THE PROPAGATOR

MONTHLY NEWSLETTER OF THE ILLAWARRA AMATEUR RADIO SOCIETY

PO BOX 1838 WOLLONGONG NSW 2500

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MEETINGS ARE HELD ON THE SECOND MONDAY OF EACH MONTH (EXCEPT JANUARY) AT 7.30 P.M. IN THE CONGREGATIONAL HALL, CORNER OF COOMBE AND MARKET STREETS, WOLLONGONG. VISITORS ARE WELCOME TO ATTEND MEETINGS.

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THIS MONTH'S MEETING will feature a talk by Lyle VK2ALU about MOONBOUNCE (EME). Lyle will discuss with appropriate pictures, past and future projects of the world famous VK2AMW/P EME station. This project requires the participation of all club members whether licenced or not.

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LAST MONTH'S MEETING

No doubt due to a combination of wet weather and the Queen's Birthday long weekend, attendance of members was down to about half the usual number. After some general business, President Keith Curie VK2OB introduced the guest speakers John VK2ZUH and Bob VK2YOD, who proceeded to give us a most interesting and informative description of the progress of Amateur Television in N.S.W.

Ray VK2DB who had also come down from Sydney was unable to attend the meeting due to sustaining a cracked rib. We wish him a speedy recovery and hope to see him at a future meeting.

Most ATV enthusiasts are apparently in the Western Suburbs where some 10 people are regularly on the air, with others being as far away as Gosford. Vision is in the 70cm band (426MHz) with speech on 2m, and as usually only about 10W are used, with a bandwidth of around 11MHz DSB basically line of sight, a good antenna is essential. A considerable amount of equipment in ATV is homebrew, some examples of which were passed around the meeting.

Details were also given of the ATV repeater awaiting D.O.C. approval, sited at Bondi but to be moved to Mt. Bowen. Questions from members showed the keen interest the subject had aroused.

The raffle prize of a Fan Heater was won by Morry VK2BMV. Eric VK2YVF announced the commencement of slow morse on 2m, (repeater Channel 9). The meeting concluded with the usual refreshments.

THE MOONBOUNCE PROJECT

Those of you who have been members of the Illawarra Amateur Radio Society for about 5 years or more will have some memories of the Dapto Moonbounce Project. Newer members may or may not have heard of it.

Briefly it was, basically, a long term project undertaken by our Society and particularly by a few of the members over a long period and by others who gave of their assistance over lesser periods to first of all, set up, then operate a UHF communications station under the Societies call sign VK2AMW which could use the earth-moon-earth path to contact amateur stations in other countries with similar facilities. Construction work started in 1970.

The success of the Project is a matter of history, as a number of contacts were made over a period of several years, including, first of all, holding the long distance record for an amateur UHF contact for some years by working G3LTF and later by achieving the WAC Award on the 70cm band. At that time there were very few amateur stations in the world capable of achieving these results, of which we were justly proud.

Unfortunately the Project was terminated abruptly by the work of vandals who succeeded in irrepairably damaging the equipment at its Dapto site late in 1977.

The communications system had made use of a parabolic reflecter antenna was owned by the University of Wollongong and they undertook to relocate it to a more suitable site. This was approximately 4 years ago and many difficulties have had to be overcome to make the move.

However I am now able to report that the major components of the disk antenna have been recently re-erected on the necessary concrete foundation block and a small operating building has been constructed nearby. 240 volt supply for lighting and power have been connected up and conduits have been laid between the disk and the operating building, ready for the many runs of control, protection and power cables to be run to the disk together with the various coaxial cables.

A request was made to Department of Communications some months ago for our high power transmitting permit to be renewed but to date no advice has been received that this has been granted, although in the initial discussions with representatives of the department, no doubts were expressed that use should be able to obtain the required permit at the new site.

It is now a matter of the members of the Society deciding what they wish to do with the facility which is again offered to us by the University of Wollongong.

Needless to say, quite a lot of work would be required to make the facility operational as an EME communication medium. Much of this work does not require advanced knowledge of UHF construction, such as getting the disk drive motors and selsyn position readouts working, running and terminating control and protection cables, checking out power supplies etc.

Personally, I would like to see others take over most of the Project if it is to be reactivated, in view of my very limited time available for the next year or two, but thats up to our members, who may feel that they would like to participate in the Project, to decide. Maybe there is someone who is keen enough and can find the time to manage it.

