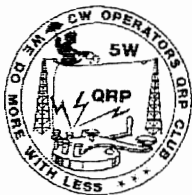


Promoting Low Power CW Mode Communication and Homebrewing
in the Amateur Radio Service



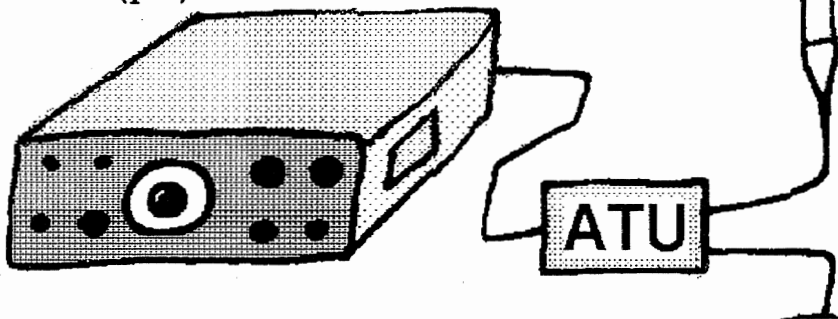
September 1993

Issue No. 39

Lo-Key

The Journal of the
CW Operators' QRP Club Inc.

Peter VK6BWI tries QRP
on 160m (p.4)



CONTENTS

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

AUSTRALIA

- | | |
|---------------------------------|--------------------------------------|
| 2 Incorporation | 18 Cluhtivities |
| 3 Welcome to New Members | 19 Reducing ICOM Rigs to QRP Power |
| 4 QRP on 160 Metres | 20 Home Brew RF Impedance Bridge |
| 5 Morse Power ! | 23 Circuits and Shortcuts |
| 6 Treasurer's Annual Report | Silent Key |
| 7 From the Editor's Desk | 24 'Natter Net' Notes |
| 8 Awards and Contests | 25 U Can Help ! |
| 10 C.S.W. Keyer Paddle | 26 QRP Dual Band Transceiver Project |
| CW Net News | 27 QRP Kit-Set Centre |
| 12 Ceramic Resonator Oscillator | 28 Club Sales - Price List |
| 13 Some Useful Varicap Theory | 31 Boomerang Circuit Books |
| 16 Abel's la belle Labels | |

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INCORPORATION



What Has Happened - And Why

On and from 31st August 1993 our club became the **CW Operators' QRP Club Incorporated**, an independent legal entity with corporate status.

This was done mainly for legal reasons and is expected to have little effect on activities of the club or on most of our members - it will be 'business as usual'. Incorporation limits the legal and financial liability of individual members and makes the incorporated club, which is a legal entity distinct from its members, responsible for any debts and legal actions. There are some exceptions where an individual may still be sued, rather than the corporate body. We are a non-profit organisation, meaning that any profits earned are not divided up and returned to members, and incorporation helps to clarify our taxation situation.

We now have a set of rules, as required, and are subject to the Associations Incorporation Act, 1985 of South Australia and Regulations under this Act.

We will send you a copy of our rules if you provide a S.A.S.E. envelope (same size as Lo-Key envelope) with your request to the Treasurer (address on back cover).

Copies of the Act are available from:

State Information,
Grenfell Centre Plaza,
25 Grenfell St., Adelaide S.A. 5000
Australia

So What's New ?

A number of things will change and more information about this will be given in December Lo-Key.

Perhaps the most obvious is that you get to choose one of two types of membership: Ordinary Member and Council Member. Council Members get the opportunity to vote on the business issues of running the

club, but pay higher annual subscription fees.

If you are interested in being a Council Member (from 1 January 1994) please indicate this when you request a copy of the rules. There will be a formal request with your account which will be an insert with December Lo-Key.

In the meantime, all members are now on our records as Ordinary Members of the incorporated club.

Note that under our rules the Committee may offer Council membership at Ordinary Member rates, to members who undertake activities or hold positions which are of special importance.

We will hold Ordinary Membership subs. for calendar year 1994 at the current level of \$A 10 VK, \$A 12 ZL and \$A 14 DX. Council Membership subs. will be \$A 15 VK, \$A 18 ZL & \$A 21 DX.

What's Next ?

Between now and the issue of December Lo-Key your existing Committee will be approaching CW Ops Club members within VK5 to set up an initial Management Committee. A working committee able to participate in face-to-face discussions is needed at this time. In future we will have annual elections to fill vacant positions.

We already have most of the required records and will set up minute books etc. The hope is that the incorporated club can be run with the minimum of 'red tape', as in the past.

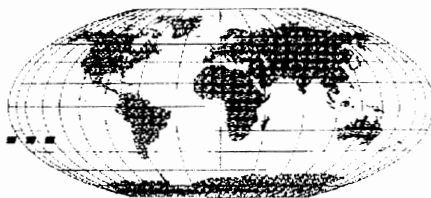
Kevin Zietz
VK5AKZ #43
Treasurer

Don Callow
VK5AIL
Editor of Lo-Key

Management Committee



Welcome To New Members



332 SWL	Michael	AUSTIN	DUNSTABLE	Bedfordshire	UK
333 VK4GNN	Gordon	NIELSEN	MARYBOROUGH	Queensland	
334 VK2JSB	Shannon	BATHIS	MORTDALE	New South Wales	
335 VK4AOG	Tom	SAWERS	SMITHFIELD	Queensland	
336 VK3DHV	Bob	CHAPMAN	BRIGHTON	Victoria	
337 SWL	David	PONSONBY	PARATTAH	Tasmania	
338 VK5ALS	George	STEWART	TRANMERE	South Australia	
339 VK3CNX	Geofrey	TRESISE	BURWOOD	Victoria	
340 VK2GXM	Tony	JONES	CAMPBELLTOWN	New South Wales	
341 SWL	Oscar	VARJU	CANNONVALE	Queensland	
342 VK3ARC	Ross	CROUCHER	FRANKSTON	Victoria	
343 K6ZAN	Ralph	BUTLER	SAN JOSE	California	USA
344 VK3BR	Bill	ROPER	MENTONE	Victoria	
345 VK6XZ	Bruce	HUNT	HUNTINGDALE	Western Australia	
346 VK4CPY	Bill	FRANKS	MIAMI	Queensland	
347 KD4OGV	Chas	MAYHUGH	FORT MYERS	Florida	USA

Welcome from all of us.

And please spread the word about the CW Ops QRP Club. If you 'lose' your Lo-Key to a prospective member, let us know and we will replace it. Or we can provide copies of our promotional brochures.*

- "The more the merrier"

* Committee addresses on page 32



QRP on 160 Metres

By Peter Parker VK6BWI #66

160m is an interesting band for the QRP operator as it combines good local coverage with a lack of overcrowding; in some ways it is like VHF. Equipment is simple to build and even a fairly modest antenna can produce worthwhile results.

My own use of the band began when I modified my homebrew 2W DSB/CW direct conversion transceiver because of the poor results of QRP double sideband on 80m. My signal was almost always below the noise level, even for very local contacts. 160m in contrast appears to provide stronger signals over very short paths, although not uniformly in all directions, possibly due to variations in ground conductivity. Conditions appear to vary night to night less on 160 than 80 metres, though this becomes less true for DX signals. Occasionally US CW signals can be heard even on simple receivers and noise-susceptible receiving antennas.

These stable conditions (except when there is a thunderstorm) make the band an interesting alternative to two metre simplex operation. CW operation provides the furthest ranges, out to at least 200 km, even with a couple of watts and antennas as low as three metres above ground level. Winter is the best season to operate 160, but even in summer many solid contacts can be had, though this is helped by the current popularity of the band in Western Australia.

Over 75 VK6's have been heard on 160m in the last year in Perth, and most nights there is activity on 1840 kHz from 1130 UTC. Most local activity on the band is SSB, and QRP DSB can be quite successful. At a distance of 6 km signals are generally 57-8 and they fade with increasing distance, though this is heavily dependent on the local noise level at the receiving station.

From this station several successful QRP (2W) DSB contacts have been made with stations as far away as Esperance, a distance of 600 km.

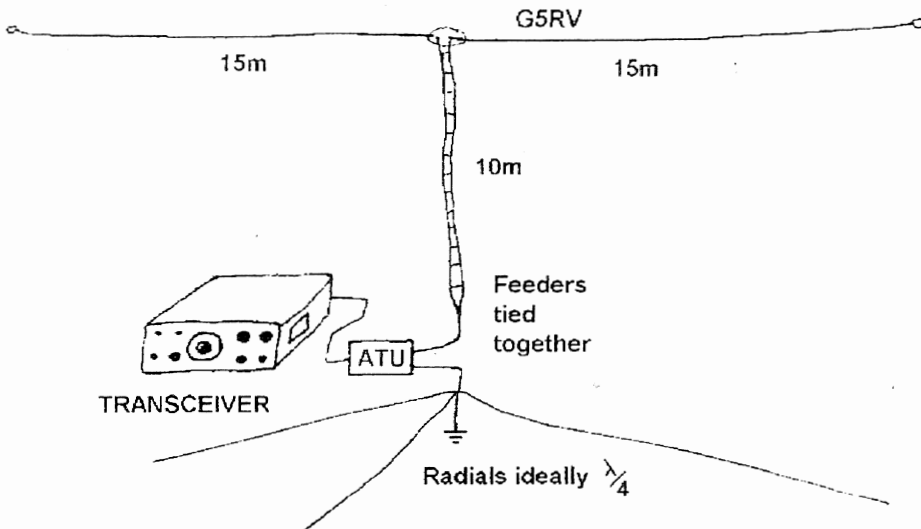
In the Eastern States the frequency 1825 kHz is commonly used while here in VK6 1840 kHz is favoured. In between these frequencies DX can sometimes be heard, much being CW. It is recommended that your equipment be VFO controlled, though crystals for 1843 kHz are readily available.

It should not be too hard to modify 80m homebrew equipment to 160m, but it must be borne in mind that the gain of RF transistors is higher at medium frequencies and sound construction practices minimise the risk of self-oscillations. Where broadband toroidal inductors are used remember to add more turns to ensure that the inductor will cover 1.8 MHz.

A balanced modulator which refused to work on 160 but operated well on 80m was fixed by doubling the number of bifilar turns on its output broadband toroid.

Just in case you wish to sample 160m before you build a transmitter for the band, it is worth noting that AM broadcast receivers can sometimes be adjusted internally to tune up to 1.8 MHz by raising the upper limit of the set's local oscillator frequency coverage. With a BFO and antenna, it may be possible to tune in local SSB or CW signals though this is a very makeshift arrangement and no substitute for a good direct conversion or superhet receiver. Receiving capability is important on 160m as noise levels can be high.

