

QTC



News from RASA

July/August 2020

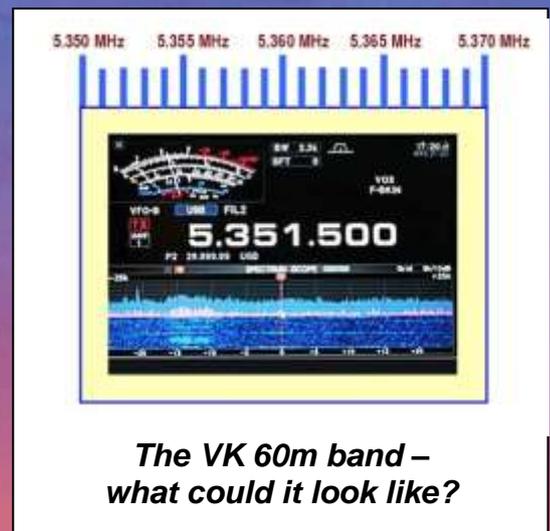
The Radio Amateur Society of Australia

Updates on regulations

*Getting started in HF
DX-ing*

Killing QRM at your QTH

Web resources



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QTC is published every second month. If you would like to receive your copy you can either visit our web site to download, or send us an email and we'll put you on our distribution list.

You are welcome to join RASA or make a donation to support our work.

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Email us at info@vkradioamateurs.org

QTC from the Editorial Team

Welcome to the first edition of QTC (“I have a message/telegram for you”), a regular PDF e-magazine for Amateur Radio enthusiasts. Many of our members and Bulletin readers have asked us to fill a void in the Amateur Radio landscape here in Australia.

QTC is a pilot. We will trial this free e-magazine before deciding how and where we take it in the longer term. We would like your ideas and feedback.

How can we offer a free magazine? The answer is simple. From the outset, RASA was established with a low-cost operating model.

Everything we do is based on providing services to the AR community in a cost-effective manner. We use the internet and cloud-based products for our business systems.

One of our objectives is to demonstrate to the VK community that effective representation and support needn't cost a lot of money. Our business overheads are extremely low.

This philosophy plays through to everything we do. We use 21st century technology and management tools that have transformed the way successful businesses are managed.

QTC will follow this philosophy. It is produced by volunteers and delivered as a PDF e-magazine. This means we have no printing or postage costs. The magazine has a very short lead time from production to availability – the concept of “delivery” is redundant.

Of course, the reader can print their own paper copy if they wish.

E-magazines contain dynamic links to interesting articles and references on the internet. QTC also links to web sites for sponsors and advertisers. Hover your mouse pointer over any image to see if it is a hot link; if so, click and you'll be directed to that web site. Hotlinks in the text are highlighted in [blue](#).

QTC will also include news that we publish in our more regular fortnightly Podcasts and QTC-Lite email bulletins.

QTC will provide regular columns as well as feature articles. We welcome articles from clubs and readers.

In this first edition, we have included links to many Australian suppliers of amateur radio equipment and related accessories. If we've overlooked any, please send us an email.

Welcome to QTC. We hope you enjoy our inaugural edition and we encourage you to send us your feedback, ideas, and questions.

73, QTC Editorial Team

editor@qtcmag.com

RASA News

In our first year of operation (2018/19) we focused on establishing the society with a robust set of processes and business systems.

We set policies for representation and how we engaged with the sector, published a web-site and established a social media presence.

We established a strategy and set of goals that align with the issues confronting amateur radio in the 21st century. One common theme we heard was *“how can I reduce or eliminate the QRM/RFI in my shack?”*

This was one of our strategic priorities in 2019.

Our free on-line interference (RFI) mitigation resource, QRM Guru was launched in March 2019 at [PerthTech](#). It has been very well received, both here in Australia and around the world.

QRM Guru has over 25 contributions from amateurs, 11 videos and 60 pages of content to help you fight QRM in your shack. Our free online email support has assisted 18 amateurs in understanding and addressing their local issues.

We have put together [value for money kits](#) to assist amateurs in identifying and minimising QRM/RFI.

In 2019 we visited 15 radio clubs and three Hamfests across VK2, 3, 4, 5 and 6.

In 2020 we turn our focus to growth and supporting newcomers. In April we released our free [Welcome to Amateur Radio](#) guide. This guide is aimed at the newcomer to our hobby. It bridges a gap for new licencees.

This e-magazine is a new initiative for Amateur Radio in Australia.

We'll need your feedback and help to make it a success.

QTC will:

- be published every second month for 12 months;
- focus on regular topics;
- provide an insight into regulation and representation in plain language;
- provide links to interesting and informative web sites; and
- seek your input, questions and ideas.

So, please send us:

- questions you'd like answered;
- ideas for the magazine, and
- articles for the magazine.

In other news, we continue to participate in the ACMA Syllabus Review Panel. No firm decisions have been made yet, but we're hopeful to see the first output from the Panel in the near future.

We consult regularly with the ACMA and you can read our recent 60m submission in this edition.

More broadly, RASA membership has grown and our web sites are very popular.

Our members and supporters enable us to provide these services. Our annual membership fee is just \$8.

Please, send us your feedback, and we hope you enjoy this new e-magazine.

73, The RASA Team

<mailto:info@vkradioamateurs.org>



**BEING HEARD
IS IMPORTANT**

The Radio Amateur Society of Australia inc.
vkradioamateurs.org



RASA now produces a fortnightly Podcast. This technology allows us to get regular messages to you at a time and place that suits you.

You can download our Podcast by visiting this [link](#) – bookmark it!

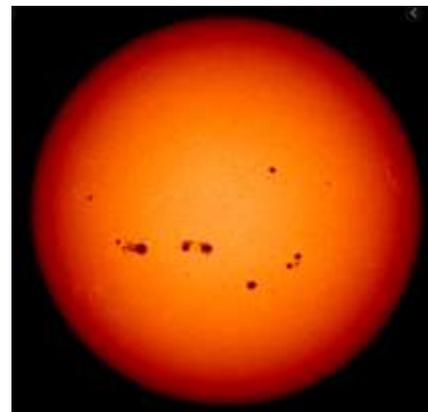
Or, search on vkamateurradionews on Apple iTunes.

