AWA Newsletter

June 2009

Antique Wireless Association of Southern Africa

Inside this issue:

AWA Committee:

Reflections:

Isn't it amazing how the tunes have all changed about the sun spot cycle ?

It was only a short while ago that every one was predicting the end of cycle 23 and the beginning of cycle 24 and that cycle 24 was going to be the most awesome cycle that we have seen in years.

Now, it seems that cycle 24 is going to be maybe one of the worst we have ever seen.

So what does this mean to us as Amateur Enthusiasts ? Does this mean we now pack away our radios and wait for another cycle to pass and then start to reach it's maximum before we even think of pulling them out of mothballs, or does it mean this is a great opportunity to really see how good we are at making amateur radio work ?

Personally, I prefer the latter and will do all that I can to make contacts on HF using SSB, CW and AM. Yes, even AM.

This is the time to try out different antenna systems and get them to operate at maximum. This is the time when we need to adapt ourselves to getting through the noise that is being generated by an ever increasing electronic media world by doing all that we have learned in our theory and from others. I was never that great at learning theory, but I am always willing to experiment different ideas from those that I know have the theoretical expertise.

I have put too much time and effort in to the restoration and use of my vintage equipment to stop using it now because of a little bit of noise on the bands and poor propagation.

One thing I am sure of, is that I am not alone in this reasoning. I read the SARL Forum on a daily basis and there are plenty of our SA Hams that are still ardent about communicating via radio. I just hope the momentum will always be there and we will keep moving forward to achieve the things we dream about.

Don't give up on amateur radio just yet, especially on your fine old rigs that have worked so well for so many years. Lets light up the tubes and the ionosphere.

Best 73

De Andy ZS6ADY

Wikipedia

Electrolytic Capacitors:

An **electrolytic capacitor** is a type of capacitor that uses an ionic conducting liquid as one of its plates with a larger capacitance per unit volume than other types. They are valuable in relatively high-current and low-frequency electrical circuits. This is especially the case in power-supply filters, where they store charge needed to moderate output voltage and current fluctuations in rectifier output. They are also widely used as coupling capacitors in circuits where AC should be conducted but DC should not.

Electrolytic capacitors can have a very high capacitance, allowing filters made with them to have very low corner frequencies.

Construction: Aluminum electrolytic capacitors are constructed from two conducting aluminum foils, one of which is coated with an insulating oxide layer, and a paper spacer soaked ((Continued on Page 7) in

CW Net:

This last month I took part in the CW QRP contest. I didn't score many points, but it was well worth the try.

I must admit, contesting on CW has never really been one of my high points, but I decided to get the name of ZS0AWA out there and see what happens. I don't even know how the scoring works, but if I look at the top scorers, there were some pretty high points takers out there.

Well done to Pierre who fared pretty well and is always egging me on to do more in the CW fraternity. It was really Pierre that persuaded me to try my hand at the contest.

I have difficulty in hearing with my Tinnitus at about the same frequency as a lot of the signals coming in, so signals that are too low, tend to disappear in the noise rather easily. That being the case, I employed my trusty PC with "CW Get" loaded to assist me with the softer signals. Only problem is I don't know whose hearing is worse, mine or the PC. Wow there were some garbled messages coming up on the screen.

Anyway, I still had a good time and think I heard more stations than what I actually tried contacting. Some of them could not hear me either (maybe they also have Tinnitus).

I don't think I will make a good CW contester, but the experience was great and it reminded me a lot of my first CW contact, you know the sweat and all ?

What attracts me to CW ? Well maybe it's just the fact that I can still do it and I don't want to lose it again. Lots of guys say it's

like riding a bicycle, you never forget how, but if you don't practice, the peddling becomes very difficult.

73

De ZS0AWA/CW …-.-

SSB activity:

The bands have certainly not been very kind to us this past month with some of the worst conditions I have experienced in a long time. 40m has been especially difficult, but not impossible.

Once again I want to encourage our local guys in and around Gauteng to try using the 80m relay to call in. 80m has been really good as far as short distance comms are concerned and even some of the Div 5 stations use it in preference to 40m because of the inconsistency.

