APC NEWS

MERRY CHRISTMAS

MOORABBIN & DISTRICT RADIO CLUB

VK3APC
FOUNDED
1948

HAPPY NEW YEAR

IN THIS ISSUE

Club BBQ
Market Place
Members activities
More Lockdown Projects

QTC

What a year. Unprecedented. Difficult, frustrating and for some depressing, The COVID19 Virus and a dreadful sunspot minimum. Donald Trump to depart after four divisive years, China gets tough and we all got a year older. But good times are ahead.

There will be an end of year BBQ at the Club Rooms to mark the end of 2020. 2021 will not be like 2019 but I expect it will be better than 2020. There will be Club meetings and activities but maybe not quite as previously.

Band conditions are improving but there are still monumental collapses of propagation.

We have a new Market Place section of goodies for sale and many articles for December reading.

I hope you like this issue.

TRADE DISCOUNT:
All Club members can get what is effectively a trade discount card by emailing me a passport type photo and you will get a card for use at Altronics and Jaycar. Also if you are a member of the WIA you can now download a discount card from the WIA website..

Seasons wishes and 73.   Ron VK3AFW Editor.

THE M&DRC COMMITTEE WISHES ALL MEMBERS SAFE TIMES AND

A MERRY CHRISTMAS

AND A

HAPPY NEW YEAR

M&DRC in LOCKDOWN

EVERY Tuesday 10:00 AM Club On Air Meeting. 146.550 MHz QSY's to VK3RMC 147.325 after 10:30 AM
Second Friday of the Month except December and January.   **8:00 PM. Friday Frolics. VK3RMC 147.325 MHz**
EVERY week day evening. 4:45 PM on. Drive Time. 146.550 MHz
EVERY Wednesday night, 8:00 PM. Club Net.   **VK3RMC 147.325 MHz or 146.550 MHz and on Digital Voice.**

Updated 6 Decenber 2020

CLUB BARBECUE

The Committee has decided to hold a BBQ at midday on Sat**urday 12 December** in the grounds near the Clubroom. This will be very much weather dependent as there is little shelter available and we will be unable to retreat to the hall due to COVID limits. Rain will cause the event to be postponed.

However, if all goes well, you are all welcome to come and enjoy our final meeting for the year. There will be limited catering available and it is suggested that you bring some food and refreshment to supplement the soft drink and burgers on offer from the club.

Any further enquiries may be directed to the Secretary Ken Millis, millisk@hotmail.com

We look forward to seeing you there.

GREETINGS FROM THE PRESIDENT

Christmas Greetings to all MDRC Members and Friends

Well there is no doubt 2020 has be one difficult year for many and a total disruption to our lives both socially and also financially in some cases owing to the Covid19 lockdown.

The Met Buro has predicted 25C and sunny for the MDRC Christmas break up this weekend at the clubrooms, starting at 12pm.

Let's enjoy the opportunity to all catch up and share our stories…social distancing of course.
I look forward to when we can all get back together for the normal Tuesday and Friday night meetings.

Thanks go to Ken VK3KIM for tunning the Tuesday meetings on air, to Alby for doing the sane via the repeater, to Tony VK3CAt for the weekly evening nets and Ron VK3AFW for keeping the social events flowing on the second Friday of the month..

Several times I tried to call in without success…only to find out that my antenna had broken off at the socket…Hmm that will do it.
Now its all fixed and RMC is once again full scale at my QTH.

GREETINGS FROM THE PRESIDENT

The committee have been meeting on zoom on a reduced schedule over the Covid19 period but now we can travel a bit further from home, plans are afoot to repair and replace some components on the antenna system over the Christmas break.

So from my family to yours, wishing all a very Merry Christmas and Happy New Year 2021 and I hope to see you all Saturday.

73 Lee
VK3GK
MDRC President.

HOTHAM SOTA ADVENTURES

The world has changed since the outbreak of the COVID 19 pandemic. In Victoria we have had harsh restrictions that have prevented many operators getting out into the field to activate both parks and summits.

This year we cancelled the annual Hotham SOTA Summit due to bush fires and hoped to reschedule later in the year. The window has now opened and the 2021 5th Hotham SOTA Summit is in the planning stages.

HOTHAM SOTA ADVENTURES cont'd

As many SOTA operators know, we usually spend our winter at Mt Hotham managing a ski lodge. This year the opportunity presented itself for us to stay in the CFA station as CFA volunteers. The post required us to be on call for fire incidents and also we were given administrative tasks to undertake.

