AWA Newsletter

 # 90

July 2013

Affiliated to the SARL

Antique Wireless Association of Southern Africa

Inside this issue:

AWA Committee:

* President—Richard ZS6TF
* Technical Advisor—Rad ZS6RAD
* Secretary/PRO—Andy ZS6ADY
* Western Cape—John ZS1WJ

Reflections:

I have been privileged to go on what I would call a well deserved holiday, but what my Boss might call a waste of company time.

Being down in the Eastern Cape for 2 weeks of absolutely wonderful weather, has given me the time to sit and rethink many issues and also ponder upon many friends that have come and gone in the time I have been involved with the AWA.

Being down Plettenberg Bay area has brought back some fond memories of OM Willem and the many discussions we had about fishing, riding motor bikes, motor bikes in general. Moto GP, formula 1, and of course radios.

When I think of the Presidents we have had over the years, whom I have had the opportunity of knowing each one of them personally, then there are also a few good memories.

OM Bushy, who had a passion for Collins radios and could tell you almost every component in them without looking at a technical drawing and exactly what problems you would encounter should one of these components fail.

OM Rod, who had a passion for anything with valves in it and who had built so many homebrew projects using bits and pieces from old radios.

These are no longer with us, except for Rod of course who moved to NZ, but still not able to hear the words of wisdom so often spoken by him.

I would think that for many of us there are those who have made some kind of impression on our lives, be it big or small, but we will always think of the kind words spoken, the kind deeds done. The many hours spent in conversation with friends who have more than just a similar interest in things of life.

These are the kinds of people who have an important part to play in the development of radio hams, no matter where they are.

I still have many friends who would fall into this same category and whom I would be glad to call them friend. They may not feel the same way about me, but that is of little consequence, because its my feelings that play a part in my development as a person.

Let us not forget those who have helped form and shape us into the hams that we are today. They certainly have played an important role.

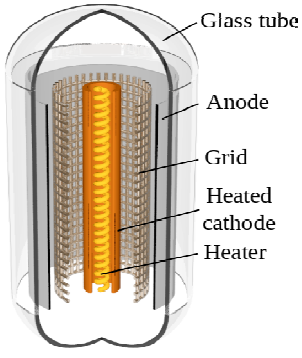
Best 73

DE Andy ZS6ADY

WIKIPEDIA

Construction of a Triode :

All triodes have a hot cathode electrode heated by a filament, which releases electrons, and a flat metal plate electrode to which the electrons are attracted, with a grid consisting of a screen of wires between them to control the current. These are sealed inside a glass container from which the air has been removed. Since the filament eventually burns out the tube has a limited lifetime and is made as a replaceable unit; the electrodes are attached to terminal pins which plug into a socket. The operating lifetime of a triode is about 2000 hours for small tubes and 10,000 hours for power tubes



Structure of a modern low-power triode vacuum tube. The glass and outer electrodes are shown partly cut away to reveal the construction

CW Net:

It would seem that CW is one of those modes that works at all times, except in the minds of people.

I find it amazing that one month there are people peeling out of all the cracks, playing CW with great enthusiasm, and the next thing there is just no one around at all.

Of course I cannot include the old faithful's here who are always there for nets and any other time you may need them. They are just always there. But there are others who seem to flitter in and out of the CW area of the band with great ease and absolute stealth that you actually wonder if they were ever there.

Lets face it, CW is not something that one can just turn on and off at will, and, maybe its just me, but I find if I don't keep practicing, I tend to lose a lot of it.

I need to keep doing it, or else I lose it.

So where do these people go when they are not on the local bands doing their CW. Do they keep their hand in on the DX bands or are they just the lucky ones who never need to try and keep their ear and hand in ?

But, let us not distract ourselves from the real issue at hand, CW remains one of those modes that one can always hear somewhere on the bands. It remains an international language that can be used by anyone with a bit of enthusiasm and an interest in communicating via radio with someone else with a similar interest.

