

THE PROPAGATOR

MONTHLY NEWSLETTER OF THE ILLAWARRA AMATEUR RADIO SOCIETY

PO BOX 1838 WOLLONGONG NSW 2500

DECEMBER 1980

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.

THIS MONTH'S MEETING:

Monday 8th December at 7.30 p.m., at the Congregational Hall, Coombe Street Wollongong.

The meeting will feature a demonstration of solid-state radio-teletype and slow-scan television by Dave VK2YKQ/VAV with his Apple computer and by Paul VK2ZQT with his Tono computer. See Dave's article on the subject in this issue of the Propagator.

Our thanks to Syd Molen VK2SG for publicising the meeting in the VK2TTY RTTY news broadcasts.

LAST MONTH'S MEETING:

With over 80 people attending the meeting, and with 126 lots of gear to be auctioned, the Congregational Hall was very full. President Keith VK2OB concluded the formal part of the meeting, including general business, in about 7 seconds. Auctioneer Denis VK2DMR then went into his 2-hour non-stop act. The goodies included CRO's, HF and VHF power amplifiers, carphones, microwave equipment, a computer, and more.

Prime buyers for the night were Dave VK2YKQ/VAV and Andrew VK2YVM. Dave now has the greatest equipment density of any shack in the district and has to do periodic foundation inspections to ensure he is not sinking into the Bellambi marshes. For Andrew, this month's article on "How to get the stuff into the House" is prescribed reading.

CHRISTMAS FAMILY BARBECUE:

Sunday December 7th, on Saddleback Mountain, starting around lunchtime. A bring-your-own-everything function for the whole family. Last year's gathering of amateurs, families and dogs was thoroughly enjoyable - Paul VK2ZQT was running his 1,000 foot long-wire attached to a box-kite; Les VK2ALK was running a Honda Civic attached to a mobile HF rig and multi-band antenna; and the VHF blokes were desensing each other working all the distant repeaters.

FEBRUARY MEETING:

As usual, there will be no meeting of the Society in January. The first meeting in 1981 will be on Monday 9th February.





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*	KENWOOD HC10 Digital World Hamclock.....	\$102.00
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*	KENWOOD STI Base Stand for 2400.....	\$85.00
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*	KENWOOD TS520SE HF TCVR (1 only).....	\$700.00
*	KENWOOD MC501 Economy Base Mic 50K.....	\$30.00

* * * * *

NEW MODELS DUE EARLY NOVEMBER

Kenwood TS130 V/S 8 Band - Speech Processor - I.F. Shift
Selectable band width - Auto size Band selection

"V" Model 10 Watts Output.....\$714.00

"S" Model 100 Watts Output.....\$847.00

Kenwood TS830S - complete 8 Band Base TCVR Superb 1M.D
Rejection - Dual Resonator for each band -

Excellent Dynamic Range and Low noise level -

Variable Band Pass tuning and I.F. Shift -

Tuneable Notch Filter - R.F. Speech Processor

ETC. ETC.\$1,193.00

* * * * *

Kenwood HS5 Deluxe Headphones\$38.00

Kenwood RD300 300/1KW DummyLoad.....\$87.00

Drake Low Pass Filters.....\$ 21.00

Hi-Mound Marble Base Morse Keys.....\$45.00

6146B Finals for TS520 ETC.....\$12.00

MA5 Kenwood 80-10 metre Mobile Ant. System.....\$104.00

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

HOW TO GET THE STUFF INTO THE HOUSE

- W200J in 73 Magazine, via
"The Lyrebird", Winter 1978.

Unless your home operates on the kind of budget that permits sable coat Christmas presents for the XYL, swimming pools for the kids, your own ski chalet, and the casual weekend jetting to Acapulco or Majorca, chances are you are up against a problem that has faced nearly every ham since Marconi -

How do you get the stuff into house unseen... or, alternatively, how do you avoid telling her how much it cost?

Over a period of some years of supporting several hobbies and during which acquisitions of new and used cameras, lenses, fly rods, table saws, shotguns, sports cars, etc, to say nothing of radio gear, had to be explained, rationalized, lobbied or even concealed, this practitioner has assembled a variety of ploys, some from personal experience and others from fellow-hobbyists, whose contributions I acknowledge with thanks and whose identities I had best keep to myself.

In the hope that some fellow-sufferer may find herein the solution to his particular problem, I have decided to compile and publish the best of these stratagems in what might be called, "Hamsmanship, or How to Build Your Amateur Radio Station Without Actually Shedding Blood".

Old masters at the game - AM types and single-letter prefix gaffers - may find some of these tactics old hat. But they will realize that a whole new generation of amateurs has come along and, further, the problem of getting the stuff into the house without touching off domestic warfare has escalated astronomically in these days of nearly 100% store-bought stations. Even the newest Novice, judging from the magazine photos, starts his career with an array of commercial gear that looks like the control panel of an Apollo moonship.

These new hams need our help. Let us share with them our secrets and our methods. The future - possibly even the survival - of amateur radio may well be involved.

One word of caution before we begin the lesson: Do not, repeat DO NOT leave this lying about the house for her to read. Commit these pages to memory and then rip them out and either burn them or put them in an envelope and mail to Box 88, Moscow. That way they'll never be heard of again.

Now, then -

1. This one calls for the breezy, off-hand treatment. You bring in the new scope, linear, keyer or whatever it is and before she can start with, "How much did that cost?", you cry happily, "Boy, you couldn't beat this for \$15" (or whatever figure the traffic will bear.) Remember, you didn't say you paid only \$15 for it - just that you couldn't beat it for \$15 - and that's the gospel truth.
2. The David Harum or old-mule-trader ploy. You come gaily into the house with your latest treasure, a smug grin on your face, and emit something like "Wow! Look what I traded old Haywire Magee out of for my old rotator." Never mind mentioning that you also forked over \$250 in addition to that old rotator to make the "trade".
3. A variation of No. 2: Your line is, "Can you imagine the dope letting this go for only \$35?" You sure can't, OM. His rock-bottom price was \$150 and that's what you coughed up. But you didn't say you paid \$35.
4. Another variation: You take the old rig to your friendly local ham dealer who sells used gear on consignments for a commission. A few weeks later you report happily "Some guy bought my old rig and I got enough for it to get this new one." Yeah, enough maybe for the down payment - but who needs to know you still owe the friendly local etc. \$398.80?
5. Become a home-brewer. Spend long hours in the basement workshop. Cut lots of scrap metal loudly. Drill lots of holes ditto. Bang chassis around. Let the smell of soldering and scorched insulation permeate the house. Study schematics at the dinner table. On the air, talk loudly about the linear you're building. After two or three weeks of this, come proudly upstairs with the new rig, or whatever. Stripped of nameplate, or course, or even without front panel. Some time later you can "acquire" a cabinet or front panel for it and... "Look, Honey, this old Collins (or Heath or Swan or...) panel I picked up just fits the rig. Looks real commercial, doesn't it?"

..... continued next page.

How to get the stuff into the house - contd.

6. You need a garage or workshop where you can cache the parts of a beam for this one. Then you make a big show of going into the shop with an armload of old aluminium tubing, busted TV antennas, etc. Emerge some days later, after the usual drilling and sawing noises, with the elements of your new tri-band beauty and, "See what I lashed up. Amazing what you can do with a bunch of old aluminium."
7. Your XYL has been bugging you about getting a new color TV. So you agree to buy one if you can have the old one for parts. Show her those great articles about how you can build a five-band KW transceiver with the parts scrounged from old TV's. You'll be surprised, and you hope she will be too, at the nifty new rig (frequency counter, oscilloscope or whatever it is you dream of) you were able to build with those old TV parts (plus a few odds and ends from Heathkit, maybe.)

