LO·KEY

NEWS BULLETIN

CW OPERATORS QRP CLUB
WE DO MORE WITH LESS
5W
QRP

PUBLISHED QUARTERLY

CONTENTS

"WE DO MORE WITH LESS"!

25 12th AVENUE W. MOONAH, HOBART, TASMANIA AUSTRALIA

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MEMBERSHIP

The CW OPERATORS QRP CLUB is an International Club, open to Amateurs and Short Wave Listeners from any country. The Club was formed with the aim of promoting QRP using the CW mode, on ALL frequencies allocated to the Amateur Service.

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ANNUAL MEMBERSHIP FEES

VK....$8 : ZL.... Lo-Key by surface mail....$A9 : ZL....Lo-Key by airmail....$A10 : DX....Lo-Key by surface mail.... $A9 : DX.... Lo-Key by airmail....$A12. Please make all Money Orders and Cheques payable to the CW OPERATORS QRP CLUB. IRC's not acceptable.

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CORRESPONDENCE

Please address all correspondence for the Secretary, CW Operators QRP Club, 25 12th Avenue, West Moonah, Tasmania. 7009. Australia All membership fees to be sent to the Treasurer, CW Operators QRP Club, 41 Tobruk Avenue, St. Marys, S.A. 5042 Australia.

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CLUB CALLING FREQUENCIES

1815:3530:7025:14050:21130: 28125

***

INTERNATIONAL CALLING FREQS

3560:7030:14060:21060:28060:

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LO-KEY

Published in March : June : September : December.

1985-86 CLUB SCOREBOARD

NOVICE SECTION

STN		3-5					21		28				TOT

FULL CALL SECTION

STN	1-8	3-5	7	10	14	18	21	24	28	52	144	430	TO
KV7X	0	23	36	2	426	0	I6	0	0	0	0	0	503
VK3BGH	0	191	57	0	8	0	I0	0	I	0	0	0	367
VK5BJF	2	40	I3	I5	2I	0	I0	0	0	0	0	0	82
VK7VV	0	7	7	0	72	0	0	0	0	0	0	0	72

I was Pleased to receive the Scoreboard logs for the first quater of this season, I know that many other members have been active so I am looking forward in receiving their logs for inclusion in the September issue of the LO-KEY. Great scoring by JAY KV7X seems he really got stuck into the WPX-contest. GRAEME VK3BGH also firing on all cylinders, Well done GRAEME and thanks for the very neat and concise log .

Hang in there JEFF VK5BJF, you and I will give them a run for their money wont we? BLIMEY' just realised that NEIL VK3CGE and MATT ZLIATW and all the other sporting types are thinking the same thing. SO come on fellows, lets see them logs.'O'yes dont miss the information on the new Score board rules and the Awards program now in progress, don't worry about the logs I have in my hands at the moment, I will enter them into my MASTER LOG BOOK, I know it is not usual to alter rules after the start of a contest, but no one will suffer, if you consider the new system I am sure you will agree.

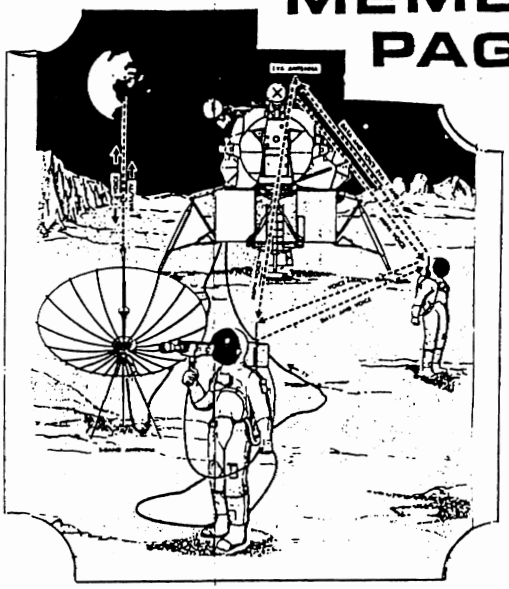
Good hunting

RAI.

Kai

PLEASE NOTE, ON PAGE 5, ZONES AS INDICATED ARE THE 40ZONE PLAN.

DX MEMBER'S PAGE



Member No 78 Jay KV7X, would appear to be a very keen QRPer, perusing through his scoreboard log there are some rather delectable DX contacts, proves a point that contest do bring out the DX, and if by chance propagation just happens to coincide with the action, one can have a ball.

Jay has a pretty good chance of taking top honours in his QRP catagory looking at his score of 174 valid QSO's and 134 multipliers giving a total score for the WPX contest of 28,944 points.

Incidentally Jay worked VR2RHJ for country No 92 for his DXCC/QRP, well done Jay we wish you the best of luck getting the other 8 countries and more importantly receiving the QSL cards. Please keep us informed, I think you will possibly be only the second QRPer in our club to achieve DXCC/QRP modesty forbids me to name the other member. Hi.

Of course if other members have such claims I would be interested to hear from them. Well that is all the news from DX members, I would appreciate some input from overseas.

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CLUB BUSINESS

SUBSCRIPTIONS

The time is ripe I feel to address a few of the clubs teathing problems, nothing serious you understand, but the committee have decided to alter the system of subscription payments. From now on all subscriptions will fall due each year in the month of January. New members and members renewing their membership up till January will pay the full fees on their normal renewel date, (this date is printed on your address label, find it before you lose it.) Come January, subscriptions will be paid on a pro-rata basis by those members it concerns, but don't worry about working it out, Kevin and his computer will do that, and you will be notified in plenty of time to send it in.

This system as most of you will know is exactly the same as the W.I.A use, so you will apprieciate the obvious benefits, and you will be in no doubt as to when your subscription are due.

I am sorry if it appears that we are continually nagging about renewal of memberships, but it is a fact that many members fail to do so, we are sure not intentionally, but it is easly forgotten. The new system we feel will help.

SCOREBOARD AND AWARDS

It will be good news for many of you to learn that we finally have our very own certificate, and a very handsome one it is to, designed to cover any one of the awards to be described later.

Elsewhere in this issue you will find a facsimile of a log sheet designed for the purpose of logging your scoreboard result, and for recording, your progress in the award chasing department. If you so wish.

When these logs are submitted, preferable two weeks before Lo-Key is produced, they will be compiled and listed into a MASTER LOG BOOK. Copies of the log sheet are available from the secretary on receipt of a S.A.E. if every one uses this log sheet. The job of compiling will be made a lot simpler.

Score board rules have been modified as follows to incorperate the awards programme.

RULES 'COMMANDMENTS'

I. Duration I2 months from Ist April to 3Ist March
2. Sections 'A' full 'B' novice 'C' listener
3. Open to all members of the CW OPS QRP club.
4. All bands under term and condition or license held.
5. CW only mode Max 5W RF output.
6. QRPP. I watt or less X2 multiplier.
7. QRP/QRP both ways X2 multiplier.
8. CW to CW only no cross modes or cross bands allowed.
9. Station can only be worked again within a 24 hour period if on a different band each time.
IO. Contact must start and finish at QRP level, play the game don't call at QRO then, Slide down to QRP level, a definate 'NO NO'.

SCORING

I (one) point for contacts in own (IARU) zone.
2 (two) points for contacts outside own (IARU) zone but still in own country.
3 (three) points for countries outside own zone and outside own country.

Multiply the points of each contact X2 if using QRP both ways.
Multiply the points of each contact X2 if using QRPP (I watt or less).

AWARDS

AWARDS PRESENTED FOR THE FOLLOWING ACHIEVEMENTS (CW OPS QRP CLUB MEMBERS ONLY).