I have, of course, various ideas on what we might most eaily achieve and what might prove to be most interesting directions to go in view of continued close liaison with various other amateurs currently operating via EME and particularly since my recent opportunity to personally talk to some of the leading EME exponents and to see their gear operating in different QTH's in England and Europe.

Nevertheless I fully understand that we all see Amateur radio as our hobby and that each one of us has his own way of enjoying the hobby. Maybe not many of the members might like to take on the continuing challenge of EME - but maybe some might - and others might feel that by taking on only a small component of the project they may get some satisfaction of being part of such an enterprise. How do you feel? Have you any ideas? If so then please let me know or be ready to bring them up at club meetings.

LYLE PATERSON
VK2ALU

CORRECTION
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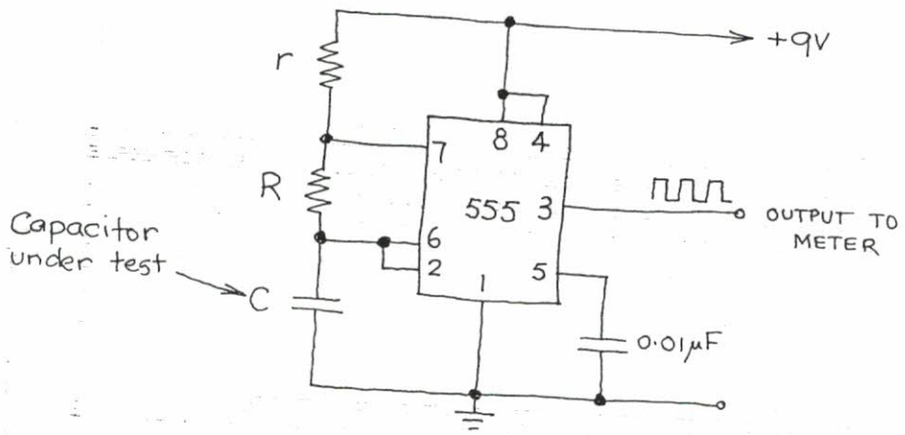
SPECIAL EVENT CALLSIGN PREFIX

The "AX" prefix may be used from 15th August,1982 to 15th October 1982 inclusive. And not November as stated in June Propagator.

MEASURING CAPACITANCE

One approach to measuring the value of unknown capacitors is to place in an RC oscillator circuit with a known value of resistance, measure the oscillator frequency, and calculate the capacitance - thus getting more use out of the shack frequency meter and calculator.

A simple oscillator circuit which provides moderate precision is the common 555 astable:



Period of the circuit is $T = 0.693(r + 2R)C$ where T is in seconds, r and R are in ohms and C is in farads.

Frequency of the circuit is $f = \frac{1.44}{(r + 2R)C}$ where f is in Hertz, r and R in ohms, and C in farads. (see National Semiconductor Linear Data).

While the above expressions allow capacitance to be calculated, life can be made simpler and the calculator batteries conserved by (a) making r very much less than R - less than one-tenth and it can be ignored; and (b) selecting a value of R which makes the meter readout equal to the capacitance value (assuming that period, T, can be directly read by the meter).

If r can be neglected, the period becomes $T = 1.386\ RC$, whence

$$C = \frac{T}{1.386R} \text{ farads,} \quad \text{or} \quad C = \frac{T}{1.386\ R} \times 10^6 \text{ microfarads.}$$

If R is chosen to be 722 Kilohms, C (microfarads) = T (seconds)
or C (picofarads) = T (microseconds)

The closest value to 722 Kilohms which is easily obtainable is 720K, by either 330K and 390K in series, or 1.2M and 1.8M in parallel. Since r should be less than a tenth of R, a suitable value would be 4K7.

This arrangement has not yet been tried in practice, but will certainly be given a go before considering laying out $50 or so for a direct-reading capacitance meter kit!

- Brian VK2AXI

REPEATER REPORT.

BY [illegible]

MOUNT MURRAY

REPAIRS TO THE MAST WHICH WAS BLOWN DOWN ON 25TH APRIL IS ALMOST COMPLETE. A STRONGER BOTTOM SECTION HAS BEEN WELDED ON AND GUY WIRES FITTED AT THE HALF WAY POINT. MORE GUY WIRE IS BEING PURCHASED FOR THE TOP. GUY ANCHOR POINTS ARE WELL SECURED IN CONCRETE.