If you have room, a loop antenna is a useful low-noise antenna. Alternatively, indoor loops, rotatable to null out interference, could be used in conjunction with a separate transmitting antenna. Antennas



such as a dipole or G5RV for the HF bands can be effective if they are loaded against a ground such as a plumbing system and/or radials of 20 - 40m long. With such a system any improvements to your earth will raise your signal strength

and that of incoming signals (and noise), though even a mediocre antenna will produce contacts provided there are other 160m operators close enough to you.

GODC

MORSE POWER !

Morse Code: "Positive Value Worldwide"

The Board reaffirmed its position that international Morse code proficiency must remain a requirement for licenses conveying privileges below 30 MHz, as currently specified in the international Radio Regulations. The Board noted the importance of Morse code, and wanted no mistake made on the international front of the League's resolve to maintain the present requirement should an assault ever be mounted. The action is also a signal to League members of the policymakers' continuing commitment. (See Minute 41.)

Some good policy coming from the ARRL Board of Directors is shown opposite (in an extract from *QST* March 1993 p.73).

Minute 41 includes: "Proficiency in Morse code has been an international requirement for many decades, and Morse code is the international language that fosters communications between peoples with differing languages"

GODC

TREASURER'S ANNUAL REPORT

STATEMENT OF RECEIPTS AND EXPENDITURE FOR YEAR ENDED 30 JUNE 1993

	<u>\$ RECEIPTS</u>	<u>\$ EXPEND</u> <u>-ITURE</u>	<u>\$ BALANCE</u> (1)	<u>1991-92</u>
ADVANCE	0.00	500.00	- 500.00 (6)	-
BANK CHARGES	0.00	29.25	- 29.25	- 20.44
CREDIT ACCOUNT	24.80	19.00	5.80	0.00
DONATIONS	32.96	0.00	32.96	142.50
BANK INTEREST	78.30	0.00	78.30	84.08
KIT SETS	1984.45	1562.19	422.26 (3)	66.02
LO-KEY	198.60	2469.03	- 2270.43	- 1237.24
POSTAGE GENERAL	6.14	137.57	- 131.43	- 52.76
ADMINISTRATION	0.00	531.50	- 531.50	- 276.06
LOGO STICKERS	0.00	0.00	0.00	10.00
SUBSCRIPTIONS	3006.70	0.00	3006.70 (2)	1876.66
SUNDRIES	10.00	0.00	10.00	320.00
SUB TOTALS	\$ 5341.95	\$ 5248.54	\$ 93.41 (5)	\$ 912.76

CASH :		ORDINARY A/C	\$ 300.73
		CHEQUE A/C	\$ 2732.94 (7)
1992-93	\$ 93.41	SPECIAL PURPOSE	\$ 41.99
B/F BALANCE (6/92)	\$ 3095.52	IN HAND	\$ 113.27
NEW BALANCE :	\$ 3188.93	CURRENT :	\$ 3188.93

1993-94 BUDGET :

BROUGHT FORWARD	\$ 3188.93
EST. LO-KEY	\$- 2500.00
EST. STATIONERY + POST	\$- 650.00
EST. BANK	\$- 30.00
BUDGET WORKING BALANCE 93-94	\$ 8.93

NOTES :

- 1/ These accounts are prepared on a cash flow basis and therefore do not account for stock or liabilities. Significant items are addressed in these notes.
- 2/ \$216.10 included in the subscription accounts paid during 92-93 is in respect of advance subscriptions for 1994 and beyond.
- 3/ The Kit-Set activity has stock of apx \$537, at sale price. See Note 6.
- 4/ Membership stats. for the year ended 30/06/93: 13 members left the club and 72 joined the club. Current financial membership is 259.
THANK YOU to ALL those responsible for joining up new members.
- 5/ We have shown a cash flow surplus for the 1992-93 fiscal year. Your committee has been keeping a close eye on budget matters during the year and whilst we have shown a "surplus" for two consecutive years the net position over the last three years still calculates to a net loss of apx \$37.60.
- 6/ An additional advance of \$500 (the total is now \$1000.00) towards new kit-set batches and Lo-Key production has been made to Don Callow VK5AIL #75, Kit-Set Centre manager and Lo-Key editor.
- 7/ Made up of \$5286.27 statement + \$127.63 deposit cheques - \$2680.96 drawn cheques.
- 8/ A BIG THANK YOU FOR YOUR SUPPORT and especially to those of you who made DONATIONS of TIME or FINANCE.

K. R. Zietz VK5AKZ #43
TREASURER 1992-93

GOOL



FROM THE EDITOR'S DESK

By Don Callow VK5AIL #75

5 Joyce St. Glengowrie SA 5044

To authors/contributors - If you are able to send items on disk it makes things much easier for me and the end result should still be the same as you originally intended.

For projects, I can accept Protel Schematic, Autotrax and Easytrax files, but don't forget to use a large size for your Schematic text annotations, because your A4-sized diagram will be reduced to about 2/3 or 3/4 of its original size for printing in Lo-Key.

By the way: In June 1993 *Electronics Australia* magazine (p.127) it was stated that Protel Easytrax PCB layout software is available as freeware if you send a floppy disk, either 1.2Mb 5-1/4" or 1.44Mb 3-1/2", to Protel Technology, GPO Box 204, Hobart, Tasmania 7001. Version 2.06 for IBM-compatibles is supplied (or will be if the offer is still open) and is the same as the fully licensed version except documentation is on diskette. It hurts me a little to type this, as I paid about \$400 for mine several years ago, admittedly with the manual and 90 days free support - "them's the breaks" !!

To assist you I have listed the freeware with the Club Files C090.

Aldus PageMaker 5.0 is used for Lo-Key, which means I can accept just about any DOS or Windows word processor files you can produce - but please send an ASCII text file version as well.

just in case of trouble. Your manual will tell you how to produce this if you don't already know. Hard copy is handy if you have used any tricky character formatting or equations.

I have a hand scanner that scans up to 130 mm (5") width in one pass. This works OK on typewritten and machine printed material.

All this technology allows the Lo-key masters to be produced for photocopying without the need to reach for the sticky tape at all. The paper masters are printed direct and entirely from 'magnetic media'. Except where the scanner can't handle a photograph, such as the cover of the June issue.

Good news for the Editor !

Rod Green VK6KRG #28 has taken pity on me and offered to help by preparing some of the circuit diagrams for Lo-Key. Circuits selected for processing by Rod will be returned to me on diskette in Protel Schematic format, which makes things very simple.

Thanks, Rod !

Don VK5AIL

p.s. At last ! A while ago I managed to spend some time on my Club Communicator Tx and managed to double its output power to above the target 4 watts. Future article on the way !

GGG

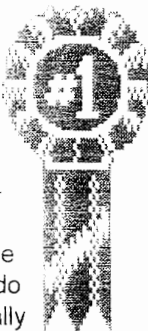
AWARDS AND CONTESTS

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

Greetings to all members and I hope that your home-brewing and particularly your CW skills continue well.

Did you all take part in the RD Contest recently? I do hope that there was a really good representation of CW signals that weekend.

As regards our club Scrambles for August, 1993, I am sorry to report that they were very disappointing, both from the conditions and the numbers of members taking part. I think that it is a very strange thing that non-members will make a special effort to participate in Scrambles when told about them on W.I.A. broadcasts, but then do not hear club members taking part. You may say "Well, why don't they join our Club?" A good point, but I think that it shows that there are those who do things for the love of the exercise and who do not feel that they must be in a club in order to enjoy their activity. To balance this the question may be asked "Why are we in this Club?"



RESULTS OF SCRAMBLES

Scramble 27 - 15 July 1993

- | | | | | |
|----|--------|------|-------|-----------|
| 1 | VK3AAM | #224 | Phil | 10 points |
| 2 | VK4EV | #130 | Ron | 7 " |
| =3 | VK2WES | #162 | Wes | 5 " |
| & | VK3ANP | #125 | David | 5 " |

A log was also received from regular participant Reg VK3BPG, who reported very heavy QRM conditions to the point that he could make no contacts at all.

Scramble 28 - 25 July 1993

- | | | | | |
|---|--------|------|-----|-----------|
| 1 | VK2WES | #162 | Wes | 10 points |
|---|--------|------|-----|-----------|

For both Scrambles I was interested to read that Wes #162 was able to hear several DX stations, mostly Japanese, but unable to contact them.

No logs were received for Scrambles 29 & 30.

I am not surprised that there were poor results for the two Sunday Scrambles, but I feel that the exercise should be repeated in the Spring or Summer.

'Negotiations' are in progress with **Ron VK4EV #130** re the national QRP Day in 1994. This is looking good and I hope that final details may be announced in December Lo-Key.

South African Radio League Low-Power Interest Group Field Day

Sunday 24th October, 1993 2100 to 0200UTC

7.030, 10.110, 14.060 & 21.060 MHz

Dave Gemmell ZS6AAW has advised of, and asked for, Australian participation, in the A.F.R.L. QRP Field Day. Please make an effort to listen. Conditions during our morning may not be the best, but any help will be much appreciated.

SPECIAL EVENT SPECIAL EVENT SPECIAL EVENT SPECIAL EVENT

SPRING 1993 SCRAMBLES

Scramble 31 Thursday October 21st
80 metres 3.500-3.535 MHz
1000-1200UTC

Scramble 32 Thursday November 25th
40 metres 7.000-7.035 MHz
1000-1200UTC

Please make a note of these events now and let's show that there are people who can and do use CW for enjoyment.

SCRAMBLE RULES

TRY A SCRAMBLE, especially if you are not keen on contests - you will be pleasantly surprised. Homebrew or similar equipment is preferred, but you are most welcome to wind down the power output of your black or grey box and join in. Winners receive a unique **Clothespeg Key Trophies**, donated by **Steve Mahony VK5AIM #184** and all placegetters receive a **CW Ops QRP Club Achievement Certificate**.

AIM: To score maximum points by working as many CW stations as possible.

DURATION/TIME: As specified - usually 1-1/2 or 2 hours.

MODE: CW only. Club members to use QRP (5W max. output to antenna).

CALL: No control station to check into - just tune up, start calling, and enjoy yourself. The call to use is **CQ QRP TEST** and Club Members should of course use the /QRP suffix. There is no need to exchange serial numbers.

SCORING:

QRO VK ...1 point QRO DX ...5 points
QRP VK ...5 points QRP DX ...15 points

ENTRIES: Send log extracts to me without delay please. Just show time of contact (UTC), callsign of station you had QSO with and /QRP if he/she was a QRP

station, name of operator (if you know it), signal reports given and received, and points claimed.

RESULTS: Results usually appear in the next Lo-Key after the event.