Our email Bulletin will be re-named QTC-Lite and will include a transcript of the Podcast. It will be published every two weeks.

Should there ever be any urgent news, we'll use QTC-Lite to alert our readers.

Sunspots

A little bit about sunspots.



Sunspots come and go in an approximate 11-year cycle. The rise to maximum (4 to 5 years) is usually faster than the descent to minimum (6 to 7 years). At and near the maximum of a solar cycle, the increased number of sunspots causes more ultraviolet radiation to impinge on the atmosphere. This results in significantly more F region ionization, allowing the ionosphere to refract higher frequencies (15, 12, 10, and even 6 meters) back to Earth for DX contacts. At and near the minimum between solar cycles, the number of sunspots is so low that higher frequencies go through the ionosphere into space. Commensurate with solar minimum, though, is less absorption and a more stable ionosphere, resulting in the best propagation on the lower frequencies (160 and 80 meters). Thus, in general, high SSNs are best for high-frequency propagation, and low SSNs are best for low-frequency propagation.

(source: [ARRL](#))

Regs & Representation

This regular column will focus on keeping you up-to-date with Regulations and how they impact our hobby.

The ACMA has been improving communication with amateurs recently with an [email subscription service](#) for information relevant to Amateur Radio.

We'll sift through the announcements as well as anything RASA is working on in this area and keep you updated. Of course, this means sometimes there may not be much to report!



Callsigns & your personal information

As we have reported previously, you do not have to change your callsign if you move interstate. That's right. If you really like your callsign and want to take it with you when you move interstate you can do that now.

You just need to tell ACMA your new postal address.

ACMA have also advised that they no longer require an actual station address, only a postal address.

However, repeater and beacon licences still require a physical address for frequency coordination purposes.

Amateurs postal addresses are listed in the ACMA online database – this is a requirement of the Radio Communications Act. If you have privacy concerns, you can

use a PO Box, or an address care of your local post office.

Another alternative may be to use your local amateur radio club's address or PO Box if they are agreeable.

ACMA prefer to communicate with amateurs by email whenever possible, as this is much quicker and more efficient. You should check that your email address is correct with ACMA if you use this method.

Visit their [online database](#) and check your details.

To change your postal address, send an email to ACMA at info@acma.gov.au

Reciprocal Licencing

ACMA have advised that [Reciprocal Licences](#) issued after September 2019 are valid for only one year and are not renewable.

So, how does this effect Australians who decide to obtain an overseas licence and use it in Australia? The most popular method for doing this is to obtain a US licence through examinations held in Australia. This has been promoted by VEA Australia (a group of Australian hams authorised to conduct FCC USA exams) here in Australia.

The costs of sitting a US exam and licence are less than those for an Australian equivalent, but only in the short term. After one year, a US licence cannot be renewed. The amateur then either has to sit a full set of Australian assessments or undergo a process of Recognition of Prior Learning from AMC – which involves additional costs.

Despite a level of consistency afforded by ITU rules and regulations, there are still differences in competencies between Australian and US licences. So, for example, practical and on-air components

may need to be assessed. And then there is, of course, the small matter of Australian regulations. These must be covered in a separate exam, unless you already hold a Standard level Australian licence.

Reciprocal Licences are designed for short term (90 day) overseas visitors to Australia; not for permanent residents or citizens.

Overseas amateurs visiting Australia

To operate an amateur station, you must be qualified. We recognise some licences and qualifications from other countries

It may be attractive to gain an overseas qualification to use a licence in a foreign country, to access remote stations, or as a personal educational exercise. But, as a method for obtaining a permanent renewable Australian licence, it is expensive and time consuming.

Governments set policy for licencing, and this includes prices for exams and licences. It is simply inappropriate to suggest that Australians should attempt to use a US system to effectively subvert Australian regulations and processes.

In summary: If you want an Australian licence, sit Australian exams.



Woodpecker

Ever wondered what happened to the Russian Woodpecker?



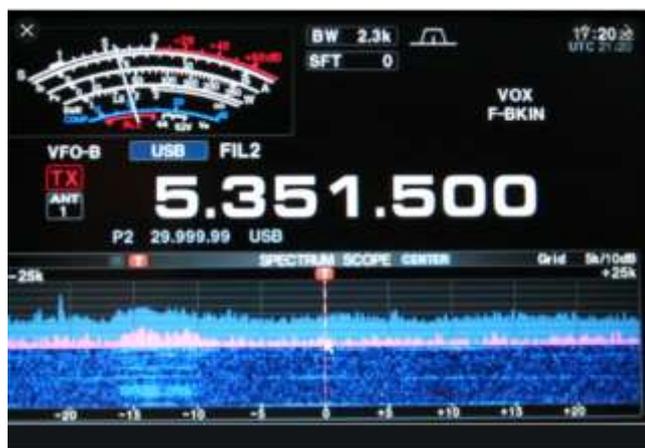
The Duga systems were extremely powerful, over 10 MW in some cases, and broadcast in the [shortwave radio](#) bands. They appeared without warning, sounding like a sharp, repetitive tapping noise at 10 Hz repetition rate,^[1] which led to it being nicknamed by shortwave listeners the **Russian Woodpecker**. The random frequency hops disrupted legitimate broadcasts, [amateur radio](#) operations, oceanic commercial aviation communications, and utility transmissions, resulting in thousands of complaints by many countries worldwide. The signal became such a nuisance that some receivers used on amateur radio and television, such as the Datong Model SRB2 Auto Woodpecker Blanker, began including 'Woodpecker Blankers' in their circuit designs in an effort to filter out the interference
(source: wiki)

Click [here](#) for a short video about the Woodpecker.

Regs & Representation – 60 metres

5MHz – ACMA calls for Consultation

Australia is lagging the rest of the world with access to the 5MHz (60 metre) band. Approved at World Radio Conference 2015 (WRC15), over 210 countries now have access, including most of our Pacific neighbours.



You can read our latest updates regarding 60m progress [here](#).

In May 2020, the ACMA invited comments examining its potential use by radio amateurs. You can read their release [here](#).

Submissions closed on 19 June 2020. RASA made a submission, which is presented on the following pages.

