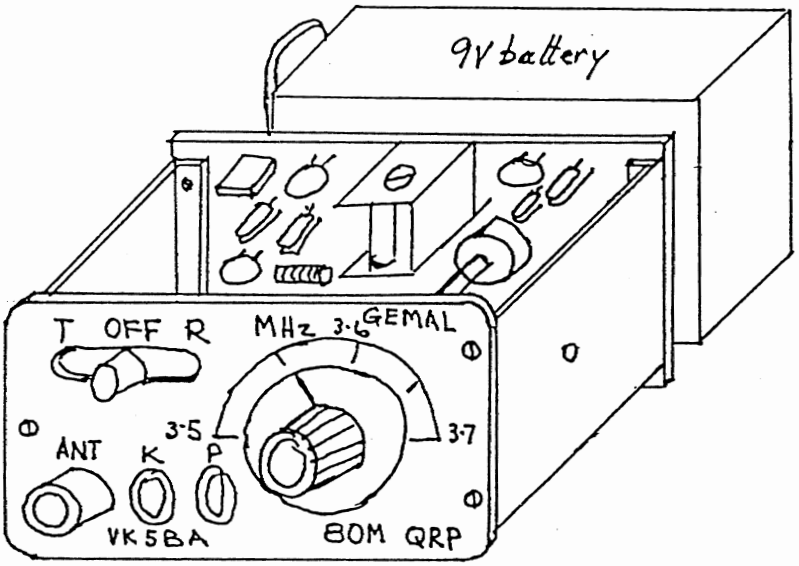
MARCH 1989
ISSUE No.21

LO-KEY

THE JOURNAL OF THE CW OPERATORS QRP CLUB

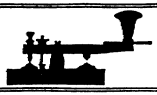
Promoting the Use of Low Power
CW Mode Communication
and Home-Brewing
in the Amateur Radio Service



CONTENTS

890312 P1A Z55A/B5

NEXT CW SCRAMBLE *THURSDAY 27 APRIL 1989* *See p.18*



POSITIONS

EXECUTIVE COMMITTEE

- Administers Club policy for the benefit of members.

ORGANISER
Max Brunger VK5OS (2) 3 Durham Ave. LOCKLEYS SA 5032 Australia
Please send to Max membership enquiries, suggestions and comments and other mail concerning club business, except as specified otherwise on this page.

TREASURER
Kevin Zietz VK5AKZ (43) 41 Tobruk Ave. ST MARYS SA 5042 Australia
Please send to Kevin membership applications and subscriptions, other payments (except for kit-sets), requests for Club logo stickers, donations, other financial correspondence, changes of details such as address or call-sign.

EDITOR OF LO-KEY
Don Callow VK5AIL (75) 5 Joyce St. GLENGOWRIE SA 5044 Australia
Please send to Don contributions for Lo-Key and suggestions about this journal.

OTHER KEY POSITIONS

PUBLIC RELATIONS OFFICER
AWARDS AND CONTESTS MANAGER
Ian Godsil VK3DID (112) P.O. Box 411 NORTH BALWYN Victoria 3104 Australia
Ian handles the promotion of the Club, general liaison and communications with other Clubs and with editors of radio/electronics magazines.
Also, please send award claims, scoreboard entries and contest logs to Ian.

STATE CO-ORDINATORS
VK2: Garry Cottle VK2AGC (121) 22 Johnston Rd. BASS HILL NSW 2197
VK3: Lindsay La Pouple VK3DXH (47) 1/31 Nelson St. BALACLAVA VIC 3183
VK7: Rai Taylor VK7VV (3) 25 Twelfth Ave. WEST MOONAH TAS 7009
Send to Rai requests and payment (with your details) for Club QSL cards.

INFORMATION NET CONTROLLER
Max Brunger VK5OS (2). Identification is VK5OS. QRO SSB is used.
CW stations may call BK de (call-sign) to have their presence acknowledged.
You hear information about the Club and can take part in technical discussions.
MEMBERS AND VISITORS WILL BE WARMLY WELCOMED.
FRIDAY NIGHTS FROM 1030Z NEAR 3620KHZ.

CW NET CONTROLLER
Ted Daniels VK2CWH/QRP (89). Call is CQ CW OPS/QRP de VK2CWH/QRP K
QRP power is used i.e. no more than 5 Watts to UR antenna. Ted adjusts speed to suit the slowest operator in the Net and uses only simple abbreviations.
ALL WELCOME, PARTICULARLY THE INEXPERIENCED AND NOVICES.
WEDNESDAY NIGHTS FROM 0900Z AT 3529KHZ or lower if QRM.
Also ZL QRP activity Friday nights from 0800Z on 3530kHz.

CLUB STATION VK5BCW
Based at the RICHMOND South Australia QTH of Len O'Donnell VK5ZF (1).

KIT-SET ACTIVITY CO-ORDINATOR
Don Callow VK5AIL (75) 5 Joyce St. GLENGOWRIE SA 5044 Australia
Send to Don orders (with payment) for kit-sets; technical queries & suggestions.

PROJECTS OFFICER
Rod Green VK6KRG (28) 4 Rothsay St. FORRESTFIELD WA 6058 Australia
Radio projects for Lo-Key and kit-sets.

THE BOOKSHOP
Norm Lee VK5GI (139) 25 Ralston St. NORTH ADELAIDE SA 5006
Magazine and book reviews; circulation of circuits and useful information about home-brewing.

GENERAL INFORMATION

QRP CALLING FREQUENCIES
1815kHz.....3530kHz.....7030kHz.....10106kHz.....14060kHz.....21060kHz.....28060kHz

CLUB MEMBERSHIP SUBSCRIPTION
Due each January.....Australia $A10.....New Zealand $A12.....DX $A14

LO-KEY - THE CLUB JOURNAL
Published quarterly - March.....June.....September.....December.
QRP & CW home-brewing, operating, SWLing etc. **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.

ORGANISER'S OFFERINGS By Max VK5OS (2)

Now that we are settling down to 1989 I hope that we are all enjoying our hobby and that homebrewing is coming to the fore. Of the letters received from new or prospective members 78% have mentioned their participation in building as being a major part of their enjoyment, and all of them sought information about organised CW QRP.

Of course I mention Wednesday night CW Net with Ted VK2CWH (89) and have felt for some time that Vk5ZF (1) Len's suggestion of having a particular frequency and time for members with a new rig to call for a QSO to get an appraisal of stability, clicks, thumps etc. needs to be implemented.

So, as from Friday 27 January 1989, the Club Info. Net has included a segment at 1100Z (9.30pm S.A. Daylight Saving, 10.00pm Eastern summer time) for members who want an appraisal of a CW QRP rig. No doubt the first few nights will be rough until we set a pattern ! I suggest you call in (ssb) before the CW segment and inform Net Control (VK5OS) that you wish to transmit and if Xtal locked, on which frequency. This is to avoid two or more stations transmitting simultaneously which I will not - repeat *not* - be able to handle !

Now to the next point - it appears the bulk of CW gear is aimed at 80MHz, and I hope that the Club can diversify, particularly to 18MHz. At my location this band has less QRN than the lower bands, hence my preference.

But it matters not - there are transmitter circuits for all WARC bands in various magazines, so "warm up the iron and try a new band".

NEW VK2 CO-ORDINATOR: Garry VK2AGC (121)

Congratulations to Garry VK2AGC, who is the new Co-ordinator for VK2. Garry's QTH is now shown on page 2. VK2 - or New South Wales to most of the population - has about 1 in 4 of our Members, so it's good to see the VK2 position filled. Several Members volunteered for this position and the Executive Committee thank those people for their interest, which is much appreciated.

73 ***Max***

(Editor's Note: SRI to Jack VK5FZ (118) for the error in your call-sign in Lo-Key #20 p.3 and SRI to Len VK5ZF (1) for inadvertently 'borrowing' yours. Next time I'll go the whole way and use VK3ZF which belongs to George, #143 !)

WE COULDN'T HAVE PUT IT BETTER OURSELVES.....

Here is a tearsheet from a column by our Member #31 Fred Bonavita W5QJM in the October 1988 issue of QRP Quarterly, the journal of the QRP Amateur Radio Club, International (QRP ARCI), based in the USA.

After a couple of years piloting the CW Operators QRP Club of Australia, Len O'Donnell, VK5ZF, has stepped down as president and editor of the group's fine quarterly newsletter, Lo-Key. No word yet on a successor.

Len did a monumental job keeping things together after the demise of the old VK QRP Club a few years ago. His efforts are reflected in the enthusiasm of the club and the quality of the newsletter, which has run some very interesting technical articles.

GEMAL: VK5BA MINI QRP TCVR By Malcolm VK5BA (8)

MALcolm's GEM !

Editor's Note: Malcolm VK5BA has sent some very interesting information on a QRP transceiver he designed and built last year. It puts out about 400mW and is called the GEMAL.
A circuit diagram, sketches, photograph and notes were provided. All except the photo. are reproduced in this article.
When you compare the size of the rig with its 9V battery power source, it makes you wonder what Malcolm would do if 9V batteries were AAA size !
Malcolm says:

"Twelve months ago I suggested a Bi-Centenary competition to build a minimum QRP rig. Len didn't get a positive response so nothing happened. I had a go anyway.

