THE WEST RAND AMATEUR RADIO CLUB

November 2007
Volume 8, Issue 3

ANODE

Inside this issue:

Editor's Comments

Volume 8 Issue 3
November 2007

Well its getting near Christmas. I hope you are all ready for the holidays. Warm up the soldering iron, polish the pliers and put the reading glasses on…

The club social and ham-fest is happening on the 24th of this month. The "odd" thing about this one is that the flea market/boot sale will be starting early. Sunrise will be at 05:09 that morning so I expect most of you to be waiting there outside the gate at that time. The club's Christmas get together will happen after 14:00, when we will braai and set out the tables under the trees for a relaxing time.

The article below (written in haste) is about the sine wave generator section of the project that Stuart and I discussed with the club previously. We would like this to become a "club project" for the enthusiastic members who want to build something "useful".

The club's birthday list

I have noticed in previous bulletins that generally the bulletin reader has to "wake up" OM Willem for the birthday book. Sometimes even he is not

(continued on page 2)

Sine Wave Generator Project

Special points of interest:

- Contact details on back page (updated)
- Next Ham-Comp is at 13:00 on the 18th November.

The Beginning

We were discussing the testing of H. F. S.S.B. transmitters. To generate two sine waves for driving the transmitter without disconnecting the microphone would mean placing a "loudspeaker" next to the microphone. This "black box" would generate two tones that were not harmonically related. These tones would simulate constant modulation and would save the operator's voice!

Coincidentally I had a prototype already worked out and tested. I had been using a simple multivibrator circuit to drive the divider chip. So now I dug out a crystal oscillator and divider board to check the high frequency operation. With 500kHz driving the circuit, the output was a 'nice' sine wave at 1.95kHz.

After testing I sent this to Stuart (the club chairman) :-

I have a "working prototype", providing me with adequate performance on my bench. This is the "heart" of the two tone generator, proposed to you earlier.

I have had the opportunity to check the harmonic content and output level consistency. Both of which are good. The harmonic content is -36db down or better at any output frequency.

(continued on page 2)

Editor's rants and raves - comments

(continued from page 1)

available for the bulletin. As club secretary, I should be providing you with the current/up-to-date birthdays for the members. But I notice that quite often the dates of birthdays are for past members that were members last century!

So I am asking you to consider that we should have two birthday lists; one for the current members and families; and one for the past membership. [I nearly typed 'old' there, but then I stopped myself!] The club's database has only past members from about 2000 in its "pool" of member data. Can someone provide more data regarding past members? We should be contacting these past members and encouraging them to rejoin the club.

Both of these lists will be available on the club's web-site. So the bulletin readers will be able to check them before reading the bulletin.

BTW the club's web-site is still:-

`Http://jbcs.dnsalias.net/ham_radio/`

Remember if you put your call sign into the box at the bottom of the page, you will be taken to the next page to confirm your details and shown the calendar. The 'name' field is optional, so you don't have to enter anything.

{—}

(Continued on page 3)

Sine Wave Generator Project

(continued from page 1)

[30db is 31.62 times and 6db is 2 times. Thus -36db is 1 / 63.24 or 0.0158 or 1.58% distortion] This was measured on my HP spectrum analyser. The output is a constant over the entire audio frequency range; 20-20,000Hz. This is entirely due to the method of generating the sine wave.

Whilst the distortion could be improved, it is unnecessary for this project. This is largely due to the 'leakage' of the switching transients and the mis-matching of the resistors. They are only 5% tolerance and should be better than 1%, if you are a "purist"! The use of a "real" D to A unit would also improve the accuracy / distortion of the sine wave.

The "source" is at present a square wave generator derived from a 5MHz crystal giving 1MHz, 500kHz and 100kHz. I propose to use a VCO running from around 100kHz to 800kHz to allow the user to set one of the tones. The other can be fixed at say 800Hz/400Hz for 'low end' marking.

