March 1994 -- Issue No. 41

Lo-Key

The Journal of the CW Operators' QRP Club – Promoting Low Power CW Mode Communication and Homebrewing

INSTRUCTIONS FOR USING THE . . . .

"UNIVERSITY" SUPERTESTER

This instrument has been especially designed to provide a means of simply, speedily and efficiently testing all of the components which go to make up a radio receiver or amplifier. It is also extremely useful in the testing of electrical circuits and equipment. It combines the functions of a millammeter, D.C. voltmeter, A.C. voltmeter, output meter, ohmmeter, valve tester, paper and mica condenser tester, electrolytic condenser leakage tester and electrolytic condenser impedance tester.

The following instructions describe the method of using the vario orthodox manner, but there are many wider applications which will r comes more familiar with the instrument.

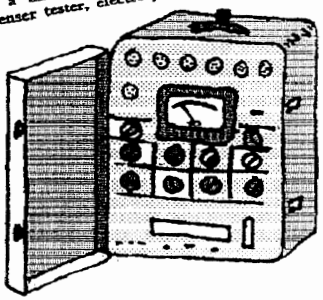
D.C. CURRENTS

ranges covered are 0-1 M.A., 0-5 M.A., 0-25 M.A. To take current mea- should be turned to to the

position whe The instrume milliamps.

D.C. VOLT

The ranges



'Supertester' - Eminently collectible !

Weighs nearly 20 lb. They don't make 'em like this any more ! **(See page 22)**

CONTENTS

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

2/3/94 e:\page\lk#41\lk#41.PM5 x0.75

By Kevin Zietz VK5AKZ #43
Treasurer & Membership Secretary
41 Tobruk Ave.
ST MARYS S.A. 5042 Australia

KEVIN'S KOMMENTS

If you receive an account with this issue it means that I have not yet (mid-February) received a response to your December '93 account. This is a reminder for OVER-DUE ANNUAL SUBS and other pro-rata adjustments to extend your membership to 31 December 1994. We bring everyone to this date mainly to make the budget estimates easier.

I have been kept very busy - even more than usual - due to family commitments and the FLOOD of club mail. It all seems to come at once !

If you find that information from me seems out of step with your financial (or other) records, please remember that there are often delays between the date we process payments, orders etc. and the date you receive Lo-Key. And items can 'cross in the post'. We make a big effort just before Lo-Key goes out, but there is much quarterly work for each issue and some correspondence has to be put aside during the last few days.

We don't have a large team - there is an editorial team of one and an accounting/records team of one ! By the way, my humble (Ed. - cheap) but faithful (Ed. - reliable) 9-pin printer takes more than 4 hours to print members' annual account forms. Still quicker than doing it manually !

On a more positive note, we are still seeing a significant number of new member applications & enquiries.

Australia Post Passes the Test ! Those of you who receive Lo-Key with the house number and street hand-written on your address label (because they are *Not For Publication*) will have noticed this was blank for the December issue.

We didn't overlook it in the rush, we were just testing Australia Post to see if they know where you live.

(If you believe this you'd believe anything !)

Would anyone who lost their radio shack or equipment in the January **bushfires in N.S.W.** please write and let us know about it.

Welcome To New Members ...

367	BV2BJ	Lai LARRY	TAIPEI	TAIWAN
377	VK2NBZ	Jack MARSH	PUNCH BOWL	New South Wales
378	VK5ANB	David GILES	MT GAMBIER	South Australia
379	VK3BC	Frank FELDMAN	McCRAE	Victoria

Enjoy your QRP; and if you have any queries don't hesitate to ask.

73 Kevin VK5AKZ

AWARDS AND CONTESTS

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

In greeting everyone for 1994, I am very pleased to say ***Thank You*** to those members, mostly 'recent joiners', who have 'had-a-go' at the recent Scrambles. Thank you for your participation and your notes saying that you enjoyed them.

It is the intention that Scrambles be friendly and not too rigid, but competitive. SCRAMBLE RULES are very simple and were printed in September 1993 Lo-Key #39 on page 9.

Question: Can anyone see any serious objection to scheduling Scrambles on some of the WARC bands later in the year?

Unfortunately I missed out publishing results in December Lo-Key, so here is a listing of recent Scrambles, except #34 (will be in next time):-

SCRAMBLE #31 80m 21 Oct 1993

1	**VK3BPG #7**	**Reg**	**46 pts**
2	**VK3AAM #224**	**Phil**	**39 "**
3	**VK5BLS #209**	**Barry**	**35 "**
4	VK4EV #130	Ron	31 "
5	VK2WES #162	Wes	30 "
6	VK2ACN #182	Alan	20 "
7	VK3ANP #125	David	10 "
8	VK3NEA #313	Alan	5 "

A really good night, this one and great to see Alan #313 in there.

SCRAMBLE #32 40m 25 Nov 1993

1	**VK2WES #162**	**Wes**	**15 pts**
2	**VK4EV #130**	**Ron**	**6 "**

It seems that bands other than 80 metres are not as popular. Anyway, thanks you two.

SCRAMBLE #33 80m 27 Jan 1994

1	**VK2EB #334**	**Shannon**	**17 pts**
2	**VK2WES #162**	**Wes**	**15 "**
3	**VK4EV #130**	**Ron**	**12 "**
4	VK3AAM #224	Phil	10 "

Admittedly not very well advertised, this one, but a fine effort from newcomer Shannon #334. Congratulations and hope to hear more of you.

SCRAMBLES FOR 2ND QUARTER 1994

#35 Wed March 16th
1030-1300 UTC
20m(14.010-14.070MHz)

#36 Thu April 14th
1030-1200 UTC
80m(3.500-3.535MHz)

#37 Wed May 4th
1030-1200 UTC
40m(7.000-7.035MHz)

MARK YOUR CALENDAR NOW

SPECIAL EVENT —**— SPECIAL EVENT —**— SPECIAL EVENT

June 14th each year is designated as **QRP DAY** in the AR fraternity.

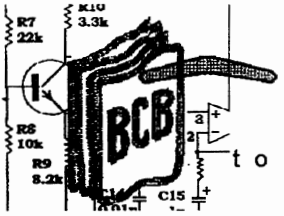
To celebrate this, to continue our thrust to promote interest in and use of the CW mode and to raise interest in the Club, we shall be holding a Special Competition on Saturday/Sunday 11th/12th June, 1994 and we ask all members to publicize the occasion and to do your best to take part.

Rules are printed opposite.

73, Ken **VK3DID #112**

BOOMERANG CIRCUIT BOOKS

Don Callow VK5AIL 5 Joyce St., Glengowrie SA 5044



Here are the BCB circulation lists. An asterisk * means that you will be sent all BCB's. The BCB is sent out when we get 5 or 6 members on its list. You pay the postage the next member (current rates are $2.65 interstate and $2.00 intrastate).

A double ** indicates the M.A.D. R.C. members who will be passing the B.C.B.'s from hand to hand. The numbers in brackets are from my records of 'who has seen what' - I have left names in even for 'repeats'.

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

BCB #2 - 6th flight
(mid March)

*Tom VK5TL
*Shannon VK2EB
*Alan VK3NEA
**Ross VK3ARC
**Alan VK3AUC
**Bob VK3BBI (2)
**Doug VK3CCY (2,3,4)
**Bob VK3DHV
**Joe VK3DJI
**Stewart VK3ESD
**Bill VK3AWC (3)

BCB #3 - 7th flight
(current):

*Daryl VK7DMJ
*Len VK4CWM
*Ron VK3MHM
*Doug VK3CCY
(and see 8th flight)
*Trevor VK5ATQ

BCB #3 - 8th flight
(when back from 7th)

**Ross VK3ARC
**Alan VK3AUC
**Bob VK3BBI (2)
**Doug VK3CCY (2,3,4)
**Bob VK3DHV
**Joe VK3DJI
**Stewart VK3ESD
**Bill VK3AWC
*Tom VK5TL
*Shannon VK2EB
Alan VK3NEA

BCB #4 - 5th flight
(early April)

*Tom VK5TL
*Trevor VK5ATQ
*Shannon VK2EB
*Alan VK3NEA
*Ron VK4EV
**Ross VK3ARC
**Alan VK3AUC
**Bob VK3BBI (2)
**Doug VK3CCY (2,3,4)
**Bob VK3DHV
**Joe VK3DJI
**Stewart VK3ESD
**Bill VK3AWC

QRP WEEKEND 1994 CONTEST RULES

Contest sponsored by the **CW Operators' QRP Club** Inc.
c/o Kevin Zietz, VK5AKZ, 41 Tobruk Ave., St Marys, SA 5042

1. **DATE:** Saturday/Sunday 11th/12th June 1994.

2. **TIME:** 0000 UTC Saturday to 0800 UTC Sunday.

3. **AREA:** VK, ZL, P29 Call Areas

4. **FREQUENCIES:** All normally recognized CW sections of 80/40/20/15/10 metre bands.

5. **BAND USAGE:** In order to spread interest and to reduce possible congestion, stations are asked to distribute their calling across bands using this guide:

On Hour = All Bands	Hour + 15 mins. = 40 metres
Hour + 30 mins. = 20 metres	Hour + 45 mins. = 15/10 metres

Stations should preferably call on recognized QRP Calling Frequencies (1.815, 3.530, 7.030, 14.060, 21.060 & 28.060 MHz), then QSY to a working frequency.

6. **CONTACT INFORMATION:** Contacts are to be logged with RST plus a 3 digit number commencing with 001 and incrementing by one digit for each contact.