The snow season started slow with COVID19 restrictions being put in place for resort entry and lift ticket sales. We managed 2 days skiing before the lift company shut the lifts. Most guests left the resort with the Resort Management Board eventually closing the resort except for residents. We had enough snow for cross country and ski touring.
Overall the season ended up being very poor with limited snow.
The Stage 3 restrictions in Regional Victoria gave us the freedom to exercise and carry out outside recreation activities (SOTA).

Being a fairly dry winter I took the opportunity to work a lot of previously activated summits and quite a few new ones. At the date of writing this report I'd managed to qualify around 30 summits.
One event I was keen to do was the ZL3CC Memorial Day activation. I setup on Mt Hotham in very poor conditions with gale force winds and bitterly cold weather. I had very little luck making contacts and ended up after many squid pole collapses to eventually break the squid pole. I

HOTHAM SOTA ADVENTURES cont'

I've appreciated the many contacts I've made during this winter. The frequent chasers are always there and included VK3PF, VK3SQ, VK2IO, ZL1BYZ and ZK1WA.

As restrictions eased in Victoria we returned to Melbourne late October. During the November I managed a few Melbourne local summits.

I posted a notice on SOTA Groups.io advising the intention to run the Hotham SOTA summit in Feb 2021.

I was overwhelmed with the response with 16 odd starters within 24 hours including a couple from NZ. At this stage we have 23+ attendees. I have sourced one lodge and will obtain another to cater for overflow.

We usually run the weekend by splitting up the group into teams of 4 and send them off in different directions so that they can maximise their point opportunities and we co-ordinate as many Summit to Summit contacts as possible.

Anyone is welcome on the weekend with some choosing to chase rather than activate.
If you are interested please contact Brian (0425 721 860) to lodge an expression of interest to intend. If you are unable to attend then keep an eye out on SOTAWatch for those activating.   *Brian VK3BCM*

THE MARKET PLACE

In this issue we introduce a new feature The Market Place. Here we list and show items the Club has for sale. The list shows the price and following are photos of the items.

If you are interested in something listed please contact Ken VK3KIM the Club Secretary

THE MARKET PLACE CONT'D

Image	Description	Price
9803	2m Ground Plane	$30
9804	Diamond X50 2m/70cm Vertical	$50
9805	Superflex and Heliax Cable assemblies various lengths	POA
9808	Roof Mount Bracket	$15
9809	MDRC Slim Jim 2m with 2m cable	$45
9810	MDRC J-Pole 2m/70cm	$65
9812	Icom IC Q7 2m/70cm H/H (Q7 runs on 2xAA batteries)	$50
9817	Belcom S-868 27Mhz AM/SSB	$75
9818	Mizuho DC -7X CW QRP Kit 40m	$100
9819	Hansen SWR 6 Power Meter HF 10w/100w	$40
9820	Palomar R-X Noise Bridge	$25
9821	Icom IC 2AT 2m H/H	$50
9822	Puxing PX777 VHF/UHF Hand Held with two chargers 4 W UHF 128 channels	$50
9823	BHI NES10-2 Noise Cancelling Speaker	$40
9824	AR7 with speaker and power supply. Tuning Boxes	$160

