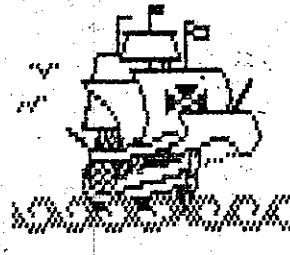


BICENTENNIAL.



THE PROPAGATOR

BICENTENNIAL.



ILLAWARRA AMATEUR RADIO SOC. INC.

MONTHLY NEWSLETTER OF THE ILLAWARRA AMATEUR RADIO SOC. INC.
 VOLUME - 88, NUMBER : 2. MARCH 1988.
 REGISTERED BY AUSTRALIA POST PUBLICATION NUMBER : NBH - 1491.

MEETINGS ARE HELD ON THE SECOND TUESDAY OF EACH MONTH,
 (EXCEPT JANUARY) AT 7.30.PM. AT THE STATE EMERGENCY SERVICES,
 BUILDING, IN MONTAGUE STREET, NORTH WOLLONGONG.

VISITORS ARE MOST WELCOME TO ATTEND THE MEETING'S.

FEBRUARY MONTHLY MEETING

The monthly meeting was attended by thirty two members and business included changes to the Clubs monthly broadcast and Nets. The arrangements for Broadcasts are given in detail elsewhere in this issue.

Keith VK2OB advised the meeting that the Amateur Tech course will run over the school year with students able to sit either or both novice and full call exams at the end of the year according to their progress.

C.W. tapes are available from Keith at the tech but no actual C.W. classes will be run.

The speaker for the evening was Ray VK2XCC/PHD who showed a video tape of the Club Xmas Picnic at Cordeaux Dam. Highlights were Santa doing his thing with the harmonics and

Darth Varda entertaining the children and some dogs.

Ray then showed some video tape of his trip around Australia with some interesting footage of Palm Valley, Ayers Rock and Alice Springs.

The meeting closed with the usual tea and coffee and conversation.

February Extra Committee Meeting :

A well attended meeting discussed plans for future meeting and Club broadcasts. Keith outlined the Amateur course at the Tech for this year and stated there are vacancies for the Wednesday evening practical class and for the Monday four hour theory class. A letter was received from D.O.C. outlining decisions on the devolution of

Amateur Examinations. This in summary stated that the responsibility for examinations will be devolved.

TAFE Colleges, WIA divisions, Amateur Clubs and private individuals have shown interest in providing an examiner service and public forums are to be held in all states in February to discuss examinations devolution and administration procedures.

The D.O.C. will maintain responsibility for examination standards and will continue to administer exams for handicapped candidates as required. D.O.C. will continue to prepare exam - papers until March 1989.

MARCH MEETING

The speaker for the March meeting will be John VK2XGJ and the subject will be packet radio. John intends to have a working display of packet using equipment available for a modest outlay.

I.A.R.S.

FUND RAISING LIST.

LIST NUMBER 4

25 WEEKS COMMENCING ON THE 6th JULY 1987.

NUMBER	NAME ECT.	:	NUMBER	NAME ECT.
1	J. HOFFMAN	:	21	F. BROWN
2	N. BLANEY	:	22	C. VAUGHAN
3	I. NEILL	:	23	
4	T. MOWBRAY	:	24	D. ROUTLEDGE
5		:	25	J. TAYLOR
6	J. SIMON	:	26	M. KEECH
7	J. WOODWARD	:	27	
8	C. LACEY	:	28	
9	M.v.d.VORSTENBOSCH	:	29	J. HAYES
10		:	30	K. CURLE
11		:	31	
12	G. PARSONS	:	32	D. CAPON
13	P. READ	:	33	
14		:	34	M. WOODWARD
15	V. HEE	:	35	R. BALL
16	D. ROUTLEDGE	:	36	P. BALL
17	D. HENDERSON	:	37	J. LAWER
18	R. Mc KNIGHT	:	38	P. HOWCHIN
19	T. BROWN	:	39	
20	V. HEE	:	40	C. PROCTOR

GoLotto! Multi-week PLAYERS COPY

1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	STANDARD GAME	<input checked="" type="checkbox"/>
7	8	9	10	11	12	7	8	9	10	11	12	7	8	9	10	11	12	7	8	9	10	11	12	7	8	9	10	11	12	IMPORTANT	<input type="checkbox"/>
13	14	15	16	17	18	13	14	15	16	17	18	13	14	15	16	17	18	13	14	15	16	17	18	13	14	15	16	17	18	X YOUR	<input type="checkbox"/>
19	20	21	22	23	24	19	20	21	22	23	24	19	20	21	22	23	24	19	20	21	22	23	24	19	20	21	22	23	24	SELECTED	<input type="checkbox"/>
25	26	27	28	29	30	25	26	27	28	29	30	25	26	27	28	29	30	25	26	27	28	29	30	25	26	27	28	29	30	SYSTEM	<input type="checkbox"/>
31	32	33	34	35	36	31	32	33	34	35	36	31	32	33	34	35	36	31	32	33	34	35	36	31	32	33	34	35	36		<input type="checkbox"/>
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37	38	39	40			37	38	39	40			37	38	39	40			37	38	39	40			37	38	39	40				<input type="checkbox"/>

BOTH MON. AND WED. DRAWS CROSS A MON. DRAW ONLY CROSS X

700045 02280 8 07
Agents No. Encoder No. Year/Week

W. A. CHADBURN
45 BELTANA AVE
DAPTO 2517
IARS FRL4

DEVIATION VHF-FM RTTY MODULATION INDEX

MARK SPACE

PART 1--

TONIGHT'S LESSON IS FROM THE FIRST BOOK OF DEVIATION. WE WILL READ THE PARABLE OF THE MARKS AND THE SPACES.

