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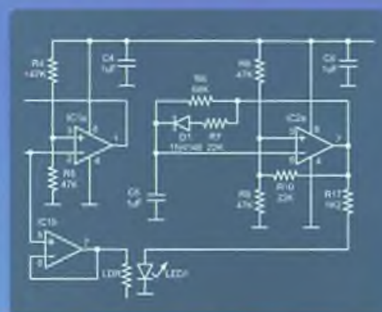
Xmas Island holiday DX jaunt



Crafty rig & amp tester

Novel shack earthing hack

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Columns

General

Technical

This issue's cover: Victoria's wind-swept Cape Nelson lighthouse was the scene for a weekend's activation in 2022's ILLW by Glenn VK3CAM.

Collins S-line conservation and conversation - Job 3, by Phil Fitzherbert VK3FF, will appear in the next edition - Issue 3 for 2023.

NEXT ISSUE: Test and Measurement

Contributions to Amateur Radio

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

Back Issues
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.

Editorial

Roger Harrison VK2ZRH

Said Harry Ham

"The bands are all rooned," said Harry Ham
In accents all forlorn,
Outside the club, down by the dam
One early Sat'dee morn.

The members then attending slumped
With chins upon their chests
Breathing low, yet barely pumped
While deciding what was best.

A loudly whine and sorry rave
Was what the members feared
From Harry Ham and his mate Dave,
The pair that no one cheered.

Another member soon chimed in,
"What *is* your beef there mate?
Tell us! Don't mutter in your chin!"
"Them solar signs aren't great!"

He spoke! The members shocked!
At Harry's verbal drought.
No wonder now the clubroom rocked,
They marvelled at the rout.

"I tell you now, that Sun of ours
Exhibits feeble thrust,
But science says the cycle's fit
To capture all our trust."

The Pres'dent turned to remonstrate
With doubters, skeptics all.
Asks Dave and Harry to debate,
That early Sat'dee morn.

And round it went, all in that hall
Till they were verb'lly worn;
They came upon consensus all,
That early Sat'dee morn.

After *Said Hanrahan*, by John O'Brien
(penname of Patrick Joseph Hartigan, a man of the cloth).

Sharp-eyed readers may notice that, this issue, our colleague Simon Rumble VK2VSR is no longer listed in Column 1 on Page 3. Simon has taken on a new job, that no longer has the flexibility that previously allowed him to contribute to the work of the Publications Committee.

Simon joined the Committee in late 2020, during the height of the pandemic, at a time when we were producing one issue of the magazine a month in order to complete the full complement of six issues for the year. He took on the role of PubCom Secretary, which he carried out with diligence and efficiency. Simon wrote a few articles for us along the way.

So long, Simon, it's been good to know you (to paraphrase American folk poet, Woody Guthrie). See you further down the log.

Amateurs aid response to middle eastern quakes

The two earthquakes of 7.8 and 7.5 magnitude that hit Türkiye and northern Syria on 6 February wrought a humanitarian disaster not seen for decades; deaths rose rapidly to the tens of 1000s while millions lost their homes or anywhere to live.

A quick response came from individual radio amateurs and organisations, such as Türkiye's national amateur radio society, Telsiz ve Radyo Amatörleri Cemiyeti (Wireless and Radio Amateur Society) – TRAC – and the International Amateur Radio Union's (IARU) Region 1 society. It was reported that radio played a pivotal role on many levels.

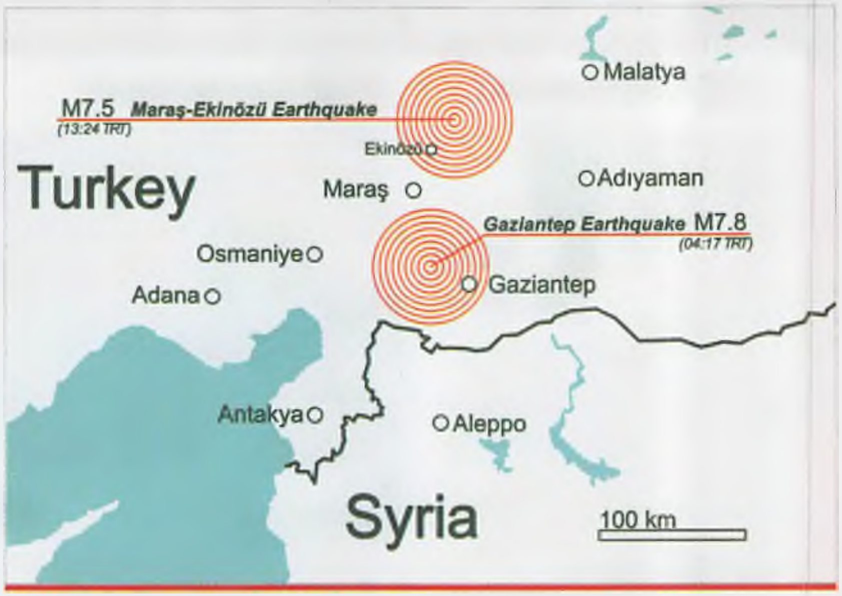
The President of TRAC, Aziz Sasa TA1E, arrived at the disaster area shortly after 6 February, assisting with frequency coordination for the teams carrying out search operations.

Aziz contacted the IARU Region 1 Emergency Communications Co-Ordinator, Greg Mossop G0DUB, to seek wider aid coordination as 1000s of aftershocks further unsettled the situation.

The Turkish emergency communications group primarily used 28.540 MHz along with VHF and UHF bands, but also making use of 3,777 and 7,092 kHz, as needed.

Greg G0DUB said that many countries sent search and rescue (SAR) resources but the only ones known to have (hams) embedded in them (were) Georgia and Bosnia-&-Herzegovina. The Romanian SAR team (had) no operators, but (had) communications equipment supplied by RVSU, one of the amateur radio emergency groups (from) Romania.

With the large number of rescue teams deployed to the country, there have been challenges in coordinating teams, locations, and frequencies, Mossop said. Operations continued as the SAR response moved into the recovery phase.



Map of the disaster area, showing the quakes' epicentres (Wikipedia image).

AR Newsline. ARRL. IARU

Sunspots hit a high

Solar Cycle 25 continues spreading joy among DXers on the HF ham bands. According to Australia's Space Weather Services (SWS), the observed monthly sunspot number for January 2023 hit 143.6, a 9-year high according to the USA's National Oceanic and Atmospheric Administration (NOAA).

Back in February 2014, the monthly sunspot number hit 146.1, right on the peak of Cycle 24 according to the SWS website. However, this February's sunspot number fell to 110.9, a tad above the SWS's forecast of 105. Visit: www.sws.bom.gov.au/Solar/1/6

Celebrating Marconi on the air

International Marconi Day (IMD) is observed annually on the Saturday closest to 25 April, the birth date of Guglielmo Giovanni Maria Marconi, the Italian inventor and electrical engineer credited with the invention of wireless telegraphy, Marconi's Law, and sending the first wireless transmission over open sea.

This year, Marconi Day takes place on 22 April, between 0000 – 2359 UTC.

Marconi, still celebrated.

The Cornish Radio Amateur Club (CRAC) sponsors an on-air event for the occasion, the object being for amateurs from around the world to contact other amateur stations located at Historic Marconi Sites – places that have a connection with Marconi himself. There are many in the UK and across Europe. In the UK, CRAC will be operating

GB4IMD. Visit: http://gx4crc.com/gb4imd/

The Hornsby and District Amateur Radio Club (HADARC) will be operating VK2IMD, the only Australian Marconi Day station licence.

HADARC has this privilege because of the wireless experiments conducted personally between prominent Australian businessman Ernest Fisk and Marconi, in 1918. Fisk established the local end of the experiment at his home in Wahroonga, giving historical significance to the district.

Marconi was an undoubted giant of the early years of wireless technology development and commercial success with the UK-based Marconi Co.

In Australia during the post-WW1 years, his 'presence' was seemingly always felt in the background during commercial and defence developments of wireless technology and applications.

Through that same era, Ernest

Ernest Fisk, Australian industrialist (AWM).

Fisk, later to be knighted, became a key figure in releasing the government's grip on wireless spectrum in the years immediately following WW1. During 1919, while President of the WIA NSW Division, he became pro-active in having the spectrum re-opened to amateur experimenters.

A special QSL card can be obtained for contacting VK2IMD. Visit: www.hadarc.org.au/imd.html

Hams highlighting human security

Amateurs world-wide are invited to get on the air on 18 April to help promote Human Security for All (HS4A), the theme for World Amateur Radio Day 2023.

For the first time, the United Nations Trust Fund for Human Security and the World Academy of Art and Science are partnering with the International Amateur Radio Union (IARU) in a campaign to highlight the role that amateur radio plays in addressing the world's most pressing needs.

Human Security measures security at the individual level. First introduced by the UN in

1994, the concept identifies seven interrelated dimensions of security that are essential to an individual's wellbeing: economic, food, health, environmental, personal, community and political.

The partners believe amateur radio is uniquely positioned to address people-centered, context-specific security challenges by promoting technical knowledge, practical skills, innovative technology, and the deployment of backup systems at the community level that can be called upon in times of emergency. Visit: www.iaru.org

Band upgrades in Brazil

The 70 cm amateur band (430–440 MHz) was elevated to primary service status by the Brazilian Telecommunications Agency (Anatel) recently, while 81-81.5 GHz was added to the 4 mm band (76-81 GHz, secondary).

These upgrades resulted from resolutions made at the World Radio Conference 2019 (WRC-19), supported by the International Amateur Radio Union (IARU) in cooperation with the Brazilian Amateur Radio Society (LABRE – www.labre.org.br), and the respective national administrations and delegations.

Shuffling WIA seats on Standards committees

The WIA participates on two Standards Australia committees on radiocommunications standards; RC-004 on maritime equipment, and RC-006 concerning radio equipment in general.

Noel Higgins VK3NH has been a long-time chair on both committees, as well as representing the WIA, until recently. Noel is retiring as the WIA representative on RC-004, but will remain as chair of RC-006.

Taking up the vacancy on RC-004 is Peter Porkony VK2EMR, recently appointed by the WIA Board. Peter previously worked for the Australian Maritime Safety Authority (AMSA) and has a wealth of experience that he can bring to the committee, which he once chaired as the AMSA representative.

EVENTS

- MAYHAM (the Wyong Field Day) is cancelled. Correct. It will *not* happen this year.

  The world is coming to an end! Amateur radio in Australia, as we've known it, will never be the same! Chicken Little was right – the sky is falling.

  The Central Coast Amateur Radio Club (CCARC) in NSW has announced that it is *"refocusing and re-aligning the direction of the event, and hope to return in 2024."* Phew! See: ccarc.org.au
- **Antennapalooza** returns for the eighth time. This year, it's over the weekend of 15-16 April, including Friday the 14th.

  Held on RF-quiet acreage at Drouin West, east of the Victorian capital of Melbourne. Lectures, eyeball QSOs, antenna checks and shootouts, camping. See: antennapalooza.net.au/
- **The SERG Convention** and Foxhunting Championships 2023, organised by the South East Radio Group (SERG) in Mount Gambier SA, is on for the weekend of 11-10 June. That's the King's Birthday weekend in VK5!

  Foxhunting frolics happen over both days, while the convention is on Sunday 11th. The venue's hall will have tables filled with goodies and homebrew gear; catering is available and the traditional dinner follows. Book your accommodation now, says John Drew VK5DJ. See: serg.org.au
- **Sunfest 2023**, driven by Queensland's Sunshine Coast Amateur Radio Club (SCARC), will blaze brightly on Sunday 9 September. Venue is Mountain Creek State School's massive air-conditioned auditorium. Mountain Creek is just west of Mooloolaba 4557. See: vk4wis.org
- **Claimed to be Victoria's biggest** such event, the 2023 Moorabbin and District Amateur Radio Club (MDRC) 2023 HamFest will be on Saturday 6th May. The doors of Kingston City Hall will slam open at 10am. The venue is located at the corner of Nepean Highway and South Rd, Moorabbin. The accompanying photo shows the general features to be experienced, plus major and minor door prizes, and light refreshments to accompany eyeball QSOs. See: https://mdrcorg.au/hamfest/

Trade Showcase

Shortwavers' 'bible' is back!

The 2023 World Radio TV Handbook - aka WRTH - has long been considered the shortwave enthusiasts Bible. It contains a worldwide listing of all MW, SW, FM and TV stations.

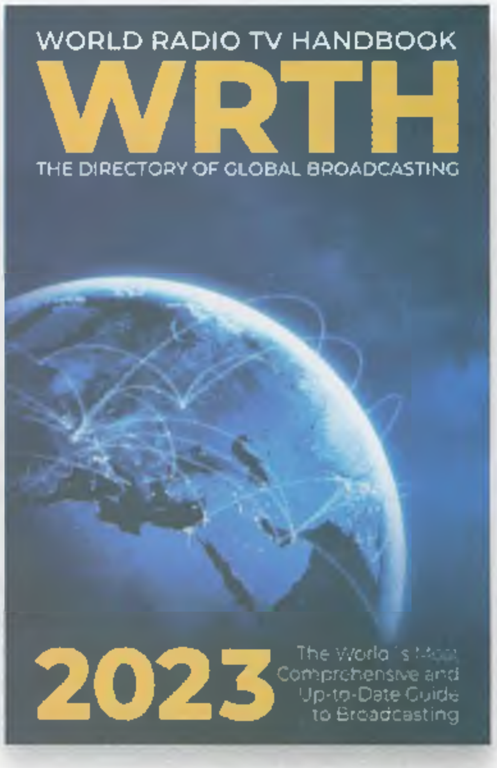
With a new publisher - Radio Data Centre GmbH (www.wrth.com), this year's edition is packed with 848 pages of technical information, weighs 1 kg and is 35 mm thick! It is the first to be released by Radio Data Centre.

WRTH will help identify signals that can be heard by shortwave enthusiasts the world over.

The book features a comprehensive shortwave station listing by frequency, from 2310 kHz to 25,800 kHz. The international mediumwave (MW) listing starts at 153 kHz and covers all stations up to 1700 kHz, which is bound to be very useful for MW DXers.

Included is a listing of clandestine broadcasters, numerous shortwave receiver reviews, and a world maps section showing transmitter locations. Most of the regular contributors from past years remain, and there are a few new entrants, the Radio Data Centre said.

WRTH is available from Tecsun Radios Australia, www.tecsunradios.com.au.



WestNews

Will McGhie VK6UU
e will2@iinet.net.au

I asked Rob VK6LD for details on how AllStar developed in VK6, as it has become a large network throughout Western Australia. Over to you Rob.

The AllStar network in VK6

I was probably quite late to the "AllStar revolution". AllStar (*www.allstarlink.org*) is a great way to connect your FM radio to other users locally, interstate or across the world, using only your 2m or 70cm handheld, mobile, or base radio. In many cases, you probably won't even notice the link is active, until you hear somebody coming through from a location far outside your repeater's normal coverage area.

The sheer versatility of AllStar makes it hard to categorise what it is. In a nutshell, it is a simplex node that mimics a repeater for a single operator or, with a bit more power, can be made to cover a small town; an end-client node that links a repeater off-air or a fully functional repeater controller with remote access to adjust levels, timeout, tail length, courtesy tones, etc.

It could also be a point-to-point link for repeater systems, a split-site repeater controller. It's a scheduler for nets, can download and play amateur radio-related news broadcasts and automated announcements, cross-link to digital modes (DMR, Yaesu Fusion C4FM, P25), be made accessible by phone apps, desktop VOIP phone handsets, and even Windows software.

AllStar is based on Asterisk – a free, open source, Linux-based PBX telephone system that is used in business to handle large-scale phone systems, be it extensions, voicemail, auto-answer etc. AllStar has been adapted from Asterisk to connect radio systems carrying voice, PTT, COS, and other radio-specific information.

Completed AllStar node - mobile FM rig sitting atop an AllStar node box, ready to go to site.

The Asterisk software can also provide a real-time view of which node/repeater is active on the network in the case of an open squelch or stuck PTT, and temporarily silence any node causing a problem. You can join the wider AllStar network and community (7299 nodes and counting as of 9 January 2023) or set up your own private 'off-net' system.

Developing a new system

Back in 2008-2014, the VK6 Southern Electronics Group (SEG) was using IRLP (Internet Radio Linking Project) in big, clunky PC boxes to link Mount Barker to Manjimup 2m repeaters. Mount Barker to Albany was an off-air 70cm link; the system kind-of worked, but audio quality wasn't the best, down time was also fairly regular.

The next plan was to link amateurs in Katanning to Mount Barker. Mal, at the time VK6MT, and now VK8MT, said there was this new system, AllStar; it was "the latest and greatest", running on something called a Beagle Bone Black single board computer.

Not knowing too much at the time, Mal gave me a list of things to buy from various places to get the links running. It was kind-of expensive and really bit into the SEG bank balance. Max VK6FN stepped in with some generous support to acquire all the parts.

Over the course of maybe six months or more, I built up three initial nodes – one for the Mount Barker 70cm repeater, one for the Manjimup 2m repeater, and one for Manjimup townsite on 70cm simplex (you can see Max's influence on getting new technology running).

AllStar had some similarities to IRLP, but it was also a very steep learning curve and, soon enough, we had three new nodes on the air and linked to Mal in Katanning and Bob VK6ZGN in Perth.

Around the same time, John VK6RX, living in Perth at the time, was building a few nodes as well as hub nodes on virtual servers in data centres to connect everything together.

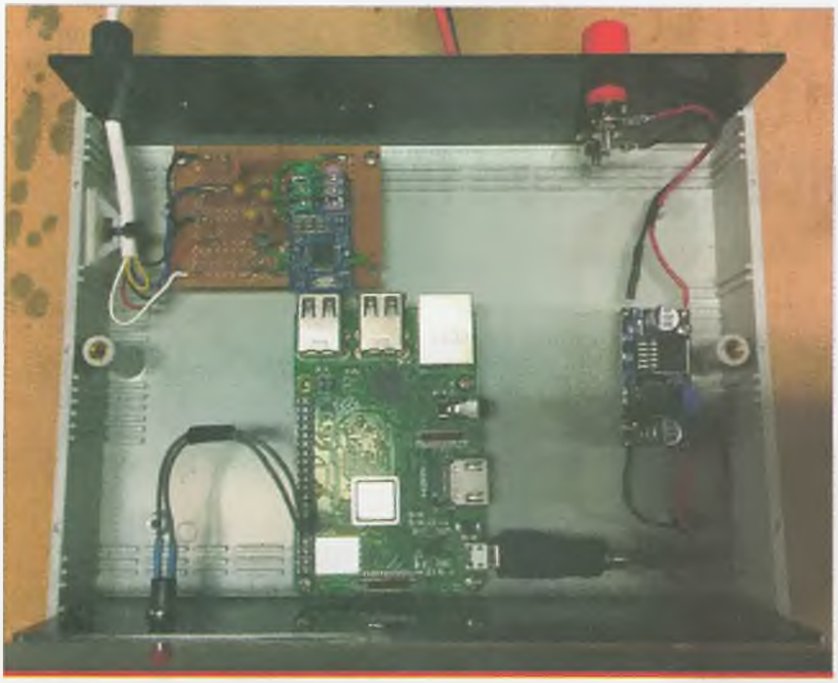
Price pressures eased

Duncan VK6GHZ found a source in the UK building 70cm AllStar micronodes and was arranging group purchases. I bought a couple of these and cracked open the case to discover how these things were being homebrewed at about a third-to-half the price of all the parts I had purchased for the first three SEG nodes.

The AllStar system uses a number of audio codecs to get very good audio quality, from low bandwidth to high bandwidth capacity. The nodes negotiate the audio codec between themselves when connecting.

The hardware side of AllStar is also pretty cheap to implement, with the hardware costing $150-$200 if you're able to do some soldering and building. There is plenty of information available online and SEG is always happy to help anyone interested in connecting a local repeater or building a simplex hotspot for your area.

From there, a few more regional nodes were added to Albany and the 70cm off-air link was removed; Denmark



Inside the AllStar node box – a Raspberry Pi single board computer and a homebrew USB soundcard-to-radio interface.

and maybe one or two others were also added around this time. I was getting donations of equipment that, with a little bit of work, could be modified to be useful for AllStar.

The word spreads

Covid hit and, with more time on my hands at home, I started to get a few requests to build more nodes for more areas, as word was spreading about the versatility of AllStar. Some others had, like me, bought all the parts to build their own node, but never got around to putting it together, so I was also finishing off those projects.

I started looking on the map and ACMA database for areas that had more than a few licensed amateurs, but no 2m or 70cm repeaters, to see if SEG could help out by locating a node in that area.

Then, I worked on better building and internal layouts of node systems. I got to see inside some micronode builds by another UK amateur, G7RPG, who do fine work. I was able to pick up some tips and tricks from those.

Why Wiluna? Well, Mark VK6BSA is going out there to start a new job. In his now-former role, Mark was driving perhaps 45-60 minutes each way to and from work each day and was active on the 2m VK6RLM repeater. To keep in touch with all his mates from out in Wiluna, I built him a node that he can plug into 12 VDC, a 2m antenna and his internet connection when he gets to Wiluna, so he can stay in touch.

Hamads

FOR SALE - ACT

Closing-down sale. Test gear, transceivers, radio shack accessories, technical library including early copies AR for disposal after 68 years on-air. Reasonable offers accepted, some items free to good homes.

Pick-up at my Canberra QTH only. Contact Paul VK7ZAJ by email: paule2@bigpond.com.au

It's time-out for leap seconds: an expert explains why

The pesky little IT and internet clock adjustments will be paused from 2035

Darryl Veitch – Professor of Computer Networking, University of Technology Sydney

Meeting in Versailles, France, on Friday, 18 November, the Bureau International des Poids et Mesures (BIPM) called time-out on "leap seconds" – the little jumps occasionally added to clocks running on Coordinated Universal Time (UTC), to keep them in sync with Earth's rotation.

The 24-hour clock at University of Greenwich. The longitude of the Royal Observatory of Greenwich was established as the zero meridian, from which international standard civil time was determined, known as Greenwich Mean Time (GMT). It was superseded by Coordinated Universal Time (UTC) on 1 January 1972.

From 2035, leap seconds will be abandoned for 100 years or so and will probably never return. It's time to work out exactly what to do with a problem that has become increasingly urgent, and severe, with the rise of the digital world.

Why do we have leap seconds?

Roll back to 1972, when the arrival of highly accurate atomic clocks laid bare the fact that days are not exactly 86,400 standard seconds long (that being 24 hours, with each hour comprising 3,600 seconds).

The difference is only in milliseconds, but accumulates inexorably. Ultimately, the Sun would appear overhead at "midnight" – an indignity that metrologists (people who study the science of measurement) were determined to prevent. Complicating matters further, Earth's rotation, and thus the length of a day, actually varies erratically and can't be predicted far in advance.

The solution arrived at was leap seconds: one-second corrections applied at the end of December and/or June on an ad hoc basis. Leaps were scheduled to ensure the timekeeping system we all use, Coordinated Universal Time (UTC), is never more than 0.9 seconds away from the Earth-tracking alternative, Universal Time (UT1).

But all this was before computers ruled the Earth. Leap seconds were an elegant solution when first proposed, but are diabolical when it comes to software implementations.

This is because a leap second is an abrupt change that badly breaks key assumptions used in software to represent time. Base concepts such as time never repeating, standing still, or going backward are all at risk – as well as other quaint notions like each minute lasting exactly 60 seconds.

Leaping into danger

Question: what's worse than mixing computers and leap seconds? Answer: mixing billions of interconnected networked computers, all trying to execute a leap second jump at (theoretically) the same time, with a great many failing in a wide variety of ways.

It gets better: most of those computers are learning about the impending leap second from the network itself. Better still, almost all are constantly synchronising their internal clocks by communicating over the internet to other computers called time servers, and believing the timing information these supply.

Imagine this scene then: during leap-second madness, some time-server computers can be wrong, but client computers relying on them don't know it. Or they can be right, but client computer software disbelieves them. Or both client and server computers leap, but at slightly different times, and as a result software gets confused. Or perhaps a computer never receives word that a leap is happening, does nothing, and ends up a second ahead of the rest of the world.

All of this and more was seen in the analysis of timing data from the last leap-second event in 2016.

The ways in which computer confusion over time can impact networked systems are too numerous to describe. Already there are documented cases of significant outages and impacts arising from the most recent leap second events.

More broadly though, consider the networked critical infrastructure our world runs on, including electricity grids, telecommunications systems, financial systems, and services such as collision avoidance in shipping and aviation. Many of these rely on accurate timing at millisecond scales, or even down to nanoseconds. An error of one second could have huge and even deadly impacts.

Time's up!

In recognition of the growing costs to our computer-based world, the idea of doing away with leap seconds has been on the table since 2015.

The International Telecommunications Union, the standards body that governs leap seconds, pushed back a decision several times. But pressure continued to grow on multiple fronts, including from major tech players such as Google and Meta (formerly Facebook).

The majority of international participants in the vote, including the US, France and Australia, supported the recent decision to drop the leap second.

The Versailles decision is not to abandon the idea of keeping everyday timekeeping (UTC) aligned with Earth. It's more a recognition that the disadvantages of the current leap second system are too high, and getting worse. We need to stop it before something really bad happens!

