Illawarra Amateur Radio Society

Propagator August 2026

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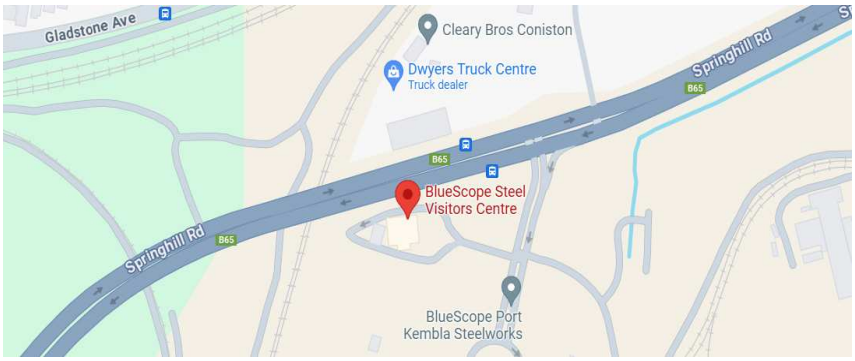
Upcoming Meeting on the 11th August 2026

The next meeting will be at the Blue Scope Steel visitors centre 7.30pm

Blue Scope Northgate entrance off Springhill Road (See website for detailed map)



VK2RUW (Knights Hill)
34.6231° S, 150.6942° E
QF55IJ

AMATEUR RADIO IN THE ILLAWARRA SINCE 1948

VK2RMP (Maddens Plains)
34°15'30.6"S 150°56'47.4"E
QF55LR

VK2AMW

Our last meeting 14th July 2026

APRS by Roger VK2VRK

It was a very informative presentation with some great visual stimulation.

Roger shared the vast features of APRS even sending family members SMS messages right to their phones. Yes, without a network through the magic of DIGIPEATERS!!!

Getting started on APRS is easy: Compatible radios start from as little as $100

There are many radios to choose from, with rogers personal favourite pictured on the **Right**

https://www.verotelecom.com/Products/VGC-VR-N76-Dual-Band-Ham-Radio-KISS-TNC-Bluetooth-APRS-Satellite-Tracking-p2511333.html

A video showing the radio and its capabilities: https://www.youtube.com/watch?v=4mQucwO8FJU

Highly recommended is the Bluetooth speaker microphone and an additional battery. Phone app programmable only! This radio can connect to your Phone any of the Bluetooth apps:

Please see all the links for all the information below :

Aprsdroid: https://play.google.com/store/search?q=aprsdroid&c=apps

Aprs.fi (paid subscription) https://play.google.com/store/search?q=aprs.fi&c=apps

Once a radio and app are in the mix basic settings to connect to the nearest iGATE or digipeater:

PATH WIDE 1-1,WIDE 2-1 is the most suitable setting for APRS which ensures that the signal is not digi-peated over too many stations, we need to be mindful that we do not clog up the network.

Beacon rate: 60 seconds minimum. Beacon rate for a fixed station is **60 MINUTES**

How paths work: https://blog.aprs.fi/2020/02/how-aprs-paths-work.html#:~:text=The%20APRS%20packet%20path%20is,asks%20how%20paths%20actually%20work.

Australia's APRS frequency is : 145.175Mhz Wideband (4.5Khz deviation)

Some other cool tools:

APRS to SMS: https://aprs.wiki/

APRS to wtts app: https://wtsapp.org/

A TNC that can be connected to a radio from our friends from Microsat in Poland:

https://microsat.com.pl/product_info.php?products_id=62&ceid2=daf58bc330de5888d50f232aa1b2eaeb

Highly recommended and ships to Australia.

More information:

https://how.aprs.works/\

Thanks Roger for the great presentation, roger will be more than happy to assist and advise on the APRS system. If you require more information, please contact the IARS.

As always there was the nice cuppa with biscuits waiting for you in reception, come along to the next meeting and enjoy.

See you all on the 11th August 2026 for the next meeting and our AGM

There was no Snowball this month, however all monies paid will be moved forward one month.

Come along next meeting and play the lucky Snowball!

For $5 you can earn some good cash, and all monies go to your society, win-win.

As usual see Simon VK2KU, the fella with the coloured balls and big smile

If you want a chance at winning some good cash money, don't forget to play SNOWBALL at the next meeting.

The Disposables Table

Great donations this month, box full of N connectors , High power SCR's for that crowbar project (previous IARS project see website) , battery chargers and lots more gadgets. Thanks to all that donated!

NEXT Meeting…….

Can you believe a whole year has flown by….again !!!!

It's that exciting time again for our Annual General Meeting! We're thrilled to gather and elect our fantastic committee for the year ahead, and we'd absolutely love for you to get involved.

Want to join the team?

While many of our current committee members are staying on board, all positions are open! It's a wonderful way to support the society.

How to get involved & vote:

- **Nominate:** Grab the form on the next page or via the IARS Website, or simply email iars.keithb@gmail.com secretary@iars.org.au to have them sent right to your inbox.

- **Vote:** Just double-check that your membership fees are up to date so you can cast your vote and throw your hat in the ring!

Once the elections wrap up, stick around for a brilliantly entertaining presentation by Barry VK2ADQ on the history of the AWA (Amalgamated Wireless Australasia) for those that don't know.

It's going to be a very interesting presentation, and we can't wait to see you there!

Want to know more?
iars.keithb@gmail.com or secretary@iars.org.au

ILLAWARRA AMATEUR RADIO SOCIETY (INC)
PO Box 1838, Wollongong NSW 2500
Web: www.iars.org.au Email: secretary@iars.org.au

NOMINATION FORM

Election of Office Bearers and Committee Members

I, _____
[must be current Illawarra Amateur Radio Society Member offering for a position or proposing a member for position as an officer.]

wish to nominate _____ Call sign _____
[name of candidate you wish to nominate or yourself]

for the position of *[please tick desired position]*

- ☐ President
- ☐ Vice President
- ☐ Secretary
- ☐ Treasurer
- ☐ Member of Committee

Signature of Proposer 1: _____ Call Sign _____ Date: _____
[am a current Illawarra Amateur Radio Society Member]

Signature of Proposer 2 ***(Optional)*** **:** _____ Call Sign _____ Date: _____
[am a current Illawarra Amateur Radio Society Member]

Consent of Candidate

I, _____ am willing to except the role if I am elected to this

position at the Annual General Meeting of the Illawarra Amateur Radio Society. I agree to be bound to the rules and constitution of the Illawarra Amateur Radio Society paying my best attention to the business of the Illawarra Amateur Radio Society during my term of 'office.'