Whilst we wait for a decision on 60m access, why not subscribe to a newsletter. There are few out there.



Joe Pater W8GEX publishes a newsletter with updates 60m worldwide. Visit his [website and subscribe](#). There is also a Facebook page you can follow.

You can also listen around the band and get a sense of how propagation works. RASA asked VK amateurs to send in SWL logs. You can read the general finding from these results [here](#).

We'll keep you updated with news from the ACMA as soon as it comes to hand, as well as an analysis of their decision.

Mr. Chris Worley
Spectrum Planning Section
Australian Communications and Media Authority

Via on line submission

Dear Mr. Worley,

CONSULTATION PAPER – POSSIBLE USE OF 5351.5-5366.5 BY THE AMATEUR SERVICE

Thank you for the opportunity to comment on the above consultation paper. The Radio Amateur Society of Australia (RASA) offers the following comments.

Upper band limit

We agree that the number of stations and their wide geographic dispersal on the 5366.5 kHz allocation would preclude any sharing with amateur services on the eastern seaboard.

For this reason, it is proposed that the upper end of the band be restricted to 5365 kHz.

Sharing with commercial services

Data from the ACMA RADCOM database as presented in your paper indicates that the remainder of the band below 5365 kHz is allocated to commercial services in remote and very remote locations.

ACMA Frequency assignment practice guideline number 8 defines an indicative communication distance of approximately 300 km at 5 MHz during daylight hours, based on a typical transmitter power of 100W.

The 15W EIRP limit granted to amateurs and the remote locations of the incumbent services means that there is minimal potential for interference.

The only channel that is located relatively close to population centres – 5356.5 kHz at Dubbo NSW - has been shared with WICEN for more than ten years, with no reports of interference. Moreover, WICEN operate under a land mobile licence, which allows 100W transmit power.

Although the public RADCOM database does not list all Defence allocations, Defence does not normally directly share channels/segments with commercial land mobile services.

Proposed way ahead – Option 3

We understand why there would be reticence to giving amateurs immediate unrestricted access to what is a commercial land mobile segment.

Other administrations have taken a graduated approach to the introduction of the 5 MHz amateur band, and we suggest that this strategy would be appropriate for Australia.

A channelised arrangement has been used in many other countries to introduce the 5 MHz amateur band – notably, UK, Europe, the USA and New Zealand. These countries all have high commercial utilisation of 5 MHz and much shorter distances between amateurs and commercial users than Australia.

Allowing unfettered access to the segment would make any sharing issues very difficult to resolve, as amateurs may not be operating directly on commercial frequencies.

Accordingly, we propose that amateur voice operation be restricted to spot frequencies on the existing commercial allocations, using USB mode only with a maximum 2.8 kHz bandwidth and 15W ERP.

Additionally, we propose a trial of narrow band modes in two vacant sub-segments, one of which lines up with a very popular world-wide amateur digital mode frequency (FT8 mode).

Amateur licence class

In view of the small size of the allocation and the technical requirements, it is proposed that the band be available to Advanced class licencees only.

The proposed allocations are detailed in the table at Annex A

Yours sincerely

G.C. Dunstan
President

16 June 2020

Encl

ANNEX A – PROPOSED AMATEUR ALLOCATIONS AT 5 MHZ

<i>Freq (note 1)</i>	<i>Use</i>
5351	Voice (notes 2 and 3)
5355	Voice (note 3)
5358-60	Narrow band modes (note 4)
5360	Voice (note 3)
5363-65	Narrow band modes (notes 4 and 5)

Notes:

1. Voice frequencies expressed as suppressed carrier; narrow band sub bands expressed as occupied frequencies. Maximum power output 15W ERP for all modes.
2. It is noted that this frequency is 500Hz below the lower band limit, however this is proposed as a trade-off for the proposed reduction of 1.5 kHz at the top of the band to mitigate against interference to a very large Queensland allocation.
3. Voice channels are fixed frequency, 2.8 kHz bandwidth, USB mode only
4. Maximum bandwidth 100Hz
5. There is only one Queensland allocation on 5364 kHz (tx and rx, suppressed carrier), located in a very remote area - Normanton in the Gulf of Carpentaria.



Killing that QRM

Welcome to our first regular column of Kill that QRM. This column will be a little more conversational than many of the articles you'll find on QRM Guru.

We'll kick this issue off with some general discussion about what QRM means to you and why resolving QRM or RFI in your shack will be unique to your personal situation. Whilst there are common approaches to identifying and addressing QRM, there simply is no single answer to every QRM/RFI scenario.

Let's start by clarifying a few terms and setting a baseline for future articles.

QRM is the Q-Code that has traditionally been used to describe man-made interference. This includes interference from other radio signals; including (sometimes) other amateur signals or unwanted commercial signals that are causing *you* interference. However, in more recent times it is also used to describe the unwanted noise caused by the plethora of consumer electronics that radiate unwelcome noise on our bands.



By contrast, QRN is the Q-Code used to describe noise caused by nature. Most common for the radio amateur, this will be storm generated static, rain static and other auroral anomalies.

To learn more about QRM and its different sources, head to QRM Guru and check this [link](#)

Now, back your situation, and why it is unique.

Let's start by presenting a few different scenarios to help explain what we're talking about and why your expectations to resolving QRM may be very different to the next person.

An amateur living in suburban Sydney wants to ragchew on 40 and 80 metres with friends each afternoon and evening. He faces S7-S9 wide-band noise. His goal is reduce his noise level by 2-3 S-points on 40 and 80m.

However, another amateur lives in rural Victoria and likes to chase a bit of DX. His favourite band has recently suffered some QRM at various hours of the day, taking his noise from S2 to S4-5. This limits his ability to hear and work the weaker signals

A third amateur likes to experiment on VHF, building and testing 2m beam antennas and then taking part in fox hunts. A very annoying signal close to the preferred operating frequency and repeater channel has appeared. It's interfering with reception.

Yet another amateur lives in suburban Brisbane and like to contest. Local noise on HF makes this almost impossible.

Whilst all these scenarios suffer the same symptoms (i.e. noise), the expectations and situations to seek a resolution are unique.