THE MARKET PLACE CONT'D

9803


9804

9808

9805

THE MARKET PLACE CONT'D

9809

9810
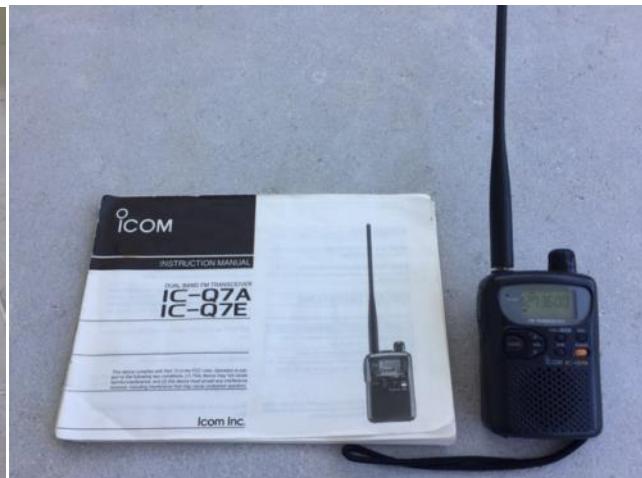
9812

THE MARKET PLACE CONT'D

9817

9818

9819
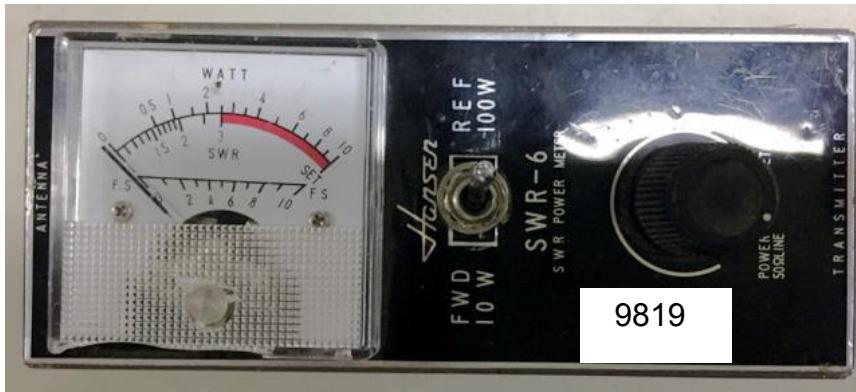
THE MARKET PLACE CONT'D

9820

9822

9821

THE MARKET PLACE CONT'D

9823

9824

THE MARKET PLACE CONT'D

40 m dipole with winder, balun and bag.

$40 plus postage

THE MARKET PLACE CONT'D

White Wabbit Winders $5 each or 5 for $20 plus postage.

Coming soon, 9:1 balun $40 plus postage

Hook up wire. Offers? Contact Ken VK3KIM

THE MARKET PLACE CONT'D

Ron VK3AFW is offering the following;

MFJ Carolina Windom, 3.5 —30 MHz OCF doublet complete with feedline. Used twice in QRP field days and packed away. Excellent condition. Replaced by a lighter antenna. $100, pick up at Club.

Xiegu X108 20 W HF transceiver. Used on Norfolk Is SOTA expedition and several others in VK3. Spent some time in large lunch box hibernating. Replaced by RS918. $400 with lunch box but no lunch, pick up at Club.

RS918 Clone 10 W HF SDR transceiver. Used on half a dozen SOTA activations. In original box. Replaced by IC705. Excellent condition. $400 pick up at Cub.

Contacts: Ken: millisk@hotmail.com

Brian: adsljmv0@tpg.com.au

Ron: vk3afw42@gmail.com

RARE RADIO; VALVE WANTED

Carl, VK3CRL recently donated to the Club a rare Japanese WW2 VHF field transceiver; a model 94-6.

See more details at:

 https://www.cryptomuseum.com/spy/94-6/index.htm#ref_1.

Photo courtesy the Crypto Museum.

It would be great to at least get a working UM30MC double triode valve and any of the accessories.

Can you help?

Digital Mobile Radio and the VK DMR Network.
By Tony VK3CAT

Following a talk at the MDRC from Roger VK3KYY, I purchased my first DMR radio. Like many others, I chose the Radioddity GD-77 hand held (see right) as it represented an inexpensive introduction and had local support in the way of programming courtesy of Roger..

The GD-77, is a Chinese built radio offering FM & DMR modes covering VHF & UHF.

Programing is done through a CPS (Customer Programming Software) to create a Code Plug. This is done on a PC.

Digital Mobile Radio and the VK DMR Network cont'd.

Following up on the GD77, I purchased a TYT MD-9600 series 3 for the shack, its twin, a Retevis RT-90 for the Land Cruiser and a Connect Systems CS-800D for the work van. All these latter additions are similar in features, programing & frequency range to the GD-77.

Digital programing is much different to analogue where one programs as channels the frequencies of some local repeaters, CTCSS if required and the desired split & some simplex frequencies. Alpha tag it then it's done!

No, you need to get your head around the concept that DMR is a radio network.

Channels are called talk groups.

TTY 9600

RT90

Digital Mobile Radio and the VK DMR Network cont'd.

Each talk group needs to be associated with its correct Receive Group and Digital Contact. Time slot & Colour code programing is also required for each channel.
The frequency stored is that of one or more repeaters that are a part of the DMR network. Simplex is a little different.

Program set up for the shack can be different to that for a mobile and this depends upon the radio.
In the shack, you really do not need to program every repeater you can access as each repeater shares the same list of talk groups (channels).
Typically the repeaters are programmed into a "Zone" which contains all of the desired "Talk Groups (Channels)"
This means I could be chatting via VK3RMC on Talk Group 3803 to Denis VK3JN who is connected up to the VK3RPS repeater also on TG-3803. Note, same channel but different repeater; the link being done through the internet.

The typical programming is to have a Zone for each repeater and all the Talk Groups (Channels) programmed into each Zone.

Digital Mobile Radio and the VK DMR Network cont'd.

