

Official Bulletin



MHz to GHz

The West Australian VHF Group Bulletin

AUGUST 2007

THE WEST AUSTRALIAN VHF GROUP (INC)
PO BOX 189 APPLECROSS

Web site: <http://vhf.worldsbest.com.au>

e-mail committee to: committee@vhf.wirelessplanet.com.au

President	Luigi	VK6YEH	Vice President	Murray	VK6HL
Secretary	Terry	VK6ZLT	Treasurer	Chris	VK6KCH
Activities			Materials		
Publicity					
Museum Rep	Tom	VK6ZAF			
Trustee	Wally	VK6KZ	Trustee	Don	VK6HK
AUG	20	COMMITTEE MEETING	NOV	19	COMMITTEE MEETING
	28	GENERAL MEETING		26	GENERAL MEETING
SEPT	17	COMMITTEE MEETING	JAN	14	COMMITTEE MEETING
	24	GENERAL MEETING		21	GENERAL MEETING
OCT	15	COMMITTEE MEETING	FEB	18	COMMITTEE MEETING
	22	GENERAL MEETING		25	GENERAL MEETING

General Meeting Place: Wireless Hill Museum Lecture Room. Entry via corner of Almondbury and McCallum Crescent Ardross.

Meeting Time: 8pm.

Editors Note:

Welcome to the 2007 issue of the VHF Group bulletin.

There is an old saying "We are either cash rich and time poor, or, we are time rich and cash poor." Unfortunately I cannot claim to be cash rich, but, I certainly am time poor. Many duties both at work and at home have led me to the belief that I am not able to devote enough time into the functions required to maintain an effective presidency. As a consequence, and regretfully, I will be stepping down from the presidency of the VHF Group and hope another with more time will be able to fulfill its requirements. It is hoped that the time saved can be diverted to building activities within the group.

Whilst I do not wish to dwell on social issues, in this bulletin, I believe the issue of time is affecting not only this club, but, many others in the community at large. A recent report in the West Australian highlighted the decline in volunteers for school canteens. Some have attributed this, at least in part, to a decline in community spirit, but perhaps an economic necessity is more the driving factor. One could take the view that a retired member would have ample time to oversee the running of the clubs activities, but a casual conversation with them finds that many are busier than ever. Families who have chosen to move, or have purchase their first property during the recent surge in housing prices, have found many struggling to make ends meet. With both parents working and the high cost of childcare, grandparents are offering to look after pre-primary children, or, assisting in other ways, such as building maintenance or improvement. On my own account, a backyard renovation project which should have taken about four to six months of week-end work, has now gone over 12 months for one reason or another.

For this reason, I am eternally grateful to those members of the group who have manages to devote time to the group activities. People like Terry VK6ZLT who has been a very supportive secretary and Don VK6HK who has devoted much time and energy to the maintaining of the beacons. It is hoped that I can contribute in other ways to the club and hope others will join me.

One of the purposes of this bulletin is to advise group members of the up and coming annual general meeting in September. The committee is again up for renewal and you will find a nomination form in the Club Activities section. I would like to invite members to be come more involved in the day to day running of the group. Perhaps you may wish to nominated someone else. In either case, please fill in the form before the Annual General meeting. Even though I am stepping down as president, I am hoping to devote more time to the clubs projects.

With the end of the 2006 financial year, 2007 memberships are up for renewal. If you haven't yet paid you subscriptions, please fill in the attached form and forward a cheque to the address shown above. Alternatively, one can pay at one of our general meetings or send an e-mail to the committee (address on front page) for bank details if you wish to do a direct transfer. Persons wishing to become new members, an application form is attached to the end of the bulletin.

This bulletins technical articles include, an experimental DC/DC converter, an adapter board for the Jupiter GPS module and information on constructing Quadrifilar antennas.

Finally the editor wishes to thank all those who contributed to the bulletin.

Club Activities:

1296MHz Amplifier Purchase

Phil VK6ZKO advised the committee that RF Resale was selling some 1296MHz amplifiers which we may use in our beacons. The committee reviewed its requirements and purchased four of these units for future beacons and to act as spares.

The amplifier has a 24VDC input and produces 35W with 1dB compression from a 10mW input signal.

Alan Devlin (VK3XPD), the proprietor of RF Resale, generously donated one of the units for use in our beacons. Many thanks to Alan.

