LO-KEY

THE JOURNAL OF THE CW OPERATORS QRP CLUB

ISSUE No. 17 MARCH 1988.

Promoting in Australia, the use of Low Power (maximum 5 watts output), using the CW mode of transmission, on Homebrewed Equipment, in the Amateur Service.

Editor - Len O'Donnell VK5ZF, 33 Lucas St., Richmond, S.A. 5033, Australia.

WE DO MORE WITH LESS

****
CLUB INFORMATION PAGE
****

CLUB EXECUTIVE COMMITTEE AND THEIR FUNCTIONS.

TREASURER....KEVIN ZIETZ VK5AKZ (43), 41 Tobruk Ave, St. Marys, S.A. 5042, Australia. Please send ALL payments such as annual subscriptions, Kit-set charges, Payment for Technical Handbooks, Reprints of Technical articles, QSL cards, Donations etc., direct to Kevin. Also ALL changes of address.

SECRETARY....RAI TAYLOR VK7VV (3), 25 Twelfth Ave., West Moonah, Tasmania 7009, Australia. Please send all mail concerning general club business, such as suggestions, complaints, etc. direct to Rai.

PRESIDENT.....
PUBLIC RELATIONS.....
AWARDS AND CONTESTS..
EDITOR.....

LEN O'DONNELL VK5ZF (1), 33 Lucas St., Richmond, S.A. 5033, Australia. Please send all mail concerning Club Policy, Membership applications, Club liaison, Awards and Contests, also ALL correspondence related to the issue of the club journal LO-KEY, direct to Len.

The above three members constitute the Executive Committee, and together formulate club policy, and any changes that need to be made.

OTHER CLUB ADMINISTRATORS AND THEIR FUNCTIONS

IN CHARGE OF KIT-SET ACTIVITY....DON CALLOW VK5AIL (75), 5 Joyce St., Glengowrie, S.A. 5044, Australia. All orders for Kit-sets, Technical enquiries etc., please send direct to Don.

KIT-SET ACTIVITY HELPERS ....MAX (2) VK5OS, ROD (28) VK6KRG, LEN (1) VK5ZF.

TECHNICAL PROJECTS....ROD GREEN VK6KRG (28), 72 Yelverton St., Donnybrook, W.A. 6239, Australia. Please send ALL mail, concerning Rod's technical designs direct to Rod.

STATE CO-ORDINATORS

VK3....Lindsay LaPouple (47), 41 Ternse Rd., Upwey, Victoria 3158.
VK7....Rai Taylor (3), 25 Twelfth Ave., West Moonah, Tasmania 7009.
Matters of local concern, please send all mail to your local State Co-ordinator.

****

CLUB ACTIVITIES

INFORMATION NET....is controlled by Max (2) VK5OS. QRO SSB is used, and operates each Friday evening at 1030Z on 3620khz. VK5OS will be the call-sign that is used by the controller. ALL members are invited to check in.

CW ACTIVITY...Wednesday evenings 0930Z on 3535khz. Controller Brian VK2BVE (22).
Saturday and Sunday afternoons at 0630Z on 14060khz (QRP). Controller Rai VK7VV (3).
Friday evenings at 0800Z on 3530khz, ZL QRP CW activity

KIT-SET ACTIVITY....Nominated kit-sets of club projects available to club members. All enquiries to Don VK5AIL (75).

QSL CARDS.....With club logo and your own call sign. Details from Rai VK7VV (3).

QRP HANDBOOKS AND ARTICLES...Reprints and copies. Details from Len VK5ZF (1).

TRAVELLING CIRCUIT BOOKS....QRP circuits and information approx. 180 pages. All details from Len VK5ZF (1).

****

GENERAL INFORMATION

QRP FREQUENCIES....1815khz...3530khz...7030khz...10106khz...14060khz... 21060khz... 28060khz.

MEMBERSHIP FEES....Due each January, Australia $10, New Zealand $A12, DX $A14.

LO-KEY.....Published quarterly...March, June, Sept., Dec. QRP circuits, articles, and information always welcomed. Please send to the Editor Len VK5ZF (1)

****

BUILD IT, DONT BUY IT...WHEN YOU HAVE BUILT IT, USE IT... QRP IS IT.

****
****

POWER SUPPLY UNIT

****
****

....Article by Len VK5ZF (1)

....Original design by Craig Maitland VK5ZAW

....Short Kit-set from E.S.C. VK5 Div. W.I.A.

Here is a Power supply unit, an ideal companion unit for our Club Communicator kit-set, or it will power any QRP rig requiring 13.8 volts at up to 5 amps of well regulated, and overload protected DC voltage. The short kit on which this article is based, is available from the Equipment Supply Committee Manager Ian Bedson VK5ZBI, 23 Condada Ave., Parkholme, S.A. 5043. The price of the kit is $18 plus postage, to non members of the VK5 Div. WIA, while members are post free. Here is what you get in the short kit....

PARTS LIST (short kit).

QUANTITY	DESCRIPTION
1	.47 ohm 5 watt resistor
3	.33 ohm 5 watt resistor
1	33 ohm ¼ watt resistor
1	82 ohm ¼ watt resistor
1	100 ohm ¼ watt resistor
1	270 ohm ¼ watt resistor
1	560 ohm ¼ watt resistor
1	820 ohm ¼ watt resistor
2	1K ohm ¼ watt resistor
1	6.8K ohm ¼ watt resistor
1	15K ohm ¼ watt resistor
1	22K ohm ¼ watt resistor
1	27K ohm ¼ watt resistor
2	.001 uF disc capacitor
2	. 01 uF disc capacitor
3	.1 uF greencap capacitor
2	47 uF 25 volt electrolytic
1	100 uF 25 volt electrolytic
1	10 volt 400 MW zener diode
1	15 volt 400 MW zener diode
1	C122E SCR
3	BC547 transistors
1	BD139 transistor
1	2N3055 transistor
1	Printed circuit board
4	A15A diodes or 5 amp bridge rectifier
1	10K trim pot
1	Set of instuctions

That completes the check list for the short kit, which I checked out to make sure all components were included, then put them all into a "Glad" sandwich bag (very handy for storing electronic parts), and put the bag of components out of the way for now. Much more important right now is what is not provided in the way of parts to complete this project, because these are the parts that are going to determine the size of the case that you use. First I will list them and then I will talk about the items....

PARTS LIST NOT supplied in kit.

QUANTITY	DESCRIPTION
1	Power transformer (see article) 18 volts at 5 amps
1	8000uF 35 volt (2 X5600 uF) (see article)
1	Heat sink, 6" of Minifin or homebrew it (see article)
2	Front loading panel mounting fuse holders.
1	5 amp fuse
1	2 amp fuse
1	Indicator Lamp
1	On / Off Switch

Power Supply Unit Cont.

QUANTITY	DESCRIPTION
2	Terminals (1 red / 1 black)
1	Grommet ½"
1	Power cord and 3 pin plug
1	Ammeter 0 - 5 amps
1	Voltmeter 0 - 30 volts
4	case feet
Misc.	Hook-up wire, Spacers, nuts / bolts, Club sticker, wire for lead to rig, spray paint, solder lugs, etc.

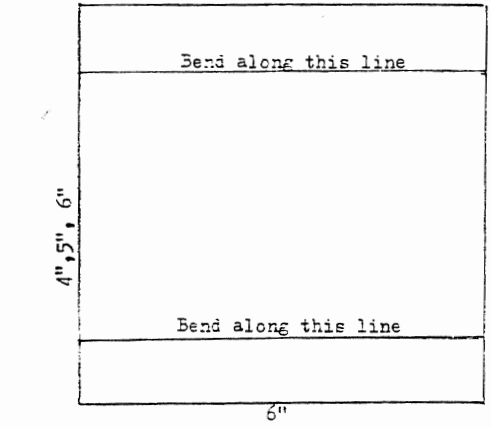
First a few words on the power transformer. It needs to be a step down transformer with a primary voltage of 240 volts, and a secondary voltage of 18 volts, or 36 volts center tapped. For those people who have had a little experience with transformers, it would not be hard to strip the existing secondary from a TV power transformer, and replace it with an 18 volt secondary winding. Your first requirment in selecting a suitable transformer is to decide on the current the unit is capable of handling. In my case I decided that the current requirement that best suited my needs was 5 amps. The guage of wire used and the size of the core area play a very important part in the current a transformer can supply under load conditions. If you are going to attempt to rewind an old TV transformer, and have selected an adequate wire diameter, try winding on 6 turns to start, and then measure the voltage. You are looking to read 1 volt, and if it is higher or lower than 1 volt, then adjust the turns as necessary to give you exactly 1 volt. Having arrived at the number of turns to give you 1 volt, just multiply the number of turns for 1 volt by 18, you will then have the number of turns required to give you 18 volts. This is called the turns per volt ratio of the transformer. As an exampe, if it takes 6 turns to give you 1 volt, then 6 X 18 = 108 turns to give you 18 v. Another source of suitable transformers to modify for power supply use, are those transformers used to control electric blankets. I managed to come across a number of these types recently, and have put them away for modification, just as soon as I can get a little spare time. For this particular power supply that I am describ-to you, I have used a DSE2000 an 18 volt 6amp unit from Dick Smith. If you only need a 2 or 3 amp power supply for your needs, then you can use a smaller physical size transformer. Remember to make sure the secondary voltage is always around 18 volts for the reasons given in the kit-set instructions.