{—}

Documentation

So I started to draw the circuit using a software package called RFFlow. This package I have had for quite a while and it doesn't appear to have become unusable. However on checking up on their web-site, I found the new version is no longer free-for-trial but "dies" after 30 days. It is also "expensive" in comparison to our cost of living here. ($60+) The 'weak' Rand has something to do with this. This puts it beyond the pocket of local radio amateurs and electronic enthusiasts. I shall be actively looking for an open source package in the near future.

[NOTE: Open Source PCB layout and SPICE programs are available for Linux and of extremely high quality.]

Circuit Description

The circuit shown below is of the sine-wave generator only. This 'sub-circuit' can be used for a variety of functions as a part of a larger unit. The input 'clock' can be generated by several different types of oscillator and can accom-

(Continued on page 5)

Editor's rants and raves - comments

(Continued from page 2)

Ham-Comp hardware

Some time ago, several of you expressed a desire to use the sound card with "digital signal processing" to do the RTTY, PSK31 and Morse decoding. This places a much higher requirement on the hardware processing samples of audio signals at many times a second. Even to produce an MP3 compressed audio file from the speakers requires a Pentium 1 processor. A 80486 can and does reproduce a WAVE file without great effort. A 8088/86 running at 4.77MHz can decode morse quite happily when its is fed into one of the hardware ports. But to sample and process/filter a waveform requires much more cpu power.

Whilst this is now becoming easier hardware to get hold of, you should remember that the 80386 and 80486 can still do a lot of other functions with ease. Some Internet routers are based upon 386/486 cpu's and the Hubble Space telescope still has an 80386 at its heart!

Jackal Hunting in the veldt

In the past we have had some Fox/Jackal hunts at the club which were quite well supported. Interest has increased but I think we had a bit of a setback recently. The speaker at the meeting, OM Ron, told us all about past "fox hunts" and the new International requirements for these well organised events. He was kind enough to mention the web site (in Europe) where we could get the current information. Geoff, after the meeting sent me the pdf's, which make for "daunting" reading.

We in South Africa have been living in the past. The technical requirements of a "fox" are not too difficult but the frequencies and modulation methods used are quite different from what we have been using.

So I think if we want to participate in future "fox hunts" as a club, we should revisit the specification and configuration of our "club beacon".

Club Open day and Contest

Don't forget the club will be "open" on the 17/18/19th for much of the time for the contest. Please come along and support the operators or operate! If you don't know what contest I am talking about, please see the SARL web-site for the contest calendar.

73
JB

Project "Ham-Comp" [Revised]

Objective
To assemble as many complete working computer systems with amateur radio software for distribution amongst members and interested parties. To raise the club members' ability and resources level.

Method
Collect all computer hardware at the club. Use 'bring & fix' meetings to teach/train members in hardware assembly of pc's. Use volunteer members to test and report on pc based software. Schedule assembly then software installation and then test and demonstration.

Requirements

Lowest level of hardware:
80386SX with 4MB+, 80MB hard disk drive, 2 x Serial ports, 1 x parallel port, monochrome display & monitor. Sound card.

2007-11-11 Revised: This is going to have to change to support sound card use for RTTY/ PSK31/MORSE DECODING. The new minimum standard hardware is a Pentium 1 with PCI sound card.

Software operating systems:
Linux with DOS compatibility: to run console applications. The Open Source utility program; DosBox does this with ease. It also runs the majority of "fussy" DOS programs.

Linux with WINE (Windows Emulator): to run Win 9x apps. The X window system replaces the need for Windows compatibility as most software authors are writing in cross-platform code that runs on both systems.

Windows 98se - if desperate. The BBS/APRS system is still running Win98SE!

Applications
Morse Tx/Rx, RTTY, packet modes. Call book/ Log database.

We shall explore the use of Windows apps running under the Linux emulator. This cuts the cost and problems with legal versions of Windows.

Use of pc for test equipment. Measurement of Voltage & Current. The Oscilloscope. Signal generation.

We should also explore the software development tools available to provide innovation and amateur generation of usable software and systems.

Cost implications
Virtually nil for both hardware and software. We will 'scrounge' most of the hardware. The software we can install from the clubs Linux box. CD's can easily be created for use by members.

