Antique Wireless Association of Southern Africa
Newsletter

235 February 2026

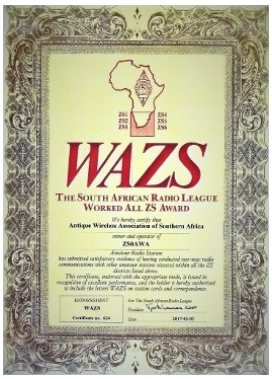
Taylor 45A Valve Characteristic Tester

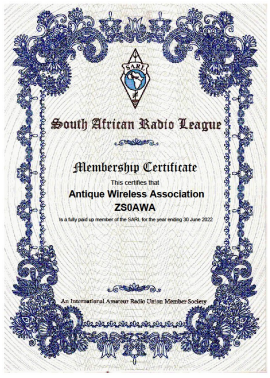
The Taylor 45A valve tester was manufactured in the early 1950s by Taylor Electrical Instruments Ltd. in Slough, England. It is a Series 2 model designed for testing thermionic valves (vacuum tubes), widely used by radio and television service engineers of that era.

It supported a wide range of receiving valves, rectifiers, cathode ray tubes, and miscellaneous types (via interchangeable charts) .

The Taylor 45A is considered a **classic piece of vintage test equipment** and is sought after by collectors of radio/TV service gear. While functional, many surviving units require **restoration** (checking capacitors, resistors, and calibration).

Documentation such as **valve charts and manuals** are crucial for proper use and are often archived online.





Inside this issue:

AWA Committee:

* President—Chris ZS6GM
* Vice President—
* Technical Advisor—Rad ZS6RAD
* Secretary/PRO—Andy ZS6ADY
* KZN—Don ZS5DR
* WC—John ZS1WJ
* Historian— Louis ZS6SK
* Members—Renato ZS6REN Wally ZS6WLY

Reflections:

The first month of the year has passed with light speed and we are fast heading down the track of another year.

The sun has been misbehaving something terrible and conditions have not been great, but yet there are still some of the old "die hards" out there calling CQ and getting results.

Many are speculating whether this could turn out to be another Carrington event, but as rightly pointed out, in those days there was not much that could be affected by it. Whatever is happening, the sun is not in a happy place at the moment and how much damages can still be done is only speculation.

At the last AWA Saturday morning net there was a discussion around sunspots and flares, which I must admit, I still don't understand too much of, but there were a few things that came to light and tended to make a bit of sense. However, I won't over extend myself on the subject just in case I got it wrong.

Even in the days when I did my RAE, I could not fully understand the whole thing of how the sun affects our radio waves and whenever I thought the conditions should be bad, they were actually quite good. Many people spoke about the years when conditions were so good that one could tune a wet shoe string and run DX on it. Those were the years that CB was at it's best and I think because of that, many came to learn about Amateur Radio and moved over to have the full Monty. I don't know if we will ever have conditions like that again, but then I may be wrong about that too.

I do believe I could say that it has taken the whole of my Ham Radio career for me to learn many of the different aspects of the technicalities of radio theory. which is why I so enjoy the company of many of our members, who it would seem to me that they were just born with all this knowledge. It certainly was no easy route for me. Not that I am a slow learner !

So if like me you are a bit slow on these things, you should enjoy reading the article in this issue about "HF Radio Wave Propagation".

There was a lot of discussion around this subject with many thoughts. I thought it quite apt that only one person stuck their neck out and spoke of it as a "theory", which to me made a lot of sense. I personally don't think that we have fully come to understand the working of our universe and much of what we look at and read and discuss, is theory.

There is still such a lot that needs to be proved and I don't think we have been at it long enough to have all the answers. I am sure there will be those who disagree with me, there always are.

As long as we are able to communicate in one way or another, that is the important thing for me. I must just be able to use my radios to the best of their ability. As long as they are able to transmit electrical waves that can be decoded on the other end of the wave, I will be a very happy person.

I am sure many of you will be pleased to hear that our website is in full development and one of these days we will have it back up again. Thanks to the efforts of Jacques ZS6JPS, some very intrepid developers and of course a very generous donor who has provided the development fees. We have paid the Hosting fees and now it's up to the developers to do the rest.

It will be good to get the website back again and be able to keep it going for a good number of years again. It really is quite an asset to the AWA of SA.

As of yet, there is no set date, but we will keep you informed.