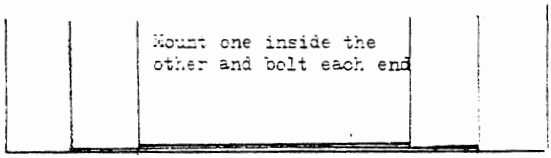
For the filter capacitor, the instructions call for 8000uF, and suggest 2 X 5600uF as an economical substitute. In my own case for this power supply that I am describing for you, I have departed from the circuit a little and paralleled 4 X 4000uF 65 volt capacitors that I happened to have on hand. As I had not tried to miniaturize my case when I fabricated it, I had adequate room for the extra capacitors. As a matter of fact I paralleled another 4000uF 65volt capacitor across the output, because I still had plenty of room, and I wanted to ensure that there would be, no traces of hum on the carrier of any rig, that I wished to connect to the power supply. It was worth the effort, because I have never had any reports of hum on the carriers of any of the rigs I have used with this supply. Likewise I have never been able to hear any hum in my receiver, when I check my signals on air. No doubt the specified amount of capacitance would be more than adequate, because in my case, I was looking for a special power supply, and I believe that I have now got one.

The heat sink specifications call for a 6" length of Minifin. I used 9" of Minifin because I had a 9" length, and because I could mount it right across the outside back panel of my case. In mounting the heatsink on the out side of the box, you allow more air to cool the heatsink quicker, or not allow it to become over-heated as much as it would, mounted on the inside of the box. Here is a way to make your own Minifin heatsink....

Take a piece of 18 or 20 guage allumimium, and mark out 3 pieces that measure 6"X6" 6"X5" and 6"X4". Then cut to size and trim the edges. Next mark 2 lines on each piece, 1" from the top and the bottom. Bend each piece along these lines top and bottom, so that you have a 90 degree bend top and bottom on all 3 pieces, lay each piece inside the other, spaced equally top and bottom. Clamp the 3 pieces together

Power Supply Unit Cont.





End view

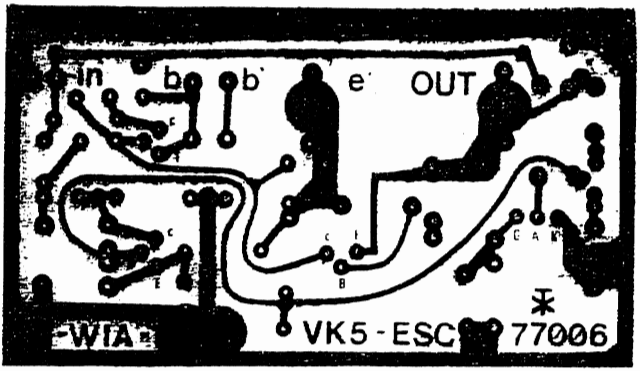
drill $\frac{1}{8}$" hle, 1" from each end and bolt the 3 pieces together. If you need a 6 fin heatsink, then add a further 3 fins facing in the opposite direction. Of course you will need longer bolts to mount them to the case.

I have used front loading panel mounted fuse holders, because I have some in my junk box, and secondly they are very handy to replace that blown fuse, without taking the case to pieces. Perhaps the only other items that need to be mentioned, are the volt meter and the amp meter, mounted on the front panel. I deviated from the recommended metering circuit, supplied with the kit. My reasons were that this is a special powef supply for my needs. Secondly my junk box (which is 20' X 12' in size), contained some meters, so I used a couple. The 0 - 30 volt meter I have connected across the output voltage, and the 0 - 5 amp meter I connected in series with the lead to the positive voltage terminal, observing of course the correct polarity of the amp meter. The rest of the bits and pieces, do not require any further remarks, or clarification.

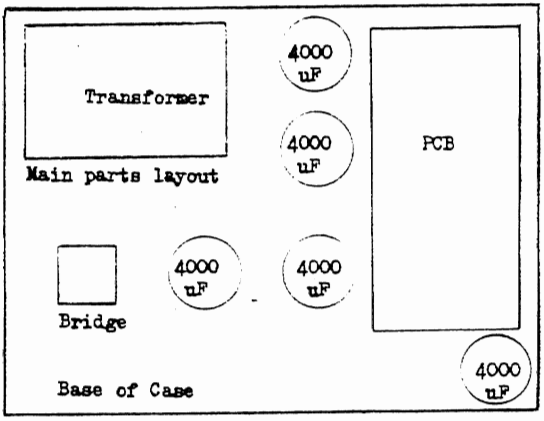
When you have obtained, all the necessary parts for the power supply unit, it is time to think of layout and case. My approach to solving this problem, is to lay out on a sheet of A4 paper, all the major components, to get an idea of the overall size. I will mention again that I do not like miniaturizing any of my gear, so I allowed myself, plenty of room from the start, and I ended up with a case $9\frac{7}{8}$" X 6" X 7", in the form of a square U, with $\frac{1}{2}$" turned over edges. The top and sides are covered with a separate piece of alluminium, bent to size, and cut to provide a sloping hood for the front panel. My case was fabricated from 20 guage scrap aluminium, which was obtained from the scrap bins of a factory. you do not have to fabricate your own case, as there are a number of suitable boxes available, from various electronic part suppliers. If you are a miniaturizing fanatic, good luck, there are cases available for your taste also. The general layout is not important and I have supplied ample illustrations of the layout that I used. The size of your parts and case, will determine your layout. The whole idea of this article is to supply enough information, so that you can take the information, and design your own power supply along similar lines. It DOES NOT have to be a duplication of what I have done, for it to work. A lot of the fun and magic of being a homebrewer, is