The unit fits into a leather case for travel. I have taken the transceiver with me on many trips this year including to UK. With a centre loaded quarter wave 80m antenna (12 feet long) it works OK from hotels etc.

I am sure the circuit can be improved by addng tp it. My idea was a minimum component yet useful rig.

Incidentally, you can add an inductor and variable capacitor in series with the crystal to get a small variable shift in frequency."

CIRCUIT DIAGRAM NOTES: (Numbers in brackets are on circuit diagram)

*** T1 and L3 are both Philips toroids 6mm o.d. colour code violet (material grade 4C6). T1 is bifilar wound.
*** L1 is a small Philips bedstead former (from TV set) 47 turns. Alternatively, use Neosid former and iron slug F16 material; 36 turns.
*** L2 is an F16 slug. 15 Turns wound directly onto slug.
*** BS170 transistor can be substituted for IRF213. The upper bias resistor is 150k for the BS170, not 100k. Value must be selected because of the large spread in gate threshold voltage. See (1) below.

(1) Value set so that with no crystal the IRFD213 Ia is in the 1 to 5mA range.

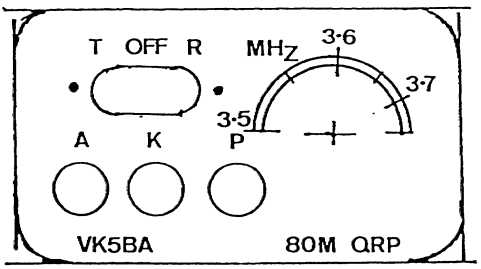
(2) Can switch transmitter supply or simply use the key. The latter allows zero beating to the transmitter frequency.

(3) 30pF Philips trimmer. Shaft extended using superglue to join. Can be direct drive or use miniature Jackson reduction drive.

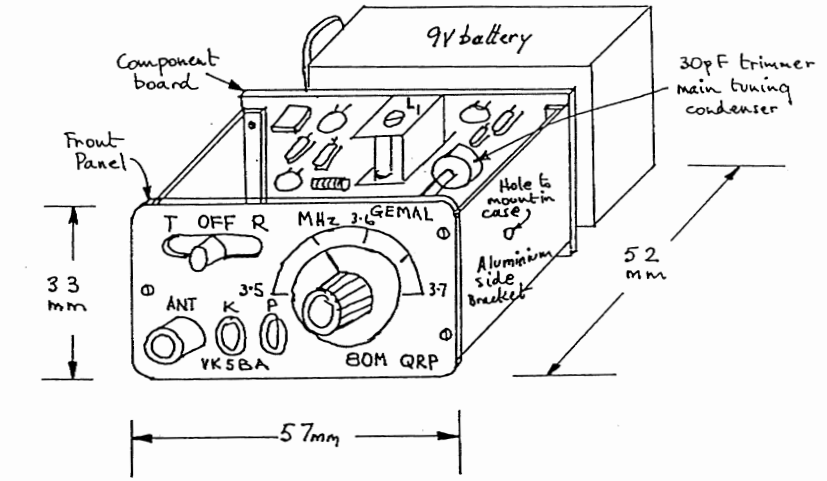
(4) Zener drive regulator optional. If omitted wire [1]. If present then you wire [2a] and [2b].

FRONT PANEL ARTWORK:

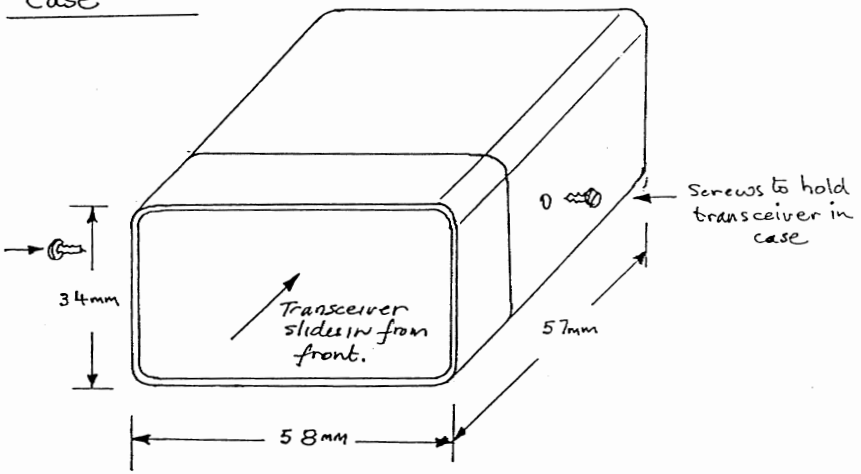
Full size (Yes, full size !)



Construction



Case

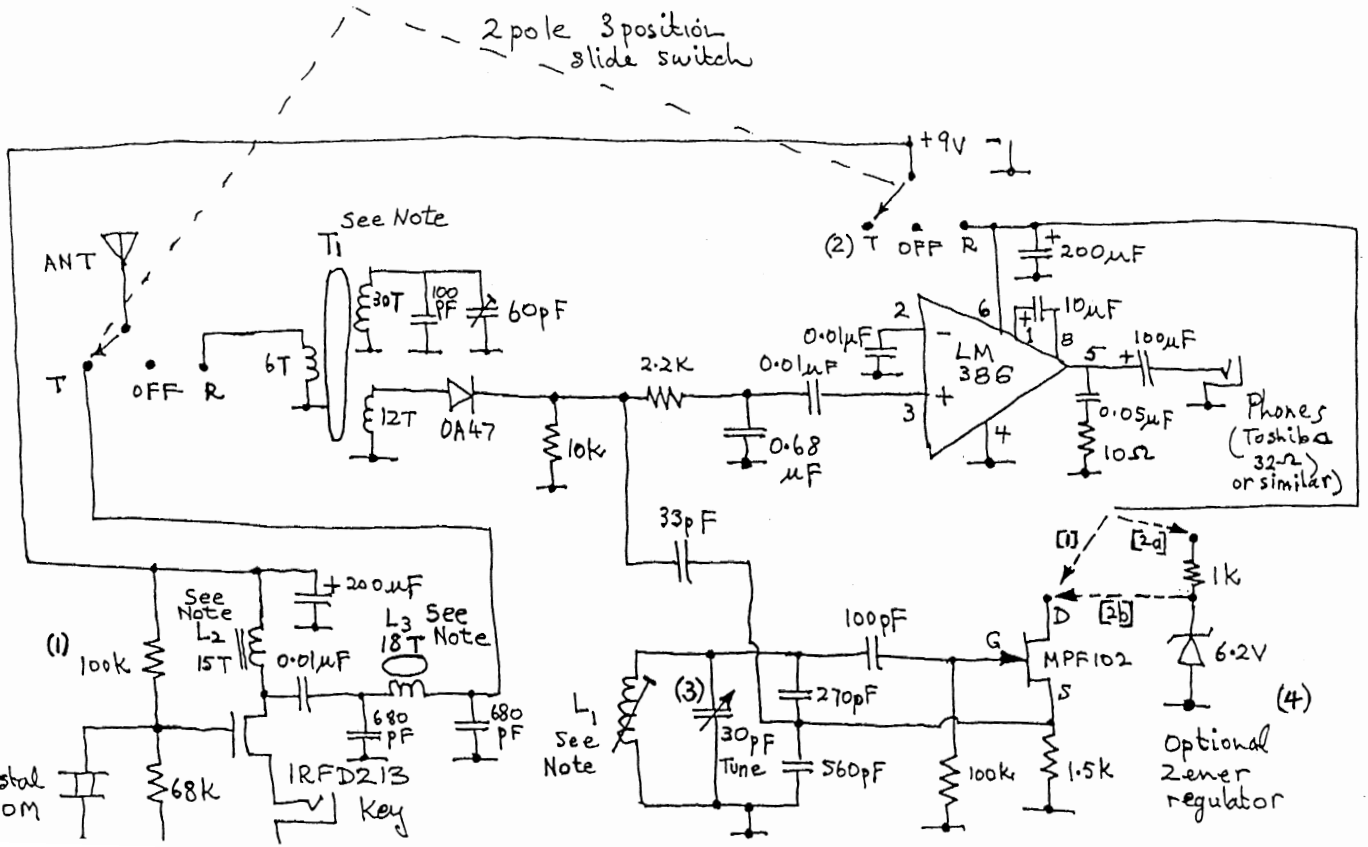


NOTES:

- Front panel and side brackets approx. 20 gauge aluminium.
- Case is a modified light dimmer case.
- Component board is a general purpose assembly board with pads on 0.1" grid, cut to size (Tandy).
- Case holds transceiver and 9V battery.

890310 MAL2 Z55A/C7

VK5BA Mini QRP Transceiver (≈ 400mV)



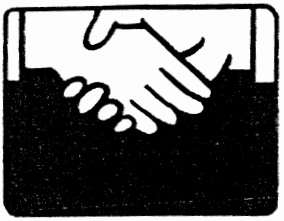
88310 MAL2 Z5A/C7

CLUBTIVITIES By Don VK5AIL (75)

* WELCOME TO NEW MEMBERS !