W.A.C. worked all continents.
DXCC worked 100 countries. (awards can be issued in stages of 25-50-75.)
W.A.M. worked all members (awards can be issued in stages of 25-50-75.)
W.A.S America worked all American states
W.A.S Australia worked all Australian states VKI to zero's.
5000 miles per watt.
Contacts for these awards only count if worked after the commencement date of 31 March 1985.

QSL cards are not required to be sent with an application for an award, however the QSL cards must be in your possesion. QSL cards and logs can be verified by an exuctive member of your particular countries amateur radio body, such as A.R.R.L. R.S.G.B. W.I.A. ect, If this is not possible, then a signed declartion of verification by two licenced amateur will suffice. The cost of these awards to cover postage ect, will be announced in future editions of Lo-Key.

CW OPERATORS QRP CLUB

.....

has earned this certificate

for the achievement of

.....

.....

Year.....

Contest Manager

BACKGROUND - WHITE. BORDER - GREEN. MOTIF - ORANGE. LETTERS - BLACK.

SCOREBOARD/AWARDS. LOG SHEET CW OPS QRP CLUB.

MEMBER No. 3 .... CALL SIGN. YK7YY ...... NAME. Rai .... QUATER END June 1985.

Z				Power Out		Sent			Rcvd							Multi		
Date	Time	Station	Freq	His	Mine	R	S	T	R	S	T	Zone	Continent	Country	State	X2	X2	Pts
1-4-85	2451	KA7APT	21	100	3	5	8	9	4	3	9	3	N AMERICA	U S A	WASH			[illegible]
[illegible]	[illegible]	K7[illegible]	21	400	3	5	9	9	[illegible]	5	9	3	N AMERICA	U S A	ARIZ			[illegible]
[illegible]	0600	VK1AA	7	10	3	5	9	9	5	9	9	30	OCEANIA	AUST	[illegible]			1
[illegible]	[illegible]	VK2[illegible]	3.5	20	3	5	9	9	5	9	9	30	OCEANIA	AUST	[illegible]			[illegible]
[illegible]	[illegible]	PA3AAS	14	100	3	5	9	9	5	3	9	14	EUROPE	NETHERLANDS				[illegible]
[illegible]	[illegible]	G3[illegible]	14	5	5	5	3	9	4	2	9	14	EUROPE	[illegible]			3	[illegible]
[illegible]	[illegible]	ZL[illegible]	14	150	3	5	8	9	5	5	9	32	OCEANIA	N Z				[illegible]
[illegible]	[illegible]	F[illegible]	14	3	3	4	3	9	4	4	9	14	EUROPE	FRANCH			3	6
[illegible]	[illegible]	OK3[illegible]	14	100	3	5	7	9	5	3	9	15	EUROPE	CZECHO				[illegible]
[illegible]	0515	KH[illegible]/A[illegible]	21	150	3	5	9	9	5	4	9	31	OCEANIA	WAKE IS				3
[illegible]	2400	VK7 RS	14	4	3	5	9	9	5	5	9	30	OCEANIA	AUST	TAS		3	6
[illegible]	[illegible]	WB9[illegible]	14	3	1	4	4	9	3	3	9	3	N AMERICA	USA	WASH	3	3	[illegible]

MEET THE NEW MEMBERS

A HEARTY WELCOME TO

Member No 85 Merv Quin, glad to have you aboard, let me have a few personnal details one day.

Member No 86 Barry Risely, I was so pleased that Barry decided to join our ranks he recently upgraded after a rather long frustrating period of mastering the IO WPM code speed.

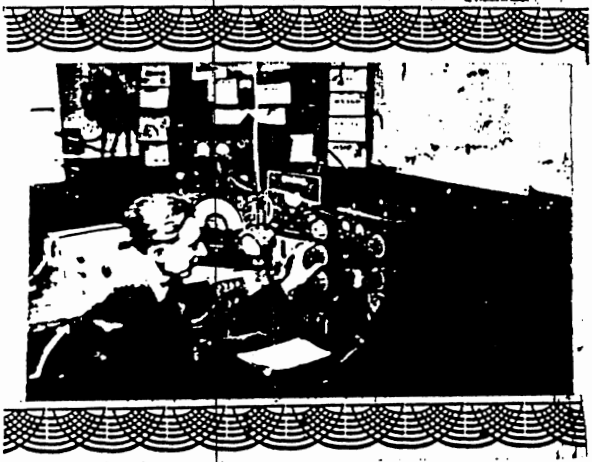
His hard work finally paid of, and now as pleased as a dog with two tails is sporting his new call sign. Rumour has it that the staff at D.O.C. has held on to the R.S. call sign waiting for the right person to come along. We are not sure if D.O.C. got tired of waiting, or found Barry to be the right person. Barry is planning to do some home brew and some QRP operating.

Member No 87 Brian Sampson, Brian is an accomplished home brewer and has threatened to one day put up an antenna and get on air, believe he is looking for a mini beam, so welcome Brian.

Member No 88 David Crottey is also interested in home brewing, presently he is studying at the Australian Maritime College. If you work David you can bet his CW will be imaculate.

Member No 89 Ted Daniels, welcome to you also Ted again I have no personnal details, would like to hear from you one day. Ted is running a home brew rig powered by one I8 watt solar panel, your experience with that set up would make an interesting article, I am sure other members agree.

NOSTALGIA



I wonder if this old photo brings back memories to any of our older members. Taken in the early fifties at Kinloss R.A.F. Base, in the hamshack, callsign was GM3HRZ, using the very popular II54/II55 gear, the operator, who else, but your editor HI. Has anyone else got something to contribute in this Nostalgia section ?.

S*C*D* PART 2

CONTINUING THE LOW COST, LOW TECHNOLOGY, QRP TRANSCEIVER PROJECT

REV.G.C.DOBBS, G3RJV

Receive Section and VFO Facility

In Part I a simple, easy to build VXO transmitter was described. This month the appropriate "kitchen table" technology construction is continued with the conversion of that transmitter into a complete transceiver, with the option of VFO control. Like the transmitter, the S.C.D. receive section could be built as a project in its own right; all that is required to make it into a complete receiver is a variable frequency oscillator on the required amateur bands.

The receive section of the S.C.D/ uses direct-conversion techniques. A direct conversion receiver could be called a mix between a conventional superheat receiver and a product detector used for CW or SSb reception: it mixes the incoming RF signal with an internally generated signal in a similar manner to the superheat, and then amplifies the difference between the two. Whereas in the superheat the resultant output is still at radio frequencies and called the intermediate frequency, or IF, in the direct-conversion receiver the resultant output is the require audio signal.

The difference between the incoming signal and the local oscillator is in the order of I KHz or less, so the result is at audio frequencies. The resultant beat note between the tow signals makes the system only really suitable for CW or SSb reception, but this is ideal for our CW tranceiver. The principle and the circuitry are so simple as to cause doubts amongst the sophisticates of the amateur radio world. The only possible defence is to ask the doubters to try the system: converts to the method claim, with justification. that a simple, but well made, direct-conversion receiver can hold its own with all but most expensive modern receivers.

Receive input coil wound on Amidon Formers
L1a over earthy end of L1

L1	L1a	Wire	Former	Bands
34t	4t	24swg	T68-2	80/40m
20t	3t	22swg	T50-2	40/20(15)m

Filter end of C10 on Transmitter

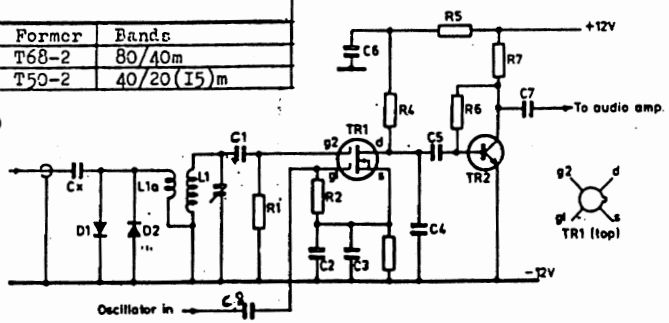


Fig 1. "S.C.D" RECEIVER MIXER CIRCUIT

A direct conversion receiver has few tuned circuits and most of the gain takes place at audio frequencies, making it ideal for home construction. These two factors, however, make it suspect, but they can be easily compensated for. Since most of the gain and selectivity take place at audio frequencies, it is usual to provide high audio gain for sensitivity and audio filtering for selectivity. The stability of the receiver is as good as the oscillator, but since in transceiver applications this is also the transmitter VFO, it is expected to be stable.