Signature of candidate: _____ Date: _____

Membership fees

Hey everyone! Just a quick, friendly reminder that we still have a few membership fees outstanding. We would absolutely love to get everything squared away before our next meeting!

At just $25 for a normal membership and $20 for concessions, IARS is still one of the cheapest clubs around. That breaks down to about $2.20 per meeting—which is officially less than a cup of coffee. (And yes, I know you've heard me say that a million times before! 😊)

Thanks so much for helping us keep things running smoothly!

Your membership fees keep your club operational, please support your club.

All monies from our interest on investment, snowball earnings, donations and membership fees all go to support the club with **Public liability insurances**, **Repeater maintenance**, **Repeater site fees**, **Blue scope meeting hall rental**, **IARS call signs with the ACMA** (yes, we still must pay apparatus fees no class licence on repeaters) , **Coffee, tea & refreshments, Outings & picnics and Christmas dinners, and we all love our PIZZA!!**

Excellent value for money!!!!

We want to thank the members who have paid membership and the extra donations we received this year, much appreciated.

To make payments you could either pay John VK2EJL at the next meeting OR use the IARS bank account (info below),

Please add your call sign or name with the payment, thank you.
(else we don't know who's paid)

'Bank: IMB Wollongong
Account name: Illawarra Amateur Radio Society
BSB: 641800
Account number: 100023291

The IARS Flying Gang

The Flying Gang is a volunteer team to support IARS members who are unable to install or repair their antenna systems due to age, injury, or other limitations.

Many members are finding it increasingly difficult to stay active on the air—especially when antennas are damaged by storms or when new systems need to be installed.

If you need assistance, simply reach out to the team using the email addresses listed below. We'll coordinate with you to provide the help you need.

The flying gang team members, please REACH OUT to anyone of the team below.

Simon VK2XQX, Simon VK2KU, Keith VK2KQB, Adam VK2AEV, Phil VK2CPH, Tony VK2TS, Bruce VK2ZPN and last but not least Mal VK2DXM

Or contact us using any one of the emails below.

iars.keithb@gmail.com ; iars.simonr@gmail.com ; simon.ferrie3@det.nsw.edu.au

Other contacts like phone numbers are on the club website at https://www.iars.org.au/?page_id=29

Licensing and upgrades?

The IARS **can help** with obtaining your Foundation, upgrading to Standard or Advanced from *the comfort of your own home,* and its FREE!!! *

We have approved **ACMA** accessors that can offer remote or face to face assessments for the **ACMA**

Please contact Keith VK2KQB at iars.keithb@gmail.com for further information on training and assessments.

Your society supports further learning, please find out more on how we can help you.

The IARS helping Amateur Radio grow in Australia

This year the IARS has assisted 6 new amateur radio enthusiasts to get their licence

Australian Government | acma Australian Communications and Media Authority

ACMA NEWS and MORE!!

ACMA - New RRL goes live from 10 June 2026

Date : 10 / 06 / 2026

Author : WIA Board

ACMA - New RRL goes live from 10 June 2026. From the 10th June 2026 the ACMA will go live with its new Register of Radiocommunications Licences (RRL) - this is following a month trialling their new RRL interface.

The WIA keeping you informed https://www.wia.org.au/newsevents/news/2026/20260610-1/index.php

If you would like to find out more about amateur radio upgrades, here are some handy links to help.

https://www.acma.gov.au/qualifications-operate-amateur-radio
https://www.acma.gov.au/amateur-radio-resources
https://www.acma.gov.au/amateur-radio-accredited-assessors
https://www.acma.gov.au/amateur-radio-licences
https://www.acma.gov.au/technical-details-amateur-radio-licences
https://www.acma.gov.au/amateur-radio-operating-procedures
https://www.acma.gov.au/amateur-radio-call-signs
https://www.acma.gov.au/amateur-class-licence
https://www.acma.gov.au/amateur-radio-related-fees

IARS NETS

1. Saturday Morning, the EAST COAST NET hosted by Steve VK2BGL at 9.30am

You are invited to join Steve every **Saturday at 9.30am** on our **146.850MHz** repeater (linked to 146.675MHz) or **VK2BGL-R** on Echo-link for a very enjoyable morning of general discussions from amateurs who log in from all over the world. This NET is linked to multiple repeater systems including VK2RFS south coast.
Join Steve and everyone for a very enjoyable 2 hours on Saturday morning.

The IARS would also like to thank Doug VK2XLJ and Angelo, VK2NWT who are is always willing to assist whilst Steve is away.

2. NEW NET Yes we have a NET IARS net on 2m , 144.150MHz USB on Monday Evenings from 8pm. Chairman Phil VK2CPH will be your host.

3. **IARS Tuesday evening weekly 80m NET on 3.666MHz at 8.30pm hosted by Mal VK2DXM using VK2AMW.**
Every Tuesday evening, (expect the second Tuesday of the month) for a great get together on 80m. Signal reports, news and general discussions are the agenda. Normally runs for around 60minutes.

4. **IARS Wednesday evening weekly 6m NET, 8pm Maddens plains 6m Repeater on 53.650Mhz with a – 1Mhz offset. 123Hz CTCS tone enabled due to interference**
Hosted by Chris VK2CDB and Simon VK2XQX, (While Geri VK2UTE is unavailable)
General discussions about building antennas for 6m, transceivers and what else comes to mind, this net is normally between 30 and 60minutes.

5. **IARS Thursday evening weekly 10m NET, 8PM on 28.466Mhz +/- for QRM/QRN Hosted by Tony VK2TS**
General discussions about building antennas for 10m, transceivers and what else comes to mind, this net is normally between 30 and 60minutes.

6. **IARS Friday evening weekly 70cm NET , 8PM on 439.675MHz ** with – 7MHz offset (No CTCSS required) Hosted by Rob VK2XIC**
General discussions keeping the repeaters in work, ***"If we don't use it, we may lose it "***

IARS REPEATERS

VK2RUW (Knights Hill) VK2RMP (Maddens Plains)

146.675 MHZ >>>>> *linked* <<<<< 146.850 MHZ

Current Repeater STATUS

- **439.675 with a – 7MHz offset, C4FM Enabled. OK – On Air *****
- **147.275 with a + 600kHz offset NO CTCSS, C4FM enabled OK – On Air *****
- **146.850 with a – 600kHz offset (linked to 146.675) NO CTCSS OK– On Air****
- **146.675 with a – 600kHz offset (at Knights Hill, linked to 146.850) NO CTCSS OK– On Air**
- **53.650Mhz with a – 1Mhz offset (123Hz CTCSS tone enabled due to interference) OK– On Air *****
- **438.725Mhz with a -5mHZ offset DMR only, OK – On Air**
- **1296.850Mhz Experimental Beacon/Simplex repeater, Maddens Plains OK – On Air ***
- **Echo-link VK2MT-R via 146.850MHz also linked to 146.675MHz and VK2BGL-L OK**
- **APRS DIGI-PEATER on 145.175MHz OK– On Air**
- **PACKET 2M on 147.575Mhz Temporarily off air**

The IARS welcomes any feedback on our repeater systems.