7. **REPEAT CONTACTS:** In order to make greater use of available band space and time, repeat contacts with the same station will be allowed with a minimum of three (3) hours between subsequent contacts.

8. **SCORING:**

Contact with NON-DX stations	- score 1 point for QRO station;
	- score 5 points for QRP station.
Contact with DX stations	- score 10 points for QRO station;
	- score 20 points for QRP station.

Note: For this contest the definition of "DX" is any station outside the VK, ZL and P29 Call Areas.

9. **CERTIFICATES** will be awarded to the first three placegetters overall and to the highest scorers in each of New Zealand, the Australian States and Papua/New Guinea.

10. **GENERAL:**

Any station claiming to operate QRP *MUST NOT* exceed a maximum of 5 watts carrier power to the antenna and should sign with the /QRP suffix.

Logs showing contacts and points claimed should be sent to:-

Ron Everingham VK4EV

30 Hunter Street, EVERTON PARK, Queensland, 4053 Australia

not later than 14th July 1994.

FROM THE EDITOR'S DESK

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

We appreciate your appreciation ! Thankyou to members who have indicated their appreciation of Lo-Key by comments on air, face-to-face, on the 'phone or in letters. This is nice to hear and pleasing to pass on to all the authors and contributors who make Lo-Key what it is.

Without articles there wouldn't be a journal at all. *Without enough articles the June issue may turn out to be a little thinner than this one and have less technical content.* So if YOU are thinking about writing up your latest (or oldest) project or perhaps tell us something about your experiences on air, then -

NOW IS THE TIME TO DO IT !

If you have any papers relating to the **formation of the CW Ops QRP Club**, these are of historical interest to us and we would like to see them, at least for copying.

Sri Peter VK6BWI - I did not show you as author of the tip on Equipment Feet (how to make your own) in the 'Circuits and Shortcuits' column of December Lo-Key (page 23).

Jack VK2NBZ joined us after receiveing a complimentary copy of Lo-Key and wrote to say he is likely to modify his FT-7 for QRP (see page 20 of December Lo-Key - other articles are in our index).

"... Presently I am using a Homebrew bread-board setup which gives me 8W out on C.W. The Rx is an old Trio-9R-59DE (tube job). Gets me by. ..."

Last but not least. For the 'production helpers' (the Committee and anyone else will be welcomed), the scheduled evening for collating & enveloping June Lo-Key is Monday **June 6 1994**, so if you have an item for Lo-Key #42 please let me have it by the last week of May, preferably a month earlier if it is a technical article.

Best 72 *Don VK5AIL*

'Natter Net' Notes

By Steve Mahony VK5AIM #184
19 Kentish Rd.
ELIZABETH DOWNS S.A. 5113

Mid-December 1993 Report

Participant numbers have been down for October, November & December. This has been because of the heavy QRN, mainly static from lightning, on 80m.

Most reported that their 'S' meters were +20 over 9 most of the time. Even VK5 to VK5 contacts were difficult to copy on some nights when I was controller.

The change to Daylight Saving has not helped as propagation on the lower bands has not properly settled down even by 9.00pm in VK5 (9.30pm Eastern states), the earliest time the net would be likely to finish. Many have commented that they have not heard it so noisy on 80m before !

Maybe we ought to think about 7 MHz/40m although we would lose any Novices as they cannot operate on that band. Of course, on some evenings 40m is just as noisy as 80 !

On one or two evenings when QRN was acceptable we almost had an 'all states' roundup: VK's 2, 3, 4, 5, 6 & 7 were represented on the net - no VK's 8 or 9. We have only one VK8 member, Ian VK8CW, who is far to the north at Darwin. (One night early in February we were joined by a VK8 visitor, QTH Alice Springs, which was great - VK5AIL.)

I don't think we are alone with poor conditions on 80m -- 20m & 15m appear to be dead at times, and you might as well forget 10m !

Please come up and give 80m a try at Net times (see outside back cover), even if it is noisy, at least you'll have had a go ! On some of the noisy nights when I have been Net Controller I have closed the Net after an hour or so.

Further Thoughts - Mid-February 1994

Do you have any comments on ***this*** idea, worked out after discussions with John VK5JO ?

We are now considering a trial using 40m during the 1994/95 summer season. The Net would be on a suitable frequency (any suggestions ?) on 40m on the first Friday of each of the months November, December, January and February and would be on 80m on the other Friday nights.

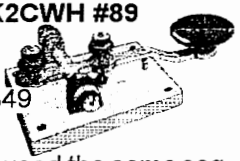
We should be able to enjoy better conditions and have some good contacts with all states. If anyone forgets and comes up on 80m, they won't find us - but if they try again the following week we will soon put them right !

Of course only those controllers with suitable equipment would be rostered for 40m. By the way, our roster has stations in VK2, VK3 and VK5 at present and I would be very pleased to hear from **YOU** if you would like to go onto the roster 4 or 5 times a year (or fewer if it suits you).

Let's know what YOU think.

CW Net News

By Ted Daniels VK2CWH #89
Wombat Hole,
Bylong Rd.,
Rylstone N.S.W. 2849



The move to 40 metres over January/February cannot be called an unqualified success !

The only members contacted over the period were: **VK2ERA Rob, ZL1ATN Matt, ZL1BYY George, VK3EZM Murray and VK3ERS Rob.**

It must be stated that, probably, no greater success would have been had on 80 metres, as noise was very bad over most of the period. Also, it was nice to contact our ZL contingent again.

The contact with Rob VK3ERS was only possible with Matt ZL1ATN QSP'ing ! Would this be the first time VK2/VK3 have worked ***long path*** from home QTH's ?!

Unfortunately, I used the same segment of 40 metres that I had used two years ago, but in the meantime that segment has come in for heavy use by Packet, RTTY etc. My apologies to any who tried to contact the Net but found that QRM made it impossible.

By the time this is in your hands the Net will be back on the old stamping ground on 80 metres (See details on page 32 - VK5AIL), so I hope to hear from lots of you there.

Regards and 72,
Ted.

CLUBTIVITIES

David Ponsonby VK7KDM #337 has done it again ! He went from SWL to VK7LDM before the September issue came out & has now upgraded and aims to give us another callsign amendment for the June issue.

Ron Steinfeld VK3WHM #274 has added just one 'dit' to his call - previously VK3MHM.

Bill Currie VK3AWC #255 is also a member of the **Moorabbin & District Radio Club.** (I'll bet they don't use the acronym **M.A.D.** for the club !)

Bill wrote to say that he knows of a number who are members of both clubs: **Doug VK3CCY, Alan VK3AUC, Bob VK3BBI, Bob VK3DHV, Joe VK3DJI, Stewart VK3ESD.**

More Packet Racket ! 4 new addresses:
Ben Koh
VK6XC@VK6ZSE.#PER.#WA.AUS.OC
David Waring
VK3ANP@VK2CPR.#SW.NSW.AUS.OC
Bruce Hunt
VK6XZ@VK6BBS.#PER.#WA.AUS.OC
Brenton Zerbe
VK5BZ@VKLZ.#ADL.#SA.AUS.OC

Tom van Andel VK7LF #368 is a new member who has recently upgraded from VK7JFK. *Good one, Tom !*

Tom sent us a prototype of his new QSL card (on which he shows our Club logo with his membership number) and mentioned: "Worked 9K2TC Kuwait on 5W QRP ssb, Got 57 rpt. Hi Hi. Who needs 400W??".

Who indeed !

The *Novisker* 80m QRP Transceiver

By: Ron Steinfeld VK3WHM #274

Introduction

As a newly licensed novice radio amateur, I faced the problem of obtaining my station equipment, most importantly a transceiver. Being an enthusiastic equipment builder, I decided to build my own. The band chosen was 80 meters, as equipment for this band is easier to build than for other bands and activity on the band is high (also, it is a novice band!).

This article details the resulting transceiver, for those in a similar position to the one I was in, or for anyone wishing to build a relatively simple and cheap, but good performing transceiver.

The transceiver was designed and built to allow a novice to go on the air and call CQ for the first time, hence the name NOVISKER, a slightly modified combination of the words 'Novice' and 'CQ'. The transceiver was designed with the major help of one book[1], to meet the following main requirements:

1) Full 80m VFO coverage (3.5 to 3.7MHz).
2) RIT control (range approx. +/- 1kHz).
3) Output power approx. 2W average into 50 ohms.
4) Good sensitivity and selectivity.
5) Low-impedance audio output to in-built 8 ohm speaker or headphones.
6) Sidetone Oscillator built in (able to be used as practice oscillator).
7) Easy to build and adjust.

Circuit Description

The following is a more detailed than usual description of the circuit, to allow the builder some insight into the circuit built.

This should give both more confidence and perhaps improve the constructor's ability to trouble-shoot it when it is built (Murphy will make sure that there *will* be some problems to trouble-shoot!). Some problems that I have encountered and solved will also be mentioned for this purpose.

The Rx is a Direct-Conversion type, designed for both CW and SSB reception, making the transceiver easily adaptable to DSB voice operation.

The **antenna signal is coupled** to the input tuned circuit by transformer T1, with a tuned secondary. The antenna's 50 ohms impedance is stepped up by the square of the turns ratio (in this case by 100) to preserve a relatively high 'Q' factor for the tuned circuit.

This is then coupled to the NE602A **product detector input** (pin 1, IC1) by C3/C4. The VFO signal is injected into pin 6 through an attenuating resistor R1, to lower the signal to a suitable level. IC1 receives power at pin 8 from a zener regulated supply. Capacitor C10 was added after it was found that a slight hum in the output originated from this stage. The large value of the capacitor, together with R2, form a low-pass filter to reject power-supply induced hum.