THE PICTURE* [illegible] THE BENT MAST TAKEN [illegible] AFTER THE [illegible]. TO THE LEFT (BEHIND [illegible]) IS THE TEMPORARY PIPE MAST PUT UP BY PAT VK2KEY AND WHICH KEPT THE REPEATER ON AIR UNTIL ANOTHER [illegible] TELESCOPIC [illegible] MAST WAS ERECTED FAR ENOUGH AWAY TO ALLOW THE REPEATER TO REMAIN ON AIR DURING THE REPAIR PROGRAM.

WE ARE EXPECTING DELIVERY FROM LANTEK OF A ROBUST 6DB GAIN OMNI-DIRECTIONAL AERIAL. THIS IS TO BE MOUNTED ON THE REPAIRED MAST. EXPERIMENTS WILL THEN TAKE PLACE WITH THE TRANSMITTER CO-SITED WITH THE RECEIVER AND USING THE NEW AERIAL FOR [illegible] AND EXISTING [illegible] AERIAL FOR RECEIVING. THE [illegible] LINK WHICH WAS PREVIOUSLY USED IN LINKING THE TRANSMITTER [illegible] WILL BE USED TO CARRY LOW VOLTAGE AC FOR CHARGING THE BATTERY. LOWER TRANSMIT POWER - ALL SOLID STATE - WILL BE USED. THE TRIAL PERIOD WILL SHOW IF THE HIGH AERIAL GAIN AND GREATER ELEVATION WILL OFFSET THE REDUCTION IN POWER. THE REPEATER'S FINAL OUTPUT POWER WILL BE DETERMINED BY THE BEST COMPROMISE BETWEEN COVERAGE AND THE ABILITY OF THE LANDLINE TO CARRY THE NECESSARY SUPPLY.

WE ARE NOW WELL ON THE WAY TO OUR FINAL GOAL OF HAVING A FULLY SOLID STATE DIPLEXED REPEATER WITH ONE AERIAL.

THE INTERFERENCE PROBLEMS DETAILED IN THE PROPAGATOR IN APRIL HAVE BEEN RESOLVED.

* Picture on Page 8

HILL 60

THE UHF REPEATER [illegible] 3025 WAS MOVED FROM ITS TEMPORARY LOCATION AT THE QTH OF [illegible] VK2KFI TO ITS PERMANENT HOME IN THE COASTGUARD BUILDING ON HILL 60. IT WAS TAKEN OFF AIR ON FRIDAY 25TH JUNE AND GIVEN A TUNE-UP AND MODIFICATIONS [illegible] TO [illegible] TO GIVE A [illegible] LEVEL.

THE AERIALS WERE RE-MOUNTED ON A NEW ALUMINIUM MAST WITH STAINLESS STEEL FITTINGS. THE AERIAL SYSTEM IS MADE TO WITHSTAND THE CORROSIVE ATMOSPHERE TO BE EXPECTED AT THAT SITE.
THE COST OF ALL THE NEW MAST AND FITTINGS WAS BORNE BY A LOCAL BUSINESS IN EXCHANGE FOR OUR SERVICES IN PROVIDING THE LABOUR NECESSARY TO INSTALL HIS UHF BASE STATION AT THE SAME SITE.

ASSISTANCE AND CO-OPERATION GIVEN BY OUR MEMBERS TO THE VOLUNTEER COASTGUARD ASSOCIATION IN THE PAST HAS RESULTED IN THE AVAILABILITY TO US OF THIS PRIME UHF SITE WITH THE ADDED BENEFITS OF FREE POWER AND EXCELLENT SECURITY. MANY HOURS OF WORK PUT IN BY MANY OF OUR MEMBERS, MUCH OF IT BEHIND THE SCENES, HAVE [illegible] IN KEEPING THE COST OF THIS PROJECT DOWN TO ZERO DOLLARS.

THANKS, FELLERS.

TESTS SO FAR SHOW AN IMPROVEMENT OF [illegible] S-POINTS [illegible] ALL AREAS. IT APPEARS TO BE WORKABLE ALMOST ANYWHERE BETWEEN KIAMA AND [illegible] AUSTINMER WITH A 300 MILLIWATT HAND-HELD UNIT.

OUR SPECIAL THANKS MUST GO TO:

[illegible] AUSTRALIAN COASTGUARD ASSOCIATION
THE [illegible] OF [illegible] COUNCIL [illegible]
[illegible] AND FAMILY

Oscilloscope capacitance meter

Simple measurement technique utilizes the timebase sawtooth waveform to obtain an accuracy better than 5%

by H. v. Z. Smit, B.Sc., B.Eng.(Elec.)