{—}

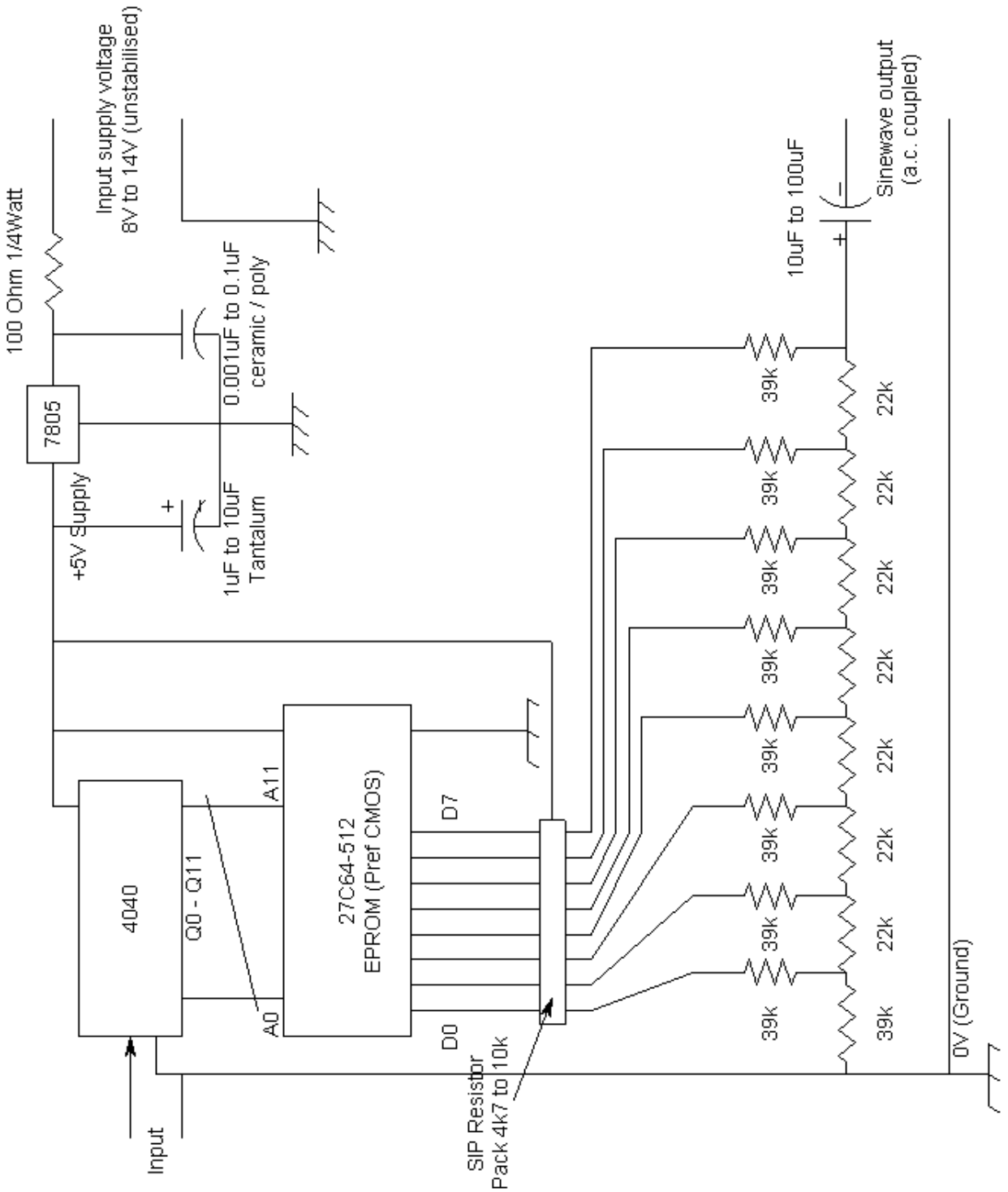
As so many people have been extremely generous with their donations of hardware, we now have plenty of PC's for distribution. Join the Ham-Comp meetings for more details. The next meeting is on Saturday the 18th of November at the club house. Meetings usually start at 13:00.

