THE WEST RAND AMATEUR RADIO CLUB


February 2002
Volume 2, Issue 8

# ANODE

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## Editor's Comments

We have four brand new articles in this issue. Some are a contribution from club members and others culled from magazines

**Isn't Amateur Radio Dead?**

"Like Latin and Afrikaans monuments should be erected to amateur radio."

Most responses are 'I don't have time for it'. Really it's a hobby and I don't have the time management skills to give it my time.

I don't really care about the general apathy in the league.

Nobody has written any protest letters or email to the Anode.

Most hobby members ignore the trends of the Internet amateur radio.

Has noone noticed the change of focus in electronic magazines such as Wireless World and magazines going bust?

Elektor has sufficient readership to now have two bumper issues per year.

Is it really true about the numbers of amateurs diminishing? Or is that just here in SA?

Is it a 'White Mans' hobby?

Isn't it like marriage, an outdated institution?

Have all the Electronic/ Engineering challenges been solved?

Think about these questions please. Maybe the Anode won't be published in future as I don't have time for it! JB

## D to A Converter that can be made in an afternoon

**A Digital to Analogue Converter that can be made in an afternoon**

**Special points of interest:**

- Contact details on back page

This all started with OM John (ZS6WL) and I talking about constant amplitude sine wave generation for test purposes. So instead of putting the pcb for a vco and components together on the Sunday afternoon, I built and then tested a D/A converter. The Digital to Analogue converter I built is crude and simple but it works very well indeed. A lot of emphasis is usually placed on the accuracy of the resistors in most designs. This can't be a serious consideration as the voltage supplied on the digital pins varies wildly.

The overall linearity and high frequency performance is more than adequate to prove the basic principle. The humble printer port can provide through a simple D/A, a waveform generator for audio to low frequencies. It can with simple software output a sine wave or any other waveform. To change the frequency, change the time delay in changing the state of the pins of the port. To change the amplitude, change the total bits set to a logical 1.

[I have supplied two simple programs after the text for you to test the D/A and to generate a low frequency sine wave.]

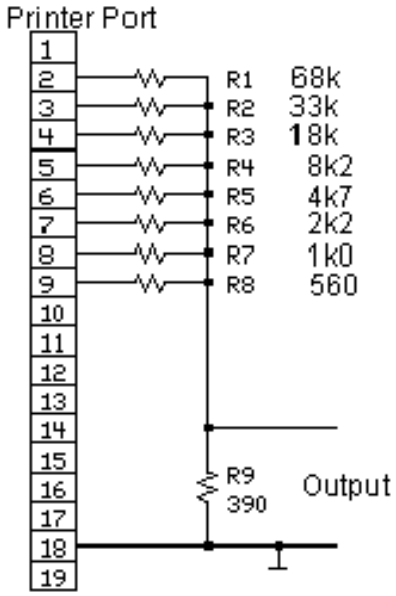
The resistors were chosen to be as near to the desired values as possible in the range 500 Ohms to 100k Ohms. The values worked out to be from