EUROPE FOR QRP WEEKEND

1600 UTC Oct 1 until 2359 UTC Oct 3

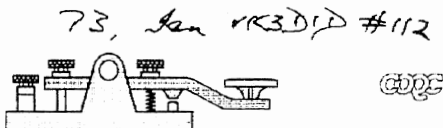
CW only, around QRP frequencies (3560, 7030, 14060, 21060, 28060, all +/- 10 kHz). Power not to exceed 5 watts rf output. Call: CQ EU QRP. Exchange (and log) RST, power output, and name of operator.

Scoring: contacts with own country do not score. European stations score 1 point for each European contact and 3 points for each contact outside Europe. Stations outside Europe score 5 points for each contact with Europe. Final score is sum of points scored on each band used.

Logs: separate log sheets must be used for each band, showing for each contact date, time, call, RST, name and power received & sent. Summary sheet must be provided showing call, name & address, claimed score for each band, total score, and brief details of equipment used. Submit logs by 15 November 1993 to:

P. Doudera, OK1CZ, U1 baterie 1, 16200 Praha 6, Czechoslovakia.

Merit certificates will be awarded to the three leading stations from each continent. Judges decision final. Event organized jointly by G QRP Club and OK QRP Club (Czech Republic).



C.S.W. Keyer Paddle

By Matt. Meenagh ZL1ATW #34

Hacksaw cuts were made in the small block of wood and Copper strips cut from an old toilet cistern are inserted in the cuts. The whole thing is held in a vice while two holes each side are bored, then screws and a solder lug fitted. Use PVC to glue the small to the larger board and when dry fit a contact point on the front apron of the large board between the paddle strips. I used a double ended solder lug for this and soldered a short piece of thick copper wire across one end to act as the contact point. Fit some touch pads to the ends of the paddles, the choice is yours; I use a piece of "BLU TACK" leaving the paper on the outside.

This double paddle works very well, better than a single paddle and as good as a commercial double paddle that I bought some years ago. Total cost 50¢ for the 4 screws that I had to buy. It took nearly as long to describe this as it did to assemble it.

What do we have when we're finished ?

- A C.S.W. Keyer Paddle

C = Copper

S = Screws

W = Wood.

CW Net News

By Ted Daniels VK2CWH #89

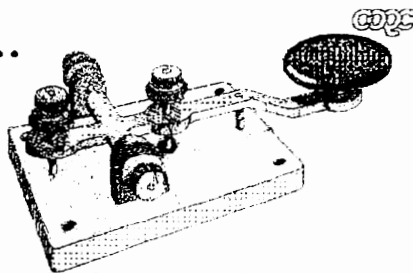
Wombat Hole,

Bylong Rd.,

Rylstone N.S.W. 2849

The Net has been running successfully through winter with an average number of five to six, which is the highest level of participation in my time as Net Controller, no doubt reflecting the Club's growth.

However, there is only one new contact to report, **VK2ERA, Rob, #126** of Kootingal, and no sooner did Rob start transmitting than the Net was wiped out by QRM on both sides ! So try again, Rob !



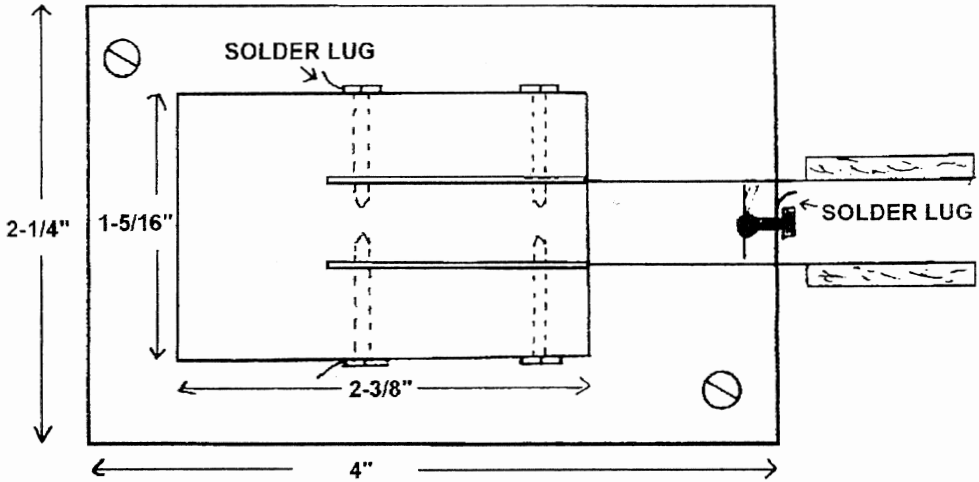
Thanks to Vince, VK2UY #36 for agreeing to take over as Net Controller on the two nights I will be absent on holidays.

There was an omen of things to come last Tuesday (August 10), when I didn't even put out a CQ, as QRM from a change passing through was a steady on 20 dB over 9 !

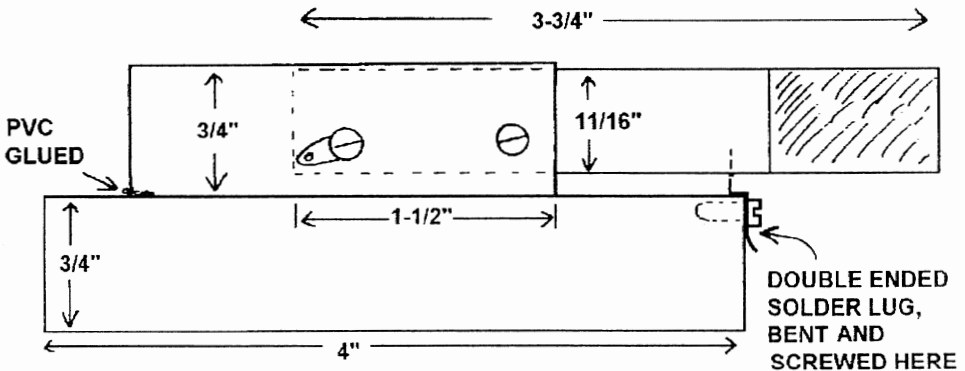
Thanks to all who support the Net.

72, Ted

C.S.W. KEYER PADDLE



TOP VIEW



SIDE VIEW

Ceramic Resonator Oscillator

By Rev Suter VK6SA #61

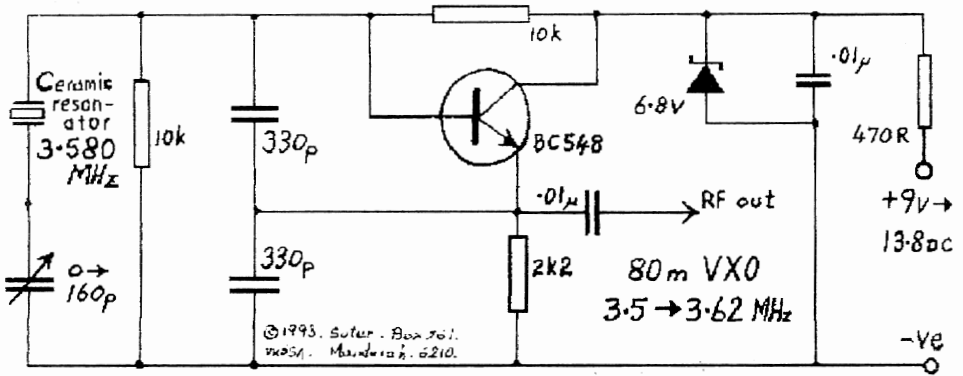
Just this week (19 July 1993) I have finished a modified oscillator that pulls a ceramic resonator over the 80 metre band from 3.500 MHz to 3.620 MHz. This is really a breakthrough in electronics because no one else has yet published any crystal-pulling or ceramic-resonator-pulling circuit of much more than 20 kHz or so. Thankyou VK6FKB & VK6RY. Resistors are 1/4W; capacitors are disc ceramic.

The advantage, other than bandwidth, is the omission of an inductor

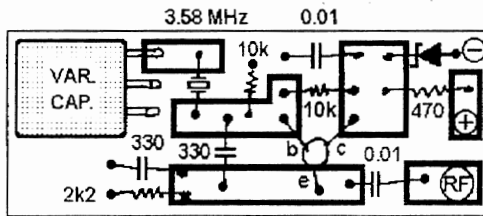
which minimises stray propagation of radio frequency and thus cuts down the requirements for shielding.

Ceramic resonators are available from Radio Spares and IRH Components (mine came off an old board). The variable capacitor - like those from a tranny radio - is from Dick Smith (DSE) R-2970 \$1.95.

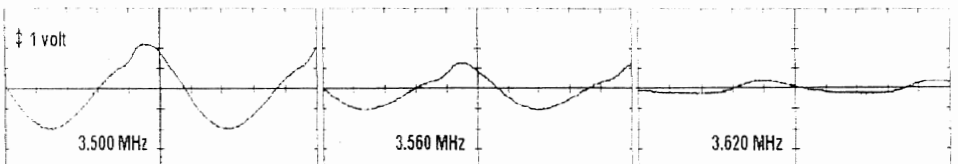
An oscillator such as this is the heart (first part) of ANY transmitter or SSB receiver and may be used for BOTH Tx and Rx in a transceiver.



Editor's Note: Rev sent me his prototype which I spent an hour or so testing. Without load on the RF output, other than a probe, I confirmed the 120 kHz range and obtained these waveforms:



E:IPAGEILK#3910SC02.PCX ARIAL 12 BOLD



Some Useful Varicap Theory

By: Ron Steinfeld VK3MHM #274

In the March issue of Lo-Key, some club members have asked for articles on interesting theory. Recently, the author has conducted some research into the topic of varicaps, partly due to my general interest in them and their behaviour and partly because I am presently working on a CW transceiver for the 80m band. I decided to incorporate an RIT control for the transceiver's VFO and a varicap diode is the most important part of that system. This article deals with some interesting findings I have made with the help of a Motorola application note (see References) - some simple mathematical manipulation lead to an easy way to work out a mathematical model (in the form of an equation) to predict the Capacitance-Voltage behaviour of a given varicap, using only minimum data figures. This model can then be used to good advantage when designing with varicaps (an example will be shown later). I hope this article will be of interest to other club members.

So, lets start from the beginning. Varicaps, for those who do not know, are semi-conductor diodes which are used as variable capacitors by varying a DC reverse bias voltage applied to them. Any semi-conductor diode can

(to some extent, at least) be used as a variable capacitor in this way. However, in most diodes which are not intended for use as varicaps, this capacitance is small and/or can only be varied over a very small range. Varicaps are diodes designed and manufactured for this purpose and exhibit larger capacitance/capacitance change. Varying a DC voltage is accomplished very easily using a simple resistive voltage divider with a potentiometer as the control, and this makes varicaps very suitable for VFO fine tuning/RIT applications. The varicap can be mounted in the VFO, while the tuning potentiometer can be mounted on the front-panel, its leads only carrying DC (compared to RF if a small mechanical variable capacitor was used).