Beacon Update Project

The beacon update project is moving slowly forward. I am currently working on a GPS locked 10MHz reference. The principle of operation is along the same lines as the unit described in QST by Brooke Shera W5OJM. In this case I am using a low drift oscillator with other precision devices. The purpose here is to compare its output stability and frequency accuracy with a simple circuit such as that described by J R Miller G3RUH (<http://www.jrmiller.demon.co.uk/projects/ministd/frqstd.htm>). By comparing the two units on a spectrum analyser one would be able to deduce their relative performance when multiplied up to 10GHz. This would form the heart of our frequency generation. It may turn out that the simpler and much cheaper unit would be suitable for our use in the new beacons.

Coincidentally, the May 2007 issue of Scatterpoint had an article by Grant Hodgson G8UBN proposing a new beacon engine. I must admit I had a strong feeling of déjà vu as I read the article. The article outlined, almost to the letter, what the VHF group is trying to produce with its range of new beacons.

Remote Beacon Project

The committee has been looking into a proposal by Fritz, VK6UZ, for constructing a small self contained beacon for temporary installation at a remote location. The beacon could then be used for path propagation measurement. Fritz has proposed a beacon that can be interrogated to set various modes of operation.

Fritz's overall requirement is in line with current beacon thinking. Merging the two would help development and provide a test bed for reliability in more extreme environments.

As mentioned previously, the club had recently purchased some 1296MHz amplifier modules. One of these could be made available for the project. Some evaluation needs to be performed before use in the field. The PA has a large heatsink with a fan. As the beacon is to be used remotely, low power consumption is essential. Temperature measurements need to be made against output power to gauge the suitability of using it without a fan. The expected low duty cycle of operation could also assist us here.

Beacon Monitoring Project

The beacon monitoring project has been evolving in the last year. Most of the difficulty has come down to finding receivers with suitable RSSI indicators. Trials this year found some units wanting in this area. The signal strength output was not a good indicator of signal level. A query was raised to look at a Winradio receiver however the evaluation could only take place in Melbourne. Perhaps if anyone has some experience with these radios or knows of someone who has used one, they can contact the group.

Failing that, it would appear the best alternative is a software defined radio using a software package such as Faros (<http://www.dxatlas.com/faros/>). This package is still being evaluated, however, the group would need to monitor several beacons across a range of bands. It would be useful if these packages contained some provision for controlling remote hardware

Committee Nomination Form

West Australian VHF Group Inc. Annual General Meeting 24th September 2007			
Nominations for Group Representatives			
Position nominated: _____			
Proposer: _____			
Name		Signature	Date
Seconder: : _____			
Name		Signature	Date
Nominee: : _____			
Name		Signature	Date

Technical Articles:

An Experimental DC/DC Converter.

By Alan Woods VK6ZWZ.

Have you ever had the need to produce negative 12 volts at 100 mA from a (nominally) positive 12 volt supply? Then perhaps this circuit is for you, or at least a good starting point. I've labelled it "experimental" because I'm not entirely satisfied with it. It is a bit fiddley to get going properly, although good fun if you have an oscilloscope. At its best, however, its capabilities are quite impressive for such a simple circuit.