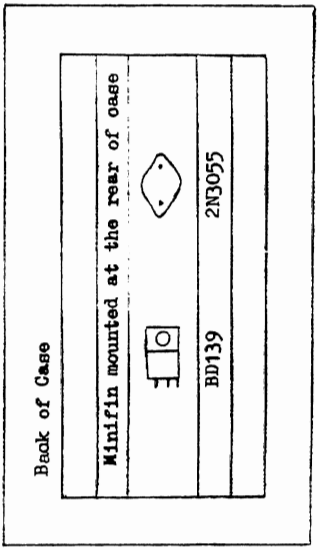
Power Supply Unit Cont.
to come up with YOUR OWN designed project, from a collection of parts and a circuit diagram. Start to think what you really would like, then go for it.
Here are the constructional notes as supplied with the Kit-set....
Basically the design uses BC547 transistors as voltage sense amplifier, current sense amplifier, and low level output. Ouyput is fed to a BD139, and then to a 2N3055 series pass transistor. For over voltage protection, a 15 volt zener and an SCR is used. When an over voltage is present, the zener conducts, thus firing the SCR. This puts a short across the input to the regulator, thus blowing the fuse. This type if protection is known as a "crowbar", and is very effective. Over current protection is achieved by developing a voltage across the .11 ohm resistor in the positive line. This voltage is sensed by a BC547 transistor and fed into the regulator circuit, thus dropping the output voltage, and therefore limiting the current to about 5 amps.
In addition to the basic kit, you will need the following parts....
POWER TRANSFORMER....The transformer used in the originals was an 18 volt at 5 amp secondary. It is possible to use a 36 volt centre tapped type, but then only 2 of the A15A diodes are used. A transformer with a lower voltage can be used, as low as 15 volts, providing that you allow for poorer voltage regulation at full load. Do not use a voltage much higher than 18 volts, otherwise the dissipation in the 2N3055 will be too high, and it will over heat excessively.
FILTER CAPACITORS....Approximately 8000uF at 35 volts is required. 2 X 5600uF will probably be more economical than a single 8000uF unit. The amount of capacity needed is dependant on the load, and the sensitivity of the radio equipment to hum.
HEAT SINK....Total dissipation in the 2N3055 is around 40 watts, so a husky heat sink will be required. Use a 6" length of Minifin or similar heat sink.
DC INPUT FUSE....Any suitable fuse carrier and 5 amp fuse will be OK. WARNING, do not omit this item, or you may be up for replacing the transformer, rectifier, and the SCR. Could be expensive, apart from defeating the safety features.
OTHER PARTS.... Additional parts, such as metering, switching, cabinet, etc., we leave to your individual requirements.
CONSTRUCTION....Insert all components, check for orientation of the transistors, zener diodes, and the electrolytics. Solder all components. The .47 ohm 5 watt resistor, is inserted vertically behind the SCR, and the other lead is brought down next to the .1uF capacitor. Next drill the heat sink to take the 2N3055 transistor, and nearby drill another hole to take the BD139 transistor. Smear both sides of the transistor insulating washer with heat sink compound, (suitable compound is Dow Corning 340 silicone heat sink compound). If not available, use a smear of silicone grease. Bolt the 2N3055 and BD139 transistors down, using a couple of layers of sticky tape, between the BD139 transistor metal face, and the heat sink to insulate it. Do not tighten the BD139 bolt more than finger tight. Check that there are no shorts, between the collectors and the heat sink. Attach wires to the input, output, and the tracks going to the 2N3055 and the BD139. Heavy current carrying wires should use at least 23/.0076 wire. Connect the input to your unregulated supply, not forgetting the 5 amp fuse carrier. Connect the other wires to the 2N3055 and the BD139 assembly, and to the output terminals. Instal 24 volt, 12 or 24 watt lamp (2 X 12volt lamps in series), in place of the 5 amp fuse, set the trim pot midway, attach a voltmeter to the output, and if all appears to be OK, switch on. The lamp should not light up, and the voltage at the output should be around 12 to 14 volts. Check that the unit is working OK by varying the trim pot, the voltage should be capable of being adjusted between about 11 and 15 volts. If the voltage exceeds 15 volts, the SCR may fire and the lamp will light up. Switch off, to allow the input voltage to drop below the holding volts of the SCR and start again. The over voltage protection can be checked out next. Turn the trim pot to maximum volts, and if it does exceed 15 volts, the SCR will fire and the lamp will light up to full brilliance Switch off to clear the SCR. If the supply will not reach 15 volts, bridge the 27K resistor with another 27K and try again. Set the voltage to 13.5 volts, then replace the lamp with the 5 amp fuse. DO NOT USE A FUSE GREATER THAN 5 AMP, OTHERWISE DAMAGE CAN OCCUR. Next check the current limiting section is working, by connecting a 0 to 10 amp meter and a 1 ohm resistor in series across the output terminals. The

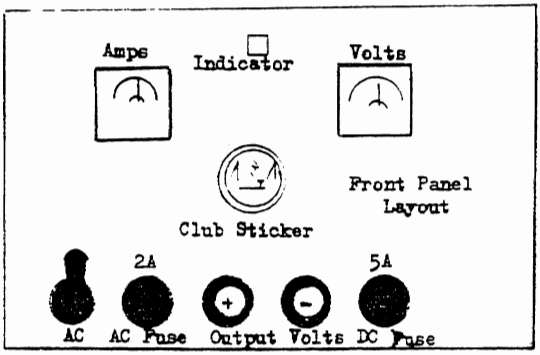
Power Supply Unit Cont.
1 ohm resistor serves to limit the current, should anything go wrong. The current should be around 5.5 to 6 amps. If all is OK the output can be shorted with safety and the short circuit current will remain the same. If all is OK, the supply is ready for use. That concludes the constructional notes, as supplied with the kit....

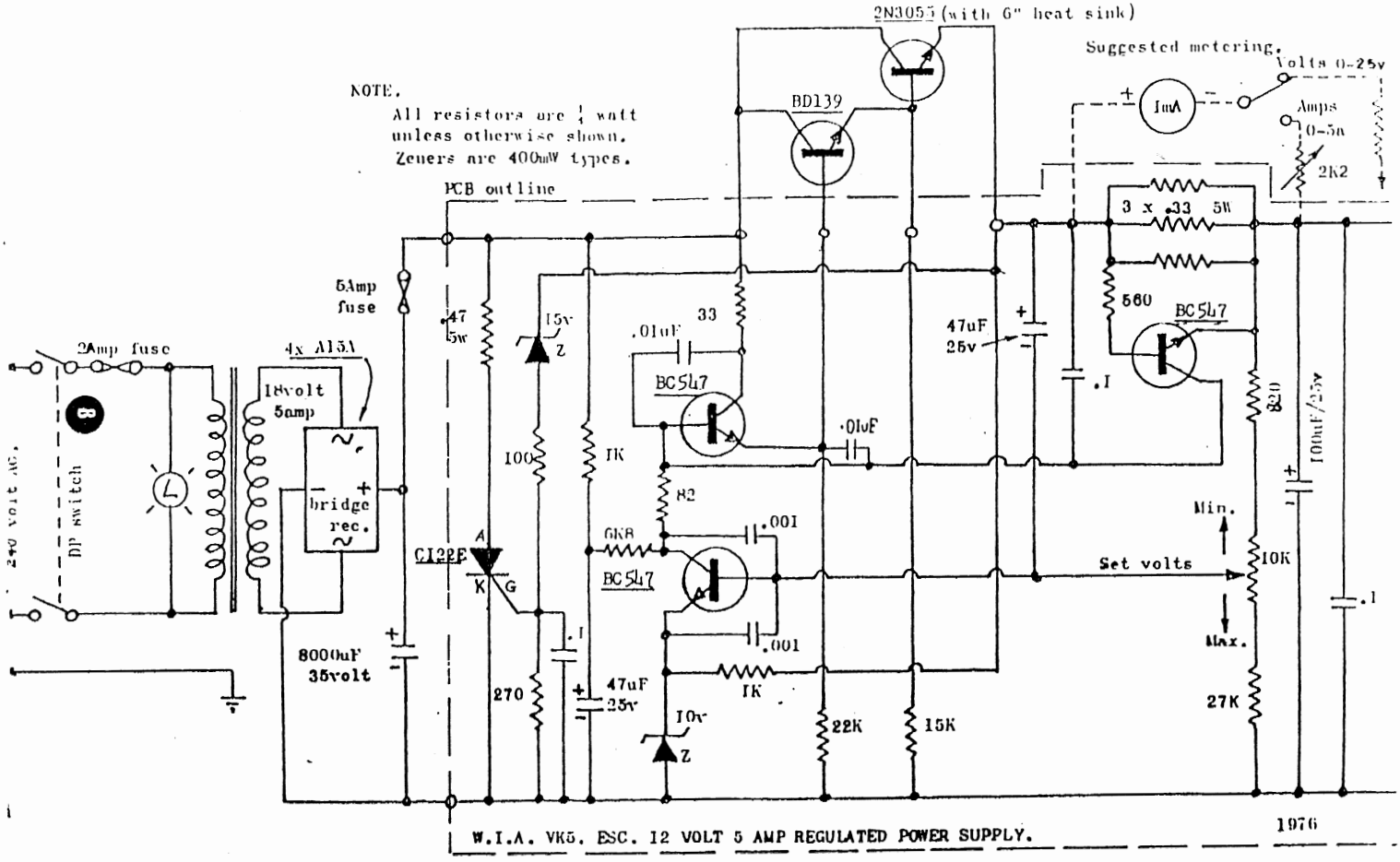


This is an illustration of the PCB. It measures 118mm X 68mm, and is an excellent quality board. The copper track is face up.

