AWA Newsletter

 # 95

December 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
* KZN—Don ZS5DR

Reflections:

So another festive season has come and gone. Another year has come and gone.

Many of our friends in amateur radio have come and gone.

Presidents and important people throughout the world have come and gone.

Each one making their own place in history in the lives of people they have come in to contact with.

Whether they have been Presidents or paupers, each has had the opportunity to make their mark in life and leave behind something for the next generation. Be it for a nation or just a family, each has left behind something of value.

Mother nature has also left behind some indelible marks on the world as we know it this year.

Let us rather look to what the future holds for us as Radio Hams this year. Not just the New Year promises we make ourselves every year, which somehow never seem to get done, but the things that really matter to us.

To support some or other cause is a very noble feature which many of us have, be it from Organisations that serve the community to actually being in the Peace Corps, there is always something we can do .

How do we tie antique wireless into that, there can be many different ways from visiting schools to linking in with various groups that educate others about radio activities.

Us old timers, with our old time radios can still make a large impact on those wanting to know more, because we have the ability and the product to show where it all came from.

Let me not discourage the younger generation that also seem to be taking an interest in antique wireless, because they will have both the old and the new under their wing very much more than the old timers.

A sombre thought, but a good one.

From all of us here at the AWA committee, thank you for the support this last year and may this next year be one filled with excitement, growth and lots of time to play radio.

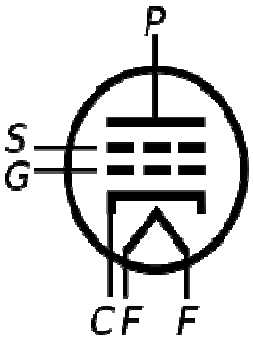
For the old timers, not too much excitement, take it easy on the growth, because we know where that normally happens, but do spend more time on the radio.

Best 73

DE Andy ZS6ADY

WIKIPEDIA

The tetrode has four concentric electrodes: the cathode, a narrow tube down the center, heated by a heating element; two grids, the control grid and screen grid, consisting of wire screens surrounding the cathode; and the plate (anode), a metal cylinder surrounding the grids. It functions similarly to the triode, from which it evolved. A separate current through the heater heats the cathode, which causes it to emit electrons into the tube. A positive voltage is applied between the plate and cathode, causing a flow of electrons from cathode to plate through the two grids. A varying voltage applied to the grid nearest the cathode, the control grid, can control this current, causing variations in the plate current. With a resistive load in the plate circuit, the varying current will result in a varying voltage at the plate. With proper biasing, this voltage will be an amplified (but inverted) version of the AC voltage applied to the control grid, thus the tetrode can provide voltage gain.



Schematic symbol of a tetrode. (*F*) filament, (*C*) cathode, (*G*) control grid, (*S*) screen grid, (*P*) plate.

The tetrode was developed to correct deficiencies in the triode tube. In the triode, the control grid was next to the plate. Capacitance between these two electrodes caused instability and oscillation, and several undesirable effects. To reduce this capacitance, a second grid was added between the control grid and the plate to make the tetrode.

CW Net:

What an interesting year it has been on the CW front. So many contacts made and so many groups still going strong.

Just recently I have been able to join up with the early morning group on CW on 40m. Just a half an hour of CW from 06:30 in the morning to get the brain ticking and greet old friends.

The Cape stations are also heard early morning which are really becoming like DX contacts these days.

Of course another area to consider is the AWA CW Activity coming up in February. If you want to get yourself ready for this one, then you better get the keys out now and start practicing.

It used to be held over a 24 hour period, but due to band conditions and very little activity, it was reduced to a couple of hours on the first Sunday of February running from 15:00 SAST in the afternoon.

Contacts on any bands are valid, but please make sure you stay within the frequencies as stipulated in the Contest Blue Book, available on the SARL website..