Please send all your feedback to iars.keithb@gmail.com and it will be passed on to our repeater team.

If the repeaters are silent, why not just give out a call, who knows who may be on the other end of the tower.

Latest Repeater Report:

* Note, this will be changing to 1.293 800 GHz Simplex soon, however, plans are in place for it to become a Full Duplex repeater system. The equipment has been sourced and should be ready before the end of the year if all goes to plan.

** **146.850MHz repeater (which is 146.250MHz RX)** at Maddens Plains is operating off a temporary antenna until the main dipole is repaired/replaced. We are in talks with an authorised tower maintenance team to carry out the works.
Please advise if you are having signal difficulties, include your location with a grid square.

*** After the huge windstorms we recently had the Tri-Band antenna number 3, which is 67meters up Maddens Plains tower is leaning at 45degrees with the underneath pointing to Wollongong, therefore all signals into Wollongong will be affected until this is rectified. (This will most likely be carried out at the same time as item ** previous

Repairs were carried out by Simon VK2XQX and Keith VK2KQB to the 147.275MHz repeater that went off air on the 16th of June and was put back on air the 27th June, not bad service ☺
Knights Hill Low Audio Link to Maddens was resolved on Sunday the 19th July. Simon VK2KU and Keith VK2KQB operated at the site with Tony VK2TS and Bruce VK2ZPN offering assistance with comms, thanks guys!

LOOKING FOR SOMETHING to SWAP, BUY, SELL, an OLD PART

Parts you may need for repairs or some radio gear you no longer need that could go to a new home…….?
Email iars.keithb@gmail.com

Electronic component and service suppliers

JLCPCB **https://jlcpcb.com**

element14 AN AVNET COMPANY https://au.element14.com

RS https://au.rs-online.com/web/

MOUSER ELECTRONICS https://au.mouser.com

DigiKey https://www.digikey.com.au

Minikits https://www.minikits.com.au

core ELECTRONICS https://core-electronics.com.au

Elite Communications & Electronics https://www.elitecommunications.com.au

Little Bird Electronics https://littlebirdelectronics.com.au

ATR Amateur Transreceiver Radio Supplies **https://amateurradiosupplies.com.au**

BNCom Australia. https://bncom.com.au

VK RADIO **YAESU Sales and repairs** https://www.vkradio.com.au

DXing https://dxing.com.au

TELCO ANTENNAS https://www.telcoantennas.com.au

ALTRONICS **https://www.altronics.com.au**

jaycar **https://www.jaycar.com.au**

TWR Technology ICOM agent **carlo.twr@gmail.com**

Radio Communications Equipment Supply, Service including radio and antenna installations, support local Wollongong business

If you know of a good supplier of electronic stuff or services 😊, please share it with us so we can all benefit.

Send information to iars.keithb@gmail.com and we will publish it in the next propagator

Share it with us, this could be suggestions, technical ideas, circuit diagrams, IARS community projects, pictures of your latest shack project, in fact

ANYTHING of interest

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Station Earthing:

Safety, RF Performance, and Lightning Protection

Earthing is the foundation of a safe, high-performing amateur radio station. A single, comprehensive grounding system serves three distinct purposes, each with its own physical requirements.

The Three Pillars of Earthing

- **Electrical Safety (AC Grounding):** Protects life by tripping breakers during equipment faults.
- **RF Grounding:** Eliminates stray RF in the shack, cures "hot lips" microphone burns, and stabilizes antenna radiation patterns.
- **Lightning Protection:** Diverts massive surge currents directly into the earth before they enter the building.

The Danger of Separate Ground Rods (The Number One Mistake)

(Lets get some old wives tales eliminated from the start 😉)

Many amateurs drive a dedicated ground rod outside the shack window and connect their radio gear ***only*** to that rod.

This creates a lethal hazard.

Why Separate Grounds Fail

- **Potential Difference:** During a nearby lightning strike or AC fault, the soil potential between the main household electrical earth and the shack earth can rise to thousands of Volts.
- **The Human Bridge:** Your equipment chassis, coaxial shields, and computer cables bridge these two separate ground systems. You or your expensive gear become the fuse.
- **The Solution:** Every ground rod driven for the radio station **must** be bonded back to the main household electrical consumer earth terminal using heavy-gauge copper conductors.

Designing the Ultimate Earthing System

To achieve low impedance for both DC faults and high-frequency RF, you must use a single-point grounding architecture.

1. The Equipment Layer

At the operating bench, every individual device sits at the top of the chain. This includes your:

- HF Transceiver
- Linear Amplifier
- Power Supply
- Station Computer or Accessories

2. The Shack Busbar (The First Collection Point)

Directly behind the operating bench runs a heavy, Multipole Brass Earthing BAR, solid copper pipe or wide copper strap.

- Every piece of equipment listed in the first layer connects to this single busbar using its own short, **independent**, heavy-gauge wire.
- **Important:** These equipment grounds are run in parallel. They are never daisy-chained from one radio into another.

3. The Single-Point Ground Panel (SPGP)

A heavy copper strap drops down from the bench busbar to a solid copper utility panel mounted where your cables enter the building.

- This panel acts as the absolute gatekeeper for the shack.
- Every incoming coaxial cable from your antennas passes through this panel and connects to a gas-discharge lightning surge arrestor.
- The surge arrestors are bolted directly to this copper panel, ensuring a metal-on-metal connection.

4. The External Earth Matrix

From the outside face of the Single-Point Ground Panel, a heavy copper strap passes straight through the wall and drops down to the external earthing hardware. This consists of:

- A dedicated shack ground rod driven directly outside the entry point.
- A continuous, heavy copper bonding conductor that runs underground from this shack rod all the way to the house's main **Power Earth Electrode** (the main switchboard ground).

By structuring the station this way, all equipment rises and falls at the exact same electrical potential during a surge, preventing dangerous high-voltage loops from forming across your gear.

