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.

ANNUAL GENERAL MEETING

THE MARCH MEETING on Monday, 8th March at 7.30p.m. will be the Annual General Meeting of the Illawarra Amateur Radio Society.

Election of Officers of the Society will be held. Here is your chance to choose who will guide the Society through 1982. The following positions required:- President, Vice President, Secretary, Treasurer, Storeman, W.I.A. liason, Newsletter Editor, Repeater Co-Ordinator, Q.S.L. Inwards Manager, Q.S.L. Outwards Manager, Publicity Officer, Broadcast Officer and 4 Committee men.

NOTES FROM THE FEBRUARY 1982 MEETING.

The meeting saw a good roll up to welcome Roger Harrison VK2ZTB editor of Electronics Today International, as he dodged the flak in showing the reasons why "The Amateur Experimenter is Dead." Well done Roger. We hope to see you back again.

THE APRIL MEETING (Monday 19th April) ... speaker will be Ray O'Grady, (Police Communications) international chairman of Satcom ... another one not to be missed. Please Note that the previously published date of April 12th is Easter Monday and is INCORRECT. The meeting will be held on April 19th.

AMATEUR RADIO CLASS 1982.

Classes for Full, Limited and Novice Amateur licenses will again run in 1982, on Friday nights 6 to 9 p.m., on the top floor of the Mathews Building at Wollongong Technical College. The first class night was Friday, 19th February. For further information, contact Keith VK2OB or Denis VK2DMR, or simply show up.

THE EPITOME OF FLATTERY.

Heard at the committee meeting of a certain Amateur Radio Society during a discussion about the actions of a Police officer in a siege.

Committeeman 1. "That copper was a pretty brave bloke, I reckon.

Committeeman 2. "I'll say. He took my missus for her driving test."

FROM THE EDITORS DESK.

I approach this task with some trepidation. For those of you who didn't know, Brian VK2AXI has been transferred from the Illawarra district. To Brian this has meant a move closer to family ties and more interesting employment. To members of the Illawarra Amateur Radio Society, Brian's gains are great losses to us.

Brian edited this journal for quite some time and the success of this journal is due, in no small way, to his efforts. To him we owe the genesis and growth of VK2KING (the only 4 letter K call in Australia). It is hoped that this valedictorian message, though it applies to Brian, does not apply to VK2KING.

Brian's efforts did not stop with the Propagator. He was also one of the lecturers at Wollongong T.A.F.E. and his Novice and Full call classes were highly successful (the writer being one of his full call successes).

In his spare time Brian was also directly involved with the State Emergency Services. (I suspect Brian's leaving may have left holes in organisations other than our own).

A presentation was made to Brian at our Christmas Barbecue to thank both him and Carol and to wish them "Bon Voyage". So to Brian & Carol "Au Revoir" we wish you both 73's and hope to see you regularly in the future.

This month I have edited the Propagator but I find the pressures of business too demanding to make this a permanent task, so if you have a literature bent or are a frustrated journo, the merest hint of a desire to help will find you filling Brian's shoes. PLEASE HINT.

73's

Denis VK2DMR.

REPEATER REPORT.

Major work this month has centred around the 2 metre repeater at Mt. Murray. At the time of writing the cubicle has been completed, thanks to the dedicated work of Mike VK2VXS, Ian VK2EXN & Morry VK2EMV. The cubicle consists of 2½metre by 2metre diameter steel cylinder on skids with a 25' steel mast. The interior is fully fitted out with benches, seats etc., and is ventilated.

Construction time for stage was approx. 120 hrs. Well done fellows.

By publication time the cubicle will be positioned at it's permanent home. This will have involved the bulldozing of an access road, excavation of the site and burying almost all of the cubicle except for the access door. This should result in a high security installation which is almost invisible except for the mast and associate antenna.

It should be noted that the Mt. Murray repeater could not be possible without the splendid co-operation of the landholders involved, Jim McKinnery who has for many years put up with those crazy amateurs tramping up his hillside in all weathers.

