January 2008
Volume 8, Issue 5

ANODE

Inside this issue:

Editor's Comments

January 2008
Volume 8, Issue 5

Oh my! An Anode article is found on Google.
I did a search on "hardware component mining" and it turned up as a "hit" on Google.

{—}

Linux tips
[Its like being given the "cheat codes" to a game.]

KDE is so like XP it needs at least 128MB memory.
So use BlackBox - it runs in less than 32MB.

Getting X Windows to run.

To start, "man Xorg". That is 'read the manual'.

You will see: Xorg -configure as one option. This will bring you back to the prompt with a new configuration file. To test the new configuration, type 'X -config /root/xorg.conf.new'.

If X windows crashes or hangs, use Ctrl & Alt & backspace. (<- the arrow above the Enter key)

Display Memory requirements
To run a GUI system satisfactorily you need a VGA display adapter with

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Listen to AMATEUR RADIO Signals!

Special points of interest:

- Contact details on back page (updated)
- Next HamComp has been postponed to February.

[from http://www.nzart.org.nz/nzart/ar_info/alivo/alivo-a.html]

You can build your own radio receiver!

The receiver-construction information given below is extracted from the booklet "Secret Listening" published by the New Zealand Association of Radio Transmitters Incorporated, P.O. Box 40 525, Upper Hutt, New Zealand.

It has been written to encourage new entrants to Amateur Radio.

Permission is given for it to be freely copied for the purpose of providing a single personal copy to persons interested in radio communicating and in amateur radio, provided:
That it is not used for any commercial purpose or promotion, and, it is copied in its original form, in its entirety and without deletion, addition or amendment.

(c)1998 and 2002, The New Zealand Association of Radio Transmitters Incorporated.

The booklet "Secret Listening" is ISBN 0-473-05140-0, NZART, March 1998. Revised 2002.

For a copy of the complete booklet "Secret Listening", send $3.00 to NZART Headquarters, P.O. Box 40 525,

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Editor's rants and raves - comments

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enough memory on it. A bare minimum of 4MB will work but more is desirable.

If you don't have sufficient memory on the display card, you will get a message similar to this:

SIS chipset; Framebuffer bpp 32 not supported for this chipset.

To unzip or extract a compressed archive; 'tar xvfj filename.tar.bz2'

To access a USB memory stick on Linux

- Try 'ls -l /dev/sd*' - usually will give no files found.
- Plug in the flash disk/stick. 'ls -l /dev/sd*' shows (typically) /dev/sda and /dev/sda1.
- Now 'mount /dev/sda1 /mnt/flashdisk' or use /dev/sda.
- You may have to; 'mkdir /mnt/flashdisk' to provide a 'mount point' for the memory stick.
- Now you can 'ls -l /mnt/flashdisk' and it should show the contents of the memory stick.
- To unplug the stick, use 'umount /dev/sda1' and the light on the stick will go out.

"Chip Creep"

I have been given a lot of 'veteran' display cards over the last few months. All are assumed

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Listen to AMATEUR RADIO Signals!

(continued from page 1)
Upper Hutt, New Zealand
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INTRODUCTION

There are signals in the air and space around you. You can listen to these signals with simple equipment, equipment you can make yourself. No licence is required to listen. This booklet shows how you can make a simple receiver to listen to Amateur Radio signals.

This booklet also brings information about AMATEUR RADIO, information to help you to understand the signals you hear.

A receiver can be made by you for about $50. All component parts are available. It will take you about 5 to 10 hours to make. Its success will depend upon the care you take. Read this booklet and decide! You will have countless hours of fun and enjoyment from listening. All kinds of activities are taking place around you - a whole new world will open up!

Further reference information

The NZART Call book and Radio Reference is published each year. It contains information useful to radio listeners and essential to radio amateurs. Copies are available for $15 post-paid from NZART Headquarters.

Make contact!

There are radio amateurs near you and a club too. Radio amateurs are keen to help newcomers and to answer your questions. We are a friendly group! You will find that AMATEUR RADIO opens up new things for you, new challenges, new things to learn!

Build your own Special Radio Receiver - and listen to Amateur Radio signals!

Fun to build ... fun to use ... and inexpensive too!

This simple but great-performing receiver is safe and easy to build by constructors of any

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Editor's rants and raves - comments

(Continued from page 2)

faulty until tested. Ones that are tested and found to be functioning, are then marked as working. One card that gave me a few beeps from the speaker - 'display failure' - was found to have the BIOS chip partly out of the socket. Gently pushing it back into the socket, cured the fault.