There are still a fair number of keen CW operators around on the local bands and very often putting out a CQ call will bring back some kind of result. The thing is that if we occupy the bands more often, then we will get more people coming up on frequency and I am convinced there is still a lot of fun to be had playing around on CW.

Over the past year I have managed to get my speed up to a round 17 wpm, with the help of some of those remaining few who listen on the bands.

20wpm seems like such a long way to go and when I start to send at that speed, very quickly find myself getting "finger tied". The brain just cant go fast enough yet and so I lose touch of where I am.

Its like having a high speed speech impediment.

Come join us on Frequency.

Vibroplex Bug

SSB activity:

The bands continue to be troubled by poor conditions mostly affecting Div 1.

Richard did a trial run of relaying the 40m net on to 20m and it was heard with good reports from the Western Cape.

This seems like a good option again to get things going to our friends down there who have become more and more difficult to hear in Div6. Between Richard and myself (Andy) we should be able to get the 20m relay back up and running and be able to share the Saturday morning net with Div1 again.

I have some work that needs to be done on my tower before I can contribute to this relay again, but hopefully that won't take too long.

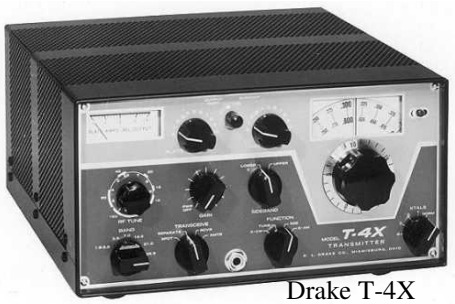
Contributions to the Saturday morning net are still good and Div5 still are tops as far as conditions are concerned. The furthest South we get so far is Om Chris down in Griekwastad, who still gets in with a good report.

On the odd occasion, Om Ken ZS2OC does manage to get in, but conditions seem to fade pretty fast down to the Eastern Cape. Ken is also plagued by a lot of local QRN, which doesn't make life any easier.

For the majority of callers, the old boat anchors still seem to be in the lead with FT101's taking the lead. Of course there are still a good few Collins KWM2-A's to be heard and then FT102's and of course the Hallicrafters HT37 of Chris ZS3B, a set of Yaesu twins and the odd Kenwood make up the rest.

This is why we like to hear what rig you are using when you call in on the net, it helps to get the statistics up.

Looking forward to hearing many more on the Saturday net.



Drake T-4X

AM:

The Wednesday evening AM nets have really not been that good with the thunderstorms that we have been experiencing across the country.

There has been the odd occasion when conditions have been great, but if you're not listening out, you will miss it, as I found out.

One Wednesday evening I listened on 80m only to decide that the QRN was way too high and that I would not be able to hear anyone,, only to find the next say when Rad called me on LL that he and Dennis had a good time that same evening with conditions being pretty good,

I wondered if they had worked the same band that I listened to ?

Saturday mornings are still good with conditions being fairly stable for local stations but not so good for the further stations unless they start early.

Barney ZS6BLL and Denis ZR6DNS, both running FT101 at about 20-25 watt output, still have great signals on the band, so big output power is really not that necessary to be heard on the band.

One often has the impression that you need to be able to put out a large amount of power to be heard, but remember that 25w output power on AM is equal to about 100w effective power fully modulated.

Of course with the regulars who call in on Saturday morning, sometimes up to 7 stations, playing MF's takes up quite a bit of the time allotted to the net.

Do come along and join us on one of the times for the AM net. Anyone is welcome to join in just for the fun of it.

Some of the rigs used, FT101's, Collins 32V, Johnson Viking Ranger, Viking Valiant, HT40, FT902 and whatever else is available.

Geloso G212

About vacuum power tubes.

By Matt Erickson KK5DR

The info I am putting forth here comes from engineers at CPI/EIMAC, Rockwell/Collins, and my years of experience with RF power tubes. The data I am publishing here, is supported in the technical article **"Care and feeding of power grid tubes"**.