ONE NIGHT AS I MAINTAINED MY SHEPHERD'S PASTORAL WATCH OVER A LOCAL REPEATER CHANNEL FLOCK, MY EAR WAS CAUGHT BY THE TWEEDLE-TWEEDLE SOUND OF THE MARKS AND THE SPACES. I LOOKED TO SEE WHAT BYTES WERE THERE, AND LO! THERE WERE NO BYTES! ONLY SCARS AND UGLY DISTORTIONS UPON THE SCREEN AND UPON THE SCROLLS OF PARCHMENT THAT FROM MY PRINTER FLEW.

I CONSULTED THE ORACLE, LIT TWO LEDS FOR CANDLES, AND THE ORACLE SPAKE UNTO ME SAYING, "CLOD, THERE ARE NO TRUE MARKS AND SPACES UPON THY CHANNEL! THESE ARE UNCLEAR AND MUST BE SCOURGED FROM THY PAGE! SEEK THEM OUT AND DESTROY THEM, FOR THEY ARE FROM ANOTHER WORLD AND MUST BE CLEANSED!"

SO, AS THE ORACLE BAD ME, I WENT FORTH WITH SWORD AND SCREEN AND SOUGHT THE UNCLEAR BITS AND MARKS AND SPACES. AND, LO!! I DID FIND THEM DOWN A MERE 15 KHZ, ISSUING FORTH FROM ANOTHER REPEATER, FULL OF SOUND AND FURY, AND OF GREAT AND FULSOME VOLUME.

SO I DID CAUSE

THESE UNCLEAR MARKS AND SPACES TO APPEAR AS IF BY MAGIC UPON THE SCREEN AND SCROLL OF MY TABERNACLE, WHEREIN I DID EXAMINE THEM. AND TRUE AS SPAKE THE ORACLE, THEY WERE INDEED UNCLEAR AND FULL OF SORES AND THE BLEMISHES THAT ARE CALLED SQUARED WAVES.

AND AFTER INVOKING THE ORACLE ONCE AGAIN, I DID SEE THAT THESE UNCLEAR MARKS AND SPACES WERE FROM THE WESTERN SHORES, FROM THE HOUSE OF A FALSE PROPHET, A FRIEND, NEWLY COME UNTO THESE DIGITAL MODES.

AND I WENT UNTO THIS FRIEND AND SAID, "FRIEND, WHYFOR ARE THY MARKS AND SPACES UNCLEAR, AND OF A FULSOME NOISE, AND A PLAGUE UPON OUR CHANNEL?"

AND MY FRIEND SPAKE UNTO ME SAYING, "FORGIVE ME OH MASTER, I KNOW NOT WHAT I HAVE DONE. I AM NEWLY COME UNTO THIS RTTY MODE AND AM AS A STRANGER IN THE LAND. ANOINT ME WITH THY WISDOM SO THAT I MAY BE CLEANSED AND FIND LOVE ONCE MORE IN THE HEARTS OF MY FELLOW MEN."

SO I SAID UNTO THE NEWCOMER, "NEWCOMER, KNEEL AND LEARN. I WILL TELL THEE OF THE RULE OF CARSON, A GREAT SAGE FROM THE LABORATORIES OF BELL. HEAR! OH NOVICE, HOW IT IS MEET UPON YOU TO LOOK TO THY "MOD INDEX".

FOR THY SIDEBANDS DOTH APPEAR UPON A CHANNEL IN THE EAST, AND THE PEASANTS ARE WROTH WITH THEE!. THOU ART

TRULY A DEVIANT SOUL, GUILTY OF MAKING GREAT NOISES UPON THE AIR, AND THY MARKS AND THY SPACES DO GROW AND INFECT THE ADJACENT CHANNEL, WHICH IS NOT COOL!"

AND THE NEWCOMER KNELT IN SHAME, AND BEGGED FORGIVENESS. HE SAID, "TELL ME OF THIS RULE OF CARSON FROM THE LABORATORIES OF BELL, SO THAT I MAY CLEANSE MY ACT AND GET WITH THE PROGRAM 'ERE THEY CAST ME OUT AS AN UNBELIEVER AND AN INFIDEL!!"

AND I SPAKE UNTO THE NEWCOMER SAYING, "OH YE OF LITTLE SMARTS! GET THEE TO A TEXTBOOK HAVING WITHIN IT THE RULES OF THE INDICES OF MODULATION.

FOR THEREIN LIES THE SECRET WHICH IS IN THE RULE OF CARSON, WHICH SAYS: "A GENERAL RULE FIRST STATED BY J.R. CARSON IN AN UNPUBLISHED MEMORANDUM AT BELL LABS DATED AUGUST 28, 1939 IS THAT THE MINIMUM BANDWIDTH REQUIRED FOR AN ANGLE-MODULATION SIGNAL IS EQUAL TO TWO TIMES (THE SUM OF THE PEAK DEVIATION AND TWICE THE HIGHEST MODULATING FREQUENCY) TO BE TRANSMITTED.

IN THE NOTATION DEFINED AS--
BW EQUALS 2(Delta F PLUS (2F SUB-M))

WHERE BW EQUALS BANDWIDTH, Delta F EQUALS PEAK DEVIATION AND F SUB-M IS THE MODULATING FREQUENCY.