How you approach your problems will very much depend on a number of factors that only you can determine:

- what is practical given your location and the source of the noise;
- whether the noise is local to your property, and therefore under your control;
- your ability to be able to identify the noise source; and
- your ability to work successfully with any neighbours whose equipment may be the source of the unwanted noise.

In the first instance you must undertake the role of a detective. You must invest some time in listening to the QRM and building a profile of its characteristics. Check this [link](#) for details.

As you profile your noise, you'll start to get an idea of how easy or hard it will be to achieve your desired outcome.

There are some basic housekeeping strategies you should consider, whatever actions you may need to take to deal with QRM:

- good station earthing;
- ensuring your own backyard is clean (i.e. reduce or eliminate your own QRM);
- adding ferrites to the leads connected to your radio; and
- considering receive or directive antennas to null the noise.



You can buy ferrite kits [here](#).

If you have difficult neighbours, consider solutions that may not seem obvious at first. Whilst some approaches may be regarded as dramatic, it is all about resolving your personal situation, and only you can be the best judge of what is possible:.

- if your neighbour's LED lights are the source of the problem, offer to have them replaced at your cost;
- consider "left field" solutions... if a contest weekend is coming up, why not pay for your neighbours to have an evening away in an AirBnB;
- establish a remote station;
- use an internet connected SDR for receiving signals, or
- operate a portable station away from the QRM.

Assess your own situation and determine just how much effort you're prepared to put into resolving your QRM problems.

QRM is **the** 21st century challenge for many amateurs. Our hobby is technical by nature, and we've all worked to overcome technical challenges.

Many amateurs spend thousands of dollars (tens of thousands in some cases) on equipment, radios, towers, antennas and accessories. We invest hundreds of hours constructing the "perfect" station for contesting, DXing or ragchewing.

If QRM is impacting your enjoyment, maybe it's time to spend hundreds of dollars and dozens of hours to do the research and develop a plan to kill that QRM.

[QRM Guru](#) is good place to start. So, get busy and send us your story of how you solved your QRM.

feedback@qrm.guru

Seen around the internet

Have you seen something around the internet that may be of interest to others? Welcome to our first regular column “*Seen around the internet*”.

We look forward to hearing from our readers and sharing your interesting internet news, web sites or YouTube links.

QSLing – a pragmatic alternative

QSLing – referred to by many as the final courtesy. Or, the QSO isn't complete until the paperwork is done.

Sending paper QSL cards is almost as old as amateur radio itself. For many however, the cost of sending cards has become prohibitive and/or simply too overwhelming. You need to design a card, find a printer and pay hefty rates to get your cards printed and posted to you. You're stuck with 1,000+ cards that can't be changed if you have a station/location change.

Then you need to fill the cards in and send them to your local outward bound bureaux. Of course, you also need to be a member of said bureaux; another expense.

Many have made the transition to electronic logging and QSLing via web services such as [Logbook of the World](#), [eQSL](#) and [qrz.com](#).

However, for those who still enjoy sending paper cards, here is a very innovative and cost effective alternative to the traditional approach.



How does it work?

“Through this URE tool and with your log in “ADIF” format, you can confirm all the contacts you want without having to manually fill out the QSLs.

Once you upload the data, the system sends to the printer the composition that you generate of your card, being this printed with the data of the correspondent without labels or tedious complements by hand.

In addition and included in the price of the service, the QSL will be automatically deposited in the BURO of URE, the Spanish Radio Amateur Association in record time.”

Read more [here](#).

Have you stumbled across something on the internet that may be useful to fellow amateurs?

If so, send us the link and we'll consider including it in a future issue of QTC.

Getting started in – HF DX

Welcome to our first regular column aimed at supporting newcomers to our hobby. We do not want to set an expectation that this is only for Foundation Licencees. Some newcomers may also be Standard or Advanced licencees, or may be old hands interested in trying new modes or facets of the hobby. We were all newcomers once and may have questions or need support.

Chasing HF DX is very popular and attracts many amateurs. But, where and how do you start, and what is HF DX?

To some, HF DX might be to have contacts across Australia and maybe into ZL and, on a good day, into North America; maybe using QRP or home brew equipment. For others, it means working hundreds of new countries and chasing rare DX-peditions at every opportunity.

If you are new to DX-ing, or have limitations you are best to set your expectations accordingly. Be realistic, do your research and talk to DX-er friends.

HF DX can be an extremely challenging and rewarding part of the hobby. There are so many elements that go into achieving success, only some of which are within your control:

- operating skills & experience
- transceiver
- transmit power
- bands
- antennas
- local noise level (QRM/RFI)
- knowledge of propagation on the various bands
- sunspot cycle
- location
- time of day and time of year

- how much time you have for DX-ing
- expectations
- budget

Now (mid-2020) is perhaps the worst time to get into HF DX-ing. We are arguably at the lowest point of the current Sunspot Cycle (Cycle 24).

“Scientists charged with predicting the Sun’s activity for the next 11-year solar cycle say that it’s likely to be weak, much like the current one. The current solar cycle, Cycle 24, is declining and predicted to reach solar minimum - the period when the Sun is least active - late in 2019 or 2020.”

Source: weather.gov

Possibly the single largest influence on HF propagation is solar activity and the sunspot cycle. You can learn more about HF propagation by watching [this video](#) from RSGB.

The skills you acquire during the sunspot minima will serve you well as we move towards improved conditions in Cycle 25. We should see conditions progressively improving over the next 2-3 years. However, in the meantime, you can still have fun and prepare your station and skills for better times ahead.

Learn to listen

Probably the most important skill for the HF DX-er is listening. And you can only do this by... well... listening. Sure, internet sites and clusters may alert you to a new DX station, or opening to certain part of the world. But, ultimately, every successful DX-er is successful because he/she has learnt to listen.

Check this [informative article](#) from RSGB.

Set realistic expectations

Especially during the sunspot minima, it's best to be realistic. If you are a Foundation Licencee and only have 40m, 15m and 10m and 10W with no directive antenna, then don't expect to work DXCC in twelve months. Set more realistic goals.

Listen to 40m and 15m at times that suit your schedule – but also check online resources to determine if propagation is likely to support DX contacts. Listen to other VK stations to get a sense for what DX they are working and when.