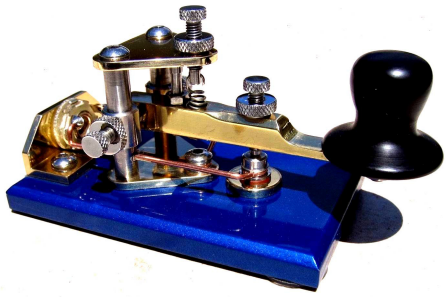
It remains a language that is not impossible to learn, but takes a bit of self discipline that we are all capable of and dedication that will not take much of our time.

CW was there before wireless came along and it will be there when the latest form of digital communication is invented, because it is the backbone to many of these forms of communication.

AS old as what some people like to call itand as outdated as some like to say it is, it will be around for many more years to come.

So why not just accept it and get back to doing some good old fashioned wireless telegraphy ?

DE ZS0AWA/CW …-.-



SSB activity:

For some reason, the call rate to the SSB net has also dropped. We know the bands have not been that great on a Saturday morning, but we still have not got to the stage where we need to be running an 80m relay.

Most people are all able to be heard, even if it is not a full 5/9 signal, they are at least Q5 readability. Which means there is no particular reason for a drop in numbers.

Maybe people would let us know if there is nay reason why they stop calling in. Is it because of the topic of discussion maybe making the net too long and drawn out ? Is it because you don't get an opportunity to have more than one round during the discussion ?

It really would be good if people would tell us what they would like to hear on the SSB Nets. If you have a problem or a point you would like to raise, then please drop us line and let us know. Remember the net is there for you the members.

A request was made to consider moving the SSB net to a different frequency as 7070 has become a frequency where many people like to call each other, or chat and at times for the net, we are having more and more to ask people to allow us to take over the frequency.

With this in mind, and a general feeling amongst a large percentage of those who call in on the SSB net, we will be moving frequency to 7140.

This will take place from Saturday 03 August, so please make a note of the change in frequency and don't think we have closed down.

Looking forward to hearing you all there.

Yaesu FT200

AM:

The AM net still rolls along at its ususal tempo, some days there are many, others there are few.

Band conditions during winter do of course play a major part in activity on 80m in the early morning. Unfortunatley the band opens late and starts to fade quite quickly for the more distant stations, but locally, conditions remain good for quite a while.

The usual callers are there and of course time is limited for the playing of MF's, so before you know it, its time to head off and get ready for the SSB net.

Playing MF's, as I have said on more than a few occasions, is really the cherry on the top for us SA hams, but it is not the be all and end all of using AM on your rig.

The quality of an AM signal is so good when the band plays along and getting your rig to transmit a purely good signal is not as easy as doing SSB.

Ask any of those who transmit AM on a regular basis, and you will find that there is a lot more setting and tweaking to get your transmission to sound the way it should.

Microphone gain and final power output settings are crucial to a good AM transmission. Not the amount of power you are putting out, but the way in which you are using it.

Overmodulating your transmission is so much easier to do on AM than on SSB and is much more noticeable.

Of course, if you are using an AM only rig, it does become much easier to set up the rig than on an SSB rig which has an AM switch on it.

Looking forward to hearing more of you trying out your hand at AM transmissions.