In all varicaps, increasing the control voltage applied to them (i.e. making the varicap even more reverse biased) decreases their capacitance. There are many considerations which limit the range of the control voltage. Firstly, it must always be high enough to keep the varicap reverse biased even at the peaks of the RF voltage across the tuned circuit in which the varicap is

placed. Also, at low voltages the Q-factor of the varicap may be too small (the Q decreases with a decreasing applied voltage). The Q, however, is usually large enough so this isn't a problem. These factors limit the maximum capacitance that can be obtained from the diode. The applied voltage must also be lower than the Inverse Breakdown Voltage of the varicap (for most varicaps, this is unusually low, often around 15 volts).

What is not often mentioned in amateur literature is how exactly does the varicap capacitance vary with the applied control voltage. While this may not be a problem if the amateur has complete data sheets about the varicap type and typical capacitance-voltage graphs, this is often not the case. This was, in fact, the position I was in recently. The CW Ops club sells a BB119 varicap for a reasonable price but, deciding to use it for my transceiver's RIT system, the only data available was that from the Dick Smith Electronics catalogue's Data Section. However, this only gave me limited information, and I needed to determine the capacitance for a variety of voltages, i.e. I needed a mathematical model (formula) to relate the capacitance of the BB119 to the DC control voltage applied to it. This would allow me to work out which voltage range I need for a VFO frequency shift of 2 kHz (+/- 1 kHz) - a 'design goal'.

From the Motorola note, the capacitance of a varicap for a given voltage is given by:

$$C_d = \frac{K}{(V + 0.7)^a}$$

Where:

- C_d - Diode capacitance (pF)
- V - Applied reverse voltage (volts)
- k, a - Constants (numbers) unique to every varicap type.

Only two 'bits' of information are needed to work out the values of a and k for a given varicap:

- 1) The capacitance of the varicap (denoted by C_g) for one applied voltage (denoted V_g).
- 2) The capacitance ratio (denoted by $Cratio$) of the varicap between two applied voltages, V_{min} (the lower voltage) and V_{max} (the higher voltage).

Without showing the working out, it can be shown that:

$$a = \frac{\log Cratio}{\log \left(\frac{V_{max} + 0.7}{V_{min} + 0.7} \right)}$$

$$\text{and } k = C_g * (V_g + 0.7)^a$$

Once the numerical values of a and k are calculated (using the above) for a given varicap, they can be substituted into the model formula and used to estimate the capacitance of the varicap for any applied voltage. Note that due to the index and log functions used in the equations, the calculations will need to be performed on a scientific calculator. (By the way, the base of the logs in the 'a' equation can be any). However, they can also be performed on a PC using a simple BASIC program which I have written for this purpose, and included herein. (See p.17)

A practical example of the above will now be given for the BB119 varicap. My DSE (Dick Smith Electronics) catalogue gives the two bits of information needed for constructing the Voltage-Capacitance model for it. The capacitance is said to be 20 to 25 pF at 4V, i.e. $V_g=4$ and $C_g=22.5$ (it seems reasonable to take the average of 20 and 25), while the capacitance ratio for $V_{min}=4$ and $V_{max}=10$ (volts) is stated as bigger than 1.3, but for the BA102 varicap it is stated as 1.4, and since the BA102 is approx. equivalent to the BB119, we shall assume $C_{ratio}=1.4$.

Using these values to work out the constants a & k for the model:

$$a = \frac{\log(1.4)}{\log\left(\frac{10 + 0.7}{4 + 0.7}\right)} \approx 0.409$$

$$k = 22.5 * (4.7)^{0.409} \approx 42.37$$

and therefore, for the BB119,

$$C_d = \frac{42.37}{(V + 0.7)^{0.409}}$$

This model can now be used for approximations of the VFO frequency shift possible for any voltage range by calculating the capacitance of the diode for each of the maximum and minimum voltages of the range, each time using the diode capacitance together with the other capacitances to calculate the total capacitance across the tuned circuit's coil, and then using this and the coil's value to calculate the resonant frequency of the tuned circuit

(and therefore, the frequency of oscillation), using the well known formula:

$$f = \frac{1}{(2\pi\sqrt{LC})}$$

You will end up with two VFO frequencies, one for the minimum voltage setting of the fine tuning potentiometer and the other for the maximum. The difference between the two gives the VFO frequency shift. The voltage range can then be altered slightly, and again the frequency shift calculated, until the required shift is obtained. While this procedure may sound hard and long, it is really very simple and may not only have the advantage of giving good results when actually built, but it may well give the amateur a sense of satisfaction, due to his design proving accurate (the author has indeed felt this).

As an example of the results obtainable using this technique, I shall give the results of my VFO with the BB119 model. In my case, a 3 to 8 volts range gave (using the model) approx. 2 kHz shift at the centre of the VFO tuning range (3.6 MHz), with slightly different shifts at the extremes of the band (3.5 MHz and 3.7 MHz). When the VFO was built, some measurements were performed using a frequency counter to test the accuracy of the predictions (a resolution of 100 Hz was used).

VFO Frequency	Predicted Shift	Measured Shift
3.5 MHz	1.8 kHz	1.8 kHz
3.6 MHz	2.0 kHz	2.0 kHz
3.7 MHz	2.3 kHz	2.1 kHz

As can be seen, the measured results were exactly as predicted except the shift at 3.7 MHz which was measured 200 Hz less than that predicted. These results show just how closely the model can be used to approximate the results.

In conclusion, the Voltage-Capacitance model presented in this article only requires that a minimum amount of information be known about a varicap, but can often provide accurate predictions to enable good initial design, before construction and experimentation are commenced. There are

many other design considerations related to varicaps in tuning applications (such as tuning linearity, temperature stability), but since this article is long enough, I shall leave these topics for another opportunity (if there is interest).

References:

Motorola Application Note AN551 - "Tuning Diode Design Techniques" (Included at the back of the Motorola Data Book "RF Device Data, Volume II")



Abel's *la belle* Labels

By Rob Abel VK2ERA #126

There it is !! - your nice newly constructed RX/TX. But doesn't it look slightly mysterious with a "blank face"?

The following is a method of labelling which is simple, efficient, tidy, and is only limited by the types of rub-on lettering available to you.

By rubbing the required names onto either clear or coloured Con-Tact (your choice) it is easy to get a very tidy and clear title as required. After doing all the required names, with approximately 1/4" spacing between each word horizontally, then take a clear piece of Con-Tact, remove backing paper and

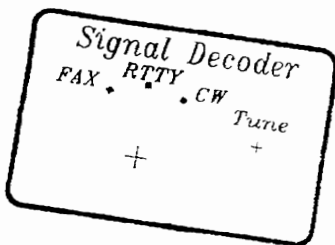
place over the names.

I usually rub the clear Con-Tact down with something smooth, so we now have a "sandwich" consisting of base Con-Tact, lettering, and clear Con-Tact.

All that remains is to cut with sharp scissors into appropriate sizes, peel off base Con-Tact backing paper and

stick in correct position on device to be labelled.

This makes a very neat and tidy label which will not fall off or rub off with finger contact on the controls. Also looks much better than those horrible looking lumps of Dymo tape !!



ANT KEY NET PWR REC TUNE


```

10 ***** This program calculates constants for *****
20 ***** the Cap.-Vol. varicap model and *****
30 ***** can calculate capacitances for any *****
40 ***** voltage given constants a & k for a varicap ***
50 *****
60 ***** Written by: Ron Steinfeld VK3MHM *****
70 ***** Date: 25 April 1993 *****
80 *****
90 CLS
100 PRINT "Please choose 1., 2. or 3.:"
110 A$=INKEY$
120 PRINT
130 PRINT "1. Calculate a & k constants for a varicap"
140 PRINT "2. Use model to calculate capacitance given voltage"
150 PRINT "3. Quit to Dos"
160 A$=INKEY$
170 IF A$="1" THEN GOTO 210
180 IF A$="2" THEN GOTO 470
190 IF A$="3" THEN SYSTEM
200 GOTO 160
210 'Calculate a & k constants for a varicap.
220 CLS
230 INPUT "What is the value of Vg (voltage at which capacitance is gi
ven) ",VG
240 INPUT "What is the varicap's capacitance at Vg (in pF) ",CG
250 INPUT "What is the capacitance ratio between Vmin and Vmax ",CRAT
260 INPUT "Insert Vmin ",VMIN
270 INPUT "Insert Vmax ",VMAX
280 A=LOG(CRAT)/LOG((VMAX+.7)/(VMIN+.7)):calculating a.
290 K=CG*(VG+.7)^A
300 'Printing constants and resulting model.
310 PRINT "The obtained results are:"
320 PRINT
330 PRINT "The value of k is";K
340 PRINT "The value of a is";A
350 PRINT
360 PRINT "Therefore the Capacitance-Voltage model for this varicap
is:"
370 PRINT
380 PRINT "Cd = ";K;" / (v+0.7)^";A
390 PRINT "Where: Cd- diode capacitance (pF).
400 PRINT " v- Applied DC voltage (V).
410 PRINT
420 PRINT "Press c for model calculations or m to return to main menu"
430 A$=INKEY$
440 IF A$="c" OR A$="C" THEN GOTO 510
450 IF A$="m" OR A$="M" THEN GOTO 10
460 GOTO 430
470 'Using model for calculation
480 CLS
490 INPUT "Insert value of k for varicap concerned ",K
500 INPUT "Insert value of a for varicap concerned ",A
510 PRINT
520 INPUT "O.K. Find Capacitance at which voltage ";V
530 CD=K/(V+.7)^A
540 PRINT "Varicap capacitance at";V;"volts is ";CD;" pF"
550 PRINT
560 PRINT " Press m for main menu or c for further calculations"
570 A$=INKEY$
580 IF A$="m" OR A$="M" THEN GOTO 10
590 IF A$="c" OR A$="C" THEN GOTO 510
600 GOTO 570

```

CLUBTIVITIES

By Don VK5AIL #75

Upgrades & New Calls

New Member **David Ponsonby VK7LDM #337** of Parattah, Tasmania, has obtained a Novice Call after many years as an SWL. Welcome to the bands, David, we wish you all the best and hope to announce an upgrade to Full Call for you in December Lo-Key ?!

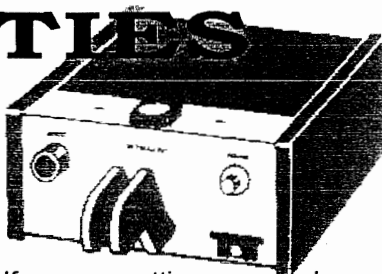
Danny McDonald VK3DNA#301 ex VK3MGR of Ballarat, Victoria, has Yes! upgraded from Novice to Full Call. Much better to stick with the standard Clear phonetics of Delta November Alfa rather than the mouthfull of *Deoxyribo Nucleic Acid*. Better still, stay with CW.