We have 6 new Members to welcome in this issue of Lo-Key. We are glad to have you with us and hope you enjoy the various activities of the Club. Maybe you have friends interested in CW / QRP / Homebrewing. If so, we suggest you show them Lo-Key.....

NUMBER	CALL	NAME
6	VK3JY	Steve Phillips
11	VK2COH	Cec Healey
17	WF6U	Hollis Button
20	VK3AYV	Howard Anders
65	VK7AJ	L. Williams
98	VK2AP	John Reynolds



* MEMBERSHIP DETAILS

Don't forget to let the Treasurer know if your details are wrong or incomplete (e.g. no first name) on the Membership List in the December issue. We also look forward to hearing about licence upgrades and changes of call-signs.

* MORE WORK - LESS AMATEUR RADIO ?

Congratulations to **Malcolm Haskard VK5BA (8)** who has recently been elected to the position of Divisional Chairman of the Institution of Radio and Electronics Engineers (IREE), South Australian Division. Malcolm is based at Technology Park north of Adelaide, where he is Principal Lecturer at the Microelectronics Centre. We all wish you the best of luck, Malcolm !

* LO-KEY INDEX AND PAST ISSUES

In the last issue I asked if anyone has an **INDEX OF LO-KEY ARTICLES.** Rai VK7VV (3) has responded to the call, advising that he is currently working on one. Thanks for your offer Rai and we hope the project makes good progress. An index will be most valuable for new Members who join and for those of us who forget about old articles - or remember an article but can't find it !

COPIES OF PAST ISSUES OF LO-KEY can only be produced if I have a good set of masters, so I have started to build up a collection. Rai VK7VV has offered some proofs from his time as Editor and Len VK5ZF (1) has cleaned out his bottom drawer and sent me some surplus Lo-Keys from previous print runs. **Thanks to Len and Rai** this project now has a flying start.

Later this year we will advise you on how the results of this work will be made available to Members.

* LO-KEY DEADLINES

We aim to post your copy of Lo-Key by the 15th (or following weekend) of the month of March, June, September and December. I can accept routine entries for regular features up to the 1st of those months.
For other entries, ***you can help*** by sending your articles or drafts, notes etc. to me by the 20th of the previous month. Give me more time if the article is large or cannot be printed 'as is'. If you're late, there is always next issue - but it's best to SEND IT NOW !

An Audio Generated A.G.C. for the Tassie Devil.

by

Max VK5OS

Here is some good news for the happy souls who have built the "Tassie Devil", designed by Ian VK7IJ (now VK8CW). This rig was first described in Lo-Key and was later updated. It was also featured in A.R. as the T.D.M. 80[1]. My circuit board came via Len VK5ZF who imported it from Rai VK7VV.

Fortunately the update came before I had gone very far so I re-routed the necessary connections before finishing - well - almost finishing it. However, this is not to be a summary of my lack of dil igence but to introduce some new circuitry which Ian has kindly supplied.

Figure 1 is the VK8CW circuit for an Audio derived AGC addition. No erudite explanations needed there except to point out that the BC109 is listed as a "low noise amplifier", so perhaps there is a tip here if you are thinking about substitutes.

Figure 2 is the component layout (not to scale)

Figure 3 is the PCB (full size)

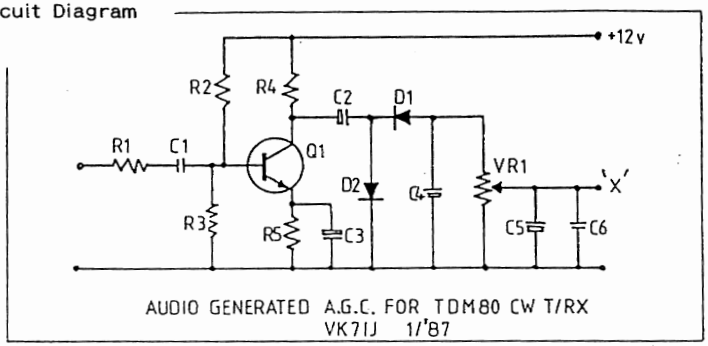
Figure 4 is the latest circuit of the Tassie Devil which I have to hand with the points for adding this little unit shown.

I know of two Tassie Devils which are in operation, both on 80 metres and am sure there are many others (perhaps on higher bands?) in existence. If you have one, how about coming on air one Wednesday night and letting some fellow club members hear what a good job you have done?

Our thanks go to Ian VK8CW for permission to use his information in Lo-Key and we hope before too long that Ian will be able to contact us on his 20mx version. That is if members rally around our efforts to get together for QRP QSOs on this band - CW of course!

[1] See Amateur Radio, Jan 1987.

Fig. 1 Circuit Diagram



	R1 4k7	C1 0·33 (g)	D1,2	1N914 etc.
	R2 200k	C2 10uF(e)		
g = greencap	R3 4k7	C3 10 uF(e)	Q1	BC109
e = electrolytic	R4 4k7	C4 47uF(e)		
c = ceramic	R5 100Ω	C5 10uF(e)		
	VR1 10k pre-set	C6 0·01uF(c)		

Note: C4 & C5 set the attack and release times.
VR1 sets a.g.c. threshold.

To install: Connect R1 to SW1/C25 junction using audio screened cable.
Disconnect R45 from ground and connect point 'X' to free end of R45.

Fig. 2 Component Layout
Component side - Not to scale

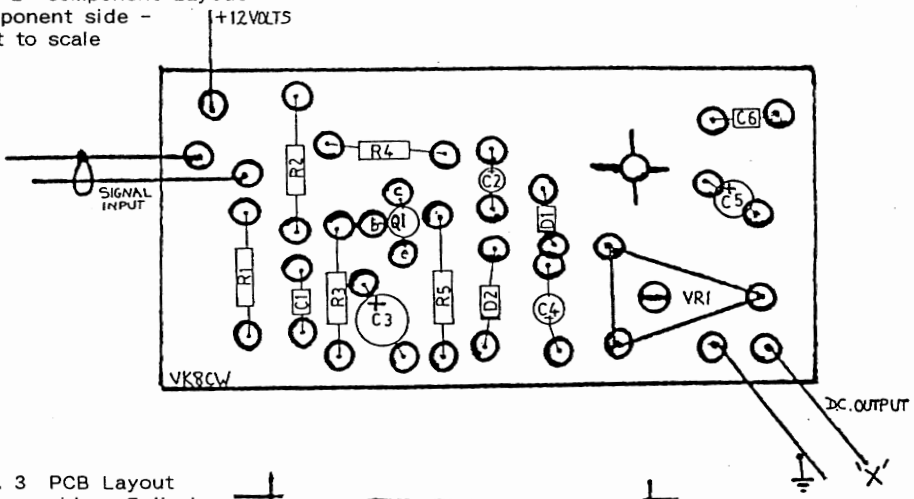
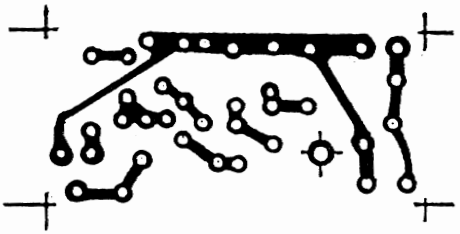


