Tony Mowbray - Unit 27 0641 San [illegible] (Rural 2pm Fri.)

THE PROPAGATOR

MONTHLY NEWSLETTER OF THE ILLAWARRA AMATEUR RADIO SOCIETY.
VOLUME - 86 , NUMBER : 2 MARCH 1986
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MEETINGS ARE HELD ON THE SECOND TUESDAY OF EACH MONTH , (EXCEPT JANUARY) AT 7.30.PM. AT THE STATE EMERGENCY SERVICES , BUILDING , MONTAGUE STREET , NORTH WOLLONGONG .

VISITORS ARE MOST WELCOME TO ATTEND MEETING'S .

The March Meeting. on Tuesday 11th March.

Annual General Meeting for 1986. Election's

MARCH MEETING THE NEXT MEETING OF THE ILLAWARRA AMATEUR RADIO SOCIETY WILL BE HELD ON TUESDAY MARCH 11TH AT THE USUAL MEETING ROOMS IN THE STATE EMERGENCY SERVICE HEADQUARTERS IN MONTAGUE STREET, NORTH WOLLONGONG.

THE MEETING WILL BE THE ANNUAL GENERAL MEETING OF THE SOCIETY WITH THE ELECTION OF OFFICE BEARERS FOR THE CLUB. THERE WILL BE SEVERAL COMMITTEE POSITIONS TO BE VOTED FOR AND ALSO THE POSITION OF BROADCAST OFFICER. DON'T BE AFRAID TO NOMINATE SOMEONE FOR A POSITION. IT IS AN EXELLENT EXPERIENCE TO BE INVOLVED IN THE COMMITTEE AND A GOOD OPORTUNITY TO PUT SOMETHING BACK INTO THE CLUB. IF YOU FEEL THAT YOU WOULD LIKE TO BE ON COMMITTEE YOURSELF THEN ARRANGE FOR SOMEONE TO NOMINATE YOU OR NOMINATE YOURSELF !!!

THERE WILL ALSO BE A TALK GIVEN BY SEVERAL MEMBERS OF THE ILLAWARRA ASTRONOMICAL SOCIETY WITH A SLIDE SHOW AND IF THE NIGHT IS CLEAR THEN POSSIBLY THEY MAY BRING ALONG A TELESCOPE TO DO SOME FIRST HAND VIEWING.

DON'T FORGET TO BRING ALONG YOUR RAFFLE TICKETS THAT YOU ALL HAVE SOLD (HAVEN'T YOU !!!) TO THE MEETING TO ENABLE THE RAFFFLE TO BE DRAWN. IF THE TICKETS ARE NOT RETURNED THEN WE WILL BE UNABLE TO DRAW THE RAFFLE. PLEASE REALISE THAT EVERY TICKET THAT YOU SELL WILL PUT MORE MUCH NEEDED COPPERS IN THE I.A.R.S. MONEY BAG.

FEBRUARY MEETING AT THE LAST MEETING THE CLUB HAD THE PLEASURE OF A GUEST TALK BY BILL MARTIN VK2COP (THE CALL WANTED BY DAVE ROUTLEDGE VK2DWR) ON THE OPERATIONS OF THE W.I.A. SERVICE INTRUDER WATCH. MANY THANKS BILL AND WE HOPE THAT YOU ENJOYED YOUR STAY IN WOLLONGONG ON YOUR ANNUAL LEAVE.

REMEMBER TO RETURN THE RAFFLE TICKETS AT THE MARCH MEETING

YOUR FEE'S FOR 1986 ARE NOW DUE

All members please note that the membership fees are now due for 1986. The fees are due every year at the Annual General Meeting of the club. This year, if fees are not paid by the end of April, the May issue of The Propagator will not be sent to that member. Thus it is in your interest to get the fees paid early as back issues of the newsletter may not be available.

NOTE -: Some members last year may have actually paid their fees twice. A record has been kept of these members and they will be exempt from fees this year.

Fees can be paid in person at the meeting on March 11th or sent to P.O. Box 1838, Wollongong, 2500. Full membership is $10 and student/concession membership is $5.

From The Editor

This will be my last issue as Editor of the newsletter The Propagator, as study committments as curtailed all radio activities. Many thanks to all those people who have helped this year in many ways with both the newsletter and the club news broadcasts.

I hope that all the club members will assist the new editor with articles throughout the year. In the last few months my stock of articles has dwindled and it has become increasingly difficult to find suitable articles for inclusion. Several suggestions have been heard recently concerning what type of articles should be included in The Propagator. These suggestions have been noted, but the Editor alone cannot supply every article suggested. So how about writing an article for inclusion - if a subject interests you it will surely interest someone else - or if you see an article somewhere then send it in to the Editor.

Again thanks to all who have helped this year.

Paul Suters VK2KPS.

REPEATER REPORT GRAEME VK2CAG

Has anyone noticed that in these repeater reports Mt. Murray seems to get the lions share of the space? In fact, the other three repeaters hardly rate a mention at all. That is because they keep on plodding along without catastrophic events that plague Mt. Murray all the time!

Mt. Murray would have more useage than all the others put together. It has had more wind and lightning damage done over the years than all the others. It has also seen more man hours put in doing improvements as well as routine maintenance and storm damage repairs than the other three.

After saying this I cannot resist the temptation to say "I told you so" to those who, a few years back, wanted the repeater moved from Mt. Murray and put instead at Sublime point. Looking back, I can see that the right decision was made when the IARS membership survey resulted in Mt. Murray remaining in its present location and another repeater sited at Sublime point to serve the Northern suburbs of Wollongong, later to be converted to a dual-mode RTTY and voice repeater, and Mt. Murray to be upgraded as a long term club project. Over the last few years things have gone almost exactly to plan, and the results are as predicted by the repeater committee back in September 1981.

I said almost, because no-one could have predicted the huge increase in useage of Mt. Murray for a variety of reasons, the main one being a greater number of people being able to access it as a result of its greater coverage. This last comment should be interpreted as an achievement to be proud of, but instead it has been a headache to those involved with the repeater and somewhat an embarrassment to the IARS. Keeping sufficient energy available for the repeaters needs has been an ongoing problem, a problem that increases each time we make an improvement to the performance of the repeater.

