

# THE PROPAGATOR

NO. 9/76

SEPTEMBER 1976

NO. 9/76

THE MONTHLY NEWSLETTER OF THE  
ILLAWARRA AMATEUR RADIO SOCIETY

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Illawarra Amateur Radio Society  
P.O. Box 1838  
WOLLONGONG. 2500

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NOTICE OF MONTHLY MEETING

SEPTEMBER 1976.

Members are advised that the monthly meeting of the Illawarra Amateur Radio Society will be held at the Wollongong Town Hall Meeting Room on Monday, 13th September 1976, at 7.30 p.m.

AGENDA.

1. Apologies and welcome to visitors.
2. Minutes of previous General Meeting.
3. Correspondence.
4. Financial report.
5. General Business.
6. Film

Film. "Computer Graphic Display", from IBM.

This film shows the uses of a visual display unit for such purposes as 3D designing and printed circuit designing. We had this film for the July meeting, but unfortunately the copy was damaged, however, Keith has tracked down another copy and we hope all will be well for this meeting.

Raffle prize will be a 6 function calculator.

CHANGE OF ADDRESS.

Please take note that the postal address for all mail is now -

P.O. BOX 1838, WOLLONGONG. 2500.



## W.I.A. NOTES

- COMPILED BY GEOFF VK2ZHU

This month there are 2 important items to report on as far as W.I.A. activity is concerned.

Those of you who received last month's issue of A.R. will have seen and read the two promotional inserts explaining why W.I.A. membership is so important at this point in time.

This membership drive was initiated by the last Federal Convention (which I attended with Tim Mills in May of this year) and is directed at gaining vital support for WARC 79. The threat of WARC 79 is very real and it is only by continual financial and moral support to those few who are doing all the work for us that we can hope to survive. If we fail we can always go back to stamp collecting or orchid growing (you can forget CB and Pirates as these won't be a legal shield for protection).

The W.I.A. membership drive is the responsibility of the individual states and the IARS have accepted the responsibility for this area. To start the drive the IARS sent in its membership application and we have been notified that our application has been accepted.

As soon as we are able to obtain sufficient copies of all relevant W.I.A. literature I will firstly contact all LICENCE HOLDERS in this area who are not W.I.A. members, with an invitation to join.

Following this exercise we will contact all IARS members who do not yet hold a licence but have the aim to become a licenced amateur and ask them to consider joining the WIA now to protect the bands they hope to use in the future.

It is understood that Dr. David Wardlow the W.I.A. Federal President will be visiting NSW in November. During his visit Tim Mills is attempting to arrange a Combined Radio Clubs Meeting in Sydney for a two way exchange of ideas between the clubs and Federal direct.

I will be attending this meeting as the IARS, WIA Representative and I would be most interested in raising any special points that the IARS membership wish discussed. Maybe you would like a point clarified on C.B., Novice, fees, beacons etc. Please let me have your requests early so that a proper agenda can be drawn up and answers prepared.

### FOR SALE.

HEATERKIT DX60B Transmitter. AM or CW. Fx Range 80,40,20,15 & 10m.

Complete with.....

RF Power Meter 1.8 to 30MHz @ 2KW Sensitivity less than 10W @ 50 Ohms.

VFO EG10B Fx 3.5 to 8.2MHz @ 5V O/P.

Test Antenna Type TM23 to 2KW.

Price \$70.00 or offer. See Merv Moore Hy-Tec, CORRIMAL.

If you miss the usual Saturday morning browse through "Cavions" you don't have to. It has been moved out to Molloy St. BULLI. The shed is full of the usual disposal type equipment most "Hams" love to hoard away and is set out where you can potter to your hearts content. Any questions on the gear will be handled by the gent in charge who answers to the name of Jack or the sound of money which ever is loudest.



#### BROADCAST.

The inaugural monthly broadcast of the IARS took place on 8/8/76 with John, VK2BHO taking the mike, on Channel 5.

It was reported that Graeme, VK2AGV had installed the new repeater transmit crystal and had restored the HI-LO power operation of the repeater.

The next broadcast will be Sunday, 12th September, at 7.15 pm, on Channel 5, Wollongong Repeater.

