Illawarra Amateur Radio Society

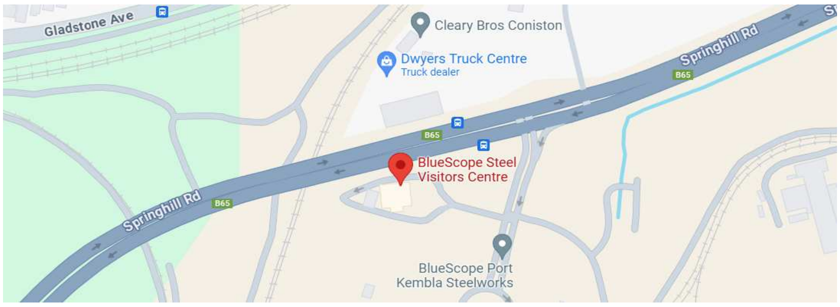
Propagator AUGUST 2024

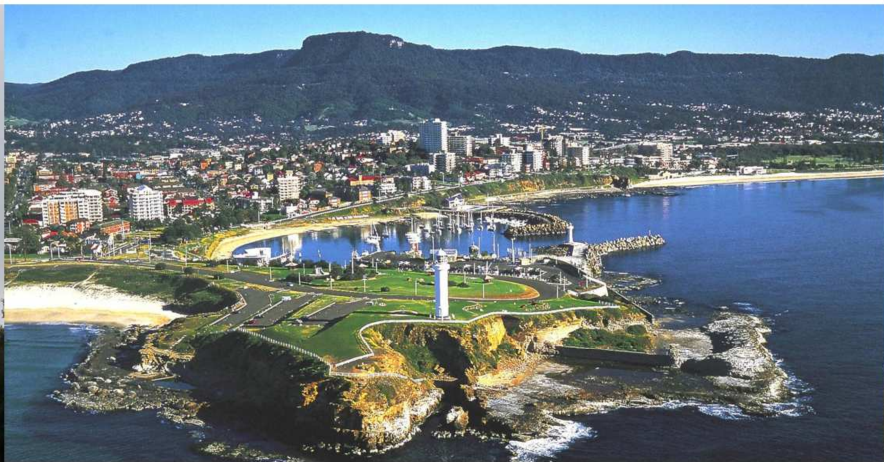
-. . .-- ... / .- -. -.. / .. -. ..-. --- .-. -- .- - .. --- -.

Upcoming Meeting on the 13th August 2024

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)





AMATEUR RADIO IN THE ILLAWARRA SINCE 1948

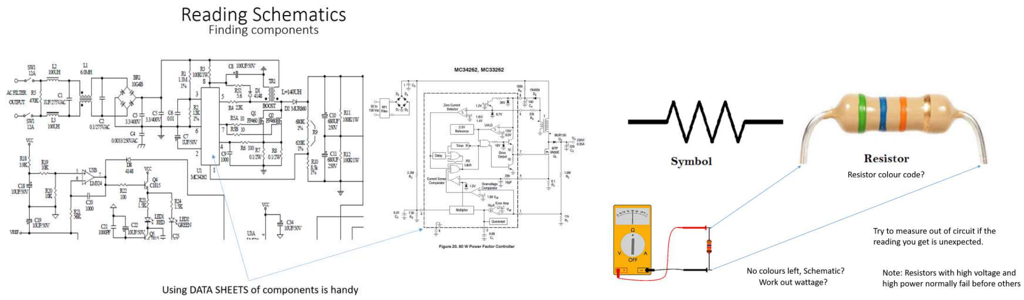
VK2RUW (Knights Hill)
34.6231° S, 150.6942° E
QF55IJ

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

VK2AMW

Our last meeting 9th July 2024

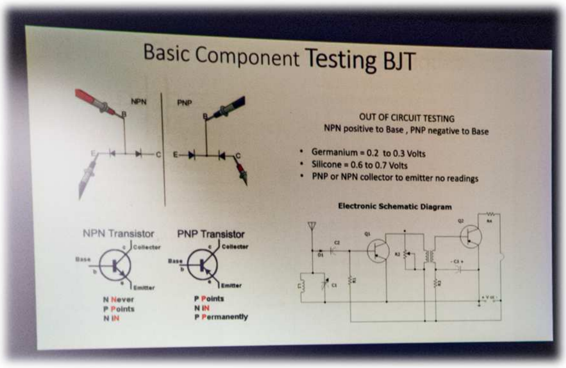
Testing basic components and reading schematics with Keith VK2KQB

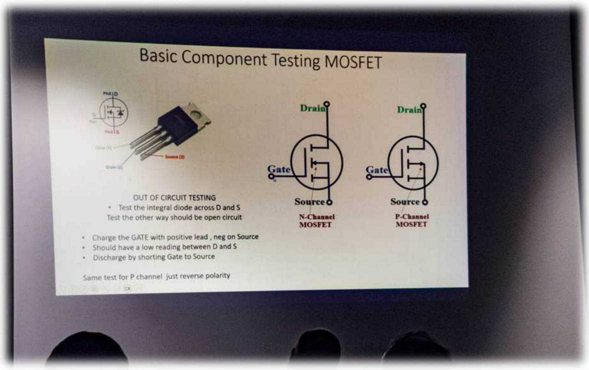


The presentation was based on basic testing and fault finding of components, including the use of low cost in the shack test equipment.

Asking question time 😊

You do WHAT!!!





Tips on testing BJT , Jfet and Mosfet transistors using simple multimeters



Setting up the meters and power supplies , checking parts and getting down to the nitty gritty 😋



It was good to see members getting involved with the component testing, great evening was had by all.

A catchup with mates afterwards, always spare biscuits to go round.

If you require more information about the presentation, please send Keith an email at iars.keithb@gmail.com

NEXT MEETING

The next meeting will be the society's AGM, where a new committee will be elected for the year moving forward.

All committee positions will be vacated with some committee members remaining available for re-election.

Please ensure that if you are nominating for a position that the nominations are submitted to the secretary at least 1 week before the meeting.

Current IARS Committee members

- President Tony Stone VK2TS
- Vice President Rob McKnight VK2MT
- Treasurer John Lawler VK2EJL
- Secretary Keith Bradshaw VK2KQB
- Committee member Simon Ryan VK2KU
- Committee member Mal St Clair VK2DXM
- Committee member Simon Ferrie VK2XQX
- Committee member Dan Demaagd VK2FDSD
- Committee member Shane Sorgsepp VK2HCO

The IARS would like to thank the committee members for all the work they did for the society during the last 12 months, hopefully they may want to come back and serve for another year, if not are you ready for the challenge? 😊

Please find nomination forms on the website or print off the next page of the propagator if you or know of someone who would like to serve in the IARS committee for 2024/2025

The NEW IARS committee will be proposing the finalisation of the new updated constitution which will be sent to all members prior to the AGM.

As always there will be the usual chinwag with a nice warm cuppa of your favourite brew, including something nice to nibble on.

ILLAWARRA AMATEUR RADIO SOCIETY (INC)

PO Box 1838, Wollongong NSW 2500
Web: www.iars.org.au Email: iars@iars.org.au

NOMINATION FORM

I, …… (name)

of ………………………………………………………………………………………………….(address)

being a member of the Illawarra Amateur Radio Society, hereby nominate for the position described below. If I am successfully elected as a committee member I agree to be bound to the rules and constitution of the Illawarra Amateur Radio Society and serve accordingly.

Nominated position: ………………………………………………………….

………………………………………………………	………………………………………..	…………………………………
Signature of nominee	Call sign	Date

I, ……………………………………………………………………………. Call sign: …………………………………………………….

being a member of the Illawarra Amateur Radio Society, second this application.

………………………………………………………	………………………………………..	…………………………………
Signature of seconder	Call sign	Date

Nomination forms must reach the secretary by the first Tuesday in August

I, ……………………………………………………………………………………… accept the nominated position.

…………………………………………………………………………….	…………………………………
Signature of the elected committee member	Date

Disposables Donation Table

Thanks to Simon VK2XQX and John VK2EJL who had some items on the table at the last meeting, EMI filters, Midland two way and a power supply.

Don't forget to bring along any old and unused items for the shack, from old valves, transistors, capacitors, resistors and anything you think someone may have a use for. So instead of it collecting dust, bring it along to the next meeting, someone will give it a new lease of life.

All it costs is a gold coin donation when you help yourself, all proceeds go to the IARS.

We have been getting plenty support for the table lately, with at least a couple of boxes of goodies every meeting.

The IARS would like to thank all the bringers and takers ☺

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

The Snowball was drawn and was assigned to **John Lodding VK2LOD,** unfortunately for John he was not present and also did not have a valid Snowball entry, therefore the Snowball has SNOWBALLED!

Make sure you are present and have a valid ticket to win some cash.