Alan Polk who gladly allows strangers to drive low loaders and bulldozers across his paddocks & through his fences.

Continued next page...

This little quiz is for Novices aspiring to be full calls. (If you have had your license for a long time, you might like to see if you could keep it- my ! haven't things changed quickly!! - What happened to tne filaments?).

1. A good method of determining if the transistors are operating in a Class-A circuit, such as an audio amplifier, IF or RF amplifier, would be to check the:

( ) a. collector-base voltage
( ) b. bias voltage
( ) c. emitter-collector voltage
( ) d. base voltage

2. In a Class-A transistor amplifier circuit using a NPN silicon transistor, which of the following conditions would appear to be normal?

( ) a. collector −5V; emitter 0V
( ) b. base −5V; collector −5.6V
( ) c. emitter −5V; base −5.6V
( ) d. collector −5V; emitter −10V

3. Which of the following statements regarding Zener diodes is true?

( ) a. a Zener diode will operate the same as any low-current solid-state diode if forward-biased
( ) b. a Zener diode will operate the same as any low-current solid-state diode if reverse-biased
( ) c. variations in the reverse-current flow in a Zener diode will cause similar variations in the Zener diode voltage level
( ) d. most Zener diodes are germanium

4. Which of the following statements is true regarding FET's (*F*ield *E*ffect *T*ransistors)?

( ) a. the gate voltage necessary to cause the FET to cut off is called the "pinch-off" voltage
( ) b. the channel of a FET must be of 'N'-type material
( ) c. MOSFET's are immune to static charges
( ) d. the difference between a junction FET (JFET) and a MOSFET is that the JFET has an insulated gate to reduce reverse-bias gate current

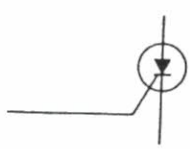


FIG. 1

5. The symbol shown in Fig. 1 is a:

( ) a. MOSFET
( ) b. thyratron
( ) c. tunnel diode
( ) d. SCR

6. A tunnel diode is most likely found in which location?

( ) a. a power supply
( ) b. the horizontal or vertical oscillator circuits of a TV set
( ) c. a UHF tuner
( ) d. an audio detector

7. The gain-bandwidth product of a transistor can tell you:

( ) a. the frequency at which the gain has decreased to 0.707 times the gain at 1000 Hz
( ) b. the frequency at which the gain has decreased 3 dB from the gain at 1000 Hz
( ) c. the frequency at which the gain has decreased to 1
( ) d. none of the above

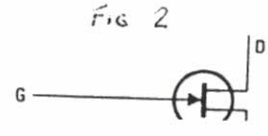
8. A frequency correction circuit using a transistor rather than a varactor uses which two elements as the variable capacitor?

( ) a. collector-base
( ) b. emitter-collector
( ) c. all three elements must be connected
( ) d. emitter-base

9. What type of transistor is shown in Fig. 2?

( ) a. a triac

FIG 2



( ) b. an N-channel JFET
( ) c. a P-channel JFET
( ) d. a unijunction transistor

10. In most high power-output transistors used in radio, amplifiers and TV receivers:

( ) a. the case is connected to the emitter
( ) b. the case is connected to the base
( ) c. the case is connected to the collector
( ) d. the case should be grounded for better shielding

AMATEUR RADIO AND TELEPHONES - Brian VK2AXI

PHONE PATCH, AUTO PATCH, AND REVERSE AUTO PATCH

It appears possible that amateurs in Australia may soon be permitted to link their radio equipment to telephone lines. Americans call the technique "phone patching". It extends the present operating privilege whereby a non-licenced third party can transmit from an amateur station under the supervision of the station licencee. With phone patch, the third party can be linked to the amateur station by telephone instead of having to be physically present.

It is possible to link a telephone line to an amateur repeater, and Americans refer to the system as an "autopatch repeater", or just "autopatch". Because the repeater is unattended, use of the telephone line is arranged by remote control, or automatically.