#### W.I.C.E.N.

Illawarra WICEN participated with other organisations in an exercise held on 15/8/76 by the Illawarra Division of SES. Members of IARS who took part were Jim VK2BBG, Jim VK2YCH, and Richard VK2ZVX.

Jim reported that from the communications point of view the exercise was extremely successful and that the amateurs participated very well in the overall plan of the Exercise.

#### QSL.

A further reminder that if you want the QSL Service from the WIA you will need to fill in the QSL form.

Forms are available from Geoff VK2ZHU, or Ian VK2ZJA.

So far the response from members has been rather poor.

#### MEMBERSHIP FEES \* PROPAGATOR SUBSCRIPTION.

As half the club year has passed, membership fees for the remainder of the year will be \$2 for Full membership and \$1 for Students and Pensioners, for new members.

It may be of interest to note that our membership stands at 99 paid up members. There are 7 old members who have not yet renewed their membership for the current year - how about paying up fellows?

#### NOVICE HANDBOOK.

We have placed an order to obtain some copies of the Novice Handbook published by the Westlakes Radio Club. It is hoped these will be available very soon. The price will be \$2 plus postage - we will not be making any profit.

#### JAMBOREE OF THE AIR 1976

The 19th Jamboree Of The Air is to be held over the weekend 16th & 17th October 1976, beginning at 0001 H EAST 16th Oct and concluding at 2359 H EAST 17th Oct 1976.

Arrangements are under way for IARS to participate in cooperation with the Illawarra Scouting authorities.

Members who hold Full Calls who are able to participate either as Home operators or as operators of a portable station using VK2AMW, please contact Ian VK2ZJA.

On past occasions the JOTA has been somewhat disorganised in this area and it is hoped that this year we can have a better arranged and therefore more beneficial JOTA.

#### FOCUS ON LEISURE.

A display entitled "Focus On Leisure" is to be held on Saturday 18th September 1976 in Burelli St., Wollongong. It is being arranged by the Department of Youth and Recreation, but no other details are known at present. The Illawarra Model Aero Club will have a display so it may well be of interest to members. No doubt there will be some publicity in the local press and radio regarding details of time and place.



# HOW TO SUPPORT AMATEUR RADIO

If you have held an amateur call sign for many years or if, maybe, you have just received yours, read on.

**Read on because you enjoy** amateur radio. You believe it helps to give you something extra. You hope there will be many more years ahead of you in this fascinating leisure activity. Maybe today's children too will also participate at some future time.

**For the duration of two world wars** amateur radio stopped altogether. It ceased to exist because all amateur stations were closed down.

**The amateur societies** however did not close down. Those amateurs who were left behind kept them going. After the wars the societies pressed for the resumption of amateur activities. And the amateur service rose again, stronger than ever.

**These two events illustrated** one important point. The ease in closing down amateur activity was not matched with any ease in allowing operations to resume.

**"Authority" needed convincing** that this was the kind of activity which should be allowed to function. Individual amateurs found little hope on their own to get things going again. Societies of amateurs — preferably nation-wide societies — were needed to show that the amateur service had teeth and was prepared to use them in every conceivable direction to achieve the objectives.

**The government and defence** services using the amateur frequencies during the wars were naturally reluctant to move elsewhere. Most of the nation's top executives seemed to know little, and cared less, about amateur radio. Amateur radio was a highly suspicious activity. When pressures from amateur societies became too great at the top, and the resumption of amateur radio had to be permitted, is it any wonder that those whose job it would be to administer the activity imposed as many restrictions upon it as they could dream up.

**Some countries have banned** amateur radio altogether. In others the restrictions are still somewhat severe. The administrations of a few countries thankfully possess a more liberal attitude. We in Australia are somewhere in between. Our licensing and control authorities know what amateur radio is and what it can do.

**As in most of the countries** with the largest amateur populations there is frequent communication between the amateur society and the licensing authorities. This is especially so in Australia. On an average there is a joint meeting about once a month, much correspondence and quite a few telephone conversations at other times. The Wireless Institute representatives speak for the amateur service as a whole since this Institute is the only nationally recognised amateur society in Australia.