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

Membership fees

We still have many membership payments outstanding and are hoping that we can get this all settled before the next meeting. The IARS membership fees are still one of the **lowest at $25.00 normal**, **$20 concession**. This relates to $2.20 per month, for 11 meetings (less than the price of a cup of coffee)

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

All monies from our interest on investment, donations and membership fees goes to support the club with **Public liability insurances**, **Repeater maintenance**, **Repeater site fees**, **Blue scope meeting hall rental**, **IARS call signs with the ACMA**, **Coffee, tea & refreshments, Outings & picnics and Christmas dinner.**

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,

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

Please join us in welcoming our new members:

- **Mike Hayes VK2BIO**
- **David Wilson VK2AAW**
- **Handyn Kerr VK2LUV**

Welcome to the IARS family

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.

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

TUNE IN to the IARS NETS

Echo-link

1. Our main net on 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, who is always willing to assist whilst Steve is away.
(Also, a special thank you to Angelo, VK2NWT who assists when either Steve or Doug is unavailable)
Lots of backup here 😊

2. **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.

3. **IARS Wednesday evening weekly 6m NET at 7.30PM on 53.650Mhz with a – 1Mhz offset Hosted by Geri VK2UTE (123Hz CTCS tone enabled due to interference) Maddens plains 6m Repeater**
General discussions about building antennas for 6m, transceivers and what else comes to mind, this net is normally between 30 and 60minutes. Good feedback after the repair and tune-up, give it a try.

4. **IARS Thursday evening weekly 10m NET at 7.30PM 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.

IARS REPEATERS

VK2RUW (Knights Hill) VK2RMP (Maddens Plains)

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

Current Repeater STATUS

- **438.225 with a - 5MHz offset. OK**
- **146.975 with a -600kHz offset NO CTCSS, C4FM enabled OFF AIR**
- **146.850 with a – 600kHz offset (linked to 146.675) NO CTCSS OK**
- **146.675 with a – 600kHz offset (linked to 146.850) NO CTCSS OK**
- **53.650Mhz with a – 1Mhz offset (123Hz CTCSS tone enabled due to interference) -OK**
- **438.725Mhz with a -5mHZ offset DMR only, OK**
- **1296.850Mhz Experimental Beacon with simplex repeater function, located Maddens Plains – OK**
- **Echo-link VK2MT-R via 146.850MHz also linked to 146.675MHz and VK2BGL-L – OK**

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.

Any donations to help us maintain our great repeater system will be greatly appreciated. Please check our banking details on our website at www.iars.org.au under the Contact details page. As reference of the donation please add your Call sign and the words "Repeater Donation"

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

Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

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

Kenwood TS-820s looking for a new home, contact Keith iars.keithb@gmail.com.au if you are interested in buying this great transceiver

Electronic component and service suppliers

Need a quick PCB in a hurry to put that latest project on, JLCPCB

https://jlcpcb.com/?from=VGB&gad=1&gclid=EAIaIQobChMInOCo_9K1gQMVGw17Bx3qLAN0EAAYASAAEgLOV_D_BwE

element14 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

Wagner https://www.wagneronline.com.au

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

ALTRONICS https://www.altronics.com.au/virtualtour/nsw/auburn/

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

Elite Communications & Electronics https://www.elitecommunications.com.au/mobile-communications-category/communication-equipment/amateur-radio/amateur-radio-accessories/

VK RADIO https://www.vkradio.com.au

DXing https://dxing.com.au

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

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

Let us know by return email iars.keithb@gmail.com

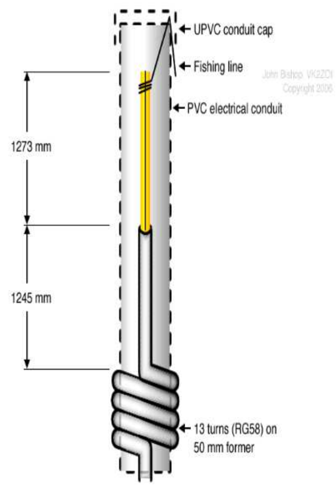
If you have some IARS related pictures or information that we can put on the IARS website, please let us know and we can get that happening.

6m Flowerpot

As we covered the 10m flowerpot last month, we thought it would be a good idea to cover a 6m flowerpot.

There is plenty of information out there all based on the original design by is a great design by the late John Bishop VK2ZOI.

6 Meter Flower Pot



The 'Flowerpot' antenna is an end-feed, coaxial dipole antenna designed by **John Bishop VK2ZOI**.

It is made using a single length of standard RG58c/u coaxial cable and has a resonant choke wound in the coax immediately below the lower element to provide RF isolation between the antenna and the feed line. The antenna is enclosed in a length of PVC pipe to protect it from the elements.

The antenna performs very well and the construction is simple, meaning almost anyone can construct one and have it running in an afternoon. All you need is some RG58c/u coax and a length of PVC pipe.

IARS's very own Simon VK2XQX is looking at a possible project with a complete kit to include the 50mm winding former. Watch this space

As there are so many options to build and test your very own flowerpot antennas, we cannot cover it all here, please use these handy links:

https://vk2zoi.com/articles/half-wave-flower-pot/

https://vk2idl.com/index.php/6m-flowerpot-antenna/

https://www.emdrc.com.au/coax-ant-for-6m/

https://barcvk4ba.com.au/assets/projects/flowerpot_antenna/VK4PK_My_6m_Flowerpot_Antenna-v1.0.pdf

https://www.lyonscomputer.com.au/Antennas/My-Antennas/Flowerpot/Flowerpot.html

Good luck and perhaps let us know how you went with your design and if you have anything special to share about your flowerpot project please send it to iars.keithb@gmail.com and we will publish it in future propagators.

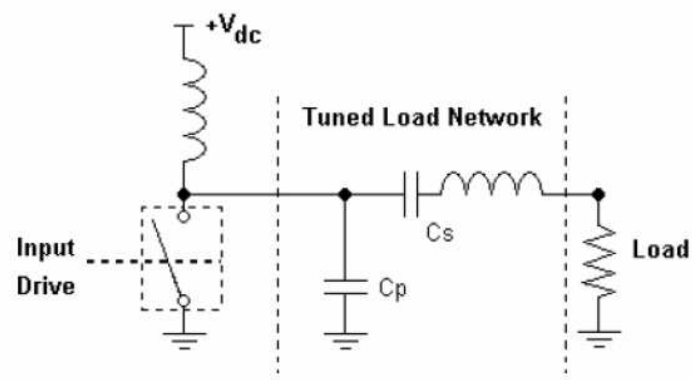
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Amplifiers! What Class are you?

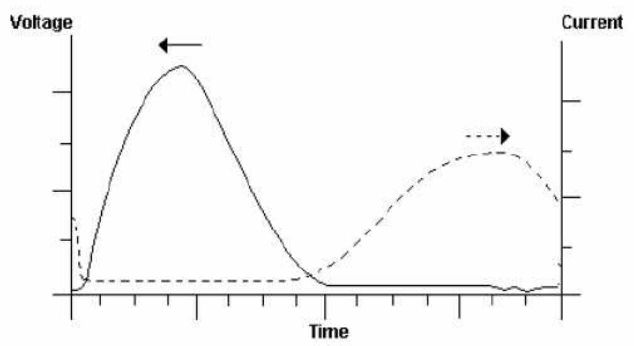
As amateur radio operators we have often heard of, and use Class A , Class B , Class AB, Class C and even a Class D. However, how about Class E and Class F, I am sure the only time I heard of class F was when one blew up while testing, it was very quickly called class "F". 😊 However, there is a definite move to the lesser-known classes of amplifiers for RF amplification and who is Doherty?

Class - E

Class-E employs a single transistor operated as a switch. The collector/drain voltage waveform is the result of the sum of the DC and RF currents charging the drain-shunt capacitance Cp which is parallel with transistor internal capacitance co. In optimum class E, the drain voltage drops to zero and has zero slope just as the transistor turns on. The result is an ideal efficiency of close to 100 %, elimination of the losses associated with charging the drain capacitance in class D, reduction of switching losses, and good tolerance of component variation.
The circuit obtains high efficiency by only operating the switching element at points of zero current (on to off switching) or zero voltage (off to on switching) which minimizes power lost in the switch, even when the switching time of the devices is long compared to the frequency of operation



Class-E amplifier



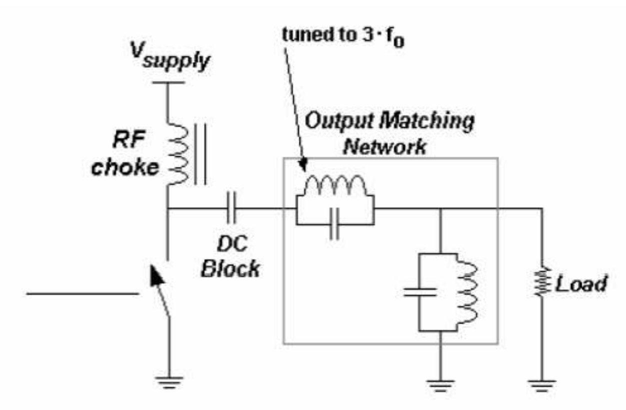
Class-E Voltage and Current waveforms

- A Class-E amplifier will exhibit an upper limit on its frequency of operation based on the output capacitance required for the output matching circuit that produces the waveforms described and shown above.
- Specifically, a Class-E amplifier for optimum efficiency requires an upper limit on capacitance Cs.
- The radio frequency choke (RFC) is large, with the result that only DC current Idc flows through it.
- The Q of the output circuit consisting of Ls and Cs is high enough so that the output current *io* and output voltage *vo* consist of only the fundamental component. That is, all harmonics are removed by this filter.
- The transistor behaves as a perfect switch. When it is on, the collector/drain voltage is zero, and when it is off the collector current is zero.
- The transistor output capacitance co, and hence Cp*,* is independent of voltage.
- If a given transistor has an intrinsic capacitance co greater than Cp_max, it is not useable at the desired frequency. This Cs requirement implies that for high power at high frequencies, higher current densities are required, as the cross-sectional area of the switch corresponds directly to the device's intrinsic capacitance.