An autopatch repeater will usually operate in exactly the same way as a "straight" repeater: an amateur transmits to the repeater on one frequency, and it retransmits on another. In addition, the amateur can make a phone call via the repeater, by transmitting audio tones from a "touch tone" keyboard. As each numbered key is pressed, a unique pair of tones is received and decoded at the repeater. When a complete telephone number is received, the repeater equipment in effect takes its phone off the hook and dials the number. Repeater listeners will then hear the ringing tone from the dialled phone, and in due course the voice of the person answering the phone. A conversation can then proceed between the amateur with his mobile or handheld transceiver and the person on the phone.

Such a system is obviously ideal for directly contacting police, ambulance, or other services in an emergency, and would be of great use for WICEN. More routinely, the ability to call home when delayed by work or traffic could promote peace on the domestic front.

Some American repeaters have a further facility called "reverse auto-patch". The idea is that you can ring up the repeater from any telephone, and then call for the station of your choice - or, indeed, call CQ! Of course, this kind of access to the repeater must be restricted to licenced amateurs.

DIFFERENCES BETWEEN U.S. AND AUSTRALIA

There are differences between the American and Australian telephone systems which will require Australian techniques and operation to be somewhat different.

In the U.S., many (or most) telephone exchanges operate with "touchtones" instead of the pulsed dialling system of Australia. In many American autopatches, the tones generated by the amateur's touch-tone keyboard are fed directly into the telephone system to dial a number. An Australian autopatch would have to convert the tones to appropriate dialling pulses.

A more difficult problem is that of money. In the U.S., telephone subscribers are charged a fairly stiff rental, but are not charged for local calls. Hence a radio club with an autopatch repeater knows in advance exactly what the phone bill will be (provided the autopatch is restricted to local calls only), and can budget accordingly.

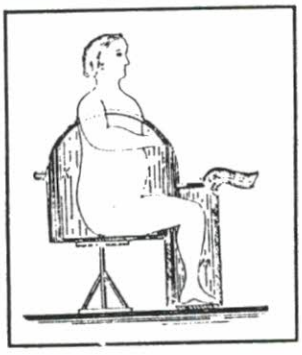
In Australia, of course, each local call costs about 10 cents. An autopatch phone bill would vary with the number of calls made - and if there were an average of 30 calls a day, the annual bill would exceed $1000 ! A viable autopatch system would therefore need to be run in such a way that users would contribute funds in general proportion to their useage.

continued next page...

Pixilated Patents

By Rick Kemmer

If you're one whom sickness displeases
And illness or misery teases,
Whether in York or Tobasco
Try the Sardius Pasco
Vacuum chamber for treating diseases.



This is No. 137 in a series of odd and interesting inventions in the electrical/electronic field from the files of the US Patent Office.

Rashes, rheumatism, or irregularity—if you suffer from virtually any disease, you may find consolation in a cure-all patented by Sardius Pasco of Delavan, Wisconsin in 1872. Whether it be athlete's foot or gall stones, the tangle of current-conducting copper-zinc tanks and vacuum pumps that Pasco calls his vacuum apparatus for treating diseases (Pat. No. 122,486) is guaranteed to bring relief.