Sine Wave Generator Project

(Continued from page 2)

modate large variations in frequency and amplitude. The CMOS divider chip has a Schmidt trigger on the input pin, so that the input can be different waveforms as well.

(Continued on page 6)



Sine Wave Generator Project

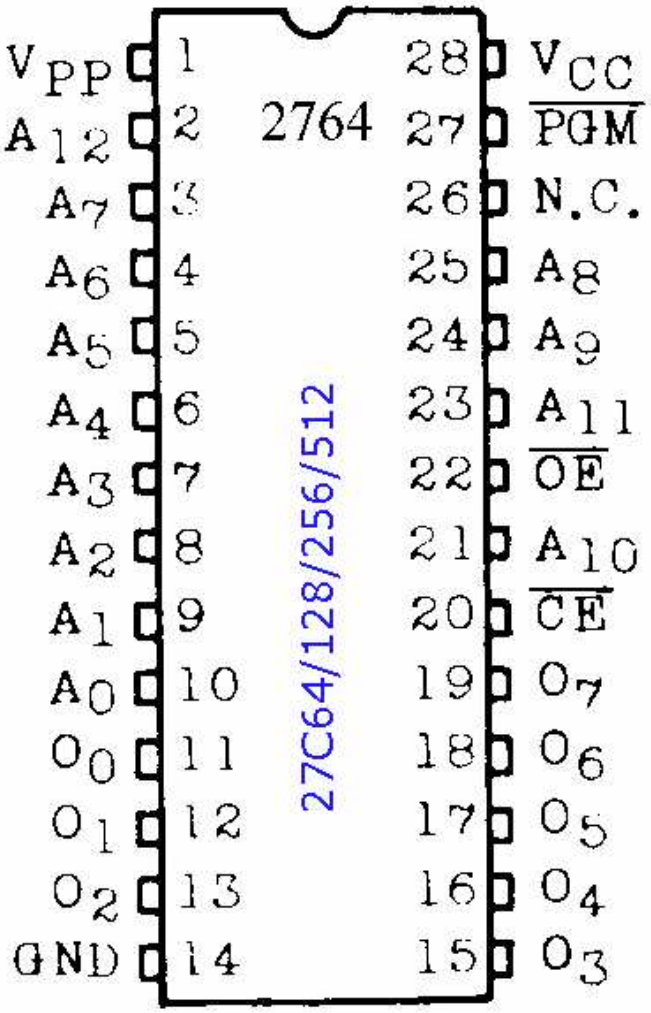
(continued from page 5)

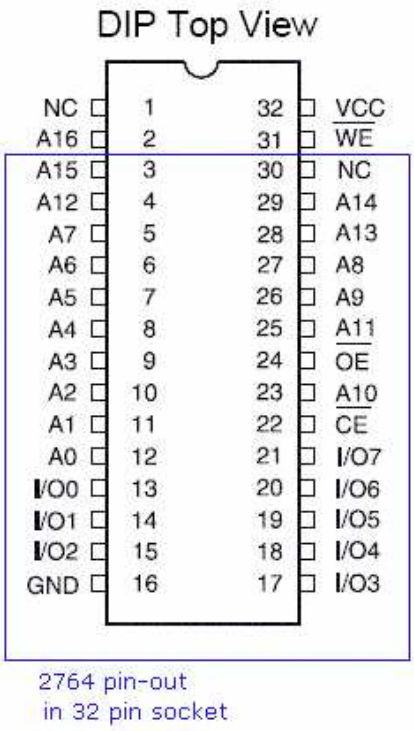
The divider chip (4040) has 12 output pins which are connected to all 12 divider outputs. This allows it to "drive" the EPROM and simply scan all the addresses from 0 to 4095.

4095? Well you must consider that the counter is a two to the power twelve counter. That means 4096 possible counts and 0 (zero) is a count, so 4096 –1 gives 4095.

ever available. I don't think you will be able to find a CMOS version of a 2716. Also the chip could easily be replaced by a CMOS memory chip such as an EEPROM taken from the BIOS socket of a PC. These are "pin-compatible" with the older EPROMS and have generally more pins. But their base set is identical to the 27 series EPROMS. See the figure below.

