

# Radio Homebrew and Experimenter's Group

An official function of the  
Amateur Radio New South Wales  
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The Radio Homebrew and Experimenter's Group workshop meetings are free to Amateur Radio NSW (WIA NSW) members. A \$5 cover charge **may** apply to non-members. Meetings are currently held at Amateur Radio House in Parramatta on the first Tuesday night of each month around 6:30pm to 9pm (doors locked by 9:30pm) **and** on the last Sunday of each ODD numbered month around 12:30pm to 4:30pm (that is after the Trash-n-Treasure). The Technical Book Shop and Technical Library are also usually open at these times for those who can't get in during the week. Cold drinks (leave your money in the fridge) and tea/coffee making facilities (FREE) are also available. Plenty of shops just up the road if you would like to grab something to eat in the hour or so break between the T&T and the Homebrew Meeting. Only a short walk from either Harris Park or Parramatta Stations and usually plenty of on-street parking for these meetings. The Sunday afternoon meeting is usually first a show-n-tell for any works-in-progress or completed projects members are working on and followed by a Technical discussion or demonstration. The Tuesday nights are an informal Technical meeting where people bring in works-in-progress to get help or ideas from the rest of those attending. These workshop meetings are informal get-togethers of amateurs interested in building, or repairing their own radio equipment. Some people bring their latest piece of equipment along to work on or to receive advice, while others offer their experience and advice in helping others.

The group has some pieces of test equipment at Parramatta, while others are brought in for the occasion. If you think that you may need some equipment, then **please contact Peter O'Connell VK2EMU by email or leave a message for him at the Parramatta office** and he will endeavor to have the appropriate piece of equipment available.

## This Month

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**This Newsletter is online at Amateur Radio NSW <http://arnsw.org.au>**

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## Radio Homebrew and Experimenter's Group News

This Tuesday 4<sup>th</sup> April will be the last meeting of the Radio Homebrew and Experimenters group at Amateur Radio House. These Tuesday evening meetings have proved to be very popular with amateurs coming along to join with others interested in building, repairing or modifying their own radio equipment. It is also an opportunity to get advice on the latest snag that you might be having or to make that all important measurement using some of the test equipment that is on hand at Amateur Radio House or is bought in by other members of the group.

It will also be the last opportunity to consult the Amateur Radio New South Wales' library before it is packed up in boxes and put in storage awaiting the move to Dural.

Also on the night there will be some discussion as to where we should continue the meetings over the next few months before the move to Dural is completed.

So if you are interested in home brewing your own radio equipment then come along to Amateur radio House 109 Wigram Street Parramatta next Tuesday evening. The meeting will start at about 7pm and will finish at 9pm with the doors locked by 9:30pm - so it will not be a late night for those younger amateurs who have to get up early in the morning to go to work.

73 de  
Peter O'Connell VK2EMU  
Coordinator  
Radio Homebrew and experimenters group

### Editors Comments – The issue is a “Members” Issue with projects by Homebrew Group members.

This issue is devoted mainly to Group member's ideas and projects, most of them have been presented in our Show-n-Tell sessions of recent meetings, details are presented here for others who would like to follow up on the ideas.

The Group projects featured in recent issues are still under way, further development is taking place, however a little hampered by some design issues (got to make it work) and other trivial matters such as family birthdays, my daughters car breaking down up at Nelsons Bay and my Mum needs her automatic garage door fixed, also I very occasionally need to sleep.

### Keep track of the Homebrew Group on the Amateur Radio NSW (VK2WI) Web site.

To keep track of the Homebrew Group please check the pages of the Divisions WEB site, look for details in NEWS, Meetings or the Homebrew Page itself on [www.arnsw.org.au](http://www.arnsw.org.au)

A few of the Homebrew Groups members and visitors do not have Internet/Email facilities, if you have contact with one of these guys could you please pass the above information along to them and also check this page for information on future meetings/venues so that you can keep them up to date. Thank you.

### Quick Project – Transistor Sorter for RF Gain

Mike Bell VK2KMB (written up by Brian VK2TOX)

While it is quite necessary to test a transistor for its DC parameters this can still leave us wondering exactly what we can use those you-beaut devices we obtained at the last Ham market of Trash'n'Treasure stall.

DC testers will help you identify whether a device is NPN or PNP and a number of its DC parameters such as DC gain. You will also determine that the device is basically functional.

To determine its usefulness you need to at least know the “FT” of a transistor, very basically this is the frequency at which the ac gain is unity (one).

Both the RSGB and ARRL manuals have quite good circuits for reasonably determining the relative RF gain of a device. They usually consist of an oscillator (xtal or free running) applied to the device under test (DUT) which is wired as a simple amplifier and then some form of indication of the output (typically a meter). The idea being that you apply a fixed frequency to the DUT and guesstimate its relative gain at that frequency.

