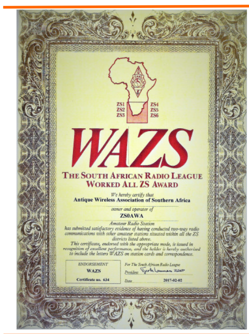
Newsletter

137

December 2017

A Member of the SARL



Inside this issue:

AWA Committee:

* Outgoing President—Jacques ZS6JPS
* Incoming President and Western Cape—John ZS1WJ
* Incoming VP—Renato ZS6REN
* Technical Advisor—Rad ZS6RAD
* Secretary/PRO—Andy ZS6ADY
* KZN—Don ZS5DR
* Incoming Historian—Oliver ZS6OG
* Outgoing Member—Ted ZS6TED

Reflections:

So it is that another year slowly draws to a close as we all look forward to something new and exciting in the New Year.

It may be a new old stock valve rig. It may be a brand new all singing and dancing fully automatic coffee making fully synthesised jam packed all band, all mode, all frequency rig.

But whatever it is that's coming your way, its bound to get the heart racing and the blood pumping, even if it is from a 700v finger in the wrong place. Something that wont happen with the all singing and dancing model of course.

As in any activity, there are always those bound to be ever the optimistic type person and there will of course be those who can find nothing to be happy about.

But the old song says "Tis the season to be jolly, fa la ..", so jolly we shall be and forget about our complaints until we are well and truly entrenched in the New Year.

This last year has certainly proved to be an interesting and at times a trying one, but as all things go, it is finally coming to an end.

As far as the AWA goes, we have certainly had a good year, with many new additions to the membership, but also sadly some losses. Please remember that at any stage should you change your email address or move to another country or whatever that takes you away, let us know so that we can keep our files updated. There have been quite a few this year who have changed email address and have not let us know, so now we have to remove them from our mailing list because of returned emails.

The New year will also see John, ZS1WJ taking office as our incoming President and I would think it fit of me on behalf of all the committee and members, to thank Jacques ZS6JPS, for his input and interest that he has shown over the last 2 years. It has been great working with Jacques and I am sure there will still be plenty of activity from him as he now takes his allotted place on the committee for another 2 year stint.

Lastly, on behalf of all of the committee, to you, all of our members, have a wonderful holiday season, take good care if you are driving anywhere, take your rig on holiday with you and have a blessed time. We look forward to better band conditions and comms in the New Year.

Best 73

DE Andy ZS6ADY

WIKIPEDIA

Amateur radio Demonstrating a proficiency in Morse code was for many years a requirement to obtain an amateur license to transmit on frequencies below 30 MHz. Following changes in international regulations in 2003, countries are no longer required to demand proficiency. The United States Federal Communications Commission, for example, phased out this requirement for all license classes on 23 February 2007.[17][18]

Modern personal computers have encouraged the use of digital modes such as radioteletype (RTTY) which previously required cumbersome mechanical equipment. Hams led the development of packet radio in the 1970s, which has employed protocols such as AX.25 and TCP/IP. Specialized digital modes such as PSK31 allow real-time, low-power communications on the shortwave bands. EchoLink using Voice over IP technology has enabled amateurs to communicate through local Internet-connected repeaters and radio nodes, while IRLP has allowed the linking of repeaters to provide greater coverage area. Automatic link establishment (ALE) has enabled continuous amateur radio networks to operate on the high frequency bands with global coverage. Other modes, such as FSK441 using software such as WSJT, are used for weak signal modes including meteor scatter and moonbounce communications.

What is my SWR meter trying to tell me? Part II

By John Fielding ZS5JF

In the first part we covered resistance and reactance in a complex circuit as well as how the impedance is determined. In this part we will cover transmitters and what they need to deliver maximum power into a complex load such as an antenna.

Transmitter Parameters

There appears to be a misunderstanding of what a transmitter output impedance looks like. An analogy is a high power audio amplifier. We use low impedance loudspeakers connected to an audio amplifier. The audio amplifier output impedance is however nothing like the loudspeaker impedance. If the loudspeaker load is 4Ω the audio amplifier is generally very low Z. If the amplifier Z where the same as the load then 50% of the power would be dissipated in the amplifier and 50% in the load. Clearly this isn't the case as the amplifier needs to drive high current into the load. The same applies to transmitters.

If the power dissipated in the transmitter is the same as the load then the maximum efficient possible is only 50%. We know from Class C amplifiers that an efficiency of around 75% to 80% is possible so therefore the output Z must be much less than the load Z.