**Representations are also made** to higher authorities such as the Minister and the Secretary of the Department. In the past it has been necessary to organise ad hoc Parliamentary lobbies by the Institute with the help of clubs, groups and individual members.

**Much more can be expected** from concerted action of this kind, backed by the Institute. The Department has in the past sought the views of the Institute on a whole range of amateur activities.

**Furthermore the Institute** maintains close contact with international amateur organisations. It is the affiliated society in Australia to the International Amateur Radio Union (IARU). This is particularly important because of the continuous exchange of information between the IARU and the member societies. This occurs either direct from IARU Headquarters or, in our case, through the IARU Region 3 Association.

**The IARU, like the WIA, is a** very active organisation. It has backing from the member societies and has observer status at International Telecommunications Union (ITU) conferences. The ITU is a specialised agency of the United Nations dealing solely with the world's radio and telecommunications affairs which naturally includes the amateur radio and the amateur satellite services.

**Nearly 150 independent coun-**tries are members of the ITU and this includes all the developed countries. In nearly 90 of these ITU member countries there is an IARU affiliated amateur radio society. At ITU international conferences each member country has one vote. This is significant to the amateur service because our interests can be advanced in one of three major ways. By the IARU team acting as a lobby at conferences, by IARU member societies maintaining close liaison with their Governments (licensing authorities) especially in advance of the conferences and by securing amateur observer status in countries' delegations. All these are essential but expensive undertakings. Why?

**It is essential for amateurs to** be strongly represented because so many other radio services (or even countries) want our frequencies and would go to almost any lengths to get them. The frequency spectrum is a finite asset — there is just so much of it, no more. On a world scale there are not enough frequencies available, even on a shared or similar basis, for man's needs. The position in Australia is not much better.

**All the frequency allocations** now available to us amateurs derive from the ITU World Administrative Radio Conference (WARC) held in Geneva in 1959 with slight modifications at the Space Conference in 1971.

**There is to be another WARC** in 1979 which will deal with the whole of the frequency spectrum allocations and regulations affecting usage, etc. This will set the pattern to the year 2000 and beyond. This means our frequencies will be severely threatened. It follows therefore that the amateur service must do an enormous amount of preparatory work even if we set out only to keep what we have.

**There is nobody except our-**selves to do this work. If we are not strong in numbers, if we are not resolute and united in our determination to evaluate our needs, prepare a proper case and stand by it and if we fail to achieve our goals we amateurs can blame nobody but ourselves. And representational work will not end with WARC 79 — it may be needed to an even greater degree thereafter.

**The Wireless Institute of Aus-**tralia is doing everything humanly possible both internally and externally to meet these challenges. The Institute needs the help of everyone — both friend and amateur — it can muster.

## amateur radio

### WIRELESS INSTITUTE OF AUSTRALIA

Application for membership forms are available from Geoff Cuthbert, VK2ZHU, or direct from The New South Wales Division of the W.I.A., 14 Atcheson St., Crows Nest, NSW. 2065.

An organisation is only as strong as its members, so let's see what you can do towards reaching the target membership of 8000.



# THEORY OF "PREFERRED" VALUES

You have probably wondered at times why apparently odd component values appear on many overseas circuits—values like 470 ohms, .22 meg and so on. Far from being odd, these values have a very logical basis, which is explained in the following article.

IT is probably only a matter of time before these "preferred" values will be employed universally and it behoves all radiomen to become familiar with the system.

Far from being "screw" the numbers have a very logical basis.

As you know, the normal stock values of radio components have run from the early days in multiples of 1, 2, 3, 4, 5, 6, 7, 8 and 9. What's wrong with that, you say? Perfectly logical!

But say, for instance, you are designing an audio amplifier and, by experiment, you find that a .1 meg plate load is a little on the low side. You are forced to use the next higher value, which is .2 meg, or to use a non-standard resistor or go to the expense of installing a second, lower value resistor to make up the resistance you require.

All of these solutions to the problem are clumsy for the very simple reason that there is 100 per cent difference between 0.1 and 0.2 meg.