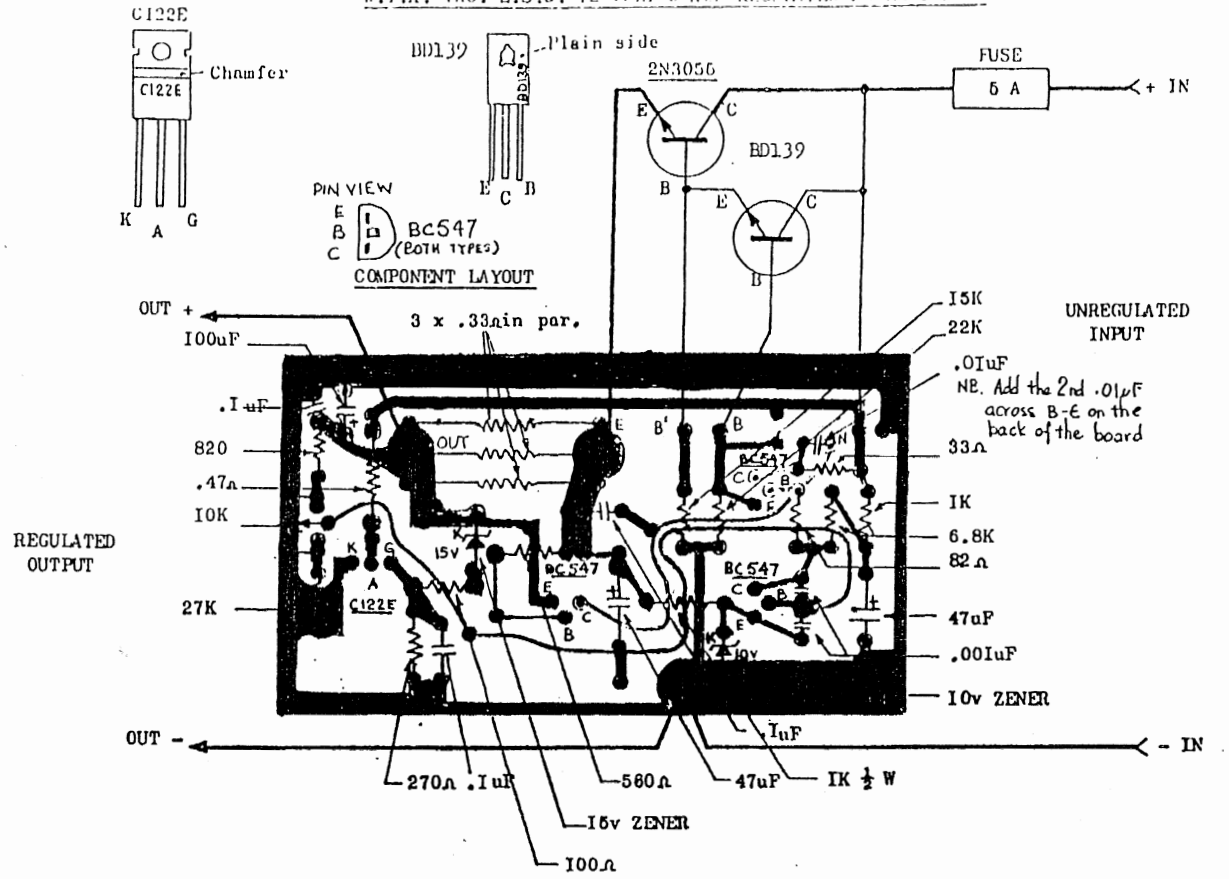







2N3055 (with 6" heat sink)
Suggested metering.
Volts 0-25v
Amps 0-5a
2K2
1mA
BD139
NOTE.
All resistors are ¼ watt unless otherwise shown.
Zeners are 400mW types.
PCB outline
3 x .33 5W
560
BC547
47uF 25v
.1
820
100uF/25v
5Amp fuse
2Amp fuse
4x A15A
240 volt AC.
DP switch
18volt 5amp
bridge rec.
8000uF 35volt
.47 5w
15v Z
.01uF
33
100
1K
82
6K8
.001
C122E
A
K
G
270
.1
47uF 25v
10v Z
22K
15K
Min.
Set volts
Max.
10K
27K
W.I.A. VK5. ESC. 12 VOLT 5 AMP REGULATED POWER SUPPLY.
1976

W.I.A. VK5. E.S.C. 12 VOLT 5 AMP REGULATED POWER SUPPLY



Power Supply Unit Cont.

Now for a few final thoughts to round the article off. The wires for the 2N3055 and BD139 transistor connections, pass through 2 half inch holes in the back panel. You can use a couple of ½" grommets, to make sure the wires do not fray on the edge of the holes. With regard to painting the case, I sprayed the bottom half grey, and the top half black, to give the case a contrast. If you would like to "jazz" the front panel up a little, then use some rub on lettering to name the controls etc. Give the lettering a coat of clear lacquer, when it is finished, and before the front panel is assembled.

As with all power supplies, they are connected to the 240 volt mains, and that means that YOU need to be careful. Make sure that all mains connections are adequately protected from accidental contact. My ON/OFF switch is a SPST toggle type and the mains indicator is a 240 volt neon type. The front loading, panel mounting, Zephyr fuse holders, take the 3AG size glass fuses. Finally do not forget to mount the four feet, on the bottom of the case.

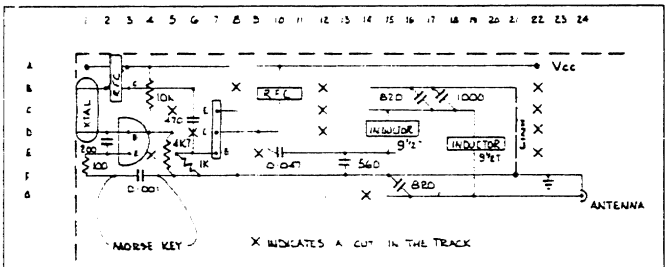
A good regulated power supply unit, protected from voltage and current overload, delivering a husky 5 amps, and 11 to 15 volts, is one of the best tools a QRPer or any Ham can own. No matter how fancy or elegant your transmitter or transceiver is, without a power supply unit to activate it, your rig is useless. Unless that Power supply is adequate, and well regulated and protected, your best design -ed rig is going to sound poor, or it could be damaged from overloading the power unit. This unit will take care of all your power supply needs for QRP operation. This is the third unit I have fabricated using this design, and I have not had no problems building or using them.

Parts for the project are available from ESC WIA VK5 DIV., DICK SMITHS, ALTRONICS, RADIO SPARES, FORCE ELECTRONICS.

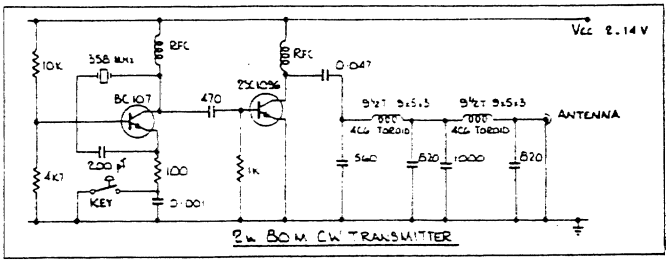
If you have any problems with the project, or if you would like me to obtain any of the necessary bits and pieces for you, then drop me a line. Happy QRPing.

****

A WEEKEND PROJECT FOR THE MORE EXPERIENCED QRPER.... From Marshall VK5FN (16) here is the circuit of an interesting 3.5mhz QRP CW transmitter. Give it a go.



Schematic of 2 W, 80 m CW Transmitter. 2 W, 80 m CW Transmitter.



****
****

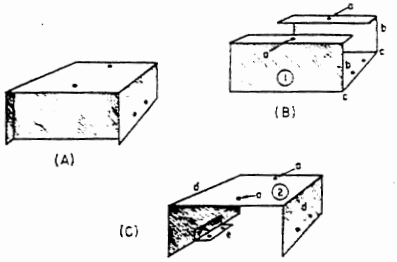
THE EASY BOX ....by W1CER

****
****

Tired of the same old utility box designs ? Here is information on how to form your own cabinets, with ordinary workshop tools. **All that is needed is a set of sheet metal** shears, a vise, and a rubber or rawhide headed hammer (mallet). The boxes can be made of aluminium,copper,brass, or galvanized iron, depending on the choice of the builder. Heavy guage stock, produces a cabinet with good rigidity. Miniature enclosures can be formed from 18 or 20 guage material. The cabinet style shown in Fig. 1 is the outgrowth of an immediate need, for a box in which to build an SWR bridge. To keep the cost low, and to have a cabinet with a recessed panel, it was decided that "HOME-BREWING" would be the most practical solution. Happily, the effort produced a simple enclosure, which took about 30 minutes to fabricate.

LAYOUT AND FORMING....After deciding what sizethe box will be, layout the pattern for the bottom half (Fig. 1B), with a square and scribe, scratching marks on the metal where the bends will be made. Form the bends marked C, by placing the stock in a vise, and warping the metal around the jaws of the vise, until a 90 degree angle is secured. When forming bends with large pieces of metal, the stock can be warped over the edge of the workbench by clamping it between the surface of the bench, and a piece of angle iron. the angle iron can be held in place with C clamps. Next, form bends B similarly. If a sharp bend radius is desired, a raw-hide hammer can be used to flatten the metal. Before forming the cover Part 2, measure the outer dimensions of the completed Part 1 . Use these dimensions when laying out Part 2. The clinker here is that you will have to make bend allowances for the thickness of the metal at D, so that the lid will fit the bottom of the box. In other words, if the metal thickness is 1/16", allow an additional 1/16" of metal for each bend made. A little practice will reveal how easily this can be done. An angle bracket (item E, Fig. 1C), is bolted to each side of the lid with 4-40 hardware. The lid is attached to the lower part of the box by securing the angle brackets to Part 1 with No. 6 sheetmetal screws. If additional strength is desired, sheetmetal screws can be used at the points marked A. If heavy guage metal is used, this should not be necessary.