Manufacturers give the required load impedance the transmitter needs to be presented with to deliver maximum power into the load. For the older valve transmitters using the Pi output network we have some available impedance matching we can adjust to obtain maximum power transfer. These are the anode tune and load capacitors, by adjusting these we can obtain a good transfer of power if the SWR is not too high. In many cases these valve transmitters would normally cater for a load impedance of about 25Ω to 150Ω, a SWR of 2:1 to 3:1. Some manufacturers get this wrong, the Kenwood TS-830 instruction manual states that the "*Transmitter output impedance is 50Ω to 75Ω"*. It isn't, but it will load into an antenna of this value.

Modern solid-state transmitters do not have the luxury of adjustable tuning capacitors; they are fixed tuned and must be presented with an impedance of 50Ω to deliver maximum power output. To correct this failing it is necessary to utilise some additional matching network, often called an ATU, to add or subtract reactance to obtain a good match to the antenna. What the ATU does is change the load impedance presented to the transmitter to correctly match the feedline impedance so the SWR presented to the transmitter is correct.

The band where this is most noticeable is 80m as this has the widest percentage coverage. If a half wave dipole antenna is used cut for 3.5MHz then when we wish to operate at 3.8MHz the antenna is now far too long and it presents a high inductive reactance, making the SWR high. To change this the ATU needs to add some capacitive reactance to cancel the inductive reactance present.

We could do this by climbing up to the antenna and fitting a suitable capacitor at the feed point, but this is often not practical. An alternative method is to connect the *correcting components* at the transmitter end of the coax cable, where it is close to the operator for adjustments to be made. But now a problem arises.

The coax cable between the transmitter output and the antenna can be a significant length in wavelength at the operating frequency. If the coax cable happens to be exactly a quarter wave at the operating frequency it flips the reactance to the opposite type. Now instead of needing, say, a capacitor at the antenna we find that we need an inductor with a different numerical reactance value to correct the mismatch. The same applies to the resistance portion of the complex impedance. If the antenna resistive portion is 100Ω at the antenna then at the transmitter end of the coax it is now different, because of the inversion taking place in the quarter wave coax. It is now a very low value, perhaps as low as 3Ω.

However, with a good ATU this is not a problem. The ATU is situated at the operating position and it is simple to twiddle a couple of knobs until the correct match occurs.

If the coax length is not a quarter wave but a half wave then the reactance and resistance is not changed from that occurring at the antenna feed point, and by adjusting the ATU a good match can be obtained. However, even if the coax is an exact quarter wave or a half wave at one spot frequency it won't be as we move about the band, everything changes as the electrical length of the coax changes!

To give you some idea of what an antenna appears to look like at the end of the coax I measured my end fed wire antenna with a Vector Network Analyser (VNA) which is a professional type of Antenna Analyser. This end fed wire antenna was cut to be a true full wavelength at 7.1MHz and it presents very high impedance at the bottom of the wire. Electrically it is a 1/4 wavelength long on 160m, so it is a low Z feed on that band. On 80m it is a half wavelength long and on 30m it is 3/2 wavelengths. On 20m it is 2 wavelengths long. On all the bands except 160m it is a high Z feed point at the bottom feed point.

However, I used a sneaky trick to convert the high Z feeds to a low Z by inserting a length of 50Ω coax as an impedance converter between the bottom end of the wire and the ATU. The VNA plot is shown in Figure 4 with the R and X values at mid band for 80m, 40m, 30m and 20m at the ATU.