At the other end of the scale the reverse is true. For example, .9 meg is only 12.5 per cent increase on .8 meg. This is an unnecessarily fine graduation of values since most radio circuits will work quite satisfactorily with all resistors and condensers within plus or minus 20 per cent.

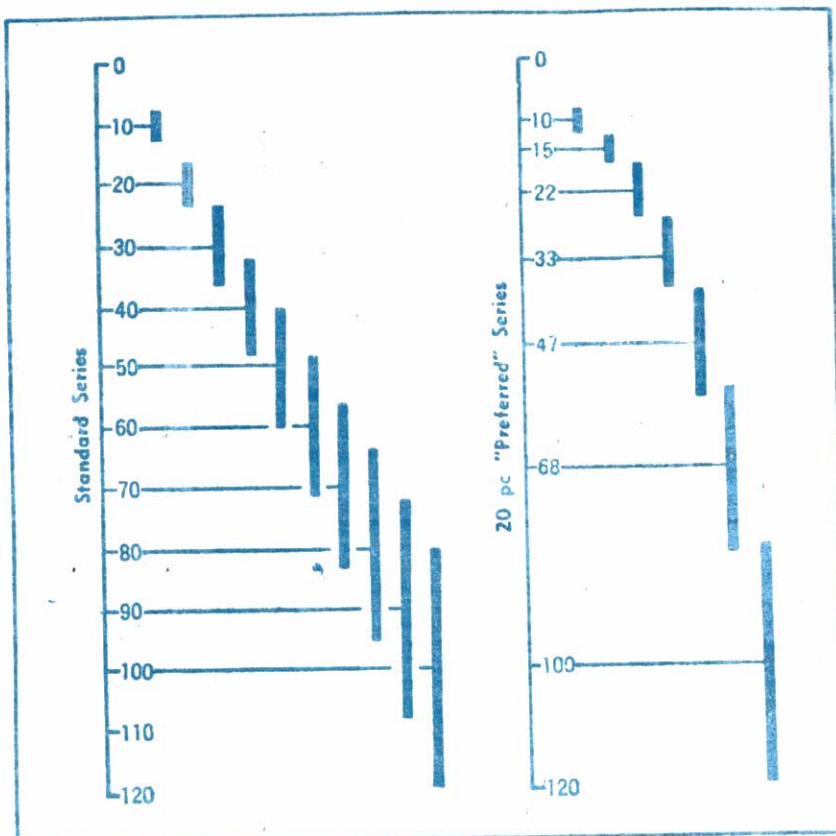
In any case, what is the use of labelling a resistor .9 meg plus or minus 20 per cent when it could be .8 or 1.0 meg and still be true to label?

In other words, percentage increase, not linear increase, is the important requirement.

## DIFICULTY OVERCOME

The "preferred" system of numbers overcomes the difficulty by progressing in relation to percentage. Note the accompanying table which lists the 20 per cent preferred numbers between 10 and 100. A 10-ohm resistor minus or plus 20 per cent may vary between 8 and 12 ohms, while a 15-ohm resistor minus or plus 20 per cent may be between 12 and 18 ohms and so on, through the scale. The system gives a continuous range of values with only very slight overlapping toward the high end.

Considering the present system in the same way we find that a 10-ohm resistor minus or plus 20 per cent may be between 8 and 12 ohms, but a 20-ohm resistor minus or plus 20 per cent is between 16 and 24 ohms.



The left hand side of the diagram lists the standard values between 10 and 100 and shows the range within which each value may lie, given a tolerance of plus or minus 20 pc. The right hand side treats the 20 pc series of "preferred" numbers in the same way. Note that each number is approximately a 50 pc increase on the previous number and that no two numbers overlap appreciably.

"Preferred" Component Values		
20% Tolerance	10% Tolerance	5% Tolerance
10	10	10
	12	11
15	15	12
	18	13
		16
22	22	18
	27	20
		22
30	33	24
	39	27
		30
47	47	33
	56	36
		39
68	68	43
	82	47
		51
100	100	56
		62
		68
		75
		82
		91
		100

As you can see, successive values are widely separated. However, at the other end of the scale the overlap is very great.

In the case of the 20 per cent preferred values each successive number is approximately 50 per cent greater than the previous number.

