ELECTRONICS Australia

HiFi, Radio & Computers

APRIL 1980

AUST $1.50* NZ $1.60

AUSTRALIA'S NEW TELETEXT SERVICE!

ALSO IN THIS ISSUE:

- All-wave radio receiver
- LCD clock/control timer
- Adj. voltage regulator
- Audio prescaler for DFMs
- Hifi Review: Nakamichi 680 cassette deck
- DREAM 6800 programs

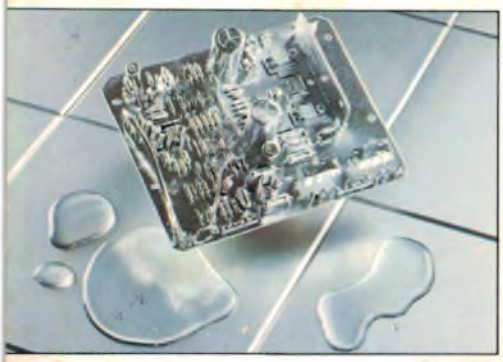
PLUS ALL OUR USUAL FEATURES

FREE INSIDE: NEW DECADE DICK SMITH CATALOGUE!

Sansui

Only hi-fi, everything hi-fi.

Saturation impossible.



Sansui's AU-X1 is the DC amplifier in which current saturation is impossible. So TIM and envelope distortion are virtually nil. And accurate reproduction of musical signals reaches new levels.

THD and TIM

You're probably aware that THD specs only indicate an amplifier's response to simple steady state signals. But dynamic musical signals may generate music-smearing TIM.

TIM, transient intermodulation distortion, can be caused by pulsive musical signals which make ordinary amplifiers cry out in distress. And that means distressful music.

Sansui's powerful solution: the DD/DC circuit

The beauty of Sansui's exclusive DD/DC (Diamond Differential DC) circuit is it allows sufficient NFB for an ultra-low THD and — at the same time — stamps out TIM. The secret of DD/DC (PAT. PEND.)is driving power so powerful that current saturation is impossible. Slew rate: ±260V/μSec: Rise/fall time: 0.5μSec. THD: under 0.007% at full rated 160 RMS watts × 2 output. You hear unprecedented clarity and precision of detail.

Now look closely at the photo. What you thought were bass and treble controls, aren't. They are simply level controls. We admit the AU-X1 integrated amplifier is relatively austere. Because purity in reproducing the most demanding musical signals requires discipline.

SANSUI
AU-X1

SANSUI ELECTRIC CO., LTD.
14-1 Izumi 2-chome, Suginami-ku, Tokyo 168, Japan
VANFI (AUST.) PTY. LTD.
162, Albert Road, South Melbourne, Victoria 3205, Austraria Tel: 699-5473
283 Alfred Street, North Sydney, N.S.W. 2060, Australia Tel: 929-0293

ELECTRONICS Australia

Volume 42 No. 1 April, 1980

Australia's largest selling electronics magazine

Shortwave receiver to build

Discover the joys of shortwave listening with this easy-to-build shortwave receiver. It covers from 500kHz to 30MHz and can be built for less than $50. Full details on p40.

Control timer

Based on an LCD clock module, this control timer can be set to switch on a mains-powered appliance at a predetermined time for a period of 16, 32, 64 or 128 minutes. Details on p48.

COMING NEXT MONTH! — Find out what's coming by turning to p68.

On the cover

Recently launched in Australia, teletext allows the user to display the latest news in print on a modified colour TV set — simply by pushing a few buttons. These three off-screen photographs are from ATN-7's "7-Text" service (see p10). (Photos courtesy ATN-7, Sydney).

FEATURES

HIFI TOPICS AND REVIEWS

PROJECTS AND CIRCUITS

MICROCOMPUTERS

AMATEUR RADIO, CB SCENE, DX

COLUMNS

DEPARTMENTS

Facts from Fluke on low-cost DMM's

Our new 4½-digit bench/portable: You've never seen anything like it.

Take a close look at the face of this instrument. Notice anything new? If you just realized you've never seen *words* on a low-cost DMM display before, you're on the right track.

This is the new 8050A from Fluke, the *lowest* priced 4½-digit multimeter available that uses microprocessor technology.

The legends on the LCD are clues to what makes the 8050A unique.

dB: You're right. The 8050A delivers direct readouts in dBm, referenced to any of 16 impedances. Use the "REF Z" button to scroll through the memory and locate the zero dBm reference you need then set it and forget it. No more tedious calculations or conversions.

REL: For relative references in the dB mode or offset measurements in all other functions. Lets you store any input as a zero value against which all others are automatically displayed as the difference. Another timesaving convenience.

HV: Just a reminder when your input is over 40V, so you won't forget about safety while in the dB or relative modes.

Of course there's much more to the 8050A. True RMS measurements to 50 kHz. Conductance for measuring resistance to 100,000 Megohms and leakage in capacitors, pcb's, cables and insulators. Diode test, 0.03% basic dc accuracy and full input protection. Plus a large family of accessories.

FLUKE®

Ad No. 2504-8050

☐ *Please send data on Fluke DMMs.*
☐ *Please have a representative call me.*

Name .....
Position .....
Company .....
Address .....
..... Postcode .....
Phone .....

ELMEASCO
Instruments Pty. Ltd.
PO BOX 30, CONCORD, NSW 2137
13-15 McDonald Street, Mortlake. 2137
Tel: (02) 736 2888 Telex: AA25887
PO BOX 107, MT. WAVERLEY, VIC. 3149
21-23 Anthony Drive, Mt. Waverley. 3149
Tel: (03) 233 4044 Telex: AA36206
Adelaide 51 3521 Brisbane 229 3161 Perth 398 3362

Editorial Viewpoint

A phoney deal?

During the past month, I happened to become involved in an ABC "Nationwide" TV segment to do with non-approved telephone devices. I hadn't thought a great deal about the matter previously, but it turned out to be a story of administrative confusion, reminiscent of the CB fiasco of a few years back.

The position is that entrepreneurs can quite legally import and sell telephone handsets and other such devices to the public, even though they have not been approved by Telecom for connection to the Australian telephone system. They can be promoted and advertised freely, provided a suitable caution is included in the small print. It is then up to the purchaser what he does with them!

Those involved in marketing the equipment insist that they are not doing anything illegal; that the equipment works and that doubting customers can try before they buy. The problem, they say, is with Telecom, who are unimaginative and unco-operative, anxious only to preserve their own monopoly; if people want specially styled handsets and other gadgets, they should be able to buy them at the best possible price, and use them without formalities and without a Telecom installation fee.

Telecom, on the other hand, point out that their system, like any other, assumes certain operating parameters and that these can be upset by the random connection of non-compatible devices. Unauthorised data links can present a possible voltage hazard and perhaps tie up exchange lines to the inconvenience of other customers. And, of course, "wireless" handsets, some of them radiating in the TV spectrum, can present a very real RF interference hazard.

Telecom say that, if the phone system starts to act up, it is they who get the blame — not your friendly retailer with a shop full of eye-catching telephone toys.

In a debating situation, it is possible to find support for both points of view but, while the wrangle goes on, the public is left in the invidious position of not being permitted to use what it can legally buy. Meanwhile, the contentious equipment continues to proliferate.

If it can be shown that Telecom is being monopolistic for its own sake, then corrective measures should be taken, to ease community resentment.

But if, on the other hand, the telephone system does need positive protection against technical abuse, then surely the Government's obligation is likewise clear: unproven equipment should not be admitted or offered to the public until prototypes have been tested and approved. But, once passed, non-prohibitive provision should be made for its ultimate connection to the system.

— Neville Williams

Registered for posting as a publication — Category B.
Printed by Magazine Printers Pty Ltd. of Regent Street, Sydney and Masterprint Pty Ltd of Dubbo, NSW, for Sungravure Pty Ltd. of Regent St, Sydney.

Editorial Office
57 Regent St. Sydney 2008.
Phone (02) 699 3622 Telex 25027
Postal Address: PO Box 163, Beaconsfield 2014.

Advertising Offices
Sydney — 57 Regent St. Sydney 2008.
Phone (02) 699 3622 Telex 25027
Representative: Narciso Pimentel.

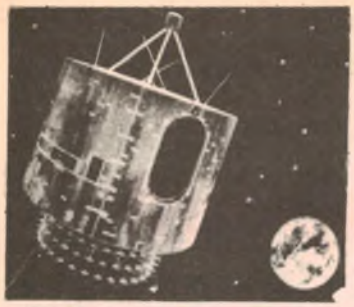
Melbourne — 392 Little Collins St. Melbourne 3000. Phone (03) 602 3033
Representative: Janice Wallace

Adelaide — Charles F. Brown & Associates Ltd. 254 Melbourne St, North Adelaide 5006
Representative: Sandy Shaw, (08) 267 4433.
Perth — 454 Murray Street, Perth 6000
Representative: Ashley Croft. (09) 21 8217.

Subscriptions
Subscription Dept, John Fairfax & Sons Ltd, GPO Box 506, Sydney 2001.
Enquiries: Phone (02) 20944, ext 2589.

Circulation Office
21 Morley Ave, Rosebery, Sydney 2018
Phone (02) 663 3911.

Distribution
Distributed in NSW by Sungravure Pty Ltd. 57 Regent St, Sydney; in Victoria by Sungravure Pty Ltd. 392 Little Collins Street, Melbourne; in South Australia by Sungravure Pty Ltd. 101-105 Weymouth St, Adelaide; in Western Australia by Sungravure Pty Ltd. 454 Murray Street, Perth; in Queensland by Gordon and Gotch (A'asia) Ltd; in Tasmania by Ingle Distributors, 93 Macquarie St, Hobart; in New Zealand by Gordon and Gotch (NZ) Ltd, Adelaide Rd, Wellington.



News Highlights

RCA going to market with video disc player

After nearly 15 years of development, RCA says that it will distribute its capacitance video disc system right across America in the first quarter of 1981. The first players will sell for less than $500 each and discs of motion pictures will be $15 to $20 each.

RCA President Edgar Griffiths said that RCA hoped to have 200,000 players in production in 1981 and forecast that video disc players would reach 30-50% penetration in colour TV home in 10 years, with disc sales of 200 to 250 million in the tenth year. Griffith revealed that the disc system "represents the largest single investment in a consumer product in RCA's history!"

The first models will not be equipped for stereophonic sound, a source of disappointment for many hifi dealers. RCA says that while later models would play in stereo, the first units were designed for use with the 140 million TV sets in American homes. Future models will also feature slow-motion, frame-freeze, reverse and other special effects.

Philips to market teletext colour TV receivers

The Philips company has announced plans to market teletext colour TV receivers in Australia. Initial deliveries to retailers are expected in early May.

During the past three years, some 200 teletext receivers have been produced at Philips' Clayton factory and supplied to the Australian television industry for teletext trials. The Clayton factory will now move into production for the domestic market, with initial production confined to the 62cm and 53cm models.

Philips says that it does not contemplate manufacturing an add-on decoder unit at this stage.

The Chairman and Managing Director of Philips Industries Holdings Limited, Mr H. D. Huyer, said that a teletext receiver would cost about $300 more than a standard colour TV receiver of equivalent screen size. The price difference would probably decrease if demand for teletext receivers was such that the company could move into full volume production.

Technology transfer to the USSR

Technology transfer to the Soviet Union is outside US control, according to a recent report to the US Congress. The report concludes that America's allies, such as Japan, West Germany, France and Great Britain, do not worry about political considerations when selling technology to Eastern Bloc countries, seeing it primarily as an economic exercise.

The report concludes there is little the US can do to prevent the Soviets from acquiring all the Western civilian technology it needs for military research and development.

Flat panel display screen

Recently announced by Canadian company Optotek is a miniaturized light emitting diode which can be fabricated into a multi-diode flat panel for use as an alternative to the CRT.

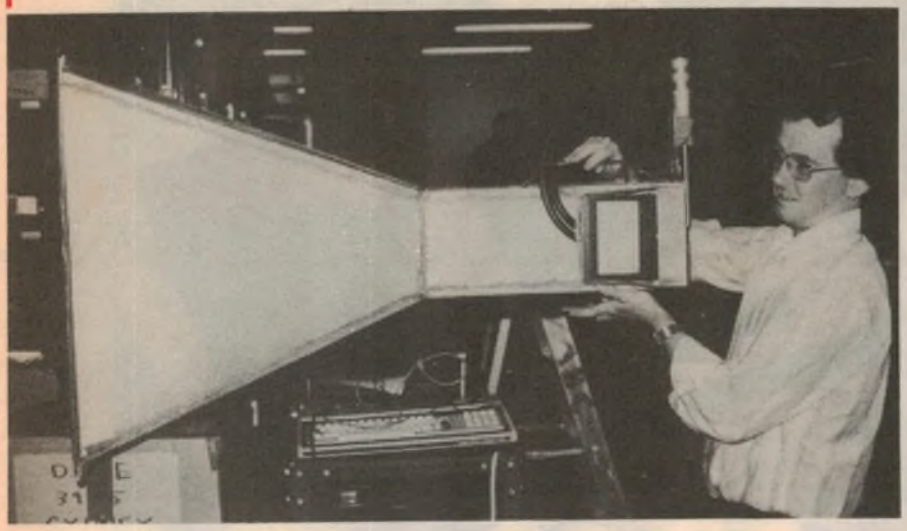
One device, produced as a joint venture between the US Air Force and the Canadian Department of Industry, is a 10 x 7.5cm screen containing some 49,000 diodes, each of which has a diameter of just 0.2mm. The device is under evaluation by the USAF and is intended as a replacement for the mixture of dials and CRT displays currently used in aircraft cockpits.

Plessey to install rail communications system

A new UHF communications system, designed to cope with the increasing volume of telephone traffic along the rail link between Broadmeadow and Werris Creek in the north-west of NSW, is to be supplied and installed by Plessey Australia Pty Ltd.

The new communications link will be the second such microwave link installed by Plessey for the NSW Public Transport Commission. Plessey says that the 5-hop system of stations and repeaters will cost around $1 million and will provide for 60 telephone channels.

The ultimate police radar detector?



APRIL 1st, 1980 — The R & D Department at Dick Smith Electronics has come up with what is claimed to be the ultimate police radar detector. The unit (pictured) mounts on the car roof and is so sensitive that it is capable of detecting faint X-band emissions from the Crab Nebula (perhaps they have speed traps over there also).
The unit was developed primarily to test the range of detectors sold at Dick Smith Electronics. Staff, however, borrow the unit at weekends so that they can drive recklessly, with complete contempt for police radar traps.
Unfortunately, only the larger V8 vehicles are capable of breaking the speed limit while carrying the new detector. Smaller cars find that the wind resistance limits their top speed to about 50km/h.

High-definition solid state imaging device

Researchers have been trying to develop a solid-state imaging device that will meet the definition requirements of television for many years now. That goal has been brought a step closer with the announcement from GEC's Hirst Research Centre (England) of the largest charge-coupled device so far produced in the UK and possibly in Europe.

The device measures 140 x 100mm and consists of a matrix of 576 lines (the operational number of lines in a 625 line picture), each with 385 elements. It is thus compatible with 625 line systems and, at 220,000 pixels, gives a definition of about 67 percent of a normal TV image.

Advantages offered by such devices include compact size, elemination of the glass envelope, and relatively low operating voltages. The GEC device runs off 15V at the moment, but this is expected to drop to 5V with further development.

Initial application of the device is expected to be in small, lightweight, rugged cameras for use in hazardous or difficult environments. Colour cameras could be produced by using three of the devices with suitable optical filtering.

CSIRO establishes energy data base

The CSIRO has announced the establishment of a new data base called the Australian Renewable Energy Resources Index (ARERI). The new data base, aims at providing a listing of all papers published by Australian authors on the subject of renewable energy resources.

Subject matter includes solar, wind, geothermal and hydro-electric energy, as well as energy derived from ocean waves, tides, currents and temperature differences at different depths in the ocean.

The entries are assembled in categories and cite author(s) and title along with other useful bibliographical details. Author and subject indexes are available.

The first published copy (ARERI No. 1, September 1978, both in printed format and on microfiche) contains over 1250 entries, and the second (ARERI No. 2, September 1979, microfiche only), carries 1665 additional items.

Copies can be purchased from CSIRO Editorial and Publications Service, PO Box 89, East Melbourne, Victoria 3002.

New terminal captures handwritten data

An interesting new product recently demonstrated in Britain is the "Micropad", a data entry device that captures handwritten information.

The outstanding feature of the Micropad is that character recognition is carried out by microprocessor-based logic within the terminal rather than by a separate minicomputer system. In this way the device can transmit characters to a local or remote computer in the same way as a conventional keyboard terminal.

Micropad is supplied with a writing station on which the paper document is placed. The user can write with a ballpoint pen or pencil, thus creating a hard copy at the same time as capturing the data for computer processing. An integral 40 character display shows that characters have been recognised.

Cost of the device is said to be around the £1800 mark!

Further information from Quest Automation Ltd, Quest House, Princes Rd, Ferndown, Dorset, England.

Space drugs could help diabetics

McDonnell Douglas Corporation and the National Aeronautics and Space Administration (NASA) have signed an agreement to permit testing in space of a pharmaceutical process that could lead to improved treatment of such diseases as diabetes and hemophilia.

Under the agreement, McDonnell Douglas will build a device designed to produce large quantities of various enzymes, cells and other pharmaceuticals when operated in the zero gravity of space.

NASA will furnish flight time on four Space Shuttle flights, starting late in 1982, to experiment with and demonstrate the process, called continuous flow electrophoresis.

The electrophoresis process separates materials in solution by subjecting them to an electrical field, but is seriously limited on Earth because of the effects of gravity which increases impurities and reduces output.

Now the business professional has an extra-ordinary programmable calculator from Texas Instruments.

Powerful but simple

The TI-59 gives you so much problem solving power it's almost like a hand-held computer. Yet it's extremely easy to use.

Just plug in expertly designed programmes

You can slip a pre-written programme module in your TI-59 calculator and instantly transform it into a sophisticated application computer. There's a tool kit of pre-programmed solutions to a wide variety of problems. TI's plug-in Solid State Software™ libraries have been designed by professionals for use with your TI-59.

Containing up to 5,000 programme steps TO SOLVE BOTH ROUTINE AND COMPLEX PROBLEMS THESE LIBRARIES INCLUDE:–

- ☐ Applied Statistics
- ☐ Business Decisions
- ☐ Securities Analysis
- ☐ Real Estate/Investment

And many others. For instance Marine Navigation and Aviation are commercial programmes you can also use for your time away from the office.

An aid throughout your business

The problem solving capacity of the TI-59 can be used right across your company. Sets of programmes for specialists in many areas are available in Speciality Pakettes and include:–

- ☐ Marketing Sales
- ☐ Production Planning
- ☐ Programming Aids
- ☐ Oil/Gas/Energy
- ☐ Statistical Testing
- ☐ Securities Analysis

Programming is so simple

You can use pre-designed programmes, write your own, or incorporate both. With the TI-59's advanced technology YOU CAN MODIFY AND EDIT YOUR PROGRAMMES AND STORE THEM ON MAGNETIC CARDS FOR RE-USE.

You'll use the TI-59 continuously in business decisions

For instance the problem solving capacity of its 100 memories or 960 programme steps is invaluable for Budgets, Statistical Analysis, Stock Options and Chain Calculations. And you can turn TI-59 into a printer-calculator which prints, lists and traces your programme with the PC-100C Printer/Plotter Accessory.

And at $349.00* TI-59 costs so little

while your optional PC-100C Printer/Plotter Accessory is just $285.*

Examine TI-59's many remarkable features.

XIII OLYMPIC WINTER GAMES LAKE PLACID 1980

YOU CAN USE IT'S PROBLEM SOLVING POWER NOW

Fifty Years of Innovation

DISTRIBUTORS: **NSW**: Email Limited (Metering Division); Silicon Valley; Dick Smith Electronics; Total Electronics. **VIC**: Email Limited; Silicon Valley; Dick Smith Electronics; Total Electronics. **SA**: Email Limited; Silicon Valley; Dick Smith Electronics; Total Electronics. **WA**: Esdailes of Cloisters; Silicon Valley; Dick Smith Electronics. **QLD**: Email Limited; Silicon Valley; Dick Smith Electronics. **TAS**: J. Walch & Sons. **NZ**: David Reid Data Products.

Texas Instruments technology – bringing affordable electronics to your fingertips.

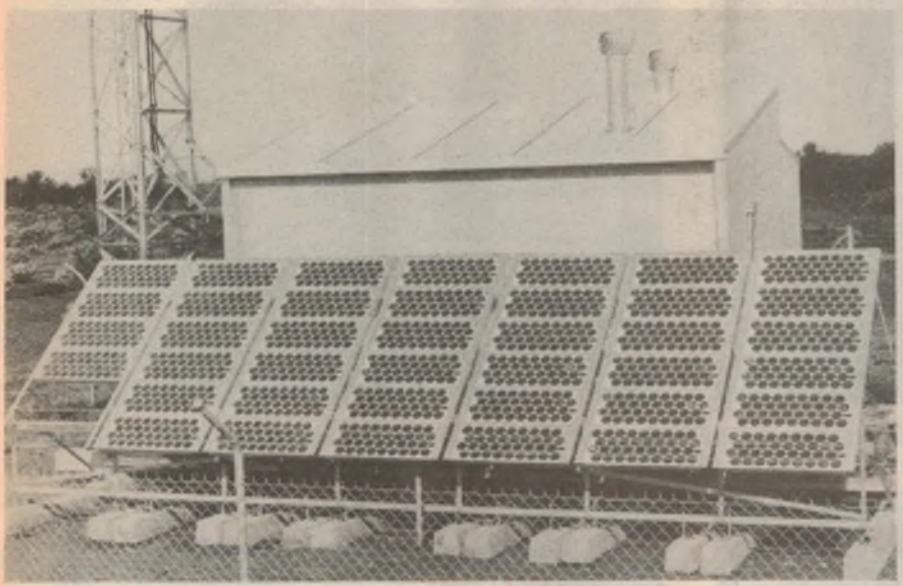
1 ADTI - 1279

TEXAS INSTRUMENTS
AUSTRALIA LIMITED

* Recommended Retail Price

NEWS HIGHLIGHTS

Lucas installs solar-powered railway communications system



Lucas Industries Australia Ltd has completed the installation of a solar-powered communications system along the new Tarcoola-Alice Springs' Railway. The system will provide continuous VHF radio communication with moving trains anywhere along the line, track maintenance crews, and the main control centres at Tarcoola and Alice Springs.

This particular solar power contract is the largest commercial application of solar power for communictions in Australia and possibly the largest in the world for railway communications. The total communication system spans 831km with 26 repeater stations, 23 solar-powered, at intervals of approximately 35km. The terminal stations are located at Tarcoola and Alice Springs, with a link-up to the main control centre at Port Augusta.

Each of the solar-powered sites comprises a weather-resistant shelter which houses the communications equipment and the batteries, a 70m tower and the solar array itself. The peak output from each array is around 1300 watts, while the equipment load is expected to reach 200 watts continuous at 24V DC when the communications system reaches its 72-channel capacity.

Business Briefs:

EMI (Australia) Limited has been awarded a $9 million contract to supply anti-submarine warfare (ASW) soanar systems to the RAN. The soanar, called Mulloka, was designed and developed in Australia. It will be fitted to the navy's River Class destoryer escorts.

D. D. Webster Electronics Pty Ltd, the Australian designer and manufacturer of the Spectrum-II range of small business computers, has moved to new premises at 17 Malvern St, Bayswater, Victoria 3153. Managing Director David Webster, said that the move follows an upsurge in sales of the Spectrum-II range (120 since July, 1977). The company currently employs 10 people but now hopes to expand both the marketing and servicing departments.

Vesco Electronic Supplies, Huntingdale, Victoria, has closed down due to outside interests of the three partners — all are four-wheeldrive enthusiasts. The company wishes to thank readers for their support during two years of trading.

Mr George Berzin of ***C.Q. Electronics*** has opened a store at 95 Regent St, Sydney, with Steve Wilson as Manager. Like the Blacktown store, it will stock an extensive range of resistors, capacitors, transistors, ICs and hardware, as well as PC boards for projects.

Computer-controlled nuclear inventory

A computer-controlled system for determining the accuracy of a nuclear materials inventory has been developed by a team of researchers at the General Electric Research and Development Center in Schenectady, New York. The new system, considered the world's most advanced, is now in operation at GE's Wilmington (North Carolina) Manufacturing Department.

The new computer-controlled system is designed to account for the tiny variations in weighing accuracy that occur on a day-to-day basis. It does this by relying on data from a computerised inventory database, and by making a systematic series of checks on the factory's measuring instruments.

GE says that some 250,000 fuel containers are processed to manufacture fuel rods for nuclear power stations at Wilmington each year. Since the number of inventory control measurements runs into millions, minor variations in weighing accuracy can become significant over a period of time if not taken into consideration.

According to GE, the computer system has reduced the time required for determining the accuracy of the inventory by 30% and has substantially improved productivity.

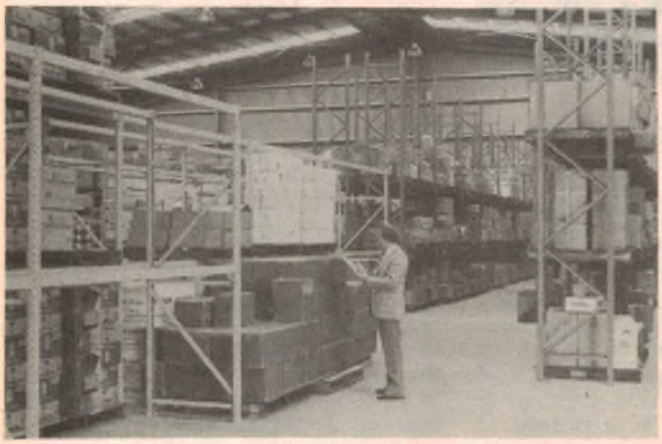
Solid-state colour TV camera

Sony is reported to have developed a colour TV camera based on a solid-state imaging sensor. The camera, about one-seventh the size of conventional colour TV cameras, will be initially supplied to All Nippon Airways for installation in airliner cockpits — the idea is to give passengers a view of take-off and landing!

Inside the new Dick Smith ranch

Dick Smith with Managing Director Ike Bain (centre) and Marketing Director Gary Johnston.

The North Ryde complex is 4,370 sq. metres in area and includes ample provision for staff car parking.



The new warehouse has room for further expansion.

Two of Dick's better-looking employees sort incoming mail.

Viewdata sold to US businesses

Twenty major United States corporations are to make use of viewdata systems specifically developed in Britain for the American business market. The corporations include the Chase Manhattan Bank, J. Walter Thompson (a large advertising agency), the publishing firms of McGraw Hill and Time Inc, and various big stockbroking firms.

Each organisation will install from one to five viewdata terminals developed by Insac Viewdata, a subsidiary of the National Enterprise Board. The orders have been placed with that company and General Telephone and Electronics (GTE), its American partner.

The terminals sold to the US will be linked by the GTE Telenet data network to a GTE computer centre at Tampa, Florida.

Sharp "executive micro-planner"

The Sharp Corporation has introduced an "executive micro-planner", a hand-held electronic device that will allow a busy person to key-in schedules in advance and then be reminded at the appropriate time by means of an alarm and a visual display.

Called the Sharp EL 6200, the device is a four-function calculator, a quartz alarm clock, an information storage centre and a calendar with capacity to the year 2099 — all in one slim package!

The micro-planner has two displays: an upper section for numerals and a lower section for letters, numerals and symbols. Display in the lower section is by means of a dot-matrix alphanumeric "rolling writer" function.

Appointments and message are entered into the machine by means of a typewriter-like keyboard containing all the letters of the alphabet. These

messages can be read out on a daily or monthly basis at the touch of a button. In addition, six symbols — an aeroplane, telephone handset, car, wine glass, a person walking and a group of two people — can be used in place of words to save display space.

into the 80's

HANIMEX TELETEXT DECODER to put TV news at viewers command

Hanimex Teletext Decoder HTD 101 will give viewers command of newest T.V. broadcast information services such as news, weather, sport and commerce, all at the press of a button.

Latest stock exchange information, gold futures, and other market activity will be available for use by the business sector.

The Teletext Decoder plugs directly into a normal television receiver and is a compact, high-performance unit available from Hanimex for the first time.

By pressing a button on what looks like an ordinary hand held channel selector the viewer can intercept the "pages" being transmitted by television stations.

* Teletext is transmitted on the unused part of a normal television screen
* Teletext is fed into the decoder directly from a conventional T.V. aerial
* Viewer selects Teletext via a slide-switch that cancels the existing picture
* "On-screen" index lists choices of available subjects by "page"
* Keyboard used to call-up "pages" by simply punching-in page number
* News services provided by T.V. channels
* When set to "news flash" page normal programme remains on view and news flashes appear across lower half of screen
* Up-to-date weather information
* Visual text is ideal for the hard of hearing
* Link-up with hard-copy printers in foreseeable future (optional extra)

FIRST STOCK AVAILABLE SHORTLY – MAKE INQUIRIES NOW!

HANIMEX

PRODUCTS FOR THE FUTURE – TODAY

N.S.W.: Old Pittwater Road, Brookvale, 2100. Phone: 938-0400.
S.A.: 49 Angas Street, Adelaide, 5000. Phone: 212-3601.
W.A.: 22 Northwood Street, Leederville, 6007. Phone: 381-4622.
VIC.: 282 Normanby Rd., Port Melbourne, 3207. Phone: 64-1111.
QLD.: 588 Wickham Street, Fortitude Valley, 4006. Phone: 52-5811.
TAS.: 169 Campbell Street, Hobart, 7000. Phone: 34-4296.

E030

News, sports results, lotteries, the weather . . .

Teletext: the electronic newspaper

Traffic lousy? Arrive home just in time to miss the evening news? Well now you can pick up a remote control unit and display the latest news in print on your TV set — simply by pushing a few buttons!

by GREG SWAIN

For the past year, Sydney television station ATN-7 has added something extra to its transmissions without the viewing audience even noticing. That something extra is a "teletext" signal which, when passed to a modified colour TV receiver, allows information to be displayed on the screen as a large-print magazine page.

Channel 7 hasn't been alone with its teletext broadcasts. Rival TCN-9 has been transmitting on an experimental basis since 1977 although, unlike ATN-7, has not chosen to continually update the information transmitted. Updating did not really matter, since TV receivers capable of decoding the teletext signal were not available to the general public.

That situation is about to change!

On February 4, P & T Minister Tony Staley caught many in the industry by surprise with the announcement of official government authorisation for a public teletext service. No sooner had the announcement been made than ATN-7 launched its "7-Text" service, a 160-page folio of news, weather, sport, stock exchange information, gold prices and a host of other information services. TCN-9 reacted a little more cautiously, apparently deciding to wait until add-on decoders and teletext receivers were sold to the public before launching its own continually updated service.

Teletext editor Shelagh Maxwell enters data into ATN-7's "7-Text" service by means of an editing terminal. "7-text" is on air during all ATN-7 transmissions.

Development

The teletext system is the result of research work carried out independently in the UK between the British Broadcasting Corporation (BBC) and the Independent Broadcasting Authority (IBA), the original idea being to provide a sub-titling service for the deaf. At first there were two separate systems but these subsequently merged into a single system prior to public launch. The BBC transmissions now go under the banner "Ceefax" (seeing facts), while the IBA transmissions are called "Oracle" (optical recognition of announcements by coded line electronics).

But what exactly is teletext?

Put simply, teletext is a one-way (ie. non-interactive) information system that rides "piggyback" to the TV receiver on the normal television signal. A television receiver equipped with a suitable digital decoder can select and display this information as an alternative, or as a superimposed addition, to the normal program. The information can be displayed in up to six colours as well as white, and in both graphic and alphanumeric form.

How it works

To see how teletext transmissions affect (or, more accurately, fail to affect) conventional colour TV sets, you only need to misadjust the vertical hold control of your receiver to bring the black area at the top of the picture (the vertical blanking period) into view. Two lines of flashing dots near the top of the picture is all you will see — the picture itself will not be affected.

So how can you mix a teletext signal with a normal TV transmission and not get interference to the regular program? To understand the answer to that question, we need to back up a little and understand how a conventional TV picture is formed.

Briefly, conventional TV transmission relies on a technique called interlacing. What this means is that instead of 25 separate pictures of 625 lines each being traced out on a TV screen each second, each 625 lines is transmitted as two separate patterns (or fields) or 312½ lines. These two patterns are transmitted alternatively and provide the equivalent of 50 separate pictures per second, and thus flicker-free viewing.

At the conclusion of each field, the electron beam spot returns to its start position at the top of the screen ready to commence the next field. The time taken for the beam to return from the bottom to the top of the screen is known as the vertical blanking period and occupies some 25 lines. No program information is transmitted during this period. Instead, it forms the black area that you see when the picture loses vertical hold and "rolls".

Some of the lines in the vertical blanking period are used for test signal injection, while others must be left blank or they may interfere with the normal working of the receiver. But lines 19 and 20 on the first half of the scan and lines 332 and 333 on the second (interlaced) half provide an ideal carrier for data information. These are the lines used to carry the teletext information.

So the data engineers have used a very clever trick. By thus transmitting the teletext signal during the vertical blanking period — that is, between the finish of one field and the start of the next — no interference to the normal program occurs!

But the technique does have one main drawback — that of access time. Teletext pages are transmitted in rotation and, because each page is made up of 24 data lines and only 2 data lines are transmitted in every field, each page requires 0.24 seconds of transmission time. This means that a teletext magazine of, say, 100 pages recycles only once every 24 seconds, giving an average access time of around 12 seconds.

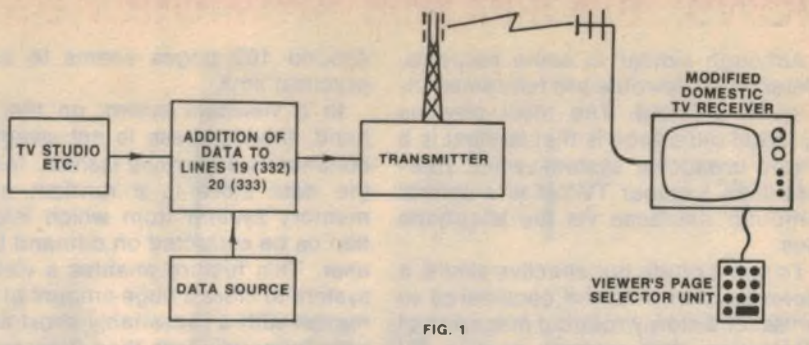


Fig 1: block diagram of the basic teletext system.

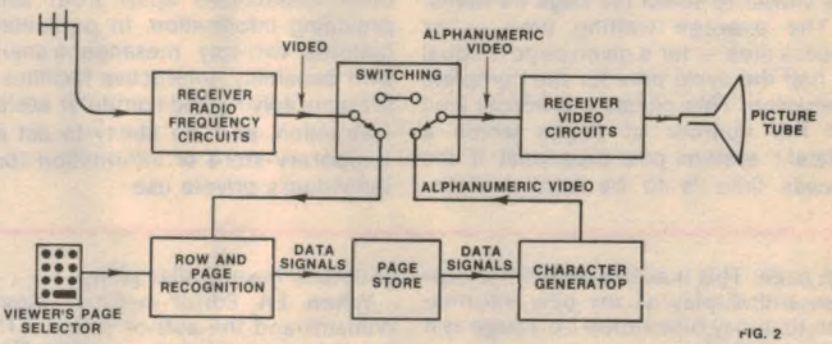


Fig. 2: block diagram of teletext receiver circuitry. The viewer may select any one of up to 160 pages by pushing buttons on the page selector.

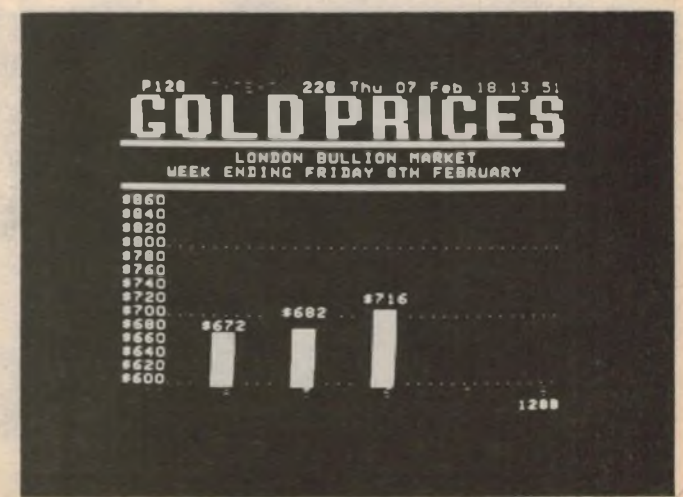
Digital decoder

At the TV receiver, the teletext signal passes to a digital decoder which is under the control of the viewer's page selector. The decoder compares the transmitted page number information with that entered into the page selector and ignores all the unwanted pages.

When the digital information at the beginning of the first line of a page matches that entered into the page selector, the data signals are fed to a page store memory. From here, the signals pass to a character generator which produces the required video signals to drive the display circuitry. The display can be held on the screen for as long as the viewer wishes.

In practice, the page store memory is updated at each fresh transmission of

Below: typical teletext displays. Page format is 24 lines containing up to 40 characters each.



Teletext and Viewdata Compared

Although similar in some respects, teletext and viewdata are fundamentally quite different. The most obvious technical difference is that teletext is a strictly broadcast system, while viewdata links a colour TV set to a central computer database via the telephone lines.

To use a crude but effective simile, a teletext system may be considered to consist of a slowly rotating magazine of information that sweeps past a TV receiver. Each page of information is identified by a unique code to enable the viewer to select the page he wants.

The average waiting time — or access time — for a given page is equal to half the cycle time for the complete magazine. This places a practical limit on the number of pages which a teletext system can broadcast if the access time is to be kept realistic. Around 160 pages seems to be the practical limit.

In a viewdata sytem, on the other hand, the database is not swept in a continuous and cyclic fashion. Instead, the data store is a random access memory system from which information ca be extracted on demand by the user. This feature enables a viewdata system to store a huge amount of information with a reasonably short access time (generally less than 2 seconds).

Also, unlike teletext, a viewdata system is interactive and has many other capabilities apart from simply providing information. In particular, it features two-way message transmission capability, interactive facilities for problem solving and computer assisted instruction, and the ability to act as a temporary store of information for an individual's private use.

But teletext has its own advantages, the main ones being its inherently lower cost and the large number of people who can access the same item or different items of data simultaneously. In addition, teletext information is provided to the viewer free of charge while viewdata information will cost the price of a telephone call.

Teletext is thus seen more as a short-term news and information system, while viewdata is more suitable for long-term reference information, message transmission and personalised data storage.

FOOTNOTE: no decision has yet been taken to launch a viewdata system in Australia. Such a decision, industry sources say, is not likely for at least four or five years!

---

the page. This makes possible the capture and display of any new information that may be entered on a page as it is transmitted.

The viewer's page selector is similar to a conventional remote control unit but with a calculator-type keyboard added to it. In addition to the usual remote control functions, it allows the viewer to choose between normal TV program and teletext, to select the page to be displayed, to display double-height characters and to superimpose special data messages on the normal program (news flashes, sports results etc).

Teletext stations

At least five stations — ATN-7, TCN-9, NBN-3, BTQ-7 and the ABC — are transmitting teletext at this stage. Of these, Sydney's ATN-7 is perhaps the most advanced with its 160-page 7-Text service, although other stations doubtless have similar plans.

When EA Editor-in-Chief Neville Williams and the author visited ATN-7 last February, teletext engineer Daryll Drake took time off to explain how the system works. The first items one sees on entering the teletext room are the two editing terminals just inside the door and an equipment rack about half-way along one wall. A teleprinter sits in the far corner of the room, spilling out paper as it digests the latest news from AAP.

It is teletext editor Shelagh Maxwell's job to take the news as it comes off the teleprinter and update the various pages on the editing terminals. As well as having standard ASCII type keyboards, the terminals also include a range of powerful editing functions and feature a range of control keys to allow various colours to be selected, to make words flash on and off, and to draw colourful graphics and large headings.

Daryll Drake is quick to point out that ATN-7's 160-page teletext service is actually transmitted as three separate magazines: magazine 1 starting at page 100; magazine 2 starting at page 200; and magazine 3 starting at page 300. this scheme has several advantages.

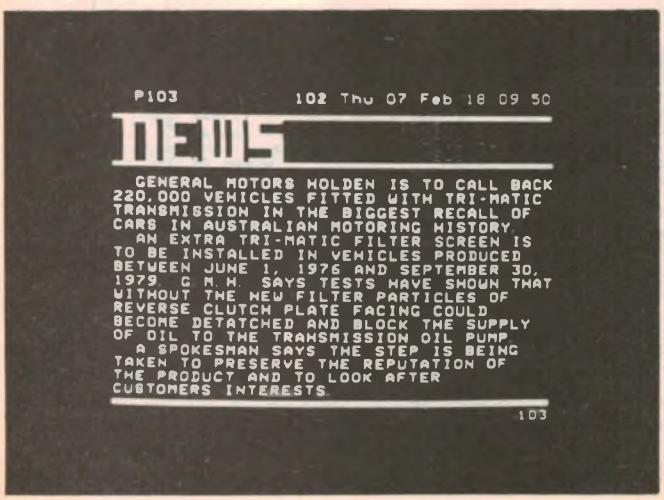
First, it allows the transmission of three separate index pages (on pages 100, 200 and 300). Second, it allows the size of individual magazines to be expanded (or reduced) at will. And third, it allows the use of control pages for an automatic page "flip-over" facility whereby each page of a given magazine is automatically displayed in turn.

ATN-7 calls this facility "Easy View".

What you need

There is a catch 22 to all this! If you want to receive teletext broadcasts it's going to cost you money.

The first line of each display always includes the page number, the date, and the time in hours, minutes and seconds.



Above: the teletext equipment rack and control console. Included in the rack are a teletext data encoder/decoder, a DEC RK105 cartridge disc system, a DEC twin-deck floppy disc system, and a PDP 11/34 minicomputer.

Essentially, you've got two choices. You can either trade your present colour TV in on one equipped to receive teletext, or you can buy an external add-on decoder unit. At least two manufacturers, Rank Industries and Philips, plan to market teletext colour TV receivers, although supplies of Rank sets will initially be quite limited. The Philips sets are expected to appear in retail stores around the end of April and will cost about $300 more than conventional TV sets the same size.

For those who don't wish to trade in their present TV set, Hanimex Pty Ltd is planning to market an add-on decoder which is simply inserted into the TV set's aerial line. Hanimex say that the unit, to sell in the $450-500 price range, should be available through various retail outlets sometime in May.

An add-on decoder has rather more circuitry than a decoder used in a teletext receiver. Whereas the decoder in a teletext receiver is interposed between the receiver IF and video circuits, an add-on decoder must be fitted with its own TV tuner and "front end" to select the required station. The signals are then fed to the decoder circuit proper and, after decoding, modulated onto a blank TV channel and fed into the set's aerial terminal.

This means that, to receive teletext, the TV set's tuner must be set to the blank channel. When normal operation is required a switch on the adapter feeds the aerial straight through to the TV set.

The only major unsolved problem now is whether the Australian public will show any enthusiasm for the system. That is something only time, and teletext receiver sales, will tell.

Not so many years ago, the main curb to the successful implementation of integrated circuits was processing technology. Now the main problem facing the semiconductor industry is defining and designing the products made possible by VLSI (very-large-scale integration). According to Gordon Moore of Intel, one of the industry's pioneers, it's what to do with VLSI ICs that's the main problem.

VLSI: what does the future hold?

by DR GORDON MOORE
Intel Corporation

A tremendous interest in VLSI is all around us. There is much talk of electron-beam and X-ray lithography tools to achieve VLSI's submicron structures. In all of the discussions, the implication is that VLSI will allow us to enjoy the same kind of fantastic low-cost advantages that previous IC technologies have provided in electronic products. Perhaps. But if the semiconductor industry had today a commercial million-transistor technology like VLSI, I'm not so sure it would know what to do with it. Besides products containing memory devices, it isn't clear how future VLSI can be used in electronic products.

Examples abound of products with costs slashed tenfold to a thousandfold because of progress in semiconductor integration levels. Each increase in integration level has opened up new applications. In several instances completely new industries have developed. These advances have been made as semiconductor technology evolved from discrete to small-scale to medium-scale and through large-scale integration levels.

Doesn't it seem logical then that an order-of-magnitude increase in IC device complexity should result in many of the same product advantages?

Memory is certainly one function that can be used in large chunks, if we assume that the cost per bit will be low enough to make this possible. Single-chip microcomputers could be extended with more memory on the chip. But even here, memory modularity at some size becomes important, thus limiting the amount of memory usefully incorporated on chip.

Beyond memory, I haven't the slightest idea how to take advantage of VLSI. In fact, the semiconductor industry is not process-technology limited for non-memory products. How best to use the results of the processing technology is really what the problem is.

Criteria for success

Several things are required to produce a successful product — that is, a product with a price that is acceptable to both the maker and user. Processing technology is only one of the ingredients of success. Fig. 1 illustrates the process of creating an LSI IC product.

Each block in the figure is made up of a number of complex factors. For example, the "design" block includes the design of the process as well as that of the product. Process design requires a description of the processing sequence, the layout rules, and the electrical description of the elements of which it is composed. Product design of a complex structure requires logic and circuit designs, mask layout, and design verification. Any one of these can be a formidable barrier.

At some point in the past, each block listed in Fig. 1 curbed the success of semiconductor products. For instance, during the first decade of the transistor, the main curb to its successful implementation was processing technology. The techniques for diffusion and for making contacts had to be developed to make the transistor a reality, though the electrical requirements of the device were fairly easy to define.

Similarly, in the early days of the integrated circuit, processing technology limited success. Features such as isolation structures had to be developed to make the IC a reality. Probably the classic case is that of the insulated-gate FET, a device that a group at Bell Laboratories originally tried to make and, in the process, got hung up on something called surface states. This led to the invention of point-contact and junction transistors. It wasn't until 15 years later that the semiconductor industry learned how to manufacture a stable MOS device.

Once the basic process steps were in place, progress in making ICs in ever more complex structures moved in an exponential fashion. The curve in Fig. 2 is essentially the envelope of IC complexity growth. Points indicated in the figure are a sprinkling of the most complex circuit types available commercially at the time indicated. Most of the circuits fall well below this curve.

I expect a change in slope to occur at about the present time. From a doubling of the slope of the curve annually for the first 15 years or so, the slope drops to about one-half its previous value to a doubling once every two years.

The projected slowdown in IC complexity growth is caused by the semiconductor industry's loss of one of the principal factors that has allowed it in the past to increase complexities: the

Gordon E. Moore is president of Intel Corp., Santa Clara, Calif. This article is based on a keynote speech he delivered at this year's International Solid State Circuits Conference. From work at the Applied Physics Laboratory of Johns Hopkins University 1953-6, Dr Moore joined the Shockley Semiconductor Laboratory of Beckman Instruments, then went on to co-found first the Fairchild Semiconductor Corp in 1957 and then the Intel Corp in 1968. He has PhD degrees in chemistry and physics from the California Institute of Technology. He is a Fellow of the American Physical Society and Electrochemical Society and a member of the National Academy of Engineering.

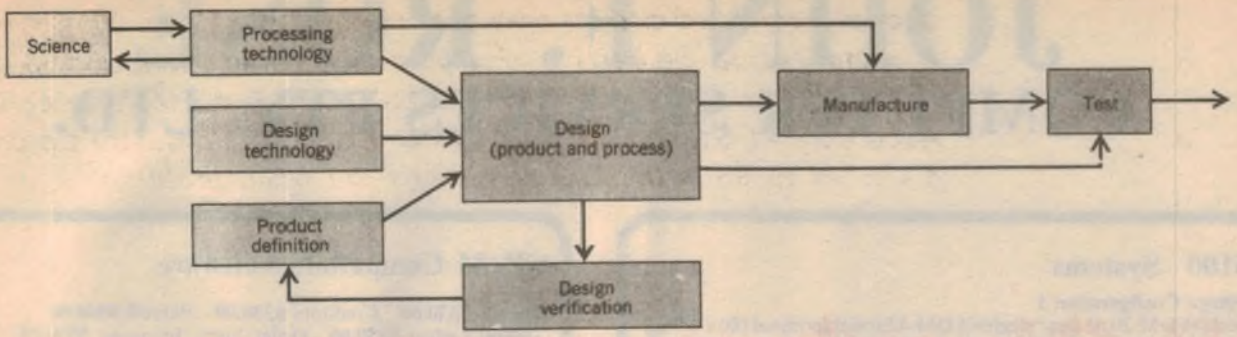


Fig. 1: making a successful IC product involves several steps besides processing. Each step is complex and can be a formidable barrier.

ability to pack more and more elements on a chip's surface by eliminating nonfunctional chip areas. The latest IC devices of Fig. 2 represent the densest ICs with the smallest nonfunctional areas.

A repetition of earlier problems

Note the gap between 1965 and 1968 in Fig. 2. This occurred because it was difficult at the time to identify any semiconductor products whose complexity came close to the potential limit. This gap did not develop because there was a lack of effort — in fact, it was a period of intense activity — but rather because of a problem in product definition. This is the very same problem the semiconductor industry now faces as VLSI technology is about to be born. It was difficult in 1965-1968 to define semiconductor products near the limits of device complexity that could at the same time fit the criteria for success.

The semiconductor industry faced two major problems then as it tried to partition digital systems into complex blocks: interconnections and product uniqueness. The interconnections problem arose from the fact that the number of leads for a circuit had increased so rapidly, with the increase in circuit components, that it went well beyond the packaging capability of that era. The product-uniqueness problem resulted because the blocks tended to become unique, with a resulting explosion of different part types, each needed in small quantities. This was not conducive to the development of successful semiconductor products.

A variety of attempts to solve the problem were explored. I remember at that time having discussions on how to design, manufacture, and test several hundred new part types every week in volumes of perhaps only 10 to 100 of each type. Several techniques evolved with what might be called today gate arrays; in these, customised layers of metal interconnections were used on standardised diffused wafers. The powerful computer design aids required to handle the large number of part numbers were slow in developing. Only recently have successful results been obtained.

These approaches have expanded over the last 14 years and are still being pursued actively in many parts of the semiconductor industry. The technical papers presented at many recent conferences bear this out. For example, IBM recently described a fantastic system using direct-electron-beam writing on the silicon wafer and a highly automatic line to handle the problem of making small quantities of a very large number of different semiconductor IC designs.

In general, the semiconductor industry's efforts to solve its problems of the 1965-1968 era were not successful. The product definition crisis persisted and limited IC complexity through the mid-60s. Two things broke the crisis for the semiconductor component manufacturer, though not necessarily for the mainframe computer manufacturer: the development of the calculator and the advent of semiconductor memory devices.

The calculator was a simple system that could be partitioned into about four 40-pin IC packages, making the interconnections problem tractable. Since it was made in large quantities, sufficient quantities of identical components used within the calculator were manufactured to justify design costs.

As for memory, it is a universal function that can be used at the highest level of integration available. With the use of on-chip decoding, the number of leads was reduced to match available packages. What remained was for semiconductor memory to be cost-competitive with established technologies so it could blossom.

Thus the interconnections and product-definition problems of the past were not necessarily solved; they were simply circumvented. The semiconductor industry developed a different set of markets to keep itself busy, postponing the solution of its previous problems.

The microprocessor

Just as the calculator and memory enabled the semiconductor industry to continue making more complex devices for certain applications, the microprocessor extended their range of use. With its architecture of general-purpose integrated structures, one could program the microprocessor to

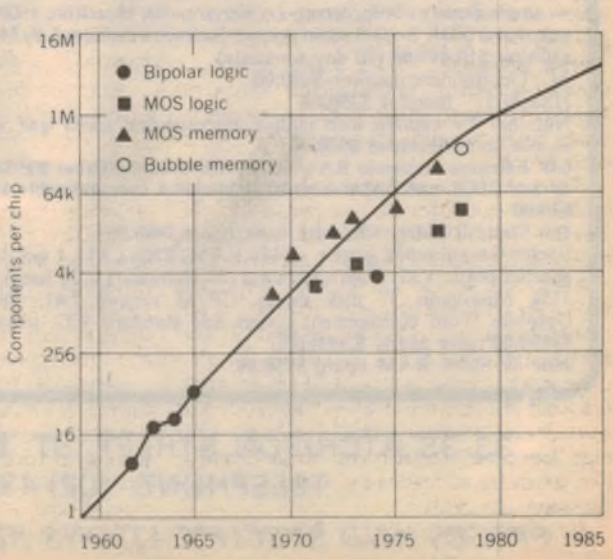


Fig. 2: Although IC complexity has grown exponentially over the last 15 years, the slope of this growth is expected to decrease because of lack of product definition and design.

JOHN F. ROSE
COMPUTER SERVICES PTY. LTD.

S100 Systems

Omega Configuration 1
Beehive DM-20 or Lear siegler ADM-42 serial terminal (80 x 25 full communications terminals) with Mainframe of 2 x Shugart SA801R double density (480k/drive), 64k Static RAM (4 Mhz with bank select), Delta Products Z80a CPU and Disk Controller, 2 programmable RS232c serial I/O ports, 3 x 8 bit parallel ports. NDK S-2000 printer (bi-directional, 132 columns, 170 CPS, 15" paper, stand and interface). Software: CP/M version 2.1 and WORDSTAR (powerful editor/word processing utility). **$10,-650.00**

Omega Configuration 2
Hazeltine 1500 Serial terminal (80 x 24) with Mainframe of 2 x Shugart SA801R double density disk drives (480K/drive), 48k RAM, 3 x Serial RS232c ports, 2 x 8 bit parallel ports, Z80a CPU. C-ITOH 8300p printer (9" paper). Software: CP/M 1.41. **$7500.00**

10 Megabyte Hard Disk
Complete with S-100 controller and full CP/M for either configuration **$5830.00.**

Video Cassette Interface
Allows access to 100 megabytes on-line. Ideal solution for backing up hard disks for archive purposes. Transfer rate 1.1 megabaud. This interface can be used with just floppy disks for large databases. Random access capability with Video Cassettes equipped with good editing facility. Modified CP/M provided. **$1010.00**

Our S-100 systems can be upgraded to full multi-user systems with hard disks and tape back-up. A full range of S-100 hardware and software is available. Send 3 x 20 cent stamps for our full catalogue.

Send for information about our new 8086 computer system and boards. Microsoft's Basic 86 and an 8086 cross compiler are available.

CP/M Compatible Software

Debtors **$330.00** Creditors **$330.00** Payroll **$500.00**
General Ledger **$330.00** Order Entry/Invoicing **$500.00**
CP/M * version 1.4 **$145.00** version 2.1 **$75.00**
MPM * version 1.0 **$305.00**
Basic 80 **$305.00** Microsoft's Basic Compiler **$355.00**
Fortran 80 **$405.00** Cobol 80 **$630.00** Edit 80 **$105.00**
Macro 80 **$155.00** XMacro 86 **$300.00**
Super Sort I **$230.00**
Wordstar (full word processing package) **$445.00** (5 versions are available and are fully described in our catalogue)
Datastar (comprehensive data entry package, completely menu driven. Mail lists produced by Datastar can be used in conjunction with Wordstar) **$355.00**
Wordmaster **$130.00**
C-Basic II**$110.00** (semi-compiler ISAM file utility available)
Pascal Z **$400.00** (with variant records and strings)
MAGSAM (Index sequential access method plus multiple key) **$320.00** (versions for Microsoft Basic and C-Basic II)
Games Disk No. 1 (with full documentation) **$45.00**
Catalogue (produces a cross referenced catalogue file of all your disks) **$45.00**
Saver reconstitutes files erased by the CP/M command ERA, also enables you to display/alter disk information independently of file structure **$45.00**
Z80 Development package **$103.00**
ZDT (debugging for Z80 Development package) **$55.00**
Whitsmith's C Compiler Produces faster code than Pascal with more extensive facilities. Linkable to Microsoft Rel files. Requires 60k CP/M **$640.00**
Selector III-C2 data base package **$300.00**
XASM 68 Non macro cross assembler with nested conditionals for Motorola MC6800 mnemonics to Intel Hex. **$210.00**
The full range of our software is described in our catalogue.

** Trademark Digital Research*

SEND 3 x 20c STAMPS FOR OUR COMPREHENSIVE CATALOGUE

SPECIALS

Altos computer system 48k RAM, 2 x Shugart SA801R disk drives — single density (240k/drive), 2 x Serial ports, Hazeltine 1500 terminal and NDK S-2000 serial printer. Software includes CP/M and utilities. **$10,499.00** (90 day warranty)
14" Electrohome monitor **$400.00**
Hitachi 17" monitor **$350.00**
National TV camera with built-in monitor and zoom lens, solid mobile stand included **$900.00**
64k Extensys Dynamic RAM card with documentation **$950.00**
20 key HEX unencoded keypad (includes 4 user definable keys) **$20.00**
16k Static RAM boards with bank select **$400.00**
Vector Graphics MZ system — 48k RAM, Z80a CPU, 1 serial & 2 parallel ports, V.G. Dumb terminal (80 characters x 24 lines), 2 x 315k Micropolis 5" disk drives, CP/M version 1.41, Vector Graphics Word management system and standard V.G. software **$4900.00** (save nearly $2000.00!).
Jade 8k Static RAM board **$150.00**
Northstar CPU Z80 board **$250.00**
Vector Graphics 48k Dynamic RAM board **$700.00**
Mostek Z80 Programming Manual **$8.00**
Godbout I/O board (2 x RS232c serial ports) **$80.00** no documentation available.
Imsai SIO board 2 x RS232c Serial ports **$200.00**
Jade I/O board 1 x serial, 1 x cassette interface **$80.00**
Ithaca Audio Video Board 64 x 16 display with full cursor control and documentation **$83.00**
Imsai PIO board 4 x 8 bit parallel ports **$200.00**
TSA operating system with full patching guide **$350.00** (Patches to run Northstar Basic on CP/M **$45.00**)
44 pin edge connectors **$2.70**
Imsai S-100 edge connectors (Solder type) **$4.20**
8251 USARTS **$4.50**
N8t26 **$1.30** 2110 (250 Nsec) **$1.30**
8275 terminal chip **$55.00**
Durst Processor model RCP 20 **$850.00**
All prices include sales tax. Freight: $1.50 for parts, $5.00 for boards. Join our mail list to receive advance notice of SPECIALS.

33-35 ATCHISON STREET, ST. LEONARDS, N.S.W., 2065, AUSTRALIA.
TELEPHONE: (02) 439 1220 TELEX: AA 27901

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

VLSI: what does the future hold?

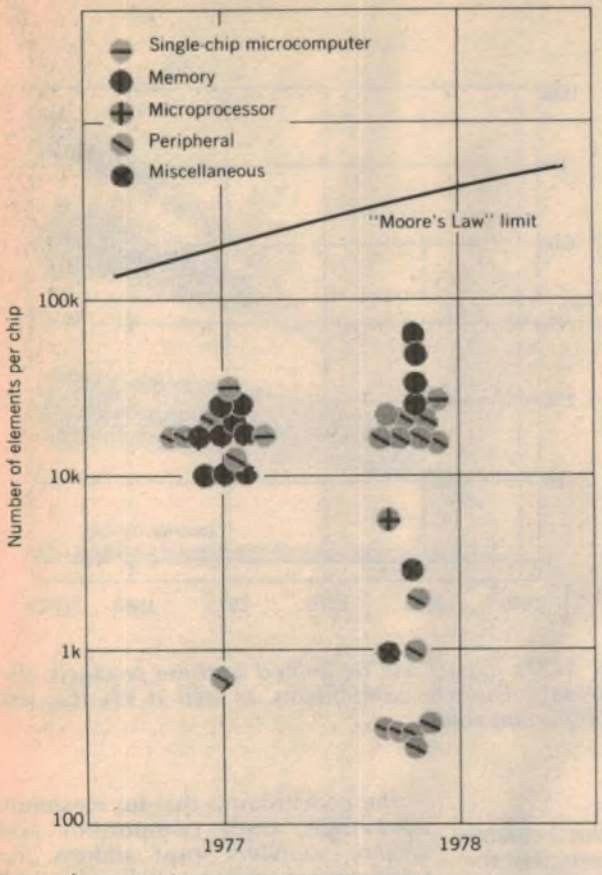


Fig. 3: the complexity of Intel Corp's IC products over the last two years. Note that few such products approach the "Moore's Law" limit.

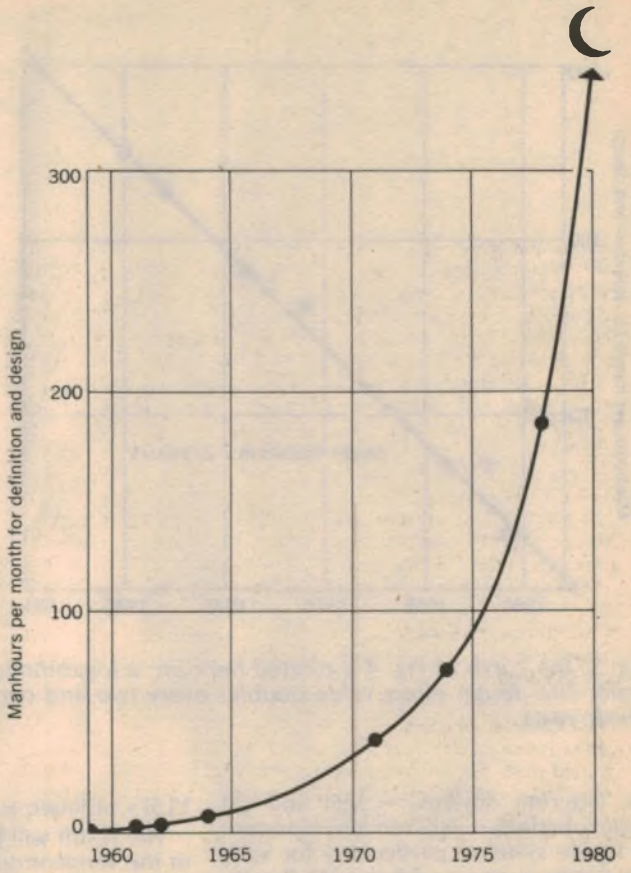


Fig. 4: the man-hours per month required for IC product definition, design, and layout grow exponentially.

perform in a wide variety of applications and provide a solution for the product-definition problem.

Thus, during the 1970s, the semiconductor industry kept developing more complex memory chips to track the complexity curve of Fig. 2, with microprocessor products following closely behind. Large-computer manufacturers were left to solve their own problems of parts-number proliferation and low-volume uses, often through the use of components with lower levels of integration.

But modern LSI technology has not eliminated the predecessor technologies of small-scale and medium-scale integration. For example, the number of bipolar semiconductor devices being produced continues to grow rapidly, from about 850 million circuits in 1972, to about 1.5 billion in 1974, down to a little over 1 billion during 1975-1976, and up again to about 2.5 billion last year worldwide.

The availability of high levels of device complexity has not resulted in the complete replacement of less complex devices; coexistence is more often the case. Even a company devoted to making LSI IC products finds that it cannot use the total capability for complexity in all its products. The complexity of products introduced by the Intel Corp, for example, over the last two years is shown in Fig. 3 and can be compared to the limits of device complexity in Fig. 2.

In Fig. 3, microprocessor and complex peripheral devices tend to group around the same level of complexity. This is the level that the semiconductor industry can presently define for useful products. Although similar devices that are two to three times more complex can be made, a definition of the products they would constitute is needed first. Thus we come full circle to our present problem: how best to make use of our semiconductor processing capability for ever more complex devices, such as VLSI ICs.

Another perspective

The product-definition problem can be shown from a different perspective if we look at the amount of effort required for product definition, design, and layout man-hours per month, starting with the first planar transistor of 1959 and projecting beyond that (Fig. 4). This design effort is plotted on a logarithmic graph in Fig. 5. As can be seen from Figs. 4 and 5, the increase in effort is exponential, doubling every two and two-thirds years.

If we assume that the cost in man-hours per month is inflating at 10% per year (a conservative figure considering the need for increased computer support, software, etc), then the costs double every two years. We should keep in mind that semiconductor device complexity is also doubling every two years, resulting in a constant cost per element to define, design, and lay out complex semiconductor ICs.

This cost can be contrasted with manufacturing costs, which are largely independent of device complexity. Whereas manufacturing costs were once dominant and exceeded those of design, the situation is now reversing, with design costs becoming dominant. The implication is clear: product definition and design technology are where work is really needed. And the answers the semiconductor industry comes up with in response to these challenges will depend on the nature of their businesses.

The component supplier must have large markets across which he can amortize his high design costs. This requires high-level standardization, either at the processor level or at the large system level. This will limit VLSI's impact as shown in Fig. 6. Only memory devices may utilize maximum complex-

VLSI: what does the future hold?

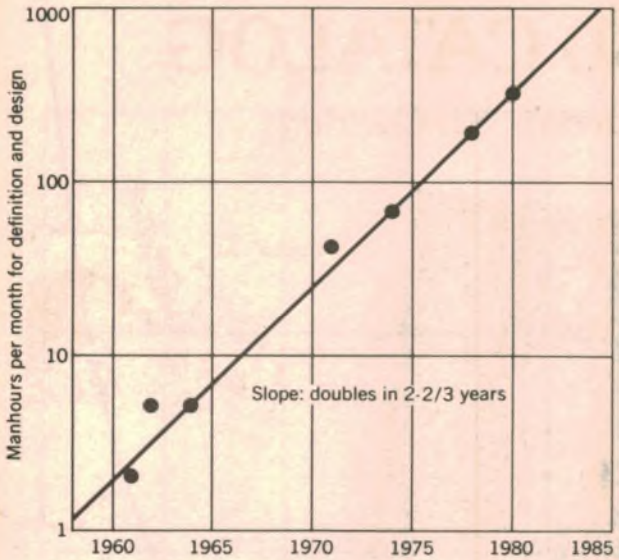


Fig. 5: the curve of Fig. 4 is plotted here on a logarithmic scale. The design effort value doubles every two and two thirds years.

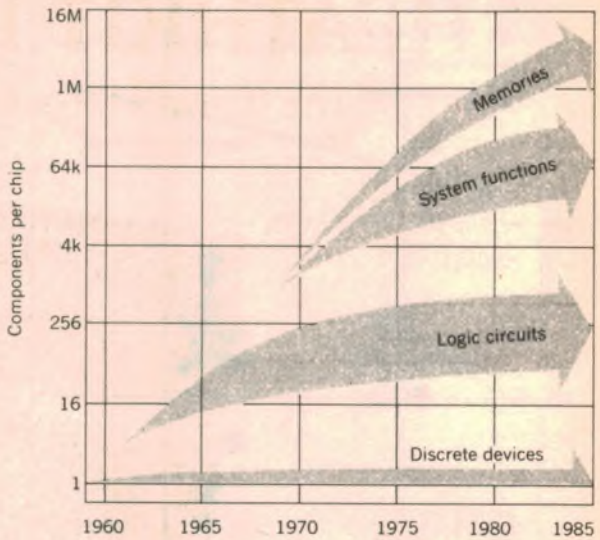


Fig. 6: VLSI's impact will be limited to these products, the author says. Discrete components, as well as TTL ICs, will play important roles.

ity. Discrete devices — MSI and LSI logic functions — will remain important in future systems, particularly for such functions as power driving. At the intermediate level of complexity, TTL ICs will continue to play important roles in future systems and will increase only gradually in complexity.