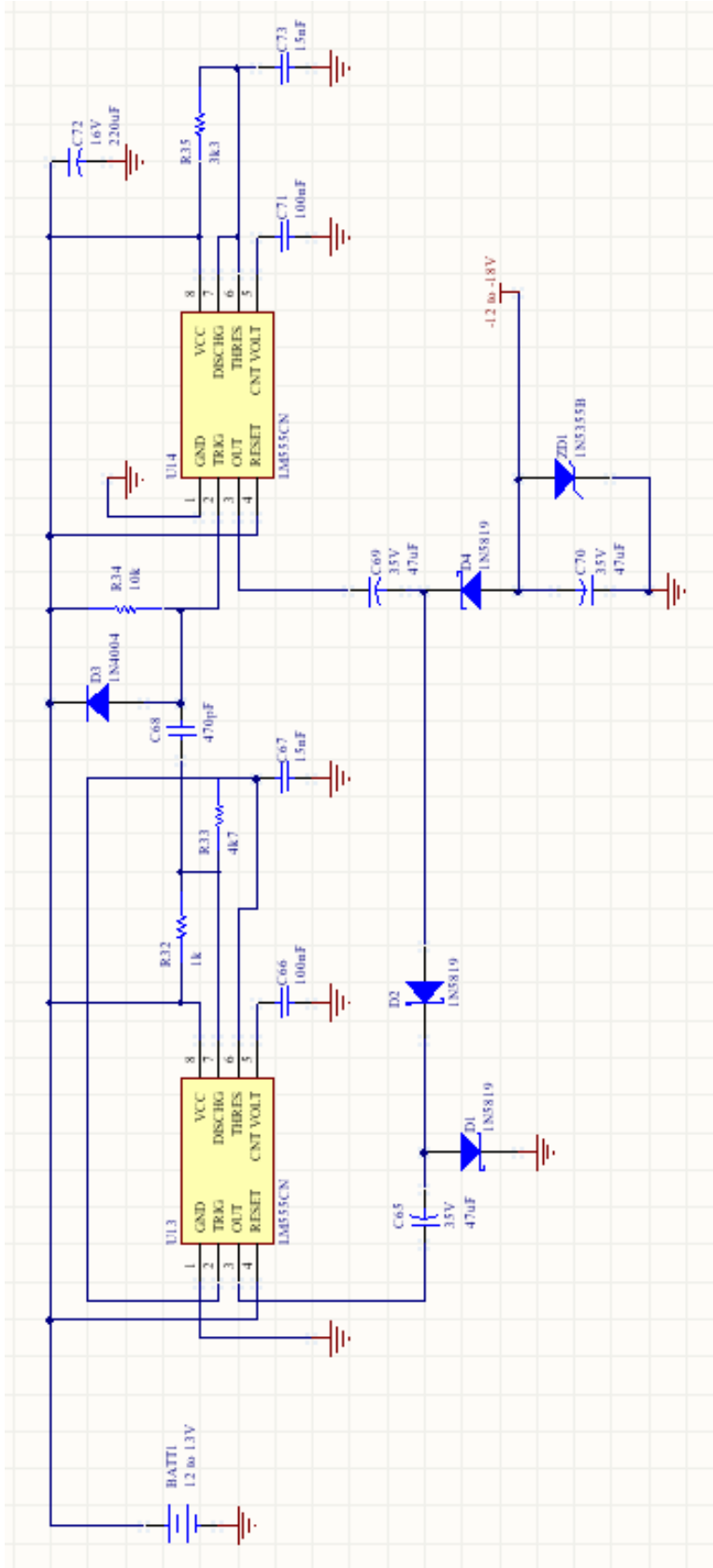
The circuit uses two of the ubiquitous and inexpensive 555 timer IC's. According to the online encyclopaedia "Wikipedia", the NE555 was first introduced by Signetics (later taken over by Philips) in 1971, and over a billion 555's are currently produced per annum. It was Al VK6ZAY who first drew my attention to the fact that the 555 is claimed to be able to "sink or source up to 200 mA", which makes it a contender for our application.

The first 555 is wired as an oscillator, with a frequency around 12 kHz. The second serves as a "one-shot" triggered when the output (pin 3) of the first goes low. The time constant of the one-shot is chosen so that its output stays high for the same period that the oscillator's is low. (That's the fiddley bit!) It would be nicer to use definite triggering at the end of this period, but this circuit has the advantage of simplicity.

Initially I did try to obtain definite triggering by cross coupling two 555's multivibrator style. This was promising except that when first switched on, this "oscillator" would just sit there and do nothing. It needed a (single) negative going pulse to one of the pin 2 trigger inputs to get it started. (Incidentally I subsequently found the same multivibrator circuit in a Motorola applications note for their dual 555 with no mention of this difficulty). As it was important in my application (a negative bias supply) that the oscillator not just start initially, but also restart should a glitch such as a momentary output short circuit occur, I abandoned that approach. Come to think of it, I don't understand why the "standard"

555 oscillator configuration (as used in our circuit) doesn't have a similar problem. I did read

somewhere that the IC includes a "starting circuit". Can anyone enlighten me please?



Now back to the circuit actually used. In practice, as long as the timing of the two stages is reasonably close they will "lock" together, in which case the circuit typically operates quite efficiently. (Often better than 45%). The exact mechanism behind this locking is not clear to me, although phenomena of this kind are of course quite common. Presumably there is some coupling of the stages via the supply line. As I recall, locking is often attributed to the locked state being that in which energy dissipation is minimized. It's only a guess, but perhaps thermal effects involving the on-chip cleverness used to control device dissipation also play a role. Having said this, several "pathologies" are possible, as may be evident if you have a CRO. To avoid these, it is important to use the same type of high stability component for both the 15nF capacitors. Also, the 3.3 k resistor could be made partially variable by replacing it with a fixed resistance of at least 1 k in series with a 5 k preset pot. This can be adjusted to give a high output voltage under load, consistent with reliable constancy of operation from switch on. (The inclusion of the fixed resistor is important. As I discovered the hard way, excessive current can destroy the internal "discharge" transistor whose collector connects to pin 7 of the IC).