NB: Under Australian state and territory electrical safety laws, any physical connection to the premises' fixed electrical wiring—including the **main earth electrode, earth neutral (MEN) link, or the main switchboard earth bar**—is legally classified as **electrical installation work and you will need to get a licenced electrician to do this connection to the main earth.**

If you think "too expensive", lets enlighten you

Economics = electrician cost ($200-300) vs

No earth = (New radio and equipment costs > $1000) Life = Priceless

Understanding the Physics

- **Touch Potential:** The voltage difference between an earthed metallic object (like a tower leg) and the ground your feet are standing on. If lightning strikes the tower, touching it will shock or kill you.
- **Step Potential:** The voltage difference between your feet as you walk near a ground rod dissipating a surge. Because the voltage drops off rapidly with distance from the rod, one foot can be at a much higher voltage than the other, driving current up one leg and down the other.
- **Mitigation:** Bury a perimeter ground loop around towers. Cover the surface area around ground rods with high-resistance material like crushed rock or asphalt to insulate human feet.

Core Protection Strategies

- **Gas Discharge Tubes (GDT):** Install coaxial surge protectors on your feedlines. They short the centre conductor to ground when voltage exceeds safe limits.
- **The 90-Degree Rule:** Keep grounding conductors straight. Lightning hates sharp bends. A 90-degree turn presents high inductance to a fast-rising pulse, causing the energy to arc off the wire.
- **Data Line Protection:** Unprotected rotator control wires, ethernet cables, and DC lines will carry surges straight to your rig. Use varistors (MOVs) and bypass capacitors on all control lines at the entry panel.

Soil Resistance (Dwight's Formula)

The resistance (R) of a single vertical ground rod of length (L) and radius (a) in soil with resistivity (ρ) is calculated as:

$$R = \frac{\rho}{2\pi L}\left[\ln\left(\frac{4L}{a}\right) - 1\right]$$

Practical Example

- Let soil resistivity ρ = 100 Ω·m (average moist soil).
- Rod length L = 2.4 m.
- Rod radius a = 0.008 m (16 mm diameter rod).

Result: ≈ 33.7 Ω.

Takeaway: A single rod rarely achieves the ideal lightning target of under 10 Ω. You must place multiple bonded rods in parallel to lower the system resistance.

Inductive Reactance of Ground Wires (XL)

$$X_L = 2\pi f L_{\text{inductance}}$$

A straight 3-metre wire has roughly 4.5 µH of inductance.

- At 1 MHz: XL = 2 * 3.14 * 1,000,000 * 0.0000045 is approx 28.3 Ohms
- If lightning delivers a modest 10,000 A surge down that wire, the voltage drop across just that 3-metre piece of wire is:

10000 Amps * 28.3 Ohms is 283,000Volts

- **Takeaway:** Keep ground leads as short and wide as possible. Use wide copper strap instead of round wire to drastically lower inductance.

The Multimeter Illusion

When you test your station ground with a standard digital multimeter (DMM), you might see a beautiful, low reading like **0.5 Ohms**. This reading creates a false sense of security. It tells you your DC path is fine, but it tells you absolutely nothing about how your system will handle RF energy or a lightning strike.

Why the Multimeter Lies to You

A multimeter measures resistance by sending a tiny, steady **Direct Current (DC)** through the wire. At DC, electricity flows uniformly through the entire cross-section of the wire, and the wire behaves as a pure resistor.

However, lightning surges and radio frequencies (RF) are **Alternating Current (AC)** signals:

- **The Lightning Pulse:** A lightning strike is a massive transient pulse with an incredibly steep wave front. Mathematically, this fast rise time gives the pulse an equivalent frequency spectrum peaking around **1 MHz**.
- **The Amateur Radio Signal:** Your transmitter generates signals from **1.8 MHz up to 430 MHz** or higher.

At these frequencies, two hidden physics principles completely change how your grounding wire behaves: **Skin Effect** and **Inductive Reactance**.

The Skin Effect (Surface Area vs. Cross-Section, this was covered in a previous propagator)

As frequency rises, the magnetic fields inside the conductor force the moving electrons outward toward the outer edge of the wire.

At DC: The multimeter uses 100% of the copper wire. Resistance is incredibly low.

- **At 1 MHz (Lightning):** The current only travels in the top **0.06 mm** (the skin depth) of the copper.
- **At 28 MHz (10m Band):** The current only travels in the top **0.01 mm** of the copper.

Because the electricity is forced into a microscopic thin layer on the outside of the conductor, the usable area of the copper drops dramatically. This causes the actual resistance of a round wire to skyrocket at high frequencies compared to what your multimeter measured at DC. This is why flat copper strap is vastly superior; it maximizes surface area where the skin effect takes place. If you don't have flat copper strap, then you can use multiple stranded core conductors to reduce the skin effect. This can add up to the total cross-sectional area you need.

Inductive Reactance (The Real Impedance Enemy)

Every wire, no matter how thick, possesses a small amount of self-inductance. At DC, inductance is invisible (0 Ohms of reactance). But to a high-frequency RF signal or a fast lightning pulse, a straight wire acts like an electronic choke or inductor.

The formula for total opposition to AC flow (Impedance, or Z) is:

$$Z = \sqrt{R^2 + X_L^2}$$

If you have a 4-metre wire running from your shack window down to your earth rod, it will have a DC resistance R of about **0.005 Ohms** on your multimeter. However, that same 4-metre straight wire has roughly **6 microhenries (µH)** of inductance.

Signal Type	Frequency	Impedance (Z)
Multimeter Test	0.00 MHz	0.01 Ohms
Lightning Equivalent	1.00 MHz	37.70 Ohms
80m Band	3.50 MHz	131.95 Ohms
10m Band	28.00 MHz	1055.58 Ohms

The Takeaway

The "To Do" and "Not To Do" Checklist

To Do

- **Do** bond your shack ground system to the main household electrical utility earth. (note electrician required)
- **Do** use wide copper strap (0.5 mm thick, 50 mm wide) for RF and lightning paths. (or multiple core conductors with the same area)
- **Do** scrape away paint from equipment chassis and use star washers for a biting mechanical bite.
- **Do** apply anti-oxidant joint compound (like Penetrox or copper grease) to all outdoor mechanical connections.
- **Do** disconnect antenna feeds completely and park them outside the house during severe storms.

Not To Do

- **Don't** use braided wire shields (like old coax braid) outdoors; they rot, hold moisture, and oxidize quickly.
- **Don't** use sharp 90-degree bends in ground wires; keep all paths sweeping and gradual.
- **Don't** daisy-chain your equipment ground wires (Rig A to Rig B, then to ground). Run separate wires to a central bar.
- **Don't** rely on a water pipe as your primary station ground; modern plumbing often switches to plastic PEX pipe underground.

AS/NZS 3000 Electrical Compliance (The Australian Rules)

In Australia, any earthing modifications or additions you make to your shack must strictly align with **AS/NZS 3000** (the Wiring Rules). You cannot bypass the main electrical safety system of your home.