The principal capability for defining and designing LSI and VLSI products is in the hands of the systems suppliers. If product definition and design become the important factors of the future — and I believe they will — systems companies may have the advantage in VLSI's ultimate success.

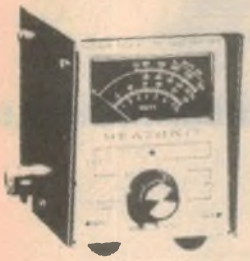
The result will be a structural change in the semiconductor industry. On the one hand, component suppliers, as always, will be pushing for standard products that are useful in large numbers across a broad spectrum of applications. On the other hand, an increasing number of systems companies, or captive suppliers, will become more skilled in making complex ICs. Such companies are even now expanding their in-house processing successfully.

As for my original question — Is the semiconductor industry ready for VLSI? — the conclusion is that for maximum advantage, both component and systems suppliers must address the problems of product definition and design. In fact, unless both industries — the semiconductor component as well as the systems company — address and solve these problems, as we look back on the VLSI era we may only be able to say "thanks for the memories".

FREE!

HEATHKIT 1980 CATALOG

The World's largest Electronic Kit Catalog

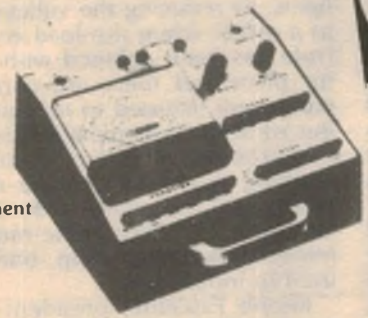


Ham Radio

Digital Test

Automotive Diagnostic

Hobby



Component Testing

Teach Yourself Electronic Kits

Kits for every interest and every budget

Every Heathkit product in our '80 catalog is designed to be built by people with little or no prior knowledge or kit-building experience. For more than a quarter of a century, people from every walk of life have been building them—successfully—and so can you.

Heathkit products offer outstanding performance at kit-form savings and provide the satisfaction that comes from creating something of value with your own hands.

Each kit includes a comprehensive, easy-to-understand assembly manual that reduces even the most complex operation to a simple step-by-step procedure. Every step is fully explained and illustrated. The possibility of error is practically eliminated because you check your work as you go.

Find out how you can enjoy the savings, value and personal satisfaction of building your own Heathkit products, by sending for the 1980 Heathkit catalog today!

Send to
Warburton Franki Heathkit Centre
220 Park Street, South Melbourne, Vic. 3205. Phone: 699 4999

Name.....

Address.....

State..... **Postcode**.....

Energy conservation & the electric motor

In the scramble for alternative sources of energy, the relatively staid concept of energy conservation has been slow to take hold. But a watt saved is a watt earned. Improvements to electric motor efficiency could save the United States 1 million barrels of oil a day by 1990.

by MARY-SHERMAN WILLIS

Conservation is commonly associated with deprivation — with doing without fuel or electricity — and is an unattractive prospect in an age of high energy productivity. But that age is declining. As S. David Freeman, director of the Tennessee Valley Authority, the largest power producer in the United States recently told a House energy subcommittee, "If we do not accept the fact that the joyride is over, we will never close the energy gap. Conservation is our cheapest and quickest source of energy."

In technology, energy conservation translates as efficiency. High efficiency means a high output of work done by a system, compared with the input of energy to do it; less fuel is used and more fuel is available for other needs. It is an idea whose time has come and it is causing an engineering revolution in housing, manufacturing and transportation — systems that are governed by the marketplace. And so, inevitably, conservation and energy efficient technology are linked to cost effectiveness.

As an important example, consider the electric motor. While its basic design principles have remained unchanged for almost 40 years, it still offers a clean, economical, quiet and versatile source of mechanical power from electricity. It can range in horsepower from 0.01hp (1hp = 0.75kW) to more than a thousand hp and can drive anything from a clock to a locomotive.

Some figures from a 1976 Arthur D. Little report and others indicate the magnitude of the role played by electric motors in the United States:

- they consume about two-thirds of all the electrical energy generated;
- they use one-third more energy than automobiles and consume the equivalent of 6 million barrels of oil (or 1.5 million tons of coal) daily;
- about 63% of US electric power drives industrial and commercial motors, with industry using the greater share;
- and most industrial motors are general purpose AC polyphase motors, used as pumps, compressors, blowers and fans. The motors are about 50% to 70% efficient when fully loaded.

In terms of efficiency, motors from one hp to 125hp could stand the most improvement. AC motors more powerful than 125hp tend already to be highly efficient, says Philip Valence, one of the authors of the A. D. Little report. In 1976, motor efficiency was of least importance to the industrial user, whose power bill for electric motor drives was less than 2% of gross sales, the report said.

But what about today? Valence is working on a second report for the Department of Energy, commissioned by Argonne National Labs, which is due this year. He is already finding signs of industry interest in "thinking conservation." The portion of the market devoted to high-efficiency motors has risen 5% in five years, he says. In 1977 only one manufacturer produced premium efficiency motors (80% or more efficient in the 1hp to 25hp range). Today, there are at least eight, and the number of orders for these motors is ten times higher than it was in 1977, according to figures of the National Electrical Manufacturers Association (NEMA).

But new high-efficiency motors cost more. Improved materials and machining, to reduce the heat losses (50% to 60% of the total losses) and lessen current requirements, can raise the premium costs as much as 25%. Yet, as energy costs go up, payback time is greatly reduced — sometimes down to two years, depending on how much the motor is used. And end-users may be adapting to longer-term payback periods, Valence says.

Meanwhile, a range of devices is becoming available to increase the efficiencies of existing motors, especially AC motors used with varying loads. The speed of an AC motor is essentially constant. As the load decreases, the excess power is simply wasted as heat. These devices use various means to change the electrical characteristics of the motor in such a way that the power can vary with the load. The motor runs more efficiently and cooler, extending its life (some say by 5% per degree cooler).

For example, the power factor controller (PFC), patented by Frank J. Nola of NASA's Marshall Space Flight Centre, reportedly saves 40% to 60% power in unloaded, one-half hp to 5hp motors. The PFC uses either Triac or silicon controlled rectifier semiconductor switches that function essentially the way a dimmer switch does for lights, by reducing the voltage applied to a motor when the load is reduced. Nola has been deluged with requests for plans and there are currently 22 companies licensed to manufacture it. But while some companies are already into production, "there are still a lot of teething problems" as one manufacturer put it, especially in developing a controller for three-phase motors and motors larger than 25hp, both widely used in industry.

Joseph Pascente, president of Electronic Relays Inc, in Downers Grove, Illinois, says his company sells a $30 PFC for single hp single-phase motors, and a 7.5hp controller for $74. Three-phase motor PFCs will be available by the end of summer, he says, and he predicts the devices will be selling for less than $5 per hp in two years (prices depend on the quantity ordered).

Another system, designed by Cravens L. Wandlass, modifies the motor windings. Wandlass has shown that his motors reduce power consumption from 12% to 50%, depending on the size of the motor and of the load. His company, Wandlass Motors Inc, in Tustin, Calif, is producing single- and three-phase motors. Wandlass says that his new motors cost much the same as standard motors because he uses the same methods of production and standard parts.

The Exxon Corp, recently claimed it has a new design for a variable speed

Frank J. Nola's revolutionary power factor controller is said to save 40-60% of power in unloaded ½hp to 5hp motors.

motor control device. Their concept — to use a microprocessor to match motor speed to the load by varying both the voltage and the frequency of the applied waveform — is not new. At least four other companies market similar devices. What is new is Exxon's claim that it can market the device for between $7.50 to $37.50 per hp by the mid-1980s — ten times cheaper than a similar device produced by another manufacturer today. But Richard Baker, the Exxon consultant who invented the device, says the figures anticipate a plummet in semiconductor costs in the next few years. If so, the payback period for the device could be as short as six months, he said.

Exxon claims also that if, by 1990, half of the industrial motors in the United States used their device, it would save the equivalent of one million barrels of oil a day, which equals about the daily oil flow from Alaska. Current oil consumption in the United States is about 19 million barrels a day.

And NASA claims that even a 4% reduction in electric power consumption from their device would save the equivalent of 250,000 barrels of oil daily.

The potential for energy savings such as these has interested government energy planners for years. Last month the Federal Trade Commission approved a rule requiring household electric appliances to be labelled with the energy efficiency of the appliances — for example, the cost of running the appliance for a year. NEMA strongly endorsed this rule.

Meanwhile, Sen Howard M. Metzenbaum (D-Ohio) has sponsored the "Industrial Equipment Efficiency Act of 1979," mandating government tested minimum standards for motor efficiency, similar to gasoline mileage standards on automobiles. Last year, the National Energy Conservation Policy Act authorised, among other things, an 18-month DOE study of the practicability and effects of these rules, now underway at A. D. Little.

But NEMA president Bernard H. Falk believes imposed standards are unnecessary and perhaps harmful. Market forces are already providing incentives for increased efficiency, and engineers are responding, he said. For example, the two-year payback period of some of the new motor controllers available today is considered an excellent investment incentive to many industrial motor users. And the five years that would be needed to establish government efficiency rules would create "chaos" in the industry. "The interplay of competitive forces created by economic pressures from users desiring to cut energy costs will achieve the same objective of energy efficiency for industrial products in less time, and at less expense to the user, than the mandatory approach being considered," Falk said.

While that view is to be expected from a proponent of free enterprise, "the question is whether or not industry is moving fast enough," Valence says. "That is what we're trying to answer in this next report."

FORUM

Conducted by Neville Williams

LISTENERS, LICENCES & LEGALITIES

The Biblical phrase about "the blind leading the blind" would be a rather apt one to describe the effort of anyone who seeks to interpret the wireless/radio licensing laws and regulations that operate in Australia. The most sensible course for the average citizen is to obey the obvious bits, ignore the remainder and hope for the best!

We have talked about this at various times in the past but, after 30-odd years of writing these columns my recollection of all that has been said is rather dim. However, the subject has been highlighted again by one of those odd prosecutions which seem to occur periodically, and which has prompted a letter from a thoroughly bemused reader.

It seems that, on the instigation of a P&T (Postal and Telecommunications Department) inspector a Victorian listener was prosecuted for using a Bearcat 210 receiver in contravention of the Wireless Telegraphy Act. He pleaded guilty to listening to amateur, CB, marine and police transmissions. After hearing the various submissions, the presiding magistrate dismissed the charges on the grounds that the receiver was capable also of receiving broadcast transmissions and, by virtue of the Broadcasting and Television Act, did not need to be licensed.

That prompted the following letter from the aforesaid bemused reader:

Dear Sir,

In reference to the above, and in view of the fact that E.A. has published designs for converters and receivers that cover some of the frequencies involved, could you please enlighten me, and other readers, as to what frequencies it is legal and not legal to listen to?

Also what equipment is legal or illegal when listening to the frequencies involved in the court case, and for other frequencies for which you have published designs for receivers and converters? (e.g. the aircraft band).

For example, is it legal for a person, who is not a licensed radio amateur or CBer, to listen to and use equipment which receives frequencies allocated to these services? Also what about aircraft, fire brigade services, etc?

Congratulations on a fine magazine, which I get every month.

J.M. (Carisbrook, Vic).

J.M. has ample grounds for asking such questions. In contemplating the tangle of laws and regulations which affect the use of radio equipment in Australia, one may soon discover aspects that are confused, inconsistent, even ludicrous. In so doing, there is a strong temptation to make fun of the administration of the day but the fact is that the problem is not directly attributable to a particular period or a particular party. It is not even peculiar to Australia — if that is any comfort!

For example, the FCC (Federal Communications Commission) in the United States has just removed the licensing restriction on the home construction of satellite TV terminals. US citizens are now free to construct and install their own backyard receptors for network satellites but they are not free to watch the TV pictures that they might thus receive!

Don't laugh. We'll be facing a similar dilemma here in the forseeable future.

First conceived around the turn of the century, in the days of spark transmitters and coherent detectors, wireless/radio laws and regulations have been adapted, augmented and patched to cope with 80 years of rapidly expanding technology and 80 years of social change.

It is easy to say that they should now be scrapped in toto and reframed; it would be a very different thing to give effect to that opinion. Consider the following needs:

(a) To examine, rationalise and re-state all the relevant laws, regulations and conventions that have been generated in Australia during the past 80-odd years;
(b) To build in the flexibility necessary to cope with ever-changing needs and technology;
(c) To accommodate to the fact that spectrum management (therefore Australian laws, regulations, etc) is a matter for continuing international debate and determination;
(d) To get all that through Parliament and on to the statute books, without a whole new batch of cumbersome amendments.

If you think that that's likely to be accomplished within the next decade, then you're an optimist, to say the least. I share the view that we'll be living with what we have for a long time to come.

As I mentioned earlier, the administrative structure to do with wireless communication emerged around the turn of the century, headed up by the Wireless Telegraphy Act of 1905. At the time, attention was focussed on short-range and maritime message handling, with international traffic and military applications in further view. Prominent in the provisions of the W/T Act was an obligation on those in a position to in-

Comment on our February editorial

AMATEUR RADIO 1980

I've got a new transceiver
It's synthesised of course,
It sends all modes and RTTY
And generates the Morse.

It's got a micro in it
Which calls and logs them too.
It prints the QSL cards,
There's nothing left to do.

And so I'll lock the shack up
And let it have a ball.
And I'll go weed the garden.
IT WON'T NEED ME AT ALL!

Roy Hartkopt VK3AOH

tercept wireless messages to preserve the secrecy of those messages. That provision is still there, untarnished by the passage of time.

The public became involved in wireless much later, around 1920, when AWA and pioneering amateurs began to transmit regular programs of voice and music. Regulations were set up to formalise the operation of amateur stations and these have been subject to progressive changes ever since.

Public broadcasting, as a distinct service, began in 1923 under its own umbrella of regulations and controls, which are still evolving.

Likewise television, FM broadcasting, public broadcasting, CB radio, mobile services, point-to-point services, maritime and emergency services, aircraft services, and so on — a bewildering array for which Australia has to regulate its use of the spectrum, both in the domestic sense and with respect to other nations through the ITU (International Telecommunications Union).

But let's get back to the average citizen.

Things were simple then

During the twenties and early thirties, the position of broadcast listeners was relatively unambiguous; they paid their licence fees and listened gratefully to the range of broadcast band stations which they managed to receive. That was about all there was to it.

But shortwave broadcasting stations began to appear and, with them, came the fad for multiband receivers. The question naturally followed: should they attract a special licence? In fact, they never did; it was accepted that the extra bands didn't count. If a receiver included the broadcast band (they all did) it was completely covered by a broadcast listener's licence, other facilities notwithstanding.

Since then, the requirement for a broadcast listener's licence has been waived but the principle established earlier has carried over: Australian residents may own and operate broadcast receivers without need for a licence — and that includes receivers which provide coverage additional to the normal broadcast services on medium wave, shortwave and VHF FM.

It was presumably on this basis that the case against the Victorian listener was dismissed.

The magistrate's ruling effectively puts the lid on that case, but the lid doesn't fit too well!

In between the various shortwave broadcast stations are amateur bands (for example) and amateur traffic can be copied on many multiband receivers. Is a listener unequivocally within his rights in listening to amateur (or other) traffic when using a receiver regarded as legal under the Broadcasting and Television Act? That is the basic point which concerns J.M.

The fact is that the Broadcasting and Television Act has nothing to do with amateur band (or any other communication channel) management or use. These are purely the concern of the Wireless Telegraphy Act, which is very specific and very narrow. In effect, it says that no person may establish, erect, maintain or use equipment capable of transmitting or receiving wireless transmissions without an appropriate licence.

Clearly the Victorian P&T prosecutor believed that the W/T Act had force and precedence, even in respect to the act of listening (ironically) to the WIA "Broadcast"! If he hadn't, he would never have pursued the matter.

Herein lies an apparent conflict between the two separate acts as they affect a multiband or communications receiver. One would seem to impose a licence requirement; the other can be interpreted to render a licence unnecessary. I quote from "Amateur Radio", Nov. '79, page 24:

"In dismissing the charges, Mr Walker stated that he accepted the submission of Counsel for the defendant that the Bearcat 210 receiver was a receiver capable of receiving broadcast programmes and, by virtue of section 130 (2) of the Broadcasting and Television Act, a licence was not required under the Wireless Telegraphy Act."

Perhaps it's just as well that the magistrate thus ruled, otherwise there would be countless thousands of owners of multiband transistor portables in a legal quandary: guilty of having maintained and used equipment capable of receiving (non-broadcast) wireless transmissions.

Nor is there any logical way out of the quandary. There is no such thing as an amateur band, or CB band, or maritime channel listener's licence. You either qualify and pay for the full transmit/receive licence — or nothing. Nor is there a way in which a private individual can get any kind of a licence to cover various other non-broadcast transmissions which are scattered across the HF spectrum. To my knowledge, there never has been a form of licence applicable to a general-coverage HF (non-broadcast band) receiver.

It boils down to this: If governments around the World, including the Australian Government, endorse a mix of broadcast and non-broadcast services across the HF bands, then they must accept the idea that the latter services will be accessible to millions of listeners using tunable multi-band receivers. How they come to terms with this is their affair; the Australian Government is apparently content to accept multi-band receivers as "broadcast" receivers and to forget the discrepancy with the W/T Act.

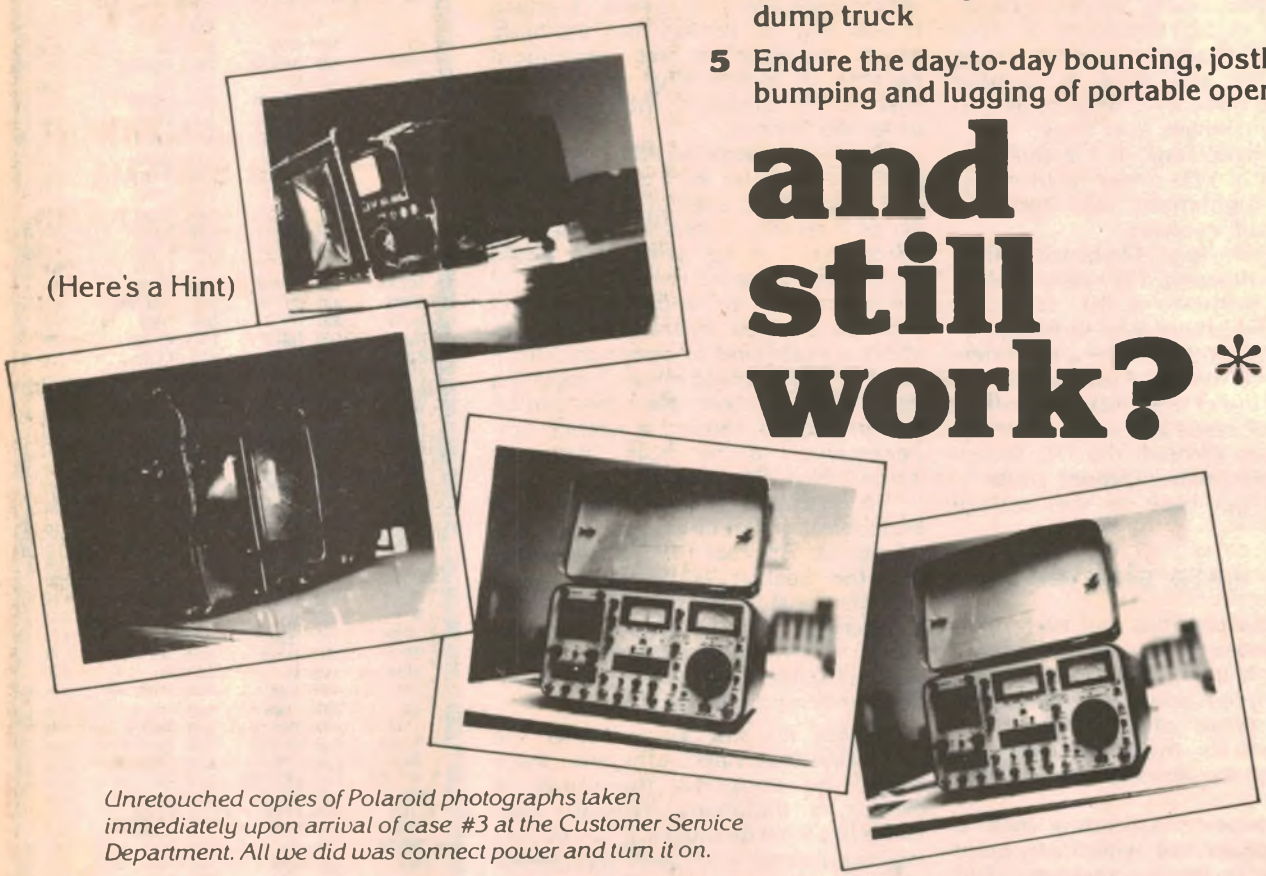
I imagine that many governments around the World are in a parallel situation.

what can

1. Fall from the back of a moving truck
2. Bounce down the stairs of a drilling platform
3. Survive a helicopter crash
4. Withstand being rolled over by a loaded dump truck
5. Endure the day-to-day bouncing, jostling, bumping and lugging of portable operation

and still work?*

(Here's a Hint)



Unretouched copies of Polaroid photographs taken immediately upon arrival of case #3 at the Customer Service Department. All we did was connect power and turn it on.

*answer: IFR Service Monitors...

FM/AM-1000A and FM/AM-1000S

All of These Features Are Standard...at a Price Far Below Competitive Monitors

- FM/AM Generator 100 Hz to 1 GHz
- Built-in Battery
- DC-1 MHz Oscilloscope
- RF Wattmeter with built-in load — 20 watts continuous, 100 watts for 30 seconds
- FM Deviation Meter
- Sensitive Monitor Receiver
- Precision Audio Generator 5 Hz to 10 kHz...(FM/AM-1000S) 10 Hz to 10 kHz plus 1 kHz fixed tone
- RF Output 0.05 μV to 5000 μV (FM/AM-1000A) 0.05 μV to 224 mV (FM/AM-1000S)
- Accurate Master Oscillator FM/AM-1000A — Oven-stabilized Crystal 0.00005% FM/AM-1000S — TCXO 0.00005% (typically 0.00002%)
- Spectrum Analyzer (FM/AM-1000S)
- RUGGED CONSTRUCTION

Australian, PNG, N.Z. and Pacific distributors:

WICOM

Sydney: 339 Pacific Hwy, Crows Nest. Ph. 436 2766
Melbourne: 68 Eastern Rd., Ph. 699 6700

FORUM: Listeners, licences & legalities

But, having accepted the principle, the number of additional bands a receiver has is beside the point, as also is its technical specifications and whether it is classified as a "portable", "super DX", "communications" or what have you. Some such receivers do happen to cover frequencies used by aircraft services, by government instrumentalities, commercial operators, and such like.

So what? They're still "broadcast" receivers, and therefore free of licence obligations under the B&T Act.

One other point should be made:

The secrecy provisions of the W/T Act might have made sense in the days when wireless equipment was primitive and when potential eavesdropping listeners were few and far between. Today it is ridiculous to expect or legislate for privacy or confidentiallity in any plain language transmission.

As for eavesdropping on amateur and CB transmissions, as per the Victorian prosecution, it would be like trying to enforce privacy of an aerobatic display! Indeed, the concept of privacy is foreign to either service, by their very nature.

What about converters, another point raised by J.M.? I would see that as only a slightly different shade of grey.

A converter coupled to a "broadcast" receiver becomes an integral part of a broadcast receiving system. Electrically, an external converter may be little different to a similar lump of circuitry inside a double-change superhet.

Certainly, none of our converters to date have ever been questioned on legal grounds.

Without seeking to quote time and place, I have talked these matters over on many different occasions with people from the PMG and P&T departments. While they admit to the occasional officer being "a bit keen", they are basically not worried about the person who technically breaches the W/T Act by listening casually to a non-broadcast signal. To paraphrase:

"If we spent our time prosecuting such people, about the only ones who would benefit would be the legal fraternity! We've got our plate full of more urgent things."

What the Department professes to be much more concerned with are those who break the law and create a nuisance in so doing.

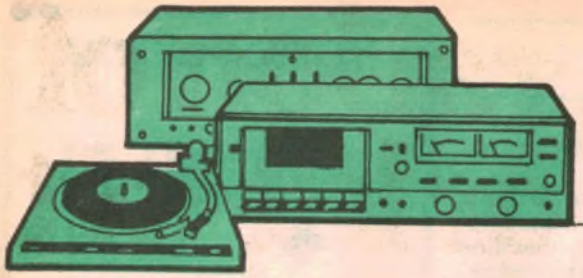
That is why they have often come down on tow-truck operators for allegedly monitoring police and emergency channels, ready to race to the scene of traffic accidents. In the process, they may be guilty of a multiple breach of the regulations: listening without a licence, publishing the contents of a private message, and using the information to their own advantage.

I gather than the prosectuion in these and similar cases is more likely to succeed if it can be shown that the receiver in use can be crystal locked on the disputed channel(s). It becomes prima facie evidence that the person concerned has a vested interest in the information so obtained, as distinct from being a casual listener.

Another kind of person typically at risk is one who has, set up and accessable, an amateur, CB or other transceiver not covered by an appropriate licence. They are obviously in a position to radiate a "pirate" transmission at the push of a button and it is no defence to protest that they have never done so. They are still open to prosecution for having established, erected and maintained or used equipment capable of transmitting or receiving (non-broadcast) messages.

In saying all this, it must be emphasised that I am not qualified to offer expert legal opinion. I am merely discussing a long-standing problem in response to a reader's letter. As distinct from the letter of the law, I would interpret what I believe to be current administrative practice in these terms:

- Owners of multiband receivers which provide coverage of the broadcast band, are free to use them as they please for casual listening.
- Without broadcast band coverage, a tunable receiver lacks the formal protection of the Broadcasting and Television Act but I doubt that a private, casual listener would attract prosecution unless he/she did something irregular to call attention to themselves.
- To repeat, publish or make use of information obtained from a communications transmission may attract prosecution, depending on circumstances. The offender is particularly vulnerable if the user of the channel has reason to complain to the authorities about the breach, and/or if it can be shown that the receiver in use is capable of being locked on to the particular channel.
- Amateur, CB and other transceivers are available fairly freely and merely to possess one is not an offence. But to have it set up for use, even for receiving, without the appropriate licence provides grounds for prosecution.
- Licences issued under the W/T Act are subject to a multiplicity of conditions relative to equipment, frequency, power, operating procedures and so on. The P&T Department tends to be helpful to those who try to abide by the conditions, but just the reverse to those that don't.



Hi Fi Topics

FROM GEORGE TILLETT: THE LAS VEGAS C.E.S. — A MIX OF VIDEO, HIFI AND DIGITAL TECHNOLOGY

This year, attendance at the Las Vegas Consumer Electronics Show was around 60,000 — up 10% on last year. But there was bad news too: a rise of 15% in customer purchase loans and a distinct air of political uncertainty. For most of the 850 exhibitors, the mood could be summed up only as "cautiously optimistic".

Last year, the new videodiscs (now called V-Discs) stole the show and, again, the Magnavision demonstration was always crowded. So was the Pioneer room — although this company's disc player will not be marketed for some time; initial production is devoted to a sophisticated industrial version designed in collaboration with IBM. As for RCA's Selectavision, the last news was that it would be available early in 1981 but, in the meantime, a large range of programs is being organised.

Many new VTR's and cameras were to be seen and some indication of the tremendous interest in video was highlighted by the appearance of five new video magazines — and more are being planned!

Toshiba introduced two new VTR's using the fixed head principle (see our October, 1979 issue). Playing time has been increased from one to two hours and there are 300 tracks instead of 200. This company also had a voice-activated TV set which says "okay" when commanded to change channels. It can only be programmed to respond to two voices — which might cause domestic problems, or solve them!

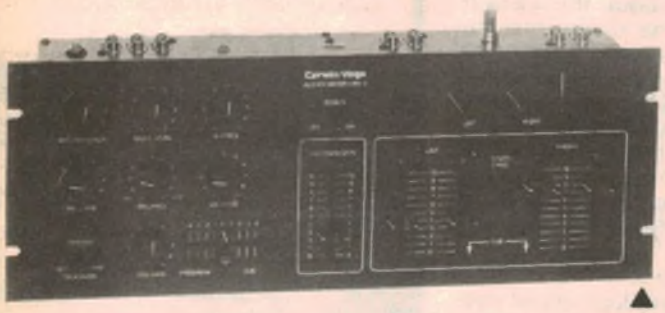
Toshiba were also showing a 4-picture TV using a MPU circuit to compress the scanning. However, this was put in the shade by a model from Sharp which could display nine pictures! I suppose you could watch them all at the same time but the general idea is to provide a quick review of all the channels. Incidentally, this 9-picture set can be controlled by a hand-held remote unit.

Akai had a neat mini-monitor called "Peek-a-View" which is intended for use with their ActiVideo mobile/home videocassette recording system. Screen size is 1½ inches and the whole unit only weighs two pounds! It is equipped with a pause control and it allows the user to see and hear whatever is being taped as well as cutting commercials at the touch of a button!

New VTR's were introduced by JVC, Akai, Sony, Hitachi Magnavox and several others. A typical model would have four to six hours programming capability, provision for remote control, variable speed, fast and slow motion, frame freeze, and an ability to program items a week in advance.

Some are fitted with "Dew indicators" a light that shows if moisture forms inside the unit. If this happens (not uncommon in high humidity areas like Florida where I live) the procedure

A far cry from their one-time sand-filled baffles, Wharfedale were exhibiting this TSR-110, with sloping front panel and trendy floor stand.



What every DJ should have, at least for disco work: Cerwin-Vega were showing this DM-2 audio mixer, which provides the usual volume, tone and balance facilities, plus voice-over and cueing. It also has a tempo-sync facility which allows the DJ to "sync a record to a given beat, thus facilitating smooth record sequences for dancing".

The new generation of factory-built or kit-set Peerless loudspeakers

It's true most speakers *look* alike and that price alone never tells the whole story. But now the new generation Danish-built Peerless loudspeakers give you a recognizable difference in sound quality–a difference that has set Peerless a notch above the others for over 50 years.

The range of new generation Peerless loudspeakers includes the fully assembled *PAS series* plus the money-saving *PLK kit-sets*. Both series contain drive units with the following characteristics.

Peerless 'X' Line Woofers

☐ Large ceramic ferrite magnets for high power handling. ☐ Specially coated cones reduce colouration to a minimum. ☐ Cones are supported by a single-roll foam or rubber surround to maintain excellent linear motion. ☐ Bass response is clean and tight at all listening levels.

Peerless Midrange Units

☐ Sealed back units prevent interaction with the woofer. Distortion and colouration are reduced to a minimum. ☐ The rear side of the cone is coated with a special damping material to eliminate colouration. ☐ Specially impregnated polyurethane cone rim provides high degree of linearity.

Peerless Tweeters

☐ Dome tweeters designed for the highest accuracy of reproduction with low distortion flat response and wide dispersion. ☐ The sealed back isolates the tweeter from interference. ☐ Specially developed dome fabric ensures no degradation of performance even after prolonged heavy loading. ☐ Assembly mounted on a precision diecast plate where rigidity ensures permanent alignment.

Peerless Dividing Networks

☐ Peerless crossovers use air-cored chokes for maximum power handling, and special electrolytic capacitors to ensure long term reliability. ☐ All components are mounted on fibreglass printed circuit boards for maximum durability, while coded clip connectors eliminate the need for soldering.

Power handling

The power handling capacity is high and conservatively rated at 100W RMS, however, due to the high efficiency of Peerless speakers, the recommended amplifier power is between 25-100W RMS.

Whether you settle for the smart timber-veneered PAS assembled series or the PLK kit-set, you're getting the same Danish-made Peerless quality–a quality selected by many of the world's most reputable names in loudspeakers, for inclusion in their own speaker systems.

Contact us now, and discover where you can hear Peerless loudspeakers–then let your ears make up your mind.

Danish-built Peerless loudspeakers, Orthodynamic headphones and unique car speakers are imported by the sole Australian agents,

G.R.D. GROUP Pty. Ltd.

698 Burke Road, Camberwell. 3124. Telephone (03)82 1256. Telex 31712

Please send me descriptive literature and dealer list: BO1294

Name .....

Address .....

Postcode .....

Get The Professional Disco Sound!

Three great reasons why a recent survey published by Billboard Magazine reveals that for the third year in a row Stanton has increased its share of the Disco phonograph cartridge market. The Stanton share has grown to an impressive 55.8%... a full 24 percentage points more than its nearest competitor.

The 500AL, known as the workhorse of the broadcast industry, meets the extremely rugged requirements of live application without sacrificing performance quality.

The 680EL is designed to deliver sound excellence and at the same time stand up to back cueing, vibrations and mishandling.

For home Disco, the 680SL is the perfect choice. It features the patented Stereohedron™ stylus tip assuring longer life for record collections.

From Disc cutting to Disco... to home entertainment ...your choice should be the Choice of the Professionals... Stanton cartridges.

STANTON #1 in DISCO

THE CHOICE OF THE PROFESSIONALS™

Sole Australian Distributors:
LEROYA INDUSTRIES PTY LTD

Head Office: 156 Railway Pde, Leederville, Western Australia, 6007. Phone 81 2930
NSW Office: 7 Jordan Rd., Wahroonga, 2076. Phone 487-2543

Available at quality conscious Hi-Fi dealers throughout Australia!

ON THE VIDEO SCENE AT LAS VEGAS

is to wait a few minutes until the warning light goes out.

Projection TV is slowly gaining in popularity — particularly one-piece systems which take up less space. Toshiba claim that their new projector tube has a brightness of 120FL (footlamberts) compared with 80 to 100FL given by other systems.

☆ ☆ ☆

The new metal film tapes created quite a stir last year and now almost every tape manufacturer has added at least one of these cassettes to the range. Newcomers include Sony, BASF, Akai and Maxell. Some criticism has been made concerning the "overselling" of these tapes — particularly as regards signal to noise.

My own tests with a number of "metal tape capability" decks confirm that there is a significant reduction in saturation at high frequencies, plus an extended range at the high end. Thus, for recordings containing an appreciable high frequency content, it would be possible to increase the actual signal going to the tape, with a consequent improvement in signal-to-noise ratio.

The advantage tends to be less noticeable in decks which are already taking advantage of dbx or Dolby noise reduction. Another problem is that the less expensive (we never say "cheaper") decks do not exploit the full potential of metal tape and, in such cases, the benefit is only marginal.

Be that as it may, every manufacturer was showing new decks with what they call "metal tape capability" and Harman-Kardon claimed to have the first cassette deck with "metal tape capability and Dolby HX".

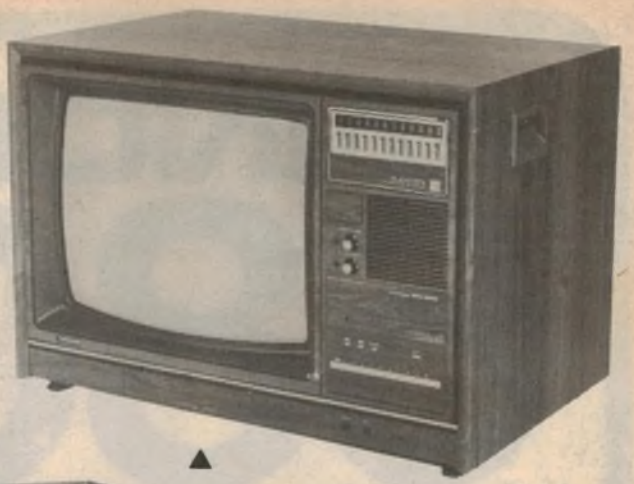
Fisher were showing a tiny microcassette using metal tapes specially made by Fuji and similar miniature recorders were introduced by Aiwa, Olympic, Toshiba and Sanyo.

Prize for "The World's Smallest Stereo Cassette Recorder" goes to Sony for their "Soundabout" which measures 140 by 89 by 32mm! It comes complete with a pair of lightweight headphones and I must say I was quite surprised by the sound quality.

Another demonstration I found enjoyable was put on by KLH in the form of a "live" versus tape comparison. There were two musicians, one playing a guitar and the other playing a double-bass and it wasn't always easy to detect when the tape recorder took over. This, incidentally was a Revox A.700, used with a Dolby "A" system. The loudspeakers were KLH 3's which are small "computer equalised" systems measuring only 320 by 215 by 152cm!

As some readers know, the dbx company recently began an ambitious program, re-mastering original tapes with their noise reduction system and then pressing new discs. A number of record companies have helped with this project and the encoded discs are notable for a remarkable dynamic range, with a velvety quiet background. The master tapes are selected for musical values and/or recording quality and, even if the results are not quite up to modern standards, the absence of background noise more than makes up for it — at least in my opinion.

But dbx have now carried the idea a stage further by introducing a digitally encoded process. This they have done in collaboration with one of the smaller



▲ *This new Toshiba receiver, displayed at Las Vegas, can be programmed to respond to any two voices. Upon a spoken command, it says "okay" and changes to the desired channel. Another Toshiba receiver on display can show four pictures simultaneously.*

◀ *Four simultaneous pictures on a Toshiba receiver is one thing, but this Sharp "Multi-vision" receiver can display no less than nine! The intention, presumably, is to allow the viewer to scan all the available programs, so that he/she can make up their mind what they really want to watch.*

Above: A notably compact video recorder by Akai (left) and, alongside it, a companion TV tuner, with in-built clock and timer. Akai's RC-V10 ActiVideo micromonitor is shown below. Referred to as their "Peek-A-View", it has a tiny 3cm screen which allows the user to check what is being recorded on the cassette system.

ANNOUNCING 68000 DEVELOPMENT SYSTEMS

The EXORmacs Development System for 68000 has just been announced. The system includes 15 slot chassis and power supply, MPU module, memory management module, deBUG module, 128K byte dynamic memory module, and an intelligent floppy disk controller module.

Software includes Structured Macro Assembler/Linkage Editor, screen based editor, symbolic deBUG and a PASCAL compiler.

Peripherals include intelligent CRT console, a 1 Mbyte, two drive double sided floppy disk, and a model 703 (180 CPS 132 column) line printer.

A large number of support modules are also available.

6800/6809 EXORciser Development Systems

The popular EXORciser II Development System is now available in both 6800 and 6809 versions. For those people already owning a 6800 EXORciser or EXORterm Development System, a 6809 upgrade kit is available. Both EXORcisers may be expanded to allow development of the

MC6802/MC6808
MC6801/MC6803/MC68701 MC6805

A wide range of support modules are available, including support modules for PIA, ACIA, SSDA, ADLC, GPIA, CRT controller and universal support module.

High level languages are available for —
6800: BASIC, FORTRAN, COBOL, MPL.
6809: FORTRAN, MPL, PASCAL.

Bulk storage is available on both single and double sided floppy disks. Up to 4 drives are supported.

A 10 Mbyte Hard Disk System is also available with expansion to 40 Mbyte. The Hard Disk System may co-reside with the floppy system to allow easy transfer of old files.

68000 Courses

Rank Electronics has much pleasure in announcing a visit from two leading Motorola lecturers to give courses on the MC68000.

Subjects will include both hardware and software aspects.

Course costs: $250.00 per head for each course.

Dates: Sydney — May 19, 20, 21 and 22.
Brisbane — May 23, 26 and 27.
Adelaide — May 28, 29 and 30.
Melbourne — June 2, 3, 4 and 5.

Hours: Sydney and Melbourne — 9.00 a.m. to 5.00 p.m.
Brisbane and Adelaide — 8.30 a.m. to 7.30 p.m.

For further details and application form please contact:

RANK ELECTRONICS
PTY LIMITED
INDUSTRIAL SYSTEMS

12 Barcoo Street, East Roseville, Sydney 2069.
Phone 406 5666

60 Rosebank Ave, Clayton South, Vic 3169
Telephone 541 8444

299 Montague Road, West End, Brisbane 4101.
Telephone 44 2851

101-105 Mooringe Avenue, Camden Park, SA 5038.
Telephone 294 6555

430 Newcastle Street, Perth 6000.
Phone 328 3933

120 Parry Street, Newcastle 2300.
Phone 26 2466

MAS5561

THE TALKING WHAT-NOTS!

"perfectionalist" record companies — M & K. Initial releases consist of recordings of the Philharmonica Hungarica and I was most impressed with those I heard at the Show.

There were several other well-organised demonstrations (and muscially satisfying) from Wharfedale, B&W, AR and KEF but one of the most interesting items of the Show was an unusual new microphone from Crown.

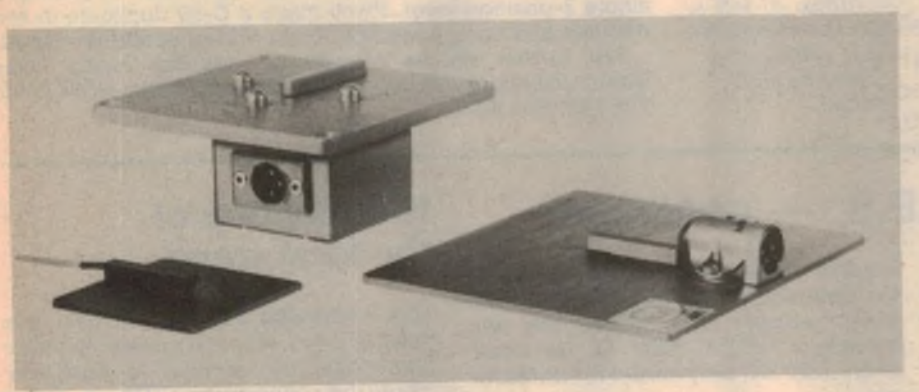
This was billed as "the first really fundamental advance in science and art of microphony in 50 years". A little extreme perhaps, but it does merit serious study and I quote from the leaflet:

"Ed Long and Ron Wickersham, in studying the behaviour of flush-mounted microphones, uncovered a basic error in our thinking. Within a few millimeters of a large surface, sound levels from a pair of equal level signals add coherently because, in close proximity to the surface, the particles are still in phase as they accelerate after being brought to a stop by the boundary. This creates a pressure field right at the surface of the boundary. A pressure field is one in which the instantaneous pressure is everywhere uniform — there is no direction of propagation."

The Quasar talking microwave oven. A voice synthesiser below the control panel announces the temperature of the food, cooking time and "Enjoy your meal!"

You don't even have to open your eyes in the morning if you have one of these Sharp talking clocks. When triggered by the hand-held remote control, it will speak the time in a synthesised human voice similar to that used in talking calculators.

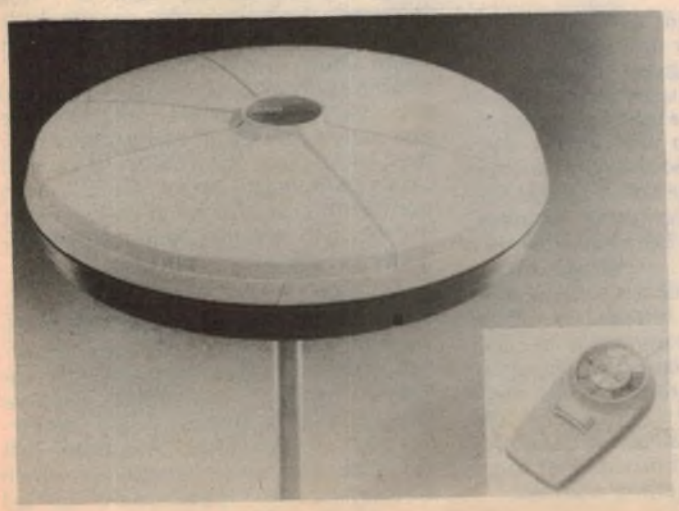
One line of thinking about microphones is that they should create a minimum amount of disturbance in the sound field. The PZM microphone would appear to exploit the reverse philosophy, with the transducer being mounted within is intended to create a local pressure field. According to George Tillett, the results were most impressive.



And so two engineers, Long and Wickersham have made use of this principle by designing the PZM microphone (Pressure Recording Microphony) which uses a special electret capsule mounted with a flat plate spaced about 0.05 inches away.

Several hundred have already been sold to recording studios who report excellent results — particularly with piano "pickup" I was most impressed with a demonstration when a PZM microphone was compared with a well-known European model costing more than ten times as much. The gain in clarity and definition was almost unbelievable. Why aren't the big companies interested in this idea?

The inventor's answer referred to the NIH syndrome (Not Invented Here) but I will be surprised if the success of the PZM doesn't change some attitudes because it does represent a significant advance in technology.



RCA's latest version of their "Mini-state" TV/FM antenna. The saucer-shaped radome is 533mm in diameter and contains a rotatable antenna, with solid-state head amplifier, capable of receiving VHF and UHF signals. It can be used indoors or out of doors and is rotated by means of the controller shown inset.

An enormous number of new calculators were shown: Sanyo have one with a built-in clock which has an alarm with stop-watch facilities — plus a calendar, and a similar model was introduced by Panasonic who also featured a more sophisticated model with dual clocks, four alarms and a 200-year calendar. (This one must really be built to last!) Sharp's EL-308 is a 10-digit desk top display calculator which can recall each step at the touch of a button while the "Talking Calculator" model confirms entries verbally with a voice

Cassette copying made easy

In recent years, the audio compact cassette has become a widely accepted means of communication in areas such as entertainment, instruction, training, welfare, etc.

In many such applications, the need arises for multiple copies of certain cassettes and the need is sometimes met by simply patching together two ordinary cassette decks — a procedure that is necessarily slow and cumbersome and not always very successful if the decks are incompatible in terms of signal level.

In response to the need, equipment manufacturers have developed a variety of cassette copiers which normally operate at much higher than normal speed and which copy the total contents of a cassette in one pass. Two channels are needed for mono cassettes, four for stereo cassettes — the latter involving somewhat higher cost.

Audio Telex Communications Pty Ltd, who are active in this field, say that a typical 1-to-1 desk copier will duplicate a C-60 cassette in a single pass in two minutes, with a capacity of up to 200 copies per working day. Little maintenance is required apart from regular cleaning. A typical stereo copier of this general type may run to around $1650 (if tax exempt). Typical users of 1-to-1 copiers include schools, church or mission groups, training officers, personnel managers, marketing executives, etc.

Where a larger throughput is necessary, it is normal practice to add slave units to the basic 1-to-1 copier. A master/slave combination providing three copies at a time can produce up to 700 copies per working day and will cost from around $3800 (excluding sales tax).

At the other end of the scale, the Telex Copyette 1&1 sells for $549 (excluding tax). Designed for use by non-technical personnel, it features very simple operation involving a single 3-position lever. It will make a C-60 duplicate in two minutes at a copy speed of 30ips; rewind speed is 120ips.

For further details of cassette copiers: Audio Telex Communications Pty Ltd, 1 Little St, Parramatta, NSW 2150. Tel: (02) 634 4344.

Above: A mono cassette Copier I (right) and a Copier II slave unit capable of producing three copies in two minutes. At left is the new Copyette 1&1, simple and economically priced.

THE LAS VEGAS C.E.S. — continued

synthesizing system.

A similar "chip" is used in Sharp's Talking Clock which "relates the time in a human voice".

Interesting — but Toshiba were demonstrating a completely voice controlled audio system. This, in turn, was capped by Quasor, who have come up with — wait for it — a talking microwave oven which announces the food temperature, cooking time remaining and then tells you to "enjoy the meal" when it is ready. Can you imagine a kitchen full of blue smoke with a thin metallic voice saying "enjoy your meal, enjoy . . .!

IN BRIEF

RCA had what they called a "Mini-State TV antenna system" which comes complete with a small remote control unit. It consists of a 53cm saucer shaped radome containing a uni-directional UHF/VHF antenna, solid-state amplifier and rotator. A matching transformer is included with coaxial connecting cable, ourdoor mast mounting bracket, legs for optional indoor mounting and the power supply unit. There are two models, a 12V DC/120V AC for boats, and a 120V AC only model for domestic use.

Bose introduced a "Spatial Expander" time delay unit which uses a CCD (Charge Coupled Device) . . . Cerwin-Vega introduced a novel mixer unit which features a built-in "beat synchronizer" to help the weary disc-jockeys . . . Babb Sound Corporation are making a range of loudspeakers which do not use centering "spiders" or rear suspensions. The voice coil rides on a teflon ring . . . Sanyo had a microwave oven which is said to offer "80 programmable recipes" — 25 of which are pre-programmed at the factory while the purchaser can "program 55 additional favourites". Well, that's what the leaflet said — but I never did find out what it was all about. It sounded as if a man could buy one of these gadgets instead of getting married.

Hifi roundup of the local scene . . .

TDK (Australia) Pty Ltd are currently making every effort to ensure that their name becomes familiar to Australian would-be consumers. TDK is being featured Australia-wide on roadside hoardings, advertised on radio in the major cities, and has become an identifiable sponsor of sporting events, and even tours. Meanwhile, reflecting the company's interest in ferrites generally (Jan. issue, page 30), TDK have opened a new plant in Sao Paulo, Brazil, to turn out ferrite cores for small coils. In fact, it is the sixth overseas plant to be opened by the Japanese company.

RALMAR AGENCIES advise that Mick Whiting has joined Source International as the sales representatives for Ralmar products in Victoria. Source International is located at 139 Canterbury Rd, Toorak 3142; telephone (03) 267 3028. The same Newsletter which announced the appointment carried

RARE ADDITIONS FROM MARANTZ WORTH READING ABOUT. AND LISTENING TO.

Rare: very valuable.
Addi'tions: the things added.
Ma'rantz: a range of ultra-high performance sophisticated components blending state-of-the-art engineering and operational versatility.

Marantz rare additions will add a new dimension to your musical enjoyment — so hook up with your local Marantz dealer and listen to your add-on or upgrade component outperform anything you've heard to date.

ST-500 AM/FM STEREO COMPUTUNER
features state-of-the-art electronic quartz-locked synthesized tuning with 14 station (7 AM, 7 FM) memory presets. AM tuning is particularly sensitive and, with more FM stations due in 1980, the ST-500 tuner is a sound investment for the future.

PM 700 INTEGRATED AMPLIFIER
features Dual 5-band Graphic Equalizers and delivers 70 watts True Power per channel into 8 ohms.

The current interest in high-definition moving coil cartridges makes the built-in moving coil head-amp on the PM 700 a particular plus. This model offers the most demanding audiophile a new concept in power, price and performance.

SD 8000 2-SPEED CASSETTE DECK
takes your system beyond the traditional limits of cassette deck technology. The Compudeck Feather-Touch control centre (inset left) offers superior programming capability, e.g. up to 19 selections in whatever order you wish. Two speeds give you the flexibility of true high-fidelity recording at 3-3/4 i.p.s. plus the economy of 1-7/8 i.p.s. when recording time is a factor. Also: Dolby Noise Reduction; digital display including clock and LED meters.

Your Marantz stockist will demonstrate the unmatched quality of Marantz components. If you demand critical performance standards hear Marantz.

marantz
Now you're listening.

Distributed by: MARANTZ (AUST.) PTY. LTD.
32 Cross Street, Brookvale, N.S.W. 2100
Telephone: (02) 939 1900 Telex AA 24121
Melbourne (03) 329 7655 Brisbane (07) 48 8882
Adelaide (08) 223 2699 Perth (09) 328 3874
Hobart (002) 44 4077

The $399* Nakamichi

New Nakamichi 480 metal compatible 2 head cassette deck.

If you know Nakamichi products, you'll know $399* sounds too cheap for real Nakamichi quality. But if you know Nakamichi, the man, you won't be that surprised.

Nakamichi's genius for innovation has created a new Nakamichi range that makes brilliant reproduction at incredibly reasonable prices a reality.

Take the new 480. It is the personification of Professor Nakamichi's latest technology and his policy of producing components with an excellent performance/cost ratio.

Nakamichi 480 can play and record conventional and the new metal tapes and is available with an optional remote control unit. It has a frequency response of 20Hz-20KHz (-20dB Rec. level), wow and flutter less than 0.11%WTD peak, 0.06%WTD rms, signal to noise ratio (Dolby NR In, 70μs) — better than 62dB at

Optional remote control unit.

400 Hz, 3% THD WTD rms, cross-talk better than 60dB at 1KHz, 0dB, erasure better than 60dB below saturation level at 1KHz and total harmonic distortion less than 1.0% at 400Hz, 0dB (ZX, EXII tapes) and less than 1.2% at 400Hz, 0dB (SX tape).

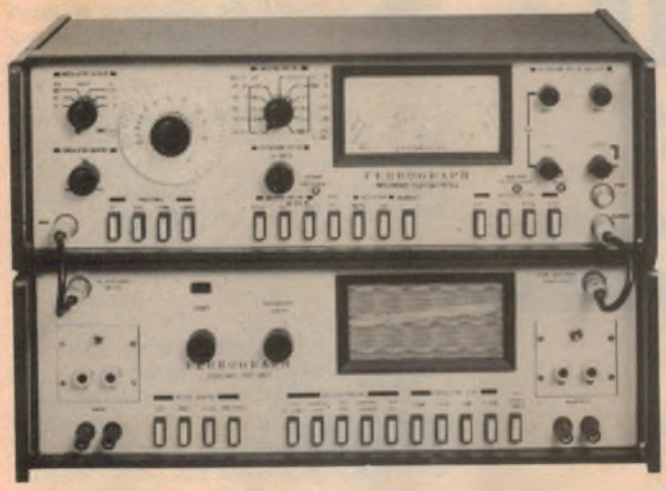
And if you're not sure about all that technical jargon, it means, quite simply, that the Nakamichi 480 performs brilliantly. But don't take our word for it. Experience the difference Nakamichi technology makes to high fidelity sound reproduction by visiting your nearest Nakamichi dealer.

Nakamichi

Products of unusual creativity and competence.

For further information contact:
Convoy International, 4 Dowling Street, Woolloomooloo, NSW 2011. Phone (02) 358 2088

*Recommended retail price.



Having renewed their association with Ferrograph (January issue p.33) British Merchandising Pty Ltd advise that they can supply the Ferrograph audio Test Set RTS2 (top) and its Auxiliary Test Unit (bottom). For details and evaluation report, contact them at 49-51 York St, Sydney.

brochures for a varied range of Intercom systems, a two-station telephone system and a doorphone set with door opener. A second 8-page brochure lists a whole range of cassette and tape accessories, including head cleaners and de-magnetisers, bulk erasers, tape splicers, cassette maintenance kits, labels, winders, and so on. Also featured are a variety of record care devices, cleaners, anti-static eliminators, preener brushes, and such like. For details of Ralmar products, their head office is at 23 Atchison St, St Leonards, 2065. Phone (02) 439 6566.

FREEDMAN ELECTRONICS PTY LTD are currently offering amplifer equipment sufficient to make the mouth water of any professional musician. In particular, they are marketing a comprehensive range of amplifiers by Carlsbro of England, which have been re-styled and up-dated for the new decade. Not surprisingly the amplifiers bristle with modern features: digital channel switching, with remote foot control; parametric equalisation; delay line, chorus/ADT, and vibrato; LED status indication; twin sustain; band pass filters; improved reverb; recording output for direct studio link; and so on. Also of interest is a 5-channel "Studio" stereo mixer model DM-1500A — intended for use in studios or by disc jockeys. Complete with graphic equaliser and other facilities, it sells for $199.00. For those interested in microphones, a Numark Ulti series uni-directional electret model UC-965 is available for $55.00. For further information: Freedman Electronics Pty Ltd, 89-91A Liverpool Rd, Summer Hill NSW 2130.

G.R.D. GROUP PTY LTD are marketing the Peerless "Caphon" car speaker system ALS-3. Designed to be bracket mounted on the panel behind the rear set, it is intended to bring to car stereo some of the pleasures of quality, wide-range listening. A three-way system, it crosses over at 1200 and 5000Hz and is credited with a response range from 45Hz to 22kHz. Impedance is 4 ohms nominal, and power handling capacity 20W RMS, or 30W on peaks. Overall dimensions are quoted as 190 x 115 x 110mm, with a gross volume of 2 litres. For further information: G.R.D. Group Pty Ltd, 698 Burke Rd, Camberwell, Vic 3124. Phone (03) 82 1256.

PIONEER ELECTRONICS AUST. PTY LTD say that much of the credit for their current series of HPM hifi loudspeakers must belong to Bart Locanthi, a Research Associate at the California Institute of Technology. Formerly Vice President of Engineering for JBL, and Director of Acoustical Engineering for Altec Lansing, he joined Pioneer North America in 1974, specifically to develop speakers for the American market.

The resulting HPM series was released in Australia in 1976 and upgraded in 1979. The current range consists of three 4-way systems and a 3-way system, each incorporating a "high polymer molecular film" supertweeter — virtually an electrostatic type using the electret principle. Being curved, the tweeter tends to radiate evenly across the listening area.

At the bass end, extensive use is made of a carbon fibre blend to produce cones of minimum weight and maximum rigidity. And, in between, the mid-range drivers have been refined by the dual process of computer analog analysis and prolonged listening tests. All drivers in the HPM series use cast aluminium rather than pressed metal frames.

The four models in the HPM series cater for nominal power inputs from 40W up to 150W and range in price from $399 per pair to $1399 for a pair of HPM-150s, which incorporate a horn-loaded omni-directional tweeter. (Rod Knapp, Pioneer Electronics Aust Pty Ltd, 178 Boundary Rd, Braeside, Vic 3195.

AUDIO TALK

TORQUE*

by TUNGIN CHEKE

The ultimate still evades us . . .

Despite the enormous advances made in hifi equipment design during the past couple of decades, and despite the promise of digital audio in the next, we are still a long way from the ultimate: true DC coupling all the way from the original sound source to the inner ear.

Like perpetual motion, DC coupling is something that visionaries dream about and talk about, but never seem to achieve in practice.

The earliest crystal sets, which sounded so unaccountably "sweet" did employ direct coupling from antenna to headphones but, immediately the manufacturers tried to make them louder, out went the DC coupling and in came transformers and capacitors — and they've been with us ever since!

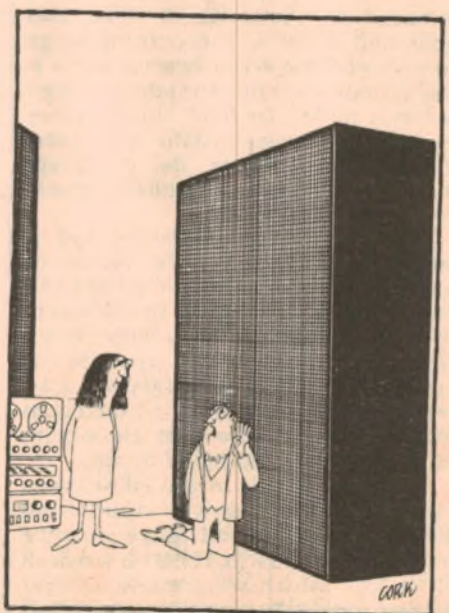
In the '30s and '40s desultory attempts were made to resurrect the DC idea but they never got beyond coupling two or three stages, at most.

Now DC coupling is back in the news, in the adverts and in the front panel markings of numerous modern amplifiers. Implicit in the term is the assumption that an amplifier so marked can respond right down to "zero frequency", and reproduce non-cyclic voltage shifts at its output socket.

What they don't tell you is that the section involved — the power amplifier — is only part of the amplifier chain and a relatively small portion of the overall reproducing system. They omit to mention that there would need to be a complete revolution elsewhere in the system for direct coupling in the amplifier to assume any real sonic significance.

Take, for example, the broadcasting and recording chains which provide the source signal for virtually all our hifi listening; they employ AC coupling throughout. Not even the much vaunted "direct cut" discs are "direct coupled". The groove follows a mean path dictated solely by the mechanical recording lathe; signal deviations from that path are purely cyclic or "AC" in character.

But even if recording engineers were to devise a scheme whereby the groove carried a displacement or "DC" component, it would be ignored by even the best modern pickups. It would simply be tracked by the arm, leaving the cartridge to respond only to the AC component — the wiggles in the groove.



"I'm going to keep right on trying until I can hear a response down to DC at the very least!"

Worse still: magnetic cartridges are velocity sensitive by nature and simply cannot translate a sustained sideways shift into a DC signal. To achieve that facility, it would be necessary to turn the clock back to a rigid arm driven by a lead-screw and fitted with, say, a piezo type cartridge.

Such a decision might work wonders for English Cosmocord but it would meet vehement opposition from firms like Shure, Ortofon, Stanton, Empire, Technics, Philips, and the rest.

Fortunately, the new digital record/replay systems would seem to have the potential to encode and recover non-cyclic ("DC") pressure phenomena at an original performance, additional to what normally passes for sound: the mean barometric pressure on the day of the performance; the changes in pressue due to wind gusting outside; the effect when a concert organ discharges air into an auditorium through mutiple pipes; the localised huffing and puffing of an impassioned vocalist.

If all that — and possibly more — were captured and recorded for subsequent replay, it might give a completely (yes, completely) DC coupled amplifier something to work on. An oscilloscope across the output terminals would not only show the expected pattern of (audible) audio frequencies, but also some quite intriguing DC offsets.

NEW LOUDSPEAKERS?

But there the matter would end. The output transistors might become variously warm or ruddy, and the speaker cones might shift this way or that, but the air pressure drama would be totally lost on the listener draped in the lounge chair yonder. All he/she would ever hear would be the AC component — the old-fashioned frequencies between 16 and 16,000Hz.

What to do then?

The first thing that would have to go would be the now-conventional vented speaker enclosure and, with it, the mathematical design doodlings of Thiele and Small; plus the fancy computer programs used by Wharfedale, KEF and others.

Whatever its merits in the mere audio range, a vented loudspeaker would be hopeless when it came to creating a long-term change in air pressure in the listening room.

Who needs a pump with a hole in it? Who would dream of trying to blow up a toy balloon if they couldn't block off their nostrils?

At the very least, one would have to reach again for those ageing Philips design manuals, that tended to favour the sealed enclosure approach. But even those designs would be found to be wanting. The sealing was nominal rather than hermetic: sufficient for the then purpose — and no more!

*** Alternatively "Twisted HIFI" first published in "Electronics Australia", April 1 1980.**

But rather than try to produce woofers which could double as pressure pumps, it may be necessary to make quite separate provision for reproducing the "DC" component in the listening room. In so doing, it might be good to indulge in some lateral thinking, discarding altogether the loudspeaker stereotype.

One might envisage, for example, two storage cylinders under the floor, one pressurised and the other evacuated, with a suitably shrouded nozzle mechanism in the listening area. A slide valve responding to the "DC-audio" signal would expose the nozzles and raise or lower the room pressure as required.

Whatever the method, the hifi system of tomorrow would therefore involve up to five types of transducer: tweeter, squawker, woofer, sub-woofer and puffer!

In some circumstances, the end effect could be sensational. One might imagine, for example, a recording of a speeding express train made in a tunnel; of the "1812 Overture" with cannon fired inside an auditorium; or, yet again, of the collision scene in "Airport '75" as the jet loses cabin pressure!

Telarc's digital best would fade into insignificance by comparison.

To make all this valid, the listening room itself would have to be hermetically sealed, at least during listening sessions. If it were not, the DC component would leak out through cracks and under doorways, leaving only the AC residue to provide what little enjoyment it could.

For serious or prolonged listening sessions, it may be inconvenient to break the seal for purely incidental reasons and a cubicle containing toilet facilities, etc, might be a desirable provision in the re-styled listening room. Conventional plumbing would, of course, be unacceptable but the differential in external/internal air pressure could be countered by adapting the techniques already used in aircraft and submarines.

One final problem remains: that of the human ear itself.

It is not DC coupled, unless one is fortunate enough to have a heavy cold or an ear infection of a particular kind.

The culprit is the Eustachian tube, which humans unwittingly developed before they understood the joys of "DC-fi". Defined as "a slender duct connecting the tympanic cavity with the pharynx", it is supposed to prevent the ear drum from being distended more than temporarily by long-term changes in air pressure. More to the point, it turns the ear into a mere "AC" signal receptor.

It would be an utterly frustrating situation if, after devising multi-facetted technology to extend hifi reproduction into the zero-frequency area, the whole effort was to be defeated by an intrinsic limitation of human auditory perception.

In an effort to establish the complete auditory effect of period cannon fire, members of the EA technical staff have been seeking to re-create the original listening situation.

Challenged on this aspect, an otherwise helpful medical consultant was anything but forthcoming:

"Yes, the Eustachian tubes do have the effect complained of . . .

"It might be possible to tie them off surgically — a kind of Eustachianectomy . . .

"It would be very uncomfortable, and persons so treated might thereafter find airplane travel something of a problem. Likewise mountain climbing . . .

Which just goes to show how the average doctor thinks. Who wouldn't readily forego plane travel, etc, if it meant that they could experience, for the first time, the joys of "DC-fi" sound reproduction?

In fact if the many thousands of jet aircraft currently plying the air routes were thus rendered redundant, enthusiasts would have at their disposal many thousands of ideal listening rooms: soundproof, acoustically treated, comfortably furnished, with airtight doors and windows — and in-built washrooms!

Hmmm . . . when the Prime Minister is finished with his 707s . . .

From Nakamichi: High-Com II and the 680 cassette deck

In the very forefront of cassette technology, Nakamichi's new model 680 deck combines top performance, using conventional tapes, with full metal tape compatibility and a half-speed provision for extra long play. Its performance can be further enhanced by mating it with Nakamichi's new High-Com II compressor/ expander unit.

The new Nakamichi 680 cassette deck. The front panel is finished in matte black with white lettering. The rack mounting brackets can be readily removed, if not required.

The new 680 deck is a natural development from the model 580, reviewed in May 1979. On that occasion, and after looking at Nakamichi's all new transport system, we hazarded the guess that it had been designed with a view to ultimate half-speed operation and the possible use of metal tape.

Both predictions turned out to be well founded and, in the following September issue, we were able to report a personal meeting with Mr Eddie Nakamichi, at which he gave us a quite intriguing preview of the new 680 two-speed, three-head, metal-compatible deck. Displayed with it was a companion "High-Com II" anti-noise compander unit, using technology jointly developed by Nakamichi and Telefunken.

In that issue, we explained the options which had confronted cassette deck manufacturers and the reasons which had led Nakamichi to follow their chosen course. That article (Sept '79, p.41) could well be read in association with what follows.

More recently we have had the all-too-brief opportunity to examine the units at first hand, in our own laboratory.

Physically, one does not need to be told that they are Nakamichi products, styled for the dedicated (and well heeled) enthusiast, who dislikes compromise.

With controls concentrated on the front panel, and connection facilities on the back, the 680 is compatible with traditional "19-inch" rack mounting — or its modern equivalent. Actual dimensions are 482mm(W) x 143mm(H) x 340mm(D), and the weight 9kg approximately.

The High-Com II unit is of similar width but only 82mm high and 270mm deep. It mates naturally with the 680, to form a very ambitious system.

On the front panel of the 680 deck, the cassette compartment with see-through cover is at the left and, beneath it, access holes for precision adjustment of the height and azimuth settings of the respective heads. Only the record head is user adjustable.

The tape control microswitch "buttons" are grouped at lower centre panel and are notable for their smoothness of operation. Nakamichi have gone one better than solenoid control by providing a third motor purely to activate the mechanism. Their thinking is that controlled motor drive is more elegant than solenoid drive.

Just above the buttons is a "pitch" control, which is normally left in its centre-detent position. By rotating it one way or the other, tape traverse speed can be varied on playback to achieve an increase or decrease in the musical pitch of the recording. It has no effect in record mode.

To the right of the buttons are four knobs: speed selection (normal or half); output signal level control; input signal level control (concentric L and R); master input level control.