Fact: There is no such thing as a perfectly sealed vacuum tube. All tubes leak.

Fact: Over time, molecules of air pass through these "imperfect" seals, contaminating the inside of the tube.

Fact: A tube that sits on the shelf collects a relatively large amount of air inside over time.

Fact: The longer the tube sits inactive, the more air is accumulated.

Fact: The larger the tube, the greater the leakage.

Fact: The high level of vacuum, and removal of contaminant molecules is maintained by something known as the, "getter", which is usually a form of "rare earth minerals", that absorb the air, when heated by the filament in the tube.

Fact: Over-heating of tube seals, can compromise the seal, and cause rapid tube failure. Tube seals can also be damaged by high current start-up in-rush, which can crack seals by mechanical stress.

Fact: There is no such thing as, "too much cooling air flow" over the tube. Too little cooling air can be a big problem, and lead to seal over-heating.

Fact: Broadcast radio/TV stations keep all their final amp tubes running with filament current, at all times, for two reasons.

1. To keep the tube ready for instant use, should the other tube fail.
2. To keep internal contamination to a minimum.

It would be impractical for amateur radio stations to keep our tubes on at all times, an alternative is to "rotate" the final amp tubes on an annual basis.

Many hams have a "spare set" of tubes. I have heard of several cases where a ham had a spare set of tubes stored "safely" away in the closet for years. One day, they decide to place the spares into operation in his aging amp. Little does he know that over the years these tubes sat in the closet, molecules of air have been sneaking into the tube, gathering in a "pile" near the bottom of the tube, which is usually the negative cathode. The ham puts the tubes into the amp, turns it on, and begins to tune up as normal, suddenly, BANG!, the tubes flash-over internally and "self-destruct".

Here is what happened inside, the "pile" of air inside the tube, was ignited into a "plasma" (a super hot ionized gas) by the combination of high voltage, heat, and the igniter RF, the plasma is negatively charged, which then travels toward the positively charged anode of the tube. Most of the time, between the anode and cathode, lays the delicate grid, which has a large hole burned through it by the traveling plasma cloud, which is extremely hot (up to 30k degrees). This rarely happens to small receiver tubes, but it is not completely unknown. I have had a number of 12BY7A RF driver tubes that over time became "gassy". The lower plate voltages in these tubes, was not enough to "ignite" the gas, but strange behavior of the tube made its replacement necessary. A good indication that a tube has become "gassy" is a "blue/purple" color near the top of the tube, or around the plate. A tube that is free of contaminant gas has no color, aside of the filament glow.

Solution: Keep your tubes "de-gas-ed", by "rotating" the "spares" with the regular tubes. A good rule of

thumb; is to swap out the tubes annually, while removing dust, lubing the fan, etc. This may not be the "best" way, but likely the most practical one.

You may ask, "how long should I allow the tube to burn-in, prior to operation?" On a tube that has an unknown amount of shelf time, 10-12 hrs would do well. For a tube that has been in your closest for known amount of time, I have developed a rule; 2 hrs per year of shelf-time. When you "rotate" your tubes, allow them 2 hrs of burn-in time prior to applying RF drive. With a new tube fresh from the factory, 6-8 hrs for large glass envelope tubes, 2-6 hrs for metal/ceramic tubes, burn-in time. A little patience, and conservative use, your tubes should see full life.

Another reason to "burn-in" a new tube is that it will finish the vacuum, removing the last remaining gasses and brings the filament/cathode up to full electron emission.

Other contaminations
There is another source of internal tube contamination other than the outside atmosphere. When a vacuum tube is driven by excessive RF levels, particles of oxide and metal gases are released into the tube. These metal gases and oxides can cause atmosphere contamination of the tube, which can lead to HV "flash-over" inside the tube. When a flash-over happens it can cause extreme levels of current to flow which cause further damage to grids, cathode, and tube seals, which then causes further flash-over, you can see where this is going. A tube that has had a history of flash-over can be opened and inspected, metallic powder and or tiny bits of gold or oxide coating will likely be found.