If you have no "555" but an Oscilloscope
mayby you would like to try this.

From time to time various methods of measuring the value of a capacitance by means of an oscilloscope have been published[1,2]. Many of these methods depend on the determination of the shape of a phase ellipse and therefore a sine-wave source is essential. Also, the value of the capacitance has usually to be calculated from the readings taken. Thus such methods tend to be of academic interest rather than useful in practice.

In the method described here, which can also be used to determine the capacitance/voltage characteristic of tuning diodes, use is made of only one selected resistor to convert the oscilloscope into a direct-reading capacitance meter covering a range between about 1pF and several μF. The accuracy of measurement is sufficient for most practical purposes. It is necessary for the timebase sawtooth of the oscilloscope to be available externally.

The vertical shift control is first set to fix the zero line on the lowest line of the graticule. The unknown capacitance C and the resistor R are then connected as shown in Fig. 1. Next the vertical deflection control is set for maximum d.c. sensitivity and the horizontal (time scale) is adjusted to give a display such as that shown in Fig. 2. The capacitance value is directly proportional to the vertical deflection after steady state conditions have been reached. This value can be easily read off the vertical centre line of the graticule.

In accordance with the expression given (derived in the Appendix), the value of R should be chosen to give the desired vertical scale factor (pF per cm or μF per cm).

$$R = TV/vF$$

where: V is 1/sensitivity of y-input in volts/cm; T is the timebase setting in μs/cm; v is the sawtooth slope in volts (vertical) per cm (horizontal); and F is the required vertical scale factor in μF/cm.

For example if: $V = 20$mV/cm, $v = 0.92$ volts per horizontal cm and $F = 1000$pF/cm (required). Choose $T = 1$ms/cm and the equation gives $R = 21.7$kΩ. The display shown in Fig. 2 was obtained with this value of R and for the above conditions. The value of the unknown can be read off as 6700pF.

Accuracy of measurement depends on the accuracy of the vertical and time scales, the accuracy with which R is known, the accuracy with which the slope of the sawtooth can be determined, the linearity of the sawtooth and finally the reading accuracy which in turn depends on line thickness, graticule quality and parallax. Errors attributable to these factors are negligible in practice.

The method has the advantage that the limits of valid measurement are immediately apparent in the display. The minimum capacitance which can be measured is limited by stray capacitances to earth and at the input of the oscilloscope. These capacitances do not introduce errors of measurement but make

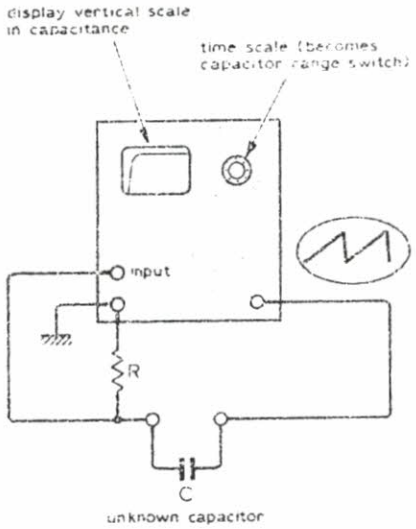
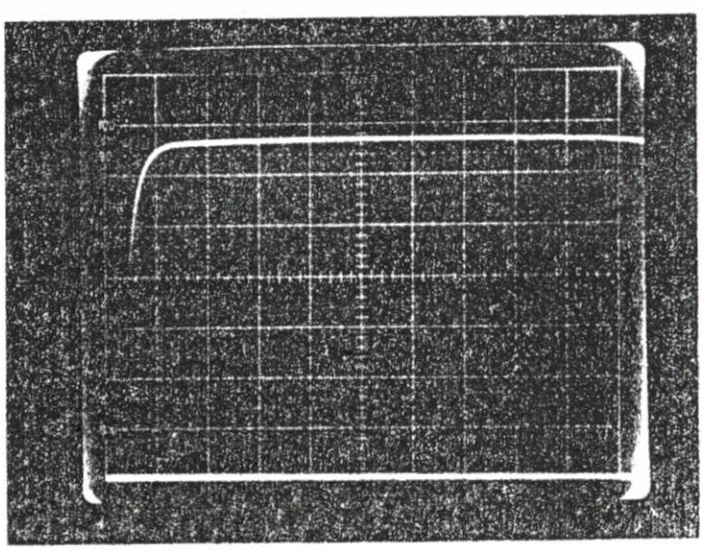


Fig. 1. Circuit used for measuring the value of capacitor C.