Fig. 3 PCB Layout
Copper side - Full size



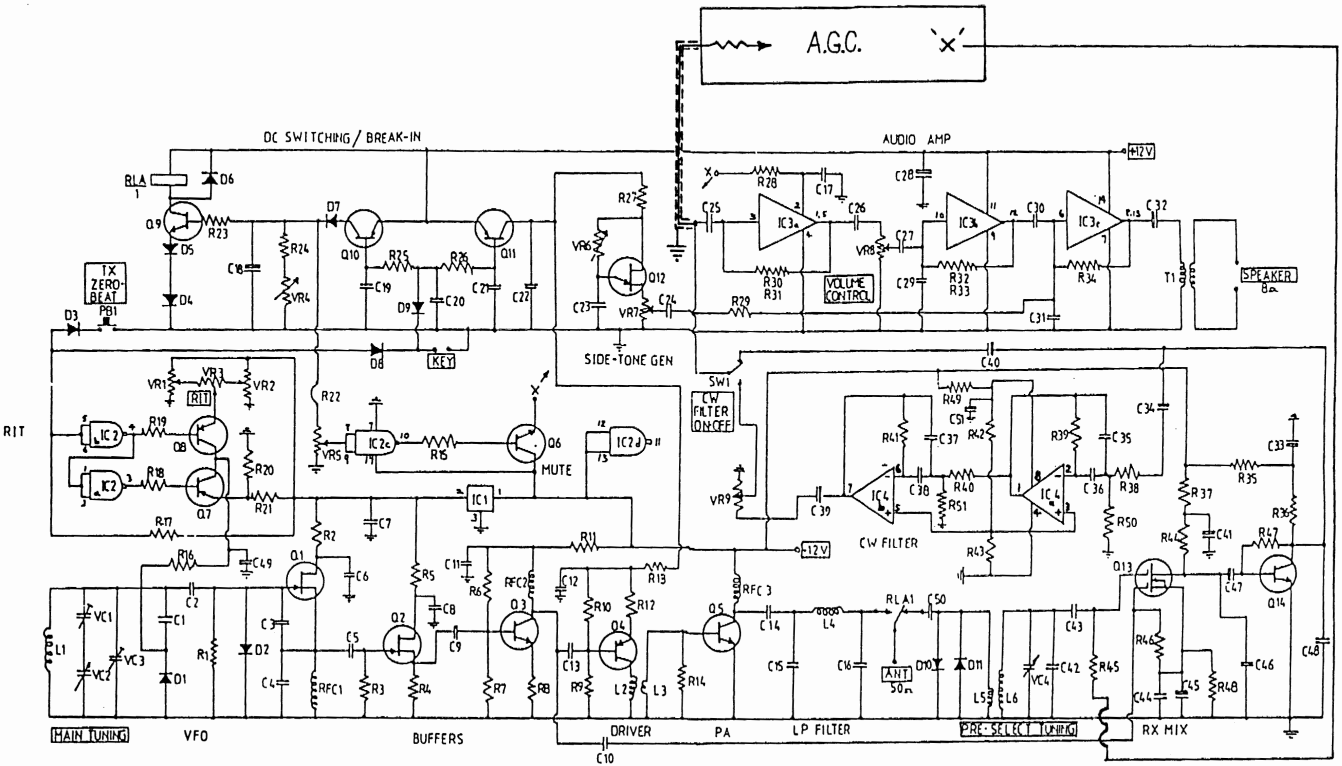
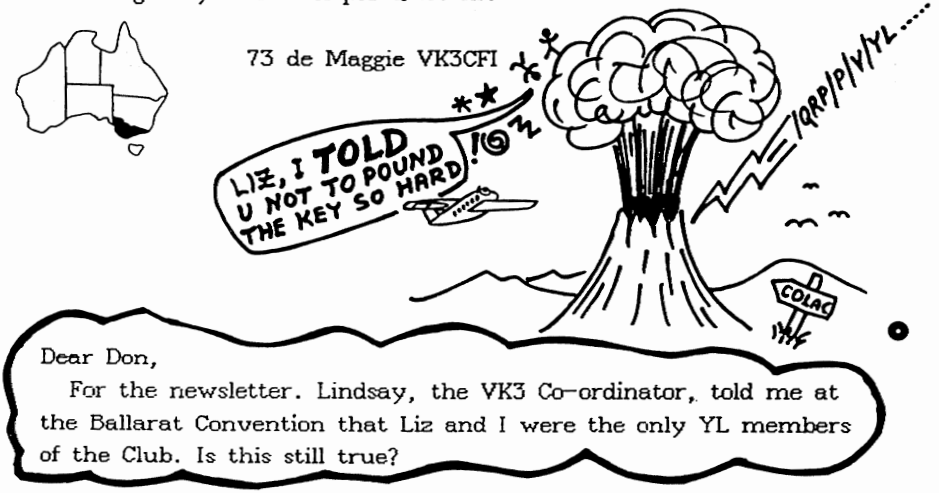

A.G.C.
'X'
DC SWITCHING / BREAK-IN
AUDIO AMP
+12V
TX ZERO-BEAT
PB1
KEY
RIT
SIDE-TONE GEN
MUTE
SW1 CW FILTER ON-OFF
VOLUME CONTROL
SPEAKER 8Ω
CW FILTER
-12V
ANT 50Ω
MAIN TUNING
VFO
BUFFERS
DRIVER
PA
LP FILTER
PRE-SELECT TUNING
RX MIX

Fig. 4

VOLCANO Field Day 1989 POWER

By the time you read this, Field Day will be upon you. Liz VK3JQ and I will be running QRP cw from atop a dead volcano outside Colac. The site is a picnic spot and there is a small brick shelter in which we will squeeze a table and our gear. Nearby there are a water source and toilets (blessed relief!) as well. The last I heard, Liz was putting together the Club Communicator, so there is a chance we'll be using that. We also have access to a TS 120V. Tall pine trees line the site so, unless Murphy intervenes, a few dipoles should go up easily. Our power source will be three batteries charged by a wind generator. Colac is not known for its long hours of sunshine and wind is an abundant commodity here.

Looking forward to meeting you during the contest. I'm not sure which call we'll use but you can tell it's me on this end of the key because I ask for three repeats of the number exchange and sign my call with pse QRS. HI.



Dear Don,

For the newsletter. Lindsay, the VK3 Co-ordinator, told me at the Ballarat Convention that Liz and I were the only YL members of the Club. Is this still true?

Dear Maggie, This is an Equal Opportunity Club, so we keep no records of the sex of our Members. However, I extracted some statistics based on first names in the list of 131 in December Lo-Key. My finding is that it is *probable, but not certain* that all Members are YLs with the exception of 129 OMs. Note that my research is theoretical, unlike that of Lindsay VK3DXH who obviously prefers practical study !

DON VK5AIL

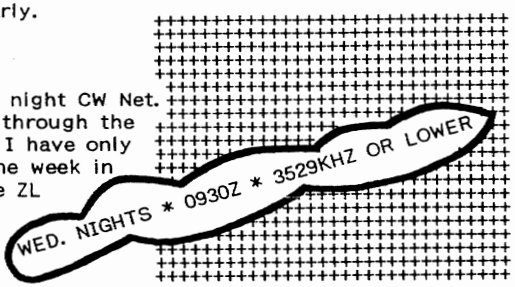
CW NET NEWS By Ted VK2CWH (89)

JANUARY CW/QRP ACTIVITY IN VK2

Well, there has been some QRP activity in VK2 in January, up on 3.579MHz. Any night you could catch half a dozen stations in the Westlakes contest. I have asked Westlakes to send some details for Lo-Key (Ed.: See *VK2/QRP ASSAULT*). I hope the QRP activity carries on after the contest is over, and I will be trying for contacts on that frequency regularly.

CLUB CW NET (TO END OF JANUARY)

Not much to report on the Wednesday night CW Net. Conditions have been very poor here through the latter months with very bad QRN and I have only been able to conduct the Net about one week in three. Also, have temporarily lost the ZL members, no doubt due to the QRN.



LIGHTNING STRIKE

I have lost the use of the HW-9 since before Xmas. An unexpected lightning strike nearby took out the finals. I am still waiting for replacements. So now I am using my old rig, a DSB80 kit with an 'Afterburner' to VK3XU (49) Drew's design, to lift output to 5 Watts for the Net.

MEMBERSHIP LIST IN LO-KEY

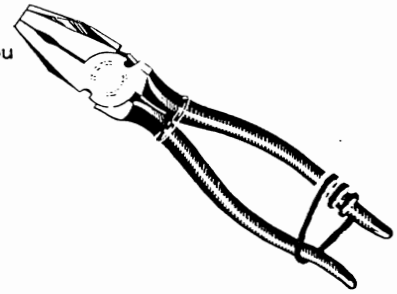
I like the Membership List by States, alphabetically. It is much easier to check if a call sign you hear is on the list.

73 *Ted*

Editor's Note: I believe band conditions have since improved. Ted now operates the CW Net on 3529kHz or lower to avoid ssb QRM from adjacent frequencies. He would like to add YOUR callsign to the list of those who have come into our Net, so ***see page 2 for the CW NET details and GIVE IT A GO.***

Circuits and Shortcuits (continued from p.13 opposite)

THREE HANDS ARE BETTER THAN TWO



Here is an old idea which will be new to some members: When you are soldering components you need one hand for the iron, one for the roll of solder and the third to hold the work, especially when its position has to be adjusted.

The idea is simple - use an ordinary pair of pliers with a strong rubber/elastic band around the handles to apply pressure to the work. For tighter (or looser) grip move the band nearer to (or away from) the end of the handles.

Try it - the idea works and saves much time.

CIRCUITS AND SHORTCUITS By Don VK5AIL (75)

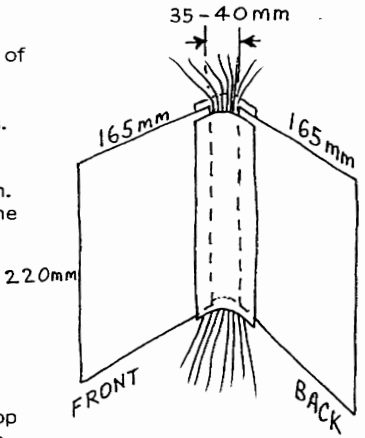
VK3DXH HOMEBREW FOLDER FOR LO-KEY

COMPONENTS LIST:

Stiff cardboard	2 pieces each 165mm x 220mm
Masking tape	35mm or wider (or use overlapping strips)
String	8 pieces each 520mm long
Coloured paper	2 pieces large enough to cover cardboard front and back
Glue	To affix coloured paper to front and back pieces
(Editor's Note:	Perhaps try self-adhesive material e.g. Con-Tact)

CONSTRUCTION:

Lay front and back flat on table or work-bench.
Fix a piece of masking tape along one 220mm edge of front. Repeat for the back.
Place another overlapping strip on these to create a gap of 35 - 40mm between front and back pieces.
Lay the pieces of twine neatly along the gap, pressing onto the sticky surface of the tape.
Leave an equal amount hanging out top and bottom.
Now place another strip(s) of masking tape over the top of the pieces of twine.
Glue the coloured paper to outside faces of front and back covers.
Suitably endorse front cover regarding contents.