The energy situation has been satisfactory up until recently but at the time of writing this (last week in Feb.) the 20 second time-out has been imposed for as long as necessary to allow the battery to fully charge up. This has resulted from long periods of repeater use by people (mainly locals) ragchewing for hours on end and not taking any notice of the warning signs of low pitched ident tone, which was intended to indicate the general trend of battery charge condition. As a result, the repeater comm-ittee will now go ahead with previously mentioned plans to fit a high/low power facility to the repeater as we feel that this will be more effective in energy conservation and will be less of an inconvenience to operators. This means that we will require two co-axial relays of a latching type with 12 volt coils, that use no energy except while switching state. Can anyone help? Please?

The preliminary application for a packet repeater at Mt. Murray has been acknowledged, and a formal application is in the stages of being filled in. Some of the information called for in the application have yet to be obtained, as the form is much more detailed than the one we had to fill out for the original install-ation at Mt. Murray some 13 years ago. Mt. Murray was the third repeater to be licenced in N.S.W.

We are hopeful that the energy situation will not jeopardise our plans for a packet repeater. We are pressing ahead with the paperwork and building of the equipment with the hope that we can obtain another solar panel to power it. So far we have received donations of a transceiver, a TNC controller, some deep cycle

On 15/2/86 during most of the afternoon Mt. Murray 6850 appeared to go into some sort of epileptic fit! The repeater was being keyed on and off in a regular rhythm about every one or two seconds,. Listening around, I heard the same thing on the St. George repeater at Heathcote, and Dural channel 7000 until it timed out. It was caused by an accidental transmission originating from an amateur in the Sydney area, for which he has apologised. It was of concern to us because the repeater did not time out as the transmission was of a pulsed nature and would not allow the transmission timer in the repeater to expire. Dural channel 7000 has an "anti-button-pushing" device which causes it to ignore repeated signals of this type. The whole exercize caused considerable unnecessary drain on our batteries at a time when they were already low, and this must have contributed to the present energy situation. An anti-button-pushing circuit could be fitted to our repeater too, but that circuit would consume a small amount of energy. We remotely switched off the repeater later in the day until the interference stopped. At the time it was not known if it was deliberate. We were fortunate this time.

This time last month I was about to find the cause of what appeared to be premature time-out on channel 6850. I promised that details of the fault would be reported this month. This is what happened:-

I visited Mt. Murray on 22/1/86 and found that the power output from the 5 watt exciter section of the transmitter faded away to nothing after a few seconds of being keyed up. Supply voltage and PTT logic levels were normal, so it was safe to assume that there was a thermal fault in the exciter unit, so that unit was removed from the site to be repaired. The repeater was put off air that afternoon.

In the workshop the exciter fired up OK, but put out only 2 watts, and that power faded away to nothing when the power supply was varied to below 12.5 or above 13 volts. A check with the RF probe showed that the power variation with voltage went right back to the first multiplier stage. I replaced the MPF121 FET and the output from that stage was fairly constant over the 11 to 15 volt range. I then re-assembled the transmitter, feeling confident of having fixed the fault, but on test found that the problem was still there. Output was now 3 watts, but the tuning of the multiplier coils was much too critical, and the power faded away to nothing outside 12 to 13.5 volt range. Obviously changing the FET made considerable improvement, but did not fully cure the problem. I then replaced the second multiplier FET (another MPF121) and got a similar degree of improvement. Rather than repeat the time consuming procedure of dismantle, change FET, re-assemble, re-align, I replaced all of the multiplier FETs, re-assembled and aligned the unit, and the output came up to a clean 5 watts min. (at 11 volts) and 7 watts max. (at 15 volts). The original FETs were all from the same batch, and all appear to have suffered some sort of loss of gain due to a change in their channel transconductance, much like the loss of emission in a valve when it ages. This is the first time I have seen this effect in semiconductor devices. The unit was made by me (cant remember when) more than 11 years ago! I wouldn't mind a dollar for every QSO that passed through it in that time!

Back on the hill and on air again on Sat 25/1/86. The battery was fully charged after having no load for 3 days. With the PA stage connected, the output was 26 watts, and 17 watts at the base of the aerial after passing through the duplexer.

CIRCUIT IDEAS

This series of circuit ideas and diagrams is the result of many requests over the last few months to include in the Propagator more circuits of practical value. The circuits shown here come from various issues of Electronics Australia's 'Circuit and Design Ideas' and Electronics Today International's 'Ideas for Experimenters'. As both these magazines note, none of the circuits have been tested.

Bi-directional LED chaser

A 555 timer IC is connected as an astable multivibrator whose output frequency is adjustable with the 100k potentiometer. The output pulses from the 555 are fed to a 4516 IC, which is a programmable binary up/down counter. The logic level on pin 10 governs the count direction and can be changed with the switch.

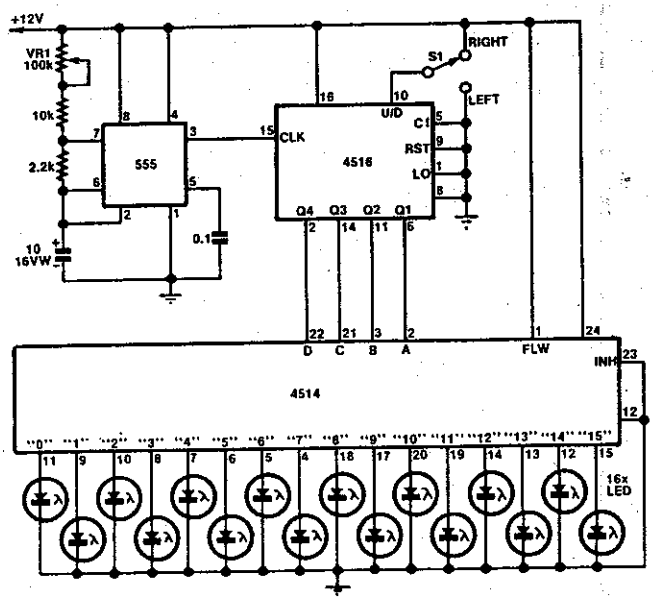
The 4516 has four outputs (Q4, Q3, Q2 and Q1) which can yield 16 unique states and these are fed to the D, C, B, A inputs of a 4514, a four-to-16 decoder, and cause each of its outputs (from 0 to 15) to yield, in turn, a unique high state. This will give the impression that the LEDs that are connected to these outputs are "moving".

It may be seen that the LEDs are driven directly from the 4514 IC, the amount of source current available being sufficient to drive the LEDs to adequate brightness.