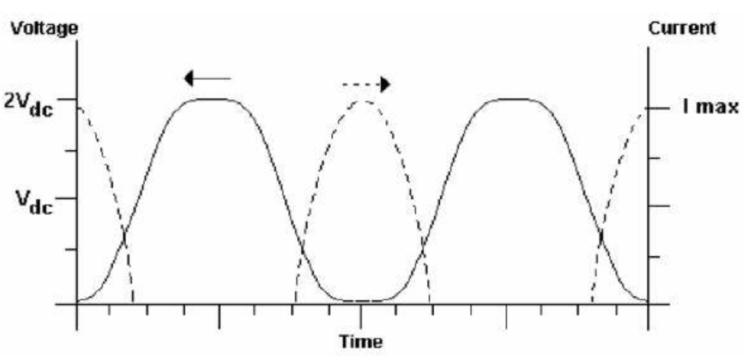
The class-E amplifier is frequently cited to have been first reported in 1975. However, a full description of class-E operation may be found in the 1964 doctoral thesis of Gerald D. Ewing. Interestingly, analytical design equations only recently became known.

Class – F

Class-F boosts both efficiency and output by using harmonic resonators in the output network to shape the drain waveforms. The voltage waveform includes one or more odd harmonics and approximates a square wave, while the current includes even harmonics and approximates a half sine wave. Alternately ("inverse class F"), the voltage can approximate a half sine wave and the current a square wave



Class-F amplifier

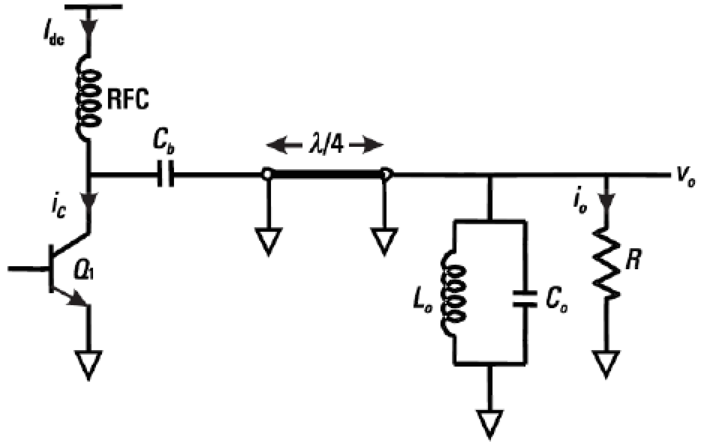


Class-F Voltage and Current waveform**s**

- The required harmonics can in principle be produced by current source operation of the transistor. However, in practice the transistor is driven into saturation during part of the RF cycle and the harmonics are produced by a self-regulating mechanism similar to that of saturating Class-C. Use of a harmonic voltage requires creating a high impedance (3 to 10 times the load impedance) at the collector/drain, while use of a harmonic current requires a low impedance (1/3 to 1/10 of the load impedance). While Class-F requires a more complex output filter than other PAs, the impedances must be correct at only a few specific frequencies. Lumped-element traps are used at lower frequencies and transmission lines are used at microwave frequencies. Typically, a shorting stub is placed a quarter or half-wavelength away from the collector/drain
- Class-F amplifier designs intentionally squaring the voltage waveform through controlling the harmonic content of the output waveform. This is accomplished by implementing an output matching network which provides high impedance 'open circuit' to the odd harmonics and low impedance 'shorts' to even harmonics. This results in a squared off (though for Class-F, truly squared) voltage waveform. The third harmonic only is peaked.
- Class-F amplifiers are capable of high efficiency (88.4% for traditionally defined Class-F, or 100% if infinite harmonic tuning is used).

- Class-F amplifier design is difficult mainly due to the complex design of the output matching network.

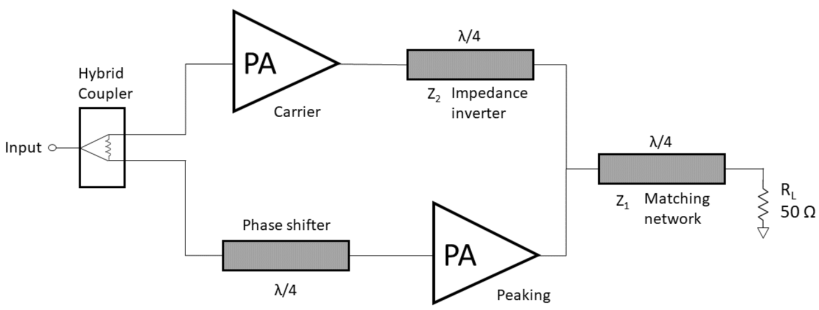
A Class-F amplifier can also be built with a quarter-wave transmission line as shown below.



- A λ/4 transmission line transforms an open circuit into a short circuit and a short circuit into an open circuit.
- At the center frequency, the tuned circuit (*Lo* and *Co*) is an open circuit, but at all other frequencies, the impedance is close to zero. Thus, at the fundamental frequency the impedance into the transmission line is *RL* .
- At even harmonics, the λ/4 transmission line leaves the short circuit as a short circuit.
- At odd harmonics, the short circuit is transformed into an open circuit. This is equivalent to having a resonator at all odd harmonics, with the result that the collector voltage waveform is a square wave (odd harmonics should be at the right levels).

Doherty Amplifiers

William H. Doherty invented this amplifier in 1936, for use in high-power AM broadcast transmitters. The technique dramatically improved the amplifier efficiency from about 30% to over 60%. The key gain device at the time was the vacuum tube, but the same approach is now applied to many different semiconductor technologies (CMOS, GaAs, LDMOSFET, and GaN).
The Doherty amplifier uses two amplifiers to optimize the overall PA performance. The carrier amplifier (or main amplifier) handles the low-power region while the peaking amplifier (or auxiliary amplifier) handles the high-power region. This sounds simple, but the practical implementation can be challenging. Figure below shows a classic Doherty amplifier with two amplifier paths, both fed from a hybrid coupler. The carrier amplifier is always on while the peaking amp remains idle unless the signal moves into the high-power region. In the high-power region, the peaking amp turns on and provides additional amplification to support the higher output power. Two important design challenges are 1) splitting and recombining the signal while maintaining time alignment 2) turning on the peaking amplifier under the proper conditions while maintaining linearity.



Send your technical subject of interest to IARS at iars.keithb@gmail.com

Memory lane, who built one of these?

DSE Radio Direction Finder

You cannot buy them anymore but with this information you should be able to build one.

Excerpted with permission from the February, 1986, issue of Electronics Australia.

Most readers will be broadly familiar with the concept of a radio direction finder (RDF). A basic RDF consists of a receiver and an antenna which can be rotated on its own axis. The direction of the transmitter is found by rotating the antenna for a signal peak or null.

You can easily demonstrate the effect for yourself using a portable transistor radio fitted with a ferrite rod antenna. By tuning the radio to a station and rotating the radio about its vertical axis, a null will be found in the signal strength. The ferrite rod antenna will then point in the direction of the station.

Of course, this method requires that "fixes" be taken at two or more widely spaced locations in order to find the true location of the transmitter. The exact location of the transmitter is determined by simple triangulation.

The classic application of this radio direction finding technique was in World War II. Many war movies showed how it was possible to track down enemy transmitters using special vans fitted with RDF equipment. Typically, these vans were fitted with a large external loop antenna which could be manually rotated. An operator inside the van listened in on headphones for peaks and dips in the signal strength. Provided the transmitter remained in the one location for long enough, its location could eventually be pinpointed.

The Dick Smith Radio Direction Finder is just the ticket for tracking down illegal transmitters and antisocial radio operators. Depending on the antenna system, it can operate on any band from 50 to 500 MHz and will work with FM receivers ranging from pocket scanners to amateur radio and CB transceivers.

Physically, the radio direction finder consists of two separate units. One contains the control and display electronics, and the other is a special antenna-switching unit (ASU) which is connected to the control unit via a 4-conductor cable.

An electronic "compass" display consisting of 32 LEDs indicates the transmitter bearing. When a signal is received, its relative bearing to the antenna system is indicated by whichever of the 32 LEDs illuminates.

In fixed installations, this allows the compass bearing of the signal to be directly indicated to within ±5.6 degrees. When an RDF unit is installed in a car, successive readings allow you to pinpoint the exact location of the transmitter.

