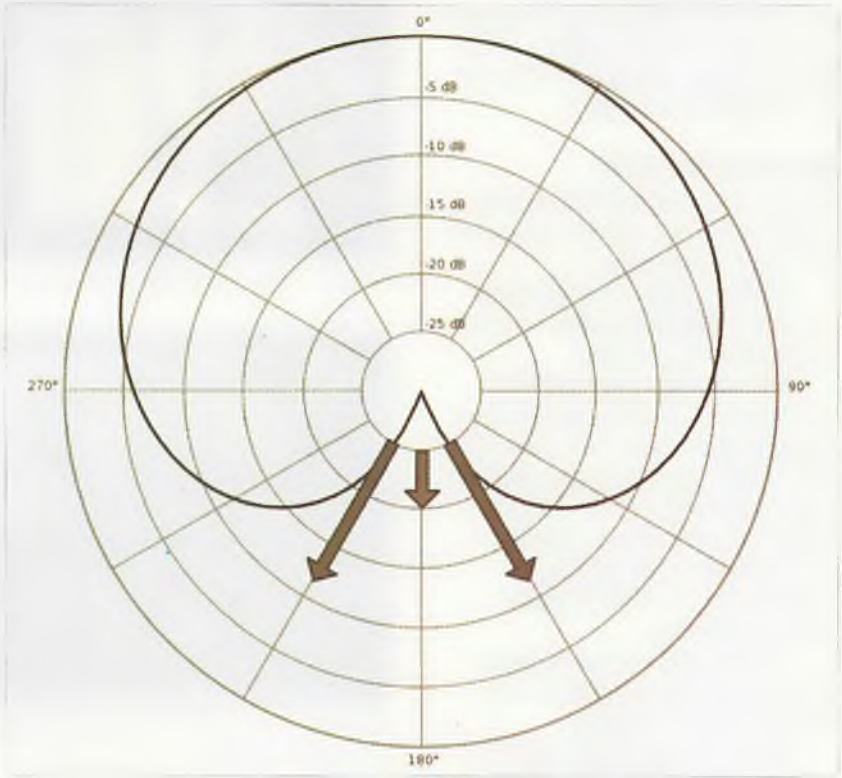



*Figure 1: A cardioid pattern has a deep 'null' in one direction. For ARDF, an antenna system having this pattern makes it easy to determine the direction of the 'fox' transmitter as the signal strength dips in the right direction, rising strongly over a narrow range of directions either side of the dip.*

- Stopwatch.
- Shows battery voltage, low voltage alarm.

Nicholas has compiled a very comprehensive assembly manual (in German and English) so the construction process looked straightforward, but there is a caveat. To save space and reduce interference, the receiver was designed using mostly 0805 (*tiny!*) surface mount components.

## Getting it together

As some of the components are hard to source, I was fortunate to find a link to Uwe Reichel DL8UWE who can supply a basic kit of hard-to-get components. In my case, he was kind enough to supply a complete kit, including a pre-cut case and most of the components, including a pre-mounted Atmel Processor and pre-bent brass tubing.

I ordered two kits, and with assistance from Bryan Ackerly VK3YNG, assembled both. The build went well, and I was so pleased with the finished product I ordered two more – an extra for me and one for Bryan.

During the next build, Bryan set up one of his pick-and-place manufacturing machines to load the boards with components, which greatly simplified the kit construction. He also did some preliminary testing of the assembled boards. Thank you Bryan. This was a good thing, as ultimately, 24 more of these receivers were ordered and built; five to be retained by the Victorian ARDF Group as loan units and the balance for members of the group.

## See how it's done

As I've now assembled and tuned 13 receivers, I decided to document the most recent build.

**Picture 1** shows the kit before assembly. **Pictures 2 and 3** show a completed circuit board.

First was the case assembly. It's made from printed circuit board material and was delivered pre-cut and drilled. Once the case assembly was completed the main lid and battery lid were added, followed by rounding off the corners and roughing up the PCB fiberglass ready for painting.

Careful masking was required to avoid getting any paint on the internal copper surfaces.

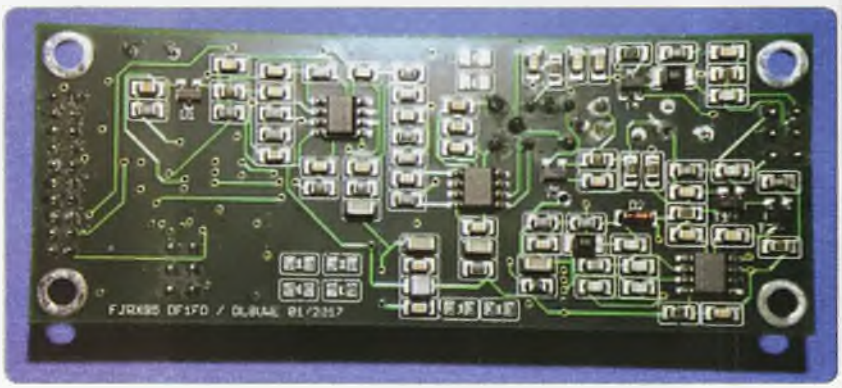
Next to be assembled was the loop antenna. The supplied tube had to be cut to length and then threaded with 12-core wire cable around the whole loop. This was then temporarily installed to ensure it fitted the case. It was removed before the painting process. See **Pictures 4 and 5**.

At this stage, I also prepared the sense antenna, which was made from an old broken tape measure as it's not part of the kit. The only issue using tape measure material was soldering an M3 Hex standoff to it. With the help of some very old Bakers Soldering Flux/Paste and a 130 Watt Birko soldering iron, it was not that difficult. See **Picture 6**.

With the case assembly and painting out of the way, it was time for the final assembly. Most of this was pretty straightforward, but there were a few catches with the most difficult being sorting out the 12 wires coming from the loop. These have to be arranged so that you have one 8-turn loop and two each of 2-turn loops of wire. There are also 20 wires from the various receiver controls which are soldered to a 2.0 mm pitch 20-pin header. See **Pictures 7 and 8**.

With the assembly complete, it was time to tune and calibrate the receiver. For this I used my trusty old HP8657A (0.1-1040 MHz) signal generator, which was perfect for the job. Once this procedure is complete, the last remaining

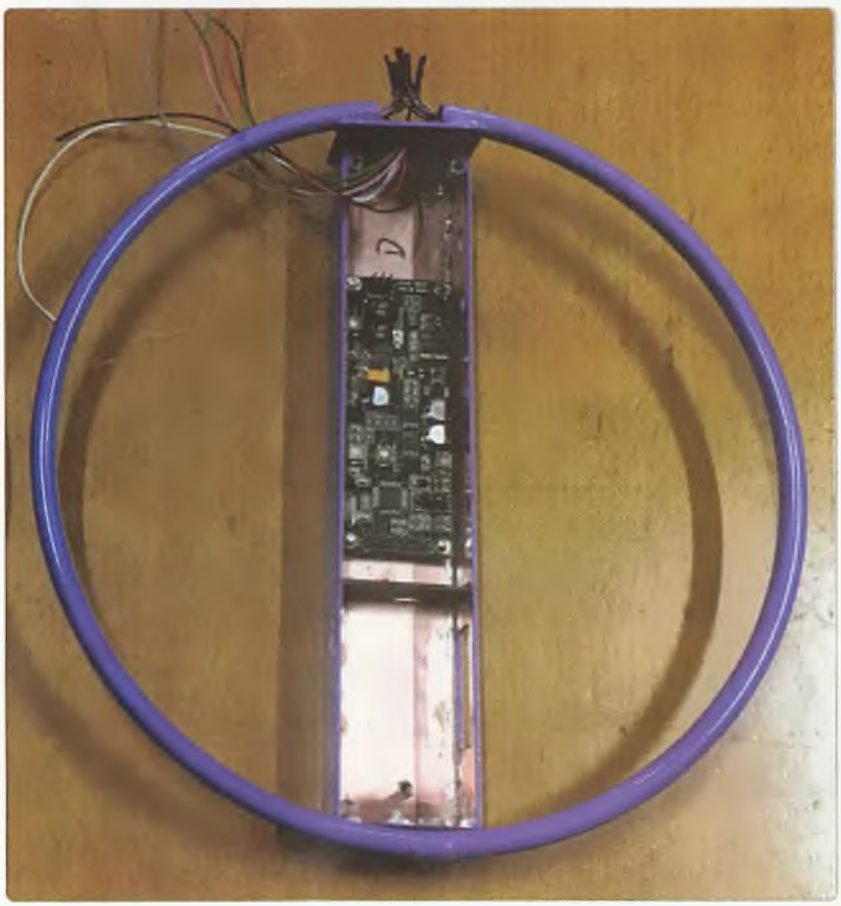
*Picture 1: The pieces of the kit, ready to assemble.*



*Picture 2: The DF1FO receiver PC board, bottom side, with surface mount components loaded.*

*Picture 3: Top side of the DF1FO receiver board. Note the microcontroller at the right.*

*Picture 4: Two of the copper tubes used to make the "shielded loop" antenna.*



*Picture 5: The painted shielded loop antenna fitted to the completed receiver box.*

*Picture 6: The sense antenna, made from a short length of old broken tape measure with an M3 Hex standoff soldered to it.*

process is to match the sense and loop antennas.

This needs to be done in an open field with about 100 metres distance between the receiver and a low-powered 80m transmitter.

The aim of this is to tune the loop for maximum signal and

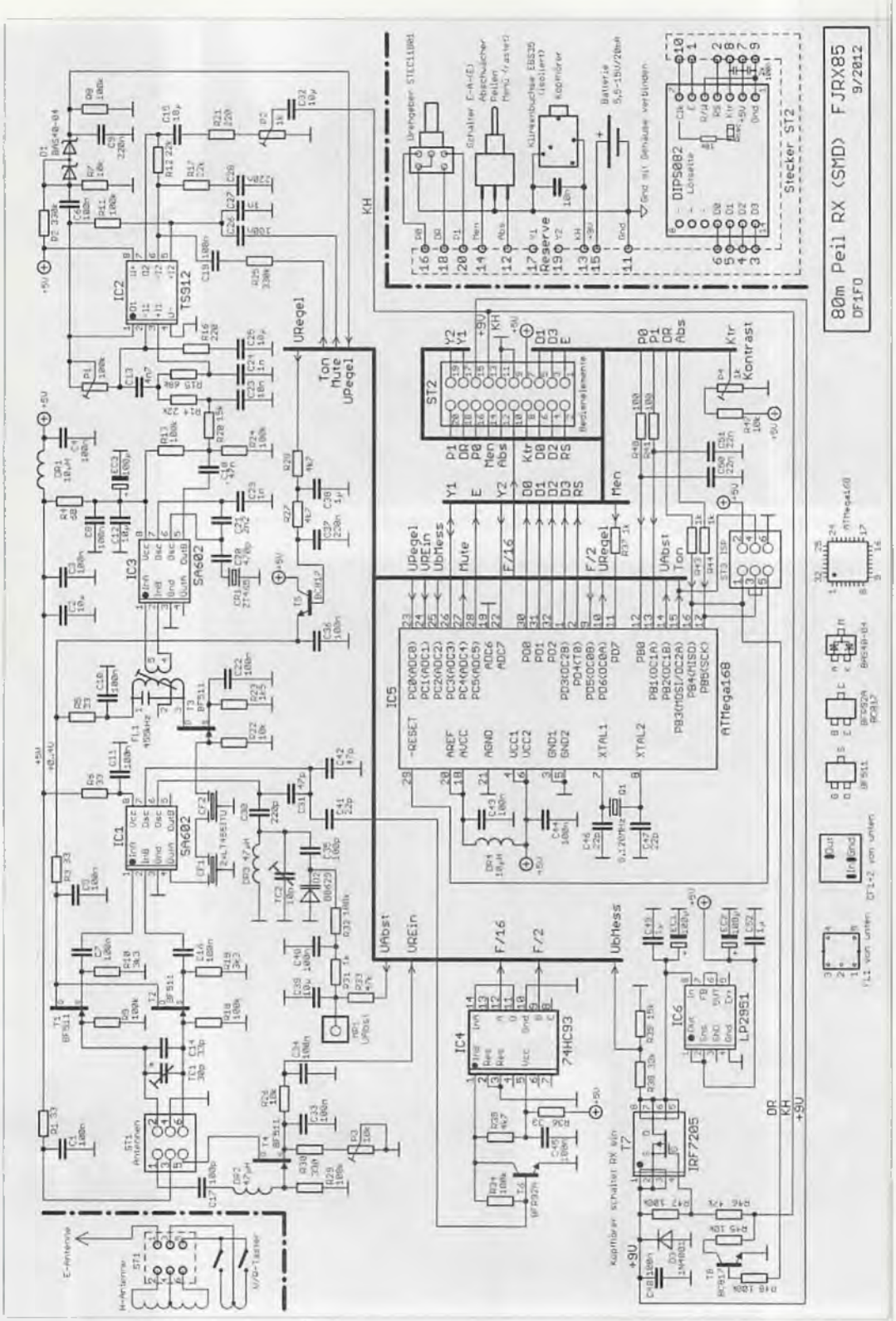



*Figure 2: While the circuit looks complicated, it is best understood by breaking it down into the operational sections. The* **receiver** *runs along the top, here. At top left, two FETs,* **T1** *and* **T2**, *form a push-pull source-follower* **preamp**, *which also matches the high impedance antenna (far left) to the low impedance inputs of* **IC1**, *an SA602* **double-balanced mixer**. *IC1 also provides the* **local oscillator** *to convert the 3.5 MHz input signal to the IF frequency of 455 kHz. A pair of ceramic resonator filters (CF1-CF2) set the IF bandwidth. A common-source FET stage,* **T3**, *provides the* **IF amplifier**, *with a tuned drain circuit (FL1) driving the product detector,* **IC3**, *another SA602. A ceramic resonator, CR1, provides the* **BFO**. *The audio from IC3 drives a two-stage* **audio amplifier** *comprising a dual op-amp,* **IC2** *(TS912). The* **control and display circuitry** *runs across the bottom half of the circuit, centring on the ATMega168* **microcontroller**. *The* **LCD display module** *(DIPS082) is at lower right. A micropower voltage regulator,* **IC6**, *with very low dropout voltage (LP2951) ensures a stable supply rail. Automatic* **attenuation** *is achieved by reducing the operating voltages of the preamp and IF amplifier FETs via* **T5**, *which is controlled by an output from the ATMega168. The output of the sense antenna is buffered by* **T4**, *which provides the signal to the microcontroller.*

Picture 7: Almost complete!

Picture 8: A pair of completed DF1FO receivers, ready for competition!

adjust the sense antenna level so that it nulls out one of the peaks of the loop antenna, giving you a cardioid, unidirectional pattern, rather than the bipolar pattern of the loop.

If you are interested in more of the build, I have some videos on my Youtube site. Just search for "DF1FO", or "Vermontcreekbed".

I must thank Nicholas DF1FO for making his design and code public, Uwe DL8UWE, and Bryan VK3YNG for all the assistance they gave me and the Victorian ARDF Group.

## WIA Contest Website

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

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

# Shorting rain static on your antenna

*Gary Watson ZL3SV*

Rain static only seems to happen when you are trying to listen to a weak signal. I am happy to share what I did many years ago to stop rain static.

To eliminate rain static, the antenna and all other surrounding metal items such as guy wires, metal items etc, need a low resistance electrical path to ground.

Rain static is caused by friction between an antenna, or any metal item that is 'above ground' electrically, and the air, where rain falling creates an accumulation of **static** charge.

Those with baluns usually have a good electrical path to ground with their antennas, but those who don't can install an RF choke from the inner of the feedline coax to ground. I used a PL259 tee and a coil with ferrite, as per the photo.

It does not stop there. If you have a pole or mast, everything needs to be at electrical ground as rain static that builds up on guy wires and other metal objects can re-radiate the noise to your antenna.

In some cases the static can be measured with a multimeter set to AC 1000 volts. Rain static noise levels on your receiver can exceed 40 db over S9.

Rain static is often heard as a whining–hissing sound that can vary in pitch depending on the rain intensity.

If you have insulators on metal guy wires, the trick is to earth the lowest ground end and install RF chokes across each insulator. They will still isolate RF but not allow rain static to build up as they are now grounded.

The same can apply with a metal roof on a shed or house, etc.

It could be that your neighbors have items above earth that re-radiate the noise to your antenna.

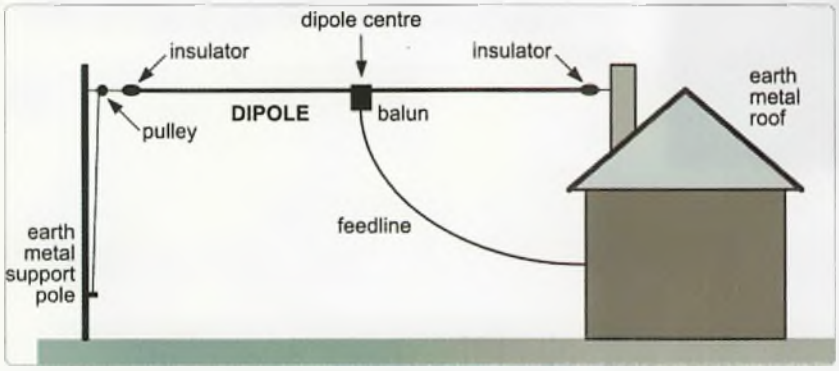
Having everything at electrical ground could also help with your overall receive noise level.

To check your antenna, you can unplug it from your rig and, with a multimeter across the terminals, you can measure the resistance, which should be as low as possible.

If it's open circuit, then you could experience rain static at some stage. Insulated antenna wire can also experience rain static, if the antenna's not grounded.

This is not a total fix as there are other considerations, but it should help you solve rain static in most cases.

*A simple, in-line RF choke between the coax centre and the shield will 'short' rain static that accumulates on your antenna. I wound about 25-30 turns of heavy-gauge wire on a length of 9 mm diameter ferrite rod (eg. 100 mm long, Jaycar LF1010). The heavy-gauge wire makes the coil self-supporting. To connect the RF choke in-line, I used a PL259 tee-piece and a female-female SO239 adaptor.*


*Even though the antenna itself may be connected to ground, metal structures in the vicinity should also be earthed.*

Plan ahead

**Summer VHF/UHF Field Day** | 16 - 17 January 2021

Find the Rules at:
*http://www.wia.org.au/members/contests/vhfuhf/*

# Homebrew HF Transceiver project

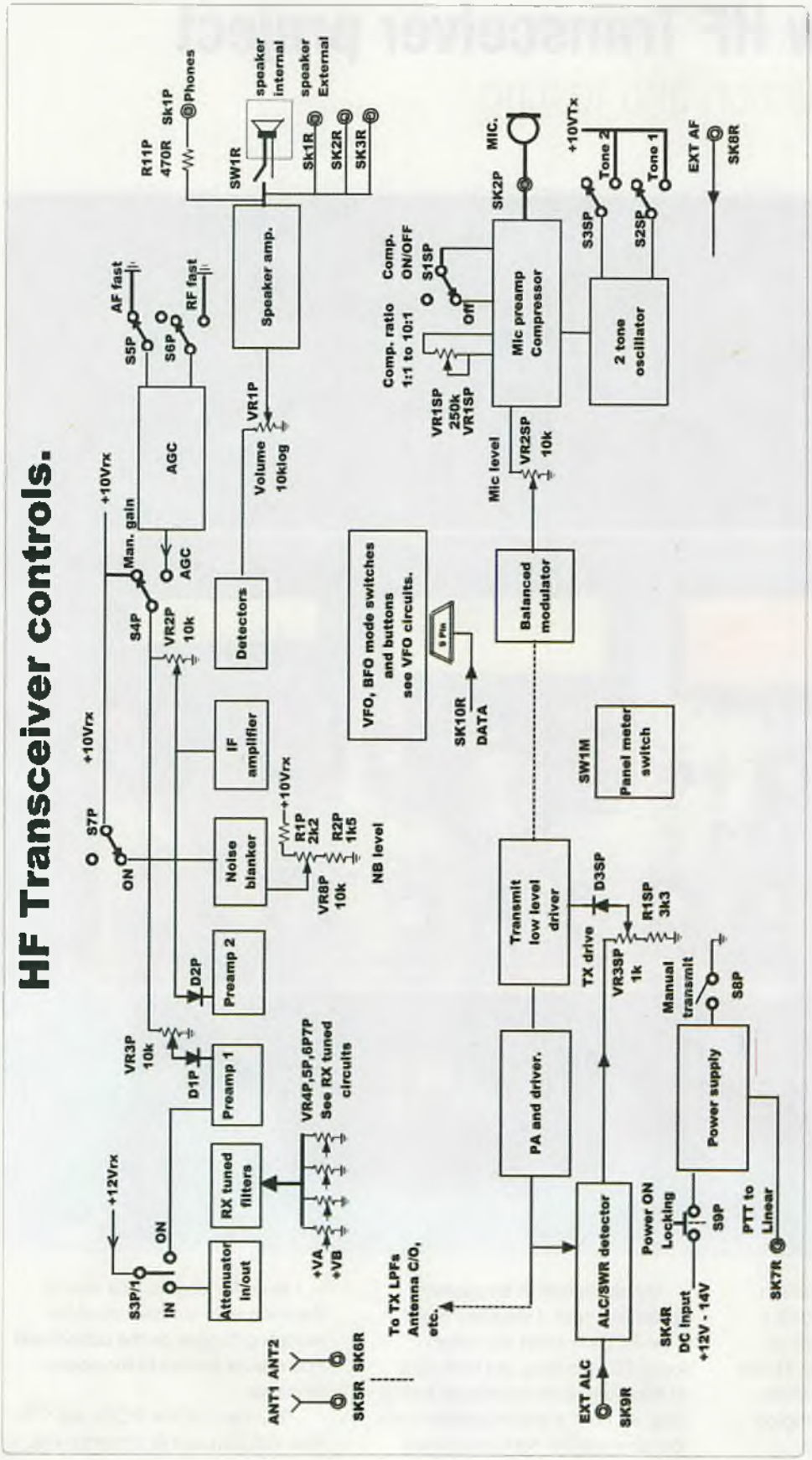
## Part 4 Construction and testing

*Luigi Destefano VK3AQZ*


As I mentioned in the introduction, in *AR* magazine Issue 6 of 2019, I don't expect anyone to construct this rig as it stands. However, I hope that the modules and information is of help to readers embarking on their own design adventures.

My unit is built in an unused transceiver case. I mounted many of the PCBs in small aluminium boxes 120 mm long, cut from 50 x 30 mm aluminium rectangular tubing obtained from a large hardware store. The tubing is low cost and comes in 1 m or 4m lengths. The tops at the ends were cut back to allow mounting flanges on the bottom and screwdriver access to the screw terminals.

So, many of the PCBs are 100 mm x45 mm and fit in the boxes.




Short brass pillars were countersunk for 3 mm screws to fix the boards inside the enclosures. Holes are drilled in the top for access to trimmers and test points. Some adjustments are accessible through the open top end of the box, so side entry trimmers are used there.

