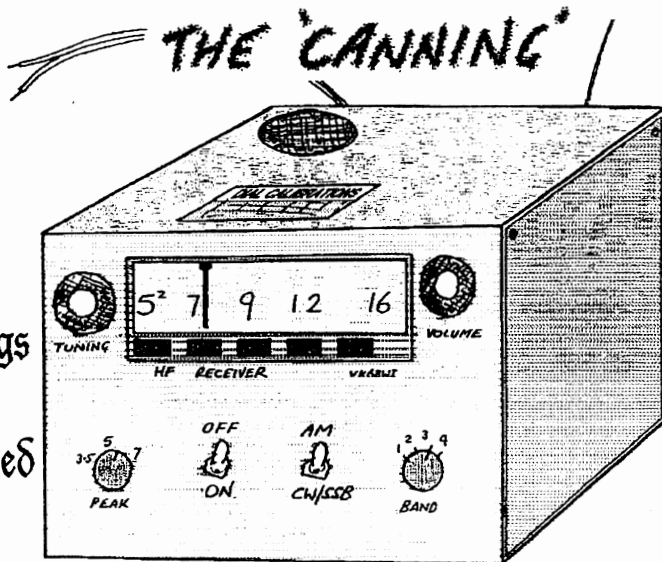


# Lo-Key

The Journal of  
the CW Operators' QRP Club Inc. ~  
Promoting Low Power CW Mode

No. 44 - December 1994 Communication and Homebrewing



Seasons Greetings  
to all the  
Decibel Challenged

3.5 - 7.5 MHz AM/SSB RECEIVER (page 4)

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Editor: Don Callow VK5AIL #75  
5 Joyce St., Glengowrie SA 5044



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# VKS BLS Chat ...

By Barry Samuel VK5BLS, President, P.O. Box 158 GUMERACHA S.A. 5233 Australia


**C**hristmas is with us again. We - the CW Ops club - have had a very successful year and I believe an even better year is coming up.

Membership continues to increase; Club CW and SSB nets continue to attract those members who have the time on the Tuesday and Friday evenings to "check in". Contests (Scrambles) continue on, under sometimes very trying conditions for QRP operation. Kit sets & components continue to hold interest - about three dozen members took advantage of this service in the last twelve months - and some new kit sets are on the horizon.

In other words, a very healthy club situation exists ! I extend a very big thankyou to all who have helped to make this possible !

In this regard, Council membership at Ordinary Member rates is once again being offered to Ted Daniels VK2CWH and Ian Godsil VK3DID in recognition of their ongoing work on the CW Net and Scrambles, respectively.

**My very best Christmas wishes to all members and your families !**

*Barry VK5BLS* 

## Welcome To New Members ....

*We're very pleased to have you join us. A couple of interesting callsigns here and both nearly off the map ! 3D2 is Fiji and A3 is Tonga (maybe Rugby Union players as well as Hams ?) Fred mentioned that he has been in Amateur radio since 1948 and comes from a radio engineering background and is one of a small group of about half a dozen Tongan hams keen on CW, QRP and home construction - You've come to the right place !!*



- |     |             |                   |                  |            |       |
|-----|-------------|-------------------|------------------|------------|-------|
| 405 | VK4NAP      | Neil McINTYRE     | MACKAY           | Queensland | Aust. |
| 406 | VK3NCP      | Christopher PLATT | MELBOURNE        | Victoria   | Aust. |
| 407 | VK4AP/3D2AP | Warwick LAKE      | NTH MACKAY       | Queensland | Aust. |
| 408 | VK3CMJ      | Max JENNINGS      | HOPPERS CROSSING | Victoria   | Aust. |

- |     |       |               |                             |                          |  |
|-----|-------|---------------|-----------------------------|--------------------------|--|
| 409 | A35MS | Fred SCHUSTER | P.O. Box 1078<br>NUKU'ALOFA | Tonga Isl., S.W. PACIFIC |  |
|-----|-------|---------------|-----------------------------|--------------------------|--|





# FROM THE EDITOR'S DESK



By Don Callow VK5AIL #76  
5 Joyce St. Glengowrie SA 5044  
Telephone (08) 295 8112 day/night

## NEXT ISSUE

Quite a few 'probables', including:-

- ♣ One or two from a set of test equipment articles by **Dave Archer VK3DVB**.
- ♣ An approach to SMD construction developed by **Bob Lukes VK3BBI**.
- ♣ Some construction ideas & photos of Z-matches (see Lo-Key #42) from **Wes Tyler VK2WES and Michael Austin #332 SWL** from the U.K.
- ♣ There has been a **very** high level of interest in **VK6KRG Rod Green's** 'Bedford' 80m receiver. This D.C. Rx makes use of a phasing network to get rid of the unwanted audio image. Quite a few people are eagerly awaiting more information about this. We will assess the possibilities of kits or maybe Rod can at least supply PCB's ?

## DEADLINES FOR LO-KEY

The normal deadline for 'last minute' items is the first of the Lo-Key month. It pays to be a few days earlier in case the postal system causes a delay. Once or twice I have even closed off a day or two *earlier*. We usually collate the printed magazine on about the 7th of the month, give or take 4 or 5 days, and post it the following day. Of course technical articles take weeks to process, longer if I am busier than usual.

**A**delaide's only electric tram runs (mostly) on its own right-of-way from the CBD to Glenelg, a distance of about 10 km. Power is 600V DC, and up until about 1990 large mercury arc rectifiers were used in the sub-stations. The tramcars are the 'originals' from the late 1920's.

## MESSAGE TO AUTHORS

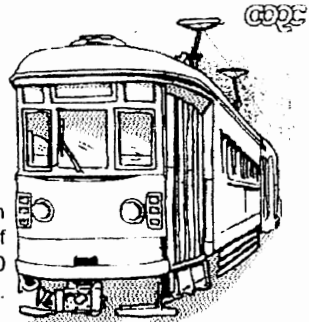
If you are sending in Protel Easytrax or Autotrax PCB layouts, please avoid the use of the standard zero  $\emptyset$ , which is slashed and is difficult to read in Lo-Key. Use an upper case **O** - and get a much clearer result.

## TNX TO AUTHORS

The flow of articles has been very good lately, so keep it up ! It's nice to get photos too, although my scanner and dot matrix printer place severe limitations on the quality that you see in Lo-Key, even when the original colour prints supplied are excellent. I do the best I can. I've been trying for several years to process some Club Communicator photographs sent in by **Ralph Robertson VK3CQK** and will make it eventually. p.s. You can tell when the heap is getting thin because I start putting my own technical work in Lo-Key !

72 & Seasons Greetings

*Don* VK5AIL



# THE 'CANNING' - An HF Receiver Using an AM Car Radio

By Peter Parker VK6BWI #66  
14 Marquis St., Bentley W.A. 6102

The use of an AM car radio as a tunable IF can simplify the construction of multi-mode HF receivers. Unlike direct-conversion receivers, which are only really usable on SSB/CW signals, a car radio tunable IF fitted with a BFO can also receive AM and FM signals; the latter being resolved by 'slope detection'. This feature may be useful when a VHF receiving converter is being used.

Whereas most simple receivers cover only one narrow band, this receiver covers the 3.5 - 7.5 MHz range in four bands each of one megahertz width. An extended coverage such as this makes the receiver useful as a piece of test equipment (e.g. for checking VFOs). The wide coverage contributes to the variety of stations which can be received; the range includes two Amateur bands, several broadcast bands and some RFDS (Royal Flying Doctor Service) and shipping frequencies. WWV and VNG on 5 MHz can also be heard at night.

HF signals are converted to the 0.5 - 1.6 MHz range by a dual gate MOSFET mixer. Two front-end tuned circuits attenuate all signals outside the band of interest. As the resonant frequency of this band-pass filter can be varied from 3.5 - 8 MHz, there is no coil switching in the front-end. Because of the gain of the MOSFET mix-



er, there is no need for pre-mixer amplification. A simple crystal oscillator provides the injection frequency for the mixer. As use is made of band imaging/reverse tuning techniques, only two crystals are needed to cover 3.5 - 7.5 MHz. The use of a 5 MHz crystal provides the 3.4 - 4.5 and 5.5 - 6.6 MHz tuning ranges, while 6 MHz gives 4.4 - 5.5 and 6.5 - 7.6 MHz coverage. The crystal frequencies need not be exact, though the four tuning ranges will then be different. Because the front-end bandpass filter is fairly sharp, there is no need for a tuned circuit in the crystal oscillator's collector. There is also no selectivity in the drain of the mixer. Providing the car radio has good image-rejection characteristics, there is little loss in performance. The receiver's main weakness is its relatively poor selectivity, particularly for CW and SSB signals. Nevertheless, during the Club's recent QRP Weekend, CW QRP signals from VK3 were audible on 80m. Tuning rate and dial resolution are dic-

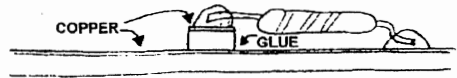
tated by the quality of the individual car radio used. If an improved tuning rate on the amateur bands is desired, the crystals could be changed so that 80 and 40m signals are converted to the 530 - 700 kHz region. Image rejection could suffer, however.

Whilst the dual-gate MOSFET is not a particularly strong mixer in a high-RF environment, its performance is adequate for this application. Ferrite beads on both gates eliminate any pick-up from strong FM or TV stations. The gain of this mixer appears to exceed the gain of a slightly simpler FET mixer.

The car radio must be kept in its metal box. The whole receiver must not be built in a wooden or plastic enclosure if reception of unwanted local broadcast stations is to be avoided. If a case is to be purchased, the Dick Smith H-2335 would be a good choice. The 155 x 115 x 180 mm size allows ample room for the car radio and converter. There should also be enough room to mount a small speaker inside the box.

Most components should be readily obtainable. The crystals are available 'off the shelf' from some suppliers. The transistor types are not critical. The prototype used a PN100 for the crystal oscillator and an unknown dual-gate MOSFET for the mixer. AM-only car radios should be available for only a few dollars from swapmeets, second-hand shops etc. Choose one with smooth tuning and an easy-to-read dial. If possible, select a radio with push-button tuning. You will then have five 'tunable memories' (just like on expensive black boxes) to store your favourite frequencies.

The converter can be built on a piece of blank, unetched printed circuit board material. 'Ugly construction' can be used.



Where there is a danger of connections becoming shorted to earth, a 5x5 mm square of fibreglass PCB material can be glued to the board, copper side up. This provides a convenient anchor point for components. In the prototype the circuit board measured 8x12 cm, and was screwed to the underside of the car radio. It thus hangs upside-down when the radio is put in the case.

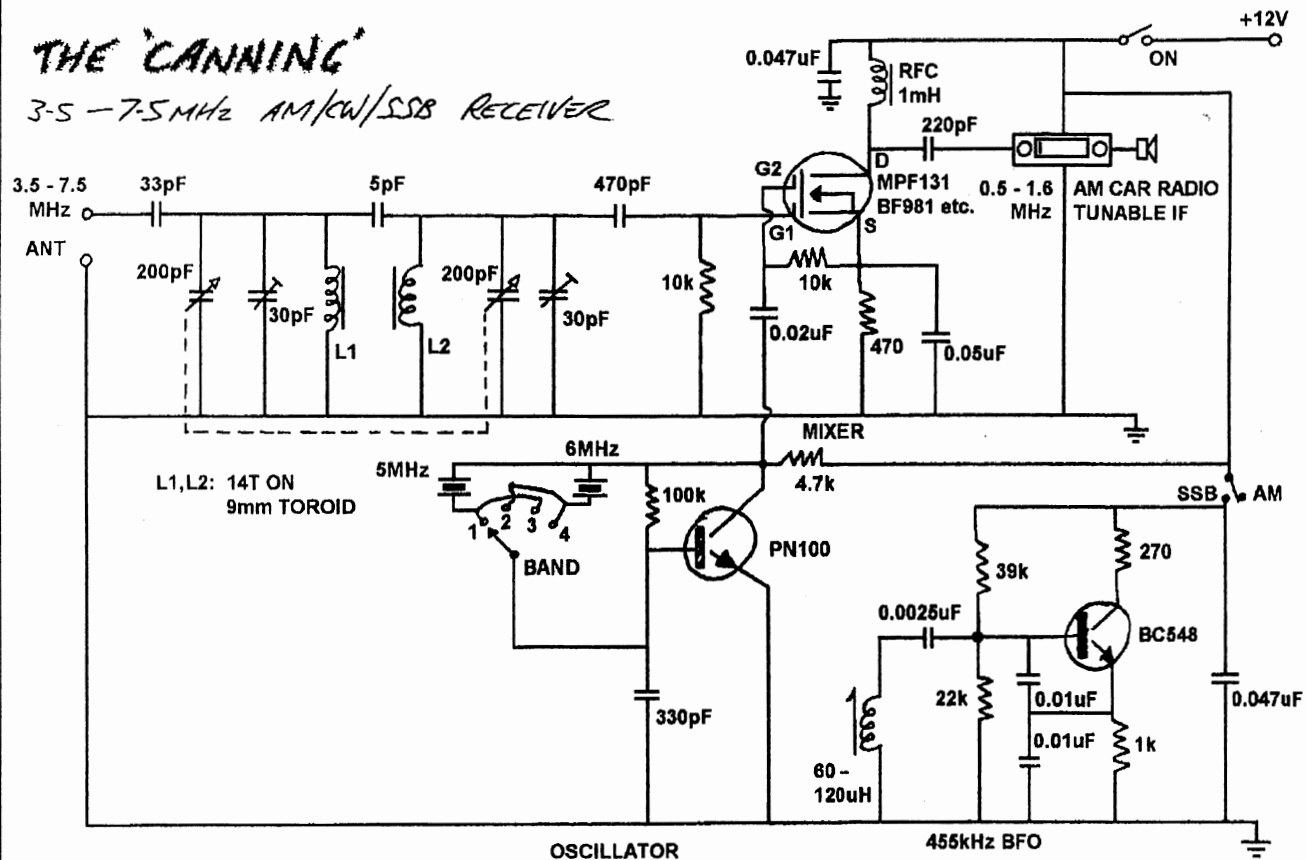
Probably the most difficult part of the project is cutting the large rectangle to fit the radio's dial through the front panel of the enclosure. Apart from that, construction should be straightforward as component values are not critical. An exception is the front-end tuned circuit, which must be able to resonate over the entire 3.5 - 7.5 MHz range.