Central Electronics 100V

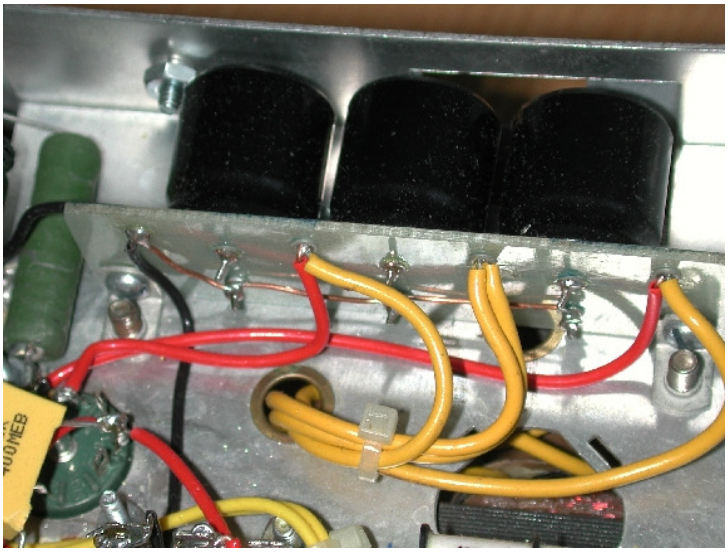
Strategies to Repair or Replace Old Electrolytic Capacitors

(*Continued from the June Issue*)

Snap Mount Caps usually mount on a PCB (printed circuit board). The pins snap in to holes in the PCB and stay there well enough to be wave soldered in place. It's easy to solder directly to the pins ... and some snap mounts have the right diameter (35mm) to replace twist-locks using the same clamps used with the computer caps above. Unfortunately, with only one section, you still have to hide the remaining sections in the chassis, although they provide the opportunity to fill some of the chassis real estate with high-quality capacitance rather than with a dead capacitor. Check out the Panasonic TSHA or TSHB (from Digikey Electronics) or Nichicon NT (Michael Percy, but likely other vendors too).

Under-Chassis Installation

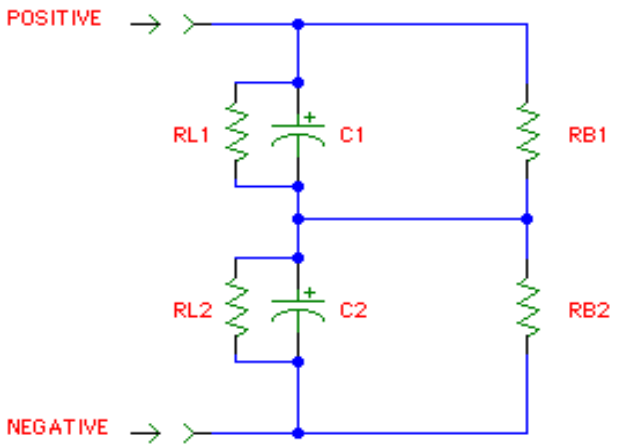
Because of the compact size of modern capacitors, usually you can find enough space within your equipment's chassis to locate replacement capacitors. If you can resolve the mechanical issues, modern styles of capacitors also have much higher performance than vintage types, thus you may enjoy a sonic benefit by only employing modern styles of caps for your replacement, rebuild or repair. Mechanical issues include :



- *Where to put the capacitors:* you need to find enough space for the new capacitors, in a location near the current wiring and away from any heat sources like voltage dropping resistors.
- *How to reroute the wiring:* you may have to unsolder the existing wiring and replace with new wiring long enough to reach the new capacitors, and route that wiring away from sources of hum (like parallel AC line wiring). Be sure to use wire that's rated for the voltages it will carry.
- *How to secure the electrolytics to the chassis:* Glueing directly to the chassis should be avoided in my opinion, although some use that method. I prefer to construct a subchassis or terminal strip, mount the electrolytics to the holder, and mount the holder to the chassis.

When you select capacitors for under-chassis mounting, be aware of the quality of the capacitor you plan to use. I know from personal experience that cheap generic surplus electrolytics will burst if subjected to high ripple current. Especially for the capacitor electrically closest to the rectifier, choose a high quality new capacitor specifically intended for high ripple currents, such as the Panasonic EB (available from Digikey Electronics).