Many other suggestions for inclusion in this article were considered and discarded for such reasons as requiring outright lying, being too impractical or far-fetched, or too susceptible of detection. Others simply were variations of one or more of the above, such as disassembling a Whizzbanger 2000 at a friend's shack and then bringing it home piece-by-piece in pocket-sized components; or installing a new KWM2 in your old Viking 1 cabinet.

None of these so far mentioned, however, can top the one reported by a ham who of necessity shall remain unidentified here. At the time the first color TV was acquired for the family, he convinced the XYL that only a 60-foot tower and super-duper king-size antenna would bring in the color picture in their location. To this day she thinks that three-element trapped Lightningbird Tribander is what makes Doris Day look so pretty.

ELECTRIC SHOCK

The smallest current which can be detected through the skin ("threshold of perception") is generally considered to be approximately 1 mA r.m.s. at 50 Hz a.c. and 5 mA d.c. (The tongue is considerably more sensitive.)

On increasing the current a stage is reached at which severe muscular contractions make it difficult for the casualty to release his hold. This "threshold of muscular decontrol" is about 15 mA at 50 Hz a.c. and 70 mA d.c.; in the lower frequency ranges the effect increases with frequency, e.g. at 60 Hz the threshold current is 7 mA. Very high frequencies do not produce this effect. Increase in current beyond about 20 mA 50 Hz a.c. or 80 mA d.c. brings a danger to life. The next stage is irregular contractions of the heart, leading to cessation of the pumping action.

This occurs at about 100 mA for both a.c. and d.c. and is almost certain to be fatal. If the current through the body rises as high as 1 amp, severe burning results. The electrical resistance of the body can vary enormously from person to person and in the same person at different times and under different conditions. This resistance can be as high as 10 000 ohms or as low as a few hundred, depending largely on whether the skin is dry or moist. Even with a resistance of 10 000 ohms the 230 V a.c. supply will result in a current of more than 20 mA, which could be lethal.

In fact, much lower voltages can be dangerous and death has been recorded from only 60 volts.

The above remarks apply essentially to current passing through the body, e.g. from hand to hand, or hand to foot. It is possible for part of the body, e.g. a finger, to short-circuit two conductors, which will not necessarily result in electric shock as described above, but which can inflict severe burns which require medical treatment.

- from Everett and Jenkins, "A Safety Handbook for Science Teachers".

SNIFFED

Corned beef was sent to a Bridgend school canteen. Teachers sniffed it and did not like it. A canteen manageress sniffed it, but pronounced it good; the town sanitary inspector sniffed it and passed it as good; the town medical officer sniffed it and declared it good - then ordered it to be destroyed because too many people had sniffed it.

- Daily Express.

- Brian Wade VK2AXI.

The keyboard contacts switch the high voltage loop supply (about 100 volts) which overcomes some of the problems caused by dirty contacts at low voltages. Since the contacts are in the form of a single-pole-double-throw switch, complete de-bouncing can be performed with an R-S flip-flop.

The flip-flop has two outputs, one the inverse of the other, so that when using the conditioner to drive an audio tone generator, it is easy to produce "upside down" tones if necessary.

The diagram illustrates a keyboard interface circuit using an optoisolator (4N28) and a NAND gate (7400). The circuit is powered by a +100V LOOP SUPPLY and a +5V supply. The +100V supply is connected to a 10K 10W resistor and a switch labeled 'KEYBOARD CONTACTS'. The switch is connected to an EM404 LED, which is in series with a 4K7 resistor and connected to the +5V supply. The 4N28 optoisolator is connected to the +5V supply and the EM404 LED. The 4N28 is connected to a 7400 NAND gate. The 7400 NAND gate is connected to a 470Ω resistor and a BDI40 LED. The BDI40 LED is connected to a +5V supply. The output of the 7400 NAND gate is labeled '5V, 300 mA OUTPUT' and 'INVERTED OUTPUT'.

[illegible]

Since I have been in Amateur Radio I have had nothing but troubles concerning antennae. Know the problem? Not enough room to put up a decent antenna system; buildings too close; can't get enough height; complaints about eyesores; trees working like dummy-loads; being woken up out of a deep sleep by someone thumping on your door complaining about the TVI you are causing (most probably using mental telepathy on your neighbour's TV set during your dream); etc, etc, etc.

Well, when all else fails, Plug In The Roof. That is what I have been doing lately. It started when Mike offered to make me a stand for some resonators I bought. I tried to use the resonators indoors but they lose quite a bit of efficiency underneath a metal roof, and there is not enough room in the flat to put down radials for a ground plane. Putting the resonators outside defeats the purpose of concealment. The resonators probably work OK inside when there is not too much QRN from storms, but when people report +20 dB QRN on 80 metres at night a few dB loss in signal makes a lot of difference.

I remembered that in CB days of the past I used the roof as a ground plane for a 9 ft. vertical. This is all right for short verticals in the higher frequency part of the band but not for 80 metres. Since the roof was not earthed due to some oversight of the builder, how about using the roof itself as the antenna? So that is what I did. Through an AT-200 matcher I tuned in the roof beautifully on 10 metres and 80 metres and get into Armidale which is 650 km north of here over a QRN of +10 noise and am still readable. South Australia has never been so good before as it is now, either. No matcher is needed on 15 metres as the SWR is only 1.5:1, and I get into Mount Isa 5/3, 5/4. I make sure I also use a good earth.

Lyle, someone suggested I give you some competition and wait for the moon to rise over my place, and then try some moonbounce with the roof - hi hi!

LED lamps

elektor july/august 1979

When it comes to mains indicator lamps, there are basically three main options: neon lamps, incandescent lamps, and LEDs. Neon lamps have the advantage that they can be connected direct to the mains supply, and also that they consume very little power. Incandescent lamps, on the other hand, must be connected to a much lower voltage (e.g. to the secondary side of the transformer), and therefore provide only indirect indication of whether the mains supply is present, whilst as a rule dissipating a relatively large amount of power.

LEDs would represent an ideal alternative to both the above approaches, since they have a longer operating life than either neon or incandescent lamps, and dissipate no more than 20 to 30 mW. Unfortunately it is necessary to protect the LED from excessive currents by employing a series resistor, which, with a mains voltage of 240 V, will itself dissipate something over 3.5 W. The circuit shown here offers a better solution. The current through

the LED is limited to a safe value not by a dropper resistor, but by the reactance of a capacitor. The advantage of this method is that no power is dissipated in the capacitor, since the current through the latter is 90° out of phase with the voltage dropped across it. The formula for calculating power dissipation for DC voltages is only valid for AC voltages provided the current and voltage are in phase i.e.

$$P_C = U_C \cdot i \cdot \cos \phi$$

With a phase shift of 90°, which is the case with capacitors, P_C is therefore 0 W ($\cos 90^\circ = 0$). What little power is consumed by the circuit is

entirely converted into light and heat by the LED.