Ranged above the control knobs is a line of 12 screwdriver adjustments

The High-Com II is a 2-band stereo compressor/expander, with a linear encode/decode ratio of 2:1. It offers a potential noise reduction of 20 to 25dB, with a rated distortion level of less than 0.1% and a substantially flat response from 20Hz to 20kHz. It can be used, in its own right, in any audio context but has been styled to mate naturally with the 680 cassette deck.

which allow the user to set up the unit for optimum Dolby tracking with different classes or brands of tape — this with the aid of an in-built 400Hz calibration oscillator.

Because of lack of time, we accepted the factory settings and used tapes recommended by the manufacturer. However, the user's manual indicates that, with more time available we could possibly have obtained improved performance in some instances.

A row of seven toggle switches at the right hand end of the panel cater for: power on/off; monitor signal select; auto timer; fluorescent display mode; Dolby and MPX on/off; equalisation select; tape type select.

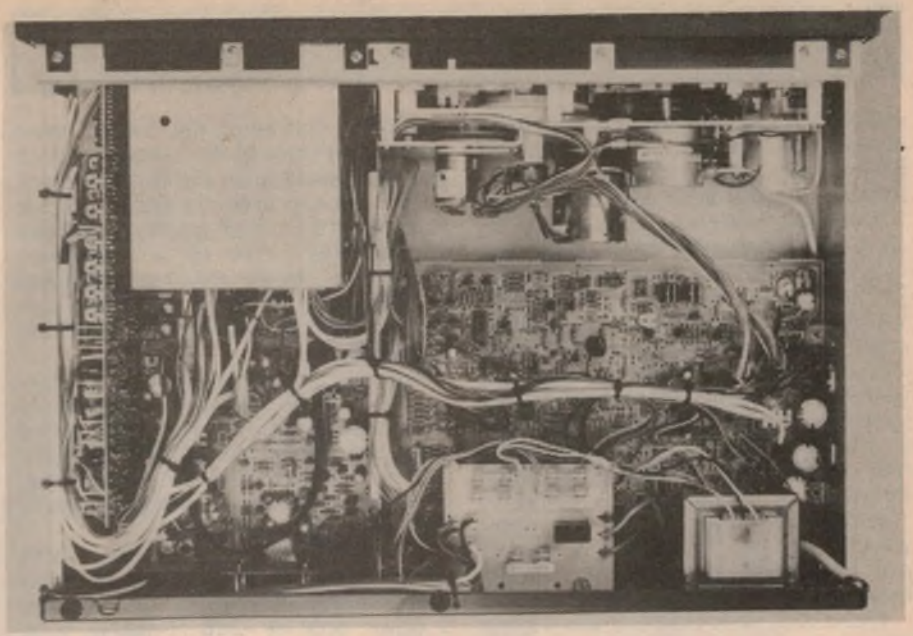
Last but not least, a rectangular window on the upper left side of the panel accommodates a twin fluorescent level display, plus a number of other tape control facilities. The display is calibrated over the quite impressive range of -40 to +10dB, with what is effectively two sets of indicators and three operating modes.

When switched to "P Hold" mode, the main bar graph display extends outwards from the -40dB point, depending on the instantaneous peak signal level. (The left channel is displayed at the top, the right channel below it). A second and brighter vertical line, with a long decay characteristic, moves ahead of the main bar graph and "remembers" the peak level attained during the previous time period; Nakamichi refer to it as the "cursor"..

In the "VU" mode, the cursor continues to function as before but the main display behaves more as a traditional VU meter.

The display can also be switched to "Cal" mode to give an expanded display either side of 0VU for calibration purposes. All told, it adds up to a very accurate, versatile and readable system.

Other items in the same window include a tape counter and reset, plus a "memory" facility that operates in conjunction with it. And there is what Nakamichi refer to as "RAMM" — Random Access Music Memory. By sensing the silent spaces between tracks, the system allows the operator to sort through any number up to 18 tracks per side, selecting, rejecting, or replaying particular tracks, as desired, by appropriate button pushing.



Obviously, there has to be a lot of electronics inside the 680 cassette deck but it is well laid out for ease of access on three main P/C boards, with colour-coded interconnecting leads. The 3-motor drive mechanism is at the top right, while the fluorescent signal level display is inside the shielded box at top left.

If all this sounds confusing, it certainly can be at first encounter. But the Nakamichi 680 is intended primarily for the enthusiast market and it must be assumed that such a purchaser will take time off to study the quite comprehensive Owner's Manual which comes with the deck.

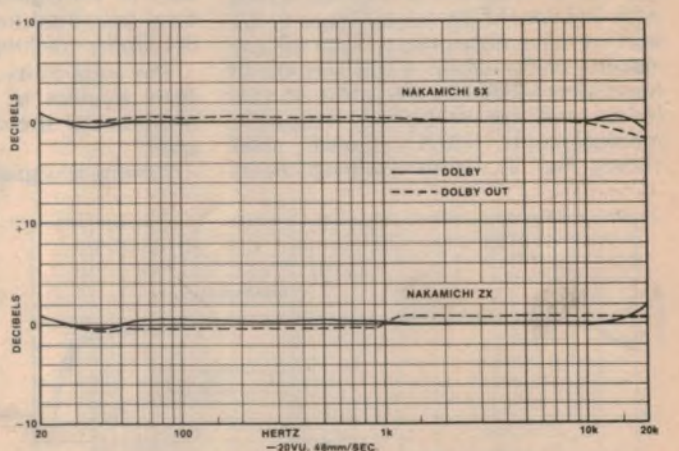
At the rear of the deck are RCA type sockets for left and right inputs and outputs, plus a DIN socket for the same purpose. Two other sockets provide respectively for remote control, and for connection (including a 10V supply) for supplementary "Black Box" series components. These include a line amplifier, a subsonic filter and a microphone "mixer".

Like the earlier 580, the 680 does not include an inbuilt microphone preamplifier or mixer. For live recordings, separate microphone facilities must be provided and the MX-100 Black Box is designed to accept what Nakamichi refer to as their "tri-microphone live recording system". While obviously in line with Nakamichi's "purist" approach, it will be seen as a disadvantage by those who are accustomed to plugging stereo microphones directly into a domestic cassette deck.

On the plus side, however, there is a socket for normal stereo headphones, and provision to vary the listening level.

In presenting their new transport

Fig. 1: The best input/output response curves we have measured to date from any cassette recorder. With metal tape, virtually flat to 20kHz.



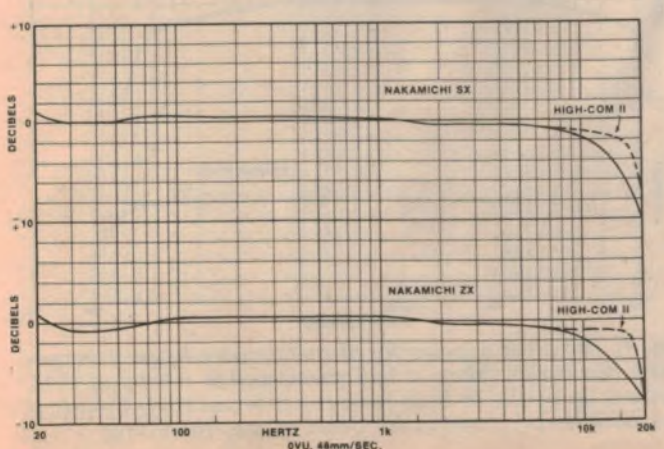


Fig. 2 (left): At 0VU, where many recorders suffer high frequency saturation, the 680 still performs well. ZX is metal coated tape, SX chrome equivalent.

system — anti-resonant, two drive motors, two capstans, etc — Nakamichi have made strong claims about its relative freedom from wow and flutter.

They have also had a good deal to say about their crystalloy heads, with gaps of 3.5 microns for the record head and 0.6 micron for the replay head. The former can cope with the strong magnetising current required for metal tape, while the latter can resolve a frequency of up to 15kHz at half cassette speed (24mm/sec), equivalent to 38kHz at normal speed. For good measure, a new type of erase head has been developed, designed to minimise "spontaneous erasure" of very short wavelengths as the tape passes over even an inactive, high flux density head.

Faced with such claims, it was natural to try to evaluate the 680 in its own right as a deck, and especially when used in its unique mode — at half speed and loaded with a metal-coated tape. It could reasonably be assumed that addition of the High-Com II unit would further boost the performance in relation to dynamic range, signal/noise ratio and effective top response at high recording levels.

Using Nakamichi ZX (metal) tape, wow and flutter was measured at 0.9% DIN weighted at normal (48mm/sec) speed; this is a commendable figure, but what really surprised us was that there was virtually no deterioration at half speed, the measured figure coming out at 0.1%.

Turning to the frequency response, the curve obtained at normal speed with Nakamichi ZX (metal) tape is the best we have measured to date for any cassette deck: within +1dB and -0.5dB from 20Hz to 20kHz; this at the normal level used for frequency response measurements, -20VU. (Lower solid curve, Fig. 1). With Dolby-B noise reduction operating, the curve is even flatter over most of the range, but with a small upward tilt at the two extremes.

The upper curves in Fig. 1 are for Nakamichi SX, a high quality ferric tape which they refer to a "chrome-equivalent". Being only 1 or 2dB down at 20kHz, the response under the particular test conditions is virtually equivalent.

Reacting to the outstanding performance at -20VU, we wondered how the deck would perform at normal speed but a test signal level of 0VU — a condition that can yield an unflattering, even disastrous curve in decks given to high frequency saturation.

Measured without Dolby (solid curve) so as to expose the inherent capabilities of the heads, the response is down only by -2dB at 10kHz, with either tape — certainly a flattering result.

Repeated with the High-Com II unit in circuit, the -2dB point shifts out to about 15kHz with SX tape and to 17kHz with ZX — a necessarily brief check which showed the potential of the High-Com II unit.

Fig. 3 shows the response through the 680 at half speed. With SX (chrome equivalent) tape, the roll-off is at about 12kHz, which is comparable to that of many less pretentious decks at normal speed.

At this speed, the superiority of the metal (ZX) tape becomes clearly apparent, with a top-end response that is effectively preserved to 20kHz. The Dolby curve is somewhat more bumpy but, in retrospect, it could probably have benefited from slight tweaking of the Dolby tracking preset.

The superiority of the metal tape is again evident in Fig. 4, showing the response at the very searching 0VU level.

Turning to signal/noise ratio, the unweighted figure without Dolby was 49dB with ZX (metal) tape and 46dB with SX tape; this at normal speed. With Dolby the figures for both tapes came out at about 52dB. It must be pointed out, however, that the subjective improvement with Dolby is greater than the unweighted figures would imply.

At half speed the S/N ratio for SX tape dropped by about 2dB both with and without Dolby.

A necessarily quick look at the noise figures with the High-Com II unit in circuit (in lieu of inbuilt Dolby) suggested unweighted noise figures for all modes up into the sixties with a very marked reduction in subjective noise content.

Harmonic distortion and noise at 0VU and 48mm/sec with ZX tape was 0.8% at 1kHz, rising to 1.5% at 10kHz. At the slower speed of 24mm/sec, the distortion was 1.5% at 1kHz and 2% at 10kHz. With SX tape at 48mm/sec, the THD was identical to the ZX tape but at half speed a 2.5% distortion was measured. No discernable increase in THD was evident with Dolby or High-Com II noise reduction systems.

Subjectively, the 680 is excellent. Switching from tape to source monitoring while recording, showed no discernible difference between the two signals, with the exception of slightly increased background noise; noise dropped significantly with Dolby in circuit. When recording with the High-Com II, direct comparisons were not possible because the system needs to be decoded on playback. However, with this in use and with ZX tape, the noise dropped to negligible proportions.

Recommended retail price of the Nakamichi 680 cassette deck is $1200 including tax and for the High-Com II, $400 including tax. RCA to RCA audio leads are supplied with both units and a demonstration C-15 ZX Metalloy tape is supplied with the 680. Head cleaning sticks are also supplied. Further inquiries should be made to Convoy International Pty Ltd, 4 Dowling Street, Woolloomooloo 2001.

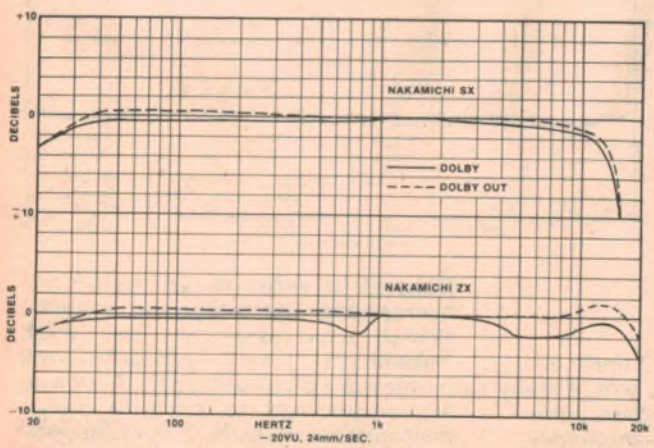


Fig. 3: The lower dashed curve for half-speed operation using metal coated tape is better than from many cassette decks at normal speed. Even with chrome equivalent tape, the response is impressive — to well beyond 10kHz.

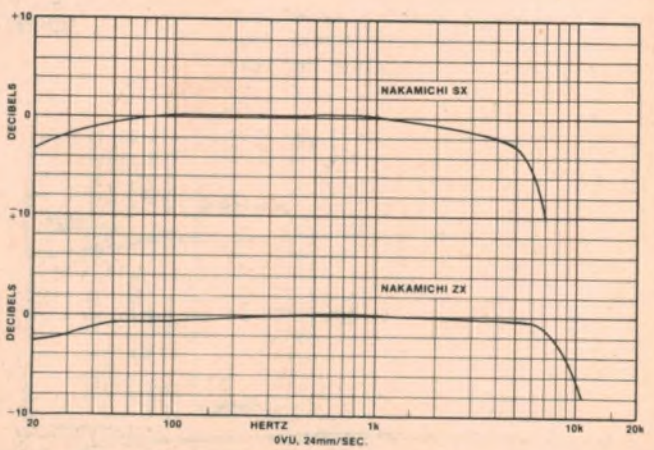


Fig. 4: The clear superiority of metal-coated tape emerges from this curve, taken at half speed and at a level of 0VU. Backed up by the in-built Dolby or external High-Com II, it is a definite proposition for good quality recording.

A modern regenerative receiver for shortwave listening

The All-Wave Three

Here is an inexpensive receiver to introduce you to the joys and mysteries of shortwave listening. Using just two transistors, a few diodes and one integrated circuit, the "All-Wave Three" as we have called the receiver, is surprisingly efficient in pulling in those distant shortwave stations. And it covers the broadcast band too.

by IAN POGSON

While there are many sensitive commercial shortwave receivers on the market which really do represent excellent value for money, the "All-Wave Three" is the do-it-yourself receiver which will appeal to the many readers whose budget does not run to several hundred dollars or more. Not that we are claiming that this under $50 unit will outperform those classy commercial receivers — far from it. But we can guarantee a great deal of enjoyment for relatively little outlay.

At the same time as saving a lot of money, the would be constructor will have the benefit of putting the "All-Wave Three" together. And with an efficient aerial and a modicum of operating skill, budding DX enthusiasts will be really enthused at the number of stations they can log. Interested? Then read on.

To get some idea of what it is all about, let us have a look at the circuit. The first stage is a regenerative RF amplifier using a 2N5485 JFET. Each coil, with the exception of the broadcast coil (L1), has two windings: a tuned winding and a feedback "tickler" or reaction winding. The antenna is connected to a tap on the tuned winding and this winding is tuned to the wanted signal with a variable capacitor of about 400pF maximum capacitance. Feedback via the respective coil winding is controlled by a 1k potentiometer in the FET source circuit. By varying the amount of resistance in the source of the FET, we vary the gain of the stage and so the amount of regeneration.

There is also a fixed resistor of 100 ohms in the source circuit of the FET bypassed by a 0.1uF capacitor to provide a minimum working bias.

Due to the relatively high current taken by the FET and the modest supply voltage, it is necessary to use a 2.5mH RF choke as the drain load. This provides a high impedance load for RF signals but is a low resistance to DC.

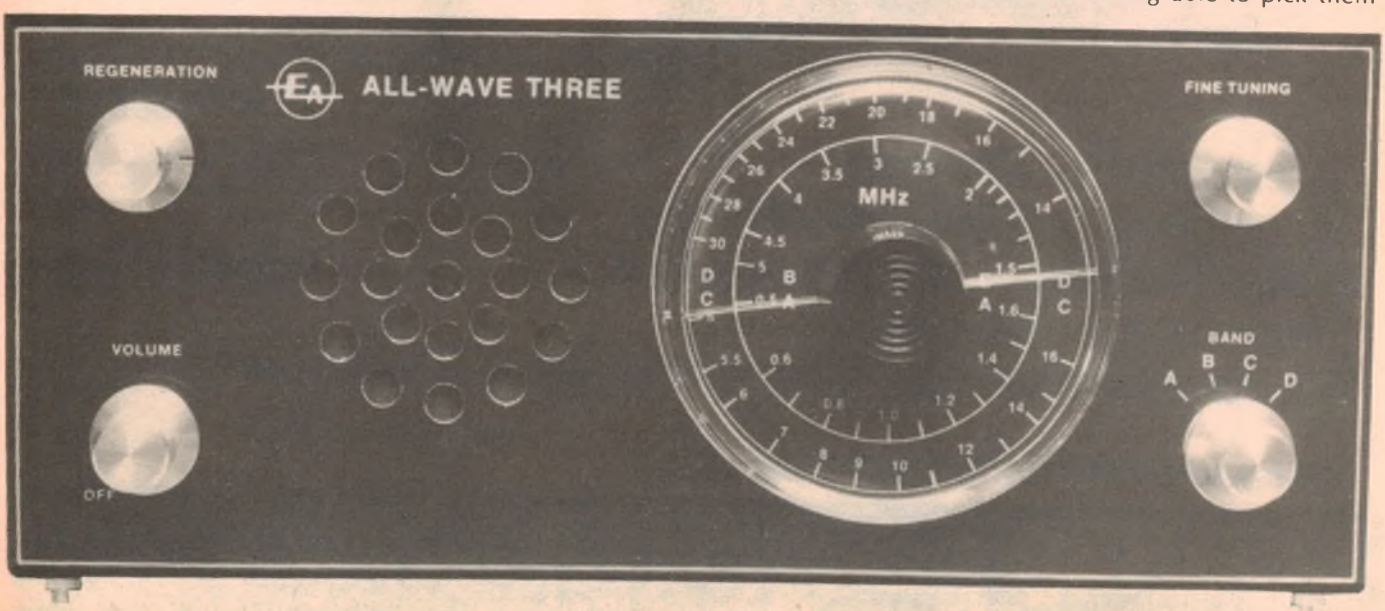
It was found during development however, that the characteristics of the RF choke were not conducive to smooth operation over the very wide frequency range from 500kHz to 30MHz. The solution was to damp the RF choke by placing a resistor in parallel with it. Furthermore, it was also found that the value of this damping had to be varied for each of the ranges.

In order to keep costs down, we have used a simple handspan dial to drive the tuning capacitor directly. This is all right for tuning the stronger broadcast stations but when it comes to tuning the weaker shortwave stations, then the extra "bandspread" afforded by the fine tuning knob makes tuning very much easier. A varicap diode is connected across the main tuning circuit and a 10k potentiometer controls its capacitance.

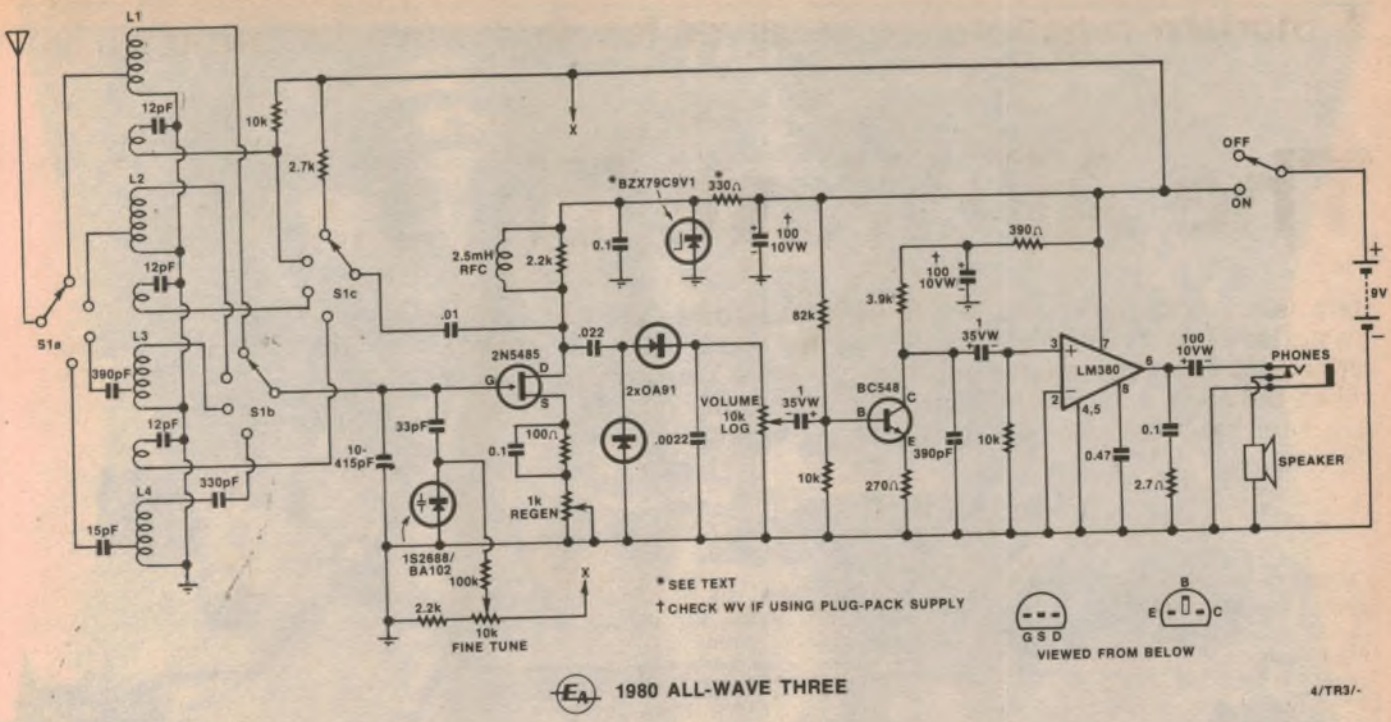
Following the RF stage is a half-wave voltage doubling detector consisting of .022uF and .0022uF capacitors and two germanium diodes.

The audio amplifier which follows is built around the popular LM380. Because of the fixed gain of 50 of the LM380, we added a transistor preamplifier to increase this gain to a more usable value. The LM380 is capable of driving a speaker of 8 or 16 ohms.

As well as providing a small loudspeaker mounted on the front panel, we have also made provision for connection of a set of low impedance headphones. When you are listening to those really distant or weak stations, headphones can make all the difference in being able to pick them



With a good antenna and skilful operation of the controls, many distant shortwave stations can be heard.



Four toroidal coils are used to cover a frequency range from 0.5 to 30MHz in this easy-to-build regenerative circuit.

out from the noise.

We have provided for battery operation but this little receiver can be run from the mains, using a plug-pack power supply which will deliver more than nine volts but no more than about 12V DC, at up to about 100mA. For this situation provision has been made on the PCB for a series resistor and a 9V zener diode to be fitted. This supplies the RF amplifier with regulated 9V, while the rest of the receiver is fed directly from the plugpack.

For battery operation omit the zener diode and replace the series resistor with a link.

At the time of writing, all the components used in the All-Wave Three are available but at the same time, some comments on some of the items may be helpful.

In order to further reduce the cost of building this project, many readers may by able to salvage some components from old radio and possibly television receivers. While we used new components in the prototype, there is no reason why you should not save a few dollars here and there.

It is important to use the same toroidal formers for the coils as used on the prototype, to ensure that the dial calibrations track and to obtain similar performance generally. We obtained our toroids from Watkin Wynne Pty Ltd, 32 Falcon Street, Crows Nest, NSW 2065. From the same source, we also obtained the Roblan 10-415pF variable capacitor, the Jabel wave-change switch and the handspan dial. These items should normally be available from your local supplier.

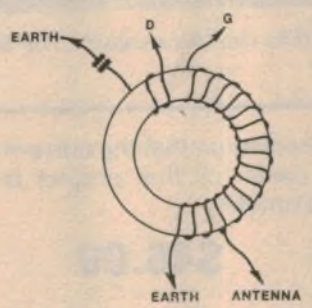
The Scotchcal front panel overlay gives a professional finish to the unit and provides the extra facilities of dial calibrations and functions. Ready made panels may be obtained from Radio Despatch Service, 869 George St Sydney, or you may make your own from the full size reproduction of the panel which we have provided.

We used a metal "L" shaped chassis to accommodate all the components and PCB assembly. Readers may do the same, or it would be possible to mount the printed circuit board on a wooden base but an earthed metal front panel is a "must" in order to minimise hand capacitance effects when tuning.

Whatever physical arrangement you use, it is very important that you make the finished assembly quite rigid, for frequency stability. The assembled chassis may be fitted into a suitable cabinet to improve the overall appearance.

Although the All-Wave Three is a modest little receiver, there is quite a deal of work to be done to build it. However, by using a PC board the job is somewhat simplified and the chance of making wiring errors is also reduced. There is no particular order in which the job should be tackled but all subassemblies should be made up first.

A logical place to start is to wind the toroidal coils. All of the relevant information is given in the coil table and should be followed closely. To ensure that the coils perform similarly to those on the prototype, it is important to use the gauges of wire as called for in the table, otherwise there will be deviations from the original windings and it is possible that the calibrations on the dial will be inaccurate.



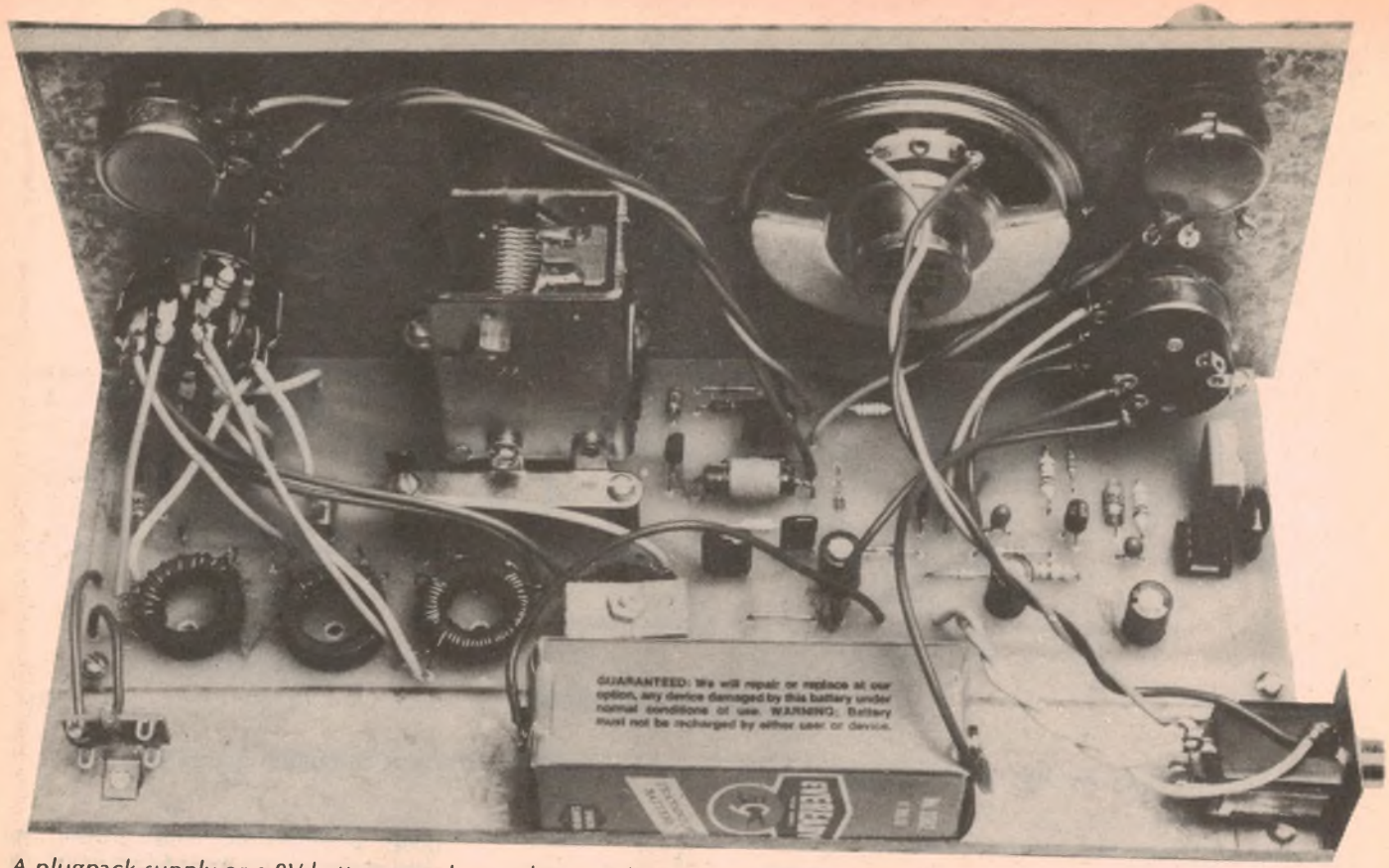
COIL DETAILS

L1 Tuned winding: 90 turns tapped at 5 turns, 30 B&S enamel wire close wound to occupy about 80% of toroid.

L2 Tuned winding: 30 turns tapped at 4 turns, 24 B&S enamel wire close wound to occupy about 45% of toroid. Reaction winding: 11 turns 24 B&S enamel wire close wound and spaced from the gate end of the tuned winding by about 2mm.

L3 Tuned winding: 8 turns tapped at 1 turn, 24 B&S enamel wire spaced to occupy about 30% of toroid. Reaction winding: 3 turns 24 B&S enamel wire on the same pitch and spaced from the gate end of the tuned winding by about 2mm.

L4 Tuned winding: 4 turns tapped at 1 turn, 24 B&S enamel wire spaced to occupy about 20% of toroid. Reaction winding: 2 turns 24 B&S enamel wire on the same pitch and spaced from the gate end of the tuned winding by about 2mm.



A plugpack supply or a 9V battery may be used to run this receiver. The battery is secured with double-sided adhesive tape.

When assembling the PCB it is usually best to start with the small components, such as resistors and diodes, followed by capacitors and then the larger components. It is important to note that the coils vary in the way they are orientated on the board. This has been done to keep the wiring orderly.

We have clamped the broadcast coil to the PCB using a small piece of stiff cardboard cut to shape and secured with a screw and nut. The other three coils are wound with a heavier gauge of wire and this enables them to be located and held without clamps.

Before mounting the variable capacitor, the four pads on the copper where the capacitor is screwed down should be lightly tinned with solder to ensure a good earth return to all four points. The capacitor is stood off the board with four 12mm long tapped brass spacers, and secured with eight round head screws. Before screwing the capacitor in place, a piece of tinned copper wire is wrapped around the fixed plates lug under the capacitor and soldered. It should be long enough to protrude through the appropriate hole in the PCB, where it will be soldered later on.

The "L" shaped chassis may be bent up from a piece of scrap aluminium, or you may use a metal front panel and a piece of wood for the baseboard. In either case, care must be taken to get all the dimensions correct, so that the variable capacitor spindle passes through the exact centre of the circular dial scale on the front panel. With the tuning capacitor fixed as to position, the correct height may be obtained by adjusting the height of the stand-off screws which are used to hold the PCB to the base board or the chassis metalwork.

We estimate that the current cost of parts for this project is approximately

$46.00

This includes sales tax.

The mounting centres for the other four controls are marked on the front panel artwork. With these controls fixed to the panel, this only leaves the speaker to be fixed. As it is only very small and lightweight and with no provision for screws, the speaker may be glued to the front panel, using an epoxy resin adhesive.

We mounted the headphone jack behind the PCB at the left side of the chassis. The antenna and earth terminals consist of a miniature tag strip fixed to the chassis at the opposite end to the headphone jack. In-between, is ample space for an Eveready 2362 9V battery.

Considerable care should be taken when terminating all the leads from the PCB. This applies particularly to the leads from the coils to the band switch. It should go without saying that leads should be as short and reasonably direct as possible, particularly from the coils and the volume control.

When fixing each of the knobs to the spindles, due regard should be given to the direction of the pointer. In the case of the switch-volume control, with the switch in the "off" position, the pointer should correspond with this marking on the panel. The regeneration control pointer should also point in about the same direction with the rotor in the extreme anti-clockwise position. Obviously, the pointer of the wave-change switch should point to the correct band.

The handspan dial for the main tuning scale is a push fit onto the capacitor spindle and the cursor should be set exactly horizontal when the capacitor moving plates are fully closed. The fine tuning knob should be set so that with the rotor and the knob pointer vertical, somewhere between the extremes of travel, rotating the control in each direction will give equal amounts of frequency tuning. This will have to be set after the receiver has been put into operation.

At this stage, the unit is almost ready for testing. Before proceeding however, all work should be thoroughly checked. Make sure that all components are in the right place and that polarities are correct. All wiring should also be checked for accuracy. Satisfied that all is well, the battery may

be connected, also with due regard to polarity.

USING THE ALL-WAVE THREE

Here are some pointers which should be useful as a guide to the tuning and operation of this kind of receiver.

For the reception of morse code or "CW" signals, the RF amplifier is brought to the point of oscillation and then the signal is tuned slightly to one side or the other, thus producing a signal or beat note. The note is selected to suit the convenience of the listener. The side selected does not matter but if interference is present it can often be avoided by selecting a particular side.

When the reaction or regeneration in the RF amplifier is increased, the sensitivity is also increased and selectivity is sharpened as well. Sensitivity and selectivity reach a maximum just at the point of oscillation. For the reception of AM signals, the regeneration should normally be set just below the point of oscillation. However, when attempting to receive very weak signals which are not satisfactory under these conditions, it is often possible to copy them if the RF amplifier is made to oscillate and the signal carefully tuned so that there is no whistle.

For SSB reception, the RF amplifier is also made to oscillate and the signal is resolved by carefully tuning for the best speech quality. It is important to note that when the RF amplifier is made to oscillate for all the conditions just mentioned, there is no point in advancing the regeneration control beyond the position where reliable oscillation is achieved.

Another important point concerns adjustments for volume with strong AM signals. Do not back off the regeneration control if the volume is too high. This practice will certainly reduce the volume, but the selectivity will be seriously degraded as well. The correct procedure is to leave the regeneration at maximum and use the volume control. For CW and SSB reception, the question does not arise, since the volume level can be adjusted only with the volume control.

As mentioned earlier, we have used a direct drive dial for the main tuning and this has been supplemented with a "fine tuning" control. In practice, particularly on the higher frequencies, the main tuning control should be set about the middle of an immediate tuning range of interest. This setting is then maintained and tuning for each individual signal is carried out by the fine tuning control. When the range of the fine tuning control is insufficient to proceed further, then the main tuning control should be readjusted.

SUITABLE ANTENNAS

This could be quite a topic in itself. For best results over the full coverage of the receiver, a number of different types of antenna would be desirable. The needs will vary according to the location and the frequencies on which most interest rests. In addition, a good earth connection is required. A fairly

PARTS LIST for the All-Wave Three

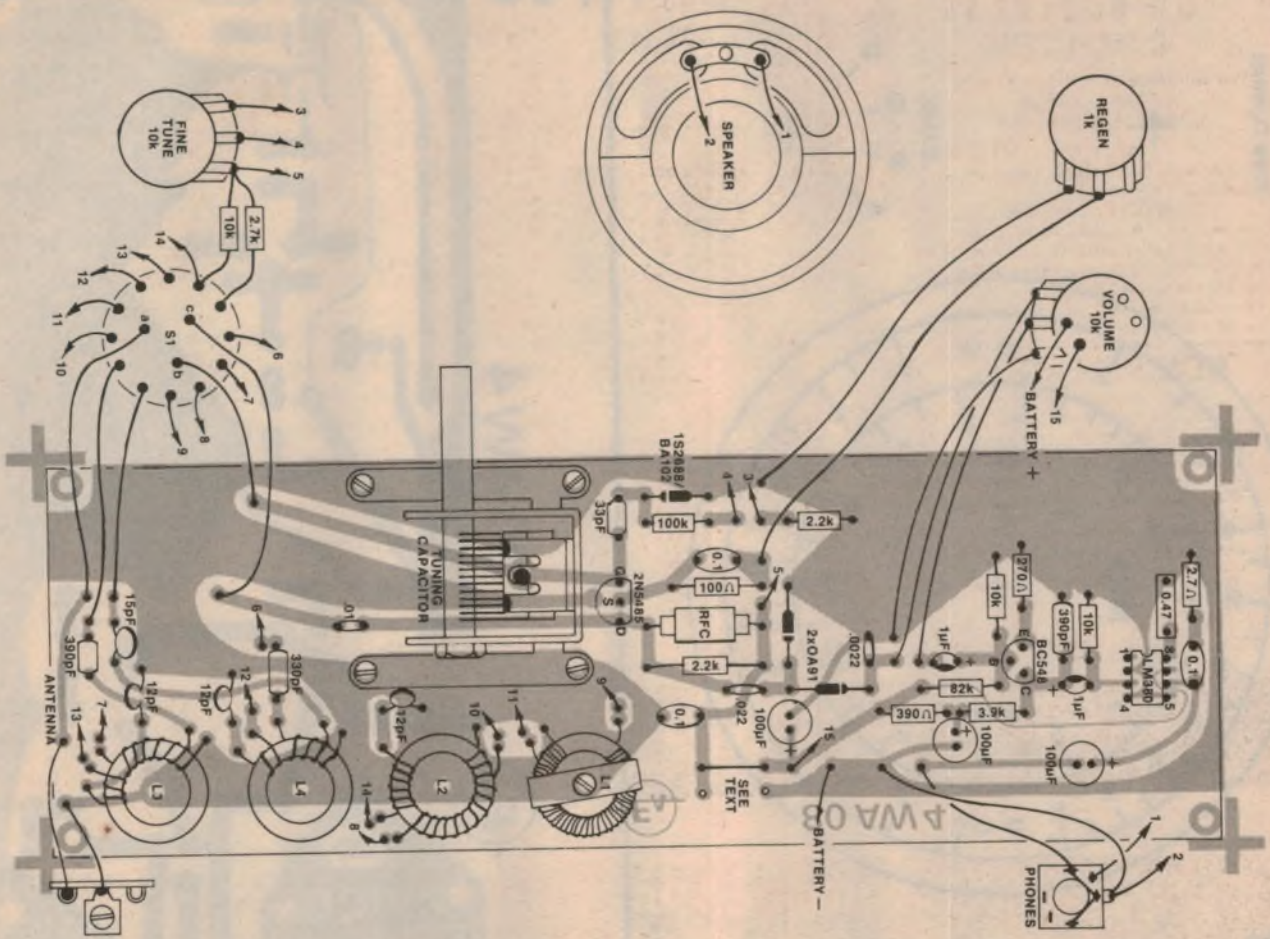
1 Front panel 239 x 98mm
1 Metal chassis 239 x 98 x 106mm
1 Cabinet to suit (optional)
1 6.5mm stereo jack socket, to suit headphones
1 miniature tag strip, 3-tags
1 60mm miniature loudspeaker
1 1k (linear) potentiometer
1 10k (linear) potentiometer
1 10k (log) potentiometer with switch
1 3-pole 4-position Jabel rotary switch
1 Jabel "handspan" dial knob
4 knobs
1 PCB 229mm x 76mm, code 80aw4
1 Roblan single gang variable capacitor 10-415pF
4 12mm tapped brass spacers
4 Neosid toroid formers 4329R/2/F5
1 2.5mH RF choke
1 IC socket 8-pin DIL
1 2362 9V battery
1 BC548 NPN transistor
1 2N5485 JFET, or similar
2 OA91 diodes
1 1S2688/BA102 varicap diode
1 BZX79C9V1 zener diode
1 IC LM380 8-pin DIL

RESISTORS (½W)
1 x 2.7 ohms, 1 x 100 ohms, 1 x 270 ohms, 1 x 390 ohms, 2 x 2.2k, 1 x 2.7k, 1 x 3.9k, 3 x 10k, 1 x 82k, 1 100k.

CAPACITORS
3 12pF NPO ceramic
1 15pF NPO ceramic
1 33pF polystyrene
1 330pF polystyrene
2 390pF polystyrene
1 .0022uF metallised polyester (greencap)
1 .01uF greencap
1 .022uF greencap
3 0.1uF greencap
1 0.47uF greencap
2 1uF/35VW tantalum
3 100uF/10VW electrolytic

MISCELLANEOUS
Screws, nuts, solder, hookup wire.

NOTE: Ratings are those used on the prototype. Components with higher ratings may generally be used providing they are physically compatible. Components with lower ratings may also be used in some cases, provided the ratings are not exceeded.



A printed circuit board and switched coils make this receiver easy to assemble.

heavy gauge of wire should be run to the nearest water pipe and clamped to it.

As a guide, for the broadcast band and frequencies up to about 3MHz, a random length antenna wire would be suitable. This may be inside or outside and of such a length as suits local conditions, proximity of wanted stations, etc. For general shortwave reception, the "Twin Doublet Aerial" as described in the issue for November, 1963 would be very suitable. If on the other hand the amateur bands are of prime interest, then an antenna designed especially for these bands would be the logical choice.

Attempting to test the prototype in our City laboratory proved to be a rather frustrating procedure. To be sure, we received all of the local Sydney broadcast stations very well. However, when switching to the shortwave bands, just about all we got was electrical noise. Also, during daylight hours at the time, there was very little in the way of shortwave signals coming through, although there would be plenty to listen to in the evenings. So, I took it home.

I connected a multi-band aerial designed for amateur frequencies to the set and it burst into life. From very early evening and for the next couple of hours, I received literally hundreds of overseas shortwave signals. Many were not identified due to lack of time but such places as Switzerland, Moscow, Peking, London, Voice of America, standard time and frequency signals, were all there. Some amateur signals on 3.5MHz and 7MHz, as well as some CBers on 27MHz were also logged.

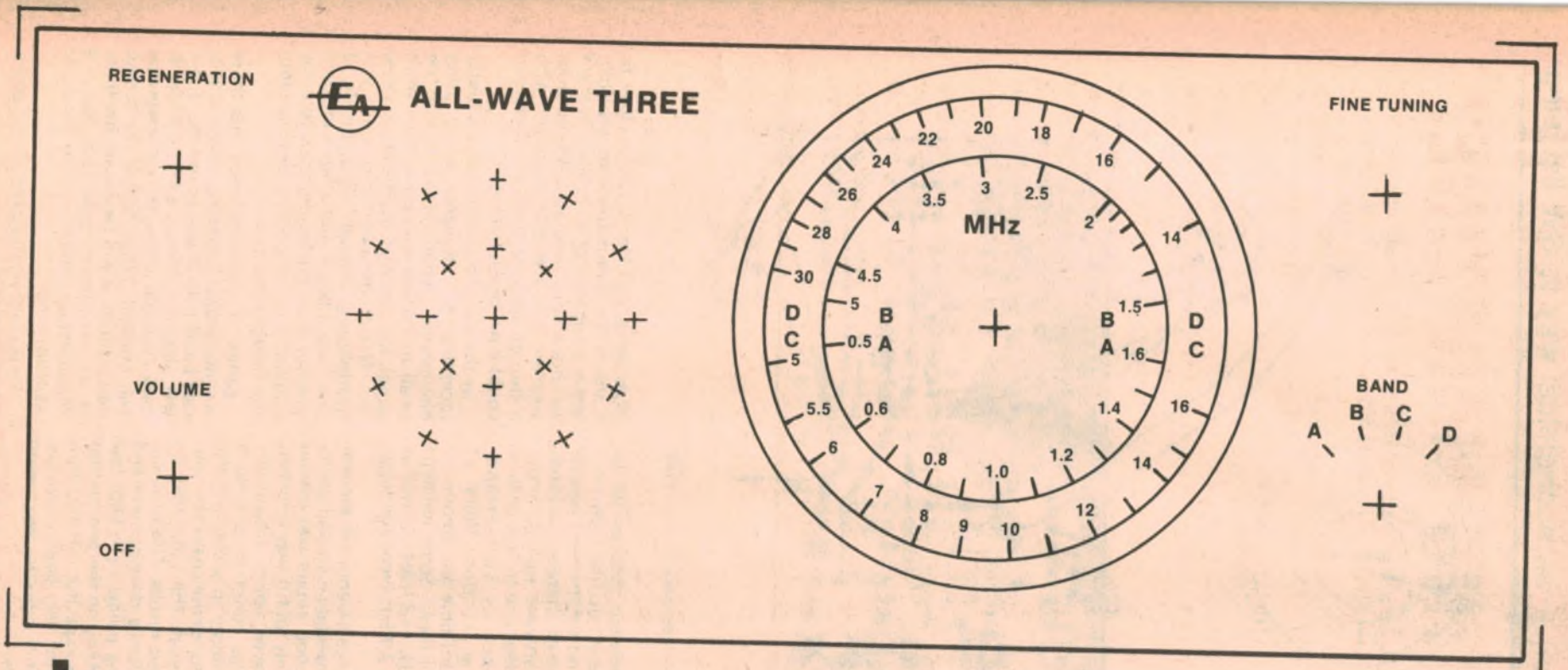
Due to the large antenna (40 metres) and the low impedance coaxial cable, the receiver tuned circuit was loaded rather excessively and it was reluctant to oscillate over some frequency ranges. This was cured by placing a 60pF Philips trimmer in series with the centre conductor of the coax cable and the aerial terminal. The value may be adjusted for best results. This problem was foreseen during development and antenna tapping points were kept low on each coil. Also, on the two highest ranges, a series capacitor was also added. However, for very large antennas, the extra trimmer capacitor was found to be necessary.

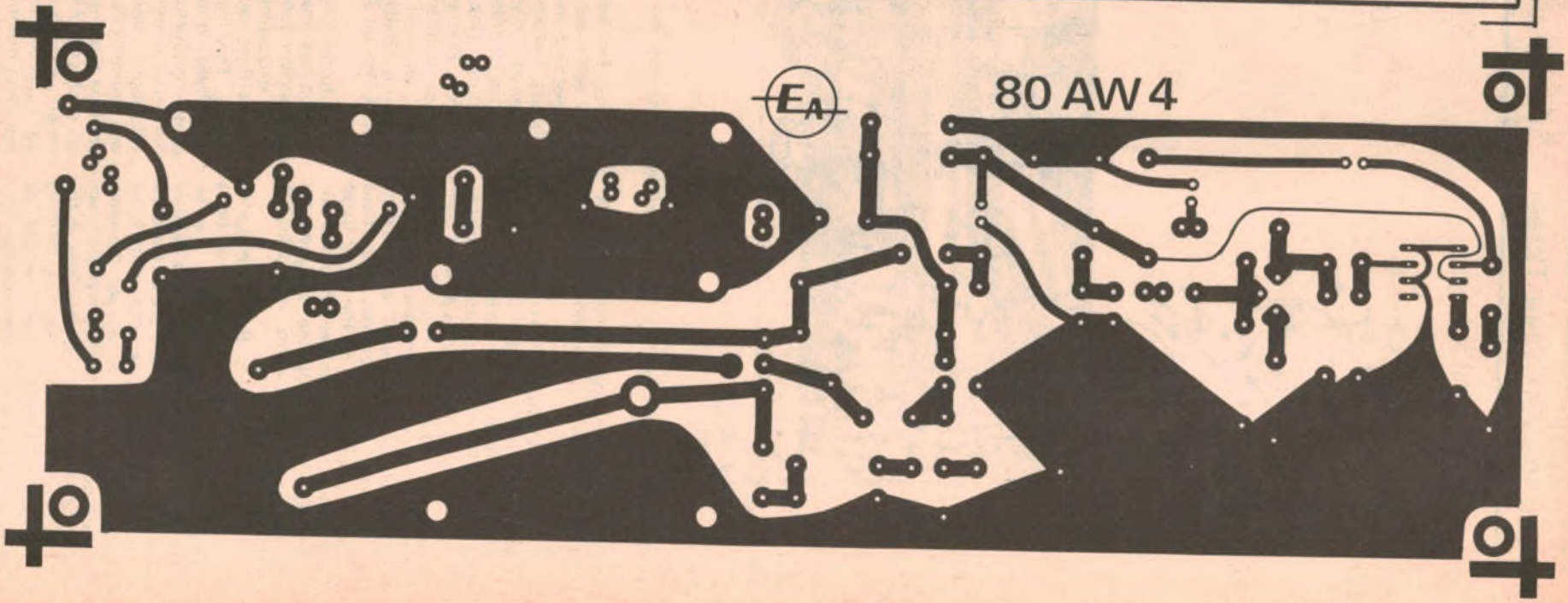
On the broadcast band, with the very large aerial and being rather close to many of the transmitter sites, selectivity was somewhat of a problem, in that I was not able to separate 2WS out from adjacent 2CH and 2SM. However, with a shorter antenna some improvement could have been achieved.

By the way, I found that much better reception was available when using headphones, when compared with the small inefficient speaker on the front panel. Readers may even elect to leave the little speaker out and use headphones instead. Alternatively, if you have a larger and a more efficient speaker in an enclosure, then you may connect it up simply by plugging it into the headphones jack.

Earlier, it was mentioned that there was no feedback winding on the broadcast band coil. It was found that there was already a certain amount of feedback available and so the extra winding was omitted. When tuning the broadcast stations, it will be found that there is an optimum position for the regeneration control and this should be kept in mind.

So there it is. Connect up the antenna and go to it.





Here is the full-size artwork for the front panel and PCB.

WHAT'S MISSING IN THIS MAGAZINE?

Noticed something missing from this magazine?
No? How about the Dick Smith Electronics Adverts?
Why are they missing . . .
You hadn't noticed the catalogue?
What do you mean, 'What catalogue?'
The Dick Smith Electronics 'New Decade Catalogue' that was included free with this magazine . . .
Still don't know what we're talking about, eh?
This can only mean one thing: Someone has pinched/borrowed/stolen/filched/lifted/purloined or otherwise acquired your copy of the new Dick Smith catalogue.
And you wouldn't want to miss out on that, would you!
You have but three options.

(a) Find the person or persons responsible for the theft and retrieve your property – a difficult job indeed!

(b) You go out and buy another copy of this magazine (check that there is a catalogue first!), which would cost you over a dollar.

(c) Or you call into your nearest Dick Smith store (or write to our Mail Order Centre) and get another catalogue, which will cost you under a dollar (75¢ to be precise!)

The choice is yours. But enjoy reading your new catalogue in any case.

Dick Smith and Staff

We proudly list below the more than 100 re-sellers who keep Dick Smith products on their shelves.
Of course, due to their location, some stores cannot carry our entire range.
Perhaps you are not located near one of our stores – and find mail order inconvenient . . . (it isn't really, but that's another story).
If this is the case, why not find the re-seller nearest you and give him a try. He may just have what you want!

AABEL MUSIC COMPANY
130 Victoria Street, Bunbury, WA 6230 (212 777)
AERO ELECTRONICS
123A Bathurst Street, Hobart, Tas 7000 (348 232)
ARMIDALE ELECTRONICS & AUDIO
33 Bowman Avenue, Armidale, NSW 2350. (724955)
ARNOLDS TV & RADIO.
568 Ruthven Street, Toowoomba, Qld 4350 (323 788)
AMATEURS PARADISE
121 Nerang Street, Southport, Qld. 4215 (322 844)
ARNOLDS RADIO, TEWANTIN
Poinciana Avenue, Tewantin, Qld. 4565 (471 227)
A & M ELECTRONICS
78A High Street, Wodonga, Vic. 3690. (244 588)
BRIAN BAMBACH ELECTRONICS
870 Hunter Street, Newcastle, NSW. 2302 (24 998)
MELLOR ENTERPRISES
Shop 2, 15 Forsythe Street, Whyalla Norrie, SA 5608 (454 764).
PETER BROWN ELECTRONICS
9 Doveton Street North, Ballarat, Vic. 3350 (323 035)
M&W ELECTRONICS
48 McNamara Street, Orange, NSW. 2800 (828 491)
BUCKARINGA HOLDINGS PTY LTD
2 Seven Street, Quorn, SA 5433. (467 171)
SOUND COMPONENTS
78 Brisbane Street, Tamworth, NSW. 2340 (661 363)
VARIETY DISCOUNTS
113 Horton Streetm Port Macquarie, NSW. 2444 (835 488)
COWRA MARINE CENTRE
155 Kendal Street, Cowra, NSW. 2794. (422 804)
A.E. COOLING
Peoplestore Building, Elizabeth Town Centre, SA. 5112 (255 8188)
CIVIC CENTRE TELEVISION
34 Fire Brace Street, Horsham, Vic. 3400 (823 724)
GCG COMMUNICATIONS
385 Mulgrave Road, Cairns, Qld. 4870. (541035)
ASCOM ELECTRONICS
60 Hartley Street, Alice Springs, NT. 5750 (521 713)
H.O. HAYNES
Binnia Street, Coolah, NSW 2843 (771 005)
CITY AMPOL SERVICE STATION
48 Muskland Street, Gympie, Qld. 4570 (821 327)
COASTAL ELECTRONICS
43 Vulcan Street, Maryvo, NSW. 2537 (742 545)
COOMA ELECTRONICS PTY LTD
56 Sharp Street, Cooma, NSW. 2630. (822 668)
FRED R HAYES ELECTRICAL
28 Station Street, Bowral, NSW. 2576 (611 881)
CONQUEST ELECTRONICS PTY
8 Katoomba Street, Katoomba, NSW. 2780. (822 491)
CRYSTAL TV RENTALS PTY LTD
66 Crystal Street, Broken Hill, NSW. 2880. (6897)
CRONAUS TV AND MUSIC CENTRE
18 Torquay Road, Pialba, Qld 4655. (281 466)
CYCLE SCENE PTY LTD
329-331 High Street, MAITLAND, NSW 2320. (335 523)
R.B. COOK SALES
53 Hasting Street, Wauchope, NSW 2446. (583)
COLLIS SOUND ELECTRONIC COMP
28 Rutherglen Road, Newborough, Vic. 3825. (273 017)
DECRO ELECTRIC
Cnr Magellan St & Brunner Hwy, Lismore, NSW 2480 (214 137)
DELTA ELECTRIX
87 Queen Street, Ayr, Nth Qld. 4807. (831357)
CAMDEN HAVEN ELECTRONICS
101 Bold Street, Laurieton, NSW 2443. (588 044)
ELEKTRON 2000
181 Wharf Road, Newcastle, NSW. 2300. (282 844)
DOUBLE DIAMOND ELECTRONICS
18 Russell Street, Goulburn, NSW 2580. (215 440)
KEITH DONGES ELECTRONICS
186 Boorowa Street, Young, NSW 2594. (821 279)
DARRYL ADAMS TV & RADIO
100 Church Street, Mudgee, NSW 2850. (721 822)
DERBY DISCOUNTS
Lot 332, Clarendon Street, DERBY, WA. 6728 (911 510)
ELECTROFIX
133 Malop Street, Geelong, Vic. 3220 (97 827)
ESPERANCE RADIO & TV SERVICE
Shop 7, Hargate Centre, Esperance, WA 6450. (711 202)
THE ELECTRONIC HOBBY CENTRE
1045 Gold Coast Hwy, Palm Beach, Qld 4221. (341 248)
FERGUSON ELECTRONICS
Cnr Etiwanda & 10th Streets, Mildura, Vic 3500. (234 940)
FEENEY'S RADIO HOUSE
54 Wyndham Street, Roma, Qld 4455.
GOODWIN ELECTRONICS
123 Station Street, Blackheath, NSW 2785. (878 379)
GAWLER CB CENTRE
51 Hillier Rd, Evanston, SA 5116. (222 148)
GORNY OF BOMBALA
120 Maybe Street, Bombala, NSW. 2553. (83 035)
GUNNEDAH AUTO ELECTRIC
66 Conadilly Street, Gunnedah, NSW 2380. (420 706)
GLOUCESTER RADIO & TV
81 Church Street, Gloucester, NSW 2422. (571 1152)
GRENFELL AUTO ELECTRICS
180 Main Street, Grenfell, NSW. 2810 (43 1733)
GRIMSHAW'S SOUND
Star Plaza, Emerald, Qld 4720. (335)
HALLS CYCLE SPOT
119 Parker Street, Cootamundra, NSW 2590. (421 662)
HOCKS TV RENTALS
87 Hannan Street, Kalgoorlie, WA 6430. (211 906)
HAWKESBURY ELECTRONIC CENTRE.
111 George Street, Windsor, NSW 2756 (773 411)
HI TEL HI FI.
145 Queen Street, St Marys, NSW 2760. (623 4442)
D & M.J. HARRINGTON.
6/1 Machinery Drive, Tweed Heads Sth, NSW 2340. (882 (364 588)
HUNTS ELECTRONICS.
18 Neil Street, Toowoomba, Qld 4350 (328 944)
HUTCHESSON'S COMMUNIC CENTRE
5 Elizabeth Street, Mt Gambier, SA 5290 (258 404)
H & E ENTERPRISES
68 Otho Street, Inverell, NSW 2360. (222 558)
INTEGRATED TECHNICAL SERVICES.
2 Carey Street, Darwin, NT 5790. (815 411)
POWER N SOUND.
15 Franklin Street, Traralgon, Vic 3844. (743 638)
KELLER ELECTRONICS.
218 Adelaide Street, Maryborough, Qld 4650. (214 559)
KINGSTON ELECTRONICS & RECORDS.
Channel Court, Kingston, Tas 7150. (298 802)
KENTRONICS
37 Pinjarra Road, Mandurah, WA. 6210. (353 227)
KB ELECTRONICS & MARINE
361 Marine Terrace, Geraldton, WA 6530. (212 178)
KENT ELECTRONICS.
42 Stuart Highway, Darwin, NT 5790. (814 748)
KALEX
Shop 4, Burgundy St Plaza, Heidelberg, Vic. 3084 (458 2978)
LYREBIRD ELECTRONICS.
50 Berry Street, Nowra, NSW 2540. (25625)
LEETON RECORD CENTRE.
121 Pine Avenue, Leeton, NSW 2705. (532 081)
MORANBAH ELECTRICAL.
Town Square, Moranbah, Qld 4744. (507 139)
MCMAHON ELECTRICAL TRADERS
53 McLeod Street, Cairns, Qld 4870.
G & L MCLACHLAN HI FI.
134 Main Street, West Wyalong, NSW 2333. (424)
MILES ENGINEERING & HARDWARE.
Marilla Street, Miles, Qld 4415. (118)
WAGGA WHOLESALE ELECTRONICS.
82 Forsyth Street, Wagga, NSW. 2650.
BRIAN MILLS ELECTRONICS.
93 Marshall Street, Cobar, NSW. 2835. (382 420)
K & J MCLACHLAN.
21 Selwyn Street, Tumbarumba, NSW 2653. (482 081)
NAMBUCCA TV SERVICE.
44 Seaview Street, Nambucca Heads, NSW 2448. (886 425)
NORTH EASTERN MUSIC
85 Bridge Street, Benalla, Vic 3672 (021 376)
NAMBOUR ELECTRONICS SHOP.
Shop 4, Lowes House, Ann St, Nambour, Qld 4560. (411 684)
ALLAN NORRIS PTY LTD.
Pacific Highway, Sth Grafton, NSW 2460. (423 400)
ODYSSEY ELECTRONICS.
181 Main Street, Bairnsdale Vic. 3875 (525 262)
ONE STOP AUTO SHOP
7 Silica Street, Lightning Ridge, NSW 2382. (144)
P.J. O'BRIEN ELECTRONICS.
270 Carp Street, Bega, NSW 2550. (21 588)
R.F. PEARSON ELECTRONICS.
62 Wee Wee Street, Walgett, NSW 2385.(243)
PREMIER SOUND.
238 Musgrave Street, Rockhampton, Qld 4700. (274 004)
PURELY ELECTRONICS.
15 East Street, Rockhampton, Qld 47000. (21 058)
THE RECORD CENTRE.
222 Banna Avenue, Griffith, NSW 2680. (821 677)
SHAWS RIVERLAND SALES & SERVICE.
13 Barwell Avenue, Berri, SA 5345 (582 230)
SUMNER ELECTRONICS
95 Mitchell Street, Bendigo, Vic 3550. (431 877)
STEVENS ELECTRONICS.
42 Victoria Street, Mackay, Qld, 4740 (511 723)
SILICON CHIP ELECTRONICS.
Suite 3, 88 Bridge Street, Muswellbrook, NSW 2333
ADVANCED ELECTRONICS.
5A The Quadrant Launceston, Tas 7250 (317 076)
TABLELAND RADIO SERVICE.
2 Jack Street, Atherton, Qld 4883. (812 017)
TOMORROWS ELECTRONICS & HI FI.
88 William Street, Gosford, NSW 2250. (247 240)
TRILOGY WHOLESALE ELECTRONICS.
40 Princes Highway, Fairy Meadow, NSW 2519 (831 219)
TROPICAL TV.
248 Fulham Road, Vincent, Qld 4814. (781 421)
VK ELECTRONICS.
57 West Park Grove, Burnie, Tas. 7320. (311 708)
VIKING ELECTRONICS PTY LTD.
3108 Gold Coast Hwy, Surfers Paradise, Qld 4217. (388 280)
WELLINGTON ELECTRICAL SERVICES.
110 Lee Street, Wellington, NSW 2820. (325)
WESTERN ELECTRONICS.
54 Keppler Street, Warrnambool, Vic 3280 (624 070)
WEBSTER ELECTRIX.
181 Hare Street, Echuca, Vic. 3625. (822 856)
VENTRONICS
Jape Shopping Centre,Cavenagh St, Darwin, NT 5790. (813481)
DOUROY PHOTOGRAPHICS
150 Main Street, Lithgow, NSW 2790 (513 173)

4-digit LCD clock and control timer

We have just come across the clock module to end all clock modules. With four-digit liquid crystal display and extremely low power consumption, this unit can be used to provide a whole range of functions such as car clock, alarm, timer, stop watch, dual timer and so on. We have used it in two separate applications; as a bedside or desk clock and as a control timer for switching mains appliances.

by JOHN CLARKE and LEO SIMPSON

By far the biggest attraction of a clock with liquid crystal display is the very low power consumption. This module draws less than 0.1 milliamp from a 1.5V battery and should operate from a 1.5V penlite cell for a year or more. With that very small power requirement, the LCD clock module can be housed in a very small case, together with the penlite cell and a couple of pushbutton switches for time-setting. That adds up to a handy bedside or desk clock.

The above proposal for a compact clock is just one of the possibilities raised by this neat clock module which is being imported by Dick Smith Electronics and sold through all Dick Smith stores and outlets at $17.50. Supplied along with the clock module is a brief data sheet which shows how to use the clock module in quite a variety of applications.

The accompanying photographs show the back of the clock module which is mounted on a small PCB measuring 60 x 38mm with a row of 19 connections along the lower edge.

All the clock circuitry, including the LCD interface circuitry, is housed in a 10mm square encapsulation with a total of 54 leads. 30 or more of these connections on the chip are necessary to drive the liquid crystal display which is not multiplexed.

Naturally, the clock module is crystal-controlled. The crystal uses the low operating frequency of 32kHz and is housed in a very compact tubular encapsulation measuring about 8mm long by about 3mm in diameter. Time-keeping accuracy is claimed to be within ±1.5 seconds per day.

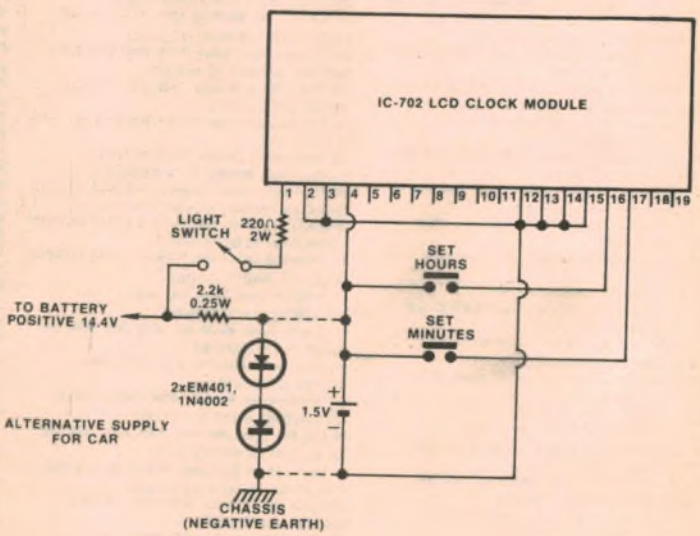
A four-digit display, with flashing colon and "AM" and "PM", is employed. The first digit has one segment missing which would otherwise be unused in either the 12-hour or 24-hour display modes. The latter mode requires a small modification to the PCB pattern.

For night-time viewing, the module has a miniature lamp to illuminate the display. This has modest brightness to keep the current consumption low, at around the 60-milliamp mark. For use in a car, this light can be controlled by the instrument panel light switch but let's not run too far ahead of ourselves.

Used as an alarm clock, the module has a pleasing but effective alarm tone which is a 2.048kHz signal modulated at 8Hz and pulsed at a one-second rate.

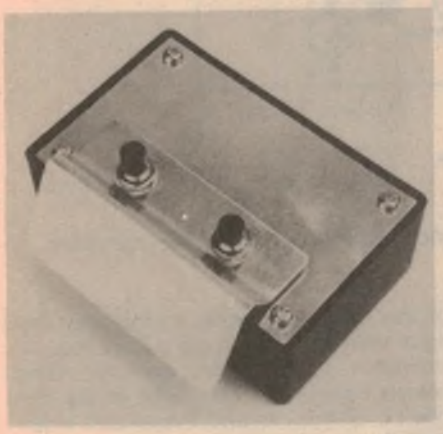
Perhaps a feature which makes the clock less effective as an alarm is the so-called "Snooze" facility. This allows the disgruntled sleeper to disable the alarm only to be re-awakened in three or four minutes time. The author is of the opinion that an alarm clock with a "snooze" facility is not a "fair dinkum" alarm. Still, there is perhaps an advantage to the Snooze feature. We have seen alarm clocks without this feature

The desk clock version (above) was powered from a 1.5V penlite cell. The circuit diagram at right also shows how the unit and the display light can be powered from a car battery.

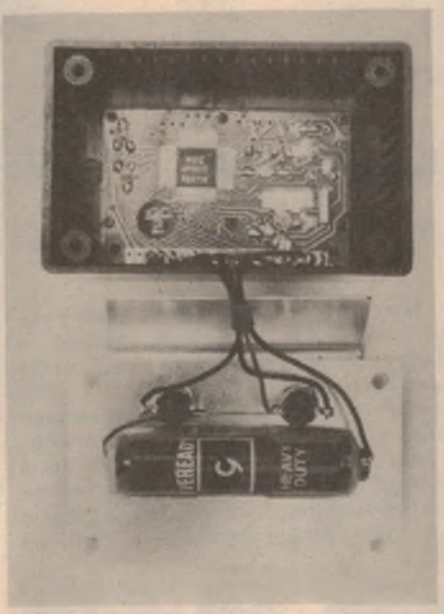


EA SIMPLE LCD CLOCK

The Control Timer can be set to switch on a mains-powered appliance at a predetermined time for a period of 16, 32, 64 or 128 minutes.



ABOVE: an aluminium bracket provides a convenient viewing angle for the clock.



RIGHT: the clock module and the battery holder are held in place with adhesive.