Murray Lewis VK3EZM #234 ex VK3JHX of Vermont South, Victoria, joined the ssb net one night in August and mentioned he had obtained his Full Call; also that he was using headphones.

Someone, who shall remain nameless (but I think it was **Barry VK5BLS** - we'll blame him anyhow because he was Net Controller !) said words to the effect that the springiness in headphones is there to allow for Novices whose heads tend to swell after they hear they have succeeded to upgrade !

A.R. Conventions & Apologies

The Editor here and now gives a public apology to **Rex Black VK2YA #131** for failing to send some display material, to promote QRP, CW and our club, for the Wagga Radio Club A.R. Convention held recently. Sorry Rex, I hope you ask me again next year !



If **you** are setting up a display we can provide A4 masters for posters of the Morse Code, a montage of illustrations from Lo-Key, Lo-Key index, 1000 Miles-Per-Watt certificate, a sample of our Achievement Certificate, a large copy of club logo, sheets of logo stickers, a number of CW Ops Club promotional brochures with application forms, and some copies of Lo-Key for display; also some other items. Arrangements can also be made for you to sign up new members, if you wish to do this.

September Packet Racket

Add this one to your list of members' packet addresses:
Bob Terrill VK3BNC@VK3IBM

The Best P.S.

We would have to agree with the sentiment in a post script on a letter from **Paul Hughes G0BXC**.

Paul mentions that he is "very keen on home construction and I am 100% QRP & 99.5% CW."

*"The best P.A. is
a good antenna !"*

Perhaps someone could make up another pithy statement about the value of CW/QRP in conserving the radio spectrum ?!

GDPC

REDUCING ICOM RIGS TO QRP POWER

Fred Bonavita W5QJM PO Box 2764, San Antonio, Texas, 78299

Requests for information on cranking back the power of ICOM transceivers have appeared in various QRP publications in recent months, and the following literally is from the horse's mouth.

It is culled from advertisements ICOM ran in some of the Amateur Radio press in the US in early 1989, and it addresses the assortment of rigs available at the time. The company may have published similar data since then as it continues to introduce new models as part of the fierce competition, but if that happened this writer missed them. These are to get the power output down to five watts, barely making the rigs "legal" for QRP, but ICOM said nothing about getting it lower with internal adjustments. Any further experimenting should be done with caution.

First, ICOM warns, remove any rings or watches while working inside these units. Be sure to have plenty of light to see what you are doing. If needed use a pocket magnifier to read component numbers on circuit boards. Avoid moving wires or cables that could become pinched after the rig covers are replaced.

IC-735; Place the rig upside down on a soft towel with the front panel and knobs facing you. Remove the eight screws on the bottom cover. Lift it off, exposing the main circuit board. In the upper right corner are four small pots in a L-shaped pattern. Locate R-267 near the bottom of the "L"; it sets the span of the RF PWR control on the front panel.

Plug an accurate wattmeter connected to a dummy load into the rig's antenna socket on the rear panel, switch the transceiver on, and adjust the front panel RF PWR control for minimum. Select CW and key the rig only long enough to read the wattmeter. Power output typically will

be ten watts.

Place an insulated screwdriver in R-267 and again key the IC-735. While watching the wattmeter, turn R-267 clockwise until the RF power out drops to five watts. If more than 30 seconds are required for precise adjustment, unkey the rig for at least 30 seconds before resuming, now rotate the RF PWR control on the front panel, key the rig and note the full output. Return RF PWR to minimum again and double check for five watts output. Switch the rig off, and replace cover.

IC-751; The same procedure is done here, but this time the internal pot to adjust is R-46. It is under the rig's top cover and in the centre of the main circuit board, to the left of the large, shiny shield in the middle of the board.

IC-751A & IC-761; Neither rig can be adjusted to QRP levels internally, but the company says reductions of from 10 to 5 watts minimum on ssb involves decreasing the RF PWR control to its minimum.

IC-781; QRP levels are reached via two front-panel controls. The RF PWR is set to minimum, and the DRIVE control is decreased until five watts are shown on the wattmeter.

IC-725; Turn the rig over with the knobs facing you, remove bottom cover and locate R-208 on the main circuit board's top right quadrant. With the dummy load and watt meter again connected to the antenna socket, set the front RF PWR control to minimum. Key the rig and adjust R-208 for five watts output. Check results as per the IC-735.

Those with older or newer ICOM rigs are urged to write the nearest distributor's customer service unit to inquire about QRP adjustments.

Home Brew RF Impedance Bridge

*"Once you have used one you'll wonder
how you got along without one !"*

By Steve Mahony VK5AIM #184



This little antenna measuring device does not require the expensive \$8.00 100 ohm carbon pot from RS Components or the small 200 pF variable cap (more scarce than rocking horse manure) that a Noise Bridge requires.

The circuit is as old as electricity itself. A Mr. Wheatstone, I believe, discovered the idea. It's used in some of the QRP ATU's shown in many QRP/ATU articles.

The component next most difficult to obtain is a centre zero microamp meter, 50-0-50 uA. I really don't think they are so difficult to obtain - you often see them amongst other meters at junk sales and electronic scrap yards. Nobody wants them - everyone wants the ordinary movement. Keep your eyes open, you'll probably pick up a nice little 2" (50 mm) dia. or square 50-0-50 uA movement for a song ! Don't worry what the scale says, up/down, left/right, in/out. All you want is a meter that will wag it's needle like a happy dog's tail.

As stated, the components are few and the circuit is basic. The box is one of the Horwood series and the two PL-259 co-ax connectors will cost you more than the rest of the components. Try to get a better quality potentiometer, 250 ohm 2W carbon, not wire wound, for the Null/Impedance reading control. NOT a cheap and nasty unit. Again, it's a type/value that you may

find at a junk sale. Check it with your ohmmeter for noise. The new DMM's with a "beep" on the ohms range are good because you will hear the "beep" if there is any dirt or noise made by the wiper. My pot was a professional quality Allen-Bradley from USA, but was ex junk box.

The components are mounted on a small piece of resistor strip mounted between the two co-ax sockets. Make the layout balanced and symmetrical, after all it is a balance bridge circuit. The components associated with the meter can also be mounted on a tag strip on the back of the meter. The pot is mounted on a small right angle bracket up as close as you can get it to the rear of the co-ax sockets and RF components.

The pot shaft then has to be extended back to the opposite end of the box, going underneath the meter and terminals. Depending on the length of the shaft of your pot, you may need an extension shaft. If you can locate one of those beautiful English capacitor insulated couplings, 'you're made'. The next best thing is a piece of 1/4" (6 mm) plastic rod and some heatshrink tubing, or even plastic fuel line and some super glue. I fitted a bearing from an old busted pot at the back panel. Just a bit neater than a hole !

A nice pointer knob and a hand drawn scale makes an excellent job. Some juggling with the pot, bracket,

shaft extension and the clearance of the meter may be required.

When the Bridge is all wired up and completed some extra components are required to calibrate it. The better the quality of the calibration components the better the calibration. Four to six 100 ohm 2W non-inductive resistors are required. You should check the resistor values, when connected in series and parallel, with your digital ohmmeter. The results and accuracy of this check become your standard. Lower wattage and slightly inductive resistors will work, but watch the amount of RF power you feed into them ! The 100 ohm resistors in parallel give: 2|| = 50 ohms, 3|| = 33 ohms, 4|| = 25 ohms. 2, 3 and 4 in series will give you higher values for calibration: 200, 300 and 400 ohms. They are also useful to calibrate QRP SWR meters - but that's another story.

A co-ax plug with 6" (150 mm) of co-ax with a couple of alligator clips on the bared ends is OK to connect up to the resistor combinations. To calibrate or use, feed ONLY 1 watt of RF from your QRP TxR, at any HF frequency. Start at 3.5 MHz and connect 50 ohms, e.g. using two 100 ohm resistors in parallel, to the LOAD via the alligator clips. Depending on the setting of the NULL pot, the meter should read left or right of centre. Adjust the pot for a NULL; it should be at 1/2 scale. By substituting various values of resistances, using parallel and series combinations as

mentioned above, various calibrations can be marked on the scale. You may have to change the polarity at the meter to make the calibrations of the NULL pot agree with the High or Low values on the scale, e.g. if the pot reads 500 on the left the meter swings left, and so on....

If you can supply LOW POWER into the Bridge on any other Amateur Bands, check the calibration on them all. Depending on your construction and luck, you will probably get it to go to 28 MHz. I have used mine successfully up to 50 MHz.

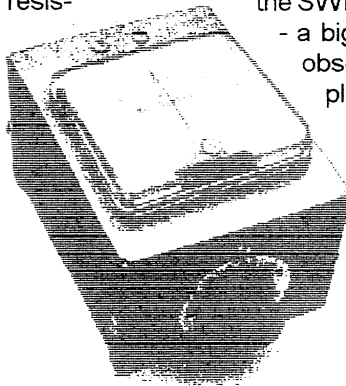
If you have a good RF dummy load of 50 ohm Z you can check the Bridge against this each time before using it, to give you a calibration check and reference.

Try the Bridge on all your antennas - you may get a pleasant surprise on some and be disgusted with others !

Check an antenna via your ATU. Set the Null/Impedance knob at 50 ohm Z and feed in 1W of RF at the desired frequency. Now adjust the ATU until the Bridge meter is at zero, or as close to zero as possible. Then disconnect the RF Bridge, reconnect the TxR via the SWR meter. Power up the TxR - a big QRO rig if you like - and observe the SWR. You'll be pleasantly surprised.

If you are lucky enough to be using one of the DAIWA or similar dual needle meters, the reflected needle will probably just lift off the stop !

You can look at the impedance of many pieces of equipment as long as



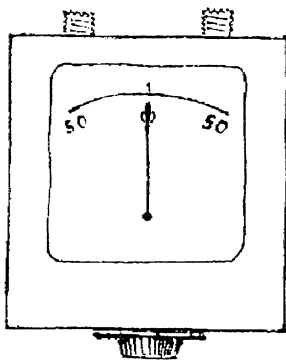
you can keep the input power down to just enough power to get a meter deflection with the circuit out of balance. Filters and co-ax cables can also be checked for resonant lengths, even the input to that MosFet PA !

Watch how much RF power you feed into the Bridge. The 250 ohm pot will be the first thing to go up in smoke !!

I can't drive my Bridge with my GDO - not enough power - although some of the older valve types of GDO will. But watch out for RESONANCE dips in the Dipper lowering the RF input and making a false NULL on the Bridge. I have used my ancient valve type RF Signal Generator to drive the Bridge on the test bench.