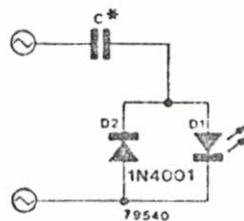
The value of capacitor C, can be calculated for any given voltage, frequency and current with the aid of the following equation:

$$C \approx \frac{i}{6.28 \cdot u \cdot f} \quad \text{where:}$$

C is the capacitance in Farads
u is the RMS value of the mains voltage
f is the mains frequency in Hz
i is the current through the LED in Amps

With a mains voltage of 240 V, a frequency of 50 Hz and a current of 20 mA, the nearest suitable value of capacitor is therefore 330 nF. The working voltage of the capacitor should be at least twice the mains voltage.

Diode D2 is included to protect the LED from excessive reverse voltages.



* 500 TOX1

U. Hartig

(Germany)

ten channel TAP

TAP (read: touch) switches come in all shapes and sizes, mainly as momentary action or simple on/off (latched) switches. Using only a handful of components, it is possible to construct a 'ten-channel' TAP, i.e. a ten-pole touch switch. When one of the ten sets of contacts is touched, the corresponding output will be taken high.

The heart of the circuit is formed by a CMOS decade counter/decoder, 4017, which is clocked by a simple CMOS oscillator. However when the contacts are open, the counter is inhibited, since the clock enable input is held high. The same is true if

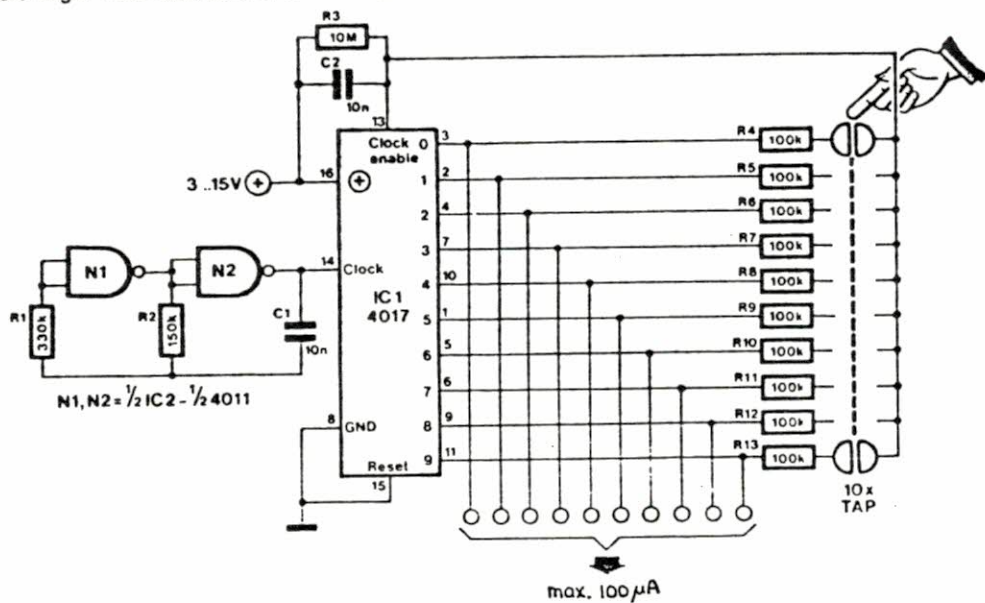
the contacts are bridged, but the corresponding output is already high, since in that case the additional skin resistance will have no effect. However, if the corresponding output is low when a set of contacts is touched, the skin resistance (which is negligibly small compared to the other resistances) forms part of a voltage divider, thereby pulling the clock enable input low. The counter is started and increments until the output in question is taken high, whereupon the clock enable input is once more taken high and the count is stopped.

Capacitor C2 is included to suppress

mains transients etc., whilst R4 . . R14 prevent the possibility of a shock in the event of a short between the contacts.

It must be emphasised that when the counter is started, each output in turn will go high (for a very short period) until the selected channel is reached. This should not prove to be a problem with most applications, however provision must be made for this when used with flip-flops and other edge triggered devices.

C. Horevoorts(The Netherlands)

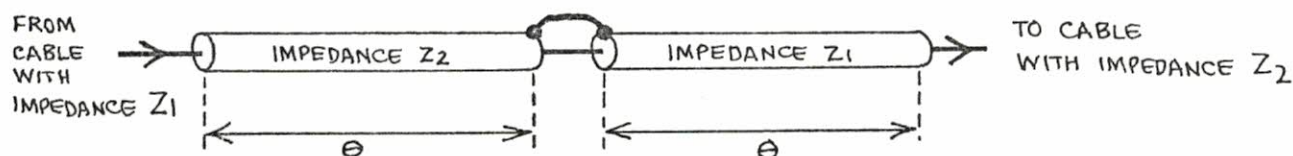
[illegible]

- Thanks to Bruce Carroll, VK2DEQ, for this contribution of RTTY art.

TRANSMISSION LINE TRANSFORMERS

In an article "wideband co-axial transformers using solid dielectric cables" (Electronic Engineering, April, 1962), two BBC engineers, A.B. Shone and W. Wharton, described a number of matching transformer techniques; one of these allows any two cables of different impedance to be matched together simply by using matching lengths made up of the two cables concerned. The original article provided fairly elaborate formulae for the construction of coaxial cable transformers.

G3KYH suggests that in practice for this type of transformer a simplification will provide all the information that is necessary, as shown.



$$\cot^2 \theta = \frac{Z_1}{Z_2} + \frac{Z_2}{Z_1} + 1$$

For a 50/75 ohm transformer this works out to an electrical length of 29.3° for each section of cable; the physical length must take into account the velocity factor of the cable (typically for coaxial cable around 0.66).

DIVIDE-BY-n USE OF 7490 I.C.

The 7490 TTL integrated circuit (now available for less than 50c) has become well known as a decade divider for such applications as providing 100kHz "markers" from 1 MHz crystals, etc.

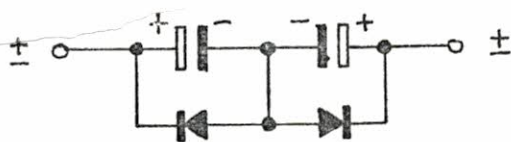
Less well known is that the 7490 can be used to divide any square-wave input signal by any whole number from 2 to 10, and that several devices used in this way can be cascaded to provide an extremely wide range of divisors.

The following table lists connections for each divisor from 2 to 10. In all cases pins 10 and 6 should be connected "low" (earth) and pin 5 to +5 volts. No connections are required to pins 4, 7 and 13.

Divisor	Input Pin No.	Output Pin No.	External connections
2	14	12	Pin 2 or 3 low
3	1	8	Pin 8 to 2, 9 to 3
4	1	8	Pin 11 to 2 and 3
5	1	11	Pin 2 or 3 low
6	14	8	Pin 12 to 1; 9 to 2; 8 to 3
7	1	11	Pin 11 to 14; 12 to 2; 8 to 3
8	14	8	Pin 12 to 1; 11 to 2 and 3
9	14	11	Pin 12 to 1 and 2; 11 to 3
10	14	11	Pin 12 to 1; 2 or 3 low.

NON-POLARIZED ELECTROLYTICS

An improvement on the usual "back-to-back" connection of electrolytic capacitors to form a non-polarized unit can be easily effected by using two diodes to short-out automatically the "reversed" capacitor. The capacitors no longer have reverse voltage across them as happens in the conventional arrangement, and also each provides its full capacitance (instead of only one half of this) to the circuit. The idea comes from "Electronic Design", 24th May 1969.



ALL SINGING - ALL DANCING ...