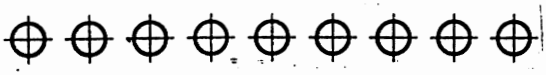
CIRCUIT

The circuit of the receive section is shown in Figs. I and 3. The heart of the receiver is the dual-gate MOSFET TRI which acts as the signal mixer; the mixer and audio pre-amplifier are contained on one board. A second small board contains an integrated circuit audio amplifier using the inexpensive, high gain, LM380N.

The input to the receive section is taken VIA the transmitter output broadband pe-network filter (S3,CII,CI2 of the transmitter circuit) which provides an additional front-end tuned circuit. This is coupled VIA Cx to a tuned input circuit LI/VCI; two diodes DI and D2 provide simple transmit/receive facilitie by blocking the excessive RF voltages present on transmit. The signal enters gate 2 of the dual gate MOSFET by way of CI.

The internal, or local, oscillator source is the oscillator from the transmitter This is fed into gate I of the mixer VIA C8; R3, C2 and C3 provide source biasing. R4 is the drain load, with C4 as RF decoupling for the output mixed signal.

The audio component is pre-amplified by TR2, from where the audio signal passes VIA C7 to an audio gain control VRI; CI then feeds the audio signal to the integrated circuit amplifier ICI. It will be noticed that no audio filter is used: this will be added at a later stage when the basic transceiver is working. The output of ICI is low impedance so it can be fed directly VIA C2 into either a small 8ohm loudspeaker or a pair of low impedance headphones.

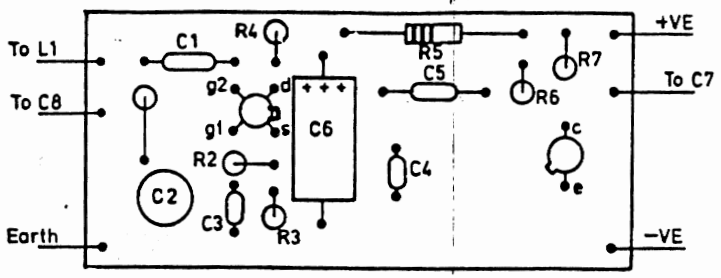


ODE TO A MODE

IN
DAYS
OF
OLD
WHEN
HAMS
WERE
BOLD
AND
SIDEBAND
NOT
INVENTED,
WORDS WERE
PASSED
BY

POUNDING BRASS AND ALL WERE QUITE CONTENTED.

(with apologies to W.N. Shakespeare).



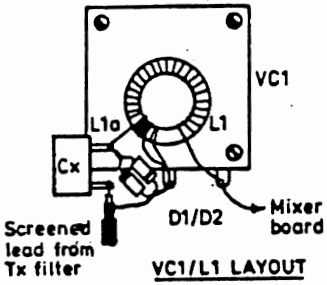
CONSTRUCTION

Fig. 2 RECEIVER MIXER BOARD LAYOUT

The layout for the mixer and audio pre-amplifier board is shown in Fig. 2. This board can either be a home etched printed circuit board or built on a matrix board. If the constructor has doubts about etching PCB board, 0.1 inch spacing perforated matrix board can be obtained. (This is rather like Veroboard except that it has no copper tracks.) The interconnections between the components can be made with copper wire on the underside of the board. The layout of Fig. 2 would suit either method of construction.

It is important that the dual gate MOSFET, which has four leads is connected the correct way. Early dual gate MOSFETS were fragile devices but this type is diode protected and has been wrongly connected and exposed to power by the author without damage. The device used by the author in all versions of this circuit has been the inexpensive substitute for the 40673, sold by J. Birkett (see any issue of S.W.M.). The board should present no problems in construction.

The most critical part of the mixer circuit is the input section which is external to the board. The transmitter described in Part I of the S.C.D. had filters which allowed operation on 80, 40 and 20 metres. An input circuit for LI/VCI which tuned all three of these bands was attempted, but with poor results; therefore values for two-band operation are given. The table of values for LI and VCI allow for operation on 80/40 metres or 40/20 metres. Although this limits the band capability of the transceiver, the result is simple construction, with options for 3 bands, two being available at any time . (incidentally, the prototype for the 40/20 metre coil also performed quite well on the I5 metre band.) It would be possible to switch two coils, but if this is attempted it is important to bear in mind that simple direct-conversion receivers are prone to cross modulation and broadcast breakthrough at the front-end, and switching must be very direct and screened leads must be used throughout.



VC1/L1 LAYOUT

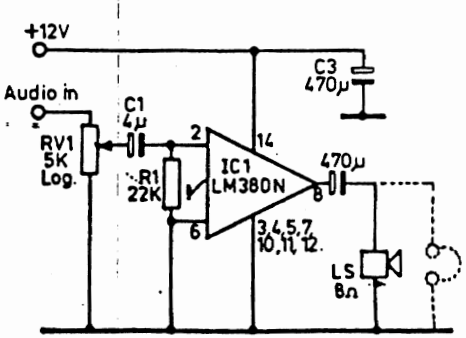


Fig.3 'S.C.D' AUDIO AMPLIFIER

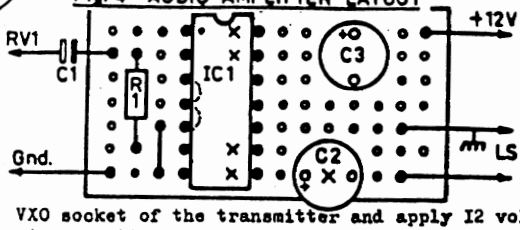
To eliminate the problems of breakthrough the construction of the Cx to VCI section must be carefully laid out, and the layout for the prototype is shown in the insert to Fig. 2. A screened lead brings the signal from the filter (output end of CIO on the transmitter) to Cx. The value of Cx is open to experimentation: try about IOOpF to begin. The problem is to allow a value high enough to obtain sufficient sensitivity for the receiver without leaving the front-end open to excessive breakthrough. Also bear in mind that Cx remains connected to the transmitter output the whole time and too large a value will result in unacceptable RF loss of the transmitter signal.

Fig. 2 shows that the layout around LI/VCI is tight. VCI is a 250pF value obtained from a 250+250pF solid dielectric broadcast radio tuning capacitor. This can be readily bought , but how much better to cull one from a scrap "Far East Wonder" transistor radio; The two small diodes DI and D2 should fit between the input lead to LIA and the earth screen which normally goes to the centre tag on such capacitors. The lead from the open end of VCI and LI should be as short as possible so the input end of the mixer board ought to be mounted as close as possible to VCI.

The oscillator injection for the mixer is taken from the oscillator on the transmitter board. The take-off point is the collector of TR2 on the transmitter board (junction of R4 and C5). A screened lead is used, the braiding being connected to the closest earthing point on the transmitter board. C8 is soldered to the mixer board using a short lead (i.e. shortening one of the capacitor leads). If the capacitor lead on the oscillator side of C8 is also shortened, it should be possible to connect the screen lead to the braiding of the screened lead to Cx. The audio pre-amplifier TR2 should present no problems and provide adequate drive for the LM38ON amplifier; it will also prove its usefulness when an audio filter is added to the receive section. The mixer section may be tested by connecting a pair of highimpedance headphones between the output of C7 and ground.