Yes I am sure there will be a change in conditions and yes 40m will improve, but for now, it certainly is not that great.

We still want to encourage you to come and join us on the net's. Though the bands are noisy, we have said before, they are not impossible. Call in and help bolster the numbers (and Willem's ego) to keep the AWA going. If calling in on the net is not your cup of tea, then let us know what you would like to hear on the net. Would you like a bulletin of some kind ? Would you like to hear news from other groups ? Would you like some technical discussion ? Remember, this net is there for you, the collector and restorer and we want to get as many rigs on air as we can.

What do we do when the new frequency allocation comes in ? I suppose we will need to move to a new frequency, depending on whether the portion of the band we are using is allocated elsewhere or not. Hopefully, we can stay exactly where we are.

Collins 75 S1 Receiver

AM:

Once again, the 40 and 80 meter bands were filled with the hum of AM signals coming from over 60 participants in the Valve QSO party in May. Many were operating on transistorised rigs, but there were quite a few operating valve rigs. Be they hybrids or pure valve.

It just goes to show there is still an interest in AM and many were there just testing out their rigs to see what they could do on AM. Using an old valve boatanchor is not an easy job in a contest and so I hooked in on one frequency and stayed there for the duration of the contest, only changing bands and frequencies to go from 40 to 80m. The old Collins worked superbly, pumping out over 100w of pure AM without missing a beat.

I use this same rig for all of my AM transmissions and the reports I get are always encouraging.

Having to manually switch transmit/receive, makes life interesting, to always get the rhythm right. I sometimes ended up transmitting into the tuner with no antenna switched in. But they are tough old ladies and can handle it well. Thanks for all the contacts guys and the reports. It was well worth it.

Collins 32 V3 AM Transmitter

THE THERMIONIC VALVE

Lat: Valva – Leaf of folding door.

Vacuum Bulb containing two or more electrodes.

The basic principle of the thermionic Valve was discovered by Edison, but no practical use was found for what was known as the "Edison Effect", and it remained a laboratory curiosity until 1904 when J A Flemming produced the first Thermionic Valve, the Flemming Diode.

The principle is this: The glowing tungsten filament of an ordinary electric lamp emits electrons in to the surrounding vacuum. These make short journeys and eventually return to the filament. If, as in Fig 1, a metal plate is sealed in to the bulb and maintained at a positive potential, a stream of electrons is drawn across the vacuum. From filament to plate, the electrons are minute particles of negative electricity and they respond to the very strong attraction exerted on them by the positively charged plate, called the anode.

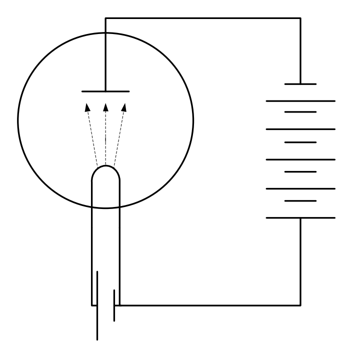

Fig 1
A Stream of electrons is drawn from filament (or cathode) to anode of an avacuated bulb

Were the anode made negative, it would repel the electrons emitted by the filament, or cathode, and no current could pass. In battery operated valves, electron emission takes place from a filament heated by the passage of current through it. Emission in most mains operated valves is from a cathode which is brought to the necessary temperature by the action of a separate heater.

If the tungsten is treated with thoria, emission is obtained at a much lower temperature.

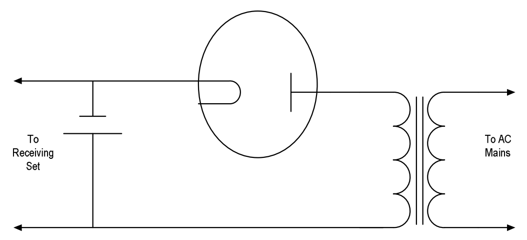

Fig 2
Thermionic Valve
The Diode used as a half wave rectifier

The thermionic valve obtained it's name because it exercises the same effect on an electron stream as do mechanical valves (e.g. the valve of a bicycle tyre, the inlet and exhaust valves of petrol and steam engines, the ball-tap of a cistern) on the flow of gases, steam or liquids. All permit a current to pass in direction only.