Clause 5.6: Bonding of Earthing Systems

- **The Rule:** AS/NZS 3000 mandates that all independent earth electrodes driven for functional purposes (such as an amateur radio communications earth) **must** be bonded to the main electrical installation earth.
- **Conductor Size:** The bonding conductor connecting your shack earth rod to the main household earth must be a minimum of **6 mm²** copper wire, enclosed in heavy-duty conduit if exposed to physical damage.
- **Why it matters:** If an electrical fault occurs in your HF amplifier, the fault current must have a low-impedance path straight back to the main switchboard to instantly trip the Residual Current Device (RCD) or circuit breaker. If your shack ground rod is isolated, the high resistance of the dry earth won't pass enough current to trip the breaker. Your equipment chassis will simply remain energized at 230V AC, waiting to electrocute anyone who touches it.

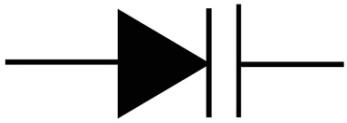
The Legal and Regulatory Boundary

- **Inside the Shack (Your Domain):** As an amateur radio operator, you are legally permitted to build your shack's single-point ground panel, run your copper busbars, and bond your radios, linear amplifiers, and coaxial shields together. This is considered low-voltage functional/signal earthing.
- **Crossing into the Fixed Wiring (The Electrician's Domain):** The moment a wire or strap must physically attach to the home's main structural earth electrode (the copper rod in the ground outside by the meter box) or the switchboard's earth bar, it becomes a **protective earthing/equipotential bonding installation**.
- **The Law:** Under **AS/NZS 3000 (Clause 5.6)** and local state acts (such as the NSW Home Building Act or the Queensland Electrical Safety Act), this connection *must* be completed, tested, and verified by a **licensed electrical contractor**.
- **Do the Prep Work Yourself.** Drive your external shack ground rods, mount your copper entry panel, and run your larger than 6 mm² green/yellow grounding cable from the shack right up to the location of the main household earth stake. Leave it unattached.
- **Call a Sparky for the Final Termination.** Hire a licensed electrician for a brief, 30-minute job. Ask them to inspect your run, use an AS/NZS 3000-compliant heavy-duty line tap or crimp tool to physically bond your station wire to the main earth electrode, and test the loop impedance to ensure it safely trips household circuit breakers under fault conditions.

This keeps the amateur completely legal, ensures the station is safe from lightning potentials, and guarantees that household insurance remains intact.

Happy earthing 😊

BACK TO BASICS



Varicap diodes, probably used one today without knowing, very old technology but, are they still used?

A varicap diode (also known as a varactor diode, tuning diode, or variable capacitance diode) is a specialized semiconductor device designed to act as a voltage-controlled variable capacitor. Unlike standard diodes that optimize rectification, varicaps exploit the variable capacitance of a reverse-biased P-N junction. They revolutionized electronics by replacing bulky mechanical tuning capacitors with compact, solid-state electronic tuning. A varicap diode is a solid-state semiconductor device that operates exclusively under reverse-bias conditions.

Key Attributes

Functional Identity: It acts as a voltage-dependent capacitor.

Circuit Symbol: It is represented as a standard diode symbol merged with a capacitor symbol, emphasizing its dual nature.

Primary Mechanism: Changing the reverse-bias voltage directly alters its internal capacitance value.

Optimization: While all P-N junctions exhibit depletion capacitance, varicaps are structurally optimized to maximize this capacitance range, ensure high quality factor (Q), and minimize series resistance.

Historical Timeline and First Use

The concept of variable junction capacitance emerged alongside early semiconductor research, but its intentional commercialization transformed RF design in the mid-20th century.

[1940s-1950s] Early Observations of Junction Capacitance, [1953] Patented by Jerome Hammer (Pacific Semiconductors) [1958] First Trademarked as "Varicap" / Broad Commercial Adoption Begins

Early Discovery (1940s–1950s): Engineers at Bell Labs and other institutions noticed that the capacitance of point-contact and junction diodes shifted with voltage.

The Patent (1953): Jerome Hammer of Pacific Semiconductors filed a patent for a voltage-variable capacitor in 1953, which laid the groundwork for intentional fabrication.

First Commercialization & Coining (1958): Pacific Semiconductors trademarked the name "Varicap" in 1958. Simultaneously, TRW Semiconductors introduced them to the market. Another common term, "Varactor" (Variable Reactor), was coined shortly after by Bell Labs engineers.

Their first major architectural deployment occurred in late-1950s and 1960s military radar systems, followed rapidly by consumer television and radio electronic tuners.

Direct Comparison: Abrupt vs. Hyper-Abrupt Varicaps

Feature	Abrupt Junction Varicap	Hyper-Abrupt Junction Varicap
Doping Profile	Uniformly distributed impurities across the junction.	Non-uniform, highly concentrated doping near the junction.
Capacitance Change	Changes slowly and linearly with voltage changes.	Changes rapidly and drastically at low voltages.
Tuning Range	Narrower capacitance tuning ratio (typically 2:1 to 4:1).	Exceptionally wide tuning ratio (up to 10:1 or more).
Quality Factor (Q)	High Q factor, low signal loss at microwave frequencies.	Lower Q factor due to higher series resistance.
Primary Use Cases	High-frequency microwave filters, multipliers, low-noise oscillators.	AM/FM radio tuners, wideband Voltage-Controlled Oscillators (VCOs).

Relevance Today:

Microwave Ultra-High Frequencies (UHF/SHF): At gigahertz frequencies, discrete varicaps or varicaps integrated onto Gallium Arsenide (GaAs) / Silicon Germanium (SiGe) dies offer superior phase noise profiles and power handling compared to fully digital synthesis.

- **Analog Precision**: They provide continuous, smooth, analogue tuning without the quantization noise or discrete steps introduces by digital switched-capacitor arrays.
- **Voltage-Controlled Oscillators (VCOs)**: Found inside phase-locked loops (PLLs) for local oscillators in cellular base stations, satellite communications, and aerospace radar.
- **RF Filters and Phase Shifters**: Used in adaptive antenna arrays and beamforming networks for 5G/6G communication infrastructure.
- **High-Frequency Frequency Multipliers**: Used in microwave and millimeter-wave transmitters to step up signal frequencies efficiently.

Handy On Line Calculators

Send us your favourite handy calculator link so we can post it here!