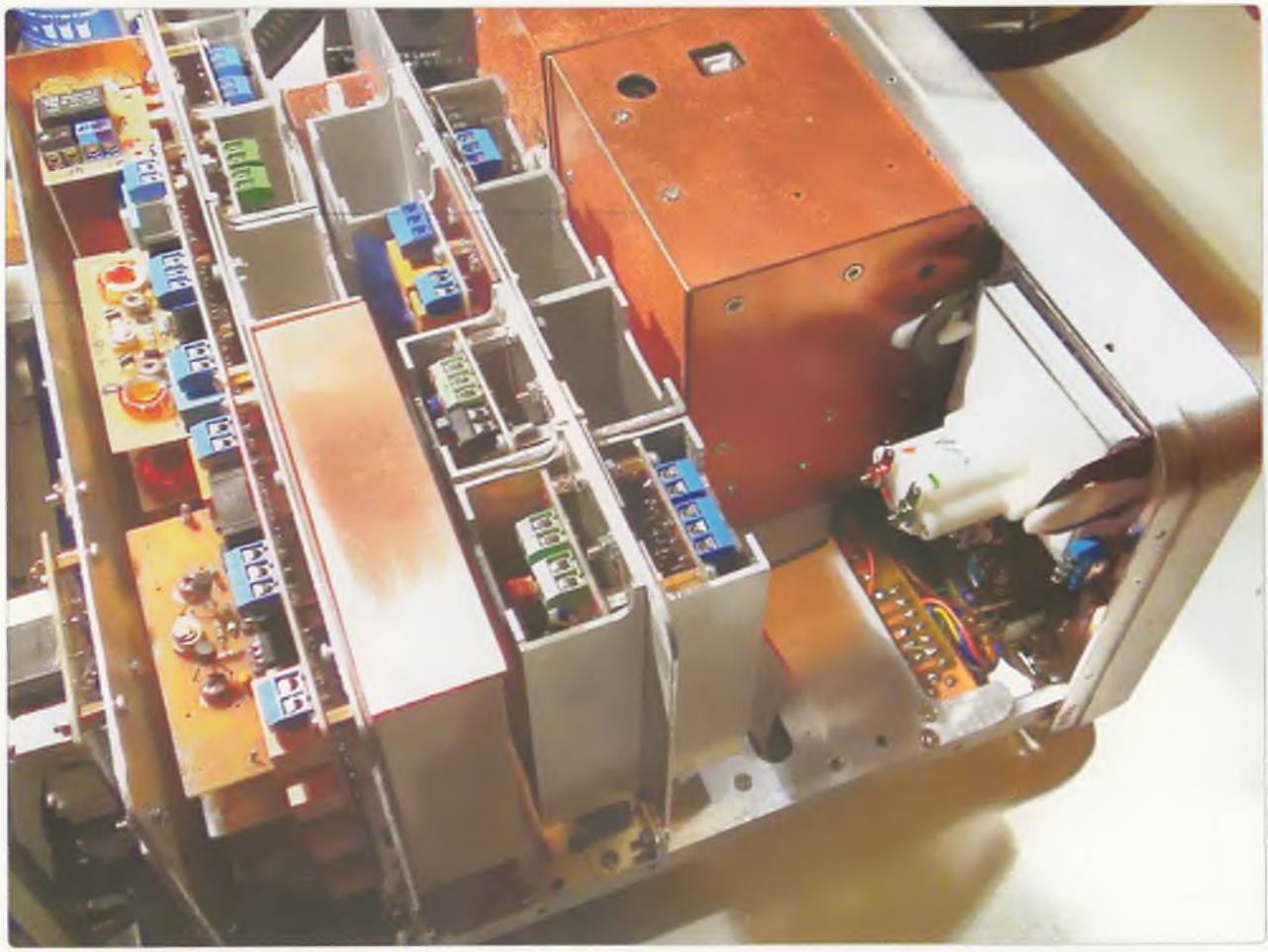
Each box, where possible, has a printed laminated label attached with all the text required to identify the terminals, test points, etc.

The tuned circuit modules and filters were larger and needed boxes made out of double-sided blank PCB material. The VFOs were also fitted in PCB boxes made to fit behind the front panel.

Over the years, I have constructed several HF rigs and found that, without good shielding, the rig suffers excessive receiver birdies and transmitter spurs. In this rig, I have swept the range from 100 kHz to 54 MHz and it is surprisingly free of birdies. There are the usual ones from the clocks in the Arduino processor around 15 MHz, and the Si5351 clocks, around 25 MHz, but these are weak.

The 9 MHz BFO signal, and its harmonics, are only a couple of S points. The displays also have clocks, and these can be heard as buzzy signals at a few spots in the spectrum. Overall, the amateur bands are clear. The result of the sweep was recorded on a video camera for reference.

*Figure 36: This shows the interconnections between controls mounted on the front, rear and side panels.*



*Many of the rig's PCBs are fitted into boxes to make modules. The boxes are made by cutting lengths from 50 x 30 mm aluminium tubing, which can be bought in one metre or four metre lengths.*

I also found that the J310 and 2N5109 seemed to amplify or generate a fair amount of noise around 400 kHz. This may be due to leakage into the case from some rather noisy appliances that that are running close to the room, and on the same power system. My solar inverter is very noisy at times. And the NBN modem generates considerable HF RF noise that is picked up by the antenna and needs to be turned off at times.

Most of the components have been mounted on homemade printed circuit boards. The circuits are laid out with the free Eagle PCB program. The track patterns are then printed on paper, copper side up, and taped to the copper side of the PCB material. All holes are then drilled using a 0.7 mm carbide drill.

Using the Eagle print as the template enables me to locate the holes accurately. After removing the template, the board is scrubbed very clean and tracks drawn on the copper using both fine and course PCB, or waterproof, pens. After etching with ferric chloride solution in a glass container, I clean the ink off and drill the larger holes, then trim the board.

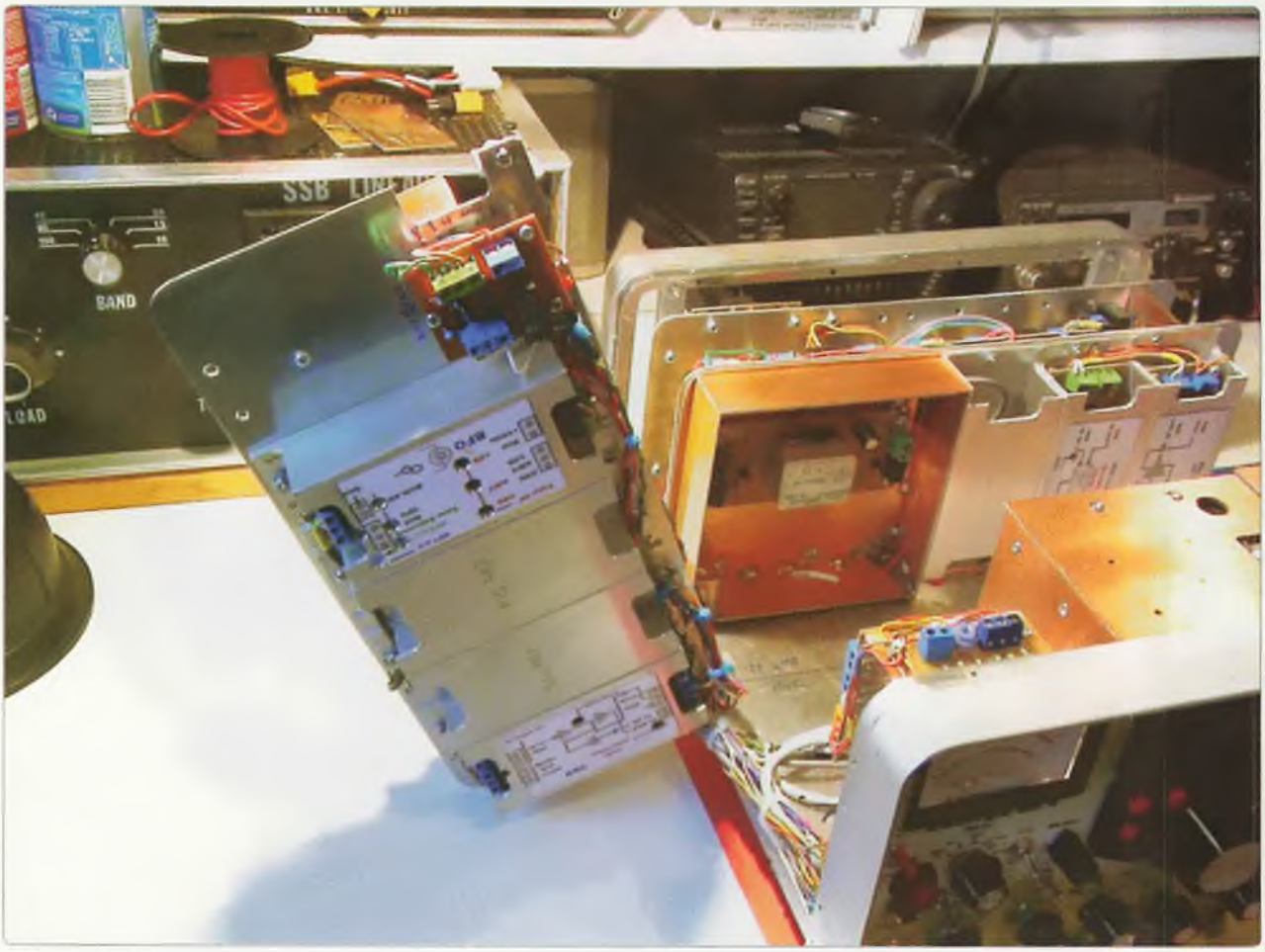
Recently, I have used the cold toner method. A laser print of the PCB tracks is printed on glossy low GSM photo paper on a colour laser jet printer. The tracks are printed in red, which means two toners are used and this gives a more even print that produces better results than a black print. The process uses a weakened Acetone solution on the back of the print, which is hand pressed, with a roller, onto the clean PCB copper layer.

The PCB with print, is then immersed in water to dissolve the photo paper. Any paper remnants are gently rubbed off by fingers. Any tracks not complete are fixed with a PCB pen. Low GSM paper works best since it allows the Acetone to penetrate the paper better.

However, everyone has their favourite method.

Most of the modules are mounted on both sides of vertical aluminium panels, which swing up and out. The cable looms go to the panels from one side of the case so that the panels remain connected. Swinging the panels up gives access to the adjustments on each module.

Where possible, modules were first tested in isolation on the test




*Most of the modules are mounted on both sides of vertical aluminium panels, which swing up and out to give access to the adjustments on each module. The cable looms go to the panels from one side of the case so that the panels remain connected when swung out.*

bench or in a prototype jig, to make sure they worked prior to fitting in the case. Many were rebuilt several times until they performed correctly.

**Figure 36** shows the interconnections between the controls mounted on the front, rear, and side panels. Screened audio cable, and mini coax with SMA connectors, are used to connect low level audio circuits and RF sections. Short SMA cables, connectors, and adapters were purchased on the web. In a few cases, I crimped my own SMA cables.

Panel-mounted parts, controls and connectors mounted on the front panel have the letter P as part of the part designation. Items mounted at the rear have the letter R, and those on the side panel, the letter SP. For example, the transmitter drive control is mounted on the side panel and is designated as VR3SP. Each module or section uses part numbers that are duplicates on other modules. For example, there is an R1 resistor in each module. Reusing part numbers means I don't end up with large number designations.

If contemplating building a HF rig of any size, I recommend that you have a commercial amateur rig of some sort available as a test unit. A good digital CRO capable of working up to 50 MHz will be invaluable in testing and aligning many of the circuits. A power meter, dummy loads, and an SWR bridge are essential.

When testing for harmonic levels, you can use your commercial receiver tuned to the harmonics, with the S meter referenced to the fundamental. The receiver gain will need to be turned down and the antenna fitted with a dummy load. A good receiver S meter will give you a good approximation of the harmonic levels in dB. Otherwise, a good spectrum analyser will do the job. And a fellow amateur nearby can listen to your harmonics also (but beware of his antenna gain at the harmonic frequency).

Some digital CROs can also give you a spectrum display. Intermodulation distortion in the transmitter chain needs to be kept low. High intermodulation distortion will affect your transmit audio quality. Nice and clean transmit

audio requires the IM products to be better than -30 dB.

When testing the modulation, a pair of good quality headphones plugged into the commercial rig, or a good receiver, will tell you if the transmitter audio is good. Don't forget to turn off any noise blanking or processing during these tests. The noise blanker will pop on your voice peaks. I have made some videos of tests conducted on some sections of the rig which I can make available to anyone interested.

I won't go into the testing and alignment of the various sections. I think anyone building a project like this will already be familiar with that aspect of the project. If not seek help from a more experienced person if possible.

## Conclusion

I would like to acknowledge the assistance from Rick Swanton, JI1HSV, in Japan, who has been following the development of this project and using some of my modules in a design of his own, with a few less bands. Rick and I have been corresponding weekly for over a year, following each other's progress, exchanging photos and ideas. Rick has also uncovered some issues and provided solutions and suggestions. I am most grateful for his help and friendship throughout this project. In Japan, home brew rigs need to be tested by the equivalent of the ACMA for spurious emissions and harmonic levels, which are quite stringent. The rig completed by Rick passed, and the testing engineer was surprised to find it exceeded the performance of current commercial rigs.

Rick found the signal-to-noise ratio and readability is better than his current commercial rig. Rick used a phase linear CW crystal filter. Group delay on linear phase filters occurs outside the pass band, and this results in reduced ringing, and therefore a better sounding CW signal (REF 1, Page 3.23). The KVG filter I am using is similar, and this also results in overall better sounding audio at the output of the product detector.

I would also like to thank Peter Westgarth, VK3APW, who has made available a spectrum analyser and good quality RF voltmeter to assist me with the measurements and also some free AD603 DIL ICs, which have been used in this project.

And lastly, to my wife Rhonda, VK3ZYL, who has put up with all the drama when things were not working and not complaining about all the purchases of extra bits on EBay and other sources. On that last point, this rig uses lots of

| Figure 36 Front panel components | | |
|---|---|---|
| **Reference** | **Value** | **Notes** |
| S1P | Select mode VFO A-B-RxA/TxB | |
| S2AP | VFO A LSB/USB/AM/FM | |
| S2BP | VFO B LSB/USB/AM/FM | |
| S3P | Attenuator on/off, OFF, Preamp 1 on/off | |
| S4P | AGC on/off | |
| S5P | AGC Hang fast/slow | |
| S6P | AGC RF fast/slow | |
| S7P | Noise Blanker on/off | |
| S8P | Manual transmit on/off switch | |
| S9P | Power on/off | |
| SW1M | Front panel meter switch. | |
| VR1P | 10k Log | Audio volume |
| VR2P | 10k Lin | RF2/IF/SQ gain + Diode D2P |
| VR3P | 10k Lin | RF1 gain+ Diode D1P |
| VR4P | 10k Log | Tune A |
| VR5P | 10k Log | Tune B |
| VR6P | 10k Log | Trim A |
| VR7P | 10k Log | Trim B |
| VR8P | 10k Lin | Noise blanker level plus 2k2 +1k5 |
| SK1P | Headphone socket with R11P (470R) | |
| SK2P | Microphone connector 4 Pin | |
| **Figure 36 Rear panel components** | | |
| SK1R | Ext speaker at rear | |
| SK2R | Rear ext speaker red banana socket | |
| SK3R | Rear ext speaker black banana socket | |
| SK4R | DC input 12-14V | |
| SK5R | Antenna 1 SO239 | |
| SK6R | Antenna 2 SO239 | |
| SK7R | PTT to linear. | |
| SK8R | AF in/out | |
| SK9R | ALC in | |
| SK10R | RS232 Data | |
| SW1R | Int speaker on/off | |
| **Figure 36 Side panel** | | |
| S1SP | Compressor on/off | |
| S2SP | Tone 1 on/off | |
| S3SP | Tone 2 on/off | |
| VR1SP | Compressor ratio 250k | |
| VR1SP | Microphone level 10k | |
| VR3SP | 1k Drive level | With resistor 3k3 + Diode D3SP |

relays. Most are small 12 volt DPDT types, which are very common on EBay. They can be purchased in bulk at quite low prices. I have also purchased quite a lot on the weekly specials from a local surplus shop in Clayton. Usually in lots of 10 for $5, or so. If I tell you how many I have used in this rig, you will not believe me!

### All the parts of this project

This project was published over these previous issues of Amateur Radio magazine, as follows:

Part 1: **Intro & Receiver**. 1st article. Vol. 87, No.6 – 2019

Part 1: **Receiver**. 2nd article. Vol. 88, No.1 – 2020

Part 2: **Transmitter**. 3rd article. Vol. 88, No.2 – 2020

Part 2: **Transmitter**. 4th article. Vol. 88, No. 3 – 2020

Part 3: **VFO system.** 1st article. Vol. 88, No. 4 – 2020

Part 3: **VFO system.** 2nd article. Vol. 88, No. 5 – 2020

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(2) Roy Hejhall, ON Semiconductor, Application Note AN531/D, MC1496 Balanced Modulator, Jan. 2002, Rev.3. *http://onsemi.com*. Application notes section.

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(4). Radio Communication Handbook, Thirteenth Edition, RSGB Publication.

(5) Wes Hayward, Introduction to Radio Frequency Design, 1994, ARRL Publication.

(6) Helge O. Granberg, Motorola RF Application Reports, AN762, Linear Amplifiers for mobile operation. Pages 128-136.

(7) Simon Monk, Programming Arduino, Getting started with sketches, Mc Graw Hill Publication.

(8) The transmitter low pass filters were designed using SVC Filter design by James L. Tonne, W4ENE. See: *http://www.tonnesoftware.com/*

(9) Mini-kits in South Australia. *http://www.minikits.com.au/*

(10) Jim Tregellas, A low distortion two-tone oscillator, Amateur Radio, June 2013, Wireless Institute of Australia, pages 14-17.

# A Cold War Warrior yields its secrets
## Refurbishing my Collins R-390A/URR

*Mike Charteris VK4QS, VK4XQM*

I shall begin at the beginning, for one needs to know the evolution of the Collins R-390/URR receiver in the post-WW2 period of 1950 through 1954, to appreciate how the bureaucratic pragmatism of the times drove the developers to display such untrammelled engineering genius.

Before 1950, the US Military was operating the Collins 51J series of receivers. The Army Signal Corps then approached Collins to develop a more advanced receiver to cover a frequency range of 500 kHz to 32 MHz. The Army also wanted improved selectivity, frequency accuracy, image rejection, dynamic range, stability, and provide good electro-mechanical design. Thus was born the engineering miracle, the Collins R-390//URR Communications Receiver.

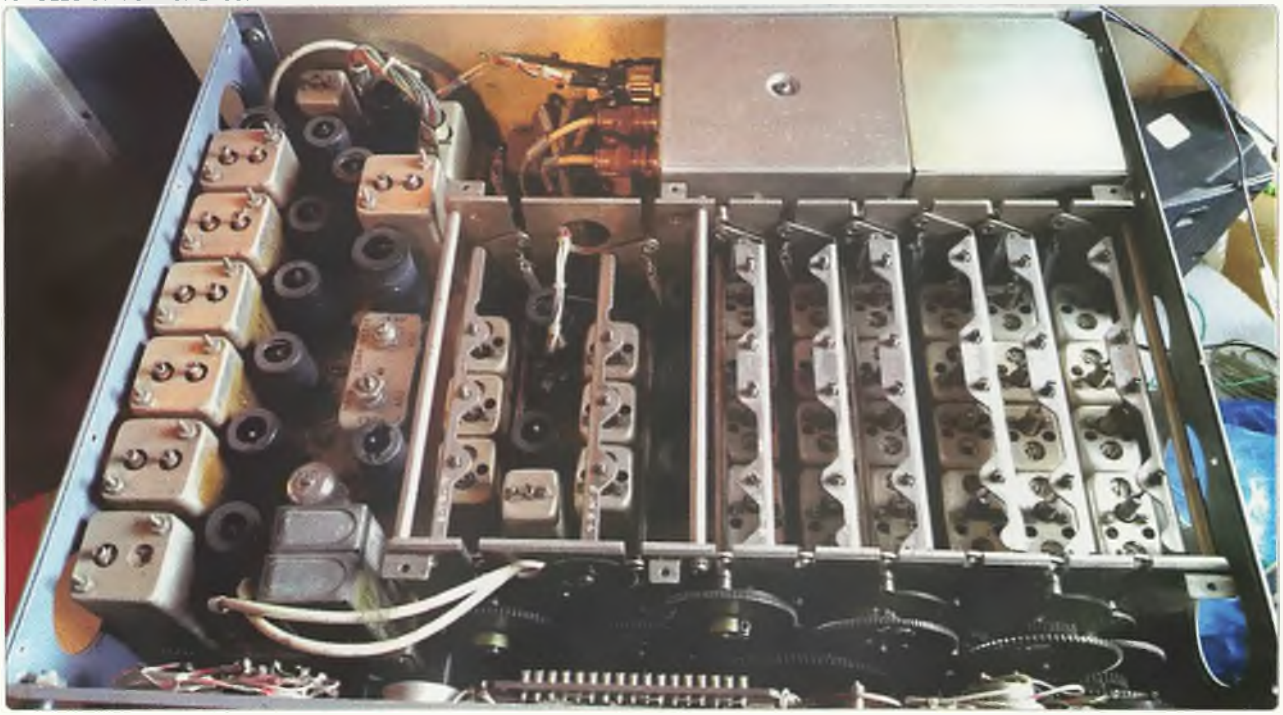
*Photo 1: The front panel of the Collins R-390 has a clean, orthogonal layout. Note the mechanical digital frequency display.*

### The contract and security

The Collins R-390/URR was to be capable of receiving AM, FSK, CW and MCW. The details were covered under the US Signal Corps specifications SCL-1134-B, and contract No: W36-39-sc-44552.

This order was placed by the US Army Signal Corps Engineering Laboratories, Fort Monmouth, New

*Photo 2: While the interior of the R390 appears complex, the shrewd mechanical design ensures that it is easy to take apart for ease of maintenance.*



# The Cold War

Following the end of WW2 in 1945, an open rivalry arose between the United States and the Soviet Union, supported by their respective allies. In a 1946 speech, UK Prime Minister Winston Churchill declared that an Iron Curtain had descended on Europe, brought down by the Soviet Union. From this beginning, the Cold War ". . was waged on political, economic, and propaganda fronts . ."

'Cold War' was first used by English author and journalist, George Orwell, in a 1945 article referring to what he predicted would be a nuclear stalemate between "two or three monstrous super-states, each possessed of a weapon by which millions of people can be wiped out in a few seconds." Orwell wrote the dystopian novel '1984'.

The Cold War solidified over 1947–48, when US aid provided to western Europe had brought those countries under American influence and the Soviets had installed openly communist regimes in eastern Europe.

The two superpowers continually antagonized each other through political manoeuvering, military coalitions, espionage, propaganda, arms buildups, economic aid, and proxy wars between other nations.

Throughout the Cold War, the United States and the Soviet Union avoided direct military confrontation in Europe and engaged in actual combat operations only to keep allies from defecting to the other side or to overthrow them after they had done so.

The Soviet Union sent troops to preserve communist rule in East Germany (1953), Hungary (1956), Czechoslovakia (1968), and Afghanistan (1979). For its part, the United States helped overthrow a left-wing government in Guatemala (1954), supported an unsuccessful invasion of Cuba (1961), invaded the Dominican Republic (1965) and Grenada (1983), and undertook a long (1964–75) and unsuccessful effort to prevent communist North Vietnam from bringing South Vietnam under its rule.

The Cold War intensified over 1958-1962 as the Americans and Soviets developed intercontinental ballistic missiles capable of delivering nuclear warheads over long distances. The two superpowers soon signed the Nuclear Test-Ban Treaty of 1963, which banned aboveground nuclear weapons testing.

In 1961, East Germany began building the notorious 'Berlin Wall' between East and West Berlin to prevent its citizens escaping to the west, eventually reaching 44 km length. The Wall remains a tangible symbol of the Cold War. It stood until November 1989, when the head of the East German Communist Party announced that citizens could cross the border whenever they pleased.

Despite all these flashpoints, over the 1960s and '70s the bipolar struggle between the Soviet and American blocs developed into a more-complicated pattern of international relationships in which the world was no longer split into two clearly opposed blocs.

Over 1989-90, the Berlin Wall came down, borders opened across eastern Europe, and free elections ousted Communist regimes everywhere in eastern Europe. In late 1991, the Soviet Union itself dissolved into its component republics. Hence, the Iron Curtain was lifted and the Cold War petered-out.