CONTINUED NEXT PAGE

DEVIATION *** CONTINUED***

WRT- THEREFORE, IT IS

IF THY DEVIATION IS 5 KHZ, AND THY MODULATING FREQUENCY IS 2125 HERTZ FOR THY MARKS AND 2295 HERTZ FOR THY SPACES, THE RULE OF CARSON SAYS THAT THY MINIMUM BANDWIDTH SHALL BE:

TWO TIMES THE SUM OF (9.250) WHICH COMES OUT TO 18.5 KHZ--WHICH IS DAMNED WELL GONNA TAKE YOU INTO THE NEXT CHANNEL AND PISS OFF THE TROOPS!!!

"THEREFORE, OH YE OF HALF A WIT, I SAY UNTO THEE, FORESOOTH! DROP THY DEVIATION DOWN TO NO MORE THAN 2 KHZ ON SPACE TONE AND THE BANDWIDTH OCCUPIED BY THY MARKS AND SPACES SHALL BE ABOUT 13.2 KHZ, WHICH WILL STAY WITHIN THE REALM OF THINE OWN CHANNEL AND NOT CAUSE BUBONIC SIDEBANDS TO SPREAD OVER THE LAND!!!"

AND I SPAKE UNTO THE NEWCOMER SAYING, "HEAR OH NEWCOMER!!" GAZE UPON THE FACE OF THY WONDROUS SPECTROUS ANALYZER AND SEE THE TUBE THEREIN, AND JUDGE YE THE MAGNITUDE OF THY

SINS!! SEE WHEREIN AND WHEREFORE THOU CREATETH A FESTERING AND A CANKERING UPON THE CHANNELS OF THY BAND AND UPON THE BAND OF THY BROTHERS!!"

AND INVOKING THE ORACLE ONCE AGAIN, I RAISED MY HAND AND THERE CAME A VISION UPON THE

TUBE OF HIS SPECTROUS ANALYZER WHICH DID APPEAR THUS AS IS SHOWN FOR 40-COLUMN DISPLAYS----

WHEREIN FC IS THE CARRIER FREQUENCY FM IS THE MODULATING FREQUENCY

"LO THE RESULT THEREFROM IS THAT THOU TAKETH UP BUNCHA DUPA MORE SPACE OF OUR HOLY SPECTRUM THAN THOU THINKETH, OH MENTAL MIDGET! THOU HAST THE WIT OF A FENCE POST, THE INTELLECT OF A HOCKEY PUCK!!"

AND THESE THINGS WHICH I COMMAND THEE THIS DAY SHALL BE FOR A SIGN UNTO THEE, FOR THEY ARE WRITTEN DOWN IN THE FUNCTIONS OF BESSEL, FROM WHICH THERE IS NO ESCAPE. YEAH, VERILY, WE ARE ALL SLAVES TO THE RULE OF CARSON AND THE FUNCTIONS OF BESSEL, AND WOE BE UNTO THSE WHO

FLAUNT THEIR MIGHT AND RISK THEIR WRATH.

AND THEREUPON I SPAKE ONCE MORE UNTO THE NEWCOMER SAYING, "AND REMEMBER THIS- THERE IS SIGNIFICANT SIDEBAND ENERGY AS LONG AS THE SIDEBANDS ARE STRONGER THAT 26 DB BELOW THE UNMODULATED CARRIER, SAYETH THE FCC! HARK! THEY ARE THE HOLY ONES, KEEPERS OF THE TICKETS AND GIVERS OF THE LAW. DO NOT ANGER THEM, FOR THEY WILL SMITE THEE AND CAUSE THEE GRIEVOUS WOUNDS.

AND SHOULD THE FEDS IGNORE THEE, THEN THY BRETHREN ON THE CHANNELS WILL SEEK THEE OUT AND CAST THEE INTO THE WILDERNESS FROM WHENCE THEE CAME!!!"

"HEAR, OH NEWCOMER!! CLEANSE THY ACT AND GET THEE TO A DEVIATION METER!! AND BE COOL FOR ALL TIMES."

AND THUS ENDS THE PARABLE OF THE MARKS AND THE SPACES AND THE ETERNAL TRUTHS OF THE RULE OF CARSON. LET THESE WORDS BE UNTO YOU FOR A LESSON.

GIVEN UNDER MY HAND AND SEAL ON THIS THIRTEENTH DAY IN THE MONTH OF DECEMBER IN THE YEAR OF OUR LORD 1983 ON THE ISLAND OF LONG---BY W2JUP, THE PATRIARCH OF FARMINGVILLE.

FROM W2JUP, FARMINGVILLE, NY 4/8/84---0630EST

NEWTEK-

ELECTRONICS

WE STOCK:

ALARMS - ANTENNAS
BOOKS - BOXES
COMPONENTS-COMPUTERS
HARDWARE - KITS - TOOLS
WIRE AND A LARGE RANGE
OF SEMICONDUCTORS FOR
THE PROFESSIONAL AND
HOBBYIST : 116 CORRIMAL
STREET. WOLLONGONG.
(JUST FROM HARP-HOTEL)
PHONE : 27 1620.

*** An efficient bussinessman who found a machine that would do half work..... Bought two! ***

CHANGES TO VOICE BROADCAST

At the last general meeting a discussion was held regarding the Monthly broadcast and the weekly nets. This came about because the VK2 division of the W.I.A. is now putting on a technical segment at 7.15 pm. on Sunday evenings. This conflicts with our Club voice broadcast.