*(Continued on page 2)*

# D to A Converter that can be made in an afternoon

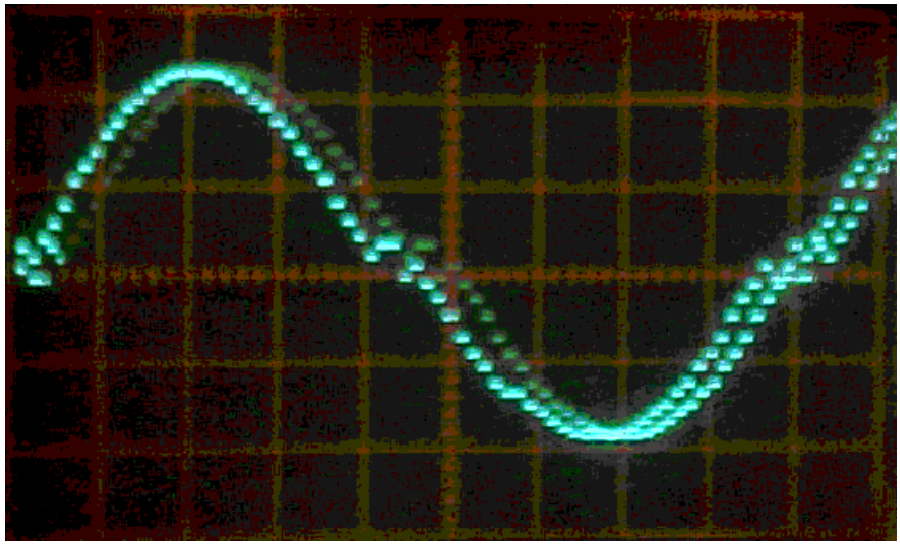
*(Continued from page 1)*

560 Ohms to 68k. The circuit is shown below.




**It couldn't be much simpler, could it?**

The output waveform that I generated is shown below.



Not perfect but close enough and constant in amplitude.

The output frequency wasn't constant because the QBasic program loop takes time to count the variable and jump back to the start of the output.

*(Continued on page 3)*

# The Short Wave Spectrum

The short wave spectrum, 1.7 - 30 MHz, lies between medium wave and FM. Under the right conditions signals on these frequencies can travel thousands of kilometres. This is thanks to a refractive series of layers in the earth's atmosphere called the ionosphere. Signals at the transmitter site are beamed up to the sky at a low angle. They are then refracted back to earth by the ionosphere. The signal then in effect "bounces" off the earth's surface again, and after a succession of "hops" reaches the antenna of the listener's receiver. The refractive properties of the ionosphere are not perfect, which is why signals can sometimes fade in and out.

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# D to A Converter that can be made in an afternoon

*(Continued from page 2)*

Also the program was quick and dirty, giving only 16 levels of output. The D to A is capable of 256 levels and could then give a much better waveform.

Having got this far I thought of how I could test the D/A port. I quickly typed up a simple program that outputted values from 0 to 255 (the maximum value for the 8 bit port). This showed straight away on the scope that the most significant bit was proportionally wrong. By putting a 2k2 resistor in parallel with the 560 Ohm resistor, the output became nicely linear and the 'glitch' you see above disappeared.

**How fast?**

The D/A port was being driven by a Qbasic program with nothing special in the way of timing. This was giving an FM look to the sine wave as the program loop was taking a lot of time to come around the loop. It would be possible to make a simple assembler loop as part of the Qbasic program. This would then provide a much faster loop and a higher frequency of operation.

**What! I can't program a computer!**

Who says you can't. If you can write a shopping list you can program. The Qbasic program (shown below) is extremely simple. It consists of two loops; one minor one that outputs the value. The second loop runs for 20000 times, about 20 seconds on a 486, and then stops the program. The sine values are pre-calculated and stored in an array for quick and easy retrieval in the minor loop.

The circuit, if it can be called that, provides constant amplitude over a wide frequency range with a sine wave of low distortion. It could provide the basis for testing ssb transmitters, modulators and lots of other applications. If you need a simple audio/lf signal generator, try building this one. It will only take an afternoon.

JB Much, much more to come.... [part 2 of n - next month]

## Programs for the D to A Converter

```
' LinTest.bas - test
' the linearity of the
' D/A
'

DO
'
FOR n = 0 TO 255
    '
    OUT &H378, n
NEXT n
'
LOOP WHILE -1
' Use Ctrl + Break to
' stop the program
```

```
'
' SineOut.bas
'
CLS
'
PRINT "Sine wave output from
simple D/A port"
'
DIM V(16) AS INTEGER

PRINT "Step", "Sine value"
'-- 90deg / 1 Radian = 1.570
FOR n = 0 TO 1.57 STEP .1
    '-- fill array
    X = SIN(n)
    '-- scale to half of 255
    X = INT(128 * X)
    V(INT(n * 10)) = X
    '
    PRINT INT(n * 10), X
    '
NEXT n
'
'
FOR C% = 1 TO 20000
    '-
    FOR n = 0 TO 15
      OUT &H378, V(n) + &H7F
    NEXT n
    '
    FOR n = 15 TO 0 STEP -1
      OUT &H378, V(n) + &H7F
    NEXT n
    '-
    FOR n = 0 TO 15
      OUT &H378, &H80 - V(n)
    NEXT n
    '
    FOR n = 15 TO 0 STEP -1
      OUT &H378, &H80 - V(n)
    NEXT n
    '
NEXT C%
'
END
```