The diode is much used in Radio, radar, television and other apparatus. The majority of AC mains wireless receiving sets, for instance, have a diode rectifier, which can be arranged as in fig 2. Current passes only during the positive half of each cycle, when the anode is made positive. The negative half cycles are, so to speak, strained out and "spurts" of uni-directional current are delivered by the valve. These are smoothed by suitable circuits in to steady stream DC. This process is called "half-wave rectification".

In practice, a full wave rectifier is usual. This consists of a double diode valve, which has two anodes and a common cathode. One end of the transformer secondary winding is connected to each anode. Every half cycle thus delivers one of the anodes positive and produces a flow of current. The diode also has many other uses.

Lee de Forest developed the triode, or three electrode valve. (Fig 3). Between the cathode and the anode, a grid (usually a helix of fine wire) is inserted. Since the grid is closer to the cathode than it is to the anode, potentials applied to the triode exercise a greater effect on the electrons stream. It may, for example, be found that to increase the cathode to anode current by mA, the anode potential must be raised by 10v, but that the same increase can be obtained by leaving the anode potential unaltered and by making the grid only 1v more positive.

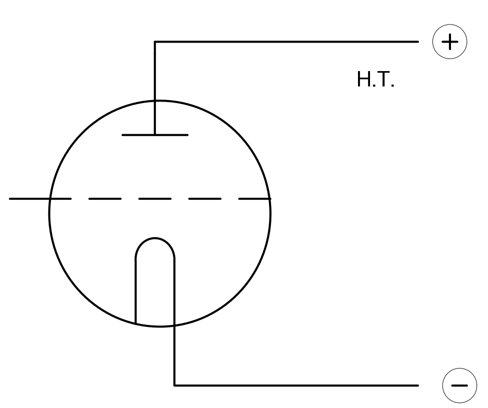

Fig 3
The Triode

The efficiency factor, or mutual conductance (symbol gm) of a valve is the ratio of the change in the anode current to the change in the grid voltage. A 1volt change in the grid voltage, produces a 2mA change in the anode current. The mutual conductance is thus 2 mA per volt, usually written 2mA/V.

If an alternating voltage reaching 1volt at the crests of the positive half cycle and -1volt at the trough of the negative half cycle, is applied to the grid of the valve, it will have as much effect on the anode current as would an alternating voltage rising to +10volt and falling to -10 volt applied to the anode. In other words, a ten-fold amplification of voltages applied to the grid occurs at the anode. The amplification factor of a valve (symbol µ) is the ratio of the change in anode voltage to the change in grid voltage producing the same effect here i.e. 10.

One other important factor is the anode resistance (symbol Ra), which is the ratio of the change in the anode volts to the change in anode current which it produces. In making the calculation, the anode current must be measured in Amps. A change of 0.002 amp (2 mA) is produced by a charge of 10 volts. The anode resistance is thus 10 ÷ 0.002 or 5,000 ohms.

The triode can do other things besides amplifying. It gives good service as a detector. (see ratio). Any two conductors separated by an insulator, or dielectric, form a capacitor, or condenser. Such capacitors are formed in the triode by anode and grid; grid and cathode; cathode and anode. Alternating and oscillating currents can pass through capacitors. The higher their frequency, the smaller is the opposition to their passage offered by a capacitor of a given value. The stray capacitance, as they are called, which are inevitable in the triode, may allow high frequency currents to leak in to paths other than their proper ones and to produce highly desirable effects.