The two-gang variable capacitor has a range of about 10 - 200 pF. Both sections must be identical for proper receiver operation. To account for stray reactances, a 30 pF trimmer capacitor is connected across each variable capacitor. Thus if the two inductors are not quite identical it should be possible to adjust the trimmers so that there is only one peak in signal strength as the Peak control is tuned across the desired receive frequency. Both induc-

Continued next page ...

# THE 'CANNING'

3.5 - 7.5 MHz AM/CW/SSB RECEIVER



The 'Canning' (continued) ...

tors are 14 turns on a 9 mm ferrite toroid available from the Club (Club cat. C013 - Philips toroid, material 4C6, colour violet).

DIAL	5	7	9	12	16
1	4.5	4.3	4.1	3.8	3.4
2	5.5	5.3	5.1	4.8	4.4
3	5.5	5.7	5.9	6.2	6.6
4	6.5	6.7	6.9	7.2	7.6

DIAL CALIBRATION - 5,6 MHz CRYSTALS

Once the converter has been constructed and is operating satisfactorily it should be possible to receive international broadcasters as well as WWV on 5 MHz during the evenings. To fully utilise the set's capabilities, a BFO should be added. Such a BFO could operate at either 455 kHz (the car radio's IF) or on the frequency of reception. The use of a signal-frequency BFO has several advantages over the conventional fixed-frequency BFO, but it was decided to use the latter on the grounds of both simplicity and allowing SSB reception over the entire tuning range of the receiver. The BFO used a variable 60 - 120 uH inductor from a defunct HF transceiver, though you might prefer to use a conventional IF transformer. Capacitance values in the BFO would have to be changed, however. The BFO is built on the same board on which the mixer and oscillator are mounted. Despite it being outside the car radio, there was sufficient BFO signal pickup without there being any need for a coupling capacitor. Without shielding between the BFO and the converter, the harmonics of the BFO signal can be heard on certain spot frequencies. I do not believe this seriously detracts from the utility of the set.

Like using a regenerative receiver, tuning this receiver is a two-handed affair; as soon as the main tuning is shifted 100 kHz or so, you must follow

with the Peak control to maximise received signal strength and image rejection. There are always two peaks over the range of the Peak control - make sure you find the correct one for the band you wish to tune. If your tuning capacitor has a low minimum capacitance, you may be able to find a third peak. If this is the case with your set, you will be able to tune the 8.4 - 9.5 MHz band with the 5 MHz crystal switched in. This works because the mixer is mixing the second harmonic of the crystal with incoming signals to produce a signal in the tunable IF range.

A selection of crystals and a wider front-end tuning range could permit coverage of other HF bands, though this has not yet been tried. In any case, it is desirable to mount a dial calibration chart on top of the set so that it is easier to know the approximate frequency to which the receiver is tuned.

Over all, the Canning is an inexpensive way to receive signals in the lower HF part of the spectrum. Its frequency stability is good, SSB tuning is quite easy, and its strong-signal performance is acceptable. The main drawback is its broad selectivity and coarse frequency readout. On a performance-cost basis the receiver is a winner (mine cost \$A 6 to build) and it's simple to construct as most of the circuitry is already in the car radio.



# THE MAX BRUNGER AWARDS FOR BEST TECHNICAL ARTICLES

Lo-Key #40 Dec. 1993 to #43 Sep. 1994

**T**his year Lloyd Butler VK5BR and Rob Gurr VK5RG jointly assessed the articles for the Technical Articles Awards. Rob took the initiative of asking Lloyd to take part, which we hope made the task twice as easy rather than twice as hard!

Both are technically very strong and both are experienced authors. WIA members will be aware of Lloyd's articles in Amateur Radio magazine in recent years on subjects as diverse as LF radio and single coil Z match experiments.

**Thanks to both of you for contributing the time and mental exertion necessary to perform this valuable role for our club.**

The adjudicators' collective comments are as follows:-

*"This year two members of the Adelaide Hills Amateur Radio Society jointly examined the articles and make the following recommendations:*

## 1. Open Section.

*The article "Novisker 80m QRP Transceiver" (issues #41 & #43), by Ron Steinfeld VK3WHM, certainly deserves the Award. The inclusion of a broadband transmission facility (DSBSC) which, although authorised, is not conducive to use on the crowded bands we find today, presented some anxiety ... the addition of a simple filter to develop an SSB signal, would have put this article in the "Exceptional" class.*



The late  
Max Brunger VK5OS #2

## 2. Test Equipment Section.

*No award recommended as there were no suitable articles.*

## 3. Special Mention.

*The article "The ASAP Transmitter", by Dave Archer VK3DVB (issue #42), takes us back to some early and fundamental construction concepts. This is supported by a practical VFO "80m VFO with Varicaps", with frequency options, and together these articles have a great deal of "food for thought".*

## 4. General Comments.

*Again the Club's bulletin is full of interesting and informative articles that provide valuable information on many home projects. We look forward to seeing more like the one by Don Callow VK5AIL, on MOSFET power amplifiers, and the finish of the article by Rod Green VK6KRG, on the 80Mx SSB receiver using phasing techniques, in forthcoming issues. We both enjoyed participating in this very interesting aspect of the Club's operation.*

**Rob Gurr VK5RG Lloyd Butler VK5BR**



**Y**our Committee is pleased to announce the winners' awards:

**Open Section** - The winner **Ron Steinfeld VK2WHM #274** receives a certificate, one year's free Club membership and \$30 credit at the QRP Kit-Set Centre during 1994/95.

**Special Mention** - A Special Prize of a certificate and \$25 credit at the QRP Kit-Set Centre goes to **Dave Archer VK3DVB #183**.

**Mrs. Roma Brunger, widow of the late Max Brunger VK5OS #2** continues to support this award and is always interested to hear about the progress of our club.

The next awards will be selected from articles in Lo-Key December 1994 to September 1995. And it's time we printed the guidelines again, so here they are !

p.s. Dave VK3DVB has recently sent in several articles about test equipment - how about going to print on **YOURS** ?

## Guidelines for the Max Brunger Awards for Best Technical Articles

1. Articles will be considered for Awards in two Sections:- an Open Section and a Test Equipment Section. Both Awards will comprise a certificate and a voucher to the value of \$30.00 for items from the QRP Kit-Set Centre (to be used within six months of the announcement of the award) and in addition the Open Section Award includes free Club membership for one year.

2. All members' articles, as published in Lo-Key from December to the following September (inclusive), will be considered.

3. All members except the Editor of Lo-Key, who administers this Awards scheme, are eligible to win an Award.

4. The winning articles will be chosen using the following criteria, modified if deemed necessary at the time of judging:-

- ◆ Relevance to the spirit and aims of the Club. See the Club logo, motto, Objects (printed on page 7 of Lo-Key #40 December 1993) and statements published from time to time above the membership application form in the item "Interested in Joining Us?" and in our Club's promotional brochure.
- ◆ Likely usefulness to members.
- ◆ Originality of content.
- ◆ Layout and degree of completeness. Is it attractive as submitted and can it be published with little extra effort? This will be used if articles are judged equal under the other criteria.

5. The Test Equipment Section is for articles about test gear and related procedures. Such an article may win the Open Section, but the same article cannot win both.



# 90 Degree Phase Shift VFO

By Bill Currie VK3AWC #255

P.O. Box 107 MORDIALLOC Victoria 3195

Further to my article 'The Gutless Wonder VCO' in Lo-Key #42 I have experimented with some other circuits. To recap, the ring oscillator shown in Fig. 1 will operate with three or any higher odd number of inverters. The frequency depends on the transition delay of each inverter. This delay depends on the type of chip, stray capacitance, temperature and the supply voltage.

Each inverter has an inherent phase shift of 180 degrees so the phase shift through 3 inverters would be 540 degrees. As oscillation depends on a 360 degree, or multiple thereof, phase shift, it can be seen that a further 180 degrees shift must be present to form a total of 720 degrees.

This is present in the transition delay of the three inverters and, provided that they are all part of the one chip, would be 60 degrees per inverter. This can be shown by examining the waveforms of any two of the inverters on a dual trace oscilloscope. It will be seen that there is actually a 240 degree (180 + 60) phase displacement present. While this is interesting it is not a great deal of use to experimenters like myself. What is needed are two signals differing by 90 degrees that can be used in phasing type single sideband receivers and transmitters.

As two inverters in series can be replaced by a single non-inverting buffer, I tried the circuit shown in Fig. 2, using some 74HC (High speed CMOS, supply 2 to 6V) chips. This circuit will oscillate happily, the frequency being variable from audio frequencies at low voltage to over 30 MHz at 6 volts. Examination of the waveforms revealed a 90 degree phase shift between traces. This would be present in the non-invert-

## A 3-Point Plug

(not really !)

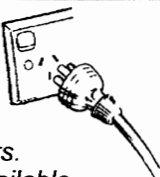
From Bill VK3AWC

*"Here is an article on 90° phase shift oscillators. As the test equipment available to me is rather limited I can't give any figures for actual phase shift. It certainly looks like 90° on my 10 MHz 'scope and it can be 'fiddled' by using different values of capacitance for C3 and C4 (see Fig. 4).*

*A book I purchased recently is 'TECHNICAL TOPICS SCRAPBOOK 1985-1989' by Pat Hawker G3VA. Technical Topics is a well regarded column in Rad. Com., the RSGB monthly magazine. This book is well worth the \$37.50 price and will serve as a source book at my QTH.*

*Incidentally, the 'Gutless Wonder' VCO (See Lo-Key June '94 p.4 - VK5AIL) won me 1st prize in the Moorabbin Hamfest, Homebrew Test Equipment Section. The fact is there was no other test equipment submitted.*

**This may have been a factor !"**



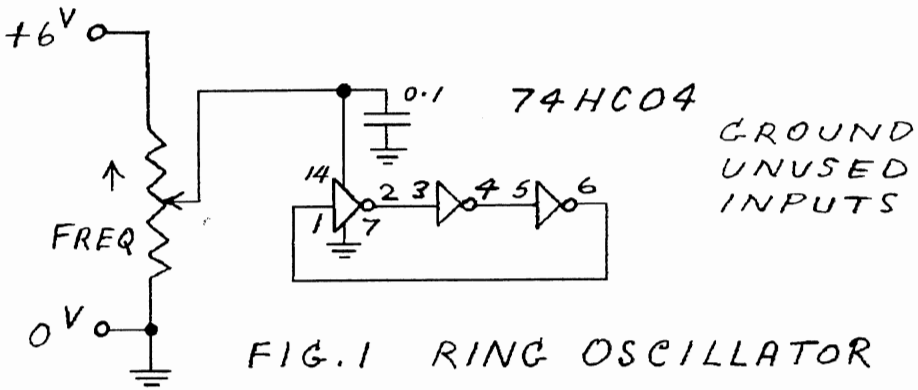


FIG. 1 RING OSCILLATOR

ing buffer whereas the inverter would have  $180 + 90$  or  $270$  degrees of shift. As  $270 + 90 = 360$  degrees we have the requirements of an oscillator fulfilled.

There is never success without some problems and I will list them as follows ...

1. The stability of the oscillator is lousy so it cannot be used directly as a VFO.
2. The waveform is triangular which may not be to your liking.

The problems were attacked in the following manner ...

1. As the invert and non-invert buffers are on separate chips, delay times may vary somewhat thereby upsetting the  $90$  degree phase shift.