# The Short Wave Spectrum

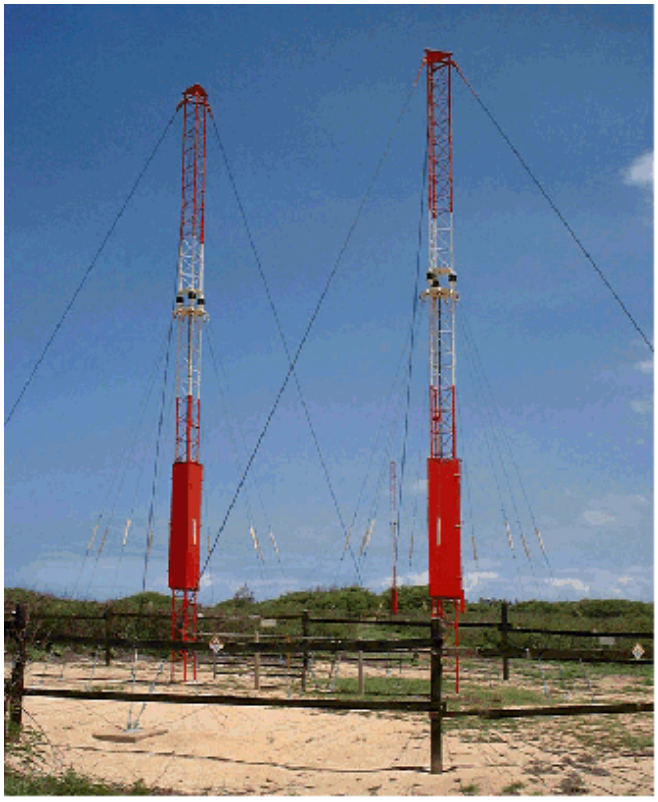
*(Continued from page 2)*

Short wave signals are also effect by solar conditions.

## NRC's SHORT WAVE ST A-TION BROADCASTS (CHU)

Time accuracy superior to telephone time accuracy is available throughout Canada and in many other parts of the world by means of NRC's radio time signals broadcast continuously from short wave radio station CHU. If corrections are made for the propagation delay from CHU to the user, and for delays in the user's receiver, an accuracy of better than 1 ms can be obtained. Signal availability at a user's location depends on ionospheric conditions. CHU also broadcasts a time code which can be decoded with common computers and modems.

Three frequencies are used: 3330, 7335, and 14 670 kHz. The transmission mode, upper single sideband with carrier reinserted, provides time signal service without requiring a special SSB radio, and also provides three standard frequencies. The frequencies are derived from one of a trio of closely synchronized atomic clocks located at the transmitter site. Three clocks are employed to permit majority logic checking. CHU time signals are also derived from these clocks. The clocks at the CHU transmitter site, about 20 km from NRC's time laboratory, are compared daily with the NRC primary caesium clocks.



The CHU station is located 15 km southwest of Ottawa at 45° 17' 47" N, 75° 45' 22" W. Main transmitter powers are 3 kW at 3330 and 14 670 kHz, and 10 kW at 7335 kHz. Individual vertical antennas are used for each frequency. The electronics systems feeding the transmitters are duplicated for reliability, and have both battery and generator protection. The generator can also supply the transmitters. The announcements are made by a talking clock using digitally recorded voices.

## NIST Radio Stations WWV and WWVH

NIST radio stations WWV (Colorado) and WWVH (Hawaii) broadcast time and frequency information 24 hours per day, 7 days per week to millions of listeners worldwide. The broadcast information includes time announcements, standard time intervals, standard frequencies, UT1 time corrections, a BCD time code, geophysical alerts, marine storm warnings, and Global Positioning System (GPS) status reports.

WWV is located in Fort Collins, Colorado, about 100 kilometres north of Denver. The low frequency station WWVB is located on the same site. WWVH is located on the Island of Kauai, Hawaii on a 12 hectare (30 acre) site near Kekaha at Kokole Point.

