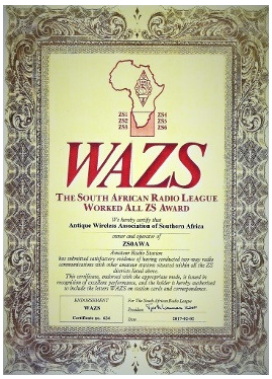
Antique Wireless Association of Southern Africa Newsletter

188 March 2022



Inside this issue:

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Reflections:

Right on time for the 1st of March, I received my ICASA notification for the renewal of the AWA Amateur License.

It had taken me the best part of 6 months to get it sorted out on the system, but eventually we managed to get it done.

When I saw the email for the renewal notice, I got the shivers down my spine, wondering what kind of frustrations were going to be associated with this now.

Much to my surprise, I logged in first time round. Went straight in to the "manage my account", and after a few clicks, the AWA license was paid up for the next year and within 10 minutes, I had the confirmation in my inbox.

What a pleasure. All I can say is, well done ICASA, after all this time of battling with amateur licenses, it has become a very simple easy process to renew. I hope you all have similar experiences and the exercise is an absolutely painless one.

How well I can remember the exercise I went through when I moved from the Northern Cape to Gauteng and I had to go through the process of changing my call sign from ZS4 to ZS6.

There was no internet at that stage and everything was handled through the postal system. Of course we still had one at that time.

It took the best part of a month to get my application papers and then to fill them in and re-post them after making payment at the local PO. I then had to wait another few weeks to get my proof of new license and on the 28th April 1991, I made my first QSO on SSB with ZS6BUI in Tzaneen using my new Div6 call sign and my Hallicrafters SX100 Rx and HT37 Tx.

Much water has passed under the bridge since then and many different transmitters/transceivers up until today. It was not too long after that I bought my first FT200 from Lima Electronics in Durban, which had been modified by Roger Davis to operate with 6146B finals.

At that stage, I was convinced my CW days were over and I was now ready to venture into the world of SSB only. In fact I did not even have a key that would work on the FT200. Did it even have CW mode ?

My days of boatanchors was at an end and I would now use modern, lightweight transceivers that I could pick up and move with out straining certain parts of the anatomy.

That of course did not last long at all for my next radio, an FT901DM was not far off from strain technology.

At least now, should I have to move out of GT, I am sure the process of changing call sign areas will never be as bad as what it used to be.

Here's to the next 30 years.

Best 73

DE Andy ZS6ADY

Wikipedia

Solar Cycle 25 began in December 2019. Several predictions have been made for sunspot cycle 25 based on different methods, ranging from very weak to strong magnitude. A physics-based prediction relying on the data-driven solar dynamo and solar surface flux transport models by Bhowmik and Nandy (2018) seems to have predicted the strength of the solar polar field at the current minima correctly and forecasts a weak but not insignificant solar cycle 25 similar or slightly stronger in strength relative to cycle 24. Notably, they rule out the possibility of the Sun falling in to a Maunder-minimum-like (inactive) state over the next decade. A preliminary consensus by a Solar Cycle 25 Prediction Panel was made in early 2019. The Panel, which was organized by NOAA's Space Weather Prediction Center (SWPC) and NASA, based on the published solar cycle 25 predictions, concluded that Solar Cycle 25 will be very similar to Solar Cycle 24. They anticipate that the Solar Cycle minimum before Cycle 25 will be long and deep, just as the minimum that preceded Cycle 24. They expect solar maximum to occur between 2023 and 2026 with a sunspot range of 95 to 130, given in terms of the revised sunspot number.

THE SWR TRAP
or
Why SWR meters can be bad for your station…

Chris Turner, ZS6GM
January 2022

When I listen across the bands and follow technical social media groups, I notice that there is still an obsession with achieving 'low SWR' on the feedline in the belief that low SWR is an indication of optimum radiation from the antenna. As Walter Maxwell W2DU says in his series of articles in QST magazine in the early 1970s, "we are in this state of mind because so much misleading information has been, and is still being published concerning the behaviour of antennas, performance in the presence of reflections when mismatched to the antenna and the meaning and interpretation of the SWR data".

We have become conditioned to avoid any mismatch and reflection at all costs. One – to – one SWR seems to be the ultimate goal. This is a myth that has been propagated 'as fact' in so many articles and papers despite the fact that correct teachings are contained in reference books such as the ARRL Antenna Book and Antennas by John D Krause.