The 100k potentiometer should be linear and it can vary the output frequency from 30Hz to 1.4Hz. The LEDs may be arranged in a straight line, a square, a circle, or any other desired configuration.

Finally, a suggested use for this device, is to fit it to a T-shirt to provide psychedelic lighting. The battery for the power supply may be fixed to a belt, or any other position which may be considered convenient.

(By Mr J. Petroulias, 30 Whitehorse Road, Blackburn, Vic 3130.)



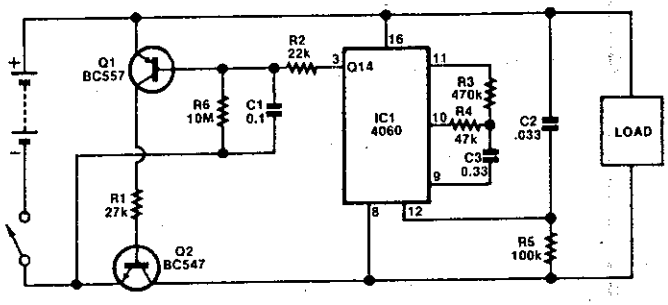
Automatic switch-off circuit saves batteries

Users of battery operated test equipment know how frustrating it is to find that batteries are flat because an instrument was not switched off. Here is a circuit which will automatically disconnect a load from a battery after a predetermined time. When the load is disconnected, the current is so small, less than a microamp, that it can be disregarded. To reconnect the load, the battery switch is turned off and then on again.

The part of the circuit which determines the "on" time is IC1 and its associated oscillator circuitry. The output of the oscillator is divided successively by two in each of the 14 stages of the counter. By pulling the reset line high, all outputs can be set low and this feature is used to ensure that the full number of divisions are carried out each time, thus ensuring quality of timing periods. Division restarts when the reset line goes low again.

When the switch is closed, current flows through the emitter-base junction of Q1 to charge C1 and in doing so, switches Q1 on momentarily. Q1 switches Q2 on and applies power to the load and to IC1. The reset line of IC1 is pulled high while C2 charges through R5 causing the counter outputs (Q14 in particular), to go low. With Q14 low, Q1 is maintained in a switched on condition, Q2 therefore remains switched on and the load continues to receive power.

With the component values shown, the oscillator oscillates at about 30Hz. This is divided by 16,384 with the result that after about nine minutes, Q14 goes high and switches off Q1, which in turn switches off Q2. This disconnects the load from the battery.

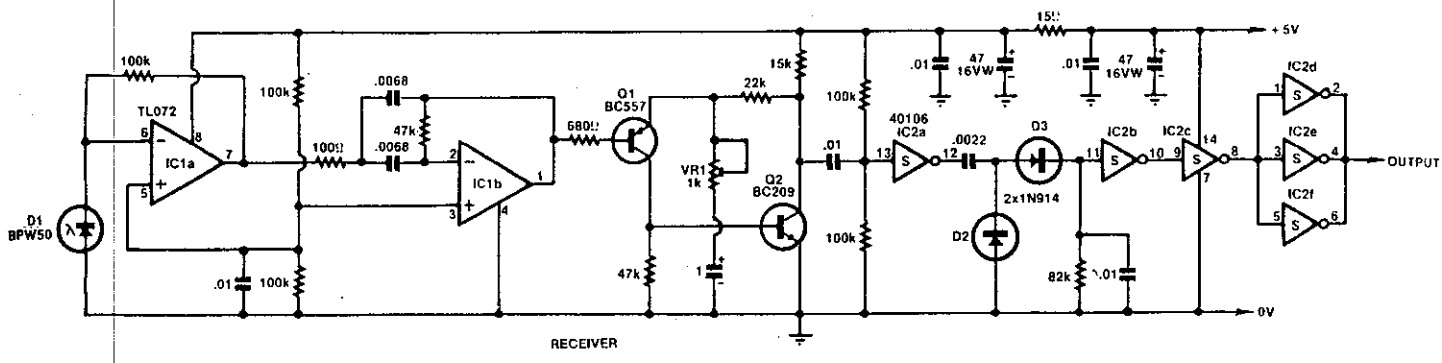


None of the component values appear to be critical. R1 is sized to allow sufficient base current to flow to saturate Q2. For light current loads, a value of from 10 to 15 times the load resistance is of the right order.

Q2 must be large enough to carry the load current. Since power transistors tend to require relatively large base currents, a Darlington pair may be used. As drawn, the circuit will operate over a voltage range of about 4.5 to 15 volts. For higher voltages, the Vss connection of IC1 could be connected to load negative via a zener diode so that Vdd to Vss across the IC is no greater than 15V. R5 should be connected beween pins eight and 12.

Longer timing periods could be obtained by increasing the capacitance of C3 and/or the values of R3 and R4 in accordance with the data book information on the IC.

(By Jim Parnell, ZL2APE, in "Break-In", January-February, 1980.)



Transistors Q1 and Q2 form a Darlington pair which drives the infrared LEDs. With the supply voltage shown, the LED current is about 140mA.

The receiver uses a BPW50 photodiode to detect the infrared radiation emitted by the transmitter. IC1a forms a buffer amplifier for this diode, and IC1b a bandpass filter. This filter is necessary to remove spurious signals generated by sources of infrared radiation such as fluorescent lights etc.