This is just one more reason NOT to over drive your tube(s).

Filament voltage?
EIMAC states that; " A 3% increase in filament voltage above the maximum rating will result in a 50% decrease in tube life." For example: a filament with a max rating of 5.00Vac, increased to 5.15Vac (3% above max) can expect a 50% decrease in life span. However, decreasing the filament voltage to a low level can cause a radical drop in electron emissions. Check your filament voltage at the tube socket, using a VOM that reads "True RMS". If the voltage is to high (many times it is), and your amp has a separate filament transformer, install an adjustable power resistor in the transformer primary, and carefully adjust the secondary voltage till it is with-in the specified range, preferable slightly lower. If your amp uses an "all-in-one" power transformer, you can use a length of small wire to lower the filament voltage, but this will take a great deal of "trial & error" to find the right size and length or wire.

Plate voltage?
Exceeding the manufacturers maximum plate/anode voltage can lead to an HV flashover, and possibly destruction of the tube and or damage to the PSU or other parts.

A good rule of thumb; is to not exceed the maximum voltage by more than a 2% margin. Meaning that if your tube has a max plate voltage rating of 3000vdc, the max safe voltage would be 3060vdc. So, if you are using 3200vdc, you are taking a gamble. The key would be to closely match the plate voltage to the tube in use. For maximum gain, and best safety margin. This rule is most important when installing a new tube, which has a large gain level when compared to the old weak tube. Also, the new tube may have a high level of gas remaining in it, and operating the tube over its max plate voltage rating may well push it "over the edge".

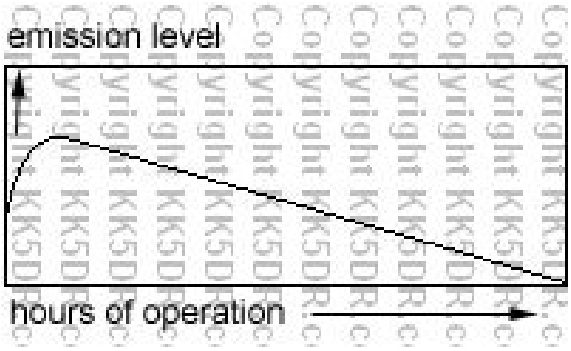
A tube operating at maximum plate voltage, will reach its maximum RF gain level, and max power output level too. Anything over that max level becomes wasteful, dangerous, and sometimes unstable. Sure, it looks great on the watt meter, but it might come at a high price.

Emission
Every vacuum tube has an element that is known as the electron emission source usually it is either an oxide coating as in indirectly heated cathode tubes, or a treated filament as in directly heated cathodes. When the element is heated, either directly or indirectly, it emits "extra" electrons that are driven by the electromotive force & current flow within the tube, to the anode, this is how a tube amplifies. This process is continuous, as long as the tube heater/filament is active, electrons flow, even when the tube is in standby/cut-

off mode. The supply of electrons is NOT endless, every tube that is active, is on the way to the end of its life span. However, turning the tube "off" and "on" a number times unnecessarily would cause more damage than to leave the tube on for a few hours between uses. Thermal cycling is more harmful than continuous operation, but a balance of the two should be had.

For example; If you use you amplifier for a morning schedule, and then again for a noon sked, it would be better to leave the unit on and in standby mode during the interim time. If you operate several times during the day with your amp, it is far better to leave the amp on all day than to turn it on and off several times each day. This minimizes the thermal cycling of the filament/heater elements. Thermal-cycling is far more damaging then loss of emission levels.