Which bands are best?

Given we are at the sunspot minima, these suggestions are somewhat conservative (or realistic, depending on your perspective). For Advanced licencees the best bands will be 40, 30 and 20m.

Standard will be 40 and 20m and Foundation Licencees will be 40m.

Most of the time (in 2020 and 2021) your most reliable DX bands will be 40-20m. Bands above 20m will be unpredictable and fickle. Lower power levels and antennas with no directivity or gain will make the game even harder.

This is not to say bands above 20 will be “dead”... you’ll just need to spend more time listening and unless you have directive antennas with gain and a little more power you’ll get frustrated very quickly.

Working DX on the lower bands (80, 160m) both require larger more efficient antennas and (probably) more power.

It is also worth remembering, that here in VK, other than ZL, most DX is a long way away. This is especially so when considering the bulk of available DX is in North America (~10,000kms) and Europe (~16,000km).

Which modes?

This will very much depend on your interest and expectations. There are other considerations, such as your power level, bands, and antenna. As we are at the bottom of the sunspot cycle, you probably want to get “the most bang for your buck”. On this basis, digital modes (particularly FT8) and CW would be the preferred options.

Use internet resources to help you in your DX quest

Online spotting services like the one below have changed the landscape of DX-ing.

Call Sign	Freq	Mode	Time	Info	Country
NBTT @	10150.0	SSB	20:42:15 Jun	58 W40.0a	Trinidad & Tobago
LW4010 @	14307.0	PSK31	20:42:15 Jun	Esteban Alvarez - San Pedro	Spain
Y0652C @	14603.0	LURFOV	20:42:15 Jun	gracia Fernando	Argentina
U2XMP	10188.0	CLUBM	20:42:15 Jun	FT4, Yea	Azores
W4ESE @	10338.0	10A80	20:42:15 Jun	Roger Maria Award and 2 Ref Qs	Saudi
W4E	30113.0	XE20R	20:42:15 Jun	FT8 4+ QSOs DL80	Mexico
U40RWK @	30314.7	ZP888	20:41:15 Jun	FT8	Dominica
LUTPS	14100.0	QMBW	20:41:15 Jun		Belgium
U40VX	10113.0	8W40	20:41:15 Jun	30 W40	Trinidad & Tobago
DL3ME	14248.0	CK3AT	20:41:15 Jun	copy you in DL 5 top 9	Hungary
N4R1I	10188.0	80W40	20:41:15 Jun	Shooting into Georgia	Webcam Station

A great way to observe HF propagation in real time is the Weak Signal Propagation Reporter. Check it out [here](#).

Consider subscribing to newsletters. Some are free and some are paid services.

Bernie McClenny W3UR has been publishing the Daily DX for many years. “The DailyDX is not just a daily email with a few bits and pieces in it or even a rolling blog. It is the most comprehensive listing of DX information available daily, delivered right to your inbox.”



Set up a simple [WSPR](#) station at home. It is a great project and you will learn a lot about propagation paths on various bands at different times of the day and night.

Consider this checklist for getting started:

- ✓ What bands are realistic given your licence class, equipment and antennas?
- ✓ What antennas will be best for DX?
- ✓ How much money can you spend?
- ✓ Is my station DX ready?
 - Low noise
 - Comfortable ergonomics (chair, operating position)
 - Suitable transceiver & headphones
- ✓ Access to internet and appropriate web tools and logging software

Some key take-aways

- Learn to listen
- Be patient
- Set realistic expectations
- Call CQ
- Use DX clusters and other forums to help make contacts
- Consider digital modes – more bang for buck in these times of poor propagation

In future editions, we will provide suggestions as to the best antennas to consider when starting out with HF DX-ing.

In the meantime, please send us your stories and suggestions to help others getting started.

Lightning Tracker

Noise is the enemy of the keen DX-er. Storm static and thunder crashes are not only a potential risk to the safety of your station, they can ruin a night in front of the receiver. Storm static and crashes (QRN) may well deny the keen DX-er that elusive rare contact in the log.



There is another element to tracking storms that may not be apparent at first. Is the DX you hope to log suffering QRN from lightning?

If you are hoping to work some North American DX on the lower bands, check the lightning tracker first. If the region you are aiming for is suffering widespread lightning strikes, you're unlikely to get a QSO in the log.

This is especially true on the lower bands; 160-40m.

There are a number of lightning trackers on the internet. A quick search with your favourite search engine will find a few different options.

You could start with Blitzortung by clicking this [link](#).

Technical Article – 3-Phase Power Converters

Welcome to our first regular technical article. We need input from you, our readers. If you have an interesting article, or a special request, please send us an email.

3-Phase power converters - There is probably one near you

By Ian Jackson VK3BUF

This article is about the modern rotary power converter that generates 3-Phase power for domestic and industrial use around Australia.

How this is relevant to Amateur radio? Many Amateurs like a bit of machining work and a surprising number run metal lathes and saw benches at home. Many of these machines require 3-Phase power, which most homes do not have.

There are now around 10,000 power converters scattered across Australia. Many run all day long and there is often concern about their QRM impact on our HF bands (fortunately unfounded).

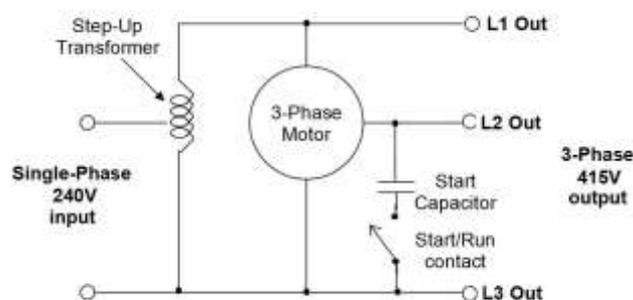
While rotary power converters have been around for at least 70 years, details of contemporary systems are poorly documented. Hence this QTC article is something of an exclusive report on this technology.

I do not suggest that Amateurs try to build or service one of these systems. They run at 415VAC with enough current to kill an elephant. This makes them quite dangerous to work on.

This article is simply about providing better understanding of the technology. It is *not* intended as a construction project.

What is a Rotary Power Converter?