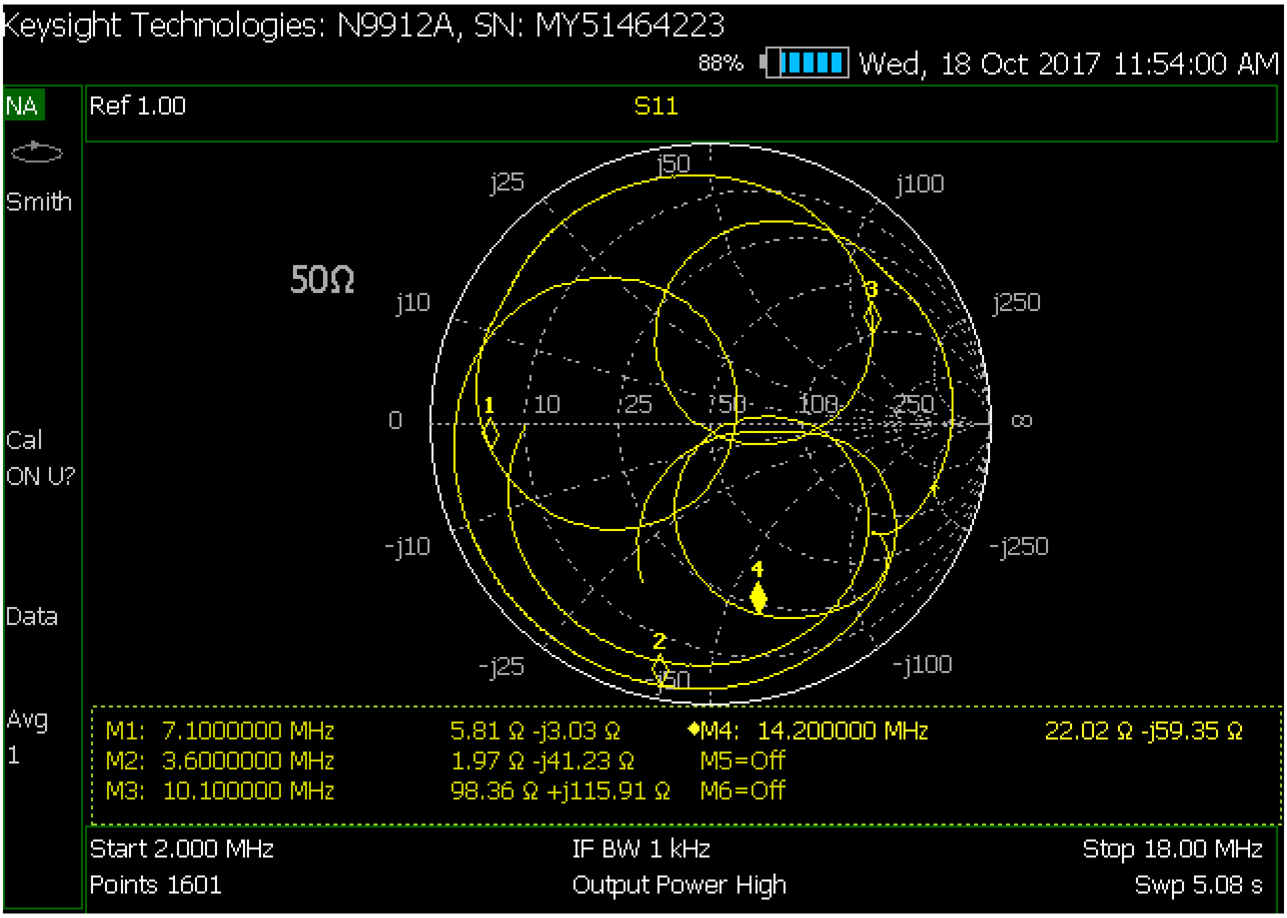


Figure 4 Feed point Z of end fed wire antenna

Unfortunately the VNA doesn't go below 2MHz so we plotted from 2MHz to 18MHz to obtain the results. At 3.6MHz the R and X are 1.97Ω and –j41.3Ω. This is a Z of 41.2Ω and a SWR of 1.21:1.

On 40m the R and X are 5.81 –j3.03 (Z = 6.55Ω), on 30m R and X are 98.36 +115.9 (Z = 152Ω) and on 20m R and X are 22 –j59.35 (Z = 63.3Ω). All of these are simple to match to 50Ω with a good ATU.

You will observe the multiple loops on the plot, which is how a multiple wavelength end fed wire antenna behaves. The quadrants of the plot cover plus and minus j values as well as the R values from 0 to infinity.

The ATU component values are shown in Figure 5. Each band was treated separately and the values calculated for a 50Ω match to the transmitter. The additional 75pf capacitor across the 330pf capacitor was needed to increase the total value because the variable capacitor was too low in value for some bands. This capacitor on 30m experiences a high RF voltage and needs to be a wide spaced type. On all the other bands a broadcast variable would be suitable for a 100W transmitter for C1 and C2.

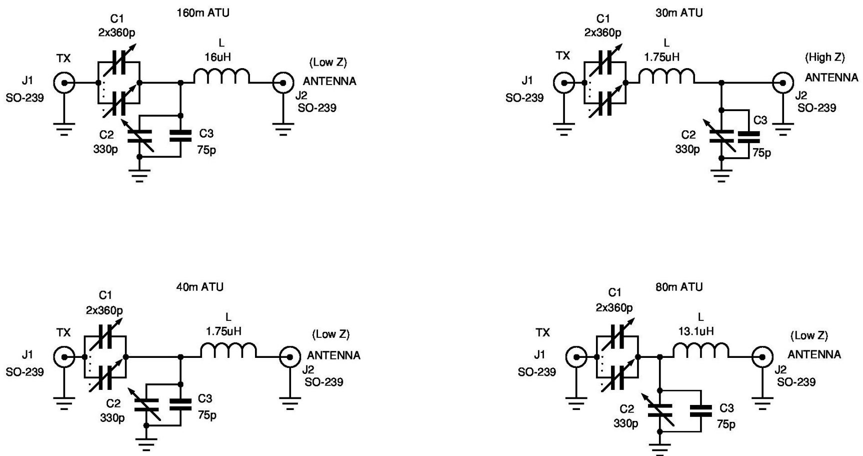


Figure 5 ATU component values for 160 to 30m ATU

Figure 6 shows the bands combined into a single ATU with the necessary band switching.