Skin Depth Calculator https://www.omnicalculator.com/physics/skin-depth

Ladder line calculator www.smrcc.org.uk/tools/OpenWire.htm

Cavity Filter designer https://www.changpuak.ch/electronics/Coaxial_Tank_VHF_Filter_Designer.php

Cavity resonance calculator https://learnemc.com/ext/calculators/cavity_resonance/index.html

COAX LOSS Calculator https://kv5r.com/ham-radio/coax-loss-calculator/

Impedance ….. https://www.omnicalculator.com/physics/rlc-impedance

Wavelength …. https://www.omnicalculator.com/physics/wavelength

PI attenuator values …… https://www.omnicalculator.com/other/pi-attenuator

Xc …… https://www.omnicalculator.com/physics/capacitive-reactance

XL …… https://www.omnicalculator.com/physics/inductive-reactance

Cut Off ….. https://www.omnicalculator.com/physics/cutoff-frequency

VSWR …… https://www.omnicalculator.com/physics/vswr-voltage-standing-wave-ratio

LM317 Regulator resistor selector ….. https://www.omnicalculator.com/other/lm317

Resistor Colour code calculator….. https://www.digikey.com.au/en/resources/conversion-calculators/conversion-calculator-resistor-color-code

Resistor Heat rise ……. https://calculator.academy/resistor-heat-calculator/

Volt Drop Calculator AC and DC …….. https://www.rapidtables.com/calc/wire/voltage-drop-calculator.html

Helix antenna calculator ……. https://sgcderek.github.io/tools/helix-calc.html

Parabolic dish calculator ……. https://www.everythingrf.com/rf-calculators/parabolic-reflector-antenna-gain

We are looking for more handy on-line calculators, if you have one that isn't listed above, please share with us so that more amateur radio enthusiasts can benefit ☺

OR

If you have any links to handy hints or information, please send it to us!

How many of these can you still answer correctly?

Question 1. What would the approximate sine angle of the waveform be if the peak voltage was 17Volts and the instantaneous voltage was 12Volts.

(a) 92°
(b) 15°
(c) 45°
(d) 33°

Question 2. The bipolar transistor circuit configuration used to match high impedance to low impedance is the:

(a) emitter follower
(b) common base
(c) common emitter
(d) common source

Question 3. In a full-wave bridge rectifier, the peak inverse voltage rating of each of the four diodes must be:

(a) low to ensure long life
(b) rated at half the alternating voltage across the transformer secondary
(c) equal to or exceed the rms value of the secondary voltage
(d) more than 1.4 times the rms value of the secondary voltage

Question 4. A common collector (also called emitter follower) transistor amplifier has a voltage gain of:

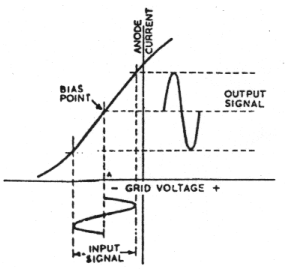
(a) less than one
(b) greater than one
(c) greater than 20
(d) greater than 100

Question 5. The bandwidth of an amplitude modulated signal is determined by the:

(a) amplitude of the modulating audio
(b) frequency of the modulating audio
(c) microphone gain control
(d) deviation gain control

Question 6. This characteristic curve is that of a class:

(a) A amplifier
(b) B amplifier
(c) C amplifier
(d) AB amplifier



Answers next propagator ☺

Answers to the last propagator questions … Q1 = b; Q2 = a; Q3 = a; Q4 = c; Q5 = c ; Q6 = b

How well did you do, will you still pass the Amateur Radio test?

OLD PROPAGATOR MEMORIES

The Propagator

CLUB CALL VK2AMW
VOLUME 08/06 ISSUED AUGUST, 2006
NOW PRINTED MONTHLY
WORTH MORE THAN BANANAS
MEETINGS HELD SECOND TUESDAY OF EACH MONTH (EXCEPT JANUARY).
INDUSTRY WORLD VISITORS CENTRE, SPRINGHILL ROAD, CONISISON
THE PROPAGATOR IS THE OFFICIAL NEWSLETTER OF ILLAWARRA AMATEUR RADIO SOCIETY INC.
PO BOX 1838 WOLLONGONG 2500.
WEB PAGE - WWW.IARS.ORG.AU
E-MAIL- SECRETARY@IARS.ORG.AU
EDITOR- MAEVA BENNETT VK2HUG

Club Broadcasts for 2006 – Each Tuesday, except Meeting night, at 7.30 pm with Geoff, Jack and Peter

EDITORIAL

Surprise – this issue is on time! Well, almost!

I hope you find this issue interesting and informative and that you get a smile. Apologies to Bob VK2 WRJ, but I think he will enjoy the cartoon on the last page. I spend quite a lot of time surfing the net to find interesting bit for the magazine, if you have any good sites, please let me know.

Thank you for your patience over the past few months, to Michael for his patience and immediate action to post the Propagator to the web and to those who have sent articles for the magazine.

Maeva Bennett
VK2HUG
Editor.

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***Canteen.** Peter Reid VK2HPR.*

***Web Master.** Michael Eckardt VK4GNV*

Notice Of Illawarra Amateur Radio Society Inc 2006 Annual General Meeting

To be held on Tuesday 8th August upon the completion of our August Monthly meeting at our Club Meeting Rooms at Industry World Visitors Centre, Springhill Road, Coniston.
At this meeting Committee Reports will be tabled for 2005-6, a full yearly financial report and the election of Public Officers.
If any member wishes to bring any item to the attention of members at the AGM, please notify the Secretary in writing of you intention so that it can be added to the agenda for the meeting. Items for inclusion will not be accepted from the floor at the AGM.

An Easy Dual-Band VHF/UHF Antenna

Why settle for the performance your rubber duck offers? Build this portable J-pole and boost your signal for next to nothing!

You've just opened the box that contains your new H-T and you're eager to get on the air. But the *rubber duck* antenna that came with your radio is not working well. Sometimes you can't reach the local repeater. And even when you can, your buddies tell you that your signal is noisy.

If you have 20 minutes to spare, why not build a low-cost *J-pole* antenna that's guaranteed to outperform your rubber duck? My design is a dual-band J-pole. If you own a 2-meter/70-cm H-T, this antenna will improve your signal on *both* bands.

Hams throughout the world have built and used J-pole antennas for years. My design is simple, lends itself to experimentation and alternative construction techniques, and has the following features.

- A 1.7:1 SWR or better throughout most of the 2-meter band and less than 2:1 across the 70-cm band.
- Easy set up. You can put it on the air in a matter of seconds, or store it in a space no larger than a small paperback book.
- Simple construction. The entire antenna system can be built in less than 30 minutes using TV twin lead and coaxial cable.