I have also been given a lot of modem cards. These would have been mounted inside the PC into a PCI socket. [In South Africa, this is tantamount to throwing your whole pc into the landfill.] All of which are - as far as I am concerned - are definitely faulty. Most of these cards can be "mined" for useful components. The main one being the audio 600 Ohm transformer. These transformers will usually survive the lightning surge that comes up the line. These transformers can be used to 'isolate' your PC and interface from your transceiver for PSK31 / audio card packet/rtty/morse. If you would like one or more of these, please let me know.

"Linux Juke Box" - Use a Pentium II (up) to build one.
Use XMMS to make and play playlists. Haven't you got your vinyl onto the computer yet? Install Audacity and feed the sound card from the Hi-Fi.

{—}

Take a closer look at the modern sound card/ adapter interface.
The exponential curve of technology development is approaching the 'steep' part of the curve. Disk capacities above the 1 Tera Byte level are now available. The latest sound card / adapter is still AC97 but the hardware is capable of much more than just making beeps and burps. Multi-channel and 20 bit A-to-D's are standard. The newer adapters will attempt to 'see' what is connected to what socket and will adapt the driver output accordingly.

Also I see that the colour coded sockets (3.5mm jack sockets) and amplified speaker sets are now no longer being supplied. It would seem as if the pc world has gone totally mad for USB.

The digi-BBS is down until further notice.
Yep, ZS0HTN is no more, it is dead. It is a 'broken' bbs. Come to the 'wake' tomorrow night...

If you have a million cell-phone chargers plugged in....
[But not in SA as they blow the primary with lightning surges.]

Linux support of 'veteran' hardware. Especially scanners.
I have a couple of 'veteran' scanners that will not function under Windows 2000 or Windows XP. They used to work happily under Windows 95/98 but the makers decided not to update the drivers for the later operating systems. This would have 'broken' the newer scanner sales I suppose. I wonder if these manufacturers are still in business. However all is not lost, Linux can use most of these scanners under the 'sane' interface where the drivers have been 'reverse engineered'.

The Club UPS.
The club has acquired a couple of small UPS. I replaced the battery in one and it is now working and tested fine. Unfortunately this was for the BBS...

Fed up with the waiting for Adobe's reader to load?
Try foxit software's reader. It loads in a flash and navigate a pdf fast. Get it at:- http://www.foxitsoftware.com/

Where to put up all the pictures
One of the advantages of 'belonging' to the

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Editor's rants and raves - comments

Google fraternity is the storage that is available for free. My favourite picture organiser is Picasa and it now offers to store and show off your pictures. If you want to see all the pictures taken by me at the club and others about the club, go to:-

http://picasaweb.google.co.uk/brockjk/Amateur_Radio_Pics

GNU RADIO
http://www.gnu.org/software/gnuradio/gnuradio.html

GNU Radio is a collection of software that when combined with minimal hardware, allows the construction of radios where the actual waveforms transmitted and received are defined by software. What this means is that it turns the digital modulation schemes used in today's high performance wireless devices into software problems.

What is a Software Defined Radio?

Joe Mitola says, "A software radio is a radio whose channel modulation waveforms are defined in software. That is, waveforms are generated as sampled digital signals, converted from digital to analogue via a wideband DAC and then possibly up-converted from IF to RF. The receiver, similarly, employs a wideband Analogue to Digital Converter (ADC) that captures all of the channels of the software radio node. The receiver then extracts, down-converts and demodulates the channel waveform using software on a general purpose processor."

For our purposes, on the receive side, the idea is to get a wide band ADC as close to the antenna as is convenient, get the samples into something we can program, and then grind on them in software.

Listen to AMATEUR RADIO Signals!

age, a 'hands-on' introduction to Amateur Radio. It is developed for the New Zealand (ZL) new entrant to amateur radio listening and who is new to home radio-construction.

Battery-powered, it covers the popular amateur radio 80 metre band 3.5 to 3.9 MHz. It brings the excitement of listening to amateur radio signals, live, as they happen - alive-oh! Phone signals, both single-sideband and amplitude-modulated, and Morse code signals (continuous wave - CW) can be copied.

Its features are great sensitivity, simplicity and low cost, presentable in appearance and comfortable to use. It requires light-weight stereo headphones (real communicators use headphones!) and a length of wire as an antenna (or aerial). The batteries last for ages.