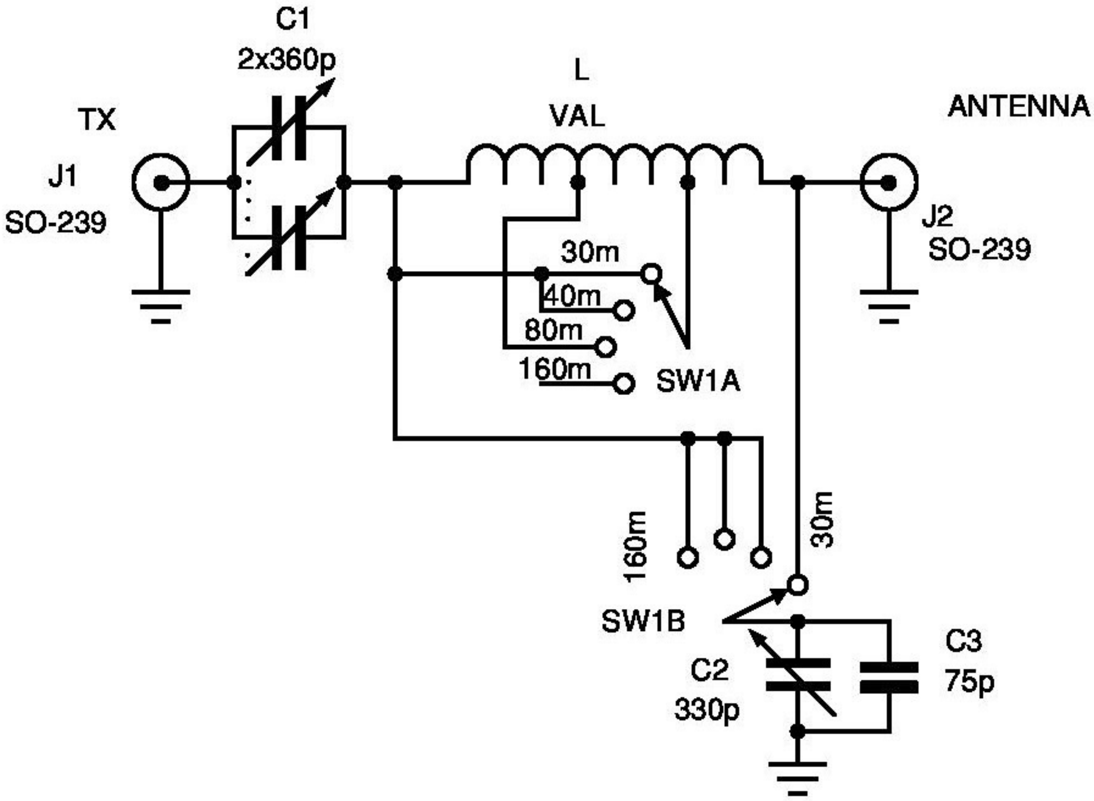
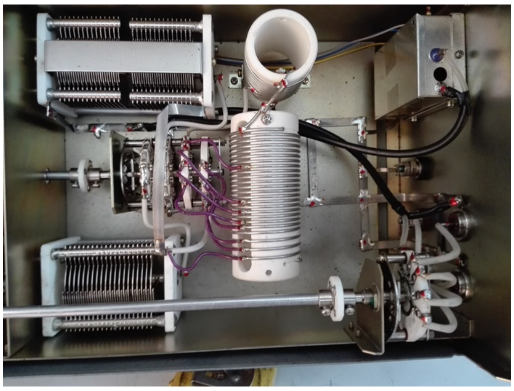


Figure 6 Four band ATU

The band change switch SW1 is a ceramic wafer switch with 4-poles. For a 100W transmitter a normal small switch will suffice. For higher power a larger switch with beefy contacts will be required.

The inductor was wound on a 50mm diameter former with one wire diameter spacing between turns using 1.5mm tinned copper wire. A piece of thick wall plastic tube was used. A helical thread of 8 turns per inch was machined to hold the wire in place. The total turns required is 22 with taps at 6 turns for 40m/30m, 11 turns for 80m and all 22 turns for 160m. Connections between the inductor, capacitors and switch were made with 1.5mm tinned copper wire with short lengths to reduce the stray inductance.