Fig. 2. Measurement of a 6700pF capacitor. Time scale is 1ms/cm (corresponding to 1nF/cm). Voltage setting is 20mV/cm.



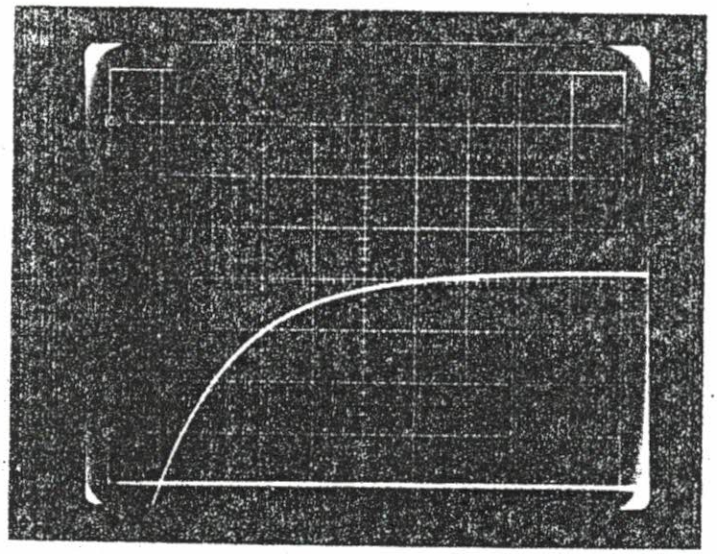


Fig. 3. Measurement of a 2.1pF capacitor. Time scale is 0.5μs/cm (corresponding to 0.5pF/cm). Voltage setting is at 20mV/cm and the oscilloscope input capacitance is 30pF.

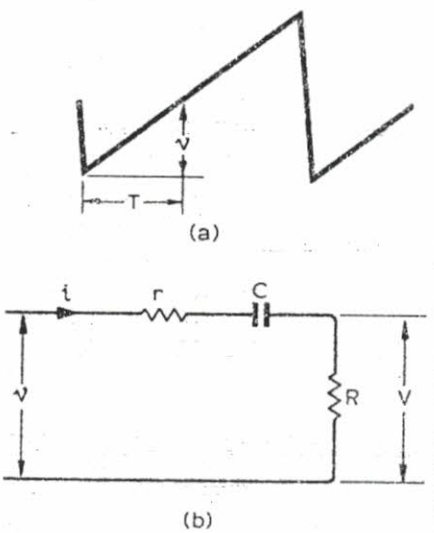


Fig. 4 (a). Timebase sawtooth waveform and (b) the circuit to which it is applied —see appendix.

accurate reading of the display difficult, as shown in Fig. 3.

It is possible to measure capacitances an order smaller than the stray capacitance. Fig. 3 shows a 2.1pF capacitor being measured although the input stray capacitance is 30pF. Theoretically there is no upper limit to the value of the capacitance which can be measured. In practice, however, the time consumed in taking a reading eventually becomes unrealistic, 100s/cm corresponding to 100μF/cm, for instance. On the other hand the practical range can be extended by a factor of 20 to 100 by decreasing the value of R. A lower limit to R is reached when the time constant rC (where r is the sawtooth generator output resistance) becomes so great that it "distorts" the waveform on the oscilloscope and a trace similar to that shown in Fig. 3 results.

If reasonable care is taken during the measurement procedure, results can be accurate to well within 5%. Accuracy can be optimized by a suitable choice of R and use of a standard capacitor C whose value is accurately known.

Appendix

Refer to Fig. 4 (a) which shows the timebase sawtooth waveform. Quantity T, represented by 1cm horizontal deflection, is by definition the time in μs at which the vertical deflection voltage is v. At any time t voltage is v_t and therefore

$$v_t = vt/T$$

This voltage is applied to the series circuit of Fig. 4 (b) where r is the output impedance of the sawtooth generator, R is the resistance of the calibrating resistor and C is the unknown capacitance. By summing voltages,

$$v_t = vt/T = iR + ir + (1/C)\int i\,dt$$

Differentiating with respect to t

$$v/T = (R + r)di/dt + i/C$$

As $t \to \infty$, $di/dt \to 0$ and thus $i \to vC/T$.