After some discussion of pro and cons, it was decided to continue with the R.T.T.Y. Broadcast at 7:00 pm. on the frequencies 147.275. Mhz (VK2RIL) and on 3.562.Mhz with callbacks taken on the same frequencies immediately afterwards.

The voice broadcast will be held straight after the W.I.A. Broadcast on 146.850.Mhz (VK2RAW) and 3.562.Mhz +/- QRM. It is envisaged that this voice broadcast would commence about 8.30 pm. after the WIA B/C with the callbacks taken after-wards.

The commencing time of the weekly net has been moved from 8:00 pm. to 8:30 pm. to avoid the conflict with the W.I.A. broadcast. The frequency of this net is of course 3.562.Mhz +/- QRM. Any licenced amateur is welcome to participate in the weekly net.

We would love to see you on Sunday nights.

73 TONY AX2ENX
Broadcast Officer.

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MON-FRI : 7.30 PM. - 9.30 PM.

SAT-SUN: 9.30 AM. - 9.00 PM.

PROGRESS WITH CLUB STATION

The Club now has an FT.7. HF. and some RTTY equipment. The committee hope to have our room usable by the

March meeting and the club needs donations or reasonable offers of parts for an antenna tuner, S.W.R. meter and a RTTY modem and 2 metre equipment. We also need antennas for HF. and VHF....

SOLAR POWER

For more than a decade, we've been hearing that the Earth's energy resources are limited and running out fast. Solar power has been the promised saviour.

It would appear that solar energy is the ideal solution—it's free, safe, available just about everywhere in the world, inexhaustible and it produces no pollution. So what's the catch?

First, solar energy is not available at night or in thickly clouded days. This means we need to develop an efficient electrical storage battery. Problem almost solved.

Second, solar energy is relatively diffuse—even in the sunniest regions less than a kilowatt of energy is produced from one square metre. Therefore, absorbing a decent amount of it requires a large area of solar cell collectors.

Finally, the original solar cells were incredibly expensive and therefore not economically feasible. Fifteen years ago, the cost of cells needed to generate a kilowatt of electricity was about a million dollars—certainly prohibitive. However, the cost is coming down.

Today, Japanese firms are turning out a cheaper substitute for the expensive crystal silicon cells.

The new amorphous silicon cells are being produced by the roll,

the material deposited as a thin film on plastic or glass.

This state-of-the-art technology is turning up on watches and pocket calculators, and will soon infiltrate many other of our electrical appliances.

The cost of solar energy is now less than \$2000 a Kilowatt, compared to around \$1000 a Kilowatt to build an electrical generating station fired by coal, oil or nuclear energy—and those costs are increasing every day.

On the other hand, the new silicon cells are getting cheaper—and the fuel is free. So the day when your office and home are powered exclusively by the sun may be closer than you think...

-Reprinted From NTT supplies, 1987.

F.R.L.4

F.R.L.4 has commenced and still has ten (10) spare numbers. This fundraiser only works well when fully subscribed and F.R.L.3. nearly repaid the contributions in full so be in it and help the Club and maybe make your fortune.

INTERESTING QUESTIONS ?

Subject: Interest Questions #3

Here is an easy one. You are given the task of taking a piece of string (a very long piece) and placing it around the earth on the equator. You work out how long it needs to be, cut it to length and join the ends then place it around the earth on the equator (how you manage to get around the earth is your problem, not mine). After you finish, you find that you miscalculated the length and your piece of string is 3 feet too long. You are then told that you're not to shorten the string, but to build up the earth under it until the string is a neat fit.

How high does the string need to be raised to make a neat fit?

For this problem, we will ignore the fact that the earth has mountains, valleys and seas and assume it to be a perfect solid sphere. Any takers? Please send answers to AX4XBB.

de Herb, SysOp @AX4XBB
taken from the
Packet BBS. 25.1.88

—FOR—
COURTESY TO
AMATEURS AND
A
VALUE
IN
OUR AREA
NOT USUALLY
SEEN ELSEWHERE
WE RECOMMEND!!!
CAVIONS

11. MOLLOY STREET, BULLI.
PHONE: 042-84-6838

TO ALL OUR CLUB
MEMBERS.

WHICHEVER WAY YOU LOOK AT IT
YOU CANT GO PAST

MARIONA GARAGE

FOR SERVICE CALL IN AND SEE
PETER CHIECO

For Your :-

- * Electronic tune up * Wheel balancing
- * Front end alignment * Brakes
- * And also Rego Checks.

146 PRINCES HIGHWAY. CORRIMAL

PHONE: 84 5650

FEB COMMITTEE

MEET

Discussion covered a wide range of topics including plans for coming meetings, "a" working bee at Clubs room on Saturday 20/2/88.. Advice was received of renewal of the licence for Clubs repeater.