Above are 3 47uF/400V Panasonic TSHA mounted on a piece of glass fiber board (FR4) using grommets. Grommets and staking tool are manufactured by Keystone and available from Mouser Electronics. You can also etch circuit boards for this purpose; Sheldon Stokes of SDS Labs built some high quality replacement boards for the Harmon-Kardon Citation II and the Dynaco ST-70. Seems a shame not to use the chassis space occupied by the twistlock caps, but Sheldon's boards are a very neat solution. Some of Sheldon's boards are also sold by Triode Electronics.



SERIES-CONNECTED CAPACITORS: Insufficient voltage ratings can be a problem, and series-connection may be the only way to obtain electrolytics with a high enough voltage rating. I know of only a very few modern-style electrolytics with voltage ratings above 450V, including LCRs (500v) and Sprague Atoms (600V). Series-connection requires addition of so-called "bleeder" or *voltage balancing resistors,* one across each capacitor, conducting a current that keeps the voltage across the series capacitors balanced. Some of this is covered in the manufacturer's application notes; sources here are the Nichicon and Rifa application notes in particular.

Even brand-new high quality electrolytic capacitors conduct to some degree. This leakage current depends on the quality of the electrolyte, temperature and condition of the capacitor, and can be represented by a resistance in parallel with the capacitor. In the figure, series-connected capacitors C1 and C2 have some leakage resistance RL1 and RL2. Because of the wide tolerances of electrolytics, this leakage current varies from sample to sample, and by Ohm's law, affects the voltage balance between electrolytic capacitors connected in series. Note that we consider only brand new, identical capacitors connected in series - no mixing of ratings, types or brands, please.

Balance resistors RB1 and RB2 keep the voltage balance between the series capacitors within tolerance by including another larger current in parallel with the leakage current. The balancing current is chosen large enough to overwhelm any leakage imbalance and thereby to guarantee safe operation. To calculate the value of the balancing resistors, first determine the approximate maximum leakage of the series-connected capacitors. The leakage current in uA ranges from 1/5 sqrt(CV) to 1/2 sqrt(CV) according to Nichicon, with C in uF, V in volts and current in uA. You can also get leakage specifications from your capacitor's data sheet. One common rule-of-thumb for the balancing current is 10x the leakage current - thus for two 100uF/350V capacitors connected in series to form a 50uF capacitor, maximum leakage of 1/2 sqrt(100*350) = 94uA, times 10 is about 1 mA. Let's say we want our applied voltage to be 650V, then RB1 and RB2 = 325K ohms. Power dissipation of I*V = 0.325W, so a minimum 1W resistor would give an adequate safety margin. Be sure to check the voltage rating of any balancing resistors too.

You'd think that two 350V electrolytics connected in series would have a voltage rating of 700V, but the loose tolerances of electrolytics again interferes. As pointed out in the Evox Rifa electrolytic capacitor application note, series capacitors act as a capacitive voltage divider, and N electrolytics connected in series with a capacitance tolerance range of Cmin to Cmax have a maximum divided voltage (at the junction of the two capacitors)

Vdiv = (Vapplied * Cmax) / (Cmax + (N - 1) * Cmin).

Ok, so in our example, with a +/- 20% capacitance tolerance,

Cmax = 1.2*100 and Cmin = 0.8*100, with

Vdiv = (650*120)/(120 + (2-1)*80) = 390V.

This exceeds the voltage rating of the electrolytics by 40 volts; with some algebra we can see that 350+350 gives a 583V maximum when the capacitive tolerance is 20%. For our applied voltage of 650V, the minimum voltage rating for each capacitor would need to be 400V.

In its application note, Nichicon presents a more precise calculation of the balancing current than the 10x-leakage rule given above.

Let Vdif = (Vmax - Vmin) be the difference in operating voltage resulting from leakage imbalance for the two electrolytics in series and

Idif = (Imax - Imin) is the maximum difference in leakage current between the two capacitors,

then RB1 = RB2 = Vdif / Idif (see the application note, although it's fairly easy to derive this result).