FINISHING TOUCHES....Boxes of this style are handy for housing field-strength meters, SWR bridges, ATU's, QRP transmitters and DC receivers, and similar items. The appearance of such gear, can be enhanced by painting the cabinet, and labeling the controls with decals A two-tone finish will add to the professional appearance of the equipment. Make certain that the bare metal is free of grease and dirt before painting it. A coating of zinc chromate will be useful as a primer, enabling the finish coat of paint to adhere to the cabinet. Zinc chromate and finish paints are available at most hardware stores. They are sold in spray cans, making the job of painting a simple chore. If you are interested in having your equipment look a bit more original, TRY THE EASY BOX.



Details for forming the Easy Box. The completed box is shown at A. Information concerning parts B and C of the drawing is given in the text.

I have found that it pays to be VERY CAREFUL to set out your measurements, and have ALL sides of your material squared accurately before proceeding. Preparation is the whole secret of success here. An extra piece of angle iron screwed to your bench, before you clamp a second piece on top, will do wonders for your bending....Editor.

C W O P E R A T O R S Q R P C L U B

Promoting the Use of Low Power Morse Code Communication
and Home-Brewing in the Amateur Radio Service

KIT-SET ACTIVITY CENTRE

Quality Reliability Price

CLUB COMMUNICATOR KIT-SETS

by Don VK5AIL (75)

The Club Communicator is now available in kit-set form to members of the CW Operators QRP Club. Here are some questions you may have - and my answers:

Question 1: WHAT IS IT ?

Answer: The Club Communicator is an 80m band QRP CW transmitter, recommended power 4W. The Full Kit-Set comprises four modules and a set of parts for assembly into a case.
The modules are -

VFO Variable Frequency Oscillator
7.0 - 7.4MHz range,
adjustable by you.

BDT Buffer, Divide-by-two, Timer
Output is 3.5 - 3.7MHz.

PA Power Amplifier
Recommended output is 4W.

QSK Keying Board
Does T/R switching between transmit and receive modes.

You can buy the Full Kit-Set
or
individual modules.

Information about the *early* version appears in *Lo-Key* #14 June 1987 (p. 21) and *Amateur Radio* March 1988. Our kit-set includes some new PCBs and a new manual, aimed at beginners. The circuit is the original.

Question 2: WHO CAN BUY IT ?

Answer: Any paid-up Club Member interested in home-brewing. It will suit beginners who wish to learn about radio AND it will suit the more experienced who wish to experiment with the modules, develop them or use them in other rigs.

Question 3: HOW MUCH DOES IT COST ?

Answer: Standard Prices are:

$A 77.00 for Full Kit-Set
$A 18.00 for VFO Module
$A 13.00 for BDT Module
$A 30.00 for PA Module
$A 16.00 for QSK Module

Each of these prices includes postage within Australia.

These prices apply from 1st April until 30th June 1988. Orders received later will be subject to any change in prices.

Orders postmarked before 1st April will be supplied at the prices in December 1987 Lo-Key #16 e.g. $75.00 for Full Kit-Set.

CLUB COMMUNICATOR KIT-SETS

(Continued)

Question 4: WHAT DO I ACTUALLY GET ?

Answer: Each module is supplied as a PCB plus the parts to be mounted on that board or which are part of that circuit. A *comprehensive* instruction manual is supplied to suit each order.

The PCB size is 52 x 52mm (2" x 2"), except for the PA which is 78 x 78 (3" x 3").

No case is supplied as this would increase both the cost of the kit and the postage, so you can pick your own or use the size we recommend.

Question 5: HOW DO I ORDER IT ?

Answer: Send your order, saying whether you want the Full Kit-Set *OR* naming which modules you want, to me (Don VK5AIL) at the address shown below. Cheques should be made out to CW OPERATORS QRP CLUB.

Please include your name & address for sending the parcel and also your call-sign, membership number and first name.

Question 6: WHEN WILL I GET IT ?

Answer: The first batch has been sold out and another batch of 10 will be produced for supply in June 1988 at the latest.

FIRST IN - FIRST SERVED, so it is best to send your order (including money) early. If the initial batch is gone before you place your order there may be delivery delay while we get more components.

Question 7: WHAT IF I HAVE A QUESTION YOU HAVEN'T THOUGHT OF ?

Answer: Contact me on the Friday night Club Net (SSB) or telephone me or write. I will handle technical questions, but may have to refer some of the really tricky ones to Rod VK6KRG who designed the original rig.

. o . o . o . o . o . o . o .

Original concept/design:

Rod Green VK6KRG (28)
Club Projects Officer
72 Yelverton St. South
Donnybrook 6239
WESTERN AUSTRALIA

Kit-Set development:

Don Callow VK5AIL (75)
Kit-Set Activity Centre
5 Joyce St.
Glengowrie 5044
SOUTH AUSTRALIA
Telephone (08) 295 8112 (home)

73s

VK5AIL (75)
14 March 1988

****
****

THE ONER VFO ....Ian Keyser G3ROO (Reprinted from Sprat)

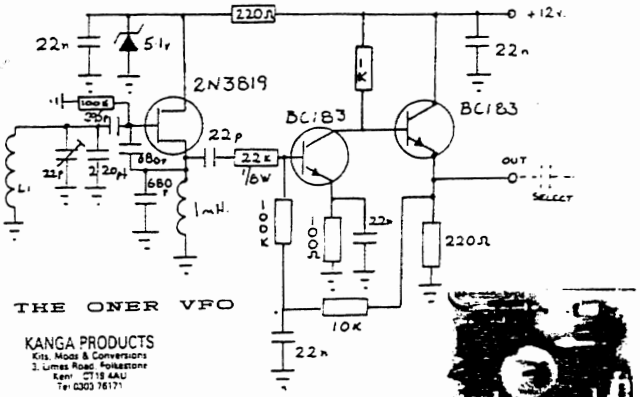
****
****

Before we go any further into the VFO, we must point out that although this was designed to run into the "Oner Tx", it is a very useful little VFO in its own right. As it is our high stability VFO, compressed onto a very small board 1" square with the frills removed, it will not compare with the stability of that unit, but it will be adequate for QSO's on 80 and 40 meters.
It is impossible to give any meaningful drift curves, as the unit is un-boxed, and the coil is wound on a dust iron core ring, but as can be seen, it is more than stable enough. The original VFO for the Oner was built when George G3RJV, was on a visit to this QTH, and we built a Oner for fun. Our unit was lacking in drive, so I laid out the board as shown below, and we now have 5mw across 50 ohms. It could even drive a diode ring for the receiver.
The circuit is a 2N3189 FET oscillator loosely coupled to a wide band amplifier which I knocked together, many years ago on a visit to George. There was suffic-ient room to include the output capacitor on the board, and so one end is sol-dered to the connection of the 220 ohm resistor to the emitter of the output transistor, and this is used to connect to the base of the Oner's oscillator transistor, saves the price of wire.
The tuning capacitor used is a trimmer, and this has a 3/32 brass adjusting screw. To make this adjustable you have two courses open to you, the first is to use a disk of plastic, Araldited to the adjusting screw, and edge tune it. Or secondly, to take a length of ¼" knitting needle, and drill a hole at its end, and Araldite this on as an extenssion spindle to take the knob, reduction drive or whatever you want. The most important thing is to supply support for the shaft, and I have done this using another 1" square piece of board, with a ¼" hole drilled in the correct position. This acts as the front panel, soldered upright on a 1" X 3" strip of board as a base plate. The VFO is mounted 1" be-hind the front panel, and then a screen with two holes in it, one to take the +12 volts, and the other to feed the capacitor to the Oner PCB. This second piece acts as a screen, and reduces the chance of feedback. A third piece of PCB acts as the back drop, and takes the low pass filter built ugly style, and the aerial socket. No aerial switching is used, as I use the transmitter on the main aerial, and use the whip aerial on the station SRX30 for receive.
There is not much else to say about it, except to place all the resistors on the board first, keeping the 10K resistor forced as far as possible to the edge of the board, as this fouls the tuning trimmer. In fact it is not a good idea to solder the 10K resistor in, until the trimmer has been tried. When this is correct, solder the trimmer in place, then add the other components, leaving the polystyrene capacitors till last. Also note that the 220pF and the 680pF poly capacitors use the same earthing hole.
For those of you who have followed my articles in the past, will know that I use beeswax extensively for fixing, it is the best thing for tuned circuits especially, and this circuit is no exception. There is no room to mount the coil ring, so this is soldered to the board across the underside of the trimmer capacitor, when the turns have been adjusted, to get it oscillating on almost 3500khz, with the trimmer capacitor fully meshed. Beeswax is then dripped on to it, to fix it in place. Final trimming of frequency is done, by moving the turns on the ring, until the lower point is fixed on 3499khz. The top frequency with the capacitor unmeshed, should be about 3590khs.