The audio amplifier board layout is shown in Fig. 4. The prototype was built of a piece of O.I inch matrix Veroboard, although PCB construction would be quite simple. ICI was soldered directly into the board, but the more cautious could use a I4-pin IC holder. The Veroboard layout is easy to follow: the important points are to remember the breads in the copper strips (made with a drill bit) between IC pins 3,4 and 5 underneath the board with a short piece of wire. This board may be tested before use, by connecting a loudspeaker and power, then a plying a "finger hum test" to CI. Screened leads in and out of VRI are useful but not vital. Some constructors express difficulty in mounting Veroboard because drilled holes cross or break the tracks; the easiest method is to hold them on the base with a little blob of putty such as Blutack.

Fig. 4 AUDIO AMPLIFIER LAYOUT



TESTING THE RECEIVE SECTION

When both boards have been completed the receive section is ready for test. Ensure that the inputs to Cx and C8 have been taken from the correct points, insert a suitable crystal in VXO socket of the transmitter and apply I2 volts to both transmitter and receiver sections.

The receiver front-end should be carefully tuned with VCI. It is vital that the tuned circuit VCI and LI resonate on exactly the required receive frequency. Detuning VCI far from the correct point also certainly result in the reception of unwanted signals. Simple direct-conversions although this can be a slight problem it can also be an aid to tuning up the receive front-end. The prototype showed some microphony and provided a very simple front-end tuning check. When VCI was exactly on tune, a tap on the case produced a slight 'pinging' sound in the audio output.

The sensitivity and inherent low noise of a simple direct-conversion receive should be apparent with the S.C.D. receive section. At this point the selectivity will be poor, but an audio filter can be added later. VRI is the only gain control and gain should be used sparingly, with headphones suggested rather than a loudspeaker for CW work. The S.C.D. is now ready for use as a simple transceiver.

The transmit/receive facility allowed by the use of DI and D2 will be enough to protect the front-end of the receiver with the key down. The rig can be used in this basic form without any switching at all-simply key to transmit. This is crude, but works with one evident difficulty: when keying loud thumps will come through on the audio signal. However at this basic stage, one can simply turn down the audio gain control, VRI. A more sophisticated transmit/receive arrangement will be added later.

Even with this form of operation the side-tone oscillator described in the first article on the S.C.D. can be used. The sidetone output from C2 of the sidetone circuit can be fed to pin 2 of ICI in the audio amplifier circuit. This will allow the keying to be monitored, the level being adjusted on the sidetone circuit board with VR2. This is far better than keying "deaf" or using the receiver thumps to monitor the Morse.

In this basic form the S.C.D. can provide many useful QSOs. The prototype has worked throughout the UK on 80 metres and into Europe on 40 metres, using 90 feet of wire tuned with a simple L-match ATU. The basic S.C.D. has also been used on 20 metres with one crystal available to work most of Europe, the east coast of the U.S.A. and one Asia contact in the shape of a UA9. All 20 metre contacts were with a simple dipole in a north-south plane over the roof of the G3RJV QTH.

The basic S.C.D. should be operated like any QRP transceiver. Avoid calling CQ, wait for stations to call on the frequency or call a station on frequency at the end of another QSO. Key carefully and not too fast - no one can be a bully with QRP; Try to avoid saying you are QRP until the other station has given his report, it often makes a difference in what report is given; Then wait for the compliments of the other station and feel smug.

Fig. 5 VFO TUNED CIRCUIT

VFO coils wound on Amidon formers					
L2	Wire	Former	TC1	VC2	Band
50 t	28swg	T50-2	50pF	50pF	80m
19 t	24swg	T50-2	200pF	50pF	40m

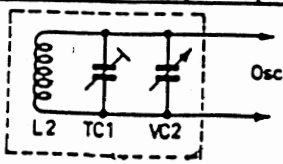


Table of Values
Fig. 1

R1 = 47K
R2 = 33K
R3 = 1K
R4, R7 = 4.7k
R5 = 220 ohms
R6 = 1.2M
C1, C8 = 100 pF
C2 = 25 µF elec.
C3 = 0,02 µF
C4 = 0.01 µF
C5, C7 = 0.22 µF
C6 = 100 µF elec.
TR1 = 40673 (*see text*)
TR2 = BC109
VC1 = 250 pF variable
L1, L1A = *see text*
D1, D2 = 1N914 or similar
Cx = *see text*

VFO Facility

Naturally, operating a crystal controlled or VXO controlled can be tedious at times and a QRP transmitter is all the better for full variable frequency operation. It is very easy to use the S.C.D. as a variable frequency transceiver provided that the limitations of such a simple design are taken into account. Sadly the simplicity of the system restricts the VFO operation to the lower frequency bands, but the addition is so simple as to be worth a try by any S.C.D. constructor.

The VXO circuit for the transmitter described in the first S.C.D. article is capable of variable frequency operation merely by the addition of a tuned circuit. A simple L/C circuit like the one shown in Fig.5 is used to replace X1 and VC1 in the gate circuit of TR1 of the transmitter. The principle is very simple, but the practice is prone to all VFO problems.

The tuned circuit arrangement of Fig.5 must be built into a sturdy screen box, with stout and direct short leads; a slow motion drive of the simple epicyclic type will be required for VC2. A solid plug-and-socket arrangement is used between the VFO box and the transmitter. Almost any type of solid two pin plug and socket will serve, the prototype used some two pin types which had languished in the G3RJV junk box for years. It is really advisable to have a direct plug and socket connection between the VFO box and the transmitter as leads will ask for instability trouble: the plug is best mounted on the VFO box and the socket on the transmitter front panel. The socket on the transmitter is wired between the top pin of the crystal socket (C1) and chassis.

The addition of the VFO is open to individual experimentation, part of the joy (and frustration) of a simple transceiver. The prototype had individual VFO boxes for 80 metres and 40 metres, which were plugged in for the band required. The values for the tuned circuit can be copied from the values suggested, found by experimentation, or pinched from any other good VFO circuit. As the addition is so simple, the best method is to try and see. The author attempted a VFO on 20 metres but failed to get basic stability and obtained unacceptable frequency shift on keying. It may be that other S.C.D. builders may have more luck - that is what simple equipment building is all about;

VFO Operation

And now for the bad news....In VFO operation with the prototype S.C.D. it was found that the input power usually had been reduced to prevent too much VFO frequency pulling. The setting up of the transmitter in the first part of the S.C.D. project described how to adjust the drive to the PA stage. In the VXO form, the author usually ran the transmitter with the Rx of the circuit as a direct short to the key. This amount of drive was found to pull the frequency of the VFO by an unacceptable amount when the transmitter was keyed. It is simple to check this by listening to the output on another receiver. Resetting the drive level can overcome this problem.

It is a simple matter to try low values of resistance in the Rx point of the circuit until the frequency shift is reduced to an acceptable level. The amount of shift must not be so wide that one is transmitting outside the audible bandpass of the receiver with the VFO control set in the same position. Any difference between the frequency of the VFO on transmit and receive can be checked by listening to the VFO on another receiver on transmit and receive. With a simple transceiver like this it is difficult to call a station exactly on the same frequency or zero beat, but practise will avoid annoying other operators or losing QSOs by being off-frequency.

It is quite possible to check the amount of frequency offset between transmit and receive by using a receiver. What is desired is to learn what the pitch of the other station's signal should sound like in order for the transmitter to be on his frequency. This ought to be very quickly learned after a few QSOs, even

without a check on another receiver (what may seem to be a problem has become second nature to many QRP transceiver operators who use a direct-conversion receiver and transmitter with a common oscillator). Another important factor is to remember to tune the band in the same direction each time, usually from low to higher frequencies, since the receiver will have a mirror image signal the other side of zero beat.