Using the current range given above, Idif = 0.3*sqrt(CV)*Tc*F, where Tc is a temperature coefficient and F is a fudge factor.

Electrolytics conduct more as the temperature increases, with Tc at 20C of 1, increasing to 2 at about 60C and 5 at about 85C. Again, you can find this characteristic in your capacitor's data sheet. The fudge factor is an arbitrary safety factor of an extra 40%, thus for our example at 60C: 0.3*sqrt (100*400)*2*1.4 = 168uA. Nichicon picks an arbitrary Vdif of 10% of the capacitor rating, but by knowing the intended application we can make a better worst-case estimate.

Consider that the worst-case voltage imbalance due to leakage current between the series capacitors increases with decreasing balance resistor current. Thus the larger an imbalance we can tolerate, the smaller our balance current can be. If we do not ignore the capacitive tolerance, *we must add the capacitive and leakage effects to get a valid worst-case estimate* of the voltage imbalance.

Using the 2 at 400V/100uF series connection operating at 650V, the worst-case voltage imbalance due to the capacitive tolerance of 20% is 390 - 260 = 130V. This imbalance can increase due to leakage at most by 20V to 400 - 250 = 150V, and Vdif/Idif = 20V/168uA = 120K ohms or 2.7mA. This is 0.9W per balance resistor... requiring two 2W or larger power resistors.
A better solution would be to increase the voltage rating to 450V, resulting in a small increase in leakage current difference (10uA) with an increase in voltage imbalance tolerance by 100V. Then Vdif/Idif = 120V/178uA = 675K ohms or 480uA at 0.16W. It may also be worthwhile to match devices to minimize capacitive imbalance, although some tolerance should remain to accommodate possible changes in the characteristics of ageing capacitors.

Since 450V is the highest readily available electrolytic voltage rating, for voltages much over 650V we should increase the number of series-connected capacitors. With 3 450V series-connected capacitors and 20% capacitive tolerance,
the maximum operating voltage is 450*(120 + 2*80)/120 = 1050V.

Choosing an operating voltage of 900V, with a nominal 300V across each capacitor, if two capacitors operate at their lowest

voltage and one at its highest,

then Vmax = 1.2*900/(1.2 + 0.8 + 0.8) = 346V.

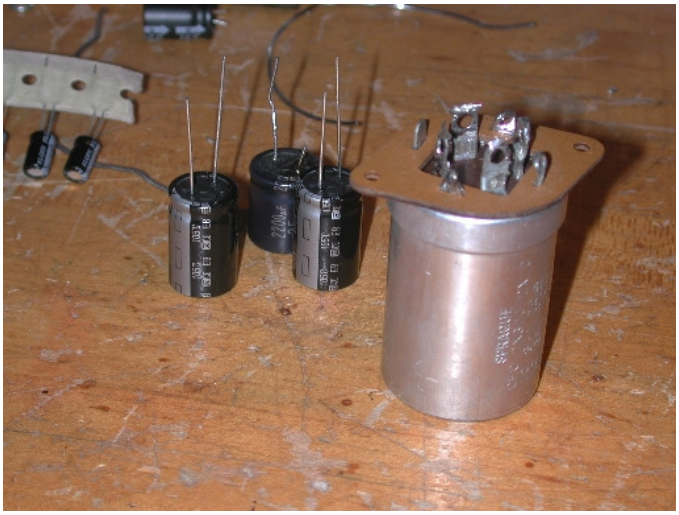
Here Vdif = 2*(450-346) and Idif is still 178uA, thus Vdif/Idif = 1.2M ohms or 250uA.

Boiling this down to math-free conclusions, for multiple identical series-connected electrolytic capacitors:

- The sum of the voltage ratings should be 30-40% higher than the applied voltage.
- A voltage-balancing resistor network is required, and the balance current need be no more than about 1 mA.