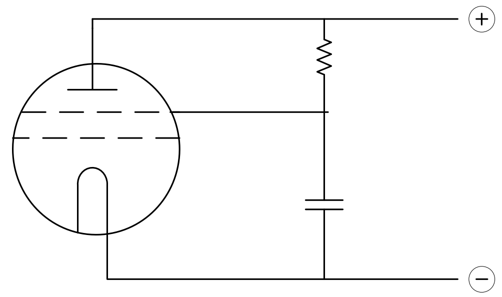

Fig 4
Thermionic Valve
The Screen Grid Valve

The capacitance between two conductors can be reduced to zero by placing an earthed conducting screen between them. This is what is done in the screen grid valve (fig4). The screening grid is not directly earthed, but the large capacitor “C” offers so little opposition to the passage of high frequency currents, that it is as good as earthed, so far as they are concerned.

The chief virtue of the screen grid four electrode valve, or tetrode, is that it allows enormous amplification a t high frequencies. It has however, one serious drawback. Suppose that we apply a fixed potential of, say, 80v to the screen and gradually raise the anode voltage, starting from zero. At first, the anode current increases as the anode voltage is increased. Then comes a point at which it begins to fall. This fall continues for some time as progressive increases are made in the anode voltage. Then the anode current begins to rise steeply again for a time and again the rise becomes small, no matter how much the anode voltage is increased.

What is happening during the unexpected fall is that fast travelling electrons from the cathode knock other electrons out of the anode, and these secondary electrons are captured by the positively charged screen. The anode is robbed of electrons and its current falls. Later, when the anode voltage is made higher than that of the grid, the secondary electrons are attracted back to the anode before they have gone very far.

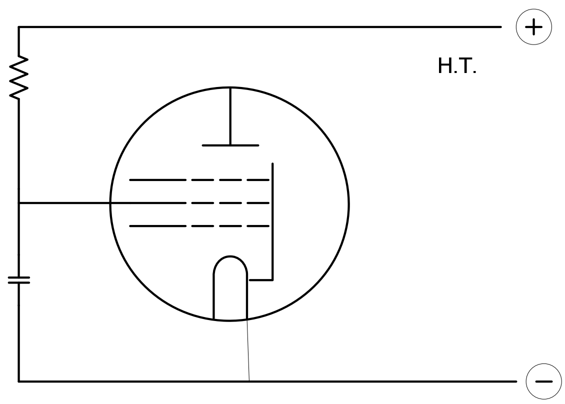

Fig 5
The Pentode

All this is avoided in the five electrode pentode valve (fig 5), in which a suppressor grid connected to the cathode, is placed between the anode and screen. The suppressor neutralises the pull of the screen and the secondary electrons return to the anode, even if its positive potential is low. The pentode is a most useful valve with an amplification factor of 2,000 or more. Its stray capacitances are very small indeed.

Hexode (6 electrodes) and heptode (7 electrode) and other complex valves are used for particular purposes.

The diode-triode, the triode hexode and the double diode pentode, are really assemblies with a common cathode of two or more valves in one bulb.

(This article from Peter ZS4PAW, who got it out of Universal Encyclopaedia 1939 – by Hazel Watson)

What was amateur radio like in the olden days?

Today we are spoilt with modern solid state transceivers and digital signal processing etc. What was it like in the olden days when amateurs built most of their equipment?

Let us take a look back to days before commercial manufacturers came on the market. The average constructor followed the articles published in national magazines like the ARRL QST and the RSGB Bulletin (later Radcom). Here were a great number of articles written by essentially "experimenters" although many worked in professional capacities. One item is feed lines. Before about 1940 all amateurs used a type antenna coupling that was link coupled to the anode of the final amplifier valve (tube) and had a fairly high feed impedance. A popular antenna was the T antenna with a flat top and a single wire feed line connected to a link coupling or tap on the parallel tuned PA valve tank coil. This gave a fairly high voltage RF feed to a high impedance "riser wire" that connected to the horizontal flat top half wave wire. A derivative of this antenna was known as the Windom antenna fed at an offset from the centre point with a ¼ wave vertical wire tuned against a ground wire for "earth". Other popular antennas were half wave dipoles fed with open wire balanced feed lines. That these systems worked efficiently is evident by the great number of QSO's that were made. VSWR meters were only invented about 1958 by Warren Bruene at Collins Radio and prior to this amateurs, and professional engineers, simply tuned for maximum RF current into the feed line using RF ammeters as the measuring instrument. In fact this method was used well into the 1990s for maritime transmitters before being discarded.