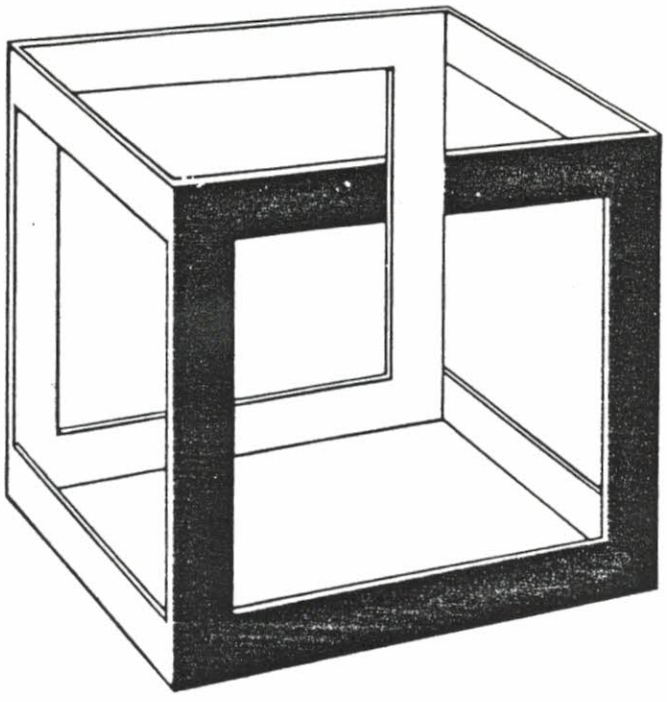
According to a usually unreliable but interesting source, the vacuum chamber has a colorful history. Its first cure, in 1873, was attested by an old sea captain who claimed the vacuum suffocated barnacles that threatened to devour his wooden leg. General Custer sat in a Pasco Chamber for three days before Little Big Horn trying to cure an allergy to feathers, and Marconi electrified the world with shocking ideas he dreamt up during nightly constitutionals in his chamber.

In the 1920's with the advent of prohibition, Pasco chambers started turning up in more and more homes. It was found that by detaching the vacuum pumps and electrical plug-ins, the chambers functioned well in making gin. One amorous socialite actually married a commoner with an eye to acquiring her daddy's highly decorated and expensive Pasco Chamber. Asked why he married a girl of such lowly social standing, he replied, "She may be only a moonshiner's daughter, but I love her still."

Even in the days hen its brewing functions supplante its curing functions, the medicinal contributions of the vacuum chamber were recognized, and home brew flu juice helped you forget your ailments. Years later, then-vice president Richard Nixon relaxed in the sobering atmosphere of a Pasco Chamber afte ing stoned during a parade throug e streets of Caracas, Venezuela.

How does the fabulous Pasco Chamber work? It's based on the simple physical fact that there are about 14 pounds of atmospheric pressure per square inch pressing down and holding your disease in. When a vacuum is applied, the disease can ooze out of you unhindered, and the zinc-copper chamber adds an additional electrical jolt to melt tumors, cancers, and warts simultaneously.

Even if you aren't carrying a dread disease, modern technology provides new uses for the Pasco Chamber. By sitting in one for several days before embarking on the first Pan Am lunar flight, you can get used to operating in a vacuum like the one in outer space. More down to earth, you can steep ice tea in the vacuum chamber, and take it out already cold and fit to drink. If your deodorant quits, you can sit in a vacuum chamber with the offensive odor being removed by the pumps into an anti-air pollution device. Outside of the initial investment, it's a lot less costly than stopping in the drugstore once a week for extra dry.

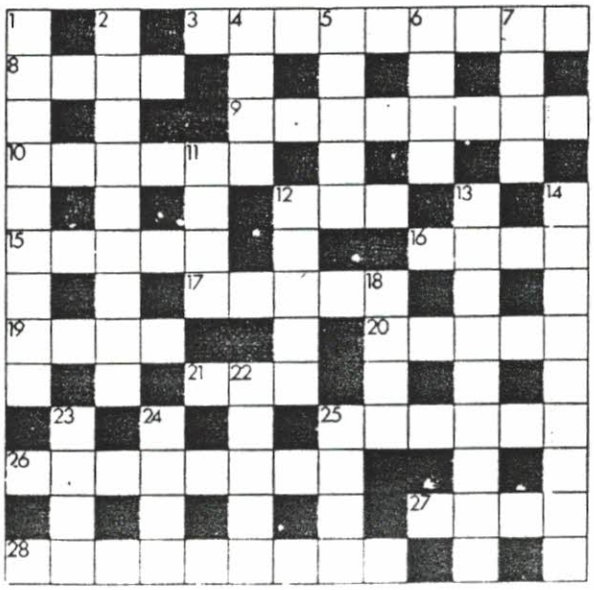


Amplifying waveguide and circulator. (10 gHz)
(65dB Gain - all angles must be 90°).

"A pocket calculator? But who wants to calculate the number of pockets they've got?"