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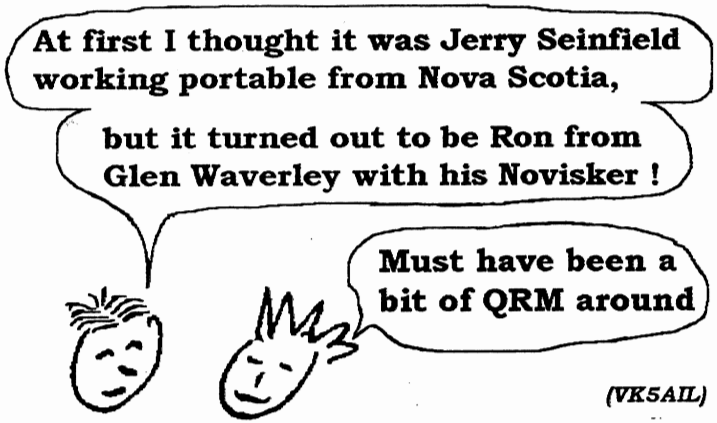

(VK5AIL)

Audio output from the product detector is taken from pins 4,5 and amplified by an **Op. Amp**. Differential amplifier giving a gain of approximately 25dB. The op-amp is biased at half the supply voltage by R8/R9, and this reference voltage is also used to bias IC7, while IC3 is directly biased from the output of IC6. Again, good filtering is used for the supply of the IC (R7,C70), both against hum and oscillations. The op. amp used as IC6 is a special low noise type. This was used in earlier experiments with lower product detector gains which made the noise figure of the audio preamp important. However, the presently used NE602A has a high gain (about 20dB), so a cheaper, noisier device can be used as IC6 with no decrease in sensitivity.

Following the preamp are the **low-pass filters** based on a TL084 Quad Op amp (IC3). Two op amps (IC3A,B) are used as a filter with cutoff at approx. 1kHz for CW reception, while the other two opamps are used as a filter with cutoff 2.5kHz for SSB reception. Bandwidth switch S2 selects either the SSB filter in 'Wide' mode, or the CW filter *cascaded with* the SSB filter in 'Narrow' mode. The SSB filter greatly sharpens up the rejection beyond 3kHz in 'Narrow' mode, thus increasing selectivity for CW reception. A lowpass filter was used for CW to enable easy tuning to zero beat (see Operation). As the filters have quite a low gain, another stage is used following them (IC7) with a gain of approx. 20dB. IC7 is powered by the same filtered source of IC3, and uses the bias voltage of IC6.

Transistor Q3 is used as a switch to **mute the Rx during transmit**. In Rx mode, the transistor is biased off, and appears as a very high resistance to the circuit, thus allowing the signal to pass to the volume control RV1 through R28/R29 almost unattenuated. In Tx mode, S1B switches +12V to the point Tx+12V, thus turning on Q3. This causes the collector-emitter resistance to be very low, and thus the signal is attenuated greatly through R28. Capacitors C75 and C22 were chosen to

soften up the muting to eliminate clicks (see 'Tx/Rx switching' for more details on click elimination).

The **Audio Power amplifier** is quite conventional based on an LM386 IC. Capacitors C76 and C77 were added to bypass the inputs of IC4 for stray RF. The DC supply of the IC is well filtered using R71 and C70. Originally, no filter was used and the circuit oscillated at high volume positions. DC bypassing is an excellent weapon against oscillations. Resistor R33 sets the gain of the LM386 to approx. 100 (40dB). Resistors R73/R72 attenuate the output signal to a level suitable for the MIC input of my tape recorder, for recording of the first QSO!

The VFO is a parallel tuned Colpitts type using a MPF106/2N5485 JFET. The supply voltage is regulated down to 8 volts using a 7808 regulator, which also powers the VFO buffer (Q9,Q10). The tuning capacitor is a small plastic type as sold by Dick Smith Electronics. The 60pF section is used for the VFO while the 160pF section broadly tunes the Rx input tuned circuit.

The **RIT** system is based on a BB119 varicap, tuned by pot. RV2 in Rx mode. During Tx, the varicap receives a constant bias voltage from R48/R49, approx. equivalent to a mid. setting of RV2. The tuning range is approx. +/- 1kHz with a tuning voltage range of 3 to 8 volts. The range was calculated as explained in my article in September Lo-Key.

Following the VFO is a two transistor **feedback buffer**. It has approx. unity gain (the gain equals the ratio R55/R53). The output of the buffer is about 2V pk-pk at the base of Q11. The buffer simultaneously drives both the Tx P.A. driver stage Q11 and the Rx NE602 detector.

The PA driver is a tuned class A amplifier, biased to about 30mA DC current. Trimmer cap. CV4 is tuned for maximum Tx Output power. Transformer T2 steps down the tuned circuit impedance to the low input impedance of the **P.A.** Q12, a conventional class C stage using a relatively cheap and readily available transistor 2N3019. Although a small heatsink for Q12 is advisable, I have found that the transistor is quite cool during operation, even without any heatsink. A small TO-39 flag heatsink from my junk box was used, just in case.

A simple **low-pass filter** follows the P.A. and was found to be satisfactory. The output was viewed with a high frequency oscilloscope and looked like a perfect sine wave with an amplitude of about 27V pk-pk into a 50 ohm dummy load (or 1.82 W).

Keying is achieved by switching the +12V supply to the PA driver stage, Q11. Transistor Q4 is used as a switch, turning on when the key is pressed. C30/R39 were chosen to shape the keyed RF rise and fall times to about 5ms. Transistor Q13 is another switch used to enable a 555 sidetone oscillator when the key is pressed. Switch S3 allows disconnection of Q4 from the key to allow the use of the sidetone oscillator as a **morse sending practice oscillator** without actually transmitting power (to practice for an upgrade from novice to full licence!).

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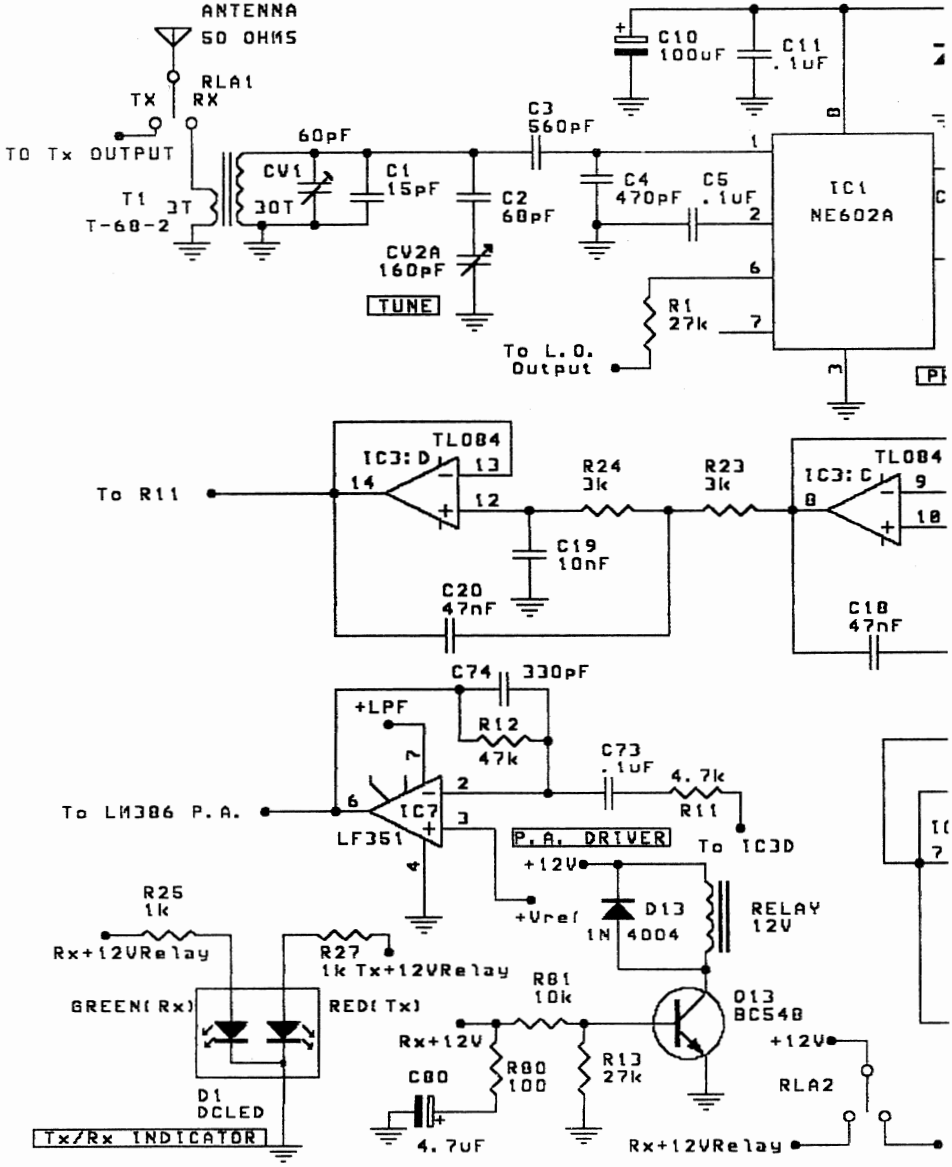
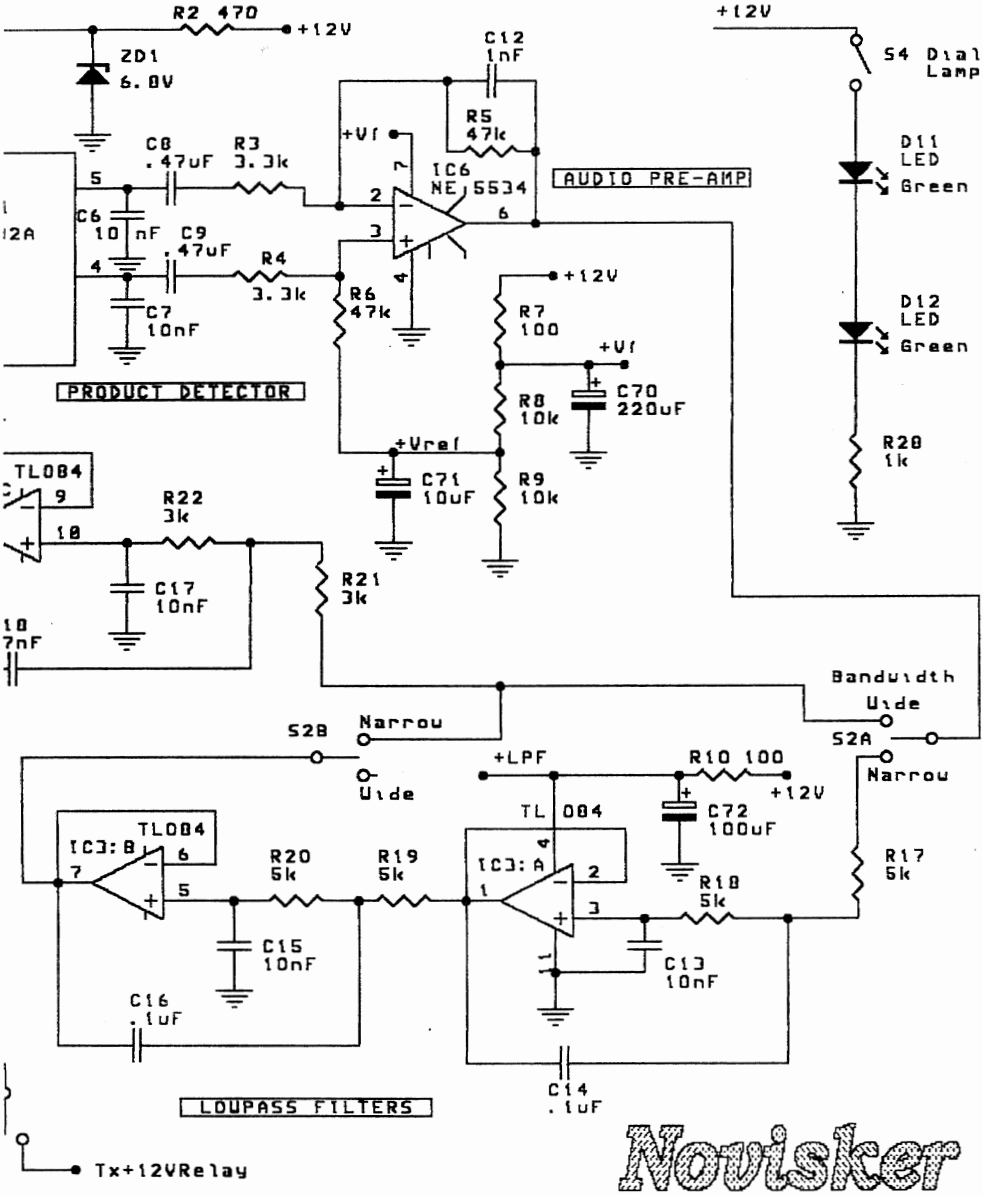