It can be made at home using common hand tools, while learning about components, soldering, wiring, tuned circuits, antennas and listening to radio communication on-air. A great way to learn about radio and to listen to HF amateur radio communications - with a receiver that you yourself have made!

How does it work?

This part may at first seem complicated - skip it if you wish and come back to it later!

The outline block diagram is in Fig.1, a direct-conversion receiver. A steady carrier signal at a frequency of (say) 3.736 megahertz is fed to a mixer. (3.736 MHz is 3736 kilohertz, kHz). The local oscillator at 3735 kHz will beat with this signal and produce various output frequencies, such as the difference between the two signals:

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1 kHz (1000 Hz), and the sum: 7471 kHz.

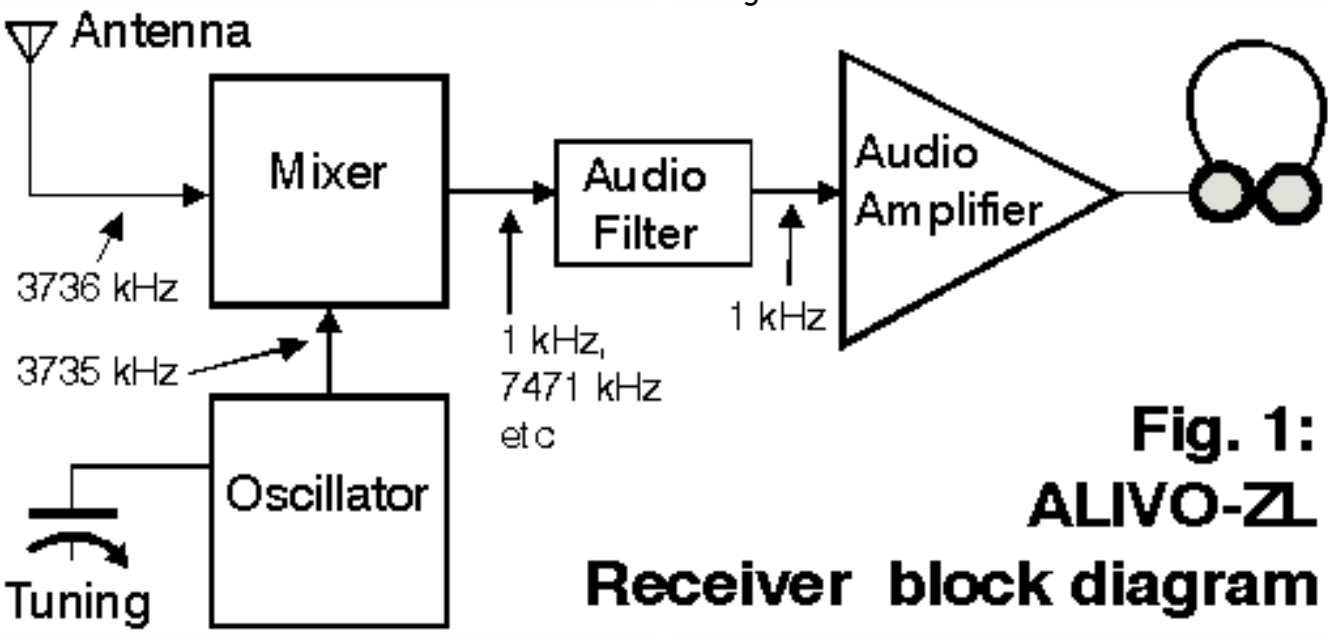

Fig. 1: ALIVO-ZL Receiver block diagram

The output from the mixer is passed to an audio filter. The 1 kHz signal passes through and is amplified by the audio amplifier. The 1 kHz sound is heard in the phones. Changing the frequency of the oscillator with the tuning control - as the receiver is tuned across the band - will change the pitch of the audio signal you hear. SSB (single-sideband - speech) and CW (continuous wave - Morse code) signals can be 'tuned in' by careful adjustment of the tuning control.

The circuit diagram

The circuit is shown in Fig 2. Integrated circuit IC1 acts first as a radio frequency amplifier and then as a mixer, with L3 and various capacitors as the oscillator. It is followed by IC2, an audio amplifier.