Figure 1 - DC/DC Converter Circuit Diagram

Of course if you have a CRO you can adjust the preset to obtain perfect timing.

To achieve good efficiency, it is important to use Schottky diodes in the 3 positions indicated. I also used tantalum devices for the two 47uF capacitors. The effective output resistance of the converter is quite high, so you will probably want to regulate the output somehow. A very crude form of (partial) shunt regulation is shown in the form of an 18 volt zener wired directly across the output so that it works in combination with the internal resistance. This zener was included mainly to provide an output load under all conditions. Without it, the magnitude of the output voltage with no load could rise to (almost) twice the supply voltage and operation appeared erratic. Perhaps this was due to “spikes” getting back into the 555’s. Depending on the manufacturer, the absolute maximum working voltage of a 555 is generally specified as either 16 or 18 volts, and most specs apply only up to +15 volts on the supply line.

The maximum device dissipation also varies with the manufacturer. I was somewhat shocked to discover that the official Philips specification is only 600 mW. At least one other manufacturer has a spec which is almost twice that, while a couple don’t seem to list a maximum dissipation at all on their data sheets. I had been working from one of these and had assumed that the current sunk or sourced via the output pin was essentially internally limited to a safe value. So be warned! If the prototype is anything to go by, this circuit is capable of significantly exceeding the 600 milliwatt rating if the load current and input voltages are high enough.

So here’s what the prototype did and is probably safe. At +12 volts in, the output voltage was around –18 volts until about 25 mA was drawn. It was still greater than –12 volts at 100 mA out. Rather higher figures apply at +13 volts in. As you might have guessed from my “shock”, the prototype actually survived much crueller treatment under soak testing for hours with no signs of distress. (But at any higher input voltage the zener will get *hot* if there is no external load.) Repeat such experiments at your own risk!

Well now I can take back the negative voltage supply that had been “borrowed” from my 5.7 GHz gear. “Why do I need a negative supply for 5.7 GHz?” did I hear you ask? Well those NEC gold (coloured) boxes for 6 GHz or so, which are inexpensively available surplus, run off a negative supply. They contain a very nice microwave amplifier. These vary quite a bit in performance at 5.7 GHz, but you can experimentally select them for low noise figure, good power output, or high gain. The box also includes a receive mixer and an IF amp that will work at 2 m. So if you have several of them, and retune one of the microwave filters from the same source, you only need add a low level local oscillator-multiplier unit to complete a basic receive converter for 6 cm. And the negative voltage required? Guess what, it’s –18 volts! Which is the other reason I chose an 18 volt zener.

Adapter board for Jupiter GPS Module.

By Luigi Iemi VK6YEH.

Some of you may have purchased the Conexant Jupiter GPS module. The 2mm pitch connector makes it difficult to mount on a 0.1inch strip board. One could purchase a connector and wire it across to another board, however, this may be messy. This adapter board uses a 2mm pitch socket and routes the control signals and power to a 0.1inch pitch header. Mounting posts allow the unit to be more securely mounted.

Resistors R1 to R4 and H1 allow the constructor maximum flexibility to configure the unit as circumstances require.