Mobile & Portable operation.
More so in mobile situations, you need to change repeaters on the fly to maintain the contact & this is where differences in how the radios operate come into play with Code Plug programming

GD-77 and CS-800D.
The above "shack set-up" works OK as when changing Zones (remember each zone represents a different repeater), so long as the Talk Group order remains uniform, the same Talk Group of the new repeater will be displayed; easy as pushing an up / down button or two. Example: Zone 1 could be VK3RMC and Channel 4 is Talk Group 3803.
Zone 2 could be VK3RPS and Channel 4 is also Talk Group 3803.

Digital Mobile Radio & the VK DMR Network cont'd.

<u>MD-9600 and RT-90.</u>

With these radios, a Zone is split into two portions called A & B
Each portion is a little like having two VFOs displayed, each can be programmed with up to 32 Talk Groups. Unless locked, both A & B portions will be scanned.

Changing Zones will revert you to the first Talk Group programmed into that Zone. Example: Chatting on VK3RMC on TG-3803 *(the 4th channel in the zone)*, in my case, shifting over to VK3RPS will have me on TG-505 *(the 1st channel in the zone).*Thus, every repeater change requires lots of button presses.
I also add that whilst buttons can be programmed to change Zones, the switching is very slow. The other option requires entering the menu system.
I have found it better for mobile operation with these radios for programming to be the same as for home use but to add some additional Zones specifically for typical mobile use.

Example: Zone name = Mobile.
Display A: Talk Groups = TG-505 on repeaters VK3RPS, RAJ, RMC, RMM, RGL,.RTE,.RAH &RDR.

Display B: Talk Groups = TG-3803 on repeaters VK3RPS, RAJ, RMC, RMM, RGL, RTE, RAH & RDR.

Digital Mobile Radio & the VK DMR Network

This means I can put a call out on the national call Talk Group -505 then easily press the A/B button to move to have a conversation on TG-3803.

If I need to change repeaters, then the channel up / down buttons will select the same used Talk Group but on the next programmed repeater.

<div align="center">

Comparisons:

</div>

GD-77

Provides reasonable value & is a good entry point. I would not be the end of the world if I lost it on a mountain top. Sensitivity and selectivity could be better.

Roger"s community edition CPS offers a good user interface.

Use at home through my MMDVM Hotspot (real radio?) is handy, like having a repeater in the back yard. Also, for user activated Talk Groups, can leave repeaters available for RF users.

CS-800D.

The best attribute is the remotable front panel. Interconnection via a common Cat5 or similar data cable.

Pros: CPS allows "Channels" inside a Zone can be sorted by either their allotted name of Channel ID number.

FM & DMR "Channels" are in separate lists. This makes your Code Plug appear more orderly in the CPS after editing.

Audio channel read out partially compensates for the small display.

Changing Zones, does not revert to Channel 1

Digital Mobile Radio & the VK DMR Network

Cons:
No VFO Mode.
Can't send a message to a second radio that has the same DMR ID.
Mic connector is a vertical RJ socket. Not so easy to disconnect mic.

MD-9600 & RT-90:

Pros.
Strong audio.
Decent display, colour makes it easier to read than the orange in the CS-800D
A / B split in each Zone makes navigation easier.
Cons.
Difficult to change Zones whilst activity is present on the current monitored Talk Group. Activity on "A" will lock out reception of "B" if the secondary portion is selected unless then "A" is locked out. Same situation "B" to "A".
VFO mode available, not simple to access via the menu system and microphone.
CPS not as good as the CS-800D, single section for both analogue & digital channels which can only be sorted by their :Alias / Alpha Tag.

Digital Mobile Radio & the VK DMR Network

Conclusion:

DMR is a viable alternative to conventional FM radio on V/UHF.

DMR does require a good input signal into a repeater and does not appear to be as robust as FM for mobile operations.

The audio quality can be excellent.

Could be likened to a Zener Diode, signal levels do not make much difference until the Zener Knee is reached, where the signal literally falls off a cliff.

The network linking opens up a new horizon.

Activity appears to have gone off the boil but the network continues to be expanded.

Programming takes a bit of effort to get used to & definitely needs a PC.

Equipment represents quite good value.

Tony VK3CAT

A REPORT FROM ROGER VK3KYY

I've not been very active on air this month because of work commitments. My ATU design is still on hold, mainly due to lack of spare time.

Most of the components for it have arrived from China, apart from the CPU. But one set of relays are the wrong voltage (5V instead of 12V), and also a lot of the components arrived with no documentation, so I'm struggling to correlate what I have received against what I ordered.

Its a big learning, that I should not order different components from various small suppliers in China, and instead order everything from one component supplier, either in China or Australia.