Have a great month as we stream though the ether. Make sure to apply electrons in the right places to cause the right results and remember to keep that one hand in the pocket when playing with HT.

Best 73

Andy ZS6ADY

Chris's Musings

February 2026

On a recent Saturday AWA net, Richard F4WCD pointed out that radio amateurs are drawn from different walks for life for different reasons.
There are those whose main interest is communicating; rag chewing, chasing DX, contesting, emergency communication exercises and other on-air activities. They may or may not be that technically inclined.
Then there are the 'techies', who love experimenting; operating bordering on being a secondary activity in support of their technical activities. And there are those whose amateur radio interest is related to their profession or work Either they pursued an engineering profession because of their amateur radio interest or their profession sparked an interest in amateur radio. All these people bring a wealth of interest to the amateur radio service. But whatever your interest, there is a place in amateur radio for you.
The AWA nets are the place for learning, sharing knowledge and experience or just having fun. Spread the word and encourage other hams to join in and share their knowledge or just support the AWA.
A new website is in development. It proved to be a valuable resource to share information and technical articles. The site had visitors from all over the world and the technical archive had a vast store of information, some not found anywhere else. That's why it is so important that it is revived and renewed. If you have technical articles or other interesting information please do share it with us for inclusion in the new site. Whether the articles are about your personal experiences as a communicator, constructor, restorer, engineer or the relationship between your amateur radio and professional activities, they will be of interest to AWA members.

Technical Topics

Counterpoises, Earth Rods and Radials.

Chris Turner, ZS6GM

More than once in the recent past, I have listened to hams on air saying, 'when I installed radials on my 14AVQ, R6, HF6V vertical antenna, the SWR went up, so the radials must be degrading my antenna and affecting the efficiency'. Let's take a look and reveal the facts.

The first and undeniable truth is that SWR alone does not determine antenna efficiency. Another truth is that a low SWR is not an indication of great efficiency or indeed that your antenna is working as it should. Another truth - all the energy applied to the antenna is radiated eventually despite any mismatch and resulting SWR. I've covered this subject in several previous Technical Topics.[1,2]

So what is really happening?

First a question. Would you put a dummy load in series with your antenna to reduce the SWR? The answer is evident! A dummy load which is really a resistor does not radiate, so if the transmit energy is shared between the load and the antenna, only that portion applied to the antenna can be radiated. The load absorbs the rest. But, you say, it makes the SWR better, so it must be working.

A full size quarter wave ($\lambda/4$) monopole antenna, operated over a perfect ground has an input impedance of 36 ohms. Half of the 72 ohms of a half wave ($\lambda/2$) dipole. For the purposes of this discussion, let us ignore the reactive component of the antenna because it does not absorb any energy. Only the resistive portion absorbs energy.

The input impedance of a short monopole antenna $\lambda/8$, over perfect ground will be approximately 6 -j400. In other words the radiation resistance is 6 ohms depending on the diameter of the antenna.

Let us consider a HyGain 14 AVQ that has a physical height of 5.5 metres operating on 40 metres (7 MHz). The radiation resistance $Rr = 40\pi^2(h/\lambda)^2 = 40 \times (3.1416)^2 \times (0.1284)^2 = 6.5$ ohms. The traps and any matching will cancel the reactive part of the input impedance. Not considering any losses, this antenna will have an SWR of 8.3:1.

If the SWR is any less than this, it means that there are other losses such as ground loss or resistive loss in the antenna [traps].

Without any radials, and only an earth rod, the typical ground loss resistance over moderate earth will be in the order of 30 to 35 ohms or more. Adding a minimum number of radials e.g. 4, the ground loss will be margin-

ally reduced. An average radial system of 16 or more radials will reduce the ground loss to roughly 10 to 15 ohms. An excellent ground system with 32 or more radials can reduce the ground loss to under 5 to 8 ohms. The efficiency of the antenna, expressed by the Greek letter gamma is: $\eta = Rr /(Rr+Rloss)$.
How does this translate to SWR and efficiency?

Table 1 shows the SWR vs efficiency vs the number of radials of the 14 AVQ operating at 40 metres over a moderate ground.

Radials	Rg Ω	SWR	Efficiency %
1	35	1.4:1	12
4	25	1.6:1	19
16	10	3:1	37
32	6	4:1	50

Table 1 – SWR, Efficiency vs Ground Loss

A counterpoise is a single radial, not necessarily a quarter wave long.