The good news is we can afford to wait the suggested 100 years or so. During this time, the discrepancy may grow to as much as a minute, but that's not very significant if you consider what we endure with daylight savings time each year. The logic is that by dropping the leap second right now, we can avoid its dangers and allow plenty of time to work out less disruptive ways to keep time aligned.

How could we deal with this down the track?

An extreme approach would be to fully adopt an abstract definition of time, abandoning the long-held association between time and Earth's movements. Another is to make larger adjustments than a second, but far less frequently

QRV
The Don Edwards Memorial Slow Morse Contest 2023

The contest is to remember Don Edwards VK2NV (SK), a long-time member of the St. George Amateur Radio Society and keen Morse operator. It is also to encourage amateurs who rarely or never use Morse code to give it a try. Open to all VK and ZL amateurs. Only single, non-assisted stations. No multi-operator stations.

Saturday 20 May 6pm to 9pm AEST (0800-1100 UTC) – **80 metres**

Sunday 21 May 1pm to 4pm AEST (0300-0600 UTC) – **40 metres**

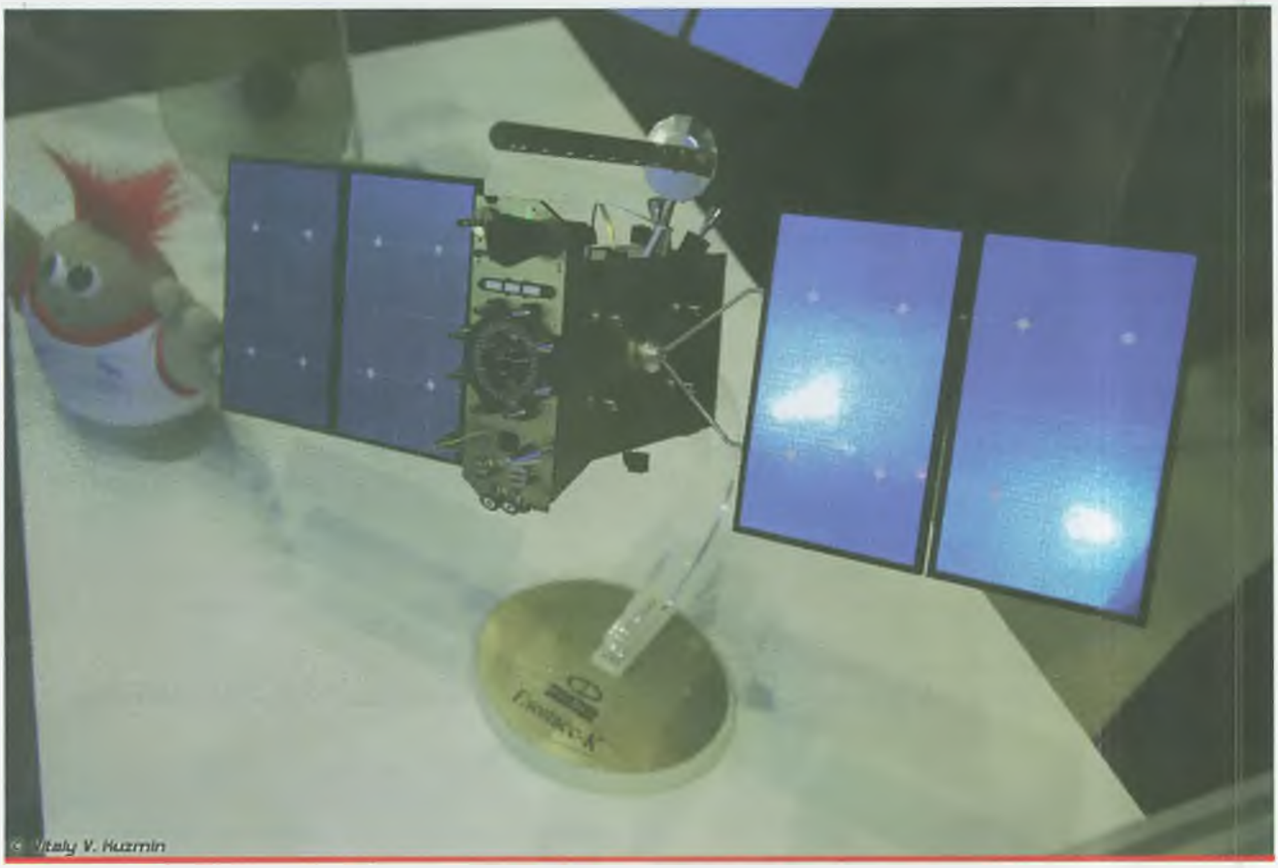
Amateurs can enter either or both sessions – home, portable or mobile.

The speed limit is 10 words per minute to encourage inexperienced or rusty operators to try their hand or fist – all contacts sent by hand and received by ear. No keyboards, memory keyers or computer readers allowed. Hand sent Morse code can be from a straight key, mechanical bug, or electronic keyer (but no memory or canned messages).

Scoring: Each contact will be counted as 1 point. To encourage those who never sat for or passed a Morse exam for their licence, an extra 2 points per session can be claimed. Contestants who also self declare that "they had fun" during the contest can add 1 extra bonus point.

Logging requirements and all other details are set out in the SGARS website.

www.sgars.org



Model of the Glonass-K spacecraft. Russia voted against the decision to abandon leap seconds, in part because this will require a major update to its global navigation satellite system, GLONASS, which incorporates leap seconds. (Image by Vitaly V. Kuzmin, from Wikipedia).

and with far better preparation to limit the dangers – perhaps in an age where software has evolved beyond bugs.

The decision of how far we're willing to let things drift before a new approach is decided upon has its own deadline: the next meeting of the Bureau International des Poids et Mesures is set for 2026. In the meantime, we'll be stuck with leap seconds until 2035.

Since the Earth has, surprisingly, begun to spin faster in recent decades, the next leap second may, for the first time, involve removing a second to speed up UTC, rather than adding a second to slow it down.

Software for this case is largely already in place, but has never been tested in the wild – so be prepared to leap into the unknown.

Further reading

A brief history of telling time:
https://tinyurl.com/37h385px

Scientists are hoping to redefine the second – here's why:
https://tinyurl.com/2wtbk49a

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Disclosure: Darryl Veitch has received funding from the ARC for network timing research.

https://tinyurl.com/leapsecs

Russia voted against the decision to abandon leap seconds, in part because this will require a major update to its global navigation satellite system, GLONASS, which incorporates leap seconds. Shutterstock

2023 Australia Day Contest report

Alan Shannon VK4SN – WIA Contest Manager
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w vk4sn.com

To keep things simple, an operator can use the AX or VK prefixes for all of Australia Day and submit a log for the 12 hours that the contest runs. This is good for FT8 users as the log can be made up from the ADI file generated by normal use of WSJT-X.

Very few pickings were heard on CW or SSB as most were on FT8 going for distance points with a never-ending flow of QSOs.

Twenty two logs from VK and five DX logs were received. Feedback over log submission seemed to indicate that some are finding it hard to use or setup N1MM logger. A comprehensive set of notes shows the whole procedure complete with pictures. All this and more can be downloaded from the WIA contest pages.

Failure to read the new rules for this year was most evident, resulting in a few problems for some. These were eventually overcome and the logs ultimately accepted via vklogchecker.com.

DX involvement

Remembering that half the world is sleeping during our contest time slot, if not at work during a weekday, more overseas advertising for next year is needed to boost DX participation.

Favourable comments from our DX friends were received.

- *"Thanks so much for the results notice and certificate. I think the Australia Day event is a great concept – quite similar to the successful RAC Canada Day contest in July."*
- *"I definitely look forward to participating in the next Australia Day event."*
- *"Thank you very much Alan for allowing us in Hawaii to participate in your contest. / I hope you will continue the contest next year. I will be looking forward for it."*

This contest is all about having a bit of fun on your day off and does not gain points for the WIA Contest champion. Thanks everyone for your participation.

Results

Place	Callsign	Operator/s	Score
Single Op Phone			
1st	AX5PAS	VK5PAS	826,294
2nd	VK7IAN	VK7IAN	97,192
3rd	VK5Y	VK5IAK	30,623
4th	VKIO	VKIAO	12,568
5th	VK3W	VK3TIN	8,215
6th	AX4OTZ	AX4OTZ	7,727
7th	VK4HRE	VK4HRE	7,660
8th	AX4ADC	AX4ADC	3,139
9th	VK3AMO	VK3AMO	2,766
10th	VK4SN	VK4SN	1,860
11th	VK4ER	VK4ER	1,474
12th	AX2TTL	AX2TTL	1,471
13th	VK4O	VK4MUD	1
Single Op CW			
1st	W7VC	W7VC	11,667
Single Op Digital			
1st	AX4ADC	AX4ADC	3,292,694
2nd	VK4O	VK4MUD	2,713,094
3rd	VK4SN	VK4SN	2,319,194
4th	VK2EHQ	VK2EHQ	2,262,338
5th	VKIO	VKIAO	1,783,561
6th	AX5BD	AX5BD	749,789
7th	WH6EY	WH6EY	739,096
8th	KH6RDO	KH6RDO	440,063
9th	VL5F	VK5AJQ	256,395
10th	AX7STO	AX7STO	243,465
11th	VK5WU	VK5WU	197,732
12th	AX2EY	VK2EY	153,919
13th	NH6O	NH6O	73,964
14th	HS0ZOY	HS0ZOY	67,497
15th	AX4OTZ	AX4OTZ	30,639
Multi Op Single			
1st	VK4HM	VK4BOB VK4SJB VK4JU	257,432
2nd	VL4A	VK4BLE VK4FOMP	251,162
Multi-Multi			
1st	AX5ARA	VK5STU VK5NIG	304,691
DX Winners			
1st CW	W7VC	W7VC	11,667
1st DG	WH6EY	WH6EY	739,096
2nd DG	KH6RDO	KH6RDO	440,063
3rd DG	NH6O	NH6O	73,964
4th DG	HS0ZOY	HS0ZOY	67,497


ILLW 2022
21-22 August

Victoria's wind-swept Cape Nelson lighthouse was the scene for -

Fun and frolics on the International Lighthouse and Lightship weekend

Glenn Alford VK3CAM, VK3ILH

Well, after almost two years of COVID lockdown and travel restrictions in Victoria, finally, we could plan to go to the coast, find a real lighthouse and be a part of this world-wide amateur radio event.

Previous years, apart from the COVID period, I operated from Port Albert Maritime Museum. It was good, but there was limited space for antennas around the outdoor exhibits adjacent to the museum premises. Plus, the coffee shop across the road had recently closed; in the past it served excellent coffee and food.

There is a number of lighthouse opportunities around the Victorian

At the rig in the cottage on-site at the lighthouse.

EXPLAINER

What is ILLW?

The International Lighthouse and Lightship Weekend (ILLW) is an annual world-wide amateur radio activity each August in which amateurs operate from lighthouse and lightship locations in countries across the globe.

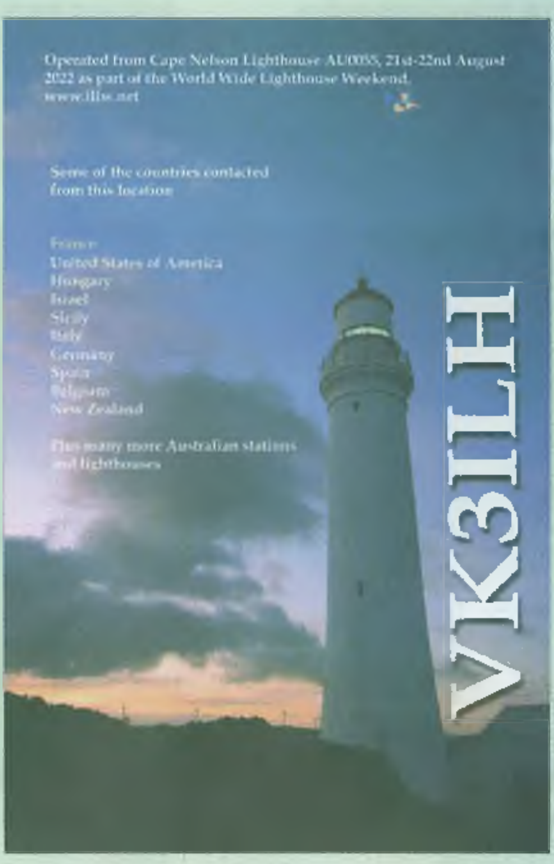
The mission is to jointly expose to the public amateur radio and the plight of lighthouses and lightships and the necessity to preserve maritime heritage.

2022 was ILLW's 25th anniversary. August has become 'Lighthouse Month'.

ILLW is claimed to be a very 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.

Generally taking place on the third full weekend in August and lasting the weekend's 48 hours, it has grown since beginning in 1998 and now attracts participation from lighthouse and lightship locations in some 50 countries world-wide.

That first year, 158 locations registered to participate; participation peaked in 2013 with over 500 location registrations in over 50 countries world-wide. Some 80 locations across Australia and New Zealand now join in. Visit: https://illw.net/



Cape Nelson lighthouse is an imposing sight as you approach it.

coast. The ones closer to Melbourne are registered quite early. I think about nine Victorian lighthouses registered for the event.

Decisions, decisions

So, looking at the options, it's always good to find accommodation on-site from which to operate, so that your operating hours can be endless. Mains power is very handy, plus, you can score somewhere warm with good heating, given it is winter in the southern hemisphere in August.

You also need to consider other on-site facilities, like a café. Cape Nelson, near Portland, seemed ideal, given that I last activated the site in 2009. It was time to return.

Location, location

Lying 360 km west of Melbourne, Cape Nelson is just over four hour's drive from home. Named after Lieutenant James Grant's ship, the Lady Nelson, the lighthouse was built in 1884 and fitted with a Chance Brothers 3.6m lantern. https://tinyurl.com/58xf967s

The lighthouse was constructed from local stone and is about 32m high. It's positioned on the cliff top, with a stone wind wall leading back to the old stables, and further back, the keeper's cottages.

The stables, now Isabella's café, named after a shipwreck, and the keeper's cottages, are now fully renovated with modern facilities.

Large, fenced grounds around each cottage offer generous spaces for antennas, but no trees or standing poles to support wire antennas.

Our cottage accommodation adjacent to the lighthouse. The R5 multiband vertical antenna as lashed to the fence. The squid pole was attached to the cottage verandah.

My sign promoting amateur radio, attached to the cottage gate.

Fun, frolics-n-freezin'

My wife, Margaret, and I drove down there on the Friday morning. To established the QTH, we set up a Cushcraft R5 vertical, so at least we had 10-20 metres we could operate on. That afternoon, using 100 watts I put out a few calls and worked France, Italy, and the USA, all with very good signal reports.

That night, the weather was not going to disappoint. It blew a gale! Heavy rain was even going sideways. The R5 was in its element bending gracefully, but not yielding. But what should you expect, located on Victoria's south west coast when a southerly cold front comes through?

The wind was like a constant freight train hurtling past the keeper's cottage. One could be very grateful that the cottage was very well built from local stone and not straw.

The next morning, Saturday, Darrin Pearce VK3AAP arrived to offer much-needed help and support. He brought a squid pole, with various wire dipole; a 40m centre-feed and an end-feed for 80m.

The rig, an Icom IC-775, one could describe as a beast, features a built-in power supply and tuner. It is a heavy rig to use in portable operations. Fortunately, I had no issues in tuning the wire and vertical antennas.

The other delight about working from these locations is – there is no RF noise. *None*. So, if there is even a very weak signal, you can still work them. Quite different to some Melbourne locations.

Summary

The organisers reported about 370 world-wide registrations. Over the two days of the event, we worked around 80 contacts. Among the countries worked were France, Italy, USA, Hungary, Israel, Sicily, Germany, Spain, Belgium, and New Zealand. In addition, we worked many Australian lighthouse locations and other stations, including some members from my local club, the Eastern and Mountain District Radio Club (EMDRC), David VK3RU and John VK3PZ.

In all, a great weekend, fuelled by good coffee at Isabella's café in easy walking distance. Also good for take-aways, if needed.

There are some very good walks around Portland Coastal Park. August also offers the chance of whale spotting along the coast. The other great asset is the changeable colours as the day progresses towards sunset. Quite incredible

If you have not participated in an International Lighthouse Weekend, give it a go. It's not a competition. Information and registrations can be found on www.illw.net.

Sunset at Cape Nelson.

Christmas Island holiday with DX jaunt

Stephen Warrillow VK3SN

Christmas Island would have to be one of our nation's best kept secrets. Where else in Australia could you lazily snorkel across a tropical reef in the morning and be the centre of a massive DX pile up in the afternoon?

How about being somewhere uniquely exotic and wonderfully unfamiliar without ever quite crossing an international border? For the curious adventurer, Christmas Island is a masterclass on the interplay between geology, geography, ecology, evolution, human culture, and history. It is also an awesome place to play radio!

A background

The Indian Ocean Territory of Christmas Island lies only a few hundred kilometres south of Java and is more than 1500 km from the Australian mainland (see the map here). The island was uninhabited when first described by European visitors in the 17th century and named for the day on which an English East India Company ship sailed past in 1643. The British subsequently annexed the island in 1888 when valuable phosphate reserves were identified.

The years that followed included the lamentable use of indentured labour from other British dominions to mine phosphate and a period of Japanese occupation during the second world war.

The island officially became part of the Commonwealth of Australia in 1958 and has a small but proud local population of Islanders with a diverse background of cultures, ethnicity and religious beliefs. Phosphate is still the mainstay of the local economy, while the somewhat controversial immigration detention centre and a small tourism industry also provide employment.

Christmas Island has unique geology and wildlife. Above the water is a roughly triangular island of about 19 km in total length, visibly

Red crabs are endemic to the island.

dominated by the summit of a 4500 metre volcanic mountain rising from the floor of the Indian Ocean.

About two thirds of the island is national park that protects the habitat of many remarkable species, including the iconic red crab. Millions of these curious creatures famously migrate to the ocean each year in one of the most spectacular events of the natural world.

Post-pandemic holiday

I'd been interested in visiting Christmas Island for a while and when work commitments began to settle a bit after the COVID pandemic response, my wife and I decided to organise a holiday for late September 2022.

This would definitely be a vacation (rather than a serious DXpedition) and the amateur station setup needed to be quite simple. In the end, I decided to go with an approach I'd used successfully on previous DX vacations and took a compact 100 W HF radio (Yaesu FT-991), a switchmode power supply, a broadband dipole, a heavy-duty squid pole, some RG58 coax, and a laptop.

A small tuner and G5RV-dipole were also packed in case of issues with the main antenna. By the time I packed clothes, snorkelling gear, and other items I was just able to sneak under the airline's strictly enforced 23 kg weight limit for checked luggage.

An online search put me in touch with the wonderful blokes from the Christmas Island Amateur Radio Club (CIARC) and within a few weeks I was a member. I accepted the opportunity to use the club callsign VK9XX and organised my WSJT-X, HRD, ClubLog, and QRZ.com set up accordingly, as well as engaging an experienced QSL manager to sort out cards. Now I just needed to get to the island!

It took nearly two days to reach Christmas Island from Melbourne. The journey is a little convoluted due to the distances involved and the need for the aircraft to refuel along the way. However, the flights from Perth went according to schedule.

On arrival at the island, we collected our small (and somewhat battered) 4WD hire car from the airport and headed to Flying Fish Cove where we had a week of accommodation booked at one of the few motels on the island. I had contacted the owner some weeks prior and was delighted to receive a 'ham friendly' response that assured me it would be OK to set up an HF dipole if it was discrete, safe, and not in the way of other guests.

Our accommodation was beautifully situated and featured an elevated balcony with stunning views of the sunset each evening. The next morning, I lashed the squid pole to the balcony railing as the centre point for the broadband dipole and hoisted the ends into conveniently located trees nearby.

This inverted-V arrangement was safely out of the way of pedestrians and hotel guests as well as being reasonably discrete. The coax was neatly routed into to the motel room, which had a small workstation with WiFi, 240 VAC power, desk and chair. Setting up took about an hour in total – even my wife was impressed! After a few brief tests to ensure everything worked properly, it was time to head out and explore while the day was still young.

Rainforest walks are popular explorations.

Coconut crabs, or Palm crabs, are also found on Christmas Island. Charles Darwin described them as "monstrous."

My station setup – simplicity was the key.

I lashed the squid pole antenna support to the accommodation's balcony railing.

The centre of the antenna was held as high from the ground as practicable.

Exploring

Having a 4WD is essential to fully explore Christmas Island. Navigation is easy, given its small size and few roads, but it certainly helped to have downloaded relevant maps to my phone before arriving; there is only limited 2G mobile phone coverage and no mobile data. The island has a large central plateau that sits high above a narrow rim of rocky coast.

Over the next week, we managed to swim at almost every beach, climb down into rocky inlets, get drenched at blowholes, sit under waterfalls, and snorkel coral reefs teeming with fish.

Dolly beach was a definite favourite and well worth the 45-minute hike in. We also walked the extensive network of trails through unspoiled rainforest where wildlife is everywhere, especially the island's iconic crab species. Land crabs are the true custodians of Christmas Island and the locals take great pride in protecting them and their unique environment.

And now, the DX

After a full first day of exploration, it was time to play radio. Once a few final checks were complete, I set up FT8 on the laptop and put out a call using VK9X. I figured there might be a few stations keen to work Christmas Island, but I definitely wasn't prepared for the pile up that followed.

Seasoned DXpedition operators would take this in their stride. However, it was exhilarating and a little intimidating to see well over a hundred stations calling and then trying to work them all as fairly, accurately, and efficiently as possible.

This was my first go at being a fox in 'fox-and-hound' mode and the learning curve was steep, despite having read-up on the subject before leaving home. I appreciate the kind advice, feedback, and patience of the many more experienced operators who got in touch via email to assist me.

I managed to figure out reasonable band and frequency selections for activity across different times and pathways and was glad for the simplicity of band changing with a broadband dipole – not optimally efficient, but convenient, allowing activity from 80m to 10m on a single wire.

Pathways to VK/ZL and North America were difficult due to local terrain, so these stations were prioritised where possible in order to give them a fighting chance in the pile up. Except when there were technical glitches, all contacts were uploaded to ClubLog and QRZ.com automatically in real-time. Naturally, I planned to send logs subsequently to the QSL manager, LoTW, and eQSL in due course.

While I had intended to work some SSB, it

Just what you can expect from a tropical island.

rapidly became clear that FT8 was by far the best option, given the basic antenna and modest power of my station. A major bonus was I could quietly work late into the night without annoying anyone with constant "CQ DX this is VK9XX calling . . ."

When not active on the air, I connected a tiny ZachTek '80to10' WSPR desktop transmitter to the broadband dipole and had a lot of fun seeing how far 250 mW would get. The *WSPR Rocks!* website provides quite powerful reporting capabilities, and it was lots of fun to see how bands and time of day interact while using this low power mode.

Over the course of the week, things settled into a nice rhythm of getting on air for a few hours in early morning, late afternoon and late evening. It was important that radio fitted around the island adventure and not the other way around for us to really experience the best of our holiday.

Each day, we made the most of our time to see as much as we could across Christmas Island. This approach worked really well and ensured the best of both worlds – a truly immersive experience in the island's unique natural beauty and a lot of fun running a basic, but highly sought-after, DX station.

After a fantastic week, it was time to lower the antenna and pack up the gear. I worked up until the hour before we had to leave for the airport, giving contacts to as many stations as possible before departing.

Epilogue

Over about five days of operating I managed to log nearly 2400 contacts while also seeing almost all the sights of this remarkable island.

Not everything had gone perfectly to plan, but overall, I was rather pleased with the radio activity and now felt much better prepared for similar endeavours in the future. Part of the success was definitely due to the kind and friendly support of the guys from the CIARC who were unfailingly helpful with advice and recommendations.

Is Christmas Island worth a visit? For any amateur keen to explore natural wonders while working some serious DX, then the answer is *yes*!

Christmas Island is a truly special part of Australia and lots of fun to visit yet retains all the best aspects of an exotic adventure off the beaten track. On the flight home, I reflected on how easy the whole process had been and wondered about further opportunities to combine an adventure holiday with a bit of DX.

Given how enjoyable this trip was, I feel quite confident that my family will happily agree to similar holidays in the future. Time to start planning!

At the rig, enjoying working the pile ups!

90 years of continuous publication!