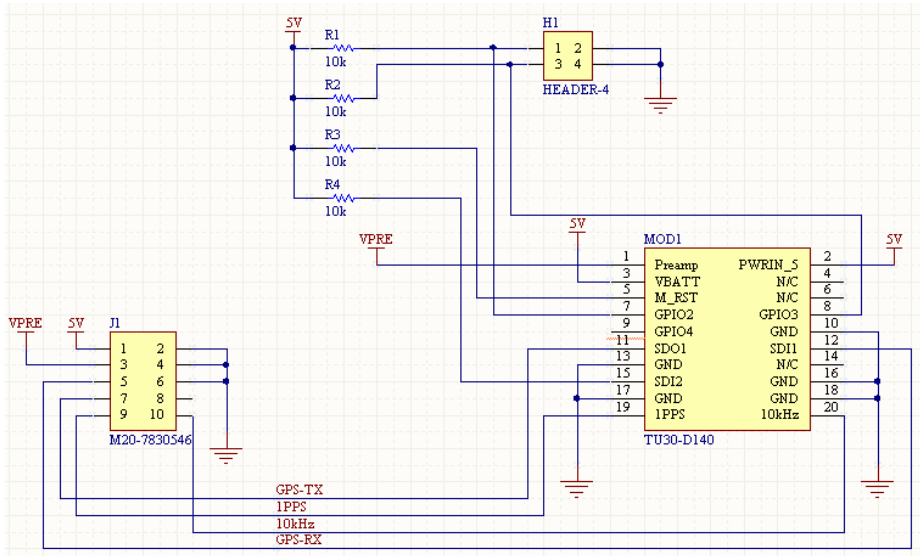


Figure 2 - Adapter Board Circuit Diagram

Parts list

- R1 – R4: 10k 0805 SMD resistor
- J1: 10 way 0.1inch header
- H1: 4 way 0.1inch header
- MOD1: Harwin M22-7141042 2mm pitch socket. Available from Farnell. Part No 110-9738 and Jupiter GPS module
- Misc: 4 off 3 x 8mm threaded spacers
8 off 3 x 6mm pan head screws
4 off 3mm star washers
4 off 3mm flat washers

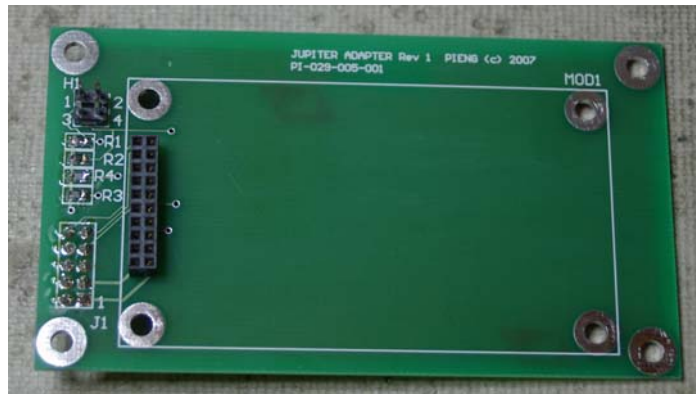


Figure 3 - Adapter Board

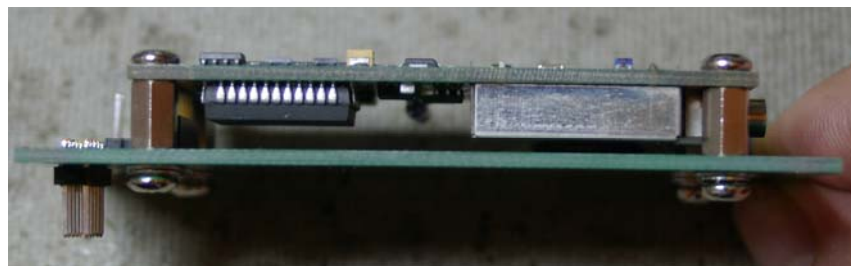


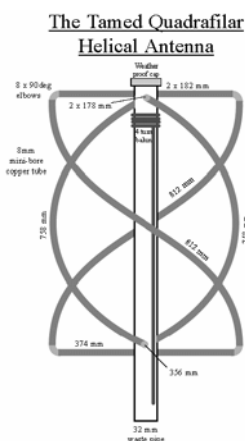
Figure 4 - Adapter Board Side View



Figure 5 - Adapter Board with GPS Unit

Quadrifilar Helix Antennas.

By Terry Leitch VK6ZLT.



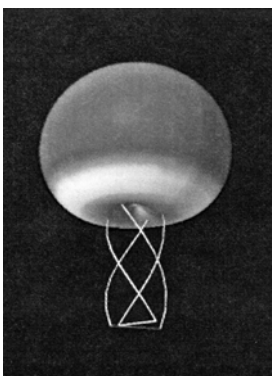
What is a Quadrifilar Helix Antenna (QHA)?

Simply - It's the best antenna to use for APT satellite reception - the featured antenna is depicted on the left.

To paraphrase M. Walter Maxwell

"It comprises two bifilar helical loops oriented in mutual orthogonal relationship on a common axis. The terminals of each loop are fed in anti-phase and the currents in the two loops are in phase quadrature. By selecting the appropriate configuration of the loops, a wide range of pattern shapes is available". The basic form of resonant QHA was developed by Dr. C. C. Kilgus of the Applied Physics Laboratory, Johns-Hopkins University, Silver Spring, Md. and published in December 1970 in "The Microwave Journal".