From this can be clearly seen that antenna efficiency has nothing to do with the antenna SWR and everything to do with ground and other losses.

Conclusion

Getting back to the opening comments: *'when I installed radials on my 14AVQ, R6, HF6V vertical antenna, the SWR went up, so the radials must be degrading my antenna and affecting the efficiency'.*

It should now be clear why the SWR gets worse when the ground is improved and why the efficiency actually improves. The SWR mismatch can always be taken care of by means of an antenna matching unit (ATU).

References

Chris Turner, *The SWR Trap*, Radio ZS, January 2022.

Chris Turner, T*echnical Topics – Where's That Reflected Power,* August 2025.

HF RADIO WAVE PROPAGATION IN A NUTSHELL

Chris Turner, ZS6GM

Most amateur radio HF communication takes place on the high frequency bands in the range of 3.5 to 30 MHz. It was in the early days for wireless communication that commercial users and regulators assigned the short wave frequencies to amateur experimenters, because these frequencies were deemed to be of no real use. But as is the spirit of radio amateurs, they soon discovered the long ranges possible using sky wave communication on the higher bands. And of course after that, everyone wanted a look in.

The concepts of sky waves, skip distance and skip zone are at the core of HF radio propagation. With distances of many thousands of kilometres being possible using ionospheric propagation, sky waves, skip distance, and skip zone are concepts encountered all the time.

The Ionosphere

The Ionosphere, located roughly 60 to 1,000 km above Earth, comprises ionised plasma having three main Sun-dependent layers, more correctly referred to as regions; D, E, and F. The layers vary in density and altitude according to solar radiation. As solar radiation increases during the day they become denser, weakening at night. Solar radiation intensity varies according to the distance from the Sun and the number of active sunspots. The effectiveness of the Ionosphere is therefore influenced by the seasons and the 11 year solar cycle. More about this later.

Main Layers Of The Ionosphere

The Ionosphere is not static, but is constantly changing depending on the solar radiation. It has several layers (regions) as illustrated in Figure 1.

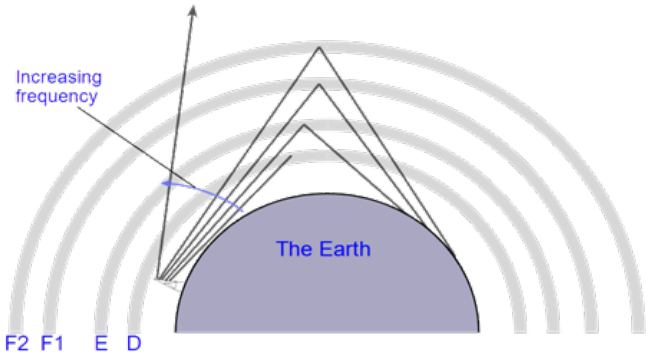


Figure 1 – Ionospheric layers

D-Layer (approx. 60–90 km): The lowest region, present only during the day, it absorbs medium frequency radio waves and largely disappears at night.

E-Layer (approx. 90–150 km): Known as the Kennelly-Heaviside layer, the middle layer, most active during the day.

F-Layer (approx. 150–500+ km): The layer with the highest electron density, crucial for long-distance, high-frequency radio communication. The F layer splits in two during the hours of daylight.

F1 (Daytime, lower altitude): Forms during the day at roughly 150–220 km.

F2 (Day & Night, higher altitude): The primary, most persistent layer for radio propagation, peaking at an altitude of about 400 km.

The Effect Of The Ionospheric Layers On HF Propagation

To understand the characteristics of Sky Wave propagation, it is worth viewing what happens to a radio communications signal as the frequency increases. During the day low frequency signals below 3 MHz generally only propagate using the ground wave. Any signals that reach the D region are absorbed. However at night as the D region disappears signals reach the other regions and may be heard over much greater distances.

As the frequency of the signal is increased, it reaches a point where it starts to penetrate the D region and reach the E region, where it is reflected and

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passes back through the D region and returns to Earth at a distance from the transmitter. As the frequency further increases, the signal is refracted ever less by the E region and eventually it passes right through and reaches the F1 region, where it may be reflected, passing back through the D and E regions to reach the Earth again. Because the altitude of the F1 region is higher than the E region, the communication distance will be greater than that for an E region reflection. Finally as the frequency of the radio signal increases still further, it eventually passes through the F1 region and onto the F2 region, the highest of the ionospheric regions providing the longest communication distance. As a rough guide the maximum propagation distance for the E region is around 2500 km and 5000 km for the F2 region.