Emission levels remain nearly constant all the way from new tube, to 10,000 hrs or more of continuous filament operation. When a tube is brand new its emission will be lower than after it has been in operation for a few dozen or more hours. This interval in known as the "burn-in" time, where-in the tubes vacuum is "finished" by the heat applied to the "getter", also the emission element is coming up to full electron flow during this time. After a few hundred hours the tube emission will reach a peak, after this the tube will have a very long slow glide to the end of its life span which is the point where the emission falls too low to be usable, or the filament/heater fails. Usually the end of the tube life is somewhere between 12,000 and 24,000 hours of filament/heater on-time. By amateur radio usage standards this is a very, very long time. I would not worry too much about your tubes failing in this mode, 90% of all tubes used in ham radio fail due to chronic over-drive conditions, which damages the oxide coatings of indirectly heated tubes, and or the grid structures of directly heated filaments. This is NOT my opinion alone, but info shared with me by the engineers at EIMAC. They have seen it far too many times, for too many years for it to be an accident.



Above is a graphic representing the emission level verses hours, of a typical power tube. The graph is not to scale, the hours side is 12K hours.

Keep the thermal cycles of the tube to a minimum, and RF drive levels to the proper settings as prescribed by the amplifier manufacturer.

Keep your tune-up times down, and extend the life of your tubes.
To read much, much more about RF power tubes, stop by the EIMAC web site, and read the technical article titled **"Care and feeding of power grid tubes."** Mind you, this booklet is fairly technical and might be above the level of the average ham today, but it is very informative. Please download the PDF, you will learn much more than I can go into here.

How does a vacuum tube amplify RF power?
The EIMAC booklet goes into much greater detail, but here is a quick and dirty explanation. The cathode surface emits free electrons, which are propelled by the flow of DC current and RF, driven by the RF voltage and DC voltage combined. These free electrons account for a greater number of electrons arriving at the plate than are accounted for by the DC current alone. Thus we have amplification of any signal, audio or RF, that is imposed on the DC current stream.

Tube conditioning:
New tubes should be carefully "burned-in", some will have "flash-over" problems in the very beginning of

their life due to residual gases and metal vapors remaining inside the tube. I have found that this process can take some time, and RF drive should be very carefully applied to the tube during this time. If plate current levels become unstable, the RF drive and or the plate voltage should be reduced. Sometimes the process of "conditioning" the tube could take all day (8-24 hrs). During the process, the tube is run with heater/filament only (no RF drive) for at least the first 4 hrs of operation. Then, a small amount of RF drive is applied, if abnormal operation is noticed, the drive should be removed and the tube should be "burned-in" for a few more hours. Gradually, during the conditioning period the RF drive signal is increased, operating conditions are closely monitored during this time. When full power out is reached, and normal operating conditions are observed, the tube can be considered fully "conditioned" and ready for regular use in the amp.

Used tubes that have been sitting in storage for a number of years should be treated in the same way, but the time of "burn-in" is shorter since the tube has already been conditioned when it was new. The main reason for repeating this process is to "burn-off" any contaminating gases that have reached the inside of the tube. The general "rule of thumb" for the number of hours of conditioning required for a used tube is simple. If the number of years is known that the tube was out of service, add one hour of burn-in for each year. If the number of years is unknown, use 4 hours to begin with, if the tube does not behave well after this, repeat the burn-in period.

More difficult cases of HV flash-over can require that the HV be removed from the tube for a number of hours until residual gases are absorbed. A tube that refuses to settle down after more than 24 hours of conditioning may be beyond help. If they do not settle after 48 hours of burn-in, they should be removed and discarded.

Remember; have a spare tube on the self, and swap them out every year. The set will likely out last you, even with daily use.

End of useable life:
Every tube will have an "end of life" point. Directly heated cathode tubes usually drop off emission until they are no longer usable. Some say that the tube has gone "soft" at this point. When the filament opens is an obvious sign, but this can happen at nearly any time during its life span.