From this guesstimate you can deduce the FT of the DUT. So if gain at say 10MHz is three, then one can assume its FT will be 30MHz ie 3 x 10MHz.

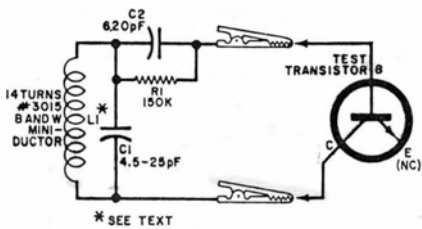
I have built a couple of the above testers and they work fine, only problem is calibrating the meter to get some idea of the gain of the DUT. Best I could come up with at the time was to test some known devices, tabulate the readings and then compare readings obtained with the DUTs.

This works OK, but is not very exact. By having a number of oscillators in the tester the DUT can be tested at these frequencies and cross check the results.

Mike VK2KMB came up with a tester which I think is quicker and easier to use and gives good results. He got the idea from a small project in a 1969 electronics magazine, with only a photocopy of the pages we are unable to determine the actual magazine name (apologies to the original source). However it appeared in print in May 1969 and was authored by Raymond F. Arthur.

The tester works on the principle that the FT of a device is greatly dependant on the actual capacitance between the Base and Collector of the device, as this capacitance causes transistor gain to drop off as frequency of operation increases. Fairly obviously the smaller the value of capacitance the higher the frequency the device can function at or more accurately retain a useful value of gain.

In lower frequency devices I understand it is quite acceptable to actually measure this capacitance with an ordinary



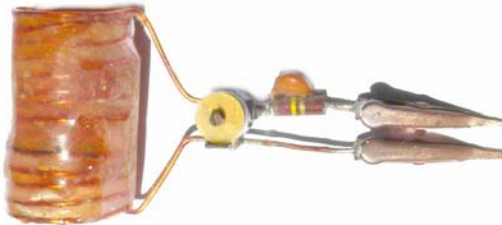
capacitance meter (analog or digital) in order to sort out the faster devices from the slower ones. In applications such as low to medium speed switching, audio and perhaps the HF band this would work but as the requirement for speed increases or operation in higher HF and into VHF/UHF the devices would be better tested in a circuit running closer to the actual operating speed.

Also I would think you should limit the following tests to low power devices.

capacitance the LC network will now resonate at a lower frequency. The difference in these two frequencies can readily be used to determine the value of the additional parallel capacitance.

Mike's circuit is really quite simple and effective, it relies on the fact that if you resonate a coil/capacitor network at a certain frequency, then add a parallel

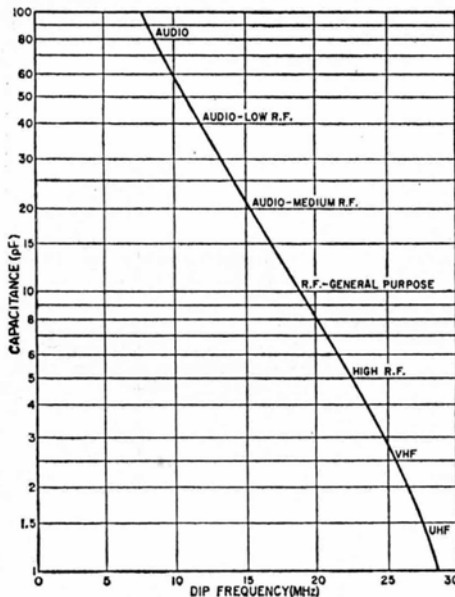
LC tank circuit with a few extra components to minimize loading of the BJT junction.



When constructed the  $L_1C_1$  tank circuit should be rigid and self supporting with the two ends of the coil bent out perpendicular to the axis of the coil and about 40 to 50mm long. Bend these leads so that you can solder the trimmer  $C_1$  directly to the leads of the coil. Clip the top lead short at the solder joint then solder  $C_2$  and  $R_1$  to this junction, solder the other ends of  $C_2$  and  $R_1$  together, then solder to this second junction the bit of coil lead you previously clipped off. Keep all leads symmetrical and the leads of  $C_2R_1$  as short as possible. Now bend the resultant pair of

leads so that they run parallel to each other and are about 10mm apart. Fit an alligator clip to each, ordinary un-insulated ones are fine to use. Your LC tank circuit should now look something like Mike's as shown below.

Mike has liberally coated his in Estapol® varnish to protect and hold the coil rigid. I guess I might also mount the whole thing in a small plastic case to protect all the components and also somewhere to stick the calibration chart to.