The potentiometer R1 in the receiver input circuit is an attenuator. At one end of its travel it earths the antenna. At the other end it feeds the incoming signal from the antenna direct to the primary coil L1, coupling from there into the tuned circuit L2 and C1 (with C2) and to pins 1 and 2 of IC1. So R1 controls the level of signal through the receiver and the loudness of the audio heard at the headphones. C2 is peaked for maximum signal.

The audio filter is between pins 4 and 5 of IC1 and pins 3 and 2 of IC2, with the audio output lead from pin 5 of IC2 to the headphone jack (socket). A single capacitor C19, between pins 1 and 8 of IC2 sets the audio gain.

The positive lead of the 6 volt battery connects through the on/off switch to pin 6 of IC2 and to pin 8 of IC1. Pin 3 of IC1 goes to earth and pin 4 of IC2 is also earthed, completing the d.c. path through each IC. The battery negative lead is also connected to earth. 'Earth' and 'chassis' mean the same thing here. Both terms mean the common metal front panel and the copper of the circuit board.

Pin 7 of IC2 is not connected (nc) to anything.

How to go about it ...

All components for this receiver can be pur-

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chased new from electronics parts suppliers. Some may be found in 'junk boxes' but be sure to use only good quality items. Many other parts can be substituted.

4. Screw the circuit board to the baseboard and connect it to the front panel components.

5. Simple setting-up tests follow.

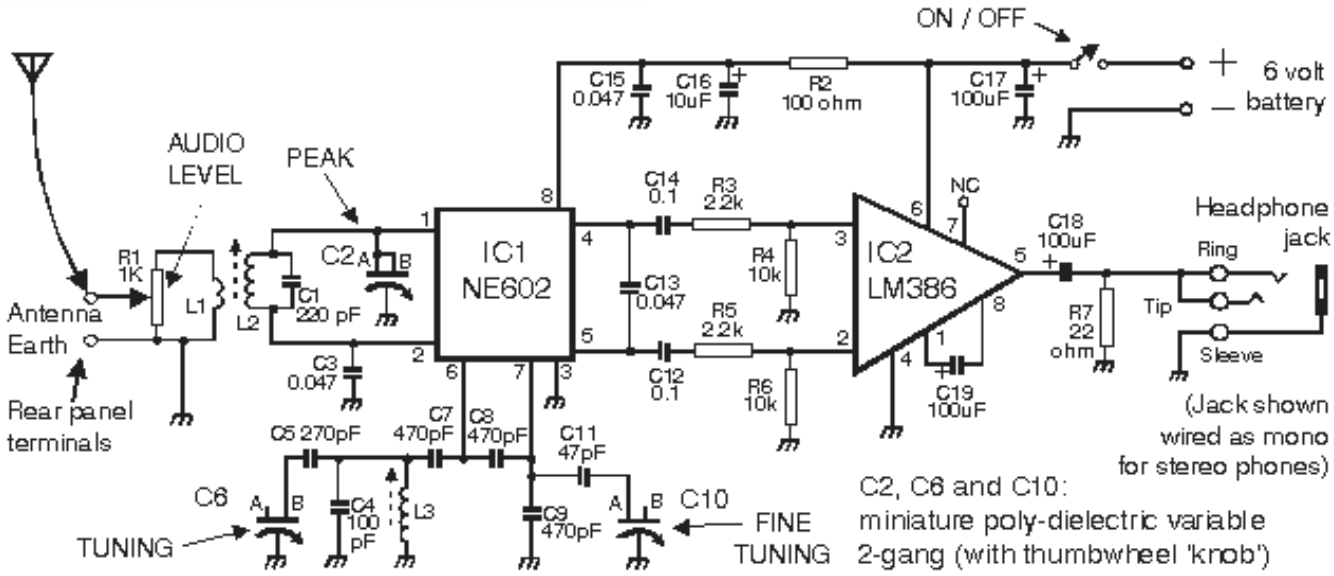

Fig. 2 ALIVO-ZL Receiver circuit diagram

Three variable capacitors are required, for the Tuning C6, for the Fine Tuning C10, and for the Peak control C2. These are miniature two-section 140/160 pF poly-dielectric models which can be purchased new or taken from discarded broadcast AM transistor radios. They come complete with a thumbwheel which is used in this receiver as a conventional knob - a cost-saving!

There are distinct stages in construction:

1. Prepare a metal front panel and a wooden baseboard, the 'chassis' on which to build the receiver.

2. Mount components on the front panel.

3. Prepare and wire the electronic components on a piece of printed circuit board.

6. Make a cover to enclose the unit, attach some rubber feet or felt pads.

The receiver is complete and ready for service.