### Broadcast Frequencies

Both stations operate in the high frequency (HF) portion of the radio spectrum. WWV and WWVH radiate 10,000 W on 5, 10, and 15 MHz. The radiated power is lower on the other frequencies: WWV radiates 2500 W on 2.5 and 20 MHz while WWVH radiates 5000 W on 2.5 MHz and does not broadcast on 20 MHz. Each fre-

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# Antenna Building A 72 ohm vertical dipole antenna

**Step 1:**
Take 2,953 and divide it by the frequency in Megahertz that you want to listen to (eg. 2953/144Mhz = 20.5 inches). This is 1/4th of a wavelength in inches. Now cut sections of thin copper wire to this length.

**Step 2:**
Take 8,859 and divide it by the frequency in Megahertz that you want to listen to (eg. 8,859/144Mhz = 61.5 inches) This is 1/2 of a wavelength inside of 72 ohm RG-59 TV coax. Obtain a length of this stuff and cut it to an odd multiple of the number of inches you got in step 2 (eg. 1 x 61.5; 3 x 61.5; 5x61.5; 7 x 61.5 et cetera, et cetera, depending on how long you need.

**Step 3:**
I know "solder" is exclusively a noun and NOT A VERB to many people, but this step requires you to SOLDER SOMETHING! strip the end of the coax and solder one of the wires from step 1 to the centre conductor and the other wire from step 1 to the outside shield. MAKE SURE THEY DO NOT TOUCH.

**NOTE:**
Use really thin copper magnet wire and bare the enamel before soldering.

**Step 4:**
Tape your antenna to any non-conductive surface like your wall, your bathtub, your window, your dead tree in the back yard, your china cabinet, I don't care BUT DO IT THE FOLOWING WAY:

Take the wire you soldered to the centre conductor and tape up [by up, I mean in the vertical direction facing the sky, the place where airplanes fly, the clouds, heaven or the home of the holy deity of your choice.]

Take the wire you soldered to the outside shield and tape it down [down is the opposite direction of up. It is where the dirt, sand, soil, gravity and stuff comes from.]

**Step 5: The final step.**

Go to Radio Shaft and buy the connector to fit your scanner. Do you see where your antenna is taped up and down? Good. Now go to the other end and connect your adapter, after all I don't want you to ruin all that hard work. Gratulieren meinen Freund oder meine Fruendin! You have successfully built a 72 ohm vertical dipole antenna. Now, you can plug in your scanner and enjoy the 3 or 4 dB gain over using a rubber duck.

Written by: brown82@MARSHALL.EDU

# Win9x Performance Tips

No matter what you do with your computer, there are probably a few adjustments you can make to your system that will make it run better.

Computer speed is a complex formula, with CPU speed, amount of memory, memory speed, video card speed and hard disk speed being the major variables. It's possible to tune Windows to compensate for these factors. I've seen Pentium II systems run slower than 486s. I've also seen overachieving 90MHz Pentiums that certainly felt much faster.

Before spending a lot on PC upgrades, I prefer to make sure the system is making the best use of the hardware it has. Then, if this proves inadequate, I upgrade. The optimised system will make better use of the upgrades anyway, so this is never a waste of time.

**CHECK YOUR FREE DISK SPACE**

If the free space on a hard disk falls to below 10 percent of the size of the drive or 100 megabytes (whichever is smaller), performance slows to a crawl. To check your available disk space, double-click My Computer, hit F5 and click once on 'C:'. The drive's capacity and free disk space is shown in the lower pane of the window.

If you're low, search for and delete files with the extensions tmp, ~mp, and chk. Next, empty your Web browser's cache. This will give you a good start on solving your space problems.

# Win9x Performance Tips

**UNINSTALL UNNECESSARY APPLICATIONS**

To see what's installed on the system, open your Control Panel and go to Add/Remove Programs. Uninstall any seldom-used programs. You can always reinstall a program if you need it later.

Unused applications slow your hard drive, even if you aren't running them. As a general rule, the fewer applications you have installed on your system, the faster it runs. Leaving software installed just because you might need it someday is a bad idea. Now that programs come on CD-Rom and install in minutes, it makes no sense to leave a program you run once a year installed all the time.