In Part 3 we will look at dipole antennas and quarter wave vertical antennas.



Inside of a typical Manual Antenna Tuner.

This one an FC902, complements of Tom ZS6OMT.

AWASA 2017 AGM
18 November

For the third time running, the venue for the AGM was at the South African Institute of Electrical engineers. What a splendid venue it is too, and to top it all it was a bright sunny day, perfect for a flea market.

The morning kicked off with Rad ZS6RAD doing his usual stint at the helm of the SSB net using the SAIEE station. Not too many calls, but conditions were quite noisy too.

There was the usual hustle and bustle behind Rad as people started to arrive to take walk about in the Museum, which is looking stunning by the way, Oliver has certainly been putting a lot of work in with the SAIEE boys and the displays really look great.

Slowly but surely more and more arrived and it had all the makings of being a good AGM.

Oliver soon dragged everyone off on a tour of the Library with all the old books that have been placed with tender care into the racks there. One that caught my eye was published in 1921. The

care and expertise that has been put in to making all these display available is amazing.

At 10 o clock, all journeyed to the auditorium and in to the main room where the AGM was to be held and soon things got under way.

Jacques welcomed all to the AGM and a special word of greeting to the President elect John ZS1WJ who travelled up from Cape Town to be with us. Many came from far and wide and it really turned out to be a very successful AGM. One of the best attended so far.

With all the nitty gritty at an end and the introduction of a re-elected committee, a newly elected President and Vice president, it was time to go outside and enjoy the spoils of the day. Flea market and a braai, what more could one ask for.

If you want to know what happened in the meeting, check out the AGM minutes on the website www.awasa.org.za

Jacques ZS6JPS—outgoing President

John ZS1 WJ –Incoming President

New VP Renato ZS6REN

By their own admission" a bunch of repro-bates

The Happy Guys

The Sad Guys

New Historian Oliver ZS6OG

CW Recipient

Reconditioning Transmitting Valves
from the web pages of Frits, PA0FRI

A project by Renato Bordin ZS6REN and Henry Stephan ZS6MC.

I could have simply given everyone a link to Frits's web pages but turns out that many of us have no internet access and Henry would like to share his passion on the subject. The idea behind this project, since we may have problems trying to test transmitting valves on a regular valve tester, is to identify:

- Valves with poor emission or "soft" valves.
- Also by trying to test an "Unknown" valve in your transmitter, could damage your transmitter, especially if short circuits exist within a valve due to previous mishandling.
- Match valves for linear amplifiers featuring multiple output valves and
- Recondition valves that have not seen use for many years including new old stock valves. This is done by running the valve with only the heaters on for a period of at least 12 hours.

Frit's writes that it's wise to prepare a valve for use in transmitters by optimising cathode emission or risk flashover and permanently damaging the valve. This project is all about the power supplies needed to run matching tests or emission tests on a number of different valves. **See Fig 1**.

To achieve this, we need two power supplies, a 6.3V AC filament supply and a variable Dc supply. The filament transformer I used for this project is a little underrated hence the use of a Variac to tweak the filament voltage to 6.3V. The use of a Variac is not necessary if used with a transformer delivering the right amount of current or if used with a Dc regulated power supply on filament duty.

The anode supply used is designed around a TL783C voltage regulator. This TO220 package device can deliver 700mA from a little over 1 volt to 125V, perfect for our application and requiring very few supporting components. If you are familiar with a LM7812 or 7805 regulator, then you have understood how easy it is to use this device.

The valve under test has the anode and grids tied together in diode mode connected to the variable Dc supplies positive terminal and the negative tied to the cathode. The first test, is to run the filament without any voltage on the anode for the recommended one hour to get the electrons moving and all excited on the cathode.