I hope that this article answers these questions.

- What happens to the power that is reflected back towards the transmitter?
- What is a 'conjugate match' ?
- Is SWR important in order to radiate maximum power from an antenna?

What is SWR?

SWR is the ratio of forward power to reflected power on a transmission line. Most so called SWR meters (reflectometers) actually measure voltage standing wave ratio, VSWR, which is the ratio of (forward voltage + reflected voltage) to (forward voltage – reflected voltage) as measured on a transmission line.

Transmission Lines

A transmission line may be open wire or coaxial cable and is to RF what a pipe is to fluid. All transmission lines have a characteristic impedance related to the mechanical dimensions, whether a coaxial cable or open wire line. In amateur radio open wire lines will generally have an impedance of 300, 450 or 600 ohms. Common coaxial cables will have an impedance of 50 ohms or 75 (or 72) ohms.

When a transmission line is terminated in its characteristic impedance by an antenna or other load at one end, and power applied at the other end, all the power will be absorbed in the load and there will be no power reflected back from the load and the VSWR will be 1:1 at any point on the transmission line.

The Conjugate Match

The transfer of power from a source (transmitter) to load (antenna) follows Ohms law. When the source and load are pure resistances, maximum power transfer takes place when the load resistance is equal to the source resistance. But what happens when the load is a complex impedance and has resistance and reactance? We use a technique called Conjugate Matching.

Figure 1.

Conjugate Match is achieved when the reactive portion of the load is matched by applying an equal but opposite reactance at the source. This matching cancels the reactive component in the load so that only the resistive portion is left and Ohm's Law applies. Conjugate matching is also used to match the active output circuits in a transmitter to the transmission line. Matching is in one direction only, from source to load.

Figure 2.

Matching need not be applied at the load but may be applied at any position on the transmission line between the source and the load. You may ask "why does the mismatch at the load not cause high SWR and therefore losses when there is no conjugate match at the load end of the transmission line?"

Optimum power is delivered by a transmitter using conjugate coupling into the transmission line in order to deliver optimum power. But this match is in one direction only, that is forward. If one looks back into the transmitter, the line is completely mismatched during the time that the transmitter is delivering power.

Conjugate Match means that if in one direction from a junction the impedance has the dimensions R+jX then in the opposite direction the impedance will have the dimensions R-jX. This means that when a conjugate match is accomplished in a system, any reactance appearing at any junction is cancelled by an equal and opposite reactance. This includes any reactance appearing at a load, such as a non-resonant antenna. This reactance cancellation results in a net system reactance of zero establishing resonance in the entire system. In this condition, the generator (transmitter) delivers its maximum available power to the load (antenna).

We Need To Examine The Mechanism.

The source, i.e. the transmitter output stage has tuned circuits which provide a conjugate match between the output impedance of the tubes / transistors to the transmission line.

In the case where the load is purely resistive, and its resistance (impedance) is the same as the transmission line, maximum power will be absorbed by the load/antenna and radiated.

Now take the case of a lossless transmission line. If the transmission line is open circuit at the far end, or the transmission line is short circuit, all the power conducted along the transmission line will be reflected back to the source. If the load is reactive, i.e. comprises resistance and reactance, a portion of the power will be reflected back towards the source and a portion will be absorbed.

Contrary to the myth, the reflected power does not make its way back to the active output amplifier and it cannot be absorbed into the transmitter. Remember that the matching is in one direction from source to load. When the reflected power arrives back at the source, it sees a total mismatch so it is again reflected back towards the load. A bit like ping pong.

In the case of a lossless transmission line, because there is no absorption of power at the load, and there is no absorption of power at the source, there is no loss of power. So, in a real-life system, the only loss of power in the system will be the result of transmission line losses. All the power will be radiated by the antenna.

The Proof Is In The Eating

This experiment will prove that no power is lost at the transmitter resulting from a mismatch or high SWR. A directional wattmeter will show that forward power always = source power + reflected power.

For this experiment it is important that the transmitter output is fixed and does not automatically compensate for changes in load. Ideally, a tube transmitter should be used.

Connect a directional wattmeter between the transmitter and the transmission line, after any tuner. Arrange for a mismatch at the antenna end of the line by moving the transmit frequency away from perfect antenna match. Figure 3.

Connect a dummy load to the output of the wattmeter and measure forward power. This we call source power. There should be zero reflected power. Now connect the transmission line and again measure the forward power and reflected power. You will notice that the forward power will now equal the source power + reflected power. So, if the source power is 20 Watts and the reflected power is 5 Watts, the forward power will measure 25 Watts.