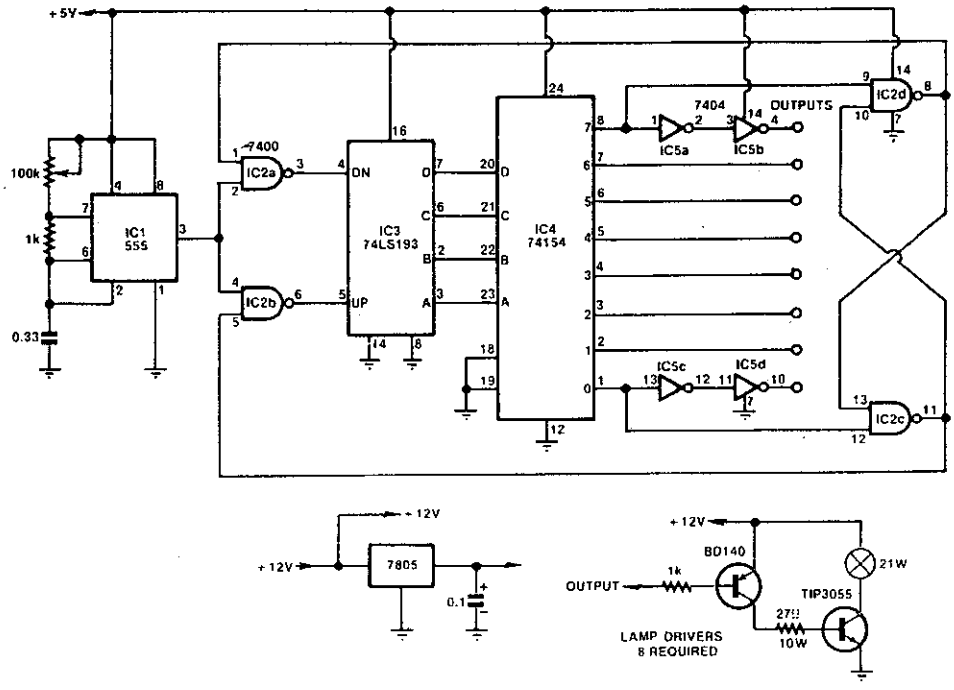
After filtering, the signal is amplified by the stage comprising Q1 and Q2. The gain of this amplifier can be adjusted by means of trimpot VR1.

Schmitt trigger IC2a squares up the waveform, while the detector circuit, comprising diodes D1 and D2, the .01μF capacitor and the 82kΩ resistor, integrates the resulting signal. After squaring up and buffering by the remaining gates of IC2, the original signal is reproduced.

One point to note about this circuit is that at high signal levels, ie. with the transmitter very close to the receiver, the bandpass filter can saturate, causing distortion of the recovered signal. It is also necessary to house the receiver in a metal box to minimise interference.

A. Sinton,
Taupo, New Zealand.

Knight Rider scanner light



This circuit has been designed to emulate the red scanning light on the car Kitt, in the Knight Rider TV show. The circuit will drive eight standard automotive lamps. The wattage rating of the lamps depends on the type of output transistors. The transistors used here would allow lamps rated at up to 30W to be used.

More or less than eight lamps can be used, simply by shifting the connection on pin 8 of IC4 to a higher or lower counter output, and adding or subtracting output stages.

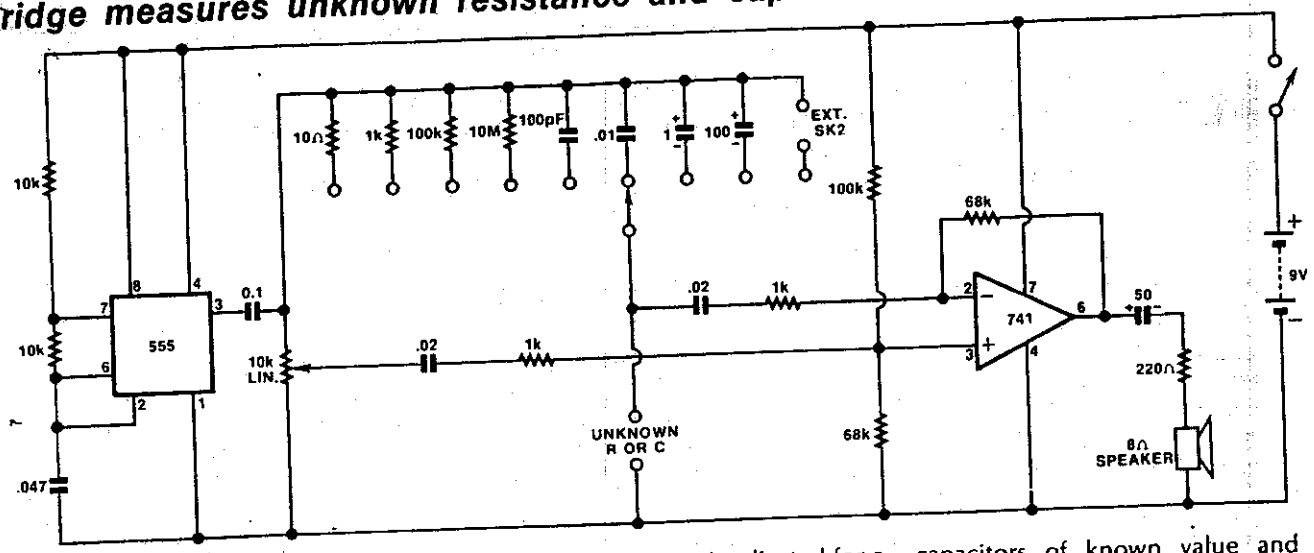
The flash rate is controlled by the oscillator formed by IC1 (555) and associated components. The output of this oscillator is gated into either the up or down counter inputs of IC3 by the NAND gates IC2a and IC2b. IC4, a 4-line to 16-line decoder, is clocked up or down by IC3. When either the 0 or 7 count is reached, the flipflop formed by IC2c and IC2d toggles, and the count direction is reversed.

The driver stages are connected to the decoded outputs of IC4, except for the first and last stages which are connected via a buffer. This was found to be necessary because of the extra load applied to these stages by the NAND gates.

A three terminal regulator provides the 5V supply necessary for the TTL ICs.

Craig Terry,
Berwick, Vic.

Bridge measures unknown resistance and capacitance



This bridge may be used to determine, with reasonable accuracy, the value of resistors and capacitors over a very wide range. The bridge is formed by two arms of the 10k potentiometer, the unknown and the reference value as chosen by the switch. The 555 serves as an oscillator in the audio range and the 10k potentiometer is adjusted for a minimum output from the headphones or loudspeaker, as determined by the 741 difference amplifier.

The 10k potentiometer should be calibrated by determining significant points obtained by using resistors or capacitors of known value and accuracy. The external reference socket may be used as a means for testing coils or for different ranges other than those which the switch offers.

(By Mr D. Brighton, Franklin Road, Huonville, Tasmania 7109.)

Improved resistance-capacitance oscillator

In a common form of RC oscillator as show in figure 1, a parallel-T network in a negative feedback loop nulls at one frequency, allowing positive feedback via the potentiometer to sustain oscillation at that frequency. The frequency stability is worse and the harmonic distortion is higher than that of a resonant (inductance/capacitance) oscillator because the bandwidth of an RC network is greater than the bandwidth of an LC circuit.