Receiver offset tuning will be aided in the next part of the S.C.D. project by the addition of Receiver Incremental Tuning. This will not only aid operation of the basic receiver, but be essential when audio filtering is used. Receiver Incremental Tuning, or RIT, will also prove its worth if much VFO operation is contemplated with the S.C.D.

The next part of the S.C.D. project will not only include the addition of RIT and an audio selectivity filter, but a SWR Bridge and an ATU idea that will enable the low power output to be used more effectively.

COLOUR CODE FOR RESISTORS.

I0ohm/I0R/brown black black.
I2ohm/I2R/brown red black.
I5ohm/I5R/brown green black.
I8ohm/I8R/brown grey black.
22ohm/22R/red red black.
27ohm/27R/red purple black.
33ohm/33R/orange orange black.
39ohm/39R/orange white black.
47ohm/47R/yellow purple black.
56ohm/ 56R/green blue black.
68ohm/68R/blue grey black.
82ohm/82R/grey red black.
I00ohm/I00R/brown black brown.
I20ohm/I20R/brown red brown.
I50ohm/I50R/brown green brown.
I80ohm/I80R/ brown grey brown.
220ohm/220R/red red brown.
270ohm/270R/red/purple brown.
330ohm/330R/orange orange brown.
390ohm/390R/orange white brown.
470ohm/470R/yellow purple brown.
560ohm/560R/green blue brown.
680ohm/680R/blue grey brown.
820ohm/820R/grey red brown.
Ik/Ik/brown black red.
I.2k/Ik2 brown red red.
I.5/Ik5/brown red red.
I.8k/Ik8/brown grey red.
2.2k/2k2/red red red.
2.7k/2k7/red purple red.
3.3k/3k3/orange orange red.
3.9k/3k3/orange white red.
4.7k/4k7/yellow purple red.
5.6k/5k6/green blue red.
6.8k/6k8/blue grey red.
8.2k/8k2/grey red red .
I0k/I0K/brown black orange.
I2k/I2k/brown red orange.
I5k/I5k/brown red orange.
I8k/I8k brown grey orange.
22k/22k/red red orange.
27k/27k/red purple orange.
33k/33k/orange orange orange.
39k/39k/orange white orange.
47k/47/yellow purple orange.
56k/56/green blue orange.
68k/68k/blue grey orange.
82k/82k/grey red orange.
I00k/I00k/brown black yellow.
I20k/I20k/brown red yellow.
I50k/I50k/brown green yellow.
I.80k/I80k/brown grey yellow.
220k/22ok/red red yellow.
270k/270k/red purple yellow .
330k/330k/orange orange yellow.
390k/390k/orange white yellow.
470k/470k/yellow purple yellow.
560k/560k/green blue yellow.
680k/680k/blue grey yellow.
820k/820k/grey red yellow.
Im/Im/brown black green.
I.2m/Im2brown red green.
I.5m/Im5/brown green brown.
I.8m/Im8/brown grey green.
2.2m/2m2/red red green.
2.7m/2m7/red purple green.
3.3m/3m3/orange orange green.
3.9m/3m9/orange white green.
4.7m/4m7/yellow purple green.
5.6m/6m6green blue green.

Some thoughts on 'S' meters.

What precisely is an 'S' meter? Well, all it is, is an extremely erratic, undependable instrument, used only too often when giving signal reports.

Years ago, someone mistakenly concluded that, because there are 9 'S' units on their Rx meters, and 9 graduations on the universal signal strength chart, that there must be some correlation between the two. .. Bulldust! There is none.

An 'S' meter, properly calibrated, is supposed to read S9 for an incoming signal of 50 microvolts. Some recent manufacturers have seen fit to set the level at 100 microvolts. This, of course, has no significance - it is similar to a car manufacturer installing a speedometer that will record 240 kph when the car can't exceed 180 kph.

The important thing to remember is that apparently no two meters will give the same reading on a given signal. Even the meters on two identical rigs made by the same manufacturer will vary. So I maintain that signal reports should not be based on the S meter readings, for the simple reason that they happen to be the least standardised item in your Ham shack, and cannot be depended on for an accurate measurement. If you bought a frequency meter or signal generator that was as inaccurate as your S meter, you would soon get rid of it.

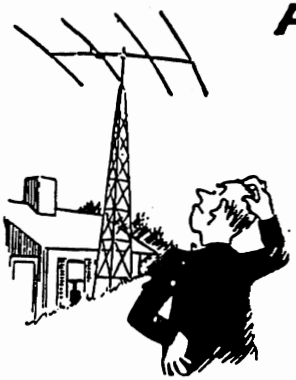
Let me refresh your memory with the accepted RST system of reporting:

S 1	Faint signal, barely perceptible.
S 2	Very weak signal.
S 3	Weak signal.
S 4	Fair signal.
S 5	Fairly good signal.
S 6	Good signal.
S 7	Moderately good signal.
S 8	Strong signal.
S 9	Extremely strong signal.

I am sure you will agree that there is nothing here to indicate any meter reading. The report is based on a personal judgment. Unfortunately, it has got out of hand, so much so that, if an incoming signal is only S 5 or S 6, the station operator is so embarrassed that he will tell the other station "Sorry, old man, you are showing only S 5 on the meter, but you sound S 9". Well, blow me down, then that's the report you should give him. Never mind what the silly S meter says. I am sure you have heard or worked stations perfectly readable or Q 5, with your S meter not even moving. True? How on earth can you give them a 0 report? Believe it or not, I have a few 5/0/9 reports in my logbook, given to me when working QRP. I would at least have to be heard at S 2 or S 3 to be Q 5. The most reliable way to give reports is by using the ears nature gave you, and use the RST system. Forget the S meter. Of course, S meters do have some use. A fairly useful application is when conducting tests with different antennas from the same station, or evaluating two different stations with similar equipment. So, please give a thought to the poor person on the other end. He may need your QSL card for an award, and the minimum report acceptable may be 3/2/9.

- - Rai VK7VV

ANTENNA FARMING



HOW TO ADJUST BEAM-ANTENNAS
ANOTHER WORLD

by Lew McCoy
WI ICP

The meat of this article should be (and hopefully is) about matching and adjusting beam antennas. That was what the bulk of my mail asked for. Again, the important tool for this job is the S.W.R. bridge. I already told you how to take a frequency run to determine resonance. Of course, the bridge is most important when it comes to getting a match.

There are countless methods for matching antennas-and beam antennas. To me the simplest, and the one that I have used the most, is the gamma match. Fig.3 shows the gamma match. I am probably going to oversimplify this explanation, but here goes. If you look at a dipole opened and fed at the center, the impedance is on the order of 70 ohms. If you take that same dipole and don't open the center but connect the center (ground it) to the boom of your antenna, the center of that grounded element could be said to be at zero impedance, or ground. As one moves out the element from the boom on one side, the impedance increases until it reaches maximum at the end (something probably on the order of 4000 ohms). For our gamma match we merely tap the gamma rod at or near the 50 ohm point. The gamma capacitor is used to tune out any reactance that is present. However, keep in mind that the impedance gamma-rod point can vary because of several factors. Our driven element is affected by the other element spacings and lenghts. The height of beam above ground is another controlling factor. In other words, no two beams are EXACTLY alike, and consequently, the matching point for the gamma rod and gamma capacitor can be different for each one. (otherwise, I wouldn't be writing this article;)

We find, therefore, that in the real world we would have to adjust every single beam for its particular location in order to obtain a perfect match. I should qualify that statement by saying that this isn't necessarily true for v.h.f. antennas. Such antennas can be manufactured so that they will provide an accurate match as long as they are installed in the clear and at least a few wavelengths above ground. But with the lower bands-10 on up through 40-the height above true ground is going to be different in each case. What follows naturally is the question, what about my commercially made beam, particularly with a triband beam where the height above true ground must be a compromise? I really cannot answer that except to say that the manufacturer builds his antenna and installs matching devices that hopefully will meet all of the different buyers' needs. Unfortunately, that is an impossible task, because no two beams go up to the same height, etc. In such a case there isn't a great deal that can be done about matching, because commercially made antennas have fixed matching sections and don't allow for adjment.