Critical Frequency

The critical frequency is a measure of the state of the Ionosphere and its effect on HF propagation. It is measured by means of an instrument known as an 'ionosonde', which transmits a pulse of varying frequency, vertically towards the Ionosphere. If a return signal is received at the transmitter site, the round trip propagation time provides an indication of height of the ionospheric layer. As the frequency is increased, a point is reached where the signal will pass right through the layer to the next highest one. This is called the critical frequency and is designated *foE* or *fof2*.

Maximum Usable Frequency, MUF

HF signals transmitted via the Ionosphere over a given path are subject to the condition of the Ionosphere and its layers. The angle of incidence of the propagating wave to the particular layer, determines whether the signal will be returned to Earth or not. The higher the altitude of that layer, the greater the communication distance; a simple matter of geometry. As the frequency of the signal increases, a point is reached where it passes straight through and is not returned to Earth. This is known as the Maximum Usable Frequency – MUF).

Lowest Usable Frequency, LUF

As the transmit frequency decreases, D layer absorption increases to a point where the return received signal is so weak as to be unusable, therefore making communication impossible. This point is defined as the Lowest Usable Frequency (LUF). Propagation prediction programs will generally specify the signal to noise ratio at which the LUF occurs.

The LUF increases with an increase in solar radiation which causes more ionisation hence more absorption.

Skip Zone

A **skip zone** (also known as a silent zone or zone of silence) in radio communications, is an annular (ring-shaped) region located between the maximum range of a transmitter's **ground wave** and the minimum distance at which the **sky wave** returns to Earth. Within this zone, radio signals cannot be received. See figure 2.

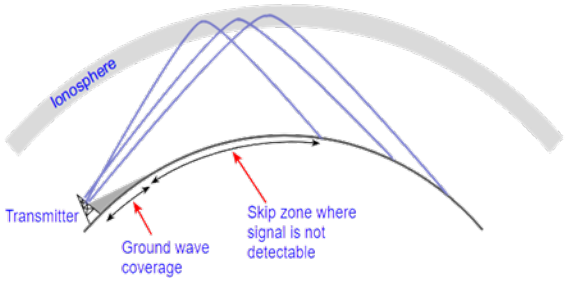

Figure 2 - Ionosphere showing ground wave and skip zone

Frequency Selection

Professional radio communicators make use of propagation prediction services to select their desired HF frequency of operation.

Radio amateurs are much more inquisitive and use their experience as well as charts and computer programs to select the best frequency band for a particular distance, direction and time of day.

When using a propagation prediction service or computer program, there are important terms and definitions used:

Lowest Usable Frequency, LUF: The LUF is the lowest frequency at which the received field intensity is sufficient to provide the required signal-to-noise ratio at a specific time of day.

Maximum usable Frequency MUF: The MUF is the highest signal frequency that can be

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used for transmission between two points via reflection from the Ionosphere, at a given time.

Critical Frequency: The critical frequency for a given layer or region in the Ionosphere is the highest frequency at which a signal travelling vertically upwards is reflected back to ground. This gives a good indication of the state of the Ionosphere. This is particularly useful for NVIS (near vertical incidence) communication.

Optimum Working Frequency: The optimum working frequency is the highest effective frequency that is predicted to be usable for a specified path and time of day for 90% of the days of the month.

The Sun And HF Propagation

The ionisation in the Ionosphere is chiefly caused by radiation from the Sun. As a result, the state of the Sun and the radiation received from it, governs the state of the Ionosphere and HF propagation.

There are several key topics concerning the Sun and the radiation received from it:

Sunspots & sunspot cycle: Sunspots are areas on the surface of the Sun that are a little cooler than the surrounding areas. Their presence leads to higher levels of radiation being emitted and therefore this affects HF propagation. Sunspots have been recognised on the surface of the Sun for centuries and the correlation between the number of sunspots and their effect on radio propagation has been observed by radio amateurs from very early on.

Solar disturbances: From time to time, massive disturbances occur on the surface of the Sun. Solar flares and coronal mass ejections known as CMEs also give rise to increased levels of radiation which affect HF propagation.