****

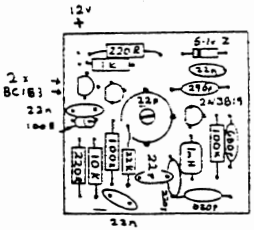
This VFO design is available in kit form, as is the original Oner Tx design, from England, if any of our members are interested.
The design could easily be modified to a larger PCB layout, if the builder de-sired. There is no real point going miniature with the PCB, unless this kind of ultra small design turns you on. A larger and not so confined layout could only improve the VFO's stability.

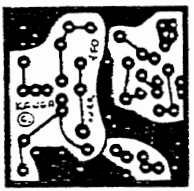
(Cont.)



COMPONENTS

1 : 5V1 Zenner
3 : 22N
1 : 22P
1 : 220 POLY
1 : 295 POLY
2 : 680 OR 560 POLY
1 : 100R
2 : 220R
1 : 1K
1 : 1K
1 : 10K
1 : 22K 1/8 WATT
2 : 100K
1 : 1MH RFC
1 : E555 OR 2N3819
2 : BC183
1 : 22P TRIMMER
L1: 35 TURNS 30SWG ON T37-2

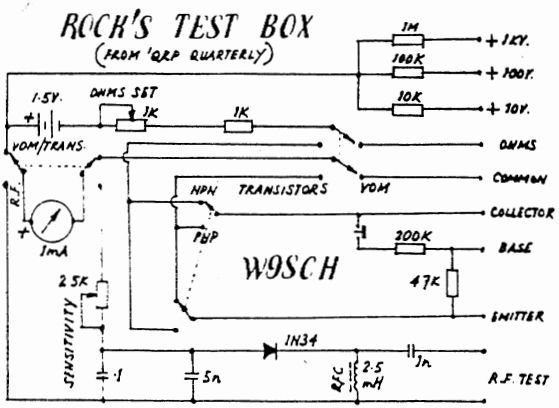




Look for a further article on the "Oner Tr and VFO goes Down Under", in a future issue of Lo-Key. It will be designed for the 7mhz band, to create an interest by members in equipment other than the usual 3.5 mhz QRP circuits. Full details on construction, and any necessary modifications, as well as details of a suitable output filter, and adequate ideas on how to box up the completed project. ....Len VK5ZF (1)

****
****
ROCK'S TEST BOX
****
****

....(Reprinted from QRP Quarterly)



"to measure is to know" the wise Hollanders say, but commercially made test gear is beyond the budget of many of us. On the other hand it is practcally impossible to get a freshly fledged "homebrewed" QRP rig working correctly without some checks being made. We describe here a simple and relatively inexpensive test set-up, which almost any QRPer can build and use. And you will use it, too.
This gadget provides three basic functions :-

1. A DC voltmeter
2. A practical transistor tester
3. A "Soup Sniffer" or RF Volt Scope"

We can not call the latter an RF voltmeter because it is not calibrated, but it is extremely useful just the same. The most expensive item used is a 0-1ma meter, probably as cheap as any meter you can buy, and often available for even less at ham "flea markets". It is also able to take more punishment than are more sensitive types, a valuable ham feature.
The voltmeter provides the three voltage ranges I have found most useful over the years. Other ranges may be set-up if you prefer. Remember you must provide a thousand ohms of series resistance, for every volt of full scale reading. (Due to the limited sensitivity I do not recommend a full scale range of less than 10 volts.)

****

The description of the little tester does not go into much detail, but the circuit seems straight forward and very simple. Should make an ideal project if you are just beginning in homebrewing your QRP equipment. Reckon I might try it myself. Let you know the result next issue of Lo-Key.....Len VK5ZP (1)

****
****

PARALLELING SMALL TRANSISTORS FOR QRP RF POWER

....by Doug DeMaw (W1FB)
(Reprinted from Sprat)

****
****

A number of RF power transistors are sold as "ballasted" devices. Ballasting means that the composite transistor has built in protection against SWR conditions, that can cause excessive current in the transistor junction. Practically, these ballasted devices consist of numerous small transistors that are formed on a common silicon chip or substrate. The bases are in parallel, and so are the collectors. But each emitter contains small resistance of identical value to the other resistors. The ends of these many ballasting resistors, opposite the emitters, are connected in parallel within the transistor. This is shown in Fig. 1.

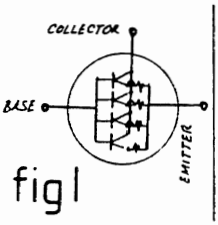


fig1

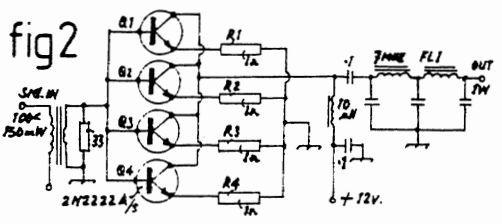


fig2

What do these individual emitter resistors do. They prevent what the industry refers to as "hot spotting". In more ordinary language, the resistors prevent any single transistor on the chip, from hogging current during mismatch events. Using other words, the resistors tend to equalize the current flow among the family of small transistors, thereby preventing one or more of them from hogging current and burning out a section of the overall power transistor.

For many years I have used this principle to make QRP amplifiers from such devices as the popular 2N2222, 2N3904 and similar high fT devices. The advantage is that these transistors are low cost and readily available. Four 2N2222As for example, can provide 1 watt of output power up to 30mhz, with very low driving power (approximately 100 - 150mw.) Fig. 2 shows a typical circuit in which four 2N2222As are used. Higher output power may be obtained by using six or eight transistors in parallel. Additional driving power is required if this scheme is adopted. Also larger RF transistors, such as the 2N3866 may be paralleled and ballasted to provide 2 watts output (2 transistors), or 4 watts output (4 transistors).

I recommend that you attempt to match the transistors before placing them in parallel. Insert a MA meter in the collector supply, apply 9 or 12volts with a 1 ohm resistor in the emmitter lead to ground. Use 1 volt of forward bias to the base. Select transistors that yield equal or nearly equal (5% matching) current under these conditions. I have also done transistor matching with an 18mhz crystal oscillator. I use a 1N34A rectifier diode at the oscillator output to read the DC current produced by the oscillator (100uA meter). Select transistors that produce equal output readings. I have never found it necessary to use heat sinks on the four 2N2222As in parallel at 1 watt output. They do run a bit warm, but never become too hot under 50% CW duty cycle. Heat sinks can be made from thin copper and press fit on each device. These sinks need be only ¾" long. When selecting small signal RF transistors for parallel use, make sure the safe Vce (Collector to emmitter voltage) is at least 36 volts, and that the devices are of identical manufacture. Also choose devices that have an fT of at least five times the highest proposed operating frequency. The collector voltage

Paralleling Small Transistors for QRP RF Power (Cont.)

under CW conditions will rise to twice the supply voltage. Under conditions of SWR or self oscillation, the effective Vce may rise as high as four times the supply voltage. Allow plenty of leeway when choosing a Vce maximum rating. The collector load impedance is determined the same way it is when using a single RF power transistor. It may be found from Z(collector) = Vce^2/Po, where Z is in ohms and Po is the anticipated output power of the stage. Thus for a 1 watt amplifier (four 2N2222As) the collector impedance is 144/2 = 72 ohms. This is for a 12 volt Vce. I have never had a device failure when using parallel small signal transistors, within their safe dissipation ratings. It is important however to keep all transistor leads short. Also the ballast resistors should be returned to a common PCB bus, and their pig tails must be as short as possible. The resistors must be mounted as close to the emitter lead as possible in order to prevent unwanted lead inductance, which causes a gain loss by way of degenerative feedback. Some degenerative feedback will be present by virtue of the unbypassed 1 ohm resistors. It represents a performance tradeoff in favour of the ballasting feature.