The domestic 230V single phase mains supply is not suitable for large motors. The start current of a single phase motor is about double that of a three phase motor of the same capacity. For this reason, many stand-alone industrial machines in bakeries, dairies and metalworking factories all tend to use 3-Phase motors. This becomes problematic if there is no 3-Phase power in your area, or if the workshop space you rent wants \$20-30K for a 3-Phase supply upgrade.



Basic rotary converters were unsophisticated

Rotary power converters have been with us for many years. Essentially, they take 240V, put it through an auto-transformer to step it up to approximately 415V, then apply this to two of the three wires in a 3-Phase 'pilot' motor. A pilot motor is a regular 3-Phase motor with the output shaft removed.

If you can make this motor spin on just 2 phase connections, it becomes a form of rotating transformer and will generate a third phase from the third motor leg.

There are two problems with this approach. Firstly, the motor will not turn on its own if you connect 415V to only two legs. It just quivers, drawing plenty of current, not knowing which way to rotate. This is resolved by temporarily connecting a large value of capacitance between the second and third motor phases.

As the current through this leg now phase-shifts through the capacitor, it simulates a field rotation and determines which way the motor should start spinning.

This brings us to the second problem.

Unloaded, you may well find 415V being generated on this third leg of a pilot motor. As soon as you try to connect this freshly created phase to a load, this new phase will sag in voltage, by as much as 30-50%. Early converters combated this effect by using a pilot motor that was twice as large as the 3-Phase motor in the intended load.

This was both expensive and bulky, and, the output voltage tended to wander a bit. But it did get a few people out of trouble when there were no alternatives.

Why not just use an inverter or Variable Speed Drive (VSD)?

Inverters have only been with us since high power insulated-gate bipolar transistor (IGBT) semiconductors have come of age, but there are problems. If you are starting from just 240V, an Inverter drive cannot make 415V, 3-Phase unless it also has a very large power transformer. Few systems can do this. Most inverters will only be able to synthesise a lower voltage 230V 3-Phase. This is suitable for 3-Phase motors wired in the Star configuration but will not work for Delta.

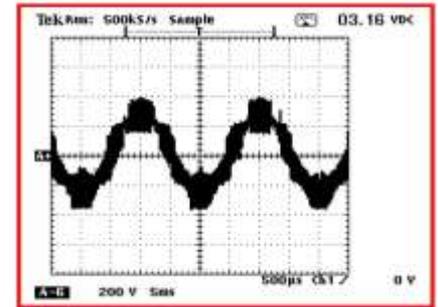
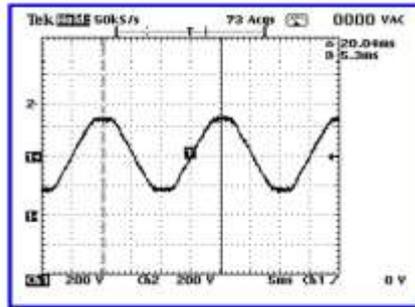
Star and Delta are the two methods that a motor can be configured to receive 3-phase power.

They have different power-curve characteristics.

Star is a Y- shape motor coil winding with the centre point tied to Neutral and one phase goes to each extremity of the Y. Delta is like a triangle of three motor windings, where a phase connects to each corner. There is no Neutral connection.

Very large 3-phase motors often come with contactor sets so that they start in Star config and switch to Delta a few seconds later.

A lot of heavy loads want Delta connections.



Comparing a rotary converter output (left) with a QRM laden inverter drive

If you have multiple motors in a workshop, say a saw bench and sawdust extractor and a roller door, then each motor needs its own inverter, wired separately. Where Rotary Converters are used, one unit in the corner of the building can run lots of motors at the same time. Finally, some loads, (for example a 3-Phase air compressor) have very high start current surge.

Inverters do not like big start currents and trip out if you try to force them. By contrast, rotary converters have sufficient kinetic energy in their spinning pilot motor to give big motor loads a good kick to get them started.

My involvement with these power converters.

Back in 2004, I was asked by a client to develop some electronic controls for rotary converters. We added time delays so that the start capacitor was only briefly engaged, and the machine load was not connected until the pilot motor was at full speed. This was straightforward.

Then I saw the potential for much finer control by setting up banks of capacitors that could be added to the L2 phase electronically.



An 8kW 3-Phase converter

By engaging up to four banks of capacitors in a form of binary switching, we could balance eight different levels of output load and support an automatic 'boost' level for hard-to-start loads.

These capacitors were sometimes hundreds of microfarads with 600VAC continuous load, so they stacked up like soft drink cans. They were switched with large Silicon Controlled Rectifier (SCR) and diode combinations called 'thyristors'.

The thyristors needed an 1800V rating to survive the peak-to-peak extremes of the high output voltages. Resistive-capacitive snubbers and spike protectors were applied to each device.

It was difficult technology to work with. The microprocessor had to measure and make decisions on very high, very spikey voltages and it had to do it on a cycle-by-cycle basis at 50Hz within the spinning pilot motor. Timing with the third generated phase was critical, as switching it a few milliseconds early or late would immediately destroy a \$100 semiconductor block. Careful mains synchronisation within a hostile environment was in order.

To make things even more interesting, the negative power rail of the 5V feeding the microprocessor had to be live and floating to one of the 415V output phases. Any attempt to check one of these circuits with a conventional oscilloscope using an earthed shield would vaporise the test

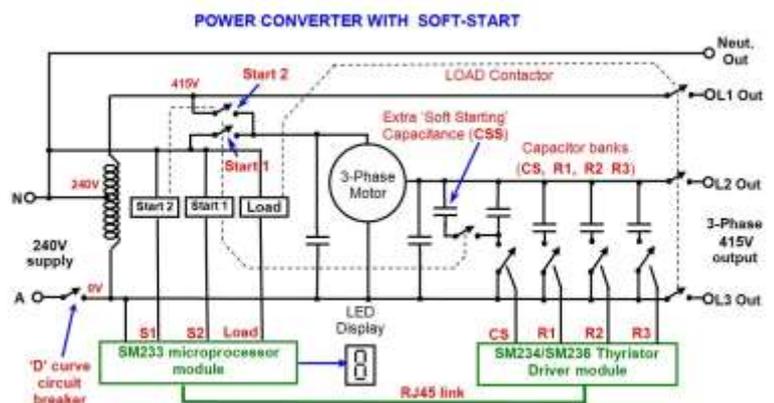
equipment. A 100MHz portable Tektronics scope with isolated inputs became an essential tool.