ANTENNA
50 OHMS
RLA1
TX
RX
TO Tx OUTPUT
T1
T-68-2
3T
30T
60pF
CV1
C1
15pF
C2
68pF
C3
560pF
C4
470pF
C5
.1uF
CV2A
160pF
TUNE
C10
100uF
C11
.1uF
IC1
NE602A
R1
27k
To L.O.
Output
To R11
TL084
IC3:D
IC3:C
R24
3k
R23
3k
C19
10nF
C20
47nF
C18
47nF
C74
330pF
+LPF
R12
47k
C73
.1uF
4.7k
R11
To LM386 P.A.
IC7
LF351
P.A. DRIVER
To IC3D
+12V
+Vref
D13
1N 4004
RELAY
12V
R25
1k
Rx+12VRelay
R27
1k Tx+12VRelay
GREEN(Rx)
RED(Tx)
D1
DCLED
Tx/Rx INDICATOR
R81
10k
Q13
BC548
Rx+12V
R80
100
R13
27k
C80
4.7uF
+12V
RLA2
Rx+12VRelay



Novisker

Continued over ...

The **sidetone output** is taken from C28 giving a more pleasant triangular-like waveform instead of a harsh sounding rectangular wave. This is fed to pin 2 of the LM386, through an attenuating resistor R31. Transistor Q5 and R41 can be eliminated and R31 connected directly to C28 if required since buffering is no longer needed (earlier in the development the loading was greater on capacitor C28). The sidetone volume is independent of the setting of the volume control and can be adjusted by R31 and R32.

The P.A. output is rectified by D10 and measured by a small junk-box **meter to monitor the output**. Different meters can be used by changing the value of R63.

The whole transceiver is powered by an **external 12V power supply**, which only needs to supply a maximum current of about 350mA during key-down periods. While not shown on the schematic, a power switch was also fitted to the prototype.

Tx/Rx Switching

Originally, Tx/Rx switching was done simply with a DPDT toggle switch. One pole was used to switch the antenna, while the other pole switched +12V to provide the Rx+12V and Tx+12V rails used for muting, RIT, and LED indicator (A Dual-Colour common cathode LED was used and is a very neat Tx/Rx indicator).

However, this arrangement yielded very loud clicks when switching from Rx to Tx, making it impossible to use headphones without extreme discomfort (and some hearing loss! Hi!). The main cause of these clicks was found to be mechanical switching noise at the receiver input. This noise was amplified by the whole gain of the Rx and appeared *before* the muting circuit has been fully activated (when switching back from Tx to Rx, the noise appeared before the muting has lifted, and so was not heard).

The solution was to use **electronically controlled antenna switching** and *delay* the antenna switching from Rx to Tx until the muting is fully on so that the clicks will be muted. A junk-box DPDT relay was used for this purpose, driven by transistor Q13, which is fed by the Rx+12V line from the toggle switch. When switching to Rx, the transistor immediately turns on and activates the relay to switch the antenna to the receiver, also charging capacitor C80. When switching to Tx, the +12V suddenly disappears from Rx+12V but C80 delays the switch-off of Q13 and the relay for about 100ms or so, allowing the muting to turn on, meanwhile.

This arrangement has provided a completely click-free switching system, which is comfortable to operate.

Construction and Adjustment

The 'Novisker' is relatively straightforward to build and get going. The prototype was built on a double-sided PCB, one side containing the tracks, and the other (the component side) serving as a ground plane. However, by the time it was finished with all the improvements, there were just about as many components on the track side

as on the groundplane side of the board!

Due to the many changes, the PCB is not presented here. I would suggest building the transceiver using **'ugly construction'** as explained in the ARRL handbook[2]. In this type of construction the circuit is built directly on a ground plane (using a single sided blank PCB). I am currently working on a project using this technique and find it excellent. It is not difficult and saves a lot of time that it takes even to make a PCB, let alone design it as well.

The suggested order of construction/Adjustment:

1) Build the VFO, preferably in its own shielded box (which can be made from PCB material) and get it operating, together with the RIT and buffer.

The frequency range is adjusted by setting the tuning capacitor CV2 to maximum capacitance and adjusting CV3 for a frequency of a few kHz under 3.5MHz. Tune CV2 to minimum capacitance and confirm the output to be a few kHz above 3.7MHz. The frequency can also be trimmed by squeezing or spreading the turns of L1 on the toroid.

Following calibration, stick L1 rigidly to the board using a suitable glue. I used a clear balsa wood glue purchased from a hobby shop. Any mechanical movement of the coil will shift the frequency significantly, so it is important to fix the coil well.

The VFO output should be 2Vpk-pk. Also check that the RIT shifts the frequency approx. +/- 1kHz during Rx compared to the Tx frequency. Mark on the front panel the position of the RIT control which gives the same VFO frequency as in Tx mode.

2) Build the Rx, adjust CV2 for maximum audio output when receiving a signal around 3.6MHz.

Use shielded audio cable for all audio wiring and ground the shield braid. I recommend grounding the volume pot's case too, to reduce any possible hum. The prototype is completely free of hum, after implementing these precautions. I also used audio shielded cable for all RF wiring as it is much easier to work with (and cheaper) than coaxial cables.

3) Build the Tx, including sidetone and Tx/Rx switching. Adjust CV4 for maximum RF output into a 50 ohm dummy load (e.g. two 100ohm 1W resistors in parallel) - should be about 27V pk-pk.

