

Radio

Homebrew

and

Experimenter's

Group

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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. Currently we have two "meetings" a month with an extra one on the Trash and Treasure Sundays as follows :

First Tuesday of each month 7 - 9 pm at McDonalds, cnr Church St and Victoria Rd, Parramatta (upstairs dining room) Buses stop outside and plenty of parking. We usually arrive around 6:30 and have something to eat before the meeting.
Third Tuesday of each month a Radio Net on 2m using the VK2WI Dural Repeater (147.00) duplex at 7:30pm. We get together on-air and discuss our latest projects, antenae and radio gear. All welcome.
Technical/Presentation Meeting after the Trash and Treasure Meets which are usually on the last Sunday of each odd-numbered month. The meetings starts about one hour after the Trash and Treasure and runs from around 1:00pm to 4:30pm, they are at our VK2WI site at 63 Quarry Rd, Dural (first right turn after the round-about at Dural and follow your nose, look for the tower on your left hand side, plenty of parking on site.

These meetings are informal get-togethers of amateurs interested in building, or repairing their own radio equipment, there is usually a "show and tell" segment, where Amateurs can bring along their latest project (or even an old one) and show others what they have been up to. This is usually held before the demonstration or lecture organized for that particular meeting. We are always interested to see how others get a circuit working or sort out various hardware problems.

If at a meeting you need some test equipment either to fault find, calibrate or demonstrate something, then **please contact Peter O'Connell VK2EMU by email or leave a message for him at the office** and he will endeavor to have the appropriate piece of equipment available.

Check out the "Homebrew" page on www.arnsw.org.au for the latest news for the latest news on the Homebrew Group. If you would like an extra copy of this newsletter, you will find a PDF version also on this page. Suggest you visit this site regularly to keep up to date with what is happening at ARNSW and for lots more information of interests to Hams.

This Month

- **Editors Comments – The issue is a "Members" Issue with projects by Homebrew Group members.**
 - **Keep track of the Homebrew Group on the Amateur Radio NSW (VK2WI) Web site.**
- **"Metal Bashing" (Stephen VK2BLQ)**
- **Project – Xtal Calibrator Pt 01 (Stephen VK2BLQ)**

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

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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 (gota 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

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.

Metal Bashing For Beginners

Stephen VK2BLQ

Firstly, there are many things in the home workshop that can cut, blind, burn and poison, so be careful; use eye protection when cutting or drilling and hearing protection when operating power tools.

Useful tools.

A list of tools for metal could go on for pages, but a lot can be done with just a few tools such as ;

- Nibbling tool, Tin Snips, Hack saw, Hole saws, Step drill, Twist drills and an assortment of Files; flat, round, half round and needle files.
- For measuring and marking out a Steel Rule, Combination Square, Scribe, pencils and Texta pens.
- For bending a Ball Pien Hammer, G-Clamps, Bench Vice and a few short lengths of Steel angle.

Resurrecting an old box

Old stereo systems found at garage sales or lying in the street can be put to good use by stripping the box and saving the useful bits. Clean up the grime and rust and giving it a respray makes it look like new.

Old computers such as ATs XTs are quite regularly seen sitting on nature strips. These, too, can be stripped of useful components (if the thing can't be fired up and used as a PC) and the box can also be cleaned up and projects mounted inside.

Bending a chassis.

Homebrewing shouldn't mean that we need to build our projects in biscuit tins. A simple sheet metal chassis can be made with bits and pieces from the hardware store shelves. Following is a simple “Bender” made out of a few lengths of angle iron, a couple of hinges and some nuts and bolts.

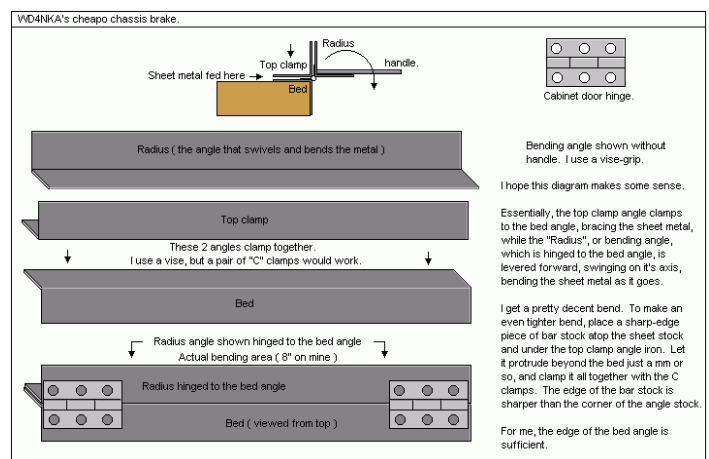
References: Gary Johanson WD4NKA's web site for the drawings of a chassis brake.
Drew Diamond's Radio Projects, Vol 2 & 3, AR magazine September 1998.