Note that most modern solid-state transmitters use an output power levelling circuit. This means that if there is reflected power, the transmitter will reduce its output so that the forward power is reduced. This disguises the additive effect of forward and reflected power.

Where to Match

We said earlier that it is not necessary to match the antenna at its feed point but that matching can take place anywhere between the source (transmitter) and the load. For example, coaxial stubs and tuned transmission lines are examples. An antenna matching unit at the transmitter output is just as effective. Remember to place your SWR meter between the transmitter and the ATU so that you match the system to the transmitter output. Not between the ATU and transmission line.

The only reason to aim for a reasonable antenna SWR (typically less than 3:1) is to mitigate transmission line loss-

es. This means that you can quite happily use non-resonant antennas like the G5RV/ZS6BKW with an antenna matching unit at the transmitter output. Or you can use a fairly narrow band self-resonant antenna over a much wider range of frequencies and suffer no measurable loss in radiated power.

Summary

It is erroneously believed that any reduction in SWR or reflected power as measured on the transmission line feeding an antenna, results in a direct one for one increase in radiated power. The wrong reasoning is the assumption that if power is being reflected it cannot be absorbed in the load (antenna), but is absorbed or dissipated in the transmitter.

The truth is that all the power that enters the line is absorbed by the load except that which is dissipated in the line itself due to transmission line attenuation. This is true even when the load is not matched to the line impedance. All the power delivered by the transmitter is completely absorbed, even in a mismatched load because the power reflected by the mismatch is conserved and returned to the load by re-reflection from the transmitter matching or line coupling circuitry.

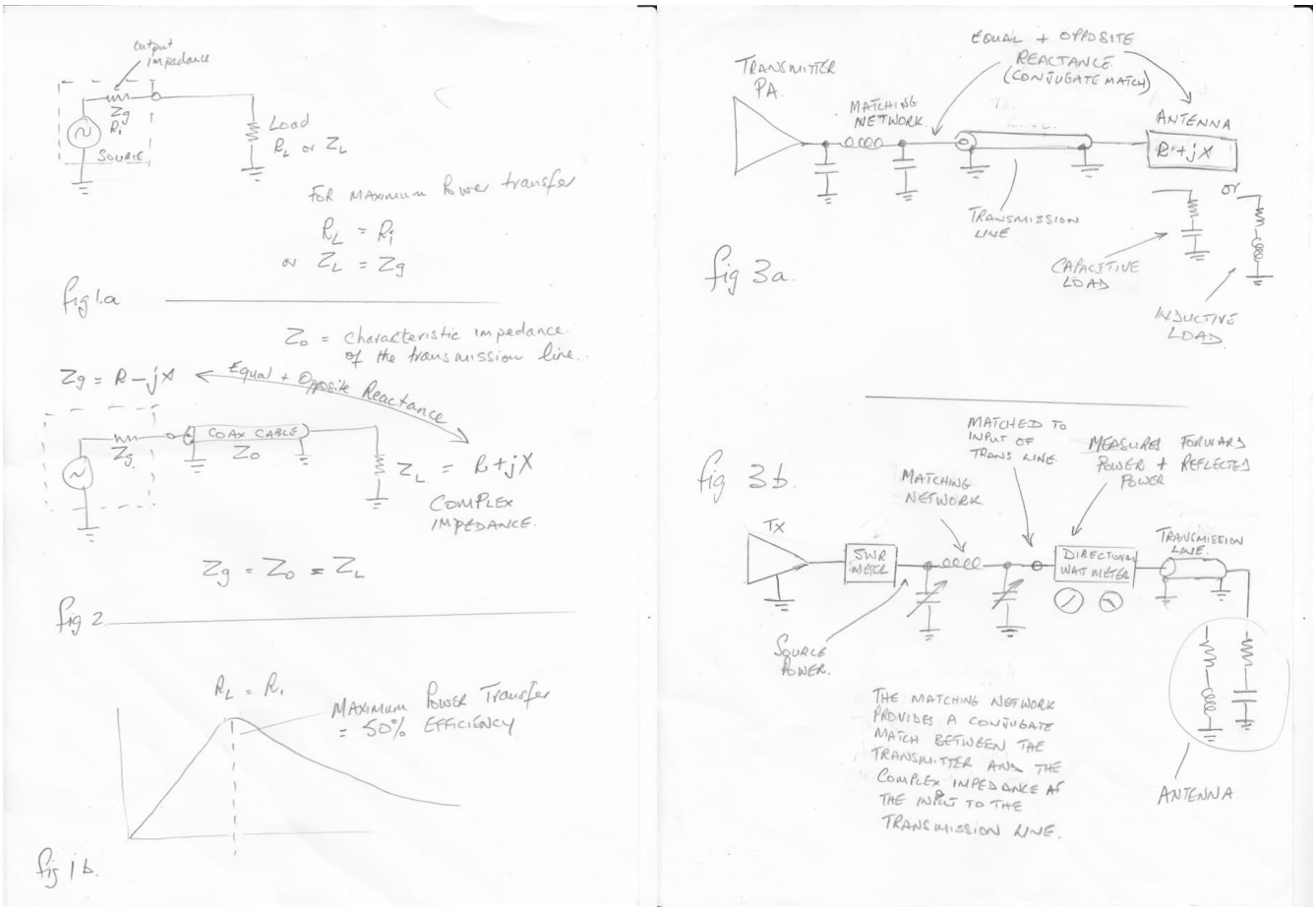
It is important to remember that because the forward power in a transmission line is the sum of the source and reflected powers, the forward power will always be greater than the source power when the SWR is greater than 1. Therefore, our concern of SWR involves only the loss from the transmission line attenuation. This means that we can tolerate a higher SWR when line attenuation is low.