Getting back to our homemade beam and gamma matching, how about some general guidelines? That's easy. The gamma capacitor can be figured at 2 meter beam would require a variable capacitor of 14 pF maximum. For 10 metres, 70 pF should do the job. Receiver-type plate spacing, say 0.025, should be adequate for powers of 1kw. I usually insulate the capacitor by housing it in a plastic freezer box which I mount on the boom directly at the driven element

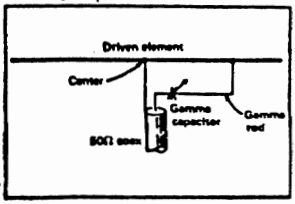


Fig. 3- Electrical circuit of a gamma match. Details are described in the text.

(I always use a ground-to-boom driven element.) Incidentally, I usually mount a coax fitting right on the plastic freezer box with a metal bracket to hold the fitting. The bracket is secured to the boom as close to the driven element as possible. This means the shield (outer coax conductor) is grounded right at the driven element. As to the gamma rod, I recomend an adjustable one if possible. Once you find the correct length, a fixed rod can be used. I have used $\frac{1}{4}$ to $\frac{1}{2}$ inch diameter aluminum tubing for the gamma rod spaced anywhere from 2 to 4 inches from the driven element. The spacing of the rod from the driven element and the diameter of the rod will, of course, depend on the frequency/band of the beam. For the 2 meter beam, my gamma rod was a piece of No. I2 wire spaced about I inch from the driven element. For I0 meters and lower, I would use $\frac{1}{4}$ to $\frac{1}{2}$ inch material.

I won't guarantee these figures, but a starting guess for gamma-rod point of attachment to the driven element is as follows: I0 meters, I0 inches from the center of the driven element; for I5, try 20 inches; and for 20, try 30 inches. I know these dimensions worked for me on a triband delta loop and on individual Yagis.

With an s.w.r. bridge in the line, feed enough power into the system to get a reading. I prefer installing the bridge right near the driven element for these tests. Switch the s.w.r. meter to read reflected power. Next, adjust both the gamma rod and gamma capacitor for a perfect match. It should be possible to get the s.w.r. bridge to a zero reading, indicating a I to I match. If not, move the gamma tap in or out and try again.

I should have mentioned that your rig should be set at the resonant frequency of the driven element. (Or it should be set at the frequency you THINK is resonant). A question that pops up is that of the beam being matched via the gamma on a different frequency? it so happens that his is possible with the gamma matching device. However, this isn't really important, because the point to keep in mind is that the beam IS matched to 50 ohms, plus the gamma won't work very far off frequency-at least not from my experience. Some purists may argue that the driven element must be exactly resonant, because by matching the antenna at resonance a lower s.w.r. across the band will result. This is true, but the problem is one of determining EXACT resonance of the beam. If you cut the beam elements to the formula lengths given in the handbooks, you should be close enough for all practical purposes. It would be nice if you could open the driven element and make a frequency run as described earlier, but as you can see, this is practically impossible.

TUNE THE ELEMENTS-OR NOT

Back in the late 40s when a lot of us were just discovering Yagi-type beams, there were countless discussions and arguments about tuning the beams (again, I am referring to I0 through 40, not v.h.f.). By tuning, I mean adjusting the element lengths and spacings for maximum gain or front-to-back. One thing most of us found out was that it was impossible to get any kind of meaningful results. If there was another amateur a mile or so away, it was possible to work back and forth adjusting beams, but such situations did not occur often. In any event, over the years and with the accumulation of much information, the handbook figures for element lengths have become very accurate. Therefore, save yourself the tears and headaches and just accept the figures.

If you want the best performance on v.h.f., however, then element adjusting for maximum gain is desirable. Here there is an advantage because it is possible to set up an antenna range over a short distnace-25 to 50 feet-that will

work. For descriptions of really accurate methods of adjusting and measuring beams, I would definitely bow to the experts who run v.h.f. and u.h.f. antenna gain contests. (By the way, CQ wouldn't mind receiving an article on that subject.) However, to tune a beam simply for maximum gain-not accurately, but satisfactory isn't that difficult. One easy method is to make a dipole (horizontal or vertical, as needed) and feed a small amount of power into the antenna. On 2 metres, for example, a low-power handheld will work. Mount the dipole about 25 feet or more away from the beam and at the same height as the beam. Using a short length of 50 ohm line, connect a receiver with an S-metre or signal indicator to the beam. A tunable absorption wavemeter would also work. You may have to play with the amount of signal being fed to the transmitting dipole to get it down to a level that is usable at the beam end. A resistor-divider network (pad) could be helpful here. Once you get the reading on the receiver to a usable range, then adjust the beam directors for maximum reading. (I am assuming, of course, that you built a beam with adjustable elements;) After you get maximum reading, rotate the beam so that the back is on the power source and adjust the reflector for minimum reading. Your beam should be fairly well tuned. Admittedly, this is a rather crude method, but it does work. More important, it will give you a feel for designing and adjusting your own beams.

There are a few more points I should mention. For one, always use the least amount of power possible in making any of the adjustments described. High power can give false readings in many ways. Always make sure you have good electrical connections, or false readings will result. The most important tool is your s.w.r. bridge; it provides you with visual indications. This is not to say that noise bridges are not good; they are just a little more difficult to interpret.

SOME CLOSING THOUGHTS

Study the available handbooks for matching methods. While I like the gamma system, there are many other good ones. I like the gamma because I am familiar with it, having used it to match grounded towers, verticals, and Lord knows what else-oh yes, a rain gutter, bed springs, and a wire fence; Bill Orr, W6SAI, describes another matching system similar to the gamma called the Omega match, which is supposed to be smoother to use than the gamma. It is described in any of his recent handbooks.

I hope this has been helpful and will provide the reader with some ideas of his or her own. My plan for a future issue of CQ is to describe some matching methods using toroids, particularly for single and multiband verticals.

Experimenting with antennas is a great deal of fun and can be very rewarding. Good luck;

BITS AND PIECES

A suggestion by Jeff VK5BJF (57) and supported by Len VK5ZF(I) is that our club management investigates the possibility of supplying members with logo stickers suitable for attaching to QSL cards for that special DX QSO or attaching to the front of our H/Brew gear to 'jazz up' the front panels ect. Stickers could be done in a couple of colours and background colour; and could be sold to members with a small profit to help with club funds. Will look into that (ed).

Len VK5ZF No I has produced a design for the club QSL card. Refer to page 18 March edition of Lo-Key. These cards are now available to reduce printing costs. Rai VK7VV No 3 has agreed to do all the artwork and setting up for the printer. He also will be responsible for the cutting and trimming of the cards on completion. This action has enabled the club to offer members a good quality low priced QSL card. Each print run will contain the artwork for four different call signs, producing 4000 cards, that means 1000 cards for each call sign. Orders for less than 1000 cards are therefore uneconomical for him to produce. But at the low price of $50-00 per thousand who cares.Hi. Drop Rai a line with your orders, and to save wasting your stamp include any other information that may be of interest to your fellow members for inclusion in September Lo-Key.

Your editor is always looking for suitable articles, circuits, ideas, and personal antidotes. As this is our own QRP mag dedicated to low power operating I believe we should be communicating with each other with this in mind, also, I would much prefer to use original ideas and circuits that you yourselves have developed. With this in mind, give the idea some thought. The committee will be awarding a certificate for the best (simplest?) published QRP project each quarter.
At the end of the year all entries submitted will be judged, and a certificate awarded.