Bending sheet metal

It's important to measure accurately, mistakes end up as expensive wasted metal. Remember the saying
“Measure twice, cut once”.

Aluminium is still fairly inexpensive, easy to work and comes in a variety of thicknesses, shapes and sizes. Check out your local Aluminium Centre for off cuts.

Tin and galvanised iron tarnish and corrode eventually, so should be painted and still make good covers for a chassis. But they are easily cut and bent, even can be soldered
A good thickness for bending boxes for the sort of projects we build is 1.0 mm (about 18 gauge). Other thickness of aluminium such as 1.6mm (16 gauge) and 3mm are harder to bend, but are good for brackets and front panels. Thinner sheet such as 0.8mm is a bit thin for chassis, but is OK for cover plate on a front panel or shielding sections within a box.



Simple bends can be made by clamping the aluminium sheet between two lengths of angle in a bench vice and struck with a hammer via a block of wood to prevent ugly dents.

I don't have welding facilities to construct the bender that Drew Diamond described. Shown here is a simple chassis brake I built with common workshop items, and off-the-shelf bits at the local hardware emporium.



Worked example step-by-step chassis making.

1. Make a scale model from cardboard.
2. Place the components on it and then use it as a template on the sheet metal. Sometimes the metal has an adhesive film, use this as the outside- on-display face. You may have to work on a mirror image, be careful.
3. Cut, file, centre pop; this is the time consuming bit. It's easier to do all this before bending.

A jig saw will scratch the sheet, so mask off the line with masking tape. Drill 3.5mm holes at the corners of the bends.

4. Tabs need to be bent first, work from the inside bends to the outside. This type of chassis is a bit fiddly.
5. Once the chassis has been completed, rub down with steel wool and turps to remove scratches and to clean prior to painting. A dip in Caustic soda (Draino) is useful.
6. Mask off the holes to stop the paint leaking into the inside. Spray or brush, up to the individual.

When making the bends, always allow for the bending radius of the metal; it is approximately 1.5 times the thickness. For example; allow 1.5mm when bending 1mm sheet, otherwise the chassis may end up too big or too small. Best to practice on a few small bits of the material you are going to use, so as to get the "feel" of how much to allow and so get a nice neat fit.

Project – Xtal Calibrator – Pt 01

Stephen VK2BLQ (Written up by Brian VK2TOX)

From time to time we all need a reasonably precise source of frequency or pulses, be it for checking the calibration of a receiver dial, calibrating an CRO timebase display or calibrating a signal or pulse generator. Exactly what frequencies are needed obviously depends on what you are doing and how accurate you need to be. For a particular job most of us just "cobble" up a Xtal oscillator or breadboard an oscillator block, but of course next time you have to do the same thing again.

However as everyone's needs are different and the actual components available may vary we will look at a Xtal based calibrator in a "building block" fashion. You pick what you want to do or use what components you have available. The actual choice is a bit of "chicken and egg" situation as you have to balance what you want against what you have or can acquire.

TimeBase

This is the basic source of signals which we then process as required. Basically we can use :

- (a) An external signal source
- (b) An internal Variable signal source
- (c) An internal Xtal oscillator circuit
- (d) A Oscillator Block ie from a PC motherboard or surplus equipment
- (e) A combination of the above.

Some years ago in "73" Magazine they ran a very interesting project utilising a combination of the above, we will revisit this concept in our next issue. For the meantime we will look at a project based on an internal Xtal oscillator.