1. By using a chip containing Exclusive OR gates (74HC86) or Exclusive NOR gates (74HC266) it is possible to configure inverting and non-inverting gates

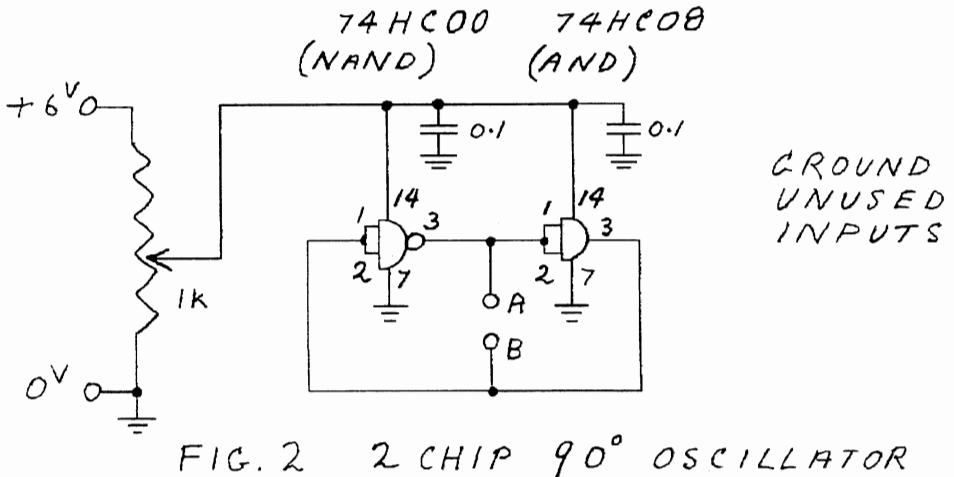


FIG. 2 2 CHIP  $90^\circ$  OSCILLATOR

on the one chip.

2. As the oscillator can be 'locked' to a crystal, a ceramic resonator or an external VFO, stability can be obtained while preserving the 90 degree phase shift.

3. The remaining two gates of the quad gate chips mentioned in 1. can be used to buffer the wave form or even 'round it up a bit' for non digital types.

Some further circuits are shown.

Fig. 3 shows an experimental circuit using a 74HC266. Outputs A & B can be used to connect crystals or ceramic resonators and to examine the wave-forms present.

Fig. 4 shows a practical circuit which will give an output of frequency F at point C. The output at D can be selected by a 5 position switch (or jumpers), giving outputs for each numbered switch position of ...

- |                |  |
|----------------|--|
| 1 F            | (Same as output C)                               |
| 2 F + 180 deg. | (Use with C for driving push pull stages)        |
| 3 F + 90 deg.  | (For phasing type SSB receivers or transmitters) |
| 4 F - 90 deg.  |  |
| 5 2F           | (7MHz from 3.5MHz, one phase only)               |

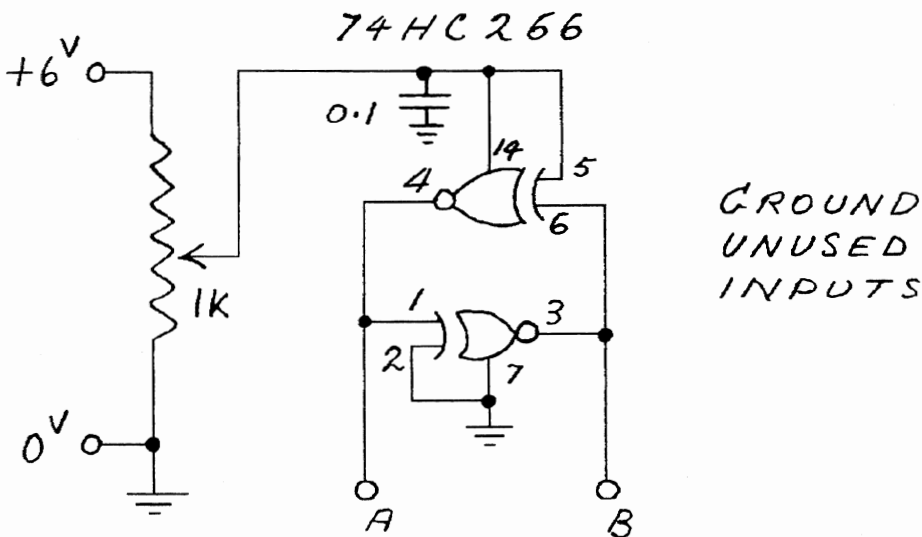


FIG. 3 1 CHIP 90° OSCILLATOR

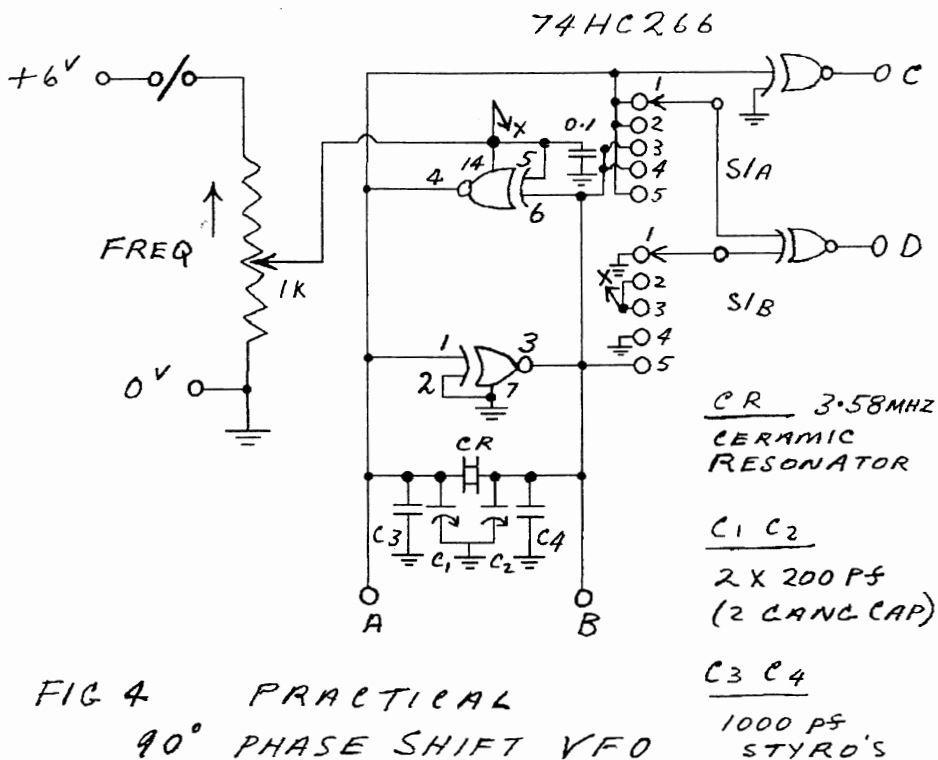


FIG 4 PRACTICAL  
90° PHASE SHIFT VFO

OUTPUT  
"C" FREQUENCY F (FOR REFERENCE) ONLY

- SWITCH POS.
- "D" {
1. F (SAME AS OUTPUT C)
  2.  $F + 180^\circ$  (USE WITH C FOR DRIVING PUSH PULL STAGES)
  3.  $F + 90^\circ$  (FOR PHASING TYPE SSB RCVR'S OR XMTR'S)
  4.  $F - 90^\circ$
  5.  $2F$  (7MHZ FROM 3.5MHZ, ONE PHASE ONLY)

To use the circuit in Fig. 4 as a VFO, adjust the supply voltage until the oscillator 'locks on' to the 3.58 MHz ceramic resonator, then use the two gang capacitor C1/C2 to tune. To use an external VFO, remove the ceramic resonator and feed the VFO via two 100 pF capacitors to A & B, then adjust the supply voltage and/or the variable capacitor for 'locking'. You can experiment with the values of the earthed capacitors at A & B to suit the frequencies and modes you are using. For more output, you may need to add linear buffers using a separate 74HC chip fed from 6 volts.

At this time I have not actually used the circuits in SSB receivers or transmitters but present them as an alternative to the **VFO (Freq. x 4) then divide by 4**, digital method of obtaining

a 90 degree phase shift. Gary Breed K9AY uses an RC network for RF phase shifting in his article 'A New Breed of Receiver' (QST, Jan 1988). This project, if adapted to 3.5 MHz, would be ideal to use to test the phase shift oscillator. I hope that these circuits stir up some interest in home brew phasing type SSB construction. There may be a need for voltage regulation and thermal insulation in the circuits shown - that is left for you to supply.

Incidentally, Stewart Day of Stewart Electronics and Daycom Communications is arranging for 3.58 MHz ceramic resonators to be carried as a stock item. Daycom's address is 37A Fenton Street, Huntingdale Vic. 3166 and is two doors from Stewart Electronics.



## KEVIN'S KOMMENTS

### Accounts Time -

Once again it's time to pay your subs ! If your account shows an odd figure it is most probably because you joined part way through a year. We adjust things as soon as possible so that you pay for a CALENDAR year each time.

### Future Fees -

Fees for 1995 will be the same as for 1994 but, subject to further consideration after our 1994/95 results are known, the Committee intends to raise the fees in 1996 as shown below. The

By Kevin Zietz VK5AKZ #43  
Treasurer & Secretary

41 Tobruk Ave.

ST MARYS S.A. 5042 Australia

last increase was \$2 in 1987, bringing the VK fees up to \$10 for that year.

	'94 & '95	'96
VK Members	\$A 10	\$A 12
ZL Members	\$A 12	\$A 14
DX Members	\$A 14	\$A 16

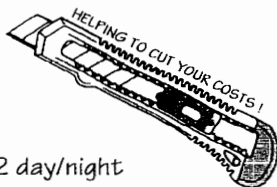
The good news is that you can pay in advance if you wish and THE CURRENT RATES WILL APPLY.

Season Greetings to all ...

73 Kevin VK5AKZ



# Just Kitting!



By Don Callow VK5AIL #75

5 Joyce St., Glengowrie S.A. 5044

Tel. (08) 295 8112 day/night

## 20m Receiver Kit

**SUDDENly Available!**

We have a Sudden receiver kit for the 20m band, bought from Kanga Kits U.K. & including the original 3-section gang capacitor (price about \$12 ? when they were still available from DSE 4 or 5 years ago!). The main bits you supply are a case, knobs, connectors, wire & solder and earphones.

There is only one Rx, which has just become available. Price is \$54. If you're wise you'll be first!



## Specials

LM301AN Op Amp IC's suitable for use in the circuit of VK3DVB's impedance meter. We have only a few of these, available, price \$1.40 each, so be quick!

(E4450)

6264 Static RAM

10nbr 8k x 8 bit SRAM IC's branded "HM6264LP-15". Price only \$5.00 each.

(E2967)

2N3771 Transistor

Silicon NPN power transistor 30A. TO-3 case. Price \$4.50 each.

(E4429)

## New Items

Voltage regulator 12V 1A 7812K TO-3 case. C120 \$1.50 ea. (ICE14)



Voltage regulator 12V 1A 7812T TO-220 case. C121 \$1.40 ea. (E4302)



Voltage regulator -12V 1A 7812K TO-3 case. C122 \$1.60 ea. (ICE14)



*Christmas Special - Take 50 cents off each if ordered before 1 Jan 1995.*

## Full Price List

If you would like a full price List, including Bonus Bits, please write or ring. It's a while since one appeared in Lo-Key, due to the space being used for other (more important ?!) things.

## Simple Electronic Keyer Layout

Do you have a good layout drawing for this very popular project? We supply a DSE H-5660 prototype board with each K01B kit, but do not have a parts & track cutting layout. Help!! (Let's know if you need a blank track layout.)

## Hybrid circuits

A solution looking for a problem ...

More help wanted! Do you know of any use for hybrid circuit modules? Peter Grove VK3EOP has had a clean out and sent the Club a box of these. There are two types:

60 mm long, branded NEC H1113A 96

30 mm long, branded NEC NPD505A 96.

It's too much to hope that circuits are available or that these can be used for Amateur Radio or components salvaged - or is it?

GDG



\*\*\*\*\*

# An RF Milliwatt Meter

By Rodney Champness VK3UG #212  
17 Helms Court BENALLA Victoria 3672

I had cause to build a milliwatt meter so that I could measure RF power in the 0.5 milliwatt to 2 watt range. Power meters that will measure in this range are thin on the ground. I researched many articles on this subject and obtained a variety of ideas about things to try. Many were quite complex, or wouldn't cover the range I needed, hence this rather simple but quite effective instrument was built.

Normal higher wattage meters do not bias the detection diode to the point of conduction so are quite inaccurate at low power levels and in the milliwatt region do not read at all. In this circuit the silicon diode used for detection is biased so that it is just conducting, hence it is at its most sensitive operating point for this task. The circuit is a balanced bridge as can be seen from the circuit diagram, with the 500 ohm potentiometer being adjusted for zero meter reading with no RF input. When RF is applied the bridge is unbalanced and the meter will give a reading.