AT the 1984 IARU Region I Conference, a resolution was passed,"JUNE 17th- will be proclaimed as a yearly HF QRP Day. Region I will take steps needed to get this day proclaimed as an International QRP DAY with the goal that all amateurs, world wide, use low power on that day of the year".
The CW OPS QRP CLUB Support the idea and declare JUNE 17th 1986 A SPEACIAL QRP ACTIVITY DAY. What a pity we did not hear of this in time to participate.

We owe a great deal to Len who as No 1 member and father of our present club has performed a rather remarkable achievement in holding this club together for the last year and a half.At considerable personal expense both in time and money almost single handed has organised and built up the club to what it is to day. Len rightly so is having a well earned rest from the club pressures, and should be heard by all and sunder working a bit of DX.
THANK YOU LEN.....

Club nets

Our club nets will be commencing July 9th, feed back from members indicate that possible a tuesday evening would suit most people, how ever if this proves not to be the case in practise, another day and time will be tried join in if you can and let the net controller know your prferances.

Blast off will be 8PM EST-1000Z on 3.615 subject to QRM on SSB QRO, preceded by a CW session QRP/QRP at 7.30PM EST-0940Z. 3.530

Neil VK3CGE No I9 will be the net controller, other times and frequencies can be tried, providing we have enough members willing to be net controllers to organise them as neither Neil or myself have a great deal of time to spare in this venture.

If you feel you have time on a regular basis discuss this with Neil or myself. Since the inception of our club I have considered club nets as a very important part to the overall concept of club friendship, and a natural way of keeping members up to date with club business, after all said and done what better way is there to try out that new home brew project or antenna system, and be able to discuss it with amateurs with the same bias towards low power operating.

Not to good on the old key? Don't worry you will find a sympathetic ear and kindly words of encouragment as well friendly advise when you participate with other members, so please keep the net in mind and support Neil as much as possible.

In the years to come, not to many I hope, when old SOL does the right thing and condition DX wise improve I hope to have a DX net on the HF bands so that we can involve our QRP friends overseas, however for the moment lets concentrate on making our local net a suodess.

Spent the last couple of months designing filters and tone decoders ect and now have a good working modem on RTTY, if anyone else out there is set up on RTTY or wants information on my system I will be only to pleased let them have it, and before anyone asks, YES, I am looking for RTTY/QRP QSO'S.

Well , that just about wraps up my effort, there will not be any prizes for the member who finds the most spelling, or grammatical errors in this issue, just keep in mind that it is my first attempt at this sort of thing I have enjoyed doing it, and promise to improve in the future.

THOUGHT FOR THE DAY. " Hand-sent morse is more basic than BASIC." (W3OA)

Over heard on 80m, " A bloke needs to be more of an archaeologist than service man to fix my old FT2oo.".

Over heard on 2m, "Well Jim my shack is just a house with sleeping accomodation".

73
RAI.
Lai

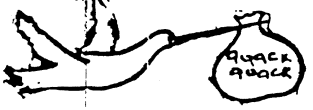
STATE ROUNDUP

VK5 STATE NEWS BY JEFF VK5BJF No 57 STATE CO-ORDINATOR.

There is some talk and a good deal of interest, by several of the VK5 gang on the revival of a net for members of our club. It is thought that once a month could be more appropriate than a weekly net. Those members who would like to chat more often can hold an informal rag chew on air as often as they like. It has been suggested that Saturday morning or Sunday morning might also be a good time to hold such a net, the way the 3.5mhz is crowded with nets daring the evenings. Anyway let us keep the pot boiling on this one and support the committee in re-establishing our net as soon as practical.
It is rumored here in VK5 that a signal signing the call VK5AKZ No 43 has been heard on the 7mh3 band testing. As the signals disappeared in a short space of time, we are not all that sure of our facts. If there is perhaps a grain of truth in this report, maybe we are about to hear Kevin make his appearance on this band. That will be great.
My spies inform me that Don VK5NDC No 75 has recently been heard contacting VK3 and ZL stations on 3.5 mhz band. Nice work Don, the sigs sounded terriffic Don is the proud owner of a brand new Heath kit HW9 QRP transceiver, which he has put together and has it working exceptionally well. He is on the look out for contacts with other club members, so please keep a look out for him.
It has come to my ears that Len VK5ZF No I (who is taking a rest from the admin side of the club), is hard at work in building up a little QRP rig (valve type). He will be on the air shortly running 5 watts of CW on 3.5, 7,I4, 2I, and 28 mhzs, and is hoping at long last to have some QSO's with other members. Further reports indicate that Len is also attempting to repair his old FT200 rig. Unbelievable;;
Speaking for myself, I have built up the 5 watt CW TX that Drew described in his H/Book. It works extremely well on IO mhz., and since I received the xtal for the band, I have really been active on this frequency.
In conclusion I have been working in to the USA on IO mhz of late and I am VERY KEEN to make contact with any of our 'State Side' members on IO megs QRP CW. Times around I2.30-I300 Utc. How about it gentlemen.
I ask all our VK5 members to let me know what you are doing QRP wise, so I can let our members know what is happening in the QRP world from South Australia.

VK3 STATE NEWS SUPPLIED BY NEIL VK3CGE No I9 STATE CO-ORDINATOR.

Neil reports that he is active around 0300utc over the weekends on 20 metres, also looking around for VK3CJG/P SSB around 0800Z on 7.072.
Graeme VK3BGH No 82 has been a busy boy working all bands looking for W.I.A. members, he must be very close to cracking the W.I.A. 75 QRP award.
Congratulations to you Fred EX VK3KGY No 52 now would you believe VK3CFK well done. That just about covers VK3 news except of course to wish Neil and his good wife our hearty congratulations on the arrival of Michelle Rose during Easter, well Neil when you get up at 3am to warm up the babies bottle you can always turn the rig on, never know what you might catch.



Should have been twins, here's the nextone.

MEMBERSHIP LIST 30/6/85

1 VK5ZF Len O'DONNELL 33 Lucas St., RICHMOND S.A. 5033
2 VK5OS Max BRUNGER 3 Durham Ave., LOCKLEYS S.A. 5032
3 VK7VV Rai TAYLOR 25 12th Ave., WEST MOONAH TAS 7009
4 VK2JAC A. CARTWRIGHT 10 Kent St., BELLAMBI N.S.W. 2518
5 VK2AKE Jim EDWARDS P.O. Box 385 BOWRAL N.S.W. 2576
6 RESIGNED
7 VK3BPG R. BEDFORD 45 Milne St., CRIBB POINT VIC. 3919
8 VK5BA Malcolm HASKARD Bassnet Rd., ONE TREE HILL S.A. 5114
9 VK6YW Peter WILKINSON 28 Marmion St., DONNYBROOK W.A. 6239
10 VK2KSA Stan BROOKS 2/10 Blight St., WOLLONGONG N.S.W. 2500
11 VK4BML M. LECA 5 Clement St., WOORIM, BRIBIE IS. QLD. 4507
12 VK3PEX J. ELLOITT 8 Queens St., ROSEDALE VIC. 3847
13 VK3BXA Eric ERVINE P.O. THOONA VIC 3726
14 VK4SF Jack FORD 222 Warwick Rd., CHURCHILL IPSWICH QLD. 4305
15 VK4RE Roy HILDRED P.O. Box 387 TOOWOOMBA QLD. 4350
16 VK5FN Marshall EMM G.P.O. Box 389 ADELAIDE S.A. 5001
17 VK5AZF Dave HALL P.O. Box 76 DAW PARK S.A. 5041
18 RESIGNED.
19 VK3 COENeil EMENY 1 Beaumont Crt., MONTROSE VIC. 3765
20 RESIGNED
21 VK2ECB Tony BADGER P.O. BOX 88 BROADMEADOW N.S.W. 2343
22 VK2BVH Brian HAPLIN 5 Carramer Cres., MIRANDA N.S.W. 2228
23 VK5NAI Clarence JOHNSON 18 Milton Ave., FULHAM GARDENS S.A. 5020
24 VK5VD Rob HUGHES 6 Park St., HYDE PARK S.A. 5061
25 VK6AHM Harold MOORE C/O P.O. LAVERTON W.A. 6440
26 VK3KII Gray WILSON 16 Newsom St., ASCOT VALE VIC. 3032
27 VK4APN Paul NEWMAN 22 Hamersley Circuit, ALEXANDRA HILLS QLD. 4161
28 VK6KRG R. GREEN 72 Yelverton St. South, DONNYBROOK W.A. 6239
29 VK2DJV Glyndwr Gibbings-Johns I44 Maitland St Bingara NSW 2404.