You could excite the LC tank with a Signal generator, however the lumped LC of the test leads may de-tune the tank circuit, if you have one, a Grid Dip Meter (GDO) is possibly a better way to excite the tank circuit. You can adjust the distance (coupling) between the tank circuit and the GDO coil to get a good resonant peak.

#### Calibration

With the alligator clips open-circuited and positioned where they can be clipped to a BJT under test, excite the tank circuit with your Signal generator or GDO. Gently adjust the trimmer  $C_1$  for a dip at 30MHz. Shorting the alligator clips together should shift the dip to around 3MHz.

#### Test a Transistor

Connect the base and collector leads of the transistor to be tested to the alligator clips, it doesn't matter which lead goes to which clip. Excite the tank circuit with your Signal generator or GDO, avoid over driving with the Sig Gen or over coupling with the GDO, determine the frequency at which the tank circuit resonates or dips.

Refer to the graph, plot the resonant frequency or dip frequency and extend it up to the transistor selection curve and determine most likely use of the device you have just tested. Also shown in the vertical plane is the base-collector capacitance associated with that selection.



and some switching, also perhaps to put a set of batteries in it for mobile operation. Yes, that the way I'll go, with a changeover switch on the back panel for mains or battery operation.

That's all for now, next time we will look at the frequency counter module mounted in the PC PSU box with Mains/Battery power supply and also at various pre-scaler modules to expand the measuring range of this instrument.

## Project - 6BM8 Single Valve TX for 80m and 40m

Stephen VK2BLQ

A couple of months ago I brought along to the Homebrew meeting "Show and Tell" a simple, single valve CW QRP rig. There are numerous circuits available in the Internet. This is merely an amalgam of several versions, there is no originality by me.

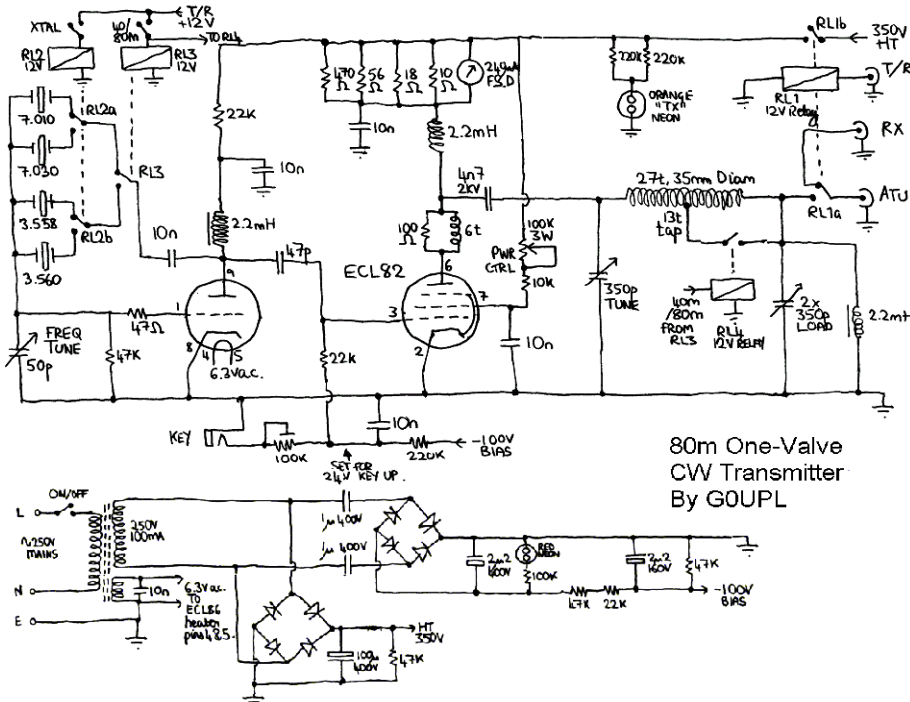
The 6BM8 / ECL84 is a Triode/Pentode found in many valve Hi-Fi amplifiers, radios and TV sets, and is still available. The triode section is a VXO crystal oscillator,



while the Pentode is a class "C" RF power amplifier.

Different touches that I made to this TX was to use off-the-shelf crystals. These are small HC6/U size and would not be able to pass too much current, precluding a design using a higher powered oscillator. These small crystals are soldered inside 3 or 5 pin Din plug connectors so that they can be made interchangeable.

The chassis was picked up at a T&T and re-sprayed Grey Hammerstone to tart it up. All the other components are currently available from the usual outlets. The two variable capacitors came from Truscotts in Melbourne, but any variable caps from an old B'Cast radio would work.