The main reason to aim for low SWR is to permit the easy matching of a transmitter with a fixed output impedance into a 50 ohm feedline. The use of an antenna matching device between the transmitter output and feedline will mitigate any SWR effects on the feedline. However, it is important to note that the SWR meter must be placed between the transmitter and tuner and NOT between the tuner and the feedline.

fig.1 transmission line with a source and load perfectly matched

fig. 2 transmission line with source and a mismatched load.

Fig.3. Experimental Setup



Hams in Space (part II)

By Jacques Botha (ZS6MAV)

In the last issue we explored some of the radios and systems supporting the International Space Station. If you missed this be sure to find AWASA issue 187 of February 2022. (http://awasa.org.za/Newsletters/2022/187Feb22.pdf)
In this issue we are delving deeper into the two radios that are respectively used by the Astronauts and Cosmonauts aboard the ISS.
To recap, a Kenwood D710E and a Kenwood D710GA are used and assigned the callsigns NA1SS and RS0ISS, respectively.
ISS crew members typically have very busy schedules but despite this have been known to make the odd contact with Hams.
A typical "workday cycle" on the ISS starts at 0730 UTC and ends at 1930 UTC. The best time to work the ISS therefore is 0730~0830 UTC or 1830~1930 UTC.
When the astronauts put out a CQ call intended for Hams or Schools it is on the 2m band and occurs at 145,800MHz. Any reply should be sent from 145.200MHz. It should be noted that this needs to happen fairly quickly due to the high speed of the passing ISS. At 27600 km/h the ISS is only available for approximately 10 minutes. Thereafter it slips back over the opposite horizon.

Amateur Radio on The International Space Station (ARISS) is a program that offers opportunities for students to experience the excitement of Amateur Radio by talking directly with crew.
The goals of the ARISS are stated as such:

Inspire interest in STEM (Science, Technology, Engineering & Math) subjects.

To provide an educational opportunity about Space Exploration, Space Technologies, and Satellite Communications for students
To provide an educational opportunity about Radio Science and Wireless Technology (aka Amateur Radio)
To provide opportunities for Amateur Radio experimentation and assessment of new technologies.
To offer the ISS crew another means of communication with the outside world and the general public.
To provide a back-up communications system between NASA, ROSCOSMOS and the ISS.

Figure 1 - The ARISS Logo

Figure 2 - The National Aeronautics and Space Administration logo

Now, on to the Kenwood D710's. Let's start by exploring some of the more interesting features.

Wideband RX coverage : 118~524 MHz
50W TX Output
Dual Band, dual watch
APRS
Digital Code Squelch with 104 selectable codes
MC-59 16 key backlit microphone
Amber or Green backlight
Two Speaker output Jacks
Manufactured in 2007

Figure 3 -The Russian State Space Corporation known simply as ROSCOSMOS

Figure 4 - Colonel Chris Hadfield having a QSO on the ISS Kenwood

Figure 5 - Captain Sunita Williams operating one of the Kenwood stations

Figure 6 - Engineer Paolo Nespoli enjoying Zero-G and a quick QSO

Next month – What antennas do they use, what modes to employ and how to work the ISS!