30 VK3CCE R. SOUTHWOOD 159 Wattletree Rd., MALVERN VIC. 3144
31 W5QJM Fred BONAVITA P.O. Box 12072, Capitol Station AUSTIN TEXAS 78711 U.S.A.
32 VK1FB Glen TORR P.O. Box E93, Queen Victoria Tce., A.C.T. 2600
33 VK5BVJ Murray JONES Pelican Point C/O P.O. CARPENTER ROCKS S.A. 5291
34 ZL1ATW Matt MEENAGH, 82 KEMP ROAD KERIKERI, BAY OF ISLANDS, NZ.

35 VK7NWK Wayne KELLY RSD 2322 Mountain River Rd., MOUNTAIN RIVER TAS. 7102
36 VK7JE Jerry SMUNTY Huon Rd., NEIKA TAS. 7102
37 VK7NRE Bob EDWARDS 205 Davey St., HOBART TAS 7000
38 VK7NAJ Arthur BLACKWELL KELLIE ELDERSIDE TAS 7400
39 VK7UP Geoff FRY 29 Latana Rd., RISDONVALE TAS 7016
40 VK7JK J. ROGERS 1 Darville Crt., BLACKMANS BAY TAS. 7152
41 VK2QB Leo PINKEVITCH 20 Cathrine St., KOTARA SOUTH N.S.W. 2288
42 VK7BZ Phil LOVETT 61 Lipscombe Ave., SANDY BAY TAS 7005
43 VK5AKZ Kevin ZIETZ 41 Tobruk Ave., ST MARYS S.A. 5042
44 ZL1BRK David STEWART 11 Kerry Dell HOWICK AUCKLAND NEW ZEALAND
45 VK3BMJ Col REID 16 Fyfe Ave., RINGWOOD VIC. 3134
46 KX6GO Walt MILLS P.O. Box 8387 A.P.O. SANFRANCISCO 96555 U.S.A.

47 VK3PLP Linsay LaPOUPLE 5/10 Gurner St., ST KILDA VIC. 3182
48 VK5ANL Norm LEE 25 Ralston St., NORTH ADELAIDE. S.A. 5006
49 VK3XU Drew DIAMOND 43 Boyana Cres., CROYDON VIC. 3136
50 G8PG/GW8PG Gus TAYLOR 37 Pickerville Road, GREASBY MERSEYSIDE, L49 3ND ENGLAND
51 WIA-L20944 C. POPE 17 Goode St., DUBBO N.S.W. 2830
52 VK3CFK Fred KOLB 6 Claronga Street, SOUTH OAKLEIGH VIC. 3167
53 VK7SA Maurie POTTER 19 Blessington St., SOUTH ARM TAS. 7022

54 VK6ATM T. MAITLAND P.O. Box 88 , WYALKATCHEM. W.A. 6485
55 VK4FAL Jim LYALL 8 Queen St., MARYBOROUGH. QLD. 4650
56 ZL3PM
57 VK5BJF Jeff WALLACE Box 344, CLARE. S.A. 5453
58 VK5AGP G. PHILLIS 413 The Terrace, PORT PIRIE. S.A. 5540
59 ZL2BJC Iain HILL 29 Holdsworth Ave., UPPER HUTT NEW ZEALAND
60 VK4AXA J. PETERSEN 181 Brisbane Rd., BOOVAL IPSWITCH QLD. 4304
61 VK5AWS W. STEPHENS 34 Threadgold St., PT. PIRIE. S.A. 5540
62 VE3JFH Ed SHIELDS 412 Talfourd St., SARNIA ONT. N7T IR6 CANADA
63 N7DGZ Bob BROWN 504 Channel View Drive, ANACORTES. W.A. 98221 U.S.A.
64 KA5IVA Louis SMITH 4013 S. Sandusky Ave., TULSA, OKLAHOMA 74135 U.S.A.
65 VK3OX Mark CAMPBELL 20 Bostock St., WARRNAMBOOL VIC. 3280
66 VK5PH Eric STEELE 13 Third St., MINLATON S.A. 5575
67 W6SKQ Bob SPIDELL 45020 N. Camolin Ave., LANCASTER CALIFORNIA 93534 U.S.A.
68 WB2OUQ David WERNER 68 Gordon Ave., LANCASTER. NEW YORK 14086 U.S.A.
69 VK7ZO Graham RANFT 3 Newlands Ave., LENAH VALLEY TAS. 7008
70 WA1JVY Mark PEREIRA 4633 Acushnet Ave., NEW BEDFORD MASSACHUSETTS 02745 U.S.A.
71 NW6F Bob JACOBS P.O. Box 2122 CAPISTRANO BEACH CALIFORNIA 92624 U.S.A.
72 VK2AW Basil DALE 20/112 Shirley Rd., WOLLSTONECRAFT N.S.W. 2065
73 YU3XL Krizanic KONRAD (RADO) Bezenskova CELJE 63000 YUGOSLAVIA
74 K7DAP Alan MacALEVY E660 Pickering Drive, SHELTON WASHINGTON 98584 U.S.A.
75 VK5NDC Don CALLOW 5 JOYCE St., GLENGOWRIE S.A. 5044
76 VK3CBO Rod ADAMS C/- Post Office, KIEWA. VIC. 3691.
77 VK3CPC Peter COOKE 44 Broadway ELWOOD VIC 3184
78 KV7X Jay STURDIVANT P.O. BOX 3027 BELLINGHAM WASHINGTON 98227 U.S.A.
79 SWL/ZL Mark DONALDSON P.O. Box 899 PAPAKURA NEW ZEALAND
80 VK6NQL P. SCALES B34 S.M.Q. PARABURDOO W.A. 6754
81 KA4LKH Barry STRICKLAND RT1 BOX 216 SYLVANIA ALABAMA 35988 U.S.A.
82 VK3BGH Graeme Harris C/O P.O. BOX I26 LILYDALE RINGWOOD VIC 3I40.
83 WB6MTR Winfred FRANKS 1001 Sylmar Space 107 CLOVIS, C.A. 93612 U.S.A.
84 VK3CIG Dick McINTOSH BOX 159 WHOROULY EAST VIC. 3735
85 VK3KQD Merv Quin I04 Lane Street Ballarat Vic. 3350
86 VK7RS Barry Risely I4 Mirunna Rd Lindisfarne Tas. 7015
87 VK7BS Brian Sampson 3I Joynton Avenue Lenah Valley Tas. 7008
88 VK7 NBN David Crotty C/O Australian Maritime College PO Box 708 Newnham Tas. 7248
89 VK2CWH Ted Daniels Wombat Hole Bylong Rd Rylstone NSW. 2849

Present unfinancial members, ,9,I3,I7,I8,20, ,23,24,26,27,30,3I,32,35 37 ,39,45,46,48,49, NOTE if you have a friend who has forgotten to renew amongst the above, give him a prod, he would of missed this issue of LO- Key.

WHO

Numbers of following members will need to renew before next Sept. issue. 50,56,57,59,60,6I,64,65,69.