TO PLACE LO-KEY IN COVER:

Open holder out flat.
Open Lo-Key out at middle, place on cover, take top and bottom pieces of twine, fold over and tie, thus securing Lo-Key in folder.

THIS FOLDER WILL HOLD TWO YEARS SUPPLY OF LO-KEY.

Contributed by Lindsay VK3DXH (47) VK3 State Co-ordinator

MICRO-FINGERS

There *IS* an inexpensive substitute for a pearl catch.

Unless you have 3mm diameter fingers, you probably use a pearl catch when you have to reach in between components on a board or need to pick out a particular resistor from a *junk-box jumble*.

Try a giant hook probe - a 90mm long version of an IC test clip - at under $A4 instead of a pearl catch at about $A7. Of course the real way is wait until these large test clips are 'out on special' for no more than a dollar !

Circuits and Shortcuits - Continued on p.12 opposite

HAVING FUN WITH ROD's VK6KRG (28) HOMEBREW 15 m CW TX

By Ben VK6XC (147)

Rod is now living in his new Qth in Forrestfield, which is only about 5 minutes walk from my Qth. We have become very good friends and share a very same interests. When I was in Rod's Shack, he shown me his pride and joys. The 80 m CW Tx he built and there is also a 15 m CW transmitter (his latest project). Rod said he will be putting his project into LO-KEY most probably as a kit form. One day, I was very surprised when Rod said that I can borrow his 15 m Tx and give it a soak test. I cannot refused such offer as I have never transmit on a Homebrew 15 m rig before.

When I got home, I started hooking the 15 m rig up to my 4 element Tribander Beam (A4 Cushcraft) and the Kenwood TS 440 S as the Receiver. I thought maybe it is easy to work some JA station as they are many of them on Frequency especially on 15 m. Plugged in the old Brass Pounder and gave out a burst of CQ CQ CQ DX DE VK6XC /QRP.... As soon as I throw off the Tx switch and just about reaching out to adjust the RIT, I got a JA responding back my CQ call. "OH, WHAT A FEELING..." Both feet off the floor. ha ha. Later that day I worked about a dozen JA s and a YC. Well, I said to my self, maybe I gave it a break and come back later and work some Europeans when the band opens to Europe.

After my dinner that evening, I got Rod on the Land line told him of the contacts I made. Yes, he was monitoring the transmission and commented that it is very nice clean cw tone.

Later that evening, when the 15 m band opens up. I worked 4 Europeans (Dl, Yu, Ua & On), one station was using 500 watts, he was not impress when he knew that I was using only 4 watts.

In conclusion, I would like to add that the 15 m Tx is very easy to operate. Needs abit of practise getting to align the tx frequency to the receiver frequency. I have tried Qsy with a few station and have no real problem. The VFO is very stable I noticed very little frequency drift. The reports I have received are between 339 to 579 (a 599 from UA they are usually kind hearted). I like the performance of this 15 m tx and I will definitely built it, when the KIT-SET is available from the club. Many thanks to Rod for the loan of the QRP rig.

Editor/Kit-Set Activity Co-ordinator Note: I have recently received the documentation for a 15m CW QRP transmitter from our Projects Officer Rod VK6KRG (28).
It is obvious that a great deal of effort/dedication has gone into this, so ***TNX Rod.*** One of my main tasks before the next issue of Lo-Key will be to process this contribution. We will put a series of articles into Lo-Key and, *if it can be arranged,* provide at least a short-form kit-set containing those components which are relatively difficult for constructors to obtain. Members will be advised of the outcome in the next issue.

Club Information Net Notes

by

Max VK5OS

One night, Jeff VK5BJF/P called from Kangaroo Island in the horizontal mode - Jeff that is, not the antenna. He was recumbent on the front seat of the vehicle with 1/4 wave of wire hooked onto the trusty 707 and getting 5x9 from Adelaide! Now, Reg VK3BPG and I had just spent an hour worrying about resonant antennas and ATUs to get 1:1 swr in caravan parks to avoid tvi, and didn't realise that it could be so easy! Still, I don't think the XYL was watching tv, Jeff, or there might have been a different story!!

Merv VK3ADX gave us a burst on his new DSB transmitter - all of 1 watt PEP and I didn't miss a word here in Adelaide in spite of the usual QRN. Merv reports the rig is basically Drew Diamond VK3XU with mods to suit Merv's taste and availability of parts!

Neil (I have got the name right at last!) VK7FN called in on a Club Communicator and a nice clean stable easy to copy signal it was - aided by good key-work. Thanks Neil, Don (VK5AIL) was particularly pleased to hear another one on the air.

Among a number of suggestions made during the Nets was one by Merv VK3ADX who asked if we could organise a QRP/P contest, scramble or call it what you will - stati on to be in the field away from home location (Backyards illegal!!) and battery powered. Good idea - to be arranged. Elsewhere in this issue is th e data of the next Club CW scramble, so use this one please as a warm-up for a portable exercise.

Another facet of our Net was revealed - ie, non-members are welcomed - when Cec VK2COH called in to acknowledge receipt of a complimentary copy of Lo -Key and the news was that he is joining the club AND placing an order for a Club Communicator. Welcome, Cec, hope to hear you on both nets in the near future - and a lot of other members too, hint hint!

Peter VK2EPD asked on Net about problems with the TDM80 (Tassie Devil). He received a number of tips from Rai VK7VV and Merv VK3ADX and we await the results.

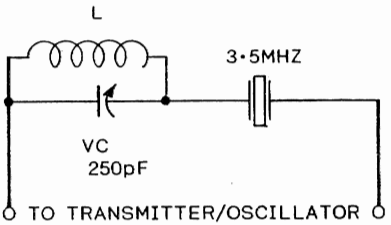
73, Max VK5OS

VXOs FOR THE NOVICE By Peter VK6BWI (66)

A VXO or Variable Crystal Oscillator is a device which can vary the output frequency of a crystal oscillator. A good VXO will shift the frequency by 0.2% e.g. a 3.5MHz oscillator would shift up to 7kHz. Frequency shift is always downwards i.e. to frequencies below the crystal frequency.

There are various circuits for variable crystal oscillators, but all of them add reactance to the circuit by using capacitors and inductors.

This VXO can be added to most crystal oscillators. (1) The variable capacitor is a 250pF unit from an old valve receiver and the coil is wound on a 12mm plastic former with about 100 turns. These values can be varied quite considerably.



Build the VXO well - for best stability. If you are building a VXO transmitter from scratch, use short wires and avoid crystal sockets and switching of crystals using ordinary switches. I added this VXO to a valve transmitter which had several sockets in parallel to take various crystals and had to use longer than desirable wires. The shift in this case was only 3 - 4 kHz with acceptable stability.

To adjust, a calibrated receiver or frequency counter is desirable. The VXO should be on about the same frequency as the crystal. Slowly turn VC and the frequency will drop very slowly. Eventually the shift will start to increase, but the oscillator will still be stable. If you keep going, instability in the form of drift will be apparent and the oscillator will drop out.

VXOs are particularly useful above 7MHz. The 10MHz band, which is very narrow, requires only one crystal for the CW segment (10.100 - 10.115MHz) as the maximum shift will be up to 20kHz.

If you use overtone crystals, the shift will increase if you use them in fundamental mode. A 54MHz xtal on 18MHz provided 150kHz of shift ! You will need to use a different VXO circuit, however.

MORE ON VXOs:

Amateur Radio Techniques by Pat Hawker G3VA (RSGB)
Solid State Design for the Radio Amateur by Wes Hayward W7ZOI
and Doug DeMaw W1FB (ARRL)

ARRL Handbook
RSGB Radio Communications Handbook

(1) . . Editor's Note: This article is directed at Novices who are experimenting - look for oscillator circuits using xtals in series mode.

CIRCUITS AND SHORTCUITS By Don VK5AIL (75)

END PREPARATION OF COAXIAL CABLE

To prepare an end of RG-174 mini coaxial cable for soldering:

1. With a SHARP blade make a shallow cut around the outer insulation 12mm from the end. Do NOT let the blade touch the braid wires.

2. Slip the 12mm long piece of insulation off the remaining cable, by applying just enough force to break the material not cut by the blade. It may help to run another cut along the 12mm length to be removed and prise it open at the end, then peel off.