You can appreciate, therefore, that the system has a distinct advantage from the economic point of view. Instead of stocking 10 values to cover a 10 to 1 range your dealer need only stock seven components. And yet with the fewer components he is able to give you a better practical range of values.

This is all very true for home constructors or experimenters, but how much more so for large organisations

The table at left shows the preferred numbers in the 20 pc, 10 pc and 5 pc series. Values from the 20 pc series may have a tolerance of as much as plus or minus 20 pc but values from the 10 pc series would have a tolerance at least as good as plus or minus 10 pc &c.







## Moonbounce Report - September 1976.

We were advised by K3JJZ of the W3CCX group, which had operated portable 432MHz EME in Columbia Sth. America, in July-August that they had experienced a number of power failures during the scheduled test periods. Unfortunately one of these had occurred during the scheduled test with VK2AMW. They were successful in working a number of other stations, some of whom made 432MHz WAC with their contact with HK1TL.

Our scheduled tests for August were carried out on 29/8. A transmitter power supply problem prevented contacts during the 'W' test period in the morning but VK2ZEN heard W4ZXI, 'M' copy, while VK2ALU worked on the power supply. (including removal of a mouse's nest)

During the evening, a further group of tests were scheduled with stations in Europe. SM5LE was not heard and was probably not on. Signals were heard during the F2TU test period, but bad QRM from another French station, who was peaking to 10dB over noise, prevented copy. The moon set prior to the scheduled test period with LX1DB due to an error in scheduling by the hardworking ham who provides the worldwide test schedules each month.

A check was made on 29/8 for received signal strength of emanations from the concentrated star mass at the centre of the Galaxy. This is a good reference signal level, as it is not subject to the same fluctuations in level as the emanations from the Sun and is also more comparable in strength to the lower level EME signals received from some stations.

A QSL card was received during the month from SM5LE for our first Australia - Sweden 432MHz contact, made on 30/7/76.

Lyle VK2ALU.

### A PRACTICAL HINT.

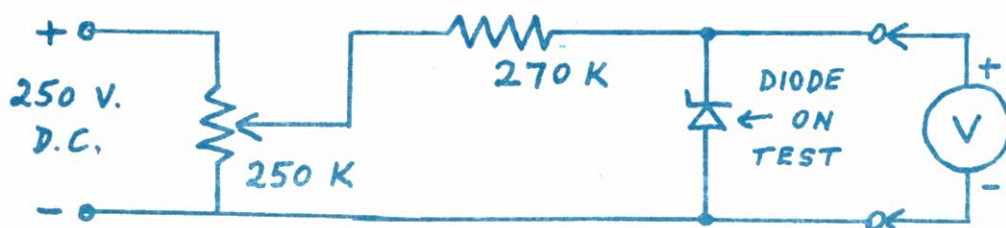
From "A.P.C.", newsletter of Moorabbin & District Radio Club.

#### TESTING UNKNOWN ZENER DIODES.

The diagram shows a simple method for determining the zener point of unknown zener diodes. All that is needed is a sensitive voltmeter and a few small parts. The 250k linear pot. is used as a voltage divider and the 270k fixed resistor is used as a current limiter.

The diode is placed in circuit with the cathode to the positive side of the supply. The voltage is adjusted upwards (with the pot.) until the meter shows no further increase in voltage; the indicated voltage on the meter is then the zener breakdown voltage of the device under test.

If the meter reads zero, the zener diode is short circuit and if the meter reads the supply voltage, the diode is open circuit.