****

Bits and Pieces (Cont.)

CLUB COMMUNICATOR ARTICLE PUBLISHED IN AR MAGAZINE

It has been drawn to my attention that an article, featuring the Club Communicator circuit has been published in AR. As the Committee is in possession of the sole publishing rights for this project, we are at a loss to know why this article was published without permission. Members are also advised that the artwork and drawings are not the ones supplied by our Club kit Aotvity Center. The Club Committee is looking into the matter, and will take the appro -priate action.

****

CLUB CONTESTS AND AWARDS

I would like to advise all members, and in particular our new members, that a program of Contests and Awards will be re-introduced, as from the next issue of Lo-Key.
Our Scrambles, the VK and DX Scoreboard Contests will be on again. Full rules and details will be given in the June issue.
As for awards there will be details of our present awards, plus a further list of QRP goals that you can aim for.
When we get a few more Club Communicators on the air, I believe the Club may run a contest especially for our Homebrewers. It could be fun.

****

DX CONTACTS

Two of our DX members Matt ZL1ATW (34), and Fred W5QJM (31) are looking for contacts with VK members. Please keep a look out for Matt on the QRP frequencies on both the 14 and 28mhz bands. Fred is looking for contacts on the 10mhz band. Please keep an ear open for these two members.

****

To conclude this issue of Bits and pieces, may I ask all members to support the Club as much as possible. Please realise that with that large drop in membership, the Club will have to watch its expenditure very closely indeed for the next twelve months or so. Rest assured that we will be doing our best with what we have got. God bless.

****

TRY TO PUT QRP ON AS MANY BANDS AS POSSIBLE. SPEND MORE TIME ON THE AIR NOW

AN INVITATION FROM THE QRP AMATEUR RADIO CLUB INTERNATIONAL

....via Fred W5QJM (31)

QRP Amateur Radio Club International will sponser a technical forum, hold its annual directors' meeting, and have its annual awards banquet in conjunction with the ARRL 75th Anniversary Convention, the weekend of June 2 - 4 1989, in Arlington Texas.
An invitation is issued to those interested in presenting technical papers at the forum. All QRP enthusiasts are invited and urged to attend the gathering. A program of technical sessions and discussions, a contest for homebrewed equipment, a hospitality suite, a featured speaker at the awards banquet and an information booth, are among events planned for the weekend.
Arlington is half way between Dallas and Fort Worth, and is the home of the famous Six Flags Over Texas amusement park, and is not far from the stadium where the Texas Rangers baseball team plays. More details will be available as convention time nears. Meanwhile, those interested in presenting papers, or otherwise participating in the activities, are urged to get in touch with Fred Bonavita W5QJM, PO Box 12072, Capitol Station, Austin, Texas 78711, USA
Some more information from Fred's Letter..... Perhaps of more long range importance, is an announcement about the 1989 ARRL convention, and an invitation for participation by our friends in Australia. 18 months advance notice, ought to provide time for some folks, to put aside some extra cash, and perhaps prepare some technical papers to be presented. We encourage as many of the VK gang as possible, to join us on June 2, 3 and 4 1989, for this convention. QRP ARCI is planning a major program, in conjunction with the other ARRL events. We have already lined up one featured speaker, and we expect to sign others soon. It would be a major plus for the entire affair, if a VK QRPer or more than one, could attend and make a presentation. If nothing else it would be a very interesting occasion, to see a colour slide presentation, QRPing Down Under, something in the order of 20 to 30 mins. duration. The G QRP Club says it will make every effort to have a delegation in the colonies for the convention. That means George Dobbs, Chris Page, George Burt, and possibly others will attend. We have also extended invitations to the Clubs in Brasil, the Benelux group, Italy and so on. I hope you can find room for this information in the next issue of Lo-Key please, and I will send occasional up-dates as events unfold.

****

As far as the CW Operators QRP Club is concerned, the invitation has some very interesting possibilities. The matter has not been discussed by our Committee as yet, but I can assure you that it will. One thing I can tell you, is that our Club is not in any position to fund a delegate to the convention. The G QRP Club can and does partially do this, as they now have 4000 plus members. With our 80 members, it is just out of the question. Perhaps one of our members may like to make the trip privately, who knows. The aspect of presenting a technical paper to be read is interesting. Do I hear any volunteers to prepare one. Fred's final thought of preparing a 20 to 30 min colour slide presentation package on "QRPing down under", is a subject that is very close to my heart. For the last year or so, I have had considerable thoughts on a colour slide PR presentation, only for a longer period, probably in the order of 60 mins. The idea is to sell QRPing, CW and Homebrewing along with our Club, to the other Amateurs around Australia. Here is an opportunity for our members to get involved in something for the Club, by writing to me with your ideas about putting together a PR advertising package. If you have any technical details of how to go about it and what costs are involved, please include them in your letter. In the meantime I will start looking into the matter of the invitation with the Club committee.

****
EDITOR'S COMMENT
****

As you will have noticed, there has been a change of Editors for our Club journal Lo-Key. Rai needs a rest from the job, so I have taken it on again. Before I go on and tell you more about what to expect in Lo-Key, I would just like to pause for a moment to say thank-you and well done to Rai, for his effort as Editor for the last three years. All members would want to join me, I know, in this word of appreciation.

Now back to business. There are a number of ways that Lo-Key can be up-graded, and I will be looking at some of them from this issue on. My first action will be to establish an issuing date for each quarter. Lo-Key will be posted to all members, on or before the 15th day of March, June Sept. and Dec. To enable me to do this, I will make the dead-line for all copy for an issue of Lo-Key, to reach me by the 15th day of Feb. May, May, Aug., and Nov. This will give me four weeks to prepare each issue. Of course I am only playing this by ear, so I will maintain this schedule for the four issues of 1988, and review it at the end of the year, to make any necessary adjustments.

The second matter I am going to tackle, is the quality of the circuits and write-ups, for our technical articles. My procedure will be very simple. All I require from any member, wishing to submit a technical article, is a rough circuit diagram, a parts list, and the revelant notes that are needed to complete the project. I will take it from there, and do the presentation myself. In this manner I can guarantee an even and unchanging standard of quality for our technical articles.

This brings me to the type of articles I will be presenting in Lo-Key. I certainly have a number of ideas that I want to implement. Firstly I will be adding a much more practical approach to the technical articles. I have felt for a long time that while most circuits and write-ups give adequate electronic information, they seem to neglet or only briefly skip over the necessary practical assembly information. From here on I will take the steps to present a much more balanced style of article. In other words, I want our beginners to be able to "Home-brew", and successfully di-gest any article on a project, presented in Lo-Key. I have an idea that most of our members might agree with me on this point.

The problem of obtaining sufficient original material for each issue of Lo-Key, has caused me considerable concern, but after much deliberation I have decided on a course of action. Articles from members will always be welcomed and used when ever it is possible, so please continue to send in any suitable material. To ensure that I have a sufficient supply of articles for publication, I will use my own resources to develop circuits, and give existing circuits a different approach. My intention is to build up a bank of articles on all aspects of QRPing, so that I can plan issues of Lo-Key months in advance of the issue date. To have to wait to see what was in the post, would be the best way I would know of falling behind with the issue dead-line. I propose to avoid this possibility from the start.

I feel that Lo-Key is the one common link between all members of our group, and I would like to use it to best advantage in motivating us to enjoy our chosen branch of Amateur Radio, QRPing, CW, and Home-brewing. QRPing is about to take off in Australia, and the CW Operators QRP Club is the organisation to be doing the pushing. Therefore our Club Journal Lo-Key will become a very important medium to attract new members to this branch of Amateur Radio. With this overall view constantly in my mind, I will be trying to keep the contents of Lo-Key, interesting, instuctive and informative. I am going to enjoy the next few years of my QRPing, what about you....

LEN VK5ZF (1)

****

IF YOU WOULD LIKE ME TO SEND A SPARE COPY OF LO-KEY TO A MATE OF YOURS, GIVE ME HIS NAME AND ADDRESS..... IT IS TIME TO SPREAD THE WORD ON QRP AND THE CLUB.