How the WIA's Amateur Radio magazine came into being

Peter Wolfenden VK3RV, WIA Historian

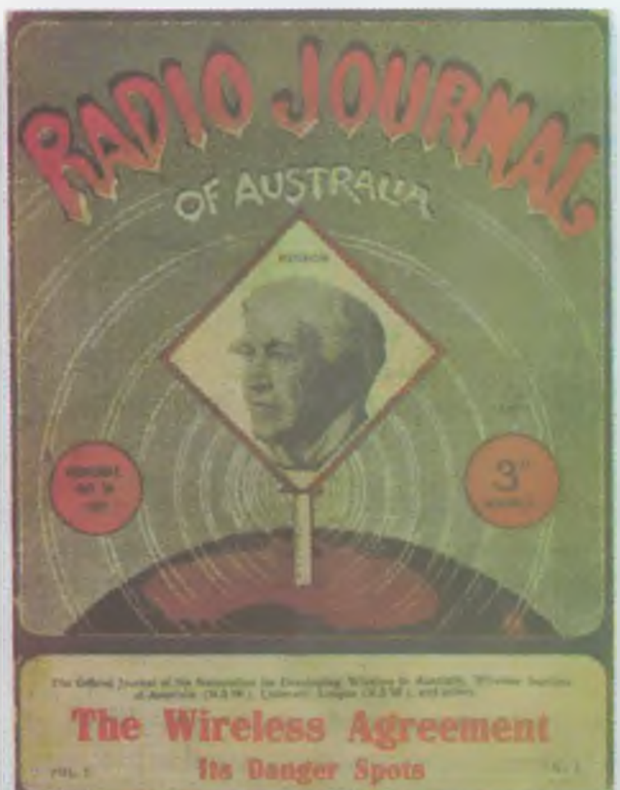
Part 2

As this magazine approaches 90 years of continuous publication in October, a glance back at some of our predecessors suggest that its gestation and birth was not quite straightforward. We continue the tour through the complex world of newsletters and magazines before *Amateur Radio* emerged and stood alone!

As previously mentioned, the individual WIA divisions usually fed local newspapers or magazines with information about their activities, but by the mid-1920s, most had also begun their own regular newsletters or magazines. Here follows descriptions of some examples of official early Institute and other radio publications, together with aspects of the part some played in the lead-up to *Amateur Radio* magazine.

In NSW

The *Wireless Institute Gazette* began in February 1926 as a small printed publication issued monthly, with a page size of about 140 x 200 mm and running to eight pages. It contained general divisional information and reports of activities, together with a few short technical articles.



In 1927, this publication was 'the official journal' of several stakeholder organisations, including the WIA.

The *Radio Journal of Australia*, was a commercial magazine, published from November 1927 in a small format. It was edited by George Taylor, the man responsible for that first 1910 meeting in Sydney of "like-minded" wireless people from which the WIA developed. The magazine claimed it was: *"The official journal of the Association for Developing Wireless in Australia, the Listener's League of NSW, and the Wireless Institute of Australia (NSW Division)"* – almost any organization with an interest in wireless! It was, however, very short-lived.

A magazine titled *CQ* launched in December 1927, published initially by the *NSW Radio Transmitters' League*. It, too, was a small format magazine of some 12 pages, about 145 x 220 mm in size. Comes October 1929 and CQ became *"A magazine issued by the NSW Division of the WIA"* with pages boosted to 16.

At the 6th Federal Convention held in Queensland during September 1929, it was agreed that CQ should be re-badged as *QTC* (then the name of the Queensland Division's journal) and become the Official Organ of the WIA nationally. But, complications with the requirements of a key advertiser/sponsor prevented this "amalgamation" from occurring.
(See Queensland, later, for further QTC information).

Somehow, at this time a magazine audaciously titled *Television and Radio Review of Australia*, got involved. Published by Oswald Mingay's Australian Radio Publications in Sydney, machinations resulted in this magazine becoming the Official Organ of the WIA – for two months only. Its first edition as the WIA organ was December 1931 and the last edition, January 1932, when it ceased being published as a public magazine.

It appears to have been a very messy situation and possibly had politics and high-powered business people involved. In the end the magazine fell over! .

A tangled web of intrigue saw this magazine spring to life as an organ of the WIA for December 1931 and January 1932, then vanishing.

In Victoria

The Editorial to the first edition of *Amateur Radio* carried an observation from the Victorian Division's President, George Thompson VK3TH, stating that an earlier divisional magazine existed there. He said: "*.. It is a far cry from our old magazine which appeared in 1921 to the present time, and during the intervening years, many and varied attempts have been made to offer the army of radio enthusiasts in Australia something worthwhile, which would be of real interest, value and help.*"

That statement just about sums up the complex and confusing period between post-WWI and the early 1930s regarding a national amateur-oriented magazine in Australia.

As to the so-called '1921 magazine,' no firm evidence could be found of it until October 2022, when a chance discovery was made of some VK3 Divisional Committee Minutes covering the years 1928 to 1930. Among the regular financials was an item titled, "Harmonics." What was that? Surely not payment to a child-minding facility, or even something to do with suppressing annoying early broadcast stations' harmonics – a genuine problem for most early amateur shortwave experimenters located in areas close to an early broadcast station.

Then, suddenly, everything started to fall into place in reading the December 1929 Committee Minutes, not only regarding the mysterious Harmonics payment, but also potential changes for other divisional magazines.

Quoting directly from the Minutes: *Moved Mr. Gronow, seconded Mr. Johns, "that at the request of the Federal Executive, a ballot of all Financial Members be taken through the medium of "Harmonics" as to whether "CQ" or "QTC" should be adopted as the Official Organ of the Institute."*

So, *Harmonics* had to be that missing pre-1933, VK3 newsletter or duplicated magazine! Minutes prior to 1928 have not yet been located, so we can't confirm the starting year for the magazine, but we now know that *Harmonics* was still circulating in Victoria over a number of years during the late 1920s when both *CQ* and *QTC* were still in circulation.

There were other, largely over-looked, Victorian magazines during the mid-1920s that are relevant to this history. In December 1923, a commercial magazine,

Early titles claiming WIA official organ status – a timeline

The Radio Experimenter
May to possibly July 1924.

Experimental Radio and Broadcast News later re-badged ***Radio Broadcast***
October 1925 to 1927.

QTC
December 1930 to November 1931.

Television and Radio Review of Australia
December 1931 to January 1932

Claiming longevity-ness in 1923 was this magazine's marketing ploy, edited by notable Melbourne amateurs.

The Radio Experimenter was first published. It claimed that it was the oldest (commercial) wireless publication in Victoria.

Initially edited by Howard Love 3BM and Ross Hull 3JU, both well-known Melbourne amateurs and office bearers of the WIA Victorian Division. For a short time following the 1st Federal Convention in 1924, when *The Radio Experimenter* was temporarily appointed, it legitimately claimed to be the Official Organ of the WIA, but this claim was soon dropped.

Then, in August 1924, another similar magazine, titled *Experimental Radio and Broadcast News*, suddenly appeared on the bookstands (later re-badged as *Radio Broadcast*). Apparently, it had a financial connection with some members of the WIA Victorian Division. Both printed magazines were about the same size, about 220 x 280 mm, a little larger than this current magazine. The number of pages varied, at times reaching over 60.

Both magazines co-existed for some months, but Love and Hull's names were no longer mentioned on the Editorial page of the *Radio Experimenter* magazine, as they were now the Editor and Manager for the new magazine – the opposition!

In 1925, following the 2nd Federal Convention in Perth (in August), *Radio Broadcast* was formally adopted as the "Official Organ" of the WIA. However, it faded out of existence during 1927, perhaps due to the loss of Ross Hull to the ARRL.

Amateur Radio magazine began in October 1933, initially as a production of the WIA Victorian Division, but some decades later, becoming the responsibility of the Federal Executive.

In hindsight, there was a lot of publishing experience being gained in Victoria during these heady times of amateur radio and shortwave expansion. One person quietly gaining that experience was the indefatigable Ross Hull. No wonder the ARRL snapped him up for *QST* and other ARRL publishing activities when he finally made it to America in 1926!

In Queensland

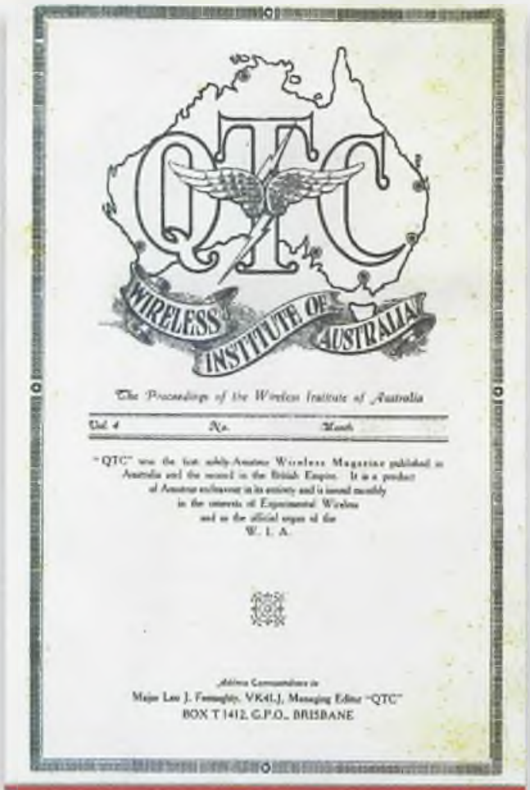
In 1925, *The Queensland Radio News*, a commercial magazine, was first published in February and became the Official Organ of the WIA Queensland Division. It appears to have been typical of the general commercial magazines published in other states at that time, with 50 to 60 pages. However, Institute information was quite limited at times.

QTC magazine, was published from July 1927 by the Queensland Radio Transmitters League (RTL), which later became part of the Australian RTL. The editor and enthusiastic driver of *QTC* was Major Leo Feenaghty OA4LJ. He produced a foolscap-sized publication (340 x 430 mm) of up to 16 sheets.

During 1929, most ARTL branches merged with the

No sooner than one 'official organ' appeared, than another stepped-in; this one in 1924.

The re-badged *Experimental Radio and Broadcast News* was adopted as an official organ in 1925.



Although often an outlier publication, QTC held out as a national official organ for the Institute over 1930-31.

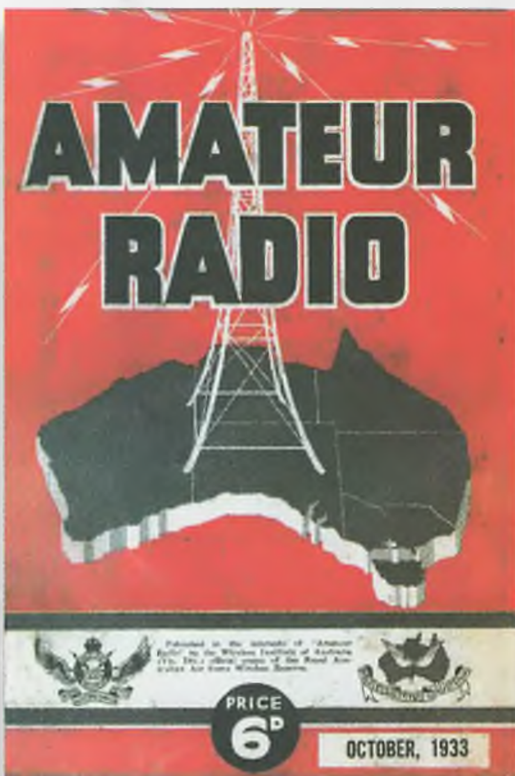
WIA and *QTC* became the WIA Queensland Division's Official Journal, just as *CQ* in NSW followed a similar path.

From the late 1930s, *QTC* regained life as the Official Organ of the WIA (nationally), and proudly proclaimed it was "The Proceedings of the Wireless Institute of Australia," but unease continued to surround the official journal.

On 25 November 1931, *The Brisbane Telegraph* reported that, at the WIA's 8th Federal Convention held in Sydney during October, it was decided – with the Editor's (perhaps reluctant) concurrence, from November 1931, *QTC* would no longer be the Official Organ of the WIA as it was to be replaced by a commercial "*. . . new book, from 1 December 1931.*"

Another string of aggravation developed between various parties, bringing further changes that, from the Australian amateur's viewpoint (particularly WIA members), were only resolved once *Amateur Radio* magazine firmly found its feet. Details of exactly what happened and who, or what, was behind it all, are not clearly known.

A continuing theme over the years appears to have been that a perceived necessity was a distancing between the commercial and amateur reporting of experimental radio and a need for independence of the private experimenter.



Finally, October 1933 saw the launch of "*something worthwhile, which would be of real interest, value and help.*"

ZERO-BEAT Magazine

During research for the 90th Anniversary of Amateur Radio magazine, a number of other specialised Australian radio magazines were 're-discovered'.

Some of these were relatively short-lived, others managed to continue for decades until their need no longer existed, as in the case of small radio clubs, or no longer needed fields of amateur endeavor. The various VHF Group magazines are one such example.

Just getting onto the VHF or UHF bands 50-odd years back was often a challenge for many newcomers. As for making aerials that actually worked – another challenge!

Often, such publications resulted in the establishment of even more specialised groups and newsletters, some being affiliated with the WIA, others independent.

Continuing with the VHF example, specialised off-shoots concentrated on highly focused activities such as EME, microwaves, repeaters, ATV etc. Some of these, including SWL reports, were also often covered in AR over the years.

One magazine that had come my way over 55 years ago recently re-attracted my attention – Zero-Beat, a newsletter to help keep members of the existing Short Wave Listeners Group of the WIA Victorian Division informed.

Vol.1, No.1 for May 1966 was nine foolscap pages containing a background to the newsletter, some technical articles, a detailed survey for the SWL group membership, and an article about VHF for the SWL. A number of notable people were involved with Zero-Beat's introduction. Michael Krochmal (now VK3KRO), one of the magazine initiator's, became the Editor. In the first Editorial he wrote:

"Suddenly it struck us that we needed an official organ through which our members could communicate. At that time (membership nearing 300), communication between these members was poor. Soon we had formed a team to establish and publish the organ, and so it is now my great pleasure to announce formally the birth of a harmonic to the SWL group, ZERO-BEAT marking the end of months of preparation, and the beginning of a new era in SWLing."

Mentioned within that first issue are the names of other individuals who were already prominent in aspects of radio generally, amateur radio in particular, or heading that way.

Besides Michael, there was Harry Roach, a staunch and significant SWL over many years. As President of the SWL group, Harry wrote a technical article about adding a BFO for SSB reception – still a new field for recent newcomers to the ranks of SWLs.

Then there was A.K. Box, an experienced writer of 'things wireless' in a number of Australian magazines over many years. G.R. Hughes (whom I suspect was Geoff Hughes VK3AUX), a quiet achiever and supporter of the hobby over many years. He was a keen VHF/UHF/microwave experimenter and one of, if not the, first to transmit electronic ATV in Melbourne, some years before commercial TV began in in 1956.

Then there was WIA-L3158. What can be said about this person? At the time I would suspect he was still a (keen?) student at RMIT, but destined to influence all of us for the better (or worse) over the many intervening years! Oh, his name was, and still is, Harrison – *that* Roger Harrison – then VK3ZRY, later VK2ZRH.

Within Zero-Beat, Roger set out to convince SWLs to try listening on the 6m, 2m and 70cm bands.

Since those days, Roger, definitely a dedicated man, became involved with many magazines within the electronics and industrial manufacturing fields. We are lucky to have him helping the amateur radio fraternity, and in particular our flagship, AR magazine. From stories I've heard via 'the grape vine' from regular columnists, they have appreciated his tenacity and the contemplative consideration given to their regular toil. Roger has brought many skills to our magazine – thank you Roger – keep it up!

Returning to the main point (there is one!), this hobby has spawned many specialist magazines and newsletters over the years that can be a great source of otherwise forgotten history. The WIA Archive would like to hear from you if you think you may have any such unusual Australian publications. If you feel you can contribute, please contact the WIA History and Archive Committee via the WIA website: www.wia.org.au > For Members > WIA History > WIA Archive

In South Australia

A commercial magazine titled *S.A. Wireless (Monthly)* was formally appointed as the WIA South Australian Division's official organ from its first issue in April 1924. It appears to have covered the Division's activities quite well, reporting on them in some depth.

Radio Broadcast was formally adopted in September 1925 by the SA Division as the official SA journal, agreed at the WIA 2nd Federal Convention in Perth, held in August 1925.

S.A. WI Journal, was initially foolscap sized, from December 1959. Later it became a 150 x 210 mm sized booklet with a 400 copy print run. In Jan 2001, the journal was renamed as *SA and NT Newsletter*, and became a supplement to *Amateur Radio* magazine.

In Western Australia

In similar fashion to other states, the *WIA Bulletin* began in June 1929 as a small document (about 150 x 210 mm). Early issues contained limited local information – more of a newsletter. Volume 3, No.2 in August 1931 increased page numbers to six and included a two-page technical article on shortwave adaptors.

By January 1932, it had expanded further to 24 printed pages. The contents included a number of technical articles, information about the Institute and office bearers, and including seven pages of advertising.

In Tasmania

To date, no record can be found of a regular local magazine, but some newspapers often had columns written by notable local amateurs that included mention of Institute activities.

The **WIA Archive** would like to hear about any other early amateur radio magazines produced by WIA State Divisions, in particular, Tasmania.

We would also like to find copies of the early Victorian magazine/newsletter, Harmonics. Contact vk3rv@wia.org.au.

Newcomers' Notebook

From developments in a lab arose a solid-state survivor

Behold, the Bipolar Junction Transistor!

Jules Perrin VK3JFP

The two basic types of transistors in wide use today are the Bipolar Junction Transistor (BJT) and the Field Effect Transistor (FET). The FET differs in construction and uses different terms for its leads; I will address it in a separate article. This article focuses on the BJT.

In a previous Newcomers' Notebook on diodes (Vol.90 No.3, 2022, pp56-57), I addressed the issue of *conventional current flow* and electron current flow. I will continue using electron current flow here. Refer to **Figure 1** for a refresh.

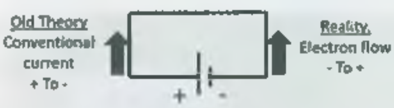


Figure 1. Diagram of 'conventional current' flow theory and reality.

Sandwich transistor

The bipolar point-contact transistor was invented in December 1947 at the Bell Telephone Laboratories in the USA. The junction version, known as the Bipolar Junction Transistor (BJT), was developed in 1948. A press release in 1951 announced the development of this new 'sandwich' transistor. The point contact transistor languished as the BJT took off. Mass-produced silicon transistors appeared during the early-1950s.

The origin of the name transistor varies, depending on who's telling the story. The common theme is that it is an abbreviated combination of the words transconductance (or transfer) and varistor (or resistor). "Transistor" stuck and has remained the name of choice.

The transistor revolutionised the field of electronics. The size of devices shrank, and power consumption levels plummeted. No longer did a product's active devices (valves or tubes) generally need mains power to run as the application of transistors ensured they could be easily powered by a battery. The development of battery-operated domestic transistor radios grew the consumer base.

Since their development, the design of transistors has reduced in size many-fold. Now, hundreds of components, including transistors, are etched into integrated circuits (ICs) on a small slice of silicon.

Two applications

A transistor can be used as a switch, or as an amplifier. The main concept is that a small current in one lead of the transistor can control a greater current flow between the other two leads.

Looking at **Figure 2**, you'll see a BJT as a 'black box' (the insides not revealed) with three leads: Collector, Base and Emitter. A small current change in the base – the input signal – can produce a greater change in the current flow between the Emitter and Collector. The shape of the signal gets inverted. As the base-emitter voltage rises, the current flow between emitter and collector of the transistor increases through the collector load, dropping the voltage at the collector.

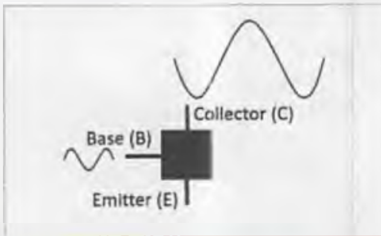


Figure 2. The BJT as a 'black box' – one needn't know what's inside. Operation of the circuit is what's of interest.

The measure of the amplification, or gain, of a transistor is called Beta (β), often expressed as hFE (for DC, or "large signal", values) or hfe ("small signal"). The 'FE' or 'fe' may be written as a subscript. There are many applications for transistors and the use of their gain parameter varies according to the application.

TRANSISTOR PACKAGES

A transistor's small slice of silicon is mounted inside a specified package, of which there are hundreds of standard types. Generally, a transistor type's packaging reflects its field of application.

Here, small signal transistors are largely grouped on the left, while the three relatively larger packages are power transistors.

The two transistors furthest left are surface-mount devices developed for high density circuit applications on specialised printed circuit boards.

On the inside: Left – a small signal device. Right – a power device; the metal package helps carry away heat. (images: Wikimedia)

Some transistors are housed in plastic cases (they'll be small signal types), while others are mounted in metal cases (power transistors); some have a plastic case incorporating a metal lug (which also generally signifies they're power transistors). The lug may be connected to the emitter, the collector, or totally isolated.

The metal case or lug of power transistors is for mounting the package to a heatsink so that heat is dissipated to keep the transistor within its designed operating temperature range.

Base material

The base material of transistors is usually silicon (Si) or germanium (Ge). Neither of these is a great conductor; so, the manufacturer "dopes" the material (injects an impurity). Doping with aluminium creates a base material lacking an electron and these are called holes. The resulting material is called P-type.

Doping with phosphorus creates a base material with an extra electron. The resulting material is called N-type.

When N-type and P-type base materials are joined, the P-type has the holes, and the N-type has the electrons looking to fill the holes. A small number of electrons will flow to fill the holes at the junction. This small junction area is called the depletion layer, region or zone.

As the name BJT implies, there are two junctions in the transistor where the materials join. Using the two material types, the BJTs can be configured as:

- NPN
- PNP

Common terms

Table 1 is a short list of common terms used when referring to transistors. Understanding these will help you in reading transistor data sheets.

NPN

The NPN transistor needs a voltage between the base and emitter of about 0.7 V for silicon (Si) and 0.3 V for germanium (Ge) to cause the electrons to flow between the emitter and the collector. This voltage is needed to move the electrons across the depletion layer. In doing so, electrons will also flow between the emitter and the collector.

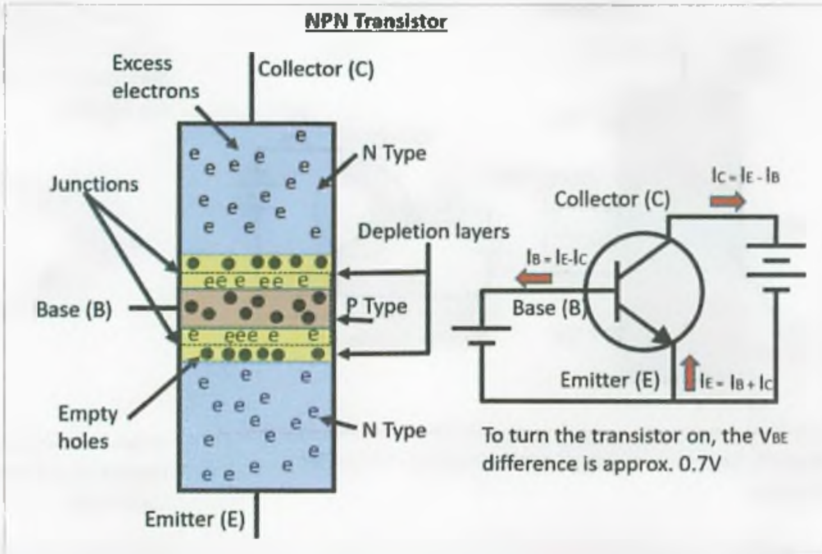


Figure 3. The construction model and basic operation of the NPN transistor.

See **Figure 3.**

NPN transistors are used:

- in switching applications
- in amplifier circuits
- in Darlington pair circuits to provide very high amplification
- as temperature sensors
- in some very high frequency applications.

A common small-signal NPN transistor is the 2N3904. Search for and read the data sheet. A common power NPN transistor is the 2N3055. Search for and read the data sheet for a comparison.

PNP

As with the NPN, the silicon PNP transistor needs a base-emitter voltage of about 0.7 V to pull the electrons across the depletion layer and cause electron flow between emitter and collector. The comparable VBE for germanium (Ge) is 0.3 V. See Figure 4. Note the polarity difference with Figure 3.

PNP transistors are used:

- as switches
- in amplifying circuits
- in Darlington pair circuits
- in 'complementary' circuits with NPN transistors
- in motor control applications.

A common small signal PNP transistor is the 2N3906. If you search for and read the data sheet, you'll see that it's complementary to the 2N3904. A common power NPN transistor is the 2N2995. Its datasheet reveals that it's complementary to the 2N3055.

Table 1.

V_{EB} or V_{BE}	Voltage between the Emitter and Base
V_{CB}	Voltage between the Collector and Base
V_{CE}	Voltage between the Collector and Emitter
$V_{BE(sat)}$	Voltage between the Base and Emitter, when sufficient IBE current is applied to fully saturate the BJT; saturation is when VCE is at its minimum, sometimes called 'fully turned on'
V_B	Voltage between the Base and circuit common (often called 'ground')
V_C	Voltage between the Collector and common, or ground
V_E	Voltage between the Emitter and common, or ground
Beta (β) or h_{FE}	Beta (h_{FE}) is a transistor's DC current gain at a particular temperature, current and voltage. β or $h_{FE} = i_{CE} / i_{BE}$
hfe	hfe is a transistor's AC current gain, which decreases with increasing signal frequency
I_B	Current in the Base
I_C	Current in the Collector
I_E	Current in the Emitter

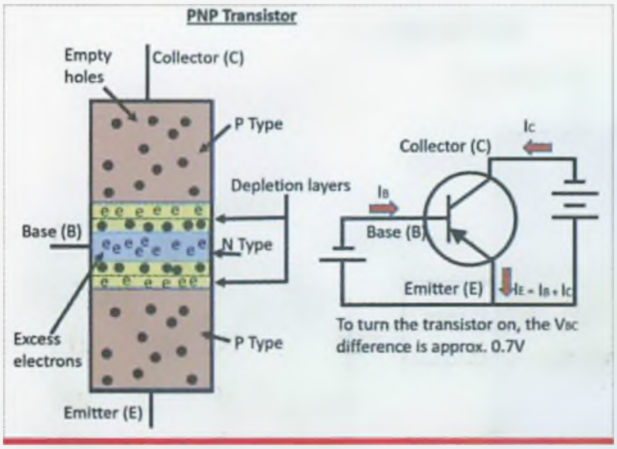


Figure 4. The construction model and basic operation of the PNP transistor.