HAM ACROSTIC

ANSWERS NEXT MONTH



ACROSS

3 Permanent method for a good set! (5, 4)
8 Lamp worked round open terminal? (4)
9 Opponent of current circuits? (8)
10 Not conscious of such signals? (6)
12 Shortage of a dial system? (3)
15 Reduces the volume of gale-warnings? (5)
16 Drama Marconi's Mum got into? (4)
17 Gives some sort of reception! (5)
19 Swearing about a hot switch? (4)
20 Winners run through such recordings? (5)
21 Member needled over the gramophone? (3)
25 Sound on ears inwardly disconnected! (6)
26 They're driven from the TV chairs! (3, 5)
27 & 1 Down Currently going through with impure stuff? (4, 9)
28 Handy army alternative to radio (9)

DOWN

1 See 27 Across
2 A bouncer needed for TV reception? (9)
4 Sir, a twist to correct distorted melodies! (4)
5 Where to find a radio part on the map? (5)
6 Buzzer used to jam? (4)
7 Old sound transmitter with strings? (4)
11 Metal dish for a separator network? (4)
12 Waste amps with non-electric radio involved? (5)
13 They're designed for individual listeners (9)
14 Press television to cover these? (4, 5)
18 Knock-out in wireless tuning! (4)
22 Range of arc he got into a transformer (5)
23 Appendage of sound equipment (4)
24 Broke bit of a signal from the continent (4)
25 Final receiver of what the employer makes (4)

AROUND THE TRAPS...

Overheard during I.A.R.S. committee meeting:

Amateur 1: "Did you see the new transceivers in XYZ's shop?"
Amateur 2: "I wouldn't buy from that mob just on principle!"
Amatuer 1: "They're selling them for $150 less than anywhere else".
Amateur 2: "Weeeell... so much for principle!"

Mini-beam: It seems that a local institution with its own amateur radio club had a mix-up with feedlines and antennas, with the result that several interstate contacts were had on 20 metres with nothing more than a PL259 coaxial connecter at the end of the feedline! Small wonder that the SWR was "a bit funny", and signal reports were down...

Overheard in a Keira Street Electronics Emporium:
Customer, perusing general coverage receiver: "Why doesn't it go over 29.9 on the digital readout?"
Salesman: "Because, Sir, it's ILLEGAL to go any higher than that!"

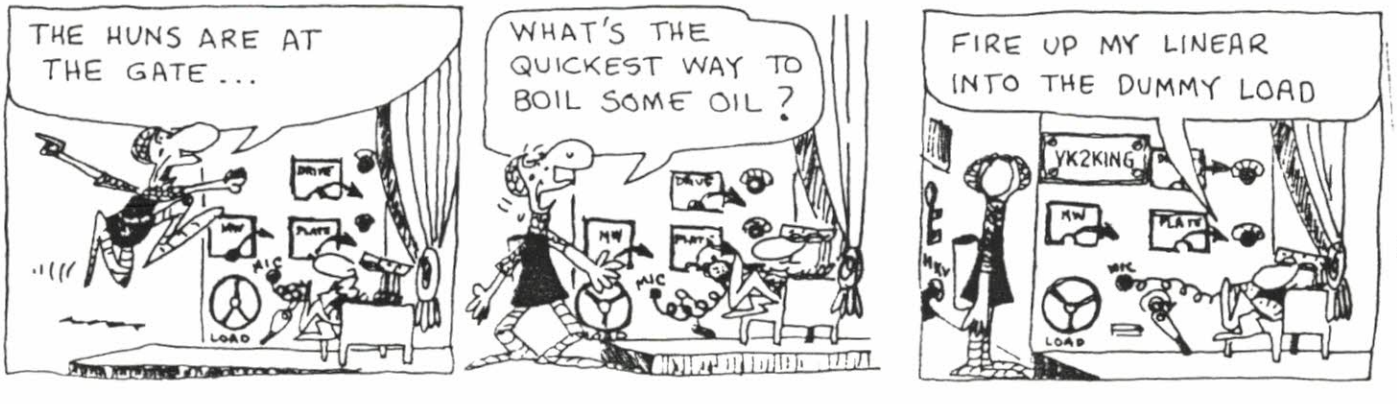
Planned Cooling: During recent power restrictions, which required air-conditioners to be turned off, the power-station planning office, in one of Sydney's high-rise glass office blocks, became uncomfortably hot. S.E.C. engineers, not to be beaten, taped sheets of projected power station plans to the windows to keep out the sun and cool the office!