Small increases in solar radiation can improve HF radio conditions, but as the intensity increases, the result can lead to propagation degradation or complete fade-out.

Sudden Ionospheric Disturbance, SID: A sudden ionospheric disturbance is usually caused by intense X-ray radiation from a solar flare, often associated with a CME.

Coronal Mass Ejection, CME: A Coronal Mass Ejection (CME) is a massive, sudden release of plasma and magnetic fields from the Sun's corona into the heliosphere. These events, which can eject billions of tons of coronal material at speeds ranging from 250 to 3000 km/hr and often accompany solar flares and can trigger geomagnetic storms if they impact Earth's magnetosphere.

T Index: The T index is an ionospheric index used to quantify HF propagation conditions. Originally developed for use in Australia, now widely used, it serves as an **"equivalent sunspot number"** derived from real-time ionosonde measurements of the maximum ionospheric frequencies ($foF2$) rather than just optical sunspot numbers. T-index is a number between -50 and 250 and has been designed to be equivalent in value to a sunspot number. Its usefulness as an ionospheric index is that it can change during short-term ionospheric disturbances, such as those resulting from the impact of a CME. For example, the daily sunspot number (SSN) might be 100. A dramatic ionospheric depression resulting from a CME, might drive the T-index from around 100 down to 20 but the sunspot number would remain at 100 throughout.

A-index: The A-index represents the daily average of magnetic activity, which is influenced by solar wind and solar events like coronal mass ejections. It is a daily, linear measurement of Earth's geomagnetic field activity, averaged from eight 3-hour K-indices. Lower values (1 – 7) of A -index are better and indicate a quiet, stable Ionosphere for long-distance communication. Higher values (10+) signify geomagnetic storms which lead to high absorption and poor, noisy signal conditions. The Ap-index, the planetary A-index is a global average, which is more reliable for long-haul radio path predictions. Note that the A-index and K-index

track geomagnetic fluctuations influenced by solar activity, but they do not directly measure the solar phenomena themselves.

Key Aspects of the A-Index:

- **0–7 (Quiet):** Excellent conditions for signal propagation.
- **8–15 (Unsettled):** Fair to average conditions.
- **16–29 (Active):** Poor conditions, potential for signal flutter.
- **30+ (Storm):** Very poor blocked conditions.

K-index: The K-index is a 3-hour, logarithmic measure of current disturbance, while the A-index is the 24-hour linear average, offering a daily overview.

10 centimetre Solar Flux: The 10cm solar flux number (**Solar Flux Index - SFI**) is a measure of the intensity of solar radio emissions, specifically at a wavelength of **10.7 cm (2800 MHz)**. It serves as a daily, objective index of overall solar activity, representing the noise generated by the Sun from the upper chromosphere and lower corona.

In radio propagation, this index is crucial, because it acts as a proxy for the solar Extreme Ultraviolet (EUV) radiation that ionises Earth's upper atmosphere, dictating the maximum usable frequency (MUF) for HF (High Frequency) communication. There is a correlation between SFI and SSN.

SSN - Sunspot Number: The sunspot number is the 12-month smoothed, numerical index representing the total number of sunspots and spot groups on the solar disk, serving as a primary indicator of solar activity.

Sunspots

The number of sunspots has a considerable effect on the levels of radiation emitted by the Sun and resulting impact on the Ionosphere. Higher SSN values correlate with increased ultraviolet radiation, which enhances ionospheric ionisation, creating denser F-layers that allow for improved long-distance high-frequency (HF) radio propagation, especially on higher bands (14 MHz and above).

Figure 3 shows the Sun's disc. The sunspots sometimes called freckles can be clearly seen.

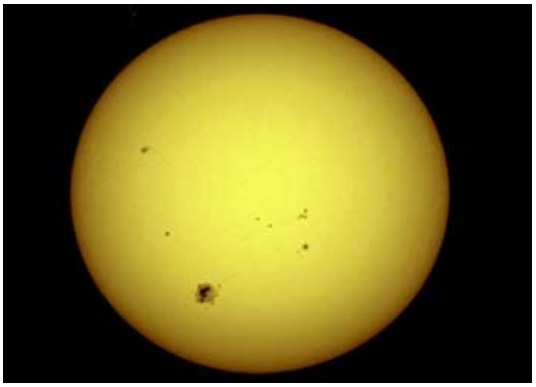

Figure 3. The Sun's disc showing visible sunspots

Eleven Year Cycle

The number of sunspots on the surface of the sun varies with time. At times very few or even none may be visible, whereas at other times the number is very much greater. Although the number varies greatly over short periods of time as the sun rotates, careful analysis using the SSN reveals a longer term trend of approximately eleven years over which the number of sunspots varies.