**DEFRAGMENT YOUR HARD DRIVE**

After you maximise your free space you'll want to defragment your drive, whether Windows says you need to or not. Defragment your hard drive after removing large quantities of data from it, and any time you install software. You should make a habit of defragmenting your drive once a month or any time fragmentation climbs above about two percent (Windows' Defrag has a very liberal view on fragmentation).

**ELIMINATE EXCESS FONTS**

Fonts consume disk space and CPU cycles whether you're using them or not. If you have hundreds of fonts, either get a package such as Adobe Type Manager Deluxe that lets you group and categorise them, or group and categorise them into folders yourself, dragging their contents into your fonts folder as you need them. If fonts aren't in the C:\Windows\Fonts directory, they aren't consuming CPU cycles, even though they're still occupying disk space.

For general use, the default set of fonts installed with Windows is adequate: Arial, Courier New, Marlett, MS Sans Serif, MS Serif, Symbol, Times New Roman, Verdana, Wingdings and Webdings. If you have MS Office installed, you'll also need Tahoma. A few extras won't kill your system, but keep it reasonable.

If you want the fastest PC possible, strip out all unused fonts and the bold and italic versions even of fonts you use. Windows can generate draft-quality bolds and italics from the base font when needed. This gives lower-quality printouts but it'll give you a faster gaming rig.

**LOSE AUTOEXEC.BAT AND CONFIG.SYS**

On most systems, you can rename Autoexec.Bat and Config.Sys to stop Windows using them. The result is often a faster, more stable system. If you run into problems, change them back.

**CLEAN OUT YOUR STARTUP GROUP**

Windows usually loads programs at startup that you don't need. Right-click your Start Menu, select Explore and go to Programs, Startup. If you have Microsoft Office installed, you'll probably find Microsoft Find Fast and Office Startup there. Both can go. If there are others there that you don't need to have loaded automatically, get rid of them.

Programs can also load from Win.ini and from the Registry. If you have Windows 98 or Me, go to Start, Run and type 'msconfig'. From the Startup tab, you can selectively enable and disable hidden startup programs. Likely candidates for banishment are Realtray.exe (from RealAudio) and LoadWC from Internet Explorer. This saves a couple of megs of Ram and some CPU cycles.

If you have Windows 95, you can download a freeware program called Startup Manager from www.delphifreestuff.com/freeware/files/smsetup.exe to do the same thing.

**OPTIMISE YOUR VIRTUAL MEMORY**

If you have Windows 98 or later and more than 64Mb of

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# Win9x Performance Tips

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Ram, load c:\windows\system.ini into a text editor, scroll down to the section marked '[386Enh]' and add the line

ConservativeSwapFileUsage=1.

This reduces Windows' usage of virtual memory - always a good thing.

To optimise the rest of your settings, go into Control Panel, System, Performance, Virtual Memory and select 'Let me specify my own virtual memory settings'.

Traditionally, power users multiply the amount of Ram they have by two or three and specify that amount as their minimum and maximum virtual memory size. But this assumes everybody buys a third as much Ram as they need. That's not really true any more.

I try to make sure physical memory plus virtual memory is about 128Mb. If you have 32Mb Ram, give yourself a 96Mb swap file. If you have 64Mb, give yourself a 64Mb swap file.

If you have 128Mb or more, use the default setting - you'll use virtual memory too sporadically for optimisation to do any good. In two other instances, you'll want to use the default virtual memory settings. Voice recognition software uses virtual memory unpredictably and suffers when not enough is available. Also, systems with 4Mb or 8Mb of Ram go slow with fixed virtual memory settings.

Windows keeps the last few accessed file and directory names in Ram to improve performance. Open the System Control Panel, click on the Performance tab and under File System, change the Typical Role of this Machine to Network Server.

Under some circumstances, Windows polls the CD-Rom drive every few seconds to see if you've inserted a CD. This can slow things noticeably. You can turn this off by opening the System control panel, then going to Device Manager, CD-Rom, (name of your CD-Rom drive), Properties, Settings. Clear the box labelled Auto Insert Notification, then click OK. If you have more than one CD or DVD device, repeat this process for each drive in your system.