How It Works

The theory of operation is reasonably simple. Radio signals received on a rapidly moving antenna undergo a frequency shift due to the Doppler effect, an effect well known to anyone who has observed a moving car with its horn blowing.

Consider a single antenna mounted on the edge of a rapidly spinning disc (Fig. 1). As the antenna moves towards the source of the rf carrier, the apparent frequency will increase due to the Doppler effect (Fig. 2). Conversely, as the antenna moves away, the frequency will decrease.

Thus, the rotating antenna causes frequency modulation of the received carrier. When this type of antenna is connected to an FM receiver, a tone is heard. By analyzing the phase of this tone, the direction of the transmitter can be determined.

To avoid the obvious drawback of a mechanically rotated system, the Dick Smith RDF simulates a rotating antenna electronically. Four vertical whip antennas are arranged around a circle with a diameter of 0.07–0.4 wavelengths. The antennas are electronically switched clockwise in sequence such that all four antennas are scanned once every 1/1250th of a second.

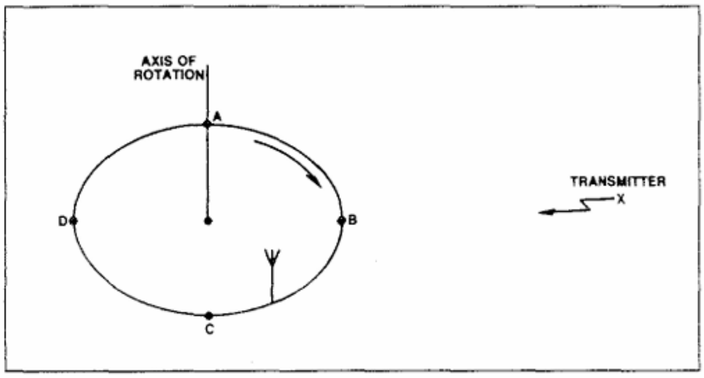


Fig. 1. Signals received by an antenna mounted on the edge of a rotating disc are frequency modulated due to the Doppler effect.

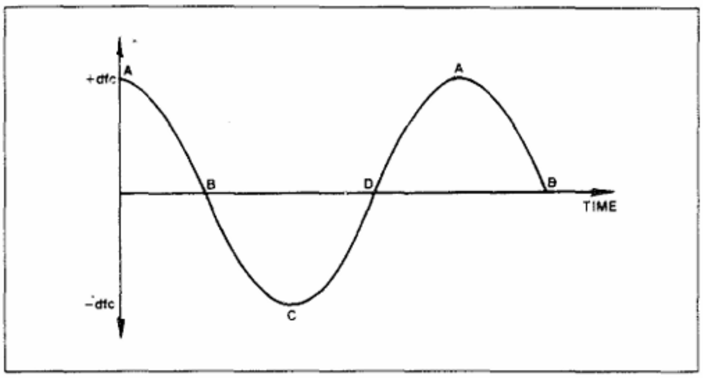


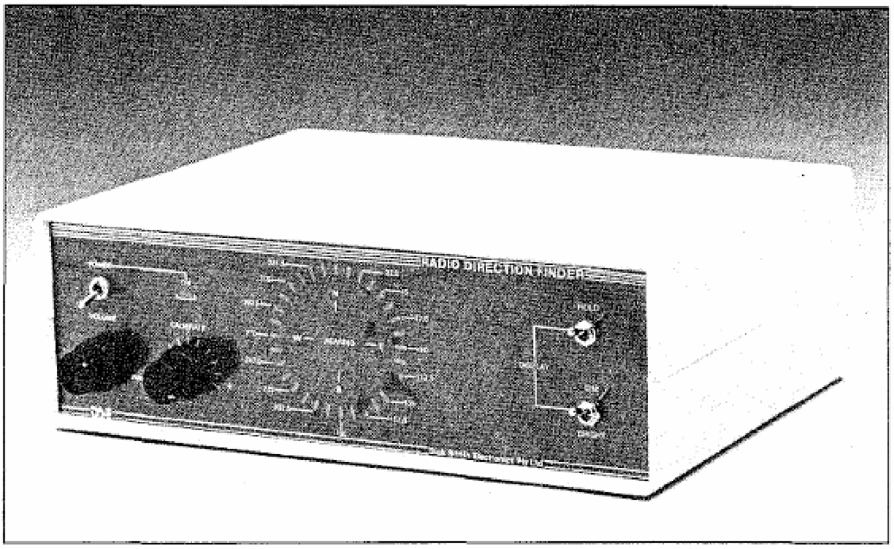
Fig. 2. This graph illustrates the frequency shift as the antenna moves towards and away from the transmitter.

This situation is equivalent to one vertical antenna mounted on the perimeter of a disc spinning at 1250 revolutions per second. A diameter of, say, 800 mm (for the 2-meter band) results in a tangential velocity of 3140 meters per second.

If the carrier frequency is 144 MHz, the carrier will deviate 1.5 kHz at a rate of 1250 Hz. For lower carrier frequencies, the deviation will be proportionally lower. Note, however, that the 1250-Hz modulating tone remains constant, as it is a function of the antenna switching rate only.

The output from the FM receiver is applied to the signal input of the RDF adapter and compared with an internal reference phase. The resultant phase angle appears as a 5-bit binary code which is decoded to a one-of-32 output to drive the appropriate LED indicator.

In addition, the detected audio tone can be monitored on an internal loudspeaker. This provides an audible indication that the receiver is correctly tuned to the transmitter frequency.



The Dick Smith Electronics Radio Direction Finder.

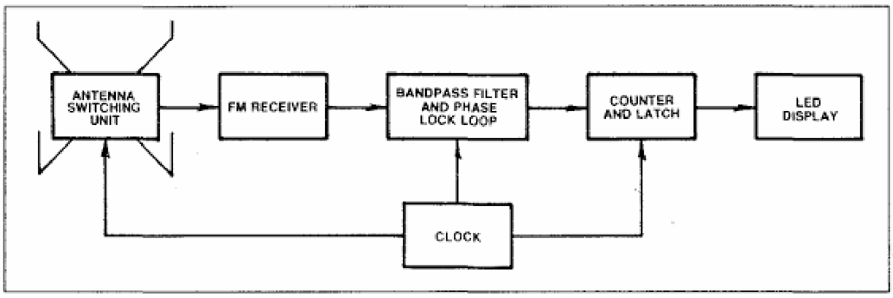


Fig. 3. Block diagram of the Radio Direction Finder. Signals from the antenna-switching unit are fed to an FM receiver and the output is compared to a reference phase.

The Circuit

Antenna switching is accomplished by first deriving a 2-bit binary code from a 1-MHz master oscillator. Here's how it's done:

Inverter stages IC2a, b, and c (4069) form the 1-MHz oscillator, with buffering provided by IC2d. This clocks decade counters IC4 and IC7, both of which divide by five to produce a 40-kHz signal on pin 1 (CK) of IC10.

IC10 is a 4024 7-stage binary counter. Its Q1–Q5 outputs directly drive the D1–D5 inputs of IC12, a 40174 hex latch, while Q4 and Q5 also drive IC9, which is a 4555 one-of-four decoder.

What happens is that IC9 accepts a 2-bit binary code from IC10 and provides the quadrature antenna-switching signals. These signals are interfaced by a 1488 line driver (IC6). The outputs of IC6 swing positive and negative in sequence to provide bias for the matrix diodes (D201–D208) in the antenna-switching unit (ASU).

The diode matrix is arranged so that, at any given instant, three of the antennas are effectively shorted and only one is coupled to the receiver. For example, when pin 11 of IC6 is low (−9 V), D205–D207 are forward-biased and short out antennas 2 to 4. At the same time, D201 will also be forward-biased while D202–D204 are turned off. Antenna 1 will thus be connected to the receiver.

The detected audio tone from the FM receiver is applied to the input of the RDF adapter, limited by D1 and D2, and filtered by a single-pole active low-pass filter stage (IC5). This chip is described by National Semiconductor as an MF5 Universal Monolithic Switched Capacitor Filter. Basically, it is a general-purpose active-filter building block.

The rest of IC5 is configured as a second-order bandpass filter to remove unwanted audio modulation from the 1250-Hz tone. The center frequency of the filter is set to 1250 Hz by the clock signal applied to pin 8. This clock signal is derived via IC3, which divides the 1-MHz master oscillator signal by eight.

Note that the clock for the bandpass filter is derived from the same source as that used to switch the antennas. This means that the filter is automatically centered on the scanning tone, even when there is some frequency drift.

The output of IC5 (pin 1) is a sine wave with a nominal frequency of 1250 Hz. This signal is applied to op amp IC11a, which functions as a phase shifter. Adjustment of the phase shifter is by means of VR1.

The job of the phase shifter is to allow calibration of the circuit and to compensate for any audio phase shifts in the receiver.

From there, the signal is further processed by a 4046 phase-locked loop (PLL). The function of this stage is to average out any modulation present in the passband of IC5 and to produce a 1250-Hz square wave which is essentially free of noise and jitter.

It is this signal that is used to latch IC12. The output of the PLL (pins 3 and 4) is first inverted by IC2f and applied to D-type flip-flop IC13a. Subsequently, when the flip-flop's D input goes high, IC13a latches IC12 on the first positive-going clock pulse from pin 10 of IC4.