The meter is built into a metal tobacco tin, although any small metal enclosure will do. So that the meter can be used up to the VHF region with reasonable accuracy, keep the leads on compo-

nents R1, R2, C1 & D1 as short as possible at both ends, and those to R3 & RFC as short as possible where they join to the diode. The RF choke is a small moulded unit and three ferrite beads are slipped over the lead at the diode end. The RF connector used is a BNC type, but use what you like; what you choose will depend on the frequency range you wish to measure.

I decided to use a digital multimeter as the indicator set on DC voltage gave a range up to 10 volts. 10 volts equates to 2 watts. There is a calibration chart that I use with the meter as this, for me, is the easiest way of correlating the DC voltage read with the RF power input. Cross checking the meter, I found that it is within about 1dB throughout the measurement range.

It is quite practical to increase the wattage rating of the meter to 5 watts by increasing the number of resistors to five: three 270 ohm 1W and two 220 ohm 1W, all in parallel. The 500 ohm potentiometer R6 is used to balance the bridge. It is really a bit coarse for the job and a lower value pot could be used with a series resistor in the earthy end to make up approximately the total of 500 ohms.

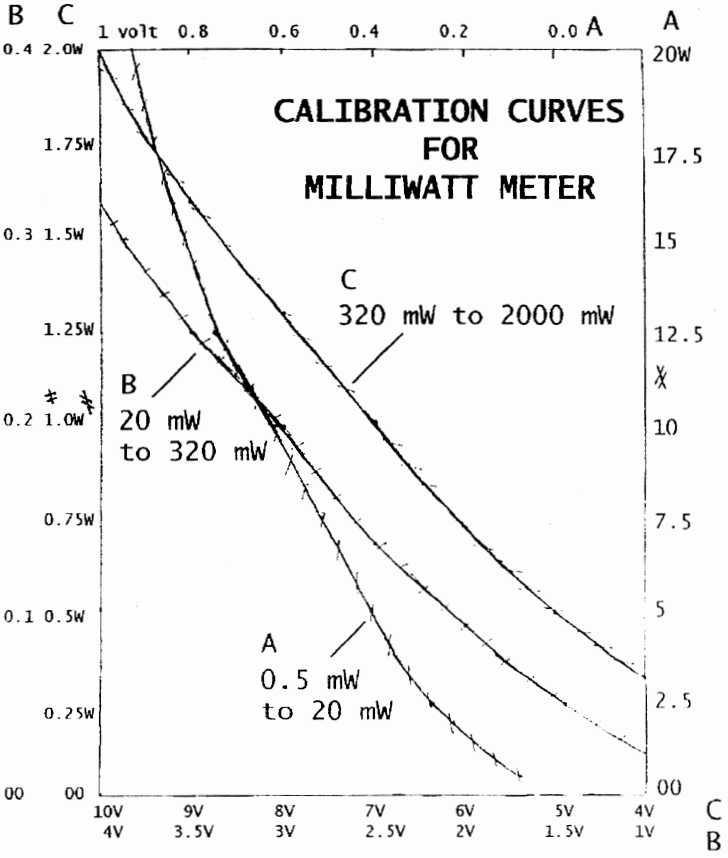
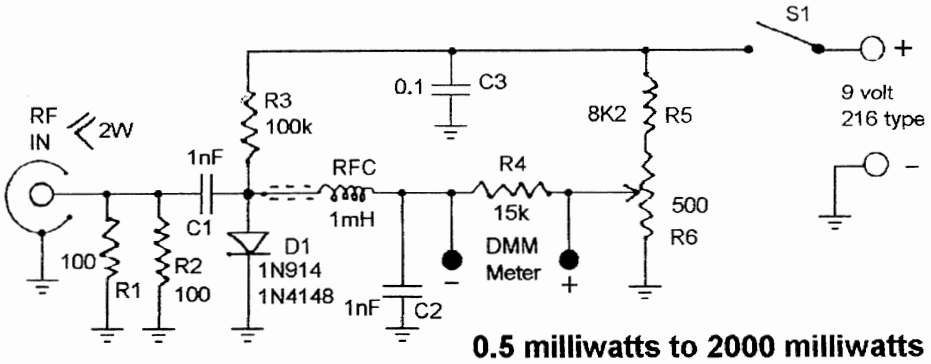
*Rodney Champness VK3UG*



\*\*\*\*\*



# CIRCUIT DIAGRAM



# AWARDS AND CONTESTS

By Ian Godsil VK3DID #112  
25 Monaco St., PARKDALE Victoria 3194

**G**reetings to all Club Members, as another year draws rapidly to its ending.

The Winter has passed, the storms are with us in the southern areas, but how many people bother to LISTEN to CW at any time, let alone turn on their radios and practise the code ??? Judging from the responses in the Contest Logs in recent months: so few as to claim "no-one" !

reflection of our social attitudes and approach to most things in Life; so I ask all Members to ponder this carefully and to try to make a resolve in 1995 to:

- (a) have a working CW rig;
- (b) take part in at least a couple of Scrambles during the year; and
- (c) send me a log of your participation.

We seem to have reached a stage in the Club where the same few people are doing most of the work. (*'Twas ever thus ! But MORE people are helping now - VK5AIL*) Perhaps there is an opening somewhere for you ?

My thanks again to those who support these Club efforts. In wishing all Members Good Things for 1995, I look forward with hope that participation in the Club Scrambles will be one of them.

## SCRAMBLES FOR SUMMER 1995

(Rules in Lo-Key Sep 1993 p.9.)

#43 Thursday, January 19th  
80 metres 1030 - 1200 UTC

#44 Thursday, February 9th  
80 metres 1030 - 1200 UTC

73, Ian VK3DID



### RESULTS OF WINTER SCRAMBLES 1994

Scramble #40

=1st VK4EV Ron #130 12 points  
VK2WES Wes #162 " " "

Scramble #41

1st VK3BPG Reg #7 16 points  
2nd VK2WES Wes #162 11 "

Scramble #42 No logs received

I refuse to believe that there is so little interest in the Scrambles that only two or three people take part (after all: Murphy was an optimist, so why not me ?), but there is no widespread COMMITMENT to this aspect of the Club's activities. This is no doubt a

# αCαLαUαBαTαIαVαIαTαIαEαSα



## On Air - Almost

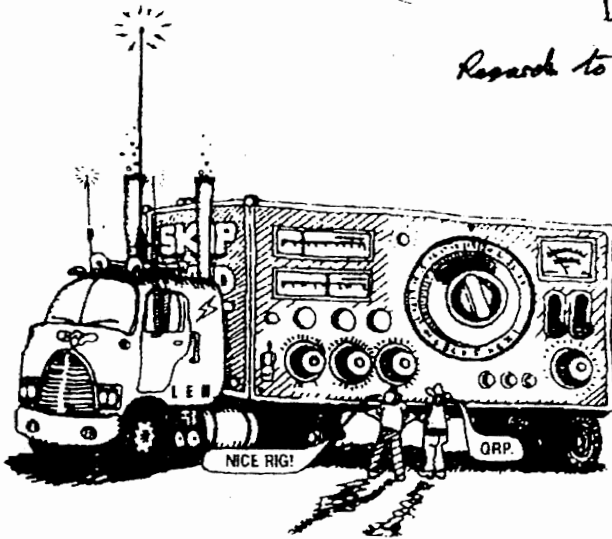
Another club member is heading for that first QSO (probably achieved by now) - **Garry Bell** ex-SWL is now **VK5PCM** and is homebrewing his way towards the bands.

**Spider Web Antenna ?** *will catch up with it later.*

This is **VK4LA Glyn's** way of telling us he hasn't been on air much lately. Maybe it was trying to catch his bug key ?



*Regards to you and yours*



**You should see the valve version !**

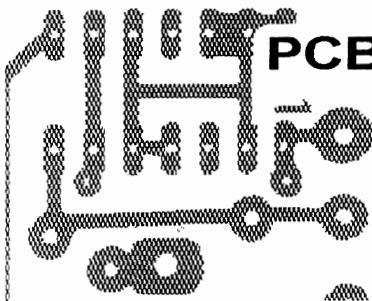
Cartoon submitted by **Lindsay LaPouple VK3DXH**, with thanks to the **Eastern and Mountain Districts Radio Club**, from that club's Bulletin.

## N.C.R.G. (Northern Corridor Radio Group) Hamfest

**Rod VK6KRG, Peter VK6BWI, Martin VK6BER** and other VK6 QRP'ers 'flew the flag' for QRP at this annual event on November 6th. We hope they had a good day and will tell us how it all went.

If **YOU** are going to be involved with a hamfest or other similar event you may be in a position to hand out our Club brochures to membership prospects. Pse contact the Editor and let's know how many brochures you would like.

A small, stylized logo or signature.



# PCB Manufacturing Hints

By Bob Lukes VK3BBI  
22 Dorothy St.  
East Burwood Vic. 3151

## Etching

**F**ig. 1 shows my etching setup. The etching solution (I use ferric chloride) is indirectly heated from the water, heated by a 1.5 ohms resistor which is connected to an 8V transformer winding. The air is supplied by a small 12V fan. If you use a household vacuum cleaner (set up to blow) you must use a simple air control valve - refer to Fig. 2.

Place the PCB in solution as shown in Fig. 3. This way all the sludge drops directly to the bottom of the tank, resulting in an evenly etched board. If the PCB is placed in a vertical position all the sludge flows from top to bottom of the board resulting in slow and uneven etching and the top shows "undercutting".

In the case of double sided PCB's the board has to be turned over at least once.

**Text continued over page ...**

---

♣ **John Bishop VK5JO** is keen to obtain a loan of a copy of '73' magazine for January 1994 and is particularly interested in the QRP column. John will reimburse any necessary expenses, so if you can help please John c/o VK5AIL at the above address.

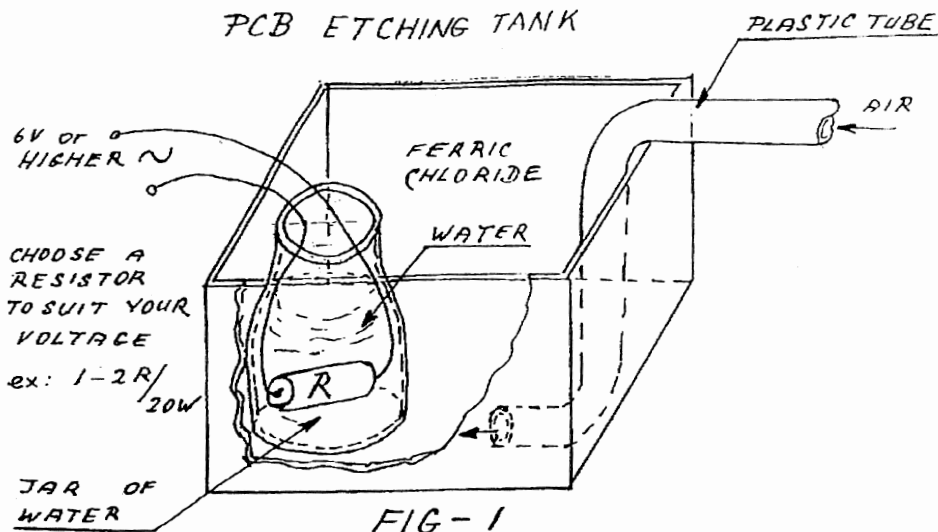
♣ **David Jarick VK4LDJ** (134 Wakefield St., Bald Hills, Queensland 4036) writes "I have an old Trio TS-500 trans. which I would like to modify for QRP and need a couple of 6146B valves." *Can you help David ?*

GDPC

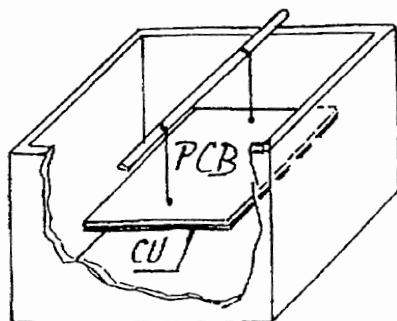
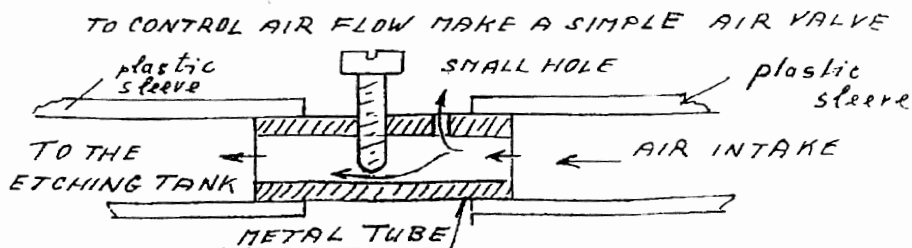
## U Can Help !