Amplifier configurations

There are three basic single-stage BJT amplifier configurations as shown in **Figure 5**.

Common emitter. This is typically used as a voltage amplifier and offers high current gain (typically two hundred), medium input resistance, and a high-ish output resistance. The output of a common-emitter amplifier is 180 degrees out of phase with the input signal.

Common base. Also known as grounded-base, this is typically used as a current buffer or voltage amplifier when inter-electrode capacitances are critical, e.g., to avoid unwanted feedback between the emitter and collector circuits, as in RF amplifiers.

Common collector. Also known as an emitter-follower, this is typically used as a voltage buffer. Input resistance is quite high and output resistance is very low. So, this circuit can provide impedance transformation without altering the phase of the signal.

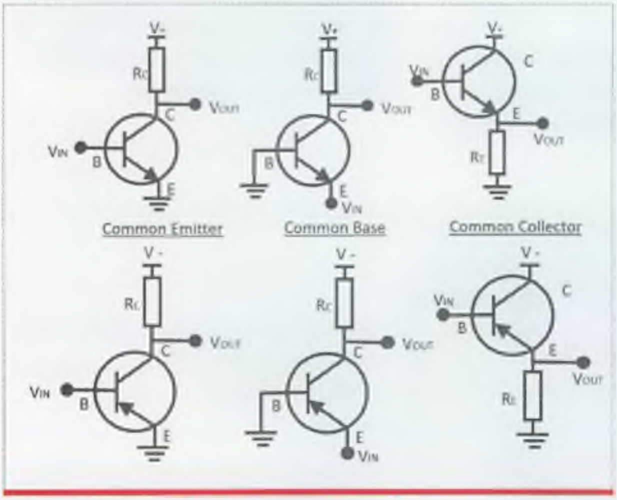


Figure 5. Transistor amplifier configurations.

The Darlington pair

Invented by Sidney Darlington in 1953, the Darlington pair, or Darlington transistor, combines two BJTs to create a very high current gain. Compounding amplification is achieved where the input current change is amplified by the first transistor and then amplified again by the second transistor. Gain of 100,000 up to a million can be achieved. See **Figure 6.**

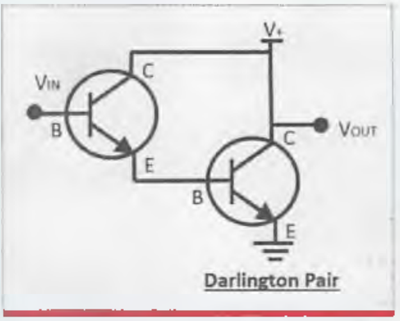


Figure 6. The Darlington pair achieves high current gain.

The Darlington transistor configuration is treated as a single unit as it has only one emitter, collector, and base; no external connection to the base of the second transistor is available.

Some Darlingtons are on the one silicon slice, or die; e.g, the BD678. You can create a Darlington with two discrete transistors, such as a 2N3904 driving a 2N3055.

This device is also known as a 'Super beta transistor' because of its high amplification properties.

Complementary symmetry push-pull amplifier

This circuit uses a pair of PNP – NPN transistors with complementary specifications and ratings to supply high power to a load. It is widely used in audio power amplifiers. It is the most efficient configuration for transforming DC power from the power supply to the AC power driving the load.

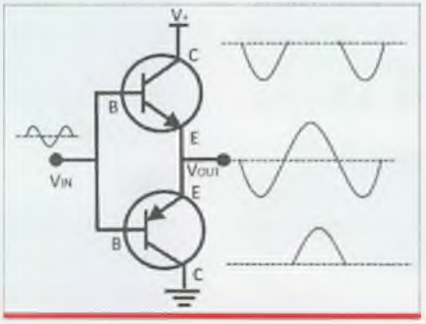


Figure 7. The ingenious complementary symmetry push-pull amplifier has many advantages.

Referring to **Figure 7**, the bottom (PNP) transistor pushes the output on the positive half cycle of the input signal, while the top one (NPN) pulls load current on the negative half cycle.

Which leg is which?

Looking at the symbol for a BJT, I use the arrowhead to remind me which leg is which. If it points inward, it is a PNP. If it points outward, it is an NPN. Also, electron flow goes opposite to the arrow in the transistor.

If you'd like to go further on the subject of understanding and using BJTs, take a look at this instructive website: https://tinyurl.com/TheBJT

If you have a topic you would like to be addressed in a future instalment of Newcomers' Notebook, email Jules at jp.bqt@bigpond.net.au

Have fun and stay safe.

Crafty project mimics speech by pulsing 1 kHz audio signal

Dude! Ditch your whistlin' rig/amp test and build this poppin' pulser

Jim Tregellas VK5JST

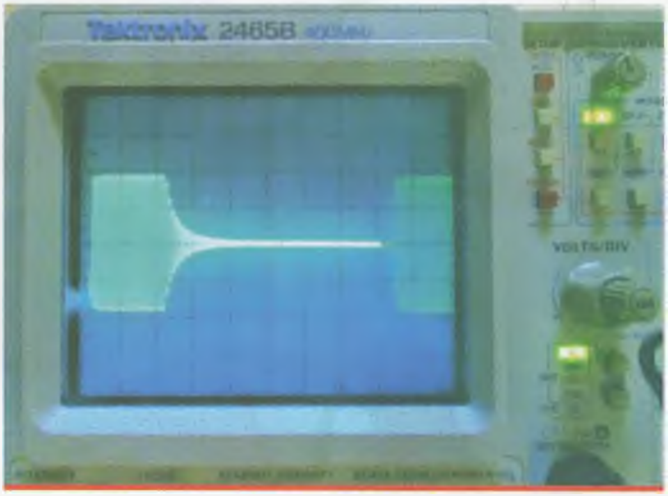


Figure 1. Oscilloscope screen shot of the project's audio output signal.

Testing and setting up HF transceivers and linear amplifiers is something of an art form, with plenty of traps for young players. Several nasty issues immediately come to mind. But, without a doubt, the most important of these is that almost all power supplies provided in commercial amateur equipment are underrated when the rig or linear amplifier is operated at full power for long periods of time and may overheat destructively. Overheating also applies to heatsinks for solid-state RF output stages.

The worst issues occur when a transceiver or amplifier is operated under FM or AM conditions, because these modes of operation create a continuous signal (as do digital modes – Ed.). SSB is more forgiving, as the signal amplitude varies in sympathy with the audio signal, but many makers take advantage of this, providing power supplies that are very underrated unfortunately when you decide to transmit continuous signal modes.

One standard test method for SSB is to apply a two-tone test signal to the microphone input of the

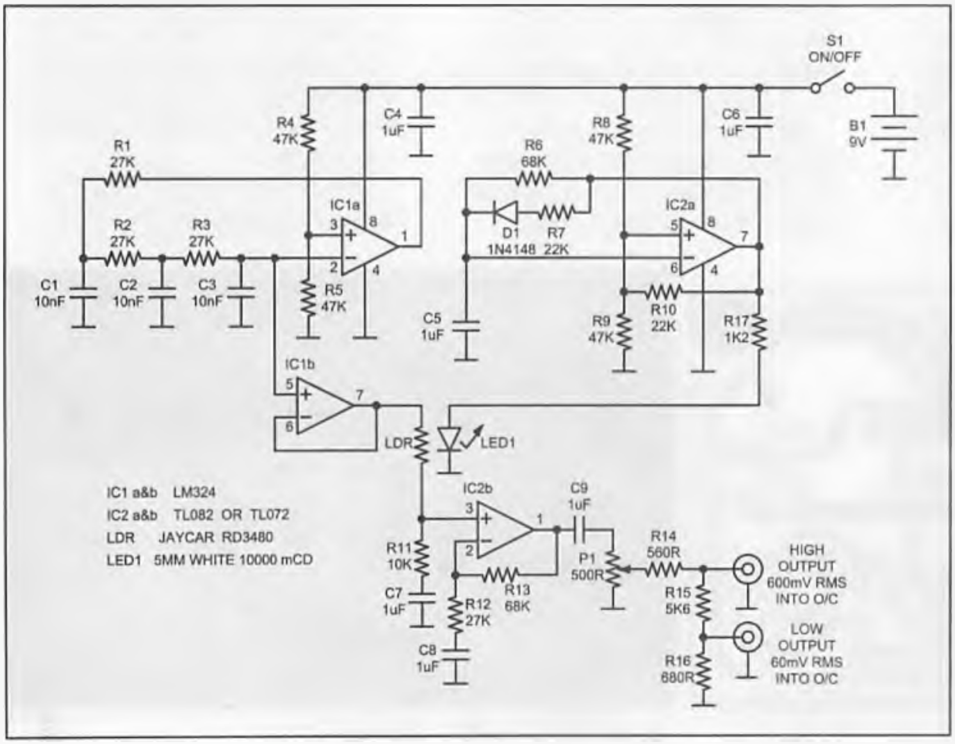


Figure 2. The circuit of this project is remarkably simple – a 1 kHz oscillator modulated at a 10 Hz rate by a 1:4 on/off square wave to mimic the characteristics of speech with compression.

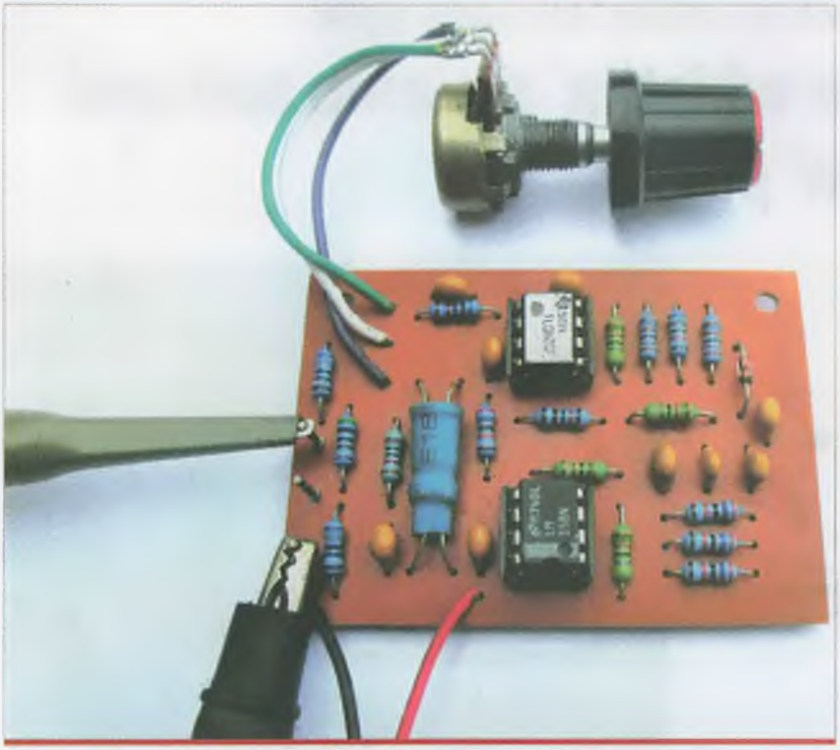


Figure 3. I built the unit using a small PC board that will fit easily into a common diecast box.

rig being tested. This is a stringent test as the resulting power developed is one half of the continuous power output possible and so cannot be applied continuously without issues arising. An interesting side issue is that, under such demanding conditions, power supply outputs sag, and the peak power obtained is less than it would be under SSB voice conditions and hence the test fails to give a true indication of performance.

So, if the test is to be realistic, what is really needed is for the test signal to *mimic* actual voice conditions. Now, typically, voice has a 1:6 relationship between average power and peak envelope power (PEP), or a 1:4 relationship if the voice signal is substantially compressed. This circuit simulates exactly that by providing short bursts of a 1 kHz sinewave at a 10 Hz rate.

The duty cycle of the pulsed 1 kHz audio signal from this project is 25%. This mimics the compressed human voice and allows you to conduct continuous testing without over-taxing (or perhaps overheating) your rig. To measure the resulting output power means you will need a power meter that can display PEP (such as described in *Amateur Radio* Vol.89 2021 No.6, pp18-23, *Digital display VSWR and RF power meter*).

How it works

The circuit is shown in **Figure 2**. A 1 kHz sine wave is developed by IC1a. This is the dual form of the standard phase-shift oscillator to be found in the literature, which uses a high-pass network, and is almost impossible to adjust for a good sine output, in my experience.

To get such an oscillator working involves getting a good sine at the amplifier output, which in turn means setting the loop gain exactly so that a good sinewave is present at all points in the circuit, a process that is not helped by the high-pass network which, by its very design, passes harmonics!

This circuit works by simply providing a very large (and non-critical) amplifier gain, with a square wave resulting at the amplifier output. After filtering of the square wave through the following low-pass network – R2-R3-C1-C2-C3, a quite good sinewave results at the amplifier input (pin 2) which, in turn, is then re-amplified to become a square wave.

The amplifier IC1a is biased to half the supply rail via the voltage

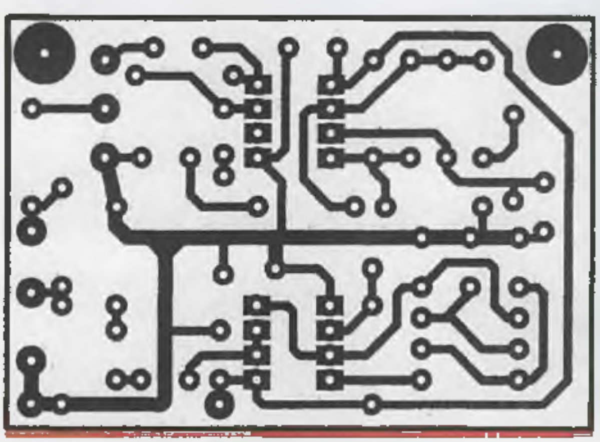


Figure 4. Printed circuit board artwork.

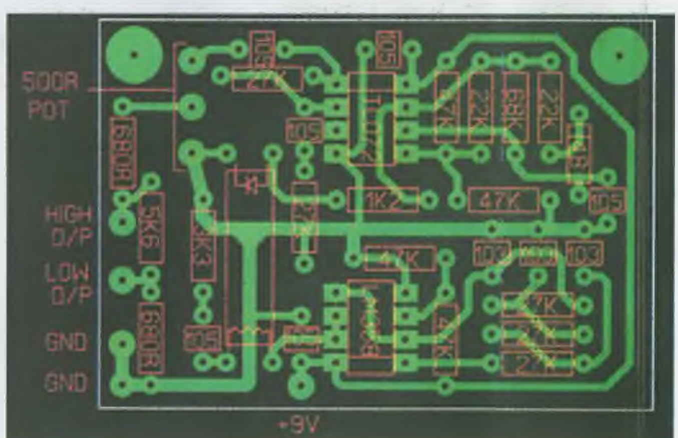


Figure 5. Printed circuit board component overlay.

divider R4-R5, resulting in a 550 mVp-p (peak-to-peak) sinewave sitting on top of a dc level of 4.5 volts. IC1b is connected as a unity gain amplifier to provide low impedance buffering of this signal.

The 10 Hz rectangular wave is generated as follows. IC2b is a low frequency oscillator in which the output (pin 7) switches rapidly between the op-amp's maximum and minimum possible output levels (0.6 V and 7.6 V), in turn charging C5 via D1-R7 and discharging C5 via R6.

Positive feedback via R10 to R8-R9 establishes Schmitt trigger levels at the non-inverting input (pin 5) of 2.5 V and 6.1 V which, when exceeded across C5, cause the output to switch states. The rectangular output waveform is caused by C5 charging faster via D1-R7 than it discharges via R6.

The rectangular output of IC2a is applied to LED1 , turning it on and off. The light-dependent resistor, LDR, varies its resistance accordingly, from a high value to a low value, thus varying the sinewave output of IC1b due to the potentiometer action of the LDR and R11.

The LDR and LED are close-coupled within a piece of heatshrink tubing. The LDR resistance varies from about 2000 ohms when LED1 is on, to many hundreds of kohms when it's off. This switching technique results in *no* dc level shifts during switching and hence no odd audio effects.

The resultant pulsed audio is applied to IC2b (which has a gain of 3.5) and finally to the output level potentiometer (P1) and attenuator (R14-R15-R16).

Parts List

Resistors and potentiometer

All resistors are 0.25 watt 5%)

2@ 680R
1@ 1k2
1@ 5k6
1@ 10k
2@ 22k
5@ 27k
4@ 47k
1@ 68k
1@ 500R linear potentiometer
1@ LDR Jaycar Part No. RD3480

Capacitors

All capacitors are 25 or 50 volt monolithic multiplate types with 0.2 inch (5.08 mm) lead spacing.

3@ 10 nf
5@ 1 uF

Semiconductors

1@ LM358
1@ TL072 or TL082
1@1N4148
1@ LED 5 mm dia. 10000 mCD white

Miscellaneous

1@ PCB single-sided 61 x 43 mm
Short length of 5 or 6 mm dia. heatshrink tube.

Final comments

When you build this, use a diecast box. You can probably use a plastic box, but don't blame the author if you experience RF feedback! Depending on demand, I may get a few printed circuit boards made.

Author contact:
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A novel shack earthing hack

Earthing and bonding at Trig Point Hill

Peter Sumner VK5PJ
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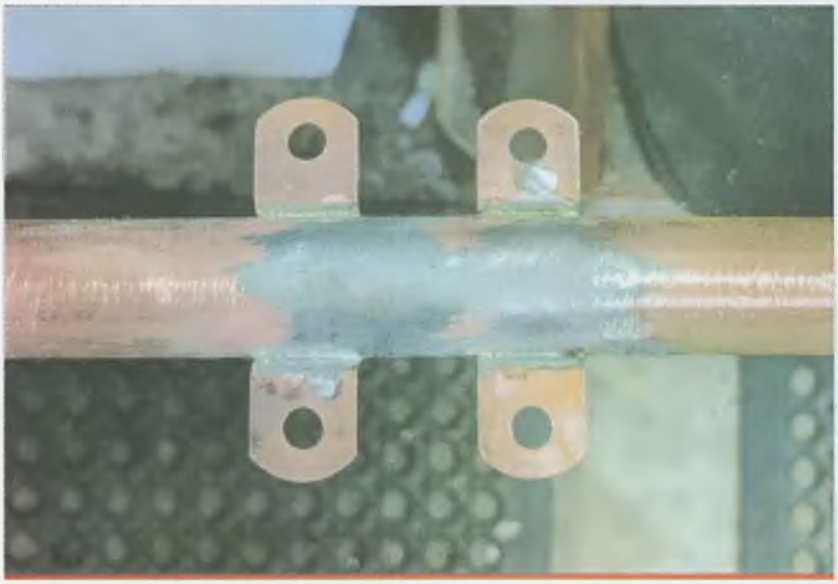


Photo 1. Two copper saddles soldered onto the earth pipe for connections to the radio gear.

A sometimes-forgotten part of a ham's shack is the earthing system. I must admit I had only made half-hearted attempts at a good RF station earth, which is odd as my earlier working life had a large component of making sure all gear was properly bonded and earthed. I am not sure if it was the cost of heavy copper cable and copper bar stock that put me off, but I just always seemed to find a reason not to do it in my shack.

Some while back, I had a light globe moment. Why try and use all these fancy earth bars when I had some left-over copper gas pipe (19 mm outside diameter) in the shed? A scheme was hatched to use commonly available hardware store parts to make a shack earthing system that could be flexible to use and not break the bank.

Elbow and saddles

My operating area is an L-shaped desk, so I bought a 19 mm copper elbow to fit my scrap 19 mm pipe, along with some heavy duty solder and a handful of copper saddles to fit the 19 mm pipe as connection points. I borrowed a small gas torch as my old Birko heavy duty soldering iron was not up to the task.

The method I settled on to bond each piece of my radio gear to the pipe was to use a flying lead between the gear and the nearest copper saddle. In the end, I mounted the pipe on the rear of the operating desk, passing the flying (earth) leads through existing holes.

I first measured the lengths of copper tube needed to run behind my desk. I only had to cut the tube in two. I then soldered my two pieces of 19 mm copper tube into the copper elbow so I could take it to the desk in my shack and mark on it

Photo 2. Copper saddles located at different points, to be adjacent to radio gear on the shack desk. I didn't manage to solder each in place at the same angle!

Photo 3. The 90-degree elbow joining the two pipe lengths to fit the rear of my operating desk.

where I needed the earth connection points to be.

Some places on the shack desk have lots of gear closely grouped so multiple, closely-spaced copper saddles were needed in those spots. I attached these connection saddles crest-downwards, the opposite direction to that needed to secure the pipe to the desk; see Photos 1, 2 and 3.

Looking back at it, I should have used a pop rivet through each saddle crest and the pipe, to help locate it on the pipe. Soldering the multiple copper saddles in some places became tricky when I could not control the heat from the gas flame. This resulted in a number of oddly-angled saddles because they slipped around the pipe when the heat was on! Note to self: do not do it like that again.

I cleaned-up each saddle to get bright metal, as well as the locations on the pipe where they were to go. Then, I tinned the inside surface of each saddle followed by tinning each location on the pipe where a saddle was to go. This was a bit messy, but effective. As I mentioned earlier, a pop rivet through the crest of a saddle and the pipe probably would have been a good way to keep each saddle in the right spot when the heat was applied.

I hammered a copper-coated steel earth spike (bought from Bunnings) into the ground just outside my shack and arranged a wall exit to run a link between the earth stake and the shack earth.

At the end of the copper pipe nearest to my wall exit point, I flattened the pipe using my vice and a hammer to create a 'tab' through which I could drill an 8 mm hole. See Photo 4. The purpose of this was to attach a lug on my cable leading out to the earth spike just outside the shack wall.

Flexibility

For the flying leads used between the rear of the radio gear and the earth system, the cable I chose was from the RS components catalogue as it has a high strand count, making it super flexible, one of my main criteria for it.

I think this is where I blew my budget, as I could have settled on a lower-spec cable. But, once again, my previous work experiences drove this choice. Our Quality Assurance person at Jindalee where I worked previously would have been happy with my cable choice, for once.

The cable I installed between the end of the copper pipe to the earth stake outside was a bit of a fluke. I was given a short length of cable from a commercial transmitter install and had spirited it away (as you do) because "it might come in handy one day." This proved to be ideal for the purpose here *but*, on the flip side, you could use multiple lengths of the more common household earth cable in a bundle. There is nothing that says it has to be *one* cable.

For the connecting lug, I visited my local car parts people and bought a heavy duty crimp lug to fit the cable I had. If you chose the multi-cable bundle solution, then you could use a similar cable lug or many smaller crimp lugs. There is no strict 'best way' here, it is all about getting a low resistance connection.

You must remember, this earth is not there to carry high current, just to create a low impedance path between the radio gear and to provide a common earth point for the shack.

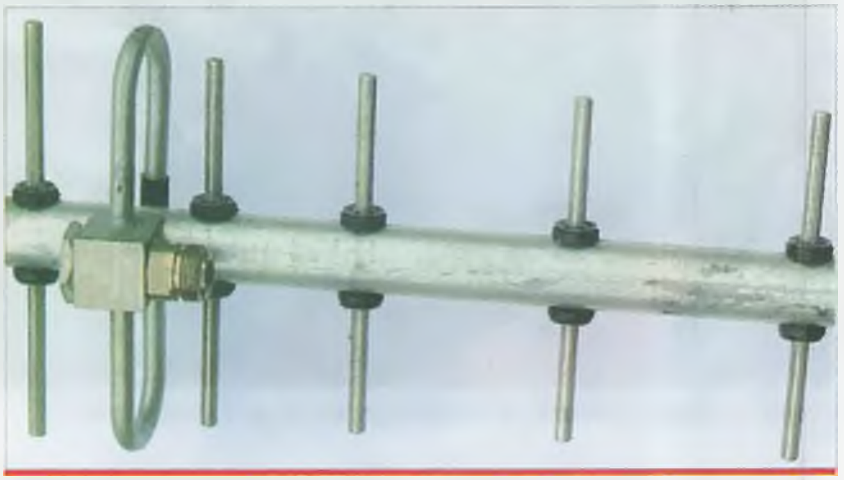
Photo 4. The flattened pipe end, before drilling to take a bolted-on lug for the earth stake link.

Here's the drill for VHF-UHF Yagi builders

Dude! Yagis should have round booms and parallel elements

Peter Sumner VK5PJ

The use and drilling of round boom material should not be beyond the average ham's workshop. Since the cheaper brands of home handyman tools have become common in the stores, the ability to own the needed tools has become an affordable reality for most.