The march of microprocessors (mP) and microcomputers (mC) into Amateur Radio is by now a well worn topic, but it may be timely to comment again, before the December meeting, on the current trends and the main streams of activity in this area, as mPs and mCs are being used increasingly for control, generation and processing of signals in amateur radio stations.

Before going on, a few definitions: A microprocessor is the LSI IC that is the foundation on which the current revolution is built. A microcomputer is quite a deal larger than this and is a system of one or more mP chips with supporting memory and interfacing IC's as well as terminals, interfacing, and possibly cassette or disk storage for programs.

The uses of mP's and mC's can be categorised many ways, but I have chosen the following:



While this is by no means the only way of viewing the situation and certainly, systems can easily fit more than one classification, this approach emphasises the two different approaches to a task, Software or Hardware.

Hardware.

This approach to using mPs will probably be the easiest for amateurs to follow, as you simply regard the mP as another IC. Hardware oriented systems are usually based on small mP development systems like the 2650 or SCMP, although the "Macronics" interfaces for larger mC systems could easily be regarded as fitting into this area. The system usually contains dedicated signal processing ICs in the front end of the system, and the mP looks after the decoding of the signal - this is the "home-brew" side of hardware, and quite a number of amateurs, especially RTTY operators, are into this facet of mPs. These small home-brew systems are quite flexible in that the home-brewer invariably writes his own program for controlling the mP - but I see the hardware aspect predominating.

Off-the-shelf items like the Tono, Robot and Info-Tech systems are the black-box side of hardware. These systems are dedicated to the processing of radio signals, be it RTTY, Morse, Slow-scan TV or whatever, and they do it very well. They are hard-wired for their task, and the program (software) that controls the mP, and decodes the signal is transparent to the user. The program is usually semi-permanent in a PROM memory device and can be changed, but usually only at the factory. These changes usually are released as a new model of the device (more sales - you know how it goes). Dedicated systems such as these cannot easily be used for anything except what they were sold to do.

Software.

This is the alternate approach to a task. This usually requires a larger system than the hardware approach - hence a higher initial cost, but as almost all of the processing and control is done by a program that can easily be changed, this approach proves to be the most versatile and flexible resulting in an overall cost benefit - the more you use it, the cheaper it becomes.

With the mC system, you may also take a black-box approach and simply buy a program to run on your mC to do the job you want. If you want the mC to do something different, buy another program. The home-brewer will write his own programs for his machine and save on costs - and enjoy it as well. As an example of the software approach, I have a slow-scan TV program that allows me to receive and transmit SSTV of US standard (120 lines). If I want to receive a different standard or even some odd-ball line number like 201 or whatever, I just change one line in the program, and away I go!

..... continued next page.

All singing, all dancing... continued.

The same is true of RTTY, no more changing gears on the model 15 to change the baud rate, throw away that UART, just change a line in the program. There are other benefits on RTTY - ever tried 2400 baud, ASCII code or any other code that you can define in the program? On a mC is only means a change in the program - but, you say, a Model 15 costs a damn sight less than one of those new-fangled micro's! Yes it does, but I can use the micro for keeping the station log, storing valve data for easy recall, sending morse, RTTY, SSTV, tracking my telescope, storing a few slow-scan or RTTY pictures, controlling a 2 metre PLL - (instant scanner!), teaching the kids maths.... OK, enough!

Flexibility, that's what I'm driving at, a super-multi-purpose tool that is limited only by your imagination, and as far as cost goes, the cost of a micro is much less than the cost of all the things that it can replace.

Just sit down and total up the cost of a RTTY system, say a Tono, a Scanner-control unit for your Kenwood, a Slow-scan monitor, the time and effort you put into looking up log-books, the cost of the kid's TV games, and the value of the knowledge of current technology you would gain by using a micro. Be careful though, don't just jump in and think a micro will be a solution to all your troubles, for as with most things, you can only get out results, if you put some work into it.

Of course this is a very superficial look at these new and interesting beasts, and was intended to get you thinking about the subject before the December meeting so bring all of your questions with you and let Paul and I try to answer them for you.

73,

Dave Henderson VK2YKQ/VAV.

p.s. All singing? Yes. All dancing? Well, wait a few years!

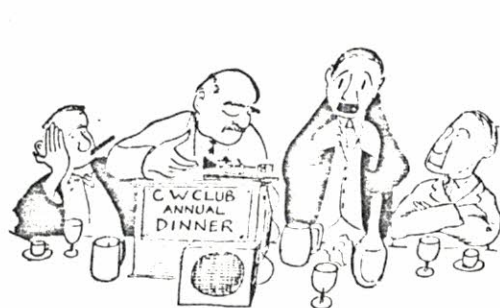
WOODPECKERS:

A new Siberian-based "Woodpecker" has now been confirmed, transmitting a slightly different pulse pattern than his three more western brothers, and apparently located in the Kamchatka Peninsula area. It definitely points up much further east than the central Siberian woodpecker that came on last fall.

The European Woodpecker started a new transmission pattern in late March, with a 50-100 kHz wide signal and a 25-35 Hz pulse rate. It's been spending long periods on the low end of 10 meters between 1200 and 1400 UTC, and points up from the same area as the old European woodpecker.

A woodpecker noise-blanker circuit will be presented in the June issue of "Ham Radio". Designed by DJ7VY for receivers with a 9 MHz i-f, the circuit is not widely known outside Europe, where it was originally published two years ago.

- "Ham Radio", May 1980.



Q3C0C

"... and now, gentlemen, our Chairman will give his annual report."



"... Well, that's about the story from here."

Pixilated Patents

By Mike Rivise

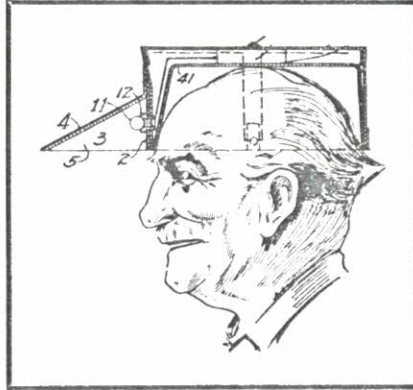
"Light Headed!"

This is No. 127 in a series of odd and interesting inventions in the electrical/electronic field from the files of the US Patent Office.

If you observe all of the unrest and rapid change in the world today and wonder what lies ahead, then this month's invention might be a help. John Kolibas' combined cap and automatic flashlight invention could give a view of what's in front of you, but only about 8 or 10 feet ahead. In fact, one advantage claimed for the flashlight-cap (patent No. 1,572,210 in 1926) is that its concave reflecting surface on the underside of the visor will reflect light down in front of the user where it is supposedly needed. As such, it would not make one light afoot, but would give light upon one's feet. Also, rather than a crown on your head, you would have a headlight in your headpiece.

The cap is outfitted with two battery-powered flashlight bulbs on the front part of the headband. The automatic part of the device comes from a switch located in another part of the headband such that the lights are automatically turned on whenever the cap is seated firmly on the head. Though this arrangement might cause the wearer to be referred to as bright-eyed and light-headed, the cap could certainly help in several areas. For example, it could be just the thing for looking for your wife's gloves in the theatre, for nighttime jogging, for safer safecracking so that you crack the safe and not your knuckles, and for finding your way out of the basement when your do-it-yourself project does in the fuses.