By **Don Callow VK5AIL**  
5 Joyce St., GLENGOWRIE S.A. 5044  
Tel. [08] 295 8112



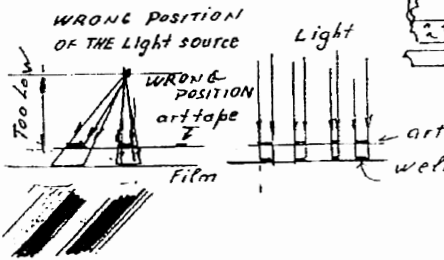
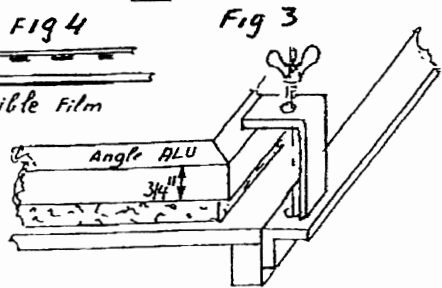
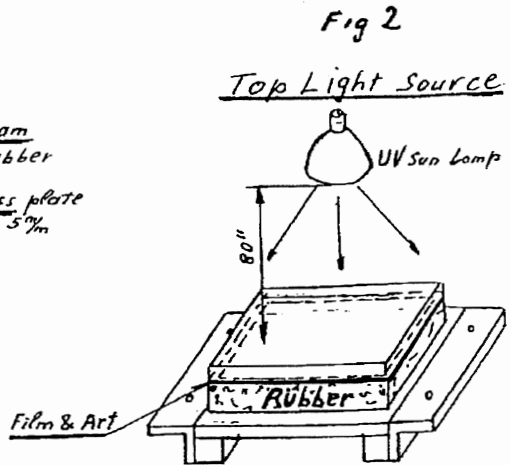
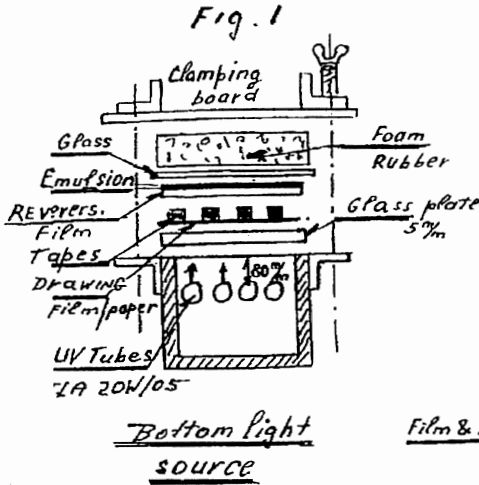


USE VACUUM CLEANER OR HAIRDRIER OR  
SMALL FAN AS AIR SOURCE



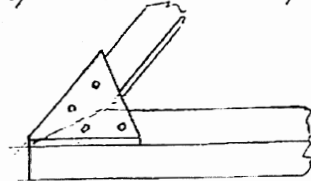
# Exposure Arrangements

**F**igs. 1 to 7 show the construction of my exposure frame and also include some related hints. In the past I used a bottom light source, but now use an overhead light.



**Fig. 5**

**Fig. 6**





# Natter Net Notes

By Steve Mahony VK5AIM\*



**A**fter my "stir" in September we were all pleased to hear some new callsigns on the Net and also some members who hadn't been on for a while revisited. This made for some extra good nets - **So Keep It Up !!**

Just a reminder - You can use any legal power level you like when you come up on the Natter Net, as this one is QRO SSB. Of course the Tuesday evening net run by **Ted VK2CWH** is QRP CW.

The Net is a good source of problem-solving information on homebrewing and you can often compare notes with others building the same rig. By the way, **VK3XU Drew Diamond's** TCF 80m sideband/CW

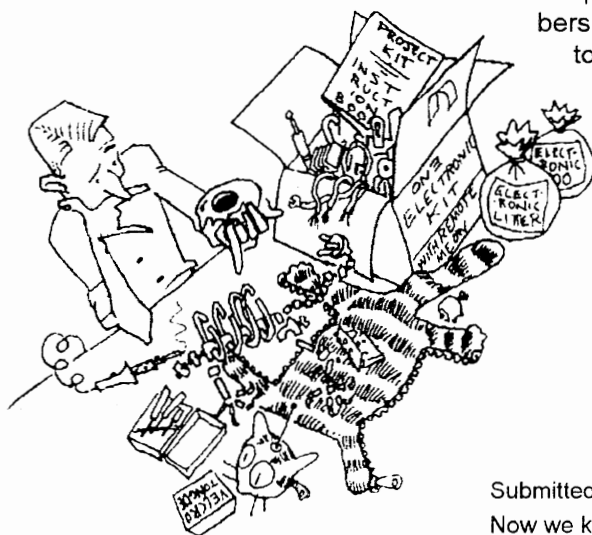
tcvr seems to be a popular project with members these days. Early September Natter Netters **Max VK3CMJ** (is using) and **Trevor VK5NDD** (is building) are the latest I heard about. The rig was featured in Amateur Radio magazine October 1993 p.4.

Now that Daylight Saving is with us again, the Friday evening net starting time is 0930 UTC. Frequency is 3620 kHz +/- QRM, as usual. Listen for the Net Controller's callsign - could be Graeme VK3BXG, Barry VK5BLS, David VK3ANP, Trevor VK5NDD, David VK7KDM, Brenton VK5BZ, Rob VK2ERA, Don VK5AIL, Tony VK3CTM, Steve VK5AIM, Murray VK3EZM, Kevin VK5AKZ or Peter VK2EPD.

A special thankyou to these members and **Seasons Greetings** to all who have participated in the SSB Natter Net in 1994.

*Steve* VK5AIM

\* 19 Kentish Rd.  
Elizabeth Downs S.A. 5113



KIT PROJECTS

Submitted by Steve VK5AIM.  
Now we know what happened to K1TTY !  
(Cartoon source unknown)

# BOOMERANG CIRCUIT BOOKS

Barry Samuel VK5BLS

P.O. Box 158, GUMERACHA S.A. 5233

**H**ere again are the BCB circulation lists. You will be sent all BCB's unless you say otherwise, You pay the postage to the next member (current postal rates are \$2.65 interstate and \$2.00 intrastate).

A double \*\* indicates the Moorabbin and District R.C. members who will be passing the B.C.B.'s from hand to hand.

*If you are in VK and wish to go on the list for the BCB's please let me know.*

## BCB #2 - 6th flight

*Current*

Tom VK5TL  
Shannon VK2EB  
Alan VK3NEA  
Peter VK3AKS  
\*\*Ross VK3ARC  
\*\*Alan VK3AUC  
\*\*Bob VK3DHV  
\*\*Joe VK3DJI  
\*\*Stewart VK3ESD  
\*\*Bill VK3AWC

## BCB #2 - 7th flight

*When we get 5 names on the list.*

Don VK6KAR  
Ron VK4EV  
Bob VK3BBI

## BCB #3 - 8th flight

*Current*

\*\*Ross VK3ARC  
\*\*Alan VK3AUC  
\*\*Bob VK3BBI  
\*\*Bob VK3DHV  
\*\*Joe VK3DJI  
\*\*Stewart VK3ESD  
\*\*Bill VK3AWC  
Tom VK5TL  
Shannon VK2EB  
Alan VK3NEA  
Peter VK3AKS

## BCB #3 - 9th flight

*When we get five names.*

Don VK6KAR

## BCB #4 - 5th flight

*Current*

Tom VK5TL  
Trevor VK5ATQ  
Shannon VK2EB  
Alan VK3NEA  
Ron VK4EV  
\*\*Ross VK3ARC  
\*\*Alan VK3AUC  
\*\*Bob VK3BBI  
\*\*Bob VK3DHV  
\*\*Joe VK3DJI  
\*\*Stewart VK3ESD  
\*\*Bill VK3AWC  
Peter VK3AKS

## BCB #4 - 6th flight

*When we get five names.*

Don VK6KAR

## BCB #5 - 1st flight

*Current*

Jack VK2AY  
Shannon VK2EB  
Warren VK2FKU  
Alan VK2KW  
\*\*Ross VK3ARC  
\*\*Alan VK3AUC  
\*\*Bob VK3BBI  
\*\*Doug VK3CCY  
\*\*Bob VK3DHV  
\*\*Joe VK3DJI  
\*\*Stewart VK3ESD  
\*\*Bill VK3AWC  
Don VK6KAR

## BCB #5 - 2nd flight

*Later*

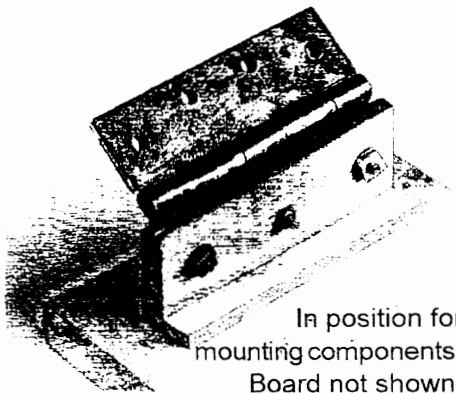
Murray VK3EZM  
Alan VK3NEA  
Lex VK3SSB  
Ron VK3WHM  
Len VK4CWM

## BCB #5 - 3rd flight

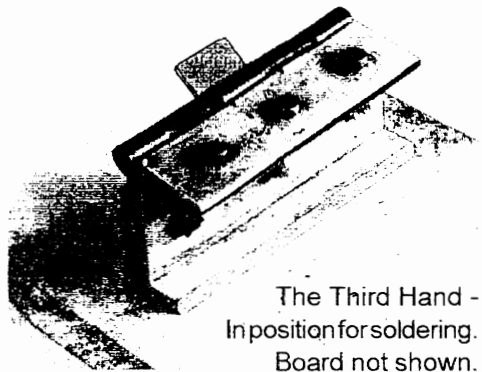
*Later still !*

Ron VK4EV  
Trevor VK5ATQ  
Peter VK3AKS  
Leith VK5LG  
Tom VK5TL





In position for mounting components.  
Board not shown.



The Third Hand - In position for soldering.  
Board not shown.



# The Third Hand

Submitted by Reg Bedford VK3BPG #7

*"I thought you might be interested in an idea from my stock of old magazines. I made this up many years ago; it gets plenty of use here as I get older (71 now) and the fingers seize up. You may like its simplicity. To buy a similar tool at the electronic retailers would cost you about \$33 and I don't think it would do a better job of holding a small PCB."*

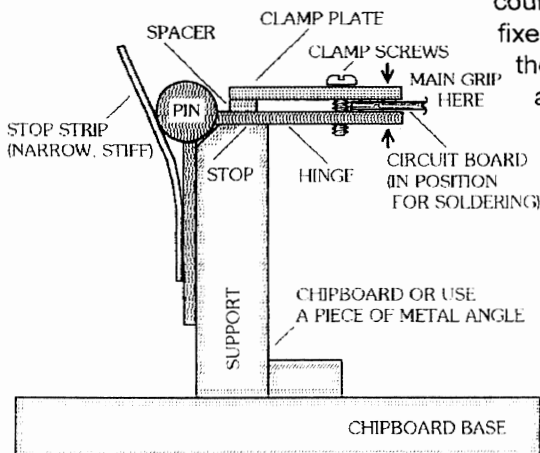
The 'third hand' idea used at the VK3BPG QTH appeared in August 1980 ETI (*Electronics Today International*, which was later absorbed into *Electronics Australia*) in a short article by A.J. Lowe. It uses a simple hinge (a 'heavy' one), with a clamp to hold the circuit board to one leaf, the whole thing being fixed to a chipboard base. See sketches below and opposite, based on the ETI illustrations.

It is used in two main positions. In one position (about 45° from horizontal) the components can be loaded onto the board. The second position (horizontal) is reached by rotating the hinge to turn the board upside-down for

soldering. One edge of the support provides a 'stop' to hold the circuit board steady during soldering. You can also use this position if components are to be soldered direct to the copper (no holes in the board).

The spacer should be the same thickness as your circuit board, or slightly thicker, as the main clamping force should be near the edge of the clamping plate. The spacer can be fixed to the clamp plate; the easiest way is to cut the clamp plate and spacer from a single piece of angle. It is best to provide about 5 or 6 holes for clamp screws and use 3 or 4 at a time. The screws go into tapped holes in the hinge leaf. You could try reversing the screws to form fixed studs and use wing nuts to clamp the board. The board should butt up against the screws. If only two are used and that side of the circuit board is clear, the board can go past and in between the screws.

To avoid scratching your circuit board, use a layer or two of insulation tape on the clamping surfaces. This also allows the jig to be used for testing and experimenting with finished boards.