Unfortunately, inductors are usually large and expensive but a suitably proportioned parallel-T network can, with the addition of an extra resistor and capacitor, produce two outputs, one at point A (figure 2), a voltage which nulls at one frequency and the second at point B, a voltage which peaks, and is in phase with the network input voltage, at the same frequency. Positive feedback can now be taken from point B, giving a measure of frequency discrimination to the positive feedback loop and narrowing the overall oscillator bandwidth.

A comparison of measurements made on the two circuits shows the improvement to be expected. Standard tolerance resistors

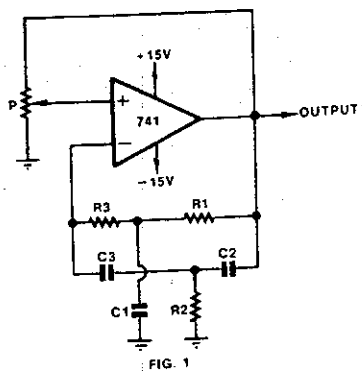


FIG. 1

and capacitors were used. Better results can be obtained by using matched components, or by using trimpots for R3 and R4. Both circuits were adjusted to give an output voltage of 4.5V P-P.

The frequency stability for a 10% supply voltage change was 0.17% for figure 1 and .011% for figure 2. Harmonic distortion was measured at 2.2% and 0.55%, respectively.

The choice of frequency, 1591.5Hz, may seem unusual but has been deliberately chosen as part of an impedance meter, to simplify calculations of inductive and capacitive reactance. Provided the parameters given below are observed, an oscillator of any frequency may be made.

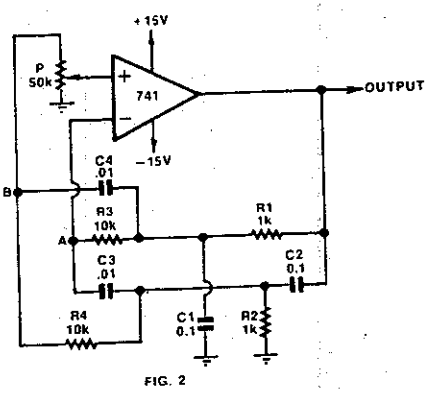


FIG. 2

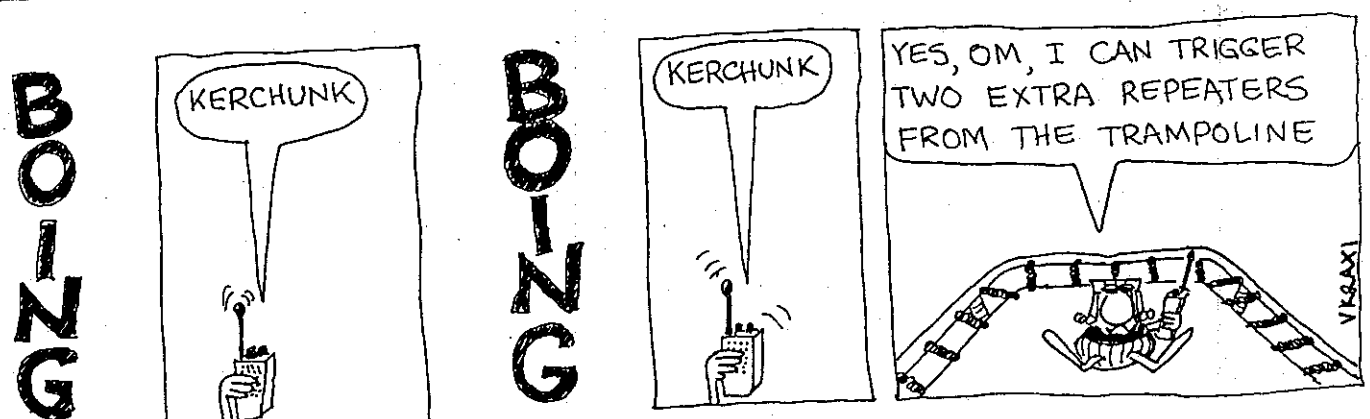
$R1 = R2 = Xc1 = Xc2$

$R3 = R4 = Xc3 = Xc4 = k1R1$, where k is equal to or greater than 10

$P = k2R3$, where k2 is equal to or greater than 5

X is the reactance at the frequency of oscillation, fo.

(By Mr R. Salter, 12 Ayr Street, Macleod, Victoria 3085.)



The Complete Idiot's Guide to Becoming a Lid

(or how to be a lousy operator)

THE ASTOUNDING GROWTH in the number of amateur radio licenses issued in the past few years has resulted in a virtual logjam on the bands. As a byproduct of this overcrowding, good operating practices are vanishing as rapidly as bottles of '64 Lafite Rothschild.