Other uses might include finding your partner in one of those pulsating-light discotheques; for helping to see your income tax form at midnight on



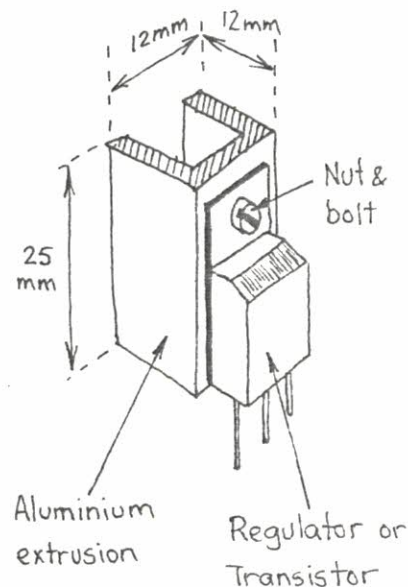
April 14; for walking home when you are out with your girl and your car really is out of gas; and for getting a good look at the feet of the guy that mugs you on a dark street.

The fact that the lights go on automatically when the cap is put on could also come in handy. You could use it to signal for help when you get lost trying to impress the neighborhood boys with your hiking abilities. Also, for checking your food in a darkly lit restaurant to see whether it is still alive, and then to flash for service (and maybe an ambulance) when you find that it is.

Concerning the drawing for this 1926 invention, it is interesting to speculate about the gentleman's hair style. If that point in back was ever the rage, it escaped my notice. Possibly it is an aerodynamic coiffure to reduce wind resistance when he is running backwards. Or, maybe the weight of the batteries, bulbs, wires, etc., stretched his scalp and caused it to gather back there—that might also explain the threadbare area in front. Or, could it be something simple like the lights melting his "greasy kid stuff" and allowing it to run down the back?

HEATSINK TIP

Small heatsinks for three-terminal voltage regulator and small power transistors can be made very cheaply from pieces of extruded aluminium. An example is given in the sketch.



TRIPLE GRIP

For those occasions when a "third hand" is desperately needed for gripping something, try an ordinary pair of pliers with a rubber band around the handles.



IT'S ALL GREEK TO HIM

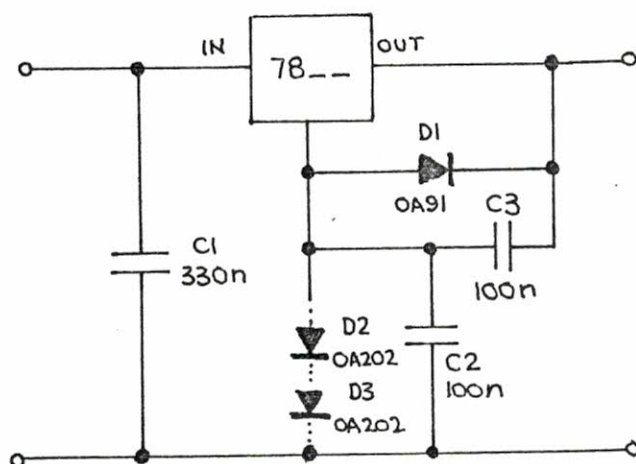
There was a kind curate of Kew,
Who kept a large cat in a pew;
There he taught it each week
A new letter of Greek,
But it never got further than Mu .

"JACKED UP" REGULATOR

When a precise voltage source is required for a particular application, it is common practice to modify the output voltage of a voltage regulator by "jacking-up" the common, i.e. raising its potential above ground. This useful method has its disadvantages. In the event of a short-circuit the common would become reversed biased and the regulator would lose its protection, thus resulting in its destruction.

In the circuit shown the germanium diode D1 prevents the common becoming more than 0.2 volt reverse biased under short circuit conditions and thereby protecting the regulator from damage.

The addition of C2 is to ensure stability. Diodes D2 and D3 (as an example) raise the output voltage by about 1.3 volts.



- "Practical Electronics", February 1980

THE TROUBLE WITH COCKROACHES - Letter in "New Scientist".

Sir - Mr Green's interesting article: "The trouble with cockroaches", prompts the following story of an experience of a friend of mine some years ago. Returning late from the club one Saturday night he found everybody in bed, but his kitchen floor alive with cockroaches.

Being of a tidy mind he sucked up as many as he could in a vacuum cleaner. Then the thought that they were not dead but merely snug in the cleaner prompted him to connect it by rubber tubing to a gas tap, and to fill the cleaner with gas. He retired happily to bed and slept late.

Next morning his wife found the cleaner and thought she would clean up a little; she switched on and it promptly blew up! The representative of the manufacturers was called in, and he confessed that he had "never seen one go like that before".

My friend kept his silence and eventually got his replacement vacuum cleaner.

- R.J. Morley, 73 Egmont Rd, Sutton, Surrey.

CROSSED LINES

A telephone subscriber on a New Forest exchange complained that his phone rang every time the lavatory chain was pulled. The complaint proved true, reports the G.P.O. magazine, and the chain reaction has now been put right.

- Daily Express.

International Standard Values for Copper

Copper for electrical conductors such as those used in cables requires to be of very high purity. This fact is now universally accepted, but it was not fully appreciated by the early electricians, and it was Sir William Thomson, later Lord Kelvin, who showed that the loss of signal strength experienced in the first transatlantic telegraph cable was largely due to the use of copper which, although nominally of high conductivity, proved to have too high an impurity content. As a result of this discovery, the permissible impurity level of the now familiar high conductivity grades of copper was established, and in due course certain standards for high conductivity copper were laid down by the International Electro-Technical Commission; these are:—

1. At a temperature of 20° C. the resistance of a wire of Standard Annealed Copper 1 metre in length and of uniform section of 1 square millimetre is 1/58 ohm (0.017241 . . ohm).
2. At a temperature of 20° C. the density is 8.89 grammes per cubic centimetre.
3. At a temperature of 20° C. the "constant mass" temperature coefficient of resistance is 0.00393 = 1/254.45 . . per ° C.
4. At a temperature of 20° C. the resistance of a wire of uniform section 1 metre in length and weighing 1 gramme is $1/58 \times 8.89 = 0.15328$. . ohm.

The following Table contains resistance figures for annealed high conductivity copper based upon the values given in the I.E.C. Standard.

Annealed Copper (20° C.)					
Microhm-cm. . . . .	..	..	..	..	1.7241
Microhm-inch . . . . .	..	..	..	..	0.67879
Microhms/ft./sq. in. section . . . . .	..	..	..	..	8.1455
Ohms/1000 yd./sq. in. section . . . . .	..	..	..	..	0.024437
Wire, 1 metre long, weighing 1 gram, ohms . . . . .	..	..	..	..	0.15328
Wire, 1 mile long, weighing 1 lb., ohms . . . . .	..	..	..	..	875.20
Wire 1 ft. long, weighing 1 lb., microhms . . . . .	..	..	..	..	31.393

Sizes of fuse elements composed of tinned copper wire or standard alloy* wire for use in semi-enclosed fuses

Current rating of fuse amp	Tinned copper wire		Standard-alloy* wire	
	Diameter inch	S.W.G.	Diameter inch	S.W.G.
1.8	—	—	0.0164	27
3.0	0.006	38	0.024	23
4.3	0.0076	36	—	—
5.0	0.0084	35	0.032	21
8.5	0.0124	30	—	—
10.0	0.0136	29	—	—
15.0	0.020	25	—	—
17.0	0.022	24	—	—
20.0	0.024	23	—	—
24.0	0.028	22	—	—
29.0	0.032	21	—	—
32.0	0.036	20	—	—
38.0	0.040	19	—	—
45.0	0.048	18	—	—
55.0	0.056	17	—	—
78.0	0.072	15	—	—
102.0	0.080	14	—	—

NOVICE NOTES NUMBER THREE

Useless information about conductors - (no, not bus conductors, you fool!)