PARTS LIST

Simple LCD Clock

1 LCD clock module IC-702
2 miniature momentary pushbutton switches
1 plastic utility box 83 x 54 x 28mm
1 piece of scrap aluminium 80 x 40mm
1 AA size (penlite) 1.5V cell
1 battery holder to suit AA size cell

MISCELLANEOUS
Nuts, bolts, hook-up wire, solder.

Control Timer

1 LCD clock module IC-702
1 PCB 102 x 53mm coded 80c14
1 Scotchcal front panel
1 Metal diecast case, 190 x 110 x 60mm
1 Ferguson PF2851, DSE 2851, A&R 6474 transformer, 12.6V centre-tapped 150mA
1 relay 12V coil, SPDT 5A 240V contacts (265/12/C2)
2 momentary pushbutton switches
2 SPST switches
1 DPDT switch
1 2-pole 4-way rotary switch
1 flushmounting 240V AC socket (Clipsal S/1/415 series)
1 mains cord and plug
1 knob
1 2-way mains terminal strip
1 cable clamp and grommet

RESISTORS
(¼ or ½W unless otherwise specified)
1 x 100k, 1 x 10k, 1 x 6.8k, 1 x 2.2k, 3 x 1k, 1 x 120 ohms 1W, 1 x 100 ohms 1W.

CAPACITORS
1 220uF 25VW electrolytic PC type
1 .082uF 250VAC or 630VW polycarbonate

SEMICONDUCTORS
4 EM401, 1N4002 rectifier diodes
1 EM404, 1N4004 rectifier diode
2 red LEDS
1 BC549, BC209 or BC149 NPN transistor
1 BC557, BC307 PNP transistor

MISCELLANEOUS
Nuts, bolts, PC stakes, ribbon cable, mains cable, solder etc.

Note: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with higher ratings may generally be used provided they are physically compatible.

which have been somewhat maltreated. You must make your own decision when you make up your own clock. A separate external transistor and miniature loudspeaker are required for the alarm feature.

Even though the clock has only a four-digit display, it is possible to display the "seconds" readout for stopwatch or time-setting use. Seconds display is obtained by connecting the appropriate control terminal to the positive supply.

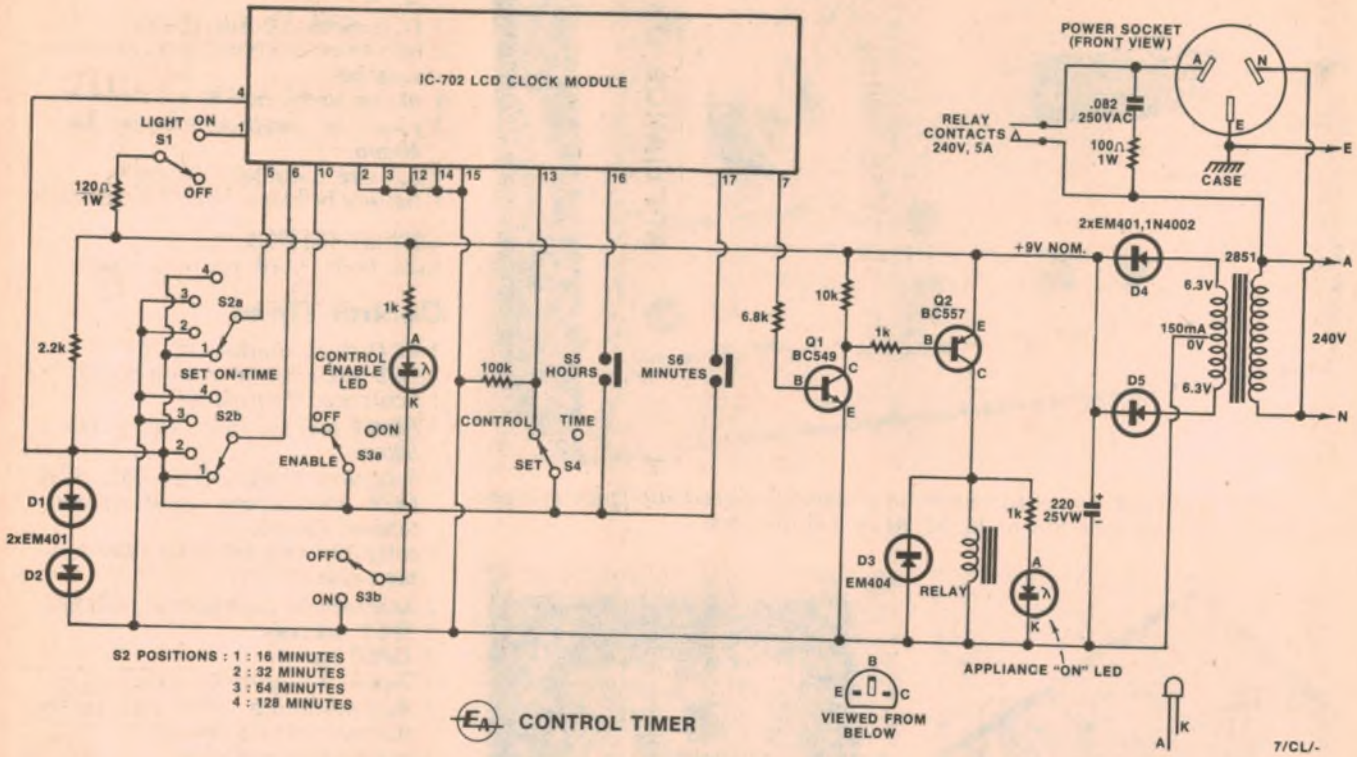
While the Hong Kong manufacturers suggest quite a few applications for this clock module, we decided to build it up in two forms, to keep this article simple. This should be enough to whet your appetite. Our first application uses the module in a desk clock format. This could also be adapted easily for use in a car.

We constructed our desk clock version in a plastic utility box measuring 83 x 54 x 28mm. Instead of mounting the clock module on what would normally be the lid of the case, we made a suitable rectangular cutout in the plastic base of the case and this became the front while the aluminium lid became the rear. Two switches were mounted on the lid to give time-setting for the hours and minutes display.

As with most digital clocks, the set minutes and set hours switches are permanently armed. That is, as soon as one of the switch buttons is pressed, the display digits associated with that switch increment every second if held continuously or increment faster if the pushbutton switch is pushed rapidly on and off.

The clock module can be secured in the rectangular cutout with a suitable adhesive. Make sure that the module is flush with the outside surface of the case for a neat finish.

We made up a holder for the penlite cell by cutting a dual holder in half and mounting one half on the case lid, us-



The circuit diagram of the Control Timer. S2 sets the on-time, S4 the switch-on time, and Q1 and Q2 drive the relay.

ing adhesive. No on-off switch is required.

Finally, we made up a small angle bracket of aluminium and affixed it to the case lid (using the switch nuts to secure it) to give a convenient viewing angle for the clock.

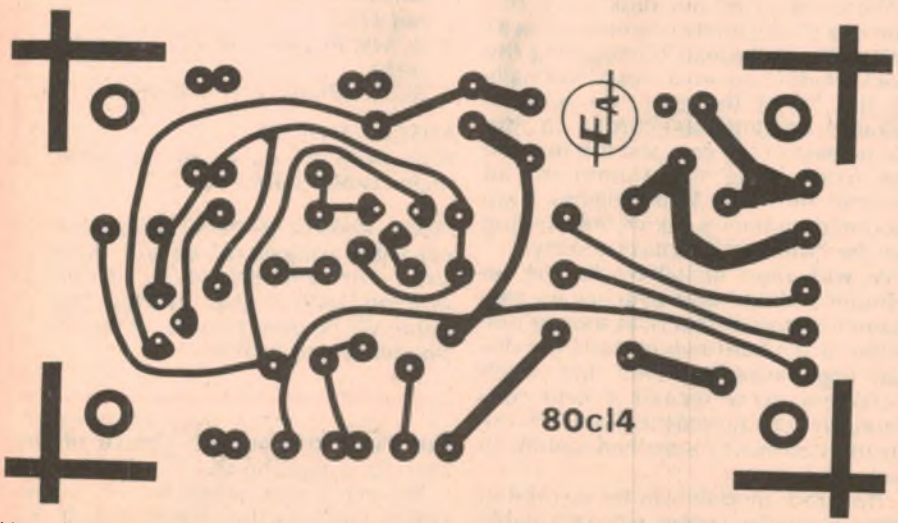
CAR CLOCK

This simple clock idea can be simply adapted for use in a car. As shown on the circuit, the car battery provides the power rather than the 1.5V cell.

The 1.3 to 1.8-volt power supply requirement for the clock module is derived from the voltage drop across two forward biased diodes. We used rectifier diodes which have a voltage drop of about 0.7 volts at low currents.

We suggest that you check the total voltage across the two diodes before connecting the clock module, just to be safe. The voltage should be around 1.4 volts.

To drive the internal display light of the module, a 220 ohm resistor is connected from pin 1 to the switched side of the car light switch. In this way the light will only come on when the instrument panel lights are on. (The return supply for the light is via the chassis of the car and the circuit is for negative earth vehicles only.)



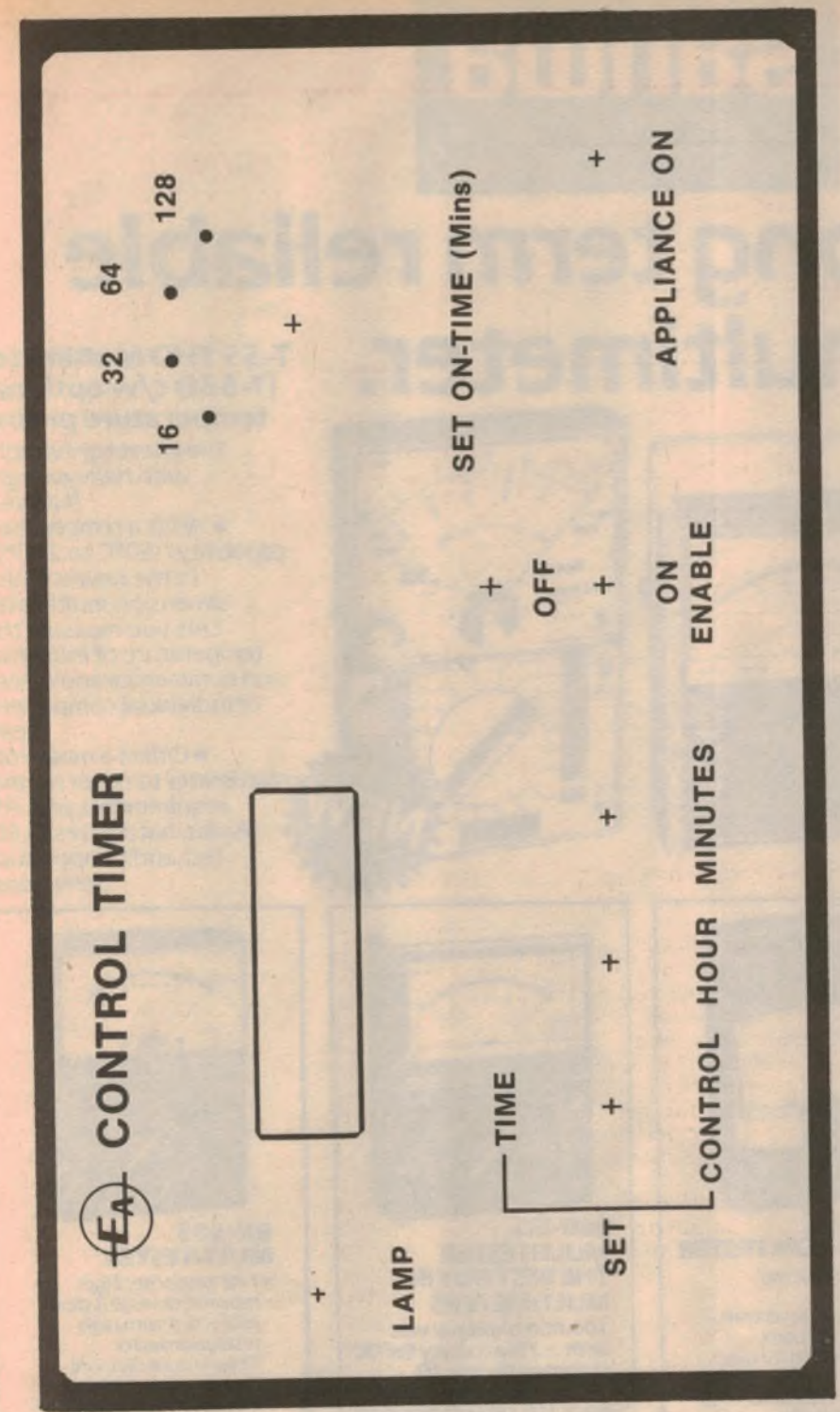
Here is an actual size artwork for the Control Timer PC board.

CONTROL TIMER

Our Control Timer is a more ambitious project. It can be used to switch on a mains-powered appliance at a predetermined time for a period of 16, 32, 64 or 128 minutes. Appliances or combinations of appliances drawing up to 1200 watts may be switched.

Our control timer has a number of advantages over commercial 24-hour timers. For a start it accurately displays the time and it can be set more accurately than a commercial timer. It could find application with high fidelity systems, swimming pool filters, automatic control of house lights and so on. We are sure that readers will think of many more applications.

The control timer is housed in a metal diecast case, measuring 190 x 110 x 60mm and has a number of switches and knobs to provide the control functions. There is a "lamp" switch to provide internal illumination of the clock display in darkness and a "Set" selector which allows the time-setting pushbuttons to set the displayed time or the predetermined time for the appliance to be switched.



Actual size reproduction of the front panel artwork.

When setting the latter time it is best to set the "enable" switch to off to prevent the appliance being inadvertantly switched. With the "enable" switch set to the on position the control timer is set and the appliance will be switched at the predetermined time. When the appliance is switched, the "appliance on" LED will light up. The "set on-time" rotary switch determines the duration that the appliance will be switched, ie 16, 32, 64 or 128 minutes.

The control timer circuit is powered by a small transformer feeding a full-wave rectifier and 220uF capacitor to develop about 9 volts DC. The clock module itself is again powered from the voltage derived across two silicon rectifier diodes.

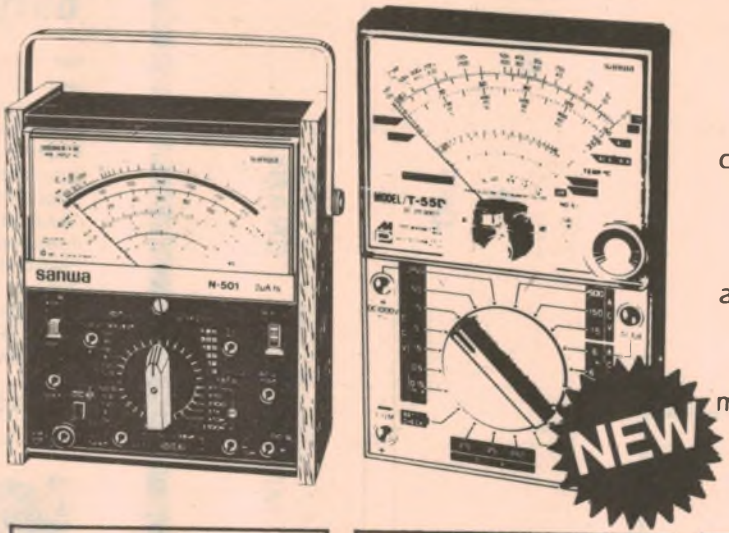
Q1 and Q2 amplify the control signal from the timer module to drive the relay. Diode D3 protects Q2 from the back-EMF when the relay is de-energised. Q2 also switches a LED to indicate that the appliance load is connected to the mains.

sanwa

...the long term reliable multimeter.

N501 Multimeter The executive choice!

- Measurements similar to a VTVM can be taken as the N501 has a constant IMΩ input impedance on the ACV ranges.
- Widespread coverage of the principal measurements is available as the N501 has AC + DC Volts to 1.2kV, AC and DC Amps to 12 Amps and 6 resistance ranges to 200 MΩs.
- Attractive, 9mm thick walnut sideboards help protect the multimeter from accidental damage.



T-55 THD Multimeter (T-55D c/w optional temperature probe)

The latest lightweight with heavyweight features!

- Adds a temperature capability (-50°C to 200°C) to the newest thin-dimension multimeter. Lets you measure the temperature of industrial and commercial appliances or individual component heat.
- Offers a multi-role multimeter to cover normal requirements plus AC Amps, battery test, LED test and temperature selections.

U-60D UNIVERSAL MULTITESTER

- 44μA movement–quality performance, diode protected
- Stable ACV measurement – solid-state rectifier & enlarged frequency coverage.
- Linear scale characteristic –common scale reading for DCV and ACV
- Semiconductor test –simultaneous reading of load current & voltage with Ω
- Temperature measurement of –30°C to +150°C with extra probe

PDM500C INSULATION TESTER

- Easy push button operation.
- Large easily read scale.
- No wearing parts (transistorized for long trouble-free life).
- One-man operation–no handle to crank.

Specifications
Rated Voltage 500V.
Resistance 100 Megohm.
Effective scale reading: 0.1–100–200 Megohm.
Continuity Scale: 0–100 ohms.
Including vinyl-leather case with lead pouch, shoulder strap and insulated test leads.

460-ED MULTITESTER THE BEST BUY IN MULTIMETERS

100,000 ohms per volt with ± 2% accuracy for DC ranges with only 10 microamperes loss at full scale. H.F. current blocking when making DC measurements.

- 10μA movement–100kΩ/V, varistor protected
- Polarity reversal switch–negative measurements
- Equalising transformer–common shunts & jacks for 1.2A & 12A DC/AC

BX-505 MULTITESTER

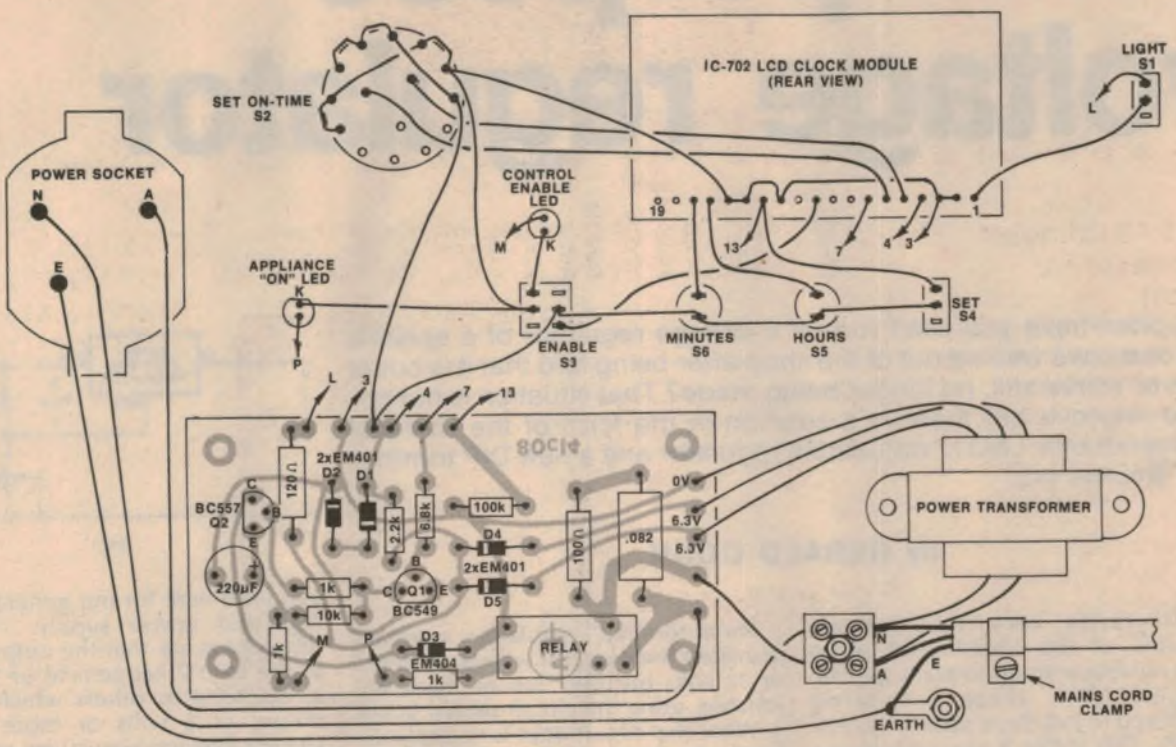
- Fast-response, 24μA movement–fuse & diode protected with high resolution factor (0.4μA/scale division)
- Revised scale marking–intermediate readings readily determined
- Polarity reversal switching–negative measurements
- Series capacitor terminal (OUTPUT+)–AF output level check

RANGES: AC & DCV to 1.2kV (30kVDC with optional probe). AC & DCA to 12 amps

WARBURTON FRANKI

- ADELAIDE 356-7333 • BRISBANE 52-7255 • HOBART 23-1841
- MELBOURNE 699-4999 • PERTH 277-7000 • SYDNEY 648-1711
- AUCKLAND N.Z. 77-0924 • WELLINGTON N.Z. 698-272

WF623/78



Take special care with the mains wiring of the Control Timer and make sure that the metal diecast case is earthed.

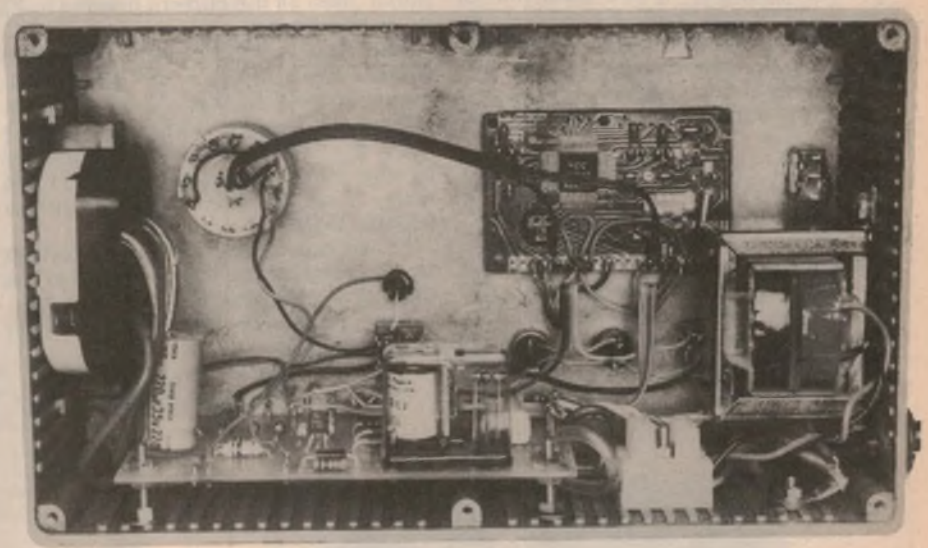
We estimate that the current cost of parts for the clock in both car and free standing versions is approximately

$21

and the cost for the control timer approximately

$52

Both prices include sales tax.



As already mentioned, the "set on-time" switch allows the programming of the "appliance on" period. This is done by applying either a high or low signal to pins 5 and 6. If pins 5 and 6 are both high then the duration time is 16 minutes; 5 low and 6 high — 32 mins; 5 low and 6 low — 64 mins; and 5 high and 6 low — 128 mins. The switch sections S2a and S2b perform these programming levels.

The "enable" switch, when closed between pin 10 and positive, prevents the control output at pin 7 from going high. When opened, the other switch section, S1b, is closed and lights the control "enable" LED.

The relay contacts are rated at 5 amps and 240 volts AC. A snubber network is across this contact to suppress any transients when switching. Be sure to use a 630VW DC or 250VAC rated capacitor here and a 1 watt resistor.

We designed a small PCB measuring 102 x 53mm (coded 80cl4) to accommodate the relay and its associated components. We recommend the use of PC stakes for the low voltage connections to the PCB but the mains connections should be soldered directly.

Use a grommet for the mains cable entry hole and secure the cable with a clamp. The mains active and neutral conductors should be terminated to an insulated terminal block while the earth wire connects to the earth terminal on the flush-mounting AC socket and to a solder lug connected to the metal case. Note that these wiring details should be followed for safety's sake.

Readers may have wondered why we used a relatively expensive diecast case for this project rather than a cheaper plastic utility box of much the same size. Again, safety is the reason. The diecast box is very strong and can withstand being dropped.

Multi-purpose voltage regulator

How often have you tried to buy a voltage regulator of a specific type and have walked out of the shop after being told that it is out of stock or worse still, no longer being made? That situation is not going to improve but there is a solution in the form of the National Semiconductor LM317 adjustable regulator and a new DIP trimmer from Bourns Inc.

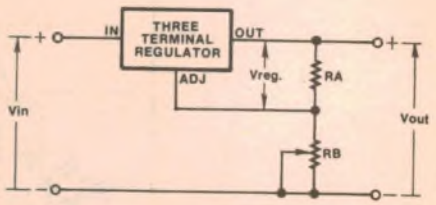


FIG. 1

by GERALD COHN

Until fairly recently, voltage regulators of the LM340/7800 series were available with up to eight specific voltages. Now, these are being rationalised to just three values, 5V, 12V and 15V. This is fine if you wish to use one of these three most commonly called for types but "you are up the creek without a paddle" if you want one of the discontinued types. A neat and tidy solution to this dilemma is to use the National Semiconductor LM317 adjustable regulator which enables you to obtain any output voltage between 1.25 and 37 volts.

The only trouble with the LM317 is that it requires a trimpot, which is relatively wasteful of space, and an extra resistor. Well now Bourns Inc of the USA have produced a neat dual-in-line 6 pin package which incorporates a fixed resistor and a trimmer. This was brought to our attention by Radio Despatch Service, of 869 George Street, Sydney, who have stocks available.

Three-terminal regulators normally provide a fixed output voltage such as 5 or 12 volts but they can be made adjustable, using the circuit shown in Fig. 1. What this circuit does is to apply the fixed regulator output voltage, Vreg, across resistor Ra. Assuming that no current is drawn by the adjustment terminal, then all the current flowing in Ra must flow in Rb.

The result of the current flowing in resistor Rb is to "jack up" the adjustment terminal so that the total output voltage is Vreg + VRb. As we have seen, the voltage across Rb is defined by the current through Ra which, in turn, is set by the regulator output voltage Vreg.

So we can define the output voltage of Fig. 1 merely by the selection of the ratio of the two resistors, Ra and Rb.

The formula to express this relationship is:

Vout = Vreg + (Vreg x Rb)/Ra.

This is the principle behind the circuit used here for our general purpose regulated power supply. The major differences are that the output voltage of the LM317 happens to be 1.25 volts, as opposed to others which have an output of 5 volts or more and the current flowing out of the adjustment terminal is negligible.

The remainder of our discussion is referenced to the main circuit diagram:

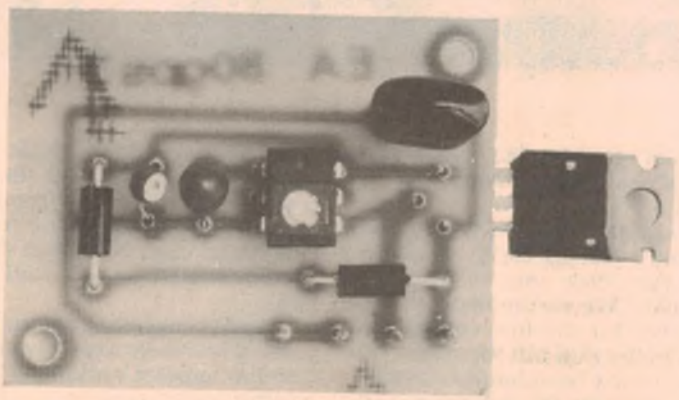
Diode D1 serves to protect the LM317 from damage if a charged capacitive load is connected to the output of the circuit when it is not energised. Such a capacitive load would tend to discharge via the junctions of the LM317 in an attempt to charge up the filter capacitors after the rectifier stage. If this happens, diode D1 safely shunts any such discharge around the LM317.

The adjust terminal is bypassed by a 1uF capacitor to improve the ripple rejection of the LM317 regulator. It does this by bypassing remaining ripple at the adjustment terminal.

Diode D2 is placed in circuit to protect the IC in case the output of the circuit is shorted. The diode effectively bypasses the IC, removing any danger of damage occurring. The 0.1uF and the 10uF capacitors provide improved stability and transient response.

The output voltage of the circuit is set by trimming the pot in the DIL package.

Construction of the unit is a simple

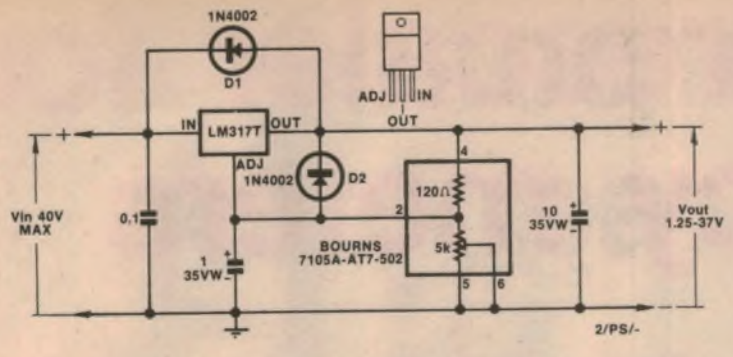


A view of the completed regulator board. The regulator IC can be mounted on the top of the PCB instead of underneath as shown here.

We estimate that the current cost of parts for this project is approximately

$6.00

This includes sales tax.



Here is the complete circuit of the regulator. The Bourns trimmer package has only four connections internally but all six pins are used to simplify the PCB layout.

matter and should take about half an hour at the most. All the circuitry for the regulator is accommodated on a small printed circuit board measuring 46 x 36mm and coded 80gps3.

The component overlay diagram shows the placement of the various components. The three terminal regulator is shown as being mounted to the underside of the board, but this is not necessary, and it can be mounted on top if this is more convenient.

If the current drawn from the output is to exceed 300mA, then adequate provision has to be made for heat-sinking the regulator IC.

When mounting the components onto the PCB, take note of the orientation of the two diodes and the two tantalum capacitors. Orientation of the DIP package is simple as the pot is offset to one end.

Once construction is complete hook the board up to a well filtered DC source and, using a multimeter, confirm that the output voltage is in fact present, and that it is somewhat lower than the input voltage. Now, using a small screwdriver rotate the pot in the DIL package and confirm that the voltage at the output changes. If this is all in order, then all that remains to be done is to set the output voltage to the required value, and install the regulator into your piece of equipment.

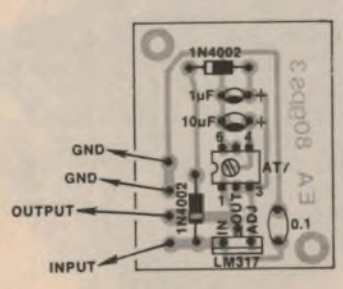
If you have a digital multimeter on hand it is possible to set the output voltage very precisely. We found that we could set the trimmer to within 25 millivolts of a given specified voltage.

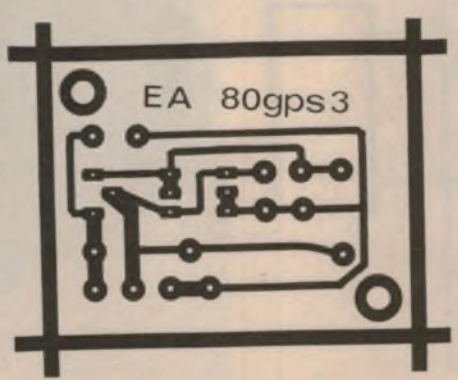
Finally, a note of caution: Although the device is rated to supply an output of up to 37V, at no time should the input/output differential exceed 40V. This is the figure quoted as being the maximum the device can safely handle, and in practice it is generally better to limit this to 35V or so.

Well, there you have it, a solution to all your voltage regulator problems. And there is a big advantage with this circuit in that you can now use the same regulator chip to fulfil almost every voltage regulator requirement that you are likely to encounter (at least for output currents up to 1.5A anyway).

PARTS LIST

1 Printed circuit board 46 x 36mm (coded 80gps3)
1 LM317T three terminal regulator
2 1N4002 diodes
1 0.1uF metallised polyester capacitor (greencap)
1 1uF/35VW tantalum capacitor
1 10uF/35VW tantalum capacitor
1 Bourns MFT resistor/trimmer package P/N 7105A-AT7-502
4 PCB stakes





Above: PCB overlay showing component placement and orientation. The regulator IC can be mounted on the top or underneath as in the photograph. Right: A full size reproduction of the PCB.

Audio prescaler for frequency meters

Multiplies frequencies from 25-100Hz by 100

Here is a neat solution to improving the resolution of a frequency meter when measuring low frequencies. The signal is multiplied one hundred times by the prescaler, without loss of accuracy, before passing on to the frequency meter. This enables the frequency meter to deliver three or four-digit resolution on low frequency readings.

by JOHN CLARKE

Well, why "prescale"? After all, digital frequency counters have no trouble measuring low frequencies. Well, there are really two problems in the measurement of low frequencies using run-of the mill digital frequency counters. The first of these has to do with "resolution", which refers to the smallest resolvable (ie, readable) unit of measurement. For a conventional digital counter, resolution is one Hertz. Now while a resolution of one Hertz is fine when you are measuring frequencies of 1MHz or more, it is poor when measuring frequencies below 100Hz.

The more expensive frequency counters overcome this problem by providing a facility for period measurement, so that high resolution (in terms of microseconds, usually) is then possible.

The second problem to do with low frequency measurement is that of accuracy. While, for high frequency measurement, the measurement accuracy is dependent mainly on the accuracy of the crystal derived timebase, for low frequencies it depends mainly on the "gating" time. For typical counters, the gating time is usually one second (maximum).

Depending on how the signal frequency being counted actually synchronises (or not) with the counter's gating periods, there may be a counting error. This usually amounts to plus one digit. For example, a one-second gating time and a 10Hz input signal may result in a reading of 10Hz or 11Hz.

Again, for high frequencies, a counting error of plus one digit is not important but it introduces appreciable error when measuring low frequencies. In the example, a count error of plus one digit is equal to an error of 10%.

Our prescaler neatly solves these problems of resolution and counting error by multiplying the signal frequency by one hundred. In so doing, it improves the resolution by one hundredfold.

The term "prescaler" is normally applied to frequency division, so that high frequencies are divided down to a frequency suitable for measurement by the frequency counter. Our prescaler actually multiplies the input signal by 100 to suit the capabilities of the frequency counter and therefore still deserves the title of "prescaler".

The audio prescaler will multiply frequencies from 2.5Hz to 100Hz by 100. The input sensitivity is 30mV p-p with a maximum allowable input of 8V. The input impedance is 1 megohm. The output from the prescaler is 7 to 10V

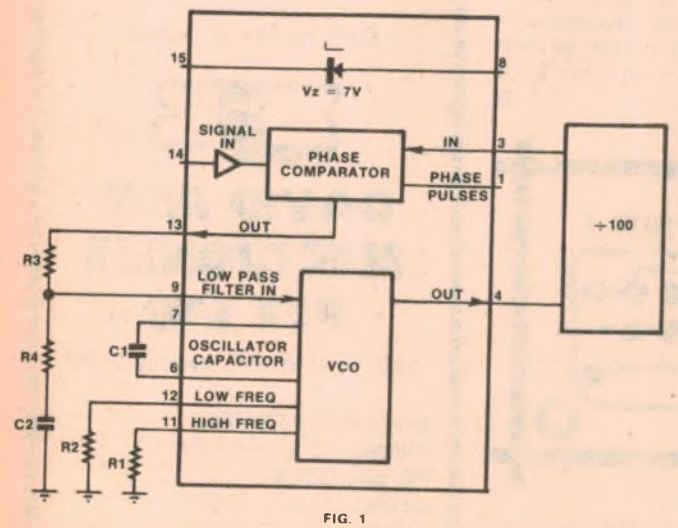
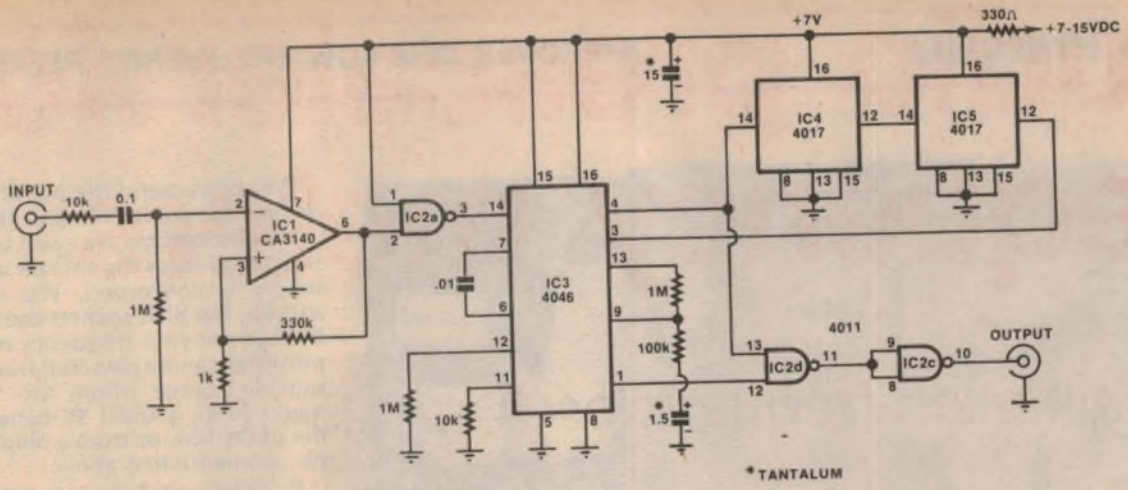


FIG. 1

Fig. 1: Basic scheme of the audio prescaler circuit.

The prototype was built into a low-cost plastic utility box.



AUDIO PRESCALER

A Schmitt trigger (IC1), a phase-locked loop (IC3) and two decade counters (IC4) form the basis of this simple circuit.

p-p depending on the power supply. This can be reduced with a resistive divider if necessary. The input waveform should be a sinusuoid or square wave.

The basis of our prescaler is a phase-locked loop IC combined with a pair of decade counter IC's which give a total division of one hundred. The basic format is shown in Fig. 1.

A phase-locked loop (PLL) is comprised of two parts, a voltage-controlled oscillator and a phase comparator. In our circuit, the VCO "free-runs" at about 250Hz when no input signal is present (at pin 14 of the PLL). The VCO output at pin 4 is fed to the "divide-by 100" counter stages mentioned previously to emerge as a low frequency (2.5Hz or higher) at one of the comparator inputs, pin 3.

When an input signal is applied to the other comparator input, pin 14, the comparator detects whether the two inputs are in phase. If not, the comparator develops an error voltage which is fed to the VCO to shift its output frequency.

Through this process, the comparator is able to bring the signal at pin 3 into phase with the signal at pin 14, while the VCO then runs at an exact 100-times the input frequency. This VCO output is then fed to the external frequency counter.

The VCO can be programmed to run within a certain specified range by selecting the resistors at pins 11 and 12 and the capacitor at pins 6 and 7. With the components as specified the VCO will oscillate between 2.5kHz and 100kHz.

Five integrated circuits make up the complete circuit. Besides the PLL and two decade counters, there is a CA3140 fet-input op amp and a 4011 quad 2-input NAND gate. The op amp is connected as a Schmitt trigger to provide the necessary square wave input for the PLL.

As well, the op amp provides a high input impedance (one megohm) and high input sensitivity.

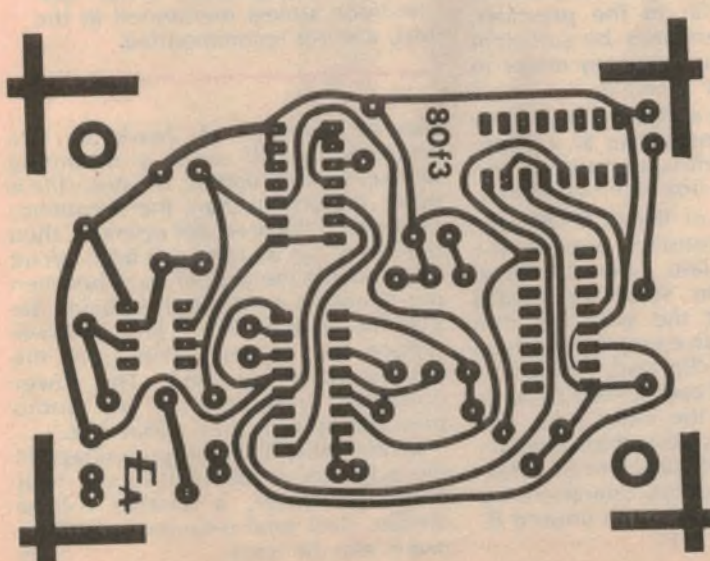
As explained previously, when no signal is applied to the input of the PLL, the VCO will oscillate in the "free run" mode at about 2.5kHz and this signal would normally be read by an external frequency meter as a valid signal. This problem is overcome by the 4011 which gates through valid VCO output signals when the PLL is "locked" to an input signal.

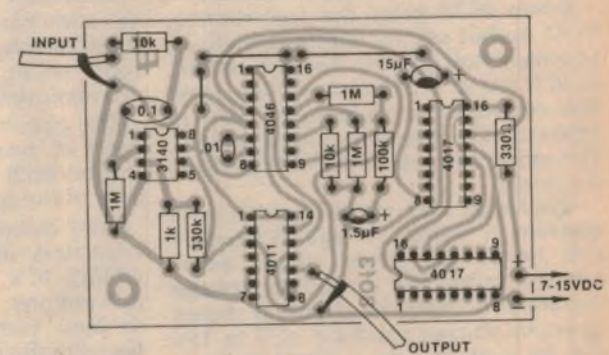
One of the NAND gate inputs of the 4011 is used to monitor the "phase pulses" output of the VCO. This output is "high" whenever the PLL is locked onto an incoming signal and is "low" when the VCO is free-running. Thus, IC2d gates the free-running VCO output off and so avoids a spurious reading

We estimate that the current cost of parts for this project is approximately

$16

including sales tax. This does not include the plugpack power supply.



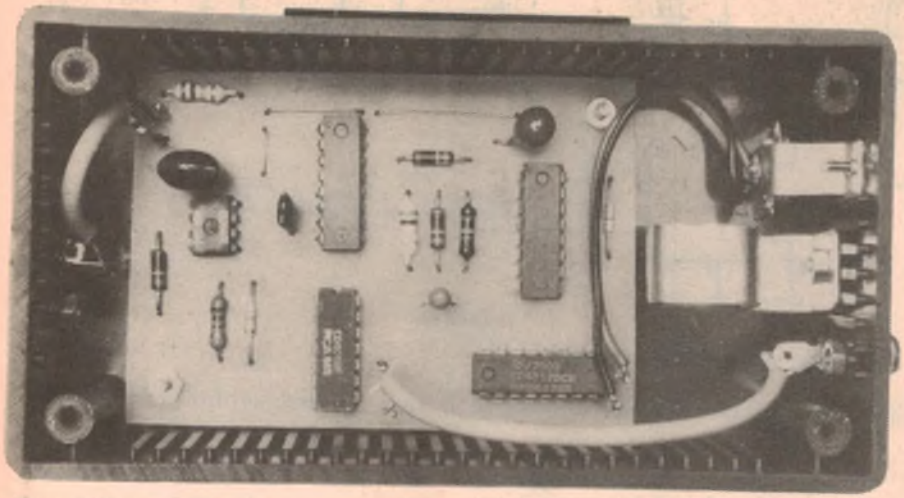


This wiring diagram shows the PC board as viewed from the component side. Note the use of shielded cable for the input and output connections.

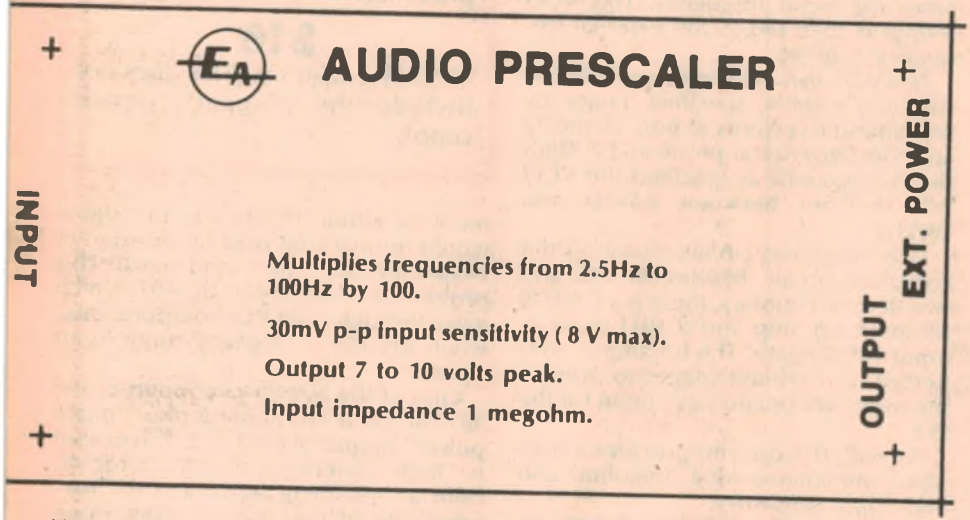
At left is an actual size artwork for the printed circuit board. The board measures 57 x 83mm.

Audio Prescaler

IMPROVES DFM LOW-FREQUENCY RESOLUTION



Above: View inside the prototype. The unit can be powered from either a battery, a plugback supply, or a source within the frequency meter itself.



Here is an actual-size reproduction of the front panel artwork.

on the external frequency counter.

When IC2d gates the free-running VCO output off, its output is high, ie, approximately 7V DC. For this reason, IC2d is fed to IC2c to invert the output and results in a "quiescent" level of zero volts DC when no signal is present. The remaining gate in the 4011 package is unused.

The range over which the VCO will oscillate is supply voltage dependent and hence the zener diode incorporated within IC3 is used for voltage stabilisation. With the circuit as shown an input voltage variation of 7 to 15V can be coped with. Current drain is about 10 milliamps. The unit can be powered from a nine-volt battery or a mains plugpack supply.

CONSTRUCTION

Our version was made up in a plastic utility box measuring 130 x 68 x 41mm. A Scotchcal panel for the lid provides an attractive finish to the prescaler. Alternatively, there may be sufficient room within your frequency meter to accommodate the prescaler.

The circuitry is accommodated on a small PC board measuring 57 x 83mm (coded 80f3) which is mounted to the base of the utility box with two screws.

Start assembly of the PCB with the capacitors and resistors, leaving the CMOS IC's till last. Take the usual precautions when soldering CMOS devices. Connect the soldering iron barrel to the negative supply pattern on the PCB, using a clip lead, and solder the supply pins of each CMOS package before soldering the other pins. This enables the static protection circuitry within each CMOS device to be effective during the soldering operation. It is not necessary to solder the unused IC pins.

We recommend the use of PC stakes or pins for connections to the PCB.

Various options are open to the constructor as far as the sockets and power supply is concerned. We used RCA sockets, but BNC sockets could be used if these suit your frequency meter. The prescaler can be powered from either a suitable source within the frequency meter itself, a small 9V battery within the utility box, or from a plugback supply, as mentioned above.

If battery operation is envisaged, a switch will have to be provided and mounted where we have placed the power socket. A look at the photograph will show a mounting bracket for a 9V battery. If battery life is more important than the frequency over which the prescaler operates, then the zener can be removed from circuit by removing the copper track between pin 15 and 16 on IC3 and replacing the 330 ohm resistor with a link. This will reduce the current drain from the battery to about 3mA. The lower operating frequency of the audio prescaler at 9V is then about 4Hz.

Incidentally, if the output voltage of the prescaler is too high to suit your frequency meter, a suitable voltage divider, with total resistance of 10k or more, may be used.

PARTS LIST

1 PCB, 80f3, 57 x 83mm
1 plastic utility box 130 x 68 x 41mm or similar
1 Scotchcal front panel 125 x 62mm
2 RCA sockets
1 2.1mm DC input socket to suit plugpack
1 CA3140 op amp
1 4011 quad two-input NAND gate
2 4017 decade counters
1 4046 phase-locked loop

RESISTORS
(¼ or ½W, 10% tolerance)
3 x 1M, 1 x 330k, 1 x 100k, 2 x 10k, 1 x 1k, 1 x 330 ohms.

CAPACITORS
1 x .01uF metallised polyester
1 x 0.1uF metallised polyester
1 x 1.5uF/15VW tantalum electrolytic
1 x 15uF/15VW tantalum electrolytic

Miscellaneous: screws, nuts, scrap aluminium, hook up wire, shielded cable, etc.

Note: Capacitors and resistors with higher ratings may be used if physically compatible. Other substitutions, unless mentioned in the text, are not recommended.

ROD IRVING ELECTRONICS

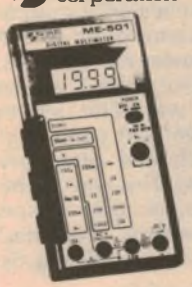
499 HIGH STREET, NORTHCOTE 3070, MELBOURNE VICTORIA. Ph. (03) 489 8131.

NEW PRODUCTS

RIE are now distributors for 3M products including Scotchcal range.

8016 blue on white plastic	$4.10
8018 green on white plastic	$4.10
8011 red on white plastic	$4.60
8012 black on transparent plastic	$4.10
8013 black on yellow plastic	$4.10
8015 black on white plastic	$4.10
8009 light blue on aluminium	$4.10
8001 red on aluminium	$4.10
8005 black on aluminium	$4.60
8007 reversing film	$3.75
* Note — all above sheets 10in x 12in	
8500 Photosensitive developer	$4.40
3900 clear coating (glossy finish)	$9.30
3930 clear coating (matte finish)	$9.30
ML-3 Applicator block	$3.90
ML-4 developer pads 10 for:— 8002KA evaluation kit	$8.90

SOAR corporation



Digital hand multimeter **$77**

EA METAL DETECTOR

EA 79md 9	$2.60
As A Kit (without H/phones)	19.90
ET576	4.90
Dream 6800	9.90
ETI 472	2.90
ETI 471	9.90
ETI 470	2.75
ETI Series 4000 Kit	179.00
ETI 585 Rx ultrasonic Rx	15.95
ETI 585 Tx ultrasonic Tx	8.95

INTERSIL ICL7106 LCD EVALUATION KIT

$32.50

INTERSIL LCD 3½ DIGIT PANEL METER KITS

Build a working DPM in ½-hour with these complete evaluation kits.

Test these new parts for yourself with intersil's low cost prototyping kits complete with A/D converter and LCD display (for the 7106) or LED display (for the 7107). Kits provide all matrials including PC board, for a functioning panel meter ICL7106EV (LCD).

COMPONENTS

2114 RAMS	$5.60
2708 EPROM	8.50
741's 10 up	2.50
4116	10.00
BD139 10 up	4.00
BD140 10 up	4.00
SC141D 10 up	11.00
SC151D 10 up	21.10
RED LEDS 10 up	1.40
RED LEDS 100 up	11.00
YELLOW LEDS 10 up	2.90
8 PIN I/C SKTS 10 up	2.00
BC547 10 up	1.00
BC548	0.15 ea.
BC549	0.19 ea
MJ802	3.60
6,800/50V CAPS (LUG)	4.50
5,600/40V CAPS (PCB)	1.90

KITS & CIRCUIT BOARDS

ETI SERIES 4000 AMP

- **Complte Kit** $179.00
- Quality front panel to suit above $8.99
- ETI 470 kit of parts 19.90
- ETI 480 kit of parts 100w (incl. bracket) 19.75
- ETI 470 PS kit of parts (includes relay, not transformer) 19.50
- Transformer to suit 22.90
- ETI 471 pre-amp 45.50
- ETI 585R ultra sonic RX 15.95
- ETI 585T ultra sonic TX 8.95
- EA 79 SF9 sound flash trigger 15.00
- All parts available for DREAM computer project
- P.C.B.'s (all quality fibreglass boards)
  - ETI 574 disco strobe 2.80
  - ETI 549A metal detector 2.75
  - DREAM circuit board 9.90

PROJECT BOARDS (FIBREGLASS)

ETI 043	1.40	ETI 481M	2.00
ETI 044	1.30	ETI 481PS	3.50
ETI 047	1.50	ETI 483	2.20
ETI 061	1.40	ETI 484	3.90
ETI 062	1.80	ETI 485	2.90
ETI 063	1.70	ETI 486	2.90
ETI 064	1.70	ETI 489A	2.50
ETI 065	1.70	ETI 499	1.99
ETI 067	1.80	ETI 528	2.20
ETI 068	1.40	ETI 541	2.20
ETI 071	1.40	ETI 547	2.20
ETI 072	1.80	ETI 581	2.20
ETI 081	1.50	ETI 583	2.20
ETI 083	1.80	ETI 585R	1.60
ETI 084	1.70	ETI 585T	1.40
ETI 085	1.30	ETI 586	2.30
ETI 130	1.90	ETI 603	2.50
ETI 134	1.90	ETI 604	1.60
ETI 135	1.90	ETI 635	2.90
ETI 136	1.80	ETI 638A	3.90
ETI 137A	2.90	ETI 708	1.90
ETI 137B	2.90	ETI 713	3.90
ETI 139	1.90	ETI 714	1.90
ETI 245	1.60	ETI 717	2.90
ETI 417	1.80	EA 78A0B	2.90
ETI 445	1.50	EA 78TM8	2.00
ETI 446	1.90	EA 78N6	3.20
ETI 449	1.50	EA 78NG4	2.50
ETI 450A	1.90	EA 78UT4	3.90
ETI 450B	1.90	EA 78T3	4.20
ETI 480	2.40	EA 78C5	3.90
ETI 480PS	2.40		

COMPUTER COMPONENTS

Attention Sorcerer & TRS 80 owners. Memory expansion kits available. We also offer full service on the popular computer projects and systems.

SPECIAL 4116 RAM OFFER
8 OFF PRIME SPEC 4116 I/Cs $79.00
16 4116s for $150.00
STATIC RAM KIT 16K S-100

KIT FORM **$269.00**
ASS & TESTED **$299.00**

All front panels available for ETI &EA projects in scotchcal from July '79. Phone for details.

DIP PLUGS

Ideal for use with flat ribbon cable or to mount components on

14 pin $0.56	24 pin $0.94
16 pin $0.58	40 pin $2.00

POWER TRANSFORMERS

SPECIALLY DESIGNED FOR MICROCOMPUTERS

- Good regulation electrostatic shield
- RI 805 8V @ 5A 2x15V @ 1A $19.50
- RI 810 8V @ 10A 2x15V @ 1A $21.50
- RI 820 8V @ 20A 15V @ 1A 15V @ 3A $33.50

20 TURN CERMET TRIM POT

SPECTROL 43P ACTUAL SIZE

STOCK RESISTANCE VALUES
10R, 20R, 50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 100K, 200K, 500K, 1M, 2M.

1—9	1.30
10—99	1.10
100	1.00

Values may be mixed.

Hexadecimal Keypad

$21.50/each

19-key pad includes 1-10 keys ABCDEF and 2 optional keys and a shift key

Ideal for dream project

MULTIDIALS

Dials to suit 10 T Pots	
Model 21 1.8" dia	$9.90
Model 16 9" dia	$9.50
Model 18 1" x 1.75" dia	$17.50

COMPUTER COOLING FANS

Muffin fan 4⅝" square	
110V	$26.50
240V	$24.50
Sprite fan 3⅛" square	
110V	$26.50
240V	$24.50

Range of larger fans available. Send for details.

cermet single TURN TRIM POT

Spectrol model 63P ACTUAL SIZE

STOCK VALUES
10R, 20R, 50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 200K, 500K, 1M, 2M

1—9	0.95
10—99	0.85
100	0.75

Values may be mixed.

P.C. EDGE CONNECTORS

S100 gold plated wire wrap	$6.60
S100 solder tail	$5.90
D2 Motorola bus	
43/86 solder tail	$6.34
43/86 gold plated wire wrap	$7.40

DREAM

ELECTRONIC AUSTRALIA MICROCOMPUTER PROJECT

Kit for main board (including programme 2708) **$109.00**

PCB (fibre glass) only	$9.90
2708 programmed	$15.50
Key Pad 19 keys	$21.50
Kit (less key pad)	$90.00
PCB for power supply	$3.50

10 TURN POTENTIOMETERS

Stock resistance values

50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 100k

Spectrol model 534 ¼" shaft

Price 1—9	$6.25
10 + values may be mixed	$5.75

HEAVIER ITEMS ADD ADDITIONAL POSTAGE. EXTRA HEAVY ITEMS SENT COMET FREIGHT ON. PRICES SUBJECT TO CHANGE WITHOUT NOTICE. SEND 40c & S.A.E. FOR FREE CATALOGUE.

MAIL ORDERS: PO BOX 135, NORTHCOTE, VIC 3070.
MIN. PACK & POST $1.00. P & P ON TRANSFORMERS MIN. $5.00

The Serviceman

No fault is simple — when it's three layers down!

When is an appliance too old to service? This is something like asking how long is a piece of string — and nearly as hard to answer. While most of us develop some kind of instinct about such things there is always an element of chance involved and it is still possible to get caught, as this month's story reveals.

As recently as the November 1979 issue I discussed this subject, as an afterthought to my experience with a TV set in a holiday cottage. First aid to produce a (just) watchable picture was one thing, but getting the set back into first class operation would have been quite uneconomic.

Nor would it have taken a genius to work this out; with just about every function in the set in need of attention it would have been a major overhaul in every sense of the term. By comparison, the tape recorder which is the subject of this month's story should have been a push-over.

Granted, it was at least 15-years-old, and a valve device, but there any comparison with the TV set finished. It had, according to the owner, only one fault (failure to record properly) which I mentally registered as being most likely due to a sick bias/erase oscillator valve. This, coupled with the fact that the owner had the original manual and circuit, persuaded me to tackle the job.

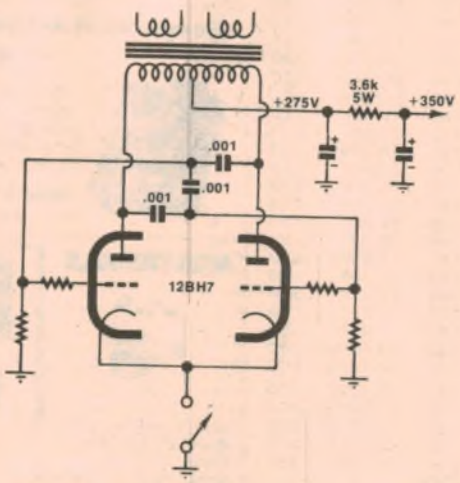
It was a Sony recorder, model TC-500A, stereo, mains powered, all built into a substantial carrying case with two speakers fitted as a two-piece detachable lid. It was built like a battleship and weighed 25kg — or close to half a hundredweight by pre-metric standards. I was glad I didn't have to carry it any further than from the counter to the workshop.

A few preliminary tests confirmed the owner's description of the fault; while the VU meters responded to signals into the microphone, thereby absolving it and its associated amplifier, the system would not record these signals or, indeed, erase the previous recording. This latter point alone clearly suggested partial or total failure of the bias oscillator system.

I removed the head cover, identified the erase head, and used the CRO to check for oscillator voltage across the head. There wasn't a sign of anything, thereby confirming the general nature of the fault.

The oscillator valve was a 12BH7 twin triode, in a cross-coupled multivibrator circuit, with a centre tapped transformer coupling one plate to the other. The valve itself seemed the most likely suspect, particularly as, according to the owner, all the valves were original.

So much for the theory; locating the valve and changing it wasn't quite so simple. Just getting the chassis out of its wooden case was a major operation, after which I realised just how tightly everything had been packed in. The electronics had been stacked around the motor, with a large portion of it (mainly the record and replay sections) in a shielded section.



It seems only yesterday that circuits like the above were normal and commonplace — a tape recorder bias oscillator using a twin triode valve and three high voltage mica capacitors in the grid and anode circuitry. Valves? Mica capacitors?

Fortunately, the erase oscillator, along with the power supply, was one section outside the shield, but it still wasn't the most accessible arrangement I have seen. Changing the valve was reasonably easy, but achieved virtually nothing. The system still would not record.

Closer inspection revealed a couple of clues. There was some gunk in the vicinity of the main power electrolytics, suggesting that they had been overheated in some way. This led to the second clue; a five watt resistor in close proximity which had obviously been badly overheated. This was all the more obvious because, for some reason best known to the makers, they had enclosed the resistor in shrink plastic tubing!

The next thing was to try to get at the 12BH7 socket and measure some voltages, but this was easier said than done. The whole erase oscillator circuit was tucked in behind the power transformer, and I had to partially dismantle this part of the chassis before I could even juggle a pair of test prods into position to make a few voltage measurements.

According to the circuit, the main HT supply was 350V in the record mode, and this was applied to the plates of the 12BH7 via a 3.6k decoupling resistor (the one which had overheated) and the centre tap of the coupling transformer. The HT voltage was close enough, but that on the 12BH7 plates was another matter.

According to the circuit it should have been 275V in the record mode but, in fact, it was only a little over 70V. No wonder the poor old 3.6k resistor was getting hot, it would have been dissipating over 20W! (At the same time, I calculated that it would normally dissipate only about 1.5W, which would make the plastic tubing more acceptable, even if the reason for it is not obvious.)

Looking at the circuit it appeared that the only other components, apart from the valve, which might be suspect were three .001uF capacitors in the grid cir-

cuits of the valve. But confirming this was another matter. It was virtually impossible to get at the capacitor leads with the meter prods without a lot more dismantling.

I gained the impression that this section of the recorder was the first to be wired, so that everything else had been built around or on top of it. There were also numerous harnesses connecting the various sections together so that to dismantle the set any further would have been a massive, and costly, operation.

The only other possibility seemed to be to cut the capacitors loose, one by one, until I found the faulty one — and hope that Murphy was on holidays! Even this wasn't easy but, selecting the most accessible one, I managed to get a small pair of cutters in and clip the first pigtail, bend the capacitor out of the way, and then clip the second one.

And that proved to be about the only bright spot of the whole operation because, believe it or not, that was the faulty one — a dead short. I couldn't be sure which one it was, but it was most likely one of the two which couple to the grids. If so, it would have applied the full HT voltage to one grid, effectively preventing oscillation and causing that valve to draw several times its normal current.

But my troubles were far from over. I now had to replace the capacitor, and this presented two problems; finding a suitable replacement, and getting it in there. The capacitor was one of the old mica type, which were often rated as high as 1000V, and I had not idea where I could put my hands on anything with an equivalent rating in this age of low voltage circuits and components.

Finally a colleague came to the rescue with a 1600V polycarbonate type which was also physically compatible. But then I had to fit it and this was obviously going to be even harder than getting the faulty one out. There was no way that I could hold the pigtail in position while I applied solder and heat; it was hard enough just getting a small soldering iron in there.

In the end I carefully trimmed the pigtails to the right length, tinned them, and loaded the end of each with a generous blob of solder. Then, working by feel as much as by sight, I managed to mate the pigtail and its terminal and coax the iron onto the junction. As far as I could tell, it made a solid joint.

With the first pigtail anchored, soldering the second one was a little easier, although still tricky enough. That done, I switched the recorder on and it worked. Voltages now matched the figures on the circuit and, more important, it would erase and record.

I was a little worried about the 3.6k resistor, and the electrolytics which had been heated by its overload. Ideally, both should have been replaced but, again, it would have been a massive undertaking. I was able to measure the resistor from other points in the circuit,

"Your take-up reel seems to be acting rather funny, Ed!"

and it was spot on, while I could detect no trace of hum in any of the operating modes.

In the circumstances I decided that any further work would be hard to justify.

But something more was necessary. Having cured the recording problem I suddenly realised that only one of the two channels was working on playback and a quick changeover of the speakers showed that it was in one speaker. An ohmmeter check then narrowed it down to the cable.

It was a shielded cable and I was surprised to discover that both the active and the shield were open circuit. Closer examination showed that it had apparently been pinched, probably in a doorway, about half way along its length, but even this did not explain how both conductors had been broken.

It seems most likely that, when the cable was caught in the doorway, somebody had tried to free it with a hefty pull, without bothering to find out why it wouldn't move. Anyway, that problem was soon fixed, and the machine returned to the owner.

Naturally, he was happy to have it fixed, and seemed not unduly perturbed by the bill which, while not insignificant, was not exorbitant either. But he had no idea how lucky he had been. Had the fault involved one of the less accessible components the labour cost would have been considerably higher. Either that, or he may have elected not to have the job done, leaving me out of pocket for the work already done.

The simple fact is that, in the 15 years since that device came on the market, labour costs have risen so much that a few hours work now represent a significant proportion of the original purchase price. Which isn't a good place to start from anyway, but when we add a tricky layout and the need for hard-to-get components, the situation can easily get quite out of hand.

So keep that in mind the next time you are tempted to tackle an old appliance because the fault looks easy.

Another innovation from Hioki

MEET A TOUGH BABY

*Only 22mm thick and can drop from a height of 1 metre without any harm.

HIOKI 3012
Thin
Drop-Proof
Multimeter

Specifications:

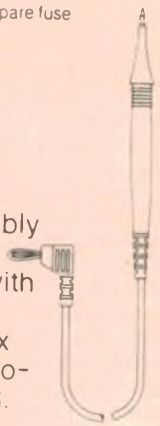
DC VOLTAGE :03. 3. 10. 30. 100. 300. 1000V 20kΩ/V. ±3% of F.S
DC CURRENT :(50μA). 1. 3. 30. 300mA 300mV drop. ±3% of F.S
AC VOLTAGE :10. 30. 100. 300. 1000V 10kΩ/V ±4% of F.S
RESISTANCE :10k. 100k. 1MΩ (Rc 100Ω) ±3% of Scale Length
POWER SOURCE :1.5V (Size AA)
ACCESSORY CIRCUIT :Meter protecting circuit. Circuit protecting 0.5A fuse DC-AC 1000V measuring terminal OUTPUT terminal
METER :TAUT BAND type (with mirror scale)
DIMENSIONS :Approx. 140Hx84Wx22Dmm (Max. 26D)
Approx. 250g
ACCESSORIES :Test leads. 0.5A Spare fuse Soft case. Strap

Our little pocket tester is so slim, small and light you might overlook the fact that it is a rugged, hard-working precision instrument – tougher than most multimeters twice the size. It can fall from a work bench (1 metre high) and still work perfectly well.

The "DROP-PROOF" pocket multi-meter demonstrates our claim that "HIOKI puts you years ahead". It gives you the advantage of HIOKI Core Magnetic TAUT BAND for precise readings.

It is friction-free and is remarkably resistant to shock.

The pencil type leads fittted with guards are a pleasure to handle, especially when testing complex electronic circuits, etc. HIOKI innovation is apparent in every detail.



HIOKI PUTS YOU YEARS AHEAD!

•SYDNEY 6016600 • MELBOURNE 3296511 •
BRISBANE 525231 • ADELAIDE 466411 • PERTH 4466622 •

H. ROWE & CO. PTY. LTD.

SOLE AUSTRALIAN AGENTS

Reverting to more everyday service matters, a colleague offers the comment that it pays to test your test equipment at regular intervals. As you can probably guess, this remark was prompted by a somewhat embarrassing incident due to blind faith in an instrument, which turned out not to be justified.

It started with a repair to a colour set which, when completed, necessitated resetting a particular supply rail to exactly 165V, this being controlled by a tab pot in a voltage regulator circuit. To do the job my colleague connected the leads from his old and trusted valve type volt-ohmmeter which had served him faithfully for the last umpteen years.