**Roger Harrison VK2ZRH**

**Sources:** *Encyclopedia Britannica – www.britannica.com; JFK Library – www.jfklibrary.org; Wikipedia.*

Jersey, and it was classified as, "Secret": *This document contains information affecting the national defence of the United States within the meaning of Espionage laws, Title 18, U.S.C., Sections 793 and 794. The transmission or revelation of its contents in any manner to an unauthorized person is prohibited by law.*

## Production and costs

By mid-1950, the Collins engineering team had successfully completed the first units of the R-390 and R391, with both units exceeding expectations and specifications of the US Army. Consequently, Collins was awarded the Contract to supply 3000 receivers by the end of that year.

Accordingly, a further contract – dated in 1951 – saw Collins manufacture another 10,000 units over the next two years. No cost was spared in the production of these receivers, with the R-390 coming in at US$2000 and the R-391 a whooping US$3000.

By comparison, the average home in the USA in the 1950s cost in the order of US$7400. Based on the 1950s prices that'd be like paying more than $20,000 today for the R-390, and a staggering $32,000 for the R-391.

## Engineering 1950-53

The R-390//URR and R-391//URR were only manufactured by Collins and Motorola between 1950 and 1953. They covered from 500 kHz to 32 MHz. With 33 Valves and no cost spared, they have been described as the *ultimate* valve communications receivers. Being a superhet design, triple conversion was used for the frequencies

between 500 kHz and 8 MHz and double conversion from 8 MHz to 32 MHz.

These receivers use an ingenious series of gears, cogs and cams coupled to the inductive tuning of the RF stages (two before the 1st mixer), along with a very stable and linear permeability tuned oscillator. Add to this the Veeder-Root mechanical digital display for very accurate frequency readout down to 1 kHz, or better, and you have a valve communications receiver of the highest order.

If this was not enough, the R-391//URR had the added feature and advantage of eight presettable (channel) frequencies, selectable locally or remotely by way of a complex set of gears driven by a 28 Vdc motor. Even more amazing was the "repeatability" of this function to within 300 Hz.

*Photo 3: The Collins R-391/URR kept the orthogonal panel layout and frequency display features and included an 8-channel 'auto-tune memory'.*

## Complaints and cost-cutting

Despite the fact that the R-390/URR Series had exceeded the expectations of the military across all defence services, there was still the nagging issue of the excessive price of these units. The Signal Corps had also raised a few complaints regarding the heat generated by the unit's 33 tubes and the side effects it cause in the audio module.

Another complaint centred on the complex serviceability in relation to the dreaded removable "green" Locking Gear that had to be installed before removing the RF Module. In response to these concerns, a cost-cutting exercise was undertaken in late 1953 to see what could be done to modify the R-390/URR series to effect savings without compromising capability.

## Slimming-down the R-390

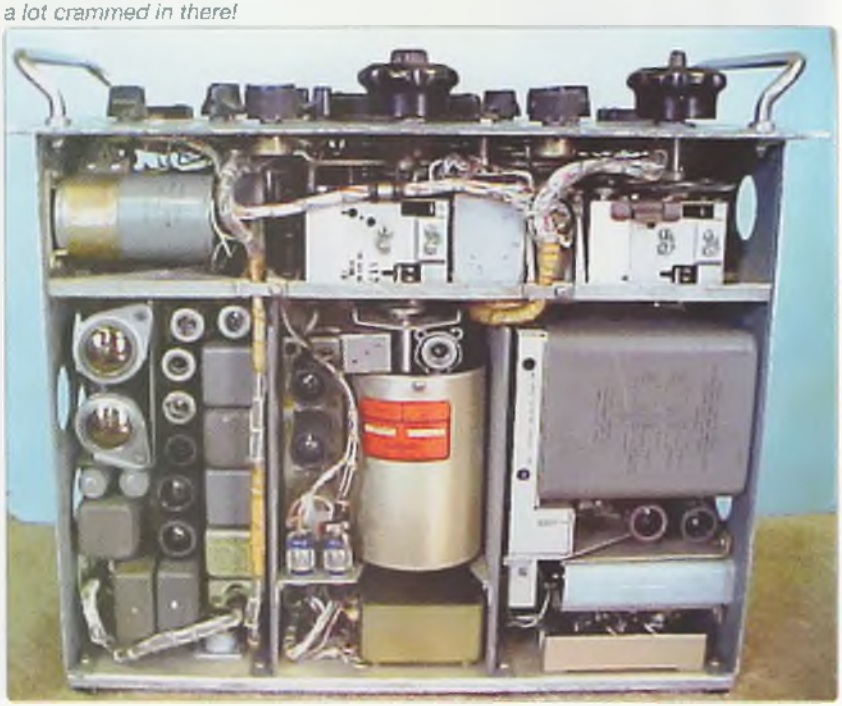
In late September 1953, the R-390 was put under the microscope, examined in detail and a list made of units and components that could either be removed for cost reduction or other improvements. These examinations were undertaken by both Collins Engineers and the Signal Corps Electronic Laboratories.

Unit savings were as follows, Audio Unit (US$) $34, antenna relay $2, power supply $12, IF unit $20, crystal calibrator $12, RF unit $56, VFO $3, crystal oscillator $68, final assembly $26, total – $233.

Now, this may not seem like a lot of money, but the equivalent in today's dollars is in the order of $2242, per unit. If you consider the fact that some 55,000 or so R-390As were produced, then it runs into millions of dollars saved by the government.

The next challenge was to actually build this new cost-effective R-390A and test it for performance before contracting it out for manufacture. What came out of this research was a receiver that now consisted of 26 valves, reduced

*Photo 4: Underside view of the R-391/URR; despite the cost-reduction there's still a lot crammed in there!*



from 33, the same frequency coverage, with just one RF Stage, and the IF stages were reduced from six to four.

Once again, the frequencies between 500 kHz to 8 MHz were triple conversion, while those from 8 MHz to 32 MHz being double conversion. The IF System now used "LC" type filtering to obtain essentially the same bandwidths, but retained the Crystal Filter for the two narrowest bandwidths as before.

A good few mechanical changes were also introduced in the R-390A, to incorporate simplicity for serviceability. The full list of modification by way of parts and components for this new cost-reduced receiver is extensive. Thus was born the R-390A//URR, which saw Collins and Motorola contracted to produce 10,000 in 1954, with Collins awarded a further contract to produce another 10,000 of them in 1955. Additional contracts followed, which saw the R-390A produced by many other companies apart from Collins.

*Photo 5: The first act of refurbishment is to remove the receiver's front panel. Most controls and the frequency display window are mounted to the front panel (photo by VK4QS).*

## My first Collins Cold War Warrior – the R-391/URR

My journey with the Collins R-390-series of valve communications receivers began in 1990 when I phoned a guy who was advertising a Collins R-391/URR for sale. I bought the set and the seller even threw in his copy of "Ferrell's Confidential Frequency List".

Upon arriving home, I set up the receiver and decided to try out one of the frequencies the previous owner had noted in Ferrell's frequency list, this being 11.175 MHz. The frequency was silent, apart from atmospheric band noise. I wondered what my chances were at receiving some transmissions. Just as the sun was setting, the R-391/URR burst into

*Photo 6: With the front panel laid on its face, you can access the wiring of the controls. Note that the tumblers of the Veeder-Root frequency readout are mounted to a sub-panel (photo by VK4QS).*

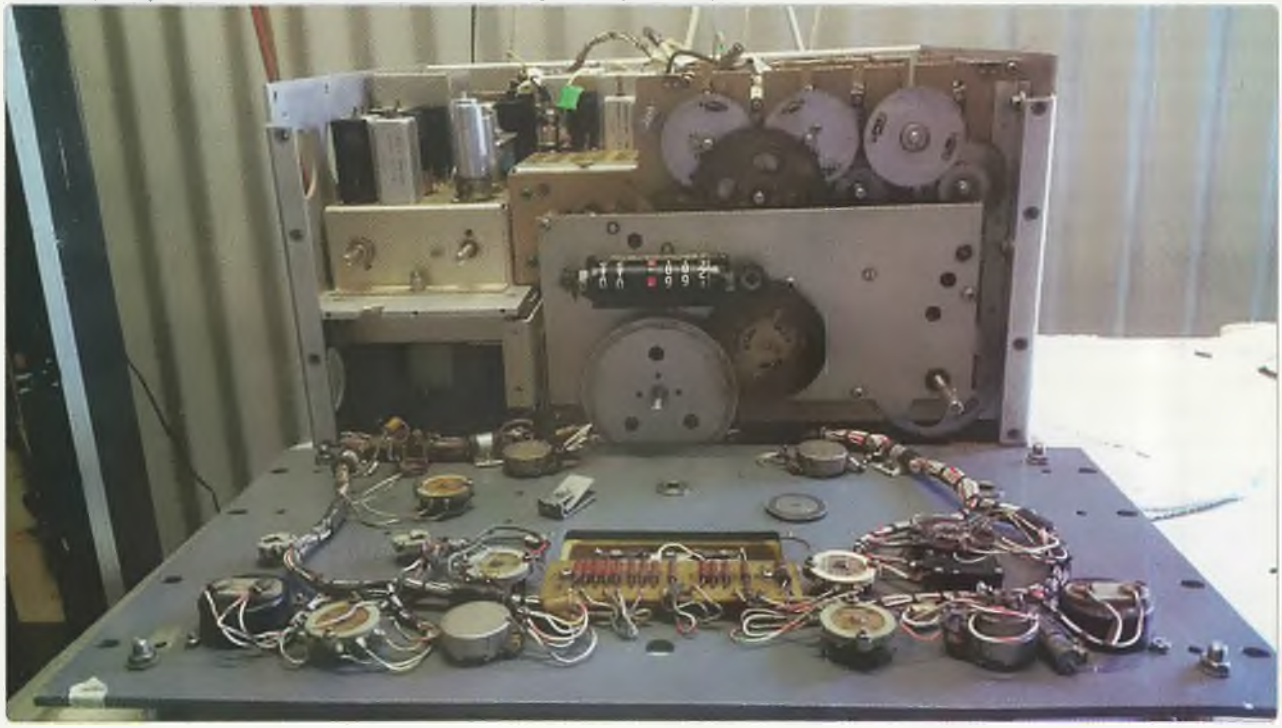


*Photo 7: Underside of the IF unit – where the sidecutters hit the component leads! All the new blue resistors you can see are high quality 5% values that I used to replace the old ones (Photo VK4QS).*

life with the following loud and strong transmission:

SKYKING-SKYKING DO NOT ANSWER, MESSAGE AS FOLLOWS:
B3CF MT6W K4QS VQ4M ETC....YOKOTA OUT.

I had just intercepted my first ever Emergency Action Message (EAM), a coded military transmission from Yakota Air Force Base, located 45 km northwest of Tokyo, at the foot of the Okutama Mountains. These messages are transmitted across the world on various frequencies simultaneously on the HF Global Communications System.

From that moment forward, I was hooked on these incredible receivers and, consequently, have over the past 30 years, owned many that have come and gone to the good homes of fellow Collins enthusiasts.

## Refurbishing my Collins R-390A over 2018-20

I have owned my current Collins R-390A/URR for about 15 years now and it has served me well despite the fact that it was manufactured in 1955 and is thus 65 years old. In the past few years, though, I had noticed that the sensitivity had dropped off considerably, even though it had recently had a new set of valves installed. So, in May 2018, I decided I would have to bite the bullet and dismantle it for refurbishment.

I thought this was going to be a very daunting task as I had never undertaken such work before, despite being a Systems Electrician working on Electric passenger Trains for 13 years. But I was lucky enough to have the assistance of my good mate Bert Pitt, a retired ex-Telstra Technician, who visited each Wednesday.

Bert's passion is the restoration of broadcast band valve radios, to the point of even building them from scratch with the precision and skill of an artisan. He had never seen a communications receiver before I gave him a Racal RA-17 to restore for his collection. Thus, we both embarked on the study and refurbishment of my R-390A/URR with a view to attaining original specifications, if possible.

Now, if you've ever looked into the depths of a Collins R-390A/URR to consider dismantling it, you could be forgiven for thinking whether or not you could ever get it back together again. I was fortunate to have the "Y2K" manual for this behemoth and a lot of study was undertaken before the first screw was turned.

The internet is also a fantastic resource with first-hand information articles on the restoration process from the likes of David Medley, an Australian, and Chuck Ripple WA4HHG, who are renowned R-390-series enthusiasts.

I am indeed indebted to the written knowledge of these men and the contributors to the Y2K manual for the vast amount of information covering these engineering miracles in order to refurbish mine with confidence.

## Attention to the IF module

Thus, the Phillip's head screwdriver was engaged into the first face panel screw as I embarked on what

became a one day a week, two-year journey. As it happens, once the face panel screws are removed, all of the pots and switches of the R-390A stay attached to the front panel to be lowered down in front of you.

There are two coupling connectors on the inside of the panel for the BFO and the IF Unit that must be undone, too. When you get to this stage, the brilliance of this amazing receiver's construction emerges before your very eyes.

Once the front panel is laid forward, the green cheese-head captive screws holding the IF unit can be unscrewed. Next, is the main multi-pin connector at the back of the IF Unit to be unplugged. This leaves a couple of small plugs that look like mini-BNCs that need to be dealt with fairly carefully.

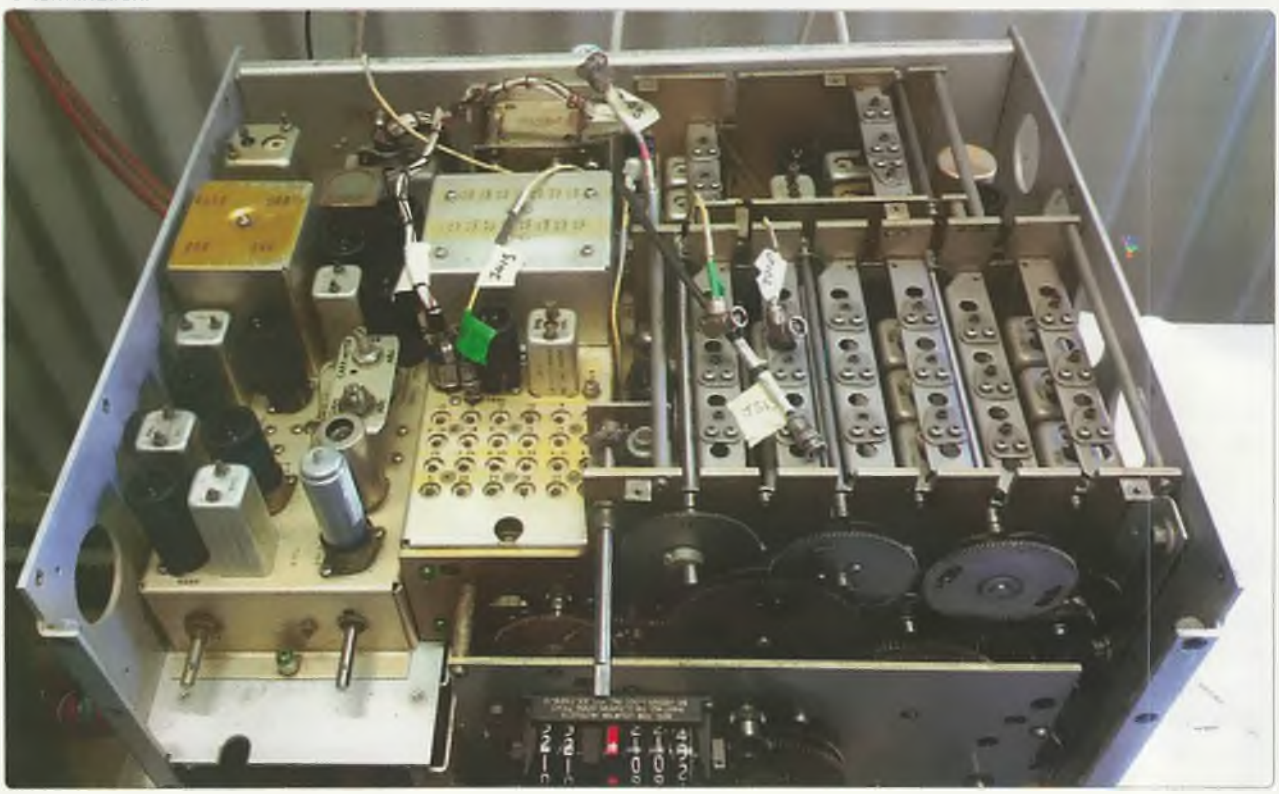
Now the IF Unit can be removed from the chassis and rolled over to reveal all the old 10% resistors and paper capacitors that have served so well over the past 65 years.

*Photo 8: Bert Pitt and the author working on the R-390A/URR RF deck.*

The first step in the refurbishment was to check the value of each of the existing resistors. Most if not all started out life as 10%-ers in 1955. But upon being checked, most if not all were found to have significantly increased in value. This, of course leads, to the deterioration of the signal stream which sees the sensitivity of the receiver nosedive.

I had purchased a bulk pack

*Photo 9: Looking into the maw of the beast! Topside view of the receiver reveals the assembly of gears and cams that drive the receivers tuning arrangements. A few flying leads with mini-BNCs needed some attention; however, only one required re-termination.*



of resistors covering the range of resistance values commonly used. These were sorted and mini-bagged up in group values for easy access.

Once the values of the R-390's resistors had been checked they were systematically replaced one by one in all modules.

The method used was a case of necessity, whereby the old resistors were cut with as much lead as possible. Next, the new replacement resistor was cut for length and then had its lead spiralled around a thin piece of wire to coil-loop the ends. These were now fed over the existing lead of the old resistor and neatly soldered in place.

A few did require some plastic tube insulation due to their proximity to other wires. The same time-consuming technique was applied for the replacement capacitors, as can be seen in yellow ones in the IF Unit, for neatness of task.

## Next, the RF deck

Once again, when it came to removing the RF deck, it was really pretty straightforward, with the unscrewing of a few green cheesehead captive screws, undoing a couple of MBC connectors, a little bit of jiggling and out it came.

This, of course, had been fundamental in the design to enable field repairs if necessary to return the unit to service. As I said before, you can't help but be amazed at the engineering simplicity by which this very complicated receiver can be dismantled in such little time. To my surprise, there was plenty of room to work in and lots of fresh air space to keep everything relatively cool.

The same procedure was carried out by which all the resistors were checked for their values. True to age and form, most if not all, were way out from their 10% value ranges and were replaced with 5%-ers.

We moved on to replace as many capacitors as possible with the same procedure of cutting to the lead and looping the new lead on and soldering. All of the disc ceramics proved ok and were left alone. Some rather tight spots were encountered but, eventually, were overcome with persistence.

After completing the refurbishment of the R-390-A// URR, I reassembled it and switched it on. All my fears were realized when, upon being connected to the antenna, the unit was flat out just receiving AM Broadcast stations.

We carried out further tests with the signal generator but, alas, this unit seemed to have a giant fault that prevented it coming to life. The main suspects were the MBC leads that, after 65 years, were somewhat cracked.

Eventually, upon examining and wiggling the MBC leads tagged in the photo, it was found that one needed to be re-terminated.

If ever you have made up BNC leads then you can appreciate how tedious these leads were at half the physical size with wires were as fine as your hair with tiny bead insulators.

With this completed, we again re-assembled the receiver and applied power. Well, the difference could not have been more remarkable as it just about jumped off the bench as the AM broadcast band stations came in loud and clear from all over Queensland and NSW to Maryborough.

Later that afternoon, I tuned into 40m for some CW and SSB with great results as strong signals raised the Carrier Level Meter to 30 dB. Though not designed for the reception of SSB, the unit does remarkably well with a little riding of the RF gain control. Prior to this, an alignment procedure was considered, then dismissed with the good results.

## Expectations exceeded

A new set of valves and all these new resistors and capacitors actually saw my Collins R-390A// URR reborn!

I hooked it up to my signal generator and injected 3 uV into the antenna socket. The response was loud and clear, so the level was lowered further to just 1 uV and again, the signal came through pretty audible. So, just to show off, I dropped it to a 0.33 uV and blow me down if this receiver did not pick it up and show it as an audio signal. I was astounded and gratified that all my work had been rewarded with such amazing results.

What I took away from this refurbishment adventure across the course of two years was that these receivers were indeed the miracle of their day.

Over recent weeks, I have compared it to the weakest HF voice and CW signals I could find on my FTDX-9000, and my Collins is there, side-by-side with bells on. Not bad for a Cold War Warrior receiver that just turned 65 years of age.

One thing we often fail to appreciate when sitting in front of such ex-military receivers is to imagine the places where they were operated when in service. Be it a ship, a submarine, a Signals Intelligence station in Asia, or just out of the front line during a conflict. If only they could talk of the places they have been, we would indeed be privy to their secret world.

I do hope this article inspires others to refurbish one of their communications receivers and to write a review for *AR* magazine.

## References


1) Final Engineering Report on the Collins R-390/URR, by L.W. Couillard, Project Engineer, September 15th 1953, by Des Ball & Richard Tanter
2) The Collins R-390-A/URR Y2K manual.
3) Various Websites on Collins R-390 Series, David Medley, & Chuck Ripple
4) Collins Service Manual


## Acknowledgements


Thanks to LA5KI and RX Control for the use of some images.

# Power pitfalls to avoid in using the FT-817 as a transverter IF or with external PAs

*Dr Kevin Johnston VK4UH*

The Yaesu FT-817 is a remarkable transceiver that has stood the test of time in a number of applications. It has been described as a portable station-in-a-box, which is well-deserved.

**If you are using one as the driver for microwave transverters or with external amplifiers for portable or SOTA activities, for example, then you really need to read this article. There is a potential time-bomb ticking within.**

## General description

The Yaesu FT-817 series of transceivers was introduced in the early 2000s. These rigs sold in their thousands all round the world and provide a real "shack on the shoulder" for portable operation on all the HF ham bands, 6m 2m and 70cms, and operated all modes.

They also provide general coverage receive capability for shortwave and even AM Airband and WBFM broadcast reception. The small, light-weight, rugged and fully self-contained rigs found many uses in the hobby as it developed over the year, especially for portable SOTA and parks activities, and also as IF driver rigs for the microwave transverters, where the low power output was a major advantage in protecting against the almost inevitable overdrive damage when the 100-watt radios are used in this setting.

There have been three models of the rig. The original FT-817 was replaced by the FT-817ND, with a few internal and operations improvements. This was followed by the current FT-818 offering a teaspoon-full more power output. All models follow the same basic architecture and construction.

*Figure 1: After-market DC connection for the '817 protects the flimsy DC plug/socket and provides more robust Anderson powerpole connectors.*

## Known problems

Although a great rig, the '817 does have a few skeletons in the cupboard, a few design issues and common problems, which have persisted across all three models and versions. Specifically, there are several stock-faults related to DC power – some are well known, some not.

The '817 was designed to be entirely self-contained. All versions were supplied with a battery holder intended to carry AA-sized NiCd or NMHd cells in an internal compartment accessed via a door panel in the underside of the case. Depending on operating practice, this internal battery pack allowed operation for a few hours, at best.

In addition, the '817s can also be powered from an external 12 Vdc source via a coaxial power input socket on the rear apron of the rig. The '817 also contains a charging circuit and timer to allow the internal battery pack to be recharged from that external 12 Vdc supply, without the need to remove it from the case.

The external power input lead and socket are well recognised as the cause of the first of the power problems. The coaxial power plug and socket used by Yaesu has a long barrel and a small diameter (1.7 mm) and is subject to a lot of stress and strain, especially when used in backpacks or carry boxes for portable use. Both plug and socket are a common source of intermittent connections and frequent mechanical failure.