The voltage V across R, as applied to the vertical input of the oscilloscope, is equal to iR, therefore

$$V = vCR/T$$

or $$C = VT/vR$$

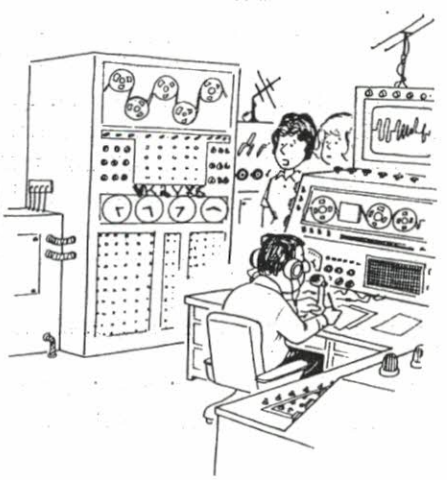
By a suitable choice of R and T, any given value of V can be made to correspond with a convenient value of C. Thus if C is replaced by F (μF per cm) then $F = VT/vR$, where V is now in volts per cm.

References

1. Rider & Uslon, "Encyclopaedia on cathode-ray oscilloscopes and their uses", 1959 edition, pp.14–4 to 14–7.
2. Millay, J., "Progress in semiconductor testing", *Tekscope*, Nov. 1972, p.3.

Morry got his De'mot" board working

"They didn't have a 3-amp fuse so I bought three 1-amp fuses instead!" (From Popular Electronics magazine).



"It started out as a simple listening post. But that's how MARKE is. . . When he gets involved in something, he goes all out."

THE ILLAWARRA AMATEUR RADIO SOCIETY

Meetings: Second monday of each month except January at 7.30 PM in the Congregational Church Hall, Coombe Street, Wollongong.

Postal: The Secretary, I.A.R.S., P.O. Box 1838, Wollongong 2500.

Repeaters: VHF 6850 (146.250 in / 146.850 out) - VK2RAW
UHF 8225 (433.225 in / 438.225 out) - VK2RUW

Broadcasts: Club news on VHF 6850, UHF 8225 & by relays via VK2PBP on 28.460 Mhz and VK2YKQ on 3.565 Mhz at 7.15 PM on the sunday night preceeding the monthly meeting. News to Eric Fien VK2YVF on telephone 71 6364 by 6.30 PM.
W.I.A. relays via VHF 6850 at 11.00 AM & 7.30 PM every sunday.

Nets: 3.565 Mhz SSB on sundays at 8.00 PM & 28.440 morse at 8.00 PM every tuesday.

Newsletter: The Propagator is mailed to reach members in the week preceeding the meeting. Editor Leo Kleeborn, VK2YJK, telephone 84 9751 for news items and advertisments. Copy deadline is the last tuesday of the month.

Membership: Write to the Secretary or contact any committee member. Annual dues are $ 7.00 full member & $ 4.00 pensioner or concessional member.

QSL Service: Available to members of the I.A.R.S. who are ALSO members of the W.I.A. Bureau managers - Mike Keech (Inwards) & Ian Calcott (Outwards).

Award: The Award of the I.A.R.S. is the Lawrence Hargrave Award. VK stations must work 10 different I.A.R.S. members: Overseas stations must work 5 I.A.R.S. members. Alternatively any amateur who works the Club Station VK2AMW qualifies for the award. Send details of contacts - stations worked, day date, time and frequencies together with $ 2.00 or 4 I.R.C.'s to the Secretary. QSL cards are not required.

Store: The store operates at each meeting. Contact Paul Ferguson for stock details.

Committee: President - Keith Curle, 24 Beach Drive, Woonona 2517. VK2OB
Vice President - Denis McKay, 17 Doncaster Street, Corrimal 2518. VK2DMR
Secretary - Dave Myers, P.O. Box 1838, Wollongong 2500. VK2PBP
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NOVELTIES

Roberto Monsivais, of Mexico City, has perfected a life detector which has been billed at the New York Sixth Annual Inventors' Expo as the "only way in the world to avoid being embalmed or buried alive." The little number is called "a coffin monitor" and saves the living dead from trying to burrow their way out of the grave by beeping. Of course, beeping is fine as long as there's a 24-hour answering service.

S.M.H