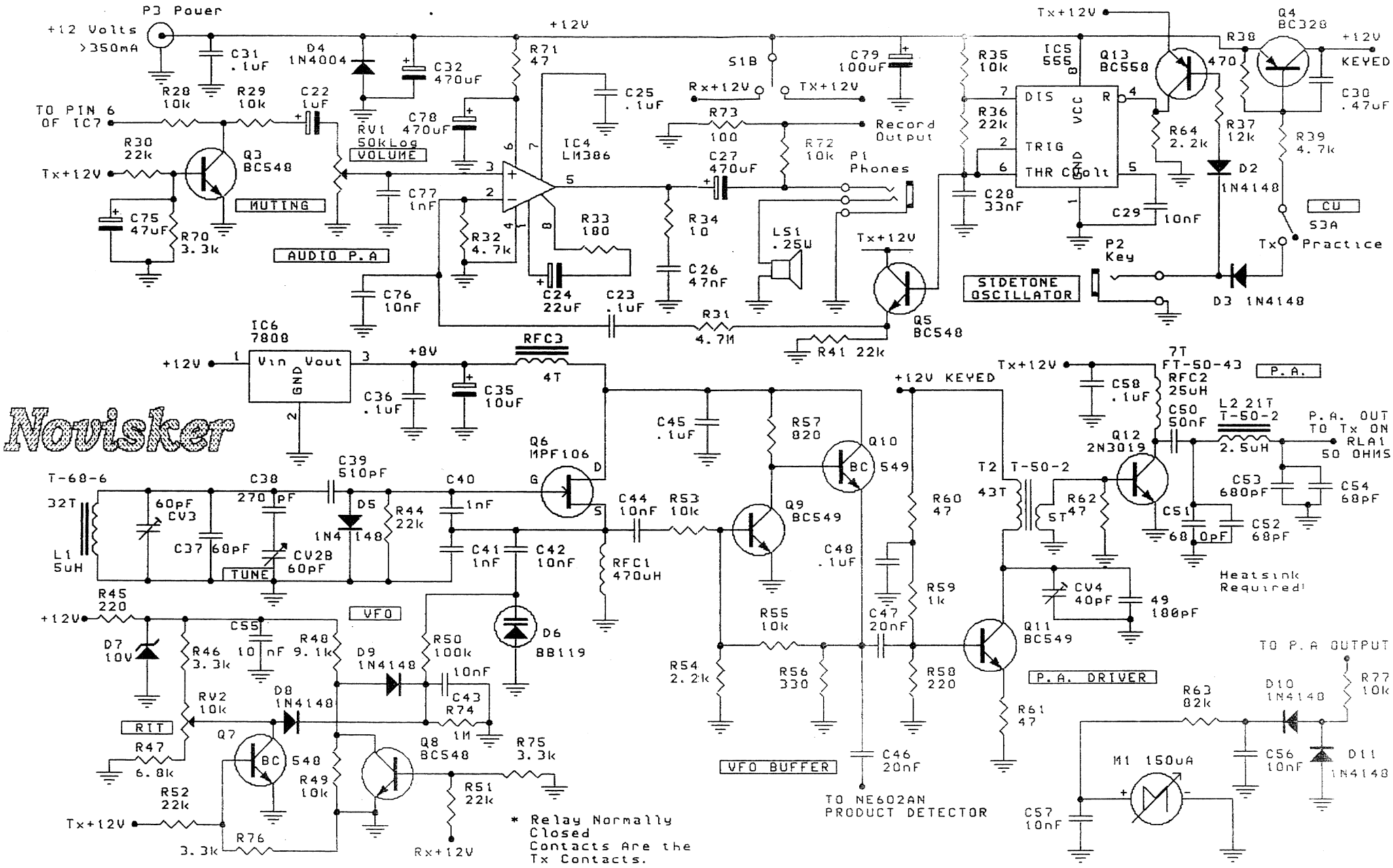
I constructed a mechanical reduction drive and dial using junk-box parts salvaged from an old broadcast radio. This was a conventional arrangement with a small shaft turning a large wheel fitted to the tuning capacitor's rotor via a loop of string moving past a short straight dial, a piece of plastic glued to the string serving as the tuning pointer.

However, having used the receiver for some time without any reduction, using a large knob attached directly to the cap. rotor, I found it quite satisfactory, and stations were not difficult to tune. This approach could be used permanently, and saves a lot of time and effort building the mechanical assembly (and doesn't require special junk-box parts).

For useful **troubleshooting** information, refer to References 1 and 2. ***and be patient!***

Continued over ...

The *Novisker* (continued) ...



Continued over ...

Operation

Following my use of the transceiver for some months, I can offer some operating hints.

When **tuning to a calling CW station**, set the RIT control to the marked position (Rx freq. = Tx freq.) and use the main tune control to tune the signal to zero beat. Then use the RIT to tune either up or down in order to hear your preferred tone. This will ensure that you will be transmitting on the other station's frequency. Often it will be possible to avoid QRM by tuning to a particular side of zero beat, so always try both to see which one is better, if troubled by QRM.

When **receiving SSB transmissions**, the narrow filter position is often helpful in eliminating QRM while retaining most of the intelligibility, but a wide filter makes the voice sound much more natural.

For CW, use the narrow position always, since there is no advantage in a wide filter.

So this is the 'Novisker' transceiver. Building and refining it has given me a lot of experience to tackle other, perhaps more challenging projects, as well as providing me with my first transceiver. I hope it will help other members in a similar way.

References

1. 'Solid State Design for the Radio Amateur'
By W.Hayward and D.DeMaw, 1986, ARRL.
2. 'The ARRL Handbook for the Radio Amateur'
1989 Edition, ARRL.

For information regarding 'Ugly Construction', see page 24-11.

INCORPORATION UPDATE

We are pleased to advise that the first Management Committee of the incorporated club has been appointed in accordance with sub-rule 9.4 of our Club Rules (constitution). The first formal meeting will have been held just before this issue of Lo-Key is posted (the committee will be collating and enveloping Lo-Key on the night of the meeting !).

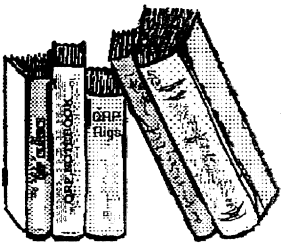
The members are:

Barry Samuel VK5BLS
Brenton Zerbe VK5BZ
Don Callow VK5AIL
John Bishop VK5JO
Kevin Zietz VK5AKZ
Steve Mahony VK5AIM
Trevor Quick VK5ATQ

The committee at the time of incorporation comprised Kevin VK5AKZ, Treasurer and Membership Secretary, and Don VK5AIL, Editor of Lo-Key. The third position, Organiser, had been kept vacant pending incorporation.

LOOKING FOR QRP BOOKS ?

(Many homebrewers are !)



The new **DAYCOM** catalogue for Summer 1994 (which was an insert in ***Amateur Radio Action*** magazine, December 1993 issue) has a special section for QRP books .

Daycom Communications is located at 37A Fenton St., HUNTINGDALE Victoria 3166. Telephone (03) 543 6444 & FAX (03) 543 6386.

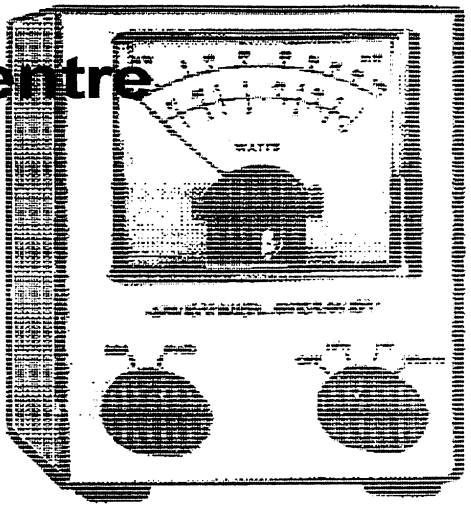
Here are the titles, with prices and order codes:

BR323	QRP Classics	1st Ed.	ARRL	$32.00
BR441	G-QRP Circuit Handbook	1983	G-QRP Club	$31.00
BR10	Your QRP Operating Companion	1st Ed.	ARRL	$16.00
BR452	G-QRP Antenna Handbook	1st Ed.	G-QRP Club	$22.50
BR170	QRP Notebook (Doug DeMaw W1FB)	2nd Ed.	ARRL	$26.00

If you are a member of the Wireless Institute of Australia you can get these through WIA Divisional Bookshops for the same prices (the same order codes are used). See inside back cover of January 1994 ***Amateur Radio***.

QRP Kit-Set Centre

By Don Callow VK5AIL
5 Joyce St., Glengowrie S.A. 5044
Tel. (08) 295 8112 day/night



Prices & Conditions

See list in September Lo-Key #39 and additions & changes in later issues.

Bonus Bits - A Reminder

Some members forget to add Bonus Bits to their orders. These are extras at no cost - see September Lo-Key #39 for the 'rules' and Lo-Key's #39 and #40 for the list.

VN88AF Case Styles

Most orders for VN88AF MOSFET transistors are now being supplied in TO-220AB case styles, in lieu of the more common TO-202.

THE LEAD PATTERNS ARE DIFFERENT. Data sheets show only the TO-202. From left to right:

TO-202	S	G	D	(Tab = D)
TO220AB	G	D	S	(Tab = D)

See Fig. 2 in the article on MOSFET PA's in this Lo-Key.

The obvious way out of this, if the PCB layout is designed for TO-202, is to carefully and smoothly bend the TO-220 leads to suit. By rotating the transistor a few degrees around the bolt the Gate and Drain line up quite well, but this necessitates taking the Source lead the 'long way round'. You may choose to solder a suitable piece of wire to the Source pad on the PCB, effectively increasing the length of this lead.

Lo-Price Lo-Key !

Would you like to collect a full set of Lo-Key's ? It's hard (costly) to get a complete Lo-Key set these days, especially if you are a new member. So this should help you ...