Largely ubiquitous in VHF-UHF station installations from 6m through 23cm, Yagis of a few elements to 10s of them offer the best results for the amount of "hardware in the air". More so for portable field day operations! Camera lens distortion makes the elements here appear non-parallel (*- Ed*).

If your txool needs to build VHF-UHF Yagis are not yet fulfilled, you might consider borrowing them, or at least the use of them.

Why do I prefer round booms over square?

1/ I am a traditionalist. A Yagi should have a round boom.

2/ There are telescoping sizes available in round tube, square sections have no neat-fitting telescoping sizes. This is important if you wish to lengthen, join or strengthen a boom as the neat mechanical fit of telescoping sizes of round tubing provides both strength and relatively low weights.

3/ A round boom provides a lower profile for side winds and, in the long run, reduces the load on the rotator and tower, in my personal opinion.

Basic needs

Most of the tools needed to produce a drilled boom for your next VHF or UHF Yagi are modest and can be found in either yours or a close friend's workshop. The only exception to this is the *sliding jig-and-clamp* to keep the boom aligned (see **Photo 1**). But I'll get to that in a minute.

So, let's start with a little list of basic hand tools you will want to have around.

- **Drill bits.** It's best to have both metric and imperial sizes available for drilling metal, including a large bit to act as a de-burring tool (unless you have the real thing).
- **Hand-held power drill.** A mains or battery-powered drill that you are happy with and is not too heavy to hold.
- **Small drill press.** These are quite cheap and can still provide good accuracy for this task. Even the frames/stands holding a hand drill (e.g, Jaycar TD2463) are up to most tasks. You might consider borrowing one.

Photo 1. The *sliding jig-and-clamp* tool essential for keeping the boom aligned during drilling.

Figure 1. My boom drilling setup, ready to go. Inset – the other view of the setup.

Table 1 – TOOLS LIST

Copy this list and tick-off each item as you acquire (buy-beg-borrow) it.

- ❑ Drill bits
- ❑ Hand-held power drill
- ❑ Small drill press
- ❑ Centre punch
- ❑ Hammers
- ❑ Files
- ❑ Pipe cutter
- ❑ Tape measure
- ❑ Spirit level
- ❑ Pens
- ❑ Spanners

- **Centre punch.** Either a manual type, which requires the use of a small hammer, or a spring-loaded self-puncher (e.g, Jaycar TH1770).
- **Hammers.** Get a small engineer's hammer and a bigger claw hammer for times when something needs a real whack.
- **Files.** Both round and flat types.
- **Pipe cutter.** This should be big enough to cut tube up to 30 mm diameter and, depending on the type, possibly a second one to cut smaller diameter material for your elements.
- **Tape measure.** Do not skimp on cost here. Where possible, opt for one that can get you from one end of a long boom to the other, or close to it. This will help reduce marking errors (personal experience).

Figure 2. Sack trucks make good supports.

Figure 3. The boom is self-centred by the V-block of the jig.

Figure 4. Ready to go!

- **Spirit level.** It does not need to be overly long, used mainly for the setup process to get the bed of the drilling jig level and the drill vertical.
- **Pens.** Reasonable quality fine-point permanent ink marking pens and/or a good HB pencil.
- **Spanners.** Assorted spanners are endlessly necessary to tighten clamps (adjustable types are handy).

The tools list is in no way excessive and, except for the drill press, many would probably be in your shed or workshop already; okay, maybe not the tube-cutter, but you owe yourself the treat of buying one, they work much nicer than a hacksaw on aluminium tube.

You will notice that a hacksaw is *not* on the list of tools. It is probably the most dangerous tool to have around for cutting aluminium tube as it can wander horribly and spoil an otherwise great looking boom.

Choose a Yagi design

Decide on a design well before you start to assemble your materials.

Be sure the chosen design can be scaled or adjusted to meet your available material or that you have the same material used in the original design.

Many builders have come unstuck by thinking they can fudge an existing design to a new material size.

I am not here to push or recommend a particular design, this part is all up to you.

The jig

This jig, in many ways, is the heart of how it all comes together. It comprises three parts, one being a length of rectangular hollow-section (RHS) tube – 70 x 45 mm in my case – that you can buy from your local metal supplier. The next two parts require you to do a bit of cutting and bolting to assemble the components into the finished items.

Rather than trying to describe blow-by-blow of how they were built, I am sure that each of you will have your own take on how best to get to the finished product. I am only trying to show that it can be done in a home workshop with a minimum of tools.

My jig you see here is loosely modelled on a friend's setup (all thanks to Bob VK6KRC) who has built many more Yagis than I have over the years. His jigs were hand-crafted works of art, whereas mine are from the 'Meccano Set' school of assembly!

Figure 5. The other side view of Figure 4.

Figure 6. Securing the RHS tube.

Figure 7. The 'V' jigs: fixed on the left, sliding one at right.

This is where the action happens, the boom material will be self-centred by the V-block of the jig, which is secured in place on the RHS tube under the drill's chuck. A pilot hole has been drilled in the valley of the V to allow the position of the drill and the jig to be aligned.

In **Figure 3**, you might notice that I have not yet done the final alignment and the drill is to one side of the valley of the jig. Once the jig is checked, each subsequent hole drilled will be centred on the boom.

The basis of the jig can be thought of as a bed, like that used in a lathe, in that everything on the jig moves relative to this bed. This provides you a consistent reference for each of the drilled holes in the boom material, so that they all stay in alignment.

By having the sliding clamp and the drill locator point as items attached to the bed, the angle of each hole should be repeatable each time you lower the drill press head to drill a new element hole.

As the cliché goes, a picture is worth a thousand words, so here follows a series of photos of my boom drilling jig setup.

Firstly, **Figure 1** shows an overview of my boom drilling setup out the front of the shed. Your driveway could just as easily be used for this. Anywhere you can get enough area.

When assembled, there is not much to it – one drill press, one length of RHS tube and two custom-made clamps.

Sack trucks are a cheap and plentiful around my place, hence they get repurposed for all sorts of jobs. You can see that there is a length of 32 mm aluminium tube on the jig ready to go for one of two 13-element YU7EF-design 144 MHz Yagis that were built in a batch when this setup was photographed.

Figure 8. Underside of the fixed jig.

In **Figure 4** we are ready to drill our first hole. I would normally first do this with a section of scrap tube to check I have not made any errors ("measure twice, cut once").

Figure 5 shows another view of the business end of the drill and tube. The V created by the jig provides a simple way to keep the tube located where it is needed *at all times* during the drilling process.

Figure 9. Overview of the fixed jig.

Figure 10. A view of the fixed jig in place.

Figure 11. The sliding-jig-and-clamp *in situ*.

Figure 12. Another view of Figure 11.

Figure 13. Overview of the sliding-jig-and-clamp.

Let's look at how you might make some similar 'V' jig. These are all pieces of scrap I bought from a local metal retailer at the time. Most parts are cut and bolted together as that is what I was limited to in my home workshop. Where welding was needed, I relied on a friend to do that as I did not have the skills or equipment to do welding.

I think every version made will be slightly different, but what I want to convey is that, with a little bit of thought, you can easily overcome the mechanics need to accurately drill a round boom for a Yagi.

The 'bed' for the jig has only one addition, a flat plate that is used to secure it to the drill press. This is shown in **Figure 6**. The central bolt also acts as a rough locator on the drill press platform.

Two outer bolts secure the plate in place to ensure there is no movement between the bed and the drill-press platform.

Figure 7 shows the two jigs sitting on the bed, the fixed jig to the left and the sliding jig to the right. The sliding jig is used to clamp and stop the tube twisting as you progress drilling element holes.

Figure 8 shows the underside of the fixed jig, while **Figures 9** and **10** show different profiles of it. For the keen eyed among you, yes, that is my camera lens cap keeping the two parts of the sliding-jig-and-clamp apart for the photos.

The sliding jig is just as important as the fixed one under the drill, without which we would just get a series of holes on random angles – not a pretty sight for a VHF or UHF Yagi.

Figures 11, 12 and 13 show the sliding-jig-and-clamp at various angles that should give you a fair idea of the very basic construction.

The procedure

The process is quite straightforward. Mark out the element positions on the tube, remember the ancient adage – measure twice, drill once. I have made enough mistakes over the years to fill a few scrap bins.

Set up the jigs. Test that the drill goes centrally through the pilot hole in the valley of the fixed jig. Find the right drill size for the element holes. If at all possible, buy a new drill bit. Or, if you can sharpen the one you have, do so to ensure you get clean holes.

If you can find a metric or imperial drill size that is just *under* the needed size, then it is often best to have an ever so slightly smaller hole than needed as it is easier to remove some metal than to put it back in the hole.

Start drilling and sliding the tube along to the next hole. When the sliding jig gets close to the drill bed, turn off the drill and manually wind the drill down into the last hole if your drill press allows. Lock it in place. This has now locked the angle of the tube in preparation for the sliding clamp to be moved.

You can now loosen off the clamps on the sliding jig and move it back down the bed and tighten it again. You are now ready to carry on drilling. If it's a very long boom, then you may have to repeat this procedure a few times.

Figure 14 shows a boom for a 70cm Yagi I did some time ago. Sorry for the blurry depth of field, I had forgotten to put the camera on manual.

I recommend your boom should always be longer than the needed length during the drilling process, this allows for the sliding clamp to still have a firm hold on the tube when you get to the last hole needed. The boom can be trimmed afterwards to your preferred length.

Figure 14. A 70cm Yagi I made earlier!

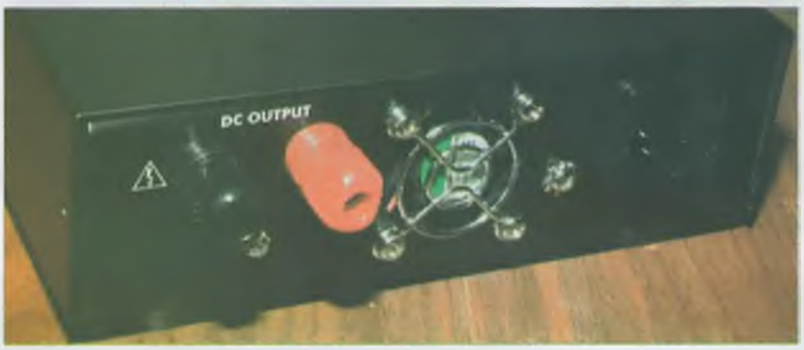
Figure 15. I allow 150 mm at the boom ends.

Figure 15 shows my hand holding the very end of a 70cm Yagi boom that has not yet been trimmed. As a rough guide, I allow an extra 150 mm for the boom length for this purpose.

Given a bit of thought, it is not beyond the home handyman. Maybe your friends or club could hold a workshop day and make the setup time worthwhile, sharing tools and any costs.

Adding Anderson Powerpole connectors to a Manson switchmode power supply

Peter Forbes VK3QI, VI3P



The popular Manson SPA-8230 13.8 VDC high current supply is said to be 'designed for use with radio equipment,' featuring low RFI emissions, high efficiency, fault protection and a small footprint. The front and rear panel layouts may be swapped left to right, depending on where or when you bought it! Output connections include a front panel cigarette socket (10 amps) and rear panel binding posts (20+ amps). Adding Anderson Powerpoles makes for plug-and-play convenience.

Many amateurs have the Manson SPA-8230, or similar, switchmode power supply to power their transceivers. Apart from a front-mounted cigarette socket, they usually have rear panel banana style binding post connectors, or large spade style terminals, to provide the necessary 13.8 volts DC at 20 amps, or so.

Given that many amateurs prefer to use Anderson Powerpoles for easy and non-confusing connections, it is convenient to have Powerpoles installed on the power supply.

Getting suitable Powerpole chassis-mount connectors has always been problematic. But recently, 3D printed easy-mount shells that are able to house varying numbers of poles became obtainable. One such supplier is Anderson Connect in Carrum Downs, Victoria, who manufacture a variety of such shells that fit the 15/30/45 amp style Anderson connectors (**Photo 1**). See: www.andersonconnect.com.au/store/

Photo 1. These 3D-printed shells will hold a stack of three Powerpoles and are small enough to fit on the front panel of a Manson SPA-8230. Right - rear view of a shell.

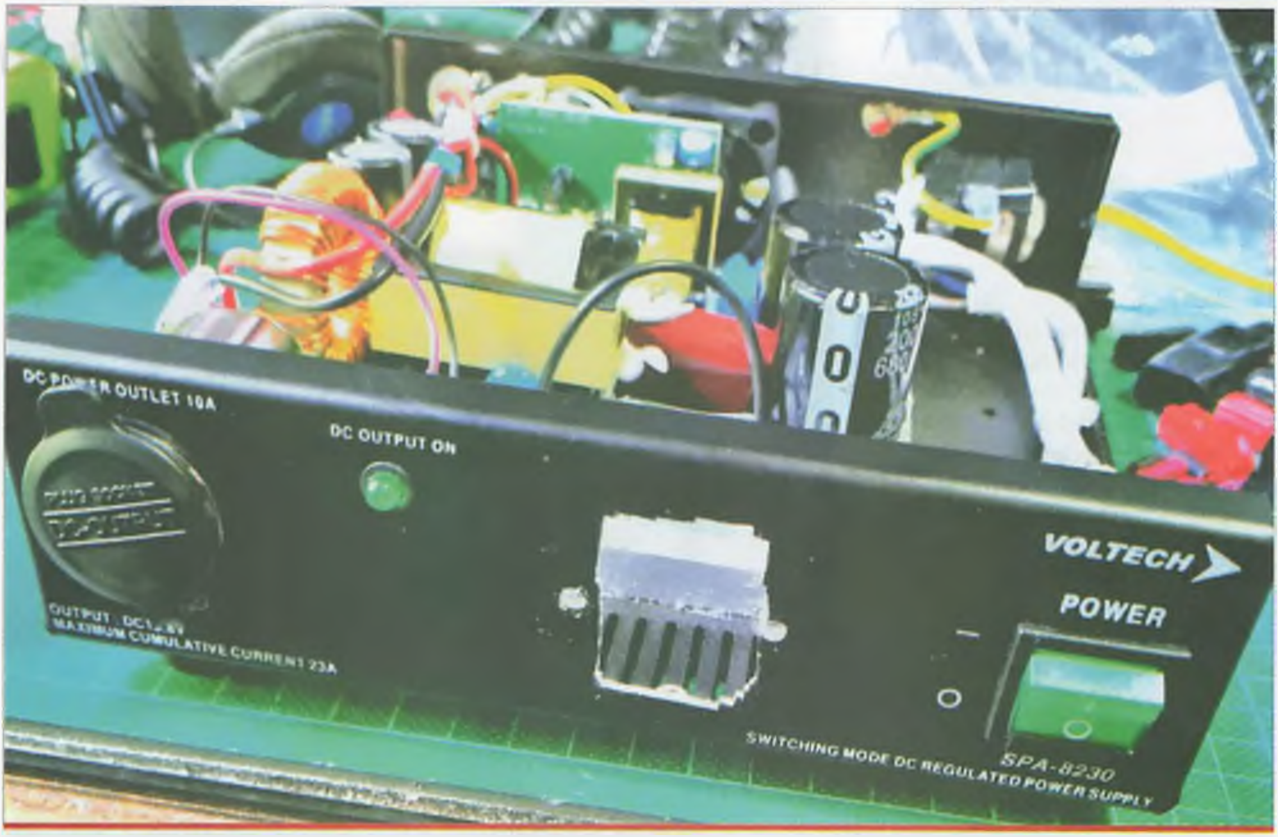


Photo 2. A little metalwork is needed to create a hole for the 3-pole connector shell. Excuse the rough nibbling – you can't see it in the finished product! The shell has a skirt that covers the rough hole edges, thankfully.

What drove me to it

The club I belong to, the Eastern and Mountain District Radio Club (EMDRC – www.emdrc.com.au) organises a widely-known, top-scoring portable station to participate in VHF-UHF field days under the club call sign.

The VK3ER/p tent on the hilltops now uses Icom IC-9700 transceivers for 2m and 70cm. Having recently bought a Manson SPA-8230 to power the rigs, I thought it convenient to provide a number of Powerpole connections.

With no metering, it looked to me that the Manson had enough panel space to fit a 3-pole chassis connector shell.

Metalwork and more

Taking a bit of care with a drill and nibbling tool, I was able to create a suitable opening for the 3-pole chassis connector shell to fit, as you can see in **Photo 2** and **Photo 3**.

Bundled wires for each pole are solder-joined and then insulated with heatshrink and connected back to the main rear binding post terminals where they are soldered in place.

Photo 3. A rear-side view of the hole I created in the front panel.

Clip-on (or clamp-on) "type 31" ferrites (e.g, Mini-Kits FB31-167281, or similar – Ed.) are added, just to ensure that additional RF filtering is provided in case the added wiring picks up additional switching noise by coupling to the circuit board components.

A word of warning – care should be taken in making sure that the Powerpoles are connected the same way as the plugs that will plug into them. It is possible to reverse the connectors by 180 degrees. If that occurs, it is easy to knock out the connectors from the 3D printed shell using a piece of suitably-sized wood while the outer shell rests on a vice.

If you are contemplating using Anderson Powerpole connectors for your projects, the EMDRC – through Layton, our components man – has a good supply of plugs and terminals, together with the correct crimping tool. Visit: www.emdrc.org.au

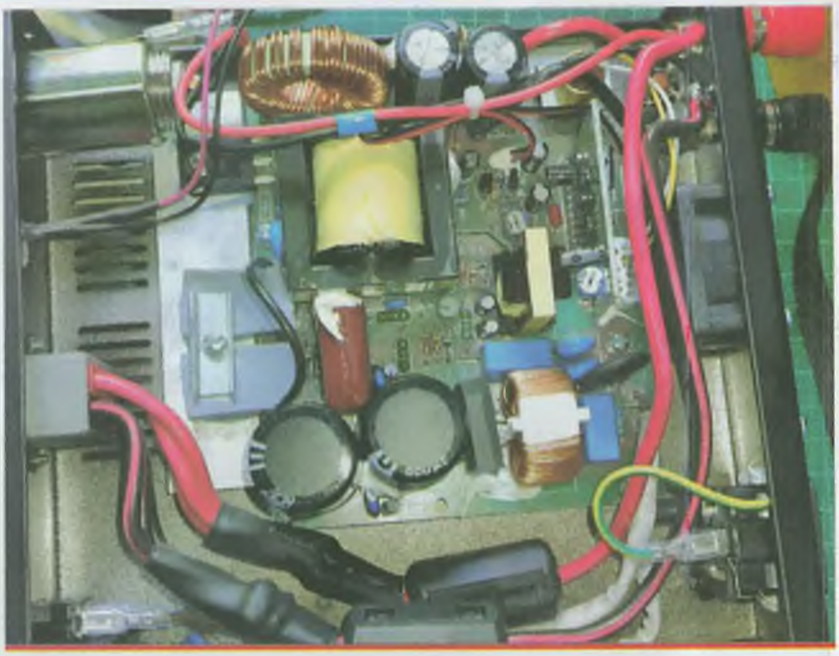


Photo 4. Each set of red and red/black Powerpole leads are soldered together, to be connected to the rear binding posts via a single heavy lead. The joints are first covered with heatshrink. Clip-on ferrites deal with any RFI picked up from the PC board.

Photo 5. The finished product looks neat and is quite convenient.

Soldering to stainless steel

Peter Sumner VK5PJ

Photo 1. Using a common fluid as flux, soldering to stainless steel is straightforward.

On some occasions, the need arises to electrically connect to a stainless steel part. In most cases that I've seen, people have used a compression joint to achieve a connection. This is not always a good solution when the connection point is subject to the rigors of outdoor weather.

I first came across this when a friend showed me some stainless rod from an old locally-made VHF whip that had a heavy duty Ampex solder lug attached to its end.

At first, I thought it was just a friction fit, but upon closer inspection I could see a fully-flowed solder joint with good wetting along the stainless steel rod. I thought this was black magic until Bob VK6KRC showed me how.

The product you need is a generic 'rust converter' fluid, available from most hardware or paint stores (e.g, Corrofix, Septone – Ed). Check the container to ensure the active ingredient is *phosphoric acid*. You use this rust converter as a paint-on flux for the stainless steel. (Read the product's *safety advice*; avoid skin or eye contact. – Ed).

I solder through the rust converter with an older Weller soldering iron (1980s style) and normal '60/40' (SnPb) flux-cored solder. Once the area to be soldered is tinned, you treat it like any other solder joint and clean up with isopropyl alcohol and an old toothbrush.

Please only do this procedure in a well-ventilated area, as I'm unsure of the content of the fumes when soldering and would hate to think someone gets ill from soldering to stainless this way.

Soldering to aluminium

Peter Sumner VK5PJ

This one is harder than the soldering to stainless steel procedure. Aluminium is a very good heat conductor, which makes this a challenge.

Firstly, clean the spot you want to solder to, then apply *light machine oil* to this area and clean again with a small piece of wet-and-dry sandpaper; apply more oil, if needed.

The area you want to solder to must maintain a film of oil as this stops the very quick oxidation process that aluminium exhibits when in contact with the air.

Once you're happy with the cleaned spot, get your soldering iron ready with a hot tip and your (60/40) solder. Be prepared for this to take a while as the aluminium will draw away the heat you apply and not let the area get hot enough to tin.

During tinning, you may need to clean and repeat the process. Your patience should be rewarded with a tinned area on the aluminium that you can then re-work to connect a wire or other conductor. Do not expect the aluminium to give up its resistance to being soldered too easily. It's a tough customer, but success can be sweet.

Note: I have not ever tried to use a flame as that would, I suspect, just burn the oil away too quickly.

Preserving aluminium joints outdoors

Roger Harrison VK2ZRH

Photo 2. Alminox comes in small tubes – use it sparingly.

Aluminium rod and tube is used widely in building antennas, particular for beams on the HF bands and through the VHF-UHF bands. Joints and connections are rife in antennas built with aluminium. Out in the weather, joints and connections deteriorate and antenna performance declines.

In the far distant past, I was introduced to the preservative properties of a product known as *Alminox*. Indeed, the indefatigable Gordon McDonald VK2ZAB (SK), a keen antenna builder, praised its properties in *Amateur Radio* back in the June 1987 issue, page 48. Maybe it was him.

Gordon said: ". . . [it] works like a beauty and saves the frustration of the yearly maintenance of your antenna system," and added ". . . moreover, if you wish to make modifications, those joints will come apart with little effort, and the aluminium will be found to be still bright and shiny."

Alminox is a Utilux product, sold in 250-gram tubes under product code H2397. It is described as an electrical jointing compound, ". . . recommended for aluminium to aluminium bolted or compression connections. It creates sound electrical connections, preventing oxidation and corrosion and providing excellent outdoor weathering protection . . . it contains zinc particles that penetrate the oxide film that forms on aluminium surfaces, providing low initial contact resistance. The compound seals out air and moisture, preventing oxidation and corrosion, and ensuring high conductivity."

It can also be used where the jointing components use dissimilar metals. The inclusion of zinc particles differentiates it from other jointing compounds.

A good joint can be hard to find

Roger Harrison VK2ZRH

Photo 3. Duralac is sold in automotive, maritime and electronics stores (e.g, Jaycar – NA1026).

Protecting electrical joints of dissimilar metals involves quite a bit of science. Contact between dissimilar metals invites galvanic corrosion (after Luigi Galvani). Also known as bimetallic corrosion, the process, and the problem, occurs because one metal in the joint will oxidise when an electrolyte is present, such as – water, salts, or even bacteria. (I knew that a course in Properties of Materials I did as a student back in the 1960s would come in handy, one day).

A corrosion combating electrical jointing compound called *Duralac* was apparently developed by the US aerospace industry and is now widely used in the metals fabrication industries. It is a viscous compound and particularly recommended where aluminium and stainless steel come in contact (think – antennas).

Duralac's purpose is to seal a joint to inhibit the electrolytic process. It is sold in small tubes and is expensive, but you only need to use a tiny amount (undiluted). It is best applied with a small brush. The volatile solvent in it evaporates and the compound sets to the touch, but remains tacky for quite a while.

Liquid Silastic

Peter Sumner VK5PJ

At times there is a need to ensure your sealant of choice gets into all of the nooks and crannies of a project that is going to spend time outside. For me, it was ensuring that the feedpoint of a VHF Yagi project received the best treatment I could muster.

I had heard mention of some people using 'liquid Silastic' and, thinking this was indeed a product you could buy, I dutifully went and asked Mr Google.

To my surprise, there were any number of references to liquid Silastic, but not to a product. Instead, online answers referred to a way to thin-down normal Silastic from its paste-like consistency to something closer to a liquid.

The thinner in question is mineral turpentine. Yes, that container of paint clean-up fluid is calling out to you from the dark corners of the cupboard: 'let's have fun and make some liquid Silastic.'

There is no special trick to this. Find a surface you can use to mix on, probably an old bit of plastic like an ice cream container lid is best as it's smooth and sturdy. Deposit a big blob of Silastic onto the mixing board and shape a depression in the middle. Add some turps. Start mixing, repeating the addition of turps as you continue and mixing until you get your desired consistency.