Rather to his surprise, he found that the tab pot needed to be turned almost full up to provide the required 165V. But since it did supply it, he accepted that this was a normal characteristic for that set.

The only snag was that, two days after delivering the set to the customer, it was back in the shop with a flashed over diode in the EHT system. Becoming suspicious, he checked the 165V rail again, using a different meter. Imagine his reaction when it read closer to 200V than 165.

Subsequent investigation showed that the volt-ohmmeter had developed a sick 12AU7 valve and was reading something like 40V low! What was more, there was every evidence that this error had been becoming progressively worse over a period of several months.

As of now, my colleague is going through some mental gymnastics trying to recall how many "critical" rail voltages he has set over the last few months, and what the chances are that some of them may still bounce.

Hence his advice to test your test gear. And, while his was a valve device, more prone to ageing effects than modern equipment, the latter are not immune to faults, often of a subtle kind, which can upset their accuracy.

YOU NEVER KNOW . . .

Next up, this snippet comes from an overseas mag which runs a column similar to this one. It concerns a portable TV set which failed when the owner touched the set's in-built aerial with a coin. (It is not explained WHY the owner was so motivated — but then, owners do some funny things.)

Anyway, having tapped the aerial with a coin, the set promptly dropped its bundle — picture and sound. Not completely but very weak. My opposite number, who is obviously descended from Sherlock Holmes, deduced that (1) the weak vision AND sound signals suggested the fault involved a common signal path, probably in the front end, (2) that, as it had failed as a result of something contacting the aerial, it was most likely the RF stage, and (3) since the "something" was the owner he must have acquired a static charge of some kind, probably as a result of wearing synthetic fabric and/or rubber soled shoes.

On his own admission, he was spot on. The owner had been out running in his track suit and running shoes and, on investigation, the RF amplifier transistor had an open circuit base/emitter junction.

Such brilliance makes me hold my head in shame. If only, just once, I could pull a Sherlock Holmes act like that, I would feel there was some justice in the world. As it is, I will have to keep plodding along, doing things the hard way.

Seriously though, it does appear that some of the more advanced transistor types, while having undoubted advantages in terms of performance, can be unduly sensitive to things like static charges, etc. On the other hand, Sherlock hinted that the set manufacturer may not have provided adequate protection against this precise train of events.

VAPOURISED COPPER . . .

And to finish off, here is a brief comment on my story in the November 1979 issue, about the vaporised copper tracks in some National TV receivers. Following its publication I received a letter from one of the original correspondents, Mr M. W. of Surfers Paradise.

His opening comment on my story was a cryptic phrase suggesting that it was less than convincing. Then he went on to say; ". . . all the aerial systems in all of the motels in question, or at least the ones we have been talking about, had a new reticulation system fitted. Yours Truly did install said aerial points in most of the motels, using DC isolated aerial points made by Hills."

To which I can only reply that, as far as I am concerned, the situation which I described could exist and, if it did, could account for the problem. Significantly, it has not been questioned by the other two correspondents and, in fact, it was from their suggestions, coupled with careful examination of a chassis, that I evolved my explanation.

Which is not to say that it is the only explanation. There could well be another one in Mr M. W.'s case and, if so, I suggest he would be in a much better position to investigate it than I. It would undoubtedly make an equally interesting story but, in the meantime, the November explanation seems to be the best one we have!

CIRCUIT & DESIGN IDEAS

Interesting circuit ideas and design notes selected from technical literature, reader contributions and staff jottings. As they have not necessarily been tested in our laboratory, responsibility cannot be accepted. Contributions to this section are always welcome, and will be paid for if used.

Conducted by Ian Pogson

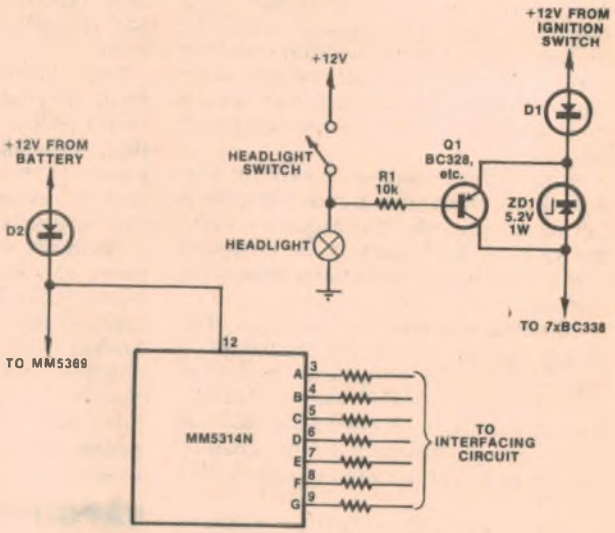
Readout dimmer for the 6-Digit Crystal clock

I recently built the 6-digit Crystal Clock as described in March, 1979 for my car and found that it worked well. However, while the display was quite visible in normal daylight, it was far too bright for night driving. By adding three components to the existing circuit, I was able to dim the display as required when the car headlights are switched on.

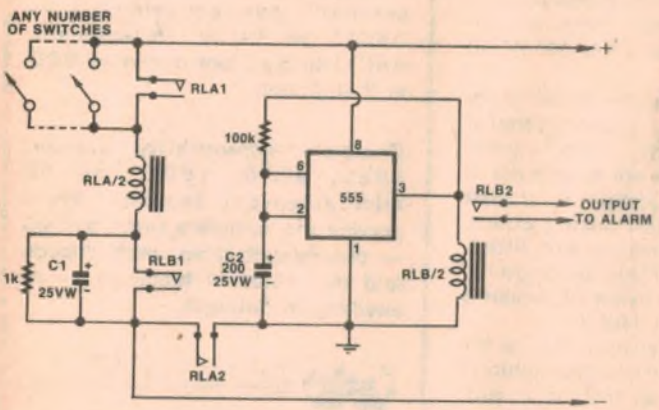
While the headlights are off, a negative potential via the headlight globe is applied to the base of Q1 via R1, turning it on, short-circuiting ZD1 and applying the 12V from the ignition switch to the display. When the headlights are switched on, full voltage from the headlight switch is applied to the base of Q1, turning it off and by doing so, the zener diode ZD1 is placed in series with the 12V supply reducing the voltage to the display. Depending on the zener voltage selected, the brightness of the display can be dimmed as required. In my case, I used a 1W 5.2V zener diode.

I hope that this modification may be of interest to other readers who have possibly had the same problem.

(By Mr C. Maujean, 15 Jindavee Crescent, Slacks Creek, Qld 4127)



Self resetting burglar alarm



This device draws no current until triggered. Once activated the alarm will sound for a preset time, then switch off and reset. If relay contacts chatter after the timer has switched off the value of C1 may have to be decreased.

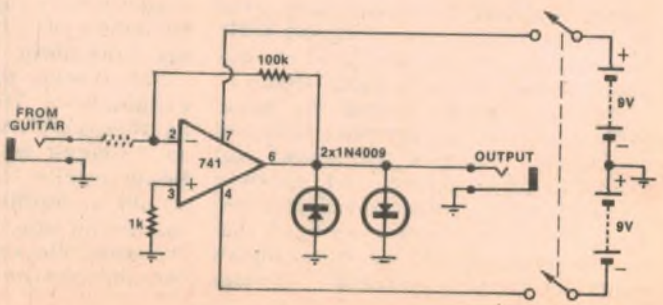
With the values as they are shown, the alarm should sound for about 20 seconds. By increasing the value of C2 the alarm on period is increased. The supply voltage can be anywhere between 4.5 and 18 volts, provided the appropriate relay is used.

(By Stephen Locke, ZL1TPP, in "Break-In".)

Add fuzz to your electric guitar

If you have not already tried adding "fuzz" to your electric guitar, perhaps you might like to try this simple circuit. As may be seen, it operates from two 9V batteries. The 741 op amp is wired as an inverting amplifier and this is followed by two diodes across the output. The diodes clip the signal and by doing so add extra harmonics thereby adding the now familiar sound called "fuzz". The amount of fuzz added may be controlled by the volume controls on the guitar.

(By Mr K. Stone, 4 Jennifer Street, Cheltenham, Victoria 3192.)



Modification to calculators for incremental counting

With a small modification to the presently available very low power low priced LCD calculators, an inexpensive incremental electronic counter can be made to replace costly power-consuming mechanical counters. The calculator should have a "constant" or "k" facility and a calculator should be chosen that does not turn itself off after a certain inoperative time.

The modification to the calculator consists of attaching two thin wires to the contacts operated by the = key. Do not solder directly to the gold plated contacts because that would damage the contacts and could make the = key inoperative. Look instead for lands connected to the = contacts and solder the wires to these. The wires are fed through a small hole and terminated to a small connector.

Most algebraic calculators operate in the "constant" mode by pressing x + + y =, or, x - - y =, where x is the amount added to or substracted from the initial value y, every time = is pressed. x can have any value except O, so any amount can be added or subtracted, which is very useful to convert an operation to length or volume, or another physical amount.

Very briefly, here are some suggested applications:

1. Frame counter in time lapse or animated movies. Two kinds of synchronising contacts are provided with modern movie cameras. One is the flash contact closing once for every frame, the other is the sound synchronising contact, closing once for every four frames. The calculator will need to be set up to suit the individual case.

2. Distance covered by bicycle. A contact is installed on the front wheel. The circumference of the wheel is determined and this distance is keyed into the calculator and so the total distance is recorded.

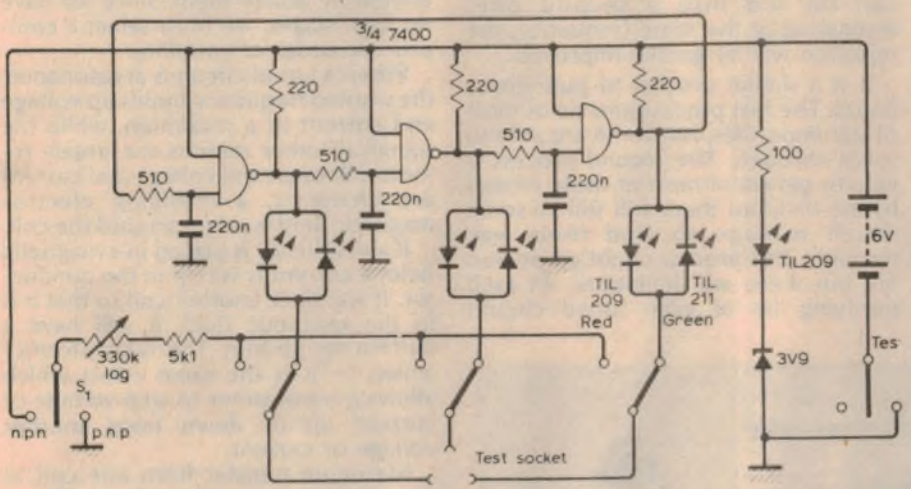
3. Counting persons or vehicles entering or leaving. One calculator is used to add the incoming cars or persons, another is used to add those leaving. The difference in count is the number of cars or persons still remaining.

These are just a few of the applications which come to mind. Undoubtedly, many more applications are possible, taking into account the low cost and low power consumption of the device.

The maximum count rate has to be determined for each calculator and depends on scanning rate of the contacts and time necessary to execute the required instruction. The calculators which I have tried will count up to eight counts per second, which is fast enough for most applications.

(By Mr J. Brandwyk, Electronics Workshop, School of Earth Sciences, Flinders University of South Australia, Bedford Park, SA 5042.)

Improved transistor tester



This transistor tester is based on a circuit by N. E. Thomas in the March, 1977 issue of Wireless World. Any unknown bipolar transistor can be placed in the test socket and the transistor leads can be in any order.

The ring-of-three oscillator produces a three-phase waveform which switches either two green and one red LED on for an NPN device or two red and one green for a PNP type. By switching S1 to the appropriate position, the base can be biased via the correct test socket switch.

When this has been identified, increasing the base current by reducing the variable resistance turns the collector LED on first, so all three leads are identified. Noting the position of the wiper and the brightness of the LED gives an indication of the gain of the transistor.

(By M. Odyniec, in "Wireless World".)

Lets talk about Crystal Sets (Part 2)

Basic Electronics

Last month we introduced you to the basic crystal set and how it worked. This month we have two crystal sets for you, the first an improved version of the one described last month and the second a miniature version which is actually built into a matchbox.

First, let us briefly recap on what we said last month: A basic radio receiver consists of an antenna (and earth) to receive the signals, a tuned circuit to separate the wanted signals from all the other signals in the radio spectrum, a detector to extract the audible signal from the radio signal, and an earphone — to convert the audio signal into sound.

The antenna, detector and headphones were discussed last month. There is not much (at least in this type of receiver) which one can do to improve performance. However, the tuned circuit can take a variety of forms — and it is this with which we are concerned this month.

Last month's basic crystal set was tuned by varying the capacitance. Our first set this month uses the same method, but the other uses variable inductance. We will talk more about this later.

Our first set is similar in some respects to last month's design, but has one vital difference: instead of a single tuned circuit we now have two; two coils and two tuning capacitors.

Why two tuned circuits? A serious limitation with any crystal set is its poor selectivity. The reason is simple; a single tuned circuit just cannot provide sufficient discrimination between the wanted and unwanted signals. This is aggravated by the fact that the single tuned circuit will be loaded by both the antenna and detector circuits connected to it. (More about "loading" in a moment.)

It is for this reason that larger sets use several tuned circuits (plus other tricks) in order to achieve adequate selectivity. If the output of one tuned circuit can be fed into a second one, resonating at the same frequency, the rejection will be greatly improved.

It is a similar process to purifying a liquid. The first process gets rid of most of the impurities, but some are able to sneak through. The second process is able to get rid of most of those missed by the first, but there will still be some which manage to find their way through. This process could go on and on, but there are limitations. At each purifying (as at each tuned circuit) some of the wanted material is lost. Therefore, there is a limit to the number of stages one can have.

Unfortunately, feeding the output of one tuned circuit directly into a second one is the least desirable procedure. If these two circuits are too intimately coupled they cease to function as separate circuits, and behave more like a single circuit. On the other hand, if they are not adequately coupled, there will be a serious loss of signal.

This problem is overcome in larger sets by interposing amplifying stages between the tuned circuits, which also effectively isolate them. Since we have no such stages, we must select a compromise order of coupling.

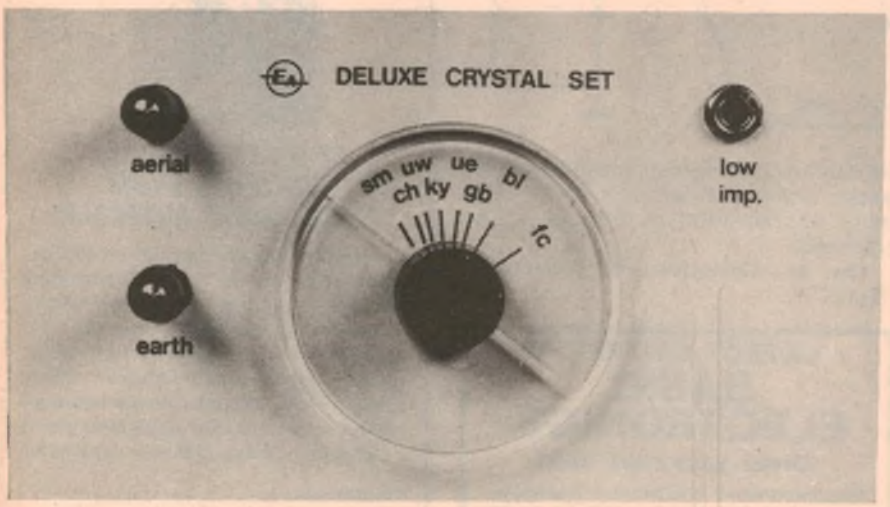
When a tuned circuit is at resonance, the wanted frequency builds up voltage and current to a maximum, while the signals of other stations are largely rejected. Because the voltage and current are changing, a changing electromagnetic field is set up around the coil.

If a conductor is placed in a magnetic field, a current is set up in the conductor. If we place another coil so that it is in the magnetic field, it will have a current set up in it. This is transformer action — it is the same effect which allows a transformer to step voltage or current up or down from another voltage or current.

Maximum transfer from one coil to the other occurs when the coils are oriented in the same direction (either end to end or alongside one another) and are close together. But, as we have seen, it is not always desirable to have maximum coupling between the coils.

For this reason we have made the coupling variable, by arranging one coil so that it can slide along a slot cut in the baseboard. This is quite a simple method of altering coupling.

The situation may arise that, no matter how close the coils are placed, there is still not enough coupling for reasonable listening. In this case, a small amount of capacitive coupling may be added by connecting a 4.7pF capacitor between the tuned circuits (see circuit). Note that 4.7pF will be



Front panel of the deluxe crystal set. Note the simple handspan dial with the station markings behind it. The panel was made from stiff card, using Letraset rub-on letters.

about the maximum value — it will probably not require this much.

The coupling is not the only item which needs adjustment. Note the trimmers on top of the tuning capacitor. These are used to adjust the individual tuned circuits so that they both resonate at the same frequency for a given dial setting. Adjustment should be made at the high frequency end of the band (2SM, 3AK, etc).

We used two different types of trimmer, mainly to show what to look for on discarded sets. The first is a compression type, adjusted with a screwdriver, while the other is a concentric type, screwed in by hand. Any other type may be used. Simply solder them between the fixed plates of the capacitor and the frame.

As in last month's crystal set, a high impedance to low impedance speaker transformer is used for the headphones.

Earlier in this discussion we used the term "loading" in regard to the tuned circuits. The selectivity of a tuned circuit is affected quite markedly by the external circuits we connect to it; such as the detector, headphones and the antenna. The more intimately these are coupled to the tuned circuits the more they load it, and the worse the selectivity.

This is the reason for the taps on the coil; they allow us to select the best order of coupling. The tap giving the smallest number of turns produces the lightest loading and the best selectivity, but gives the weakest signal. Conversely, the tap with the largest number of turns gives the strongest signal, but the worst selectivity.

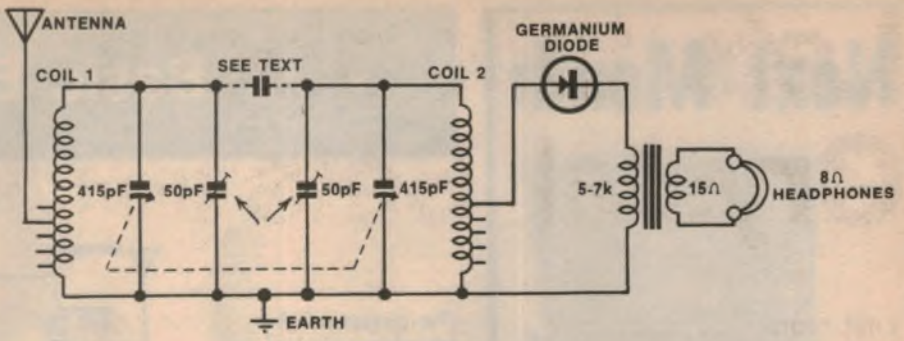
In any given situation the best tap will depend on such factors as the size of the antenna, strength of the signals, number of stations available, etc. Thus the user has to make his own selection, possibly even changing them to receive different stations.

Construction of the set is not too involved — anyone with basic woodworking tools could manage it. In fact, some may like to treat our construction as a starting point, and enclose the crystal set in a wooden case.

We used a plywood base board, measuring 200 x 140mm, with a Masonite front panel measuring 200 x 120mm. The front panel is glued and nailed to the baseboard. Placement of components is not critical, as long as you place both coils in a straight line. The slot for the moving coil is 115mm long, and starts 10mm from the side of the baseboard, 30mm from the back.

Lightly centre punch marks along the slot line every 5mm, and drill them with a 3mm drill. Then elongate each hole so that it meets its neighbour. Finish the slot with a rat tail file.

Both the moving and stationary coils are secured with screws and nuts. (The amount of metal is too small to have any serious adverse effect.)



The circuit of the Deluxe Crystal Set, showing the two tuned circuits. The capacitor (dotted) between them may be required only under certain circumstances (see text). The trimmer capacitors are used to align the tuned circuits at the top of the band.

When mounting the moving coil leave enough wire to allow it to travel the full length of the slot. Similarly for the lead from the taps.

Longer nuts and screws are needed for the moving coil, as this has two nuts on each screw. Washers are used to stop the heads from coming through the slot, and these must be placed on each screw before insertion. We also used washers between the nuts and cardboard former, to prevent undue stress on the cardboard.

Because the screwheads protrude below the bottom of the baseboard, rubber feet are screwed to the four corners to provide clearance.

Other components (gang, transformer) are mounted with No. 4 or 6 self-tapping screws. Watch that the shaft of the tuning capacitor emerges in the middle of the front panel — it would be wise to mark this first. The transformer mounts between the moving coil and the headphone sockets.

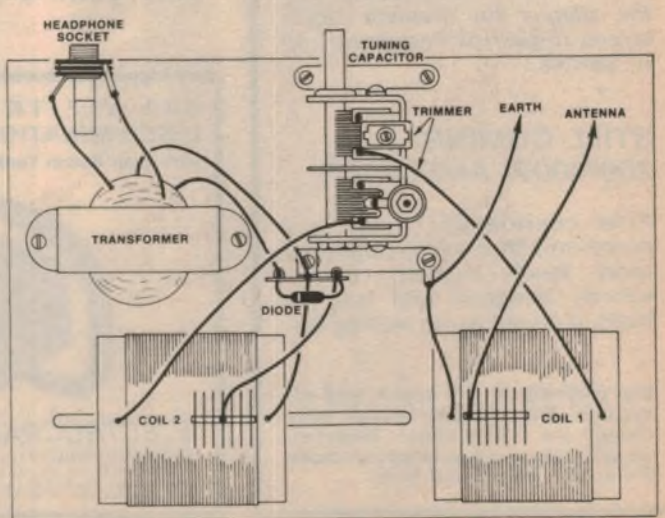
A 3 lug tagstrip (1-E-1) is mounted underneath the right hand side screw holding the gang. On this is mounted the detector diode.

On the front panel, two terminals (red & black) provide the antenna and earth connections, while a socket is provided for a pair of low-impedance headphones. The dial is a push on "handspan" dial suitable for 6mm shafts. As many older tuning capacitors have 9.5mm shafts, an adaptor may be necessary. These should be available from your supplier, along with the handspan dial. If your supplier has difficulty with the dial he should be able to obtain them from Watkin Wynne Pty Ltd, who are the wholesalers. Note that you must obtain one through your normal supplier.

The front panel is made from a piece of thin cardboard, lettered with "Letraset". The cardboard was stuck to the Masonite with "Aquadhere" wood glue.

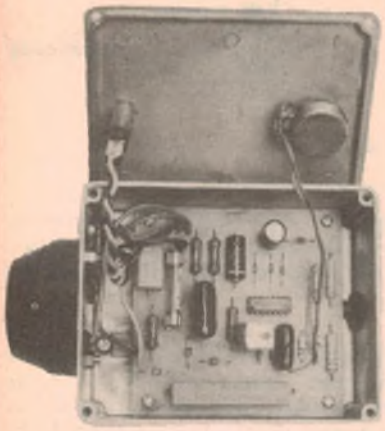
Lettering of the stations is best left until the set is complete. When the wiring is completed, check for errors. If you are sure there are none, connect the antenna and detector leads into the highest tap on their respective coil. This should ensure that at least something will be able to brute-force its way through.

If stations are well separated, leave the taps where they are. But we imagine there will be little or no selectivity on this high tap. Even moving the coils wide apart may not help much. Move the antenna and detector taps to about half way down, and check. Keep moving down until you are able



The layout of the Deluxe Crystal Set is not critical, but that shown here is a logical one. The coil on the left is the movable one, sliding in the slot shown. Refer to the photograph of the front panel for the terminal and jack positions.

Next Month



ZERO VOLTAGE SWITCHING POWER CONTROLLER

Phase-controlled Triac circuits generate considerable radio interference. This "zero voltage switching" power controller generates no interference at all and can be built using off-the-shelf components. Use it to control heating appliances such as radiators, vertical grillers and electric blankets.

TV/CRO ADAPTER

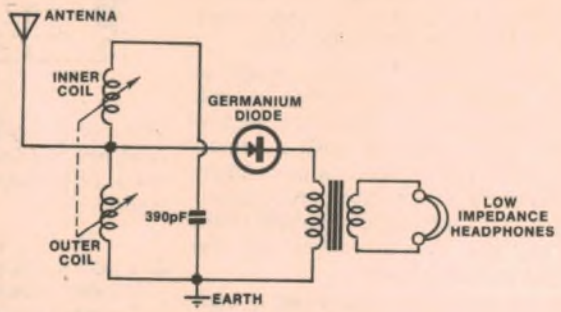
Turn your disused black and white television set into a large-screen oscilloscope with our TV/CRO Adapter. This economical unit can be built for under $30 and has its own modulator for direct connection to the TV antenna terminals. Use the adapter for dramatic large-screen display of frequencies up to 300kHz.

STILL COMING: 200/300W AMPLIFIER

After considerable delay, our power amplifier will be published soon. Really rugged, conservatively designed and easy to build, it is well worth waiting for.

Our planning for this issue is well advanced but circumstances may change the final content. However, we will make every attempt to include the articles mentioned here.

Basic Electronics



The circuit of the Matchbox Crystal Set. Tuning is achieved by varying the coupling between the two coils.

to separate each station well. Then tune to a high frequency station (2SM in Sydney, 3AK Melbourne, etc) and adjust both trimmers for maximum volume. Once the trimmers are peaked, try moving the coil back and forth.

Incidentally, the only way to make sure alignment is correct at the low frequency end (2FC or 3AR) is to ensure that the coils are identical. It is difficult to provide adjustment on either coil to correct this. So take care when winding the coils.

As you learn to use the crystal set, you should find the right combination of taps and coupling to give optimum results from all your favourite stations.

The next set is quite novel — believe it or not, it is built in a matchbox!

It contains just two commercial components — a diode and a small fixed capacitor. The other two major components are a pair of home-made coils. One coil is mounted inside the matchbox tray and the other is wound over the outer portion of the box. To tune it, all you do is try to get a match out of the box — in other words, move the tray. This tunes in the stations!

Why build a crystal set in a matchbox? Well, why not? Apart from its novelty and simplicity, this little crystal set is capable of a good performance. Connected to a good antenna and earth, it will perform just as well as the "straight" crystal set described last month, and nearly as good as the deluxe model just described.

The operation of this set is based on the fact that the inductance of one coil can be changed by another coil in close proximity. Because the coils are simply connected in series, it might appear that the resonant frequency of the tuned circuit would be governed only by the capacitance across the coils.

This is only part of the story. Because the coils can be moved relative to one another, we have a situation where the inductance of one coil can "buck" or oppose the inductance of the other coil. By the same token, the opposite is true. By physically turning one coil through 180 degrees, the inductances can be made to assist, or add to one another. In practice, more range is obtained by opposition than addition.

By planning the size of the coils, and the amount of fixed capacitance across

them, we can make them cover the broadcast band. The natural resonant frequency of the inside coil will be around 750kHz — roughly corresponding to 2BL in Sydney and 3LO in Melbourne. By placing the outer coil on one way, down to 530kHz is covered. Turning this coil around will cover the other end of the band — up to 1600kHz.

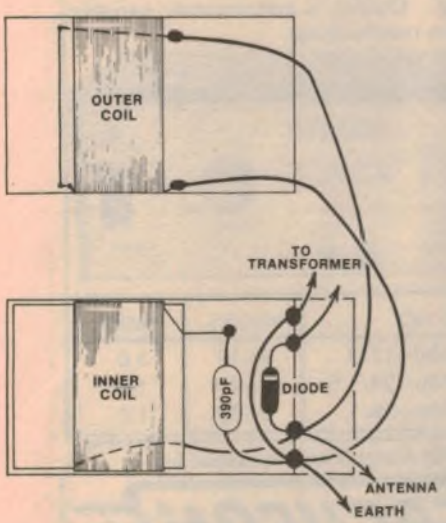
Construction of the matchbox crystal set could hardly be simpler. No woodwork, very little soldering and a few components. You will need an ordinary matchbox (try to get one as new and strong as possible) some thin cardboard, some good paper or cardboard glue, a germanium diode, a 390pF polyester, mica or ceramic capacitor and around ten metres of 30 B&S insulated copper wire.

The first step is to construct the cardboard former for the inner coil. Using the pattern given as a template, cut a thin cardboard piece the same size, and bend where shown. Glue this and leave to set. While it is setting, you can wind the outer coil on the matchbox cover.

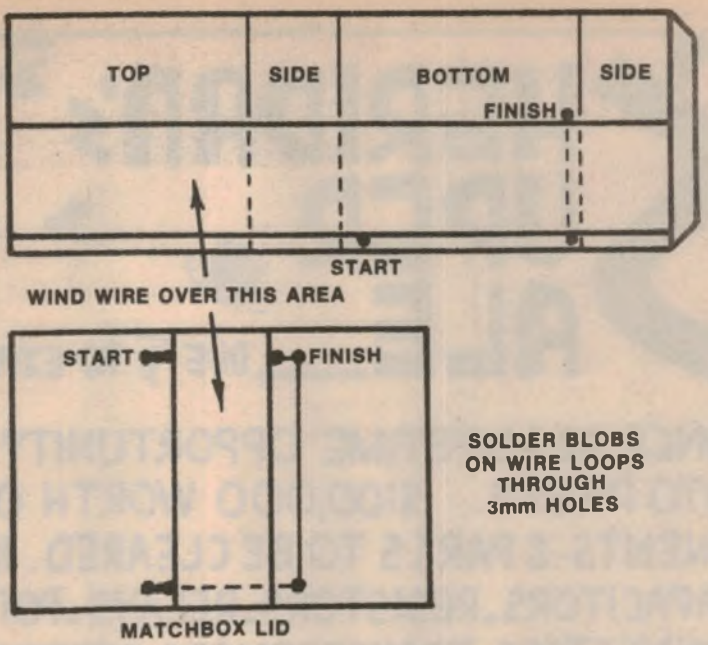
Where shown, drill two holes 3mm apart. Scrape the enamel off 50mm of wire and pass the end of this wire through the hole closest to the centre of the box. Pass it back out the other hole, and continue to loop it in this fashion four or five times. This will securely anchor the wire. Cut off any excess wire.

Now wind on the turns. These should be as tight and neat as possible. They should not be able to move when the job is completed. Wind on 39 turns and, when these are completed, drill another two holes similar to the first pair, as close to the last turn as possible.

Cut the wire 50mm from the hole, and scrape the enamel off this. Loop through the holes in the same way as before, and cut off any excess.



Layout of the Matchbox Crystal Set is simple, with the antenna, earth and transformer connections mounted on the end of the matchbox tray.



These drawings are actual size templates showing where the folds are made, and how the coil is wound.

With a hot, clean iron, place a blob of solder over each of the loops. You will use these as anchorage points later.

The inner coil is wound on the former which we described earlier, the former then being glued inside the tray. The coil is wound in much the same manner as the outer one. The ends are terminated in a similar way, by passing them through pairs of holes sevral times, but the wire is not trimmed close. Leave about 30mm of flying lead. This coil is slightly larger, requiring 48 turns.

Before glueing the former into the tray, you must perform minor surgery. If you look closely at a matchbox tray, you will see the end is made by folding the two sideflaps in and the bottom up and over these sideflaps. The bottom flap must be unfolded — this is used to pull the tray in and out — while the side flaps must remain in position as the anchorage points for all connecting leads.

Because unfolding the bottom flap reduces the strength, it is a good idea to give all flaps a liberal coating of glue before going any further. At the same time, another piece of cardboard, the same size as the extended flap, can be glued over this to give added strength.

Now the former can be glued in place. A glue such as "Tarzan's Grip" is very good for this purpose. The former is glued as close as possible to the end of the tray opposite to the end we have been working on. When the glue is dry, you can prepare the components for soldering.

We have evolved a rather novel way to make connections and hold the components in place. In the end of the tray, we made four small holes. As you can see from the drawing, these are for the antenna, earth, and transformer connections. Through the "earth" hole, we passed one end of the capacitor lead, bent it 90 degrees vertically, then bent it again 180 degrees over the top of the tray and back down the inside. This was then squeezed hard with a pair of pliers to hold it in place.

The other three terminals were treated similarly. Where possible, component pigtails were used as the bend-over terminals. For the "earthy" transformer terminal, a piece of tinned copper wire was bent over the flap, then along the bottom of the box to the earth terminal.

Connections to the terminals were made by drilling four holes through the tray underneath the wire terminals. Thin leads pass up through these holes and solder onto the wires. The advantage of the crimped wire terminal may now be seen. If we relied on solder connections alone inside the matchbox, when we soldered the wires to the terminals, the solder inside might come unstuck. By mechanically holding the components in place, soldering can be carried on without this risk.

The outer coil is connected by means of flying leads to the antenna and earth terminals. These flying leads are cut from thin hookup wire and soldered to the "solder blobs" on the matchbox lid

You may note that after we soldered the leads to the outer coil, we wrapped a piece of insulation tape around the box. This is to prevent undue stress on the solder joints.

Using this set is child's play — simply move the inner tray in relation to the outer cover, and you should find station coming and going!

Relaxation Oscillators

What they are and how they work

Basic Electronics

by GERALD COHN

A great many pieces of electronic equipment employ an oscillator of one type or another. The different types include crystal oscillators, LC (or tuned) oscillators such as the Hartley and Colpitts, Schmitt trigger oscillators, as well as the type discussed here, the relaxation oscillator.

The relaxation oscillator is one of the simplest types comprising only three components. Perhaps the first relaxation oscillator to be developed used the neon lamp as the active device.

A neon lamp or discharge tube has a glass envelope with two leads which is filled with the rare inert gas, neon. When a high voltage is applied to the tube, the gas ionises and gives a characteristic red glow as the "discharge" current flows. While neon lamps are now only used as indicators on equipment, they once had more important applications such as the relaxation oscillator used in an oscilloscope timebase.

Special neon discharge tubes were also used as voltage regulators, at typically 150V.

The circuit of Fig. 1 shows the relaxation oscillator based on the neon lamp. Here the capacitor C, is charged via resistor R. The neon lamp is connected across the capacitor.

When the voltage across the capacitor reaches the firing voltage of the neon lamp, the lamp will light and the capacitor will discharge to a value where the lamp extinguishes. Now the capacitor will once again start to charge repeating the whole cycle again. This cycle will continue for as long as power is applied to the circuit. So the circuit oscillates and so the neon blinks on and off.

The frequency of oscillation of the circuit is dependent on three factors — the values of the charging resistor, the capacitor and the supply voltage. Increasing the value of the charging resistor or increasing the value of the capacitor will reduce the frequency of oscillation, while increasing the value of the supply voltage will tend to increase the frequency of oscillation.

If the supply voltage is too high we find that the current through the resistor is enough to maintain conduction in the neon lamp thereby preventing the circuit from operating as an oscillator.

The voltage waveform shown in Fig. 3a shows the charging and discharging of the capacitor. In the case shown, the neon fires at about 95V and extinguishes below 70V.

Fig. 2 shows why the neon lamp can function as an oscillator device. Below the firing voltage, a neon lamp can be regarded as a very high resistance, which is represented by the section of the curve below the firing point. Then, at the firing point, the neon suddenly breaks down to what can be regarded as a "negative resistance" which is indicated by a region of the curve where increasing current across the lamp results in reduced voltage across it.

This negative resistance region of the neon characteristic has a negative slope while a normal resistor (shown by the straight line on Fig. 2) has a positive slope.

Readers with access to a variable high voltage power supply can demonstrate this negative resistance characteristic of the neon, if they so wish. Just connect the neon in series with the high voltage (say 100 to 200V, variable) via a 1M resistor. Now raise the voltage until the neon just fires and measure the voltage across the neon. Now increase the voltage marginally, say by 10V, to increase the neon current. A new measurement across the neon will show that the voltage across it has reduced slightly, rather than increased. Eventually, a point will be reached where increasing the neon current will again cause an increase in voltage, which would mean that the neon had moved out of the negative resistance region.

So the criterion for oscillation, which is met by the neon, is a negative

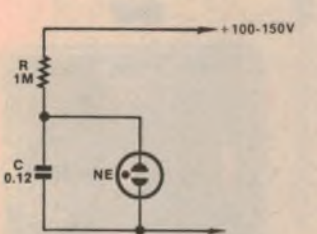


FIG. 1

Fig. 2 shows the negative resistance characteristic of the neon lamp while Fig. 3a shows the voltage waveform across the capacitor in the neon circuit of Fig. 1. Fig. 3b shows the voltage across the capacitor in the diac circuit of Fig. 4.

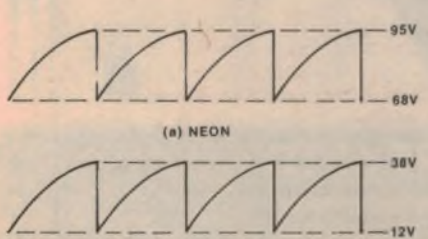


FIG. 3

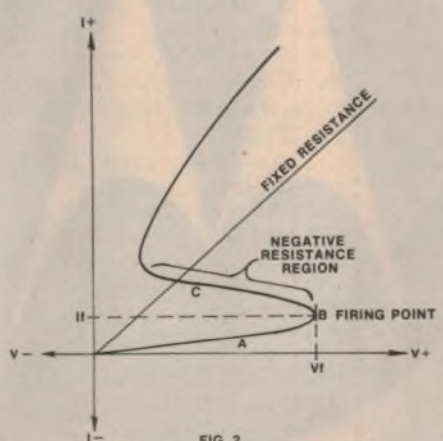


FIG. 2

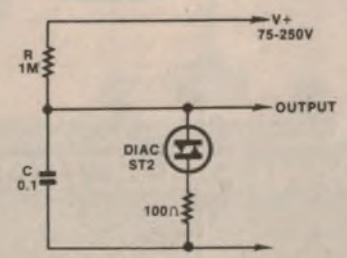


FIG. 4 : DIAC OSCILLATOR

resistance characteristic beyond its breakdown or firing point. The negative resistance allows the neon to discharge the capacitor and then extinguish, allowing the capacitor to charge up again, and so on. Relating this to the Fig. 2, the capacitor first charges along the curve from A to B, where the neon fires and discharges the capacitor along the curve from B to C. At C, the neon extinguishes and reverts to its high resistance state at A, allowing the cycle to begin again.

We should point out that Fig. 2 only represents the positive region of the neon characteristic. As the neon is a bipolar device, it will work just as well in the same circuit with a negative voltage applied.

Another device which has a negative resistance characteristic and which can be used in a relaxation oscillator is the Diac. This is a three-layer solid state device which is normally used to trigger SCRs and Triacs. Like the neon, the Diac has a high resistance state up to its "breakover" or firing voltage which may be anywhere from 27 to 40V, positive or negative.

When the Diac fires, it breaks down to a negative resistance. The Diac can be used with the same components as the neon and will operate over a wider input voltage range. Just to be on the safe side we have added a 100 ohm resistor in series with the Diac, for protection. Fig. 4 shows the Diac circuit, while Fig. 3(b) shows the oscillator waveform.

Yet another device which has a negative resistance characteristic and which can be used in a relaxation oscillator is the unijunction transistor or UJT, for short. This is a three terminal device which, unlike the normal bipolar transistor, has only one junction. In some ways, it is rather like a diode with two cathode connections, marked B1 and B2. The other connection is known as the emitter.

The UJT is commonly used in timing circuits and as a trigger current generator for SCRs and Triacs. A typical circuit using a UJT is shown in Fig. 6. When power is applied, the capacitor is charged towards the positive rail via the 10k resistor.

When the capacitor voltage reaches the so-called "peak point" voltage of the UJT, Vp, the emitter-base-1 path of the UJT becomes a negative resistance and discharges the capacitor to deliver a voltage pulse at base-1. When the capacitor has discharged the emitter-base-1 path reverts to its high resistance path and the capacitor is able to recharge again, continuing the cycle.

The resulting waveforms at the emitter and base-1 of the UJT are shown in Fig. 6. We should also mention that, coincident with the positive voltage pulse at base-1, the UJT also delivers a weak negative going pulse at base-2 which can be useful in some circuit applications.

The UJT parameter of particular interest is the "intrinsic standoff ratio". This parameter is the ratio of the "peak point" voltage of the UJT minus 0.6V, to the voltage applied between base-2 and base-1. Typical unijunctions have an intrinsic standoff ratio of from 0.47 to 0.8. To explain this further, if a UJT has an intrinsic standoff ratio of 0.5 and an interbase voltage of 10V, then the "peak point" voltage is 5.6V.

The problem with the UJT intrinsic standoff ratio is that the circuit designer has to accept the tolerance spread and relatively poor temperature stability of this parameter. Recognising this, the General Electric Company of the USA developed a new device which is called a "programmable unijunction transistor" or PUT, for short. This device has the advantage of being able to substitute for the UJT but the "intrinsic standoff ratio" or Vp, can be programmed by selecting two resistors. In addition, the PUT has generally improved parameters over the UJT.

Actually, the PUT is a silicon controlled-rectifier, SCR, with an anode gate rather than the cathode gate of conventional SCRs. An SCR remains in the non-conducting state until triggered into conduction by a signal of low voltage and current into the gate. In the case of the PUT (or anode-gate SCR) the gate voltage must be 0.6V below the anode for the device to break into conduction.

To put it another way, the anode of the PUT must rise 0.6V above the gate voltage, for the device to conduct. When the PUT is used as a UJT, the gate voltage is fixed by selection of a pair of resistors (hence the reference to "programming") and the anode must rise above the gate voltage for conduction to begin. The PUT version of the UJT oscillator is shown in Fig. 7. This is simplified in normal practice, to the circuit of Fig. 8.

All of the components used in the circuits described here should be available from your local parts supplier.

For those readers wishing to learn more about UJTs, PUTs, Diacs, SCRs and their application, we refer you to the General Electric SCR Manual, (see review in the December 1979 issue) which is available from technical bookshops and some parts suppliers

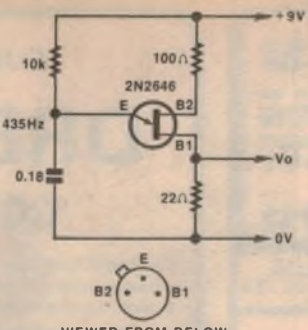


FIG. 5 : UJT OSCILLATOR

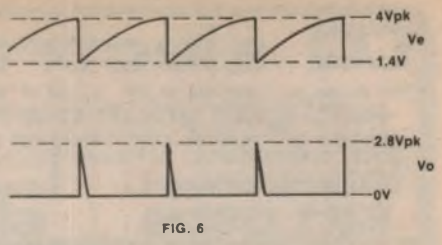


FIG. 6

The upper waveform of Fig. 6 shows the voltage across the capacitor in the UJT circuit while the lower shows the output obtained from B1 of the UJT.

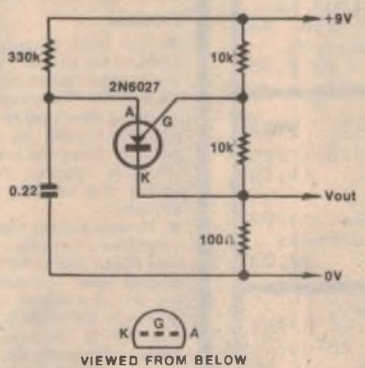


FIG. 7 : PUT OSCILLATOR

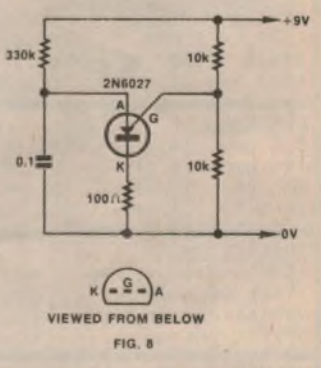
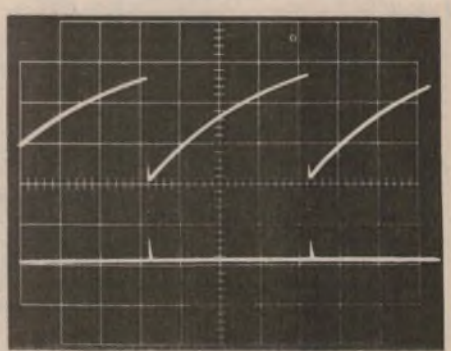


FIG. 8

The photograph shows the waveforms obtained from the UJT circuit of Fig. 5. Note that these are similar to those of Fig. 6. The CRO settings for these waveforms were: 0.5ms/cm and 2V/cm.



CQ electronics

and get your components

SHOP 9, TOWN CENTRE
30 CAMPBELL STREET
blacktown.
621 5809

95 REGENT STREET
CENTRAL RAILWAY
sydney.
698 8079

PC BOARDS
All single sided EA and ETI boards at 50¢per board plus 2¢ per hole. All boards tinned and on fibreglass.
Boards to your artwork are $2.50 per board plus 2¢ per hole.
40cm x 30 cm glass PC board available for $1.60 at shops. Sorry no mail order on blanks.

SPEAKER TRANSFORMERS

E1	5000/3.5	$1.90
E2	7000/3.5	$1.90
E40	5000/15	$1.90
E47/1	6500/15	$1.90

CRYSTALS

10.7	MHz.	$4.95
30.0	MHz.	$4.95
50.0	MHz.	$4.95

INTEGRATED CIRCUITS

HD0165	encoder	$3.95
2708	EPROM	$8.00
8251A	UART	$5.50
4060	4K DRAM	$4.50

SPEAKERS

6.5 cm.	50 ohm	$1.50
10 cm.	8 ohm	$1.95
12 cm.	15 ohm	$2.25
18 x 12	15 ohm	$3.50

TRANSISTORS

SE7055 220V video	60¢
TT382 (2n3054)	50¢
NSD153 darlington	90¢
BF173 VHF amp	60¢

VALVES

6AW8, 6GW8, 6BY7, 6EM5, 6DS8, 6DR8, EF80, all	50¢
6V4, 12AU7, 6BQ6, 6BA8, 6BX6, 6BQ7, 7AN7, 19Y3, all	$1.00

OSCILLOSCOPE TUBE
3BP1 7 cm. $11.50

UHF CONVERTER
UN311A Phillips $ 7.50

VHF TV TUNER
NT3024 Phillips $ 7.50

TURNTABLE
GARRARD CC10 turntable, 7 inch platter and KS40A cartridge.....
SPECIAL $19.95
Without cartridge $15.00

RECHARGEABLE BATTERIES
Sanyo AAA size $1.00

SOLDERING IRONS

240V, 30W Economy	$8.50
240V, 60W Economy	$9.50

CROSSOVER COILS
Specials for speakers.

.35mH, .5mH	$1.90
.75mH, 1mH	$2.25
1.2mH, 1.5mH,	$2.85
1.8mH, 2mH, 2.5mH	$3.30

Also wound to order.

SPEAKER BOXES
For shop customers only. Folded, veneered frames. Various sizes from $9.00

RADAR ALARM
For shop customers only. Feeney private eye radar alarm with rechargeable battery, entry and exit delays, and control key. An external horn can be connected if required.
A few only at $150.00

CLOCK MODULES
Mechanical clocks. 240V plus 6V globe with green display, only $4.50

Mechanical clocks. 120V white on black display.
2 for only $7.00

WIRES AND CABLES
100 metre rolls of 1/061 huge variety of colours. 5 rolls for only $10.00

25 metre rolls of black EHT cable. High quality.
roll only $5.00

20 metre rolls of multi ribbon cable. Six strand
roll only $5.00

REVERBERATION SPRINGS

Rola type 52	$6.50
Drive module CQ9	$8.50
Transformer for CQ9	5.50

TAPES

Philips 4inch LP10	$1.50
Philips 4inch DP10	$1.80
Empty 4inch reels	50¢

COMPUTER PHERIPHERALS
Preloved electric typewriters, tape punches and tape readers. Ring CITY.

Capacitors and resistors, integrated circuits, Wires and cables, semiconductors, fuses, knobs Radio and TV valves, plugs and sockets, pots Manufacturers of PC boards and disco lighting.

Prices subject to change without notice
Pack and postage within Australia: $1.00

02-621 5809
WRITE
CQ ELECTRONICS
30 CAMPBELL ST
BLACKTOWN 2148

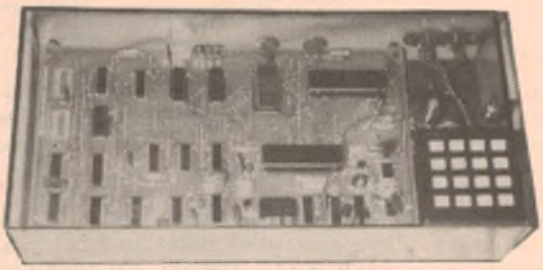
bankcard welcome

FULLY EXPANDABLE

DREAM 6802

COMPUTER KITS

One board computer complete with monitor/interpreter, video interface, cassette interface, keyboard (HEX) interface and RAM. Simultaneously a sophisticated video game and a "serious" computer!



COMPLETE KITS $135
inc. cabinet
COMPLETE KITS $149
inc. cabinet & keyboard

Modulator $3 extra. Insured post $2.50.
C.O.D. $2 extra. Phone C.O.Ds accepted.

- The high quality "Digitran" keyboard has an 'over-centre' action to give positive contact and excellent tactile response. This greatly reduces keying errors, which will be especially appreciated towards the end of a long program! Since the keyboard greatly influences operator enjoyment, we believe that anything less is false economy.
- Perspex Cabinet. The computer is assembled on a hardboard base and is then FULLY ENCLOSED with a tinted perspex cover. This protects the unit, and acts as a display case.
- FULLY EXPANDABLE. Space has been left for later expansion of the memory. The heavy-duty power supply has the current capability recommended by the designer for this purpose.

"UFO INTERCEPT"
One of many video games

POWER SUPPLY KITS (1 AMP) $29
Contains all components, a heavy gauge aluminium chassis (undrilled), and a Marviplate cover. Compact size 171 x 130 x 70mm.

HEAVY-DUTY POWER SUPPLY KITS (3 AMP) $45
Complete kit with cabinet as above. Power supply kits are post free with DREAM kits and are not available separately.

- Pre-tinned fibreglass PC board with a COMPONENT OVERLAY for easy assembly.
- Programmed EPROM
- Full instructions supplied
- Provision for extra PIA's, ACIA's, etc. without additional logic.
- The PCB has been modified to accept a 6802 chip, which includes a clock, thereby eliminating the hard-to-get 6875. The 6802 was not available when the DREAM was designed, and the modification has been approved by the designer (Michael J. Bauer of Deakin University).
- When comparing prices, it should be noted that our kits are guaranteed to contain only prime quality, guaranteed components.
- Service is available.

MONEY-BACK GUARANTEE
Examine your purchase for 7 days (without removing the IC's from their packing) and if not satisfied, return it for a full refund. Please mention 'Electronics Australia' on your order. For further information see 'EA' May to August '79.

Phone for details of Sydney counter sales.
Please note new phone number.

Please send me the following items:
- ☐ Dream 6802 at $135 .....
- ☐ Dream 6802 at $149 .....
- ☐ 1A Power Supply kit at $29 .....
- ☐ 3A Power Supply kit at $45 .....
- ☐ RF Modulator at $3 .....

Post and Pack $2.50
TOTAL _____

Name .....
Signature .....
Address .....
.....
Postcode .....
Phone No. .....

I enclose ☐ cheque/money order ☐ COD ($2 extra). I understand that this order is subject to a 7 day money-back guarantee.

J.R. COMPONENTS

PO Box 128, Eastwood, NSW. 2122. Ph (02) 85 3385.
Tasmanian Agents -
AERO ELECTRONICS, 123A Bathurst St, Hobart.

Three programs for DREAM 6800 computer

For the many DREAM 6800 enthusiasts we finally have a number of programs to publish. Three programs are featured here, an Alarm Clock, Reaction Timer and a refined version of the Secret Number program published in July 1979, part three of the DREAM 6800 articles.

The author of the first program, the Alarm Clock, is Graham Leadbeater, of 16 Ellison Street, Ringwood, Victoria, 3134. He can tell the story:

The DREAM 6800, programmed as an alarm clock, will never be a serious competitor to its mechanical counterpart in terms of reliability, cost, convenience and power consumption. It is, however, much more fun!

This program had its beginning at 11.00pm one night. I was about to wind the alarm clock (it was one of those primitive mechanical types with no digital readout and not even a power cord) when I discovered that our five-year-old son had destroyed it in a sand-pit experiment. What to do? How will I wake up? Bewdy!! I'll write a DREAM program!

I already had a clock program so it was a simple matter to turn on the bleeper when the hours and minutes reached pre-set values. Then followed a number of thoughts starting with "Wouldn't it be nice if . . ." and I set about improving the program to allow the alarm time to be examined and changed. Then I decided that there should be a way of enabling/disabling the alarm facility and an interrupted tone seemed more satisfying than a continuous note. All this had to be possible without affecting the normal advancement of the real time. The program published here is the result.

Once it was working it had to be tidied up, documented, and saved on a cassette. Thus it was many hours and many cups of coffee later that I got to bed, tired but happy. I'm told that the alarm went off as expected but I slept right through it!

Seriously though, this program could easily be adapted to control security lighting, alarm systems, greenhouse watering, swimming pool pumps or anything that needs to be turned on and off at regular times. It also tells the time.

To set the real time, load hex values for hours, minutes and seconds into 0033, 4, 5 respectively (variables 3, 4 and 5) then start as for any CHIP-8 program. The time will be displayed on the screen.

To set the alarm time, hold down keys D or C to display alarm time and increment the hours or minutes respectively at a 1Hz rate. To examine the alarm time without changing it, hold down key E. The display reverts to real time when keys are released. When incrementing alarm minutes (with key C), the alarm hours will also be incremented as the minutes pass zero. If you would prefer the setting of the alarm hours and minutes to be completely independent, change the data at

024A to 4B3C
024C to 6B00
024E to 1256

To enable the alarm, hold down key A until the symbol "A" appears at the bottom of the screen. To disable, follow the same procedure until the symbol disappears. You could put your normal waking time into the setting-up data, hours into 0201, minutes into 0203, and the alarm time will always be set to this value when the program is loaded.

The operation of the program should be evident from a study of the listing. If you would prefer a 24-hour display, change the data at 021F and 0253 to 19.

Three bytes have to be changed if the program is to be run on a D2 kit equipped with CHIP-8 interpreter (Dec. 1979). These are in the machine code subroutines for tone control. The changes are necessary because the D2's PIA is located at a different address to that in the DREAM 6800. And that's it. Pleasant dreams.

The remaining two programs were written by Kris Zalkalns, of 56 Rosehill Street, Scoresby, Victoria 3179.

The Reaction Timer program allows five seconds in which to react, otherwise a fault condition is indicated. Initially one second is stored and the word "READY" is displayed. Any hex key then is pressed after which, any time up to five seconds later a hex digit will flash briefly on the screen. Briefly means about 1/10th of a second. The object of the exercise is to press the corresponding key in the shortest time, to display reaction time to 1/10th of a second. As an incentive, if reaction time is less than 1 second, the word "GREAT" is displayed. Any hex key is then pressed to display "READY" and the best time to beat, as "ready" must be displayed before any attempt is made to better your time. Once again, any hex key is pressed and away you go. If the incorrect key is pressed, the correct digit is displayed on the left of the screen and the key pressed on the right. When it is felt no further improvement to your time can be made, press Reset and Go (Fn. 3) to reinitialise the time to beat to one second.

The other program is a refined version of the secret number program that appeared in the original DREAM articles. I feel, that to end any program with a jump to monitor as this one

0200	6A	00	6B	00	6C	00	6D	00	69	32	F9	15	75	01	35	3C
0210	12	22	65	00	74	01	34	3C	12	22	64	00	73	01	43	0D
0220	63	01	66	0C	67	0C	6E	0E	EE	A1	12	56	6E	0C	EE	A1
0230	12	48	6E	0D	EE	A1	12	50	00	E0	88	30	22	8E	88	40
0240	22	A4	88	50	22	A4	12	60	7B	01	3B	3C	12	56	6B	00
0250	7A	01	4A	0D	6A	01	00	E0	88	A0	22	8E	88	B0	22	A4
0260	6E	0A	EE	A1	7D	80	3D	80	12	84	66	1C	67	1A	FE	29
0270	D6	75	53	A0	12	84	54	B0	12	84	7C	80	4C	00	12	84
0280	02	AE	12	86	02	B2	F9	07	39	00	12	86	12	08	A2	B8
0290	F8	33	F2	65	41	00	12	9C	F1	29	D6	75	76	04	F2	29
02A0	D6	75	00	EE	A2	B8	76	0A	F8	33	F2	65	12	98	86	41
02B0	20	02	86	01	B7	80	12	39	00	00	00	00	00	00	00	00

Above is the listing for the Alarm Clock program. If the program is to be run on a modified D2 kit, then change the data at: 02AF to 35, 02B3 to 3D and 02B6 to 05.

does, is a bit untidy, and would rather have a "wait for keydown", then clear screen and return to start, or alternately, return to monitor, as in example:

After the main program
0XXX F00A Wait for key press
0XXX 400F If key F
0XXX F000 Return to monitor
otherwise
0XXX 00E0 Clear screen and
0XXX 1200 Restart program.

I have used a similar arrangement, as well as adding a timer. The reason for the timer becomes obvious, as with practise, the number of tries to find the hidden number can average 7-9 moves. By adding a timer means the person with a quicker brain obviously will get a given number in a much shorter time. The timer will not start until the first guess is entered, and from that point 10 minutes is allowed in which to find the number. If 10 minutes is reached without a solution, the hidden number will appear, as well as if, like in the original program, 99 tries or key F (frustrated) occur. At the end of the run, whatever the outcome, the time is displayed. Pressing any key (except Reset) will now restart the program.

Below is the listing for the Reaction Timer program.

0200	230C	A3F0	2298	2298
0208	2298	6500	6000	6100
0210	6200	F255	22A6	6534
0218	22C8	A3F6	22DA	22DC
0220	22EE	6500	22A6	A3F6
0228	F265	A3F3	F255	6500
0230	22A6	6402	6D00	A3F3
0238	22FC	A3F3	F255	8500
0240	A3F0	22FC	A3F0	F255
0248	9500	1308	9510	1252
0250	9520	7D01	4400	125C
0258	74FF	1236	6508	22C8
0260	6534	22C8	7E01	6534
0268	22C8	4D06	1286	4E63
0270	13B4	6130	F115	F107
0278	3100	1276	6508	22C8
0280	121A	A3F0	22BE	6064
0288	F018	6530	6600	0000
0290	2380	FF0A	00E0	1200
0298	6409	C00F	8405	4F00
02A0	1298	F055	00EE	6600
02A8	3500	12BE	A3F3	F265
02B0	F029	22C2	F129	22C2
02B8	F229	22C2	00EE	A3F0
02C0	12AE	D565	7508	00EE
02C8	661A	3508	12D2	FD29
02D0	12C2	A3F6	FE33	F265
02D8	12B4	6A00	12F4	400F
02E0	13B4	6109	8105	4F00
02E8	12DC	F055	00EE	3E00
02F0	23BA	12DC	3E00	1314
02F8	F00A	12DE	F265	8300
0300	8010	8120	8230	00EE
0308	7D02	1254	6900	6800
0310	6E00	00EE	6732	F715
0318	F707	480A	13B4	132A
0320	3700	1318	235E	6A00
0328	1314	0344	1320	7A01
0330	4A03	235E	6104	F118
0338	610D	F115	F107	3100
0340	133C	12DE	BDC2	9797
0348	307D	0018	2707	C6A1
0350	D129	2708	39C6	9ED1
0358	29BD	C0D0	3900	393C
0360	1368	493C	136E	00EE
0368	7901	2374	1366	2374
0370	7901	1366	493C	137A
0378	00EE	6900	7801	00EE
0380	A3F9	F833	F265	480A
0388	1394	23A2	F933	F265
0390	239A	00EE	652C	239E
0398	138C	A3AE	23A8	F129
03A0	23A8	F229	23A8	00EE
03A8	D565	7504	00EE	0000
03B0	0000	4000	651A	660D
03B8	1282	235E	235E	00EE

Below is the listing for the Secret Number program.

0200	68F5	640A	6010	22B2
0208	8340	6A1A	6B18	A3F0
0210	F333	F265	2264	6A1E
0218	6B0D	2282	CC0F	C6FA
0220	2278	FC29	2272	6603
0228	2278	2284	6300	6605
0230	A3F0	F333	F265	2278
0238	4332	1294	7301	02C2
0240	59C0	1246	124C	E99E
0248	122E	1290	8530	75FF
0250	6602	F618	6A1A	6B03
0258	2264	8384	601F	3F01
0260	2288	12AC	F129	2272
0268	A30A	2272	F229	2272
0270	00EE	DAB5	7A04	00EE
0278	F615	F607	3600	127A
0280	00EE	F00A	00E0	00EE
0288	22B2	8835	8450	00EE
0290	601A	1310	6015	6A1A
0298	6B02	2264	6700	6605
02A0	F618	7701	2278	3705
02A8	129E	22B2	F00A	00E0
02B0	1204	6A16	6B0D	02C8
02B8	2272	7001	3A2A	12B6
02C0	00EE	BDC2	9797	3939
02C8	9630	810F	2203	7EC1
02D0	9380	10CE	02E0	7EC1
02D8	9896	3048	4848	4897
02E0	3039	BBDE	F3CE	B7DE
02E8	D6DC	4BDA	934E	B7DE
02F0	F6DA	F248	492E	D6DC
02F8	F6DA	B6DE	F24E	F3CE
0300	F64E	BBDE	F3CE	B7DE
0308	492E	0000	0000	4000
0310	6A01	6B0D	FC29	2272
0318	7A37	F929	2272	1296

(Editor's note: We invite readers who have written DREAM 6800 programs to submit their efforts for publication. We are also interested in publishing programs for the 2650 system and other personal computers using BASIC language).

Microcomputer News & Products

1980 home computer shows for Sydney May 22-25 and Melbourne Sept 11-14

The burgeoning personal computer, microprocessor and small business systems market will be highlighted by the staging of Home Computer shows during 1980. The Sydney Home Computer Show will be held in the Westco Pavilion at the Sydney Showgrounds on May 22, 23, 24 and 25. The Melbourne Home Computer Show will be held at the Kew Civic Centre on September 11, 12, 13 and 14.

The three previous annual Shows — two in Melbourne and one in Sydney attracted a combined total of more than 40,000 people and over 130 companies and exhibitors displayed their products. According to newly appointed 1980 Home Computer Show director, John Kennedy, the two shows planned for this year will capitalise on the interest generated by the previous Shows and will reveal the rising maturity of the microcomputer industry in Australia. "The 1980 Home Computer Shows, apart from reflecting the current status of microcomputer equipment and technology, will also offer a valuable insight into future directions. The 1980 Show will coincide also with the expansion of the educational market as secondary and tertiary institutions plan their immediate purchases of equipment."

Applications are now open for display stands at the Sydney show and applications for stands at the Melbourne show will open in July. An exhibitors' prospectus is available on request from the 1980 Home Computer Show, 443 Little Collins Street, Melbourne, Victoria 3000. Phone (03) 67 1377 or Sydney (02) 918 8174.

FRESH APPLE PRODUCTS FROM COMPUTERLAND MELBOURNE

Computerland Melbourne has announced the release of a range of new products supporting the popular Apple II Computer:

- An 11 Megabyte Winchester Disk Unit from Corvus Systems, plugs directly into the Apple bus and is fully compatible with Apple's Disk operation System. The drive features a transfer rate of over 50k Bytes/Second and average access time of 50 milliseconds.
- The Apple Graphics Tablet is now available. It enables the Apple to be used as an artist's sketch pad, an engineer's drawing board or a mathematician's chalk board.
- The AI-02 high speed A/D Converter has 16 input channels for temperature sensing, light sensing, pressure sensing and numerous other applications.
- The Supertalker device enables digitization of human speech for storage into memory. This speech may be reproduced under program control.
- The ROMPLUS 12k Rom Card includes a 2k Keyboard Filter Rom which features high powered graphics and shape table subroutines.
- A Joystick is now available to replace the games paddles.
- The ALF Music Synthesiser enables 3-note polyphonic music output from the Computer under software control.
- Software new releases should spark interest in business areas. New packages include The Controller (General Business System), The Cashier (Point of Sale/Stock, Invoicing), Desk Top Plan (Forecasting, Job Costing, Profit/Loss), Visicalc (Preplan Management Planning Program), Applepost (Mail List).

Further information is available from: Computerland Melbourne, (Grd Floor) 555 Collins Street, Melbourne 3000.

EMI TO MANUFACTURE RAYTHEON TERMINALS

Raytheon International Data Systems and EMI (Australia) Ltd have announced an agreement whereby EMI is to manufacture Raytheon terminals in Australia.

There is a strong likelihood of Australian-made terminals being exported to Raytheon users in South-East Asia if "the price is right" said a Raytheon spokesman.

NEW VIDEO DISPLAY MODULE FROM E&M ELECTRONICS

E&M Electronics announce the release of their new video display module, the EME-3. This module has some special features which should prove to be popular with users of microcomputers.

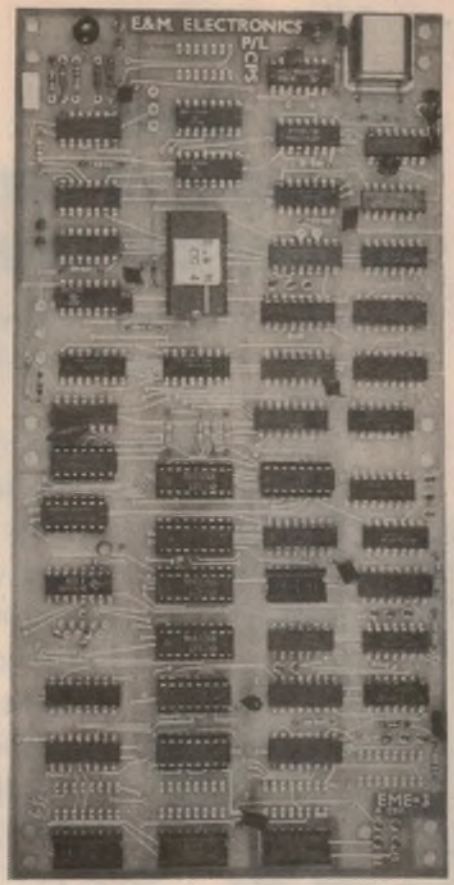
The main feature of the module is its ability to interface directly with the computer simply by connecting it directly to the system's data and address buses, with little or no additional interfacing being required.

2k of on-board RAM stores the video information in a number of preselected screen formats. The character generator ROM is proprietary to E&M Electronics and therefore special symbols and characters can be programmed into it upon request. The total repertoire of the generator is 128 characters.

Other facilities include a scroll effected by a single write instruction, selectable reverse video and character underlining with a flashing underline being an additional option.

The output signal is a non-interlaced composite video signal suitable for driving standard 625-line monitors directly.

Further information can be obtained from E&M Electronics, 136 Marrickville Road, Marrickville, NSW 2204. Phone (02) 51 5880.



HALF A LOAF IS BETTER THAN . . .

National Semiconductor have announced the release of their 2758 EPROM which features single +5 volt operation. The EPROM is manufactured from reject 2716 die where only one half of the die is found to be defective. The operational characteristics of the device are identical to those of the 2716 with the exception of the most significant address bit. Depending on which half of the die is defective, the MSB (most significant bit) of the address is tied either high or low. For these chips, it's a case of "Half a loaf is better than no bread at all".