All of the SWR data in this article was measured at the transmitter end of the feed line. The reference impedance is 50 Ω, since most equipment is designed for this impedance.

J-Pole Antenna Theory

The J-pole is a vertically polarized antenna with two elements: the radiator and the matching stub. Although the antenna's radiator and stub are ½ wavelength and ¼ wavelength, respectively, it operates as an end-fed half-wave antenna. Here's how you determine the lengths of the J-pole's two elements:

$$L_{1/2} = \frac{8856 \times V}{f}$$

$$L_{1/4} = \frac{2952 \times V}{f}$$

where:

$L_{1/2}$ = the length of the ½-wavelength radiator in inches

$L_{1/4}$ = the length of the ¼-wavelength stub in inches

V = the velocity factor of the TV twin lead

f = the design frequency in MHz

These equations are more straightforward than they look. Just plug in the numbers and go. My design assumes that 146 MHz is the center frequency on the 2-meter band. You may, of course, substitute a center frequency of your choice. Even though the antenna is designed using a 2-meter center frequency, it also works well on 70 cm—as you'll see later.

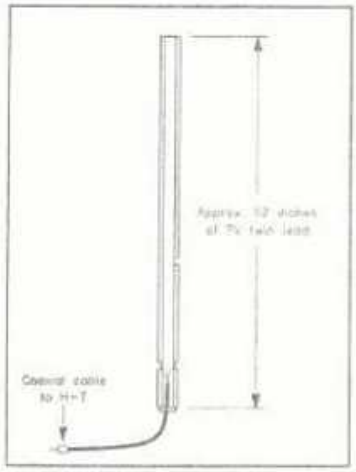

Figure 1—The J-pole antenna is approximately 52 inches long and may be hung from just about anywhere.

Don't let the *velocity factor* throw you. The concept is easy to understand. Put simply, the time required for a signal to travel down a length of wire is *longer* than the time required for the same signal to travel the same distance in free space. This delay—the velocity factor—is expressed in terms of the speed of light, either as a percentage or a decimal fraction. Knowing the velocity factor is important when you're building antennas and working with

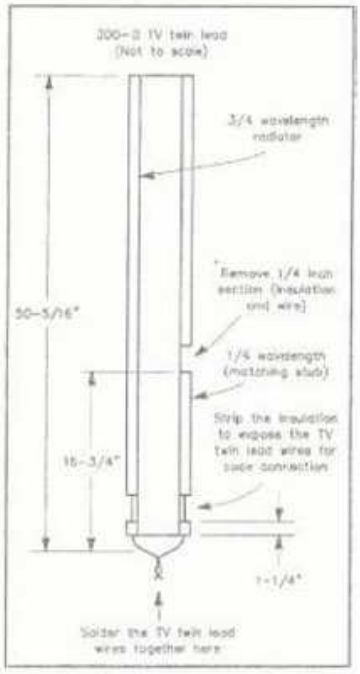

Figure 2—The basic J-pole layout. Note the areas where insulation and/or wire must be removed.

Will share more oldies next month.

To read more information about this old propagator and others, use this link

https://www.iars.org.au/wp-content/uploads/2020/09/2006-08-August.pdf

Ted VK2ARA is officially retiring from amateur radio after decades of dedicated service as one of the Illawarra's most iconic operators.

How do we begin to describe the massive impact Ted has had on our radio community?

For years, alongside Brian (VK2AH), Ted has been the welcoming gateway to our hobby. He personally assessed my own Amateur Radio Certificate of Proficiency, and he has literally done the same for hundreds of other operators across the region. Plus, how many amateur radio members still have one of Ted's special hand-crafted knives in their kitchen drawer? 😊

Recently, Ted reached out to share the news that every amateur dreads hearing: he is stepping down. Due to his wife's current illness and his own personal health struggles, Ted has reached this difficult crossroads. He has asked to share a short letter with all our club members, which you can read below.

Anyone who knows Ted will surely feel a deep sense of loss reading it. He has been a brilliant mentor with more radio knowledge than anyone else I know, and a true friend who always had a solution to any problem—complete with a hot kettle and a packet of biscuits in his famous shack. "Those were the days, my friend."

We wish Ted and his wife all the absolute best moving forward, and we are all hoping for a steady improvement in their health.

On behalf of all of us in Wollongong, thank you for everything, Ted.

From Ted ………………………

"On my behalf can you please thank the members for their support over the past 28 years.

We did not always agree but we all tried to support our hobby as we saw it.

I am closing down radio as you know, but also heavy leatherwork, blade smithing , knives and coins.

I have a massive collection of large and small hand and power tools.

If anyone is interested in suffering an hour of my company, in the chance of finding that special item, they are welcome to ring me on 42729521 and arrange a mutually suitable visit.

They may need to bring a trailer or UTE, not just a shopping bag.

Bring your own coin change.

Thank You All !

>><<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

Update from John VK2AAL (Nursing home in Punchbowl Sydney)

John sends his warmest regards and a big hello to everyone from his retirement home! We are thrilled to share that his health is on the mend after a few hiccups, and he is feeling much better. He wants us all to know that he is keeping our club family close in his thoughts. John is looking forward to jumping back on air and hopefully having a chat and catching up with everyone just as soon as he is back to full strength.

Let's all send some great energy right back to him!

(If anyone would like to persoanlly visit John, please reach out to us and we can send you the details)

News & Upcoming contests

Remembrance Day Contest

Next contest 15th & 16th August 2026

Contest Manager

Alan Shannon VK4SN
vk4sn@wia.org.au

Changes in 2025:
1. The manager will provide awards for the top 3 Youth entries.

Remember to send in team nominations before contest start

Contest Introduction

This contest commemorates the Amateurs who died during World War II and is designed to encourage friendly participation and help improve the operating skills of participants. It is held on the weekend closest to the 15th August, the date on which hostilities ceased in the southwest Pacific area.

More Information https://www.wia.org.au/members/contests/rdcontest/

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International Lighthouse Lightship Weekend - ILLW

Normally held on the 3rd full weekend in August

This year: 00.01 UTC 15th August to 24.00 UTC 16th August 2026 (48 hours)

Next year 00.01 UTC 21st August to 24.00 22nd August 2027 (48 hours)

For More information please see https://www.lighthouse-weekend.international

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Spectrum, Innovation and the Future: Registrations Open for ACMA RadComms 2026

Date : 09 / 07 / 2026
Author : ACMA

Australia's premier spectrum management conference is back, with the Australian Communications and Media Authority (ACMA) opening registrations for RadComms 2026.
This year's conference, themed "Global challenges, local solutions", will be held on 25-26 August 2026 at the RACV City Club in Melbourne.