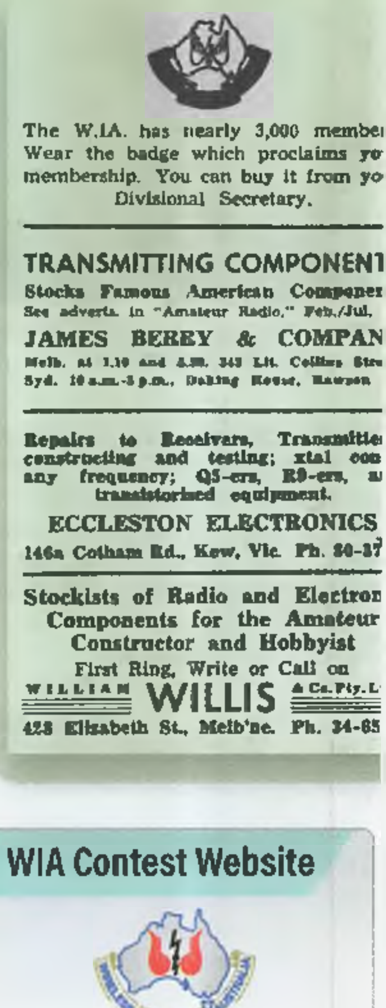
You can then pour the result into or onto the area you want to protect. In my case, the liquid Silastic completely covered the Yagi feedpoint and coax with no air bubbles or sneaky missed bits. I was impressed!

You will need to allow a longer drying time for the liquid version of your concoction, but so far it has stood up to 18 months of weather in my case, with no sign of being in any way inferior to its un-thinned cousin.

While this is not a trick you would use every day, it is handy to have in your arsenal of answers and will impress others when you demonstrate how easy it is to do.

THE WAY WE WERE

A clip from *AR* mag, December 1964, page 31.



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WIA Contest Website

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

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

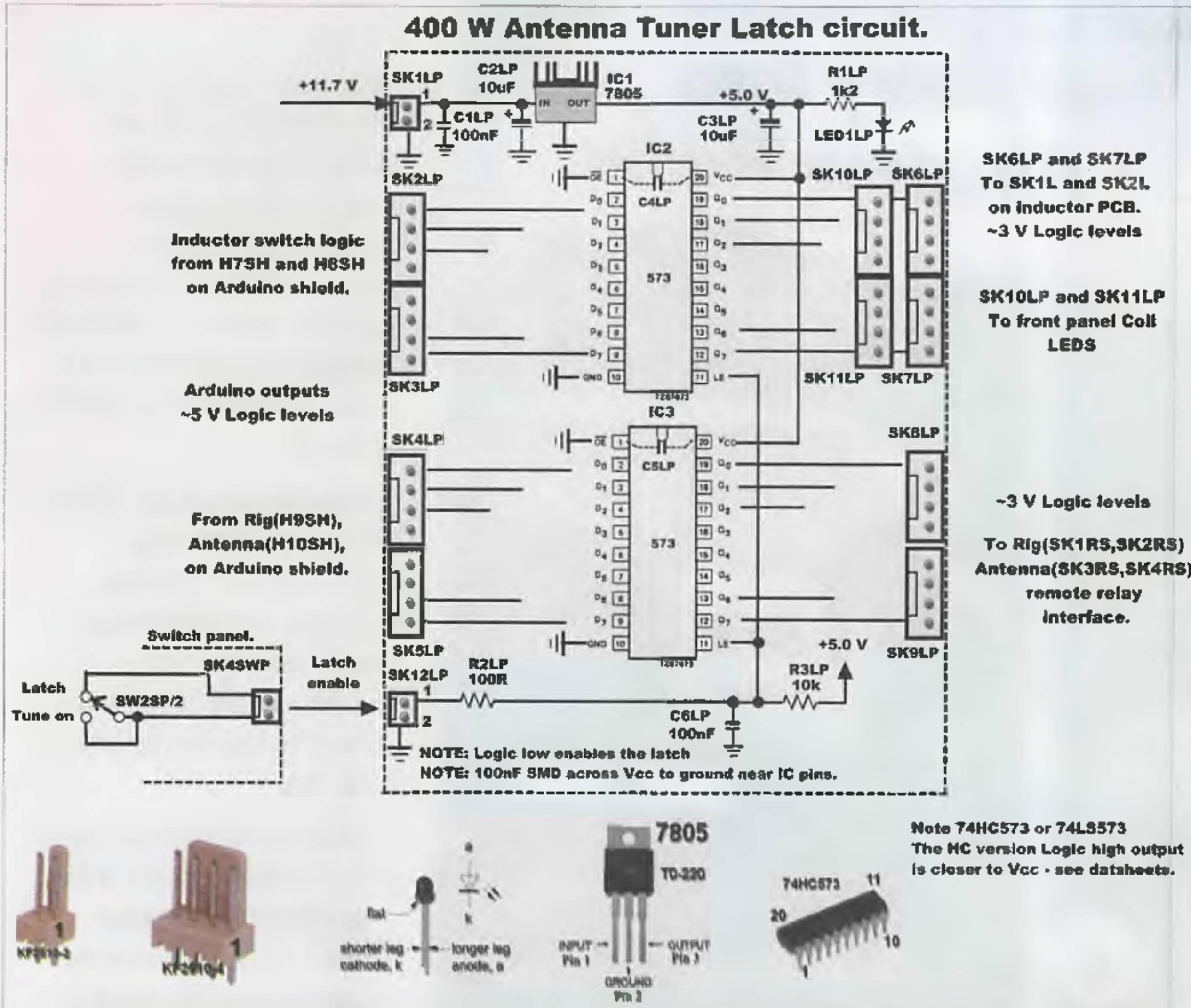
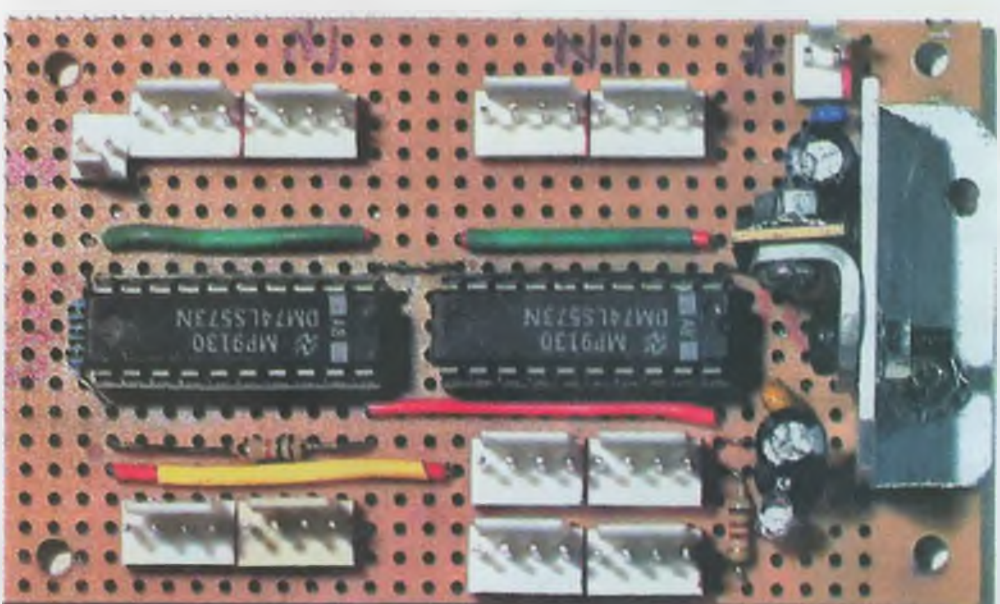


Figure 6. The latch circuit.



NOTE: The Parts List tables for all the Part 2 circuits are on Page 61.

Photo 5. The latch circuit board

VK3AQZ's project is not "yet another tuner" – it features a twist, or two

Homebrew 400 watt T-network antenna tuner – Part 2

Luigi Destefano VK3AQZ

CIRCUITS AND PHOTOS
Compromised reproduction last issue

Issues with the drawings and photos in Part 1 led to compromised reproduction in the magazine's last issue. Both the print and digital (PDF) editions are affected. There were no problems identified elsewhere in Issue 1. The affected drawings are on pages 32, 34, 36, 38 and 40. Photos 1 (page 33) and 2 (page 37) are affected. The issues were in no way the fault of AR's graphics producer, Fontana Design.

For the benefit of readers following this project, we have posted high quality images on the *AR* Issue 1 web page at: www.wia.org.au/members/armag/2023/january/

We thank author Luigi Destefano VK3AQZ for bringing this to our attention promptly. *Roger Harrison VK2ZRH, Editor in Chief.*

This is the final part of my high-power antenna tuner project.

The latch circuit

The latch circuit is shown in Figure 6. The outputs of the processor control the inductor stepper motors and remote relays via two 74HC573 (IC2 and IC3) that are 8-bit latches. The reason for the latches is that, on some frequencies, the LCD scanning and processor clock can be heard in the receiver. Turning the processor off removes the annoying signals.

Without the latches, turning the processor off would de-energise the relays and the tuner would no longer be doing its job. There is no need to latch the variable capacitors since they remain at the last position. Photo 5 shows the latch board.

The latch design is the same as that in my L tuner [1], with the exception that only two ICs are required. The latch is activated by placing a logic low on the latch enable pin (14) of the 74HC573 ICs. Once the latch is enabled, the IC no longer responds to input changes.

The latch is activated by a DPDT toggle switch. One pole enables the latch, and the second pole removes power to the processor. For more details, refer to the L tuner article.

The ATU switch panel

The antenna tuner switch panel (Figure 7 – next page) consists of four small toggle switches and the rotary encoder. The switch panel is attached to the front removable section of the tuner using the switch and encoder mounting nuts.

These controls manage the following functions.

SW1SP	Power	On / Off
SW2SP/1	Processor Power	On / Off
SW2SP/2	Latch	On / Off
SW3SP	Select	Dummy load / Tuner / Bypass.
SW4SP/1	Adjust	L (Inductor)
SW4SP/2	Adjust	C (Capacitor)

The rotary encoder, in conjunction with a set of momentary push buttons mounted directly below the switch panel, can adjust the variables.

The panel was designed for easy removal by using KF 2510 connectors mounted on a small piece of prototype

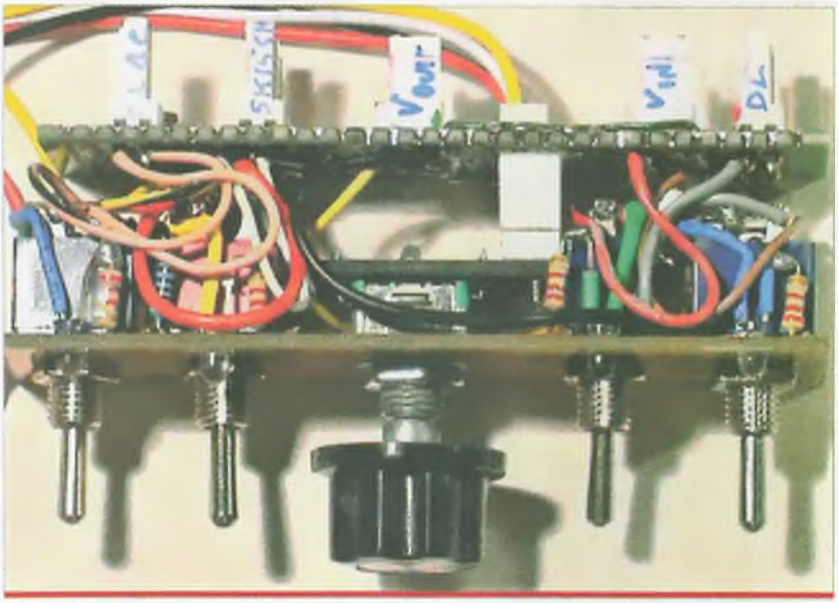


Photo 6. The switch panel is attached to the removable front section of the ATU.

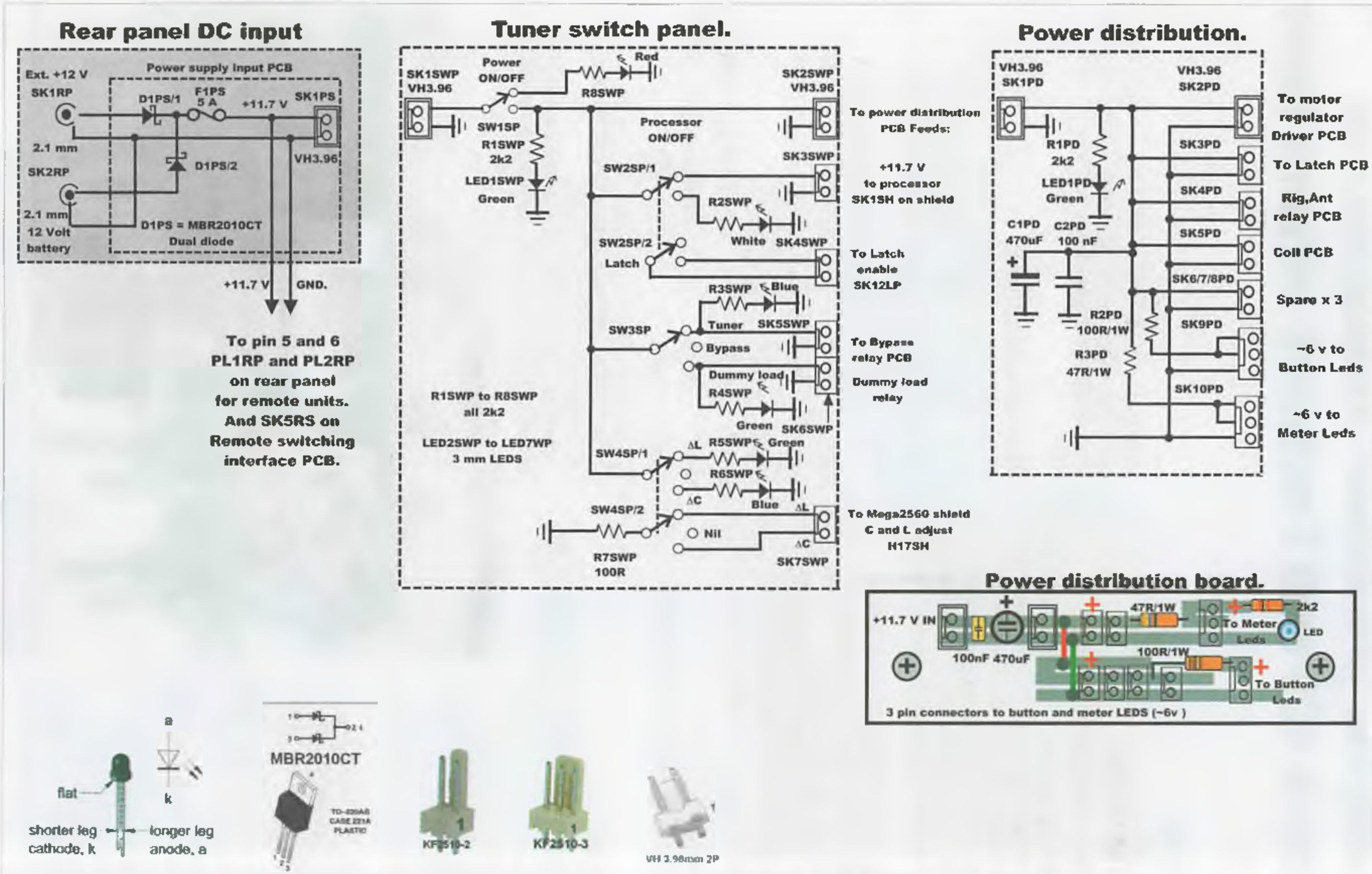


Figure 7. Circuit of the tuner switch panel.

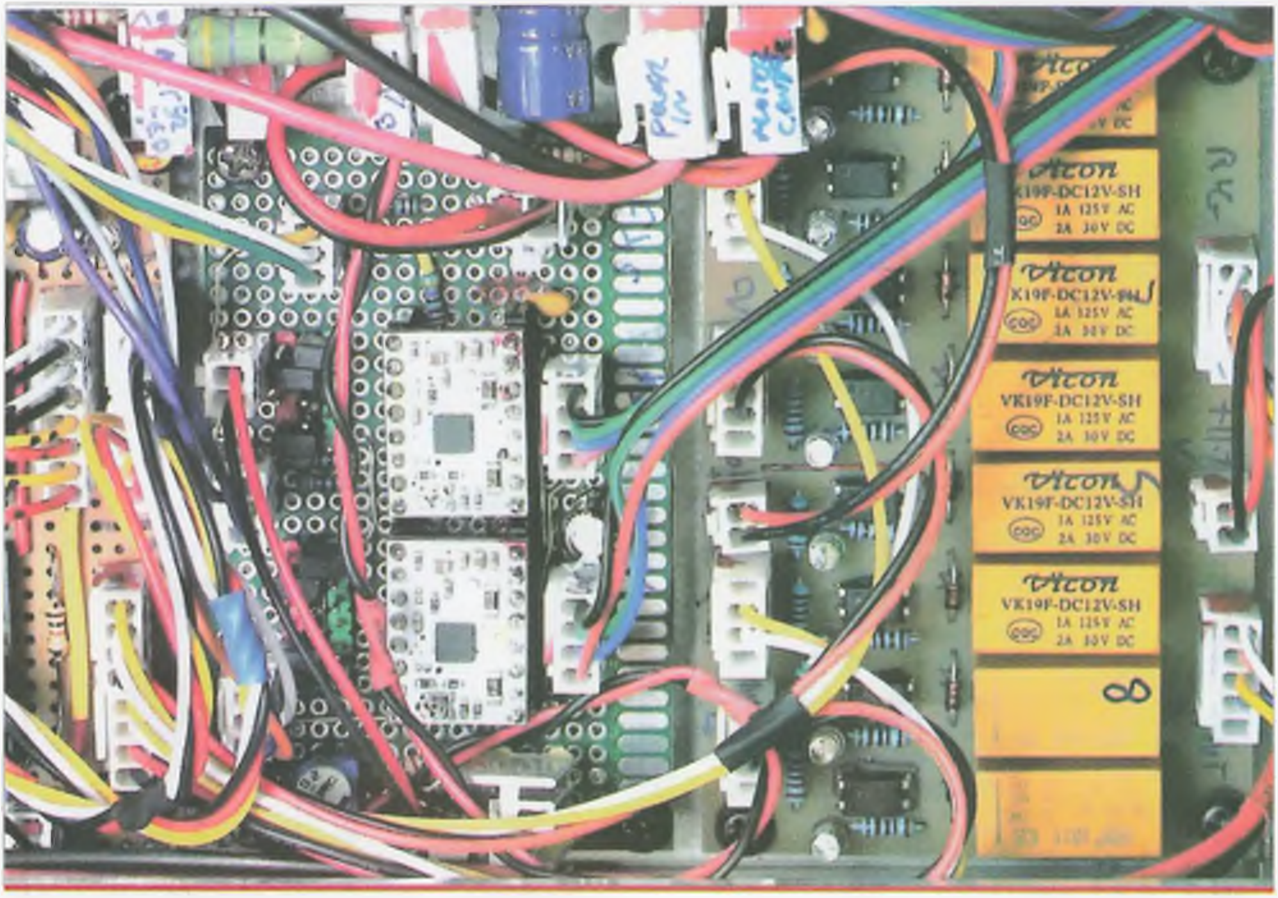


Photo 7. The remote switching relays are used to select a variety of antennas.

PCB attached directly behind the switch panel. Access to the switches is via a removable front metal panel on the case and tilting forward. Photo 6 shows the switch panel and connectors.

Remote switching interface

In my shack, I have several rigs that I can use on various HF band antennas. The antennas are switched remotely through a processor-controlled set of relays.

The details of this section are the same as in my L tuner, so please refer to that article for more information. The circuit is given in **Figure** 8, while the remote switching relays, as installed, are shown in **Photo** 7.

Power + VSWR bridge, and phase discriminator

The circuit of the forward and reflected power bridge is shown in **Figure** 9, which includes a phase discriminator circuit.

The Stockton bridge configuration (T1 and T2) samples forward and reflected power voltages. The design is like others I have used in my transceiver and L tuner project articles. You can refer to them for more detail. In this project I have used the larger FT82-61 toroid to cope with the higher power.

The output of the bridge feeds a pair of analogue meters mounted on the front panel. These meters were salvaged from a small Asahi ME-11X SWR bridge and have a 50 uA sensitivity. The meter section contains switching for 10 W, 100 W, and 1 kW power levels.

Since the sensitivity of the meters is high, each power level has its own high resistance trimpot (VR1 to VR3). The reflected power meter has its own trim pot (VR5).

I decided to use simple analogue meters in this tuner because they can withstand high RF field levels. LCD and electronic displays require significant shielding from high RF levels. Analogue meters have the advantage that they will continue to operate without power. That is useful if the tuner is not powered up but is still in line.

The voltage across my meters, at full deflection, is around 250 mV. If you have similar meters to mine, you may want to put a Germanium diode across the meters for protection against excessive voltage.

If you construct this bridge, you may find the forward and reflected power diode outputs are reversed, or do not make sense. That can be caused by the phasing of the transformer windings. It can be a little confusing in which direction to start the secondary windings.

If the results do not make sense, try reversing the leads, or use the outputs that produce forward and reflected

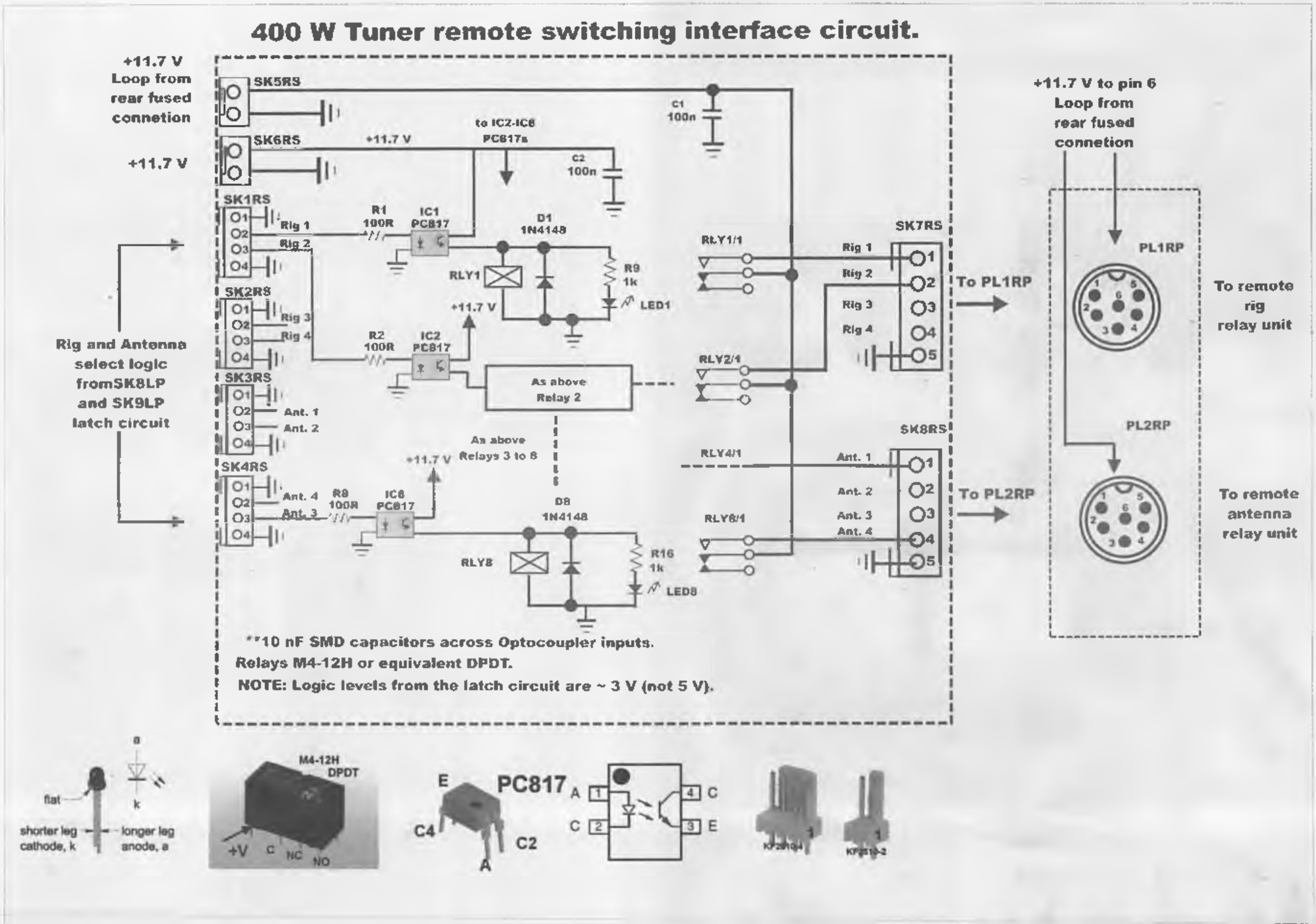


Figure 9 The remote switching interface circuit was developed for my L tuner project.