# SIDEBAND ELECTRONICS SALES

**UNIDEN** model 2020 AC-DC transceivers 10 to 80 M with 3 crystal filters \$550

**TRIO-KENWOOD** model TS-520 AC-DC transceivers 10 to 80 M. Still only \$530

**YAESU-MUSEN** model FT 101-E AC-DC transceivers 10 to 160 M w. speech processor \$650

**TRIO-KENWOOD** model QR-666 receiver 170 KHz to 30 MHz AC-DC Now \$250

**BARLOW-WADLEY** model XCR-30 MK II portable DC communications receiver Now \$180

## HY-GAIN ANTENNAS

14AVQ 10-40 M. verticals, 19' tall, no guys \$65

18AVT-WB 10-80 M. verticals, 23' tall, no guys \$90

TH3JR 10-15-20 junior 3 el. Yagi 12' boom \$135

TH3MK3 10-15-20 senior 3 el. Yagi 14' boom \$180

TH6DXX 10-15-20 senior 6 el. Yagi 24' boom \$225

HY-QUAD 10-15-20 cubical quad Yagi 8' boom \$200

TIGER ARRAY 204BA 20 M 4 el. Yagi 26' boom \$190

BN-86 balun for beam purchasers only \$18

## ANTENNA ROTATORS

Model CDR AR-22 junior rotator for small and light beams \$55

Model CDR Ham-II for all hf beams except 40 M. ones! \$165

KEN model KR-400 for all medium size hf beams with internal disc brake \$100

KEN model KR-500 for vertical elevation control of satellite tracking \$100

All models rotators come complete with 230V AC indicator-control units.

4-conductor light cable for AR-22 20 cents per yard

12-conductor light cable for Ham-II 30 cents per yard

8-conductor heavy cable for Ham-II 70 cents per yard

6-conductor heavy cable for KR-400-500 60 cents per yard

**DRAKE W-4 SWR—WATT METER** 0-200 and 0-2000 Watt scales \$60

**DRAKE TV-1000 TVI Low pass Filter** \$25

**SINGLE METER SWR METER** \$15

**TWIN METER SWR METER** \$22

## MARK MOBILE ANTENNAS

Helical 6' long HW-40 for 40 M. \$18

High power KW-40 for 40 M. \$25

HW-20 for 20 M. \$16

Swivel mobile mount and chrome plated spring for all \$12

## ASAHI MOBILE ANTENNAS

AS-2 DW-E 1/4 wave 2 M. mobile whip \$8

AS-WW 3/8 wave 2 M. mobile whip \$18

AS-GM gutter clip mount with canle and connectors \$10

M-Ring body mount and cap for 1/4 M. whips \$5

## CUSH CRAFT ANTENNAS

Model DGPA 52-27 MHz adjustable ground plane \$25

LAC-2 lightning arrestors \$6

Model AR-2 RINGO 3/8 waves verticals \$20

AR-2X RINGO RANGER double 3/8 waves verticals \$35

ARX-2 extension for AR-2 \$15

A147-20T combination vertical-horizontal 2 M. Yagis, 10 elements each \$60

A147-11 11 elements 2 M. Yagi \$30

**CRYSTAL FILTERS** 9 MHz, similar to FT-200 ones, with carrier crystals \$35

**KYOKUTO** 2 Meter FM 15 Watt output transceivers with digital read-out and crystal synthesized PLL circuitry, now with 800 transmit and 1000 receive channels 5 KHz apart, covers all of 144 to 148 MHz, receive to 149 MHz, no more crystals to buy, includes simplex, repeater and anti-repeater operation. Still only \$300

**ICOM IC-2022** Meter SSB handy transceivers, 144.0 to 144.4 MHz. still only \$185

**TRIO-KENWOOD** model TS-700A FM-AM-CW-SSB transceivers, full 144 to 148 MHz coverage, 10 Watt output VFO controlled, self contained AC-DC operation \$575

**AUTOMATIC MORSE KEYERS** EK-150 with built-in squeeze key paddle AC operated with monitor \$75

**FERRITE CORE BALUNS** cheaper Japanese product for up to 500 W RF with coax conn. \$12

**COAX CABLE CONNECTORS-SWITCHES** Amphenol type male for RG8U and RG58U cable, two types, female chassis mount, double male, double female, all types 100 cents each