Since then a lot of research has been done into the number of turns and length/diameter ratios. All of these affect the radiation pattern. The "traditional" fractional turn design produces a cardioid radiation pattern. It has been found that tall narrow QHA exhibit a "shaped-conical" pattern with high gains to the horizon and decreased gain overhead, which is much better suited to APT ground stations. Most of the published data and designs on narrow antennas however have been more suited to UHF and do not translate well to 137.5 MHz (weather satellite downlink). One of the best is a narrow 5 turn, but at these frequencies it would make an antenna 7 metres high!



My interest in QHA antennas for amateur radio satellites rather than weather satellites reception was stimulated by antennas which are able to receive radio reception of differing polarization + having a reception pattern that has virtually no hole vertically above the antenna. Such is my experience with constructing "Lindenblad" antennas (quadrature angled folded dipoles).

Upon quick search of the internet provided a wealth of information.

Actual construction started with a thorough examination of the jcoppens site, assisted by details from ON7EQ's site ...

[Quadrifilar helicoidal antenna - Javascript on-line calculator](http://www.jcoppens.com/ant/qfh/calc.en.php)

<http://www.jcoppens.com/ant/qfh/calc.en.php>



For another calculator try the VE3SQR site.

The beauty about this antenna calculator is that it is easy to produce dimensions for the antenna along with the drilling template for the top and bottom junctions. This is very handy to drill holes in the irrigation piping that I used for the mast section. I used soft copper piping which I obtained from local plumbing specialist for the aerial conductor but any sort of cable or piping. However, if co-ax cable is used the velocity factor of the cable must be taken into account. The calculator can compute for different conductor diameters.

As mentioned in one of the sites use of pre-amplifier must be used with caution as the cable connection to the antenna is a **DC SHORT**.

My prototype "proof of project" antenna @ 145.9 MHz is not exactly pretty, however it does work fine with acquisition of signals close to the horizon as well as no dropout overhead is very encouraging. Here are some photos of my antenna and the installation.

Here are some internet sites to check out.
[QFA Antennas - Pictures and design data](http://www.jcoppens.com/ant/index.en.php) -
<http://www.jcoppens.com/ant/index.en.php>

[Quadrifilar helicoidal antenna - calculator](http://www.jcoppens.com/ant/qfh/calc.en.php) -
<http://www.jcoppens.com/ant/qfh/calc.en.php>

[Quadrifilar helicoidal antenna - Photos of ON7EQ's version](#) -



http://www.jcoppens.com/ant/qfh/fotos_7eq.en.php

[Quad Antena QHA para satélites polares. \(30STV\)](http://perso.wanadoo.es/dimoni/ant_qha.htm) -
http://perso.wanadoo.es/dimoni/ant_qha.htm

[quad antennas](http://website.lineone.net/~askrlc/) - <http://website.lineone.net/~askrlc/>

[Quadrifilar Antenna design](http://bobcash.freespaces.com/qha_4.html) -
http://bobcash.freespaces.com/qha_4.html
 Don't forget have ago experiment, experiment.



73's Terry VK6ZLT



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WESTERN AUSTRALIA 6953

<http://vhf.wirelessplanet.com.au>

MEMBERSHIP INFORMATION AND APPLICATION FORM

The VHF Group is an association of persons interested in the encourage and scientific development if V.H.F. Radio communications in all its branches, including satellites, Earth-Moon-Earth, long distance (DX), microwaves etc etc etc.

MEETING PLACE Wireless Hill Museum lecture room. (Entry via corner of Almondbury and McCallum Crescent Ardross).

MEETING TIMES General meeting on fourth Monday of each month except December, 8.00 pm at Wireless Hill. Council meeting on third Monday at 8.00 pm at nominated venues.

ACTIVITIES Monthly meeting.
Swap-meets, junk sales, components sales,
Regular technical lectures at the meetings.
Club station at Wireless Hill Museum with HF and VHF antenna systems.

SUBSCRIPTIONS Metropolitan \$20.00 per year payable before the end of June for the next financial year. Country \$18.00 per year for those residing more than 60km from the Perth GPO.

APPLICATION FOR MEMBERSHIP

SURNAME.....OTHER NAMES.....

ADDRESS.....

..... POST CODE

CALLSIGN.....PHONE(H).....

(W).....

NOMINATOR.....

SECONDER.....

SIGNATURE.....

DATE.....

Monthly meeting.

APPROVED FOR MEMBERSHIP..... (PRESIDENT)