The physical construction

The design shown in Fig. 3 is cheap to duplicate. The construction shown is easy for anyone to build with a minimum of tools and there is still access to every component for experimenting.

The finished receiver must look the part, so take time preparing the front panel. The panel is a piece of flat sheet aluminium, 195 mm by 90 mm. The thickness can be about 1.2mm (18 gauge). Your local plumber will have some scrap ... but make sure that it is flat!

The front panel decal in Fig. 4 can be photocop-

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ied. Glue one copy to the front panel and use it as a drilling template. For a professional appearance, a second copy can be laminated in clear plastic and glued on the finished front panel. If you want a neat fresh copy, send a large A4-size self-addressed envelope with 80c stamp to NZART HQ, P.O. Box 40-525, Upper Hutt, New Zealand. Ask for the 'ALIVO-ZL' decal.

Carefully check the physical position of each component mounted on the front panel. Check the size of hole required for each item by measuring from the component itself - before you drill! Do all the drilling and filing and finish the front panel metalwork before any components are mounted. Take care and do a neat job.

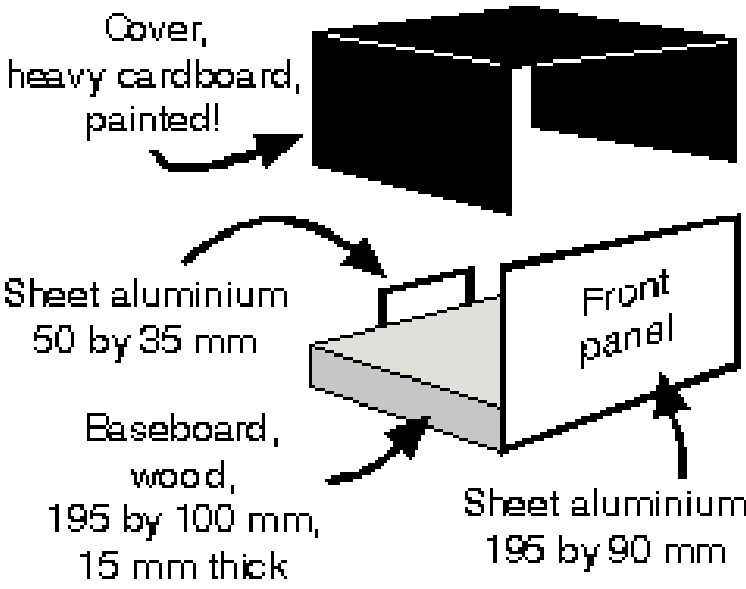

Fig. 3 Cabinet construction

Mount the three variable capacitors with care. You may need to space them back from the panel with a spacer. Fail to do this and the capacitor mounting bolts may project too far into the interior of the capacitor and damage it. Shape a paper-clip into a U as shown in Fig. 5. Place it between the panel and the capacitor. Check the length of your mounting bolts and the thickness of your panel. You may need a spacer that is thicker or you may not need one at all!

The two built-in trimmer capacitors inside each variable capacitor should be set to mid-value. On the back face of each capacitor are two screws. Rotate each so that the trimmer capacitor (seen through the plastic) is half-meshed (at about mid-capacity). This is important to get the correct tuning range for the receiver during the setting-up.

The baseboard is a piece of wood 195 mm by 100 mm and about 15 mm thick. Select a piece that is clean with neat edges and cut it to size. Compressed particle board is ideal. Paint it with several coats. Screw the front panel to the baseboard with self-tapping screws.

The antenna and earth terminals are mounted on an aluminium panel, 50 mm by 35 mm, screwed on the back edge of the baseboard.

The Tuning dial

The main dial operates the oscillator tuning capacitor C6. The pointer is made by unwinding a wire 'glide' type paper clip, and making a needle as shown in Fig. 5. One end is formed into a spring to grip the hub of the thumbwheel knob (which comes with the tuning capacitor). This makes the needle adjustment easy. The other end is flattened between a hammer and a hard surface to make a precision blade pointer!

Set the needle to point to zero when C6 is fully anti-clockwise.