3. Squash the braid up in the direction away from the end. Avoid breaking any braid wires.

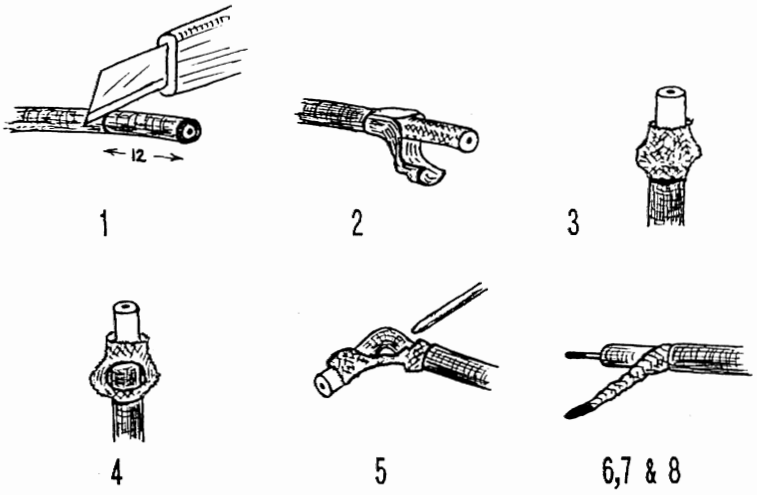
4. Using a strong, blunt pin or similar, GENTLY open up a hole about 3mm from the start of the outer insulation. Bend over the cable (at the position of the hole) between thumb and forefinger.

5. Then poke the pin or other tool under the inner cable and hook it out through the hole. This takes practice.

6. Neatly squeeze the loose tail of the braid, without twisting it tight, so that you have a flexible tail for soldering.

7. Remove about 6mm from the end of the inner conductor.

8. Tin the centre conductor and tip (just the TIP) of the braid. You need a flexible tail on the braid, without potential short circuits from bits of wire sticking out.



AWARDS AND CONTESTS By Ian VK3DID (112)

DX SCOREBOARD

Keeping track of the DX Scoreboard will be a most interesting task, as it is only when logs arrive that one can see what can be achieved with determination and persistence.

The outstanding effort for this Quarter is Jay KV7X (78) who is obviously a regular worker on almost every band. Jay writes that he has worked 208 countries with already 185 confirmed. A magnificent effort Jay. Many thanks and keep up the good work !

Perhaps the rest of us do not have as much time as Jay, but what about giving it a go ? The DX is there just waiting to be worked, especially with the increasing sunspot activity. Hopefully next Quarter will see increased participation.

Dust off your keys, turn down the wick and let's "do more with less" !

CLUB DX SCOREBOARD - 1 Aug '88 to 31 July '89

Scores to 20 February 1989

CALL	NAME	NBR	10M	15M	20M	40M	80M	160M	TOTAL
KV7X	Jay	78	382	256	2036	80	-	-	2754
VK7VV	Rai	3			424				424
VK8CW	Ian	91			420				420
VK5ZF	Len	1		97					97

ENTRIES: See Lo-Key #18 June 1988 p.23 for the Scoreboard Rules.

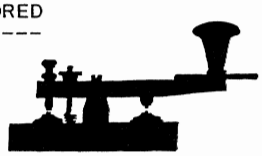
* SCRAMBLE * SCRAMBLE * SCRAMBLE *

CLUB CW SCRAMBLE #9 is to be held on 80m on THURSDAY 27 APRIL 1989.
We are arranging to have the Club Station operating. Be in it !

RULES OBJECT: To score points by working as many stations as possible on the 3.5MHz band. DURATION: 2 hours, starting at 1030Z and finishing at 1230Z. MODE: CW only. Club Members to use QRP (maximum 5 Watts output). CALL: No Control Station to check in to, JUST COME UP AND START CALLING. The call to use is CQ QRP TEST and Members should use the /QRP suffix.

SCORING:

CW STATION WORKED	POINTS SCORED
QRO VK	1
QRO DX	5
QRP VK	4
QRP DX	10
CLUB STATION VK5BCW	15



ENTRIES: Send log extracts to the Awards and Contests Manager (QTH below) *without delay* please. RESULTS: Results including certificate winners will be given in Lo-Key #22 June 1989.

CERTIFICATES

All of the 'old' certificates we owed Members were posted to the winners/achievers in January. We finally made it ! But if there is a problem with *yours*, please let me know and I will give it TOP PRIORITY.

Well, that's it for this issue,

73 Ian Godsil VK3DID (112) Awards and Contests Manager
P.O. Box 411 NORTH BALWYN VIC 3104

VK2/QRP ASSAULT By Garry VK2AGC (121)

QRP is well and truly alive and well here in VK2. This has been confirmed during the last few months due largely to the efforts of the Westlakes Amateur Radio Club.

This highly respected club has made available to its members a QRP kit. The project is simple in design and very reasonably priced. The concept was initiated in an endeavour to encourage a little home-brewing with a great deal of QRP CW thrown in for good measure.

The transmitter is designed to operate on a fixed frequency. A Colour Burst crystal on 3.579MHz was chosen because of availability and cost. I hope to be able to publish the circuit of this remarkable little transmitter in the next issue of Lo-Key - with the permission of the Westlakes Club, of course.

A QRP CW contest was conducted by Westlakes from 1 to 31 January 1989 with a trophy being awarded to the highest points scorer. This trophy has been donated by Fred VK2AAX, an avid CW operator and a man willing to encourage others in the joy of CW.

For anyone wanting a contact with an operator using one of these great little kits, 3.579MHz is the frequency to keep in mind. With winter approaching and band conditions on the improve for 80 metre QRP, many contacts are expected.

Having made over 40 contacts during January 1989, and although this might not seem like much, I was delighted with the achievement.

That's all the info I have for this issue of Lo-Key, but if anyone would like to help with bits and pieces please feel free to drop me a line or call. (NO reverse charges please !!) .

Regards & 73s ***Garry*** VK2AGC (121) VK2 State Co-ordinator
22 Johnston Road BASS HILL NSW 2197

‹‹‹‹‹ NEXT ISSUE OF LO-KEY ›››››

If all goes well the next issue will contain the first part of VK6KRG Rod's 15m transmitter project, and a reprint of the original EA78 electronic keyer article, which the Managing Editor of **Electronics Australia** magazine has given us approval to reproduce. EA78 needs a keyer paddle, so we will tell you how to obtain the well-known **Galbraith** keyer paddles (in case you have run out of old hacksaw blades from Reg VK3BPG to make your own !).

KIT-SET ACTIVITY CENTRE By Don VK5AIL (75)

KIT-SETS

The Club currently has two kit-sets available to Members:

*** The Club Communicator, a CW QRP transmitter for the 80m band; and
*** A Sensitive SWR Meter, with 5W dummy load.

We also try to keep a range of spare parts for the kits, particularly those items difficult to obtain from normal sources, and sometimes have other useful items which we advertise in Lo-Key.

Orders and payment should be sent to me (at the address shown on page 2) or to the Treasurer. Please make out the cheque to CW OPERATORS QRP CLUB.

Prices and other details remain as shown on pages 20 & 21 of Lo-Key #20 December 1988. The price of the Full Kit-Set is $77.00.

SUPPLY OF COMPONENTS

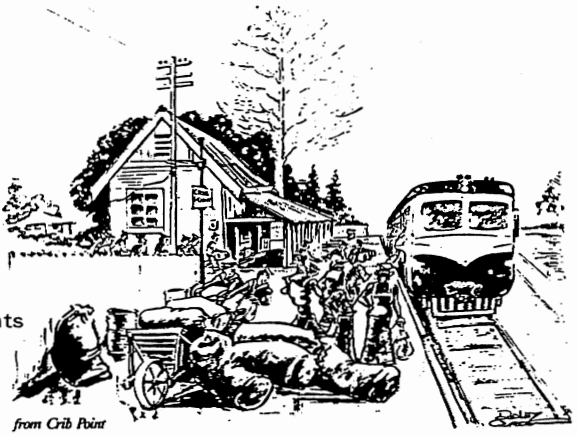
The Kit-Set Activity Centre has available for purchase by Club Members a range of spare parts for our kit-sets. If out of stock of a particular item we will try to help you obtain what you need or suggest substitutes or arrange a note in the 'U CAN Help' column of Lo-Key.

Or if you just want help to locate a source of components for a project out of Lo-Key or some other magazine, just let us know in writing or via the Friday night Club Info. Net. The Net has produced a few 'winners' already ! And if you solve the problem yourself before we do PLEASE let us know, because others will probably be interested in the solution and of course we are wasting time hunting for a source if you have already found one.

We also have other home-brewing components for sale to members. Some of these have been obtained from suppliers at discounted prices. However, the main aim is to help you get the hard-to-get radio components, not just to sell cheap components. And the Club operates on a non-profit basis.

A few of the components are listed below, with the price per pack (which INCLUDES POSTAGE within Australia) and the number in a pack. The items are brand new except where stated otherwise.

Orders can be sent to Don VK5AIL (75), or to the Treasurer Kevin VK5AKZ (43) if that is more convenient. See page 2 for addresses. Cheques should be made payable to CW OPERATORS QRP CLUB. For small money amounts below $A 5.00, it is alright to send the equivalent value of postage stamps (as long as they are unused Australian stamps valued at $1.00 or less !)



Crib Point (60km south of Melbourne)
QTH of Reg VK3BPG (7) - and half of the Navy ?