Indirectly heated cathode tubes end their lives a little more abruptly with a sustained HV flashover that damages the grids and or cathode surface to the point where the tube is no longer stable at any voltage or drive level, or the heater opens. Emission will have dropped off a great deal by this point. The cause for the HV flash-over is usually barium contamination of the atmosphere in the tube making the vacuum conductive at all plate voltage levels. The oxide coating of the cathode will have been reduced to the point where areas will super-heat, causing ionization and then HV flash-over and or sparking to the plate. This is not a reversible condition and indicates end-of-life for the tube. The HV arc in this condition can cause enough magnetic field that the heater can be distorted to the point which it opens under such mechanical stress. Either way, it is end of the line for the tube.

With careful attention to these details, you can get a full life span from your tubes.

President's Corner
by Richard ZS6TF

The new year approaches.

May I wish all of the AWA membership and your families a happy festive season and a re-charging of energy to tackle the challenges of 2014. One of the challenges for me is to support Ted and the rest of the team in making the antique wireless scene more interesting by trawling radio history for gems to recount. Prefacing the 1944 ARRL handbook , the 21st edition, is a paragraph which reminds us things were a lot worse then.

"Amateur radio is silent now — its keys stilled, its microphones lifeless, dust gathering in scores of thousands of radio shacks, their operators off to war. Amateur radio is silent now — but it is not dead. The radio hams of yesterday are working towards a different purpose, but fundamentally their work now is much the same as their hobby was before. And underlying their thoughts as they give their best in the uniformed services or in industry or in research is the hopeful assurance that one day they will be back on the air as amateurs again"

It is hard to imagine today a world where all amateur radio activity was forbidden and it should make us thankful for the freedom on the air that we enjoy today.

Our new President Ted Hart will preside over an association of which we can all feel proud as it is a rolling stone gathering heritage and momentum as it goes, the repair and re-commissioning of radios of yesteryear being at an all-time high.

Ted was born 1940 in Mayfair Johannesburg where he stayed until his parents moved to Bloemfontein when aged 11.His father was a miner turned builder and Ted acquired a number of practical construction skills at an early age. Following his schooling at Grey College, and at Kingswood college in Grahamstown, he did 5 years articles in Bloemfontein whilst studying for his legal degree the hard way at nights with UOFS. At 22 years he was admitted as an Attorney and Conveyancer and became a married man.

Most of his life he has practiced as an Attorney, except for three years as secretary of a Public Company, and a further three years as CEO of a large Medical Benefit Society. He returned to legal Practice in 1984 and is now semi- retired, with XYL Pat, 5 children and 11 grandchildren.

He played hockey until almost forty, and then started golfing which he still enjoys. He was a founder member of the Lions club of Klerksdorp and served the community for 31 years as a Lion, with several years as President.

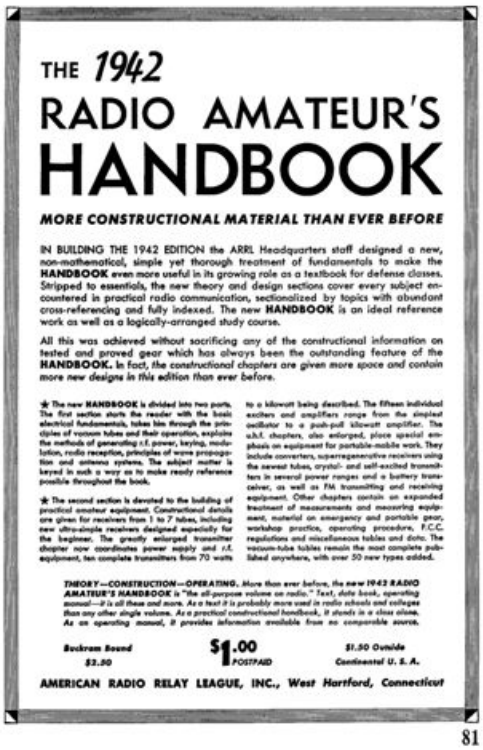
His interest in radio started with CB and he obtained his amateur license in 1982 and through the pleasure he derives from operating has made many good friends on the air. The AWA has been a natural extension of this and he is not scared to get his hands into the bowels of an AM rig in search of a better signal.