Preparing the circuit board

Start with a piece of blank printed circuit board stock, 75 mm by 50 mm as shown in Fig. 6. This is insulating material with a sheet of copper bonded on to one side. File all the edges and corners to make them clean and smooth. Drill the mounting holes as shown. Polish the copper

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with a scrap of steel wool, make it clean and bright. Hold the board by its edges to keep it free from finger-marks. Spray it with clear polyurethane from a spray can, a very thin covering - a quick swiping flick of paint spray. Leave it for 24 hours to dry hard. You can solder through this paint layer and it will keep the board looking bright.

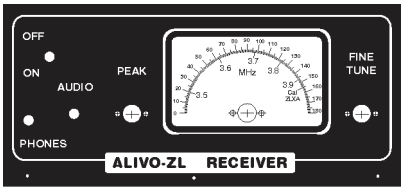

Fig. 4. Front panel decal. Actual size is 195mm by 90mm.

Mounting the integrated circuits

The IC's lie on their backs on the board in 'dead-bug' fashion. They must be spaced well apart so that other components can be positioned between them. The positions of many components on the board are dictated by the pin numbering of the integrated circuits. Remember to keep leads short and to place bypass capacitors close to the pins. You have very little choice in component placement and will have to place them as generally shown in Fig. 6.

Scrape the paint on the circuit board at the places where the IC's are to be positioned, exposing the copper. Put a blob of glue at each of these places on the bright copper. Then position each IC in turn, legs in the air, on each blob of glue. Check the type number of each IC before placing it (you cannot read the label after it is positioned!) Use a magnifying glass! Be very sure that you position each IC so that the location 'notch' identifying the start of the pin numbering is correctly aligned!

Put the board aside until the glue has set. It is then ready for wiring.

Wiring the board

Cut the component leads to length and shape them, fixing each component into position by soldering, one at a time. Use a fine-tipped soldering iron. Keep leads short. Be neat. You can solder through the paint on the board to get the various 'earths' (to the copper) for the components.

Soldering for the first time? Try some other scrap components for practice first. Read about soldering techniques in amateur radio refer-

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ence books.

Each IC has one pin which is earthed. Use scrap wire discarded from a component lead to connect the earth pin of each IC to the copper board.

Take time and be patient when wiring the board. Be careful when using the soldering iron and avoid overheating components. Heat the joint not the solder. Apply the solder to the joint when the joint is at the right heat. Be sparing with the solder. Clean the tip of the iron frequently, grab it with a clean rag folded several times to avoid burning yourself!

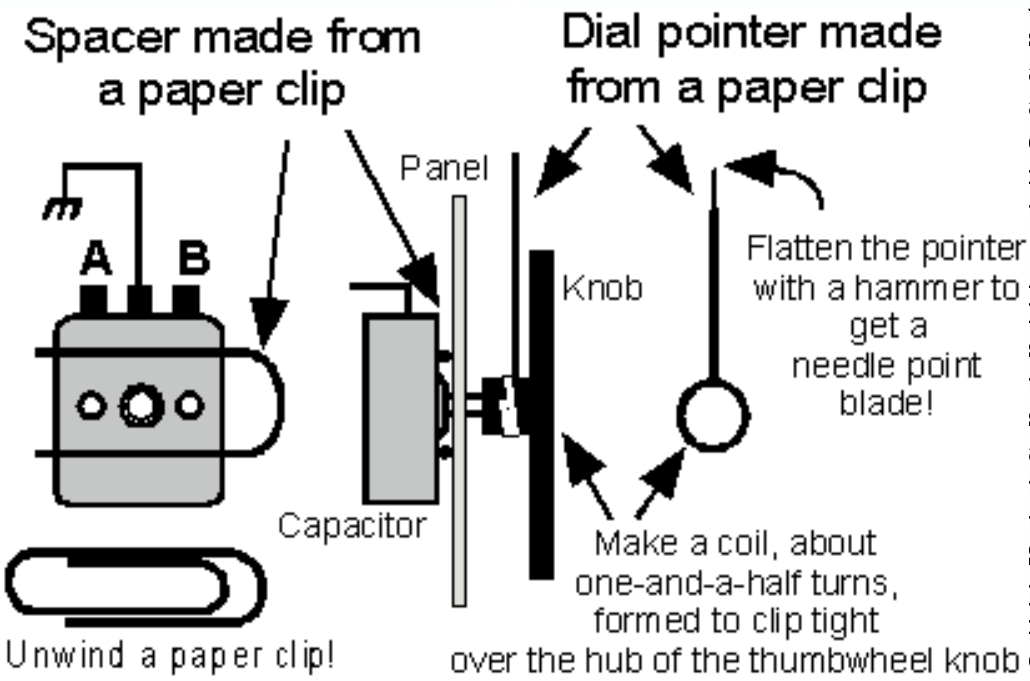

Fig. 5 Capacitor mounting and the dial pointer

Do not twist or wrap the component leads around the IC pins. A component lead has to only touch the pin and the solder will do the rest. Bend the component lead so that a 1 mm (say) length of the lead is making contact with the pin, then solder it.