That way, I'm likely to know what I have and haven't received.

My Malachite SDR receiver board finally arrived from China, after being in transit for over 3 months. I was days away from getting a full re-fund when it arrived.

The board is designed by a group of Russian hams, and has been cloned by the Chinese. It can receive from LF though to UHF, in a variety of modes e.g LSB, USB, FM.

Here are some links to give an overview of the receiver

https://www.qsl.net/n9ewo/malahit.html

https://www.rtl-sdr.com/the-malachite-dsp-a-195-russian-made-portable-wideband-sdr-with-touch-screen/comment-page-1/

A REPORT FROM ROGER cont'd
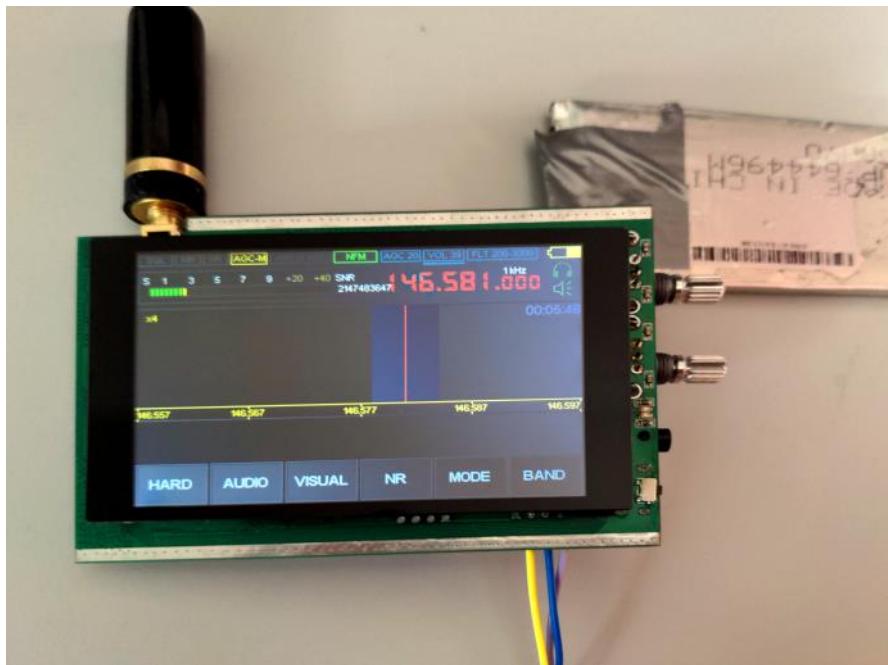
Being a cheap skate, I bought a bare board, without a case, battery or even the speaker.

I have quite a few old laptop batteries, and that's what its connected to in the photo. (left).

The other board that's currently soldered to it, is a programmer dongle to do firmware upgrades. It is possible to do firmware upgrades via USB, but its not as reliable and the USB firmware upgrade requires a couple of pads on the back to the PC to be bridged.

So since I already had the programming dongle, I used that to update the firmware.

A REPORT FROM ROGER cont'd

The business model for the Russians is to artificially limit the frequency range of the firmware, and to charge $50 for a license code to make the firmware fully functional.

But I don't think the business model is going to work because….
(a) the Chinese already figured out how to generate license codes, and started to sell them for $45 to undercut the Russians, and
(b) for anyone tech savvie like me, it was quite simple to look in the firmware data file, and find the section which checked the license code number, and remove it.

I initially had a problem, because after doing a firmware upgrade, the board went nuts and wouldn't work at all. But luckily I know someone else who has one, and they told me they had the same problem, and after the firmware upgrade, the board will only work if a battery is attached, and won't run off a USB charger on its own.

This is obviously bad hardware design, but as the radio is supposed to be portable, then its not a big problem to connect a Lipo battery