The result of all this is that IC12 is latched with a 5-bit code that is directly related to the transmitter direction. A phase-comparator function is thus performed.

Note that IC13a is necessary to prevent the latching signal from coinciding with a change of data on IC12's inputs.

A pair of 74LS154 one-of-16 decoders (IC101 and IC102) on the display board converts the 5-bit code to a one-of-32 output. These decoders directly drive the 32 display LEDs to indicate that transmitter position.

Switch SW102 allows the display to be held or "frozen" by resetting IC13a. SW101 serves as a power on/off switch, while SW103 allows the display to be dimmed by switching a 330-Ohm resistor into the common anode circuit of the LED display.

To make the unit as easy as possible to use, the audio output from the FM receiver is also fed to an internal loudspeaker. The volume is adjusted by means of potentiometer VR102, which is mounted on the front panel.

Power Supply

Power for the RDF unit is derived from an external 12-V source which connects to a 2-conductor socket on the rear panel. This supplies +12 V direct to several ICs and to the input of 3-terminal regulator IC1. IC1, in turn, supplies a regulated +5-V rail to the remaining ICs.

Op amp IC11b provides a buffered +6-V rail to IC5 and also to the phase-calibration control (VR101).

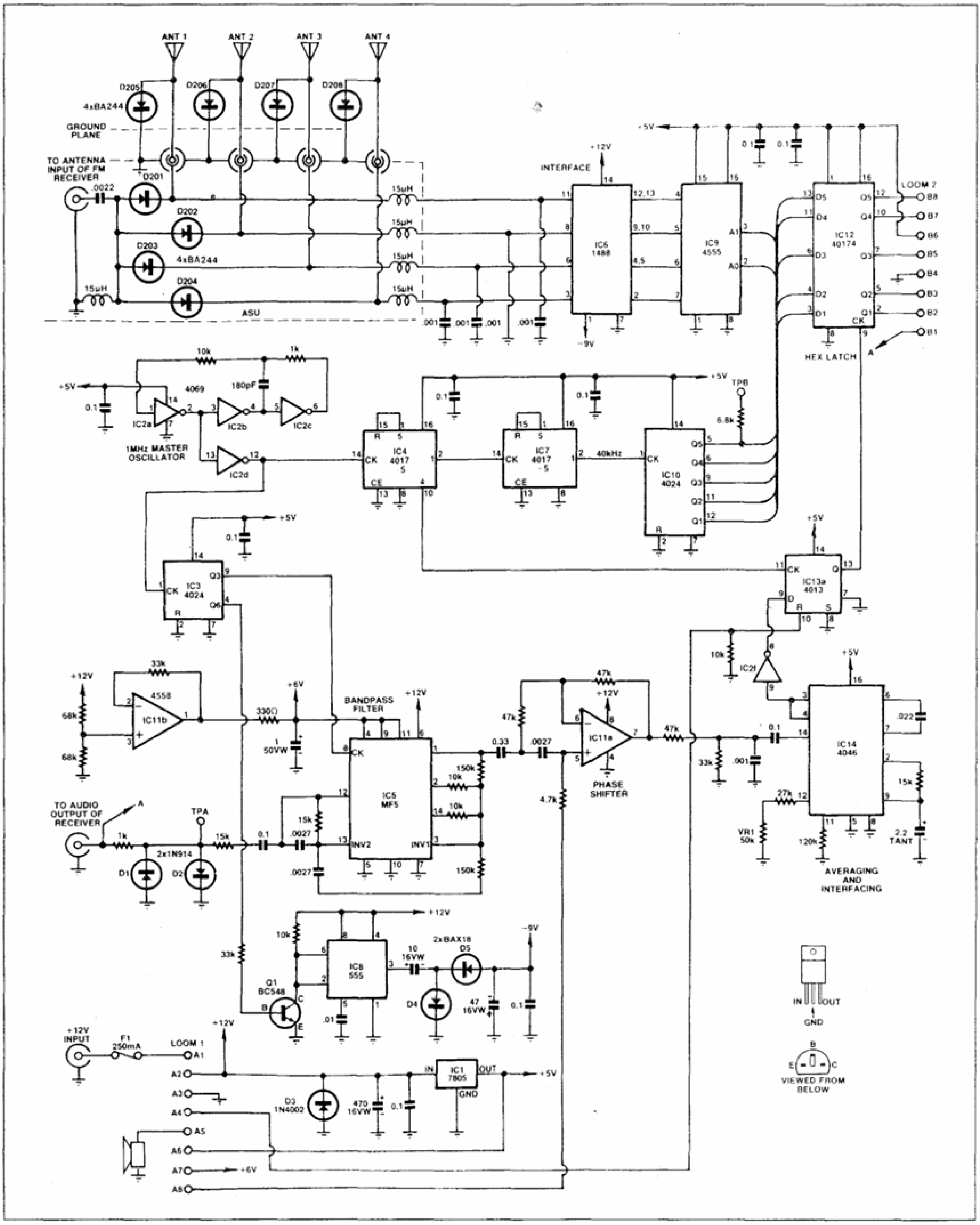


Fig. 4. The control and antenna-switching circuitry.

Finally, a −9-V supply rail is required for the 1488 line-driver IC. This is generated by a dc-to-dc converter circuit based on 555 timer IC8. It buffers a 16-kHz square wave derived from IC3 and drives a diode charge pump based on D4 and D5 to produce the required −9-V rail.

Transistor Q1 simply functions as a switch. Its job is to interface the +5-V CMOS circuit to the +12-V timer circuit.

Construction

Construction is straightforward, with most of the parts mounted on three PC boards, two in the main unit and one in the ASU.

A plastic instrument case fitted with a per-

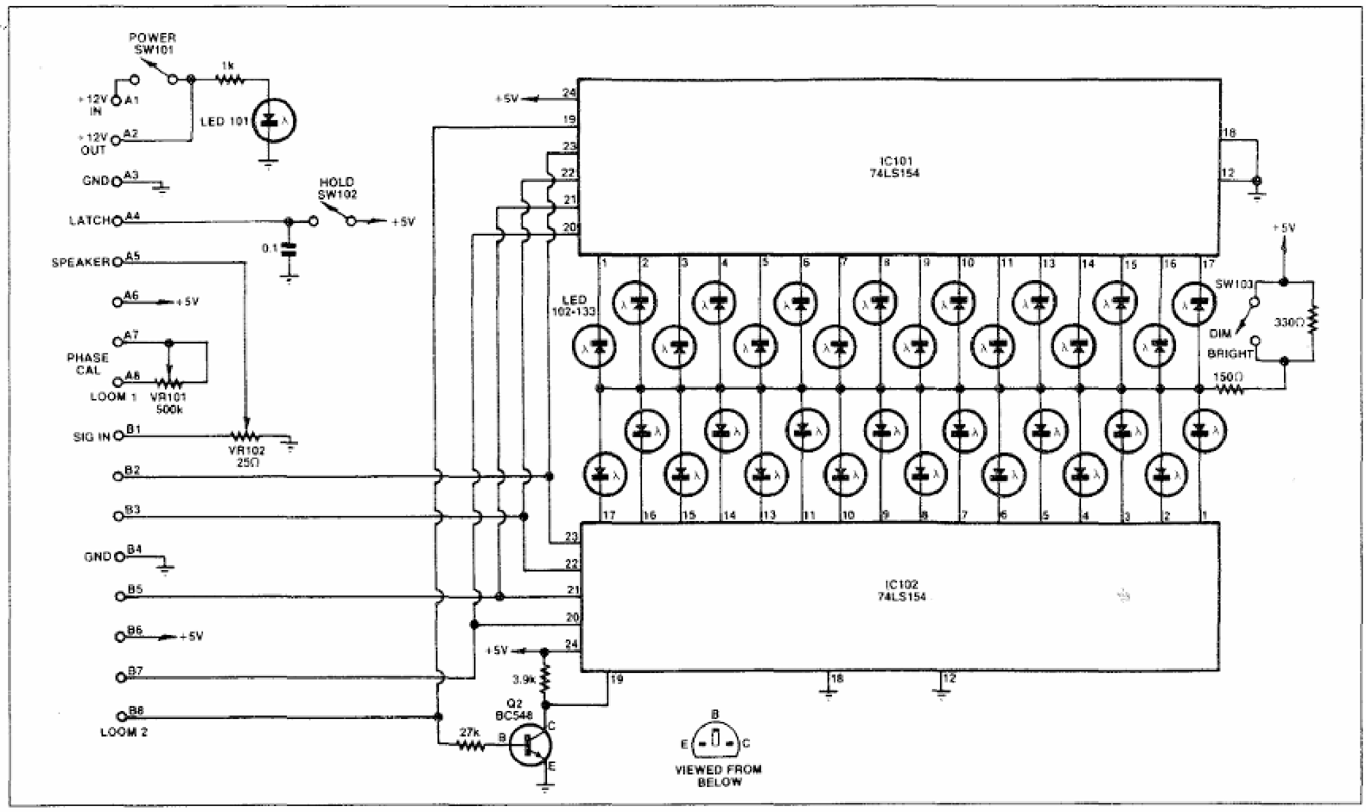


Fig. 5. The display circuit.

spex front panel houses the control electronics, while the ASU board is housed in a plastic project box.