Unlike the hams of 1944, 70 years later we can look forward to a forthcoming year of rewarding activity with the Antique Wireless Association.

(From the Editor:

Thanks to Richard for the many interesting articles he has provided over the last 2 years. It took a bit of coaxing, as I usually did with the Presidents, to get him going, but thereafter he provided us with some real gems. All the best in your new portfolio Richard from all of us in the AWA.

Thank you for the interest and enthusiasm you took on the post of President with and we look forward to many more articles from you.)


THE 1942
RADIO AMATEUR'S
HANDBOOK

MORE CONSTRUCTIONAL MATERIAL THAN EVER BEFORE

IN BUILDING THE 1942 EDITION the ARRL Headquarters staff designed a new, non-mathematical, simple yet thorough treatment of fundamentals to make the HANDBOOK even more useful in its growing role as a textbook for defense classes. Stripped to essentials, the new theory and design sections cover every subject encountered in practical radio communication, sectionalized by topics with abundant cross-referencing and fully indexed. The new HANDBOOK is an ideal reference work as well as a logically-arranged study course.

All this was achieved without sacrificing any of the constructional information on tested and proved gear which has always been the outstanding feature of the HANDBOOK. In fact, the constructional chapters are given more space and contain more new designs in this edition than ever before.

★ The new HANDBOOK is divided into two parts. The first section starts the reader with the basic electrical fundamentals, takes him through the principles of vacuum tubes and their operation, explains the methods of generating r.f. power, keying, modulation, radio reception, principles of wave propagation and antenna systems. The subject matter is keyed in such a way as to make ready reference possible throughout the book.

★ The second section is devoted to the building of practical amateur equipment. Constructional details are given for receivers from 1 to 7 tubes, including new ultra-simple receivers designed especially for the beginner. The greatly enlarged transmitter chapter now coordinates power supply and r.f. equipment, ten complete transmitters from 70 watts to a kilowatt being described. The fifteen individual exciters and amplifiers range from the simplest oscillator to a push-pull kilowatt amplifier. The u.h.f. chapters, also enlarged, place special emphasis on equipment for portable-mobile work. They include converters, superregenerative receivers using the newest tubes, crystal- and self-excited transmitters in several power ranges and a battery transceiver, as well as FM transmitting and receiving equipment. Other chapters contain an expanded treatment of measurements and measuring equipment, material on emergency and portable gear, workshop practice, operating procedure, F.C.C. regulations and miscellaneous tables and data. The vacuum-tube tables remain the most complete published anywhere, with over 50 new types added.

THEORY—CONSTRUCTION—OPERATING. More than ever before, the new 1942 RADIO AMATEUR'S HANDBOOK is "the all-purpose volume on radio." Text, data book, operating manual—it is all these and more. As a text it is probably more used in radio schools and colleges than any other single volume. As a practical constructional handbook, it stands in a class alone. As an operating manual, it provides information available from no comparable source.

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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:

Net Times and Frequencies:

Saturday 06:00—AM Net—3615
Saturday 07:00—Western Cape SSB Net—7080
Saturday 08:30— National SSB Net— 7140; relayed on 14140
Saturday 14:00— CW Net—7020
Wednesday 19:00— AM Net—3615, band conditions permitting.

AWA CW Activity Day:

Date : Sunday 02 February

Time : 15:00 SAST to 19:00 SAST

Frequencies: 20m—14,000 to 14,060 ; 40m—7,000 to 7,040; 80m—3,510 to 3,560.

Exchange : RST + grid square locator

Categories:
a) Single Operator All Band, Low Power (maximum 100 W)
b) Single operator All Band, QRP (Maximum 5 W)
c) Single Operator Single Band, Low Power (maximum 100 W)
d) Single operator Single band, QRP (maximum 5 W)

Scoring: 1point for each contact, 2 points for QRP.

Certificates will be awarded to the highest scores.