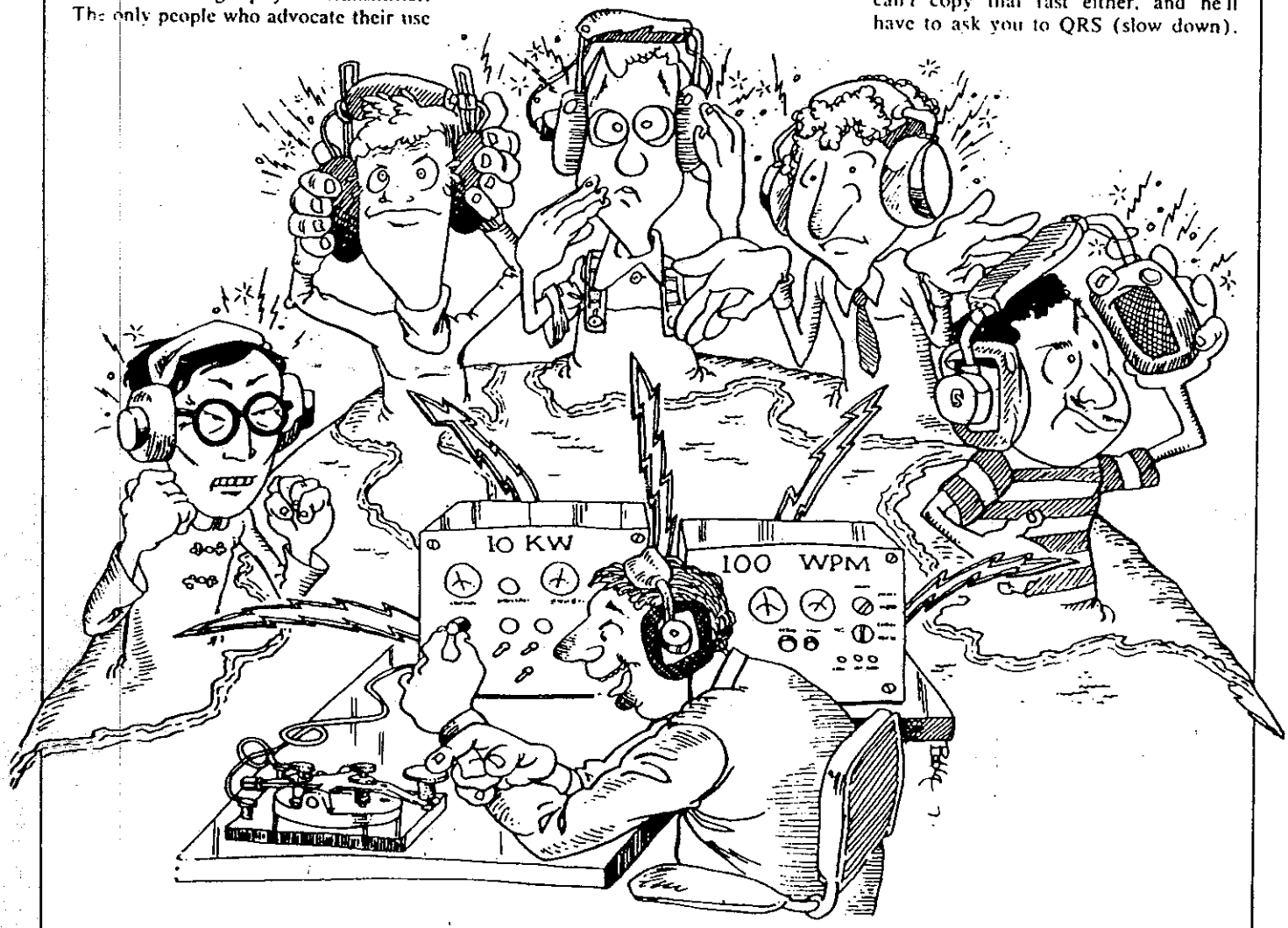
A poor operator is known as a "lid," and a lid is to be pitied, and hopefully educated, but not tolerated. If the educatory process is approached with tact, the errant operator's practices can be amended without alienating him or her. In this light, we bring you The Complete Idiot's Guide to Becoming a Lid.

On Tuning Up. Don't bother using one of those ridiculous oil-filled dummy loads for tuning up your transmitter. The only people who advocate their use are the people who manufacture them. The $20 to $30 which you might waste on them could buy a lot of beer. Instead, find the busiest frequency on the band, be it CW or phone. Since most of the activity is taking place here, it makes sense to load up your rig in the neighborhood in which you'll be operating, right? To allow for temperature variations, take at least ten minutes to accomplish tuneup, throwing a test tone about every 20 seconds or so, to allow for drift, and to let the other ops know that you're there.

On Calling CQ. Any frequency within your license segment is fair and legal territory for you to call CQ in. You don't necessarily have to be concerned with other stations transmitting on the same frequency, since you won't bother them while they are transmitting because they can't hear you.

Never answer another operator's CQ. Where's the challenge in that? You already know he wants to start a QSO. Instead, try calling a CQ right on the same frequency, and see who gets the first response. After all, why shouldn't every day be a contest day?

On CW. Now that you've finally gotten rid of that old manual key in favor of one of the new keyers, you can really burn up the ether with your speed. Always send just a bit faster than you can copy, because chances are the other op can't copy that fast either, and he'll have to ask you to QRS (slow down).



Becoming a Lid

Continued.

It's a lot better, and less embarrassing, than if he asks you to QRQ (send faster). After all, you did spend a lot of money on that keyer.

Since you did spend all that money with the idea of becoming a better CW operator, it's a good idea to stay away from all of those abbreviations and "Q" signals. Nobody understands them, and you get more practice if you spell every word out.

On Phone. Stay away from those international phonetics when sending your call. Tres passé. Something catchy and current is much better. If those foreign ops can't get it, that's tough. They should watch more television.

Remember, there are many more CB'ers than hams, and the CB lingo is now part of everyday English. There's absolutely nothing wrong with using everyday vocabulary on the ham bands. That textbook grammar is strictly kid stuff.

One of the most efficacious methods of "punching through" on the HF phone bands (below 30 MHz) is to turn up your speech compressor to maximum. The splatter will clear out anything within 10 kHz in either direction. Let's face it: if your phone signal is good within its limited 2 kHz bandwidth, it ought to sound five times as good with the additional space. Don't give in to those guys who inevitably will ask you to detune. If their rigs don't have enough receiver filtering, that's their problem, not yours.

On Working DX. Don't wait until that DX station finishes calling CQ before you start answering. Start calling him as soon as you have his call down. He may have a local frequency manager listening on the side, who is taking down the calls of the stations answering the CQ, in order to have a list for the DX station to reply to. You can be first on the list, so why wait?

Regardless of how many other stations might be waiting to work him, always get the QSL routing information from your DX contact. Not only do you get the information you need, but you perform a service to the other operators waiting on frequency by allowing them to copy it also. Making the DX station repeat it a few times is always a good practice. Sometimes their English ain't too cool.

On VHF FM Repeaters. Always initiate a conversation by calling CQ. It's foolish to announce that you are listening on the frequency, because if you're not talking, it's obvious that you are indeed listening. Calling CQ will identify you as an A-1 HF operator.

Once you have the repeater, keep the pauses between transmissions to an absolute minimum, because there's always the possibility of losing the channel to someone else. First come, first served. Also, don't be misled by those people who yell "emergency!" That's just a ruse to get you off, and get themselves on. If there's a real emergency, they can use the landline. That's what it's there for.

Conclusion. Obviously, this has been a guide towards what *not* to do, and you can probably add to it based upon your own experiences. It is truly unfortunate that many operators substitute dollars and cents for common sense, and kilowatts for milliwatts when the latter, in each case, is sufficient to accomplish the task at hand. Remember, the whole world is listening to you. Think about it the next time you fire up the rig. ■

Reprinted from 'Amateur Radio Today'

MULTIPLE INVERTED DIPOLES

Put a lot more antenna in a lot less space at a lower cost

by Ed Noll W3FQJ

The single inverted dipole (inverted "vee") is a common transmitting antenna. It is easy to erect, low in cost and an effective RF radiator.