After a few months of hard work and a modest pile of dead semiconductors, we produced a viable rotary power converter. It provides very accurate microprocessor tracking of output voltages under wide load conditions. The power transformers were custom wound and oven-baked for us by a Melbourne company. It created a lot of interest and solved many power infrastructure problems. In 2007 we featured this equipment on the ABC TV show New Inventors. This was a load of fun, but it was difficult to convey the nature of the technology in just a couple of minutes – and, they weren't safe for children and only came in one colour.

A closer look

There were four capacitor banks of different sizes. Exact values were proportional to the size of the converter, but there was always a large cap, a medium one, a smaller one and a very small one. A microprocessor had to carefully track voltages and make decisions very fast. All code was written in assembly language. With comments, this was about 6,000 lines.

The software tracks the AC output voltage



The modern software controlled converter system

from the power transformer (L1) and the created phase out of the pilot motor (L2). If the L2 began to fade under load, it would begin to switch the capacitor banks in a

binary sequence in 100ms steps until the voltage matched L1 again.

If a load was removed, it would track backwards in binary until balance was restored, like a form of cruise control.

The microprocessor also managed contactor operation, so that supply and output contactors were only activated when the microprocessor was certain that the system was happy.

The rotating pilot motor, phase and voltage conversion efficiency is around 95%, so they run fairly cool. Counter intuitively, maximum efficiency occurs under the highest load conditions.

The advantages of electronic control

It may seem like weird science, but it was tremendously effective. This tracking method changed the marketplace.

With these techniques, the pilot motor could be halved in size compared to 'original' rotary converters. These converters are rated anywhere from 2 to 45 kW, so some of these bigger units are fair monsters, with pilot motors the size of car engines, auto-power transformers like eskies and capacitors stacked like milk crates.

Converters larger than 8kW required a 480V Single Phase supply. This is effectively two 240V supplies with a shared common Neutral, sometimes erroneously described as 'two-phase'.

Thousands of properties around Australia have 480V single phase power going past, but no access to 3-Phase. Look up in the air at roadsides. If the mains supply has only one or two wires between poles, you are in single-phase country.

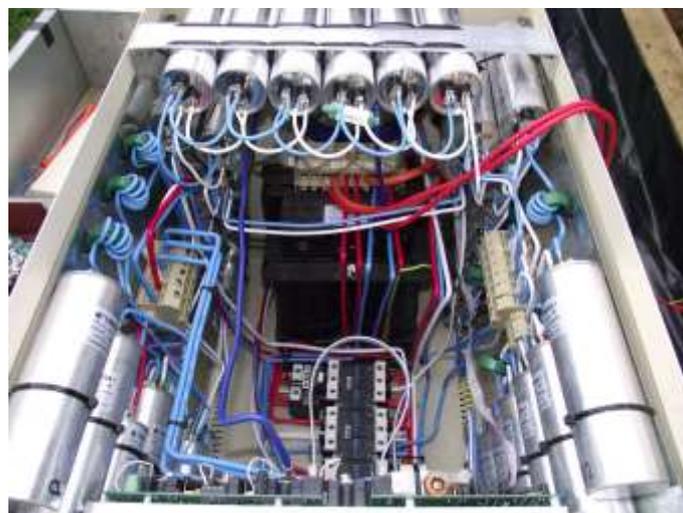
Power converters are used on all sorts of loads. 3-Phase refrigeration systems at dairies, bakery mixers, packaging and fruit sorting machines, saw benches for kitchen fabricators, refrigerated containers, car hoists, bore pumps, pivot irrigators – and of

course, Amateur radio operators who want to machine antenna parts with a 3-Phase lathe in their garage.

Because of the intrinsic lower start currents of 3-Phase systems, converters can run 3-Phase motors where similar rated single phase motors would just stall and dip every light in the neighbourhood. Where the mains supply was a bit long, or the pole transformers a bit small, a two-stage start sequence for the pilot motor gave low-impact start-ups. While initially sceptical, power companies eventually endorsed the technology as it reduced impacts on their grid.

The QRM factor

This leads us to another aspect of major importance: the potential to create electrical interference to communications gear. High output inverters have a bad reputation for creating intense switching noise that will wipe out HF.



The interior of a 45kW converter is a very busy space

Inverters need lots of ferrite filtering and suppression. These rotary converters are working with pure sine waves from power transformers and spinning motors. All capacitor switching takes place close to zero crossing points of sine waves, even under heavy inductive loads. They are intrinsically quiet with minimal unwanted radiated emissions and have no problems passing EMC compliance testing.

Where is this technology today?

Presently, there are around 10,000 converters using this technology around



Single phase power lines are still widespread in Australia

Australia. Many of them are in remote locations where the only power comes from Single-Wire Earth Return (SWER) lines. For thousands of businesses it means that they can operate at full potential where 3-Phase grid connections are either unavailable or are prohibitively expensive. (\$40,000 or more for connection fees).

Whilst I have no role in converter manufacture and sales, the electronics in these units are only sourced from my small workshop. Maybe this is why not much has been written about this technology.

The design is stable, and few changes have been made in recent years. We named our two cats Star and Delta as a tribute to three phase power.

In a bizarre twist, there has been a surge in demand for converter systems since the onset of the Covid19 virus, as many businesses can no longer afford factory rent and revert to garages and farms to reduce overheads. Often this means they need 3-Phase power where none is readily available.

Today most power technology is turn-key imported and has little domestic involvement, but this story is something of an exception. It has had a quiet but significant effect on small business in Australia.

QRM Kill Kits

Ferrite kits to suppress unwanted noise in your shack. Click the image to head to our online shop.



Build a simple DF Loop to help you localise and pinpoint the source of the noise. Click on the image to head to our online shop.



I've been really thinking..(yes, really)

The blessing and the curse that is social media

A friend once described social media as “the best thing and the worst thing to happen to amateur radio”....