Connections between the ASU and the control unit should be run using 4-conductor cable, while the connection to the FM receiver should be run using coaxial cable. All you have to do is trim the cables to the desired lengths and terminate them with the appropriate plugs.

Note that the wiring connections to the plugs at both ends of the control cable must be made on a one-to-one basis, otherwise the antennas will not rotate in the correct sequence.

Setting Up

An alligator clip lead and a small screwdriver are all that is necessary to adjust the unit.

Connect up a 12-V supply (be careful of polarity!) and switch on with the hold off and the ASU disconnected. All the LEDs in the display should rapidly flicker on and off as the display is scanned.

Assuming all is well, connect the two test points (TPA and TPB) together using the clip lead and adjust VR1 until a single LED is latched. Confirm this adjustment by unhooking and reconnecting the clip lead.

If the display does not latch when the test lead is reconnected, repeat the above procedure. This adjustment brings the vco to within the capture range of the PLL.

Note that, with the calibration control at mid-position, the latched LED should be the one at the top of the circle.

ANTENNAS AND OPERATION

For mobile operation, four 1/4-wave vertical whip antennas attached to a roof-rack assembly would be the best approach. The ASU could then be conveniently located between the antennas. It should be weather-proofed using a silicone sealant.

In most cases, a separate ground plane will have to be provided adjacent to the antenna bases. A suggested method is to secure a sheet of aluminum to the roof-rack. Make sure that the assembly cannot come loose!

A hand-held transceiver can be used to aid the initial setting-up procedure. Depending on the setup, it may be necessary to rotate the antenna array until the compass rose reads true relative to the direction of the vehicle.

The calibration control can be used to make the final adjustment. A walk around the antenna array with the hand-held transceiver will then reveal if the installation is functioning correctly. This should take place in an open area to avoid strong signal reflections.

In the case of a fixed installation, four ground-plane antennas should be mounted symmetrically on a vertical mast, together with the ASU. The array can then be adjusted so that the compass rose displays the true bearing with the calibration control set to mid-position.

Note that, in either case, the distance between opposing antennas should be between 0.07 and 0.4 wavelengths.

If a dual-trace oscilloscope is available, VR1 can be adjusted for a 90° phase angle between the signal input (pin 14, IC14) and the PLL comparator input (pin 3, IC14).

Finally, the control unit can be checked out by connecting outputs 1, 2, 3, and 4 (to the ASU) in sequence to test point TPA. First, connect output 1 to TPA and adjust the calibration control so that the latched LED is at 0°. The 90° LED should now light when output 2 is shorted, the 180° LED when output 3 is shorted, and the 270° LED when output 4 is shorted.

That completes the construction. Your Radio Direction Finder is now ready for use.

Where To Buy The Kit

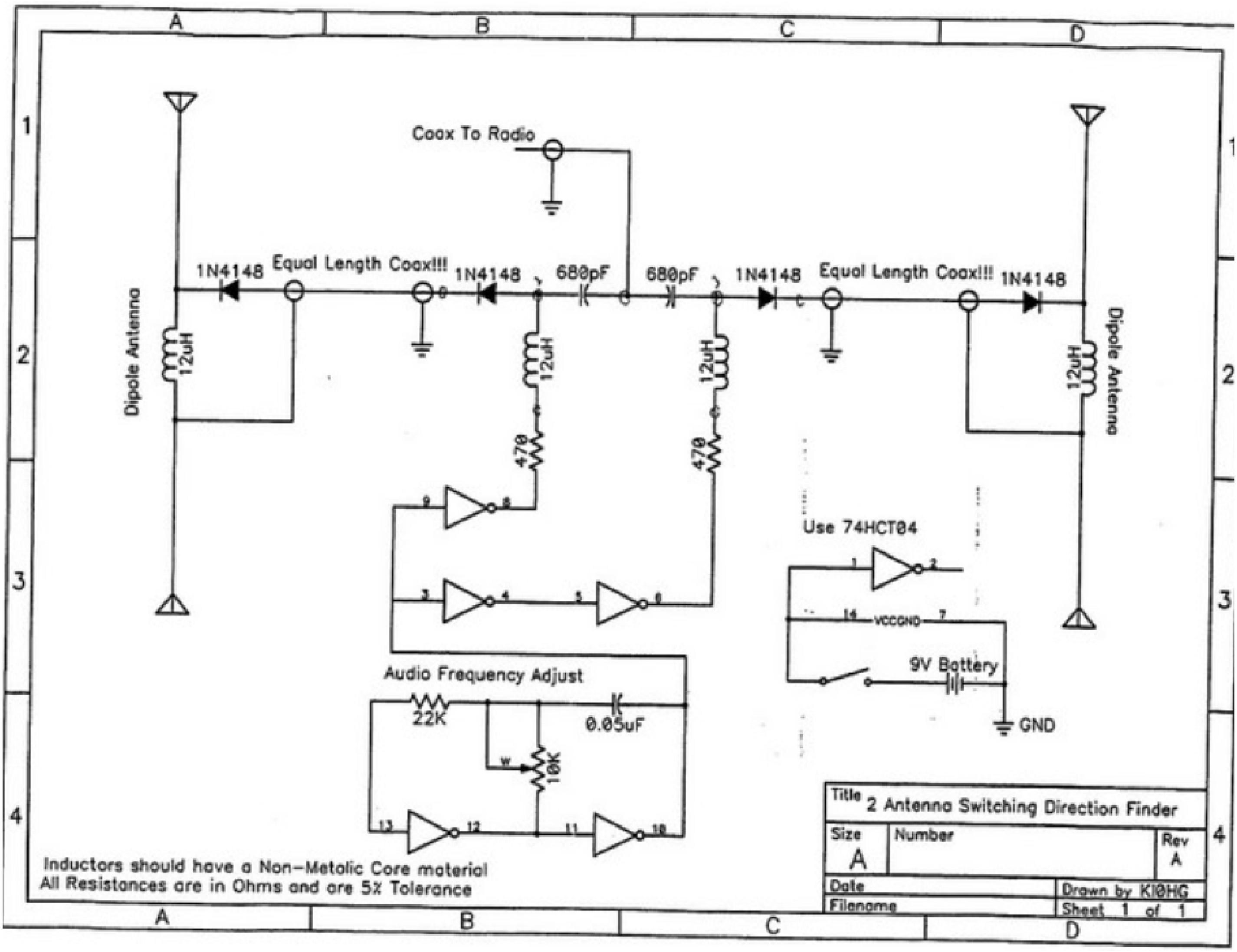
The Radio Direction Finder described here was developed by the Research and Development Department at Dick Smith Electronics Pty Ltd. It is available as a complete kit of parts by mail order or from your nearest Dick Smith Electronics store.

The kit comes complete and includes a perspex front panel, screenprinted fiberglass PC boards, antenna bases, plugs and sockets, and a detailed construction manual. The cost is $99 plus postage and packing charges where applicable.

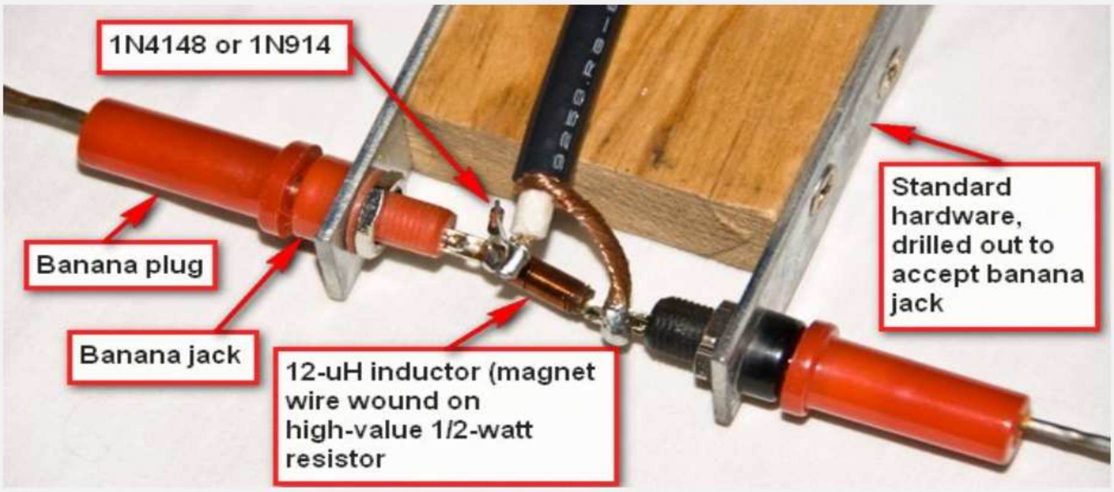
Mail orders should be sent to: Dick Smith Electronics, PO Box 8021, Redwood City CA 94063; (800)-332-5373. ■

Fantastic Fox Finder from KIØHG—Construction Details

Hidden transmitter hunting, aka fox hunting, is a fun activity with serious overtones. Ideally it's a game, but the same equipment and skills can help find those in distress or track down a jammer. This post provides a schematic and construction details for a circuit developed by Dave Sharpe, KIØHG. His circuit below is by far the simplest direction finder I've run across. It works with two dipoles on a pole and provides a tone when the antenna array isn't quite pointed right, and nulls the tone when it is. I've used mine in many a two-meter fox hunt and it takes me right to the fox. Let's start with the schematic.