The standard external power cable supplied with the rig uses very light-gauge wire and is supplied "wire-ended" and without fuses in either the positive or negative lead. There is also no protection against reverse polarity. Although more than adequate for powering the rig itself, there is scant protection under some fault conditions.

The NiCd/NMHd battery packs themselves provided very limited operating time and, especially if left uncharged for prolonged periods of time, were prone to leak electrolyte into the rig, often with disastrous results.


*Photo 1: An aftermarket internal battery, such as the WindCamp LiPo battery pack, avoids some failure issues.*

The intrinsic weakness of the power input jack has been overcome by many owners with the use of aftermarket or home 3d-Printed power blocks, which enclose and support the original flimsy power plug, and firmly mount to the nearby earthing point on the '817 rear apron. See **Figure 1**. The power blocks allowed external power to be connected via stronger and more reliable Anderson power-pole connectors without any permanent modification to the radio.

The second power supply related issue was the problem of PA failure and the '817's reputation for "eating" output transistors. Shortly after first release came reports of unexplained PA failure, often after the rigs had been left switched off for extended periods of time.

For reasons best known to Yaesu, the '817 PA itself was permanently connected to the battery supply, even when the rig was powered off. The power drain was microscopically small, so this did not reduce battery capacity to any significant amount. However, all NiCd and NMHd cells have a significant internal discharge rate and will slowly self-discharge when left for any length of time.

Particularly with the early models, as the battery pack discharged during periods of non-use, a critical voltage was reached where the "unloaded" PA transistors went into destructive self-oscillation. Later upgrades included the redesign of the PAs and a change of output devices to minimise this risk. The manuals, however, still recommend removing the battery packs from the rigs, during periods of storage. How many people always remembered to do this?

Many owners simply removed the internal battery pack altogether, to avoid battery leakage and PA failure problem, or elected to install aftermarket LiPo battery packs such as the WindCamp option. The change in battery chemistry prevented the original '817 charger/timer from being used and the new LiPo packs were supplied with an appropriate external mains charger and a replacement battery compartment door with an alternate charging socket and switch to disconnect the pack when not in use.

## Hidden issues

The third power supply problem is less well known. This problem only emerges if the '817 is used with an external linear amplifier or as a driver for transverters for other bands. Further, the problem only occurs if the radio itself is sharing the same 12 Vdc supply with the external equipment.

When an external device is drawing many amps of current from a 12 V source, there is inevitably a voltage drop along its own supply leads. For example, an external microwave transverter or a 60 watt linear amplifier used for portable SOTA activity might be drawing 8-10 amps of current at 12 V.

If the '817 and external device are sharing the same DC supply, then any voltage drop across the negative return line of the external amplifier or transverter will also appears on the outer braid of the RF coax linking them. Current will flow back to the earthed case of the '817 through the coax braid and back to the supply negative.

Current will always find an alternative path back to the supply, if it is available. Since the resistance of the coax braid may be lower than the resistance of the negative return lead itself, then a significant proportion of the linear or transverter DC current may return to the negative side of the supply via this path.

First impression might be that this should not matter. This would true were it not for the fact that the '817 negative supply lead is NOT directly grounded to the chassis of the rig. A simple continuity check with a multimeter between negative supply lead and ground post of the

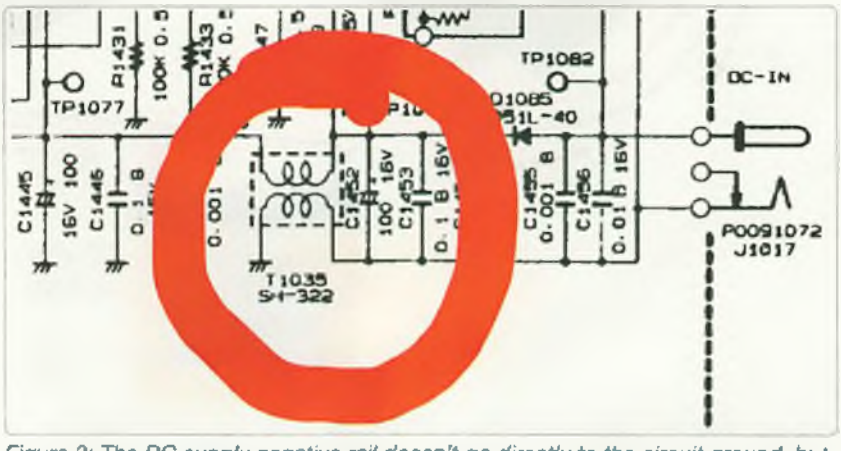



*Figure 2: The DC supply negative rail doesn't go directly to the circuit ground, but via one (flimsy) winding on T1035.*

'817 will confirm they are electrically connected. However, as even a cursory inspection of the circuit diagram will show, this connection is anything but direct; see **Figure 2**.


*Photo 2: The DC supply line common-mode filter, T1035 (Figure 2), is wound on this miniature ferrite core.*

The coaxial power inlet socket itself (J1017) is insulated from the chassis, i.e. the negative outer terminal is not directly grounded. Rather, DC current passes along very thin circuit tracks on the PCB motherboard, then through a toroidal common-mode choke (T1035) to ground (**Photo 2**). Both positive and negative rails pass through this tiny ferrite toroidal transformer on fine enamelled copper wire with no other insulation between the windings. This choke is presumably intended to filter any RF noise from entering the radio from the external DC supply.

The negative current pathway is entirely adequate for running the '817 itself from the external supply, the 'native' rig only drawing less than 1 A on full power. However, any additional current from external amplifiers or transverters, connected via coax to the '817 will also have to follow this route back to the negative rail of a common supply. See **Figure 3**.

There are many reports of rigs failing in this situation and then refusing to power up, either from the external or internal supplies. This happened to the author out of the blue, despite having used the '817 to drive microwave transverters for many years without problems.

As had been reported by others, inspection of my radio identified an area of burned track on the motherboard, between the common mode choke T1035 and the power input socket. Regrettably, without fully appreciating the cause of the failure, the rig was repaired by soldering a strip of copper braid to replace and reinforce the damaged track. See **Photo 3**. Although the rig was returned to full working order, at least for a while, the actual design flaw had not been addressed.

The second failure was more dramatic. Sometime later, again driving a microwave transverter, the rig failed with the "all-too-telling" smell of burning wiring and the release of "magic smoke".

Inspection this time showed that the repaired circuit track from the earlier repair was intact. However,

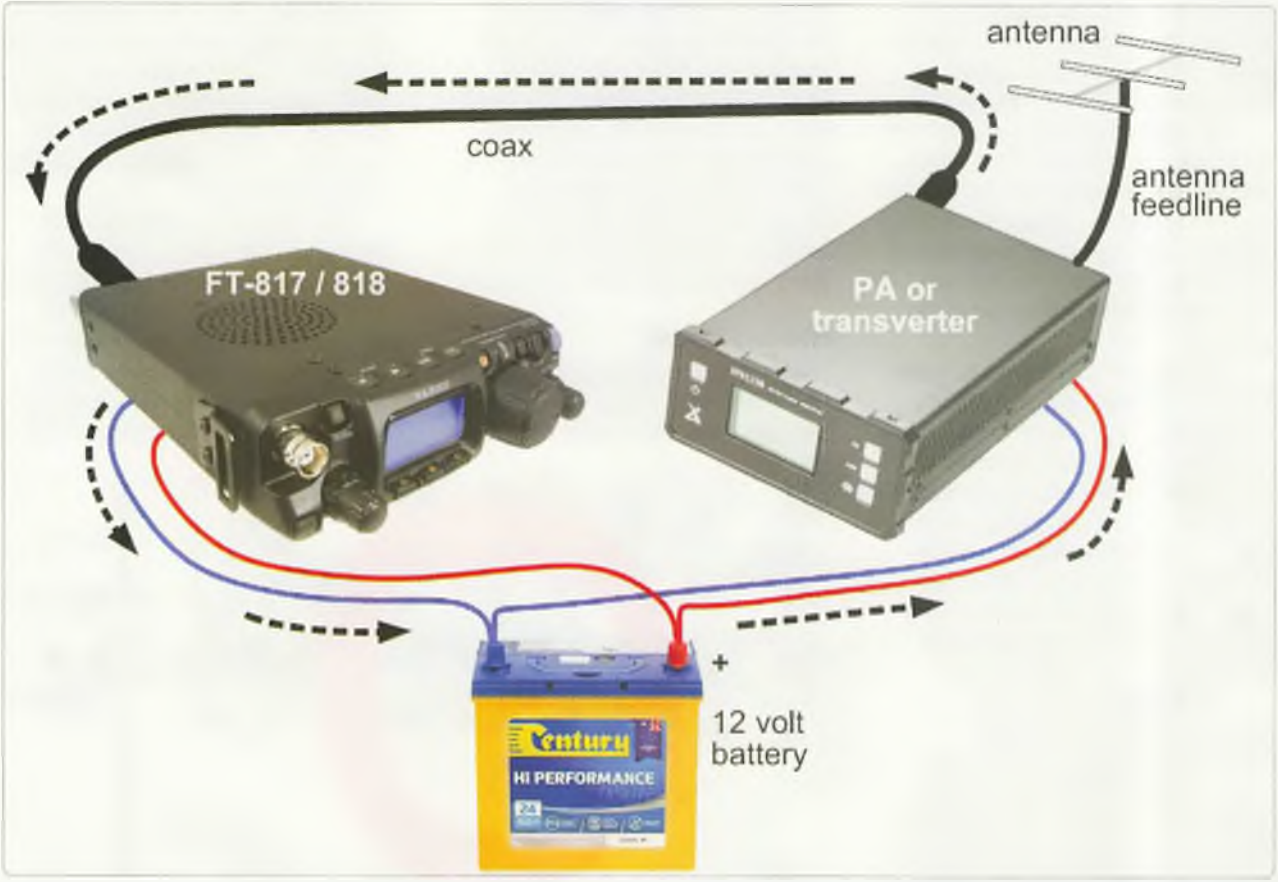



*Figure 3: If the '817 and a transverter or PA are sharing the same DC supply, then any voltage drop across the negative return line of the external amplifier or transverter will also appears on the outer braid of the RF coax linking them. Current will flow back to the earthed case of the '817 through the coax braid and back to the supply negative, which can lead to failures within the '817.*

*Photo 3: Replacing burned-out PCB track is not a solution to the DC negative line loop problem.*

the common-mode choke itself had been destroyed. Further, the circuit mounted fuse F1001, which protects the internal battery from short circuit, and the in-line diode (D1085) intended to prevent the internal battery supply from feeding back to the external power socket, were also open-circuit – in fact, vaporised! The positive rail of the motherboard was still shorted to ground.

The presumed mode of failure this time was that, having reinforced the circuit track in the earlier repair, the next "weakest link" was the 'negative line' winding in the choke itself. This had overheated, lost its insulation, and shorted to the positive winding. At this point, the positive rails of both the external supply and the internal battery were shorted to ground, leading to destruction of the windings and loss of fuse and diode.

This time, the rig was repaired permanently. The negative pole of the DC input socket was firmly bonded to the chassis as it entered the radio. The fuse and diode were replaced back to standard. The choke was rewound but only the positive line winding was replaced.

The value of this filter, T1035, is very questionable. Removal or bypassing the earth rail of that filter has made no discernible difference to the operation of the '817. If an external 12 Vdc supply were to be feeding that much noise back to the rig, then it should probably be reassigned to the bin! It is possible of course to prevent this problem occurring on your own '817 without any internal modification to the radio or circuit boards or, in fact, even opening the case.

Firstly, this can be achieved by bonding the negative lead of the external power cable directly to the chassis, close to the power socket itself. A solder lug screwed into the ground post on the rear apron close to the power socket is a simple alternative.

A more elegant solution, if one of the Anderson style adapters is used, is to bring a separate negative lead out of the block and ground that to the earth post – **Photo 4**.

At the same time, it would be prudent to include a heavy-duty reverse polarity *"Suicide Diode"* directly across the supply socket – but only after the power feed is fused appropriately. Accidental reversal of polarity will now blow the fuse rather than destroy internal circuitry or wiring.

For completeness, there is a fourth potential problem to be aware of. While running in the field, there will likely be several interconnecting cables between the '817 and any external transverters or amplifiers. In my own case, I run an umbilical cord containing IF coax, PTT and 10 MHz reference out from the '817 Go-Box to whichever microwave transverter is required. All three of these leads are terminated in metal plugs, which themselves are grounded back to the rig.

If any of the plugs is inadvertently allowed to come into contact with the positive battery terminal, then a significant short-circuit will occur back through the leads and rig chassis. The rig might well survive a brief insult of this type if the above modification is in place. If not done, then the circuit boards and filter choke will almost certainly suffer catastrophic damage.

If you run your '817 with an amplifier or a transverter in the field, then I would strongly urge you to consider this modification. Unless you always run your rig on a separate battery or supply from the amplifier, and who actually wants to carry a second battery while portable, then your rig is at risk.

Protection is quick, easy and cheap – repairs are not.

*Photo 4: If you use one of the Anderson style adapters, bring a separate negative lead out of the block and ground that to the earth post.*

# Echoes – 25, 50 and 100 years ago

## A glance back at Amateur Radio magazine over the years

*WIA History and Archive Committee*


*Photo1: First Issue of AR, October 1933.*

### Some background – 100 years ago

Following WW1, amateurs (or 'experimenters' as they were then known) were hoping to be allowed back on the air immediately. It was not to be the case for almost another three years, and then only after much lobbying, re-organisation, and new regulations, that transmitting licenses were finally made available.

Wireless technology changed considerably during and after WW1. Spark was well and truly on the way out and valve technologies had come into their own. Valves paved the way for experimenters to investigate and apply 'phone (AM) transmissions, quickly followed by low-powered shortwave communications. Amateur radio was rapidly becoming "international", so much so that experimenters became known as "the world's first citizens"- long before the internet.

***Amateur Radio*** magazine had been published from 1933 and varied in size over the years. The first issue, October 1933, contained about 20 pages, plus the four sides of the covers.

1939 saw another World War force the close-down of all 'experimental stations' here and in many other countries. ***Amateur Radio*** magazine struggled on with declining advertising and, by March 1941, had scaled down from about 26 printed pages (and fewer at times), to a format of about 10 duplicated pages. ***AR*** continued to be produced during WW2 by a dedicated team of volunteers in the Victorian Division and it served as a great morale booster for many Australian amateurs.

### 75 years ago – January 1945

Although still a duplicated edition of 16 pages, plus covers, ***AR*** covered many topics.

The opening lines of the Editorial were: *"As the war drags on and on, it is remarkable that value of the 'Amateur' is being more and more appreciated." It then quoted the Editor of Electronics magazine (USA), who*


*Photo 2: January 1945.*

*wrote: "It is only fair to state, right now, that the best men on his staff are those who have had Amateur experience. This testimony is available anytime, anywhere that it may be useful in keeping the amateur in radio, after the war."*

The NSW Division reported on its AGM, and amongst the items was its Wartime Civil Defence Network. Included in the report was a comment made by the Minister: *"Fortunately the Network was never called upon to function in an emergency, but it is quite safe to say if it had been called upon, it would have met every demand made upon it"*. Mention was also made of two other areas of Civil Defence: the Bushfires Radio Network and the Sydney Harbour Patrol, considered to continue long after hostilities ceased.

For three years, NSW had carried the responsibility of WIA Federal Headquarters, but it was endorsed by the Division that Headquarters should be re-located to where the Chief Radio Inspector was situated, i.e. Melbourne. This would readily provide the personal contact aspect for Institute discussions of post-WW2 amateur radio operating conditions.

Technical articles included Test Equipment by VK3WQ, and Oscillator Frequency Stability. Other articles were book reviews and the continuing, popular WW2 series by Jim Corbin VK2YC, "Slouch Hats and Forage Caps". This regular 'column' allowed many overseas amateurs to keep in touch with each other and their friends back home. It was a great morale booster for such difficult times.

The only advertisement included, other than WIA material, was for Trimax's *ABAC Transformers*.

## 50 years ago – January 1970

The magazine contained 36 pages, plus covers, of which the front featured the Cook Bi-centenary Award certificate. This, together with the new Australian prefix of AX, made available for the 12 months of 1970, generated a lot of international interest. Most active amateurs made use of the AX prefix, even the VHFers. Special QSL cards were made available, suitable for callsign overprinting.

Federal Comment, by Michael Owen VK3KI, dwelt on the fact that 1970 was the sixtieth year of the WIA and that, while participating in the Cook Bi-Centenary, with the AX prefix and the related Award, we should also remember that radio frequencies had become one of the most valuable resources of the world today. *"Let us do all in our power to add to the strength and stability of our organization which is, in the last resort, the only real means of defence that we have."*

On the same page as the details of the Bi-centenary Award was the long-awaited (about 2 ½ years) announcement, that Australis Oscar 5 was set for launch by NASA on January 9th. However, a further delay of two weeks ensued before AO-5 did reach space and orbited. This was the first Australian, and first foreign amateur built satellite to be launched, all previous amateur satellites were designed and built in the USA.


*Photo 3: January 1970.*

The higher frequencies were also attracting a lot of attention at that time and ***AR*** contained detailed articles on the popular VK3 VHF Group's 432 MHz converter kit together with a solid state 1296 MHz converter by H. W. Sanford, VK4ZT. In-depth technical articles included "The Nature of Matter" by C. A. Cullinan VK3AXU, and "Common Sense Transistor Parameters", by R. L. Gunther VK7RG.

Regular columns included DX, VHF, Magazine Reviews, Awards, and Australian DXCC Countries. The most outstanding advertisement was from Bail Electronics, featuring the new Yeasu FT200, 5-band transceiver.

## 25 Years Ago – January 1995

***AR*** had grown to 56 pages, plus the covers, which for some years by then were being printed in full colour. This issue's front cover featured Bill Rice VK3ABP in his fascinating and mostly "home grown" shack. Bill was a long-standing Technical Editor for ***AR*** and, Managing Editor for a further 14 years, a man of great skill and experience.

Technical articles were popular and voluminous, this particular issue containing about 15 pages of such material. There were two interesting capacitor articles. One on capacitors at high RF power levels, by Lloyd Butler VK5BR, and the other, by Drew Diamond VK3XU,

on adapting air-spaced trimmer capacitors to shafted variable capacitor applications. All good information for those about to venture into construction.

General articles took up about four pages and, as it was the January issue, there was a 5-page Index of the previous year's articles.

Then followed the numerous regular columns – and *numerous* is the word here! Some 'columns' took a page or more, others a good half-page each, all reflecting the subject matter they were representing.

ALARA headed up this section, followed by AMSAT, Awards, Contests, Divisional Notes, FTAC (Federal Technical Advisory Committee), How's DX, Members Opinions, Pounding Brass, Repeater Link, VHF/UHF – An Expanding World, Silent Keys, HF Predictions and Spotlight on SWLing. In total, about 23 pages of material mostly about, or involving, Australian amateur radio.

Interspersed were short news items and announcements, WIA information pages and plenty of Trade advertisements. Dick Smith had the centre-spread, plus another full page. Icom the full-colour outside back cover, Kenwood the inside front cover, and WIA Bookshops filled the inside back cover with a detailed listing of the many books they could supply. Emtronics had a full page and Strictly Ham, Daycom, ARA magazine, A&J Coman Antennas, Tower Communication and Outbacker ran smaller part-page advertisements. HamAds took up the best part of another page. All in all, a very full and diverse issue by any standards. Australian amateur radio was alive and well!

Where have all of those columnists and authors gone? Perhaps they are now spread out over the various club websites and other electronic media. A pity, perhaps, for much of their hard work while now more focused locally, is perhaps in the long term, likely to be largely ephemeral.

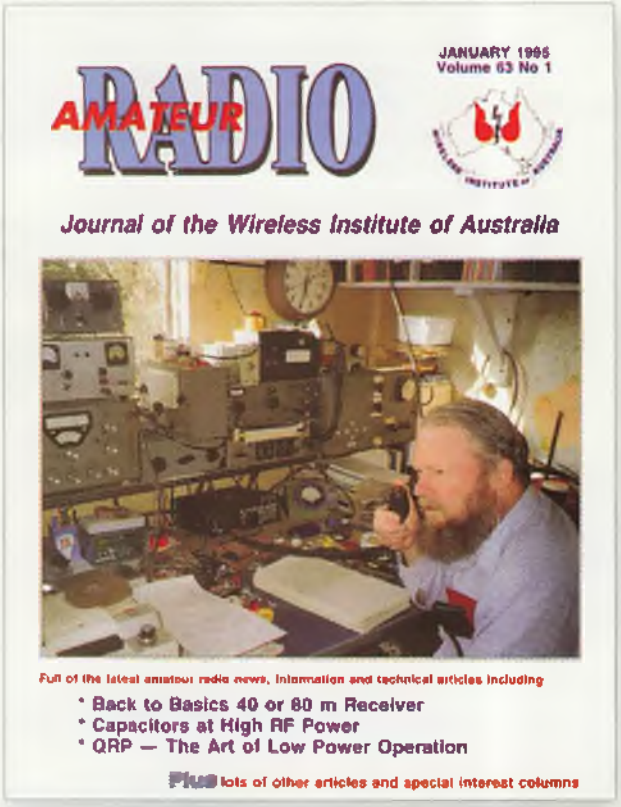



*Photo 4: January 1995.*

# *Pages from the Past*

*From the Argus (Melbourne) Newspaper, January 7th 1914*

## PRIVATE WIRELESS | ADDITIONAL LICENSES

The number of private wireless stations within the Commonwealth is steadily increasing, and yesterday the Postmaster General (Mr. Wynne) granted 20 further licences to private individuals to permit them to erect and use wireless stations. Inclusive of the 20 licences granted yesterday, there are now 423 private stations in Australia – 194 being in New South Wales, 177 in Victoria, 8 in Queensland, 20 in South Australia, 15 in West Australia and 9 in Tasmania.

Before anyone is allowed to erect and use a private wireless station, a fee of 21 shillings per annum (worth about $500 today – Ed.) has to be paid to the Commonwealth. The stations are receiving stations only, and each licensee is bound to secrecy as to messages which he may intercept. ¶

# A field day high

*Matthew Ayres VK2BAI*

It was indeed a hard week for me. Yes, one of those weeks where a lot of matters coalesce into a large wave of perfect storm issues. Well that was until an email arrived talking about the Central Coast Amateur Radio Club's (CCARC) latest venture into the wilderness. All of a sudden, my issues were left behind and the call to radio in the field took hold.

I've seen Dick Smith take on wilderness adventures before, so I was wary at first. The call to action was from Brad VK2NMZ promoting a field day on a rugged mountain an hour out of Sydney – Mount Elliot.

My first questions were:

1. Was the mountain COVID safe?
2. Were there indeed people living 1 hour out of Sydney?
3. Were the local people friendly?
4. Were there feral animals likely to randomly attack at any time?

*(Note: these were not serious questions)*

After careful investigation, my questions all came back as non-issues.

- All mountains are COVID safe!
- Indeed, there are people living one hour north of Sydney!
- The locals are top people!
- There are no feral animals, but I did see a friendly bird sit on my military radio!

## Where is Mount Elliot?

Just in case you want to visit, this is a top site for radio, picnics and bush walks. Its location is 66 km north of Wahroonga.

It's an easy drive up the M1 north of Sydney and I used the turnoff at Ourimbah and went via Lisaro. There is cheap petrol in Lisaro and it's sealed road all the way to the summit.

The lookout is wonderful and provides a view all the way to the coast and 180 degrees of panoramic views. There are toilets and a gas BBQ for public use.

*Photo 1: The Clansman PRC 320 military HF radio cover 2-30 MHz and comes with an inbuilt ATU. The telephone-style handset includes a "pressa!" switch in the middle used to transmit.*

## Getting set up

In his usual fashion, Bob VK2AOR was working the RNS repeater on 2m while people drove to the site. In fact, some chose to walk up the mountain and had radio backpacks (impressive!). Myself – my gear was just too heavy, so a car worked well.