*** A nickel goes a long way now.... You can carry it around for days without finding a thing it will buy. ***

*** Bussiness is:-

The art of extracting money from another man's pocket without resorting to violence. ***

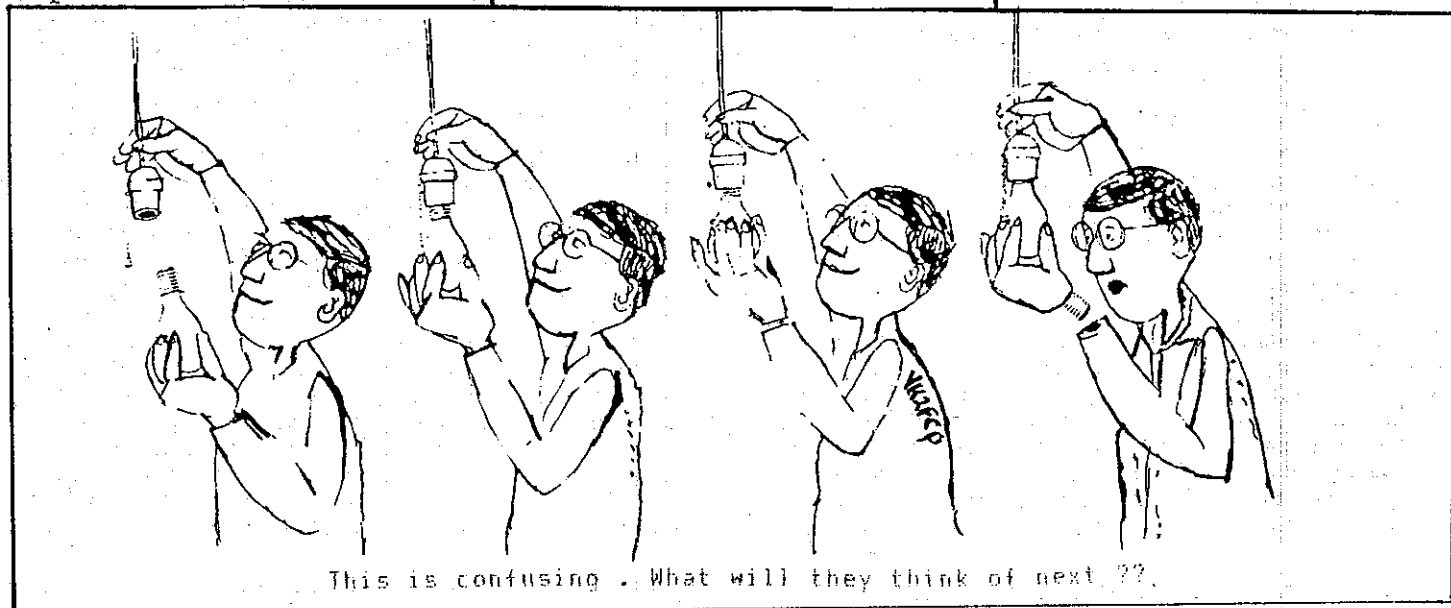
OZ DESIGNED PACKET

A new low cost, high performance Australian designed and manufactured packet radio TNC has now reached production prototype status. This TNC features software compatibility with the TNC-220. Australian written and supported software will be available some time during early 1988, the TNC will be produced in kit form by the Melbourne Packet Radio Group.

All proceeds from the TNC sales will be used to expand, improve and maintain the packet radio repeater network.

The TNC-220 plus, is designed to make use of improved high speed modems that will become available over the next few years. One feature included in the design is an expansion bus that will make it suitable for low cost multi-portrepeater controllers. For futher information contact MPRG via VK3AVE.

taken from W-A-R-C.



Computer frequency counter interface unit

Roger Graham VK2AIV

Here is a simple to build, low-cost little plug-in board which allows you to use your computer as an audio frequency counter. This article shows how to use it with your Apple II, other computers to follow.

THIS EASY do-it-yourself project enables your computer to read audio frequencies from dc up to approx 14 kHz. The readout (digital, of course!) appears in large-sized text on-screen, easily visible from a distance. Originally made up as a teaching aid for use with science classes studying sound, the project and program could be of interest to others who have a computer but no frequency meter.

Hardware requirements

The little printed circuit board for this unit is about as big as two postage stamps . . . just 60 x 25 millimetres. It carries a two-dollar op-amp, four diodes, three resistors and three capacitors. The whole board is glued upright on the back of a 16-pin DIL plug ready to insert in the Apple games socket. For use with other computers, it may simply be wired to an appropriate connector. A metre of shielded wire terminating in two small alligator clips enables you to take audio frequency readings direct from the voice coil terminals of a speaker or other source.

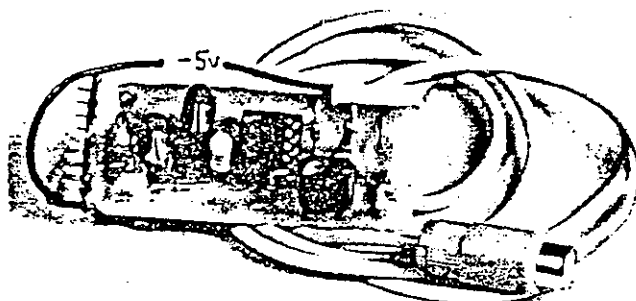
The circuit is basically a "squarer-upper", to convert sine wave audio signals into neat square wave pulses which the computer can count. Audio waveforms with an amplitude of up to a volt or two are applied to one input of the op-amp via the 100nF capacitor. Two silicon diodes, D1 and D2, limit the maximum voltage swing at this input, to prevent damage to the op-amp if an excessively large signal is applied.

The printed circuit board is very simple. You may choose to make your own from the design reproduced here, or purchase a readymade board. Some electronics retailers may present the project as a kit. (See 'Retail Roundup' this issue).

The first thing you should do before assembly is to examine the tracks on your pc board. See that all holes are drilled and the correct diameter. Check there are no tiny 'bridges' between the IC pads. If all's well, the components may now be assembled on the board.