A limitation of the inverted dipole is the fact that it is basically a single-band antenna. If you are interested in operation on more than one band, two or more inverted dipoles with separate transmission lines are assumed. This assumption is not necessarily so. Dipoles for different bands can be attached to the same mounting structure and fed with a single transmission line. Here's how to do it with minimal interaction among dipoles.

Two-Dipole Arrangement. The inverted dipole is particularly attractive as a basic multiple dipole configuration. A typical arrangement is shown in Fig. 1 for a combined 40-meter and 80-meter dipole setup. Both dipoles are connected to a central dipole-to-coaxial cable connector or other type of insulator. This is fastened to the top of a mast or other support structure. Quarter-wavelength dipole elements are run from the connector down to four low supports (spaced 90° apart) for the inverted-vee configuration. Note that the 80-meter dipole connects to low supports that are at the 0 degree and 180 degree positions. The 40-meter inverted dipole is mounted at right angles to the 80-meter inverted dipole.

The maximum voltage points of the antennas are well separated and there is minimum interaction between the two dipoles. Such interaction is difficult to avoid when the antennas are mounted in the same plane. At the resonant frequencies, the inverted dipoles display the characteristic 50 to 72-ohm impedances. On 40-meters, the 80-meter dipole has a high impedance and does not affect 40-meter operation. Likewise, the 40-meter antenna displays a high impedance at the resonant frequency of the 80-meter dipole.

A single transmission line connects the two-band antenna to the transmitter. Impedance match and operation are the same as would be obtained if there were two entirely separate dipoles and transmission lines.

Dipole Dimensions. Typical dimensions for the crossed, two-band dipole configuration are given in Fig. 1 for 40-meter and 80-meter phone band operation. It should be mentioned that the basic configuration can be used for either inverted-vee or straight horizontal dipole construction. Obviously, for strictly horizontal dipole construction, additional masts are required. The advantage of the inverted dipole arrangement is that the antenna ends are at a low height and can be held by short poles or fence posts. An additional advantage of the inverted dipole construction is that it is easy to trim antenna length to obtain a precise resonant frequency because each element can be let down conveniently.

Quite often, the author cuts the antenna for the phone portion of a given band. For CW operation, short lengths of wire can be clipped or wrapped around the antenna ends to resonate the antenna in the CW segment of a given band.

Inasmuch as the elements go off at 90-degree intervals, the antenna's quar-

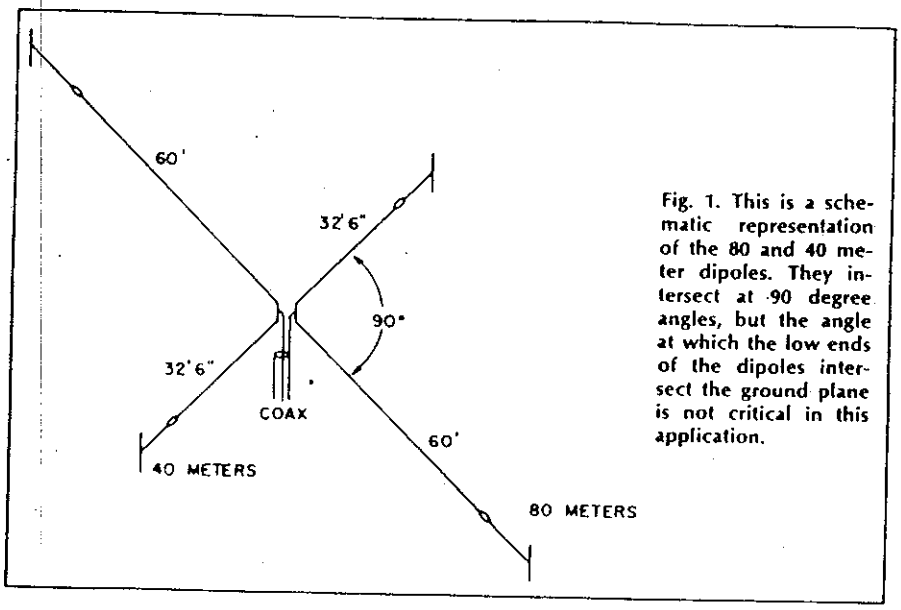


Fig. 1. This is a schematic representation of the 80 and 40 meter dipoles. They intersect at 90 degree angles, but the angle at which the low ends of the dipoles intersect the ground plane is not critical in this application.

ter-wave segments themselves act as guy wires for the high center mast in an inverted-vee configuration. No additional guy wires are required and therefore interaction among radiating elements and guy wires is eliminated.

The length of each quarter-wave segment can be calculated using the simple equation:

$$\text{Quarter-wavelength elements} = \frac{234}{f}$$

The calculations for 40 and 80-meter phone operation are:

$$\text{40-meter quarter wavelength} = \frac{234}{3.9} = 60\text{-feet}$$

$$\text{80-meter quarter wavelength} = \frac{234}{7.2} = 32.5\text{-feet}$$

Table 1 provides dimensions for cutting dipole segments for Novice and SSB sections of some of the more popular Amateur radio bands.

Two-Section, Tri-Band Antenna. The author constructed the antenna of Fig. 2 for three-band phone operation. Basically it is a 20-meter and 40-meter configuration of crossed, inverted-vee dipoles with a facility for adding length to the 40-meter antenna to obtain 15-meter phone segment resonance. The 20-meter quarter-wave elements are 16.5-feet in length. Resonance was at 14.2 megaHertz. The 40-meter inverted dipole was first cut for 32-feet, 6-inches. However, the resonant frequency was a bit low. Consequently three inches were cut off each end, and resonance was then found to be near 7.2 MHz.

After some experimentation, it was found that if 13-inches were clipped on to the ends of the 40-meter dipole, a three-quarter wavelength resonance could be obtained at approximately 21.3 megaHertz. This 13-inches was the overall length of an alligator clip plus a short piece of antenna wire. In the inverted configuration, it is very easy to let down each end of the 40-meter antenna to clip on the 15-meter addition whenever operation is desired on that band.

If you have an antenna tuner, the 13-inch extensions are not required. The tuner will permit you to match your transmitter on 15-meters, and there will be no significant deterioration in antenna system performance. This arrangement provides a simple, good-performance and low-cost three-band antenna system.