Look out for the next issue of the AWASA Newsletter

All image credits and references available from the author on by request.

Amateur Radio Station Earthing

Chris Turner, ZS6GM

This guide is intended for licensed radio amateurs who have passed the Radio Amateurs Examination and assumes a knowledge of electrical principles and safety practice.

The information herein is provided in good faith and the author cannot be held responsible for misuse or misunderstanding. Any electrical work should be undertaken by a suitably qualified electrical contractor.

Why Earthing is Important?

The purpose of earthing (also known as grounding), is to avoid or minimize the danger of electrocution or fire due to earth leakage current flowing through an undesired path and to ensure that the exposed metal parts of electrical appliances or other electrical installations do not become 'live' with respect to [mass] earth.

Another reason for earthing is to protect sensitive equipment such as amateur radio and computer equipment against mains borne impulses from static or lightning discharges.

In addition to the foregoing, amateur radio installations require earthing to radiate radio frequencies efficiently from an antenna, to bleed off static electricity from antenna systems, to provide a measure of lightening protection, as well as the safety requirements of an appliance with a conducting enclosure or fittings in the close proximity of others.

South African Standard, SANS 10142-1 provides the code of practice for low voltage (230/400 Volt) electrical installations in South Africa.

Basic requirements of an Earth system are to:

protect human lives
provide safety for electrical devices and appliances from leakage current.
keep voltage stable on the phases of a 3 phase supply (If fault occurs on any one phase).
protect electric system and buildings from lightning.
avoid the risk of fire in electrical installation systems.

Terms used in Electrical Earthing

Earth: The connection between an electrical installation via a conductor to the buried plate or rod in the [mass] earth.

Earthed: When an electrical device, appliance or wiring system is connected to the earth through an earth electrode, it is said to be "Earthed".

Earth Electrode: A conductor (or conductive plate) buried in the earth for electrical earthing system. It is known as an Earth Electrode. Earth electrodes may have different forms such as, conductive plate, conductive rod, metal water pipe or any other conductor with low resistance.

Earthing Lead: The conductor wire or conductive strip connected between Earth electrode and thr Electrical installation system.

Earth Continuity Conductor: The conductor wire, which is connected among different electrical devices such as distribution board, plugs and appliances.

Earth Resistance: This is the total resistance between earth electrode and earth in Ω (Ohms). Earth resistance is the algebraic sum of the resistances of earth continuity conductor, earthing lead, earth electrode and earth.

Electricity Distributor: Frequently referred to as the Utility company, is the supplier of electricity to the consumer. In South Africa this is usually either Eskom or a local municipality.

Line: High potential leg of the incoming power supply or a phase in a three phase system.

Mass Earth: Mother earth or real ground.

Neutral: Low potential or earthed leg of the incoming electricity supply and is the star point on a 3 phase electrical supply.

PEN: Combined Neutral and Protective conductor on an incoming supply.

PME: Protective Multiple Earth, a system where multiple earth electrodes are connected to the protective earth conductor.

Earthing Types

Mains electricity systems are categorised according to how the earthing is implemented. The common ones are TN-S, TN-C-S and TT.

There are five types of earthing system:

TN-S
TN-C-S
TT
TN-C
IT

Where those letters indicate:

T = Earth (from the French word Terre)
N = Neutral
S = Separate
C = Combined
I = Isolated

First letter:

T The live parts in the system have one or more direct connections to earth.

I The live parts in the system have no connection to earth, or are connected only through a high impedance.

Second letter:

T All exposed conductive parts are connected via your earth conductors to a local earth (ground) connection.

N All exposed conductive parts are connected via your earth conductors to the earth provided by the supplier.

Remaining letter(s):

C Combined neutral and protective earth functions (same conductor).

S Separate neutral and protective earth functions (separate conductors).

In Summary

TN-C No separate earth conductors anywhere - neutral used as earth throughout the supply installation (very rarely used but is sometimes found in old houses with overhead supply).

TN-S Most common in older houses, with the supplier providing a separate earth conductor back to the substation. The earth may be a separate conductor with overhead wire supply or the sheath on underground cable supply.

TN-C-S (Protective Multiple Earthing) Supply combines neutral and earth, but they are separated out in the installation. More common in newer houses and those with overhead bundled supply cables.