But.. After spending a lot of time to get the board up and running, I've not really had time to use it.
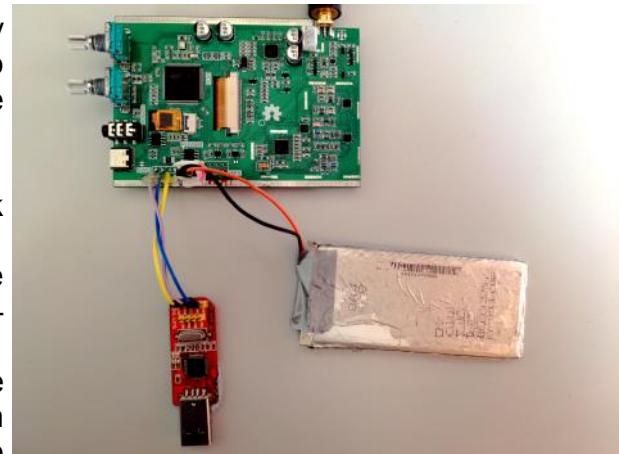
A REPORT FROM ROGER cont'd
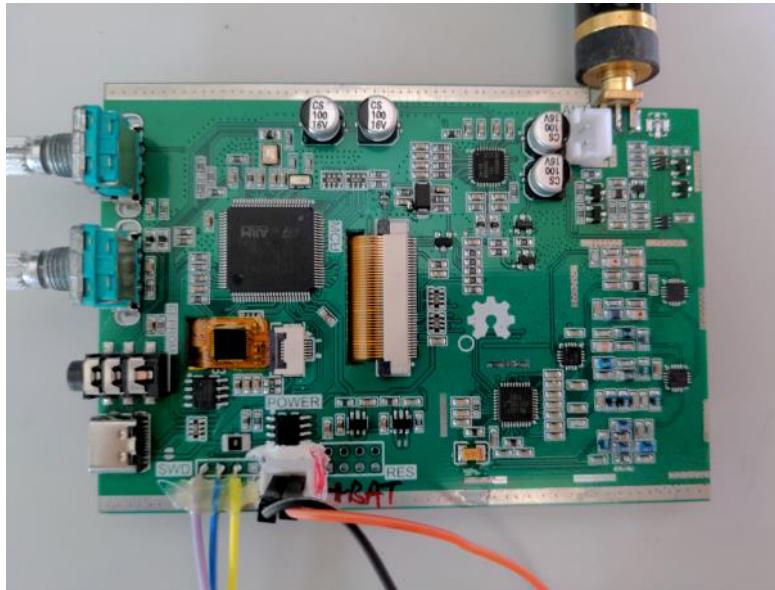
Apart from that.

Work continues on the OpenGD77 firmware, but it now mainly involves Daniel F1RMB sending me bug fixes, which I apply to the firmware and attempt to test. Rather than me actually doing any development work – because I don't have much free time.

The last public release of firmware was a Beta version on the 12th of November, and I've not had any major bug reports on this, even though the GD-77 version has been downloaded over 700 times.

So I'm probably going to declare that Beta version to be stable in the next week, which usually triggers a lot more people to download it, The last 2 stable versions had over 2200 downloads of the GD-77 version alone.

Cheers,
Roger, VK3KYY

A HINT FOR REPEATER USERS

Did-You-Know?

Did you know that your VHF and UHF radios have a function listed as TOT.

If you set it to 60 Seconds your radio will time out and over-ride your PTT button when transmitting. This is handy when working via a repeater as your radio will Time out at the same time as the repeater, This prevents you continuing to hold the Repeater after it times out while you continue to talk.

73

Ian VK3SV
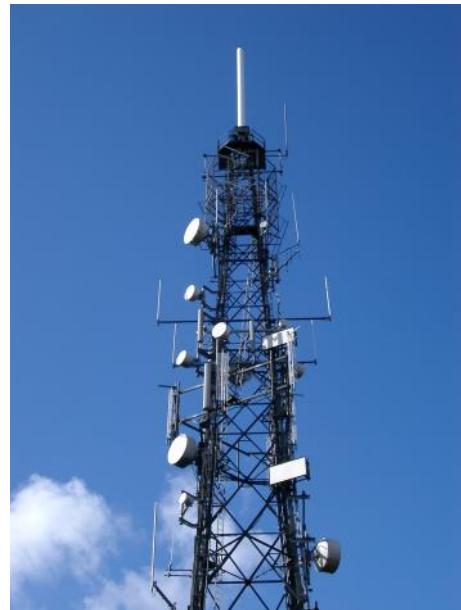
A JS8CALL TRANSCEIVER by Ben VK3FBCN

I have just received a Phaser SSB kit for JS8call but haven't started building it yet

The **Phaser Digital Mode Transceiver™**

is a single-board, 4-watt SSB radio specifically designed for using digital modes with computers running WSJT-X, DigiPan, FLDIGI and most other digital mode applications.