At the peak of this cycle conditions on the bands at the top of the short wave spectrum are very good. At the bottom of the cycle (low SSN) the higher frequency bands will not usually support normal propagation via the Ionosphere and the lower bands come into their own due to reduced D layer absorption.

In conclusion, you can never stop learning about the Sun and its effect on radiocommunication, the weather and the Earth's climate.

Useful Links and prediction tools.

The following online resources are particularly useful for monitoring solar and HF propagation conditions:

https://spaceweather.com : provides real time space weather information such as sunspot number, x-ray flux, planetary indices and other useful information. Best of all it is an AI (LLM) free zone, which means no illusionary answers!

https://sws.bom.gov.au : provided by the Australian Space Weather Service. It has a number of HF tools including vari-

ous HF prediction tools, some of which are amateur radio friendly. It is of particular interest to South African amateurs because it has specific southern hemisphere tools.

https://spaceweather.sansa.org.za : SANSA Space Science is host to the only Space Weather Regional Warning Centre in Africa which operates as part of the International Space Environment Service (ISES). The Space Weather Centre provides an important service by monitoring the Sun and its activity to provide information on space weather conditions. There is live access to two ionosondes, and there is a daily space weather bulletin and there is real time *FoF2* (critical frequency) chart.

Other resources.

https://www.dxmaps.com

https://dx.qsl.net/propagation

https://hf.dxview.org

https://www.voacap.com/hf/

RESULTS OF THE AWA CW ACTIVITY DAY

1st Place Ian ZS6AIA – 6 points
2ND Place Eddie ZS6BNE; Mickey ZS5QB; Mike ZS6MSW – all 5 points
3rd Place Arthur ZS5DUV – 2 points

The AWA station scored 9 points

There were a total of 10 stations active on CW. 9 of them on 40m and one on 20m.

CONTACT US:

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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.

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Notices:

Net Times and Frequencies (SAST):
Saturday 07:00 (05:00 UTC) —Western Cape SSB Net —7.140; Every afternoon during the week from 17:00
Saturday 08:30 (06:30 UTC)— National SSB Net— 7.125;
Echolink—ZS0AWA-L;
ZS6STN Sandton repeater—145.700
Kempton Park Repeater—145.6625
Relay on 10.125 and 14.135 (Try all and see what suits you)
Saturday 14:00 (12:00 UTC)— CW Net—7025

AWASA Telegram group:

Should you want to get on the AWA Telegram group where a lot of technical discussion takes place, send a message to Andy ZS6ADY asking to be placed on the group. This is a no-Nonsense group, only for AWA business. You must download the Telegram App first. …..+27824484368

For Sale

"Transworld" transmitter, and separate matching "Transworld" receiver, with optional 19" rack mount
(Some informative documentation is included).
Both cosmetically good, but working condition uncertain.
R1.5k ONCO for the lot
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Goods will only be released upon receipt of POP and payment has been verified.
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Swan TV2B transverter
Cosmetically good, but working condition uncertain.
(The Swan TV2B is a vintage 2-meter (144 MHz) amateur radio transverter)
Asking R250 ONCO
Courier costs to your account.

Goods will only be released upon receipt of POP and payment has been verified.
Please contact Eldred ZS1DJ on Whatsapp 072 4374789

Hallicrafter Super Skyrider Model SX-28 receiver
Working condition uncertain
R250 ONCO
Courier costs to your account.
Goods will only be released upon receipt of POP and payment has been verified.
Pics available on request.
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Winch - Electronic - single phase
This unit is capable of lifting 71' / 21.6 m of tower
It was serviced by the expert, and in good cosmetic condition.
R10k NOT NEGOTIABLE
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Both need minor repairs
R550 ONCO for both.
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FRG7 Receivers (2)
Working condition uncertain – Asking R550 each or R1k for both.
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WANTED:

Yaesu XF-455MC CW crystal filter (Frequency: 455 kHz / Bandwidth: 600 Hz)

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