In the last 10 km, Bob mentioned his lovely wife had made a lemon meringue pie and it was "first arriving gets first slice". I was indeed motivated and pushed the accelerator down just that bit faster to make sure there was a slice left when I got there.

When I unpacked, Bob made me welcome with a large slice of pie. Amateur radio operators love good radio and good food, so the day was off to a good start.

## Military radio

For the site, I used a Clansman PC-320. This military radio was imported from the UK and operates over 2-30 MHz continuous. It was most often known from the Falkland's War and was designed with no expense spared.

The radio has an inbuilt ATU for external antennas and also can be used with a "battle whip". In this case, I used an end-fed squid pole-mounted vertical of 7.5 meters and loaded this with the help of a ground stake that I made and attached to the radio frame.

## Radio is about activity

Firstly, Bob VK2AOR had a go at calling CQ using the PRC 320. Photo 2 shows Bob active on 40 meters using the rig's handset.

Out-and-about using our radios is also about promoting the hobby. There were some YLs attending as well, so why not invite them to try

*Photo 2: Bob VK2AOR calls CQ with the PRC 320 rig.*

radio for the first time? It was good that both visitors, Evie and Millie, said hello on the radio, both to local and cross-border contacts.

This is a great way to get new people being introduced to amateur radio. I must also say that Jenna kept Brad on his best behaviour and enjoyed good conversations over a great lunch.

## SOTA-generated activity

One good thing about operating on a mountain is that it often enables operators to get a SOTA number to 'activate' the site. In this case, Mount Elliot is SOTA VK2/HU093 and really was a great drawcard for people to contact us. At one stage, there was a dog-pile calling in on 7.100 MHz just from one CQ. In fact, it was so good at one stage that even a ZL called in 5x9. How good is that?

With all this activity, some five operating sites were setup across some 100-200 meters of park grounds. I worked some 10 contacts from VK2, VK3, VK4 and ZL. All the other operators I'm sure worked even more!

*Photo 3: There was almost a queue to use the Clansman. Brad VK2NMZ, not wanting to miss out on some hot contacts rolling in on 40 meters, made some calls and worked into VK3.*

## Lunch in style

Let's face it, amateurs love a good lunch. That often means a BBQ and coffee. Brad demonstrated his master-class skills in coffee making and I blame him entirely on making me have coffee envy. It's incurable. I now need to go out and buy a portable coffee setup and will send him the bill. Don't tell him, please.

On the lunch front, sausages were the order of the day. But given I had no time to get any sausages, I raided the VK2BAI cupboard and only found a can of SPAM. Yes, I BBQed it and used lots of tomato sauce on a bread sandwich. Yes, it was lunch, but next time, trust me, I'll go buy some sausages.

## Bob inspires

A great part of attending park activations is looking at homebrew gear made to help in the field. Bob VK2OAR had made a portable field strength meter using a diode the size of a pin-head. It worked so well that, on top of coffee envy, I now also have field strength envy!

Well, it's not envy, it's just being inspired to make something similar – what a practical device for use in the field. No batteries, just relative strength from the portable antenna. If you go portable, this is a great project to build.

## Stations everywhere

Let's have a look at the stations that were running portable on the mountain:

- Brad VK2NMZ running a Yaesu FT-857 with a linked dipole antenna, working mostly on 20m on voice and JS8 call.
- Alan VK2MG with a linked dipole, Yaesu FT-818, mostly working on 80m, 20m and 17m; he finished up with 23 contacts.
- Matt VK2BAI with a Clansman PRC 320 and end-fed vertical, 10 contacts.
- Colin VK2JCC with his Clansman PRC 320 and end-fed vertical.
- Graham VK2GRA with a Yaesu FT-857, a vertical 40m / 10m antenna with tape measure radials.
- Ray VK2HJW with an Elecraft KX3 and end-fed wire strung over a tree.
- Max VK2XOR with an Elecraft KX2; working mostly on JS8 call, with end-fed wire, or Pac-12 vertical antenna.
- Bob VK2AOR had a Yaesu FT-817 and his stepper motor-controlled magloop antenna.

And let's not forget those who just enjoyed the conversations and trading ideas: Matt, Ryan VK2FRTS, Col VK2ZCO, Jim VK2FJEG, Steve VK2SKC, Myles VK2ASS, Jaye VK2FOMG and maybe I forgot some; apologies if I did.

*Photo 4: Lunch is also an opportunity to learn, discussing homebrew gear brought along for the event.*

More gear on the mountain than in my shack!

### Colin works Europe!

Just to lift the bar, Colin VK2JCC, who was about 10 meters away distance-wise, made a great contact into Europe! I'm sure it was just to beat the ZL I had just worked! His portable setup with a Clansman was amazing – well though-out.

### Next steps

What I learned from the field day was: (1) Meeting clubs out of your area is a hell of a lot of fun; (2) You are really welcomed by other clubs and their members; (3) Out-of-area visits expose you to new ideas, which are really valuable; (4) Mountains are everywhere, lets activate them with fellow amateurs (with coffee!).

Thanks to CCARC for a great day in the field.

*Photo 5: Colin VK2JCC has a well thought-out portable setup that works well.*

*Photo 6: I, too enjoyed some on-air time. That's Colin VK2JCC over on the right, in the background.*

# *Pages from the Past*

*From the Sydney Morning Herald 14 March 1910*

## INSTITUTE OF WIRELESS TELEGRAPHY

The Institute of Wireless Telegraphy of Australia was inaugurated on Friday [11 March] at a meeting at the Australia [hotel].

Mr. George Taylor, who was chairman, pointed out that investigations of wireless were to-day on the verge of an arena of wonder. They were like explorers of a strange country where every step was a discovery. But as success could only be achieved after many failures, there was need of mutual co-operation between investigators to avoid making the same mistakes, and to climb together when any discovery would be achieved. ¶

# VHF/UHF - An Expanding World

*David K Minchin VK5KK*

In this edition of the column, by popular demand, we have more information on horn feeds, including details on a local machinist in VK5 who has made some prototypes for us this issue. Also, we have the fourth instalment of the construction series looking at VCTCXO frequency references, as well as another flash-back from my column 20 years ago looking at the ill-fated Phase3D satellite project!

## Conical horn feeds revisited

Last month's construction series on conical horn feeds and Cassegrain reflectors has stirred some interest!

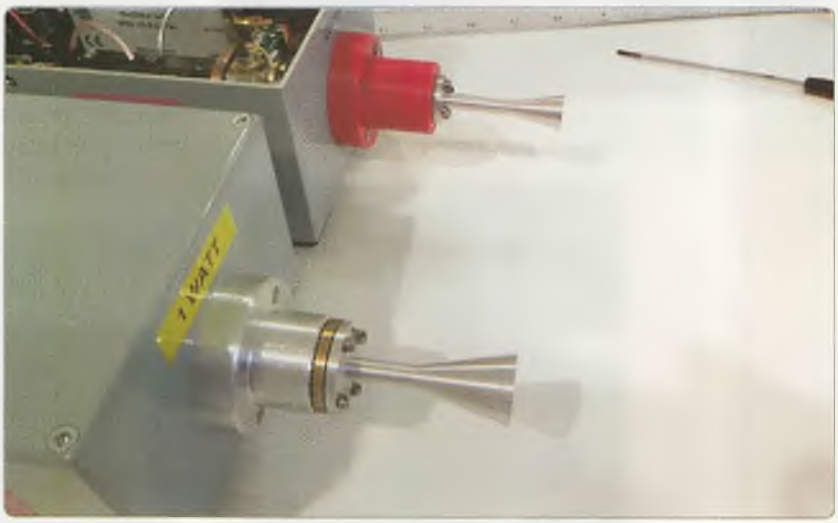



*Photo 2: 47 and 76 GHz Conical feeds mounted on transverters.*

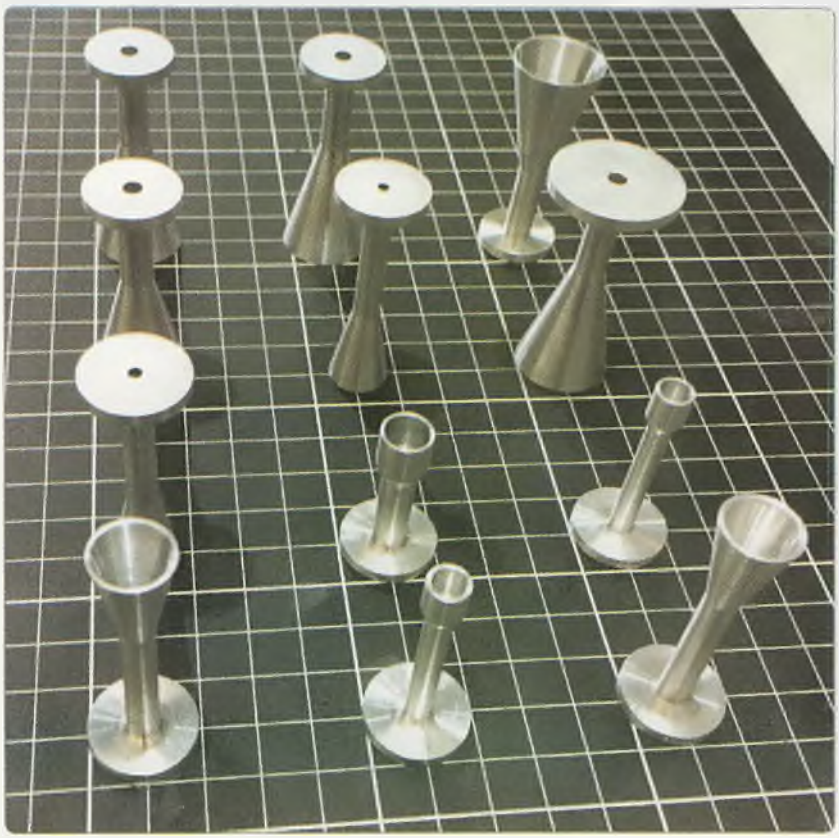


*Photo 1: 47 and 76 GHz Conical and Dual-mode horn feeds.*

The most common question has been how and where to get small horn feeds, given that there are some tooling and machining limitations beyond the capabilities of the average hobby lathe.

Around the time that the past column was being put together, John VK5OI was working with a local machinist to get some prototype horn feeds CNC-machined for 47 and 76 GHz. The 3D CAD screen grab in the last column was the first 47 GHz prototype John designed, based on Paul Wade W1GHZ calculations.

The length of circular waveguide section and horn dimensions (18 dBi gain) was calculated for use with a Nurad Cassegrain dish with a focal point about 40 mm in from the apex of the main dish. Since then, John has designed a matching W1GHZ horn for 76 GHz as well as Dick Turrin W2IMU dual-mode horns for 47 and 76 GHz for typical 600

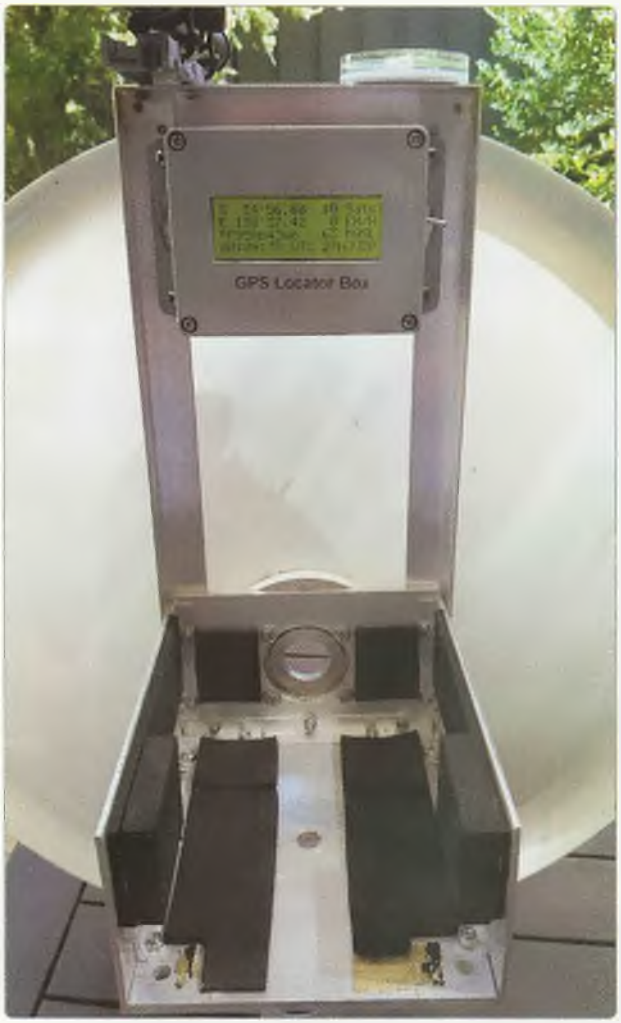



*Photo 3: NEC 600 mm mmWave quick-change transverter mount with 30 mm hub*

*Photo 4: 47 GHz horn feed location for a Cassegrain reflector.*


*Photo 5: 3D printed 30 mm hub adapter for the Nurad 300mm dish.*

mm Ku-band satellite offset dishes with F/D of about 0.6.

The challenge in machining such small horn feeds is achieving the taper (36 degrees) right down to "a point", i.e. circular waveguide section of 2.5 mm diameter in the case of a 76 GHz feed. For a 122 GHz horn, the taper would need to go down to 1.7 mm diameter!

To achieve this, the machinist needed to do some special tool setups. However, ordering 12 horn feeds easily absorbed that cost. **Photo 1** shows the mix of four different types of horns manufactured for 47 and 76 GHz, mostly with blank UG385 flanges (20 mm dia.) and one with a UG383 flange (28 mm dia.). The flanges have been deliberately left blank to cater for the time when flange mounting holes are at 45 degrees and/or need to have 4-40 UNC threads.

**Photo 2** shows two horn feeds mounted on VK5KK's Mk 2 quick-change transverter system that uses a 30 mm diameter boss. The 30 mm dimension has become my pseudo standard ID, originally based on the size of machined hub in a 600 mm NEC dish (**Photos 3** and **4**).

For the Nurad dish, I have 3D printed (using PET-G material) an adapter flange (**Photo 5**) that takes the same 30 mm boss, so both dishes can be used in tandem

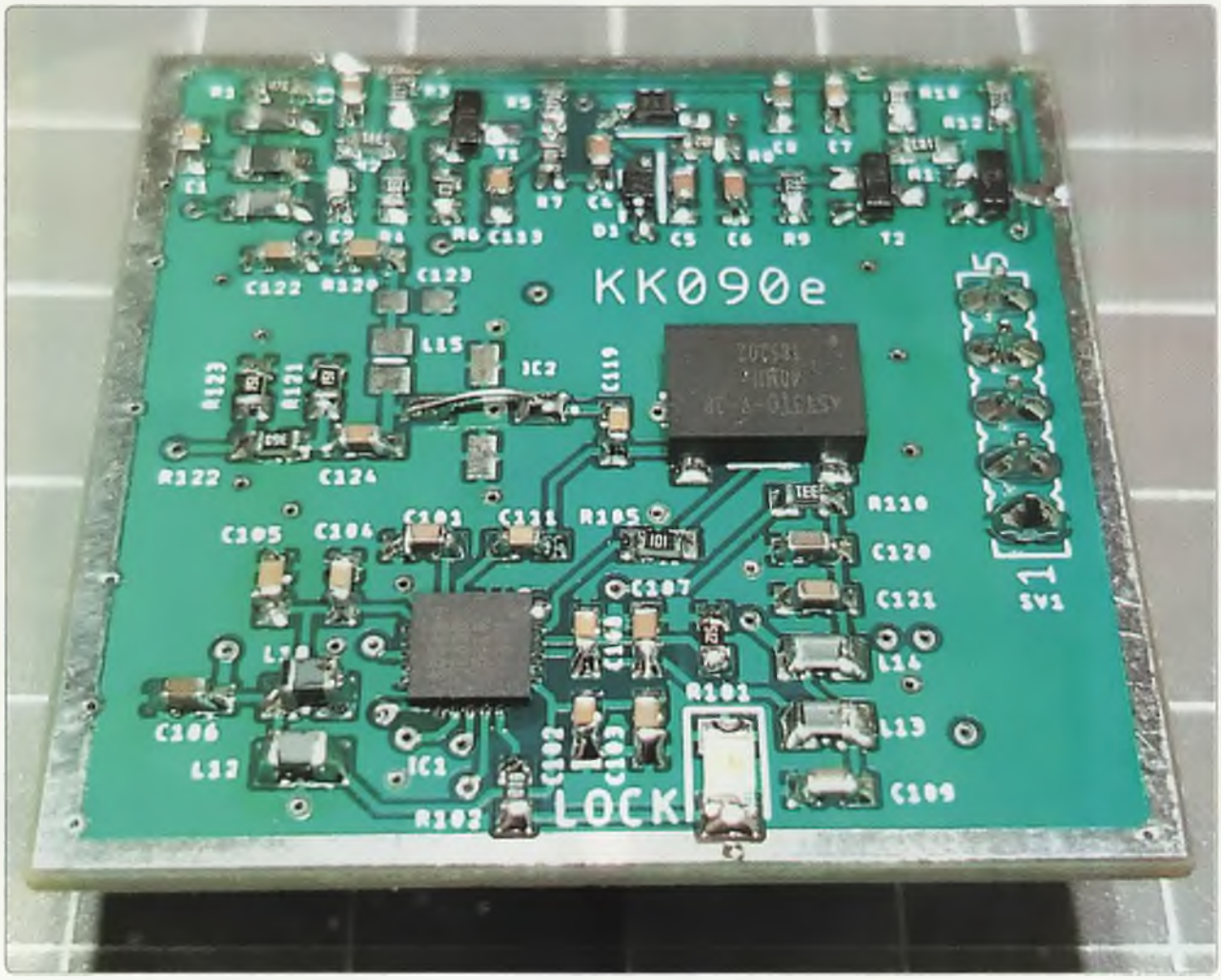



*Photo 6: Top side of reference oscillator with VCTCXO (centre) and PLL (bottom).*

and transverters can be swapped quickly. The dimensioning is such that the focal length can be adjusted by up to +/- 10 mm as a sanity check, once you find the sweet spot, simply mark it on the main boss.

The first mounting boss and adapter for the Nurad dish was machined from aluminium on an EMCO Unimat 3 lathe (Austrian-made in the 1980s). I have since created g-code for both, and 3D printed using PETG material.

Each mounting boss has standard waveguide running through it with a flange either end. The front flange has threaded holes, so feeds can be swapped or removed. I have a traditional shepherd's crook I can swap onto the 47 GHz system; this was handy during the initial development of the conical horn feed/Cassegrain system. If anyone would like the *.STL files for these or Cassegrain parts, just email me.

If you would like to have any of the four types of horns manufactured, please contact Jasminder Singh at *singhengineeringaustralia@yahoo.com*, or phone 0449 521 116. The current cost is A$55.00 each. If you would like a different dimensioned horn feed (or any other small CNC job) there may be a set up charge, but his rates are entirely reasonable. If you would like the flanges drilled, he can do that, too.

## Construction Series Part 4

### VCTCXO Frequency references for Microwave PLLs

This is the first of two parts dedicated to creating a VCTCXO frequency reference for microwave PLLs. This started as one project, but has ended up being four projects, given the wide variety of VCTCXO and VCXO oscillators available.

In this part, we will first look at why we should consider using higher frequency reference versus what we have used traditionally (10 MHz).

In the PLL series several years ago, we discussed the main contributors to PLL phase noise, being noise from the VCO, the

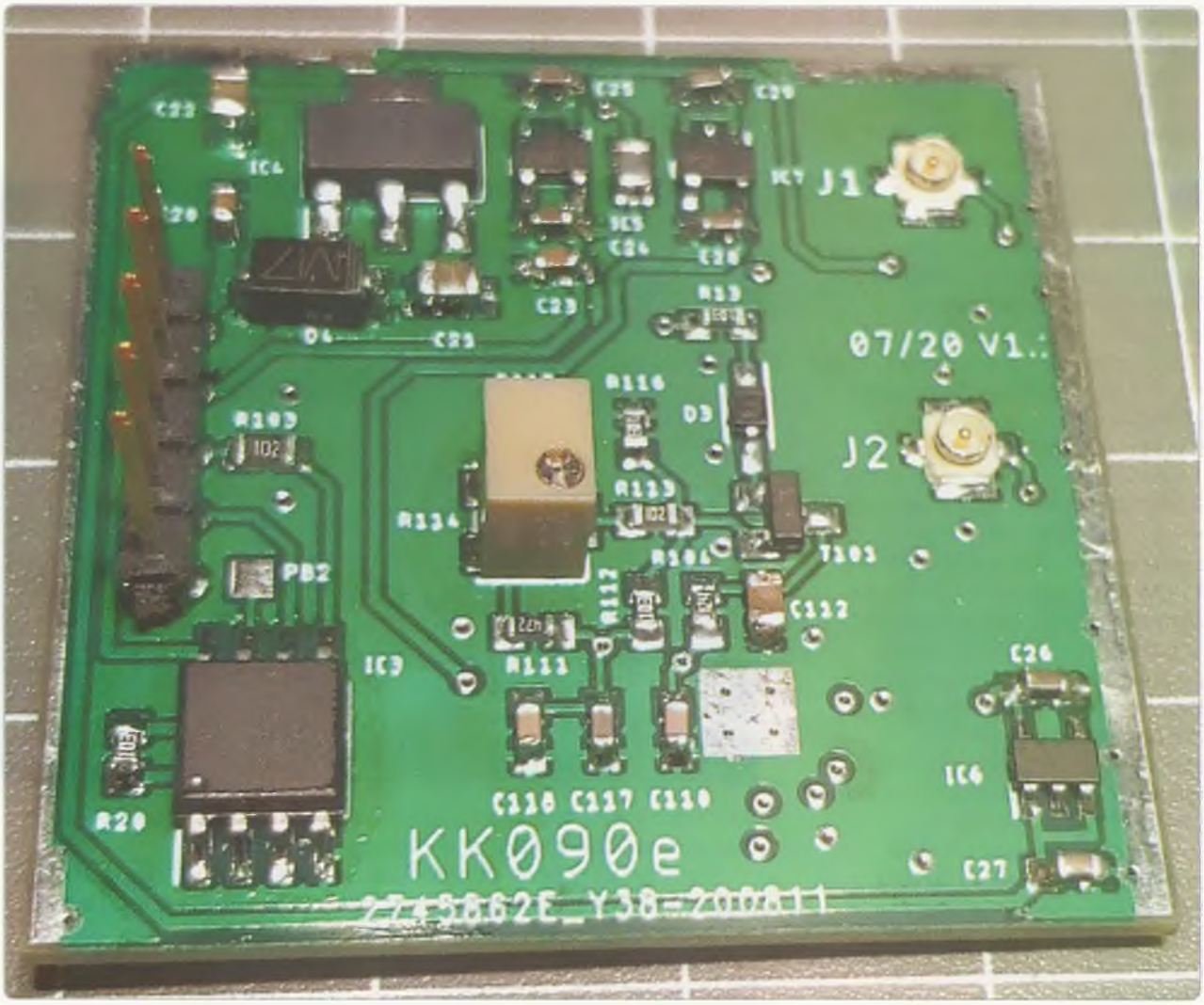



*Photo 7: Bottom side of reference oscillator with CPU and DC regulators.*

Phase detector/loop filter, and the reference oscillator. We spent time looking at the options to find good performance from the first two factors but only summarized the reference oscillator as needing to be "clean".