Murphy strikes again: A local amateur built a very nice receiver pre-amplifier for his transceiver, setting it up as an outboard unit with changeover relays for transmitting. For sheer expedience (a complaint which, let's face it, afflicts most amateurs!) he derived the power for the changeover relays from the shack lighting circuit. Needless to say, the next time he operated was in daylight - with the shack lights off - and on the first transmission, his full RF output went into the helpless preamp, which went up in smoke.

School history... some penetrating historical insights, as revealed by the answers in some school history examinations...

"When Australians meet overseas, they immedieately stick together".
"In Italy after the first world war, the people were divided into fractions".
"Poverty is simply a term to describe the poor".
"In 59 BC, Caesar took Pompey and Crassus and cemented them into the First Triumvirate."
"In the nineteenth century the population of Europe almost doubled due largely to the efforts of Florence Nightingale and Louis Pasteur."

WORLD'S WORST TV PROGRAMME: An opinion poll showed that a 1978 French television interview - with an Armenian woman - transmitted at peak viewing time and selected in the previous day's paper as the evening's best programme - was watched by no viewers at all.



Repeater Report - contd.

And not least John Thomas who happily allows those crazy amateurs to use his hill as a lightning arrestor and to dig holes in his hill to bury a big dog kennel.

John, Alan and Jim we thank you.

Finally, thanks to Ack Wilton and his boys for the use of his premises and equipment.

All of this, just to enable us to use the 2 metre band more effectively - Crazy maybe - dedicated definitely.

Denis VK2DMR.

SPARE A THOUGHT.

I have held an Amateur license now for approximately four years and have been a member of the committee of the Illawarra Amateur Radio Society for 3 of those 4 yrs. On a number of occasions I have taken to an internal discourse about what the functions of a radio society or club is or should be. For the record I have set out below my own thoughts on this. The reasons for doing this are manyfold but I guess the main reasons are:-

a) maybe you have never even asked yourself why you joined a radio club. (It's a question worth asking.)
b) maybe you could get more out of your membership.
c) maybe the club could gain something in this process.
d) maybe my own analysis could be wrong (if you don't agree - let the editor know - in a letter, not by a brick through his front window).

1. A Radio Club or Society should be a source of both fellowship and a means of encouraging growth (both to individual amateur and to the fraternity of amateurs. Those aims should include
2. Effective leadership which should include all sections of the society membership.
3. Participation by as many members as possible in the Societies activities.
4. Good Public Relations both in terms of positive action to promote Amateur Radio and in countering poor reporting when it appears in the local press.
5. An on-going programme of training of members by means of Nets, technical discussions, and guest lecturers at Society meetings.
6. An on-going programme of recruitment of new amateurs and of sponsoring training/ education programmes and licensing classes.
7. Close co-operation with emergency communications organisations eg., W.I.C.E.N., S.E.S., Volunteer Coast Guard Etc.
8. Sponsorship of Technical and Working Groups in technical activities.
9. Training in self regulation of the service eg., fox hunts, direction finding groups.

In summary this is your radio club. Are you getting what you thought you would get? What did you expect? What can the Club do to meet your expectations? What can you do to help?

Please note that the Annual General Meeting is this month.

Denis VK2DMR.

The Things People say.

"Right, I've got that all OK. To avoid timing out, I must wait for the "K". Er...Er... is that the long burst of Morse, or the short bit?"

... Brighton & District RS Newsletter.

"This car I've borrowed is most peculiar. If you put the right-hand indicators on and then turn left, they cancel."