TT No earth provided by supplier; installation requires its own earth rod etc. Note that a local TT earth in older installations will frequently not offer a low enough impedance by itself to provide adequate operation of an earth leakage circuit breaker also known as an RCD or residual current device.

IT Supply is a special case which does not have an earth provided by the electricity distributor. It is often provided as a special supply for Information Technology equipment that needs a noise free electrical supply. A portable generator or inverter or solar installation may also be an IT Supply because it has no external no earth connection but supplies its own earth rod.

Main Earthing Terminal

The main earthing terminal (MET) in a building is the place where the main earth, the main equipotential bonding conductors, and the connection to the circuit protective conductors for installation's circuits meet. On smaller installations this will frequently be hidden away inside a distribution board, where the main earth bus bar has additional connection points for the connection to the main earth, individual earth wires and bonding conductors.

Note on Utility (electricity distributor) earthing

The electricity utility / distributor has specific earthing requirements on the distribution network to ensure safety and supply security. Consumer electricity supplies are derived from high voltage distribution networks via distribution transformers or sub-stations. Modern suburban distribution networks make use of so call mini-subs and many urban and rural distribution systems use pole mounted transformers. Earthing provides two main protective purposes.

Should a fault occur on a transformer or sub-station earthing prevents dangerous high voltages from being accidentally transferred onto the low voltage 230/400 volt consumer supply;

The earth connection on the neutral conductor or star centre point on a 3 phase supply ensures that the consumer supply voltage cannot rise to dangerous levels above mass earth. (note: a failure on the neutral can cause a higher (or lower) than expected potential between one or more phases and neutral).

Types of Earthing System

TN-S system

This system has the neutral of the power supply connected to earth at only one point at the source – substation. The consumer's earthing terminal is usually connected to the metallic armour of the distributor's cable into the HV / LV transformer.

The earth terminal is connected by the supply protective conductor (PE) back to the star point (neutral) of the secondary winding of the supply transformer, which is also connected at that point to an earth electrode. The consumer installation does not have its own earth but relies entirely on the earth provided by the electricity distributor.

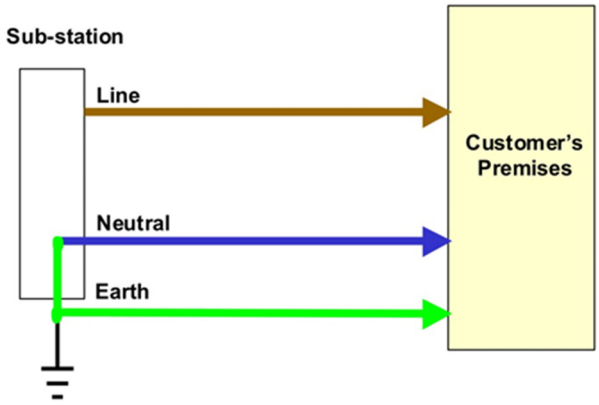


Fig 1 The TN-S Configuration

TN-C-S system

The system has the supply neutral conductor of a distribution main connected to earth at source as protective multiple earthing (PME).The supply distributor neutral conductor is also used to return earth fault currents from the consumer installation back to the source.

The electricity distributor will provide a consumer's earthing terminal which is linked to the incoming neutral conductor and the consumer's distribtution board.This combined earth and neutral system called the 'protective and neutral conductor' (PEN) or the 'combined neutral and earth' conductor (CNE). Many installations may not have a local earth rod at the consumer distribution board and may simply rely on the incoming PEN. In effect it acts as a TN-S system.

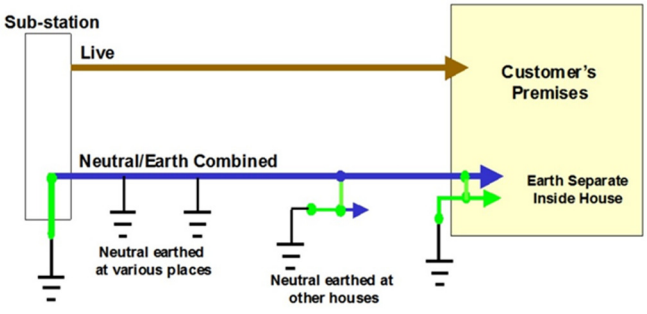


Fig 2 The TN-C-S Configuration

TT system

No earthing system is provided by power distributor. The owner must install the earthing protection by their own connection to the earth. A low impedance earth using a suitable electrode and safe arrangement meeting the wiring regulations must be provided.