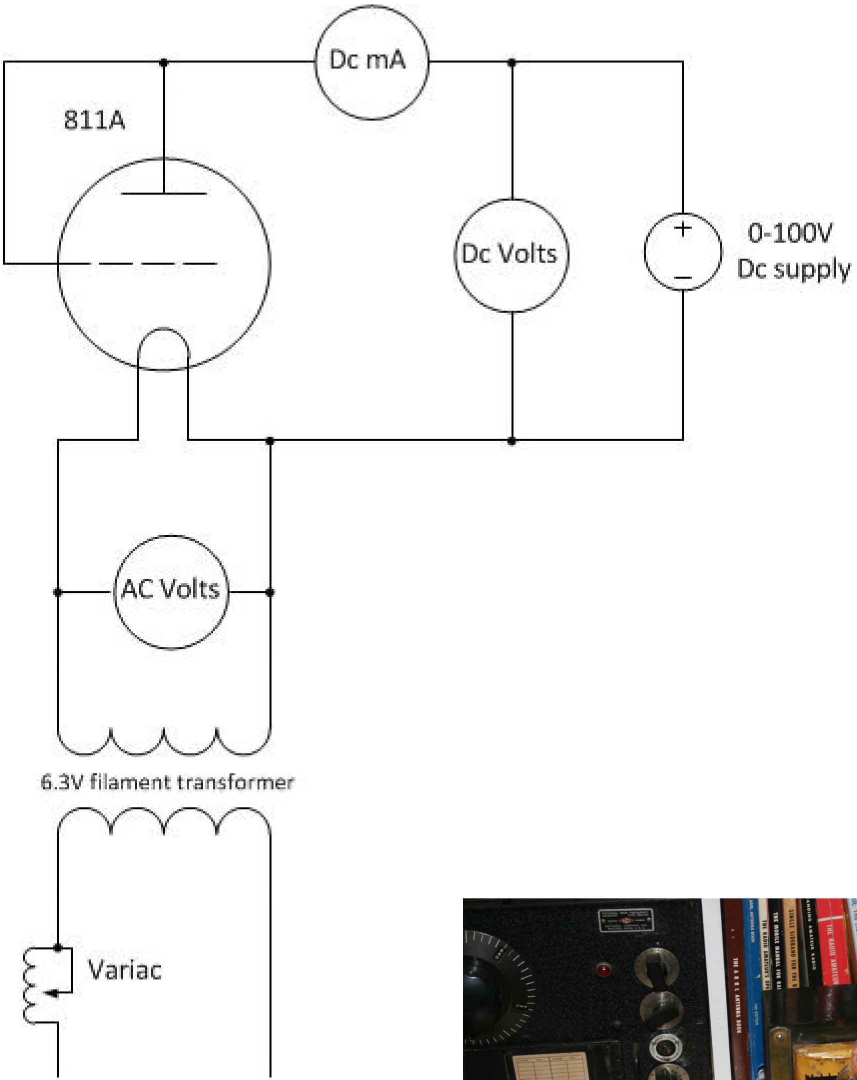
Next, we increase the Dc supply and closely watch the voltage and current drawn by the valve. We used two digital multimeters on the prototype for this task. Increase the voltage until the maximum specified current for the valve under test is flowing through the valve. For an 811A this will be 175mA and the voltage should be around 35V.

When selecting matching valves, document the results from all the valves under test and select all valves with equal voltage that is sourcing 175mA. The following table list some popular valves and expected measurements.

Valve	**Current**	**Voltage**	**Nominal V**
811A	175mA	34-35.6V	35V
572B	250mA	40-50V	44V
6LQ6	300mA	10-14V	11V
PL519	500mA	12-15V	13V
4CX1000	1A	22V	22V
3-500Z	400mA	35-45V	35V

The lower the voltage at the designated current, the better the emission of the valve, and therefore the better the quality of the valve.

Figure 1



Testing An 811A Valve

The complete setup.

Rescuing Rack Mounted Amalgamated Wireless Australia RCR-1 Receiver

Just a few West Rand Flea markets back the AWA had some free give a-ways. They consisted of rack mount receiver front ends with four centre driven tuning capacitors.

The similarity to the HRO set-up could not be overlooked.

I was tempted to collect one as a source of parts but resisted the urge. I visited Fanie ZS6NJ to take a look at his 4 square 80 antenna and was impressed by the scale of the project. Before I left Fanie offered some more of the chassis I'd seen at the flea market. This time there were two I.F. chassis, two power supplies and three of the front ends.

The gift had the making of a complete receiver.

With a little reverse engineering and help with connectors from Wilhelm ZS6BBV, Andre ZS6DT and Emil ZS6EGB and Derek ZS6DM , I made up a set of interconnecting cables and connected a speaker. I carried out some cold chassis testes and then using my Variac I brought up the power.

There was some noise in the speaker but no sign of signals.

Using the old Advace signal generator I traced the problem to the output of the 100 kHz filter. A short circuit capacitor was quickly replaced and a 100 kHz signal injected at the input to the I.F. produced audio out.

Still no sign of off air signals. I traced the next problem to the cathode of the first local oscillator which was held high. The indication was some form of switch over mechanism in the original rack configuration. I used a crocodile clip lead to short the cathode to chassis.

The set came alive. I tuned around and found the BBC and VOA.