The 10x-leakage rule makes no assumptions about the voltages of the capacitors in use, providing a conservative requirement, although not considering the voltage imbalance due to capacitance and leakage current tolerances. For the amateur builder/ repairman, using a bit more balance current than the minimum, as recommended by the 10x-leakage rule, won't matter. A more thorough analysis will guarantee that the voltage ratings of the series-connected capacitors are safely within worst-case limits. The manufacturer's recommendations point out the factors that effect the capacitor balance - temperature, range of leakage current, capacitive tolerance, voltage range - and these factors should be considered in selection and installation.

Rebuilding Capacitors



For can electrolytics with less than 450V rating, you can rebuild them yourself, keeping the existing connections. The rebuild will leave a "scar" on the can, so you may want to try a rebuilding service for any electrolytics from super valuable mint audio equipment or radios.

If you rebuild electrolytics yourself, you'll need to cut the can open and replace the existing can contents with new electrolytics, routing new wires to the terminals. This procedure requires some skill, good sense and planning so beware of shock and/or fire hazards if you make any mistakes. Here's some step-by-step: First, gather the new electrolytics you will use to replace the existing guts of the can. They must fit inside the can, so arrange them as they will be placed in the can and make sure they don't exceed the height or diameter of the can, plus some wiggle room. Note the advice on cap selection in the previous section.

Next, you need to cut the can open. I've used a wide X-acto saw, or chucked the capacitor in the metal lathe and cut through with a narrow metal-cutting bit. A friend of mine uses a Dremel tool with a cutoff disk. The capacitor contains a coil of aluminum plates (foil) separated by electrolyte and aluminum foil leadouts from the plates connect to the terminals in the phenolic base plate. A blob of tar anchors the plates in the aluminum can (typically). A mounting flange, the can and the phenolic bottom are crimped together to close the can.

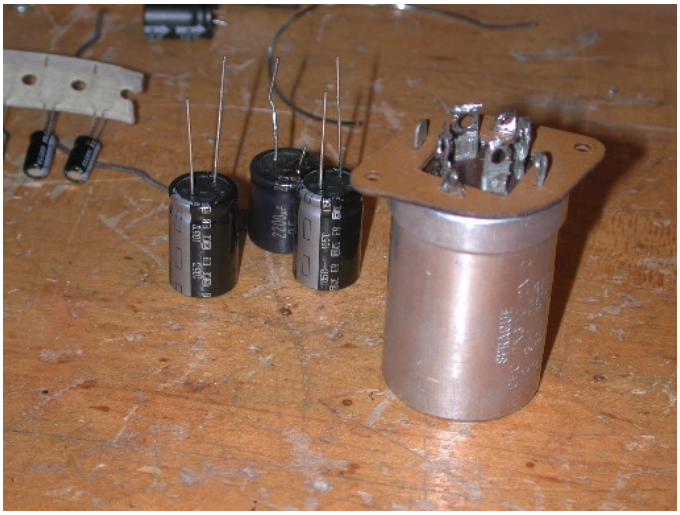
Once you have the can open, remove and discard the plates. Clip the leadout as close to the phenolic plate as you can. Scrape out the tar. Clean out any stray electrolyte with a wet cotton swab.

Okay, now for some planning: Since you've cut the leadouts, you'll need to bring wires to the terminals from the new capacitors inside the can. You'll also need to create a new ground connection, since the electrolytics will now be insulated from the can. I start by gluing the capacitors together with a small blob of silicone sealer (RTV) in the orientation they will take when installed in the can. You need to plan the location of the leads so that they can go through the phenolic disk and wrap around the base of the existing terminals. Depending on the lead length, you might have to add some extra wire ... usually I only need to add wire for the ground lead. If you need to stack the new electrolytics inside the can so they'll fit, be sure to insulate all wires from the other wires and the can with spaghetti tubing or heatshrink tubing.