QRP



# CW OPERATORS' QRP CLUB Inc.

## MEMBERSHIP LIST

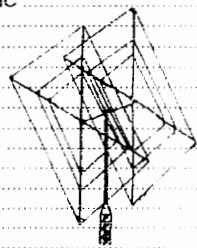
### 1 DECEMBER 1994



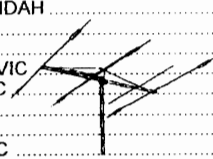
#	CALL	NAME	ADDRESS	<i>Don't forget that changes will occur during 1995.</i>	
409	A35MS	Fred SCHUSTER	P.O. Box 1078	NUKU'ALOFA	TONGA ISL SW PACIFIC
319	AA9AB	Thad JONES	2048 Trailridge Rd	MISHAWAKA IN	46544 USA
312	AB6RG	Tom ADLER	486 James Rd	PALO ALTO CA	94306 USA
367	BV2BJ	Lai LARRY	P.O. Box 105-31	TAIPEI	TAIWAN
323	G0BPS	Dick PASCOE	Seaview House Crete Rd East	FOLKESTONE KENT	CT187EG UK
361	G0BXC	Paul HUGHES	123 Garth Rd	MORDEN SURREY	SM4-4LF UK
96	G3RJV	Rev. George DOBBS	498 Manchester Rd	ROCHDALE LANGS	OL11 3HE UK
50	G8PG/GW8PG	Gus TAYLOR	37 Pickerill Rd	GREASBY MERSEYSIDE	L49 3ND UK
402	G8SEQ/VK2XYD	John BEECH	124 Belgrave Rd	WYKEN COVENTRY	CV25BH UK
374	JA1BRK	Tac YONEMURA	5-4-18 Zaimokuza	KAMAKURA KANAGAWA	248 JAPAN
373	JA3IG	Yuu YOSHITANI	1-17-29 Oimazato-Nishi	HIGASHINARI	537 OSAKA JAPAN
401	K5FO	Chuck ADAMS	830 Waite Dr	COPPER CANYON TX	75067-8581 USA
201	K5VOL	Red REYNOLDS	835 Surrye Rd	LAKE ZURICH IL	60047 USA
343	K6ZAN	Ralph BUTLER	1812 Gunston Way	SAN JOSE CA	95124 USA
197	K9PNG	Jim JONES	615 N. Benton St	PALATINE IL	60067 USA
328	KAOIQT	James JOHNS	37 Carmichael Way	GROTON MA	01450 USA
403	KB0LRB	Lynn GEITGEY	4807 Rainbow Bl	WESTWOOD KS	66205-1934 USA
347	KD4GV	Chas MAYHUGH	6656 Garland St	FT MYERS FL	33912 USA
321	KE9G	Donald KOZLOVSKY	28W256 Purnell Rd	WEST CHICAGO IL	60185 USA
318	KF8FY	Terry FRAZIER	19466 Ringgold Southern Rd	CIRCLEVILLE OH	43113 USA
327	KI6DS	Doug HENDRICKS	862 Frank Ave	DOS PALOS CA	93620 USA
325	KN1H	John COLLINS	RR2 Box 427	CORNISH NH	03745 USA
264	N8ET	Bill KELSEY	3521 Spring Lake Dr	FINDLAY OH	45840 USA
283	N9BDL	Lee ANDREAS	RT1 7600 Hwy D East	LAKE TOMAHAWK WI	54539 USA
71	NW6F/XE2IM	Jake JACOBS		APDO 73 MULEGE	BAJA CFA. SUR MEXICO
317	OK1CZ	Peter DOUDERA	U1 Batterie 1	PRAGUE 6 16200	CZECH REPUBLIC
52	P29IL	Ian LESLIE	P.O. Box 175 GOROKA	EASTERN HIGHLANDS PROVINCE	PAPUANEWGUINEA
365	PA3ALM	Dick KRAAYVELD	Merellaan 8	3145 XE MAASSLUIS	HOLLAND
132	PA3ELD	Jan VISSER	Wethow Der In't Veldstraat 28	1107BJ AMSTERDAM	HOLLAND
330	SWL	Gary FISHER	6 Totternhoe Rd	DUNSTABLE BEDFORDSHIRE	LU6 2AG UK
332	SWL	Michael AUSTIN	33 Totternhoe Rd	DUNSTABLE BEDFORDSHIRE	LU6 2AF UK
322	VE2DRB/WA6ER	Robert GOBRICK	305-31 L'anse Aux Meadows Cr	ST JOHNS NFLD AIE	5C2 CANADA
324	VE3OTC	John ERSKINE	POB 3024	SIOUX LOOKOUT ON P8T158	CANADA
340	VK2GXM	Tony JONES	3 Hilltop Rd	HARROGATE N YORKS	UK
326	W1FMR	Jim FITTON	Box 2226	SALEM NH	03079 USA
9	W3TS	Mike MICHAEL	P.O. Box 593 CHURCH LANE	HALIFAX PA	17032-0593 USA
31	W5QJM	Fred BONAVIDA	P.O. Box 2764	SAN ANTONIO TEXAS	78299-2764 USA
70	WA1JVY/7	Mark PEREIRA	405 S. 7th St.; #301	RENTON WA	98055 USA
18	WA2YMW	Bill BREARE	P.O. Box 867	HICKSVILLE NY	11802 USA
329	WA3SRE	John SALONY	131 Scott Rd	YORKE PA	17403 USA
106	WB0NQM	Richard LUCAS	412 Cattleman Ct	LAWRENCE KANSAS	66049 USA
101	WB8ZWW	Wayne WATSON	C/O 1204 Broadway	SPRINGFIELD OHIO	45504-2329 USA
17	WF6U	Hollis BUTTON	1025 Parr Ave	CAMPBELL CA	95008 USA
320	WS8T	Patrick TENDAM	10213 Columbus Grove Rd	BLUFFTON OH	45817 USA
34	ZL1ATW	Matt MEENAGH	223 Te Tomo St	Te Awamutu	2400 NEW ZEALAND
364	ZL1AWR	Hal GOODACRE	Pickering Rd	RD3 HAMILTON	2021 NEW ZEALAND
208	ZL1AWZ	Tim LEITCH	38 David St	MORRINSVILLE	NEW ZEALAND
29	ZL1BYY	George CARTWRIGHT	6 Haycock Ave	MT ROSKILL AUCKLAND	NEW ZEALAND
350	ZL1CVK	Rohan WAHRLICH	Wahangamarino Rd	RD2 TE KAUWHATA	2191 NEW ZEALAND
93	SWL	Simon ANDERSON	2/32 Severn St	BOX HILL NORTH VIC	3129
177	SWL	Lorenz ECKARD	15 Angus Cres	KUREELPA QLD	4560
236	SWL	Martin HAZELL	18 Towradgi St	NARRAWAENA NSW	2099
238	SWL	Steven JACKSON	RMB 4820	GOSFORD NSW	2250
248	SWL	Peter NEUTEBOOM	P.O. Box 534	CANNINGTON WA	6107
271	SWL	Arnold HERKELMAN	136 Camp St	TEMORA NSW	2666
279	SWL	Thuan THI	25 Livistona Rd	KARAMA NT	0812
280	SWL	Edward SMEDA	30 Luck St	ELTHAM VIC	3095
294	SWL	Robert WILKINSON	9 Barton Crt	ST AGNES SA	5097

305	SWL	Mick	PHILLIPS	16 Hoffman St	WEST BRUNSWICK VIC	3055
341	SWL	Oscar	VARJU	228 Ashmore Rd	BENOWA QLD	4217
360	SWL	Dave	GUY	P.O. Box 767	INGHAM QLD	4850
384	SWL	Colin	WATSON		LEEMING WA	6149
387	SWL	Chris	KOUFOPOULOS	61 Shierlaw St	RICHMOND SA	5033
163	VK1BL	Ted	GARNETT	24 Brigalow St	O'CONNOR ACT	2601
250	VK1NGD	Greg	DAVIS	36 Bainbridge Close	CHISHOLM ACT	2905
383	VK1RY	Fred	RYAN	47 Cockle St	CANBERRA ACT	2601
331	VK1TB	Tony	BENNETT	31 Roughley Pl	FLOREY ACT	2615
393	VK2AAX	F.	MEYER	201 Beaumont St	HAMILTON NSW	2303
182	VK2ACN	Alan	JAMES	424 Prune St	LAVINGTON NSW	2641
315	VK2ADW	Dennis	PEAKE	29 Wattle St	COLO VALE NSW	2575
121	VK2AGC	Garry	COTTLE	C/O Sergeant's Mess	RAAF BASE RICHMOND NSW	2755
5	VK2AKE	Jim	EDWARDS	P.O. Box 385	BOWRAL NSW	2576
98	VK2AP	John	THURSTON	P.O. Box 44	BLACKHEATH NSW	2785
152	VK2ATJ	Thomas	KING	P.O. Box 140	KENSINGTON NSW	2033
180	VK2AW	Basil	DALE	20/112 Shirley Rd	WOLLSTONECRAFT NSW	2065
400	VK2AWH	Harry	MARTIN	AFTADO Mt McDonald Rd	LYNDHURST NSW	2797
309	VK2AY	Jack	FLYNN	624 Jones St	ALBURY NSW	2640
32	VK2BBX	Bill	BALOGH	23 Bathurst St	LIVERPOOL NSW	2170
285	VK2BNX	Bert	ALLEN	149 Moores Way	GLENMORE VIA CAMDEN NSW	2570
233	VK2BVH	Chris	PROUD	5 Chadwick Cres	FAIRFIELD WEST NSW	2165
22	VK2BVH	Brian	HALPIN	5 Carramar Cres	MIRANDA NSW	2228
161	VK2BVVV		Bill WATTS	P.O. Box 263	NAMBUCCA HEADS NSW	2448
293	VK2CAF	John	WHITE	RMB 419 Nowra Rd	MOSS VALE NSW	2577
16	VK2CBI	Ken	ELKINGTON	44 Boland Ave	SPRINGWOOD NSW	2777
171	VK2CDO	Ype	TIMMER	Box 18	BOWRAVILLE NSW	2449
385	VK2CMR	Colin	REID	19 Bayview St	SURFSIDE BATEMANS BAY NSW	2536
11	VK2COH	Cec	HEALEY	121 Jamison Rd	PENRITH NSW	2750
226	VK2COX	Ray	TURNER	6/276 Bunnerong Rd	HILLSDALE NSW	2036
287	VK2CV	Greg	SMITH	36 Elsworth Pde	MEREWETHER HEIGHTS NSW	2291
89	VK2CWH	Ted	DANIELS	Wombat Hole Bylong Rd	RYLSTONE NSW	2849
159	VK2DCH	Maurie	CAMPS	Box 72	COLEAMBALLY NSW	2707
389	VK2DHH	Harry	HANIGAN	148 West St	SOUTH HURSTVILLE NSW	2221
95	VK2DMV	Paul	IRELAND	109 Victoria St	COFFS HARBOUR NSW	2450
192	VK2DN	John	HARPER	75 Brisbane St	ST MARYS NSW	2760
124	VK2DRL	Bob	JOHNSON	19 Britannia Rd	CASTLE HILL NSW	2154
334	VK2EB	Shannon	BATHIS	P.O. Box 66	MORTDALE NSW	2223
144	VK2EPD	Peter	CANNON	"BINALONG"	FORBES NSW	2871
126	VK2ERA	Rob	ABEL	6 Laurel St	KOOTINGAL NSW	2352
56	VK2ESR	Stephen	RAPLEY	12 Phillip St	ENMORE NSW	2042
173	VK2ETW	Trevor	WILKIN		COONABARABRAN NSW	2357
35	VK2EXD	Col	McDOUGALL		COOLAMON NSW	2701
217	VK2FKE	Bill	SCOVELL	13 Tulani Ave	DALEYS POINT NSW	2257
216	VK2FKU	Warren	ROGAN		DRUMMOYNE NSW	2047
128	VK2FNF	Jim	MCNEILL	15 Pacific St	ANGOURIE VIA YAMBA NSW	2464
376	VK2FUN	Humfrey	COWLED	13 Kevin St	MANNERING PARK NSW	2259
290	VK2FW	Ray	DAVIES	43 Towac Rd	ORANGE NSW	2800
166	VK2GJW	Jim	WATSON	Smiths Creek Rd	STOKERS SIDING NSW	2484
348	VK2GP	George	PILE	"PENRYN PARK"	EUGOWRA NSW	2806
227	VK2IRJ	Ian	JONES	527 Bangalow Rd	LISMORE NSW	2480
207	VK2JG	Noel	HILL	28 Kangaroo St	LAWSON NSW	2783
156	VK2KB	Allen	FAIRHALL	7 Parkway Ave	NEWCASTLE NSW	2300
165	VK2KSD	Stan	DOGGER	Tunnel Rd	STOKERS SIDING NSW	2484
249	VK2KW	Alan	HORSPPOOL	20 Braemar Cct	ORANGE NSW	2800
239	VK2NBF	Mick	UREN	4-81 Bream St	COOGEE NSW	2034
377	VK2NBZ	Jack	MARSH	966 Punch Bowl Rd	PUNCH BOWL NSW	2196
230	VK2NLU	Eddy	TURNER	50 Pinaroo Cres	BRADBURY NSW	2560
245	VK2NRX	Rex	BUNN	SILENT GROVE	Chinamans Gully Rd METZ VIA ARMIDALE NSW	2350
205	VK2PA	Peter	ALEXANDER	"NANDARI"	Rollands Plains VIA TELEGRAPH POINT NSW	2441
41	VK2QB	Leo	PINKEVITCH	20 Cathrine St	KOTARA SOUTH NSW	2289
363	VK2SPS	Steve	SMITH	7 Mitala Rd	NEWPORT NSW	2103
36	VK2UY	Vincent	ROBERTS	60 Edgar St	FREDERICKTON NSW	2440
30	VK2VBO	Brian	O'BRIEN	14 Belgrave St	CREMORNE NSW	2090