To make it easier (cheaper) we will accept orders **received up to 30 March '94 at a special reduced price of $A 15.00 for 10 issues**, plus the usual $4.00 for postage/packaging. *You must order in sets of 10, otherwise the normal prices apply.*

If you are a DX member, you should send $A 23.00 or, if you prefer, send $US 18.00. (You get an extra two weeks to place your order.)

By the way, prices of all orders received after December '93 Lo-Key was posted are being adjusted, so no-one has missed out through placing an order a few days too soon.

The idea is to do a single 'printing' run for each issue, hence the need to get all orders in by a deadline. Also, there is a jump in postal charges for packages containing more than about ten Lo-Key's.

MORE 'BE QUICK' SPECIALS:

NE612AN with data for $4.60 each

Most Rx builders seem to prefer the NE602AN to the NE612AN, although there is **very** little difference between them.

To move the last of the NE612AN's into ***YOUR*** Rx they have been dropped in price from $5.60 to only **$4.60 each** (including 6 pages of data per order).

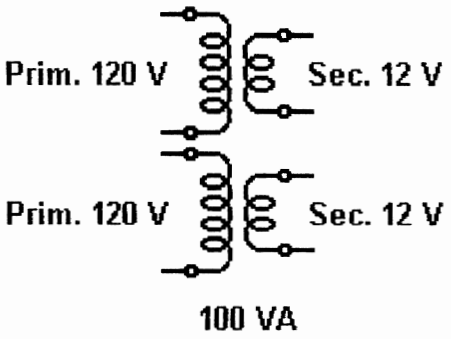
Even if you are going to stick with the NE602 for operations, why not buy a couple of NE612's for preliminary testing etc. ?

100VA Toroidal Tranx for $23 each

These are RS 208-838 100VA units (new, in individual cartons). Each has two separate 50 VA pairs of 120V primary & 12V secondary.

You can connect the primaries in series for 240V mains supply and connect the secondaries in series for **24V AC output at over 4A** (or in parallel for 12V output at 8A).

You would normally expect to pay about $60 for these, plus freight if applicable. They weigh apx 1150g (2-1/2 pounds) in the carton, but we will charge only the normal P/P of $4 per order.



Weller soldering iron tips $5 each

These are cone shaped tips for use with the popular Weller WTCPN soldering station. They are new - and are only about half of the normal retail list price:

PTA-8 1.6mm screwdriver point
PTF-7 0.8mm flat point
PTH-7 0.8mm screwdriver point.

There is very little practical difference between these shapes - I need a magnifying glass to tell the difference.

There is also one barrel nut for $7 (which is also about half normal retail price).

NEW ITEMS:

Acetal rod

C113 300mm length for $1.50
Acetal rod 8mm (5/16") diam.
Dielectric for coil formers etc.
Colour: black.

Acetal is a plastic insulating material which is exceptionally easy to work and provides an ideal stock for manufacture of coil formers and shafts or extensions. It is very tolerant of machining and cutting - a joy to work !

It does not take well to ordinary adhesives, but with careful surface cleaning and preparation, ©Araldite is recommended.

Those of you who have purchased our Club Communicator kits will recognise it as the material used for the VFO coil former.

Donated Books ...

... Thanks to John VK3CVF

QRP Equipment ($8)
Edited by Drew Diamond VK3XU
This is a bound selection of QRP projects and tips.

G-QRP Club Circuit Handbook ($13)
Compiled by Rev. George Dobbs G3RJV
This is an approved version produced by Rai Taylor VK7VV #3.

Both of these books were produced in the mid-1980's and are in excellent condition. The prices are in brackets and **include postage** within VK. There is only one of each, so speed is essential.

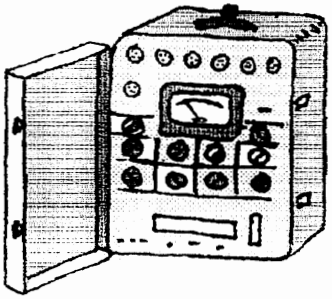
Donated Gear ...

... Thanks to Leith VK5LG

Why not take the opportunity and **make an offer** for one or both of these items ? (By the end of March, please.)

'University' Supertester Model T.S.T.

A stated on the cover this is collectible - but it is also useful, particularly if you are a valve 'fiend'. Probably late 40's vintage. Complete with instructions. See sketch above and on the cover.



It's not a 'pocket tester' - it weighs 19 lb 1 oz (plus packaging) - dimensions 14-3/8" x 11-7/8" front panel x 7" deep (metric 8.647 kg and 365 x 300 x 180 don't do it justice).

You are responsible for the cost and risk of transport. If you have to use ordinary Australia Post parcel post it should be in the range $15 to $45, depending where you are.

We are not concerned about the revenue from this, but Leith would like to see it go to a good home.

Brass Morse Key

This is a brass homebrewed key, very well made, in the style of the 'Post Office' pattern keys. The base is of 5-ply and could easily be upgraded to make a very attractive key.

Please allow $4 in your offer for postage.

U.S. Coast Guard Ends Morse Code

The United States Coast Guard has closed down its Morse Code operations on 500 kHz. The final CW transmission ended an era at 0000 UT on 31 July 1993, according to the **W5YI Report**.

Coast Guard operators first began listening for distress signals on 500 kHz at the turn of the century. The Service set up its permanent station almost 70 years ago, to monitor 500 kHz on a continuous basis.

Officials said the advent of satellite communications and digital technology had made Morse obsolete on the high seas.

(From **Amateur Radio** *Dec 1993 p.7.)*

Circuits and Shortcuits

A tip from **Wes Tyler VK2WES** for those who make their own circuit boards:-

Because the "Dalo" resist pen is not ideal for fine lines I use a Staedtler Lumograph waterproof pen, as used for producing overhead projection slides.

They are very easy to control with a very positive and precise flow. Point width can come down as low as 0.5 mm. 318WP4 is a useful pen from series F (F is fine) with a width of 0.6 mm.

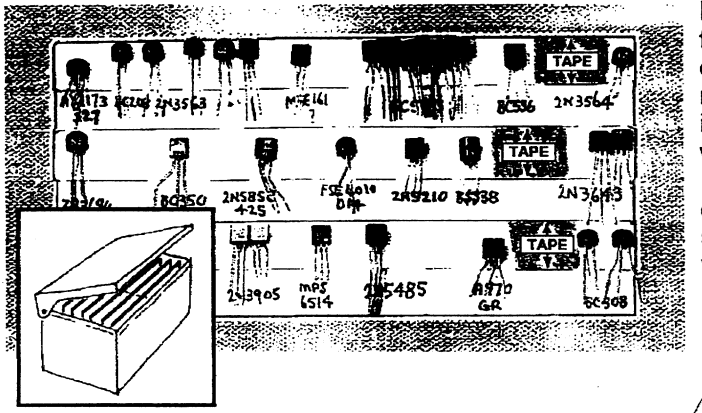
p.s. See 'QRP Classics' page 19.

(Available from stationers and art shops, rather than newsagents. -VK5AIL)

The late **Max Brunger VK5OS #2** was very neat in storing small components:-

Max used double-sided sticky tape on card to store small plastic and metal case transistors, voltage regulator IC's, SCR's etc. This works well for small quantities of 'odd' or salvaged units. The scheme works well for TO-92, TO-126, TO-220 plastic and TO-72, TO-39 metal cases, for example.

The tape is stuck on card stock cut small enough to drop into a shallow box. These cards can be stood on edge in a deep box (e.g. the ubiquitous Ferrero Rocher truffle box); then the required card can be removed without lifting others out of the way.

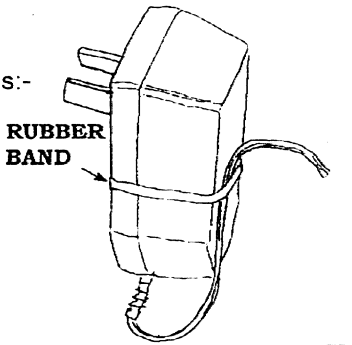


Keep the leads clear of the adhesive surface, otherwise you may have a problem running solder onto them.

To avoid premature failure of plug-pack leads:-

I use a strong, wide rubber band - or couple of turns of a thin band - around the body. This has enough give to allow the cord to move without the risk of a sharp bend as can occur with most strain relief fittings (where the cord enters the plug-pack). If it comes loose, just reposition it.

(Don VK5AIL)



MOSFET PA POWER OUTPUT

A wander through part of the 'Club Communicator' PA circuit

By Don Callow VK5AIL #75

My own 'Club Communicator' QRP CW transmitter has operated for years quite successfully with a power output of around 2 to 2-1/2 watts, although I knew that 4 watts or more should be achievable. The low power was no doubt due to my lack of RF construction and tuning experience at the time I built it, rather than any problem with the original design of the transmitter, which was the 'baby' of Rod Green VK6KRG #28 (about 50 have been produced in kit-set form).

Last year I found (made) time and did some tests with the aims of:

- *Lifting output power by tuning and/or by no more than slight changes to the original circuit; and*
- *Learning something about MOSFET PA's.*

The Club Communicator PA uses a single VN88AF MOSFET driven by pulses from a 4049 CMOS. See Fig. 1: Club Communicator PA Circuit Diagram (part only) taken from the kit-set manual. Articles describing the Club Communicator have appeared in Lo-Key #14 June 1987 p.21 and the W.I.A.'s Amateur Radio magazine March 1988 p.13.

Here are some brief notes on:

- *What I did*
- *Why*
- *The Results*

in the hope that this will be useful to others and encourage more work on this type of PA.