An OCXO (Oven Controlled Xtal Oscillator) on 10 MHz can have a phase noise as low as -150 dBc/Hz at 100 Hz offset. This is far superior to a free running VCO on 10 GHz that we are going to lock; this might have a phase noise of -82 dBc/Hz at 1000 times the frequency offset (10 kHz). As we are basically "multiplying" the reference oscillator through the PLL circuit, it is obvious that the phase noise of our reference oscillator is also be multiplied, but this is not a linear relationship.

Phase noise increases by a factor of 20 log N, where N is the division ratio of the final frequency. So, for our 10 GHz example, where N = 1000, phase noise increases by +60 dB to become within 8 dB of the VCO phase noise (-90 dBc/Hz).

In a good system, this will still be mostly masked by the VCO phase noise. However, it is clear just how important it is to have a clean reference oscillator! If the reference oscillator has higher phase noise or artifacts from power supply noise, then the reference oscillator will quickly become the dominant contributor to phase noise.

Quite a few OCXO-based GPS 10 MHz references that use switchmode voltage converters fall into this category. And it is plainly obvious why a free running VCO-based PLL should never be used for a frequency reference!

It gets worse as we go above 10 GHz, where we could have a multiplication ratio of up to 12,000 from 10 MHz. For example, on 122 GHz, that equates to + 82 dB increase in phase noise from the reference oscillator, so **ANY** reference oscillator defect will reduce performance.

It can get to the point where the amount of energy in phase noise over several hundred kHz is greater than that of the wanted frequency, reducing the output on that

frequency. This has been the most significant problem so far when configuring some Silicon Radar 122 GHz transceivers. And that is before you consider the impact of reciprocal mixing on receive from phase noise.

So, the simple answer to reduce phase noise is to reduce "N" by using a higher reference frequency. We have used 10 MHz, as it's convenient. However, commercial PLL systems use crystal-based references, typically in the range of 40 to 200 MHz, to achieve better phase noise characteristics.

A modern PLL chip, such as the ADF4159, will work with a reference of up to 260 MHz with a maximum phase detector frequency (PFD) of 110 MHz. A higher PFD puts some limitation on step size, but as most of our work just requires a single frequency this is of little concern. Even with a 25-bit PLL chip, it is still possible to get about 152 Hz steps on 122 GHz with a 40 MHz reference making direct modulation JT4f possible on that band!

In amateur circles, OE2JOM and others have created 10 MHz PLL-locked crystal oscillators for 100 – 120 MHz to gain a 20 dB improvement in phase noise of a microwave PLL.

The project to be described is an updated version of the concept, using commercially available VCTCXO (Voltage Controlled Temperature Compensated Xtal Oscillators) packages used with current microwave PLLs. These are available from several vendors in various packages, hence this project has ended up with four different PCBs using the same basic circuit modified to suit the characteristics of each.

Some of these have excellent temperature stability (less than +/- 0.3 ppm) making them quite usable for a quick FM test on mmWave frequencies without being locked. It is also possible to use simpler VCXO oscillators in the circuit with much the same phase noise but sacrificing free-running stability.

## 70cm contact from St Helena to South Africa – 3136 km


On 16 October 2020, favourable tropospheric conditions enabled a contact on the 70cm band between St Helena and South Africa, across the South Atlantic.

Spanning some 3136 km, the contact was between Garry ZD7GWM on the St Helena end and Tom ZS1TA at the South African end. Both stations were on 433 MHz FM; this was no weak-signal digital contact.

Apparently, this was the first contact on 70cm between St Helena and South Africa. The power used for the contact was a modest 35 watts into a vertical antenna at each end, reported John EI7GL.

According to Pascal F5LEN, the propagation was probably via a marine duct. Contacts on 144 MHz over this path were reported in late September this year and previously, in November 2018.

See: *https://ei7gl.blogspot.com/2020/11/3000km-plus-contact-made-on-433-mhz.html*

These are available up to 200 MHz and beyond.

The circuit uses an Analog Devices ADF4110 PLL that has much the same footprint as the higher frequency ADF 415* series we use in microwave PLLs. The PLL can operate up to 550 MHz, well past the capability of the current PLL chips we use. The PLL chip can work on a 5 V rail; however, I have used a 3.3 V rail to be compatible with common 3.3 V oscillators.

The KK090e example, in **Photos 6** and **7**, uses a 40 MHz Abracon AST3TQ-V-40.000MHz-28 VCTCXO in a small 7 x 5 mm package. 40 MHz was chosen as it is probably the minimum (12 dB) step worth considering. This oscillator has a temperature stability of +/- 280 ppb over a temperature range of -40 to +85 deg C. There are other frequencies available and a higher spec +/- 50 ppb version (that costs four times as much, though).

The circuit has provision for a MMIC output amplifier. However, as the output is around +6 dBm from the oscillator, it will not be needed unless you are splitting the output into multiple devices. A 6 dB attenuator provides some load isolation and reduces the output to a convenient 0 dBm (approx.). U.FL connectors have been used for input/output RF connections. Readily available miniature U.FL coax leads are available with SMA bulkhead connectors for panel mounting.

The PLL is initialised using 32-bit code words derived from standard Analog Devices software for the ADF4110. An ATTiny85 8-bit CPU is used. The CPU will work with several different sets of firmware available, but I decided to install an Arduino bootloader so I could use the sketch I use for higher frequency PLLs.

The same firmware used with the OE2JOM PLL could also be used, allowing access via a terminal program (Teraterm, etc) to change parameters quickly during set up. More on this in the next part.

The balance of the circuitry is for DC rail regulation and the 10 MHz reference input. A simple 5-pole filter is used to clean up the 10 MHz input, followed by a detector circuit that switches the VCTCXO to a fixed voltage set via a multi-turn pot. This centres the VCO range, but also provides a calibration point for free running use.

Multiple low noise 3.3 V regulators are used to power different parts of the circuit to reduce noise transmission between sections. These regulators are cheap ($1) so can be used almost like bypass capacitors!

Next issue, I will publish the base schematic and PCB layouts for this version, along with details of another using can-style VCXOs available up to 200 MHz.

## What happened 20 years ago

Continuing in the series of what happened 20 years ago, from my December 2020 column: "Phase 3D Launched! A new era in amateur radio communications was ushered in on November 16, 2000 (UTC) as AMSAT-DL Executive Vice President and P3D Mission Director Peter Guelzow, DB2OS, informed AMSAT News Service that the launch of the Phase 3D satellite from the European Spaceport in Kourou, French Guiana was successful -- following a spectacular nighttime launch.

*" 'It was a textbook launch,' said DB2OS, 'from the first minute of flight, until P3D separated from the Ariane 5 launch vehicle, all received telemetry indicates the launch went perfectly and our satellite appears to be in very good health.' ...courtesy AMSAT.*

*"That's the good news about Phase 3D. The not so good news concerns the eventual coverage of Phase 3D. The elliptical 36-hour orbit of the satellite will vary from 4,000 km to somewhere near 40,000 km. Japan, Europe & the USA each take their turn at maximum coverage while Australia along with the rest of the Southern hemisphere will see only part of that coverage with 4000 km high passes. While this may not be too much of a problem on the lower bands, it will probably restrict the microwave coverage from VK to just VK/ZL and a bit further. A bonus is perhaps the lower pass loss on 4000 km vs 40,000 km! And here's hoping they leave some of this stuff turned on for the Southern Hemisphere!*

*"For the next 6 or so months 3D will slowly edge into its final orbit so we will have a better chance to work 'further' now rather than later. If anyone is seriously contemplating using the 2.4 GHz and above facilities, please drop me a line and I will put you in touch with others.*

*"Phase 3D became known as OSCAR 40 when it was launched on 16/11/2000 at a cost of USD$4.5 million. The satellite operated for a few weeks until on 13/12/2000 when it stopped transmitting after its 400-newton motor was fired to change orbit. The protective cover on the motor had not been removed prior to launch with the resultant explosion causing the destructive failure of the control valves and power supplies. Several yet to be commissioned radio systems were made inoperable and the satellite was essentially dead.*

*"Ian ZL1AOX is credited with sending the successful reset signal on 25/12/2000 that restored some transmission capabilities. The loss of this thruster also meant the satellite could not be moved to its final orbit, so it remained in an equatorial orbit for the rest of its life. AO40 worked after a fashion for several years but suffered a battery failure on 25/1/2004. It was suspected that one battery may have exploded causing more damage, the low battery situation could not be rectified, and signals gradually disappeared. Colin VK5HI reported the last signal heard from AO40 on 9/3/2004, just an increase in noise on the beacon frequency."*

More on what happened 20 years ago next month!

## Online path loss calculator for 24 GHz and above

As previously covered, Iain VK5ZDs website that displays the calculated path loss for 24, 47, 76, 134 and 241 GHz has become a well-used resource to quantify mmWave band conditions. The website can be found here *http://weather.vk5microwave.net/Weather.aspx?State=H*

There is also a path loss calculator available on this link that allows live meteorological data to be entered for any site, anywhere in the world. *http://weather.vk5microwave.net/Calculate.aspx*

## In closing

Feel free to drop me a line if you have something to report, or a project you are working on, it doesn't take much to put a few lines together and helps with the diversity of this column. Just email me, at *david@vk5kk.com*

# Meteor Scatter Report

*Dr Kevin Johnston VK4UH*

## VHF Meteor Scatter: an introduction to operating practice in VK **Part 4**

In the previous section of this Introduction to Meteor Scatter Operation, the normal sequence of a digital MS QSO employing MSK144, the current go-to mode, was covered in detail.

The final, and arguably the most important, piece of the jigsaw puzzle to fit into place is the selection of the appropriate transmission period. This discussion has deliberately left till last.

As was covered earlier MSK144, in common with many other amateur digital modes, involves transmission in one of two accurately timed periods. First or Second Period.

The current agreed protocol in use in VK for MSK144 mode involves the use of 15 second transmission periods. The FIRST or EVEN periods runs from 0 to 15 seconds and from 30 to 45 seconds in each minute. The SECOND or ODD periods runs from 15 to 30 seconds and from 45 to 60 seconds in each minute. A station transmitting First Period will of course be receiving in the Second Period.

What is clearly obvious is that, in order to conduct a QSO, then two stations attempting to make contact, MUST be operating in the OPPOSITE periods i.e. one receiving while the other is transmitting and visa-versa. This of course is true for all forms of contact, digital or otherwise.

What may not be immediately obvious however is that it is also essential for each station to transmit in the SAME period as all other stations in their own area.

Digital Meteor Scatter operating is unique, even compared to other amateur digital modes of communication, in that many stations will be operating on *exactly* the same frequency and at exactly the same time.

Even modes such as FT8, where many stations may be operating simultaneously, rely on stations "spreading out" in frequency, albeit over a very narrow frequency range of a few kHz, to allow individual 50 Hz-wide transmissions to be decoded without causing mutual interference.

Even the narrowest of digital modes such as WSPR still rely on small variations in frequency and pseudo-random transmission periods to prevent the otherwise inevitable clashing of signals.

With MSK144, under a well-established operating protocol in VK, all transmissions aim to be exactly on the same frequency so correct period selection is paramount. If the protocol is not followed, then there will inevitably be paralysing mutual QRM between local stations, effectively preventing any contacts from happening.

It must be said that, in some other regions and countries, Meteor Scatter is done in an entirely different way. In those regions, CQ calls are made on one focus frequency but the QSO itself is conducted on other frequencies. The station calling CQ designates an alternative frequency, as part of the transmitted CQ string, where they will be listening for replies and for their subsequent transmissions.

In Australia, however, mostly due to the lower station density here, we have always elected to conduct all parts of all QSOs on a single

**Meteor Scatter Operating Schedule**

**Saturday**

| | | |
|---|---|---|
| VK3/5/7 | First period | Beaming North |
| VK1/2/4 | Second Period | Beaming South |

**Sunday**

| | | |
|---|---|---|
| VK 1/2/3/5/7 | First Period | Beaming North |
| VK4 | Second period | Beaming South |

focus frequency and by doing so maximise the number of contacts that are possible (primary focus frequency on 2m is 144.230 MHz, 6m 50.230 MHz).

Even when concentrating all stations onto the same frequency in this way, individual stations at great distance rarely 'clash' due to the effect of Geospecificity, as was described in an earlier section of this series.

If two stations, in the same area, were to operate in opposite periods, then it is likely that they will receive a continuous signal by direct propagation from the other while listening, and so prevent any chance of decoding any DX stations.

Akin to the rules of the road, to prevent motor collisions or our own band-plans then the protocol that is followed for digital meteor scatter, at least during the weekend activity sessions, runs as follows:

- Stations in the Southern call areas (VK3, VK5 and VK7) **ALWAYS** run **FIRST period** and beam **North**
- Stations in the Northern Call areas VK4 **ALWAYS** run **SECOND** period and beam **South**
- Stations in the Middle Call areas (VK1, VK2) **swap periods** between Saturday and Sunday
- Saturday: (VK1 VK2) run **Second Period** and beam **SOUTH.**
- Sunday:- (VK1, VK2) run **First Period** and beam **NORTH.**

This protocol is far from perfect, but it gives most stations the best chance to make as many distant contacts as possible.

There are inevitably some paths and contacts that cannot be attempted on some days. During the weekend activity sessions, for example, it is never going to be possible, under this protocol, to work stations in your own call area.

**Q.** So, it's Saturday and I'm in Sydney. I want to work a station in Brisbane but we are both supposed to be transmitting second period. How do I do that?

**A.** *Try tomorrow. Under the protocol you will be transmitting first period on Sundays.*

**Q.** I'm in Hobart but I want to try meteor scatter to stations in Victoria, can I just change to second period to work those stations?

**A.** *NO, this is never OK on 2m or 6m! If you were to do so, then you would cause QRM and likely prevent all other VK7s or VK3s from operating at all. This path is open to direct tropospheric propagation and Meteor Scatter is not required anyway. If you really want to experiment, then it is possible to do so outside of the weekend activity sessions or QSY to another, secondary, frequency.*

**Q.** I'm in country Victoria, I'm not hearing any direct stations so surely, I can call CQ in any period I like, can't I?

**A.** *Again, NO. Other well-located stations in your own or adjacent call areas may still receive your direct signals and be QRMed by you. Further, others may reply to your call you in the "wrong" period for their locality and cause QRM to all their neighbours.*

The only possible exception is for stations in close proximity on either side of a state (call-area) border. It may be impossible in that situation to follow the rules. Some common sense and local agreement may be needed.

## Resources and assistance

Where possible, it is very helpful to sit-in with an experienced operator to see first-hand how Meteor Scatter works and how a station operates. There is a learning-curve and it helps to see things running with your own eyes.

**VK-Spotter.** This is an amazing internet-based resource available to all VK/ZL operators. Although it has facilities for HF reporting, it is particularly beneficial for VHF and up operators, including those interested in VHF Meteor Scatter.

VK-Spotter allows observation of all reported QSOs posted and also indicates the callsigns and locations of connected stations. Short messages can be sent to individual operators or all the connected group. Propagation information and location/path details of all registered operators is available whether they are online or not. Further, listings are available of VK beacons and repeaters.

It is entirely acceptable practice for Meteor Scatter operators to announce their intentions and operation on the Spotter and also to post details of all completed QSOs. The only caveat is that no QSO information, such as signal reports etc, should be posted until a QSO is complete. Otherwise, the contact can be invalidated.

As with most digital modes, a QSO is considered complete once callsigns and signal reports have been exchanged and a further report indicating that all required information has been exchanged.

For MSK144, this is at the RRR stage. Once RRR is received, then the QSO is complete and both stations typically report the QSO on the Spotter and return to calling CQ or other stations. The 73 signal is a courtesy only, and for Meteor Scatter work is an unnecessary step if completion is confirmed via the Spotter.

**Social Media.** There is also an internet-based Facebook group for VK-ZL Meteor Scatter. This is a secure, closed group for licensed amateur operators interested in Meteor Scatter operation and is free to register. News, views and information are freely exchanged.

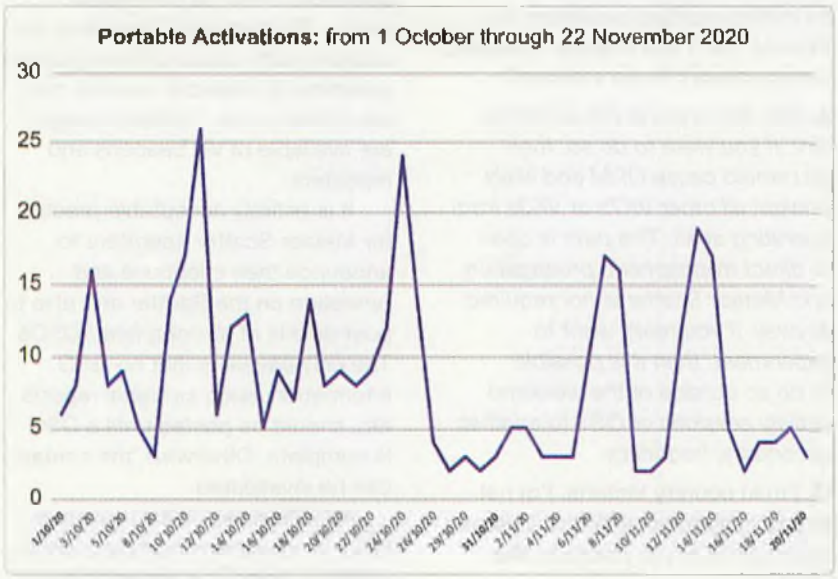
## Resources

**VK-Spotter**
Register at *"vkspotter.com"*

**Facebook**
Register at *"Meteor Scatter VK-ZL"*

# SOTA and Parks

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




*Portable Activations chart.*

## Finally seeing activation levels improving toward 'normal'

Peter VK3PF leading the charge, Gerard VK2IO close behind out activating the new VK2 parks, and Marty VK4KC taking care of VK4 parks.

Solid performances from Brian VK3BCM, Andrew VK1DA, Tony VK3YV, Stuart VK7FADZ, all out in multiple sites. There are still challenges for access to parks, primarily as a result of recent fires, but still forcing Tait VK1TRL to switch to plan B, or was it C?

Regional VK3 activators Peter VK3PF and Brian VK3BMC have been leading the charge, both taking advantage of bonus season and relaxed travel for country folk. Honourable mention for Warren VK3BYD, Rick VK3EQ and Mal VK3OAK for getting back out into the hills.

Great to see the VK3 city-based activators getting out. 120 days lockdown has created a lot of dust and cobwebs requiring blowing out.

Activations from Andrew VK3ARR picking off local summits, Peter VK3ZPF returning to the parks, meanwhile Ron VK3AFW got five activations in to leave him sitting on 999 points. One more activation required for Goathood!

Going through the history and new callsigns appearing with Bob VK2BYF, Dan VK3NDG and a late activation from Murray VK2UMZ that raised a late pile up.

Also worth noting is the gradual uptake of FT8, with activations from Wade VK1MIC, Matt VK2DAG, Tony VK3YV, Norman VK3XCI, Ian VK5CZ and John VK6XN.

SSB still accounts for the majority of contacts, but given FT8 allows contacts with low power levels (decoding up to -25 dB), it appears to be a fit-for-portable activation mode. With Foundation licence holders now having the ability to use FT8, it's here to stay.

In Australia, where gaining 44 contacts in a single activation can still be a challenge, FT8 provides a tool to secure a park activation.

Most chasers will have the ability to chase and more activators are building portable digital setups.

Neither WWFF nor SOTA require the exchange site identifier in every over.

### WWFF:

*wwff.co/wwff_cont/uploads/2018/03/WWFF-Global-Rules-V_5.3.pdf*

***3.12***

*Valid contact exchange.*
*Valid contacts will include an exchange between the activator and the hunter of their respective call signs, a signal report, and wherever possible the WWFF reference number.*

### SOTA:

*https://sotastore.blob.core.windows.net/docs/SOTA-General-Rules-April-2015.pdf*

***3.7.1 , 8.***

*At least one QSO must be made from the Summit to qualify it as an activation. In order for the activation to qualify for the points attributed to that Summit, a minimum of four QSOs must be made, each of which must be with a different station. QSOs must comprise an exchange of callsigns and signal reports, it is strongly recommended that the summit identifier be given during each contact. Where the summit identifier is not given in each contact (for example in slow CW QSOs) it should be repeated frequently every few QSOs. Note; Summits are commonly mis-identified by chasers when 'spotting' on the SOTA Reflector. Ask the Activator for the summit reference if you have not heard it stated.*

*Photo 1: The Hotham 'summiteers'. From left to right – Tony VK3CAT, Glenn VK3YY, Paul VK3HN, Ron VK3AFW, Allen VK3ARH, Brian VK3BCM and Peter VK3PF on Mt Hotham 2017.*

So, it's a case of exploit the final QSO in for-site contacts and keep the references in spots accurate.

## 5th Hotham SOTA Summit

The 5th Hotham SOTA Summit is on over the weekend of the 5th to the 8th of February 2021. The 2020 event was cancelled due to the fire situation in the North East of Victoria and Gippsland.

This coming year, the intention is to return to Mt Hotham and to use ski club accommodation as we have previously. Mt Hotham community and the North East region has suffered financially with the bush fires earlier this year, followed by COVID-19 and a cancelled ski season. The area definitely needs support.

*Photo 2: Scott VK4CZ executes a VKFF activation at Mt Mee in D'Aguilar National Park late in October.*

The format of the weekend is – arriving Friday, activate in small groups Saturday and Sunday, and return home Monday. Saturday evening, we usually have a mass activation of Mt Hotham with drinks and nibbles. While this activity will make for some questionable CW, it is also a great opportunity to admire the sunset from a premium location.

You will have the option of self-catering, with kitchen facilities available, or eating at the Mt Hotham General Store.

Most activators walk away from the weekend with 100+ activator points! It's a great way to accelerate the tally towards Mountain Goathood. We usually have six-plus mountain goats attend the weekend, so it's a great opportunity to learn the tricks, check out how people are kitted out, look at the new gear available and have fun.

Spouses/partners are welcome with many great walks around Hotham and wineries close by in the North East.

If you are a chaser, you're also most welcome and can chase from your accommodation with HF and VHF station setup in the accommodation with a commanding position over the surrounding area.

In 2019, we had Sid and Adele from South Africa attend. If our borders do open, overseas SOTA folk are welcome to join us. If we have interest, contact Brian and we can work through the logistics.

Please email Brian VK3BCM, at *bcmcdermott@tpg.com.au*, or telephone on 0425 721 860 to confirm attendance, ASAP.

Don't forget New Year's activations exploiting the UTC and New Year roll over. This is an extremely active window, with summit-to-summit –S2S – (ZL/VK) aplenty.

Also, checkout videos from Chris ZL4RA: *www.youtube.com/channel/UCOHCTGeSGqt1r76DvVJH_ww*

73 & 44,

Allen VK3ARH

# BenchNoteBook

*Peter Parker VK3YE*

## Making thick shaft variable capacitors useful

*Photo 1: Those thick shafts can be frustrating, but there's a solution.*

Up to now, I've cursed the thick shaft air-spaced variable capacitors that often came with valve radios, and regularly pop up at hamfests (**Photo 1**). While good for antenna coupler and magnetic loop antenna projects, it is difficult to couple anything to their 9.5 mm (3/8-inch) shafts. The radio dial drums they were attached to are often long gone.

By contrast, capacitors with 6.3 mm (1/4-inch) shafts suit numerous new and salvaged grub-screwed knobs. Vernier reduction drives are often compatible, allowing easier adjustment, and some verniers also have a dial. What if all these have gone from your 'store' and the only variable capacitors remaining have that thick shaft? Luckily, help is as close as your nearest hardware store. Or maybe your garden shed.

I've found that 13 mm plastic irrigation joiners (aka poly fittings) are a firm press-fit to the 9.5 mm shafts of variable capacitors. The T-piece in **Photo 2** makes a nice knob. Use white paint or correction fluid to form a pointer.

T-pieces aren't the only fittings that could be useful. An L-piece could form a knob where panel space is limited. And an I-piece with dowelling could become an extension – potentially useful for projects where you are mounting a capacitor well behind the front panel.