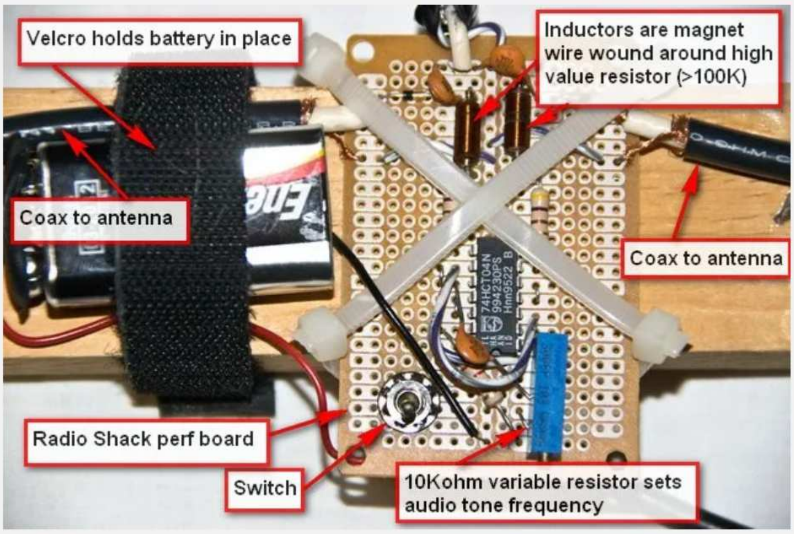


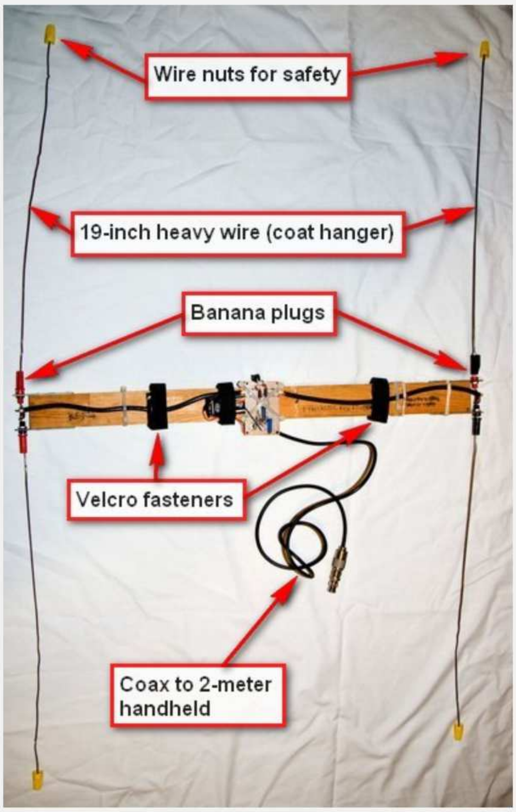
- The single IC is a 74HCT04, a CMOS hex-NOR-gate that takes very little current. Wire it as shown
- The audio tone is generated by two of the NOR-gates back to back with the 22K fixed resistor and the 10K potentiometer along with the .05µF capacitor.
- The diodes are all 1N4148 or 1N914 RF switching diodes. These are really inexpensive. The two in the middle go on the perf board along with the 680pF capacitors. The other two are at the very ends of the equal-length coax sections, as shown in the figure below



The antenna jacks at one end of the fox finder. Both ends are identical. I chose to connect the 19-inch antennas with banana plugs.

- The inductors can be store-bought, or can be made by winding magnet wire using a 1/2-watt high-value resistor—the old-fashioned cylindrical kind. The resistor should be greater than 100KΩ. The resistor is not important to the circuit.
- The pieces of coax from the circuit board to the antennas *must* be of the same length! Get this right, down to the millimeter!
- A Radio Shack perf board makes a great circuit board, as shown in the figure below.





Parts:

- 12µH inductors, 1N4148 diodes, 470Ω resistors, 22KΩ resistors, 10KΩ potentiometer,
- 0.05µF capacitor, 680pF capacitors, 74HCT04 hex inverter,

Handy On Line Calculators

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

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

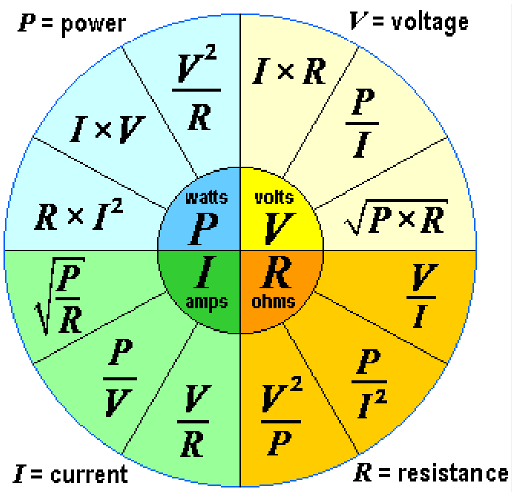
Resistor Colour code calculator..... https://www.digikey.com.au/en/resources/conversion-calculators/conversion-calculator-resistor-color-code

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

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

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



How many of these can you answer correctly?

Question 1. A power amplifier has a gain of 20 dB. When fed with an input signal of 4 watts it will have an output of:

(a) 80 watts
(b) 400 watts
(c) 200 watts
(d) 24 watts

Question 2. To forward-bias a silicon-controlled-rectifier (SCR), the anode potential must be:

(a) positive with respect to the cathode
(b) negative with respect to the cathode
(c) positive with respect to the gate
(d) negative with respect to the gate

Question 3. The maximum reverse voltage that may be applied to a diode before the "avalanche breakdown" point is reached is called:

(a) peak inverse voltage
(b) cut-off voltage
(c) saturation voltage
(d) peak-to-peak voltage

Question4. 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 5. 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 6. 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

Answers next month 😉

Answers to last month's questions … (Q1 = C ; Q2 = A ; Q3 = A ; Q4 = D ; Q5 = B ; Q6 = D)

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

Send your answers to iars.keithb@gmail.com to go into the draw for a prize at the end of the year

BLAST FROM THE Past **OLD PROPAGATOR MEMORIES**

THE PROPAGATOR

THE MONTHLY NEWSLETTER OF THE
WIRELESS INSTITUTE OF AUSTRALIA
ILLAWARRA BRANCH

Published by the Illawarra Branch of
the Wireless Institute of Australia
P.O. Box 110
DAPTO 2530

No 6/75 JUNE 1975 No 6/75

PRESIDENT:

Keith Curle VK2ZYI
24 Beach Drive
WOONONA 2517

SECRETARY:

Ian Bowmaker VK2ZJA
15 Akuna Street
KEIRAVILLE 2500

NOTICE OF GENERAL MEETING

Members are advised that the next GENERAL MEETING of the Illawarra Branch of the W.I.A. will be held at the Wollongong Town Hall Committee Room on Monday, 9th JUNE 1975 at 7.30 p.m.

JUNE MEETING. GUEST SPEAKER.

This months meeting will be both interesting and important for all those concerned with Amateur Radio.

Our guest speaker is John Milton, VK2AQM, Wollongong District Radio Inspector, who will be talking on the subject of "Novice Licensing". This subject is of interest to Amateurs and Hobbyists alike, so bring your friends along to hear about our hobby and the way to become involved in it.

A raffle is to be held with a worthwhile and useful prize - so bring your money along. In the future we expect having tools, test equipment etc. as prizes in our raffles - this is to be the first of the upgraded raffles.

There is also an important matter of business to be discussed, so we urge all members to be present.

SUBSCRIPTIONS.

For those of you who have not forwarded your subscription, we must make this your last free issue of The Propagator. Because of increased postal rates and costs we are only able to send The Propagator to fully paid up subscribers.

So, if you have found The Propagator worthwhile reading and would like to continue receiving each issue, send in your subscription immediately.

The 1975 subscription rate is $2, with concession rate of $1 for students and pensioners.

Send to - The Secretary,
Illawarra Branch, W.I.A.,
PO BOX 110, DAPTO. 2530. N.S.W.

STORE.

The Committee has decided, after looking at a number of possible plans, to run the Store direct. We anticipate to be making purchases of selected components and offering these items for sale to readers of The Propagator. The components will be of prime quality and purchases will be made so that we can offer good savings when compared to the usual sourses of component supply.

Elsewhere in this issue may be found details of components currently available.

Conditions of sale must be on the basis of -

CASH WITH ORDER
FIRST IN, FIRST SERVED
WHILE STOCKS LAST

BILL DIT KITSETS.

This the last and final notice for members who require parts to complete their Bill Dit Kitsets.