****
****

BITS AND PIECES .... by Len VK5ZF (1)

****
****

MEMBERSHIP

When I have to write up this type of item, it really gets to me, and I am wondering right now whether the effort of running the Club, for the results achieved is worth while. Our worthy Treasurer Kevin VK5AKZ (43), has informed me that we have lost a further 26 members, through failing to renew their membership subscriptions. From memory I think we gained 23 new members last year, which took a lot of work and expense to get them. Now at the beginning of this year we lose 26, which has cancelled out the recruiting work of 1987. Our number of Club members would now be back in the 80's, it really is frustrating.
Now to see if I can salvage something out of this opening paragraph of doom and gloom. This issue of Lo-Key will be sent to these unfinancial members, just in case they overlooked paying their subscriptions. Notices were sent to all of these members in the last issue of Lo-Key, so they would be aware of their financial standing with the Club, so here is hoping that the members concerned will see their numbers, and renew their subscriptions immediately. To lose 26 members is a severe blow to building this Club into a worth while group.
Here are the member's numbers concerned....

6....16....17....18....19....23....36....39....49....52....53....55....

24...59....60....61....62....64....68....70....72....74....83....85....

92...101.

If your number is on the list, PLEASE DO SOMETHING ABOUT IT NOW. We do not want to lose you.

****

CLUB COPIER

Yes we certainly have a club copier at last, and we did reach our target of $700, with some last minute generous donations. For our technically minded members the model is a UBIX V3RF, which copies 1 to 1 and also reduces (handy for Lo-Key). It is about four years old, and of course has been reconditioned. We have certainly had some teething problems with it, but hope-fully these will be resolved soon. Thank you one and all who donated to make the copier possible, and I will do my best to see that it is put to use for the benefit of the members of the Club.
It is going to have to earn its keep, and by that I mean I would like to see the copier, be able to pay for the consumables that it uses, and the service costs to maintain it in good order. It was used to produce this issue of Lo-Key, and I am thinking of doing reprints of VK3XU's QRP Equipment handbook, and the G Club QRP handbook, as well as other items. In the meantime, I would like to receive some feedback from the members, on whether you would be interested in this kind of material being made available to you.I will leave my decision up to you, and base it on your response, so what do you say.

****

PETER VK6NNN (66)

I would just like to draw the attention of the members, to the efforts of our youngest member Peter. During the latter part of 1987, Peter put together a collection of Hints, Kinks, Circuits etc., that could be of interest to other QRPers, and forwarded them on to me, so that I could edit them for use in Lo-Key. Besides a couple of lengthy letters, giving his views on the Club etc., Peter drew out several circuits that he thought

Bits and Pieces (Cont.)
maybe helpful. All in all Peter has spent considerable time, trying to share what information he has, with the other members. I commend him highly for his efforts, and I can assure him that when and wherever I can use the material I will do so. Thank you and well done Peter you are a credit to the Club. I have a little "Oner" Tx kit that will be in the post to you, just as soon as I finish this production run of Lo-Key. Also you will receive a years free Membership to the Club in appreciation of your efforts.

****

NEW MEMBERS
Once again I am very pleased to welcome the following new members to our group. They are....
(118)....Jack Burke VK5FZ, 25 La Perouse Ave., Flinders Park, S.A. 5025
(119)....Owen Betteridge ZL3QW, 8 Chambers St., Napier, New Zealand
(120)....Marcelo Franco LU5EIE, CC11 Temperly (1834), Buenos Aires, Argentina.
(88)....Alex Szopke VK7CS, 25 Beach Rd., Legana, Tasmania 7277
(32)....Bill Balogh VK2BBX, 23 Bathurst St., Liverpool, NSW 2170

I am sorry to announce that we have three resignations : Ted VK4BML, Ron VK4BRZ, and Leith VK5LG.

****

VK5 (ADELAIDE) QRP WORKSHOP
In the Adelaide area there are now 7 Club members, and it has crossed my mind that it could be an excellent idea, if we could form our local members into a Homebrewing QRP Workshop Group. My thoughts are that as most QRPers are also homebrewers, it could be advantageous to each member of the group, if we could meet on a regular basis, say once a month.
The point being that we could help each other with technical problems, or if any of us needed guideance to put together a QRP project, or we might even develop some projects of our own from scratch. Times and days could be arranged by mutual agreement, and we could meet at one of the member's shack.
So I ask Max VK5OS (2)....Malcolm VK5BA(8)....Marshall VK5FN (16).... Kevin VK5AKZ (43)....Don VK5AIL (75).... Jack VK5FZ (118)....Len VK5ZP (1), to give this matter some thought, and write me with your views on the proposal. I believe that this kind of organised get together of our members, is just what this Club needs to get the members activated.
Of course us VK5ers would not mind if you Melbourne-ites or Sydney-ites, or the Brisbane-ians, or even the Hobart-ians, pinched our idea and started their own little local groups. What do you say fellers, let us start to get something more out of this QRP Club of ours.

****

TRAVELLING CIRCUIT BOOK No. 2
Perhaps it would be in order to say a few words about the Travelling Circuit Book No. At the moment I am not sure what will be happening about it. For a long time I have been trying to interest members in putting their names on the run list, with very little response. As I recall there were some cancellations, and several new names to be added. Whether there are now enough names on the list to send the book out, I do not know. I will look into it again, when I get some free time.
To the three members who missed out on Book No 1, I will see what I can do for you shortly.

****

SUPPORT THE CLUB NET AND VK5OS, EACH FRIDAY NIGHT AT AT 1030Z, ON 3620KHZ

CW OPERATORS QRP CLUB

WCM-HCM AWARD

The WCM Award (worked Club Members Award), is offered by the CW Operators QRP Club, to ALL Amateurs and SWLs, who fulfill the following requirements.

(1) Work 10 QRP Stations that are members of the CW Operators QRP Club, thus gaining 10 points for the Basic Award (1 point for each QRP station worked.) This rule applies to the Australian Amateurs and SWLs.

(2) DX Amateurs and SWLs are required to work 5 QRP Stations that are members of the CW Operators QRP Club, thus gaining 5 points for the Basic Award. (1 point for each QRP station worked.)

(3) Working the Club Station VK5BCW counts 3 points.

(4) Up-grades are available for working 30, 50, 75, 100, QRP stations that are members of the CW OPERATORS QRP CLUB.

(5) All frequencies allocated to the Amateur Service, may be used. The mode used must be TWO-WAY CW. (Phone to CW is not valid.)

(6) All QRP Club member's stations worked, must have different call-signs. i.e. VK2ABC/QRP can only be worked once for this award. To work VK2ABC/QRP on a second frequency would not be valid.

(7) The club members station worked, must be using the QRP suffix at the time of the claimed QSO, and must be using not more than 5 watts output to the antenna.

Club members wishing to qualify for this award, must work other club members.

(8) All Log entries to be valid for this award must be made after 1/8/86.

(9) VK Amateurs and SWLs send a certified copy of the logged contacts together with a fee of $A2

(10) DX Amateurs and SWLs send a certified copy of the logged contacts together with a fee of $3.

(11) Applications for the award are to be made to.....

Awards/Contests Manager,
CW Operators QRP Club,
Len O'Donnell VK5ZF/QRP, 33 Lucas St., Richmond, S.A., 5033 Australia

NON MEMBERS PAGE ....by Len VK5ZF (1)

If you are a non member, then this page is for you. This copy of our Club Journal has been sent to you, with the hope that you may gain some idea, of the activities of the CW OPERATORS QRP CLUB, by reading it.

We are saying to Amateurs, that you can enjoy your hobby just as well, and in fact better, and it is not necessary to spend thousands of dollars to do it. In each issue of Lo-Key, we try to include as many technical articles as possible, on all types of QRP equipment, and encourage our members to fabricate their own gear.

The reason why we promote the use of the CW mode, is to show support for a skill that has been part of Amateur Radio from its inception, and we are proud of it. Our Club is possibly the only Radio Club in Australia, that actively supports CW exclusively, and we will continue to do so, while it is a legal mode of transmis-sion, in the Amateur Service.

Using low power and homebrewing our own equipment gives QRPers a tremendous feeling of achievement and satisfaction. In fact we feel that we have a purpose, in holding an Amateur Licence. Would you like to help us, to put the AMATEUR back in-to Amateur Radio. Would you like to become enthusiastic about your hobby again, then fill in the application form, and mail it to the address shown on the form. Quit pressing buttons, and start using some of the Amateur skills that you have acquired.

Cut along this line

CW OPERATORS QRP CLUB

I would like to apply for Membership to The CW Operators QRP Club, as I am interested in the use of Low Powered (QRP) operation, the CW Mode, and the art of Homebrewing my equipment. With this application I enlose $A10 for VK Amateurs, $A12 for ZL Amateurs and $A14 for DX Amateurs, which is the annual membership fee.

Call Sign.....Name(please print).....

Address.....

Please post this application to -

Len O'Donnell VK5ZF, 33 Lucas St., Richmond, S.A. 5033, Australia.