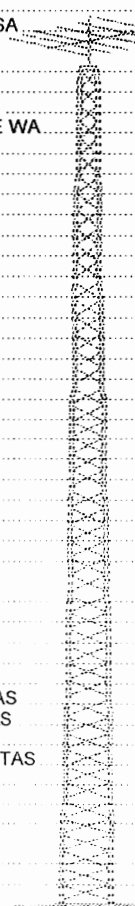
142	VK2WAS	Bill	SHORT	129 Simkin Cres	KOORINGAL WAGGA WAGGA NSW	2650
310	VK2WD	Bill	DUKES	44 Avian Cr	LANE COVE NSW	2066
162	VK3WES	Wes	TYLER	P.O. Box 43W	WEST GOSFORD NSW	2250
256	VK2WQ	Keith	SHERLOCK	174 Hall Pde	HAZELBROOK NSW	2779
372	VK2XMN	Martin	NELSON	446 Seven Hills Rd	SEVEN HILLS NSW	2147
131	VK2YA	Reg	BLACK	562 Kooringal Rd	WAGGA WAGGA NSW	2650
224	VK3AAM	Phil	CARNE	2731 Pt Nepean Rd	RYE VIC	3941
306	VK3ADP	Don	PAICE	21 Allister St	MT WAVERLEY VIC	3149
85	VK3ADX	Merv	QUINN	12 Wesley Cr	BALLAARAT VIC	3350
169	VK3AHU	Harvey	UTBER	P.O. Box 40	VIOLET TOWN VIC	3669
189	VK3AIQ	James	GLENN	30 Horsham Rd	DIMBOOLA VIC	3414
302	VK3AKS	Peter	PRIME	P.O. Box 507	BACCHUS MARSH VIC	3340
286	VK3ALR	Geoff	HIPWELL	472 Park Rd	PARK ORCHARDS VIC	3114
303	VK3AMW	Max	JOINER	19 Dunsford St	LANCEFIELD VIC	3435
125	VK3ANP	David	WARING	Banksdale Rd	HANSONVILLE VIC	3675
150	VK3APH	Tony	GOLDSWORTHY	1522 Main Rd	RESEARCH VIC	3095
342	VK3ARC	Ross	CROUCHER	3 Eyre Ct	FRANKSTON VIC	3198
235	VK3AUC	Alan	COOK		BEAUMARIS VIC	3193
204	VK3AVH	Harold	TRIBE	20 Morotai St	SORRENTO VIC	3943
255	VK3AWC	Bill	CURRIE	P.O. Box 107	MORDIALLOC VIC	3195
358	VK3AYQ	Rod J.	GREEN	22 Shackleton St	BELMONT GEELONG VIC	3216
111	VK3BBI	Bob	LUKES	22 Dorothy St	EAST BURWOOD VIC	3151
379	VK3BC	Frank	FELDMAN	30 Armstrong Rd	McCRAE VIC	3938
178	VK3BDH	David	DUNN		EAST BRIGHTON VIC	3187
82	VK3BGH	Graeme	HARRIS	9 Loma St	RINGWOOD EAST VIC	3135
149	VK3BIE	Douglas	PEARCE	P.O. Box 65	POINT LONSDALE VIC	3225
97	VK3BMC	John	CARWARDINE	38 Barcelona St	BOX HILL VIC	3128
53	VK3BNC	Bob	TERRILL	7 Locksley St	WENDOUREE VIC	3355
252	VK3BOL	Peter	LAYCOCK	6 View St	CASTLEMAINE VIC	3450
7	VK3BPG	Reg	BEDFORD	45 Milne St	CRIB POINT VIC	3919
344	VK3BR	Bill	ROPER	3 Tamar Cr	MENTONE VIC	3194
13	VK3BXA	Eric	IRVINE	P.O.	THOONA VIC	3726
55	VK3BXG	Graeme	BROWN	RMB 8375 Pryor Rd	DROUIN VIC	3818
114	VK3BYA	Derek	MC NIEL	17 Manning Rd	MALVERN EAST VIC	3145
157	VK3BYW	Fred	PIESSE	61 Munro St	EAST KEW VIC	3102
300	VK3CCA	Tuck	CHOY	7 Rees St	BURWOOD VIC	3125
297	VK3CCE	Reg	SOUTHWOOD	159 Wattletree Rd	MALVERN VIC	3144
298	VK3CCY	Doug	RICHARDS	11 Alden Cr	CHELTENHAM VIC	3192
260	VK3CDR	Ray	DEAN	19 Myoora Dr	MOOROOLBARK VIC	3138
19	VK3CGE	Neil	EMENY	1 Beaumont Cr	MONTROSE VIC	3765
408	VK3CMJ	Max	JENNINGS	5 Redwood Dr	HOPPERS CROSSING VIC	3029
339	VK3CNX	Geofrey	TRESISE	11 Patkin Cr	BURWOOD VIC	3125
354	VK3COR	Harly	GROOT	28 Plume St	MORLAVE VIC	3214
4	VK3CQ	Gilbert	GRIFFITH	7 Church St	BRIGHT VIC	3741
134	VK3CQK	Ralph	ROBERTSON	P.O. Box 23	KYABRAM VIC	3620
225	VK3CQP	Vic	HEARNE	54 Marshall St	WODONGA VIC	3690
123	VK3CUC	Ken	SHIELDS	47 Sullivan St	INGLEWOOD VIC	3517
12	VK3CVF	John A.	ELLIOTT	P.O. Box 64	BERWICK VIC	3806
386	VK3CYD	Clem	JARVIS	P.O. 285	NEWBOROUGH VIC	3825
59	VK3DBR	Barry	RIDGEWAY	Box 116	BEECHWORTH VIC	3747
39	VK3DGE	Garry	NEWTON	RMB 5044	COBRAM VIC	3644
168	VK3DGR	Graham	RUNCIMAN	P.O. Box 76	COLAC VIC	3250
355	VK3DHF	Dave	SHAW	9 Milton St	HEATHMONT VIC	3135
336	VK3DHV	Bob	CHAPMAN	25 Were St	BRIGHTON VIC	3186
112	VK3DID	Ian	GODSIL	25 Monaco St	PARKDALE VIC	3194
110	VK3DJI	Joe	LESLIE	79 Mitchell St	BENTLEIGH VIC	3204
246	VK3DKE	Lynn	EADY	5 Yarra St	YARRA GLEN VIC	3775
301	VK3DNA	Danny	McDONALD	14 Hume Cr	BALLAARAT VIC	3350
391	VK3DTC	Frank	TALBOT	19/43 Railway Pde	ELTHAM VIC	3095
381	VK3DTF	Doug	FLYNN	16 Kosciusko St	TRARALGON VIC	3844
183	VK3DVB	Dave	ARCHER	6 Jerome Ct	FRANKSTON VIC	3199
261	VK3DWF	Bill	FANNING	21 Smoult Dr	MELTON VIC	3337
47	VK3DXH	Lindsay	LaPOUPLE	2/172 Moray St	SOUTH MELBOURNE VIC	3205
390	VK3EAR	Aian	RYAN	10 Leon St	CHELTENHAM VIC	3192
164	VK3ED	Geoff	BUTTERWORTH	Lot 4 Coburns Lane	TOOLERN VALE VIC	3337



351	VK3EGM	Charlie	EVANS	Lot 57 Harris Rd	ELMINXT VIC	3250
292	VK3EHZ	John	BEDWELL	49 Winyard Dv	MOOROOLBA VIC	3138
194	VK3EOP	Peter	GROVE	P.O. Box 255	CHADSTONE CENTRE VIC	3148
316	VK3ESD	Stewart	DAY	P.O. Box 206	EMERALD VIC	3782
314	VK3EXI	Keith	ROSSITER	RMB 8021 Browns Rd	MAIN RIDGE VIC	3928
234	VK3EZM	Murray	LEWIS	7 Shalimar Crt	VERMONT SOUTH VIC	3133
155	VK3FDZ	Dave	TOMPKIN	P.O. Box 78	LARA VIC	3212
188	VK3FGL	Gil	LONG	#21/Yackatooon Village	YACKANDANDAH	3749
263	VK3FO	Ray	TAYLOR	Tandara Rd	TANDARA VIC	3571
353	VK3FRO	Eric	FROUDE	C/O Post Office	LINTON VIC	3360
380	VK3GDM	David	MAYES	8 Seymour Gr	CAMBERWELL VIC	3124
122	VK3HG	Trevor	STARRITT	"JENALAN" RMB 2340	TATURA VIC	3616
266	VK3IJ	Neil	TRAINOR	133 Bladin St	LAVERTON VIC	3028
357	VK3IM	Tim	HUNT	P.O. Box 411	MT ELIZA VIC	3930
356	VK3JFL	Richard	VOSS	22 Cedar Ave	ALFREDTON VIC	3350
308	VK3KEL	Ray	BERGER	5 Howitt Cr	WEST SUNSHINE VIC	3020
299	VK3MAW	Peter	WALTERS	5 Pridham St	MAIDSTONE VIC	3012
277	VK3MF	John	RICKARD	14 Dickason Rd	HEATHMONT VIC	3135
289	VK3MIJ	David	BENNETT	270 Humffray St	NORTH BALLARAT VIC	3350
288	VK3MOR	Bob	MORGAN	P.O. Box 295	ECHUCA VIC	3564
406	VK3NCP	Christopher	PLATT	Box 104 Market St	P.O. MELBOURNE VIC	3000
313	VK3NEA	Alan	POTTER	P.O. Box 1778	MILDURA VIC	3502
307	VK3PIZ	John	PEARCE	54 Huddersfield Rd	DEER PARK VIC	3023
176	VK3PUI	Ian	BOYD	P.O. Box 337	BALLARAT VIC	3353
254	VK3SSB	Lex	HIBBURT	11 Nursery Ridge Rd	RED CLIFFS VIC	3496
212	VK3UG	Rodney	CHAMPNESS	17 Helms Crt	BENALLA VIC	3672
371	VK3WAC	Ross	CHRISTIE	19 Browns Rd	MONTROSE VIC	3765
362	VK3WCW	Willis	CHANDLER	9 Porter Ave	HIGHTON GEELONG VIC	3216
274	VK3WHM	Ron	STEINFELD	784 Highbury Rd	GLEN WAVERLEY VIC	3150
352	VK3WVN	Kevin	HUGHES	14 Ophir St	SEBASTOPOL VIC	3356
49	VK3XU	Drew	DIAMOND	Lot 2 Gatters Rd	WONGA PARK VIC	3115
143	VK3ZF	George	COVENTRY	28-42 Happy Hollow Drv	PLENTY VIC	3090
218	VK4AAD	Ian	CAMPBELL	107 Banksia Dve	FOREST GLADE QLD	4306
27	VK4ACL	Bob	NEVILLE	124 Roscommon Rd	BOONDALL QLD	4034
395	VK4ALL	Denis	WAUGH	48 Trudy Cr	CORNUBIA QLD	4130
335	VK4AOG	Tom	SAWERS	14 Kvakatoa Close	SMITFIELD QLD	4878
407	VK4AP/3D2AP	Warwick	LAKE	P.O. Box 3209	NORTH MACKAY QLD	4740
394	VK4BDV	Noel	KOHLER	65 Paluma St	KIRWAN QLD	4817
45	VK4BIL	Bill	RAHMANN	28 Fontayne St	ASPLEY QLD	4034
44	VK4BSD	Stan	DEAN	380 St. Vincents Rd	NUDGEE QLD	4014
269	VK4CBR	Nev	POOLE	9 Maple Ave	GLADSTONE QLD	4680
221	VK4CMY/VK5HP	Doc	WESCOMBE-DOWN	Via P.O.	DALVEEN QLD	4374
346	VK4CPY	Bill	FRANKS	New Tribes Bible College	ROOTY HILL NSW	2766
276	VK4CWM	Len	McGOWAN	20 Catherine St	AYR QLD	4807
311	VK4ER	Bob	LEES	137 Akuna St	KENMORE QLD	4069
130	VK4EV	Ron	EVERINGHAM	30 Hunter St	EVERTON PARK QLD	4053
258	VK4FV	Peter	TAYLOR	36 Sundance Way	RUNAWAY BAY QLD	4216
99	VK4GH	Murray	YOUNG	36 Raintree Bvde	Little Mountain CALOUNDRA QLD	4551
333	VK4GNN	Gordon	NIELSEN		MARYBOROUGH QLD	4650
396	VK4KBI	Rodney	SILCOCK	15 Alice St	DALBY QLD	4403
21	VK4KFF	Donald	STIELER	89 Rosemary St	CABOOLTURE QLD	4510
203	VK4LA	Glyn	GIBBINGS-JOHNS	P.O. Box 521	BUNDABERG QLD	4670
382	VK4LDJ	David	JARICK	134 Wakefield St	BALD HILLS QLD	4036
104	VK4LKF	Kerry	FIELDING	22 Ellis St	LAWNTON QLD	4501
349	VK4MAS	Allan	SENDEN	16 Allen St	VICTORIA PT QLD	4165
113	VK4MUQ	Bill	MARTIN	92 Clarke St	GARBUTT TOWNSVILLE QLD	4814
405	VK4NAP	Neil	McINTYRE	P.O. Box 269	MACKAY QLD	4740
366	VK4NAS	Steve	SENIOR	68 Queen St	CABOOLTURE QLD	4510
15	VK4RE	Roy	HILDRED	P.O. Box 387	TOOWOOMBA QLD	4350
14	VK4SF	Jack	FORD	222 Warwick Rd	CHURCHILL IPSWICH QLD	4305
167	VK5ABY	Barrie	BRICE	21 River Way	FULHAM GARDENS SA	5024
253	VK5ADY	Trevor	DAYMAN	21 Filsoll St	ELIZABETH DOWNS	5113
75	VK5AIL	Don	CALLOW	5 Joyce St	GLENGOWRIE SA	5044
184	VK5AIM	Steve	MAHONY	19 Kentish Rd	ELIZABETH DOWNS SA	5113