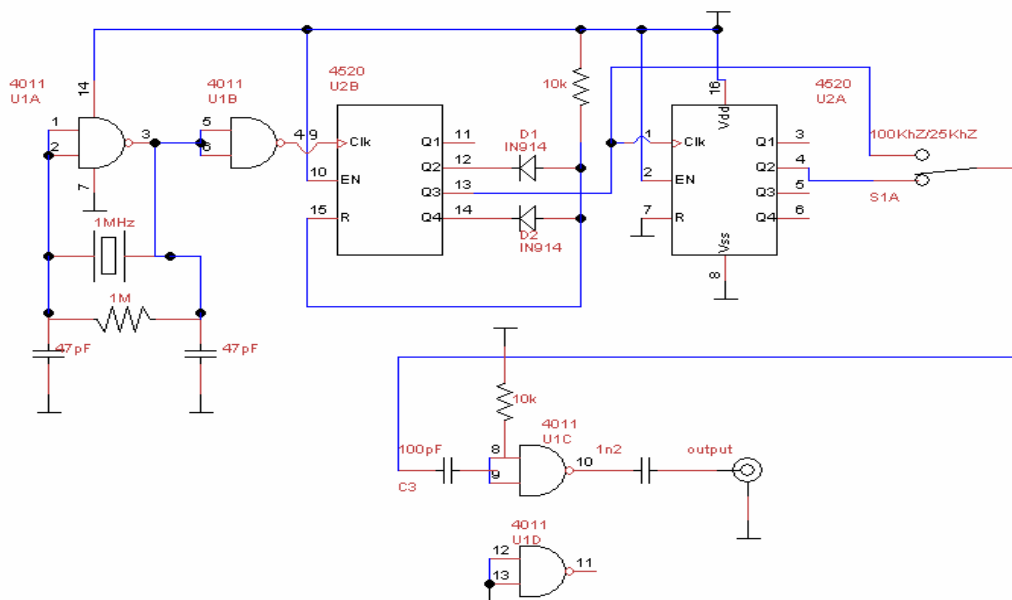
Dividers

The basic output of an oscillator is usually too high a frequency or too coarse for checking the calibration of a dial so we will usually divide it down to more usable frequencies with one or more logic divider chips or stages. Most divider chips these days contain one or more actual divider stages.

Type of chips

For this initial project we will look at using readily available CMOS chips in particular the 4518/4520 divider chips and the 4001/4011 set of chips. The main difference between the chips are as follows.

- (a) 4518 contains two BCD Up Counters (decimal dividers)
- (b) 4520 contains two Binary Up Counters (binary dividers)
- (c) 4001 contains four 2-Input NOR buffered Gates
- (d) 4011 contains four 2-Input NAND buffered Gates



For this initial part of the project let's look at a combination of 4011 and 4520 chips as per the diagram above. In the next issue of the Newsletter we will look at 4001 chips for the oscillator and buffer stages, also at 4518 decimal divider. You can "mix and match" the circuit blocks to suit your needs.

4011 and 4520 Circuit

The first 4011 gate is used as the actual timebase for the project, you can use almost any Xtal from 500KHz to 10MHz in this location, you may need to adjust the value of the two 47pF caps to suit your Xtal and even replace one of them with a small trimmer so as to "tweak" the frequency of the Xtal to exactly the frequency required. The second 4011 gate buffers the output of the Xtal osc and thus improves it's stability. In the following part of the circuit the first half of the 4520 is wired as a "divide by 10" by tying the "2" and "8" Q outputs to the "Reset" line via a couple of 1N914 diodes. The following stage of the 4520 is used as a "divide by 2" stage by taking an output from the "Q2" terminal.

This circuit is interesting in that it shows the two applications of the 4520 stages, divide by "anything" and a binary divider. This is followed by a selector switch to "grab" the outputs for each of the 4520 stages and also feeds the signals another buffer stage which isolates the project from the outside world. The small cap leading to the output terminal is to block any DC voltage appearing on the output terminal, stops it going out and external circuits feeding DC back into the chips.

Mods and additions

Although the last stage of the 4011 is shown as disabled it could actually be paralleled with the U1C stage to provide more current to the outside world. You can actually cause the first stage of the 4520 to divide by any integer (simple number) by tying the appropriate binary outputs to the Reset line with further 1N914 diodes. We could get the second stage of the 4520 to "divide by 4" by taking the output from the "Q4" terminal and so on. You could use the U1D stage for another Xtal oscillator (and switch select or logic select the two outputs). You could rewire the first 4520 stage to divide by another number and/or use a multi position selector switch at the output of the 4520 stages to select the "2", "4" or "8" outputs. Even to bypass the divider stages altogether and select the Xtal frequency itself.

Supply voltage

These chips can be powered from a supply of 5 to 15VDC, they will obviously draw more current at the higher voltages (a consideration if you need to battery power the project). However the frequency the chips can operate at depends greatly on the supply voltage. Up to around 6MHz at 10V supply, for 10MHz you will have to go to 15V supply. The operating frequency also depends on the actual "Brand" or manufacturer of the chips, their quality and the actual CMOS family you are using. In this circuit we are using the "CD" or "MC" types which are generally available from dealers or ratted from equipment.

Next Issue

As mentioned we will look at the alternate chip types, even using TTL chips. We will also look at using internal and external signals to feed the divider stages as so put together a very useful piece of test/calibration equipment. Maybe even have a look at using the various oscillator blocks off PC motherboards which actual work at frequencies very useful for Ham applications.

Meantime

Why not rustle up some components and breadboard the above circuit to try it out and get a feel for it capabilities, if you have any questions don't hesitate to write or email us, we would be happy to help.