Resistors can be soldered in place any way around. The same applies to capacitors except for electrolytic capacitors which must be correctly polarised. The diagrams show the positive lead for each electrolytic, four of them, C16, C17, C18 and C19. The component itself usually has the negative lead marked, and it is usually slightly shorter.

Note that there are three 'mid-air joints' between components - the junctions between C14 and R3, C12 and R5, and C18 and R7. Ensure that these joints are clear of the board surface. You may find it more convenient to make these joints first then shape and attach the assembled components to the IC's.

Add R2 last, wired so that it takes the short path across the top of the two IC's. Strip two pieces of insulation off some hook-up wire and use it as 'spaghetti' (insulated sleeving) on each end of R2. Push it on to the resistor fly-leads as insulation.

Winding the coils

There are three coils to wind, on two coil formers. There are many different types and sizes of coil-former and slug, so it is impossible to provide winding details for more than one type here. The following detail applies to coil formers 7 mm in diameter with a 6mm diameter slug 16 mm long. These formers should be obtained to make the construction and setting-up easy.

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Start with L2 and L3 which are each made by winding 30 turns of 0.4mm (26 or 30 SWG) enamelled copper wire on two separate slug-tuned formers. Other near-size wire can be used. Scrape the enamel from about 5 mm at the end of the wire to expose the bare copper. Twist it around a wire tie-point on the coil former. Solder the joint. Wind the coil for the full 30 turns. Bring the wire down the outside of the coil and repeat the clean and soldering task. Attach that wire to another tie-point, then cut off the surplus.

L1 is 6 turns of the same wire scramble-wound over the 'cold' (i.e. earth) end of L2 (the end that goes to C3). The coil end nearest to the tie-points should be adopted as the 'earth' or 'cold' end of the coil. The coils L1 and L2 must be isolated, there must not be a direct short-circuit between them.

The coil former L1/L2 is mounted vertical by soldering the L1 earth coil-former pin to a scrap piece of heavy-gauge stiff copper wire. That wire is then soldered to the board as shown in Fig. 6. Keep the two leads from L2 to IC1 short.

Coil L3 is mounted in a similar way - using stiff wire as stand-offs to hold the coil horizontal. It must be mounted so that it is firm and rigid, without any loose movement. Brace it with a stay too. The frequency stability of your receiver depends upon this. Run some glue along L3 to keep the turns in place.

The adjustable ferrite cores, 'slugs', inside the coil formers L1/L2 and L3 will be positioned at various places through their tuning lengths during setting-up. Make up a 'slug adjusting tool' from an old plastic knitting needle. File one end to shape so that it fits neatly into the hole or slot in the slug. Be careful with these adjustments and do not use any force. Slugs are brittle!

Later when you have the slug in the coil formers L1/L2 and L3 finally peaked, you can fix the slug in place in the coil. One method is to drop a strand of sewing cotton down the hole and wind the slug back in to its final position. If the correct size of cotton is used, the slug will still be adjustable but firmly wedged. Take care! The slugs must not be loose inside the coils!

[This article extends to over 15 pages! So I shall put part two into next months Anode.]

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Email: **zs6wr@gmail.com**

Bulletins (Sundays at …)
11h15 Start of call in of stations
11h30 Main bulletin start

Frequencies
439.000MHz 7.6MHz split
Input: 431.4MHz (West Rand Repeater)
145,625 MHz (West Rand Repeater)
10,135 MHz (HF Relay)

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SARL liaison	Willem	ZS6WWJ		marie.w@absamail.co.za

West Rand members - we need your input!

To make this the best ham radio magazine in South Africa we need your input. Please submit articles, comments, suggestions etc.

Please send plain text with no formatting to the email address below.

In July 2003, we re-published an Anode Compendium on CD. It has the issues from July 2000 until June 2005. This included the new Adobe reader. It has been updated, check with the chairman for details.

We need your input! Email us articles, comments and suggestions please.
zs6wr@gmail.com