... heard by G3GSR.

from P.W., Aug'81.

ADMIRALTY HANDBOOK

OF

WIRELESS TELEGRAPHY,

1925.

CHAPTER XIX.

CARE AND MAINTENANCE OF W/T INSTALLATIONS.

This chapter summarises the various precautions that must be taken to keep a W/T set in efficient working order.

The rating in charge of any installation should always bear in mind that it is his duty to keep every set in a state of instant readiness for use.

A set deteriorates very rapidly if neglected, and should be subjected to periodical overhauls.

Rotating Machinery. General.—The following remarks apply to Motors, Motor Alternators, Motor Generators, and Rotary Converters.

Every machine in charge of the telegraphist staff should be run weekly. If electrical power is not available, the armatures should be turned by hand. (A case is on record in which a booster failed to start when power was switched on: on inspection, the fault was found to be that rats had built their nests under the armature.)

When it is necessary to lift an armature, precautions must be taken to prevent damaging the shaft or the windings.

The bearing portion of the shaft should be covered in sacking to avoid scoring by the wire strop in lifting.

Wooden chocks should be placed against the windings to prevent the wire strop cutting them, and sacking should be placed over the outside of the armature to protect the windings in transit.

The field leads must be disconnected before any attempt is made to remove the upper half of the carcase.

When painting machines, avoid filling up the ventilation holes with paint.

Use of Blow Lamp.—A W T rating is frequently called upon to use a blow lamp for making sweated connections, and this is by no means an easy matter.

The blow lamp generally supplied consists of a spirit lamp and a boiler with a fine nozzle below and a relief valve above.

A measure for filling the boiler and a rimer for cleaning out the jet in the nozzle are also supplied.

Methylated spirit is put in the boiler and the lamp and the latter lighted; when the pressure inside the boiler is sufficient, a fine jet of burning methylated vapour will spirt out from the nozzle, and can be directed where required.

Precautions in working.—Only fill the boiler with the measure supplied, or only half full.

Keep the jet clear.

See the relief valve on top working freely.

Soldering.—Clean the two parts to be joined very thoroughly and see that they are absolutely free from grease. Heat up both parts as hot as is safe consistently with not damaging any insulation. The flux used should be a paste made of pure resin, and methylated spirits. "Rozinal" and "Fluxite" should be avoided. Melt the solder on, keeping all parts as hot as possible.

Amateur Radio and Telephones - contd.

KEEPING TRACK OF COSTS

As an absolute minimum, an Australian club would need to keep count of phone calls being made so that, if necessary, an autopatch could be disabled before the club was bankrupted.

In a more elaborate scheme, each potential user could be issued with his own 3 or 4 digit access code. The computer at the repeater could then store the access code, telephone number dialled, and the time of day for every call. The computer could produce a printout for members (and the treasurer!) which would be horribly similar to a telephone bill. A determined criminal could get hold of valid access codes, so they would need to be changeable, possibly at short notice. In fact, a user might be able to choose his own access code from a list, and phone it in to the repeater so that he could change it as often as he liked.

Alternatively, automatic tape recording of all phone patch traffic would provide a very simple record of useage, coupled with a counter to enable periodic checks on the growing telephone bill.

ACCESSIBLE NUMBERS

It would be worthwhile to have a short list of emergency telephone numbers such as 000, police, fire and ambulance, which could be accessed by anyone with a touch-tone keyboard, without needing any preliminary access code.

REVERSE AUTOPATCH AND ITS USES

A reverse autopatch facility would be useful to an amateur unable to access the repeater by radio - being outside the coverage area, or not having his transceiver with him. He could access the repeater from a telephone by dialling first the listed telephone number, then a 3 or 4 digit access code (which could be changed from time to time). The code would prevent unauthorised persons using the repeater. The amateur could then call up any of the repeater's functions by dialling the appropriate code. Data such as battery voltage and temperature could be read out in morse code (or even synthesized speech). Standby receivers or transmitters could be switched. A talk-through function could be selected - the amateur could then talk to any of the repeater's radio operators from his telephone.