Even with a board as simple as this, it's possible to make mistakes in assembly. There is no special order but watch the orientation of the four diodes and be sure that the op-amp is not inserted back to front. Three short pieces of tinned copper wire connect the board to pins 1, 2 and 8 of the 16-pin DIL plug. Later, when you are sure everything is in order, these three wires will also hold things together mechanically while a fillet of Araldite glue is added.

Note that some kinds of DIL plug are moulded from thermo-



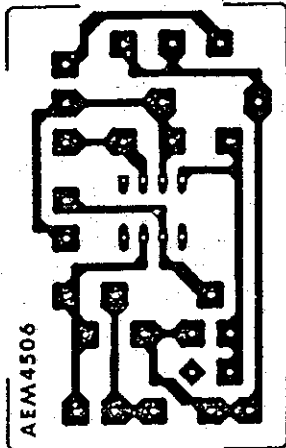
The completed prototype, with cables. As you can see, it's quite a simple project.

softening plastic, so the pins may droop out of line when heated during soldering. To avoid this disaster, insert the plug into a spare 16-pin socket before soldering. This keeps the pins in line. When soldering, use a fine-pointed bit to melt a tiny dab of fresh solder directly onto the head of the pin, and keep the iron there just long enough to make the solder flow onto the metal. Now tin the end of the wire, again keeping the iron in contact just long enough to make the solder flow. The idea is to make the beginnings of a good joint, while still leaving some active un-burned flux on the surfaces. Now rest the tinned wire against the top of the pin and dab it quickly with the hot, clean bit. Use just enough heat to flow the solder cleanly together, without prolonged dabbling about.

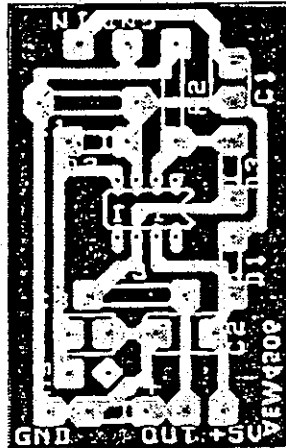
The long length of shielded wire for the input needs to be anchored securely where it joins the board. That's what the larger hole at the top of the board is for . . . just pass the end of the shielded wire through the hole from the non-copper side, before soldering down. The idea is for the outer plastic coat of the wire to be wedged securely in the hole, rather than tugging on the solder pads every time the wire is wiggled.

The -5 volt supply for the board enters via a flying lead with a small push-on connector on the end, to fit one of the four square pins of the auxiliary video connector. I used a springy brass contact removed from an old 7-pin miniature valve socket, and sleeved it securely with a generous length of spaggetti. Be careful here, so that the flying lead is not able to make accidental contact with the +12 volt pin adjacent to the -5 volt pin on the mother board. Diagram 3 shows how the unit should look when all complete. ►

CONTINUED



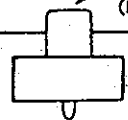
Full-size pc board artwork.



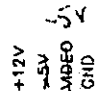
Component overlay

LOCATION OF -5V SUPPLY PIN

USUAL VIDEO CONNECTOR (RCA SOCKET)



REAR RH CORNER OF MOTHER BOARD



AUXILIARY VIDEO CONNECTOR (4 SQUARE PINS)

PLUG -5V FLYING LEAD ONTO THIS PIN

AEM4506 PARTS LIST

Semiconductors

D1-D4 1N914
IC1 CA3140

Resistors

R1, R2 22k
R3 470R

Capacitors

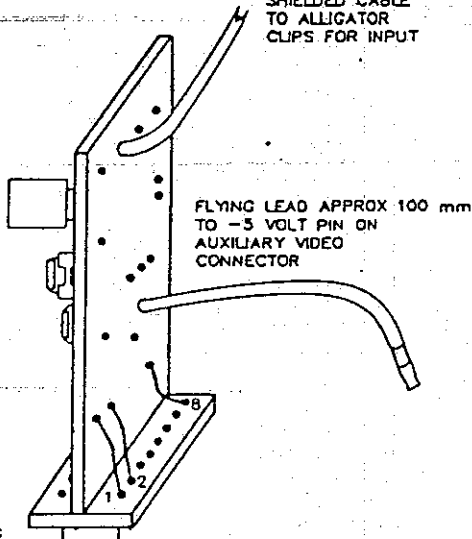
C1-C3 100n greencap

Miscellaneous

AEM4506 pc board; 16-pin DIL header; hookup wire.

Estimated cost: \$10-\$12

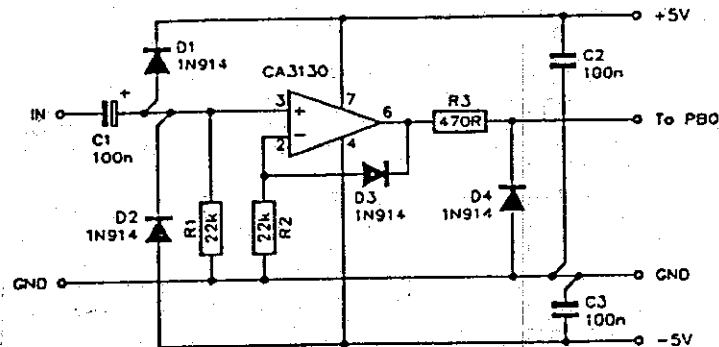
ONE METRE OR MORE SHIELDED CABLE TO ALLIGATOR CLIPS FOR INPUT



GLUE PC BOARD UPRIGHT ON BACK OF 16-PIN DIL PLUG

LEVEL

We expect that hobbyists who are **BEGINNERS** in electronics construction should be able to successfully complete this project.