Most conductors are now only available in metric sizes. These conform to a series which is based on a constant reduction in area. (This was the case originally because the series was designed by the people who drew the wire).

The series is as follows:

.05, .063, .071, .080, .09, .10, .112, .125, .140, .16, .18, .20, .224, .250, .280, .315, .355, .40, .45, .50, .56, .63, .71, .75, .80, .85, .90, .95, 1.00, 1.06, 1.12, 1.18, 1.25, 1.32, 1.40, 1.50, 1.70, 1.80, 1.90, 2.0, 2.12, 2.24, 2.36, 2.50, 2.65, 2.80, 3.0, 3.15, 3.35, 3.55.

Note on fuse table:

The use of cartridge fuses to the appropriate British Standard is normally recommended, but where a rewirable fuse is used the figures given in the table will, in the absence of recommendations made by the maker of the fuse, provide an approximate guide to the size of wire required. These figures represent the current which the fuse will carry continuously; the value at which the fuse will blow is approximately twice this, depending upon the type and construction of the fuse.

* The term "standard alloy" refers to the eutectic tin-lead alloy (63 per cent tin, 37 per cent lead).

- Thanks to Denis VK2DMR for this information.

WOLLONGONG COMPUTER CLUB/USERS GROUP

With the growing interest of amateurs in computers, the following information about the Wollongong Computer Club/Users Group should be of interest.

Membership of the club is informal and open to all interested in computers. Visitors are very welcome. The club is made up of a number of small machine oriented user groups.

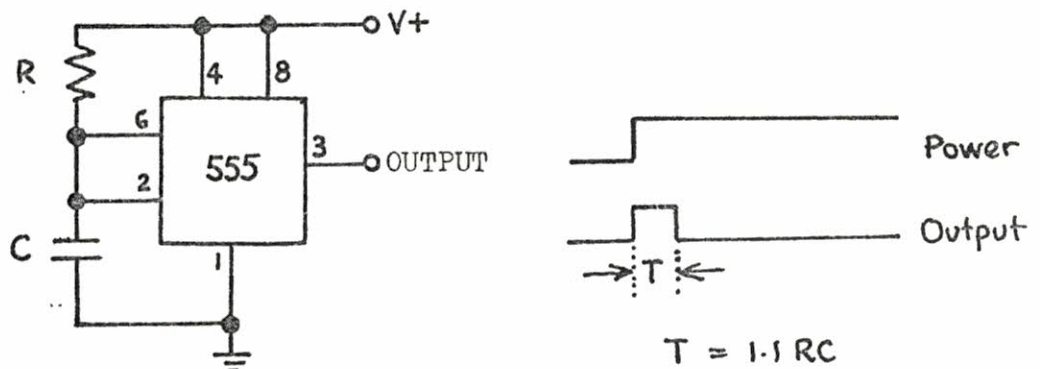
The club provides a software and information exchange on the following computers - Ohio Scientific; TRS 80 and System 80; Sorcerer; Dream 6800; Z80; E.A. 2650; B&S MAP; Bob Armstrong Eurocard 2650. This list is increasing in size and should incorporate the Apple and Sinclair ZX80 after Christmas.

A large number of club members have no computers, just a common interest. Some members have built their computers from scratch, others ready made.

A computer club is the ideal introduction into this fascinating hobby, as new members and friends have the chance to see various types of computers in action, ask questions and to get down and use them. Ready built computers may be purchased for as little as \$300 and from \$130 in kit form.

For more information and details of meeting times, contact
Paul Janson, 14 Hayward Street, Kanahooka, N.S.W. 2530, Phone (042)615451.

A POWER-UP ONE-SHOT

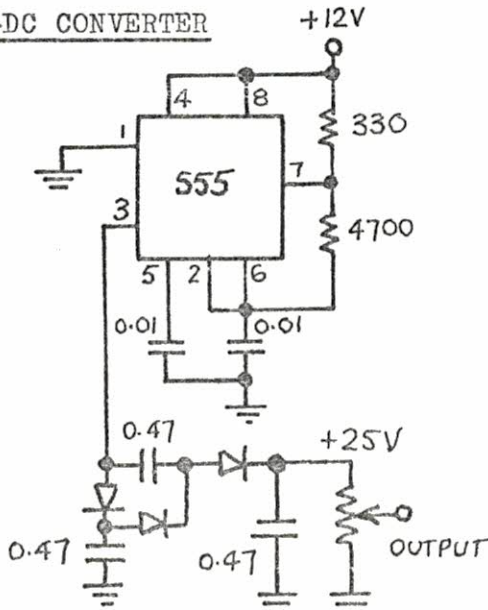


If a 555 is connected as shown, the device will self-trigger when the power is turned on, and will complete a single timing cycle. At turn-on, C is discharged, which momentarily holds pin 2 low, beginning a timing cycle. Capacitor C then charges up to V_+ through R, and when the voltage crosses $2/3V_+$, the pin 6 threshold is reached, which completes the cycle.

If R is 470K, and C is 1uF, the output pulse is approximately 0.5 seconds.

- Walter Jung, "I.C. Timer Cookbook".

DC-DC CONVERTER



Gunnplexers are easily tuned if a varying dc voltage of 5 - 20 volts is applied to the varactor tuning diode. Field operation from a 12-volt battery limits tuning range somewhat. This circuit allows maximum use of the tuning varactor.

The 555 generates a high-frequency ac voltage, which is rectified by a voltage-tripling circuit composed of the three diodes and three capacitors. Output voltage is approximately 25 volts.

The three capacitors aren't critical; values from 0.47 to 1 uF were successfully tested. The three diodes are 1N4148 or equivalent.

3 x IN4148 DIODES

- "Ham Radio", April 1980.

NEWS FROM VK2TTY

Due to the Christmas - New Year period, VK2TTY will transmit its last news broadcast for 1980 on the 21st December. VK2TTY will recommence the 1981 broadcasts on the 11th January 1981. We hope that the rest over this period will give the news staff of A.N.A.R.T.S. a chance to gather more interesting news for the new year.

The next meeting of A.N.A.R.T.S. will be held on Friday 5th December. It is hoped that our secretary will give us a talk on his recent trip to Japan, and his meetings with some of the Japanese RTTY amateurs. Don't forget the first meeting for 1981 is on 5th February 1981.

The Post and Telecommunications Department has now changed its name. It will in future be known as "The Department of Communications". The addresses and phone numbers in all states will remain as before. The new minister for the Department of Communications is Mr. Ian Sinclair.

A RTTY net has been established following the A.C.T. Division W.I.A. broadcasts which commence at 8 p.m. local time each Sunday evening. This means that the net can start about 9 p.m. after the callbacks conclude. To achieve reasonable coverage the net operates on Repeater 7, VK1RGI, Mt. Ginini at 146.35 Mhz in, 146.95 MHz out. The initial operating standards are 170 Hz shift 45 Baud Baudot code but 75 Baud Baudot, 110 and 300 Baud ASCII are available. By using Mt. Ginini repeater the coverage is extended into the Riverina and beyond Goulburn, yet local FM users can still use Repeater 6, Black Hill, Canberra for voice contacts. The repeater time-out also forces short overs to be used. Equipment in use varies from mechanical teletypes and glass TTY such as Xitex, to software terminals with VDU's. Hence the wide range of speeds and codes. ASCII has been found fascinating with its ability to edit characters and back space.