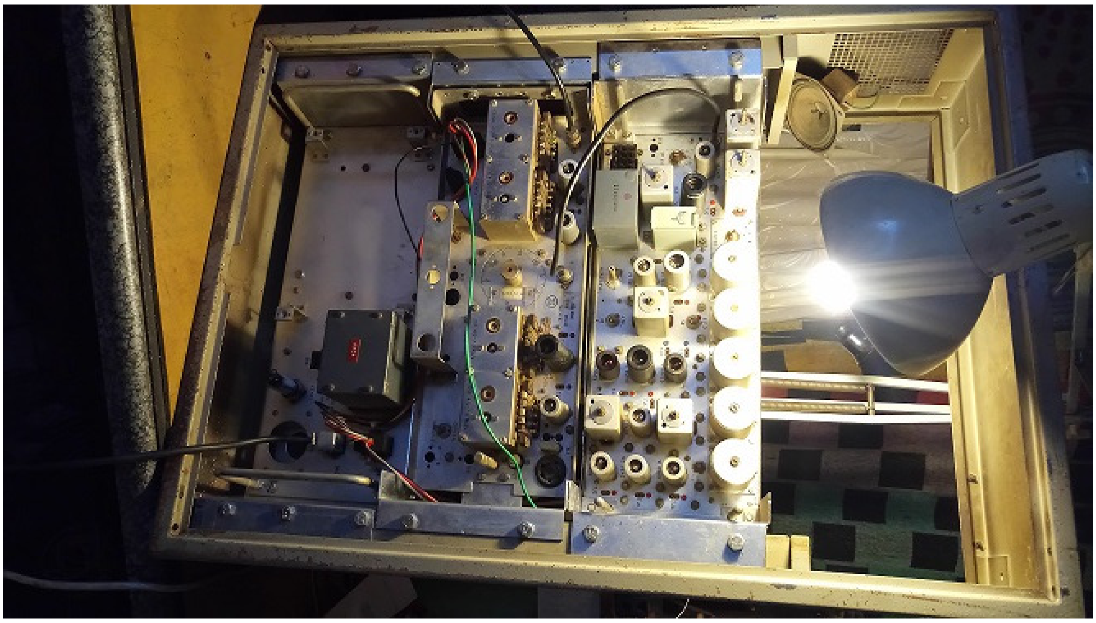
On the week end that followed I could here strong SSB signals on 40 meters. The built in BFO did not work. I traced the problem to one of the 18 pin connector pins which needed 120 volts. I jumpered the supply pin and the BFO came alive. Sadly the a.m. detector and BFO were never intended for SSB.

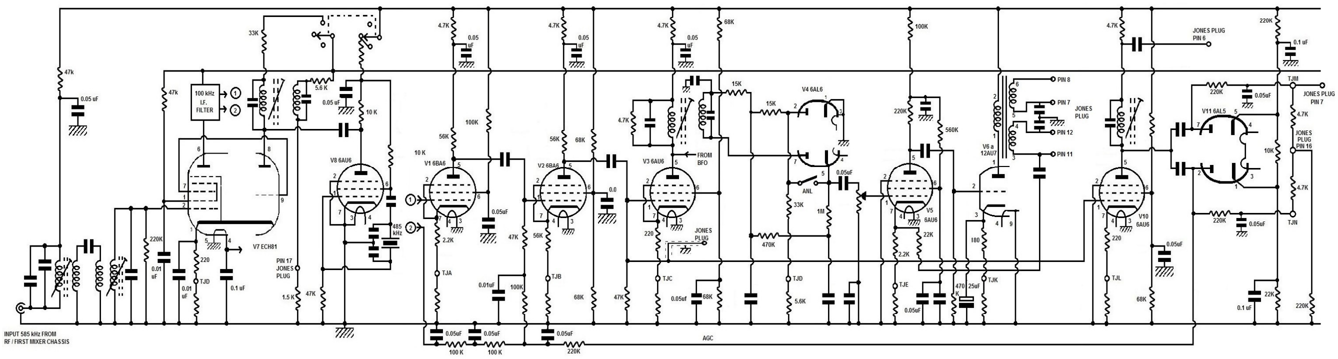
By now I had a good knowledge of the circuitry and decided to draw the complete circuit diagram.

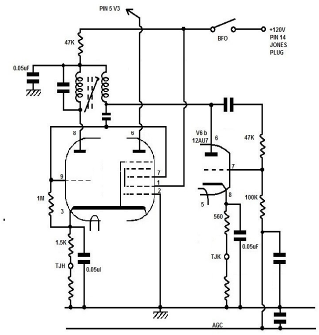
One unusual aspect of the BFO is that it's output level is controlled by the A.G.C. Looking further at the ECH81 BFO circuit I'm considering converting it to a product detector.
All the active components are there it will just take a few components and some re-wiring.