CONCLUSION

Phone patching and autopatches are techniques typical of others in amateur radio, involving technically ingenious devices, designed and built at low cost, which enhance communications ability and add to the knowledge of those involved. Let us hope that development in this area is encouraged by, and not stifled by, bureaucratic regulations.

SQUEEZED DRIVER

British Leyland recently took the wraps off one of its major research projects financed from the government's £1500 million capital input. The "safety car" incorporates no fewer than 140 devices to prevent collisions and minimise personal injury. Omni-directional radar feeds a holographic 3D picture of the road and a reverse-oriented turbo-jet provides instant braking. The safety car will not reach its final development stage until at least 1984, according to Dr. Henry Crabgirdle, chief of research. Among the principal problems is designing in enough room to seat the driver.

- "Ariadne", in New Scientist, November 1976.

BATTERY HAZARD

Do not smoke when using or examining lead/acid batteries. Hot tobacco ash can ignite the hydrogen/oxygen mixture produced during charging, and cause an explosion capable of shattering the battery case and throwing sulphuric acid several feet.

John S. Wilcox KS4B/NNNØBKS
4733 Bill Knight Road
Millington TN 38053

New Frequencies for the IC-2

MARS members will be happy to know that the no-compromise, synthesized, Icom IC-2 handie-talkie can be modified easily to transceive out of band. And, best of all, the cost of this modification is a total of *zero!*

Tuning this HT is done by setting three miniature thumbwheel switches—one each for MHz, 100 kHz, and 10 kHz. A slide switch beside the thumbwheels adds 5 kHz to the frequency. Although the MHz thumbwheel turns throughout its full 0-9 range, the synthesizer confines the actual frequency to the amateur band, as shown in Table 1.

After inspection of the circuit boards, thumbwheel switches, and schematic, it became apparent that this HT was manufactured for usage throughout the range of 140.000-149.995 MHz. By the placement of jumpers, it can be configured to the different band plans for Europe, England, and the USA.

After making this modification, the IC-2 will tune from 140.000 through 149.995 MHz in 5-kHz steps following the exact thumbwheel setting. All other functions remain the same.

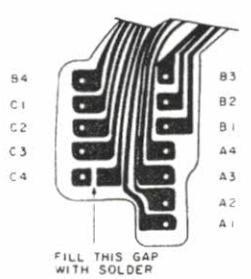


Fig. 1.

Step 1. Remove the battery pack. Remove the four screws that hold the battery retaining plate on the bottom. (Note the position of the plate to assist in reassembly.)

Step 2. Turn the HT face down. Remove the two case retaining screws.

Warning: A paper-thin, flexible, printed circuit board connects between the touchtone™ pad and chassis on the IC-2AT model. Be extremely careful if you remove the front half of the HT case.

Step 3. Remove the back half of the HT case.

Step 4. Using the picture of the HT on page 20 of the Icom manual and Fig. 1, here, find the programmable divider chip, IC1, and the flexible circuit-board tape soldered to it. Run solder across the non-conductive gap in the line designated C4. Use a small, low-wattage iron so as not to damage the flexible circuit board.

MHz Thumbwheel	Actual Frequency
0	144.XXX
1	145
2	146
3	147
4	144
5	145
6	146
7	147
8	144
9	145

Table 1.

Step 5. Remove the two retaining screws on the side of the chassis and hinge open the two circuit boards.

Step 6. Find the brown-colored jumper wire that connects two solder pads together on the underside of the MHz thumbwheel switch. Snip this jumper and tape the ends.

Step 7. Carefully reassemble the HT. Make changes in the Icom manual and on the schematic.

Navy-Marine Corps MARS in Tennessee is currently using a 600-kHz split in the 148-MHz range. If you require a non-standard split, the MARS modification article for the Tempo S1, written by Dorsey "Diz" Price K5EDS in the April, 1980, issue of *73* should be reviewed. A similar modification could be made to the IC-2. I'll let someone else write that one! ■