We must finalise the deal with our supplier by the end of June 1975.

All lists of outstanding parts must be in the hands of Bill VK2ZCO by the end of June otherwise this Branch cannot accept any responsibility for the obtaining of any outstanding components.

FOR SALE

1 only MR6A HIGH BAND F.M UNIT Complete with crystals for CHANNEL 1,4, and B . QQE03/12 FINAL , BLOCK FILTER
Also comes complete with an AC power supply $35
GEOFF CUTHBERT 2ZMU 2NIOKA Av KEIRAVILLE 2500 Ph 289085

1 only MR10C converted for 52.525 but without crystals
Modified to remove handset control unit.
Volume and mute located on main unit $20
GEOFF CUTHBERT 2ZMU 2 NIOKA Av KEIRAVILLE 2500

Moonbounce Report - June.

Construction of the new one kilowatt power amplifier for the transmitter has been completed and it is now being installed in the main transmitter chassis.

Testing should be underway in about a week's time, after the required power supply wiring changes have been made.

Approx. 50 hours concentrated effort has gone into trying to get the transmitter operational again before the June series of EME tests.

A letter has been received from F9FT who wants to arrange special EME tests with VK2AMW.

The weekly 20 metre skeds with ZL3AJJ continue to provide a useful interchange of EME information.

It was noticed that an advertisement appeared in March QST for the new ARRL publication -'Specialised Communication Techniques for the Radio Amateur' - and on the front cover of the book is a photograph of the Dapto Moonbounce installation!! It will only cost you US$3.00 to have a look. Hi!

Lyle - VK2ALU.

Will share more oldies next month.

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

https://www.iars.org.au/wp-content/uploads/2020/09/1975-06-June.pdf

Upcoming Contests ……………………………

Remembrance Day Contest

Next contest 17th & 18th August 2024

Contest Manager

Alan Shannon VK4SN
vk4sn@wia.org.au

Rule changes in 2021:
1. Foundation Licence sections discontinued
2. Remote station operation is allowed.

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.

A perpetual trophy is awarded annually to the Australian state or territory with the best performance. The name of the winning State or Territory is inscribed on the trophy, and that State or Territory then holds the trophy for 12 months. The winning State or Territory is also given a certificate, as are leading entrants.

More information on this link https://www.wia.org.au/members/contests/rdcontest/

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

Oceania DX Contest

Oceania DX (OCDX) Contest

Contest Manager

The Oceania DX (OCDX) Contest is managed by the Oceania DX Contest Committee.

Contact email is **info@oceaniadxcontest.com**

Contest Introduction

The OCDX contest is Oceania's only international style contest where contacts with stations all over the globe are able to participate.

Oceania stations may contact any station for QSO points whilst non-Oceania stations are required to contact any station in Oceania for QSO points.

The contest runs over the first two full weekends in October and has SSB, CW and SWL categories. Go to the contest web site for more information.

Contest Dates/Times:

PH - The first full weekend in October each year from 0600 UTC Saturday to 0600 UTC Sunday

CW - The second full weekend in October each year from 0600 UTC Saturday to 0600 UTC Sunday

Log deadline for PH and CW logs - 31 October.

More info here >>>>>>> https://www.wia.org.au/members/contests/oceania/

##################################

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.

For more information, please contact Rob Heyer VK2XIC at vk2xic@gmail.com

AR NEWS

CONSULTATION 2024-2: 40m Band Plan Harmonisation Challenges

Date : 09 / 07 / 2024
Author : Grant Willis VK5GR

CONSULTATION 2024-2: 40m Band Plan Harmonisation Challenges

The WIA as part of its involvement with IARU Region 3 is sponsoring a discussion on the future directions of the 40m band plan. It is now seeking feedback from members on a number of issues relating to the band to then use as input to the IARU Region 3 conference in October 2024.

The Amateur Service 7000-7200 kHz band is considered an example of one of the more dis-organised bands on a global basis.

Information link https://www.wia.org.au/newsevents/news/2024/20240709-1/index.php

CONSULTATION 2024-1: Australian Amateur Radio Repeater and Beacon Frequency Planning Rules and Process Changes

Date : 24 / 06 / 2024
Author : Grant Willis VK5GR

The WIA was first approached by the ACMA in 2022, to consider how improved transparency could be brought to Amateur repeater and beacon frequency selection processes. In addition, the ACMA wished to enable a pathway for obtaining an amateur spectrum repeater/beacon frequency assignment that did not require applicants to engage with the WIA directly if they didn't want to. The ACMA has released a consultation for the new process, including a new proposed Frequency Assignment Process document (FAP-10) in support of this (you can read about the ACMA part of the work here: https://www.acma.gov.au/consultations/2024-06/amateur-repeater-and-beacons-assignment-process)

More detailed information here …… https://www.wia.org.au/newsevents/news/2024/20240624-1/index.php

More information please use this link https://www.arnsw.org.au/html/page_tt.htm

---

Bendigo Amateur Radio & Electronics Club Inc.

Bendigo Amateur Radio & Electronics Club, RADIOFEST 2024!

An invitation to your members.

The radio community is getting excited about the **BAREC RADIOFEST**, to be held on Sunday August 18th from 10 am at the East Bendigo Public Hall, 35 Lansell St, Bendigo, Victoria.

Displays, pre-loved gear & raffles, free parking.
General admission $5.00, tables $20.00 (includes one admission).
10 am start, food and drink available.
Talk in on VK3RCV 147.150 from 8 am.
Tables can be registered at www.barec.net.au, click on 'Radiofest 2024'.
East Bendigo Public Hall, 35 Lansell St, Bendigo, Victoria.
Google Maps link: https://maps.app.goo.gl/95BcgK9g2ysqdCQdA
Enquiries to radiofest@barec.net.au, or phone our secretary, Peter VK3PWJ on 0421 349 169, or Mark VK3PDG on 0407 844 063.

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

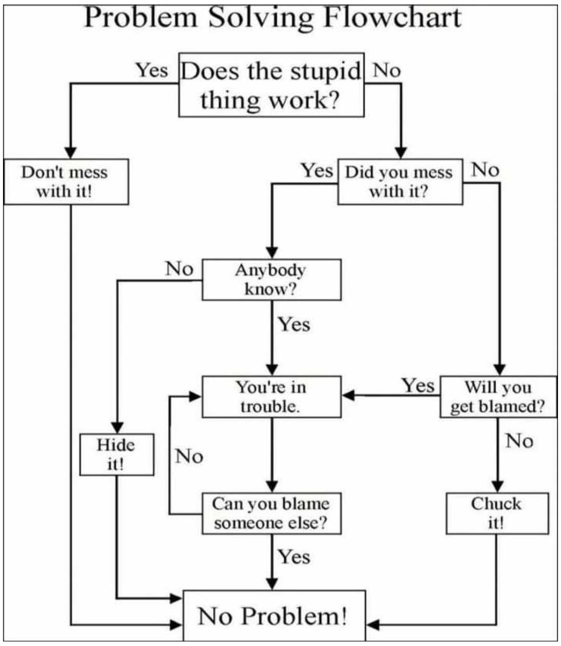
Upcoming meeting presentations ……………………………

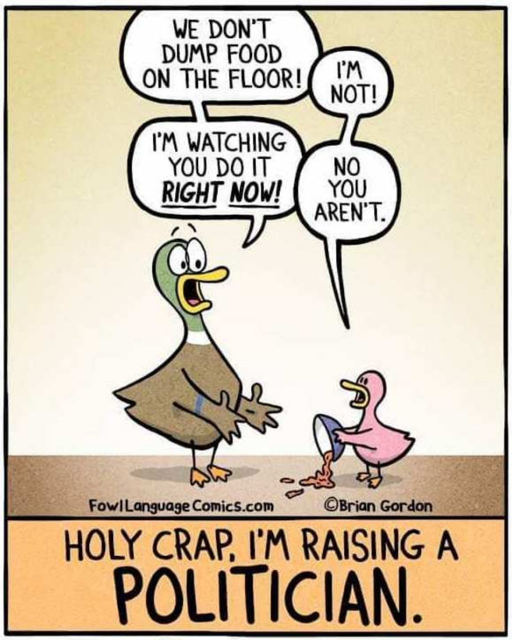
- **August 2024** : **IARS AGM** also *Voting for New proposed IARS Constitution*
- **September 2024** : **Detecting Signals in Noise!** , This will be a very interesting topic by IARS member Ciaran, (Ciaran has passed his examinations for AR, just waiting for his call sign from the ACMA).
- **October 2024** : **Show and Tell ,** Bring along that new antenna construction or project you have been working on and share it with us. There is a computer and projector available, all you need to bring is a memory stick if you want to share any media.
- **November 2024** : **IARS Annual Auction (**Simon VK2XQX) The Famous IARS Annual Auction is Around the corner, this is always a great opportunity to pick up that bargain or sell that dust collecting item no longer required.
- **December 2024** : **Pizza Dinner (possible Trivia Night TBA)** The annual IARS end of year celebration.

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 13th of August 7.30pm

73
Keith VK2KQB
IARS Secretary

IARS, Amateur Radio in the Illawarra since 1948