Windows makes absurd assumptions about the multimedia devices connected to a typical PC. Open Multimedia control panel, then go to Advanced. Expand the view for Media Control Devices. Among these you will find entries for VISCA VCR Device and Pioneer LaserDisc Player. If you don't have a laserdisc player or a VCR connected to your computer, click on these entries, hit Properties, hit Remove and hit OK.

## CHECK YOUR WALLPAPER

Intemet Explorer 4 and Active Desktop gave us the ability to use Gif, JPeg or HTML files as backdrops. Don't. Use BMP files for backdrops. Convert your wallpaper to a BMP and you'll think you doubled the speed of your CPU.

Better yet, eliminate your wallpaper entirely. This is unpopular advice, but desktop wallpaper consumes Ram to store it and CPU cycles redrawing it. If you're about to get into an intense gaming session, take down the wallpaper first, then put it back afterward.

## TURN OFF ACTIVE DESKTOP

Active Desktop is a serious drain on system performance, and it may be active without you even knowing it. Right-click on your desktop, jumpy or smooth. Try different resolutions and select ActiveDesktop (if the option is present), colour depths (Control Panel, Settings, Colours, and select Inactive. Screen Area and note which setting gives the best result.

## USE HOTKEYS INSTEAD OF DESKTOP ICONS

If you have Windows 95 and no Plus! tab, you can download the

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# Win9x Performance Tips

*(Continued from page 7)*

Windows 95 font smoothing utility from www.microsoft.com/windows95/downloads to get that capability.

It's common to keep short-cuts to frequently used applications on the desktop. Unfortunately, this slows things down for the same reason desktop wallpaper does. If you need fast access to certain programs, define hotkeys instead. They're faster than double-clicking icons, always available without having to make the desktop visible again and don't slow the system down.

To make a hotkey, right-click on the Start menu and hit Explore. Find your program's

**TURN OFF ANIMATION**

Uncheck the tick-box on the effects tab of the display properties. Its called 'Animate Windows menu's and lists'.

**LOSE THE SYSTEM SOUNDS AND DESKTOP THEMES**

Most copies of Windows contain desktop themes and you can download more from the Intemet. Don't use them.

**LOSE YOUR SCREENSAVERS**

Screensavers are obsolete and they're the worst thing you can do to your computer, short of clicking on that 'I Love You' e-mail. Lose them. Now. They drink memory and CPU cycles like sailors on leave, make your monitor work harder and sometimes crash your system.

The lone exception is the Blank Screen screensaver that comes with Windows. Using this is a good idea; it uses no CPU power and lets your monitor's phosphors rest, increasing life expectancy and reducing power consumption. If you want to protect your monitor, use Blank Screen and give it a timeout period of 30 minutes. The use of any other screensaver does more harm than good.

**TURN OFF POWER MANAGEMENT**

By default, Windows shuts down your hard drive after a period of inactivity. This causes slowdowns, because your drive has to power back up the next time it's accessed. The delay can be a second or more, in addition to causing your hard drive to wear out more quickly.

In laptops, the situation is different since you have to consider battery life. You have no choice but to use power management on your laptop, but turn it off on your desktop computer.

In Windows 95, go to Start Settings, Control Panel, Power. Clear the box that reads 'Allow Windows to manage power usage on this computer.' Then click on the Disk Drives tab and clear the checkbox there as well.

In Windows 98 and Me, simply go to Start, Settings, Control Panel, Power Management Power Schemes, Home/Office Desk Turn Off Hard Disks, Never.

**DOS STUFF**

Microsoft's plan was for Dos programs to run without special tricks, and most Dos programs will run without any difficulties. The problem is that 90 percent of people want to run the 10 percent of Dos games that push the system and cause problems - hence the perception that Windows doesn't run Dos programs well.

So the first step is to install the software (if you haven't already), then open the program's directory in Explorer, find the executable, double-click on it and see what happens.

You might actually find that Microsoft's promise that Dos games will run more smoothly than ever before is true. Too bad most of the company's promises aren't like that.