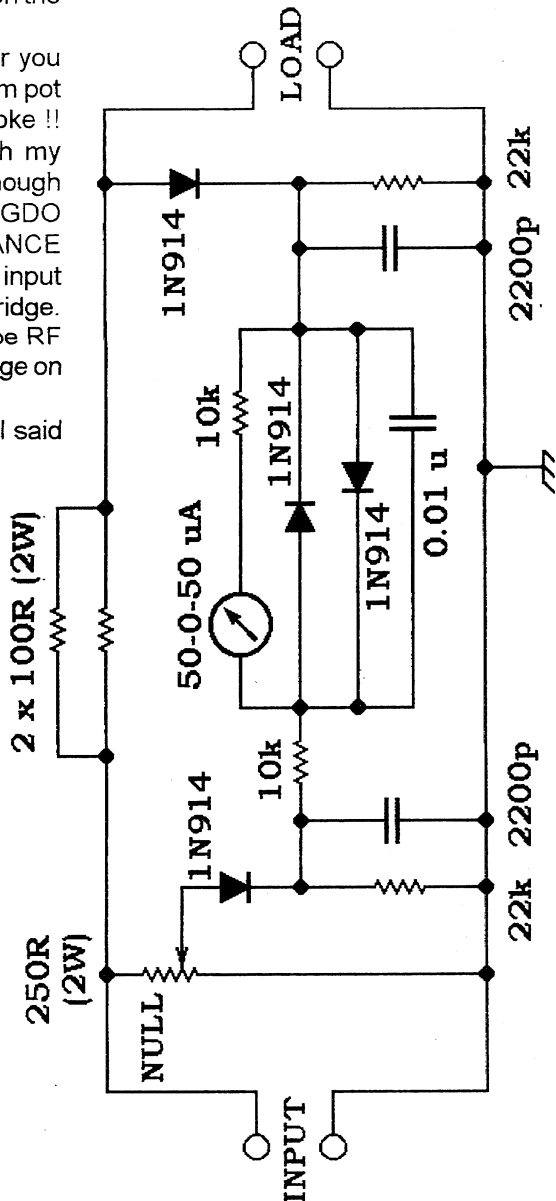
Well, there you have it. As I said at the heading of the article "Once you have used one you'll wonder how you got along without one" !

It should enable you to get all those 5 QRP watts up into the antenna system and radiated out into the ionosphere !!



(See 'Home-Brew Rf Impedance Bridge' by C.J. Klinert WB6BIH in **73 Magazine** May 1980 p. 30)



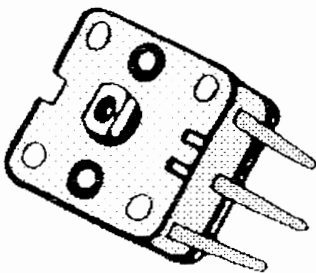


Circuits and Shortcuts

Some Technical Tips from Ian Smith VK8CW #91

Further to my previous article regarding the use of miniature tuning capacitors for VFOs (Ed. - See Lo-Key #26 June 1990 p.24), I have "discovered" some additional characteristics. After building a "stable" VFO for 3 to 3.5 MHz I found that the frequency drifted severely but only at the low frequency end. Even after warm-up it took several minutes for the frequency to settle once the VFO was retuned. However at the highest frequency the stability could not be faulted! The method I often use to set the frequency range is to place a fixed capacitor in series with the main tuning capacitor.

However when I did some mathematics related to the normal drift associated with solid dielectric tuning capacitors the problem was quantified. Basically when the 160 pF capacitor was fully meshed the heating effect of the RF circulating current caused the capacitor plates to expand, reducing the distance between the plates in-



creasing the capacitance. This explained the low frequency drift characteristic. When the capacitor was fully un-meshed this effect did not occur and the series fixed capacitor set the basic stability.

The remedy I used was to reduce the capacitance

value of the variable to that required for the frequency swing - no surprise! I pulled the capacitor apart, removed the dielectric material and every second plate from both the stator and the rotor. This was a bit tricky, to say the least, but the results were worth the effort. I now have a VFO that would be the envy of many. Incidentally the variable capacitor I used had brass plates - I feel this is superior to aluminium types. I have possibly just proved that a circle is round but hopefully some hair tearing out may be prevented? A stable VFO is still a prize to be sought. "Necessity is the Mother of Invention".

Ian VK8CW #91



Silent Key

*We regret to inform members that
Bob Spidell W6SKQ
of Lancaster, California U.S.A.
became a Silent Key*

on 15 June 1993.

*Bob was very active in the QRP-ARCI
and was an avid DX'er.*

'Natter Net' Notes

Steve Mahony VK5AIM #184
19 Kentish Rd. Elizabeth Downs S.A. 5113



Despite the winter weather with its inherent noisy conditions on 80m we have had some good roundups on the CW Ops QRP Club Natter Nets.

Recently, the Nets seem to consist mainly of VK2's, VK3's and VK5's with an occasional VK6 and VK7. An occasional VK4 is heard but like the VK6's they are lost in the crashes and bangs typical of 80m at this time of the year. I guess it's just as bad for them trying to hear the net controller.

As I stated in my March "Natter Net" notes, we would like a few more operators to participate in these nets, please. Considering the number of members we now have in the club, over 200 VK's, I am disappointed that we can't get more to join in. There must be more of you out there listening so come on - join in once in a while. From the amount of components that Don, VK5AIL tells me the Club is selling and posting out, there must be quite a few members building QRP equipment, so come on the net some night and tell your fellow builders how your project is going or, if you are having difficulties, seek advice. It's free over the air you know!



KITTY

(Cleaning the
clandestine
cat's whisker)

I wonder how many of you heard the story on the WIA broadcast (from Adelaide) the other Sunday by some Amateur saying that Amateur Radio will not exist by the year 2001? He claimed that with the instant communications provided by cellular phones, satellites, bulletin boards via computers, along with commercial interests, plus stringent technical requirements on RF emissions, there will be no room for Amateur Radio! A rather disturbing prediction!

I wonder how the authorities could "police" the regulations, with a QRP rig built into an ordinary radio, say something built into an audio cassette case running 1 watt?

Can you imagine it clandestine QRP CW Amateur Radio!

Thanks to the Net controllers who contacted me in some way to let me know that they would not be available as a Net controller for the rostered night, it makes it so much easier.

To those who *didn't* contact me, I hope they had a good excuse, otherwise I'll get Murphy to make their batteries go flat in the middle of their next QRP CW QSO's!

73, from *Steve* VK5AIM and K1TTY
Your Net Controller/Co-ordinator

GDPC

U CAN HELP !

Rod Green VK6KRG

Rod has unfortunately lost some records of correspondence with QRP Club members. If you have been waiting in vain for a response from Rod, this is probably the reason ! So Rod asks you to contact him again if he owes you a reply to your letter.

Rod Green VK6KRG

106 Rosebery St., BEDFORD, W.A. 6052

Pye FM Base Station

I have recently 'inherited' a Pye FM base station which may be a cheap way for me to get going with packet radio. Do you have access to information on what needs to be done to convert this piece of gear to operate on packet frequencies, specifically 144.900 MHz ? If you do I would greatly appreciate seeing what has to be done - the info. can then be returned to you.

Don Callow VK5AIL

5 Joyce St., GLENGOWRIE S.A. 5044



Want To Swap ?

Clipsal key, mounted on a marble base.....Will swap this for a noise bridge and QRP SWR/PWR meter - homebrewed OK as long as they are properly calibrated.

A.B.C. Telegraphic Code, 5th Ed. 1901. The book is 160 mm x 250 mm x 60 mm and weighs 3.5 kg. The hard cover is water damaged but the book is intact and is quite readable.....Will swap this for an Admiralty Handbook circa W.W.2.

Haggling is OK ! If you are interested please contact:-

Alan James VK2ACN 424 Prune St., Lavington NSW 2641

Want To Buy ?

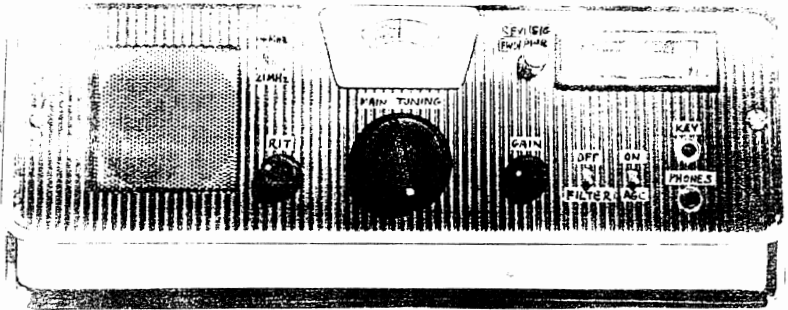
Salvage items for sale - mostly new, unused - price each is given.

- \$5 1 Gang capacitor (used) 100 pF + 100 pF. 62 mm long + shaft. 2 ball brgs.
- \$4 4 Gang capacitors 100 pF + 200 pF. Ball brg. + 'plain'. 30 mm long + shaft.
- \$8 1 Eddystone vernier slow motion dial. Dial 100 mm dia., knob 55 mm dia.
- \$7 4 Vernier drives.
- \$9 2 Vernier drives with flange.
- \$1.50 11 Flexible couplings for 1/4" shaft. 6 small 26 mm dia., 5 large 38 mm dia.
- \$0.20 25 Feedthrough capacitors. Large 23 mm body length.
18 are 4700 pF 7/32" thread. 4 are 10000 pF 1/4" thread.
- \$0.50 2 Coil formers 19 mm dia., 55 mm useful length. Permeability tuning screw.
- \$1 4 Aegis ferrite rod aerial coils 35 mm x 11 mm dia. on 125 mm ferrite rod.

Steve Mahony VK5AIM 19 Kentish Rd., ELIZABETH DOWNS S.A. 5113

QRP Dual Band Transceiver Project

Some News
From Ian Smith VK8CW #91



Recently I built a dual band QRP transceiver for 20 and 15 metres. One of my aims was to use as many parts available from the Club as possible and so make the project repeatable by other constructors.

The rig incorporates the "Audio Amplifier Stage" as described in Lo-Key #33 March 1992. It is always dangerous to expound the virtues of one's own design but I can't resist! I have been more than pleased by the performance of this stage when used as part of a complete transceiver. An additional amplifier precedes this stage to ensure that the AGC circuit is activated. The term "total control" describes my feelings about the Audio Stage.

The combination of selectable AGC, filter and manual gain control has produced an easy-to-operate rig. The meagre 6 mW of audio output gives no indication of the clarity and quality of signal available. The rig sounds dead until an antenna is plugged in! The inbuilt 2" loudspeaker reproduces with ease CW and SSB signals and ear-phone listening is a breeze. (I use a lightweight 32 ohm "Walkman" type connected for mono although 16 or 8 ohm types will give greater output).

I am the first to admit that the

circuit is not the simplest available but personally I have found that the complexity has been worth it, especially in a pile-up.