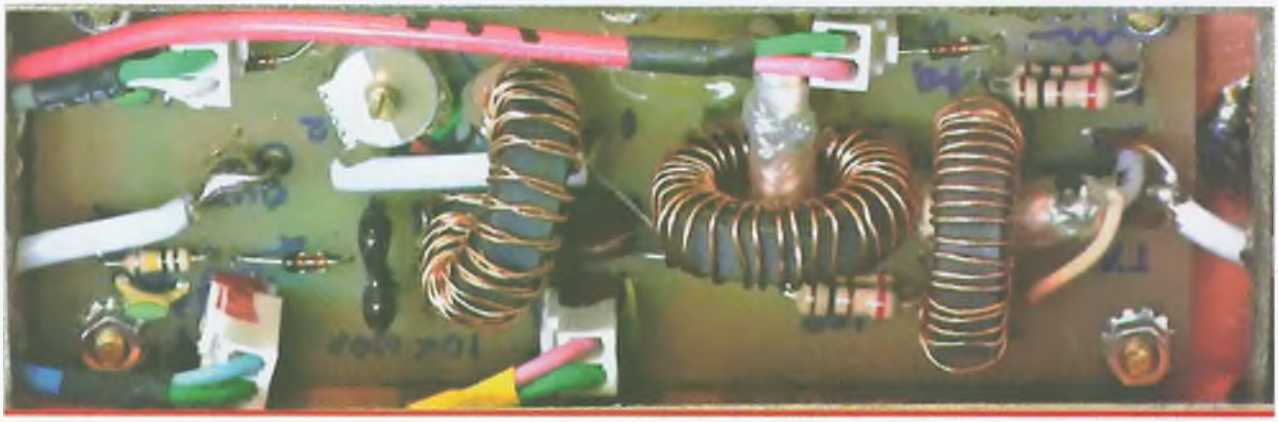


Photo 8. The power-VSWR-phase circuitry board.

Photo 9. The front panel meters. These have been repurposed from a small commercial SWR meter unit.

power. Some drawings of the bridge published on the web and magazines show different arrangements and phasing of the coils. They will work one way or the other, but the variations between circuits can be confusing.

Photo 8 shows the bridge and phase discriminator board. **Photo 9** shows the meters on the front panel; **Photo 10** shows the rear view.

The circuit also contains a phase discriminator based on a design titled the 'Phasometer' by Joel Eschmann K9MLD [2]. There are several phase discriminator designs described in amateur radio literature and used in commercial tuners. Most are a variation of the K9MLD design, which is easy to construct and seems to work well.

K9MLD's design feeds a centre-zero meter used to indicate the relative phase between the RF voltage and RF current in the wire passing through a toroid. A bifilar secondary winding (T3) feeds two diodes (D3 and D4) and the resulting DC outputs feed the positive and negative terminals of a centre-zero meter. When the meter has no deflection, the two signals are in phase.

I do not have a centre-zero meter, so I have fed one output to the forward power meter, and the other output to the reflected power meter.

The phase discriminator has small trimmers (VR4 and VR6), which are adjusted so that both meters have the same amount of deflection when the voltage and current are in phase. That would be the same as having a centre-zero meter needle at centre scale.

Observing the direction of movement of my two meter needles provides the same information as the centre zero meter. I could also use an operational amplifier, or similar, and a single meter, but this will do for now.

The output of a phase discriminator is used in automatic tuning units. I am only using the voltages at present to observe the behaviour of the outputs and ascertain how I can use them for a later update to the software or other application. I want to see if the thing is useful or not.

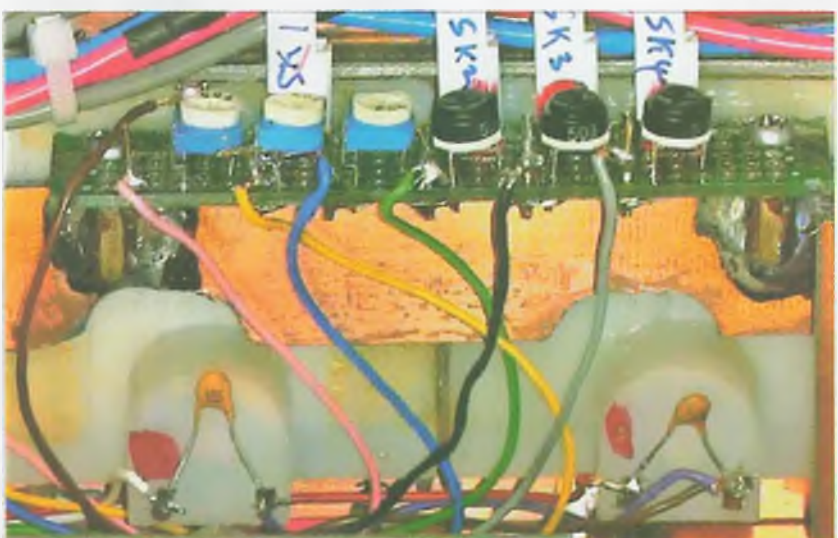


Photo 10. Rear view of the front panel meters, showing the array of trimpots.

The bypass and dummy load relays

The tuner contains bypass relays and a relay to switch to a dummy load. The relays used are quite different to the more common types. The ones I used are ST1-D12V, made by Matsushita or Panasonic, and are rated at 385 V_{RMS}, which is over 1000 V_{pp}. The switching current for the relays is rated at 8 A.

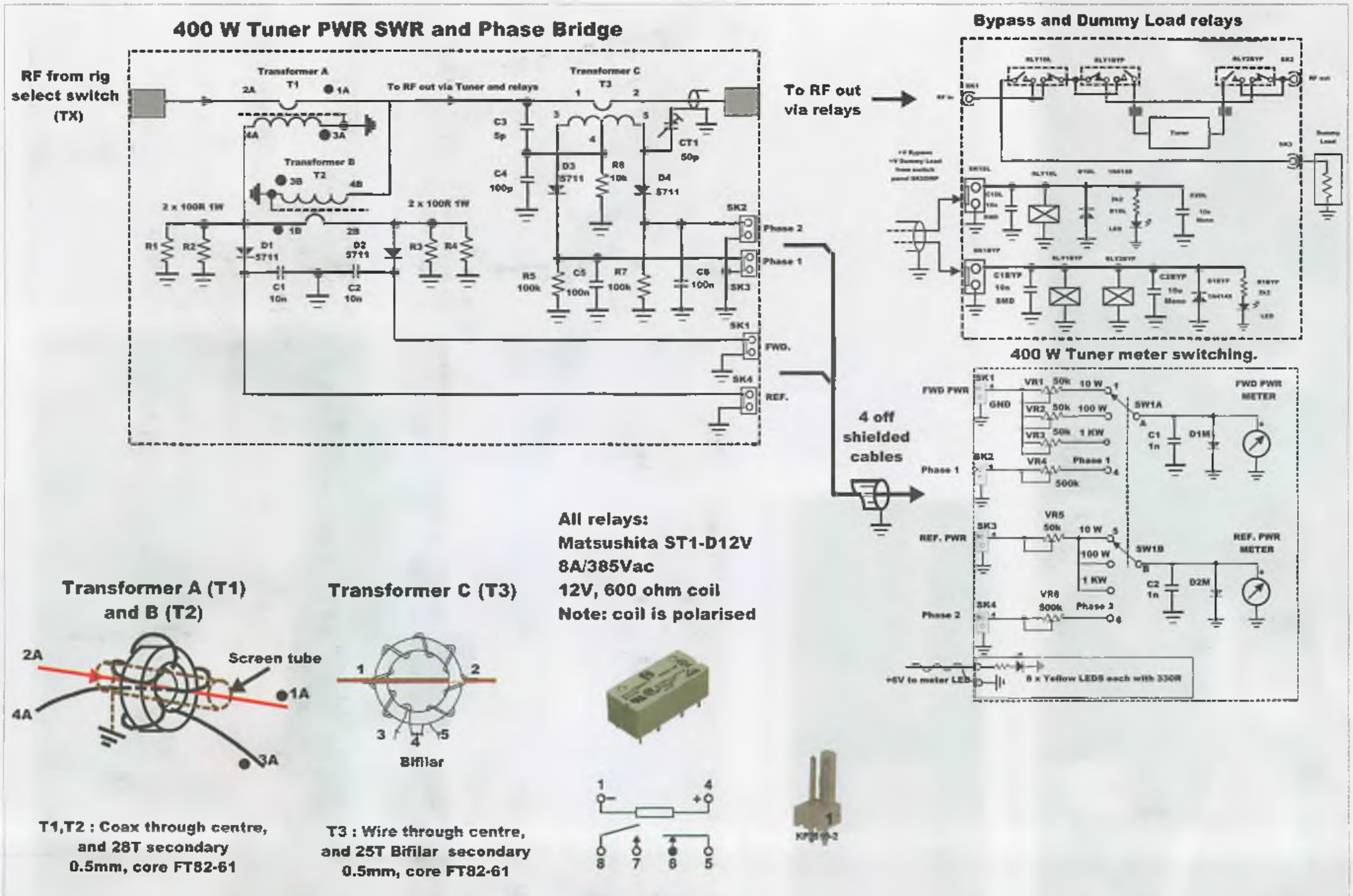


Figure 9. The top left panel encloses the power and VSWR bridge together with a phase discriminator. The incidental circuitry on the right includes bypass switching and the metering circuit.

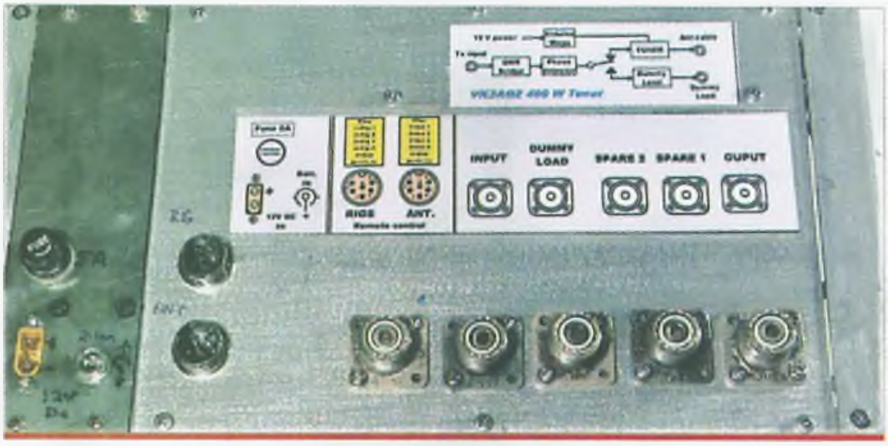


Photo 11. The ATU rear panel carries all the SO-239 sockets, the remote control connectors, and 12 VDC input connectors.

The contacts are gold and silver tin oxide, which have a high resistance to welding at high switching currents. The ST1-D12V is a small, sealed relay with unusual contact arrangements. But do not be fooled by the size. The sealed relays do not suffer from moist air, or other issues common to open air relays.

The physical layout of the relay is unusual. If you look at the contact arrangements, you will notice that there are two pairs of contacts along one edge. This means the conducting parts are quite short and close, with no long internal wires like you might see on cradle relays. As a result, it makes a good RF relay.

Other important specifications are the breakdown and surge voltage ratings. The coil to contacts surge rating is 6000 volts. Such high voltage ratings are very important in a relay required to carry high levels of RF. During the adjustment of the tuner, low power settings should be applied so the contacts are not stressed during that time.

Once low power tuning is complete, the contact ratings become important. In a high-power tuner, these need to be commensurately high. I should mention that there are low-cost high current relays used in cars and low

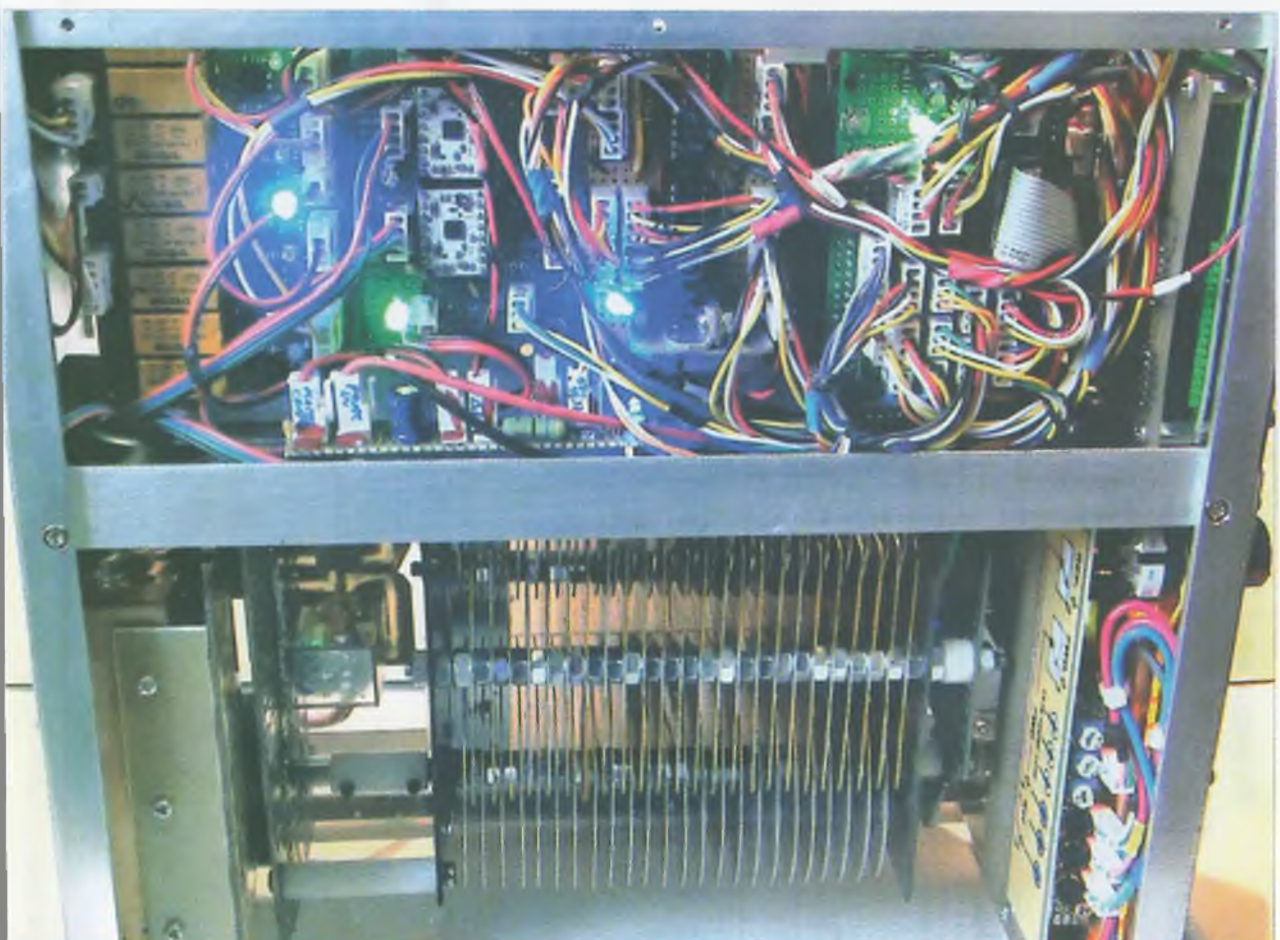


Photo 12. Top view inside the ATU. The RF section is at the bottom, with all the control electronics at the top.

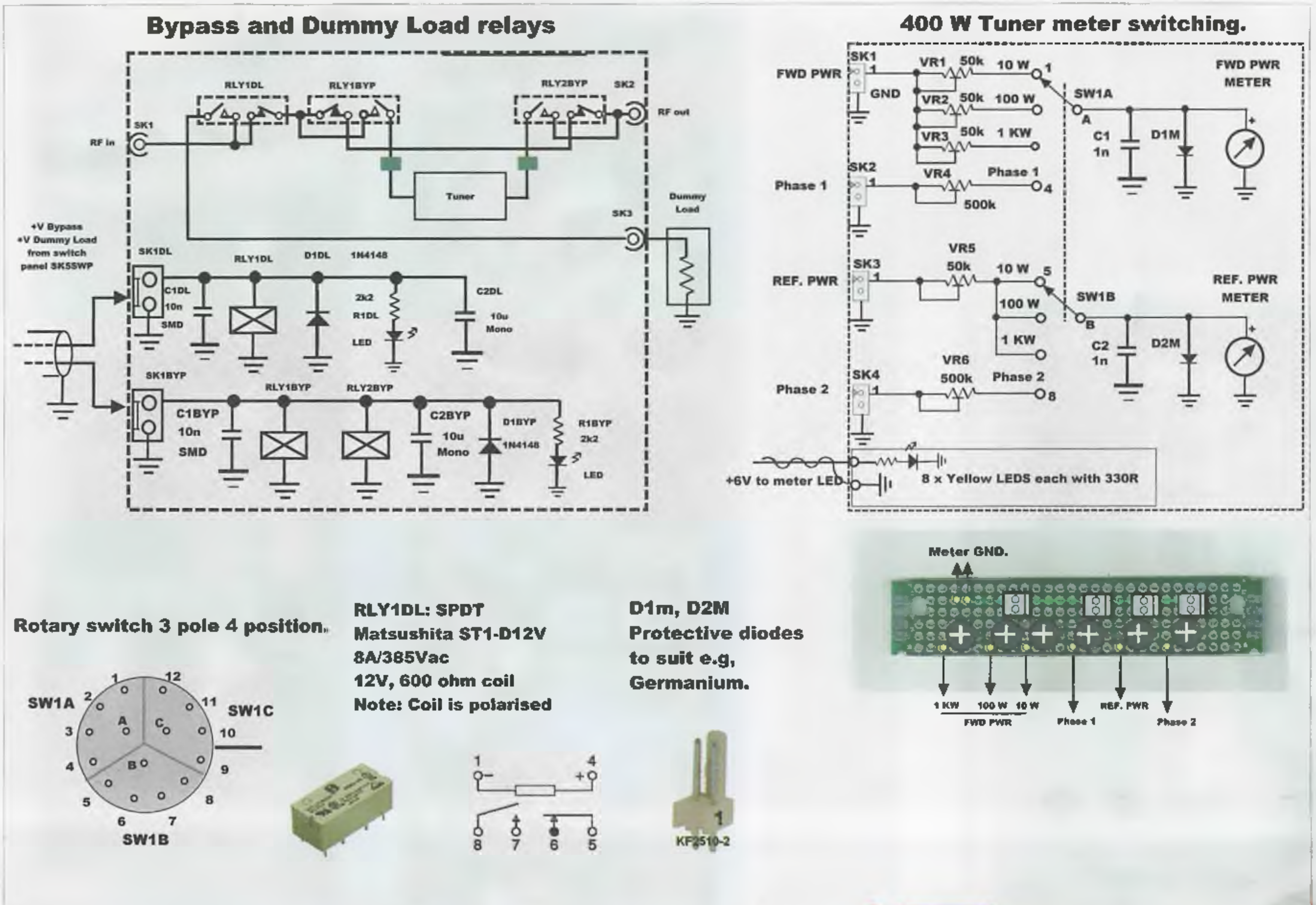


Figure 10. Bypass and dummy load switching at left, meter switching at right.

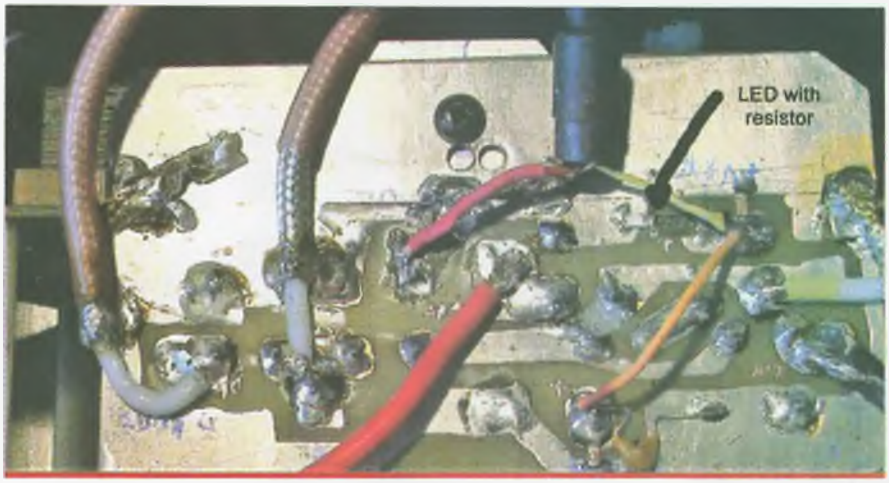


Photo 13. Copper side of the relay switching board. An SMD LED and resistor connected across a relay coil are indicated.

voltage power supplies.

However, if one checks the breakdown voltage rating you will often see it is quite low, around 30 volts. Those relays are not good in a high RF power environment. At a minimum, the relay type should be designed to switch 240 VAC at many amps.

Thus, the bypass and dummy load relays need to be very good and will cost more than a few dollars. The ST1-D12V relays I have used are available from quite a few suppliers and vary in price from $10 to $20 each.

You will see the three relays (RLY1DL, RLY1BYP and RLY2BYP) in **Photo 4** of Part 1 of this article, behind the tuning capacitors. The circuit of the relay section and meter circuit is shown in **Figure 10**.

The tuner interconnections

The modules in the tuner are connected using plug-in cables and KF2510 polarised connectors that carry the low voltage and logic signals. These connectors are low cost when purchased in bulk and you can purchase leads with crimped ends in several colours. I stick to two-pin, three-pin, and four-pin sizes.

You can buy leads with female connectors fitted at one end. The pins can also be purchased separately and you can crimp them onto wire, as needed. I do have a crimping tool, but I get a more reliable connection by very careful soldering the wire onto a terminal using a small vice and thin soldering iron tip.

Ferrite cores are fitted to some leads to reduce noise and RF pickup by the sensitive electronics. Shielded thin audio-type cable is used to carry the microswitch logic and DC voltages from the bridge inside the high RF area to the processor. VH 3.96 polarised connectors, rated at 7 A, are used for the heavier currents. **Figure 11** details all the connections and connector designations.

Construction

The tuner is mounted in a homebrew aluminium cabinet 300 mm wide by 300 mm deep by 160 mm high. It is an open frame construction with flat 1.6 mm aluminium sheets for the covers. There are four corner uprights, made of 20 x 20 x 3 mm aluminium angle, each 160 mm long. These were bundled together and finished to the same length on the bench sander.

The connecting sides, top, and bottom sections are 12 x 12 x 3 mm aluminium angle, bolted together with tapped and countersunk 3 mm bolts and nuts. The covers are fabricated from 1.6 mm aluminium sheet and the internal supports are made from 1.6 mm angle and T sections.

Aluminium panels are used to shield the processor and electronics section from the areas of the case containing high levels of RF. The Stockton bridge and meter sections are also shielded using PCB material.

The front panel consists of two separate sections. One accessing the switch panel and the other accessing the variable capacitor section. The front panel labels are drafted in a CAD program, printed on inkjet photo paper, and laminated in a silver pouch. A copy of the panels is printed and used as a drilling template.

Chrome D handles 96 mm long are fitted to the front and protect the encoder and toggle switches. These components are easily damaged if knocked front on. The rear side contains the RF connectors, power supply inputs and the remote antenna and rig connectors. The SO-239 sockets have pieces of PCB material on the inside of the metal panel. The terminating coax cable is soldered to a PCB sheet near the connector.

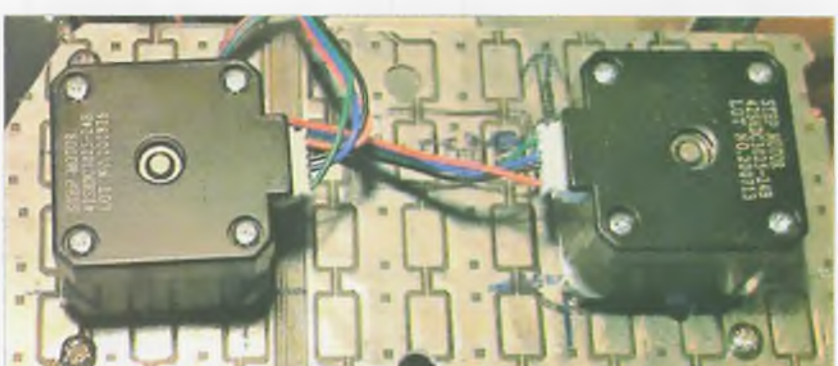


Photo 14. The stepper motors behind the variable capacitor plates.