43	VK5AKZ	Kevin	ZIETZ	41 Tobruk Ave	ST MARYS SA	5042
338	VK5ALS	George	STEWART	C/O 21 Brookside Ave	TRANMERE SA	5037
378	VK5ANB	David	GILES	17 Reginald St	MT GAMBIER SA	5290
232	VK5APS	Peter	SPENCER	4 Paxton St	CLARE SA	5453
259	VK5ARG	Alan	RICHARDSON	48 Robinson St	WHYALLA SA	5609
270	VK5ATQ	Trevor	QUICK	Churchett Rd	HOUGHTON SA	5131
8	VK5BA	Malcolm	HASKARD	Bassnet Rd	ONE TREE HILL SA	5114
57	VK5BJF	Jeff	WALLACE	Box 344	CLARE SA	5453
209	VK5BLS	Barry	SAMUEL	P.O. Box 158	GUMERACHA SA	5233
145	VK5BSC	Brian	COOPER	128 Queen St	PETERBOROUGH SA	5422
170	VK5BVM	Mick	SCHMIDT	37 Arthur St	PENOLA SA	5277
172	VK5BZ	Brenton	ZERBE	5 Chelmsford Gve	ANDREWS FARM SA	5114
304	VK5EE	Tom	AUBREY	1 Hartley St	MT GAMBIER SA	5290
257	VK5FE	Fred	WARD	36 Yarnbury Rd	ELIZABETH NORTH SA	5113
139	VK5GI	Norm	LEE	U2/3 Booth Ave	LINDEN PARK	5065
223	VK5JO	John	BISHOP		GLEN OSMOND SA	5064
154	VK5LG	Leith	COTTON	64 Weroona Ave	PARKHOLME SA	5043
404	VK5NDD	Trevor	MUNN	P.O. Box 36	NANGWARRY SA	5277
196	VK5NLY	Graham	LOCK	27 Tumut Dr	MT GAMBIER SA	5290
359	VK5PCM	Garry	BELL	1/1 View St	GLENOSMOND SA	5064
281	VK5TL	Tom	LAIDLER	18 Albion Ave	GLANDORE SA	5037
392	VK5YY	John	SCOUGALL	46 Piccadilly Rd	CRAFERS SA	5152
369	VK5ZSM	Jim	SCHOLZ	76 McRichie Cr	WHYALLA STUART SA	5608
370	VK6AAK	Alan	KING	276 Kooyong Rd	KEWDALE WA	6105
268	VK6AND	Andre'	DuPLESSIS		LESMURDIE WA	6076
54	VK6ATM	Terry	MAITLAND	P.O. Box 12	WYALKATCHEM WA	6485
220	VK6BEK	Shaun	PATSTON	9 St Leonards Ave	WEST LEEDERVILLE WA	6007
211	VK6BER	Martin	REECE	1 Gaskin Rd	KENWICK WA	6107
296	VK6BR	Barrie	FIELD	5 Crocker Way	INNALOO WA	6018
66	VK6BWI	Peter	PARKER	14 Marquis St	BENTLEY WA	6102
375	VK6EB	Les	BRADSHAW	203 The Strand	BEDFORD WA	6052
222	VK6ELL	Elliot	GREENFIELD	21 Henley Rd	ARDROSS WA	6153
272	VK6FQ	Donald	FRASER	17 Jillian St	RIVERTON WA	6148
133	VK6GRK	Greville	KNIGHT	P.O. Box 549	EXMOUTH WA	6707
80	VK6IS	Peter	SCALES	P.O. Box 47	CHIDLOW WA	6556
397	VK6KAR	Don	GRIMBLE	26 Thurburn Rt	MARANGAROO WA	6064
25	VK6KC	Keith	WILLIAMS	6 Shelton St	WAIKIKI WA	6169
28	VK6KRG	Rod	GREEN	106 Rosebery St	BEDFORD WA	6052
191	VK6LT	Bill	TOUSSAINT	9 Desford Close	SHELLEY WA	6148
399	VK6MJC	Mike	CRACK	66 Wheatley Dv	BULL CREEK WA	6149
388	VK6MV	Roy	MELLING	Lot 240 Dungog St	CUBALLING WA	6311
103	VK6MX	Warren	MEAD	347 Serpentine Rd	ALBANY WA	6330
241	VK6NQ	Merv	TURNER	23 Hanson St	ALBANY WA	6330
243	VK6OO	Stanley	MOLLOY	53 Burtonia Way	FORRESTFIELD WA	6058
267	VK6RJ	John	WIRTH	P.O. Box 427	BROOME WA	6725
61	VK6SA	Rev	SUTER	Box 261	MANDURAH WA	6210
147	VK6XC	Ben	KOH	13 Sovereign Plce	FORRESTFIELD WA	6058
345	VK6XZ	Bruce	HUNT	13 Bloom Cr	HUNTINGDALE WA	6110
65	VK7AJ	Lin	WILLIAMS	19 Gloucester St	LAUNCESTON TAS	7250
244	VK7CS	Alex	SZOPKO	25 Beach Rd	LEGANA TAS	7277
242	VK7DMJ	Daryl	HONEYWOOD		HUONVILLE TAS	7109
275	VK7EB	Ted	BEARD	148 Derwent Ave	LINDISFARNE TAS	7015
26	VK7FN	Neil	FITZPATRICK	P.O. SCAMANDER	TASMANIA	7215
40	VK7JK	John	ROGERS	1 Darville Cr	BLACKMANS BAY TAS	7052
38	VK7KBA	Arthur	BLACKWELL	"FAIRVIEW" Elderslie Rd	BRIGHTON TAS	7030
337	VK7KDM	David	PONSONBY	C/O P O	PARATTAH TAS	7120
368	VK7LF	Tom	VAN ANDEL	RSD 556 Dillons Hill Rd	GLAZIERS BAY TAS	7112
37	VK7NRE	Bob	EDWARDS	205 Davey St	HOBART TAS	7000
48	VK7NXA	Stuart	BEAN	9 Sussex St	GLENORCHY TAS	7010
3	VK7VV	Rai	TAYLOR	Lot 2 Daniels Rd	MAGRA TAS	7140
91	VK8CW	Ian	SMITH	P.O. Box 4756	DARWIN NT	0801
398	VK8JJ	Jeffrey	LAMBERT	64 Standley Cr	ALICE SPRINGS NT	0870



# VNG



## TIME & FREQUENCY SERVICE\*



**D**on't overlook the signals from VNG in Australia for checking time and frequencies. VNG is located at Llandilo, New South Wales, having previously been at Lyndhurst, Victoria, until

October 1987. Llandilo is near Penrith, an outer suburb north west of Sydney.

The following note appeared in the May 1994 issue of the W.I.A.'s *Amateur Radio* magazine (page 36):

### **Standard Time/Frequency Service**

*Here's a reminder of Australia's own Standard Time and Frequency transmission service, station VNG.*

*The service has continuous transmissions on 2500 kHz, 5000 kHz, 8638 kHz and 12984 kHz. In addition transmissions on 16000 kHz operate between 2200 and 1000 UTC.*

*On the 2.5, 5 and 16 MHz transmissions, a talking clock announces the time each minute, with a spoken station identification every 15 minutes.*

*There are no voice announcements on the 8 and 12 MHz transmissions. These have a "VNG" Morse ident every 15 minutes.*

Some previous background articles about VNG in AR, written by Marion Leiba VK1VNG/KNG, include:

The Resuscitation of VNG

(AR March 1989 p.15)

VNG Update

(November 1989 p.40)

VNG's Code and the Leap Second

(March 1990 p.25).

A practical guide to the use of VNG, with details of pulses and codes used, was written for AR by Quintin Foster:

VNG - How To Use It

(December 1990 p.26).

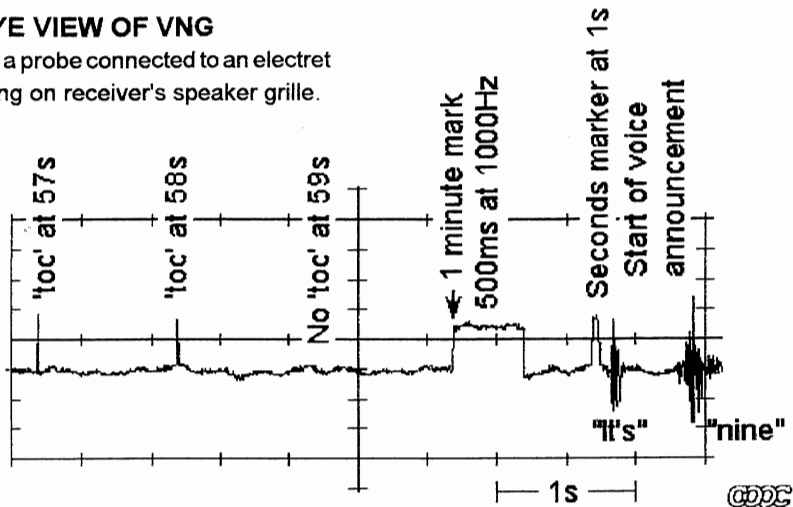
Reading this article is an absolute must if you are really serious about getting the best from VNG. It gives a full description of the signals, including the code for the minute/hour/day-of-year section, which uses binary coding of numbers.

The signal is DSB full-carrier AM telephony. 1000 Hz tones are used, varying in length from 500ms down to 5ms. You can't really hear the note for the 5ms tones - Quintin describes it as a "toc". There are four of these at one second intervals, followed by a 'missing toc' (!) before the 500ms pulse. The start of this long tone marks each minute. Before the 5th, 10th, 15th etc. minutes there are nine "tocs", instead of four. See illustration on next page.

\* *By Don Callow VK5AIL*

## A CRO'S EYE VIEW OF VNG

Picked up with a probe connected to an electret mic insert laying on receiver's speaker grille.



## POSITIONS

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## GENERAL INFORMATION

**Annual Subscription Fees:** Due January.  
 Ordinary: See page 14.  
 Council: VK \$A 15; ZL \$A 18; DX \$A 21  
**Lo-Key:** Our quarterly journal, posted mid-  
 March, June, September & December  
 ARTICLES ALWAYS WELCOME  
 The Editor reserves the right to edit all  
 material including letters sent for publica-  
 tion and to refuse acceptance of material  
 without specifying a reason.

## QRP calling frequencies:

1 815	3 530	7 030	10 106
14 060	21 060	28 060 kHz	

## § SCRAMBLES §

Awards & Contents Manager  
**Ian Godsil VK3DID #112**

25 Monaco St. Parkdale Vic. 3194

#43 80m - Thursday 19 Jan '95

#44 80m - Thursday 9 Feb '95

More details on page 18

Rules in Sep '93 Lo-Key #39 p.9

## § CW NET (QRP) §

Net Controller: **Ted Daniels VK2CWH**  
 Tuesday evenings

0930 UTC - Summer 0845 UTC  
 3529 kHz (lower if QRM)

Call: CQ CW OPS/QRP DE VK2CWH/QRP K  
 QRP power used - 5W maximum to antenna

## § SSB 'NATTER NET' §

Controllers: **Steve VK5AIM's roster**  
 Friday evenings - QRO can be used.

0930 UTC Summer  
 1030 UTC (from 31 Mar 1995)  
 3620kHz ±QRM