The EPROM is to be released in two versions, the MM2758Q-A and the MM2758Q-B. The MSB must be tied high for the A version and low for the B version. Access time is 450ns. Prices are expected to be in the $20 region with the first shipment being expected in 8 to 12 weeks time. Further information from National Semiconductor, phone (02) 93 0481.

Micronews Continued →

COUPLERS

More than a couple of reasons to buy our couplers.

To begin with, there's delivery. We gear our production capacity to keep ahead of your demand.

Then there's selection. Our line of single and dual couplers is one of the broadest on the market, with special emphasis on high-performance, general-purpose parts.

And of course, there's performance. Fairchild can meet most of your demanding requirements. For example, our "Glassolated" ™ coupler features 5 kVdc standard isolation voltage. For more reasons, call us.

FAIRCHILD DISTRIBUTORS

FAIRCHILD

Victoria:

BROWNTRONICS PTY LTD
Telephone: 419-3355

TOTAL ELECTRONICS
Telephone: 596-2891

N.S.W.:

GEORGE BROWN & CO. PTY LTD
Telephone: 519-5855

TOTAL ELECTRONICS
Telephone: 439-6722

South Australia:

PROTRONICS PTY LTD
Telephone: 212-3111

Western Australia:

WARBURTON FRANKI
Telephone: 277-7000

A.C.T.:

GEORGE BROWN & CO. PTY LTD
Telephone: 95-0455

RESERVE ELECTRONICS
Telephone: 275-2377

New Zealand:

T.E.S.A.
Telephone: 655-061

Queensland:

ELECTRONIC COMPONENTS
Telephone: 371-5677

Microcomputer News & Products

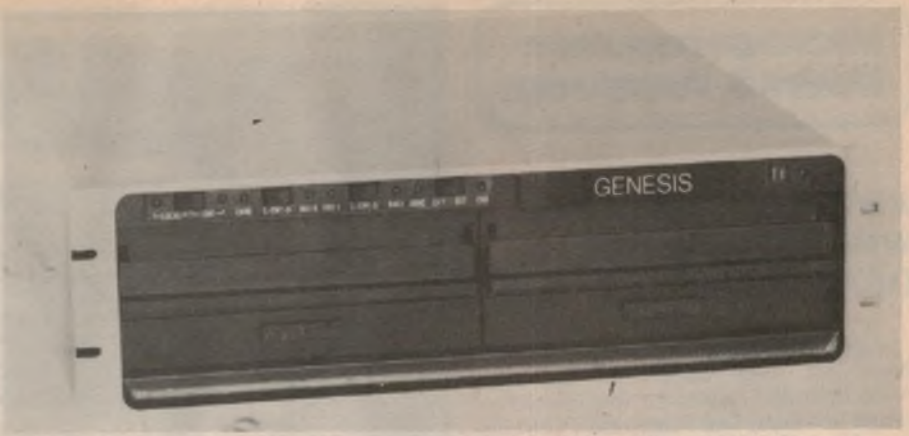
MEK6800D2 KIT MODIFICATIONS TO RUN 6809 MPU

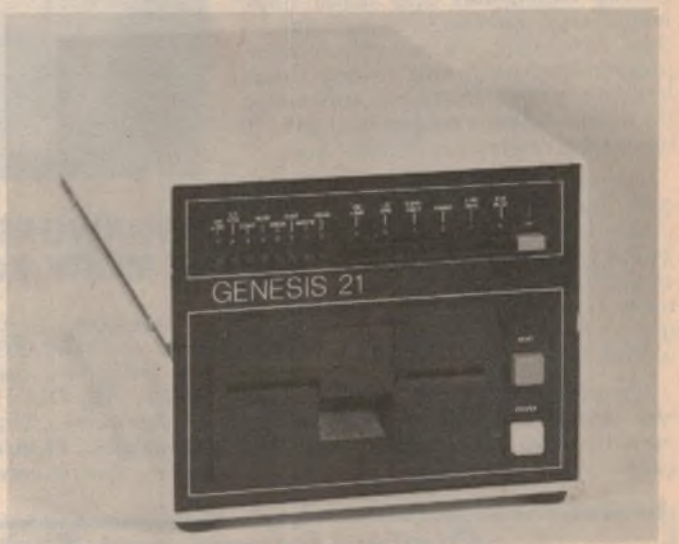
A recent Motorola release details modifications are for the standard D2 kit to allow the system to run on an MC6809.

It is intended that in conjunction with the Motorola EK9BUG4 Monitor program, the modified MMB (Microcomputer Module Board) via its ACIA can be used with an RS-232 terminal (the original keyboard and display module is not required).

The EK9BUG4 monitor program is resident on the TMS2716 2K x 8 EPROM, it replaces the JBUG monitor program of the D2 kit and provides the control and diagnostic capabilities for the MEK6800D2 with an MC6809 CPU.

Further information is available from all Silicon Valley Stores in Sydney, Adelaide, Brisbane and Melbourne.





Above and at right are the Genesis disk storage systems now being handled by British Merchandising Pty Ltd.

BRITISH MERCHANDISING TO DISTRIBUTE GENESIS DISK SYSTEMS

British Merchandising have announced that they are now the agents for the Boles & Co Inc "Genesis" disk systems.

These are microprocessor controlled and offer flexibility in application and configuration. The smaller of the two systems, the Genesis 21, is supported by proven disk electronics and data entry, edit, and communications software.

It provides fast, reliable data I/O for a variety of applications which require a low cost means to store, edit and transmit information in an RS-232 data communications network. The assembling of data off-line prior to accessing an on-line system, benefits the user by reducing the connect-time charges and format errors.

The second of the two systems, Genesis SMS FT02001, is a dual disk storage system which operates with any RS-232C compatible device.

Each system includes enclosure, power supply, controller with two RS-232C/current loop interfaces and one or two disk drives. A unique feature of the FT02001 is its ability to store information in IBM3740, diskette 1, diskette 2, diskette 2D or three additional double density formats.

The system allows up to 2M bytes storage capacity in only two drives and features selectable baud rates (50 to 19.2K), programmable sector sizes — 128 or 256 bytes and automatic self-test on power-up or reset.

Further information can be obtained from:— British Merchandising Pty Ltd, Box 3456 GPO, Sydney 2001.

(Continued on page 82)

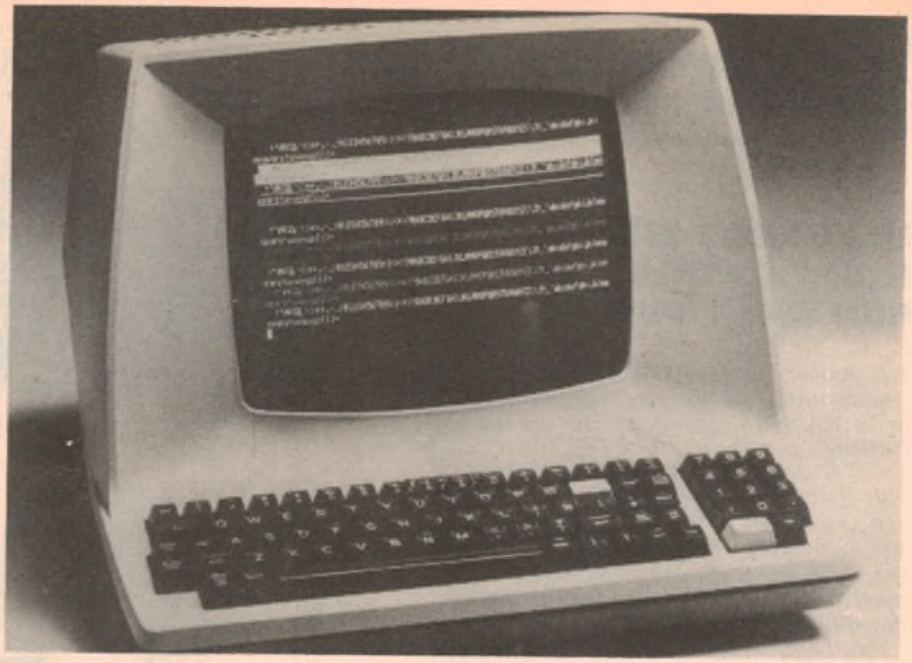
Microcomputer News & Products

ANDERSON DIGITAL WINS TELEVIDEO DEALERSHIP

Anderson Digital Equipment Pty Ltd have just been appointed the sole Australian distributor for the Televideo range of VDUs. The Televideo TVI 912 is an ADM-31 compatible unit with editing capabilities and many other features as standard. For example — dual intensity, addressable cursor, programmed underline, reverse video, blinking, switch selectable conversion or block mode transmission with 10 baud rates from 75 to 19,000 baud.

The unit is microprocessor controlled with the ability to delete or insert characters or lines. The screen provides 24 lines by 80 characters with a 12 x 10 character resolution. A second page of memory and a printer port are optional. The additional page of memory is 1920 characters.

The price of the unit is $1295, but as a new release special, ADE are selling the units for $895 when bought as a "six-pack".

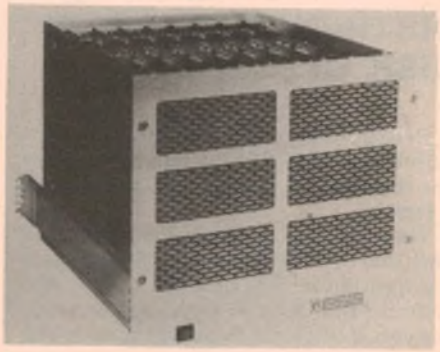


Above is the Televideo TVI 912 video display unit which is compatible with the ADM-31.

MEGAWORD CORE MEMORY FOR PDP-15

Anderson Digital Equipment announces its BC-205 bulk core system, the industry's only disk emulation system for DECs PDP-15 series of minicomputers. The BC-205 is compatible with DEC RF15/RS09 fixed head disk system, and is completely compatible with the standard operating systems and RF-11 diagnostics used on the PDP-15.

The PDP-15 is one of DECs older minicomputer systems, and in many cases its hardware is no longer considered state-of-the-art. However, because the substantial investment in software unique to the PDP-15, users are unable to justify the purchase of a more current minicomputer. Dataram's bulk core system, functioning as a fast access peripheral, can provide dramatic improvements in system throughput and bring the PDP-15 more in-line with the performance of currently available minicomputers. The BC-205 also provides all-electronic reliability.



The BC-205 is $32,500 in its minimum form of 256k words. A half-megaword (512 x 18) version is $42,625, and a full megaword system is $63,500.

For further information contact: Anderson Digital Equipment Pty Ltd, PO Box 322, Mt Waverley, Vic 3149. Phone (03) 543 2077.
PO Box 294, Ryde, NSW 2113. Phone (02) 808 1444.

NEW PAPER TAPE PUNCH INTERFACE BOARDS FROM EAI

EAI-Electronic Associates P/L have just announced two new plug-in interface boards suitable for the Facit 4070 paper punch.

The first is the model 5163 "Code Translating Interface" which incorporates a microprocessor which allows conversion from ASCII to BAUDOT (and vice versa). This facilitates connection of the 4070 punch to office machines such as telex and word processing systems for preparation of Telex tapes.

The interface accepts either RS-232C serial or current loop signals and converts them to BAUDOT 5-level paper tape output at rates from 50 to 9600 baud. The ASCII input does not have to be specially formatted.

The second interface extends the standard parallel input to the punch to include serial data input as well, simply by means of a rear switch. The interface conforms to CCITT V.24/EIA RS-232C and current loop with a choice of error code punching. Serial rates are from 75 to 600 baud.

FACIT CASSETTE DATA RECORDER

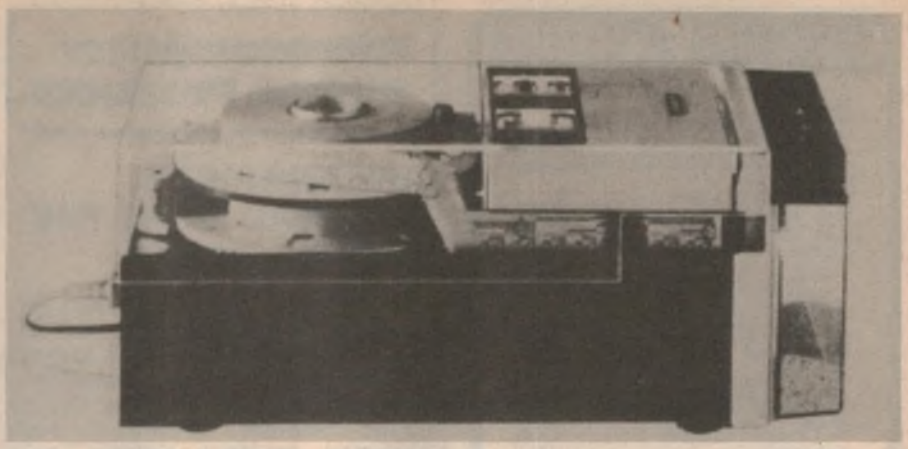
Also released through EAI-Electronic Associates Pty Ltd is the new Facit model 4028 cassette recorder which is ideal for data logging applications. It is fully compatible with the Facit 4070 tape punch. Applications include data recording at point-of-sale terminals, telephone exhanges and laboratory measurements as well as back-up for other data media, program loading and numerical control equipment.

The new unit takes care of all tape handling and data formatting internally and allows fully asynchronous communication via its interface. Battery back-up for buffer memories and extensive check routines provide for high grade data integrity.

Other features of the Facit 4028 include up to 500 characters/second average transfer speed and 230,000 characters/track storage capacity. There are no restrictions on the characters to be recorded. Indicators are provided for "Tape Low" and "End of Tape".

Further information and prices may be obtained from:
EAI-Electronic Associates Pty Ltd —
Sydney: 48 Atchison Street, St Leonards, NSW 2065. Phone (02) 439 7522.
Melbourne: Suite 1, 182 Albert Road, South Melbourne, Vic 3205. Phone (03) 699 7100.

MICRONEWS →



Above is the well known Facit 4070 tape punch while at right is the newly-released Facit model 4028 cassette data recorder. Both are distributed by EAI-Electronic Associates Pty Ltd.

Microcomputer News & Products

NEW GRAPHICS TERMINAL FROM THE DINDIMA GROUP

The Princeton 8500M graphics terminal is claimed to offer an unprecedented combination of features and benefits presently unavailable, even in higher priced systems. This includes: smooth, continuous, high resolution graphics without stair-stepping discontinuities; a high resolution 4096 x 3072 viewable window in an 8192 x 8192 addressable field; 16X panoramic zoom and preview window for selective magnification; Stroke-written alphanumerics, symbols, conics and vectors; and selective erase of graphics and alphanumerics.

These are only some of the features of this system, and complete data can be obtained from: The Dindima Group Pty Ltd, PO Box 106, Vermont, Victoria 3133. Phone (03) 873 4455.

MAGNETICS FROM COMPUTER SUPPLIES (AUSTRALIA) PTY LTD

Computer Supplies (Aust) P/L has been appointed as the Australian distributor for all Office Data Products (ODP) brands. This includes diskettes, cassettes, data cartridges and magnetic cards.

Most ODP products are available on a same-day basis, and pricing is keen. Service is promised to be second to none to end users and OEMs alike.

RIBBON CARTRIDGE RELOAD

Another service provided by Computer Supplies is the reloading of printer ribbon cartridges for most printers on the market. The savings on a reloaded cartridge are up to 50% compared to the cost of a new cartridge.

For further information and catalog/price list contact Computer Supplies Australia Pty Ltd, 54 Alexander Street, Crows Nest, NSW 2065. Phone (02) 439 5533 or 439 7071.

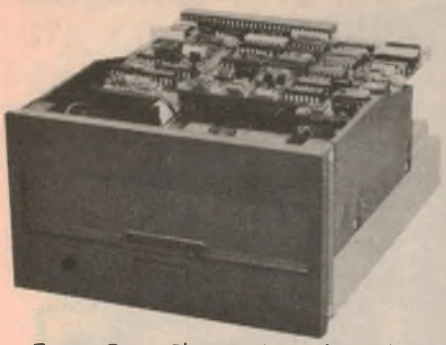
A&R ELECTRONICS DMM-10 APPLICATION NOTE

A&R Electronic Equipment Co Pty Ltd have produced an application note describing how their DMM-10 digital multimeter may be interfaced with a microprocessor. The modifications to the DMM-10 involve the addition of an interface PCB which comprises an opto-coupler, a quad dual-input Nand gate IC and a few other components. This is for serial input.

Details are also provided for serial-to-parallel conversion for Data Bus compatible input in either BCD or binary form. A "valid data" output is also available to initiate interrupts and to ensure correct timing of input.

Brief notes are given on software requirements but with no emphasis on particular microprocessors. Further details can be obtained from A&R Electronic Equipment Co Pty Ltd, PO Box 170, Box Hill, Victoria 3128.

ZERO ONE GETS MICRO PERIPHERALS



Zero One Electronics of Brisbane have been appointed Australian distributors for Micro Peripherals Inc of California. MPI, the world's second largest producer of mini-floppy drives, are currently producing three models. The most popular unit, the model 52, is double headed with a capacity of up to 500k bytes unformatted.

For further information contact Gary Worth, Zero One Electronics, 200 Moggill Rd, Taringa, Queensland 4068.

CLUB NEWS

● The Western Australian Computer Enthusiasts Group advise that they have just held their annual election of office bearers. They also advise us that their group meetings are held on the last Monday of each month except when that day coincides with a public holiday. The venue for the meetings is the premises of Taimac Video Corp, 1st Floor, Cnr Newcastle and William Streets, Perth.

All correspondence should be directed to: The Secretary, WACEG, c/- L. H. Roeger, 59 Lansdowne Road, South Perth, WA 6151.

● All users of 80-series microprocessors (8080, 8085, Z80) are invited to join a new users' group calling themselves 80AT which stands for 80 Applications Transfer. The group will function as a software exchange and applications forum. A newsletter will be published bi-monthly and meetings will be held periodically.

80AT has software from the CP/M User's Group available for distribution and is currently negotiating to gain access to the PROTEUS software library and other applications libraries. Collection of software for a library of Australian programs has already commenced. Software currently available from 80AT ranges from single I/O utilities up to complete languages such as STOIC and ALGOL-M.

Membership applications are available from 80AT, c/- Planet 3 Systems, 47 Birch St, Bankstown, NSW 2200.

● The Sord Microcomputer Users Group (SMUG) have announced the formation of their club. Interested parties are invited to contact Emmanuel Cargakis, 4/8 Clarkson Avenue, Brighton, Victoria 3186.

Personal computing for the professionals

Hewlett-Packard 85

A new personal computer system comparable in size with a typewriter and intended primarily for professional use was released onto the Australian market by Hewlett-Packard during February 1980. The new HP-85 has a built in video display and printer and features an enhanced BASIC language.

According to David Booker, general marketing manager of HP Australia, "This new computer is aimed at users who need computing power in dedicated applications at a reasonable price. This could be an engineer sharing time on a large computer system or a business professional seeking to improve decision making".

"The HP-85 is reliable and easy to use because all parts — computer, CRT, keyboard, tape cartridge and printer are in one self-contained unit. Yet it is as powerful as some computers costing much more and it can be put to work immediately on many sophisticated technical, industrial and business applications. We believe this product is indicative of HP's commitment to building advanced personal computing products" Booker concluded.

The HP-85 comes with 16K bytes of read/write memory, with 14,500 bytes available to the user. The read/write memory can be expanded to 32K bytes (30,500 bytes available) simply by plugging an optional memory module into one of the four input/output ports on the back of the machine.

The HP-85's BASIC language, which exceeds the most recent ANSI standard, makes available to the user such features as 12-digit accuracy, versatile string operations, convenient editing, 42 predefined functions, four levels of program security and flexible output formatting. The formatting capability of the machine is efficient for designing program output complete with headings, columns and spaces.

An important HP-85 capability is built-in, interactive graphics. The user can plot data on the display to clarify complex information in easy-to-understand pictorial form. For example, technical users can check test results and calculations by doing curve fitting and distribution analysis on the screen.

For user convenience the keyboard is divided into four sets of functions: typewriter keyboard for entering alpha data; numeric pad for entering numbers and doing arithmetic operations; "soft" keys which are assigned a function by the user during program development and display, editing and system control keys which permit the user to control the CRT, operating system, tape drive and printer.

In the alphanumeric mode the 127mm, high-contrast, black-and-white CRT can display up to 16 lines of data at a time, and each line can contain up to 32 characters. The HP-85 "remembers" up to 64 lines of data, any of which can be viewed by "rolling" the display on the CRT up or down.

When operating in the graphics mode the display is broken down to a 256 (wide) by 192 (high) dot field. This means that there are 49,152 distinct points available for extremely high-resolution plotting. Further, the HP-85 stores both the last alphanumeric display and the last graphics display — a feature which allows the user to freely switch from one mode to the other without losing data from either.

The quiet thermal printer, which operates in both alphanumeric and graphics modes, prints two 32-character lines per second. In the alphanumeric mode it can print the full 128 ASCII character set which consists of upper and lower-case letters, numerals and special symbols. Additionally, the full character set can be underlined, giving the HP-85 printer a 256-character-set capability.

In the graphics mode the printer can reproduce any plot on the CRT under program control or by simply pressing a button. When plotting, the printer "rotates" the display 90 degrees, giving it capability to print continuous strip charts.

The HP-85 tape drive gives the user a convenient method of storing and retrieving programs and data. It uses HP Data Cartridges, which have a user capacity of 217,000 bytes and operates at a read/write speed of 254mm/sec and search speed of 150cm/sec. The HP-85 automatically sets up a tape directory at the beginning of each tape. Using this "table of contents", the system can automatically find exact tape locations of recorded programs and data.

The new HP-85 computer from Hewlett-Packard is designed for personal use in business and industry by professionals such as engineers, scientists, accountants and investment analysts. The HP-85 features a powful central processor, typewriter-like keyboard with 20-key numeric pad, high resolution CRT display, thermal printer, cartridge tape drive, enhanced BASIC language and interactive graphics system.

(Continued on p119)

How to buy a personal computer.

Suddenly everyone is talking about personal computers. Before you buy, take time to talk with your ComputerLand We're computer experts who can answer your unanswered questions and show you how useful and how much fun personal computers can be. And we'll help you choose a computer that meets your personal needs.

Who uses personal computers.

Thousands of people have already discovered the Apple® computer—businessmen, students, hobbyists. They're using their Apples for financial management, complex problem solving—and just plain fun. You can use your Apple to analyze the stock market, manage your personal finances, control your home environment, and to invent an unlimited number of sound and action video games. That's just the beginning.

What to look for.

Once you've unlocked the power of the personal computer, you'll be using your Apple in ways you never dreamed of. That's when the capabilities of the computer you buy will really count. You don't want to be limited by the availability of pre-programmed cartridges. You'll want a computer, like Apple, that you can program yourself in an English-like language called BASIC. You don't want to settle for a black and white display. You'll want a computer, like Apple, that can turn any color tv into a dazzling array of color graphics.* The more you learn about computers, the more your imagination will demand. So you'll want a computer that can grow with you as your skills and experience with computers grow. Apple's the one.

How to get one.

The quickest way to get an Apple is to come see us. When you do, we'll have a copy of the "Personal Computer Features Evaluation" chart for you and a demonstration of what Apple II can do.

*Apple II plugs into any standard TV using an inexpensive modulator (not included).

ComputerLand®
in Melbourne

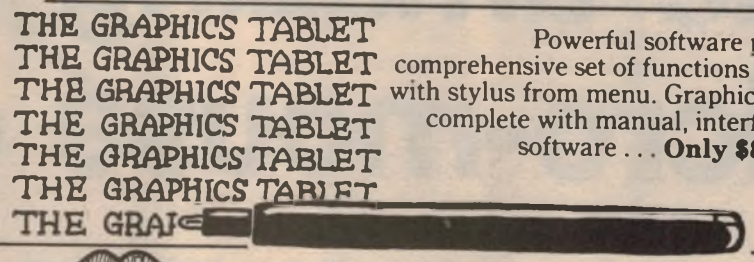
Grd. Floor, 555 Collins Street, MELBOURNE. VIC. 3000.
Phone (03) 62 6737 (03) 62 5581 Telex AA37007.

APPLE II/APPLE II PLUS COMPUTERS come complete with 12K ROM, Cassette Interface, 8 port I/O facilities, tutorial manual, language reference manual, system and hardware reference manual, introductory software manual, leads, connectors, games paddles and introductory software.

APPLE II PLUS 16K RAM . . . $1395.00*
APPLE II PLUS 32K RAM . . . $1503.00*
APPLE II PLUS 48K RAM . . . $1611.00*

There's never been a better time to buy an Apple® II.

The GRAPHICS TABLET is an image input device to enter pictorial information directly into the Apple II Computer. eg from:
– maps and photographs
– logic diagrams and schematics
– histograms
– architectural drawings – fine art



Powerful software provides comprehensive set of functions selected with stylus from menu. Graphics Tablet complete with manual, interface and software . . . **Only $874.00***

SUPERTALKER enables human speech to be digitized for storage into RAM memory. The Vocal Preparation System Software package allows user defined phrase diskettes containing words, phrases or whole sentences. Software control over record/playback mode, digitizing rate and playback volume.

SUPERTALKER . . . $349.00*

The APPLE MUSIC SYNTHESIZER is a 3 channel synthesizer with hardware control of pitch and volume, and software control of effects.

Comprehensive software includes introduction program with graphs and examples, entry program to enter and play songs, and pre-programmed music.
NOW AVAILABLE AT ONLY . . . $395.00*

OTHER NEW PRODUCTS

Software – The Controller (Accounts Receivable/Payable, General Ledger)
– The Cashier (The Retailer Inventory/Point of Sale)
– Visicalc (Preplan Financial Analysis)
– Desktop Plan (Detailed Financial Analysis)
– Apple Post (Mail List Software – up to 2500 names)

Hardware – AI-02 16 Channel Analogue Input Card
– ROM Plus 12K ROM Card
– Corvus 11 Megabyte Winchester Hard Disk
– Apple Joystick

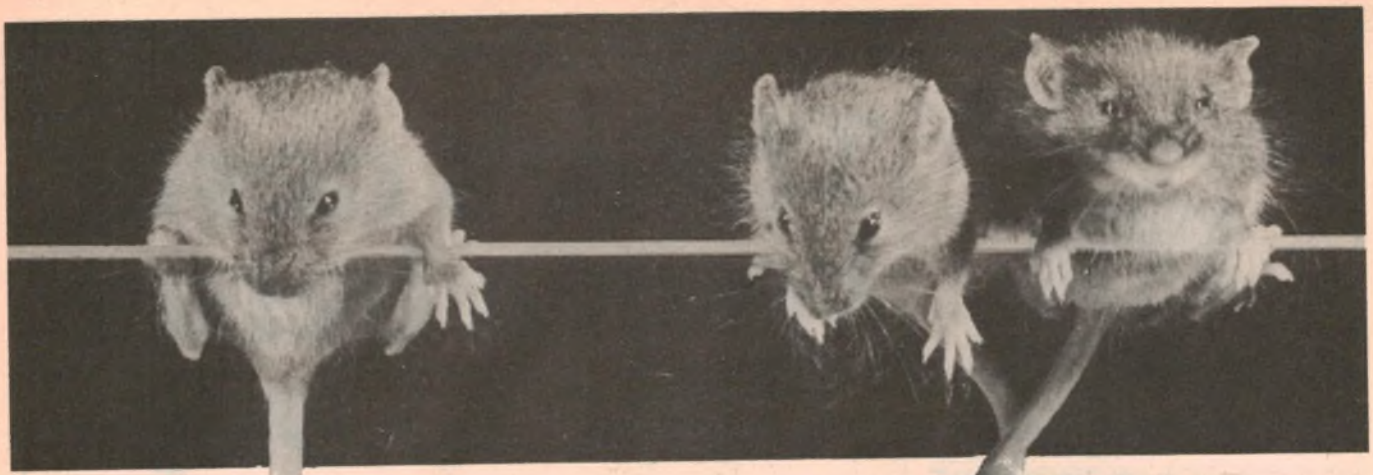
Wide range of Printers available from $415.00
Over 300 Software Programs now available

FOR FURTHER DETAILS AND INFORMATION WRITE OR CALL US

ComputerLand®
in Melbourne

Grd. Floor, 555 Collins Street, MELBOURNE. VIC. 3000.
Phone (03) 62 6737 (03) 62 5581 Telex AA37007.

*Prices do not include Sales Tax



The amazing micro-mouse contest

Mankind, it seems, will race just about anything — horses, camels, turtles, even cane toads. So why not electronic mice? In the battle of the amazing micromice names like Reckless, Mighty Kingdom and Hyperno give way to Harvey Wallbanger, Moonlight Flash and Cattywampus!

by ROGER ALLAN
Associate Editor, IEEE "Spectrum".

The stage was set. A crowd of spectators, mainly engineers, were there. So were reporters from the Wall Street Journal, the New York Times, other publications, and television. All waited in expectancy as Spectrum's (monthly magazine of the IEEE) Mystery Mouse Maze was unveiled. Then the colour television cameras of CBS and NBC began to roll; the moment would be recreated that evening for viewers of the Walter Cronkite and John Chancellor-David Brinkley news shows. The final races of the Amazing Micro-Mouse Maze Contest were beginning at the National Computer Conference in New York, and what was perhaps most amazing was the wide public interest that the competition had evoked almost since its inception.

Publicity was not the chief goal when the micromouse contest was conceived. Nor did Spectrum's editors suspect that more than 6000 entries would be received. A modest announcement of the contest was made in the May 1977 issue of Spectrum by Editor Don Christiansen, who first suggested the contest. Later, Computer magazine became a co-sponsor.

A secret maze was constructed, and the show went on the road, with time trials at the National Computer Conference in Anaheim, Calif; Personal Computing '78 in Philadelphia, WESCON in Los Angeles, and ELECTRO '79 in New York City. The challenge was to employ microprocessor technology to design and construct a self-contained "thinking mouse" that could solve a maze and, in subsequent trials, avoid its earlier mistakes. A loophole in the rules, however, let strictly mechanical, "non-intelligent" mice enter, too.

At the finals in New York's Sheraton Centre, three engineers — two from Battelle Northwest and one from WED Enterprises — teamed up to score a sweep as two of their entries took prizes for fastest and smartest mouse, respectively. Four other micromice solved Spectrum's maze, and two won prizes. Of the 15 micromice entered, only six managed to solve the maze at least once. Cattywampus, a smart micromouse, did not solve the maze but won a prize for "the most ingenious design."

Mice that could learn

Learning by exploring was, in essence, the algorithm used by Moonlight Express as it negotiated the maze in record learning time. Designed and built by Art Boland and Ron Dilbeck of Battelle Northwest Laboratories, Richland, Wash; and Phil Stover of WED Enterprises, Glendale; Calif; it was an improved version of the Moonlight Special, a smart micromouse that had demonstrated its learning prowess at previous time trials of the contest as well as at the finals.

The major difference between the Express and the Special was in their forward speeds: the Express had stepping motors with four times the torque used on the Special. Top motor speeds of 52.07cm/s for the Express vs 20.32cm/s for the Special were made possible. In addition the motor-drive circuitry for the Express was strengthened to handle the increased load of the new motors, and the Special's gear train was entirely eliminated.

Some of the hardware used in the Special — for example, interrupt logic — was eliminated by the use of IC devices that were exclusively from the Z-80A family of components (the Express was based on the Z-80A microprocessor, as was the Special). This represented only a slight modifica-

tion of the earlier electronic circuitry in the Special (Fig. 2).

A distinguishing feature of the Special was that it looked like a real mouse. Everything else — the optical-sensor arrangement, battery supply, and the high-level software — were the same in the Express as in the Special.

The Moonlight Express and Special were equally intelligent. Both went through the maze on their first runs, exploring paths and mapping nodes (or three-way crossings) into their memories. Both solved the maze on each of their second and third tries, travelling the shortest possible maze routes, from entrance to exit.

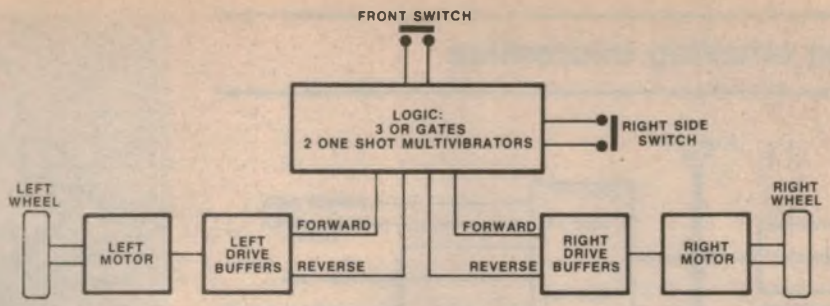


Fig. 1: This simple circuit composed only of logic elements propelled Dudley and Mushka. These two micromice solved the maze on each of their third runs at the finals, with Mushka winning the runner-up smart prize.

Doing it with logic

Not all micromice at the finals contained microprocessors. Dudley and Mushka, two Canadian entries, managed to solve the maze with simple IC logic (Fig. 1). Both had been built from the same basic design, and each solved the maze on its last run in 252s and 94.74s respectively. Dudley was entered by David Schaefer of NCR, Waterloo, Ontario, and Roger Sanderson of the University of Waterloo. Mushka, which won the runner-up smart prize, was entered by Bob Norton of Hamilton, Ontario, and John Ditner of the University of Waterloo.

The original designs for Dudley and Mushka called for a 1602 microprocessor, a Model 2758 EPROM with 1k x 8 bits of memory, a peripheral interface adapter IC, and three infrared sensors. The sensors were to detect the presence of walls around the mouse and to allow it to negotiate the maze without touching the walls. A software algorithm that would have provided the mouse with learning capability on successive trials was to be included. All of this was scrapped at the last minute, however, in favour of a simpler logic circuit due to insufficient time before the finals to do this.

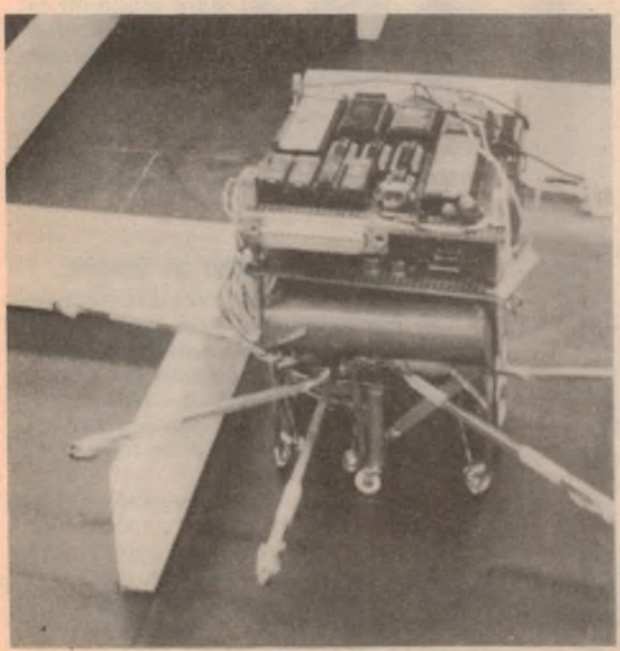
Each mouse used two 3V hobby DC motors to drive left and right wheels. Front and right switches activated a pair of one-shot multivibrators and three OR gates. Normally the mouse's left wheel was driven forward to the right. When the right switch hit the right wall, the right motor was powered forward and the left pulsed for a few milliseconds for reverse motion. The left motor then was turned on for forward motion, while the right motor was stopped. This sequence continued, causing the mouse to move forward while bumping into the right wall at intervals. For intersections, where a right turn was needed, the mouse simply followed the right wall forward. In the case of a left turn, the front switch was activated when the mouse bumped into a forward wall, turning the right motor forward and reversing the left motor long enough to make a 90-degree turn to the left.

The total parts outlay was approximately $50 for each mouse. Power was provided by two battery packs, each containing four size A NiCd rechargeable batteries. One battery pack was for the motors and one for the logic. The choice of following the right wall was arbitrary.

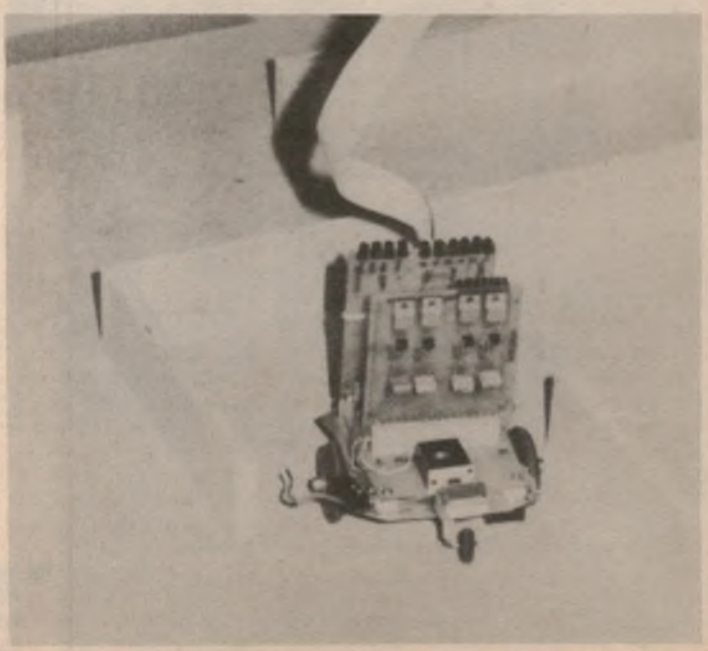
Smart mouse undone by speed

Cattywampus was one of the smarter mice. Its only problem was its poor speed control. Because it used ordinary DC motors instead of stepper ones, it would roar down the maze's opening straightaway, with no control, until it slammed into a wall, whereupon it would get stuck and be unable to negotiate a turn.

Moonlight Express, improved in speed over its predecessor, the Moonlight Special, won the prize for fastest smart mouse. It solved "Spectrum's" maze in consecutive runs of 100.88, 31.36, and 31.16s.



The original version of Dudley and Mushka used a 1602 microprocessor. It is shown here in development with an emulation cable in a test maze.



The amazing micromice

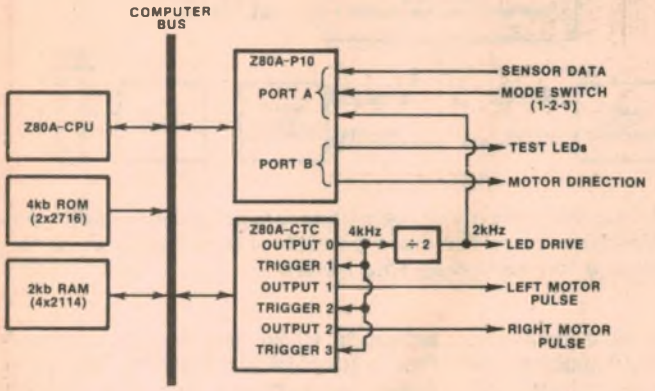
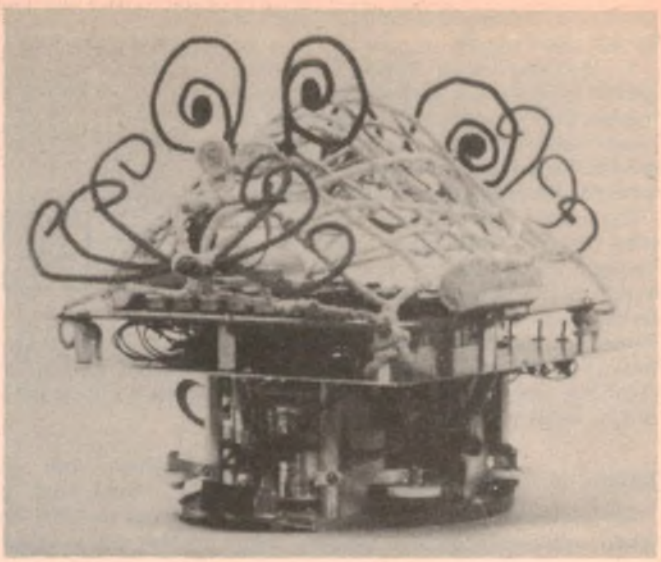


Fig. 2: Moonlight Express used Z-80A family components. Sensor data was available from the five optical pairs employed, after passing through AC amplifier/filter and comparator circuits. Motor drive pulses were passed through phase-generator and driver circuits to power a pair of stepping motors.



Cattywampus didn't solve "Spectrum's" maze but won the "most ingenious design" prize. It had a 6802 microprocessor.

Designed and built by Michael Sipser, a graduate engineering student at the University of California at Berkeley, and Howard Katseff of Bell Laboratories, Holmdel, N.J., Cattywampus won the "most ingenious design" award despite the fact that it couldn't solve the maze on its three official tries. It was one of the earliest entries in the contest, having participated at the first time trial in Anaheim, in June 1978, when Mr Katseff was also doing graduate work at Berkeley.

Despite its unsuccessful performance, this smart mouse was based on a 6802 microprocessor with a learning algorithm: two phases that governed its locomotion, "explore" and "retrace". The former was in effect when the mouse was directed to continue moving straight along the maze corridor until it entered territory that it had visited previously, whereupon the "retrace" phase took over. While the mouse was in the "explore" phase, it continually remembered all of the paths it had traversed. When it entered the "retrace" phase, the shortest path to the nearest unvisited territory was computed, and it was directed to it. Then the "explore" path took over again.

A two-level design

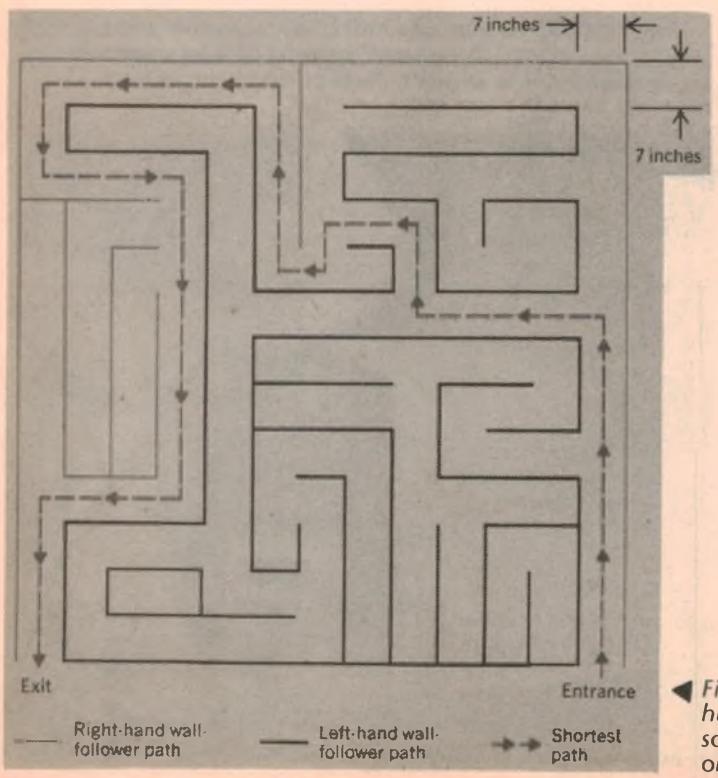
Cattywampus was built on two levels. The football-shaped lower level was 15.2cm wide. It contained two small DC motors, one for each of two wheels that were on the same level; rechargeable NiCd batteries (six 1.5V size C; three 1.5V size AA, and two 9V transistor batteries) and the circuitry to switch the motors. The upper level measuring 20.3 by 25.4cm contained the microprocessor system, interface circuits, switches, and status-indicator LEDs.

Four infrared LED/photodetector pairs (one in front, one in back, and one on each side) were mounted on the top level to detect the presence of walls. A small black-and-white cylinder was placed on each of the two motor shafts. A LED/photodetector pair, aimed at each shaft, allowed accurate determination (within a resolution of 0.64cm) of the mouse's relative position in the maze.

A complex maze at finals

The Spectrum maze used at the finals was more complex than any that the contestants had encountered before (Fig. 3). The fact that it favoured right-wall-hugging micromice over left-wall huggers was arbitrary. As it turned out, all of the wall huggers at the finals were

(Continued on p95)



◀ *Fig. 3: The maze used in the finals. Note that right-well huggers would take much less time than left-wall huggers to solve the maze. The layout was arbitrary. All walls were built on 17.78cm centres according to the contest rules.*

SWTPC

SYSTEMS — SOLUTIONS

IF YOU HAVE A PROBLEM THAT CAN BE SOLVED BY A COMPUTER — WE HAVE A SYSTEMS SOLUTION.

- Two central processors with maximum RAM capacities of 56K and 384K bytes
- Three types of disk drives with capacities of 175K, 1.2M and 16M bytes
- Two dot matrix printers with 80 and 132 line capacity

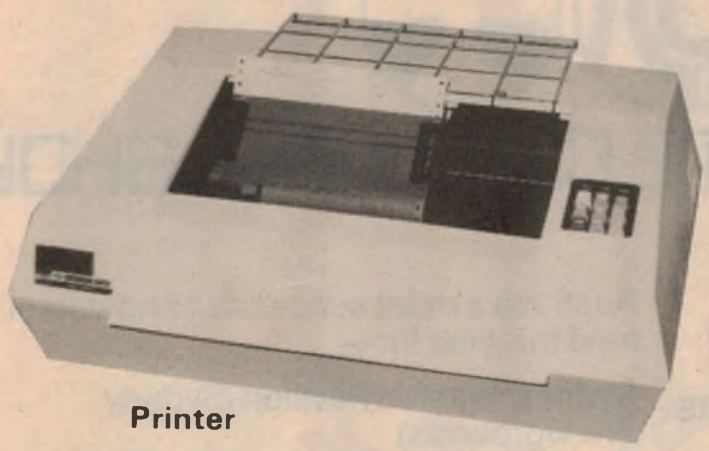
Match these to your exact need, add one or more of our intelligent terminals and put together a system from one source with guaranteed compatibility in both software and hardware.

Soutwest Technical Products systems give you unmatched power, speed and versatility.

Intelligent Terminal

6809 Central Processor

Disc System



Printer

CAN BE PROGRAMMED TO PRODUCE

- DOCUMENTS
- LETTERS
- INVENTORY LIST
- FORM LETTERS
- LEDGER
- JOURNAL
- CONTRACTS
- SALES REPORTS
- STATEMENTS
- INVOICES

AVAILABLE FROM:

SWTPC

SOUTH WEST TECHNICAL PRODUCT CORPORATION
(COVERING AUSTRALASIA)

7a BURTON STREET. DARLINGHURST. N.S.W. 2010
P. O. BOX 380 DARLINGHURST N.S-W. 2010

CABLE: "PARADIO" TELEX: AA 22579 PHONE: 02-313273.

The battle of the wall huggers

It was at the third time trial in Los Angeles last year that the Battelle team of Art Boland, Ron Dilbeck, and Phil Stover (the latter is now with WED Enterprises), decided to build a wall hugger. They had designed the Moonlight Special, the smartest micromouse observed, but at the time trial the team of Gary Gordon, Gary Sasaki, and Ken MacLeod of Hewlett-Packard, Santa Clara, Calif, introduced Harvey Wallbanger (below). This right-wall-hugging mouse, with no electronic intelligence, made up with speed what it lacked in brains. It traversed the Spectrum maze in the third time trial in 41s on its first run.

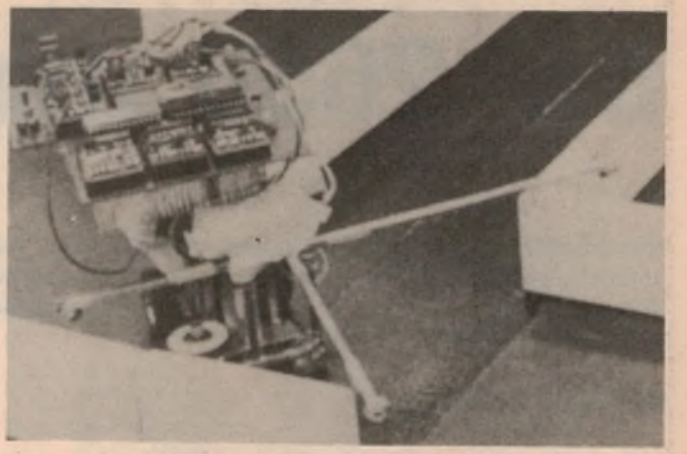
Thus was born the Moonlight Flash, (right) an optical right-wall-hugging micromouse entered by the Battelle team. Moonlight Flash won the grand prize of $1000 with a first run of 30.04s, beating out Harvey Wallbanger, whose first run was clocked at 41.68s.

Although the Moonlight Flash was not considered "intelligent," compared with the Moonlight Special and Moonlight Express — two other micromice designed by the same team — it did incorporate an 8748 microprocessor and memory that gave it just enough intelligence for the winning margin. For example, three forward optical sensors mounted on extended arms were used to provide "look ahead" capability to cut corners where possible. The microprocessor and optical sensors optimised the Moonlight Flash's turns at corners to cut down on running time. Whereas an ordinary wall hugger would make a turn at a corner, often slowing in the process and sometimes bouncing off walls, the Moonlight Flash did not require contact with the walls while rounding the corners and did not slow down.

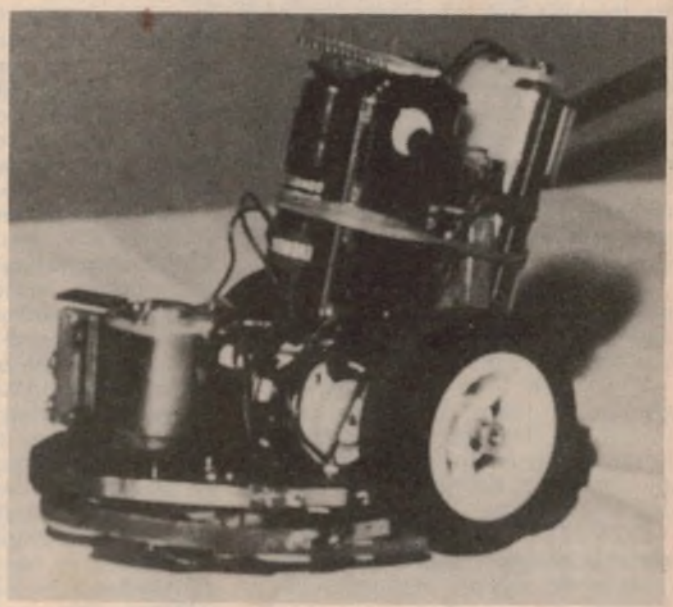
Another feature of the winner that was not used at the finals (insufficient time prevented the incorporation of this feature) was dead-end blocking. With it, the mouse would have been able to sense ahead dead ends and mousetraps and avoid them. Moonlight Flash was designed to operate from two small DC motors to achieve a top speed of 63.5cm/s. Power was provided by three sub-C Ni-Cd rechargeable and four AA batteries.

Harvey Wallbanger operated on four wheels: two main ones driven by two small DC hobby motors, one on the left and one on the right; a swivel wheel in front; and a horizontal wheel mounted on the front right and driven by a third small hobby DC motor to hug the right wall. Two contact switches, one in front and one on the right side, made up the rest of the main components.

Shortly before the finals, it was discovered that the horizontal-wheel's motor was burned out. A search for a replacement was fruitless, and it was decided to do without it. To compensate for its loss, its designers slightly rearranged Harvey Wallbanger's switches and added another switch. This was a supplement to the right-hand switch, to keep the right-hand motor turning during left turns. Harvey Wallbanger was designed for a maximum speed of 100cm/s. Power was provided by six AA alkaline batteries.



Moonlight Flash, a right-wall-following micromouse, won the top prize by completing its first run at the finals in 30.04s. It used an 8748 microprocessor and three optical sensor/receiver pairs to provide it with some intelligence. Though limited, this intelligence helped it negotiate turns smoothly, a time-saver that provided the winning margin.



Harvey Wallbanger was the first wall-hugging micromouse to solve "Spectrum's" maze in less than one minute (at the third time trial in Los Angeles). It had no intelligence and followed the right wall. It won the runner-up fastest mouse prize with a first-try run of 41.68s in the finals.

right-handed ones!

To negotiate the maze perfectly — this is, to solve the maze in the shortest run — a mouse would have had to travel but 8m from entrance to exit. Right-wall huggers would have had to travel 15.83m while left-wall huggers would have had to endure a more punishing distance of 30.05m.

In practice, only the Moonlight Express and Special made perfect runs (on their second and third trials). The $1000 grand-prize winner, the Moonlight Flash, solved the maze in 30.04s on the first run, 30.62s on the second run and 29.78s the third time around.

"It's been quite an experience," said one of the three designers of the Flash, Art Boland. "As designers of wall followers, dead-end blockers and shortest-path computers, we know the difficulties encountered in making a transition from one level of intelligence to the next. The number of entrants with plans for intelligence that didn't succeed is evidence that these transitions are more difficult than some people realise. The problem essentially boils down to one of control. For a mouse to be truly capable of learning a maze and making smart decisions about solving the maze, physical control of the mouse must be both accurate and repeatable. No attempt was made by us to implement our learning algorithms for our micromice until our control software was good enough to accept the learning algorithms."

'Execute' Program for the 2650 minicomputer

Newcomers to computing often wonder just what some of the jargon used means. This article is meant as a remedy to this situation, and attempts to explain with a practical example just what is meant by the term "execute".

by LUDI KRAUS

One of the most often used but most little understood terms bandied about by computer proponents, both professional and amateur alike is "execute". The newcomer to computing, on hearing the expression "let's execute the program", could be forgiven for thinking that this means "let's kill the program".

In fact, the dictionary definition of execute does encompass the meaning "to carry out capital punishment", ie to kill, but includes a host of other meanings as well. Thus we can speak of executing orders, plans or functions, meaning to carry out these duties or acts, or of executing a document such as a will.

In deed, the kill implication is the last meaning listed in my dictionary and is definitely not the meaning intended by our overheard programmer.

If we turn from a dictionary to a glossary of terms, as usually can be found at the rear of elementary programming manuals, we come across an alternative definition, such as the one given below:

EXECUTE — to fully perform a specific operation, such as would be accomplished by an instruction or a program.

Our newcommer could now draw the correct conclusion that when we talk of "executing a program", what we really mean is running, or, to be specific, letting the computer run a program.

"But," wails our beginner, "how do you run or execute, to use the jargon, a program?" Well, this requires a special purpose program, rather similar in concept to an assembler or an interpreter.

For the benefit of newcomers confused by those last two large words, an assembler is used to assemble programs, while an interpreter is used to interpret programs. Similarly, we will use an executioner to execute programs. (Enlightening isn't it?).

The program listing included with this article is a fully optioned executioner, intended for use with 2650 computer systems. It will operate with both machine level languages, and with higher level language, such as Basic or Pascal. It is completely relocatable and is intended to reside in the topmost portion of the user RAM.

The program can also be used in ROM, although in this case its full advantages cannot be reaped. This is because it uses a unique form of error detection and correction, which involves a special section of the program, which modifies itself.

This special section, however, before it runs, first checks to see if it is ROM-resident. If it is, it neatly bypasses itself.

The error correction carries out a series of CRC (cyclic reduncy check) tests, incorporating Hamming code and BCC (binary condition code) tests. These checks and tests enable it to correct any possible errors in the remainder of the program.

This meant, in fact, that it was only necessary to debug the first section of the program, as the second section automatically debugged itself. This saved valuable time and meant that this article could be published one month earlier than anticipated.

In order to use the program with your system, first load the program you wish to execute into the area of RAM it normally uses. If you have a ROM based system, this step is not necessary.

Next, load in the execute program. You can do this using either the A command of Pipbug, the hex input routines published in the March 1979 issue or the mini assembler published in the April 1979 issue. The program is 73 bytes long, and should be placed at the top of your memory.

If you have the 2650 Mini Computer with only 4k of RAM, start at address X'13AF. If you have implemented the 8k RAM expansion, your starting address should be X'1FAF if you have memory only in page 0, or X'2FAF if you have used the CPU RAM in page 1.

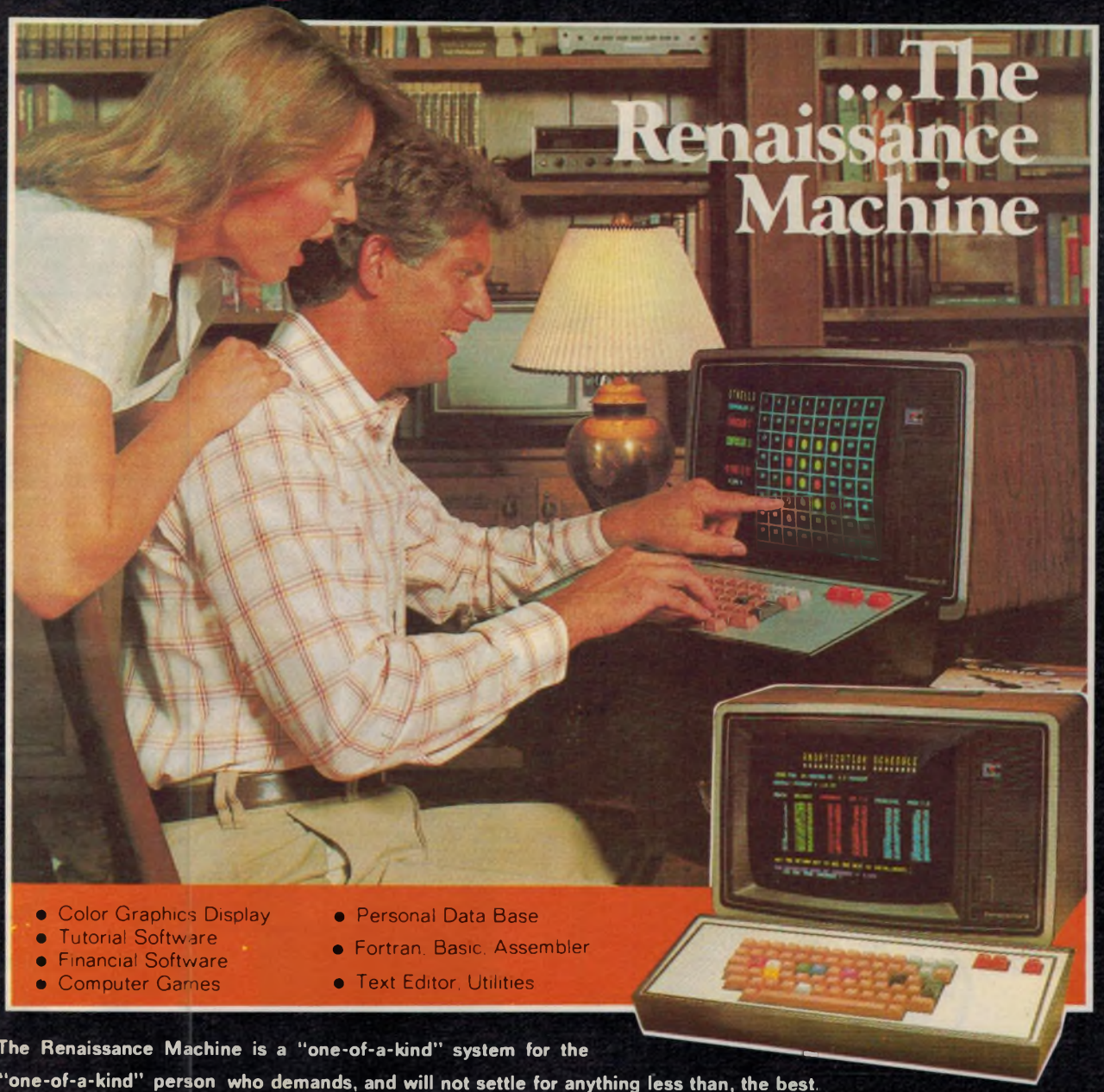
To run the EXECUTE program, simply type G 13AF XXXX CR, where XXXX is the HEX hex address of the first byte or location of the program to be executed. Control will return to Pipbug when the execution is complete. Please note that this may take some time, especially if your program includes a number of absolute and relative addressed indexed instructions.

A disassembly listing of the program has been included with this article, as an aid to those who do not have access to a disassembler. Unfortunately, no comments could be provided with the listing as that would give the game away. However, with the aid of the 2650 Microprocessor manual, novices should be able to work out the way in which the program operates.

(Editor's Note: Users are warned that this program does "execute" in the worst sense of the word.)

```
13AF 7640    PPSU          40
13B1 7518    CPSL          18
13B3 0422    LODI,R0       22
13B5 24A5    EORI,R0       A5
13B7 D0      RRL,R0
13B8 C801    STRR,R0       13BB
13BA 1B73    BCTR,UN       13AF
13BC 6850    IORR,R0       138E
13BE 50      RRR,R0
13BF 0A82    LODR,R2       *13C3
13C1 92      LPSU
13C2 4A62    ANDR,R2       13A6
13C4 01      LODZ,R1
13C5 32      REDC,R2
13C6 7A7A    BSNR,N        13C2
13C8 62      IORZ,R2
13C9 0900    LODR,R1       13CB
13CB 3F02DB  BSIA,UN       02DB
13CE 3B23    BSTR,UN       13F3
13D0 086A    LODR,R0       13BC
13D2 180E    BCTR,Z        13E2
13D4 50      RRR,R0
13D5 50      RRR,R0
13D6 50      RRR,R0
13D7 3F02B4  BSTA,UN       02B4
13DA 0875    LODR,R0       13D1
13DC D800    BIRR,Z        13DE
13DE C871    STRR,R0       13D1
13E0 1B6E    BCTR,UN       13D0
13E2 04C0    LODI,R0       C0
13E4 CC040D  STRA,R0       040D
13E7 3B02    BSTR,UN       13EB
13E9 1B79    BCTR,UN       13E4
13EB 0978    LODR,R1       13E5
13ED 0A77    LODR,R2       13E6
13EF DA02    BIRR,N        13F3
13F1 D900    BIRR,P        13F3
13F3 C970    STRR,R1       13E5
13F5 CA6F    STRR,R2       13E6
13F7 17      RETC,UN
```

Color your thinking with Compucolor 11



The Renaissance Machine is a "one-of-a-kind" system for the "one-of-a-kind" person who demands, and will not settle for anything less than, the best.

The color machine with the black and white price

Available from

ANDERSON DIGITAL EQUIPMENT PTY. LTD.

MELBOURNE: 1 Expo Court, Mt. Waverley, (03) 543 2077. SYDNEY: (02) 808 1444.

Your local dealer:
Sydney: Logic Shop (02) 699 4910 • Melbourne: Logic Shop (03) 51 1950
Newcastle: D.G.E. Systems Pty. Ltd. (049) 69 1625 • Canberra: A.D.E. (062) 58 1811
Brisbane: A.D.E. (07) 59 6436 • Adelaide: Applied Data Control Pty. Ltd. (08) 79 9211
Perth: W. J. Moncrieff Pty. Ltd. (09) 325 5722 • Hobart: Management Technology. (002) 34 4522
Darwin: Direct T.V. and Electronic Services (089) 81 9313
NEW ZEALAND:
Wellington: A.D.E. 64 4585 • Auckland: A.D.E. 87 6570 • Christchurch: A.D.E. 79 0210 — 89 7598
NEW GUINEA: Komputel Systems. 42 3924

ADE

DEALER ENQUIRIES WELCOME

MICRONTA®

Dependable Multitesters

Sale Ends May 3, 1980

27 Ranges — 30,000 Ohms

22.95

Regular Retail Price 32.95

SAVE $10

Super sensitive! Has colour coded 10.1cm meter, mirrored scale, 4 banana jacks including output jack, polarity reverse switch, zero adjust. DC Volts 0-0.3-1-3-10-30-100-300-1000 at 30,000 ohms/volt. AC Volts: 0-10-30-100-300-1000 at 10,000 ohms/volt. DC Current: 0-100 *u*A, 3-30-300 mA, 10 amps, Resistance: Rx1, Rx10, Rx1000, Rx10,000 (10 ohms centre scale). dB: −10 to +62 in 5 ranges. Accuracy: ±3% AC, ±4% DC. 15.8x11.4x4.4cm. Requires one "AA" and one 9V battery. 22-203

ArcherKit Multitester Kits Save You Time and Money Consistently!

ArcherKit

25 Ranges — 20,000 Ohms per Volt

19.95

Regular Retail Price 23.95

SAVE $4

10.1cm colour coded mirror scale. Accuracy: ±4% AC, ±3% DC. Requires 1 "AA" battery. 28-4013

43 Ranges 50,000 Ohms per Volt

26.95

Regular Retail Price 32.95

SAVE $6

11.4cm mirrored scale. Overload protection. Accuracy; ±4% AC, ±3% DC. Requires "AA" and 9V batteries. 28-4014

8 Ranges 10,000 Ohms per Volt

7.95

Regular Retail Price 8.95

SAVE $1

Pocket size. Pin jacks for all ranges. Resistance to 100k. Requires "AA" battery. 28-4012

TANDY ELECTRONICS

Available Now From
Over 200 Tandy Stores
And Participating Dealers!

REVIEWS OF RECENT

Records & Tapes

CLASSICAL ● POPULAR ● SPECIAL INTEREST

Faure, Britten: Two most enjoyable discs

FAURE: Sonata No. 1, op.13; Berceuse, op.16. DEBUSSY: Sonata in G minor. Pinchas Zukerman, violin; Marc Neikrug, piano. CBS Masterworks stereo disc 76813.

In 30 years of reviewing and listening to records, this is only the third occasion on which I've heard Faure's first sonata for violin and piano. There is no real justification for its neglect (I've yet to hear it played live!) as the music is very attractive, certainly interesting to perform and far from commonplace. The Debussy sonata, on the other hand, is quite regularly aired as is, for the matter, Faure's second violin sonata, the very late opus 108.

The Debussy, well known as I mentioned, is a work of utter beauty and it receives a very fine performance on this disc — the equal, I think, of any I have heard. The Faure work, in which the violin is far more dominant than in the wider known op.108, starts with an allegro of some excitement, full of virtuoso bits for the violinist and Zukerman rises to the occasion. The andante is melodious and contains some quite charming material for both instruments; in the final allegro, a bright and dancing movement, most of the music again belongs to the violin. Faure's Berceuse, no doubt a popular encore in its day, is delicious salon music of the better kind and, as all the music on the disc, is brilliantly performed and recorded.

This is, on the whole, a very enjoyable disc. However, Marc Neikrug is a pianist not only unknown to me, but also to a wide range of professional musicians, including visitors from Europe and the USA. Neikrug plays excellently and one presumes he is American, between the ages of 10 and 80. Since a whole three-inch column of space on the record sleeve is left blank (the equivalent of 750 words of text) I do feel the manufacturer could have given some information on the performers — even Mr Zukerman may not be a household word to some record buyers! (P.F.)

BRITTEN: Four Sea Interludes and Passacaglia from Peter Grimes; Vaughan Williams: Fantasia on a Theme by Thomas Tallis. The Philadelphia Orchestra, conductor Eugene Ormandy. RCA Red Seal stereo disc ARL 1-2744.

This recording was made in 1978 when veteran Ormandy was 79 years old, proof of the life-protracting quality which lies in music, particularly for good conductors! Ormandy has been with this orchestra for many decades and has never slackened his standards, technically or musically. The orchestral playing is as good as I've ever heard, from just about any ensemble and the recorded sound is absolutely flawless: clear, well balanced, detailed and honest.

Vaughan Williams' music has always been recognised as being peculiarly

Mandolin Concertos — highly recommended

THE MANDOLIN CONCERTOS. Antonio Vivaldi. Concerto for Two Mandolins and Strings in G Major, P.133.
Concerto for Mandolin and Strings in C Major, P.134.
Concerto for Two Mandolins, Two Theorboes, Two Flutes, Two Salmos, Two Violins "in Tromba Marina" and Cello in C Major, P.16.
Concerto for Two String Choirs with Violino Discordato in B Flat Major. I Solisti Veneti, directed by Claudio Scimone. World Record Club stereo S/6341.