All this changed during World War 2 due mainly to Edward (Taffy) Bowen a brilliant Welsh engineer who was involved with airborne radar at TRE (Telecommunications Research Establishment) at Malvern in England. Bowen was working on the early airborne intercept (AI) radar to be fitted to RAF fighters to identify enemy fighters and bombers in the nightly battle over England. The radar Bowen was involved with operated on about 120 MHz and had an output power of up to 10kW. Previous systems had used a type of open wire balanced feed lines passing through the aircraft skin via insulators to the nose mounted dipole arrays. As these had an impedance of about 300-ohms the RF voltages on the wires were very high and caused arcing to occur at high altitude. With the extra power the new valves could achieve this led to problems. Bowen was aware of a new type of screened feeder used by the British Post Office for carrier telephone systems. The first section put into operation being the cable between London and Birmingham in 1936. This was a semi-rigid copper tube with a centre wire held in place with insulating discs known as coaxial line and then sheathed with a heavy lead tube for protection. The impedance of this coaxial line was about 70W and it was manufactured by Standard Telephones & Cables (STC). It was also later used in the Chain Home VHF radar transmitters to carry the power from the transmitter to the base of the 120m tall transmitting towers. This was unsuitable for aircraft due to the weight, so Bowen approached the Imperial Chemical Industries company (ICI) research department and requested if a new material, polyethylene, could be extruded onto a twisted wire centre. This was duly done and Bowen then sheathed this with a copper braid to form the coaxial cable now so common today. This solved the arcing problem and so flexible coaxial cable was invented and widely used in airborne systems.

At the same time coaxial connectors needed to be designed, to allow this new flexible feed line to connect to the various items in the system. One of the first was designed by Burndept, a British company involved in the design of radio equipment for the military. These connectors were used extensively in aircraft installations and many army transmitters and receivers, most notably the 19-set and the C-11 and C-13 for the antenna connector. Many other connectors were designed by Paul Neill and Carl Concelman in the USA. Neill and Concelman worked for Bell Telephone Labs. The N type connector is a Neill design and it simply means "Neill Connector", Concelman not to be outdone then invented the C type connector, named after him. Later Neil and Concelman worked on several new connectors and some of these are the BNC (Bayonet Neill-Concelman) and the TNC (Threaded Neill-Concelman). The popular PL-259 / SO-239 connectors were designed by Eli Quackenbush of Amphenol to operate up to 300 MHz but were not constant impedance as the N and C types were, and originally specified as UHF connectors, a misnomer in reality. The use of UHF was because at the time anything higher than 30 MHz was considered to be Very High Frequency (VHF) and anything above 100 MHz was classified as Ultra High Frequency, so the PL-259 became known as a "UHF Connector".

After World War 2 when amateurs could again get back on the air, the whole technology of transmitters had changed. Many superb valves had been spawned during the war like the 807 and 813, and made in quantities of over a million at a time, these were available at reasonable cost from war surplus sources. Learning from experience of the war new designs where coming into print. Out was the "old fashioned" parallel tuned tank circuit and in, was the new "Pi Tank" circuit, but this now only matched into low impedance antenna feed lines. The amateur was now in a quandary, whether to keep his tried and trusted high impedance feed line or change to the new-fangled low impedance feed line using commonly available coaxial cable. This dilemma is still with us today. Whereas now most amateur equipment is designed to feed low impedance feed lines, it might not be the best option. Sure 50-ohm flexible coaxial cable is very convenient as it can be lashed to metallic supports without any degradation in signal, but its losses are much more than the older open wire feed lines and "high

(Continued on page 6)

impedance risers" of pre-war days. To use a high impedance feed line required the use of an additional impedance transformation often combined with an antenna matching unit, or ATU.