The three photos are of the latest creation. This is the 14 & 21 MHz version of the 2-band CW transceiver. Features include:-

- * 4 watts out 14 MHz and
3 watts out 21 MHz;
- * r.f. preamp for receive (no tuning);
- * AGC, narrowband etc.,
as mentioned above;
- * Metering of power, fwd/rev
and signal strength;
- * Can be built for almost any
combination for two bands;
- * 4-Pole changeover switch for band
change (toggle switch);
- * Identical frequency read out
for both bands.

**For now, happy QRP'ing es 72
Ian Smith VK8CW #91**

(Editor's note: Ian has offered to write up this project. As you can guess I've accepted and look forward to seeing the result. *And printing this page should put him 'on the spot' - Hi !*)

QRP

QRP KIT-SET CENTRE

Don Callow VK5AIL #75
5 Joyce St. Glengowrie S.A. 5044
Telephone (08) 295 8112 (day/night)

CLIPSAL MORSE KEYS

The Good News and the Bad News -

The bad news is that the **Top and Bottom Contact Holders** mentioned in June (p.25) are not obtainable, contrary to previous advice given to me. The good news is that **KNOBS - KNOBS - KNOBS** are available. Although these are for Clipsal morse keys, they could also be useful for home brew keys etc. The internal thread is 3/16" BSW. Price: **\$2.80** each.

KEY + KEY = 2 There are only two keys available: one of the popular model 610 (\$89) and one double contact model 610A key (\$99). See June Lo-Key page 25. The manufacturer has confirmed that no more of these will be made.

THANKS ROB !

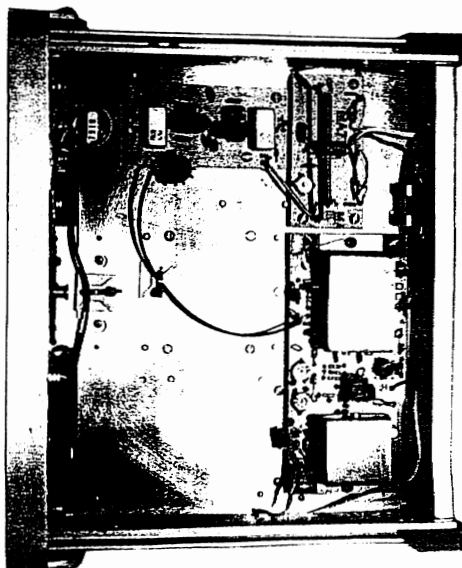
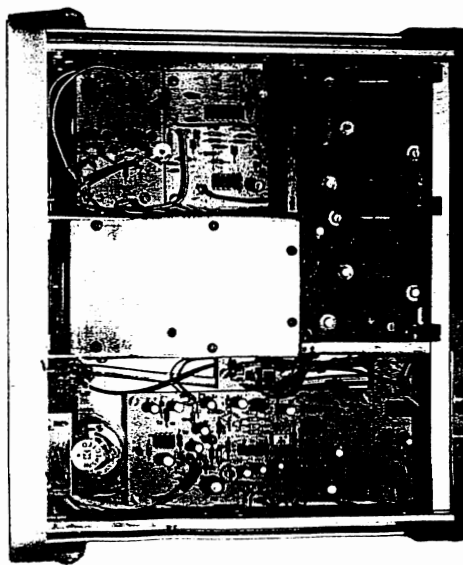
Rob Abel VK2ERA has donated a number of salvaged crystals, crystal sock-



ets and packets of various values of ceramic capacitors. The crystals will be listed in this column soon, with others contributed by **Rex Black VK2YA** and a heap I will never get around to using ! The capacitors may be used in future kit-sets and also are now on the '**Bonus Bits**' list at the end of the main Price List.

PRICE LIST

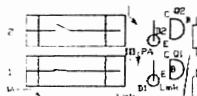
At last I have again made room in Lo-Key for a comprehensive price list - it's the first time since June 1992. Some prices have gone up, but to balance this the pencil has been sharpened and quite a few other prices have dropped, so why don't you check out the next few pages?



QRP KIT-SET CENTRE

Don Callow VK5AIL #75

5 Joyce St. Glengowrie SA 5044 (Telephone [08] 295 8112 day & night)



Supply of Kits & Components

See nominated issues of *Lo-Key* for more detail. We can also help you find many other items. We cannot guarantee availability. The responsibility for all outcomes of using replacement/substitute transistors, diodes etc. is yours. Also, we can give no more than the equivalent of the normal commercial warranty for items sold and as we do not control the means of delivery [usually Australia Post], we are not responsible for losses or damage.

Ordering Kits and Components

Send orders and payment [subs. etc. can be included] to the address above. Make out cheques to the **CW OPERATORS' QRP CLUB** and cross as 'Not Negotiable'. Add **\$4.00 per order for Postage, Packaging etc.** If outside Australia postage costs will be higher e.g. P/P for New Zealand is \$A 7.00.

For amounts up to \$A 20 it is alright to send the equivalent value of Australian postage stamps [1 and lesser values are fine]. The receipt should be enclosed with your next issue of *Lo-Key*.

Price Changes Bonus Bits

Please check all *Lo-Key* issues after the date of this list. Choose what you want from the list following the main price list.

CLUB SALES - PRICE LIST - 1 October 1993

amd 930925

"We give more for less"

The prices listed below are per pack and apply to members within Australia. The 'Nbr in pack' column tells you how many units are in each pack. Prices may change at any time without notice.

'K' in number indicates a kit-set, usually short-form.
'N' means it is a new item on the list.



'D' means that data sheet[s] are provided with each order. D3 indicates 3 pages.
'H' means that a set of insulated mounting hardware is included.

Code No.	Nbr in a pack	\$A Price per pack
K001	1	85.00
Club Communicator 3.5MHz CW QRP Tx. Full kit-set, except cases. Incl. 52 page manual. See <i>Lo-Key</i> #14 Jun '87 and #25 Mar '90 p. 16.		
K006	1	28.00
Sensitive SWR meter. Plus 5W dummy load. Manual included. Short-form kit. See <i>Lo-Key</i> #19 Sep '88 & #25 Mar '90 p. 16. and <i>Amateur Radio</i> Apl '83.		
K011	1	51.00
Flexi-Sudden multi-band Rx. 80m supplied. Based on design by George G3RJV #96. Short-form kit with manual. See <i>Lo-Key</i> #25 Mar '90. K014 is extra module for other chosen band.		
K014	1 pair	19.00
Extra BPF and VBFO modules for the Flexi-Sudden Rx. You nominate band. Instructions in <i>Lo-Key</i> #25 Mar '90.		
C002H	1	3.50 D2H
C002T	1	2.80
IRF510 MOSFET transistor TO-220 case. Hardware & data supplied only with C002H. [Replaces IRF511].		
C003	10	2.50
0.1uF [104] capacitor monolithic [blue colour]		

Code No.	Nbr in a pack	\$A Price per pack
C004	4	2.50
BAT85 Schottky [hot carrier] diode. Voltage drop is 0.2 - 0.3V. High sensitivity - can replace germanium types.		
C007	2	3.00 D3
BS170 transistor VMOS N-channel FET.		
C008H	1	4.90 D2H
C008T	1	4.30
VN88AF MOSFET transistor TO-202 case. Hardware & data supplied only with C008H.		
C011	2	4.80 D2H
IRFZ32 MOSFET transistor $V_{DS} = 50V$ $P_{DS} = 75W$ I_D cont. = 25A TO-220AB case.		
C013	2	1.10
Toroidal core 9 mm od x 6 mm id x 3 mm ht. Philips 4322 020 97170 material 4C6 ferrite [violet]		
C014	2	1.50
Toroidal core 14mm od x 9mm id x 5mm ht. Philips 4322 020 97180 material 4C6 ferrite [violet]		
C015	4	1.90
BB119 varicap/varactor diode - BA102 equivalent.		

Code No.	Nbr in a pack	\$A Price per pack
C018	2	0.60
Toroidal core 6mm od x 3mm id x 2mm ht. Philips 4322 020 97160 material 4C6 ferrite [violet]		



C021	10m	0.15
Enamelled copper wire 0.112mm diam. approx. 37B&S 40SWG		

C022	10m	0.25
Enamelled copper wire 0.17mm diam approx 34B&S 37SWG		

C024	1m	0.20
Enamelled copper wire 0.40mm diam approx 26B&S 27SWG		

C025	1m	0.80
Enamelled copper wire 1.25mm diam. approx 16B&S 18SWG		

C026	5	6.00
TIP31C transistor $V_{CE0} = 100V$ [TIP31, 31A, 31B = 40, 60, 80V]		

C032 - NE602AN	1	6.70	D8
C032 - NE612AN	1	5.60	D6
NE602 or NE612 double balanced mixer & HF oscillator for Rx.			

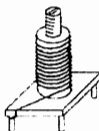
C034	2	3.00	D3
IRFD120 FET [Replaces IRFD1Z3] Used in Gemal transceiver [Lo-Key #21 Mar '89].			

C035	2	2.60
Toroidal core Neosid 4327R/2/F25 ferrite. Used in K006 Sensitive SWR meter.		

C036	2	3.00	D2
BF981 Si N-channel dual gate depletion type MOSFET SOT103 case. [Similar to 40673, MPF121, MFE121, MFE131, but case is different]. Low noise VHF DG Mesfet			

C037	2	4.70	D2
LM386 audio power amplifier. N3 version 4-12V power supply. Typical Pout 700mW [twice output of N1 version].			

C038	2	7.00	D2
LM4250 programmable amp. See Lo-Key #26 Jun '90.			



C039	1m	2.00
RG-174 mini coaxial cable 50 ohms, 2.5mm outside diam.		

C041	10	1.00
Screening beads. Ferrite FX1115 or similar.		

C043	1	1.60
Toroidal core Amidon T-50-2 [red] iron powder. 2 - 10MHz tuned circuits; 0.5 - 30MHz broadband.		

Code No.	Nbr in a pack	\$A Price per pack
C044	1	1.60
Toroidal core Amidon T-37-6 [yellow] iron powder. 10 - 20MHz tuned circuits, 2 - 50MHz broadband.		

C047	1	1.20
Toroidal core Amidon T-37-2 [red] iron powder. 2 - 10MHz tuned circuits; 0.5 - 30MHz broadband.		

C048	1	1.20
Toroidal core Amidon T-37-6 [yellow] iron powder. 10 - 20MHz tuned circuits, 2 - 50MHz broadband.		

C049	1	1.90
Toroidal core Amidon T-68-2 [red] iron powder. 2 - 10MHz tuned circuits; 0.5 - 30MHz broadband.		

C050	1	1.90
Toroidal core Amidon T-68-6 [yellow] iron powder. 10 - 20MHz tuned circuits; 2 - 50MHz broadband.		