Those odd instruments listed for the third work on this record are an indication that this is one of Vivaldi's most unusual compositions. It appears on this disc for the first time in its original form. I will use the extensive sleeve notes to briefly describe the instruments:

The "theorbo" was a taut stringed instrument of the lute family which had numerous strings coupled in pairs but in two rows tuned on separate sets of pegs. The strings belonging to the longest and most important row were tuned according to the tonality of the piece to be played and were always played "open", ie, without stopping by the left hand. This gives the instrument a rich "colour" well suited to its usual role in the bass continuo.

The "Salmo" was a wind instrument believed to be an ancestor of the clarinet. For this reason, in the present recording, the parts of the salmo have been recreated with clarinets in the higher octave. Finally, "violins in troma marina" means literally, violins imitating the marine trumpet. This is achieved by employing a special mute on the violins.

The result of these unusual instruments is an ensemble playing a composition of exceptional brilliance and light. If you like the works of Vivaldi, you will find this work quite unlike most of his compositions but very enjoyable. I found it most uplifting. Perhaps this impression was helped by the effect of our family canary bursting into joyous song immediately the first few bars sounded but, thinking about it objectively for a moment, that cannot be true. Our canary is no connoisseur — he often breaks into song at the sound of a vacuum cleaner! No, without any qualification I can state that this has been one of the most enjoyable records to come my way for some time. Highly recommended. (L.D.S.)

Reviews in this section are by Paul Frolich (P.F.), Neville Williams (W.N.W.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), Greg Swain (G.S.), Danny Hooper (D.H.) and Jennifer Williams (J.R.W.).

English and few performances of this lovely work have been recorded by other than English orchestras, usually directed by equally English conductors; all the same, this Hungarian-born maestro takes a great US orchestra through what may well be the most loving reading of this score currently available. I was quite enchanted with the performance which is such as to make you forget a hundred earlier ones and to hear the work as new.

Happily, I can praise the Britten side just as sincerely. Avoiding all excesses, Ormandy merely gives the drama inherent in this score freedom to flow; there is fine lyricism and careful adherence to the composer's dynamics and the conductor takes none of the irritating liberties that his younger colleagues tend to indulge in. The highlight of this disc is undoubtedly the glorious Passacaglia which I have never before heard played with equal power and tenderness. This record is surely a great find! (P.F.)

NOT RECOMMENDED

LEVINE CONDUCTS BRAHMS. Brahms: Symphony No. 4 in E minor, op.98. Chicago Symphony Orchestra, conducted by James Levine. RCA Red Seal Stereo disc ARL 1-2624.

James Levine is a youthful American conductor who, since emerging about 1975, has had quite a meteoric rise and, by 1979, was being rushed with engagements at major festivals, with leading orchestras and by recording studios. Clearly, RCA are having quite a torrid affair with him: there is a whole series of records entitled "Levine conducts . . ." When a conductor becomes so acclaimed that he can have his name put before that of any and every composer, it behoves us to sit up and take very careful notice.

To begin with, I do NOT like this performance; the Chicago Symphony Orchestra is a fine old ensemble and they have given us many notable readings of Brahms' music in the past, directed by many sound musicians from Fritz Reiner to Giulini and, most recently, Solti. I know that they can and do play well; their string section may not be the world's greatest, but they are good enough — when they are audible. On this occasion, there's been so much monkeying about with balance that the winds and percussion often swamp the string sound completely. I do not think the orchestra has been well recorded this time and I am sorry about this. They deserve better.

My major objections concern the conductor and, I think, him alone. Brahms' symphonic music can easily be made to sound heavy, pompous and pretentious and no opportunity is lost to prove this. In the opening movement, every rhythmic detail in the score is exaggerated, tempi are often rushed,

(Continued P.99)

For teachers and students —

ELIOT-GOLDING-PORTER

SIR ALEC GUINNESS reads T. S. ELIOT. Stereo, two-record set. Originally produced by the BBC and ARGO and currently released in Australia through the World Record Club. R-05912/3.

Born in America in 1888, T. S. Eliot became a British subject in 1927 and, by the time of his death in 1965, had established himself as a dominant figure in English-language poetry. Even so, his is the poetry which, in large degree, belongs to the student, the lecturer, the thinker — and the devotee. It is for such that this double album has been released by the W.R.C., and read by Sir Alec Guinness — a man with a long-standing affinity with the poet.

Record 1, side 1, contains Eliot's memorable "Wasteland", while side two contains eight shorter poems which Guinness himself nominated. They are read with perception and appropriate clarity of diction and I have no hesitation in commending them warmly.

Record two is devoted to the "Four Quartets", highly praised but by no means transparent in their meaning. I found them heavy going and also found myself wondering whether they would be relevant to anything but a highly specialised teaching situation — or to an Eliot devotee.

Against this, the folder contains generous notes on both Eliot and Guinness and, for those who want to dig more deeply, it would have to be considered as a valuable resource package. (J.R.W.)

WELCOME BACK TO JULIAN RUSSELL

After a prolonged and very serious illness, Julian Russell is now taking up some of his former activities. He is currently preparing reviews for inclusion in these columns next month.

WILLIAM GOLDING DISCUSSES Novel Writing and Lord of the Flies. Stereo cassette, Move MC-7022. (From Move Records, Box 266 Carlton South, 3053).

Primarily a teaching resource, this cassette contains an edited interview with the author William Golding, recorded during a visit to Australia in 1975. Unfortunately, the flow of the interview is compromised by excerpts from the film "Lord of the Flies", which are interspersed rather clumsily with the questions and answers. There are times, too, when the background noise, whatever its source, intrudes noticeably.

These reservations aside, there is nevertheless much valuable material for teaching purposes on the tape. After a brief biographical segment, Golding is questioned about a wide of issues — his attitude to literature, his choice of the novel for, the influence of the Greek classics on his work, his exploration of the themes of law and order. And, as he speaks further of his experiences during World War II, the tape brings us closer to Golding the man.

The numerous references to Greek literature position the recording as most suitable for senior students. However, given judicious monitoring by a teacher, there is much that would communicate directly to alert junior students, and increase their sensitivity to the novel and to Golding's purpose in writing it. Short accompanying notes and questions would provide some interesting follow-up study material. (J.R.W.)

☆ ☆ ☆

HAL PORTER Talks with Mary Lord about "The Watcher on the Cast-Iron Balcony" and "Selected Stories". Cassette tape (from Move Records, Box 266, Carlton South 3053).

One gets the impression that this was not a particularly easy interview to conduct. Hal Porter's thought patterns tend to be convoluted and subject to sudden switches in emphasis. And there's lots of breath noises.

Mary Lord obviously realises this and tries on occasions to draw the threads together into more meaningful comment. In so doing she also provides valuable starting points for discussion.

The tape ranges through biographical material, to Porter's motivation for writing, and his feelings and experiences while so engaged; his view of Australia and its intrinsic role in his work; his style and his resource material, derived largely from personal experiences.

Overall, the tape is less valuable for teaching purposes than the Golding cassette reviewed elsewhere but, even so, it does "humanise" the writer and puts flesh on the name behind the stories. In short: potential resource material but not a tape that would warrant priority if school funds are running low. (J.R.W.)

phrases dismembered. The second movement fares a little better, though the composer's "moderato" sounds more like a "maestoso". Taken as a whole, I have no hesitation in deploring Levine's interpretation; it is a wilful and rapacious treatment of a great work. Perhaps better things will emerge once this conductor learns to take second place to the creative musicians whom he should humbly serve. (P.F.)

☆ ☆ ☆

BRAHMS: Piano Quintet in F minor, op.34; Leon Fleisher, piano; The Juilliard String Quartet. CBS Odyssey stereo disc ODA 5128.

Although Brahms' piano quintet remains one of the very finest of chamber works, ensembles seem to shy away from recording it; or is it the recording companies' reluctance to chance their ability to cope with the known problems of balance? Whatever the answer, here we have a re-issue of an excellent performance, first issued here under the Epic label towards the end of 1963. A further two of the only four currently listed versions are as old, or nearly so, and the only recent recording of this great work I know of is that made by DG, with Eschenbach and the Amadeus Quartet and even this is now 10 years old!

In view of the vintage of this recording, the first thing to be emphasised is the excellent sound, clarity and definition; balance is good, if slightly favouring the piano — I consider this entirely acceptable, particularly in the knowledge of Brahms' alternative version, op.34b, for two pianos. The performance may not be the ideal one, but it is good; the interpretation is generally bright and lively and suited to the music's mood. My only reservation relates to the second movement "Andante, un poco adagio" which, I feel, might have been allowed greater emotional intensity; it really is a little dry, but I know that this was the fashion at the time, more particularly in the USA. This re-issue is most welcome! (P.F.)

☆ ☆ ☆

MOZART: Violin Concerti No. 2, D major, K.211 and No. 4, D major, K.218. Isaac Stern, violin; English Chamber Orchestra; Alexander Schneider, conductor. CBS stereo disc SBR 235940.

Isaac Stern has made few appearances in the record catalogues in recent years — always excepting the flow of re-issues, of course — and I am pleased to have this opportunity to

Our first from DELOS — a beauty!

THE CLASSIC TRUMPET CONCERTI OF HAYDN AND HUMMEL. The Y Chamber Orchestra of New York. Gerard Schwartz Conductor and Trumpet Soloist. Digital stereo, Delos, DMS-3001. (From P.C. Stereo, PO Box 272, Mt Gravatt, Qld 4122).

This is the first recording I have reviewed from the Delos label and it's a beauty in every way.

Technically, it was recorded in New York's excellent Masonic Temple Auditorium, using B&K microphones capable of handling peak sound levels of 160dB! The master was made on a Soundstream digital recorder, then edited and balanced under computer control, before being transferred to disc by JVC/Victor, probably at half speed.

The result is eminently satisfying, but in an unspectacular way. There is no thundering bass, no enormous dynamic excursion, no sizzling treble. What you get is just utterly clean sound, which allows the trumpet to come through untarnished by the slightest suggestion of noise or distortion.

And what trumpet! Gerard Schwartz is one of the best virtuoso trumpeters in the world today and plays with incredible skill and sensitivity. Exposed, as he is, by the completely transparent recording, every note, every cadence is precise and true.

Meanwhile, he is simultaneously conducting the Y Chamber Symphony of New York, a relatively new orchestra of about 40 players, drawn from the finest of New York's chamber musicians. They complement perfectly the solo trumpet.

As for the music, the title "Classic Trumpet Concerti" is thoroughly justified; the background of each is given in the handsome double-fold album, along with notes on the orchestra, the conductor/soloist, the featured instrument and the recording system.

One more thing: don't pass this over because you don't happen to be a classical music buff. This is highly listenable music, so performed and so recorded that you'll want to hear it over and over again, and play it to your friends. If this sounds like a enthusiastic review . . . it is! (W.N.W.)

RECORDS & TAPES

hear him once again. It would be pointless to pretend that Stern in 1978 is as miraculous a fiddler as he was 30-odd years ago when we first heard him in the flesh, nor can one claim that maturity has made him a more profound performer. With this said, one cannot but enjoy a great deal in his playing and remain grateful for his artistry.

Stern is not the first violinist to couple the two D major concerti, but he does more than most others to show how very different they really are. Some of this is, I regret, due to a tendency to exaggerate what might be called "expressiveness"; frankly, Stern now plays with excessive legato, tends to overdo rhythmic nuances and drags the beat here and there. The keen, clean edge of his erstwhile playing has become blurred and Mozart's music is the poorer for it. On the other hand, the ECO responds magnificently to the veteran Schneider, whose musicianship never falters. The recorded sound is very good and the record, with the above reservations, is warmly recommended. (P.F.)

☆ ☆ ☆

DONALD SMITH SINGS FOR YOU — World Record Club WRC R04989

This record, with one of Australia's best known voices, would make an ideal Mother's Day gift, with its nostalgic appeal of songs mainly from the big musicals of the 30's and 40's.

Donald Smith is in fine voice on these twelve tracks with the backing of the Adelaide Symphony Orchestra conducted by John Lanchbery: For You — Would You — I'm In The Mood For Love — Moonlight Becomes You — Over The Rainbow — Diane — If I Had A Talking Picture Of You — Dancing With Tears In My Eyes — I Only Have Eyes For You — You Belong To My Heart — We Were So Young — September In The Rain — You Stepped Out Of A Dream — Giannina Mia.

The quality is good overall, with just a few thin patches at the beginning. (N.J.M.)

☆ ☆ ☆

EDWARD WOODWARD, Don't Get Around Much Anymore — This Records L 37115. Festival Release.

Edward Woodward's Style certainly suits the period of most of these old favourites, with a very smooth balladeer rendition of these titles: Don't Get Around Much Anymore — The Whiffenpoof Song — My Foolish Heart — I'll Remember April — I Couldn't Sleep A Wink Last Night — I've Heard That Song Before — Lazy River — A Nightingale Sang In Berkeley

Square — Me And My Girl — As Time Goes By — Lilli Marlene.

The photo on the back of the sleeve brought back pleasant memories of tearing round the countryside in the Dickey seat of one of the first Triumph roadsters imported into Australia after the war; great fun! (N.J.M.)

☆ ☆ ☆

FUN AND GAMES. Chuck MANGIONE. Stereo AM Records L-37164. (Festival release).

According to a note on the jacket the first track "Give It All You've Got" was commissioned by the American Broadcasting Company for the 1980 Winter Olympics, presumably as theme music for their TV coverage. It's a bright, modern rhythmic "action" sound, eminently suitable for the winter Olympic thrills. On side 2 "Give It All You've Got, But Slowly" would be just right for a camera roving slowly over — say — snow covered mountains.

"I Never Missed Someone Before" is a sentimental journey, while "Pina Colada" is a somewhat abstract exercise in sound and rhythm.

The two remaining tracks "You're The Best There Is" and "Fun And Games" have a dominant rhythm just right for a party stomp.

Chuck Mangione earns the cover credit by composing and arranging all the music, supervising production and playing flugelhorn and electric and acoustic pianos. Add a string of other players and instruments and some vocal effects and you've got "Fun and Games".

The sound quality is excellent. (W.N.W.)

SCOTTISH COUNTRY ROADS. The Tartan Lads. Stereo, Interfusion/Bel L36964. Festival release.

Take a couple of Scottish lads, complete with brogue, kilts, accordian and a cheery grin and there's a fair chance that they will be able to entertain and relax you for the next half hour or so. The Tartan lads presented here are no exception, the one difference being that they choose to mix with Scottish traditional material a few C&W tracks which served them well in a recent tour of Canada:

Summer Road — Bonnie Stratheyre (medley) — Clarinet Polka — You're My Best Friend — The Lights Of Lochin-

SPECIAL PURCHASES

NEW B.S.R. RECORD CHANGERS-PLAYERS

CHANGER MODEL C197 $47.50

This is a new model just released and is fitted with a ceramic cartridge & diamond stylus. Auto or manual operation: Three speed 33, 45 & 78rpm: Cueing control and bias compensation: Changer & player spindles supplied. 11" turntable. **Post & packing extra.** NSW $2.75: Vic. Qld $3.75: WA, NT & Tas $4.75.

SPEAKER GRILLE FABRIC AT ½ PRICE

AVAILABLE IN BLACK, BLACK WITH GOLD FLECK, LIGHT & MID BROWNS. WIDTH 54"

$4.80 Per YARD. Post & Pack $1.75.

Send two 20c stamps for samples.

GARRARD CC10A RECORD CHANGER $15.75

Fitted with a Sonatone Garrard Ceramic Cartridge Sapphire Stylus supplied with template & instructions. Posts & Packing: NSW $2.50. Inter. $3.50.

NEW CAR CASSETTE CONVERTERS BICOH MODEL NA100/CC-007A AT APPROX. ½ LIST PRICE

By connecting this model with your existing AM car radio, you can enjoy the music of any cassette that has been pre-recorded.
Connection requires no alteration to the car radio. Plug your car aerial into the cassette recorder and using the patch cord supplied, connect the recorder to the aerial connection of your car radio. By following the instructions, installation is a **simple procedure. All cords & brackets are supplied. Can be used in any car with a 12-volt neg. earth** system can also be used with any AM radio by using a 12V supply.
Dimensions: 150 x 110 x 53mm.
(SEE REVIEW EA FEB 1980)

$18.50 post & pack $2.50 extra

NEW HOKUTONE 12" HI-FI SPEAKERS

Model 300F W09YL 12" power rating 20 watts. 8OHM IMP cone resence 30 cycles. Manufactured by Hokutone Onkyo Co Japan.

$12.50 *POST & PACK $2.50*

NEW RANK-ARENA F.M.-A.M. TUNER AMPLIFIER

Freight Extra **$147.00**

MODEL RA402. Output 24 watts RMS. (12+12). Response 50HZ to 50KHZ. Mag or ceramic inputs. High & low filters. Loudness control. Provision for 4 speakers.

NEW E.M.I. AND HITACHI RECORDING TAPE AT BARGAIN PRICES

HI-DYNAMIC EMITAPE — HIGH OUTPUT — LOW NOISE — HI-FIDELITY

HLP18 7" reel 1800ft. long play $5.95 P & P $1.00
HDP12 5" reel 1200ft. double play $2.95
NEW E.M.I. SUPE C90 CASSETTES, 6 FOR $10.00. *P&P $1.00*
NEW EMI HI-FI C90 CASSETTES 5 for $12.50
Hitachi LN 8-track 90 minute cartridge 5 for $10. *P & pack $1.50*

NEW AWA HI-FI SPEAKER KITS 8" 2 WAY 3 SPEAKER SYSTEMS AT LESS THAN ½ LIST PRICE

POWER RATING 20 WATTS R.M.S.
IMPEDANCE 8 OHMS
FREQUENCY RANGE 46 TO 18000 CYCLES

Supplied in kit form (less cabinet) each kit comprises: One AWA 8WAC 8in. bass unit, two AWA 4MBC 4in tweeters with ceramic magnets & curve-linear cones, crossover components, grille cloth, innabond lining and cabinet plans.

CABINETS AVAILABLE
Post & packing extra. NSW $2.50. Interstate $3.50.

$18.50 Per Kit

NEW GOODMAN-FOSTER 3-WAY 4-SPEAKER HI-FI SYSTEM $39.00 PER KIT

Frequency Range 45 to 22,000 cycles. Power rating 25 watts. RMS Imp-8ohms. Supplied in kit form (less cabinet) each kit comprises two English Goodman 8" bass units. Foster 5" mid range. Foster 1" dome tweeter crossover components. Ocodensers and inductance innabond, speaker fabric and plans of cabinet. Cabinet dimensions 23" x 13" x 10". **CABINETS AVAILABLE.**

Post & packing extra: NSW $2.70; VIC, SA, QLD, $4.70; WA $5.70. (REGISTERED POST $2.00 EXTRA IF REQUIRED) cabinets available.

NEW HOKUTONE HI-FI SPEAKER KITS AT A FRACTION OF LIST PRICE

NEW THREE WAY HIGH FIDELITY SPEAKER SYSTEM WITH A FREQUENCY RANGE OF 35 TO 20,000 CYCLES. POWER RATING 50 WATTS.

Supplied in Kit form (less cabinet) Woofer HFW-302, 12". Mid range HM-24 dome. Tweeter HT-60 dome. Three way crossover with separate controls for mid range & tweeter. Innabond lining, grill fabric & cabinet plans supplied. Cabinet dimensions 668 high, 435 wide, 310 deep.

$69.00 per kit Freight extra by rail, air or road transport.

NEW GLENBURN AT100 RECORD PLAYERS

This Glenburn AT100 changer is being sold as a player with short spindle only as changer spindles are not available.

Fully automatic turntable automatically or manually as required. 10" turntable. Cue & pause control. Record speeds 33 1/3, 45 and 78 rev/min. Finished in black with silver trim. Fitted with ceramic cartridge. Post & packaging extra. NSW $2.70; Vic. Qld; SA $3.70; WA $4.70 (registered post $2 extra if required). Same cabinet cut-out as B.S.R.

$24.00

RANK-ARENA 2 WAY SPEAKER

$42.00 PER PAIR

- 10 Watts RMS
- 8 ohm impedance
- 8" woofer with tweeter
- Supplied with lead and plug
- Teak finish

Dimensions 18"H, 11"W, 9½"D
Freight extra per rail air or road transport

TWO WAY SPEAKERS WITH SPECIFICATIONS AS ABOVE WITH WALNUT FINISH

$42.00 PER PAIR

COMMAND BOOK SHELF SPEAKERS. $30.00 PER PAIR Freight extra

- 7 watts rms
- 6" twin cone speaker
- Supplied with lead & plug
- Teak finish

Dimensions 15" H, 10" wide, 7" deep.

CLASSIC RADIO

245 PARRAMATTA RD, HABERFIELD 2045. PHONES 798-7145, 798-6507.

RECORDS & TAPES — continued

daal — the Bluebells Of Scotland — Anna Marie Mull Of Kintyre — San Antonio Rose — Scottish Selection — Bonnie Naver Bay — My Own Land — Annie's Song — One Day At A Time.

The sound quality is okay and if you fancy some appropriate music with your haggis, the Tartan Lads, Bill and Ray, can provde it. (W.N.W.)

☆ ☆ ☆

HIGH GEAR. Neil Larson. A & M Records L 37064. Festival release.

This is Neil Larson's second album follow-up to "Jungle Fever". He has played for artists as diverse as George Harrison, Gregg Allman, Paul Anka, Dr. John, and is one of the most sought after session-men working in Los Angeles.

This album is predominately instrumental except for non-verbal voicing in two of the tracks. Rickie Lee Jones performs these voicings on one of the tracks.

The recording quality of "High Gear" is good and has an innovative appeal.

The tracks on the album are: High Gear — Demonette — Futurama — This Time Tomorrow — Nile Cresent — Rio Este — Night Letter. (D.H.)

☆ ☆ ☆

101 STRINGS GOES DISCO. 101 Strings Orchestra. G 2008 Astor Records.

This USA recording by the 101 Strings Orchestra incorporates two new compositions and five old favourites to the disco beat. Two tracks are completely instrumental while the other five include vocals.

The recording quality is excellent, vocals are clear and blend well with the musical arrangements. A refreshing album.

The seven tracks on the album are: Malaguena — Heartaches Marianne — Disco Fever — Don't Tell Bill — Bye Bye Blackbird — Yes Sir, That's My Baby. (D.H.)

☆ ☆ ☆

DRACULA, Movie Sound Track. MCA 3166 Astor release.

Dracula certainly has been getting plenty of screen time of late, with a number of versions of the Bram Stoker story being available. Despite the brave words of the gentleman who wrote the notes on the jacket, the music is still very obviously movie music, and is not really compelling in isolation. Despite this comment, the composer shows considerable skill in evoking the moods of the story. If you're any kind of a Drac. fan, you may well respond more spontaneously than I did. (NJM)

DEVOTIONAL FROM WORD RECORDS AUST.

HALLELUJAH VOICES. Arrangements by Anita Kerr. Stereo, Word, WST-8808. (From Word Records Aust, 18-26 Canterbury Rd, Heathmont, Vic 3135).

The name Anita Kerr provides an almost automatic guarantee that the music will be smooth and melodic, and this album provides no exception to the rule. However, while the chorus can be relied upon to appeal to those with more conservative tastes, the overall sound is certainly not dull — thanks to the vocal arrangements and to the rhythm guitar accompaniment.

The songs are mostly new but with a blend of the traditional: Symphony of Praise — Just Because I Asked — His Song — Just As I Am — Teach Me, Lord — Keep That Moment Alive — Let Us Break Bread Together — This Song's For Him.

No lyrics are provided but the themes are evident enough. The sound is clean and, overall, this must rate as an excellent album for all-age family listening. Recommended (W.N.W.)

☆ ☆ ☆

JUST THE WAY I AM. Pat Boone. Stereo. Lamb & Lion Records, LL-1039. (From Word Records Australia, 18-26 Canterbury Rd, Heathmont, Vic 3135.)

Listening to this new Pat Boone release, I couldn't help but note how the artist had changed with the times. In contrast to his early discs — straight renditions of straight hymns — this one is a swingin' performance of modern, light devotional songs, backed by a chorus and by instruments ranging all the way from acoustic and electric guitars, through Hammond organ to trumpets, strings and saxes (not all at once, of course).

You may not know many of the numbers but the lyrics are set out in full on an inner sleeve: Something Good — More Of You — Filled To Overflowin' — You Loved Somethin' About Me — I Have — Just The Way I Am — To Be Like Him — I Go To The Rock — Jesus Was There All The Time — Stone By Stone.

From the very detailed credits, it is evident that the backing was recorded initially and the solos added at a later date in another studio. You'd never pick it from the performance but those with keen ears may note a distorted "edge" on Pat Boone's voice in most tracks. The last track, with piano-only backing, is a notable exception.

Aside from this reservation, which might deter the quality enthusiast, your reaction to the album will be determined by how you like your Gospel music: staid, way out or (as here) in between. (W.N.W.)

Letters to the editor

Nuclear power: the AAEC replies

I am always disappointed when the editorial staff of such an excellent publication as yours fails, prior to publication, to determine the accuracy of a letter contributed to its pages. In this way Mr Martin Levins of Wahroonga, NSW, was able to record without immediate right of reply a number of inaccurate statements.

As a detailed rebuttal of the whole letter would take far too much space, I shall confine myself to the points directly relevant to the Australian Atomic Energy Commission.

In paragraph (4) of his letter, Mr Levins states: "After the recent death from leukaemia of one of the Lucas Heights workers due to a sudden and accidental blast of radiation, the AAEC quietly settled out of court with the widow". This allegation appears to echo an article in the "Sun-Herald" of June 19, 1977. Unfortunately Mr Levins does not also quote a rebuttal published in the "Sydney Morning Herald" of June 21, 1977.

The facts are as follows. An officer of the AAEC made a claim in October 1976 for compensation under the provisions of the Compensation (Commonwealth Government Employees) Act, in respect of the disease leukaemia. His claim was supported by a medical report indicating that the symptoms had first appeared a few months earlier. The claim was transmitted to the Commissioner for Employees' Compensation in Canberra and it was accepted by him in terms of the provisions of the Act, for payment of compensation.

The officer was absent from work continuously from June, 1976 and died in April, 1977. Payment of compensation as prescribed in the Act was made on his death to his dependents.

In a statement dated June 20, 1977, I said that the officer's radiation exposure during his period of employment with the Commission was less than one-twentieth of the maximum permissible radiation dose recommended by the International Commission on Radiological Protection for those who work with radiation. Records show that he had never worked on nuclear reactors at Lucas Heights, although doubtless he had been in the vicinity of a reactor on occasions. He had not been involved during his employment at the Commission in any accident involving radiation exposure.

It has been observed that exposure to high doses of radiation, under some circumstances, can lead to an increased chance that the exposed person can contract leukaemia in later life. There is no evidence that this officer received such an exposure while employed by the Commission.

Leukaemia occurs throughout the population and is by no means a radiation-specific disease. However, on the basis that his employment could have been a contributing factor to the contraction of the disease, the claim for compensation was admitted by the Commissioner for Employees' Compensation. It was not "settled quietly out of court" as alleged by Mr Levins.

Mr Levins continued with the assertion that "information about the long term health of workers in the industry is difficult too obtain", adding that "this is mainly due to the fact that medical records of employees have not been kept for any significant time (15-20 years) in any nuclear institution in the world". Wrong again!

Information about the long term health of workers in the nuclear industry is not difficult to obtain. The AAEC, for example, has published figures on itself and compared them with similar organisations around the world [see Carter, Carruthers and Button, "Health and Safety Record of the Nuclear Industry" ("Atomic Energy in Australia", 19(2), April, 1976; also available in reprint from the Commission)].

Medical records have been kept of all Commission staff since the inception of the AAEC in 1953. One would have to go a long way to find any major nuclear institution which did not keep similar medical records.

I would also like to point Mr Levins towards two completely independent reports arising from the "Survey of Health of Employees in the Research Establishment of the Australian Atomic Energy Commission at Lucas Heights, Sydney". The First Report, May, 1978, 65pp, is entitled "Analysis of Medical Interview Data"; the Second Report, April 1979, 174pp, is entitled "Interpretation of Hazard and Recommendations". Both reports were prepared

(Continued on p119)

Suppressing RF interference in cars

I found your article on "Inductive Ignition Cable" in the February issue most interesting, as I have been involved in the suppression of several vehicles over a number of years. This work has mainly involved suppression so that AM receivers without noise limiters can be used in the HF and VHF regions with minimum noise pick-up.

My usual technique is to place the ignition system under a bronze flywire screen. This is quite practical where the coil, distributor and spark plugs are on one side of the engine as in 6-cylinder Holdens.

The bronze flywire is attached along one edge of the rocker cover and the bottom edge is attached under bolts on the sump at the back of the motor, the oil pump and the timing case cover. A coaxial feedthrough capacitor is fitted to the coil and the low tension cables are kept as far from the HT line as is practical. Bonding braids are also attached across each engine mount, from the rocker cover to the firewall, and across the hinges of the bonnet.

For a total outlay of about $5 quite a substantial reduction in interference level is achieved. I find I get about 20% more effective range with my 2-metre FM transceiver with the suppression fitted as compared to it removed.

For more information on this method of suppression, I would refer you to my articles in "Amateur Radio", the last being on p10 of the February, 1977 issue.

R. D. Champness,
Benalla, Victoria.

Keeping track of Notes & Errata

I refer to the letter from R. Cook, regarding indexing Notes & Errata, that appeared in the January 1980 issue.

I have purchased your magazine regularly for some time and the first item I turn to is Notes & Errata and make any necessary alterations to the original article. If there is insufficient room to make the alterations on the original article, I simply make a note referring to where the alteration can be found.

In this manner I can turn to a project and be immediately aware of any modifications that may have been published in later magazines.

K. W. George,
Nunawading, Vic.

THE FAMOUS 2M FM MOBILE IC22S

ICOM

1000'S SOLD IN AUSTRALIA

STILL ONLY $299

SYNTHESISED

* **IDEAL FOR MOBILE**
  No digital display, easy to use on the move without looking.
* **STACKS OF CHANNELS**
  22 programmable channels — 11 popular ones already done and 11 for you to program to your own choice.
* **REPEATER REVERSE**
  Full reverse at a flick of a switch.
* **SUPERB QUALITY AND PERFORMANCE**
  The ICOM name is synonomous with reliable communications, as thousands of happy owners will confirm.
* **COMPLETE**
  Comes complete with mic, mobile mounting brackets, dc lead and comprehensive instruction manual. Backed by Vicom 90 day warranty.
* **LOW RECEIVER NOISE**
  The IC22S uses a FET front end and high-Q helicalised cavity resonators. Signal gain of 90dB or more up to second mixer.
* **PROGRAMMABLE DIODE MATRIX**
  It's easy to add extra channels. Just solder in the diodes!

SIMPLY THE BEST!

Typical Technical Characteristics

General: (Australian Model). Number of semiconductors. Transistors 41. FET 7. IC 13. Diode 33 (Except Matrix Board). Frequency Coverage. 146-148 MHz. Antenna Impedance. 50 Ohms unbalanced. Power Supply Requirements. DC 13.8V ± 15% Negative Ground 2.5 A Max. Current Drain. Transmitting. Approx. 2.0A. Receiving. At Max. Audio. Approx 0.7 A. Squelched Approx. 0.4A. Dimensions. 58mm(H) x 156mm(W) x 218mm(D). Net Weight. 1.9 Kg. Channels Installed: R1-8, 40, 50, 51. **Transmissions:** Transmitting Frequency. 22 Channels in the 2m Band. Programmable by a diode matrix for any channels on 25KHz spacing. Emission Mode. 16F3. Output Power. 10W. Max. Frequency Deviation. 5KHz. Modulation System. Variable reactance phase modulation. Spurious Emission. More than 60dB below carrier. Microphone Impedance. 600 Ohms. Input level. 10mV typical. Dynamic or optional Electret condenser microphone. **Reception:** Receiving Frequency. 22 Channels in 2m Band. Modulation Acceptance. 16F3. Receiving System. Double super heterodyne. Intermediate Frequency. First IF 10.7MHz. Second IF 455KHz. Sensitivity. Less than 0.5u V (or 20dB Noise quieting. More than 30dB S+N+D/N+D at 1 u V. Squelch Sensitivity. Less than 0.3u V. Spurious Response Rejection Ratio. More than 60dB. Selectivity. ±7.5KHz at the —6dB point. ±15KHz at the —60dB point. Audio Output Power. More than 1 Watt. Audio Output Impedance. 8 Ohms.

Available from authorised dealers throughout Australia

VICOM

Check it out at your VICOM dealer.

□ Melb: 68 Eastern Rd. Sth. Melb. Ph. 699 6700
□ Syd. 339 Pacific Hwy. Crows Nest Ph. 436 2766
□ Bris. 48 6601
□ Perth 321 3407
□ Adel. 43 7981

AMATEUR RADIO

by Pierce Healy, VK2APQ

Around Australia with RTTY — or WAC from a Volkswagen Kombi van!

"I've retired". This was the opening comment of a story recounting a safari around Australia, using radioteletype as the major amateur radio mode. Among other things it demonstrates how world-wide communication can be achieved using the modest power and simple aerials dictated by mobile operation.

The story came from Sid Molen, VK2SG, telling of a nine month safari around Australia. Space does not permit the text to be given in full, but here are some of the highlights as recounted by Sid.

"I like travelling. About six years ago I did a trip around Australia in six weeks but, with more time now, having retired, I decided to try again and see some of the places that had been missed.

"So, having changed the oil in the Kombi van and purchased a small fold down caravan for the Kombi to pull, wife Jean and myself departed Pendle Hill in the western suburbs of Sydney on April 20 1979, and headed for Mount Gambier (SA) to relatives. On the way called into the Wagga Radio Club field day, and met Sid Ward, VK2SW, and wife Jean. (Photograph appeared in September, 1979 issue). Stayed a month at Mount Gambier, meeting all the local amateurs.

"One thing I forgot to mention; I took some radio gear with me. A VHF Kyokuto, and two FT101s (one being the unit used on the 'La Balsa' crossing of the Pacific Ocean) for mobile and RTTY. The RTTY gear was a Dovetron MPC1000R modem, Honeywell keyboard, and an XITEX video board into a 14 inch AWA B&W TV set. All the RTTY gear was mounted as one unit needing only audio from the receiver, or audio output to the microphone socket on transmit. The unit was portable and could be set up in anyone's station to demonstrate RTTY. The antennas were helicals for 40, 20 and 15 metres, fitting a common base. Power output was about 20 watts.

"The whole equipment could be powered from the vehicle's electrical system, using a 12V DC/240V AC inverter but where 240V was available at caravan parks this was used in preference.

"To keep my wife happy we took along the broadcast receiver in the Kombi, a portable B/C, FM, tape deck combination, and a TV receiver.

"After a month at Mount Gambier, with the weather wet and cold, it was decided to head north, planning to return in a month to pick up Jean's sister to accompany us for a trip. So via St Arnaud (Vic) to West Wyalong, Dubbo, and the Warrumbungle Ranges (NSW). Here I had trouble trying to tell an American amateur that the location was in the Warrumbungle National Park near Coonabarabran. He eventually understood when I told him near Siding Springs.

"Then on to Tamworth, Tuncurry, and Port Macquarie in time for the local amateur field day, where the RTTY gear was put on demonstration during the weekend. Then to Queensland, with stops in Brisbane, Toowoomba, Dalby, Kingaroy, Caloundra, Tin Can Bay, Bundaberg, and Rockhampton, meeting amateurs and discussing RTTY. Many of them knew of me because of the RTTY news broadcast on Sunday morning, and as publicity officer of the Australian National Amateur Radio Teleprinter Society.

"After visiting the islands in the Whitsunday Passage we proceeded to Townsville and Ingham. It was then time to return to Mount Gambier, heading inland from Townsville to Winton, Charleville and Bourke (NSW), where I had an unusual experience while working in the Remembrance Day Contest. A cup of coffee and some biscuits were on the operating desk in the Kombi when suddenly a head

The author, Sid Molen, VK2SG, at the rear of the Kombi van fitted out for RTTY. In spite of the number plate, the power used throughout the trip seldom exceeded 20W!

AMATEUR RADIO

appeared and devoured the biscuits. It was the pet emu in the caravan park.

"The next stop was Broken Hill where some late nights were spent with VK2BIC. From there through Mildura and on to Mount Gambier, where my sister-in-law was ready for the next part of the trip. Five days were spent in Adelaide, meeting RTTY operators, then north as far as Crystal Brook before learning that the road to Alice Springs was impassable, due to heavy flooding. So it was east to Broken Hill, Bourke, Winton, Mount Isa, Tennant Creek (NT), and then to Alice Springs.

"A 10 day stay in the Alice was most pleasant, meeting the members of the local radio club and helping them to get their RTTY gear on the air. In general we had a wonderful time. Then it was back up the road to Tennant Creek and Mataranka where, at 38°C, the swimming pool was very nice. On to Katherine where sight-seeing up the gorge and other spots was most enjoyable.

"Arrived in Darwin on October 2 1979, and met up with the local amateurs including the RTTY operators.

The 40-metre helical aerial (foreground) mounted near the front of the van. This was one of three aerials which fitted the same base. A two-metre, 5/8 aerial is in the background.

A highlight was a harbour cruise with VK8OH.

"After a week in Darwin we headed back to Katherine (after all it is the only way you can go) then turned west to Victoria River road house. A novelty here is a nine month old pony who has a liking for grilled fish and tartare sauce. From there to Lake Argyle and Kununarra, a town on the Ord River scheme (WA) with very nice citrus fruit and bananas, plus a nice caravan park and swimming area. But also ants in the millions, with a voracious appetite for sweet liquids.

"It was then on to Halls Creek and Fitzroy Crossing. In between those locations it is still the same road it was six years ago, except the holes are deeper and the bumps bigger; a fair test for car, caravan and driver. If you are interested, the Geike Gorge is well worth a visit but you should take everything you may need with you.

"Leaving Fitzroy Crossing the official temperature was 43°C and you could have fried eggs on the bitumen road with ease. Four days were spent in Broome where the local amateurs made us welcome.

"From Broome to Port Headland. We travelled 610km in one day — with only one stop (at Sandfire Flat) and in really high temperature it was a good haul. There is a sign on the garage at Sandfire Flat which reads 'If you want a helping hand, look up your sleeve', and I think he means it. Port Headland is a very busy area where the real interest is to watch the large bulk carriers being loaded. As well as iron ore, over one million tons of salt is shipped out. The trains are something else, 100 carriages per train with each carriage carrying 100 tonnes of iron ore. It takes one hour to load a train and the same time to unload. A 120,000 tonne bulk carrier is loaded in four hours. Of course the local amateurs were met and RTTY discussed.

"The route was then to Dampier and its satellite town of Karratha and on to Carnarvon where five days were spent. Again meeting local amateurs and discussing RTTY was high in the order of activity. Three days were then spent at the Kalbarri National Park looking at the beautiful wild flowers. Then on to the Hutt River Province — well, all I can say is we will not be going there again!

"Next stop was Geraldton. It was 41°C, the VHF repeater was not working and we could not find any amateurs. So on to Perth, calling into New Norcia to visit the very old Benedictine Monastery. We spent eight days in Perth meeting amateurs and RTTY'ers in between the many trips around the city.

"It was then down to Bunbury where, due to the three hour time difference with the eastern states we missed the Melbourne Cup but met up with some local amateurs and their wives.

"From Bunbury we proceeded to Denmark where difficulty was experienced in explaining to an American amateur that I was operating from Denmark Australia, not Denmark in Europe. Three days were spent in Albany visiting the local beauty spots and, of course, local amateurs. Then to Esperance for two days sight-seeing and back on the road to Norseman. Almost had trouble with the local police during

AMATEUR RADIO

a one day trip to Kalgoolie and Coolgardie, until we found we were both amateurs, so we parted the best of friends. That is really a hard way to meet amateurs.

"The road across the Nullarbor Plains is very good but that is about all you can say about the two day trip to Ceduna. It seemed a little odd that, after driving in South Australia for most of the day, on arriving at Ceduna you are pulled up to see if you are carrying fruit not allowed into South Australia. From Ceduna the route was around the coast to Port Lincoln. Tried to find some amateurs but no luck. On the way to Adelaide I tried to find an RTTY'er in Cowell without success.

"In Adelaide we called on relations to give them presents brought back, including 'Darwin Stubbies'. (These are not the usual stubbie — they hold 2.25 litres.) Then back to Mount Gambier where we arrived on November 29, 1979. Unfortunately I was put to work and had to paper and paint three rooms before being allowed to proceed.

"From Mount Gambier it was through Victoria, calling at Port Fairy, Werribee (near Melbourne), Phillip Island, Bairnsdale, Eden (NSW) and Sussex Inlet, arriving home at Pendle Hill on January 31, 1980.

"During the trip I had 364 contacts on RTTY, working 34 countries and also Worked All Continents (WAC), all on 20 watts and a three foot helical antenna. We travelled 39,179km, met 46 RTTY operators, attended two amateur conventions, and really had a lot of fun. There is still a lot of Australia left to see — maybe next year. But my wife tells me I have a lot of work to do at home, so we cannot get away this week. But if you hear VK2SG/1/2/3/4/5/6/7/8 I will be mobile on the road again.

"Gee this retirement is boring — I've just nothing to do. Guess I'll wander down and see who is on the air.

"VK2SG — temporarily at home."

ITU NEWS

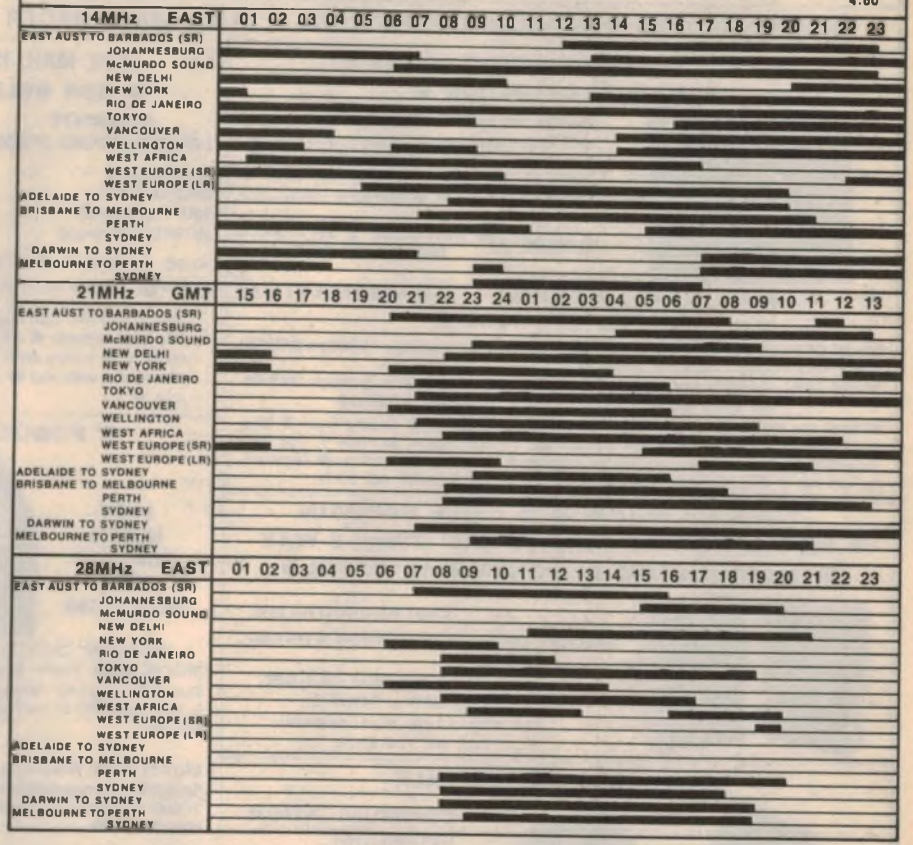
Saturday May 17, 1980 has been nominated by the International Telecommunication Union as the 12th World Telecommunication Day.

In a message from the ITU Secretary-General, he stressed the importance of telecommunication for the social and economic development and well-being of rural populations.

IONOSPHERIC PREDICTIONS FOR APRIL

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Department of Science. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). Black bands indicate periods when circuit is open.

4.80



It is anticipated that a world wide amateur radio contest will again be sponsored by the Brazilian government.

GEELONG AMATEUR RADIO-TV CLUB: Steady progress was made over the Christmas period on the six-metre beacon, the aim being to have it operational by mid-February.

AUSTRALIAN CAPITAL TERRITORY DIVISION WIA: There are three repeaters and two beacons operating in the ACT. The repeaters are — VK1RAC channel 6900 (old ch 6) running 10 watts from Black Hill, elevation 870 metres about 20km southwest of Civic Centre. VK1RGI channel 6950 (old ch 7) — Mount Ginini elevation 1770 metres.

The Canberra Radio Society 70cm repeater VK1RUC is on Isaac's Ridge. The input is 433.525MHz, output 438.525MHz.

The two metre beacon, VK1RTA, is at the Australian National University; operating frequency 144.475MHz.

The six-metre beacon is on Mt Majura, operating on 52.474MHz, at 5W.

During December, 1979, two WICEN exercises were held. The first was in conjunction with the NSW SES to test supporting emergency communications in the ACT area.

There were 64 messages sent and 73 received on behalf of the NSW SES, over a three hour period, on two nets.

A very high level of activity was a feature of the second exercise, which provided communication for the ACT junior tennis championships. A total of 416 messages were handled in 480 minutes of operation. Traffic consisted mainly of scores from 16 courts around Canberra to the Lyneham control centre. (Forward Bias — Jan 1980).

Radio clubs and other organisations, as well as individual amateur operators, are cordially invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits. All material should be sent to Pierce Healy at 69 Taylor Street, Bankstown 2200.

A.C.E. RADIO

136 VICTORIA RD, MARRICKVILLE, NSW 2204 PHONE 51-3845

ELECTRONICS CENTRE

BARGAIN PRICES ● PERSONAL ATTENTION ● SLICK MAIL ORDER SERVICE ● SATISFACTION ●

● NEW BSR STEREO RECORD PLAYER ● ● MANUAL OPERATION ●

Model P-207 ● 240V AC. 50Hz ● Auto-Stop ● S-Shape tone arm ● Ceramic cartridge, diamond stylus ● 33-45rpm ● Plays 17, 25, 30cm (7, 10, 12in) records ● Cue lever ● Template for cut-out ● operating instructions ●

$49.95 *P&P NSW $3.00; V, SA, Q $4.00; TAS, WA, NT $5.00*

● ALSO BSR STEREO COMBINATION CHANGER/PLAYERS ●

Model C198, 4-pole motor, S-shape tone arm, fitted with ceramic cartridge. **$55.00**
Fitted with magnetic cartridge. **$65.00**
Model C197, 2-pole motor, straight tone arm, fitted with ceramic cartridge. **$47.50**
P&P: NSW $3.00; V, SA, Q $4.00; TAS, WA, NT $5.00

With all the wanted facilities ● Auto or manual operation ● Cueing lever ● Bias compensator ● Adjustable stylus pressure ● 33, 45, 78rpm ● Plays 7, 10, 12in records ● Separate changer and player spindles ● Operating instructions ● Template for cut-out ● Big 28cm turntable ● Diamond stylus ● 240V AC 50Hz

FACTORY SCOOP ● ½ PRICE BARGAIN ● BRAND NEW A1 QUALITY ● 8"(20cm) 2-WAY SPEAKER SYSTEM ● 8 OHMS ● 10 WATTS ●

$42.00 pair (JUST AS GOOD AS THE RANK ARENA SYSTEM)

ATTRACTIVE WALNUT CABINET:
52H x 30W x 14½D cm
P&P NSW $3.00, SA, V, Q $4.00
TAS, NT, WA $5.50

KAMBROOK POWER-TALK COMMUNICATION INTERCOM

$46.95 pair
P&P $2.50

Absolutely no wiring necessary ● simply plug into 240VAC power outlet ● tidy rugged system for home, office, factory, etc., phase locked loop FM demodulator — automatic squelch in-built for guaranteed noise-free operation

●●● EMI TAPE ●●●

7" x 1800' absolute professional quality, as used by many major broadcasting stations.
$6.95 each *P&P $1.00*
or 4 for $24.00 *P&P $1.60*

5" x 1200' double play hi-dynamic low noise hi output
$2.95 each *P&P $1.00*

EGG INSULATORS

Top quality porcelain.
10 for **$7.95** *P&P $1.00*

WANTED TO BUY
Electronic Equipment

ADC MAGNETIC CARTRIDGE

Stereo **$12.95**
P&P 75c

Direct from USA. Model QLM30 with diamond stylus ● Std ½" mount ● Output at 5.5 CMS/Sec 5MV ● Tracking force 1-2 grams ● Frequency response 15-20,000 Hz.

C-CORE TRANSFORMERS

LOW NOISE ● HIGH EFFICIENCY ● PRIMARY 240V. 50Hz. CONT RATING

MODEL	SEC.V.	AMPS	PRICE	PACK AND POST N.S.W.	V. Q. SA. T.	WA. NT
JT 266	0-18V	8A	$25.95	$2.95	$3.75	$5.50
JT 235	260-26V	2A	$24.95	$2.95	$3.75	$5.50
JT 248	0-10V	10A	$25.95	$2.95	$3.75	$5.50
JT 249	8.5-0-8.5V 15VCT	4A 1A	$26.50			
JT 274	0-10V 2x0-12V	10A 1A	$26.50	$2.95	$3.75	$5.50
JT 253A	0-18V	12.5A 30A PEAK	$45.95	$3.50	$5.50	$7.00

● POWER TRANSFORMER FOR 300 WATT AMPLIFIER ●

47V-0-47V, 3 amp, 30VCT, ½A **$35.00**
P&P NSW $3.50 *INTERSTATE $5.50*

(THE MAIL IS — PRICE RISE NEXT MONTH) ● BSR BELT-DRIVE RECORD PLAYER ●

ABSOLUTE LATEST MODEL P-200

$95.00
P&P NSW $3.50
INTERSTATE $4.50

STYLISH S SHAPE PICK-UP ARM ● ADC MAGNETIC CARTRIDGE, DIAMOND STYLUS INCLUDED ●

ALSO AVAILABLE WITH WALNUT BASE AND PERSPEX COVER WITH HINGES **$119** P&P NSW $5.00 INTERSTATE $7.50

Specs. 240VAC 50Hz, auto or manual operation ● Plays 17, 25, 30cm (7, 10, 12in) records ● 33 and 45 rpm, adjustable counter weight and stylus pressure ● cueing lever ● Bias compensator and anti skate control ● Die-cast platter with mat ● RCA audio plugs and cable, 3-core power cable and plug ●

● PUBLIC ADDRESS AMPLIFIERS ●

3 NEW MODELS MOBILE OR FIXED INSTALLATION

12VDC OR 240VAC OPERATION

EXCELLENT QUALITY, PERFORMANCE, REPRODUCTION GUARANTEED
MODEL A-30. Power output 30 watts. High/low mic input. 200 ohms-50k ohms. Sens 3MV. Input for tape-tuner-aux. 10k ohms/50MV. Phono 100k ohms/1V. Output 4-16 ohms. With in-built automatic electronic siren. Size: 150W x 145D x 60H mm. **$89.95**.
P&P NSW $3.50 *INTERSTATE $4.50*

MODEL A-50. Power output 50 watts. 2 high/low mic inputs. 200 ohms-50k ohms. Sens 3MV. Input specs same as model A-30. Output 4, 8, 16 ohms, 25, 70, 100V line. In-built automatic electronic siren. Fog horn. 4 tone chime. Size 180W x 220D x 75H mm. **$189.00**
P&P NSW $3.50 *INTERSTATE $4.50*

All amplifiers supplied with mounting brackets, power cables. Available from stock: PA microphones, table and floor mic stands, sound columns, flares, goosenecks, speaker cable, etc.

25 WATT MOBILE TRANSCEIVER

T.C.A. model FM1675 ● 75MHz FM ● 12VDC solid state supply ● QQE03/20 in final ● rugged diecast case 27W x 23D x 13H cm ● ex-waterboard equipment ● sets are in good clean condition ● not air test ● no crystals included.
$24.95 *P&P NSW $3.50* *INTERSTATE $5.50*

.001 12KV CERAMIC CAPACITORS

10 for **$4.50** *P&P $1.50*

● DON'T MISS OUT ● LESS THAN 200 LEFT

PLESSEY ROLA SPEAKER SPECIAL

GUARANTEED TOP QUALITY BRAND NEW BARGAIN

Model C12PX. 15 ohms, 31cm (12in), twin cone. Specs: 30W rms. Reson. Freq. 40Hz. Freq. respon. 35-13,000Hz.
$19.95 ea. *P&P: NSW $2.00* *INTERSTATE $2.75*
2 for $37.00 *P&P: NSW $2.75* *INTERSTATE $3.75*

SERVICE

Moderate charges — Repairs guaranteed. Radios, Tape Recorders, Cassettes, Amps.

SOLID STATE FAN - MOTOR SPEED CONTROLLER

240VAC 2.8A Fully sealed, complete with pot and knob. **$4.50** P&P 75c

HEAVY DUTY NI-CAD RECHARGEABLE BATTERIES

1.2v

Top quality guaranteed.
Used by many Govt Depts:

SIZE D 4AH **$6.25** ea. P&P 75c
4 for $23 P&P NSW $1.50
INTERSTATE $2.50
SIZE C 1.8AH **$3.75** ea. P&P 75c
4 for $14 P&P NSW $1.50
INTERSTATE $2.50

GEARED MOTOR 240VAC 50Hz 3W $2.50

P&P 50c

5 RPM. Plenty of torque. With Cam and N/O N/C microswitch. 15 switch contacts per min. OA size. 65 x 60 x 35mm.

Refer Dec 79 EA. New Products Review.

The Australian CB SCENE

27MHz — WHO ELSE REALLY NEEDS THE BAND?

The Federal Government still seems to be determined to de-legalise 27MHz CB in mid 1982 — despite the fact that pressures have changed dramatically since that decision was made. It is now reasonable to raise the question: if not for CB, who else really needs the band?

In the early days, the Government's reasons for moving all CB acitivity to UHF seemed sound enough . . . unreasonable to us, but sound. There was the problem of TVI, interference to existing services and to audio equipment — and the great hopes that were held out for the fledgling UHF service.

Television Interference is no longer the problem that it used to be, thanks to the use of improved technology in both television sets and CB transceivers. The advent of colour television, and the subsequent updating of TV antennas and systems, especially the increasing use of co-axial cable, has a large bearing on this. With further future advances in both these fields, coupled with the long overdue prohibition on linear amplifiers and the like, this problem should eventually subside to a tolerable level.

As for the UHF service, I guess I had better tread warily, in case I upset UHF operators. I must confess that my airtime on UHF is almost non-existent . . . not through lack of interest, just through lack of finances. And herein lies one key to the UHF "problem".

UHF is a marvellous form of communication, if you are looking for short distance contacts. I am assured that the clarity on UHF is an HF operator's dream. But we are approaching the height of the sunspot activity and "skip" will be around HF for another year or so yet. Because of this, and the relative cheapness of setting up a 27MHz station, HF is still by far the most popular, overall.

The Government could improve things by allowing more power on UHF. A maximum of 5W is unduly restrictive, especially with no allowances to be made for loss through the antenna system. Unrestricted use of beams would also help, as would the legalisation of repeaters.

The manufacturers could do their bit by trimming the list price of the sets and associated equipment; likewise the retailers. Perhaps they could put pressure on the Government to reduce sales tax on UHF gear. More comprehensive advertising could help turn the tide but someone has to do something . . . soon.

Getting back to the 1982 problem for a moment: should the Government go ahead with its intention to remove 27MHz from the CBRS at that time, where does that leave us, the operators? What do we do with all our HF equipment? Will we be forced to throw it all away, under the scrutiny of a friendly RI, or will we be allowed to retain possession and be trusted not to use it?

If we lose 27 megs, the logical question is: "Who gets it?" Perhaps more to the point, "Who wants it?"

Some say the amateurs are after it, but the majority of amateurs I have spoken to say they don't want anything to do with 11m; that they are more than happy with the slice of the 10-metre band they were given in lieu of 11m.

I mean, who else but we "dumb" CBers would put up with the rest of the junk (ISM) that we share our slice of the spectrum with? The proof of how badly the amateurs want (or don't want) 11m back is the complete lack of interest they showed in the band when they had it! Here in Brisbane in 1976/77, the only channel to my knowledge which the amateurs used (unless they wanted to play "Let's stir up the CBers for a while" was channel 14 USA.

If at all possible, I would like the State Secretaries of the Emergency Monitoring services to contact me with a breakdown of the percentage of the calls which they take from their monitors originating from CBers on behalf of non-CBers. I feel that we can achieve a lot in our fight for the retention of 27MHz if we can show figures proving that CB does indeed play a vital part in community safety. I already have one set of figures from a Queensland Division of a monitoring service showing a massive 95% of all calls received are of this nature.

As a pleasant relief from the ever-present male, our CB columns are currently being prepared by Jan Christensen. A resident of Brisbane, Jan needs your help to compile a true picture of CB around Australia.

I believe that there is a truckies association which is having troubles doing the right thing by its interstate members. My source of information comes from members of the association, so is presumably reliable. All I would ask is that you all forget about State borders and get on with the job of helping one another. After all, isn't that what it's all about? You need unity within your ranks so that we can all show a united front for the retention of 27 megs. You fellas probably depend on CB a lot more than we do, so forget about intra organisational politics; let's all get our act together!

Just a couple of comments in closing: I am writing this column on a monthly basis, independently of the NCRA. I remain a member, however, and will include information which reaches me via NCRA channels.

Above all, I want this column to be a success so how about sending me other information about what is happening in your part of the world of CB? My address is now PO Box 406, Fortitude Valley, Brisbane 4006. I look forward to hearing from you . . . Jan Christensen.

SHORTWAVE SCENE

by Arthur Cushen, MBE

English now heard from Chinese regional stations

For many years, broadcasting in China was restricted to local dialects and English was heard only from Radio Peking. In the past few months, however, many regional stations throughout China have included English in their transmissions, with Chinese-English lessons being very popular.

The regional stations of China now include English-Chinese lessons in their schedules and many stations have already been heard carrying the new format. At the same time, listeners have been surprised at the prompt reply to letters requesting verification. The transmissions are generally confined to the lower frequency band and, in our case, four stations were recently verified during English-Chinese lesson transmissions.

Harbin has been heard on 4925kHz and the transmission included English-Chinese lessons at 0930GMT. The station, when confirming reception, stated that they also operated on 4840 and 5950kHz. The station is operated by a "Peoples Broadcasting Station Group".

Broadcasts from Foochow have been received on 4975kHz and here English-Chinese lessons have been noted at 1330GMT. On other occasions popular music, often of English or American origin, has been played at this time. The transmission from Foochow is also well received and carries typical Chinese programs during the balance of the day.

In Tibet, Lhasa has been noted on 4750kHz and this transmission includes English and Chinese lessons at 1315GMT. As well as being carried on 4750kHz, this station is also on 5935, 7170kHz and 9490kHz (between 1100 and 1155GMT), although the latter frequency suffers interference from Radio Moscow's Home Program. Other channels, 4035 and 5995kHz, carry the same transmission.

Yunnan Peoples Broadcasting Station operates on 4760kHz with English-Chinese lessons 1300-1330GMT. This transmission is very well received and the broadcast continues to 1605GMT. Broadcasts are also carried on 2460 and 7209kHz.

Nanning has been heard on 4915kHz with English-Chinese lessons up to 1400GMT. These lessons conclude with details of the subjects being broadcast and then follows a time signal and Chinese programs.

According to the BBC Monitoring Service, the introduction of English-Chinese lessons and commercial announcements on the regional stations in China has been most successful. Harbin, for example, broadcasts advertisements at the end of each weather forecast and during the "Social Service" programs. In addition, there are three 10-minute advertisement slots starting at 2120, 0250 and 1050GMT. Harbin also handles the commercial announcements for other regional municipal and autonomous stations throughout China.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, NZ. All times are GMT. Add 8 hours for WAST, 10 hours for EAST and 12 hours for NZT.

VATICAN USES 500kW

Late last year, the Vatican Radio commenced testing with its new 500kW transmitter and log periodic aerial and is now using this higher power for its service to Australia and New Zealand. During February the higher power was used on alternate days on either 7235 or 9615kHz. The other frequency, 11830kHz, continues with 100kW, while the new 7235kHz outlet has replaced 15120kHz.

For many years the Vatican radio has operated with five transmitters each of 100kW but already the higher power on one frequency has been very noticeable in this area. The new aerial, which can be rotated, enables the station to provide better reception in the South Pacific area. The transmission is 2210-2225GMT in English and the service is broadcast daily.

AUSTRIAN SERVICE

Vienna has made several changes to its schedule for broadcasts to Australia and New Zealand. The transmission formerly on 15260kHz 0400-0600GMT is now on 12015kHz; the transmission 0700-0900GMT is on 15440kHz from 21735kHz; and the transmission 1230-1330GMT is on 21655kHz from 17860kHz.

Other broadcasts to this area are 17745kHz 0400-0600GMT: 21500kHz 0600-0700; 21640kHz 0600-0900; 21585kHz 0900-1100; and 21725kHz 1100-1300. English is broadcast 0830-0900GMT daily in a program called "Report from Austria". A special program for the shortwave listener, "Austrian Shortwave Panorama", is carried on Sundays 0900-0915GMT.

BELGRADE'S NEW CHANNEL

Radio Yugoslavia, broadcasting from Belgrade, is now using the additional frequency of 15300kHz for its broadcast in English 1500-1600GMT. The transmission is also carried on 9620 and 15240kHz, the latter frequency giving the best reception. The new frequency

is not a success in this area as the channel is also used by Radio France International.

Belgrade's second transmission, in English, is broadcast from 1830-1900GMT and is still received well on 9620kHz.

Radio Yugoslavia is planning extensions to its world wide transmission service shortly, when new equipment is brought into operation. The station is at present using the facilities of Radio Belgrade, which has broadcast on shortwave on a restricted basis for more than 40 years.

BROADCASTS FROM PAKISTAN

Radio Pakistan is using the new frequency of 21730kHz for the slow speed news bulletin in English 0230-0240GMT. This channel is in addition to 17830 and 21590kHz, both of which give better reception.

Radio Pakistan has also been noted using two out-of-band channels for an English broadcast from 1600-1615GMT. The frequencies of 17910 and 21755kHz are both used during this transmission, which is received at excellent level. Prior to 1600GMT, transmissions are in languages of the Persian Gulf area and include Arabic. These are broadcast 1330-1600GMT with the additional frequency of 21485kHz also being used at this time.

ENGLISH FROM KUWAIT

Radio Kuwait has made a frequency change to its transmissions from 1800-2100GMT and is now using 11655kHz instead of 11690. This frequency is mainly intended for reception in Europe while two other frequencies, 15345kHz and 9650kHz, are intended for the Middle East and Gulf area.

The broadcast in English 0500-0800GMT on 21545kHz continues to be received in this area at good signal level, with news at 0530GMT.

FREQUENCY PROBLEMS

The problem of finding a clear frequency is always a major factor in international broadcasting and the saying that "great minds think alike" often comes true when one station decides to move to a new frequency only to find that another broadcaster has also made a move to that channel.

This happened recently with Radio Nederland when the station decided to use 17605kHz between 0700 and 1200GMT. After monitoring the channel and finding it clear, permission was granted by the Dutch Post Telegraph and Telephones to use the frequency. The Chief of Radio Nederland's Frequency Section visited Cyprus to observe the new channel but, the day before it was due for regular operation, KOL Israel suddenly appeared on the frequency! After consultation Israel decided that it would move to 17615kHz, leaving the way clear for Radio Nederland on 17605kHz.

NEW ISRAEL SERVICE

Broadcasts from Israel to North America have recently commenced operation, with the transmissions also providing good reception in this area. English is broadcast at 0000, 0100 and 0200GMT for 30 minutes on 7412, 9815 and 11637kHz; Spanish is at 2330 and 0230GMT with 9435 replacing 11637kHz for the first transmission; and Portuguese is at 0130GMT. Yiddish and Hebrew are heard during the other time periods.

Signals in this area are best on 11637kHz, but as we move into winter the lower frequencies should also provide good reception.

GERMANY'S EXTERNAL SERVICE

Last year the German Radio celebrated 50 years of broadcasting but the external service known as Deutsche Welle — the Voice of Germany has only been in operation for 25 years. When Deutsche Welle began broadcasting in 1953 its programs were all in German. When listeners' mail started to arrive it was noticed, however, that one letter in three was written in a foreign language. Consequently, in 1954, Deutsche Welle also began broadcasting news programs in English, French, Spanish and Portuguese. This was the birth of foreign language broadcasting in post-war Germany. It took time, of course, to develop a complete system of programs in foreign languages.

In 1959, the first foreign language department was set up — for Arabic. Other foreign language departments followed in 1960. Then, in 1962, in addition to an English and French service for Africa and North America and a Spanish and Portuguese service for Latin America, special language services were also set up for eastern and south-eastern Europe.

Over the next two years programs in the so-called vernacular languages were also added: Haussa and Kiswaheli for Africa, and Hindi and Urdu for India. In 1963, the total broadcasting time of all transmissions exceeded 54 hours each day. Today Deutsche Welle broadcasts almost 83 hours of programs every day in German and 33 other languages.

Deutsche Welle broadcasts in English in two daily transmission to Australia and these are heard 0930-1030GMT on 9650, 11850, 15275, 17780, 17800, 21540 and 21680kHz; and 2100-2200GMT on 7130 and 9765kHz. A daily broadcast in German is transmitted 0600-0950GMT on 7285, 9690, 9735, 11705, 11785, 11795, 17845 and 21560kHz. The address of the station is Deutsche Welle — The Voice of Germany, PO Box 10 04 44, 500 Cologne 1, Federal Republic of Germany.

AUSTRALIA'S NEW POLICY

This year Radio Australia, due to economic staffing pressures, has reverted to the system of only verifying reports one month in every year. This system is also used by Radio Canada and Radio Sweden, and restricts verification of reports to certain periods. In the case of Radio Canada, a verification card is sent out with their program schedule and this has to be filled in by the listener and returned to Montreal for verification. Radio Sweden uses a similar card, which is sent out occasionally to listeners.

It is understood that Radio Australia's Correspondence Section has suffered severe staff reductions (from 10 to three), forcing this major change in station verification policy.

At the same time the Listeners Club, which has been operating for many years, and the Club Forum program (broadcast for eight years) have been abolished. The Listeners Club was formed to enable Radio Australia to receive regular reception reports from listeners throughout the world. A criterion for membership was that a listener had to send in reports on a regular basis.

Like many international broadcasters, Radio Australia now has monitors established in various countries to provide it with consistent reports and seems to prefer this method over the rather spasmodic reports from listeners overseas.

LISTENING BRIEFS
ASIA

INDIA: All India Radio at Delhi has been observed opening at 1445GMT on 7155kHz with the usual interval signal. A broadcast in English follows for 15 minutes and although this channel gives fair reception, it does suffer from jamming.

MALAYSIA: Penang has been noted on 4985kHz with a newsreel program at 1300GMT. A news bulletin in English was later observed at 1400GMT.

MONGOLIA: Ulan Bator continues to be received at poor strength on its two frequencies, 6383 and 12070kHz. The English broadcast is 1200-1250GMT. This broadcast is on the air daily except for Sundays.