CIRCUIT OPERATION

The op-amp is connected as a Schmitt trigger. That is, its output flips cleanly from full-on to full-off as the input signal worms its wiggly way from a positive amplitude towards negative. The input signal passes to the op-amp's input via C1. Diodes D1 and D2 'clamp' the peak amplitude to under 1 V. the output from the op-amp is a TTL-compatible square wave (i.e. it swings between approx +5 V and zero). This square wave is fed into the computer input port via the 'PB0' line. From this point, the computer takes over, counting how many pulses arrive via PB0 every second.

CONTINUED NEXT PAGE



★ "PROBLEMS, sir. The computer's broken down and we've no-one experienced in thinking."

High School Radio Clubs?

Please Distribute Widely, Thank You. Hello out there from Ramapo High School in Franklin Lakes, N.J. (Bergen County) We have a HS radio club here and are looking for other High Schools that have Packet capabilities or just HS students in general who would like to talk with us. We currently have 11 licensed amateurs in the school and another 19 working on their licenses. Contact us through our advisor, Don, NW2S at this BBS. 73 de KB2CJI

The software

The Apple can read the status of PBO (high or low) at address SC061. A machine-code program keeps reading this address, looping back to read again and again until the value goes low, then looping until it goes high again. This marks the completion of one cycle of the input wave. The computer tallies up how many times this happens in one second, storing the answer at locations \$08-09 (in hexadecimal of course, low byte first). At the end of each second, the computer reads the stored value from \$08-09, converts it to decimal, and displays the result on screen. The result is left on view while the program goes round again, to count pulses for a further second. Then the previous value is erased and a new value displayed. i.e: the screen is updated after each new one-second count.

While all this pulse-counting is going on, the computer still has to keep track of the passage of real time. How is it to know when the necessary one-second interval has elapsed? To do this, it keeps count of how many times the program has looped back to check the status of location SC061. Each loop takes just 36 machine cycles (the program has been padded with NOPs where necessary so that every such loop is the same length, whether it involves incrementing one byte or two bytes or none at all).

Now each machine cycle takes just under one microsecond (0.978 μ s according to my textbooks). So a 36-cycle loop takes approx 35 microseconds, and a quick division (1 000 000/35 = 28 500 approx) gives the number of loops which must take place to measure out one second of time.

A "time counter" in the program is set to an initial value of \$9020 (which is approx 28 500 counts short of \$FFFF) then incremented once for every 36-cycle loop. After 28 500 such loops the counter overflows to \$0000, and it is this even which signals the end of a one-second timing interval. It follows that, once you have the frequency counter built and running, you can fine-tune it by comparison with another instrument (say a digital frequency meter) simply by altering the two bytes which set the initial value into the "time counter" in the program.

Installation in your Apple

Switch off the computer before attempting to plug the unit in. Remove the top cover and identify the Game Connector socket towards the rear right-hand corner (board location J 14). Note that pin 1 of this socket is at the end nearest to the keyboard. Plug the AEM4506 board into this socket. If you have it pointing the right way, the component side of the board will be towards the power supply of the Apple, i.e: on your left as you sit at the keyboard.

The flying lead for the -5 volt supply is plugged over one of the four protruding pins of the Auxiliary Video connector, which is at the back right-hand corner of the mother board (location K 14). The diagram here shows the four pins of this connector. Be sure you locate the correct pin.

Now you can switch the power on again.

Entering the program

We'll assume you have a disk drive connected to your Apple. Boot any suitable disk with a copy of the Disk Operating System so you can save your programs to disk when entered. The NEW to clear out any Applesoft BASIC program from the memory. Now type in the short BASIC program and save it to disk under the name FREQUENCY METER. (i.e: type SAVE FREQUENCY METER). There's no point in running it yet, until the machine code program is entered.

Now leave Applesoft and get the Monitor (type CALL-151 then Return). The prompt symbol should now be an asterisk *. Enter the starting address of the program, 6000, followed

by a colon sign (:) which is the memory-alteration command. Now type in the machine-code program one byte at a time, entering a space between each byte and the next. The monitor will allow you to enter approximately 80 bytes at a time before you hit Return; less if you wish, of course.

There are over 1500 bytes to be entered, so be patient and check as you go. Be sure to SAVE the program to disk before you attempt to RUN anything (if you've made a mistake, the program may crash and destroy all your data... no harm done, but you'll have to enter it all again!).

Assuming you have all the program entered in the memory, and no mistakes found, then SAVE it under the title FREQUENCY METER MACHINE CODE (i.e: type BSAVE FREQUENCY METER MACHINE CODE, AS6000,LS1C3). Note that if you attempt to list the machine-code program (6000L, then return) the listing will make sense only as far as address \$6161. Beyond this point there are 25 bytes of data for letters and numerals on screen, then a hi-res shape table of 24 shapes for the same letters and numerals for the next several hundred bytes.

Now at last the frequency meter is ready to go. From the disk, RUN FREQUENCY METER and you should receive what the program is about. Press any key to continue... the disk drive should start up again, and load in the machine code program. On screen should appear in large letters:

```
FREQUENCY  METER
          0      Hz
```

If the zero digit flashes on and off every one second, you probably have the program entered without error. Connect the alligator clips to the voice coil of a loudspeaker, and feed in some kind of audio signal, and you should be rewarded with a digital readout on screen.