C052	1	2.40
BNC adaptor right-angle plug to jack. Branded "Telegaertner - West Germany - Military Type". Good quality. Individually wrapped.		

C060	1	2.50
Neosid coil set: 6-pin base, former, can and 4mm screw core. You may nominate F25 [1.0 - 50MHz], F14 [0.1 - 5MHz], F16 [0.5 - 15MHz] or F29 [10 - 300MHz], otherwise F25 will be supplied.		

C064	1	3.90	D
MC1349P IF amplifier IC. Improved, high gain low noise version of MC1350P. Same pinout except pin 3 is used [not to be earthed]. Normally operates from +15V DC [max. 18V].			

C065	1	1.20	D2
MC1350P IF amplifier IC. Pinout as MC1349P, except does not use pin 3. Normally operates from +12V DC [max. 18V, OK down to 9V].			

C066	1	1.40	D5
MC1496P Balanced modulator/demodulator. Functions include modulator, product detector, double balanced mixer and frequency doubler			

C067	2	1.80
Reed relay. Normally Open, PCB mount, fully enclosed, 5V, coil resistance about 1k35		

NEC URH-902B		= 0.1" c-c
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Code No.	Nbr in a pack	\$A Price per pack
C068	2	4.50

MTP3055E n-channel enhancement MOSFET power transistor [not = 2N3055 or MJE3055]. Data: $V_{BR}(DSS) = 60V$ min., $r_{DS(on)} = 0.15\Omega$ max., $I_D = 12A$ max., $P_D = 40W$ max. [at 25C], TO-220AB case. Used in VK6KRG Rod's amplifier project in Lo-Key #34 Jun '92 p.18.



C070	2	2.40	D1
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BF960 Low noise UHF DG Mesfet

C071	1	2.00
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LF356 JFET input wide band op amp. Used in VK3XU Drew's 'Fonelist' Tx in AR Nov '80 p.10.

C072	1	1.35
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Voltage regulator 8V2 100mA UA78L82AWC TO-92 case

C088 - 5	5 incl 2 CIO	5.00
C088 - 6	6 incl 2 CIO	6.00
C088 - 7	7 incl 2 CIO	7.00

Crystals, 9 MHz nominal [27 MHz CB, 9 MHz fundamental] - matched set for crystal ladder filter construction. Each set includes 2 crystals for carrier insertion oscillators [CIO] for USB and LSB. You nominate number of crystals. See Lo-Key #37 Mar '93 p.9.

C089	1	0.30
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RCA [phono] line plug, plastic cover. Available in red and black. [C1]

C090	1	4.00	per diskette
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Club Files on IBM-compatible format diskette[s]. Nominate files required, preferred diskette size and number of diskettes. You may choose from a list of programs and ASCII text files. No paper versions provided [see C097]. Details are in Lo-Key #37 p.24 & later issues.

C092	4	7.40
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SO-239 Panel socket, UHF coax connector, square flange-mount type

Code No.	Nbr in a pack	\$A Price per pack
C093	1	25.00

Custom-designed **QSL card** master sheet, for reproduction. Layout as required by you. See Lo-Key #34 June '92 page 3.

C094	1	3.00
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The Forrestfield 21MHz CW/QRP Transmitter - Complete Set of Lo-Key Articles. Reprinted from 9 issues of Lo-Key [36 pages].

C095	1000	200.00	approx	*
	500	150.00	approx	*

Club QSL cards. You nominate exact wording of name and address etc. See Lo-Key #28 Dec '90 p.25.
* Current prices will have to be obtained.

C096	1 sheet	0.60
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Club logo stickers. 38mm diam. Each sheet contains 20 stickers. Black print on white. See Lo-Key #28 Dec '90 p.25.

C097	1 set [on paper]	0.70
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Club Lists. You get the most recent print of -
* Membership List with names, call signs and addresses [those approved for publication];
* Lo-Key Index of Technical Articles;
* Club Sales Price List; and
* A Club promotional brochure.

C099	1	2.00
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Past issues of Lo-Key. You nominate month and year or the issue number.

C110	1	0.40
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DC power socket, panel mount, open frame type, 2.1 mm [nominal] pin diameter. [PE2273/PE9999]

C111	1	3.20	D2
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MC3362 Low-power Narrow band FM receiver IC.

C112	1	1.70
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Toroidal core Amidon FT-50-43 ferrite.

Bonus Bits

These are given at no additional cost with items bought from the Kit-Set Centre. **You may nominate from the list the code number of a 'pack' for each \$10 you spend on kit-sets, components or general items (including the postage).** When stock of an item runs out there would normally be no more available, so please nominate a couple of preferences or some 'back-ups'. For example, if you spend \$43 you can have 4 free 'Bonus Bits' packs of your choice. You can have more than one pack of the same item.

F001 **Crystals** [2nbr/pack] 6561.111 and 7810 kHz or one of each. Y3 10XW [large] type ex RAAF. [This was previously C031] F

F002 **PCB graphics artwork pack** [donuts, DIP patterns, track tape etc.] Bishop and Chartpak selection with 100's of donuts etc. per pack.

F003 **Lamp switch** SPST plastic push button. [PE2603]

F004 **Adaptor** RCA/phono plug to 6.5 mm stereo phone socket metal body. [Was C051] [PE2408].

F005 **Belling Lee** line socket & line plug pair [75 ohm TV use] plastic body. [PE2277]

F006 **Blade fuse, automotive** [set of 5nbr] 5 A, 7.5 A, 10 A, 15 A and 20 A. [PE2655 - PE2659]

Code **Nbr in** **\$A Price**
No. **a pack** **per pack**



Code **Nbr in** **\$A Price**
No. **a pack** **per pack**

F007 **Blade fuse holder** In-line type. [PE2654]

F008 **Adaptor** 3.5 mm phone plug to RCA/ phono socket metal body. [PE9996]

F010 **Resistors 560 Ω** [11nbr] Roederstein WK83 5% metal oxide film 7W. Body 8 mm diam. x 30 mm long. Makes a very useful 50 Ω [nom.] dummy load. Self capacitance <0.5 pF.

F011 **Capacitors 220 pF** disc ceramic [10nbr] 20% 12 mm diam [PE2700 F PE2701]

F012 **Capacitors 0.05 uF** disc ceramic [10nbr] 20% 12 mm diam [E3693]

F013 **Capacitors 18 pF NPO** disc ceramic [5nbr] 350V 7 mm diam. [pelmet]

F014 **Capacitors 56 pF NPO** disc ceramic [5nbr] 12 mm diam. [PE2700] F

F015 **Capacitors 100 pF** disc ceramic [10nbr] 9 mm diam. [PE2700] F

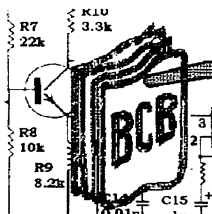
F016 **Capacitors 560 pF** disc ceramic [10nbr] 7 mm diam. [PE2700] F

E. & O.E



BOOMERANG CIRCUIT BOOKS

By Don Callow VK5AIL 5 Joyce St., Glengowrie SA 5044



Here are the current BCB circulation lists. An asterisk * in front of your name indicates that you will be sent all future BCB's (one or two a year).

If you are in VK and wish to go on the list for any of the BCB's please let me know. I have a list of those who have seen the BCB's previously, in case you can't remember. You pay the postage to the next member (\$2.65 interstate or \$2.00 intrastate).

BCB #2 - 4th flight (current):

- * Lex VK3SSB
- * Jack VK2AY #309
- * Warren VK2FKU #216
- * Daryl VKJ7DMJ #242
- * Alan VK2KW #249

BCB #2 - 5th flight (later):

- * Leith VK5LG #154
- * Len VK4CWM #276
- * Ron VK3MHM #274
- * Doug VK3CCY #298
- You ?

BCB #3 - 7th flight (later)

- * Daryl VKJ7DMJ #242
- * Len VK4CWM #276
- * Ron VK3MHM #274
- * Doug VK3CCY #298
- You ?

BCB #4 - 4th flight (current)

- * Len VK4CWM #276
- * Doug VK3CCY #298
- * Ron VK3MHM #274
- * Alan VK2KW #249
- * Daryl VKJ7DMJ #242

BCB #4 - 5th flight (later)

You ?

Edward Smeda #280 has written "I'd like to put in a suggestion for more 'QRP classics' of the late 60's and early 70's to be included in future BCB's. These early articles were largely responsible for the QRP movement as we now know it. I am sure they would hold significant nostalgic (as well as technical) interest for readers."

This seems a good idea, but perhaps difficult to achieve due to lack of access to these old articles, *but if you can help, please do !*



MANAGEMENT COMMITTEE

Treasurer & Membership Secretary

Kevin Zietz VK5AKZ #43
41 Tobruk Ave. St Marys SA 5042
Packet: VK5AKZ@VK5TTY
#ADL.#SA.AUS.OC

Membership enquiries and applications. Subscriptions. Changes of address, callsign etc.

Editor of Lo-Key, also QRP Kit-Set Centre

Don Callow VK5AIL #75
5 Joyce St. Glengowrie SA 5044
Lo-Key input. Kit-set & component orders & payments.
Membership enquiries.

GENERAL INFORMATION

Calendar Year subscription, due January:

Ordinary: VK \$A 10; N.Z. \$A 12; DX \$A 14

Council: VK \$A 15; N.Z. \$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 publication and to refuse acceptance of material without specifying a reason.

QRP calling frequencies (kHz)

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

§ MORE 1993 SCRAMBLES § AWARDS & CONTESTS MANAGER Ian Godsil VK3DID #112

25 Monaco St. Parkdale Vic. 3194
(More details on page 4)

#31 Thu 21 Oct - 80m
#32 Thu 25 Nov - 40m

§ CW NET (QRP) § Ted Daniels VK2CWH

Tuesday nights from 0945 UTC
or 0845 UTC Summer Time
3529kHz or lower if QRM

§ SSB 'NATTER NET' § Steve VK5AIM's roster

Friday nights from 1030 UTC
or 0930 UTC Summer Time
Near 3620kHz

Photocopy or cut along this line

Please post this application to:

Kevin Zietz VK5AKZ
41 Tobruk Ave.
ST MARYS SA 5042
Australia



Please print

FIRST NAME

SURNAME

CALL SIGN

ADDRESS

I would like to apply for Ordinary Membership of the CW Operators' QRP Club Inc.

Enclosed is the annual membership fee of:

\$A10 for VK Members, or

\$A12 for ZL Members, or

\$A14 for DX Members.

I agree to these details being held on the Club's data base and published.

I DO AGREE to publishing of my street name and house number. (If not, write 'NOT' in the space provided.)

SIGNATURE

Your receipt and membership number will be sent with your New Member's Pack. Future receipts will be inserted in your copy of Lo-Key.

The annual fee is due on 1 January each year, at the start of our March quarter, not on your anniversary of joining.