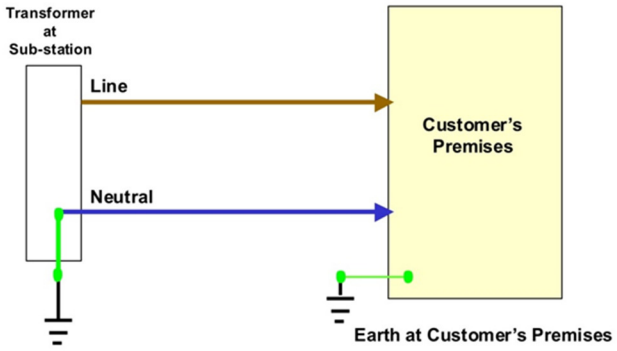


Fig 3 The TT Configuration

The neutral and earthing conductor must be separate throughout the installation because power distributor only provides the supply neutral for the connection to consumer.

The advantage of the TT system is that earth is free from externally induced high or low frequency noise. Another important advantage in special applications such as IT and radio communications, there is negligible risk in the case of a failure or break in the supply neutral conductor.

It is essential that a TT system incorporates an earth leakage (RCD) circuit breaker.

Why would I want a TT earth?

There are a number of ways that an earth can be provided for an electrical installation. Of the available types TN-S and TN-C-S, where your electricity supplier provides an earth, are by far the most common. The next most common category is the TT type. You will encounter this situation where the electricity supplier does not provide any connection to allow the installation to be earthed. If you are working on an electrical installation in an outbuilding it may not be appropriate or may even be dangerous to export the main earth.

In the case of an Amateur Radio shack where an RF and/or lightning earth are essential for safe operation it is desirable for a number of reasons to isolate the shack earth from the main earth.

One instance is where there is a break or high resistance in the incoming neutral conductor. Figure 4 illustrates how a neutral fault can cause high current to flow from other households via the shack earth system. It is also possible in a TN-C-S system for dangerous situation to occur where there can be a considerable potential difference (voltage) between the incoming main earth and the real mass earth.

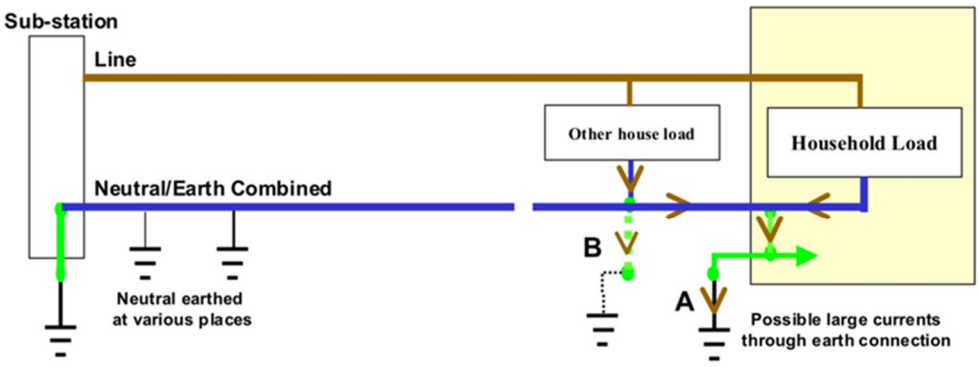


Fig 4 A Ruptured Neutral In a TN-C-S System

Because a TT earthing system will safeguard both lives and equipment it is important that a correctly designed system be installed. It should have:

- Its own earth leakage protection device.
- Low enough electrical resistance to earth to ensure correct operation of the circuit earth leakage device.
-
- Good repeatability, that is it should be able to carry fault currents repeatedly, and its performance should remain in spec all year round, irrespective of varying soil conditions.
- High resistance to corrosion
- Long life expectancy

Summary of the different systems

What system do I have?
The wiring code in South Africa is derived from the British system. The South African wiring code was originally written around standardisation on **TN-S** which means that this system is pervasive for systems installed there since 1960, reinforced by inspections.

Note that the code evolves continuously and many older or extended installations will have detail non-compliance in t he older portion. One important area is earthing due to the transition from steel to plastic conduits.