The EPROM is programmed with 4096 locations





2764 pin-out
in 32 pin socket

The EPROM is nothing special either, it is a 2764 type generally thrown away these days as it is too small to be of any significance. In fact any of the old EPROMS will do in this place but 27C64 was the first CMOS (low current) type having the sine values of 0 to 360 degrees deducted from 2.5 Volts. This EPROM is 'stepped' through each location in turn. The outputs of the EPROM are connected to a "R2R" resistor net-

(Continued on page 7)

Sine Wave Generator Project

(Continued from page 6)

work which provides a Digital-to-Analogue conversion. As there are 8 bits as outputs, there can only be 256 possible values. These values are subtracted from a d.c. voltage of 2.5 Volts and programmed into the EPROM. So the output of the D to A "swings" above and below 2.5 Volts (The half-rail supply voltage).

To ensure the best "swing" in voltage of the EPROM outputs, I have connected a "pull-up" resistor to each output pin. This is best done by a SIP (Single Inline resistor Pack). I used 10k resistors in a SIP but any value from 4k7 up to 10k will do the job.

As we are feeding the output of the D to A into something, we put an output capacitor in series with the output. This also blocks the d.c. voltage offset. The value of the capacitor is not critical and as we will ensure the circuit we feed into has a very high input impedance, can be quite low in value. 10 Microfarads is probably the lowest value here, as we could be outputting frequencies as low as 10 Hertz.

An "optional extra" is the addition of a 7805 voltage regulator with its associated capacitors and the series resistor. The resistor (100 Ohms) will 'filter' the supply line keeping noise into the oscillator to a minimum. It will also serve as a "fuse" should you supply too high a voltage to the circuit. When the resistor "smokes", switch off!

The two tone generator

For this function we will use two of these circuits and combine the outputs in an audio amplifier that drives a small loudspeaker.

To drive each circuit we will use a fixed frequency clock and the other tone will be generated by a variable frequency oscillator.

To generate say 500Hz we will need a 'clock' of 128kHz. To generate the other tone of say 800Hz to 2.5kHz, we will need an oscillator varying from 204.8kHz to 640kHz.

Uses for the sine wave generator

Using two of these generators, we will be able to construct the two-tone test generator for H.F. SSB transmitters.

With just one of these generators, we can make an audio sweep generator for checking frequency response of audio equipment. A simple sweeper can quickly show up the deficiencies of so called "hi-fi" equipment.

A clean morse code generator could also be fabricated using the circuit. As the digital divider provides synchronised square waves, it would be a simple matter to connect the key signal to "cleanly" switch on and off the tone. Switching would only take place at "zero-crossings" of the sine wave. No "key clicks"!

Project completion

This "project" seems to have caught the imagination of some of the members of the club. I hope it will become something that the members can use and look at in future and say (proudly) that they "built that"!

I shall be getting a PCB laid out and produced by one of our "local" makers before Christmas. So the members can build the circuits over the holidays.

73
JB

The West Rand Amateur Radio Club
26.14122 South - 27.91870 East

P.O. Box 562
Roodepoort
1725

Phone: 082 573 3359 (Chairman)
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)

Radio Amateurs do it with more frequency!

Chairman	Stuart Baynes	ZS6OUN	082 573 3359	sbaynes@iafrica.com
Vice Chairman	Ron Eva	ZR6RON		ronnie@calidus.co.za
Secretary (Anode)	John Brock	'PieRat'	011 768 1626	brockjk@gmail.com
Treasurer	Craig Woods	ZS6CRW	795 1550 (H)	craig.woods@absamail.co.za
Member	Romeo Nardini	ZS6ARQ		roshelec@global.co.za
Member	Joop Hesp	ZS6C		joophesp@absamail.co.za
Member	Geoff	ZS6GRL		glevey@gmail.com
Member (Repeater)	Phillip	ZS6PVT	083 267 3835	phillipvt@sse.co.za
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