Calibration

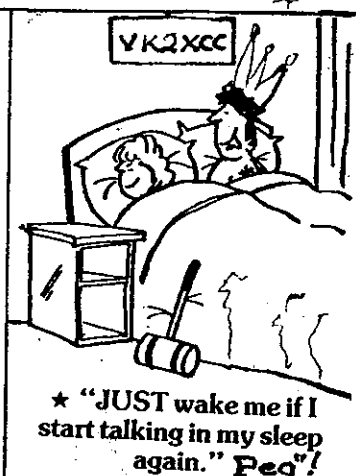
Calibration should not be necessary at all if your Apple clock frequency is the same as mine. But just in case you would like to adjust things, this is what to do:

Enter the Monitor and examine the contents of memory locations \$6085 and \$6089. At present these should read 20 and 90 respectively, being the two bytes loaded into the time-counter to initialise it to \$9020 as each new one-second count commences.

This counter is incremented after each loop in the program, and the "second" time interval is concluded on the next loop after the counter reaches \$FFFF. By adjusting the initial value in the counter, you can fine-tune the timing interval to your own satisfaction. A digital frequency meter of some kind is necessary, of course, so you can check the actual frequency being measured.

The prototype frequency meter program gave results accurate within 1% from dc up to about 14 kHz (the so-far unexplained error being a tendency to read up to 1% high towards the higher frequencies).

A PREHISTORIC mystery has scientists scratching their heads. Fossil collector William Meister, fossicking around Antelope Spring, in Utah, split open a rock and found in a footprint some crushed trilobites, small creatures who lived 280 million years ago. Only trouble is that man wasn't around them (humans only emerged about two million years ago). What's more, the fossils are embedded in the impression of a sandal!



CONTINUED IN NEXT
MONTHS PROPAGATOR

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HABGRAVE, DRV. THIRROUL

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VK2KWN WAYNE NEWPORT

BOO BOO

ON

THE NET

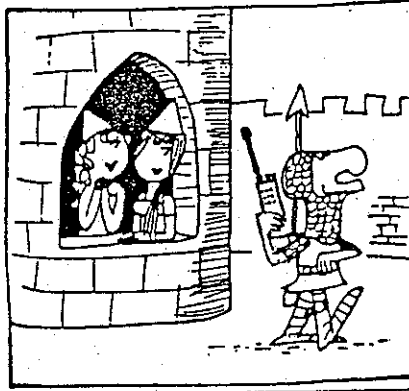
On Sunday night
14/2/88 an operator who
shall remain nameless
came up on the Club net
with the worst signal
he's ever had. After
some comments on this
lousy signal one
operator said "get off
the dummy load, and put
it on the antenna".

When our friend
came back the signal had
jumped to 20 db over
nine and a sheepish
voice owned up to
transmitting on the ATU
without an antenna, this
was due to pulling all
the plugs because of a
thunderstorm in his area
, but apparently this is
a good cure for

<< T.V.I. >>....

ON THE NET:

Sunday the 14th Feb
1988.
VK2MT-ROB, Co-ordinator.
VK2BIT-PETER, VK2DVB-
ANDY, AX2DFL-DAVE,
VK2PHD-RAY, VK3CMH-
MARTEN, VK2DWR-DAVE



VK2KWN

THE ILLAWARRA AMATEUR RADIO SOCIETY. INC.

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

MEETINGS: Are held every 2nd Tuesday of the Month except January, at 7.30.p.m. in the S.E.S. Headquarters, Montague street, North Wollongong.

REPEATERS:

VK2RAW - 146.850. - (VOICE)	VHF Mt Murray.
VK2RAW - 147.575. - (PACKET)	VHF Mt Murray.
VK2RIL - 147.275. - (VOICE & R.T.T.Y)	VHF Sublime Point.
VK2RUW - 438.225. - (VOICE)	UHF Hill 60 Port Kembla.
VK2RIL - 438.725. - (VOICE & R.T.T.Y)	UHF Sublime Point.

BROADCAST: On Sunday evening prior to the club meeting, at 7.00.p.m. R.T.T.Y. Mode Transmitted on 147.275.VHF, and relay on 3.562.Mhz. +/- QRM. Callbacks taken immediately afterwards. The voice broadcast will be held straight after the WIA Broadcast on 146.850.Mhz < VK2RAW > and 3.562.Mhz +/- QRM.

W.I.A. RELAY: On 146.850. at 10.45.am. and at 7.15.p.m. each Sunday.

CLUB - NETS: On 3.562.Mhz. SSB +/- QRM on Sunday at 8.30.p.m.

NEWSLETTER: "THE PROPAGATOR", published Monthly to reach FINANCIAL-MEMBERS in the week preceeding the club meeting. All articles, adds etc, to the editor must be in, or try, by the 3rd Tuesday each month.

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

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

STORE: The club store operates at each club meeting. by COMMITTEE-MEMBERS.

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SUNDAY - EVENING - CLUB-NET - ROSTER: STARTING AT 8.30.p.m.

8.30.p.m. FIRST SUNDAY OF THE MONTH : VK2MT - ROB McKNIGHT.

2 nd SUNDAY OF THE MONTH : VK2ENX - TONY MOWBRAY.

3 rd SUNDAY OF THE MONTH : VK2PZY - DAVE CAPON.

4 th SUNDAY OF THE MONTH : VK2PHD - RAY BALL.

5 th SUNDAY OF THE MONTH : VK2EBI - KEVIN MURPHY.

And on stand-by : VK2DUP - GRAEME PARSONS.