Receiver design has also jumped in massive leaps since the 1940s but often not as obvious as it seems. In 1940 a good CW receiver, like the HRO, had a sensitivity of about 0.25uV from a 50-ohm feed line for an easily readable signal, an experienced CW operator could copy down to 0.05uV with 99% accuracy, as many world war 2 interceptors showed when breaking the enemy transmissions. Nowadays the HF bands are full of "mush". This is largely due to "domestic interference" caused by, amongst other things, personal computers, switched mode power supplies, television time base signals, cell-phone chargers and many other man-made interference sources. Unfortunately, it doesn't appear as this will get any better in the future.

Prior to World War 2 the most obnoxious interference was due to motor car ignition systems and unsuppressed electric motors. This was a problem but not as much as we have to put with today. ADSL routers and many other systems today assail our sensitive receivers with so much "muck" that being able to work on the HF bands is becoming a real test of our determination to carry on our hobby. Another question is that of "dynamic range". Simply put, a receiver with good dynamic range can cope with high levels of adjacent channel interference. Old valve receivers although not particularly sensitive had good dynamic range and could keep working under severe adjacent channel interference. Today much expense is spent on making solid state receivers that come up to this benchmark. Indeed older valve receivers have a distinct advantage over modern equivalents using semiconductors under crowded band conditions, such as occurs in contests.

The writer can remember comparing the Yaesu FT-200 valve transceiver against the newer FT-101 solid state transceiver and was appalled to find the fancy new FT-101 was practically unusable on the 40m band in Europe due to strong intermodulation generated signals in the receiver front end. The source of these strong signals was not only amateur transmissions but also powerful broadcast transmitters outside of the band. The FT-200 was unaffected by the same strong signals because the valve receiver was almost immune to intermodulation, due to the use of valves and a better gain distribution in the various stages. On the FT-101 the 40m band seemed to be full of signals with no room to work, the FT-200 had many tens of kilohertz were no signals existed. Yaesu in their wisdom had built in too much front-end gain and insufficient selectivity, in a move to offer superior sensitivity to their competitors. This gained the early versions of the FT-101 a bad reputation amongst knowledgeable amateurs and almost crippled sales. Much modification of the FT-101 was made both by amateurs and Yaesu before the problem was eventually resolved and a complete new front end was designed using much better signal handling circuitry, especially the first mixer stage. This marked the (unofficial) designation of FT-101 MK2 to distinguish it from the original MK1 with its poor strong signal performance.

The FT-101 receiver first mixer was replaced with a balanced mixer using Schottky diodes, potted into a small epoxy block, by a group of Australian amateurs and sold as a component to retrofit the early models, this became known as the VK blob. Yaesu were at first slow to get to grips with the growing number of complaints and eventually saw sales drop to practically zero as the word got around of the inherent problems with the early version. The Fox Tango club also published many modifications to improve what otherwise was a good basic design but fell down on this critical point. Although the modifications improved the performance they still fell somewhat short of what companies like Trio-Kenwood had to offer. The Kenwood line, although generally better, sold for a higher price than the equivalent Yaesu models and so great rivalry existed between the Yaesu-Kenwood users.

The ARRL and the RSGB began to publish details of tests performed on popular HF transceivers using laboratory instruments and soon the readers were able to see the difference in performance that until then had only been estimated by on the air evaluations. This made the major manufacturers sit up and take notice. No longer could they sell equipment that was now plainly shown to be "iffy" and much effort was put into improving the designs. Advertising now included test figures (often reprints of ARRL results) showing that their equipment was superior to brand X competitors models in an attempt to gain a larger slice of the market world-wide.

(John ZS5JF)

electrolyte. The foil insulated by the oxide layer is the anode while the liquid electrolyte and the second foil act as cathode. This stack is then rolled up, fitted with pin connectors and placed in a cylindrical aluminium casing. The two most popular geometries are axial leads coming from the centre of each circular face of the cylinder, or two radial leads or lugs on one of the circular faces.

In aluminium electrolytic capacitors, the layer of insulating aluminium oxide on the surface of the aluminium plate acts as the dielectric, and it is the thinness of this layer that allows for a relatively high capacitance in a small volume. The aluminium oxide layer can withstand an electric field strength of the order of 10^9 volts per meter. The combination of high capacitance and high voltage result in high energy density.