Electrical system	**TN-S**	**TT**	**IT**	**TN-C**	**TN-C-S**
Earth fault loop im-	Low	High	Highest	Low	Low
RCD	Yes	Yes	N/A	No	Yes
Need earth electrode	No	Yes	Yes	No	Yes
Risk from broken	High	No	No	Highest	High
Safety	Safest	Safe	Less Safe	Least Safe	Safe
Electromagnetic	Low	Least	Least	High	Low
Safety risks	Broken neutral	If earth imped-ance high, poor attenuation of	Double fault, overvoltage	Broken neu-tral	Broken neutral
Advantages	Safest	Safe and relia-ble	Continuity of operation, cost	Cost	Safety and cost

Practical implications for the radio amateur with a TN-S supply

First and foremost make sure it works on an on-going basis. It is not sufficient the press the test button on the RCD (Earth leakage relay) to see if it trips. Although this is a step in the right direction, it tells you nothing about compliance of wiring to the socket outlets. Purchase a tester like the illustration and test every socket outlet routinely once a year, and after interventions.

Your shack system should be earthed separately, without connecting that earth to the earth supplied to your

distribution board by the utility. The reason for this is that regardless whether you have a single phase or 3 phase supply, the neutral is earthed by the utility at the star point of the supply transformer and that earth is brought separately to your switchboard. Since the phases are rarely balanced, currents could flow between the earths, impairing the RCD function, and under fault conditions outside your system, the currents could be extreme.

It is prudent to equip the shack with an exclusive supply from a dedicated Circuit Breaker, MCB on the switchboard. While it is stated on page 1 that earthing is installed to avoid the risk of fire in electrical installation systems, it is not the sole means of protection. The MCB's are calibrated devices to trip at a predetermined current level. This is to cater for severe phase to neutral faults where there may be no earth leakage for example shorted turns on a transformer primary with a high likelihood of fire. A separate MCB allows the selection of a suitable lower current rating for the shack for example 10 amps rather than much higher levels for shared socket outlet circuits.

Your "Shack" earth should be distributed within the shack and equipment provided with an earth stud, or a wire to a suitable chassis point connected to it to prevent across the chest potentials when operating adjacent pieces of equipment. Some shorted sockets connected to this earth are effective parking bays for antenna plugs to continuously discharge static when not in use. So called Universal equipment will need an isolating transformer to do this.

Adopt safe operating practises and habits in the shack. Troubleshooting and home-brewing equipment greatly increases the risk of accidental contact shock over just operating commercial equipment. Some examples are:-

- Take voltage measurements with one hand immobilised eg in the pocket using clip-on probes.
- Remove metallic adornments from fingers and wrists when testing.
- Make a plug in fixture to safely measure mains voltage an input current to equipment.
- When making temporary connections to transformers for ratio testing, include an earth connection to the transformer frame and core.
- Convert older radios from 2 wire to 3 wire cables and connections. Use a plug where the earth pin is longer and engages before the phase and neutral such as the DIN plug.
- When using variacs and auto-transformers, before powering up, ensure the earth is continuous from input to output and that the neutral is the common rail, not the phase (otherwise your 110 volt radio will have 230 volts on it and the other lead 110V!). Primary and secondary fusing just above the rating is good fault clearing and fire prevention practise.
- Receiving a shock is accompanied by muscular responses which can be severe. Ensure the zone you occupy is sufficiently free from sharp, loose or heavy obstacles to avoid injury, especially behind you.

Last Word

Your earth system is provided for your safety and to protect your property. It is therefore important that any electrical work be undertaken by a properly qualified electrical contractor. Additional reference material is provided in the RSGB publications in the bibliography below.

A effective mains earth is not necessarily an effective RF earth. The construction and installation of an effective RF earth is a separate topic

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Earthing and the Radio Amateur - EMC07 Advanced Leaflet, Radio Society of Great Britain

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Get your backdated issues at
http://www.awasa.org.za/index.php/newsletters

Visit our Website:
www.awasa.org.za

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.

Notices:

Net Times and Frequencies (SAST):
Saturday 07:00 (05:00 UTC) —Western Cape SSB Net— 3.640; Every afternoon from 17:00—3.640
Saturday 08:30 (06:30 UTC)— National SSB Net— 7.125; Sandton repeater 145.700
Echolink—ZS0AWA-L; ZS6STN-R
Relay on 10.125; 5.380 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.
+27824484368

For Disposal:

Yaesu FT200

Heathkit HW100

Both radios as is. Were both working when last used. Courier for buyers account.
Make a Reasonable offer.

Contact Ronnie ZS5ABD, 0722376168….Ladysmith