Frequency coverage:*

Phaser-160 board: 1.840 MHz (FT8) and 1.842 MHz (JS8/ALT)
Phaser-80 board: 3.573 MHz (FT8) and 3.578 MHz (JS8/Alt)

Phaser-60 board: 5.357 MHz (FT8) and 5.357 MHz (FT8/Alt)

Phaser-40 board: 7.074 MHz (FT8) and 7.078 MHz (JS8/Alt)

Phaser-30 board: 10.136 MHz (FT8) and 10.130 MHz (JS8/Alt)

Phaser-20 board: 14.074 MHz (FT8) and 14.078 MHz (JS8/Alt)
Phaser-17 board: 18.100 MHz (FT8) and 18.104 MHz (JS8/Alt)

* *FT8 frequency hard-coded*

* *Alt frequency soft-coded to JS8, user reprogrammable*

A JS8CALL TRANSCEIVER by Ben VK3FBCN

Tx operation: *Phasing SSB*

Tx power output: *4 Watts (nominal)*

Receive MDS: *-109 dBm*

Adjustments: *Tx Drive*

Frequency Calibration: *1-time*

User Programmable 'Alt' frequency:

*100 kHz to 30 MHz, 1 kHz resolution
  No external interface required.*

Dimensions: *4.125" x 3.85" x 1.20"*

DC Power: *12V @ 130ma (Rx), 1A (Tx)*

SMT components: *8 (pre-installed)*

Kits: *All version available: 80m, 60m, 40m, 30m, 20m and 17m*

Enclosure: *Kits optionally available*

A FUEL LAMP
APC lockdown project #9.

WARNING. THIS PROJECT HAS THE POTENTIAL TO BURN DOWN YOUR HOUSE. TAKE CARE

When the power goes off most of us reach for a torch or battery powered lamp. If the power is off for weeks or more due to a major disaster we are going to run out of battery power fast. What to do? If you are a camper you probably have a gas light and a small stove which is great until the gas runs out or you need a second light.

When I was a kid we had no services and used candles for night lights with a kerosene lamp for meals and later for homework. On Sunday nights we used a Tilley mantle lamp, a quite pretentious bit of kero lamp. We ate in the Dining Room instead of the Kitchen on Sunday nights..

I have built two small lamps that currently run on methylated spirits but could run on kerosene or similar liquid fuel. Apart from providing more light than a candle it could be used to heat small quantities of food or even cook an egg or boil water for tea or coffee. These activities would require a metal stand.

A FUEL LAMP
APC lockdown project #9.

Methylated spirits burns cleanly which is an advantage over other fuels that may be a bit smoky from to time. I found kerosene tended to smoke badly. Changing the wick length is probably the key to smokeless flames. If the exposed wick is too long there is too much fuel for the air supply, hence smoke
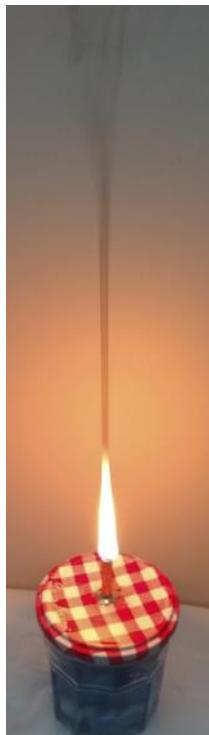
A FUEL LAMP
APC lockdown project #9.

By using a blow tube, a tube with one end blocked and small hole near that end, a high enough temperature can be attained in small objects so that silver soldering can be done.

You need a screw metal top glass jar such as is used for marmalade or a small bottle with a metal screw lid which has a good base. The next item is a metal tube preferably of brass or copper 2 to 3 mm in diameter.

Drill a hole in the bottle/jar lid to give an interference fit to the tube. The tube should be cut to be long enough to penetrate to within 10 mm of the bottom of the bottle or tube and extend 25 mm to 30 mm above the tip. A second breather hole should be drilled in the lid/top to prevent pressure build up in the bottle or jar.

Clean off the paint around the first hole and solder the tube in place. Any glue that is heat resistant up to 80 C could be used instead of solder.

A FUEL LAMP
APC lockdown project #9.

Get a wad of cotton wool and tease out a length. Roll this onto a rope that is 30 mm longer than the tube and the same diameter. This is the wick. With the aid of some thin copper wire pull the wick up the inside of the tube and leave about 5 mm beyond the top. There should be enough at the bottom to touch the bottom of the bottle or jar.

Fill the container to about ¾ of its volume and insert the wick tube and screw the lid in place. It may take 10 minutes for the wick to become wet enough to tight with a match. Within a couple of seconds you will have a bright clean flame to light your way.

Note that all fuel lamps can represent a fire hazard just as a candle does. Always place it on a firm stable surface well away from flammable materials above or around it. While modern candles tend to be decorative rather than in-tended for good illumination they cause house fires every year. Naked flames are dangerous.

HERON'S FOUNTAIN
APC lockdown project #10.

An article describing an ancient hydraulic device caught my eye.

https://makezine.com/2008/06/08/build-herons-fountain-1.