Most electrolytic capacitors are polarized and may catastrophically fail if voltage is incorrectly applied. This is because a reverse-bias voltage above 1 to 1.5 V[1][2][3] will destroy the centre layer of dielectric material via electrochemical reduction (see redox reactions). Following the loss of the dielectric material, the capacitor will short circuit, and with sufficient short circuit current, the electrolyte will rapidly heat up and either leak or cause the capacitor to burst.

To minimize the likelihood of a polarized electrolytic being incorrectly inserted into a circuit, polarity is indicated on the capacitor's exterior by a stripe with minus signs and possibly arrowheads adjacent to the negative lead or terminal. Also, the negative terminal lead of a radial electrolytic is shorter than the positive lead. On a printed circuit board, it is customary to indicate the correct orientation by using a square through-hole pad for the positive lead and a round pad for the negative.

Special capacitors designed for AC operation are available, usually referred to as "non-polarized" or "NP" types. In these, full-thickness oxide layers are formed on both the aluminium foil strips prior to assembly. On the alternate halves of the AC cycles, one or the other of the foil strips acts as a blocking diode, preventing reverse current from damaging the electrolyte of the other one. Essentially, a 10 microfarad AC capacitor behaves like two 20 microfarad DC capacitors in inverse series.

Modern capacitors have a safety valve, typically either a scored section of the can, or a specially designed end seal to vent the hot gas/liquid, but ruptures can still be dramatic. An electrolytic can withstand a reverse bias for a short period of time, but will conduct significant current and not act as a very good capacitor. Most will survive with no reverse DC bias or with only AC voltage, but circuits should be designed so that there is not a constant reverse bias for any significant amount of time. A constant forward bias is preferable, and will increase the life of the capacitor.

Don’s Technical Tip

Intermittent faults.

It is the most frustrating thing when trying to repair any type of electronic equipment to have an intermittent fault. Old and poor solder joints can be a real headache. If you have traced the fault to a certain stage in your equipment then it would be an idea to re-solder any soldered joints in that part of the circuit.

In certain circumstances it is necessary to remove all the old solder and apply fresh solder to the joint before it has a good connection. Sometimes you can get away by applying some resin flux to the joint and this refloats the solder without having to remove all the old solder.

Just remember that we now can only get lead free solder and this can be quite a problem with the older solder connections and removing all the solder is necessary to effect a good connection with the new type of solder available.

In Valve equipment fading and noise crashes can occur and sometimes these happen simultaneously. The best treatment is to gently tap the suspected tube and this invariably shows the problem up.

Some of the more modern miniature tubes seem to be particularly prone to poor manufacturing tolerances. Hot spots on the cathodes and even interelectrode shorts have been known to produce noisy bangs similar to a capacitor breaking down and the odd fade. Of course one immediately suspects the tube holder and that source should be checked and eliminated first. If you have a spare valve then try that as well it might save having to open the rig and your problems will be resolved.

Thanks to Rod ZL1RK for some valuable input with this article.

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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 transmitters and receivers. 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:

Preliminary Results from the AWA QSO Party:

AM: 1st place = Jan ZS4JAN with 178 points
2nd = Andre ZS2ACP with 132 points
3rd = Rad ZS6RAD with 117 points

SSB: 1st place = Jan ZS4JAN with 282 points
2nd place = Vince ZS6BTY with 74 points
3rd place = Marius ZS4MP with 63 points

ZS0AWA scored 150 points in the AM section and 201 points in the SSB section.

A total of 62 stations participated in the AM section and 88 in the SSB section and there were 11 logs submitted.

Final results will be published on the SARL website and news bulletin after the closing date.

Wanted:
Andy ZS6ADY is looking for a Geloso g-209 or g4-214 receiver to go with his g-212 Tx. Any possibilities you can contact him on 082 448 4368 or email andy.cairns@xsinet.co.za . Must be in reasonable condition for restoration.