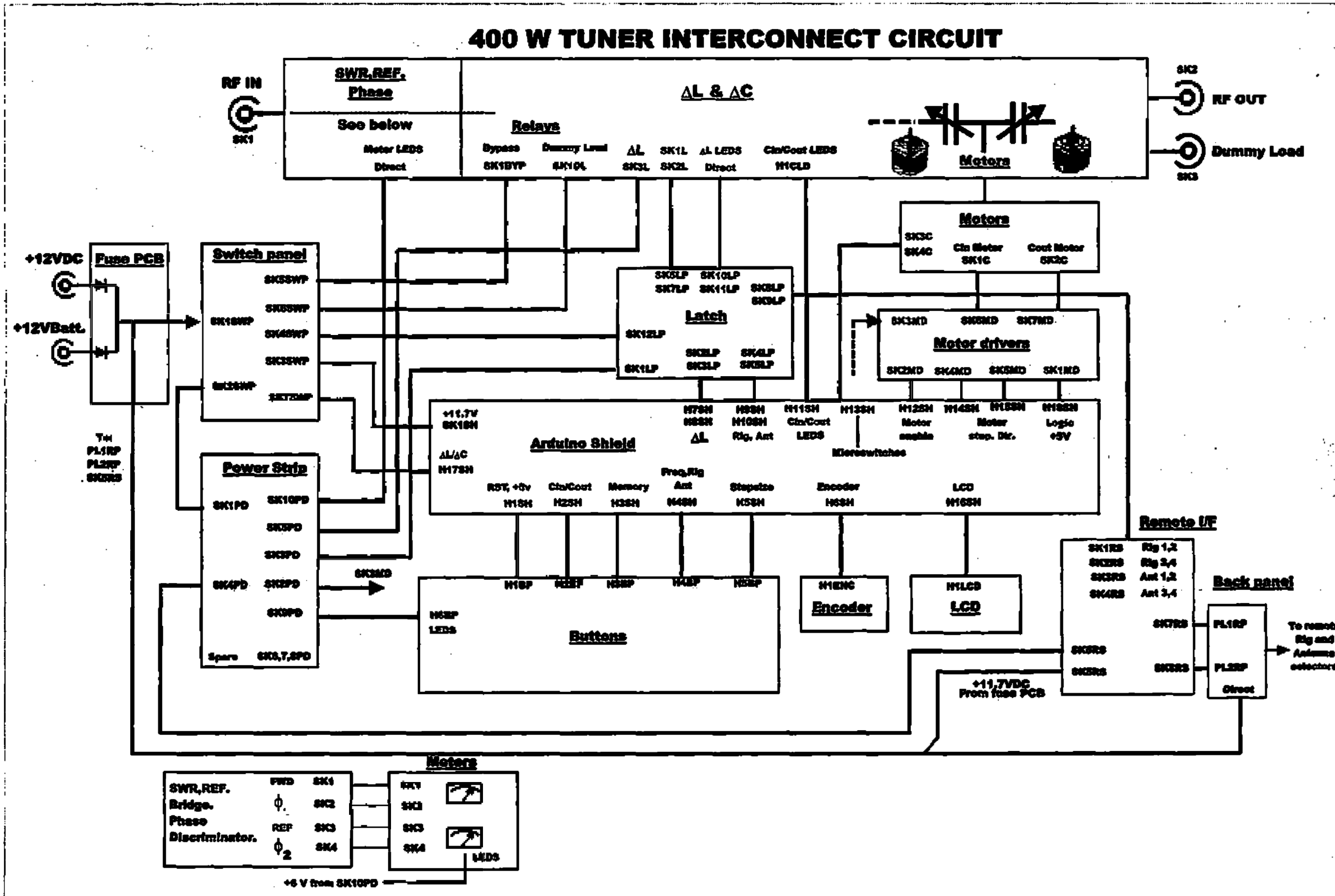


Figure 11. Tuner interconnect circuit.

C1LP,C6LP	100n	Monolithic
C2LP,C3LP	10u	Electrolytic
C4LP,C5LP	100n	SMD across IC pins 1 and 20
SK2LP to SK11LP	KF2510-4	4 pin polarised connectors
SK1LP,SK12LP	KF2510-2	2 pin polarised connectors
IC1	LM7805 + Heatsink	3 terminal regulator 5 V, 1 A.
ICSKT x2	20pin DIL IC sockets for 74HC573	
IC2,3	74HC573	Octal latch
LED1LP	3mm Green LED	
R1LP	1k2 0.5 W 5%	
R2LP	100R 0.5 W 5%	
R3LP	10k 0.5 W 5%	
NOTE: 100 nF ceramic or SMD across the supply pins of the 74HC573 Ics.		

Table 9: 400 W Tuner latch circuit components

Reference.	Value	Notes.
Rear panel components		
D1PS	MBR2010CT or PSR16C30CT Dual Shottky diode.	
F1PS	M205 fuse PCB holder and 2 A glass fuse.	
SK1PS	VH3.96 2P	2 pin VH connector
PL1RP,2	6 pin chassis mount male polarised mic. Connector.	
SK1RP,2	DC 2.1 mm chassis mount connector.	
Switch panel with small sub board holding connectors.		
LED1SP to LED7SP	3 mm Leds Colour to suit (Blue and Green)	
R1SWP,2,4,5,6,8	2k2 0.5 W 5%	
R7SWP	100R 0.5 W 5%	
SK1SWP,SK2SWP	VH3.96 2P	
SK3SWP,4,5,6,7	KF2510-2	
SW1SP	SPDT mini toggle switch ON-ON	
SW2SP	DPDT mini toggle switch ON-ON	
SW3SP,SW4SP	DP3T mini toggle switch ON-OFF-ON	
Power distribution board.		
C1PD	470u 25v	Electrolytic
CP2D	100n	Monolithic
LED1PD	3mm LED	Green
R1PD	2k2 0.5W 5%	
R2PD	100R 1W 5%	6V for Button LEDS
R3PD	47R 1W 5%	6V for Meter LEDS
SK1PD,SK2PD	VH3.96	2 pin polarised conector
SK3PD to SK10PD	KF2510-2	2 pin polarised conector

Table 10: 400 W Tuner switch panel circuit components

The power supply connectors are mounted on a separate piece of double-side PCB material for easy access to their back. The case rear is shown in Photo 11, while Photo 12 shows the top inside view. Photo 13 shows the copper side of the relay PCB and the coax connections. In the latter, you may also see small (1206-size) SMD LEDs connected across the relay coils via a 1 W, 2k2, 2512-size SMD resistor.

Reference.	Value	Notes.
C1,C2	100n	Monolithic
C3 to C36	10n	SMD across inputs, outputs, Optocouplers
D1 to D8	1N4148	
IC1 to IC8	PC817	Optocoupler 4 pin
LED1 to 8	3 mm LED	
PL1RP,2	6 pin chassis mount male mic connector.	
R1 to 8	100R 0.5 W	
R9 to 16	1k 0.5 W	
RLY1 to 8	DPDT, 12 V, 2 A	M4-12H or similar
SK1RS,2,3,4	KF2510-4	4 pin polarised connector
SK5RS,6	KF2510-2	2 pin polarised connector
SK7RS,8	KF2510-5	5 pin polarised connector

Table 11: 400 W Tuner remote switching interface circuit components.

Reference.	Value	Notes.
C1,C2	10n	Ceramic
C5	5p	Mica 500V
C4	100p	Mica 500V
CT1	5-50pf	Ceramic or polystyrene good quality trimmer
D1,2,3,4	1N5711	
R1 to 4	100R 1W 1%	Carbon or Metal Oxide. Select pairs for 50 ohms.
R5,7	100k 0.5 W 5%	Carbon
R6	10k 0.5W 5%	Carbon
SK1RS to SK4RS	KF2510-2	2 pin polarised
T1,T2	FT82-61 cores	28 turns sec. 0.5mm wire, single wire primary
T3	FT82-61 cores	25 turns sec. 05mm wire Bifilar, single wire primary

Table 12: 400 W Tuner PWR, SWR, and Phase Discriminator

C1BYP,C1DL	10n	SMD
C2BYP,C2DL	10u	Monolithic or Electrolytic 25V
D1BYP,D1DL	1N4148	
LED1BYP,LED1DL	3mm LEDS	Green and Blue
R1BYP,R1DL	2k2 0.5W 5%	
RLY1DL, RLY1BYP,2	SPST	Matsushita ST1-D12V. 12V coil, 385Vrms contacts, 8A
SK1BYP,SK1DL	KF2510-2	2 pin polarised
SK1,2,3	SO239	RF connectors on rear panel

Table 13: 400 W Tuner Bypass and Dummy load relays.

C1,C2	1n	Ceramic across meter terminals
D1m, D2M	1N34A	Any Germanium diode should be okay
LEDS 1 to 8	1206 SMD Yellow	330R 1W SMD resistors to each LED or equivalent
M1,M2	50uA meters	Suitable meters ex SWR bridge, or equivalent
SK1 to SK4	KF2510-2	2 pin polarised
VR1,2,3,5	50k trimpots	Value to suit sensitivity of meters
VR4,6	500k trmipots	Value to suit sensitivity of meters
SW1A/B	Rotary switch	Suitable 2 pole 4 position switch

Table 14: 400 W Tuner meters

Photo 14 shows the motors at the rear of the variable capacitor plates. These are bolted on to a piece of circuit board material salvaged from an old keyboard.

A note on earthing

One important point to note is the earthing of the tuner case. If possible, try to earth the case to an earth point as short a run as possible using heavy-duty braid, particularly if the coax cables and radio earth have a long run to ground.

Published articles mention that the earth becomes part of the reactance that the tuner needs to accommodate. In my case, I always have a solid earth just outside the radio shack so I cannot say if *not* having a short earth affects the tuner – but it is a good idea.

Videos

I have uploaded two videos on the operation of this tuner to YouTube. They can be viewed at the following URLs:
Part 1: www.youtube.com/watch?v=gW0okl70yU4
Part 2: www.youtube.com/watch?v=5cXY0BPsZxg

References and Resources

1. L. Destefano, VK3AQZ, 'The VK3AQZ HF antenna tuner Project – Part 1', Amateur Radio, Wireless institute of Australia, Vol. 89 No.3, pp 20-25, 2021.
2. J. Eschmann, K9MLD, 'PHASOMETER', Ham Radio, Communications Technology Inc., Greenville, New Hampshire, United States, pp 28-29, June 1990.

Amateur Radio magazine Encouragement Award

Bruce R. Kendall VK3WL, 9V1WL

Early every year, the Publications Committee (PubCom) deliberates on nominations for awards to authors who contributed articles to *Amateur Radio* magazine published in the previous calendar year.

The nominees' contributions to *AR* are considered to be of a suitably high order to warrant recognition by PubCom and the WIA, and to publicly acknowledge the work of *AR*'s authors. These are: the Al Shawsmith Award, the Higginbotham Award, and the Technical Award. (www.wia.org.au/members/wiaawards/about/).

Each year, there are submissions by new contributors published in *AR* that are noteworthy for one reason or another, but may perhaps not be 'best-in-class'.

Among the extant set of awards available to bestow on AR contributors, none has existed to acknowledge and encourage new contributors. Over 2022, PubCom members discussed the concept of an award for authors who submit worthy articles for publication where PubCom is of the view that such authors should be encouraged to submit further material.

Late in last year, PubCom briefed the WIA Board about establishing this new award and the Committee is looking forward to bestowing the first such award for articles published during 2022.

Roots

By way of background, this award has roots going back to 1975! As a green first-year electronics instrument making apprentice at the Melbourne Aeronautical Research Laboratories, I hand-wrote what would have been a difficult to read article (my handwriting has never been great) on anodizing aluminium. After submitting the manuscript by mail, I subsequently received a telephone call from the then-editor of *AR*, Bruce Bathols VK3UV.

Bruce politely and gently explained why the article as submitted wasn't suitable for publication. However, he ended the conversation not wish to discourage me, but rather providing words of encouragement, asking that I not take the matter as an outright rejection and to consider writing another article for *AR* in the future. This I did, and a rewritten and typed submission was produced that was subsequently published in *AR* for March 1978.

In 1988, I became a member of PubCom, which lasted for 10 years. I re-joined PubCom a few years ago so, to my detractors, you have Bruce VK3UV to blame! His words during that telephone conversation in 1975 have remained with me.

During my first tenure on PubCom, I often thought there were articles submitted that, while not the 'best-in-class' for that year, were worthy of mention to encourage the authors. No such award existed at that time. Fast forward to 2023 and we now have such an award to encourage new authors to submit articles for publication.

Have a go!

Don't be dissuaded if you are concerned about your technical or writing skills. The role of the technical editors and proof-readers is to assist authors with these and any other matters needing some tidying-up before publishing. You never know, you may well become a recipient of a WIA award.

ALARA

Jenny Wardrop, VK3WQ
e secretary@alara.org.au
w www.alara.org.au

Do I have a job for you!

ALARA is looking for a Historian/ Librarian. It is really not an arduous task, nor a very time consuming one, but time is slowing me down and I have decided to give up the job and just concentrate on the role of Publicity Officer.

So, in an attempt to entice you, I thought that it might be a good idea to publish the Statements of Duty for both the Historian and Librarian – normally done by the one person.

The duties of the ALARA Historian include:

- Keeping the history of the Association, publish up-dates in the Newsletter on a regular basis, where possible, and keep the membership informed through the Newsletter of activities being undertaken by the Historian and others who may have volunteered to help.
- Maintain the scrapbooks and photo albums belonging to ALARA.
- Take scrapbooks, photo albums, historical memorabilia, etcetera, to ALARAmeets and other major get-togethers.
- Publish articles in the ALARA Newsletter, Amateur Radio magazine and other magazines, as appropriate.
- Provide information to other authors, when occasions arise.
- Gradually convert as much of the historical information as possible into a digital format, while ensuring the safe-keeping of rare original documents.
- Hard drives and back-ups should be stored in separate locations in the event of fire, floods etc.

The Duties of the ALARA Librarian include:

- Catalogue and store appropriate books, magazines, and newsletters received by the Association.
- Weeding out unwanted publications in consultations with the Historian.
- Making Items available to members as necessary. (This may involve handling and postage costs).

Well, after reading that, you may be thinking 'that's far too much work for me,' but let me assure you, it's not as bad as it looks! The major photo albums and most of the scrapbooks have been digitized, but there are a few more that can be done over time.

Nearly all of the original hard copies are presently stored at the WIA headquarters in Bayswater, Victoria, so you won't be cluttered up with lots of boxes! There isn't much maintaining of scrapbooks and photo albums, as of course, most of the items for these now come to you in a digital format anyway.

I live in a bushfire prone area, and it has always worried me that one day there might be a fire. With all the flammable material now stored at the WIA headquarters, and one of the back-up drives stored off-site, this is now less likely to be a problem.

If you are interested in taking on the position, please contact me at **historian@alara.org.au**, or any other member of the committee.

And finally, I am happy to help the new Historian/Librarian in whatever way I can.

"CQ YL", by Louisa B. Sando W5RZJ.

An unexpected donation

While we are on the Historian/ Librarian subject, I had a very pleasant surprise recently. A largish envelope arrived in the mail for me from Chris Meagher VK2ACD. As Chris and I hadn't, to my knowledge, crossed paths before, I was a bit surprised and not a little intrigued. The envelope contained a book, *CQ YL*, by Louisa B. Sando W5RZJ, YL Editor of *CQ Magazine* (USA) in 1958.

In her introduction, Louisa says "At the First International Convention of the Young Ladies Relay League held in Santa Monica, California, in 1955, on the motion of W0ERR Ann Belmont, the assembled YLs voted unanimously that a permanent record should be compiled of the part women have played in amateur radio. This book is the result of that expressed wish."

I also liked Louisa's dedication in the front of the book; something I think most YLs would relate to.

To all the OMs,
Many of whom have assisted a lot of us YLs into the hobby of amateur radio, helped keep our rigs on the air, yet seldom if ever complain when Ham radio at time. assumes more importance to us than homemaking,
this work is
SINCERELY DEDICATED

Chris came across the book while sorting through some donated items at the Summerland Radio Club and thought that we might like to have it for the ALARA library. "Would we!" What a find, and thank you so much Chris for thinking of ALARA.

ALARAmeet 2023

On 4th and 5th November this year, we will be holding ALARAmeet in Hobart. But don't just come for the weekend. On the Friday, we have a pre-conference cruise to Peppermint Bay and there is a Tasmanian Symphony concert in the evening. On Monday, trips are being planned to the Huon Valley and Bruny Island.

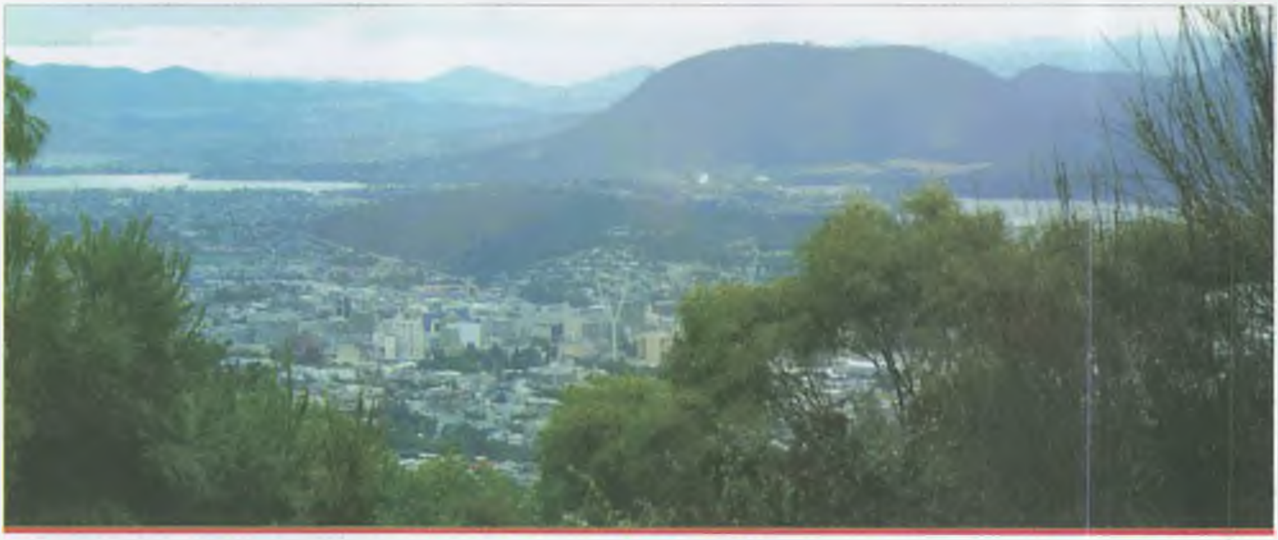
ALARAmeet will be based at The Old Woolstore, near the waterfront in Hobart. We have secured good rates that cover a variety of accommodation and are valid for stays between 1st and 7th November 2023. Have a look at their website for more details, The Old Woolstore Apartment Hotel, Hobart Tasmania. Reservations can be made now by email – reservations@oldwoolstore.com.au, or call the Reservations Team on 1800 814 676 and mention ALARAmeet to get the special rates.

This event is an opportunity to meet face to face with YLs who you have only met on the air before. It is also a chance to catch up with friends you have not seen since the last ALARAmeet in Cairns – wow that will be six years ago. We can share our radio stories, our family stories, and our other interests while exploring Hobart and hearing about its history.

Most YLs are planning to bring their OM with them and will take time to explore more of Tasmania while they are here for ALARAmeet.

REAST, the local radio club in Hobart, is organising a tour for OMs on the Saturday afternoon. It will be an exploration of historic radio sites around Hobart and should be fascinating. REAST is hosting a BBQ for ALARA on Sunday, and this will be a chance to meet more local amateurs.

Registration for ALARAmeet will open in mid-April. Forms will be included with the ALARA newsletter, will be on the ALARA website, or contact Linda VK7QP at: luther8@bigpond.com.



View of Hobart (photo: Dot Bishop VK2DB).

The waterfront at Hobart (photo: Dot Bishop VK2DB).

WIA DX Awards

Marc Hillman VK3OHM / VK3IP

Below are listed all new WIA DX Awards issued from 2023-01-13 to 2023-03-01
Go to https://www.wia.org.au/members/wiadxawards/about/.

DXCC Multi-band (3)

#	Call	Name	Mode	Band	Count
242	VK6JX	J Sparkes	Open	40-30-20m	383

DXCC Multi-band (5)

#	Call	Name	Mode	Band	Count
166	VK2BY	Bradley Devon	Phone	40-20-17-15-10m	704
167	DL6USA	Horst Matusczak	Phone	20-17-15-12-10m	841

DXCC Multi-band (7)

#	Call	Name	Mode	Band	Count
106	VK3OHM	Marc Hillman	Digital	80-40-30-20-17-15-12m	999
107	DL6USA	Horst Matusczak	CW	40-30-20-17-15-12-10m	1219

DXCC Multi-band (8)

#	Call	Name	Mode	Band	Count
63	VK3TZ	Tony Burt	CW	80-40-30-20-17-15-12-10m	1157

DXCC Multi-mode (CW)

#	Call	Name	Count
281	IZ3ENH	Stefano Mannelli	307
282	VK6JX	J Sparkes	169

DXCC Multi-mode (Digital)

#	Call	Name	Count
166	W7ONY	Tony Atkins	100
167	IZ3ENH	Stefano Mannelli	272
168	VK6JX	J Sparkes	141
169	VK2PKT	Keith Turk	126
170	VK4LK	Andrew Mason	106

DXCC Multi-mode (Open)

#	Call	Name	Count
547	IZ3ENH	Stefano Mannelli	316
548	VK6JX	J Sparkes	231
549	VK4LK	Andrew Mason	106

DXCC Multi-mode (Phone)

#	Call	Name	Count
653	IZ3ENH	Stefano Mannelli	268
654	VK3MB	Philip White	101

DXCC Multi-mode (Triple Play)

#	Call	Name	Count
32	IZ3ENH	Stefano Mannelli	241
33	VK3SIM	Simon Keane	175

DXCC Single-band

#	Call	Name	Mode	Band	Count
1228	VK6WX	Wesley Beck	Triple Play	20m	102
1229	VK3OHM	Marc Hillman	Digital	12m	100
1230	DL6USA	Horst Matusczak	CW	40m	136
1231	VK5MN	Michael Nedic	Open	40m	103
1232	VK5MN	Michael Nedic	Digital	40m	102
1233	VK2BY	Bradley Devon	Phone	10m	101
1234	VK6JX	J Sparkes	Open	40m	130
1235	VK6JX	J Sparkes	Open	30m	151
1236	VK6JX	J Sparkes	Open	20m	102
1237	VK6DU	Lance Martin	Digital	10m	100
1238	DL6USA	Horst Matusczak	Phone	40m	102
1239	DL6USA	Horst Matusczak	Phone	12m	109
1240	DL6USA	Horst Matusczak	CW	10m	133
1241	VK3NX	Charlie Kahwagi	CW	20m	100
1242	VK3TZ	Tony Burt	CW	80m	101
1243	VK3TZ	Tony Burt	CW	10m	113

Fifty On 50

#	Call	Name	Count
3	VK5BC	Brian Cleland	50

Grid Square

#	Call	Name	Mode	Band	Count
678	VK5XB	Henry Prunckun	Open	HF	452
679	VK3NX	Charlie Kahwagi	Digital	SHF	5
680	DL6USA	Horst Matusczak	Open	HF	731
681	DL6USA	Horst Matusczak	Phone	HF	505
682	DL6USA	Horst Matusczak	CW	HF	533
683	VK5XB	Henry Prunckun	Phone	HF	115
684	VK5XB	Henry Prunckun	Digital	HF	388
685	VK3IK	Christopher Bellmont	Open	6m	51
686	VK3IK	Christopher Bellmont	Digital	6m	51
687	VK6JX	J Sparkes	Open	HF	843
688	VK6JX	J Sparkes	CW	HF	219
689	VK6JX	J Sparkes	Digital	HF	711
690	VK3GA	Graham Alston	Open	6m	57
691	VK3GA	Graham Alston	Digital	6m	57
692	VK3OM	Michael Andrews	Open	6m	51
693	VK3OM	Michael Andrews	Digital	6m	51
694	VK4LK	Andrew Mason	Open	HF	458
695	VK4LK	Andrew Mason	Digital	HF	458

Oceania

#	Call	Name	Count
88	IZ3ENH	Stefano Mannelli	48

VHF Century Club

#	Call	Name	Mode	Band
177	VK3OM	Michael Andrews	Open	6m
178	VK3OM	Michael Andrews	Digital	6m

Worked All VK Call Areas HF

#	Call	Name	Mode
2456	IZ3ENH	Stefano Mannelli	Open
2457	IZ3ENH	Stefano Mannelli	Digital

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- Also available online: www.hamads.com.au
- Free service. Online Hamads are also published in *AR*.
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- Deceased estates Hamads will be published in full, even if some items are not radio equipment.
- WIA policy recommends that the serial number of all equipment for sale should be included.
- QTHR means the address is correct in the ACMA Register of Radio Licences: https://web.acma.gov.au/rrl/register_search.main_page
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- Copy must be received by the deadline on page 3 of each issue of AR.
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'Hamads' editor@wia.org.au

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- Memnet – member-exclusive email bulletins

WIA history

Our origins go back to 1910, when the first Institute was formed to represent wireless experimenters to the government. Major reform of the Radiocommunications Act over the early 2000s, and to amateur radio licensing worldwide, saw a single national organisation formed in 2004 to meet the emerging challenges.

WIA around the world

The WIA represents you internationally. We're a member of the International Amateur Radio Union (IARU), which advocates for amateurs' interests to the International Telecommunications Union, particularly at its World Radio Conferences. These determine global radio regulations and frequency allocations.

The WIA is the only Australian amateur radio body with membership of the International Amateur Radio Union.

WIA national office: Unit 20, 11-13 Havelock Road, Bayswater, Victoria 3153
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