You've not quite finished optimising yet. Open C:\Windows \System.ini and scroll down to the [386Enh] section. Add the line:

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# The Short Wave Spectrum

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quency is broadcast from a separate transmitter. Although each frequency carries the same information, multiple frequencies are used because the quality of HF reception depends on many factors such as location, time of year, time of day, the frequency being used, and atmospheric and ionospheric propagation conditions. The variety of frequencies makes it likely that at least one frequency will be usable at all times.

**Antennas**

The WWV antennas are half-wave vertical antennas that radiate omni directional patterns. There are actually 5 antennas at the station site, one for each frequency. Each antenna is connected to a single transmitter using a rigid coaxial line, and the site is designed so that no two coaxial lines cross. Each antenna is mounted on a tower that is approximately one half-wavelength tall. The tallest tower, for 2.5 MHz, is about 60 m tall. The shortest tower, for 20 MHz, is about 7.5 m tall. The top half of each antenna is a quarter-wavelength radiating element. The bottom half of each antenna consists of 9 quarter-wavelength wires that connect to the centre of the tower and slope downwards to the ground at a 45 degree angle. This sloping skirt functions as the lower half of the radiating system and also guys the antenna.

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# Win9x Performance Tips

LocalLoadHigh=1

This change forces Windows to make more use of upper memory.

A Windows 9x PC with no Autoexec.bat or Config.sys typically has a little over 580K of conventional memory (the PCs first 640K of memory) available. A Win9x PC with the settings I just gave you will have anywhere from 603K to 619K of conventional memory available.

Every Config.sys file should start with the following three lines:

```
Device=c:\windows\himem.sys
Device=c:\windows\command\emm386.exe ram hiscan
Dos=high,umb
```

This sets up upper memory and instructs Dos to use it. Sharp-eyed readers will notice a slight change in the second line from the earlier example. This is because Windows provides EMS emulation, but we're running in Dos mode, which by default does not.

If your game uses the CD-Rom or DVD-Rom drive, you have to add a driver for that. Windows 98 and Windows Me include a driver that works for most drives but it's usually pretty well hidden, so the easiest way to get it is to create an emergency boot disk (go to Control Panel Add/Remove Programs, Sp Disk and click on Create Disk), then copy Oakcdrom.sys from that disk to your hard drive (I recommend putting it in C:\Windows\Command).

If you have Windows 95, or if your drive doesn't work with Oakcdrom.sys, use the driver that came with your drive or, in the case of Scsi drives, the driver that came with your Scsi card.

Follow the instructions that came with your drive. Here's a typical line:

```
Devicehigh=c:\windows\command\oakcdrom.sys /d:cdrom004.
```

If you're using another driver, substitute its name for Oakcdrom.sys. The key is getting the filename right, and using the same /d parameter on both the CD-Rom driver in Config.sys and the MSCDEX.EXE program line in Autoexec.bat.

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

**Frequencies**
145,625 MHz (West Rand Repeater)
10,135 MHz (HF Relay)

## Radio Amateurs do it with more frequency!

**We are going on the Web**
**www.zs6wr.org.za**

Please note this has been just been registered. Our site will be up in the new year.

| | | | | |
|---|---|---|---|---|
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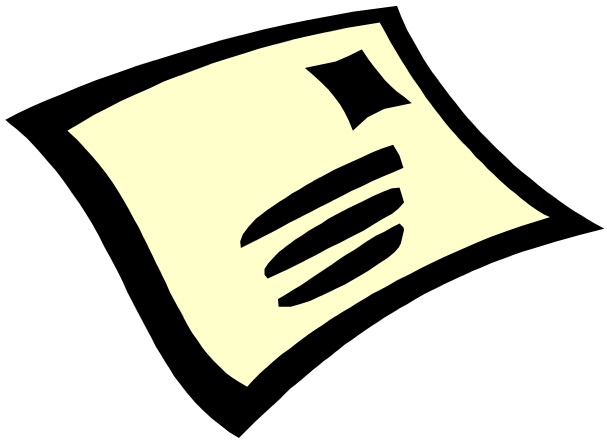
## West Rand members input - we need your input!

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 November, we published an Anode Compendium on CD. It has the issues from July 2000 until November this year. This included IE5.5 and the new Adobe reader.



**We need your input! Email us articles, comments and suggestions please.**
**john.brock@pixie.co.za**