What about the specialised applications where you need a differential variable capacitor? This is a rare type of variable capacitor where one section increases in capacitance and the other decreases as the shaft is turned. But, you could make your own with two 9.5 mm shaft variable capacitors and a cross piece joiner. This works because, with the capacitors mounted so their shafts are facing such that one's plates are being turned clockwise while the other's shaft is being turned anticlockwise.

Those unable to obtain or afford vernier reduction drives have often used large knobs as a 'poor mans' substitute. While not quite as good, the larger leverage allows easier adjustment than a small knob. You can use a similar principle by fitting an extension rod to your T-piece; 9.5 mm dowelling is a firm fit.

*Photo 2: A poly T-piece is a press-fit to a 9.5 mm shaft and provides a convenient, though unconventional, knob.*

With these ideas in mind, no longer do you need to pass up variable capacitors with thick shafts. And you might finally find a use for those you already have stashed away. With a T-piece knob, adjusting them is now as simple as turning on a tap!

*www.vk3ye.com*

# DXTalk

*Steve Barr VK3KTT*
*e vk3ktt@gmail.com*

## DXpeditions Dec-Jan

No DXpeditions have been planned as COVID-19 levels are very high.

Here's the list for January 2021:

**Jan 01-15:** 3d2ag/p Rotuma. Tony on Annual family trip; all bands 160m to 6m.

**Jan 03-09:** TI2/AB3G Costa Rica, from various locations; 40-15m; mainly CW; Special QSL OK via Club Lob OQRS.

**Jan 14-29:** 8Q7CQ Maldives, by G0VJG Nobby Styles, from Reethi Faru, Filaidhoo Is (IOTA AS-013); 80-10m; SSB + digital; QSL OK via Club Log OQRS; license pending.

## The high bands are buzzing

Around Melbourne cup day, the bands came alive! There were a number of sunspots and the SFI index reached 91. VQ9T was worked on 8/11 by many VKs.

On 17m and 15m CW also, VK5GR reports working JX2US (Jan Mayen) on 20m short path.

There were solid openings on 10m, 12m, and 15m finally. The season was very late this year. Let's hope it makes up with its intensity. This is a solid sign the cycle is on the way up.

With the way the world is at the moment, I'm not going to focus on activities but more some pointers for the new operators coming in to a fast-moving cycle.

Now is the time to be thinking about the 12m, 10m and 6m bands. These are coming to life with the sunspots and flares returning. Make sure you have a good antenna for all of these bands.

Some sneaky advice: although we don't think of the low bands in the summertime, I have had some success the last few weeks. Grey line to Europe starts earlier – 2-3 am – with more stations on and many parts of Europe and US locked down, you might be surprised.

## Excerpts from the ARRL DX News

**MINAMI TORISHIMA, JD1.** Take-san, JG8NQJ/JD1 has been QRV on 40 meters using CW around 0900z. QSL via JA8CJY.

**OGASAWARA, JD1.** Station JD1BHA has been active on 40 meters using CW around 1200z. QSL via operator's instructions.

**AUSTRIA, OE.** Members of the VIC Amateur Radio Contest DX Club are QRV with special call sign **4U2STAYHOME** until 31 December. QSL via UA3DX.

**POLAND, SP.** Members of the Ostrow Radio Amateur Radio Club are QRV as **SN3ISS** until 21 December, to celebrate the 20th anniversary of active amateur radio communication service on the International Space Station. QSL via SP3POW.

**GREECE, SV.** Special event call sign **SX40ARES** is QRV to celebrate the 40 years of the Hellenic Amateur Radio Emergency Service. QSL via operators' instructions.

**SOMALIA, T5.** Ali, EP3CQ is QRV as **6O1OO** until 15 January 2021 while working for the UN Department of Safety and Security in Mogadishu. Activity is in his spare time on 160m to 10m using CW, SSB and FT8. QSL direct.

**ASIATIC RUSSIA, UA0.** Vladimir, **R0FP** is now a resident on Iturup Island, IOTA AS-025, and is active on various bands and modes. QSL via RZ3EC.

**INDIA, VU.** Datta, VU2DSI is QRV with special call sign **AU2JCB** until 15 December to celebrate the birthday of scientist and radio pioneer Aacharya Jagadish Chandra Bose. QSL direct to home call. In addition, look for **special calls** AT2JCB, AU3JCB, VU5JCB and AU8JCB to be active as well.

**LAOS, XW.** Simon, XW0LP is now QRV on 160m to 10m, except 60m. QSL to home call.

*Jan Mayen is not an easy one to get, but VK5GR reported working JX2US on 20m, short path.*


Keep up to date with the latest DX news on the vkdxchasers Facebook page, along with *dx-world.net*

# ILLW 2020

## Another successful Lighthouse Weekend for VK4GHL

*Bob Ronai VK4BOB*

VK4GHL notched up its sixteenth successive year, making it the longest continually participating Lighthouse Weekend station in the world. The callsign reflects the location, VK4 Grassy Hill Lighthouse, in Cooktown, Far North Queensland. The event was held over the weekend of 22-23 August.

This location, by the way, is where Captain James Cook saw his first kangaroo. In memory of his stay there 250 years ago, we also operated as special event callsign VI250COOK.

Blessed with magnificent blue sky, about 28° C degrees in the day and about 18° at night, no problems with COVID-19 travel restrictions and no need for masks, a few of us from the Cairns Amateur Radio Club set up in a grassy picnic area half way up the hill.

To the east was a magnificent view of the Coral Sea, and to the west another magnificent view over the Endeavour River snaking its way inland with Cooktown itself immediately below us.

As always, the wind was keeping us company; a passing tourist asked us "why would you pick the windiest place in Australia to do this?" All we could do was say "Yeah, we know, but we're having fun!"

Willy VK4BH and I, VK4BOB, met up with tourist Dave VK3ASE, who had legally entered Queensland when our Premier opened the borders ever so briefly, on the Saturday morning and set about erecting our shelter then putting together our radio gear. This consisted of my IC7300, SPE Expert linear, four-band trapped vertical (Rippletech, by VK3TZ) on a speaker tripod with four 8m tape measures as a ground plane, plus a generator in the bush.

We discovered that my new inverter generator, as expected, radiated lots of RF crud from the extension cable, so we used another cable at the generator end plus every clip-on ferrite I had with me to reduce it down to almost zero. Dave set up his magnificent 60 ft fibreglass Spiderbeam mast with an 80m dipole.

Steve, then VK4FBRO but now VK4SJB, arrived with his Yaesu FT819, a loop antenna and an end-fed halfwave, which we erected as an inverted vee, but he had to leave mid-afternoon. We also had a brief visit from the only ham living in Cooktown, Pat VK4MUY, whose husband Dave VK4FUY unfortunately had recently gone SK.

Dennis VK4JDJ, who couldn't attend on this weekend, recently set up Pat with a station and we hope to hear her on 40m and 80m soon. Apparently she is dusting the cobwebs off her CW skills, too. Jean from the local historical society dropped by with a delicious fruit cake, a very much appreciated ritual each year, though the cynics might think it was appropriate for the fruit cakes sitting there!

Time to play radio! Lighthouse stations in Australia were sparse, but we managed SSB QSOs with VK4BAR, VK2FRE, VK2CLR and ZL6CC. We also had chats with a number of stations in VK2, VK5, VK8, ZL, Indonesia, Japan and USA, mainly on 20m but some on 40m.

We turned the generator off at 11pm and continued operating on battery power, running barefoot. Then, a bit after midnight, we heard OH6JJ. After calling him a few times, we finally got a 5x2 from him; not bad, a hundred watts into an aluminium stick stuck on a hillside! I just don't understand why anyone would question our sanity.

Dozing off in our reclining camping chairs, we decided at 2am to pack up! Thank heavens for headlamp torches. We were packed away and safely back at our motel by 3.30am, ready to catch a few hours of sleep before hitting the road back to Cairns some 300 km drive to the south. Dave continued his journey north up Cape York.

Another successful International Lighthouse and Lightship Weekend for VK4GHL from Far North Queensland, known to the locals as "paradise."

*Our shelter, looking east towards the Coral Sea. Behind is the vertical. To the left, the swimming pool poles holding up the end-fed halfwave, and to the right, part of the 80m dipole.*

## What is ILLW about?

The International Lighthouse and Lightship Weekend (ILLW) is an annual world-wide amateur radio event that usually takes place on the third full weekend in August, in which amateurs operate from lighthouse and lightship locations in countries across the globe.

Since its beginning in 1998, when 158 locations registered to participate, the event has grown and ILLW now attracts participation from over 500 lighthouse and lightship locations in over 40 countries world-wide. Some 80 locations across Australia and New Zealand now join in.

ILLW is one of the most popular international amateur radio events, probably because there are very few rules and it is not the usual contest-type event. It is also free, and there are no prizes for contacting large numbers of other stations. Most operators issue special QSL cards. Some stations obtain special callsigns. The event attracts mainstream media attention.

August has become "Lighthouse Month".

The general objective is to encourage lighthouse managers, keepers and owners to open to the public their lighthouse or lightstation and related visitor centres, with a view to raising the profile of lighthouses, lightvessels and other navigational aids, contributing to preserving and restoring our maritime heritage. Visit: *https://illw.net/*

# ALARA

*Jenny Wardrop VK3WQ*

We are very pleased to hear that one of our long-time ALARA members from "Across the Ditch" has recently received a special NZART award.

## Ngaire Jury ZL2UJT receives Godfrey Award

Acknowledging Ngaire ZL2UJT's dedicated behind-the-scenes work with her local club, at the July meeting of Branch 27 at New Plymouth, NZART President, Mark Gooding ZL2UFI, presented the Arthur (Jumbo) Godfrey Award for her work with, and contributions to, the Branch 27 ARC over many years. The criteria for this award can be seen at: *www.nzart.org.nz/nzart/conference/awards/arthur-godfrey-award*

The presentation was originally planned for the earlier NZART National Conference, which was not held because of Covid-19 restrictions.

In receiving the Award, Ngaire said: "This is to thank you all very much for your nomination of me for the Arthur "Jumbo" Godfrey Award. It was very unexpected, but I do appreciate your support. I have enjoyed my contributions to the Branch 27 Amateur Radio Club over the years, and am so happy to see it blooming and encouraging new members to come on board with our various activities. I wish you all well."

Congratulations Ngaire, well deserved indeed.

*Photo 1: Ngaire Jury ZL2UJT receiving her Arthur "Jumbo" Godfrey award from NZART President Mark Gooding ZL2UFI.*

## Maria LU1JC celebrates 102 years

This is an abbreviated story of one of the early radio amateurs in Argentina and possibly the first in the province of Entre Rios, and that love, like radio, has no borders.

Using the callsign LU1JC, María Rosa was known across radio nets and the throughout the world.

She worked as a teacher and had to leave at four in the morning to catch her train. From the railway station she used a horse drawn sulky to the little country school.

At the time when Rosa was making her first forays into radio, communications between provinces and nations was difficult. Telephones were just beginning to appear and, unlike the cellular phones of today, calls were routed through operator control hubs, often with substantial time delays.

Communicating with another country therefore was expensive and difficult. At times of emergencies, amateur operators would form a network to assist in communications during earthquakes, hurricanes, eruptions, accidents, etc. The house of María Rosa was then open to those involved with seeking friends and families' status or whereabouts; even the press collected news that she graciously updated every day. In quieter

*Photo 2: María Rosa García Girard LU1JC, from Paraná.*

times, Rosa exchanged greetings, laughter, cards and photos with other radio operators from around the world.

She spent hours in front of her radio, connected to the world. Built by her brother Pepe García Girard, the radio was almost as high as the ceiling, full of dials, lights, levers, and knobs. The peaceful house was frequently disturbed by the high-pitched screech of the frequency changes on the dial and the voices of radio friends.

Rosa had a unique habit of moving her head from side-to-side in front of the microphone and one day one of her nephews asked her, if to be a radio amateur it was also necessary to learn to move one's head in the same way?

She met Wlademir, a radio amateur PY1KZ from Brazil who, one day, after many communications and exchanges of letters and photos, arrived at her home. He was captivated and returned at the end of the year to ask for Rosa's hand from her mother. They spent the next twenty-five years happily together in their home in Rio de Janeiro, regularly visited by local and radio amateur friends. Unfortunately, in 1983, PY1KZ – General Wlademir Fernandes Bouças, first licensed in 1934, became a Silent Key.

Rosa returned to Paraná to be with her sisters and nephews after her husband died. She has entertained family and neighbours with stories of growing up in the area in a different era, bringing the history of the neighborhood into the present.

On 16 December 2008, at the age of ninety, María Rosa García Girard, already an early pioneer among women radio amateurs, attended the Radio Club Paraná to renew her license to continue with her unique call, inviting friendship and solidarity: "CQ, CQ, CQ 20 meters ... this is LU1JC calling." Five years later (aged 95) Rosa donated her equipment to the Entre Rios Radio Club.


*Photo 3: BYLARA 40th Anniversary Cup and Badge.*

In August this year, at 102, her voice does not resonate as before, but it remains firm and will be remembered forever by those who know and love her.

Encouraged by his grandfather (Wlademir Fernandes Bouças), grandson Miguel Dau, began as a Shortwave Listener (SWL) aged 11, and in 1984 following his grandfather's passing, Miguel already an amateur, took over the call sign PY1KZ. He is honored to keep his grandfather's callsign active. Miguel's QRZ page has a QSL card and photo of grandfather PY1KZ from the period. See *QRZ.com* PY1KZ

*Our thanks to Heather ZS5YH for permission to reprint part of her original article in YL Beam #86, the official magazine of the South African YLs.*

*Heather would be delighted to receive any additional information or corrections with regard to Maria Rosa Garcia.*

*I don't really feel comfortable writing an article about myself, but as you will see as you read on, I was asked to write this article for the BYLARA (British Young Ladies Amateur Radio Association) Newsletter. Somebody (rather high up in the pecking order) in Australia who subsequently read it, told me that I should include it here, so I'm just doing what I was told!*

## BYLARA Article 2019

Firstly, I would like to say, belatedly, Hearty Congratulations to BYLARA (British Young Ladies Amateur Radio Association) on achieving their 40th Anniversary. You still have four years to catch up to ALARA, as we had our 40th in 2015, but it's a great milestone all the same! (I had to say that Hi!).

I have had a long association with BYLARA. In the early 1980s, I was sponsored into BYLARA by Shirley GM4LUS, and also communicated for years with Diana G4EZI and Angie G0CCI amongst others. When Shirley found interests other than radio, I let my sponsorship lapse, but a few years ago I decided to renew it. I contacted Mabel GI8SXN, the BYLARA Sponsorship Representative, and she said that she would sponsor me herself. It has been an added bonus that, on a couple of my visits back to the UK, I have been able to meet Shirley,

*Photo 4: Childhood friends at John Sones' place. From left: John, another friend, Jennifer, my sister Gillian, and me. c.1953*

Angie and Mabel face to face.

Not so long ago I received a surprise parcel in the mail. It was a BYLARA 40th Anniversary Mug and a metal celebratory badge. On closer inspection of the wrapping, I discovered that the sender was a friend of mine, John Sones M0AAO.

It turned out that he had been to the Newark Rally in the UK and had started talking to the ladies on the BYLARA stand. He asked if they knew me and they said they did, as I had attended the YL International Meet in Milton Keynes in 2016. They then gave John the Mug and Badge, and asked if he would mind sending it to me. (Thank you very much to Jenny, Carol and co. for doing that). John then went on to tell them of our, his and my, history and they asked him to ask me if I would write it up for the BYLARA Newsletter. (No such thing as a free mug! Hi).

My version of the story follows.

John and I grew up on the outskirts of the village of Hutton, between Brentwood and Billericay, in Essex UK, and lived opposite each other. John's parents had a small-holding with pigs, poultry etc, and mine had a plant nursery.

I was a few years older than John, but on most Saturdays my younger sister Gillian and I would go over the road to play. He was an only child and probably pleased with the company – even if we were "girls"! As we grew up, we gradually went our separate ways, but I continued to keep in contact with his mother.

In my early teens, I met the cousin of a friend whose name was Mike Warrington. Five years later we married and a year after that, emigrated to Australia as "£10 Poms!"

I had always known that Mike had an interest in building radios etc. but it wasn't until we had settled in Adelaide and started a family that he made positive steps to obtain his amateur radio licence. He remembered that, in the UK, his father had built a replica of John Logie-Baird's *Televisor*, an early mechanical television receiver, although Mike had never actually seen it working. Perhaps it never did!

Mike studied for his amateur licence and in 1974, after passing the exams and achieving his Australian Limited Certificate of Proficiency (AOLCP), he became VK5ZBI. He then suggested that perhaps I should also gain my licence, as there had been a YL in his licence course, Myrna VK5YW. About three years later, Mike upgraded to his Full Call VK5AMW, and I managed to obtain the VK5ZBI callsign about three months after that. The Australian "Z call" at the time was only for VHF-UHF operation from 6m upwards.

I probably would have achieved my Full Call a lot sooner, but on the nights when a group of local Z call amateurs were at our house having CW practice for the obligatory Morse test, I was attending cake decorating classes!

I finally got my Full Call (now called Advanced) licence in 1980 and became VK5ANW. The suggestion was that, as I had missed out on VK5AJW (JW being my initials), it would be good if I had ANW, as it wouldn't matter if we heard a call for "ANW" or "AMW" on the 2m FM transceiver (the Shack being in the middle of the house), at least it would be for one or other of us! Mike is now a SK.

I don't remember when I heard that John had also become an amateur on the other side of the world. It may have been before his mother died, or when he took over writing the letters to me, and later emails.

We re-met for the first time when my daughter and I went to the UK in 1991. And later, when my partner Peter Wolfenden VK3RV and I went over in 2011, and again in 2016 for the International YL Meet, we once more met up and he and Peter found that they had a lot in common. So now the emails from John aren't always for me!

More recently, Peter and I were involved in compiling and editing a book produced by the WIA entitled *Wireless Men and Women at War*. This book dealt with the contribution of many Australian amateurs during the various wars. My chapter focused on the lady amateurs who were involved, mainly in World War Two. We sent a copy to John as a present and, after reading it, he wrote a review in the April 2019 issue of Practical Wireless; a continuation of common interests with my sister's and my childhood friend.

I re-met Peter 13 years ago. We had first met at a WIA national radio conference back in 1981. Since I have lived in Victoria with him, I was offered the callsign VK3WQ, which had belonged to another YL, Marlene Brown, whom I had known for many years. I still have VK5ANW (once dubbed Australia's Nicest Woman!!), which I sometimes use when I'm in VK5.

33, Jennifer (Jen) Wardrop
VK3WQ/VK5ANW
*ALARA Historian, Librarian and Publicity Officer*

*As a postscript to this, this year John, Peter and I have had several contacts on Echolink; the first time in all these years that we have ever worked each other.*

As this is the last issue for the year, I would like to wish everyone a safe, happy and healthy Christmas and New Year, and hopefully a Covid-free year in 2021.

**Plan ahead**

## Operate within the band plans:

*http://www.wia.org.au/members/bandplans/about/*

# Over to you

## Amateur radio, science and technology

In the middle of August this year, I recalled that the amateur radio activity calendar highlights a contest that marks an important date. The Remembrance Day Contest, the RD as it is called, and known as "the friendly contest", has coincided with the week in which the dropping of the first atomic bombs were remembered and the memorial of 75 years since the end of World War 2.

For those old enough to remember, it is a time of quiet reflection, and for the former and serving service personnel, it is a reminder of the awful price that war inflicts. For amateur radio, it is the time to remember those who enjoyed this hobby and who served and died.

Just as Australia those 75 years ago came out of the smoke and toil of battle that settled over the whole country with civilians committed to the "war effort", there was a sense of direction and the hope of renewal.

Before the war was over, there had been planning for peace, and much of what was built over the last seventy years grew on that foundation. New houses, new public works brought what was full employment for many years and businesses grew to service the peace time community.

Without becoming maudlin or nostalgic, I really think it is time for a reconstruction of this hobby.

There were the structural changes to the WIA some 16 years ago, and there has been a redesign of the licence structure. But today we seem to have a system that is largely acknowledged as belonging to the horse and cart era.

With the phenomenal publicity given to our high speed internet, the national broadband network (NBN), and the encroaching 5G cellular mobile networks, we still have exam papers put in envelopes with a stamp and mailed around the country for marking.

What happened to the paperless office that was touted 20 or more years ago? It is totally 'beyond the ken' of modern-thinking people that exams aren't conducted and assessed on line. It is ridiculous that the very government departments that guide cyber developments have allowed this regressive system to remain.

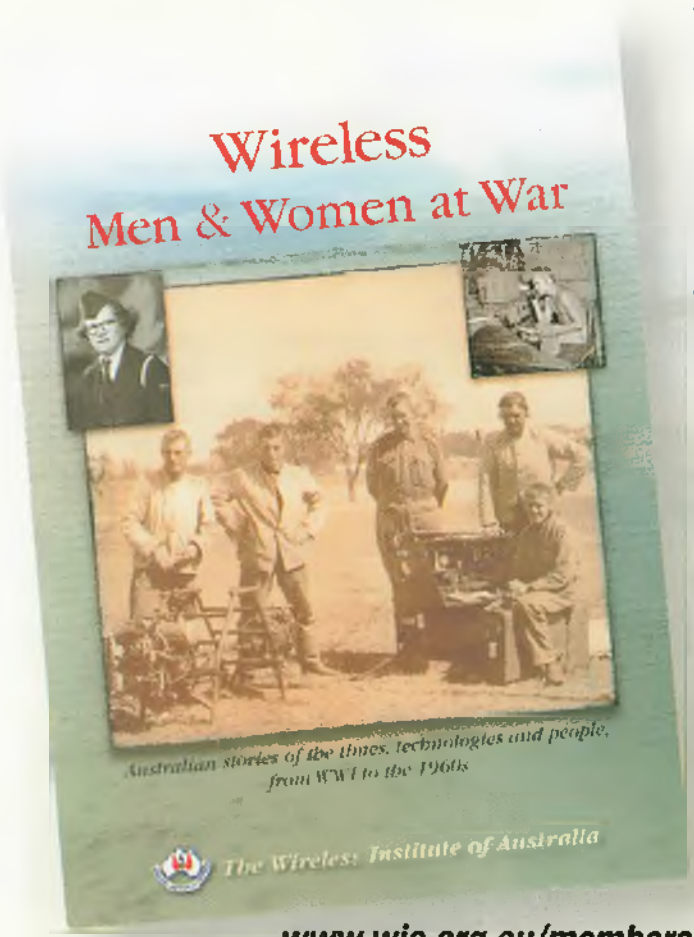
Realistically, we seem to have dropped the ball on enticing younger people to try our hobby because the marketing that they see is decidedly old fashioned to them. We seem to have thrown the Teddy out of the cot over having entry level licensing and – heaven forbid – now they have access to digital modes!

If you think that I am throwing out some challenges here, you are darned right that I am.

Here, in a country that has benefited so much from radio and electronics, we are letting slip the chance to recruit and imbue our neighbours, young and old, with some learning and a love of exploring a whole field of science and technology.

Isn't it time to come out from behind the barbecue and give others a chance to join us on the airwaves?