Danish amateurs are now using 160 meters. They have been given permission to operate CW only with 10 watts DC input in the 1720-1740 KHz and the 1830-1850 KHz part of the band. The Danish P and T stresses that the permission to operate is given on a preliminary and provisional basis and it may be withdrawn if amateurs cause interference to other services operating in the band.

NEWS FROM GB2ATG

New Callsign series for United Kingdom "B" licencees:

The G8AAA to G8ZZZ series of callsigns issued to "B" licencees (VHF only) in the United Kingdom is just about exhausted and VHF operators on the near European continent may expect to hear "B" licencees shortly using the new series of calls which is G6AAA to G6ZZZ.

Sinbad the Sailor:

Starting this month (November), to celebrate the 10th national day of the Sultanate of Oman, an experienced maritime traveller and his crew will set sail from Oman on a replica of an early Arab trading vessel made of wood and only held together by rope on a journey to China. They will be investigating the legendary voyages of Sinbad the sailor and the old routes of the Arabs to the Orient. The vessel will be guided by the stars in the old manner but will have a modern radio installation operating under the amateur callsign of A4XSV/MM. This is not a DXpedition and QSL cards should be sent through the Bureau in the usual manner.

NUDIST NABBED:

UNCLOTHED MAN, WHO ADMITS BRANDISHING PISTOL, IS CHARGED WITH CARRYING CONCEALED WEAPON.

- Providence Journal.

QSL CARDS

The club is hoping to obtain full colour, glossy, postcard-quality cards which can be used by club members as a high-quality QSL card at a very reasonable price. The cards will depict Lawrence Hargrave, his kites, and a hang-glider at Stanwell Tops. They will be available to members at cost - hopefully about \$10 per hundred. Overprinting with callsign and operator's name and address should be around \$3 per hundred extra.

To get the cards at the best possible price the club will need to have a fair idea of demand - so be prepared at the December meeting to indicate the number of cards you would want.

Don't miss this chance to get absolutely top quality cards at a very reasonable price. Further details, and a picture of the card, will be available at the December meeting.

LAWRENCE HARGRAVE COMMEMORATION

On the weekend of 28/29th March 1981 the club will be joining in the activities commemorating Lawrence Hargrave. Displays of Hargrave's work, kite flying, etc. are expected to attract plenty of media coverage. It is intended to operate the club station VK2AMW on the site for the whole weekend period, and at the same time to inaugurate the Lawrence Hargrave Award.

Keep the dates clear in your diary.

STORE SPECIALS, DECEMBER MEETING:

Double sided fibreglass PC board, 6" x 36" --- \$2

100 metre rolls of hookup wire --- \$3

Electrolytic capacitors - 10,000uF at 30V, and 15,000uF at 12-15 V
--- limited quantity only --- \$1-50 each.

MONTHLY BROADCAST:

Broadcast officer Denis McKay VK2DMR is looking for news items for the Society's monthly broadcast. Phone items in to Denis on (042) 847786.

The December broadcast will be on Sunday 7th December (same day as the Christmas Family Barbecue) at 7.15 p.m. local time, on 3.565 MHz, 28.46 MHz, 52.525 MHz, and repeater channel 5.

DATONG MORSE TUTOR RAFFLE:

Because of the auction at the November meeting it was not possible to sell tickets for the Datong Morse Tutor.

HOWEVER - tickets at \$2 each will be on sale at the Christmas Family Barbecue, Saddleback Mountain, Sunday 7th December, AND at the December meeting on Monday 8th.

The raffle will be drawn at the DECEMBER MEETING - Monday 3th December.

CHRISTMAS FAMILY BARBECUE:

Sunday 7th December, Saddleback Mountain. A 2-metre pedestrian fox hunt will be run - so bring your sniffers with you. Also there will be audio beeper hunts for the children.

FOR SALE:

FT7 Transceiver. Very good condition. Additional crystal for 10 metres. Proven performer. With VK powermate power supply unit..... \$400.

Katsumi electronic keyer.....(EK105A)..... \$35.

See John Thurstun VK2DET, 11 Cottage Grove, Corrimal.

WHAT IS HAP?

The Handicapped Aid Programme (HAP) is a voluntary organisation that aims to introduce the Hobby of DXing (Short-wave listening) to handicapped and disabled people. It is based on a successful but originally small venture started by the SPEEDX club in the U.S.A. in 1972. Since then, the World Handicapped Aid Programme has been formed.

Currently, there are HAP chapters in the U.K., India, Holland, Canada, Federal Republic of Germany, South Africa, South America as well as the United States of America. All of these HAP chapters are linked together by the HAP International Co-ordinating Committee (H.I.C.C.) for the exchange of information among the HAP organisations.

HAP's purpose is to present this fascinating activity to disabled and handicapped individuals and aid those who already are involved in it. This hobby is particularly suited to the needs of the disabled since it broadens the horizons of those confined to their homes by their handicap and brings the world to their fingertips, reducing the isolation that sometimes may exist.

Short-wave listening can be exciting and intriguing:- Imagine the news from London, Paris, Washington, Moscow or the Solomon Islands! Science News from Switzerland or high in the Andes Mountains in South America! Science News from Washington and London; sports descriptions and results from around the globe as they happen! Above all, a variety of entertainment and information not available in any other way.

HAP SERVICES

The following are the types of services provided for the HAPIES - i.e., the recipients, by the Programme:

1. Club memberships - free or at reduced rates.
2. Equipment may be lent to the HAPIE to get them started on the activity.
3. Assistance provided in modifying equipment to suit needs of the HAPIE.
4. On request, a HAP-pal appointed to advise and assist the HAPIE in his activity.
5. Certain technical pamphlets and literature provided on request.
6. Introductory Course on tape for blind DXers and other literature recorded on request.

FOR FURTHER INFORMATION CONTACT:

Robin L. Harwood, 5 Helen Street, LAUNCESTON, Tasmania. 7250.
Phone (003) 442324. (VK7RH) .

SATELLITES

Two new Russian satellites should be launched and in operation very soon, JR1SWB, secretary of JAMSAT, reports. He says he was told of the forthcoming launch by a high ranking official of the Russian Radiosport Federation. The two satellites, designated "RS-3" and "RS-4", are both supposed to be checked out and ready to go. This report seems to confirm recent suspicions that unusual 10-meter signals heard from Russia in mid-January were satellite related.

OSCAR users and other amateurs are urged to watch the 29.3 to 29.5 MHz slot carefully for unusual telemetry signals, and report anything unusual to AMSAT or ARRL.

- "Ham Radio", April 1980.

BUSTED: Nine persons who were jammed into a motor-car were injured when it struck the rear of a bus. The woman driver explained: "I didn't see the bus in time because I was nursing my baby."

***** - U.S. National Safety Council *****

BITS AND PIECES...

If residents of Bellambi were suffering from TVI on the afternoon of 22nd November then it was probably not coming from VK2VAV. Running the exciter stage of a converted CB set - skillfully coupled via two alligator clips into his 5/8 ground plane - Dave worked YB0ACJ/1 and JF2JWP whilst punching out a massive 500 mW PEP. Several days earlier Dave had admittedly yielded to temptation and cranked his rig up to 5 watts, to work HM0U (South Korea), YU3BC (Yugoslavia), H44SH (Guadalcanal), WD9IIC and AB9E in the States. Admittedly Dave was at the mercy of the elements, but you should have heard the gasp from Dick WD9IIC who was running a Kilowatt. (Signal reports were about 5/5 -5/4 both ways.)