Code No.	Nbr in a pack	$A Price per pack		Description
				PRICE LIST
C001	1	6.00		Ammeter edge type 500uA f.s.d. (DC) Kyoritsu EW-40 Needs a 14mm x 42mm cut-out in your panel.
C002	2	3.00	*	IRF510 transistor N-channel MOSFET (HEXFET) Used in some of VK3XU (49) Drew's projects.
C003	10	2.50		0.1uF (104) capacitor monolithic (blue colour)
C004	4	3.00		BAT85 Schottky (hot carrier) diode Voltage drop is 0.2 - 0.3V. High sensitivity - can replace germanium types.
C005	5	3.50		330pF Polystyrene (styroseal) capacitor 630V Unused old stock.
C006	5	3.50		560pF Polystyrene (styroseal) capacitor 125V Unused old stock.
C007	2	3.50		BS170 transistor VMOS N-channel FET.
C008	2	5.40	*	VN88AF transistor.
C009	1	4.50		Coil assembly, Club Communicator type (See Lo-Key #20) Suitable for other VFOs.
C010	1	7.70		Manual for Club Communicator 3.5MHz CW QRP Tx. Comprehensive coverage. More than 50 pages.
C011	2	6.60	*	IRFZ32 transistor.

Notes: Prices may change at any time without notice.
A simple data sheet will be provided with transistors.
* indicates that insulated mounting hardware and bolt are included.
If there are sufficient requests I will try to obtain other items that Members are having trouble finding.
We cannot guarantee availability and may have to limit quantities sold to individuals.

BRIEF SPECIFICATIONS OF TRANSISTORS (E & OE)

Type	IRFZ32	IRF510	VN88AF	BS170
Package	TO-220AB	TO-220AB	TO-202AA	TO-92 variant
V_{DS} (V)	50	100	80	60
$R_{DS(on)\ max}$ (Ω)	0.07	0.54	4	5
I_D cont (A) Tc = 25°C	25.0	5.6	1.58	0.5
I_{DM} pulsed (A)	60	20	3	-
P_D max (W)	75	43	15	0.83

Note: IRF510 = IRF511 except IRF511 V_{DS} is only 80V.

OPEN WIRE FEEDERS By Merv VK3ADX (85)

You can throw away those old toothbrushes you've been collecting for years !

Here is a practical solution to the problem of constructing open wire feeder line. The material used is the small black plastic tube (about 1/4" o.d.) which is used in sprinkler/dripper systems - and is available everywhere !

Cut it to the correct length, depending on the Z_o required - from formula:

$Z_o = 276 \log_{10} (2S/d)$

where Z_o is the characteristic impedance in ohms;
S = centre-to-centre distance between conductors;
d = diameter of conductor in same units as S.

See Transmission Lines chapter in ARRL Handbook
and HF Aerials chapter in RSGB Handbook

(I make the line then calculate Z_o ...HI !)

You may need to use trial-and-error with a few different values of S before you get the desired Z_o. Don't forget to allow some extra length beyond the holes.

My own spacers are 2-1/2" overall with holes 2" c-c and wire is 18SWG. So -

$Z_o = 276 \times \log_{10} (4/0.048) = 276 \times 1.92 = 530$ ohms (near enough to 600 ohms)

Cut all the insulators to same length, then drill or melt the holes. I made a small jig for drilling - but this is not essential. The hole size should give a press fit for the wire gauge used - no need to be too tight, though.

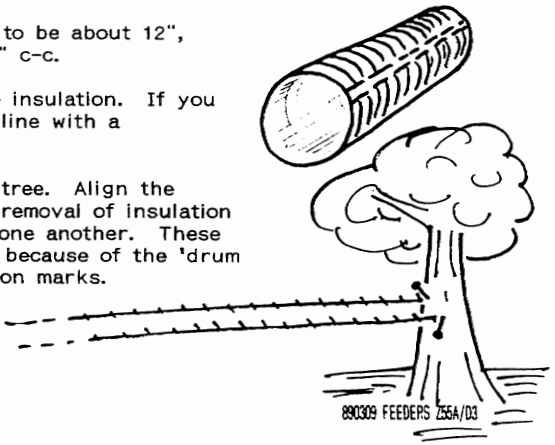
When you have enough cut, wind an amount of wire two times the length of feeder required around a tube or cylinder. The circumference of the tube must equal the desired spacing between insulators.

Circumference of tube = 22/7 x (tube diameter + one wire diameter)

e.g. if spacing between insulators is to be about 12", try a 3-1/2" tube. This will give 11" c-c.

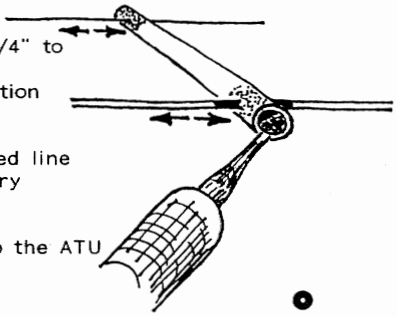
Then use abrasive paper to sand the insulation. If you are not using insulated wire draw a line with a felt-tipped pen.

Fix one end to a convenient post or tree. Align the wire so that the marks made by the removal of insulation or by the pen are in pairs opposite one another. These marks should be equally spaced now because of the 'drum trick'. Thread spacers and position on marks.



Open Wire Feeders (continued)

Then, using a caulking gun and silicone cement (e.g. Silastik brand) squirt a small amount of silicone in either end of each spacer. Don't fill tube - use just enough to reach wire and to seal the end - this holds spacer on wire and seals out moisture.



Now move spacer backwards and forwards about 1/4" to make sure wire is 'wet' with silicone sealer. You should see traces of silicone on the wire. Re-position spacer and move on to the next one.

I have found this method makes cheap·low loss feed line and (so far) appears to withstand the elements very well.

Connect one end to your antenna and the other to the ATU - and get 569 into ZL FIRST TRY on 980mW.

(EDITOR'S MUSINGS: mmmm . . . my 300 ohm TV ribbon feed line is doubtful, at best . . . and there's a few metres of the small tube in the shed - and I'll probably never use it . . . and plenty of Silastik (even if it's white) . . . Now, if I can just finish these articles for Lo-Key . . . and finish setting up that batch of kit-sets . . . and finish the Tassie Devil (why DID I try to change it to 160m) . . . and . . . Well - maybe NEXT week . . . mmmmm.

CLUB COMMUNICATOR CORNER By Don VK5AIL (75)

It is always pleasing to receive letters from Club Members, *almost* regardless of the contents. One of my most pleasant surprises recently was a note **Ralph VK3CQK (134)** sent me, with a set of colour photographs of his recently completed Club Communicator. These are magnificent and show how well Ralph has done his construction. The rig is a credit to you Ralph. The bad news is that I have been unable to reproduce them successfully for Lo-Key, but will try to have them included in the Boomerang Circuit Book.

BEEN THERE, DONE THAT SECTION:

Early in January a builder of the Club Communicator kit-set contacted me to say he was unable to get the VFO going. Of course it is possible for the VFO to be working but perhaps just away from the frequency where he was searching - perhaps he only had a multimeter and a receiver and no digital frequency meter (he didn't say). I decided to write a quick note back with some ideas about how to find the signal, which is easily missed.

But to provide 'belt and braces' I decided to send him a prototype VFO that had been made up but not used. I would pre-set it to 7.000MHz exactly. So late one night I quickly soldered in an inductor and set about checking this VFO, using just a receiver and multimeter (no digital frequency meter or GDO etc.) to see how I would perform in the same situation.

More than an hour later I still couldn't hear the signal, so was doing no better than the other Member. Eventually decided to go by the Manual and check voltages. Those of you who have *BEEN THERE AND DONE THAT* won't be surprised when I tell you that neither of the two transistors in the VFO had ever been installed - hence the frequency of oscillation was ZERO MHz !!

73 Don VK5AIL

THE BOOKSHOP
by
Norm VK5GI

Welcome to yet another edition and another column from your peripatetic reporter. (look it up!) It is hard to realise that it is just twelve months since I was signing /G0 and having eyeball QSOs with my brother Phil G1CYG, his XYL and the four harmonics. Whilst over in UK, I called into the BBC bookshop in Bush House, London - the home of the Overseas Service. I was impressed with its scope, but was told that the books for hams were in short supply. Ah well.

I commend to you Stewart Electronics which have been advertising lately in the popular ham press. I managed to get a copy of the 'QRP Notebook' by Doug DeMaw from them. Their service is quick and efficient and more power to their elbows. The book itself is a typical ARRL publication of about 80 pages, no photographs, but *lots* of great ideas and circuits. Doug's laconic style makes for easy reading, and he takes you through the reasons *why* things are happening in a circuit, which is fairly important! For ten bucks - and Stewart Electronics pay the postage - this has to be a bargain.

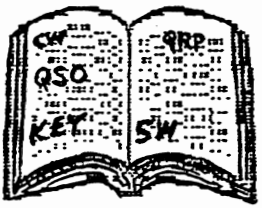
I had hoped by this time to have into my hands Ade Weiss's much acclaimed 'The Joy of QRP', but alas this is not to be for the time being. Ade runs his own publishing house, Milliwatt Publications, as well as being an Associate Professor of English at a local University. Naturally, Ade publishes his own book but he has gone on Study Leave for a while and is not contactable at the present moment.