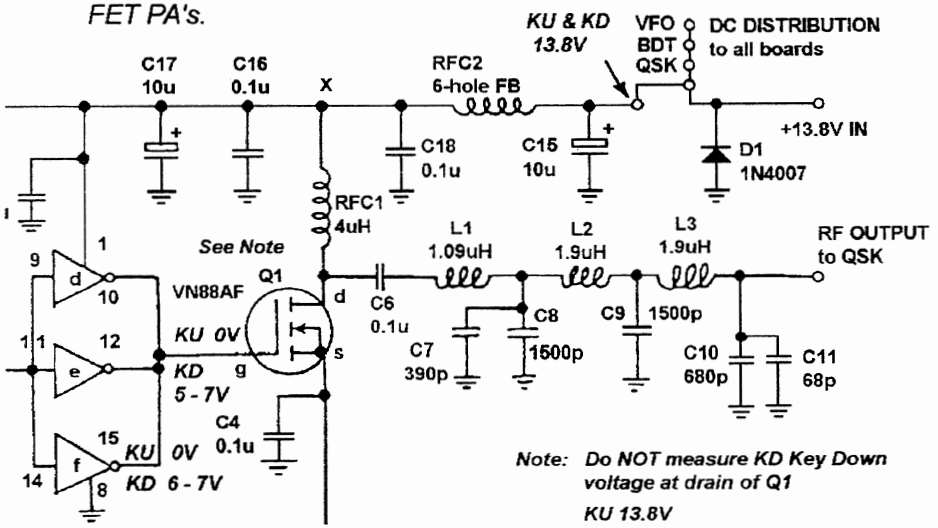


Figure 1: Club Communicator PA Circuit Diagram (part only)

Much more information was recorded than is presented here and I looked at quite a few aspects, but these notes concentrate on only three of them:

- *Protection of MOSFET and Prevention of VHF Oscillations*
- *DC voltage at the drain*
- *Output Network.*

If you have experimented with MOSFET PA's with output circuits similar to the Club Communicator, or know that I have missed something obvious, please share your knowledge with us.

PROTECTION OF MOSFET AND PREVENTION OF VHF OSCILLATIONS

I tried a variety of recommended methods aimed at protecting the transistor and preventing VHF oscillations known to be present (effects seen on CRO), and thought to be the cause of much loss of power. Most were left in place in the 'final' arrangement. The drive is a series of pulses (nominally square) from a 4049 CMOS. Some brief specifications of the VN88AF N-channel enhancement-mode MOSFET are shown in Fig. 2.

Firstly, a diode between gate and ground was used to prevent appreciable negative voltage excursions at the gate. Also, a ferrite screening bead was installed at the gate of the transistor, next to the case.

At various times I used several values of zener diodes (e.g. 36 V and 50 V 1 watt) between drain and source to prevent the V_{DSS} of the transistor being exceeded. This worked well, but the waveshape at the drain was still poor and power output low.

I then removed the zener and installed a varistor with the additional aim of curbing the VHF oscillations of the VN88AF. This immediately reduced VHF oscillations and increased power. The best result came from a Siemens S10K275 varistor. This also gave more capacitance between drain and source, measured at about 240 pF on a digital capacitance meter.

DC VOLTAGE AT THE DRAIN

The supply voltage specified in the manual for the early Club Communicator kit-sets was "12 V to 14.5 V permissible", with a nominal voltage of 13.8 V. Anything much below 12 V would be expected to seriously cut power output and/or signal quality. After all, most circuits for MOSFET PA's use supplies of twice this voltage. The VFO uses a 9 V zener for its supply, so a reasonable margin is needed above this. The14.5 V maximum would be due to the use of CMOS IC's, which will be destroyed by more than about 15 V.

The PA uses a VN88AF MOSFET, although VK6KRG Rod's early prototype used the IRF511 and Rod has recently confirmed that the IRF510 will suit. The advice regarding supply voltage for MOSFET's is that the more the better, at least up to around 28 V. For example, Doug DeMaw in QRP Notebook (page 36 of the original, blue cover edition) says: "Power FETs like high drain-source voltage. They are designed to be operated from a 24-V

Continued over ...

MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Rating	Symbol		Units
Drain-Source Voltage	V_{DSS}	80	Volts
Drain-Gate Voltage (R_{GS} = 1MΩ)	V_{DGR}	80	Volts
Continuous Drain Current @T_A = 25°C	I_D	1.2	A
Peak Drain Current	I_{DM}	3.0	A
Gate-Source Voltage	V_{GS}	±30	Volts
Total Power Dissipation @ T_A = 25°C	P_D	12	Watts
Derate above 25°C			

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified)

OFF CHARACTERISTICS			
Drain-Source Breakdown Voltage (V_{GS} = 0V, I_D = 10uA)	BV_{DSS}	80 (min.)	Volts
ON CHARACTERISTICS			
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 1mA)	$V_{GS(TH)}$	1.7 (typ.)	Volts
Static Drain-Source On-State Resistance (V_{GS} = 10V, I_D = 1.0A)	$R_{DS(ON)}$	4.0 (max.)	Ohms
Forward Transconductance (V_{DS} = 24V, I_D = 0.5A, f = 1 kHz)	g_{fs}	0.25 (typ.)	mhos
DYNAMIC CHARACTERISTICS (V_{GS} = 0V, V_{DS} = 25V, f = 1 MHz)			
Input Capacitance	C_{iss}	50	pF
Output Capacitance	C_{oss}	50	pF
Reverse Transfer Capacitance	C_{rss}	10	pF

CASE STYLES
TO-202, but some use TO-220AB

NOTE
Data mainly from GE's VN88AFA
(Any errors are mine !)

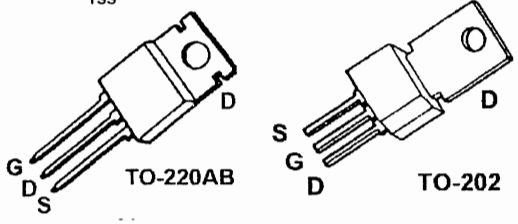


Figure 2: VN88AF Brief Specifications

supply, or greater. They will produce some power at 12 V (roughly 0.25 the power at 28 V) ..... We should try to design for a 24-V power supply if we plan to use power FETs."

From this, you would expect the power to be much better at, say, 14 V than at 12 V. I did a simple test, varying the voltage to all boards of the rig, not just the MOSFET.

Some of the results are graphed in Fig. 3 Supply Voltage Effect on Power Output, where: Po = Power Output, expressed as a percentage of power at 14.5 V (calculation assumes a perfect sine wave) and Vd = Supply voltage at drain of VN88AF, measured with a high impedance DMM (with Key Up). This shows an average drop in power of 12.5% for each drop of one volt at the drain. If the power output at 14.5 V was, say, 4 W then the output from 12.0 V would be only 2.8 W.

So if you really believe you need 'maximum' power, use the highest practical DC supply voltage.

Likewise, you won't want to lose much in getting it to the MOSFET's drain. I found that there was quite a large voltage drop on Key Down (KD), sometimes more than half a volt. Typically, from Key Up (KU) to KD, there was a 0.1 V drop at the psu terminals and a further 0.4 V drop between that point and the distribution terminals on the PA board, measured with KD.

You can't simply increase the voltage beyond 14.5 volts and try to use the voltage drop in the leads, because the CMOS chips get full voltage on KU. This means that even with 14.5 V at the DC socket of the Tx you might have less than 14 V DC at the MOSFET's

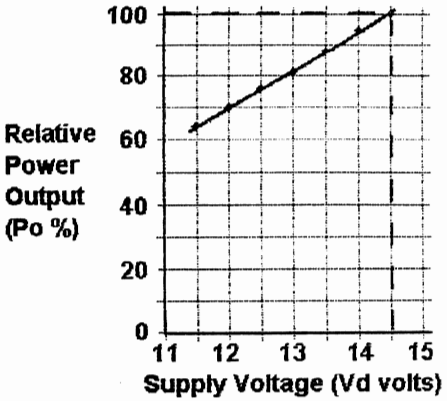


Figure 3: Supply Voltage Effect on Power Output

drain. Likewise, with 12.5 V at KU, there may be only about 12 V available at KD.

The drop was mainly across the fuse, but there was also a small loss in the power lead. An ordinary 1 A fuse dropped 0.35 V, but a slo-blo did a little better at just above 0.25 V, presumably because the fuse wire is much shorter. Maybe it would be worthwhile soldering in a short piece of plain wire as a fuse; VK6KRG's original design showed something like this.

OUTPUT NETWORK

The original output network is an L-matching network, 19 ohms to 50 ohms, followed by a harmonic filter (double-pi, 50 ohms in & 50 ohms out) which produces a very good, clean waveshape at the output terminals.

Several Club members have suggested we use Amidon toroidal cores in the Low Pass Filter, as originally

Continued over ...

MOSFET PA (continued) ...

specified by Rod VK6KRG, rather than the Philips 4C6 (violet) cores supplied in most of the kits. The L-matching network inductor has always been iron powder, because small (9 mm) ferrite cores tend to overheat in this position.

I made the change (to L2 & L3 in Fig. 1) for these tests, but at the same time tried other output circuits, so the conclusions on this point are not absolutely clear. I expect results would be at least as good with the original circuit; spectral purity perhaps even better.

Other members have suggested that the value of the RF choke at the drain could be increased. I tried this with little effect then decided to make a trap circuit resonant at 3530 kHz (to make all the output RF go in the right direction, out towards the antenna !) by using a variable capacitor in parallel with the RFC. I was surprised to see an appreciable increase in power.