Dave has been monitoring power output using an RF probe attached to a multimeter, which indicates the RMS voltage. If working into a 50 ohm load, the PEP power is given by -

$$P_{PEP} = \frac{2 \times V_{rms}^2}{50} \quad \text{watts.}$$

Dave has also been operating a DIGITALLY CONTROLLED VXO - With the can removed from the crystal (- or vice versa) - Dave has found that a friendly squeeze of the crystal with the digits (fingers) produces a sustainable alteration in frequency.

Meanwhile, Dave Meyers VK2PBP has found 80 metres a howling success recently - each time he transmitted, a melancholy miaow wafted into the shack.

Dave tracked the noise down to a feckless feline sitting on a high voltage point of the long-wire antenna, and presumable too stubborn (or too electrified) to move off it. QRPussy operation?

REPEATER MOVE:

The relocation of the channel 5 repeater mentioned earlier this year has not been abandoned, but has been delayed by building problems at the site. When the prime users of the site have finished their building, a fairly quick move is likely.

CLUB MEMBERSHIP NUMBERS.

It may be of interest to members to see the club membership numbers on which voting rights at the 3rd Conference of Clubs were based. Note that a fairly modest membership drive, and an increase in W.I.A. members, could make Illawarra the biggest club in VK2, with the greatest number of votes at Conferences. How about it, fellas?

CLUB	TOTAL MEMBERS	WIA MEMBERS, LESS MEMBERS OF OTHER CLUBS	NUMBER OF VOTES (one per 10 WIA members or part thereof)
Goulburn	15	11	2
Hornsby		15	2
Illawarra	129	65 - 8 = 57	6
Liverpool	48	30 - 1 = 29	3
Manly/Warringah	41	26 - 1 = 25	3
Mid South Coast	133	66 - 19 = 47	5
Novice	104	20	2
Orange	29	22 - 3 = 19	2
Oxley	39	25	3
South West	64	48 - 15 = 33	4
St. George		69 - 1 = 68	7
Three		15	2
Wagga	53	25	3
Westlakes	180	76 - 12 = 64	7
Wentworth			2

UN RUN MOBILE.

From Orange Amateur Radio Club's "Tuned-In" it is noted that communications were provided for the Orange Fun Run on November 9th.

Inefficiencies in race organizations were noted as there was some confusion as to the correct route and not all intersections were adequately patrolled by police.

A highlight of events was the fact that Mike VK2VWQ, a school student, ran in the race himself while reporting in on a hand held unit. Despite his disadvantage, he finished 29th overall, out of a field of 250, and came first in his division!

...and on the local scene... anyone interested in operating kite-mobile during the Lawrence Hargrave festivities next year?

A BELL STRIKES BACK.

Telephone-interconnected repeaters abound on all of the VHF bands in Los Angeles. One afternoon, a user of one of these systems wanted to place a phone call, so he hit the access code on his pad, expecting to be greeted by a dial tone. He was: so far, so good. He proceeded to dial his number and in a few seconds the sound of a normal ring was heard in his speaker. After two or three rings, suddenly on the line came an operator requesting that the caller (our amateur) deposit 35c for the first three minutes.

Obviously, there was some sort of mistake, and the amateur went to great length to explain that he was not at a pay phone but rather, as in his automobile tooling along the Ventura Freeway. The operator's response was simply that her equipment showed that the call was coming on a pay phone line, and that such calls required immediate payment.

Finally, in complete desperation, our stalwart amateur told the persistent operator that he would be happy to prepay the call if some method could be found to install a coin slot in his Midland.

At last, after going through the chain of command, the call was passed through to its destination, but not without further incident. Every three minutes an operator would come on the line requesting overtime payment and each time it was necessary to re-explain the situation. However, in the true spirit of amateur radio, our repeater user stood fast and eventually triumphed over the bureaucracy: he completed his call.

It was several days before the cause of the problem was discovered. It seems that the phone company had been converting from carrier to wireline off the hilltop, and somehow had connected the repeater to a pay telephone line. It took almost two weeks to wade through the Telco bureaucracy, but things on that system are now back to their normal status quo, except for memories of the evening that one amateur tried desperately to insert coins in a Midland 13-509.

- "73" Magazine, April, 1980.

AREWELL 1980...

There will be no "Propagator" published in January; the next issue will be posted out prior to the February meeting.

Many thanks to the production team who have spent so many hours printing, collating, stapling, folding, addressing, and mailing the Propagator. In spite of many problems, they have always got it out on time.

Thanks also go the contributors, without whose efforts there would have been nothing to produce... so keep those contributions rolling in!

We wish a happy Christmas and a prosperous New Year to all our readers.

THE ILLAWARRA AMATEUR RADIO SOCIETY

PRESIDENT: Keith Curle, VK2OB, 24 Beach Drive, Woonona, 2517.

VICE-PRESIDENT: Denis McKay, VK2DMR, 17 Doncaster St, Wollongong, 2518.

SECRETARY: John Doherty, VK2NHA, 7 Risley Road, Figtree, 2525.

TREASURER: Geoff Cuthbert, VK2ZHU.

COMMITTEE: Gao Donk VK2VPD, Ron Dorin VK2VOE, Dave Meyers VK2PBP,

Les Kirchmayer VK2ALK, Ian Squires VK2DKS;

Brian Wade VK2AXI; Kieran Kennedy VK2DAN.

PROPAGATOR EDITOR: Brian Wade VK2AXI, 72 Murray Road, Corrimal 2518.

ANNUAL SUBSCRIPTIONS: Send \$5 to the Treasurer, I.A.R.S., P.O. Box

1838, Wollongong, N.S.W. 2500, or see Geoff Cuthbert at meetings.

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

N.S.W. 2500.

QSL CARDS: For Illawarra members who are also W.I.A. members,

see Rick Hill VK2DAP at meetings, for inwards and

outwards cards.

THE ILLAWARRA AMATEUR RADIO SOCIETY - SERVICES

MONTHLY MEETINGS: Second Monday of each month (except January)

at 7.30 p.m., Congregational Hall, corner of Coombe and Market

Streets, Wollongong.

MONTHLY BROADCAST: 7.15 p.m. on the Sunday night before the monthly

meeting, on VHF repeater 5, UHF repeater 9, and 28.46 MHz.

SLOW MORSE BROADCAST: From VK2AMW on Monday nights (except meeting

nights), 7-8 p.m., on 1.805 MHz.

W.I.A. BROADCAST RELAY: Sundays 11 a.m. and 7.30 p.m., repeater 5.

MONTHLY NEWSLETTER: The Propagator is usually posted to reach

members during the week before the monthly meetings.

AMATEUR RADIO CLASSES: Preparing for Novice, Limited, and Full

licences, Fridays 6-9 p.m. See Keith Curle VK2OB or

Denis McKay VK2DMR.

CLUB NETS: 52.525 MHz FM, 8.30 a.m. Sundays.

3.565 MHz, 8.00 p.m. Sundays.

VHF REPEATER: VK2RAW, Channel 5 (146.25 MHz in, 146.85 MHz out)

UHF REPEATER: VK2RUW, Channel 9 (433.225 MHz in, 438.225 MHz out)

THE PROPAGATOR

Newsletter of the Illawarra

Amateur Radio Society.

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