Amphenol angle and T-connectors 150 cents each

3 Position coax switches \$10

RG-8U coax cable 3/8" diam. 80 cents per yard

RG-58U coax cable 3-16" diam. 30 cents per yard

Add \$1 cutting and handling cost for coax and rotator cable orders

**P.T.T. DYNAMIC MICROPHONES** 50K or 600 ohms with 4-pin Jap. plugs \$10

**DUMMY LOADS**, 50 ohms with Watt meters built-in 0-200 MHz, 0-6 — 0-30 — 0-150 Watt YP 150 \$80

**TRIO-KENWOOD DIP METERS** Model DM-800 0.7 to 250 MHz few only \$60

**27 MHz TRANSCEIVERS** 5 Watt AM 6 channels with 27.880 MHz crystals \$75

1 Watt hand-held 3 channels 27.240 crystals \$50

15 Watt PEP 23-channels AM-SSB model SE-501 \$175

**CUSH CRAFT** model CR-1 27-29 MHz Ringo 3/8 wave antennas \$35

All prices quoted are net SPRINGWOOD, N.S.W. on a cash with order basis, sales tax included in all cases, but subject to changes without prior notice. No terms nor credit nor C.O.D. facilities, only cash and carry, no exceptions. ALL RISK INSURANCE from now on free with all orders over \$100, small orders add 50 cents for insurance. Allow for freight, postage or carriage, excess remitted will be refunded. — PETER SCHULZ

# SIDEBAND ELECTRONICS SALES

PETER SCHULZ VK2 ZXL

POST BOX 184, SUTHERLAND. 2232

24 KURRI STREET, LOFTUS, 2232

TELEPHONE (02) 521-7573



## COMPONENTS FOR SALE

BOOKS - Basic Electronics A very useful book, especially for beginners.  
Published by Electronics Australia. \$3.00

Projects and Circuits Over thirty Electronics Australia projects  
combined into a book of 112 pages. \$1.50

ELECTROLYTICS - The cheapest prices you'll ever see. A special purchase  
of 25V axial lead electrolytics.

4.7 uF	6c each
47 uF	10c "
100 uF	12c "
220 uF	15c "
470 uF	20c "
1000 uF	25c "

A bag of 5 each of all except 47 uF \$3.90

NEW STOCK - At very low prices.

Pair meter leads with alligator clips	50c
Vernier dials 35 mm. Four turns knob for $\frac{1}{2}$ turn dial	\$1.50
DPDT slide switches	25c
4 pin plug and socket - pair	15c
Alligator clips - large insulated. Red or black	20c
Coax sockets UHF.	40c

<u>METERS</u>	<u>S Meter</u> - 400 uA $1\frac{3}{8}$ " x 5/8"	\$2.50
	<u>Level Meter</u> - dual 200 uA meters, illuminated	\$3.00
	<u>0-1 mA Meter</u> - 50 mm square	\$4.00
	<u>0-1 mA Meter</u> - 75 mm x 50 mm	\$5.00
	<u>0-10 A Meter</u> - 75 mm x 50 mm	\$5.00

### GREENCAP CONDENSERS

.0047, .01, .002	8c each
.047	12c "

### RESISTORS

Bags of 130 $\frac{1}{2}$ W resistors plus 4 greencaps	\$3.00 per bag
10 each of 13 values 22, 47, 82, 100, 470 ohm	
1K, 12.2K, 10K, 22K, 47K, 100K plus 4 greencaps	

OLD FAITHFULS - Still in demand

10K A and 15K A potentiometers	50c each
500 K C switch potentiometers	60c "
.0068 mf feed through capacitors	10c "
Ceramic trimmer, mica insulation	30c "
Ground Plane Antenna Base	\$1.00 "
Edge Connectors.	\$1.00 "
Tag strips	10c "
Ceramic bolt-down trimmer.	10c "
Twin wire lead fitted with 2 1.5mm plugs.	50c "
Small solder type feed through capacitors.	5c "
Wire wrap type trimmers.	10c "

### NEOSID

Formers	8c each
Balun formers - small	12c "
large	15c "
Cans - single	10c "
double	12c "
Slugs - F 29, F 16, long ferrite beads.	7c "

### FILM FESTIVAL.

From Tom Barnes comes information that a Film Festival is to be held at the Wollongong University on the 8th, 9th, and 10th October, 1976.

Further information may be obtained from Tom, VK2ABI,  
74 Cabbage Tree Lane, Fairy Meadow, or phone 84 3772.



THE PROPAGATOR.  
Newsletter of the Illawarra  
Amateur Radio Society.



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