For more information please see

https://www.wia.org.au/newsevents/news/2026/20260709-1/index.php

MeshCore Networks Continue to Expand Across Australia and Around the World

Date : 02 / 07 / 2026
Author : WIA

One of the most exciting developments in amateur radio and community communications is the rapid growth of MeshCore networks. Built using the low-power LoRa radio protocol on the licence-exempt 433 MHz and 900 MHz ISM bands, these innovative networks are demonstrating just how much can be achieved with a handful of inexpensive devices, some clever software and a community of enthusiastic volunteers.

Unlike many modern communications systems, MeshCore networks do not rely on the Internet to move messages. Instead, each node automatically communicates with neighbouring nodes, intelligently routing messages and data across the network until they reach their destination. As more nodes are added, the network becomes stronger, more resilient and capable of covering increasingly large areas with surprisingly little infrastructure.

More information at https://www.wia.org.au/newsevents/news/2026/20260702-1/index.php

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Software Defined Radio Conference 2026

Date : 05 / 07 / 2026
Author : Flinders University

Software Defined Radio Conference 2026 is to be held in Adelaide from 29 September – 2 October 2026.

We are currently working through the program — keynote speakers, technical sessions, workshops, the classified Defence Day arrangements, and the tutorial-day content.

We are actively seeking speakers, demonstrators and workshop leaders across the full breadth of the conference. If you are working on anything in software-defined radio, electronic warfare, ionospheric and atmospheric science, passive radar, antenna design, citizen-science, amateur radio, radio data, satellite SDR, sovereign-capability development, AIS or ADS-B systems, or any adjacent area — at any stage from undergraduate project through to deployed operational system — we would be very interested in hearing from you.

More information go to … https://www.wia.org.au/newsevents/news/2026/20260705-2/index.php

Book Now for Tassie Ham-E-Con 2026!

Date : 04 / 07 / 2026
Author : REAST

Whether you're a newly licensed amateur, a seasoned DXer, an experimenter, contest operator, maker or simply curious about where amateur radio is heading, Tassie Ham-E-Con 2026 promises to be an event not to miss.

Hosted by the Radio and Electronics Association of Southern Tasmania (REAST), the conference will be held on 7–8 November 2026 at the Sir Stanley Burbury Theatre, University of Tasmania, Sandy Bay, bringing together amateur radio operators, industry leaders, educators, makers and technology enthusiasts from across Australia and New Zealand. The conference theme, "Hack the Ether: Education, Ingenuity, Connection," reflects a program focused on learning, experimentation, innovation and building stronger connections across the amateur radio community.

More information go to https://www.wia.org.au/newsevents/news/2026/20260704-1/index.php

23cm Fun day on the 23rd of EVERY MONTH !!

If you are interested in 23cm or higher communications, the local IARS members are getting together with the MSCARC members on the 23rd of every month to have a fun day around the Illawarra area.

The SHF team are even looking at 13cm fun day on the 13th of every month, for more information please contact the SHF organiser Rob Heyer VK2XIC at **vk2xic@gmail.com**

Amateur radio news from around the world!

Use these handy links if you would like to see what is going on around the amateur radio world.

Radio Society of Great Britain https://rsgb.org/main

American Radio league https://www.arrl.org

Amateur Radio Germany https://www.darc.de/der-club/referate/ausland/english-version/

South African Radio League www.sarl.org.za

Italian Amateur Radio https://www.ari.it

Amateur radio France https://www.radioamateurs-france.fr

Amateur radio Russia https://srr.ru/sbory24_6/

Amateur Radio Japan https://www.jarl.org/English/

DX ATLAS DOWNLOAD https://dxatlas.com/Download.asp

https://daily.hamweekly.com

Communications Satellites

Status information and latest updates >>> https://www.amsat.org/two-way-satellites/

https://amsat-uk.org/satellites/frequencies-of-active-satellites/

Upcoming IARS meeting presentations …….

Please note the changes to the meeting schedule.

There isn't a general or committee meeting every month, but that doesn't mean we skip the fun! "
Even when there's no official meeting scheduled, we still get together every month except January.

(See the schedule below — presentation topics may change.)

Doors open at 6:30pm, giving you time to settle in, but presentations and general meetings kick off after 7:30pm. The Snowball draw happens every month, except January when there are no gatherings.
Members are very welcome to arrive from 6:30pm to enjoy a cuppa and catch up with friends in the foyer before things get underway.
We need to wrap up and be out by approximately 9:30pm, so please lend a hand on your way out by popping empty cups in the correct bin and straightening your chair or putting it back if you have moved it.

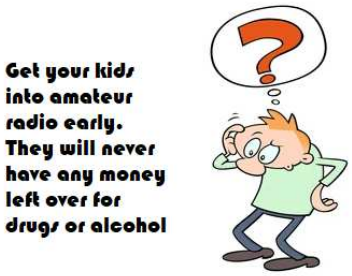
Please Note: IMPORTANT INFORMATION!
While you may feel inspired to channel your inner barista and make yourself an espresso using the coffee machine in the BlueScope foyer, we kindly ask that you refrain from doing so.
At our last meeting, an attempt to make a barista-style coffee unfortunately resulted in damage to the machine. The Visitors Centre team has since politely requested that we do not use the coffee machine.
Thank you for your understanding and cooperation.

- **August 2026** : Doors open 6.30pm **AGM** starts at 7.30pm with new committee members elected.
- **September 2026** : No committee or general meeting. Doors open 6.30pm
  7.30pm, Show And Tell, bring along your project to share with us
- **October 2026** : No committee meeting, doors open 6.30pm. General meeting starts 7.30pm
  Presentation starts after general meeting. Topic TBA
- **November 2026** : Committee meeting at 6.30pm. No General meeting.
  IARS Annual Auction with Simon VK2XQX. Doors open at 6.30pm for sellers for looking to sell their gear. Equipment must be booked in before the auction starts at 7.30pm. Please NO latecomers.
- **December** : No committee or general meeting. Doors open 6.30pm 
  IARS year end Christmas function

Fun Corner

Please send in your funnies to iars.keithb@gmail.com

Thanks to all that sent in funnies.



The **IARS needs YOUR input and support,** any technical items, amateur radio news, any projects you would like to share, in fact any AR related goings on are welcomed.

Feedback is also very important for us as it helps maintain a good read, if you would like to see more of something, or would like to see a subject added. Please let us know iars.keithb@gmail.com

That's all for now, hopefully catch you all at the

Blue Scope visitors centre on the 11th August from 7.30pm,

73
Keith VK2KQB
IARS Secretary

IARS, Amateur Radio in the Illawarra since 1948