Research in books and magazines found a few circuits showing a large value capacitor from drain to ground or to source and some special notes written on the subject. See *QRP Classics* pp. 262,3 or the originals in *QST* by Roy Lewallen W7EL (Oct 1978 p.34) and Hans-Joachim Brandt (Jan 1980 p.55) and, more recently, WF1FB's Design Notebook by Doug DeMaw (p.7). WF1FB refers to prevention of VHF oscillations. These were most evident when I was getting only 2 to 2.5 watts; subsequent power improvement coincided with control of these oscillations - surprise ! See waveshapes in Fig. 4 'Before' and Fig. 5 'After'.

Most MOSFET PA circuits use transformer coupling, which makes it easier to adjust impedances. However, I was keen to see what I could get out of the original arrangement, so tests in this area will be left to later (or to others).

My most successful circuit so far was derived from that used in the MOuSeFET transmitter by Michael Masterson WN2A - see *QRP Classics* p.69 (*QST* Dec 1986 p.19).

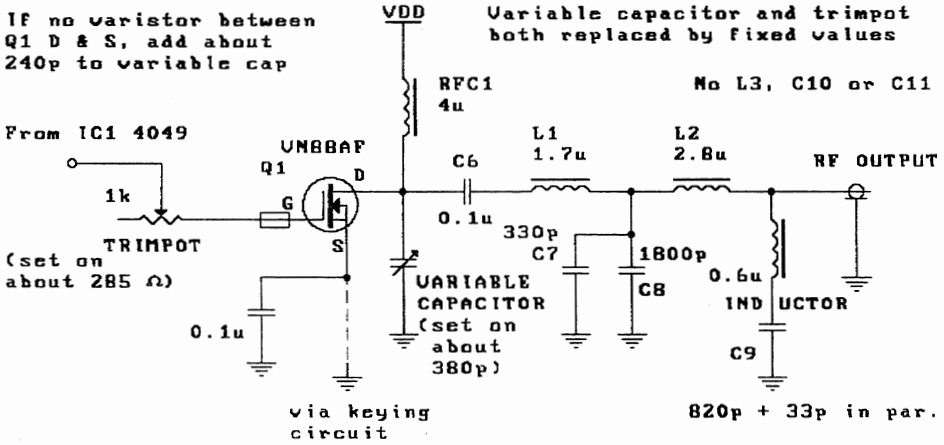
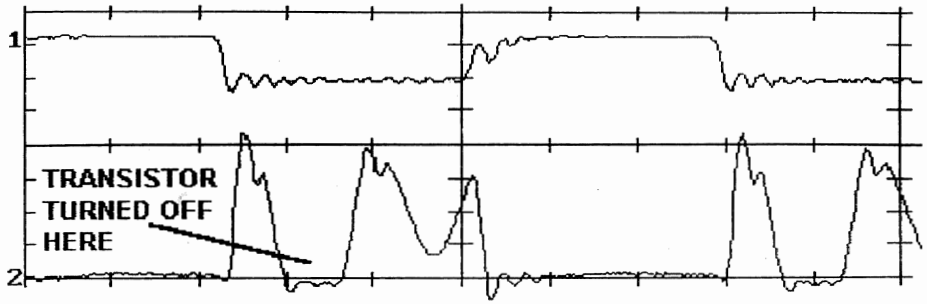
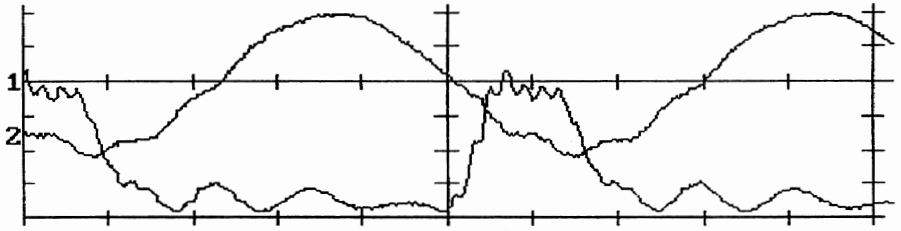


Figure 6: Typical Experimental Circuit



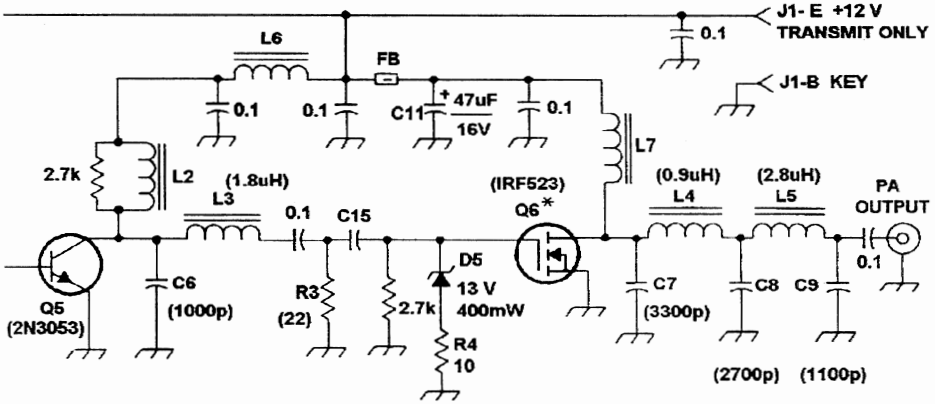
CURVE 1 - AT GATE OF MOSFET VERTICAL 10 V PER DIVISION
CURVE 2 - AT DRAIN OF MOSFET HORIZONTAL 50 nS PER DIVISION

Figure 4: Sample of 'Before' Waveshape



CURVE 1 - AT DRAIN OF MOSFET VERTICAL 10 V PER DIVISION
CURVE 2 - AT 50 OHM DUMMY LOAD HORIZONTAL 50 nS PER DIVISION

Figure 5: Typical 'After' Waveshape



CIRCUIT IS AN EDITED VERSION OF THE ORIGINAL
VALUES SHOWN IN (BRACKETS) ARE FOR 80M

* HEATSINK Q6 - SEE TEXT

Figure 7: Part of the Original MOuSeFET Circuit

Continued over ...

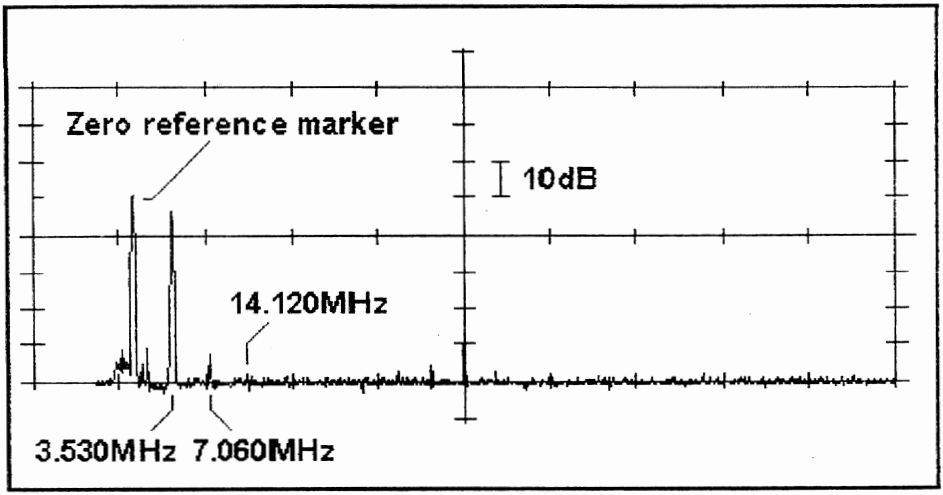


Figure 8: Spectral Analysis of Test Circuit

See Fig. 6 for a typical experimental circuit I tried with good results. The component designations correspond to those on the Club Communicator PA circuit diagram. Fig. 7 shows part of the original Mousefet circuit - note the presence of substantial capacitance between drain and ground.

I was careful to select polystyrene capacitors and wind the inductors at close to design values. Very little adjustment to coils was needed for peak power; the main adjustment was to the capacitor at the MOSFET's drain.

The best power output seen so far is about 4.5 W with an excellent waveshape at output. The worst of the spurii is at 7 MHz and was measured at about 40 dB below transmission frequency, which is quite good, although power was down to just over 4 W. See Fig. 8 for a spectral analysis. The figure had been 33 dB until the 1150 pF capacitor was replaced by the alternative circuit shown on the circuit diagram. The series circuit is resonant at 7.060 MHz but has the same reactance as the original 1150 pF at 3.530 MHz. Incidentally, the VFO in the Club Communicator Tx runs continuously at 7 MHz and the frequency is subsequently halved.

It is probable that similar results would be obtained by installing the drain capacitor and transistor protection into the original circuit with its L-matching network and pi-network LPF. After looking at the waveshapes on a CRO it seems obvious that most of the power loss was caused by VHF oscillations of the transistor.

In the end, I was certainly pleased to see more power, although it's still well within QRP limits. On-air there would probably be little, if any, difference in performance noticeable at the other station in a QSO.

U Can Help !

Alan Potter VK3NEA asks:

"Is it possible to get circuit diagrams plus PCB layout for valve type audio transceivers from QRP to 100 watts, for home construction ?"

Alan's address is: P.O. Box 1778 MILDURA Victoria 3502

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$9 2 **Vernier drives** with flange.

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~~~

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Correction - Some copies of this Lo-Key have an error in the first line of page 8. It should read: "The **sidetone output** is taken from C28 ..." (VK5AIL)
~~~

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The Editor reserves the right to edit all material including letters sent for publication and to refuse acceptance of material without specifying a reason.

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

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(More details on page3)

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