Social media like Facebook allows instant communication, instant sharing of ideas, instant forwarding of interesting articles and news. It has revolutionised the way we communicate. News is disseminated and consumed in near real time.

The days of waiting months to read about some club event in a paper magazine have gone forever.

There is a Facebook page for just about every element of our hobby....from moonbounce to HF DX to digital modes to your particular favourite radio.

People of like minds share their experiences – this is great for the hobby.

But, alas, there is a downside to all this instant communication....and that is...human nature.



Social media can provide a platform for bullying, vilification, harassment, lunacy and plain old misinformation. Although Facebook has been acting on the more egregious examples, the negative behaviour remains.

Your correspondent was raised to be polite towards others....would I walk up to a stranger in the street and abuse them? Of course not. At best, you would be abused back, at worst you could find yourself on the ground....and yet, we see such behaviour daily on Facebook...

Why do some people suddenly become 3m tall and bulletproof when they sit behind a keyboard?.... And why, oh why do people think they have an inalienable right to share their views with us, no matter what...?

The larger VK amateur radio Facebook pages often descend into chaos, with people roundly abusing each other....over the most innocuous topics...like antennas or power supplies.....!

If you can't be civil towards others, then you shouldn't be using social media. Think about your replies....count to ten....your passionately held view may not be correct.

Correct spelling and grammar also help...

Many Facebook groups work very well...principally because the admins enforce a strict “be nice” policy.... stupid/nasty behaviour is not tolerated – the offenders are removed from the group.

Arguing with a complete stranger on social media is just pointless. You are not going to change their cherished beliefs...whether they are demonstrably wrong, or not....

Walk away...

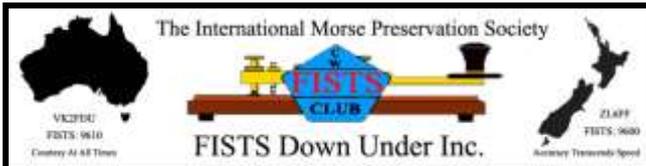
If someone on Facebook is annoying you, block them...this makes for a much more peaceful experience.

Like all technologies, we must be the master of social media...*not it of us.*

National Special Interest Groups

Links to VK national groups with a brief explanation of their activities. Click on the image to visit their web site.

Morse code – VK/ZL site all about the code



VK QRP Club – low power operation



Parks n Peaks – all about operating portable



VK Contest Club – VK Contesting



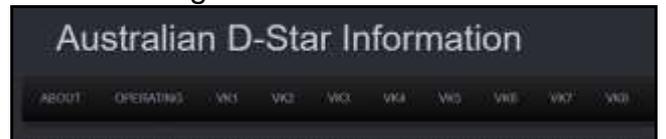
QRM Guru – resolving interference



VK Dmr Network – Digital Radio



D-Star – Digital Radio



RAOTC – for amateurs licenced 25 years or more



ALARA – Ladies Amateur Radio Association

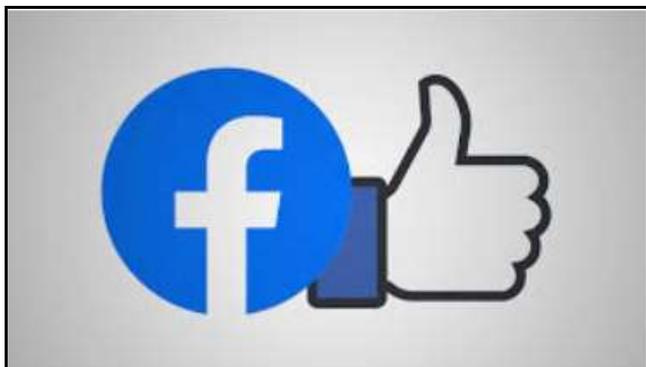


If you see we've overlooked something, please send us an email editor@qtcmag.com

Social Media Resources

VK Facebook Groups

Love it or hate it, here are some links to VK Facebook groups that may be of interest.



VK Home Brew

<https://www.facebook.com/groups/1689037384702683/>

FISTS – Morse code Preservation Society

<https://www.facebook.com/groups/1765058520392148/>

WWFF Australia – portable operating

<https://www.facebook.com/groups/1805720889702979/>

SOTA – portable operating – Summits on the Air

<https://www.facebook.com/SotaAustralia/>

VK DMR Network

<https://www.facebook.com/groups/743300879089972/>

VK QRP Club

<https://www.facebook.com/groups/VKQRClub/>

80 metre FT8 DXing

<https://www.facebook.com/groups/1609856205711413/>

QRM Guru – dealing with QRM/RFI

<https://www.facebook.com/qrmguru/>

Radio Amateurs Old Timers Club

<https://www.facebook.com/groups/1545441272389468/>

Amateur Radio Sales Australia

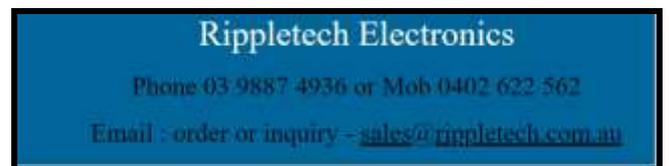
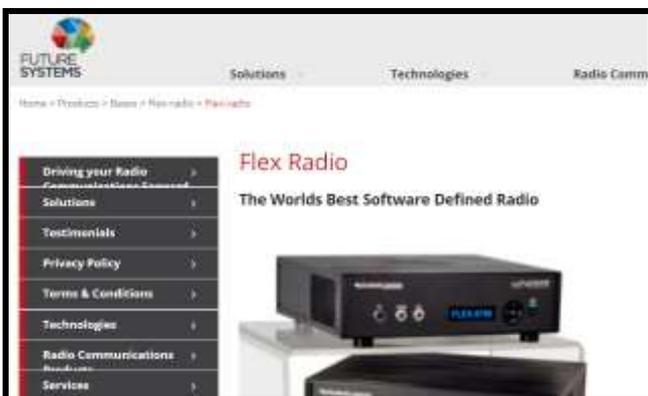
<https://www.facebook.com/groups/768281943267696/>

VK Contests

<https://www.facebook.com/groups/1239479436169142/>

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