By the way, I'm still collecting items for the Boomerang Circuit book, so if anyone has a favourite circuit that they would like to share with the rest of us, please drop me a line.

STOP PRESS

I have just hear d that orders for a pre- publication second edition of Ade Weiss's "The Joy of QRP" book are being taken right now. Pre-publication price is $US12. If you want a copy, let me know ASAP and I'll send in a bulk order. Alternatively, send your cheque to

Milliwatt Publications,
833, Duke Street,
#83, Vermillion,
South Dakota 57069
United States of America.



See you next time, or on the Friday net,

73's
Norm VK5GI

25 Ralston St. NORTH ADELAIDE 5006

BOOMERANG CIRCUIT BOOK CIRCULATION LIST Addition to list

Len VK5ZF (1) 5033 Postcode

CLUB INFO. NET QUESTIONNAIRE RESULTS

Thankyou to the Members who completed the questionnaire about the Club Info. Net (ssb QRO) activities. The results are tabulated below for your information.

Looking at the results indicates that the present night and time suit the highest number, but it is not clear-cut.

For example, Monday night had 66% of the tally for Friday night - indicating a need for further analysis - and Friday night was only about 33% of the total answers.

Of the 34 who selected Friday, between 3 and 8 call in each week (plus non-members with queries). Where, one might ponder wistfully, are the others ?? Well, no matter, those who do come up always enjoy the Nets, so the word will gradually get around.

NOW, for the gang who opted for Monday nite, *I'm game if you are !*
Between 3.610MHz and 3.625MHz at 0930Z, 1000Z and 1030Z
VK5OS will call "CQ ... all Members of the CW Operators QRP Club Net" in the hope of contacting some who can't make it on Fridays. Three calls will be made, with a listening pause in between, over a 10 minute period from each of the three times given earlier.

Commencing date to be Monday 20 March 1989.

Hope to hear you . . . Max VK5OS (2)

YOUR PREFERENCES							
DAY	0830Z	0930Z	1000Z	1030Z	1245Z	DAY	TOTAL
Sun.	1	5	1	7	-	Sun.	14
Mon.	1	9	3	11	-	Mon.	24
Tue.	1	7	-	6	-	Tue.	14
Wed.	1	3	1	6	-	Wed.	11
Thu.	1	5	4	11	-	Thu.	21
Fri.	1	6	2	24	1	Fri.	34
Sat.	-	3	-	6	-	Sat.	9
TOTAL	6	38	11	71	1		127


U CAN HELP By Don VK5AIL (75)

I hope the Members who sought help in this column in December received it. There is nothing (well, *almost* nothing) worse than having trouble finding a component or substitute for a transistor for *that circuit* which you are sure is a winner.

Here are some more requests. Perhaps U CAN HELP, so if you have the answer contact the person direct or, where the answer may be of use to other Members, let the the Editor know and it may appear in Lo-Key. Members names and postal addresses were published in the December Lo-Key.

My comments are shown as 'QRM/ED' - QRM from the Editor !

---

1. Merv VK3ADX (85) is looking for information on the R5620 programmable universal filter made by Reticon. Perhaps someone has data or, better still, has also used one.

QRM/ED: Can't find Reticon or R5620 - big mystery !

2. Norm VK5GI (139) is looking for any circuit data, manuals or other useful information on the Hallicrafters model S38 HF receiver. Norm will buy or borrow as this data is not going to be easy to track down.

Norm also needs one or all of a series of articles which appeared in **73** magazine between about February and July 1981. The subjects were a Tx FUNMITTER, a Rx FUNCEIVER and other related gear.

3. Don VK5AIL (75) would like to buy or borrow the book *Practical RF Design Manual* by Doug DeMaw W1FB (probably an ARRL book). It does not seem to be listed by the normal sources in VK. AR8610.20

4. Bob VK3BBI (111) is looking for sources of BS170 and VN88AF transistors. Other Members have asked the same questions and are also looking for the IRF510/IRF511 'twins'.

QRM/ED: My guess is that they are easier to get in VK3 and VK2 than they are in VK5. Tandy seem to have ceased stocking BS170. Rod Irving Electronics has the VN88AF in the 1988 catalogue. Anyhow, I have obtained some (see page 20), to help Members who cannot track them down at their normal sources. p.s. Bob I didn't purposely leave this out of my letter to you - I forgot !

5. Reg VK3BPG (7) is interested in information comparing various mixers.

QRM/ED: When Reg mentions this on the Club Info. Net people talk about PN210, SB1, 3N210, 40673, MFE131 & 121, MPF131, MPF102 (single gate) . . . Quite confusing - can anyone come up with information comparing various mixers ? The only reference I have found so far is a piece in *Solid State Design* (1977) by Wes Hayward W7ZOI and Doug DeMaw W1FB - see p.121.

eQRPMENT BUY-AND-SELL

If you have amateur radio equipment, components, books, magazines etc. you would like to sell, you may submit details for publishing in Lo-Key (if we have room). Just give me a brief descripton of each item (and the 'asking price' if you wish, specifying if o.n.o. or nearest offer) and your address so that other Members can contact you direct.

FROM THE EDITOR'S DESK *By Don VK5AIL (75)*

To say it is pleasing to receive so much input for Lo-Key is quite an understatement. I apologise for delays in acknowledging receipt of items - although there is never any delay for Members who call into the Club Info. Net (ssb) ! Many articles and information items which have been submitted could not be included this issue. Thankyou for the papers and - in anticipation - for your patience.

At this stage we will probably stay with 28 page issues, partly because of the jump in VK postal charges if the packet gets any thicker.

We will keep a reasonable balance between technical items and other Club activities. This also means we cannot necessarily print 'Letters To The Editor' which the writers intend to be printed in full. If appropriate, such letters will be submitted to the Executive for consideration.

Last issue we had quite a bit of Club business - this time we can get into more of the technical side, which is what the Club is all about. A cautionary note: We cannot guarantee that all the circuits, ideas and advice given in Lo-Key will work or are free of faults and errors, as it is not feasible to test most of them.

This issue contains several articles which I believe may be 'first efforts' by the authors, at least as far as Lo-Key is concerned. This is **great**. I am sure you will enjoy seeing your efforts in print and it is an opportunity which is easy to grasp in this Club. So the stalwarts who have provided informative articles during the last five years will have more time to come up with some technical 'masterpieces'.

There was a very good response to the Membership List in the last issue, particularly to the use of call-sign sequence. We will probably put this detailed list in once a year.

So, enough from me, except to thank the many Members who have made kind comments about the December issue, either on air or in letters. These comments are appreciated, I am sure, by all those who provided input and helped with production and mailing.

If you never ASK
is it because you know **everything**
or **nothing** *?*

73 Don

MORSE SESSIONS

Rex VK2YA (131) advises that the WAGGA ARC handles the **Slow Morse Sessions** for the VK2 Division of WIA each Sunday night 7.15pm to 8.30pm local time. SSB callback at 8.20pm. Frequency is 3550kHz. Various speeds to suit would-be Novices - and faster. Rex recommends that you try the **CW NET (NSW)** on 7025kHz at 10.00am to Noon (local time). The leading light is ERIC VK2BII and you will be welcomed into the Net.

INTERESTED IN JOINING US ?

IF YOU ARE A NON-MEMBER, THEN THIS PAGE IS FOR YOU !

This copy of our Club Journal has been sent to give you an appreciation of the scope of activities of the **CW OPERATORS QRP CLUB.**

In each issue of Lo-Key we include as many technical articles as possible on all types of QRP equipment and we encourage our members to make their own gear. Many articles are written with the inexperienced builder in mind - as are the instructions with the Club's kit-sets.

We promote the use of CW mode to show support for a skill that has been part of Amateur Radio since its inception - and we are proud of it. Our Club is possibly the only Radio Club in Australia that actively supports CW exclusively.

Using low power and homebrewing our own equipment gives QRPers a great feeling of achievement and satisfaction. It certainly gives us a direction and purpose in holding an Amateur Licence and enjoying our hobby.

We are saying to Amateurs that you can enjoy your hobby just as much as at present - in fact more - without having to spend thousands of dollars.

*Would you like to join us in putting the **AMATEUR** back into Amateur Radio ?*
Would you like to use more of the Amateur skills you have acquired ?
Would you like to become enthusiastic about your hobby again ?

If so, fill in the application form (or a copy of it) and mail it to our Treasurer at the address shown on the form.
A receipt and your membership number will be sent with your next Lo-Key.

Cut along this line

CW OPERATORS QRP CLUB

Promoting the Use of Low Power
CW Mode Communication
and Home-Brewing
in the Amateur Radio Service

Please post this application to:

Kevin Zietz VK5AKZ (43)
41 Tobruk Ave.
ST MARYS SA 5042
Australia

I would like to apply for Membership of the **CW Operators QRP Club.**

With this application I enclose $A10 for VK Amateurs, $A12 for ZL Amateurs, $A14 for DX Amateurs, which is the annual membership fee.

(please print)
FIRST NAME & CALL SIGN ....

INITIALS & SURNAME ....

ADDRESS .....

.....

.....

MARCH 1989

890216 OBC Z55A/A2