Novice Tri-Bander. Many Novice Amateurs must operate on a low budget and in limited space for antenna erection. Often they are confined to single

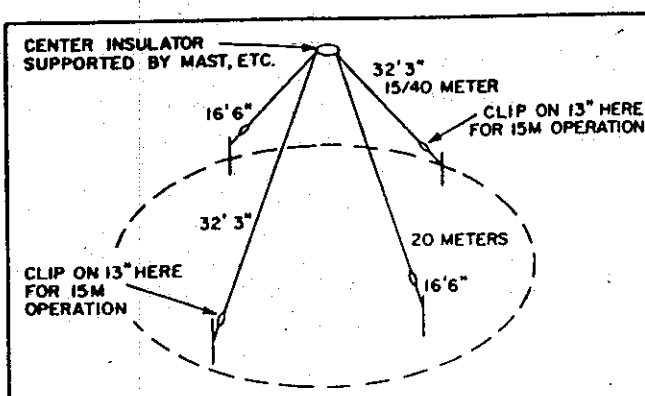


Fig. 2. This the "convertible model." With the addition of 13-inches at either end of the 40 meter antenna, it becomes possible to resonate the antenna on 15 meters as well. You can use this technique with a horizontal dipole just as well.

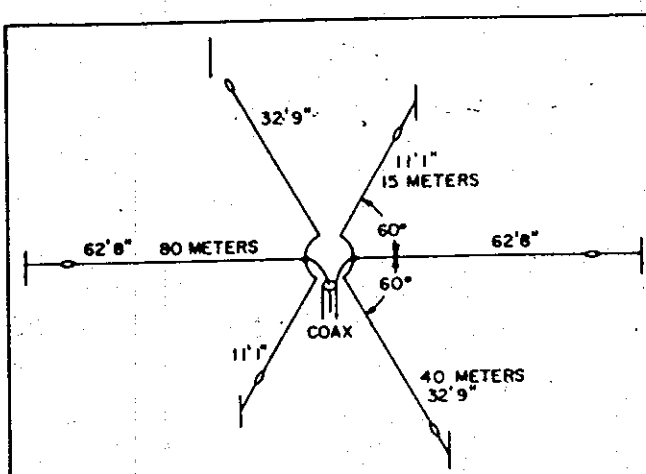


Fig. 3. The Novice tri-bander configuration has the three antennas intersecting each other at 60 degree intervals. With some minor adjustments, and a glance at the table below, it should be obvious that the 40 meter antenna can be resonated on 20 meters without too much trimming or adding.

TABLE 1 DIPOLE DIMENSIONS

Band	Mode	Length in Feet
80	CW	62.80
80	Phone	60.00
40	CW	32.85
40	Phone	32.50
20	Phone	16.50
15	CW	11.06
15	Phone	11.00
10	CW	8.30
10	Phone	8.20

Note: CW dimensions given are for Novice class band segments. For higher class CW band dimensions, refer to the formula in the text.

This table, as well as the formula given in the text, will allow you to construct inverted dipole antennas for any of the present ham bands you might wish to operate on. Remember to make your initial wire cuts a bit on the long side to allow for fine tuning after antenna is erected in operating position.

band operation. The arrangement of Fig. 3, using the inverted-vee construction, can permit three-band operation and with only a single supporting mast. Metal fence posts can be used to hold down the six antenna elements.

Adequate isolation among the three antennas is obtained by maintaining 60-degree spacing among dipoles as shown in Fig. 3. Dimensions are given for frequencies that are approximately centered in the three Novice bands on 15, 40 and 80-meters. Again, the antenna elements themselves serve as guying for the center mast. Some trimming of antenna elements may be necessary if precise resonant frequencies are desired.

Conclusion. In summary, spaced inverted dipoles with a common center connection to the transmission line permit adequate multiband operation. The system performs with a single transmission line and no tuner is required if the elements are cut carefully and perhaps trimmed if the SWR appears to be a trifle too high.

The spacing of the antenna elements minimizes interaction among dipoles and therefore matching problems are reduced or eliminated. ■

THE ILLAWARRA AMATEUR RADIO SOCIETY

P.O.BOX. 1838. WOLLONGONG.2500. N.S.W.

MEETINGS: Second Tuesday of every month except January at 7.30.pm. in the S.E.S. Headquarters, Montague Street, North Wollongong.

REPEATERS:

VK2RAW-146.850-(VOICE)	VHF	Mt Murray.
VK2RUW-438.225-(VOICE)	UHF	Hill 60, Port Kembla.
VK2RIL-147.275-(RTTY/V)	VHF	Sublime Point
VK2RIL-438.725-(RTTY/V)	UHF	Sublime Point

BROADCASTS: On Sunday evening prior to the club meeting, at 7.00.pm. R.T.T.Y. Mode, and at 7.15.pm. on voice. Transmitted on 147.275.VHF, and relay on 3.562.Mhz. Callbacks will be taken after the voice broadcast.

W.I.A. RELAY: On 146.850. at 11.00.am. and 7.30.pm. each Sunday.

CLUB NETS: 3.562.Mhz. SSB on Sunday at 8.00.pm. and a slow morse net on 28.440.Mhz on Tuesday at 8.00.pm.

NEWSLETTER: "THE PROPAGATOR", published monthly to reach financial members in the week preceeding the club meeting. All articles, adds, etc to the editor by 3rd Tuesday each month.

MEMBERSHIP: The Secretary, I.A.R.S. , P.O.Box. 1838, Wollongong, 2500. Full membership is $10 per annum; students and pensioners concessional members $5 per annum.

AWARDS: The award of the Illawarra Amateur Radio Society is the LAWRENCE-HARGRAVE AWARD. VK stations require 10 contacts with I.A.R.S. members. Overseas stations require 5 contacts with I.A.R.S. members. A contact with VK2AMW is sufficient for the award. Band-details, date, frequency, station worked and $2 or 4 I.R.C.'s. to THE AWARD-MANAGER, I.A.R.S., P.O.Box. 1838. Wollongong. 2500. No QSL cards requird.

STORE: The club store operates at each club meeting.

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2 nd SUNDAY OF THE MONTH : VK2PHD-RAY BALL.
3 rd SUNDAY OF THE MONTH : VK2EMV-M.v.d.VORSTENBOSCH.
4 th SUNDAY OF THE MONTH : VK2DWR-DAVE ROUTLEDGE.
5 th SUNDAY OF THE MONTH : VK2EBI-KEVIN MURPHY.
AND ON STANDBY IS : VK2KAJ-TONY