Regarding RTV, I use an easily obtained hardware-store brand for this job. Generic RTV does release acetic acid as it cures, so it could corrode any metals it comes in contact with. I've had no problems with corrosion, but you could use a non-corrosive electronics grade RTV if it's an issue. Hot melt glue could also be used, but be careful of your fingers since it's really hot and sticks to skin like, well, glue.

Using the smallest bit possible, drill a hole for each new lead wire next to each terminal it will attach to. Push the leads through the phenolic disk, seating the new electrolytics on the disk. Wrap the leads around their terminals, and route the ground to the can, adding a bit of spaghetti tubing if needed. Solder the new leadouts to the terminals.

I prefer to add some RTV around the capacitors to stabilize them in the can. Now you must seal up the can you cut open. I've completed quite a few of these rebuilds by just taping the can together with copper tape, but lately I've added a thin copper patch glued to the inside of the can. More glue on the patch, and the can be fit together like a match box. This leaves a thin line where the cut was, hardly noticeable. The same friend mentioned above uses some epoxy, or maybe it's liquid steel. He also



cuts close to the base and holds the top on with a fillet of epoxy, which may be more aesthetically acceptable.

Here's my Eico HF-85 with its power supply filtering capacitor rebuilt using the above method. This repair was done *in situ*, though I don't recommend leaving the electrolytic in the chassis, since you have to solder to the terminals anyway.

Tim Reese
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Some of the items displayed at the AWA open Day in June

President's Corner

By Richard ZS6TF

To bid or not to bid, that is the question

I confess to a lifelong attraction to auctions. The thought of getting something that I need or want for well below its value in competition with other bidders is a compelling force for which the chase is as satisfying as the outcome.

The emergence of online auctions has revolutionised the way people sell and buy over the internet and one particular multinational company has fully integrated the process from the gleam in the customer's eye to the end of the warranty period with every step in between.

I have bought all kinds of things using it from a second hand car, rig, tools, vintage radio parts, collectables and even car parts and have sold a few items cluttering up the QTH as well. It is reliable, there are safeguards in the system, and it is an enjoyable process but I have to say that it does not have the feeling of a live auction and it is more susceptible to manipulation than a real auction.

Often you will hear a person say, "a triple reversing widget like the one I have for sale, sold on x-Bay for $xxx last month" the intention being to justify an inflated asking price. The reality is that after commissions and other charges the vendor receives between 10 and 15% less, dependant on a number of selling options and add-ons. and an onlooker has no way of finding out if a deal is actually completed.

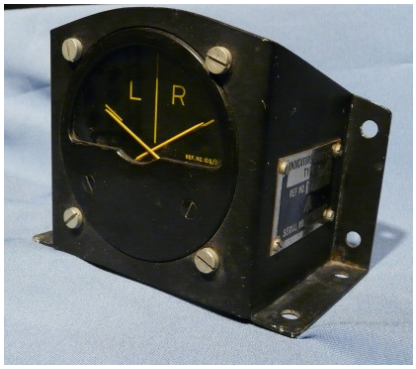
From an antique wireless perspective, American radios fetch more money in America and British radios fetch more money in Britain and in each others countries the radios change hands for less, even with the advantage of lower domestic shipping.

The biggest evil and sadly quite prevalent crime on e-auctions is shill bidding, where parties collaborate to push a price for example on a big reserve and a sale is not concluded. The item reappears re-listed somewhat later and commands a much higher price than it would otherwise. Another crime is misrepresentation which can catch you out although you have some deterrent and protection with consumer legislation.