Geoff Emery VK4ZPP




# 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***

## *Pages from the Past*

*From the Argus (Melbourne) Newspaper, April 11th 1901*

### WIRELESS TELEGRAPHY | PROPOSED WELCOME

Mr. H.W. Jenvey, telegraph engineer attached to the Postal department, has furnished the permanent head, Mr. F.L. Otrim, with the subjoined report:-

*"I beg to report that during the Easter holidays I conducted a series of experiments in wireless telegraphy. By kind permission of Mr. G. Chirnside, I was enabled to establish a station at Point Cook and Point Ormond (the Red Bluff), a distance of 10 miles in a direct line, the signals were first class. As no mast was available, we flew a kite which answered admirably. I think there would not be any difficulty in transmitting messages over 20 miles. If the Government desired it, a station could be established at Point Lonsdale for the purpose of welcoming the Duke and Duchess of Cornwall and York whilst the Ophir is still 20 miles or more from the shore."* ¶

# VK2news

*Stuart Walker VK2BMX*
e *vk2notes@arnsw.org.au*

While no events are currently planned at VK2WI Dural, and the site remains closed to visitors; you can still make contact via email, to *office@arnsw.org.au*, or by phone message, to (02) 9651 1490.

With recent changes to public health restrictions, work is underway to resume some in-person activities. The ARNSW Education team planned a training and assessment weekend for the 5th and 6th of December, only held subject to Covid19 safety plan approval. If you are interested in attending future sessions, please email the Education team, to *education@arnsw.org.au* – with the extra procedures in place, plans need to be confirmed well in advance.

For those near the ACT, the Canberra Region Amateur Radio Club conducts weekend courses, with examinations for all Australian licence grades, available on the Sunday. You can find out more on its website, *crarc.org.au*.

Many clubs and groups have recently modified or increased their on-air activities. You can let us know about the activities happening in your area by email to *news@arnsw.org.au* – just the details of the activity and contacts.

We also welcome any updates on the progress in these activities, which we can report on VK2WI News, to tell listeners how it went.

## WICEN

At a recent WICEN NSW training session, several members were presented with the NSW Bushfire Emergency Citation. There were 30 WICEN NSW members who volunteered their time in several roles during the 2019-20 Bushfire season, including providing emergency communications infrastructure for the Bega Valley.

Radio operators and logistics support were provided for a number of regional RFS Fire Control Centres, and call centre operators for the RFS Bushfire Information Line.

## Club activities

**Oxley Region ARC** nets: 7:30pm Thursday, 9am Sunday. VK2RPM repeater, 146.7 MHz with 91.5 Hz tone.

**Great Lakes Radio Club** weekly net: 7pm Mondays, on VK2RGL 147.1 MHz.

**Westlakes** nets: Monday, Wednesday and Friday, 9:30am on 3565 kHz.

**Hunter Radio Group** meeting net: Wednesday 7:30pm on 146.9 MHz.

VK2AWX News 7:30pm Monday, on 146.9 MHz and 438.025 MHz.

**Central Coast ARC** net: Thursday night on VK2RAG 146.725 MHz, 91.5 Hz tone; also Echolink "CCARCNSW".

**Amateur Radio Central West Group** afternoon tea net: 4pm daily. Monday and Friday night net: 8pm, on VK2RCW. HF net: 8pm Wednesday 3653 kHz.

**Illawarra ARS** nets: Tuesday at 8:30pm on 80m, 3666 kHz. Saturday 9:30am on VK2RMP 146.850 MHz and VK2RUW on 146.675 MHz.

**Blue Mountains ARC** nets: 8pm Tuesday on 3543 kHz, 8pm Wednesday on VK2RBM, 147.050 MHz with 123 Hz tone.

**WICEN** nets: on Sunday evenings from 6pm.

**Waverley ARS** net: 8pm Monday on VK2RBV, 438.1125 MHz. Activities online and in person, see website for details (*www.vk2bv.org*).

**Fishers Ghost ARC** net: 7:30pm Thursday on VK2RFG, 438.65 MHz and Echolink.

**St George ARS** net: 8pm Thursday, on VK2RLE 146.8 MHz.

**HADARC** Monday night: 8pm on VK2RNS, 147.25 MHz; on-air net Tuesday at 8pm on VK2RNS – net control VK2WAH ('we are home').

**Manly-Warringah** on-air meeting net: Wednesdays 8pm on 146.875 MHz.

**At ARNSW**: Morning News bulletins continue, and audio can be downloaded or streamed live from the website.

*Pride of place – the monopole at VK2WI carries antennas for many of the RF services at the ARNSW Dural station, as well as 'polecam', showing live images from the 40m level looking towards the Sydney CBD.*

# Silent Key

## Norm Philips VK4CNP

Many people in Queensland's Gympie Region, and others around the world, were saddened by the sudden passing of Norm Philips VK4CNP on Tuesday, 20 October 2020.

Norm, was born on 26 July 1920 at Clematis St, Gympie. Eight days after he was born, his mother passed away from septicaemia and he was brought up by Midwife Isabella Veal, while his father, who was a monocline operator at the Gympie Times, moved to Brisbane to work at the Brisbane Telegraph.

Norm's main interest as a young boy was scouting and his first job was as a message boy for a local chemist.

On 12 May 1937, Norm started work for the Gympie Times. Five years later, he joined the AIF and on 26 September 1941, he left Gympie for Redbank; this was the beginning of his Army service.

All his life, Norm had been interested in radio. Ever since he was a boy of fourteen when he made his first crystal radio set, he had wanted to be a Signaller. When in the Scouts, he learned Morse code, Semaphore and use of the Aldis lamp. Subsequently, he applied to the Signal Training School.

His time in the Army was traumatic as he was nearly killed near the town of Bulolo (Papua New Guinea) when one of two Japanese Mitsubishi medium bombers flying towards him dropped a bomb that exploded near him in a blinding flash. Between a week to a fortnight after the explosion, Norm was admitted to Bulolo

Hospital with Malaria, pain behind the eyes and blurring vision.

Norm returned to Australia on the ship, SS Taroona, and after the war he returned to the Gympie Times and was married to Jean Lang on 29 June 1945. Later on in life as Norm enjoyed his regular game of golf, he noticed that the ball became a blur and he had to give his golf away. Then a friend, Alan Booth VK4EAB (SK) from Kyong, who was also suffering low vision, took up the radio and got an amateur radio licence, he said to Norm, "If I can get it, you can get it too". So, Norm went and applied for his radio licence and because of his technical certificate he was exempted from the theory section and consequently received his AOCP licence (unlimited).

Norm became interested in nets and became a member of the World-Wide Peace Net, which was started by KL7AM Bob Hisamoto (SK), who was born in the USA in 1908. Bob was well known throughout the amateur world as the founder of the Japanese Amateur Radio League in 1925.

Bob promoted peace, not war, one world, one people, as the main net control station and appointed Norm as the net controller for Australia.

Other nets that Norm took part in were the Disabled Persons Net of Queensland and the Coral Coast Net, which has been running since 1967.

Norm, who was long-term member of the Wireless Institute of Australia, recently reached the milestone of turning 100 years of age and was able to catch up with members of the Gympie Communication & Electronics Group Inc, of which Norm was a valued member.

Norm was also very dedicated to his community and was appointed as a Civil Marriage Celebrant by Attorney General Senator Lionel Murphy on 29 January 1975. Norm carried out this important work for 17 years, performing his last wedding on the 14 September 1991.

During his time as a Marriage Celebrant, Norm performed 675 weddings, involving a total of 1350 people.

In the final pages of Norm's book ("My highway of life"), he said the following: "I guess one could say a person's life is mapped out for them. Some people like to live the life of a refuse doing nothing, other people like to be helpful, to look upon the duty to fellow man by exercising goodwill by example."

Vale Norm Philips VK4CNP

From Greg Weir (VK4GDW), Gympie Communications & Electronics Group Inc.

# WIA Awards

*Marc Hillman VK3OHM/VK3IP*

Below are listed all New awards issued from 2020-08-15 to 2020-11-13.

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

## New awards

### Antarctic

| # | Call | Name | Mode |
|---|---|---|---|
| 120 | VK6IR | Stephen Chamberlain | Open |
| 121 | VK6IR | Stephen Chamberlain | Phone |
| 122 | RU3QR | Sergey Zhemajtis | Open |

### DXCC Multi-band (3)

| # | Call | Name | Mode | Band | Count |
|---|---|---|---|---|---|
| 183 | RU3QR | Sergey Zhemajtis | Open | 20-17-15m | 761 |
| 184 | RU3QR | Sergey Zhemajtis | Phone | 20-17-15m | 406 |
| 185 | RU3QR | Sergey Zhemajtis | CW | 40-30-20m | 643 |
| 186 | RU3QR | Sergey Zhemajtis | Digital | 40-20-15m | 537 |
| 187 | VK6APK | Aleksandar Petkovic | Digital | 30-20-17m | 336 |

### DXCC Multi-band (5)

| # | Call | Name | Mode | Band | Count |
|---|---|---|---|---|---|
| 131 | RU3QR | Sergey Zhemajtis | Open | 40-30-20-17-15m | 1236 |
| 132 | RU3QR | Sergey Zhemajtis | CW | 40-30-20-17-15m | 1039 |
| 133 | RU3QR | Sergey Zhemajtis | Digital | 40-30-20-17-15m | 811 |
| 134 | VK3MH | Brendan Bryant | Digital | 40-30-20-17-15m | 743 |
| 135 | VK6WX | Wesley Beck | CW | 40-30-20-17-15m | 633 |
| 136 | VK6DW | Ian Cook | Digital | 40-30-20-17-15m | 622 |

### DXCC Multi-band (7)

| # | Call | Name | Mode | Band | Count |
|---|---|---|---|---|---|
| 59 | RU3QR | Sergey Zhemajtis | Open | 40-30-20-17-15-12-10m | 1631 |
| 60 | RU3QR | Sergey Zhemajtis | CW | 40-30-20-17-15-12-10m | 1344 |
| 61 | VK3EW | David McAulay | Digital | 80-40-30-20-17-15-12m | 1334 |

### DXCC Multi-band (8)

| # | Call | Name | Mode | Band | Count |
|---|---|---|---|---|---|
| 29 | RU3QR | Sergey Zhemajtis | Open | 80-40-30-20-17-15-12-10m | 1786 |
| 30 | RU3QR | Sergey Zhemajtis | CW | 80-40-30-20-17-15-12-10m | 1466 |
| 31 | VK6APK | Aleksandar Petkovic | Open | 80-40-30-20-17-15-12-10m | 1553 |

### DXCC Multi-band (9)

| # | Call | Name | Mode | Band | Count |
|---|---|---|---|---|---|
| 29 | RU3QR | Sergey Zhemajtis | Open | 160-80-40-30-20-17-15-12-10m | 1900 |
| 30 | RU3QR | Sergey Zhemajtis | CW | 160-80-40-30-20-17-15-12-10m | 1567 |

### DXCC Multi-mode (CW)

| # | Call | Name | Count |
|---|---|---|---|
| 273 | RU3QR | Sergey Zhemajtis | 271 |

### DXCC Multi-mode (Digital)

| # | Call | Name | Count |
|---|---|---|---|
| 119 | VK5UR | Andrew Hodges | 106 |
| 120 | VK3TNL | Tony Linford | 106 |
| 121 | JE2DLR | Norio Ohki | 205 |
| 122 | K7CTV | Igor Dorovskoy | 144 |
| 123 | RU3QR | Sergey Zhemajtis | 236 |
| 124 | VK6MIT | Brian Mitchell | 106 |

### DXCC Multi-mode (Open)

| # | Call | Name | Count |
|---|---|---|---|
| 502 | VK4DX | Mirza Sivcevic | 245 |
| 503 | VK5UR | Andrew Hodges | 124 |
| 504 | VK7AD | Andrew Cavill | 125 |
| 505 | VK3TNL | Tony Linford | 110 |
| 506 | K7CTV | Igor Dorovskoy | 145 |
| 507 | RU3QR | Sergey Zhemajtis | 284 |
| 508 | VK6MIT | Brian Mitchell | 106 |

### DXCC Multi-mode (Phone)

| # | Call | Name | Count |
|---|---|---|---|
| 641 | RU3QR | Sergey Zhemajtis | 239 |

### DXCC Multi-mode (Triple Play)

| # | Call | Name | Count |
|---|---|---|---|
| 14 | VK5BC | Brian Cleland | 165 |
| 15 | YL2CA | Amolds Preiss | 126 |
| 16 | RU3QR | Sergey Zhemajtis | 224 |

## DXCC Single-band

| # | Call | Name | Mode | Band | Count |
|---|---|---|---|---|---|
| 752 | VK2RZ | Alexander Taverner | Open | 40m | 103 |
| 753 | VK2RZ | Alexander Taverner | Digital | 40m | 103 |
| 754 | VK5GR | Grant Willis | Phone | 20m | 100 |
| 755 | VK5GR | Grant Willis | Digital | 80m | 105 |
| 756 | VK7AD | Andrew Cavill | Open | 20m | 108 |
| 757 | VK6WX | Wesley Beck | Open | 10m | 102 |
| 758 | VK6SJ | Stephen Kennedy | Open | 20m | 121 |
| 759 | K7CTV | Igor Dorovskoy | Digital | 40m | 115 |
| 760 | K7CTV | Igor Dorovskoy | Digital | 20m | 102 |
| 761 | K7CTV | Igor Dorovskoy | Open | 20m | 102 |
| 762 | K7CTV | Igor Dorovskoy | Open | 40m | 117 |
| 763 | RU3QR | Sergey Zhemajtis | Open | 160m | 114 |
| 764 | RU3QR | Sergey Zhemajtis | Open | 80m | 155 |
| 765 | RU3QR | Sergey Zhemajtis | Open | 40m | 216 |
| 766 | RU3QR | Sergey Zhemajtis | Open | 30m | 216 |
| 767 | RU3QR | Sergey Zhemajtis | Open | 20m | 253 |
| 768 | RU3QR | Sergey Zhemajtis | Open | 17m | 223 |
| 769 | RU3QR | Sergey Zhemajtis | Open | 15m | 235 |
| 770 | RU3QR | Sergey Zhemajtis | Open | 12m | 179 |
| 771 | RU3QR | Sergey Zhemajtis | Open | 10m | 196 |
| 772 | RU3QR | Sergey Zhemajtis | Phone | 20m | 183 |
| 773 | RU3QR | Sergey Zhemajtis | Phone | 17m | 111 |
| 774 | RU3QR | Sergey Zhemajtis | Phone | 15m | 112 |
| 775 | RU3QR | Sergey Zhemajtis | CW | 80m | 105 |
| 776 | RU3QR | Sergey Zhemajtis | CW | 40m | 180 |
| 777 | RU3QR | Sergey Zhemajtis | CW | 30m | 197 |
| 778 | RU3QR | Sergey Zhemajtis | CW | 20m | 185 |
| 779 | RU3QR | Sergey Zhemajtis | CW | 17m | 172 |
| 780 | RU3QR | Sergey Zhemajtis | CW | 15m | 171 |
| 781 | RU3QR | Sergey Zhemajtis | CW | 12m | 136 |
| 782 | RU3QR | Sergey Zhemajtis | CW | 10m | 145 |
| 783 | RU3QR | Sergey Zhemajtis | Digital | 40m | 143 |
| 784 | RU3QR | Sergey Zhemajtis | Digital | 20m | 204 |
| 785 | RU3QR | Sergey Zhemajtis | Digital | 17m | 127 |
| 786 | RU3QR | Sergey Zhemajtis | Digital | 15m | 144 |
| 787 | RU3QR | Sergey Zhemajtis | Triple Play | 20m | 150 |
| 788 | RU3QR | Sergey Zhemajtis | Digital | 30m | 123 |
| 789 | RU3QR | Sergey Zhemajtis | Phone | 10m | 103 |
| 790 | RU3QR | Sergey Zhemajtis | CW | 160m | 101 |
| 791 | VK2FR | John Sharpe | Open | 17m | 162 |
| 792 | VK2FR | John Sharpe | Open | 15m | 251 |
| 793 | VK2FR | John Sharpe | Open | 10m | 128 |
| 794 | VK2FR | John Sharpe | Phone | 17m | 116 |
| 795 | VK2FR | John Sharpe | Phone | 15m | 240 |
| 796 | VK2FR | John Sharpe | Phone | 10m | 122 |
| 797 | VK3MH | Brendan Bryant | Digital | 15m | 102 |
| 798 | VK3MB | Philip White | Open | 30m | 101 |
| 799 | VK6APK | Aleksandar Petkovic | Open | 12m | 101 |
| 800 | VK3EW | David McAulay | Digital | 12m | 106 |
| 801 | VK1MES | Malcolm Stephens | Open | 20m | 100 |
| 802 | VK1MES | Malcolm Stephens | Digital | 20m | 100 |

## DXCC Single-band

| # | Call | Name | Mode | Band | Count |
|---|---|---|---|---|---|
| 803 | VK6APK | Aleksandar Petkovic | Digital | 30m | 106 |
| 804 | VK6WX | Wesley Beck | CW | 17m | 101 |
| 805 | VK6WX | Wesley Beck | CW | 15m | 100 |
| 806 | VK6DW | Ian Cook | Open | 40m | 150 |
| 807 | VK6DW | Ian Cook | Open | 30m | 133 |
| 808 | VK6DW | Ian Cook | Open | 17m | 124 |
| 809 | VK6DW | Ian Cook | Open | 15m | 159 |
| 810 | VK6DW | Ian Cook | Open | 10m | 101 |
| 811 | VK6DW | Ian Cook | Digital | 15m | 119 |
| 812 | VK6DW | Ian Cook | Digital | 17m | 105 |
| 813 | VK6DW | Ian Cook | Digital | 30m | 120 |
| 814 | VK6DW | Ian Cook | Digital | 40m | 122 |
| 815 | VK6DW | Ian Cook | Phone | 15m | 105 |

## Grid Square

| # | Call | Name | Mode | Band | Count |
|---|---|---|---|---|---|
| 509 | VK5UR | Andrew Hodges | Open | HF | 449 |
| 510 | VK5UR | Andrew Hodges | Digital | HF | 438 |
| 511 | VK7AD | Andrew Cavill | Open | HF | 605 |
| 512 | VK7AD | Andrew Cavill | Phone | HF | 102 |
| 513 | VK7AD | Andrew Cavill | CW | HF | 320 |
| 514 | VK7AD | Andrew Cavill | Digital | HF | 424 |
| 515 | VK3FCBR | Paul Starkey | Open | HF | 631 |
| 516 | VK3FCBR | Paul Starkey | Digital | HF | 631 |
| 517 | K7CTV | Igor Dorovskoy | Digital | HF | 742 |
| 518 | K7CTV | Igor Dorovskoy | Open | HF | 745 |
| 519 | RU3QR | Sergey Zhemajtis | Open | HF | 1039 |
| 520 | RU3QR | Sergey Zhemajtis | Phone | HF | 273 |
| 521 | RU3QR | Sergey Zhemajtis | CW | HF | 469 |
| 522 | RU3QR | Sergey Zhemajtis | Digital | HF | 851 |
| 523 | VK2DCR | Douglas Rosser | Open | HF | 164 |
| 524 | VK2DCR | Douglas Rosser | Digital | HF | 152 |
| 525 | VK5UW | Brian WILSON | Digital | HF | 376 |
| 526 | VK6MIT | Brian Mitchell | Open | HF | 707 |
| 527 | VK6MIT | Brian Mitchell | Digital | HF | 705 |

## VHF Century Club

| # | Call | Name | Mode | Band |
|---|---|---|---|---|
| 157 | VK3KTT | Steven Barr | Open | 6m |
| 158 | VK3FZ | Roger Stafford | Open | 6m |
| 159 | VK3FZ | Roger Stafford | Digital | 6m |
| 160 | VK5BC | Brian Cleland | Open | 6m |
| 161 | VK5BC | Brian Cleland | Digital | 6m |

## Worked All States VHF

| # | Call | Name | Mode | Band |
|---|---|---|---|---|
| 231 | VK5UR | Andrew Hodges | Open | 6m |
| 232 | VK3KTT | Steven Barr | Digital | 6m |

## Oceania

| # | Call | Name | Count |
|---|---|---|---|
| 1 | VK3OHM | Marc Hillman | 55 |
| 2 | VK3EW | David McAulay | 60 |
| 3 | VK3GA | Graham Alston | 57 |
| 4 | VK5BC | Brian Cleland | 57 |
| 5 | VK3BDX | David Burden | 49 |
| 6 | VK2VEL | Edwin Lowe | 47 |
| 7 | VK3TX | Oscar Reyes | 29 |
| 8 | VK3AWG | Christopher Bellmont | 55 |
| 9 | VK2BY | Bradley Devon | 43 |
| 10 | VK3KTT | Steven Barr | 55 |
| 11 | VK3FZ | Roger Stafford | 59 |
| 12 | VK2QV | Rasika Liyanage | 42 |
| 13 | VK5GR | Grant Willis | 49 |
| 14 | VK7CW | Steven Salvia | 60 |
| 15 | VK6APK | Aleksandar Petkovic | 60 |
| 16 | VK2PW | Adam McCarthy | 36 |
| 17 | VK3JLS | John Seamons | 50 |
| 18 | VK6IR | Stephen Chamberlain | 58 |
| 19 | VK4DX | Mirza Sivcevic | 54 |
| 20 | VK6WX | Wesley Beck | 54 |
| 21 | VK3HJ | Luke Steele | 58 |
| 22 | VK4SN | Alan Shannon | 33 |
| 23 | VK7AD | Andrew Cavill | 33 |
| 24 | VK3GQ | Peter Carew | 35 |
| 25 | VK2IO | Gerard Hill | 49 |
| 26 | VK3SIM | Simon Keane | 55 |
| 27 | VK3DRH | David Heathcote | 36 |
| 28 | VK2TTP | Peter Pratt | 48 |
| 29 | VK2KS | Martin Hutchings | 27 |
| 30 | VK3MH | Brendan Bryant | 49 |

## Oceania

| # | Call | Name | Count |
|---|---|---|---|
| 31 | VK3ANL | Nicholas Lock | 30 |
| 32 | VK3WE | Rhett Donnan | 52 |
| 33 | VK4CAG | Graeme Dowse | 58 |
| 34 | N3NR | Nick Roscoe | 49 |
| 35 | VK2BFC | Frank Scott | 26 |
| 36 | VK6DG | David Giles | 43 |
| 37 | JE2DLR | Norio Ohki | 45 |
| 38 | LB2TB | Lars Roksund | 55 |
| 39 | VK4WDM | Wayne Melrose | 51 |
| 40 | VK2NN | Peter Garoufalis | 52 |
| 41 | RU3QR | Sergey Zhemajtis | 47 |
| 42 | VK3MB | Philip White | 44 |
| 43 | VK2HV | Paul Hanna | 60 |
| 44 | VK3JL | David Rolfe | 37 |
| 45 | VK3FN | Peter Dernikos | 53 |
| 46 | VK2PR | Peter Richardson | 54 |
| 47 | VK6SJ | Stephen Kennedy | 39 |
| 48 | VK6DW | Ian Cook | 48 |

## Worked All VK Call Areas HF

| # | Call | Name | Mode |
|---|---|---|---|
| 2411 | VK6IR | Stephen Chamberlain | Digital |
| 2412 | N3NR | Nick Roscoe | Open |
| 2413 | JE2DLR | Norio Ohki | Digital |
| 2414 | K7CTV | Igor Dorovskoy | Open |
| 2415 | K7CTV | Igor Dorovskoy | Digital |
| 2416 | RU3QR | Sergey Zhemajtis | Digital |
| 2417 | RU3QR | Sergey Zhemajtis | Open |
| 2418 | VK3MB | Philip White | Open |
| 2419 | VK3FN | Peter Dernikos | Open |
| 2420 | VK2PR | Peter Richardson | Open |

# *Pages from the Past*

*From the Argus (Melbourne) Newspaper, March 9th 1922*

## WIRELESS TELEGRAPHY SPEECH TRANSMITTED TO SYDNEY

SYDNEY, Wednesday. Mr. Charles MacLurcan reports having received on Tuesday evening, at his experimental wireless station at Strathfield, an excellent speech transmitted from the Melbourne radio station by wireless telephone. The voice was clear and free from any distortion and louder than heard through any land telephone. ¶

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



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