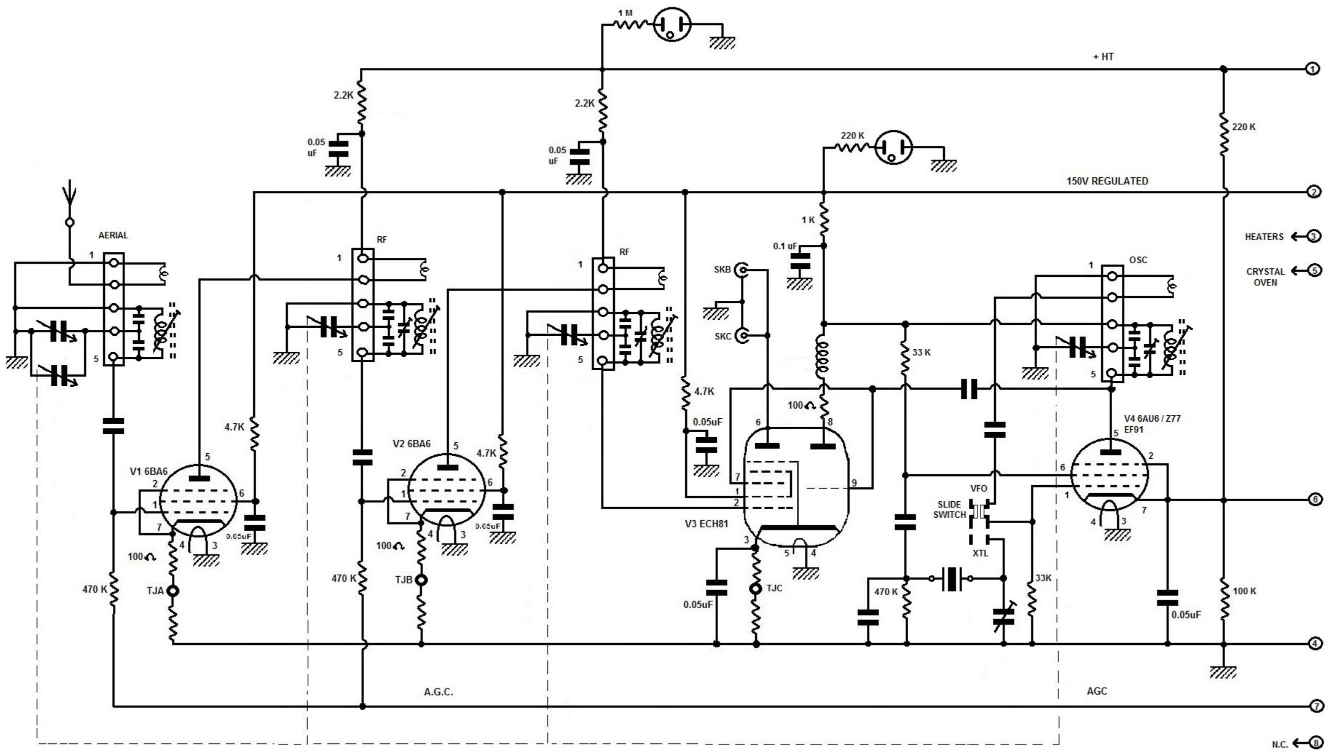
For those who may be interested I have a complete circuit diagram, although the PSU was so straight forward I have not bothered to draw it out.
I appreciated the coincidence between the Antique Wireless Association and Amalgamated Wireless Australia both AWA!

de Bill ZS6WP









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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'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. Join by logging in to our website: www.awasa.org.za

Notices:

Net Times and Frequencies (SAST):
Saturday 06:00 (04:00 UTC) —AM Net—3620
Saturday 07:00 (05:00 UTC) —Western Cape SSB Net— 3630
Saturday 07:30 (05:00 UTC) —KZN SSB Net—3615
Saturday 08:30 (06:30 UTC)— National SSB Net— 7140; (Echolink, connect to Sandton repeater ZS6STN-R)
Experimental relay on 3620 for those having difficulty with local skip conditions.
Saturday 14:00 (12:00 UTC)— CW Net—7020; (3550 after 15 min if band conditions not good on 40)
Wednesday 19:00 (17:00 UTC) — AM Net—3620, band conditions permitting.

For Disposal: AR88 Receiver still in excellent working condition with original Manual. Contact Piero on 082 341 6628

For Disposal: TS 500 Transceiver complete in working order. Comes with External VFO and Speaker, Leeson Desk Mic and a full set of spare valves. Contact Max ZS5MAX 072 158 5018. R1500 (No the Icom on top is not included)