We tend to think that 2,500 years ago they were big on the arts but there was also a considerable technical knowledge of mathematics, astronomy and civil engineering and architecture. However only a small part of the community were schooled in it. Hydraulics was well understood with siphons, aqueducts, sewers and remotely operated doors and alters. This toy illustrates some of the principles.

It took me a while to figure it out, maybe not hundreds of years. There is something intriguing about a self powered fountain. The diagram on the next page shows how it is configured.

I used three flavoured milk bottles and some garden irrigation tubing. I had to join one section as it was a bit too short otherwise.

HERON'S FOUNTAIN
APC lockdown project #10.

It is easy to drill holes in the lids and bottom of the bottles as required. The critical thing is to make airtight the tube-lid holes.

I used Blue-Tac after my silastic failed to bond.

Fill the central bottle with water through the longer tube (orange in the diagram) sticking out of the top. Fill the top reservoir.

Water from the top reservoir will now flow into the bottom bottle. (green tube) The air pressure in this bottle quickly reaches the pressure of a column of water equal to the height of the surface in the top reservoir to the bottom.
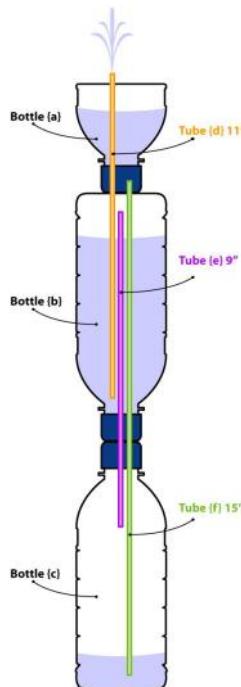
This air pressure is transferred into the air space at the top of the centre bottle. (red tube)_ The fountain (orange) tube has water at the bottom at this pressure plus the height of the water in the centre bottle. Water will spout from the fountain tube and flow until the main bottle is nearly empty. A well made fountain without air leaks will produce a fountain 50 mm (typically) higher than the water in the top reservoir.

Not quite perpetual motion but good for several minutes.

Bottle {a}
Tube {d} 11"
Tube {e} 9"
Bottle {b}
Tube {f} 15"
Bottle {c}

HERON'S FOUNTAIN
APC lockdown project #10.

My assembled and operating fountain is on the left. In spite of my best efforts there was some air leaking cutting the height of the fountain significantly. On the right the steady and self powered fountain in action.

If the exit hole of the fountain tube is made smaller the fountain will run for longer. Also making the volumes of the bottles bigger than 500 mL will increase the operating time.

Heron may not have invented this fountain but he described it in his lecture notes so gets the credit.
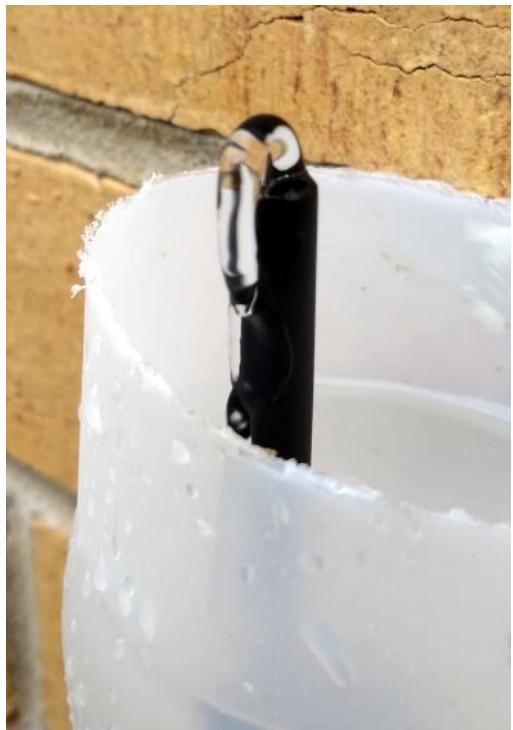
TRADE DISCOUNTS

FOR CLUB MEMBERS at ALTRONICS and JAYCAR.

Moorabbin and District Radio Club Inc. members can now buy over the counter at **Trade prices** from both **Altronics and Jaycar.** When making a purchase ask for **Trade Discount** and for **Altronics** quote the Club's Trade account number **32323** and your **call sign** or for **Jaycar** quote Customer Number **45400209. This is NOT a charge account so you use your money**. **Note: Minimum purchase of $20 may apply.**

Check out these companies at their websites.

http://www.altronics.com.au

Get your Club photo ID discount card NOW
http://www.jaycar.com.au