Here is a light-hearted look at some vintage rig descriptions and interpretations

This rig puts out a BIG signal - *It's 50 kHz wide.*
I know nothing about this rig- *Having stuffed it up I will unload it onto a sucker.*
This is a really good CW rig - *It doesn't work on SSB.*
This is a really good SSB rig - *It doesn't work on CW.*
Needs TLC to make a really good rig - *It doesn't work on CW or SSB.*
This tranceiver's transmitter is outstanding - *It doesn't receive*.
This tranceiver's receiver is hot - *It doesn't transmit due to overheating receiver.*
This rig is really hot - *It's stolen.*
I think it is a vintage regenerative type - *It oscillates if you take your hands near it.*
Recently re-valved – *Purchaser advised to insure heavily to replace dodgy valves*.
Recently worked on - *The slugs on the coils and IFT's are jammed and broken.*
I don't know if it works - *It definitely doesn't work, probably never has*.
The vintage audio sounds great - *Faithfully reproduces 50Hz*.
Just serviced – *Hoovered the spiders and sprayed with WD-40.*
It comes with the original box –*wherein I dumped it in disgust 30 years ago*..
Better buy it now, because it won't last – *Many a true word…..*
Works at full power – *Burns up wall outlets*.
This rig has wide frequency coverage - *It drifts like a scanner.*
Frequency stability is great - *The VFO doesn't work, but it has 4 crystal channels.*
Popular rig in its day - *There were whole HF nets on the repair and maintenance problems, continued in webpages and blogs full of modifications to make it work*.
It might need a bit of tweaking - *Marconi himself couldn't fix it, much less align it*.
Ex-military – *Mice gained access through the bullet hole in the back of the case*.
The dial drive may need lubricating - *The gears are jammed and the grubscrew's stripped.*
I plugged it in and it lights up – *You should have seen the two foot high flames.*
I'm selling it because I have two of them - *I'm keeping the working one with all the good parts from the other.*
Collector's item -. *If you can find a use for it let me know*.
SK sale - *If you have any problem take it up with the original owner*.
Working last time I used it –*Before the Rinderpest that is.*
I have the scale somewhere, I'll send it on to you, trust me - *You'll never ever see the scale, broken whilst cleaning.*
The valves in this rig are worth more than asking price - *The rig uses rare sweep tubes in the final which are flat and made of unobtainium*.

The rig of my dreams as a youth, but now I've got to let it go – *Now I know what a pile of **** it is.*
Legendary signal quality - *High distortion and bad audio quickly identifies this rig.*
Nostalgic vintage ham experience - *The bypass capacitors to the AC line put enough voltage on the chassis to give you a shock in the lips through the microphone.*
Shack clearance – *Need to ditch this due to XYL's ultimatum.*
There are a couple of other people interested in it – *Other guys looked at it and told me where to put it.*



President's recent e-bargains

When bidding, set yourself a limit at which you are prepared to lose it and wait for the next one .“Caveat emptor” as the Romans used to say meaning “let the buyer beware”. If it seems to be too good to be true it usually is. Happy bidding.

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Get your backdated issues at
http://groups.yahoo.com/group/AWA_SA/

Antique Wireless Association of Southern Africa

Mission Statement

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yesterdays radio's and associated equipment. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association.

Notices:

AWA Nets and times:

Saturday Morning AM Net—06:00 3615
Saturday Morning SSB Net—08:30 7070 (7140 from 03 Aug)
Saturday Afternoon CW Net—14:00 7020
Wednesday Evening AM Net—19:00 3615

You don't have to be running valve sets to join us.

AWA 10th Birthday.

For those of you who have been with us from the beginning, you may just remember that it was in March 2003 that the first meeting on air of the AWA of Southern Africa was took place.

Now it is 10 years later and we are celebrating 10 years of being on the air and many various activities that take place on air. In celebration of this, we have designed a special QSL card.

In order for you to get this celebratory QSL card, you need to contact ZS0AWA during one of the QSO parties, or activity days that take place during the year. That would be the CW activity day on the 3rd and 4th of February. The AWA QSO party on AM and SSB on the 11th and 12th May and the QSO party on the 12th and 13th October. Should you have a QSO with ZS0AWA on any of these dates, send us a QSL with a SASE and we will send you the QSL Card.