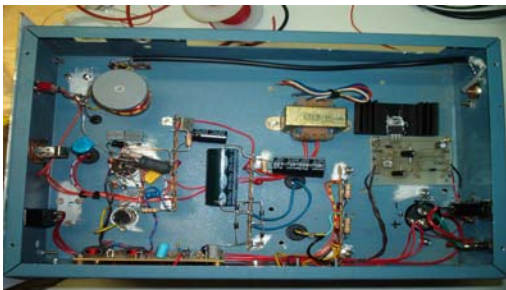


The power supply, whilst could have used a transformer from the junk box to make the HT, used a pair of transistors as inverters from 12V DC to ac and a common 240v to 24vCT ac transformer. Equally, two transformers wired back to back could do the same. Editor: will see if we can get a circuit of this PSU for a future issue.



The output was about 6 watts on 80 meters and less on 40 meters.

I designed the metalwork with the next experimental stage in mind. This is adding phone capability, achieved with a small board containing a mic amp and diode balanced modulator. The key socket would become the mic socket and the Class C amp cathode biased for linear. I expect the output power would be 3-4 watts. This seems like a simple mod to a simple Morse only transmitter for phone operation. Strangely, I have seen no references on the Internet that this has actually been done before, maybe it can't. That is what the experiment will show.



In conclusion, this is TX is only for experimenting and if you just have to build something using valves. If someone really wants to build a QRP CW/Phone transmitter, then anything from one of Drew Diamond's excellent homebrew books would be a better proposition.

Credits: Peter Parker VK3YE, Ed Cousins VK2ZST, Rob Tregear VK2ZIV, Harry Lythall SM0VPO, Hans Summers GOUPL

## Compact HF Antennae for QRP and Bushwalking

(Owen VK2AEJ)

A few weeks ago Owen VK2AEJ and myself spent an enjoyable couple of days camping in the bush out past Bathurst. Owen is a keen bushwalker is always looking for ways to enjoy his other hobby of Ham Radio whilst out in the bush. Quite obviously one of the prime considerations is the weight and size of any radio gear or accessories as everything has to be carried there and back.

He decided to use this opportunity to test out a couple of antennas he had constructed and also a small ATU he had built for the occasion. His dependably FT7 also accompanied us to the site along with a fully charged car battery.

Owen had two antennas to try out both were long wires cut to  $\frac{1}{2}$  wavelength on 40m. One was simply a length of bell wire. The other was cut from a length of fishing trace wire. This is a very flexible multi-strand section of stainless steel wire which is also plastic coated. This is quite thin, light weight and robust too, it is used to secure various arrangements of hooks and baits to the business end of a fishing line, it is also quite cheap. The ONLY PROBLEM is that its DC resistance is quite high, the length used was nearly 2000 ohms !!

The ATU was based on a variometer he had acquired somewhere along the line, it consisted of a fixed coil of around 4uH, within this coil was a separate rotating coil wired in such a way that it either aided or bucked the inductance of the fixed coil. In this application the transceiver was connected to the tapings on the fixed coil with a length of coax (shield to common/ground) and the antennae connected to the top of the fixed coil. The fixed coil was then resonated with a 120pF variable capacitor. This worked quite well to match the approx 2000ohms of the antennae to the 50ohm coax lead to the transceiver.

Then he pulled a natty little bit of kit out of his rucksack, his audible SWR meter. In a former life it had been one of those CB SWR units with two small meters on the front and using strip line inside to monitor a transmission. The meters were broken when he acquired it. With his bushwalking in mind he decided to pull the old meters out and replace them with the electrics of Drew Diamonds Audible SWR Meter which has featured in AR and his latest Circuit Books. Thus making a very compact and useful instrument, not until late one evening did I appreciate the value of the audible indication, you can tune up in the dark !! no meters to worry about.

We first tried the fishing trace wire but were unable to load it to the transceiver, the incredible DC resistance was obviously the reason, AH WELL! Now what can we use 20m of nice flexible wire for ??.

Then we strung the bell wire into the trees just above head height, in fact it was in the middle of a whole lot of young saplings, so most of it was about 2m off the ground and a couple of meters of its length led down to the ATU sitting on the ground.

I might mention that as this was a test lash-up the ATU was just mounted bare on a piece of wooden board, such that Owen found even quite modest power levels produced a bit of a "tingle" if he inadvertently touched any of the bits above ground.

So we found that the bell wire tuned up a treat with a very low SWR reading. Its efficiency as an antennae was proven later in the evening when we easily chatted to VK2, VK3, VK4 and ZL calls, who all reported an excellent signal. In fact most of them could not believe we were only pushing 10W into a piece of wire, just goes to show, it's the antennae that counts.

**See you next issue.**