NEPAL: Radio Nepal at Katmandu has returned to 3425kHz from 7105kHz and is using it from 1435-1520GMT for a broadcast in English. Two other channels, 5005 and 9590kHz, carry the same transmission. The Voice of America at Colombo is now using 7105kHz.

SRI LANKA: Colombo is using 4968kHz with gospel programs in English at 1300GMT. At 1330GMT, the station announces as the "Sri Lanka Broadcasting Corporation," with the local time given as 7pm. Programs then continue with further gospel services.

New Products

Asaca ASA 500E Video Camera

While video cassette recorders of varying formats have been heavily promoted on the Australian market, an equally useful TV accessory, the small video camera, has been almost neglected by electronics retailers. Dick Smith Electronics has sought to fill this need with their Asaca ASA 500E black and white video camera.

Made in Japan, the Asaca ASA 500E is compact self-contained camera using a recently designed 17mm separate mesh vidicon tube. The manufacturers claim that this tube offers distinct advantages over conventional CCTV camera tubes in increased sensitivity and lower lag.

Automatic light control (ALC) adjusts the camera for wide variations in lighting conditions. The lens is made by Tamron and uses a standard "C" mount which renders the camera compatible with numerous general and special purpose lenses. The fitted lens has a range of aperture settings from f1.8 to f16 and will focus over the range from 300mm to infinity.

A much greater range of focus is provided by a multi-turn knob at the rear of camera. The knob operates a lead screw which moves the vidicon/yoke assembly over a range of about 10mm. This increases the overall range of focus of the ASA 500E down to as close as 15mm. This means that the camera can be used with microscopes and other optical instruments.

A practical use, for those who are very short-sighted, is as a projector/-magnifier for books, papers and magazines.

The specifications of the ASA 500E are entirely compatible with Australian TV standards. Resolution is more than 550 lines horizontal and more than 350 lines vertical. Signal-to-noise ratio is better than 42dB while the ALC range is 10,000:1. Operating temperature range is from -10° to +50°C

Like most CCTV cameras, the ASA 500E employs random interlace rather than the 2:1 interlace featured on more expensive cameras. In practice, random interlace gives more than acceptable results.

Dimensions of the camera are 75 x 131 x 250mm (W x H x D) including knobs and rubber feet but not including the lens assembly which adds a further 35mm to the overall length. Mass of the unit is 2.2kg, not including the connecting cords.

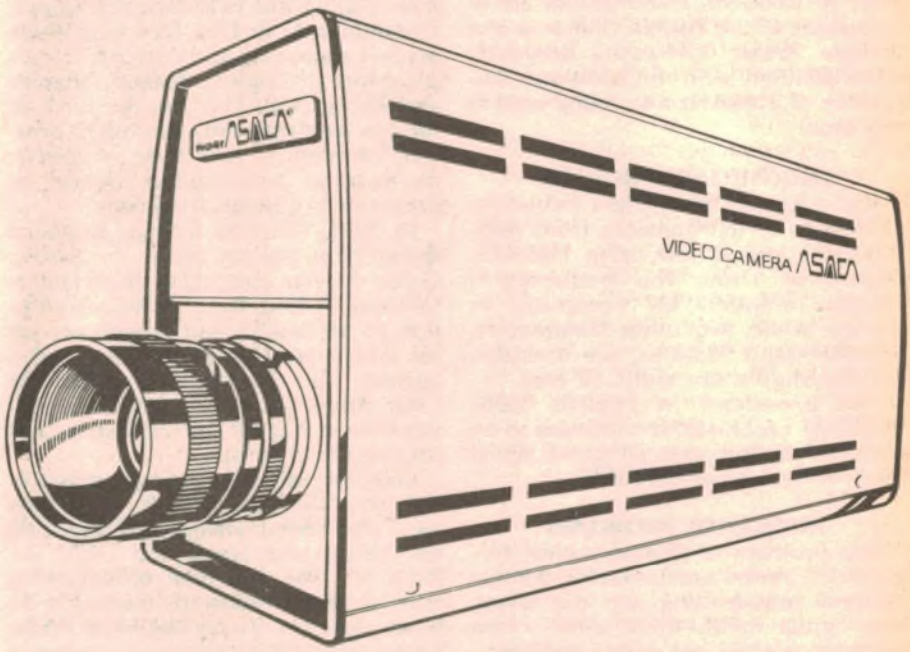
Mains powered, the ASA 500E draws about 19 watts. It is fitted with a standard 3-core flex and three-pin plug. Cord length is approximately 2.2 metres.

The 75 ohm camera output, via a standard UHF socket (PL-259), is switchable to provide either a composite video output (1V p-p) or a modulated RF output set to Australian channel 1. A matching PL-259 plug is supplied with the camera but, at the time of writing, Dick Smith Electronics has no plans to market connecting cords. DSE do have RG-58A/U 75 ohm coax cable plus the usual range of plugs such as RCA, Belling Lee and others.

Four screws secure the wrapover cover of the camera. Removing this reveals a neat interior with two long plug-in PC boards occupying the upper half of the chassis while the lower half is taken up with the vidicon/yoke assembly and the power transformer. The camera certainly appears well made and should be easy to service.

For any practical use, the camera requires a good quality tripod with a panning head or a suitable bracket, for fixed installation. The camera is compatible with most photographic tripods in that it has two sockets tapped ⅛in Whitworth.

Our reactions to the camera were very favourable. Subjectively, picture quality is almost of broadcast standard although for best contrast the ambient lighting must be fairly high, even though the unit has good ALC.



The Asaca ASA 500E B&W camera has adjustable aperture and ALC and can focus down to as little as 15mm. (Artwork by courtesy of Dick Smith Electronics.)

In our opinion, the ASA 500E represents good value for money. It is well finished, performs very well and appears to be made to last.

Recommended retail price of the Asaca ASA 500E video camera is $299 including sales tax. It is available from all Dick Smith Electronics stores and outlets. (LDS.)

Soar ME-501 Digital Multimeter

With the introduction of a high-contrast 3½ digit liquid crystal display to their popular range of multimeters, Soar have produced a winner. The ME-501 has good accuracy, low cost and is rugged in construction.

The ME-501 comes in an impact resistant plastic case measuring 171mm long x 90mm wide x 30.5mm deep and weighs about 280 grams. Along the left hand side of the instrument are eight selector switches and above these is the 12.5mm LC display. A separate On/Off switch and a transistor socket for hFE measurement is provided.

The function and range selector switches are pushbuttons with the three top buttons selecting the function while the lower five select the range. This is convenient since you have only to select the function desired and then range up or down with the range switch until the desired reading is produced.

The LC display is a high contrast type and is visible over a wide range of viewing angles. Over-range indication is by a "1" or "-1" which is displayed at the most significant digit. Polarity indication is with a minus symbol.

Looking inside the meter reveals a printed circuit based on an Intersil 7106 LSI chip. This 40-pin chip contains a dual slope analog-to-digital converter, BCD-to-seven segment decoders, liquid crystal display drivers, a clock generator and a reference voltage source.

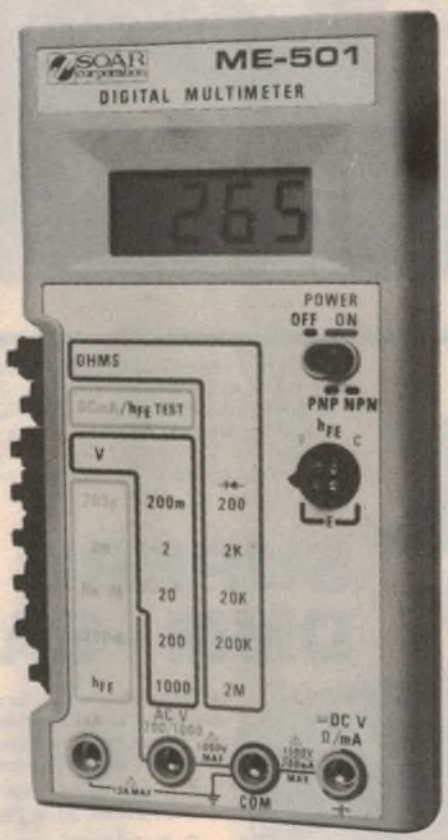
The voltage ranges for DC measurement are 200mV, 2V, 20V, 200V and 1000V, while those for AC measurement are 200V and 1000V. There are four DC current ranges, viz 200 microamps, 2, 20, and 200 milliamps and up to 10A can be measured by the use of the separate 10A socket. The "burden voltage" or voltage drop across the meter when measuring current is 200mV on all ranges except for the 10A range when the voltage is 600mV. The resistance ranges are from 200 ohm up to 2 megohm in five "times-ten" steps.

We checked the accuracy of the meter on resistance measurements and found the readings to be well within the claimed accuracy of 1% of reading plus two digits. For example with a 1% tolerance, one megohm resistor we obtained a reading of 1.004 megohms.

With DC voltage readings we obtained a reading of 10.15V for a 10.00V voltage reference. This is a slightly greater error than the specified accuracy of 0.8% of reading plus one digit. The DC current readings were within specification, that of 1.2% of reading plus two digits.

AC voltage accuracy is 1.2% of reading plus 10 digits from 40Hz up to 500Hz. While we did not attempt to establish the absolute accuracy of the AC voltage measurements, we did find that the response was indeed flat within the specified frequency range and outside that range the reading dropped 50% at 3kHz. This is a reasonable performance from a DMM.

We also checked the "normal mode" rejection ratio of the DC voltage measurement ranges. This term is a measure of the rejection ratio of AC voltages superimposed on DC. This was easily tested by using a transformer in series with a DC voltage reference. We noted no change in the DC reading of



the DMM with the AC voltage impressed on the DC voltage, even though the peak AC voltage was as high as the DC voltage.

An interesting feature of the multimeter is the hFE measurement. This has a claimed accuracy of 10% and has a base test current of 10uA. We tested the hFE of a range of transistors and found their value to be within specification. The on/off switch doubles as a PNP-NPN switch (with two "on" positions) and a reading of zero indicates the wrong choice of PNP-NPN switch position. The hFE feature works very well, and will prove very useful in testing transistors and for gain matching.

One criticism of the unit is the "diode test" feature. The manual claims that diodes can be tested when in the "ohms" and "200" ohms range. This we found, was not the case. The voltage drop across the diode on test was too low to show a reading on this low resistance range. On the 200k and 2M ranges a reading could be obtained for a forward biased diode and an overload condition for the reverse-biased condition.

In summary then, the ME-501 is a useful tool for the experimenter and hobbyist as well as for professional use. Although its accuracy is not exceptional, it has a performance that more than matches the price.

The price of the SOAR ME-501 is $70 including tax. The importers are Ampec Engineering Co Pty Ltd, 1 Wellington Street, Rozelle 2039. Refer to the Ampec advert on page 104 for retail outlets. (J.C.)

200°C TEMPERATURE SENSOR IC

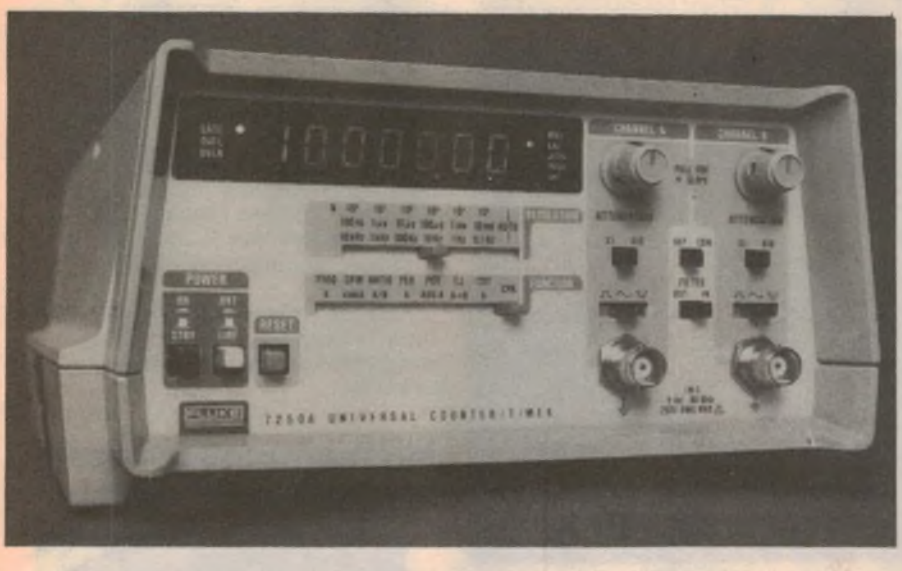
A new high performance integrated temperature sensor, specified for use up to 200°C, is now available from National Semiconductor. Called the LM135, the device is accurate to within 1°C, operates over a -55°C to 200°C temperature range, and features a direct reading output of 100mV/°K.

Electrically the LM135 acts like a zener diode, where the zener voltage is proportional to temperature. At 25°C (298°K) the output voltage is 2.98V. Operating current can be from 0.5mA to 5mA with no change in electrical performance, and once calibrated at 25°C the device is accurate over the full temperature range.

Intended for use in heating and cooling controls, instrumentation and automotive applications, the LM135 is available in a hermetic T-46 package, while a commercial device, the LM335, is available to TO-46 and TO-92 plastic packages.

Further information is available from N.S. Electronics, PO Box 89, Bayswater, Vic 3153

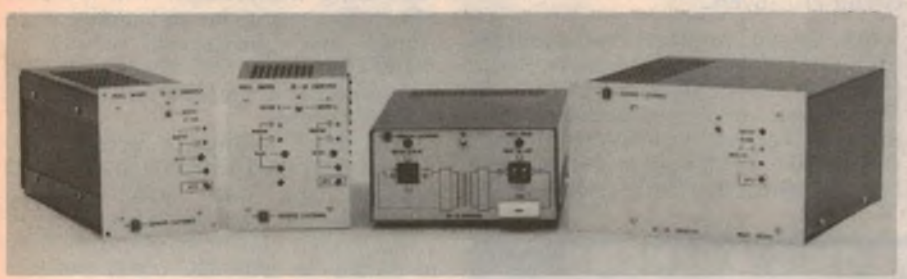
Fluke 80MHz universal counter/timer



THE FLUKE 7250A is described by the manufacturer as a low-cost 80MHz universal counter/timer. Features of the instrument include: period average for extra resolution, 100ns resolution time interval, autoranging or manual operational modes, effective RFI shielding, and continuously adjustable analog attenuators. Optional extras include two low-cost oven oscillators and a battery pack. The 7250A can be interfaced with IEEE 488 via the new Fluke Model 1120A IEEE translator.

Further information from Elmeasco Instruments Pty Ltd, PO Box 30, Concord, NSW 2137. Telephone (02) 736 2888.

New range of DC/DC converters



Electro Technics Pty Ltd, Victorian agents for Scientific Electronics, recently announced details of the range of DC/DC converters manufactured in Australia by that company. There are now four models in the range, the SM60D, XM100D, SM200D and SM60DB.

All models feature input/output isolation, extremely high efficiency (70-85%), a wide input voltage range, regulated single and dual outputs, constant current and voltage limiting, reverse input voltage protection and remote sensing of outputs. In addition the SM100D, SM200D, and SM60DB provide over-voltage crowbar protection, and the SM200D has an external sync facility.

The converters are designed for applications requiring a well regulated isolated supply derived from any DC source. They will operate over a wide input DC voltage range without changing any voltage links or taps. The high efficiency switch mode techniques used are achieved by operating at 25kHz and using special ferrite cores designed for switch mode operation. Conversion is achieved by using PWM.

Model SM60D is a single output unit providing 60 watts. Model SM100D is a single output unit providing 100 watts, while model SM200D is a single output model providing up to 200 watts output, with an external sync facility to allow the operation of multiple units in a frequency locked mode. Model SM60DB provides two independent isolated outputs, with a total power output of 60 watts.

Further information is available from Electro Technics Pty Ltd, 36 Park St, South Melbourne, Vic 3205.

LED LIGHT BAR MODULES

Hewlett-Packard has produced a series of light bar modulesuqich provide large, bright, and uniform light emitting surfaces. Six different package sizes are available, including 8.89mm square and 8.89mm x 19.05mm rectangular surface areas. Other packages have multiple surface areas which permit high density displays, and the light modules are available in red, green, or yellow.

Packages are dual-in-line on 2.54mm centres with 7.62mm rows, with a depth of only 6.096mm, easing installation requirements. The displays may be stacked to create large display areas, bar graphs, or indicators.

For further information contact Cema Electronics Pty Ltd, 21 Chandos St, St Leonards, NSW.

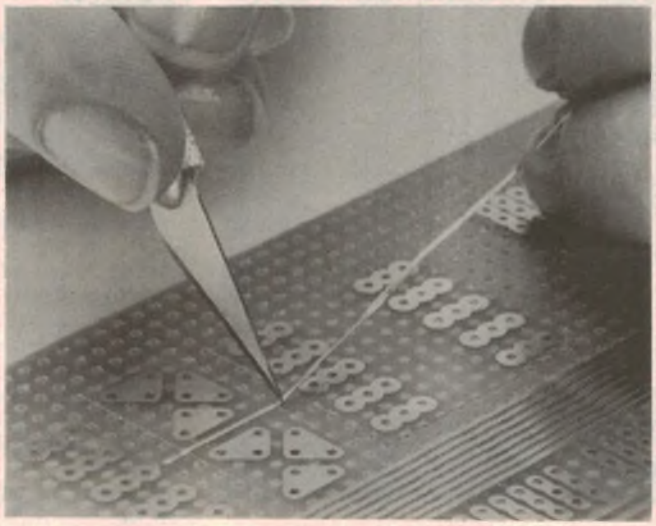
ILLUMINATED TOGGLE SWITCHES

Total Electronics has announced a new series of sub-miniature toggle switches incorporating a LED or LED flasher in the switch case. The red LED or flasher combination provides an illuminated switch which saves space and simplifies mounting requirements.

The Alco TTN family is available in a wide variety of mounting styles, including panel mounting types rated to 3A at 125V and the TTN-PC series with gold-plated contacts for low current applications. The PC mounting types are available in either uprighhor right-angle mounting styles, and a variety of optional toggle actuators is aulable.

Further information may be obtained from Total Electronics, PO Box 103, North Brighton, Vic 3186.

How to make "instant" PCBs



E-Z Circuit allows PCBs to be prototyped without recourse to messy chemicals, artwork photography or etching.

Bishop Graphics of the US has introduced a new PCB prototyping system called "E-Z Circuit".

E-Z Circuit consists of a range of pre-etched copper patterns on thin, flexible epoxy glass boards. These boards are self-adhesive, requiring only the removal of the backing paper. By mounting the various copper configurations on a matrix board it is possible to build "instant" PC boards without recourse to messy chemicals, artwork, photography or etching.

Interconnections between the various pre-etched patterns are made using strips of pressure-sensitive copper "tape". A variety of tape widths is available, while standard pattern shapes include edge connector strips, IC strips, transistor mounting pads, bus strips and donuts. All are supplied pre-drilled, ready to stick directly to the matrix board.

There are even special locating pins available to assist in proper alignment of the pads before they are pressed into place.

Multilayer boards can be made by using insulating polyester tape between circuit crossovers.

E-Z Circuit products are available from the following retail outlets: Radio Despatch Service, Sydney; Ellistronics, Melbourne; and Zero-One Electronics, Brisbane. For further information contact Circuit Components (A/Asia) Pty Ltd, 383 Forest Rd, Bexley, NSW 2207.

Power supply for Icom transceiver

Icom has released a new power supply to be used with its new high-power six-metre transceiver IC551D and other matching Icom transceivers such as the IC701.

The new switched-mode power supply is fully regulated and produces 13.8V DC at a maximum load current of 20A. The circuit also provides short circuit protection and automatic shut-off when the current exceeds 25A.

An optional fan is available if continuous operation of RTTY is contemplated.

Further information from Vicom International Pty Ltd, 68 Eastern Rd, South Melbourne 3205. Telephone (03) 699 6700.

Microprocessor-based frequency synthesiser

A high-accuracy microprocessor controlled frequency synthesiser covering the 0.001Hz to 2MHz range has been introduced by Philips Test & Measuring Instruments. The PM 5190 offers sine, triangular and square wave signals with keyboard setting of parameters on a LED display. An IEC bus interface is standard for complete remote control.

Frequency setting is accurate to ±1ppm. A crystal-controlled oscillator ensures high short- and long-term stability — ageing is less than 1.5ppm/year. Maximum output is 19.9V peak-to-peak with DC offset possible up to ±9.9V. A separate TTL output is also provided.

The frequency is shown on a full six-digit LED display with separate displays of AC and DC output values, DC polarity, and mode of operation. External amplitude modulation is possible with modulation depths up to 90%.

All functions are fully programmable through the built-in IEC bus interface. This allows use with automatic test systems without modification. The application of direct digital signal synthesis techniques ensures high switching speeds. An erase facility allows equally fast correction of input errors.

The PM 5190 is a compact portable instrument measuring 140 x 310 x 365mm and weighing only 6kg.

Enquiries to Philips Test and Measuring Instruments, 25 Paul St, North Ryde, NSW 2113.

New Products

Versatile audio spectrum analyser

The Abacus Arta 8000 Analyser is a versatile audio spectrum analyser that displays the real-time intensity and spectral distribution of sounds. By using the unit's internal pink noise generator as a signal, a system's electrical or electro-acoustic frequency response may be accurately and rapidly determined. The analyser can be used for loudspeaker measurements, tape recorder head alignment, amplifier response checks and numerous other applications involving audio circuits. Further details from The Dindima Group Pty Ltd, PO Box 106, Vermont, Victoria 3133.

Hewlett-Packard 85 . . . cont'd from p87

Nine HP-85 application software packages are immediately available on prerecorded cartridges, and packages combining a number of other commonly used programs are under development. Other programs will be available in written form from a users' library, and BASIC programs developed for HP's desktop computer systems can be adapted for use on the HP-85. Additionally, because HP's BASIC language meets the ANSI standard, most existing software complying with this standard can be adapted for HP-85 use.

The HP-85 application software now available on pre-recorded cartridges includes BASIC training, general statistics, mathematics, electrical engineering, finance, linear programming and regression analysis.

The HP-85 is 406 x 152 x 457mm (W x H x D) and weighs under 9kg, making it well suited for applications requiring portability. A 350-page owner's manual describing operation and programming comes with the new machine. Also included is a standard application software package which contains 15 useful HP-85 programs.

Price of the HP-85 is $3550 plus sales tax where applicable. All items are available immediately through selected authorised HP dealers.

Letters . . . cont'd from p105

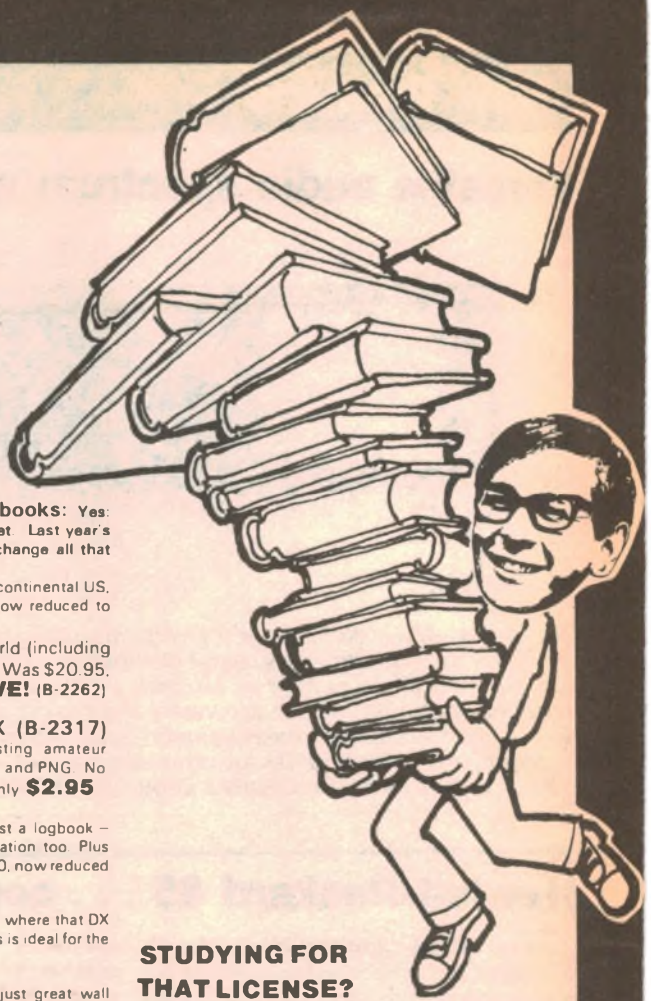
by Professor David Ferguson, Department of Occupational and Environmental Health, School of Public Health and Tropical Medicine, the University of Sydney and Commonwealth Department of Health. The terms of reference of the survey included investigation of possible effects of exposure to ionizing radiation.

In his summary to the Second Report, Professor Ferguson noted (para 14): "There was no evidence of occupational induction, whether from radiation or chemical exposure, in the cases of cancer reported in the Establishment, nor evidence of other internal effect of radiation".

Professor Ferguson also refers specifically to the case mentioned by Mr Levins. He describes the newspaper reports of the time which attributed this death to radiation as "an entirely unwarranted piece of journalistic sensationalism". In conclusion, I should like to stress that the Commission has always regarded the safety of its staff as being of paramount importance and has every confidence in its current practices. In addition, these practices are the subject of regular review by an independent Safety Review Committee appointed by the Minister for National Development and Energy under Section 20 of the Atomic Energy Act.

K.F. Alder, General Manager,
Australian Atomic Energy
Commission.

HELP!



Amateur Radio Book Stock Clearance

We're wildly overstocked with many of our popular Amateur Radio books. So much so that we've got to clear space for new stock arriving for our new catalogue. Here's your chance to *SAVE* on many titles: many of these prices are lower than those in our new catalogue! But remember: these prices are current only while current stocks last. *HURRY!*

Popular ARRL books

Electronics Data Book (B-2203) 128 pages of essential data for all involved in electronics; not just amateurs! **Still only $6.75**

Antenna Hand Book (B-2204) One of the most widely respected antenna books. Not just theory: designs too! **$8.75**

Antenna Anthology (B-2205) A collection of articles on antenna design, construction, etc. A must for every ham. **$6.25**

Hints and Kinks (B-2206) All those short cuts and ideas you'd normally forget in one handy reference volume. (Not many left!) **$6.90**

Radio Amateur's Operating Guide (B-2208) New to the game? Want to find out the correct way to do it – here's the answer! Save on this one: Was $6.90. **Now only $3.95 while stocks last**

Solid State Design for the Amateur (B-2211) 'A book of the highest quality' (EA mag.) For the thinking amateur who wants to design his own. Great value **$12.00**

Radio Amateur's VHF Manual (B-2214) A thorough treatment including history, principles, test gear, etc. Practical, too! **$6.95**

SSB for the Radio Amateur (B-2212) A digest of articles on SSB from QST – theory and practice of SSB in detail. Was $6.75. **Now Only $5.00 while stocks last. Save!**

1979 ARRL Handbook (B-2219) May be out of stock by the time this advert appears. If not, you'll save $5.00!! Was $14.95. Now **$9.95!**

Getting to know OSCAR (B-2220) What OSCAR is all about, how to use it, how to set up your station. Easily understandable. Now save nearly 20%: was $5.50, now only **$4.50**

Radio Frequency Interference (B-2222) How to identify and cure RFI. Keep on side with your neighbours: and the RI! Was $5.50. Now reduced to only **$4.50!**

Solid State Basics (B-2224) Provides both the why and the how of transistors, ic's, and other solid state devices. Was $8.75; Now only **$6.75**

Mini Log Book (B-2235) Just the thing for mobile or portable use. All the data you need to record in a handy size. Great value at **$2.00**

DICK'S OWN 'Australian Amateur Radio Handbook' (B-2320) The first amateur book written just for Australia. In a relaxed, easy-to-read style, it's a great gift idea for anyone interested in the world of amateur radio. Only **$6.95**

Big savings on 1979 world callbooks: Yes: great value for the ham or swl on a budget. Last year's callbook maybe, but the contents don't change all that much from year to year!

US Callbook (B-2260) All the amateurs of continental US, Hawaii, its posessions etc. Was $21.95, now reduced to only **$17.50**

Foreign callbook: All areas of the world (including Australia) with the exception of the US. Was $20.95, now reduced to only **$17.50. SAVE!** (B-2262)

WIA AUSTRALIAN CALLBOOK (B-2317) The most recent Australian callbook listing amateur operators and registered SWL's in Australia and PNG. No amateur can afford to be without one! Only **$2.95**

EA Logbook (B-2258) More than just a logbook – contains loads of data and amateur information too. Plus plenty of room for your station log. Was $2.50, now reduced to only **$1.95**

World Atlas (B-2268) Ever wondered where that DX call actually came from. This handy size atlas is ideal for the shack. **$3.90**

World Prefix Map (B-2264) Not just great wall decoration for your shack: this map shows the amateur prefixes of all zones, too. **$2.20**

1979 World Radio TV Handbook (B-2081) Great value for SWL's and amateurs too. A listing of all known broadcast stations in the world including frequencies. Great for frequency checks!
Was $15.95, now reduced to **$12.95!**

Reference Data for Radio Engineers (B-1104) Contains a wealth of data in its 1196 pages! Hundreds of charts, graphs, nomograms, etc. The ultimate reference book for anyone in electronics. Was $35.00. Now only **$28.00**

Radio Handbook (B-1106) Over 1000 pages; one of our most popular reference books. Easy to understand. Was $$25.00, Now only **$20.00!**

Amateur Radio Techniques (B-2040) By Pat Hawker of RSGB. Absolute bargain, 300 pages, covers just about everything! Only **$8.25**

Guide to Amateur Radio (B-2042) Another RSGB/Haker book. Assists the newcomer to ham radio in starting his shack and operating correctly. 112 pages. Great value at **$3.50**

VHF/UHF Manual (B-2054) Huge hard cover manual covers exciting world above 30MHz: with particular emphasis on microwaves. **$17.00**

80 metre DXing (B-2286) Includes all aspects of 80 metre operation, including antennas, proption characteristics, operating practices, etc. Was $5.50; now reduced to just **$3.90!!**

STUDYING FOR THAT LICENSE?

The Ham Exam Cram Book (B-2314) Great for that last minute revision. Typical questions and answers explained: A beauty! Only **$2.95**

1000 Questions for the Novice License (B-2316) From the WIA, covers everything from Ohm's law to the regulations. With answers.
A bargain at only **$3.95**

Questions and Answers for the Novice License (B-2315) Put out by Westlakes Radio Club, this book covers all the typical questions you are likely to be asked – with answers. **$4.95**

500 Questions for the AOCP (B-2318) Similar to above books, but this one is for the big one: the full amateur license. It's money well spent at just **$3.50**

VHF Handbook (B-2300) Covers all major VHF subjects: propagation, antennas, repeaters, satellites, etc etc. Clear language. 336 pages. **$6.95**

Wire antennas (B-2302) How to build a large number of types of wire antennas, including invisible types where neighbours might be a problem. Covers 160 to 2 metres! **$6.95**

Cubical Quad Antennas (B-2304) The world famous classic on Quads, revised to give new data and details of quad construction. Reduced from $5.50 to only **$3.90 SAVE!**

Beam Antenna Handbook (B-2306) Gives dimensions of beams from 6 to 40 metres, covers test instruments, baluns,etc. Only **$5.75**

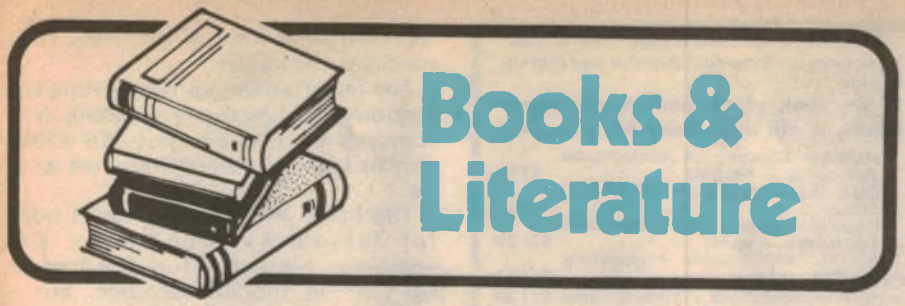
DICK SMITH ELECTRONICS

NSW	125 York Street,	SYDNEY	Ph 290 3377
	147 Hume Highway,	CHULLORA	Ph 642 8922
	162 Pacific Highway,	GORE HILL	Ph 439 5311
	30 Grose Street,	PARRAMATTA	Ph 683 1133
	396 Lane Cove Rd,	NORTH RYDE	Ph 888 3200
	263 Keira Street,	WOLLONGONG	Ph 28 3800
VIC	399 Lonsdale Street,	MELBOURNE	Ph 67 9834
	656 Bridge Road,	RICHMOND	Ph 428 1614
QLD	166 Logan Road,	BURANDA	Ph 391 6233
	842 Gympie Road,	CHERMSIDE	(Opening Soon)
ACT	96 Gladstone Street,	FYSHWICK	Ph 80 4944
SA	60 Wright Street,	ADELAIDE	Ph 212 1962
WA	414 William Street,	PERTH	Ph 328 6944

bankcard welcome here

SHOPS OPEN 9AM to 5.30PM
(Saturday: 9am till 12 noon)
BRISBANE: Half hour earlier.
ANY TERMS OFFERED ARE TO APPROVED APPLICANTS ONLY
RE-SELLERS OF DICK SMITH PRODUCTS IN MOST AREAS OF AUSTRALIA.

MAIL ORDER CENTRE: PO Box 321, NORTH RYDE NSW 2113 Ph 888 3200 PACK & POST EXTRA.



Books & Literature

Semiconductor catalogue

TECHNICAL SEMICONDUCTOR CATALOGUE. Published 1979 by Radio Parts Group. Stiff paper covers, 218 x 275mm, 153 pages. Well illustrated. Price $3.95 plus $1 P&P.

This has to be one of the most comprehensive catalogues of semiconductor devices produced in Australia. The book is a veritable wealth of information and will be of great value to anyone involved in electronics, from the hobbyist to the engineer. Recommended.

The review copy came from Radio Parts Group, 562 Spencer Street, West Melbourne, 3003. (G.C.)

Introduction to microprocessors

INTRODUCTION TO MICROPROCESSORS. Software, Hardware, Programming. By Lance A. Leventhal. Published by Prentice-Hall, Inc., Englewood Cliffs, N.J. 1978. Stiff Paper Covers, 175 x 235 x 624pp. Price in Australia $17.95.

Intended for people with a basic knowledge of programming and digital logic, this book on microprocessors is quite comprehensive. The text book would be of interest to engineers, technicians, administrators, programmers, teachers and those who want a self-study text. The emphasis is on programming and examples are given with the Intel 8080 and the Motorola 6800 microprocessors. Questions are supplied at the end of each chapter.

The first chapter compares the microprocessor to mini and large scale computers. The advantages and disadvantages of the microprocessor as against competing design techniques are explored, and some applications for their use are given.

The internal structure or architecture of microprocessors is next discussed with the 6800 and 8080 being treated in depth.

Four chapters are reserved for software. Instruction sets with various addressing methods, types of instructions and instruction formats are dealt with. Once again the 6800 and 8080 are given as examples and some of the more difficult software operations such a stack manipulation, data transfer, jumps and subroutines are described in detail.

The assembly language and methods of program design, debugging, testing and the all-important documentation is treated in three lengthy chapters.

Hardware is returned to in the seventh chapter with a description on memory systems. Interfacing and types of memory, such as read-only memory and read-write memory are considered. Bussing structures, with open-collector and tri-state outputs are described.

Input/output devices and design are treated in a similar manner to the memory section. Interrupts, being the most difficult of all microprocessor programming, is introduced in the last chapter. The author leads the reader into the concepts easily and provides plenty of examples with the 6800 and 8080.

To complete the book, a generous appendix is included. Topics covered include the number system (binary, octal and hexadecimal) with addition, subtraction and conversion from one base to another is explained using examples. A short introduction to logical functions will help those who have problems with the hardware concepts. Character codes, semiconductor technologies and memories come next. Finally come the instruction sets of the 8080 and 6800.

A short glossary is a useful addition and will explain jargon words used in the computing industry. Overall this introduction to microprocessors is both interesting and informative. The book has enough depth to bring the uninitiated up to date and should also be of help to those well-versed on microprocessors.

The review copy came from McGills Newsagency Pty Ltd, 187 Elizabeth Street, Melbourne 3000, who can supply it by mail for an additional 80c (Victoria) or $1.50 (interstate).

Databooks from Philips Elcoma

REPLACEMENT GUIDE FOR SEMICONDUCTORS. Published October 1978 by Philips Gloeilampenfabriken, Holland. Paperback, 180 pages, 148 x 210mm.

SEMICONDUCTORS AND INTEGRATED CIRCUITS. ICs for digital systems in radio and television receivers. Published August 1979 by Philips Gloeilampenfabriken, Holland. Suggested retail price for both books is $4.00.

As part of Philips comprehensive databook series, both these books are very useful and reasonably priced. Our copies were received from Philips Elcoma division, 67 Mars Road, Lane Cove, NSW 2066.

Testing Audio Equipment

AUDIO EQUIPMENT TESTS by Gordon J. King. Stiff paper covers, 158 pages 233mm x 155mm, illustrated by photographs and diagrams. Published 1979 by Newnes-Butterworths, London. Price in Australia $18.50.

How would you define and measure the IHF usable sensitivity of an FM tuner or the quieting level, or the ultimate S/N ratio etc? This new book by Gordon J. King starts there and carries on through to page 30 dealing with a whole range of FM tuner parameters and test procedures. (Unless I missed it, AM tuners are not even mentioned!).

Then follows 46 pages to do with amplifiers and preamplifiers. The treatment is concise, systematic and up-to-date, dealing with the parameters that are currently talked about (T.I.D., rise time, slew rate, etc) in addition to more traditional measurements.

Chapters 4 and 5 deal respectively with tape decks and with record players, again with all the usual tests. Chapter 6 covers loudspeakers, but at the relatively superficial level which

represents the limit of the usual non-specialist laboratory.

The final chapter is an interesting discussion of subjective evaluation, with warnings in regard to possible wrong conclusions. A general index wraps it up.

The book will have its greatest value for laboratory technicians and engineers needing a run-down or an up-date on modern practice. But it could be read also with interest by dedicated (and technically minded) hifi fans, who want to know what it's all about. Our review copy came from Butterworths, at 586 Pacific Highway, Chatswood, NSW 2067. (W.N.W.)

Professional electron tubes

PROFESSIONAL ELECTRON TUBES, 1980-81, EE and GEC. Stiff covers, spiral binder, 110 pages 297mm x 220mm. Published by the GEC Electronic Tube Co, Ltd, England.

An electron tube data book is a rarity in the solid-state era but, even so, this new abridged listing for 1980-81 has little in common with valve data books of the past.

Receiving tubes are few in number and intended mainly for specialised tasks. The other sections cover Power Devices (ignitrons, etc), Transmitting Tubes, Vacuum Capacitors, Microwave Tubes, Electro-optical Devices, Cathode-ray Tubes (for instrumentation), and Special Products (a variety of specialised tubes). Brief data is given on each, and the book concludes with a 24-page equivalents index.

The book is available free to qualified engineers or others who can demonstrate a clear commercial requirement for the information. Inquiries to: Ms Pat Anstee, G.E.C. Aust. Ltd, 201 Pacific Highway, North Sydney 2060. Tel (02) 929 5744. (W.N.W.)

Books from the IEE

Fifth European Solid State Circuits Conference — ESSCIRC 79. Published by the IEE, September 1979, No. 178. Stiff paper covers, 165 pages, 297mm x 208mm. Price in U.K. £12.50; overseas £14.50.

Published in association with other learned bodies, this is the record of a convention held at the University of Southampton, UK. It contains 54 summaries, each about 3 pages long, and representing the work of well over 100 authors. Subject matter is very wide-ranging, covering the design, production, testing and application of modern semiconductors, and all of it at an advanced level for specialist engineers.

Computer Aided Design and Manufacture of Electronic Components, Circuits and Systems. Published by the IEE, July 1979, No. 175. Specifications as above, 231 pages. Price in the U.K. £14.50; overseas £17.00

With the support of major electronic, computer and mathematics groups, this is the record of a convention hosted by the Sussex University. It contains summaries of just over 50 papers contributed by 90 authors. The average length of paper is something over 4 pages. As one would expect of the conference title, all are highly specialised but of considerable potential interest to those in the forefront of circuit system analysis.

Electronic Test And Measuring Instrumentation — TESTMEX 79. Published by the IEE, June 1979, No. 174. Specifications as above, 157 pages. Price in the U.K. £12.00; overseas £14.00.

Eight Institutions and societies were involved in TESTMEX '79, held at the Wembley Conference Centre, UK. Thirty-nine summaries are presented, from 55 authors. The papers relate to a broad range of subjects, research, communications, industry, etc — and the treatment, while advanced, is essentially practical. Digital techniques feature prominently in the design concepts.

INFORMATION CENTRE

SOUND TRIGGERED LIGHT SWITCH: I require a circuit for a "clap-triggered" light switch which will turn on your lights with a single clap of your hands and off again with another. Could you publish such a circuit? (B.R., no address supplied.)

● We shall certainly give consideration to your suggestion, B.R. In the meantime, perhaps the Sound-triggered Photo Flash circuit published in our September 1979 issue (File No. 3/EF/14) could serve as a basis for your experiments.

CDI & TACHOS: Recently, I fitted a CDI to my Datsun 240K and found that my tachometer will not work at all. Could you please guide me as to how to re-connect the tacho or suggest a circuit which will solve the problem. (K.L., Maryborough, Qld).

● Generally, the tachometers fitted to most vehicles are not at all compatible with CDI systems. The solution is to use an adapter circuit or rebuild the tachometer. Alternatively, and some would suggest that this is the best solution, you could fit our Transistor-Assisted Ignition System described in December 1979, (File No. 3/TI/15). This has none of the disadvantages of CDI, such as cross-firing, and is compatible with all tachometers.

If you adopt the former approach, we have published two articles which may be of assistance. The first, "Tune-up Tachometer" published in October 1975 (File No. 3/TM/11) is compatible with CDI but uses a Philips IC, SAK140, which may be hard to obtain. The second article, "Impulse Tachometers & CDI", published in April 1978 (File No. 3/TM/14) gives a suggested circuit which we have not tried and has been reported as unreliable. Apart from these two articles, we really cannot give you a guaranteed solution.

METAL LOCATOR: I thought that the problem of constantly drifting pitch had been solved when I read the Notes and Errata in the January 1980 issue. But after resoldering the coil, the problem still remains. I have checked the PCB for obvious defects. I purchased the kit from Dick Smith Electronics. Got any suggestions? (C.E., Rochester, Vic).

● Dick Smith Electronics supply their own coil rather than the specified Aegis coil, hence the solution given in the January Notes & Errata does not necessarily apply. To check that there is a connection to the coil use an ohmmeter.

Another cause of drifting could be the use of ceramic capacitors in either of the oscillator circuits. These have poor temperature co-efficients so we recommend the use of polystyrene capacitors instead.

PIN-BALL MACHINE: I was wondering if you have a circuit for a pin-ball machine. I was thinking of one with a digital readout, flashing lights, bell or buzzer and either mechanical or electrical flippers. I'm sure there must be other readers of your magazine who would be interested in making one. So how about it? (J.N., Pt Headland, WA).

● That is a pretty tall order, J.N. Those pin-ball machines which have all the features you mention usually employ a microprocessor and a specially programmed ROM (read-only memory) to provide all those functions. And they also use a lot of electro-mechanical hardware which is just not available to the hobbyist. We must pass on that one. If you are interested, we featured an article on the Bally microprocessor controlled pin-ball machine in February 1978.

THIELE & SMALL: Frequently in articles in electronics and hifi magazines, the work of Thiele and Small on vented loudspeaker systems is cited as being the fundamentals design principles of modern systems. Being curious, I tried to obtain a copy through major booksellers but without success. I would be very grateful if you could advise me on how and where to get one. (B.K., South Croydon, Vic).

● The work of Richard Small and Neville Thiele, has not, to our knowledge, been published in book form. Most of their papers have probably been published in the "Proceedings of The IREE Australia". We suggest you contact the Institution of Radio and Electronics Engineers Australia, Science Centre, 35-43 Clarence Street, Sydney, NSW 2000. Telephone (02) 29 4051.

In praise of transistor-assisted ignition

Dear Sir,

Allow me to compliment Leo Simpson and Ron de Jong on the Transistor-Assisted Ignition System featured in the December 1979 issue. I have built and installed this project in my big V8 and the difference between "with" and "without" in the running of the engine is absolutely outstanding.

I have a late model HZ Holden Kingswood with all the ADR27A emission control gear, including a very lean fuel-air ratio. Because of this, and the expected cross-firing which could occur, I have been shying clear of CDI, even though I used it for 10 years in a HR six-cylinder Holden with great success (although the tacho used to go haywire).

The transistor-assisted ignition from December '79 EA has definitely not given any cross-firing with my V8 engine. Running the engine in absolute darkness shows not even any characteristic halo around the plug porcelain insulators. Perfect firing!

Because the engine, even with the normal Kettering ignition, had been subject to some cross-firing, I had made spacers to keep the high tension leads apart and this seemed to eliminate the problem. Also, I should mention that the vacuum hose to the brake booster on the V8 has been routed through the high tension leads coming from the distributor cap. This hose is highly conductive because of the metal reinforcing used to inhibit the collapse of the hose, and also causes ignition problems. This can be solved by insulating the hose in plastic sleeving.

I have yet to run fuel consumption tests with the new system. However, I know I am going to be completely stunned by the results because the added liveliness of the vehicle and the added "pulling-power" must lead to better fuel consumption figures.

Thank you EA for a very professional, workable project which, I might add, is really doing something for the "save our petrol" scheme.

Ken Buckley,
Miranda, NSW.

TRANSISTOR IGNITION: After reading through your December issue I thought that a new transistor assisted ignition unit would be just the thing for my point chewing power machine and also my pocket. I was surprised at the ease of building the whole thing and getting it to work in the car. The unit is absolutely foolproof except for one small detail. The anode-cathode connections on the PUT in my particular case were transposed to the ones shown on your published circuit. Surprisingly the whole unit still worked no matter what, and quite smoothly.

Replacing the PUT correctly, the unit once again crackled to life. A noticeable difference in coil temperature was evident and the spark lead test showed absolutely no drop off with an increase in rev's.

I must mention however that this unit was not purchased in kit form and it simply shows that it is about time everyone standardised on configurations.

One thing that pointed to the dwell extension not functioning was the fact that the ignition coil didn't seem to get any hotter than normal, as suggested. In fact, it actually felt cooler. The other thing that pointed to something being slightly amiss was that when a spark lead was removed from a plug, and the spark allowed to "jump" to earth, an increase in RPM would reduce the spark intensity very quickly. (R.K., Auburn, NSW)

● You are right about the anode and cathode connections on the PUT being around the wrong way, but we have to admit this is our fault and not due to differing manufacturers' standards. We informed most kit suppliers and published the error in Notes & Errata for March.

IN-CIRCUIT TRANSISTOR TESTER: I have your book "Projects and Circuits, No. 2" and am wondering if the In-Circuit Transistor Tester can be used to test transistors out of circuit. (C.B., Hobart, Tasmania).

● Yes, C.B., the tester can be used to test transistors out of circuit.

MINI-BRUTE: I recently completed the Mini-Brute Power Supply featured in November 1977 (File No. 2/PS/43) and also incorporated the optional crowbar protection. All is satisfactory including the over-voltage protection circuitry. However, during testing it was found that it is possible to trigger the crowbar protection by rapidly switching the power supply on and off. Similarly, a rapid "on and off" of the load circuit can do the same thing.

It seems that this triggering is random, possibly one in five or sometimes nine in 10 "on/offs". I have tried switching large capacitances and inductances across the output with no triggering. Under steady test conditions, the circuit reliably triggers at 6.3V. Could you advise a suitable modification to eliminate false triggering, possibly making it immune to transients but responding to over-voltages of ¼-sec or more duration. (R.C., Narara, NSW)

● It would appear as though the over-voltage protection circuit is working exactly as intended, R.C. By rapidly switching on and off the supply you are catching the regulator circuitry "out" and so it is also allowing voltage spikes through. We would be reluctant to modify the filtering to eliminate what we regard as normal protection.

There is also another possibility which could explain the spurious triggering. Perhaps the rapid on and off switching of the transformer is generating spikes of sufficient magnitude to cause dv/dt switching in the SCR. In other words, the regulator may not be misbehaving at all.

Either way, if you wish to avoid spending money on fuses, we suggest that you do not rapidly and repeatedly switch the power supply on and off.

Electronics Australia Reader Services

If you are unable to complete an "Electronics Australia" project because you missed out on your regular issue, we can usually provide emergency assistance on the following basis:

PHOTOSTAT COPIES: $2 per project, or $2 per part where a project spreads over multiple issues. Requests can be handled more speedily if projects are positively identified, and if not accompanied by technical queries.

METALWORK DYELINES: Available for most projects at $2 each, showing dimensions, holes, cutouts, etc., but no wiring details.

PRINTED BOARD PATTERNS: Dyeline transparencies, actual size but of limited contrast: $2. Specify positive or negative. We do not sell PC boards.

PROJECT QUERIES: Members of our technical staff are NOT available to discuss individual projects, either in person at our office or by telephone.

REPLIES BY POST: Limited to advice concerning projects published within the past two years. Charge $2. We cannot provide lengthy answers, undertake special research or discuss design changes.

BACK NUMBERS: Available only until our stocks are exhausted. Within three months of publication, face value. Four months and older, if available, $2 (includes storage fee). Post and packing 60c per issue extra.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" may be submitted without fee, for reply in the magazine, at the discretion of the Editor.

COMMERCIAL, SURPLUS EQUIPMENT: No information can be supplied.

COMPONENTS: We do not deal in electronic components. Prices, specifications, etc., should be sought from advertisers or agents.

REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Beaconsfield, 2014.

Notes & Errata

SOLID STATE RELAY (August 1979, File No. 2/PC/24): It was suggested in the original article that the circuit could be modified to operate as a normally closed switch by connecting the photo transistor section of the opto coupler directly across the bridge.

For this scheme to function properly however the 1.2k resistor in series with the LED section should be decreased to 330 ohm. This increases the current sinking capability of the photo-transistor thus ensuring the Triac will turn off.

GRAPHIC ANALYSER (February 1980, File No. 1/SC/10): The orientation of some of the LEDs on the display board wiring diagram is incorrect. Only four LEDs on the bottom row are involved — numbering the LEDs 1 to 10 from left to right, LEDs 5, 7, 8 and 9 should be connected around the opposite way to that shown.

CAR BURGLAR ALARM (April 1979, File No. 3/AV/21): To improve the sensitivity of the circuit, the 680 ohm resistor connected to the base of Q4 should be changed to 1.2k and the associated 0.047uF capacitor changed to 0.47uF.

RS-232C INTERFACE (December 1979, 2/CC/47): In Fig. 4, the diode across the "transmit data" input should be reversed.

CAPACITANCE METER (March 1980, 7/CM/13): The earth track on the PC board must be connected to chassis, otherwise the display reading will "bounce" due to hum fields. This connection is shown on the circuit diagram but was omitted from the wiring diagram. The solution is to solder a wire between the earth track near the shielded cables and a lug secured to a paint-free area on the chassis.

MARKETPLACE

FOR SALE

FREE . . . List of bargain electronic components, ideal for hobbyists, servicemen, Radio Clubs, etc. Send 9" x 4" SAE Now!! MICRONICS, PO Box 175, Randwick NSW 2031.

AMIDON CORES — REFER 79 ARRL HANDBOOK. Toroids: T200-2; T106-2; T68-2/6/10; T50-2/6/10/12; T25-2/6/10/12; FT50-43/61. Beads and sleeves for wideband RF pwr amps: FB43-2401, S43-625-1. Large SASE with 35c for data/price list. R. J. & U. S. Imports, Box 157, Mortdale, NSW 2223. Tel (02) 579 3848.

TRS-80 GENERAL LEDGER ACCOUNTING SYSTEM Level 1, uses 2k memory. Cassette $14.00 Micro-Basic 80, 9 Myers Crt, Doncaster, Vic. 3108 (03) 848 6549.

COMPUTER CASSETTES: Top quality C20 "leaderless", fully guaranteed 1 — $1.80, 5 — $8.00, 10 — $16.00, 100 — $100.00.
LIGHT PEN: to suit TRS80 with software cassette (9V battery required) only $19.00 assembled $14.00 kit both items plus postage 90c.
Deforest Software 26 Station Street, Nunawading (03) 8789276.

SOFTWARE — DREAM 6800 with Chipos. "Times Tables" program teaches kids multiplication tables by displaying random numbers as "A X B =". Kids enter answers. Makes learning fun. Full listing and commentary $3.00.
Send cheque or postal note to "Software", PO Box 5146, Gold Coast Mail Centre, Queensland 4217, or NZ readers to PO Box 26, Pungarehu, NZ.

FOURTRACK RECORDING COURSE. At last, an inexpensive introduction to Multi-track sound recording. The course covers all aspects of small studio engineering setting up microphone techniques, sound balancing, mixing, etc., and will be of particular interest to musicians and home recordists. Only $60.00. Ph. John or Willy at Wirra Willa Studios, Glenfield (02) 605 1203.

ELECTRONIC ORGANS — Build your own! Send 45c stamp for full details of the SCHOBER (USA) organ kits. Schober Organs (Aust), PO Box 22, Guildford NSW, 2161. (Established 21 years.)

POWER KING POWER SUPPLIES. New range of Mini-supplies for hobbyists. PKM-1 2.5Amp. Variable 1.8v to 16v $37.00. PKM-2: 1.25Amp. Variable 2v to 35v $36.20. PKM-3 5v at 1Amp. 15v plus and negative at 100mA $39.00. PKM-4 5v at 1Amp. 12v plus and minus at 100mA.
Power Supply Kits. Contain all parts except case. These supplies can be supplied assembled in cases where required at extra charge. PKK-1 5v at 10Amp continuous $76.00; PKK-2 13.8v at 4Amp continuous $50. PKK-3 13.8v at 10Amp continuous $82.00. PKK-4 13.8v at 25Amp cont. (40A surge) $109.00. PKK-5 28v at 10Amp continuous $109.00. PKK-CMOS Supply 5v at 5Amp, plus and minus 15v (or 12v) each at 1 Amp. $96; PKK-7 Variable Regulated Supply to 30v at 10Amp, includes current and voltage meters $147.00.
Monthly Special (until April 17th Aust. — May 15th New Zealand) 2SC1307 (normally $4.80) $3.80 plus postage at $0.60.
Wide range of components, ferrite Toroids, coil formers, heatsinks, circuit board etc. SASE for enquiries.
All prices plus postage. Minimum $2.60 plus 5% order value.
ZL-VK Electronic Services, PO Box 221, Summer Hill 2130.

ALL TYPES of antique radios, books, valves, parts. Also repairs. Box 222 Alderley, 4051.

SORCERER Applications software. No trivia. Statistical, educational, home management, file manipulation. Catalogue $1. I. Gray, 9 Kelly Pl., Higgins ACT 2615.

HI-VOLTAGE XTRS — Equiv. BU205. 1500V. 2.5Amp NPN. Suit TV Horiz O/P etc. $1.20ea with full data. Add $0.80 P&P. P&D Instruments, Box C321, Clarence St. P.O. Sydney 2000.

TRS-80 & COMMODORE PET/CBM programs for business & education, also mentally stimulating games. Send SAE for latest list. Softronics Micro Systems Box 238 P.O. Lindfield NSW 2070. PET/CBM dealers.

Amateur Radio Manager

A capable person, preferably with the AOCP or AOLCP license, is required to supervise our efforts to market Amateur equipment and accessories in Australia.

Whilst we expect the suitable applicant to have a thorough technical background, preference will be given to applicants who have a proven track record in sales administration.

Please note that we will consider a semi-retired person in this instance for a part-time position.

Duties will include the evaluation of new lines, ensuring constant supply of existing lines, training sales staff and resolving technical problems regarding the equipment sold.

The appointee will be responsible to the Managing Director through the Technical Director.

Excellent salary and conditions await the right person.

Apply in writing to:

Gary Johnston, Marketing Manager,
Dick Smith Electronics Pty Ltd
PO Box 321, North Ryde NSW 2113
Phone (02) 888 3200

Complete confidence assured

RESISTOR SALE

Top quality ½W carbon film resistors. 10 OHM — 10 MEG. 3c ea. or $2.50 per 100. No minimum quantity. Will mix any values. Get some of these now & avoid paying top dollar for these common components.

If you are a beginner, seasonsed hobbyist or just want to stock up, we have available packs of 100 most commonly used resistors at $2.50.
First 100 purchases of $10 & above will receive a free veroboard pin insertion tool.
One PP charge of $1.00.

R & C Electronics,
PO Box 68, O'Halloran Hill,
South Australia 5158

AGENCIES WANTED

Substantial New Zealand electronics importer seeks agencies for test equipment, both professional quality and service grades. Import licence held and adequate finance available.

In the first instance, write -

AGENCIES,
PO Box 5001, Auckland, New Zealand.

DISPLAY ADVERTS IN MARKETPLACE are available in sizes from a minimum of 2cm x 1 col rated at $12 per col cm.

Please state classification: For Sale, Wanted, Reader Service, Position Vacant, Position Wanted, etc . . .

CLASSIFIED RATES $3 per line per insertion payable in advance. Minimum two lines.

CLOSING DATE is six weeks prior to the on-sale date. Issues are on sale the first Monday of each month.

ADDRESS all classified orders, copy, enquiries, etc. to: The Advertising Manager, **ELECTRONICS AUSTRALIA**, Box 162, Beaconsfield 2014.

WANTED

PLAYMASTER TWIN 25 OR TWIN 40. Greg Love, 58 Sparke St, Georgetown 2298.

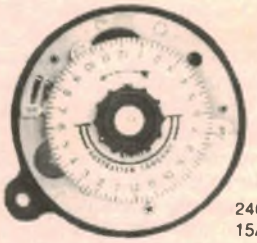
READER SERVICE

E-PROM 2708-2716-5204 and 1702. Programming Service. Your listing either Typed or neat hand printed in Hex or Octal into your E-Prom; 2708 — $22, 2716 — $35, MM5204 — $20, 1702 — $16. E-Proms modified to your requirements, up to 20 bytes — $6, up to 100 bytes — $10, up to 200 bytes — $15. Copies Etc. Also Software and Hardware assistance with your Z80, 8080 and SC/MP Developments. Enquiries welcome. Send to Micro-Assistance PO Box 49, Sandy Bay, 7005, Tasmania.

CALLING ALL DXERS — are you getting value for money with your current DX club? If not then why not see what the Australian Radio DX Club has to offer you. A monthly magazine with an average of 23 pages and branch meetings in Sydney, Melbourne, Adelaide and Perth. Also special services and products to improve your Dxing. For full details write to ARDXC P.O. Box 79, Narrabeen, NSW 2101 enclosing a 30c stamp.

SHORTWAVE LISTENERS & DXERS: Australia's National "Southern Cross DX Club inc" has the latest from the ever changing world of International Shortwave, Tropical & Medium Wave Bands, in our monthly publication "DX POST" featuring world famous Arthur Cushen's monthly column. Sample "DX POST" and details of subscription for a 25c stamp to: George Kuznecovs, 87 Cashel St, Pasadena, (Adelaide) SA 5042.

TIME CLOCKS SANGAMO



LESS DAY OMIT DEVICE $15.00

WITH DAY OMIT DEVICE $17.50

240V 50cs
15A Contacts

Used tested and guaranteed
PACK & POST N.S.W. $2.25
Vic. & Qld., S.A. $3.10, W.A. $3.60

CLOCK DISPOSAL CO.
P.O. Box 147
LINDFIELD, N.S.W. 2070

BRASS SHIPS CLOCKS SMITHS 8 DAY 7 INCH DIAMETER $110

Post A $1.75; B $3.00; C $3.60

GENUINE EX ARMY WRIST WATCHES

Complete with nylon band $19.50
Post $1.10

P.M.G. TYPE TELEPHONES

Standard desk type with magneto bell calling device. Range 30 miles. Uses standard batteries at each phone. Any number can be connected together on single line. **$39.50**

(2 TELEPHONE SETS)

$2 Cartage to Rail. Freight payable at nearest attended Railway Station.

RECEIVER No. 210

2-16 M/cs **$75**
Transmitter No. 11 suits 210 **$35**.
24 volt Power supply to suit above **$15**.
Or complete station with Headphones, Mic. **$110**.

EX ABC MAGNETIC RECORDING TAPES ¼"

PROFESSIONAL QUALITY

5" x 600'	$1.50
7" x 1200'	$2.75

P + P $1.30

10½" x 2400' $7.95
P + P A $1.65 B $2.75 C $3.10

COLLINS INDEPENDENT SIDEBAND TRANSCEIVER TRC/75

Fully synthesised transceiver with am upper, lower and independent sideband operation. 1KHz steps from 2MHz to 29.999MHz. 1 microvolt sensitivity. 2.5KHz bandwidth ssb. 6KHz bandwidth AM. 1 RW PEP max output. Fully automatic tuning of both transmitter and receiver from remote control unit. Complete with automatic aerial coupling unit, mic, headset, etc. 400Hz supply.

Ideal for amateur use

PRICE $750

COLLINS SYNTHESISED SB RECEIVER

TRC/75 receiver section of transceiver specification as above.

PRICE $400

TELEPHONE WIRE

1 mile twin (2 miles) genuine ex-Army Don. 8 perfect condition **$45.00** per drum. **$5.00** cartage to rail freight payable at destination.

20X to 60X ZOOM TELESCOPE

With Tripod. **$115.50**
Post A$2.25, B$4.10, C$6.10.

RCA 44BX MICROPHONES

PROFESSIONAL QUALITY $75
P&P A $1.80, B $3.50, C $4.55, D $4.55

AERIAL CAMERAS

WITH 8" FL 3" DIAM. LENS F24 MARK IV 2.9 LENS STOPS 11, 8, 5.6, 4, 2.9 — **$75**

$2 cartage to rail freight. Payable to nearest attended railway station.

PENTAC LENSES

3" DIAM. 8" FL WITH DIAPHRAGM STOPS 11, 8, 5.6, 4, 2.9, MOUNTED IN METAL HOUSING — **$65**
POST: A $1.85, B $3.25, C $4.10

PRISMS

4" SQUARE FACED RIGHT ANGLE PRISMS TOP QUALITY EX AIR FORCE — **$65**; OR LENS & PRISM FOR **$120**.
POST: A $1.75, B $3.00, C $3.60

SOLENOIDS

200 MA 24 volt, ⅛in push movement.
$2.50 P+P 80c

NIFE CELLS

1.2 volt, fully charged, 4in x 3in x 1in 4 AH

$1.50 each. P&P 80c

CENTRE DRILLS

15/64 x 15/64
Carbon steel **$4.00** doz. Post 60c

ARTILLERY DIAL SIGHTS MK2

Can also be adapted as a Dumpy Level or as base for a telescope has full 360° 5½" diam. gunmetal rotating circle. Adjustable elevation and depression. Has top grade ¾" diam. object lens. F.L. 10" with cross hairs, eyepiece ½" right angle prism — height 10" — weight 3½kgs. With leather carrying case. Original cost $300.

Our Special only **$27.50**
P&P A $2.25 B $4.00 C $6.00

POSTAGE KEY:

A: NSW
B: Vic, Qld, SA
C: NT, Tas
D: WA

VALVES

BRAND NEW

6SN7	$1.95	6BM8	$1.95
5U4	$1.95	6GV8	$1.95
EF50	$1.50	6AK5	$1.95
		1H6	$1.50
2x2	$1.50	832	$5.00

P+P 80c

6x4	$1.95
VR65	$1.50

STC HIGH IMPEDANCE HEADPHONES

3400 ohms, brand new, only **$5.95** pair
P&P A $1.65, B $2.75, C $3.10

ZOOM SPOTTING SCOPES

30 x 30
LENGTH 12½", HEIGHT 10"
WEIGHT 1¾ lb
$32.50

45 x 40
Length: 16in
Height: 10in
Weight: 2lb
$49.50

High grade coated lenses. Ideal for pistol and rifle ranges or general viewing. Zooms in from very low to high powers. Complete with tripods.
POST: A $1.75, B $3.00, C $3.60

TELESCOPES

25 x 30 $13.50
P&P A $1.30

SPY TELESCOPES

8 x 17 mag size of a rifle cartridge extends to 8". Only **$8.95** each, post 60c

BINOCULARS

PRISMATIC Coated Lenses. Brand new. Complete with case.

8 x 30	$42.00		
7 x 50	$48.95	P&P	
10 x 50	$51.00	A	$1.75
12 x 50	$53.00	B	$3.00
20 x 50	$65.00	C	$3.10
20 x 65	$125.00		

SMALL CLIP-ON POCKET TELESCOPE

15X **$7.00**. P+P 80c

THEODOLITES

Made by Wilds Microptic, with tripod. Model T2 reads down to one second of ARC. **$1000** (Usual Price $3200)

Freight payable at nearest attended R'way Stn.

C42 set 36 to 60M/Hz with 24 volt power supply, headphone, mic, leads etc. **$95**.
Or 42 set separate **$65**.

AIRCRAFT INSTRUMENTS

Directional Gyros
AN5735-1 Air Operated
$35
Sperry Artificial Horizon
AN5736-1 Air Operated
$45
Slip and Turn Indicators
$17.50.
P&P
A $1.65, B $2.75, C $3.10

MAGNESIUM DRY CELL BATTERIES. Suits PRC25 and dozens of other uses. 15 volts long life.
Only **$1.50** each. P & P A $1.35, B $2.75, C $3.60

ANEROID BAROMETERS
In brass case, made in London. **$39.50**
P&P A $1.65
B $2.75
C $3.10

CONDENSER LENS

2½" diam 2" F.L. **$1.50** each or **$2.50** per pair. P&P 80c

IMPELLER PUMPS

New gunmetal body. Stainless Steel Shaft. Neoprene Impeller. Up to 15ft Lift, suitable for almost any type of liquid. Self priming. Ideal boat bilge pump, sullage drains, etc. Approx. size 8" x 5"
⅜" **$35.75**, ½" **$51.00**, ¾" **$58.50**.
P+P: A $1.95, B $3.50, C $4.60

Liquid filled compass

With magnified lens sight and degree reader.
Only **$7.95** each. Post $1.30

POLARITY & CURRENT CHECKER

3 volt to 400 volt. Simple leads and prods quickly determines positive or negative with illuminated indicators, also checks AC current and intensity, fully insulated only **$4.95**, pp $1.30.

COLLINS COMMUNICATIONS RECEIVERS

500Khz to 30Mhz

Type 51J-4	Type R/391
$350.00	$500

WRIST WATCHES SWISS JAEGER

Le Coultre ex RAAF rated one of the world's best in smart chrome case with black dial. Original cost $250

SPECIAL **$49.50**
Post **$1.30**

PRISMATIC TELESCOPES

15 x 50 Ex RAN — black enamelled brass. Length 16", weight 5kg. Price **$39.50**.

$2 cartage to rail, freight payable at nearest attended railway station.

ZOOM FOCUSING MICROSCOPES

Zoom focusing microscopes, 750X battery and mirror illuminated $31.75.
Zoom 1200X similar to above $47.95.
P&P A $1.65, B $2.75, C $3.10

DIRECTOR LEVELS

Ex Army No 9 with azimuth horizontal circle and vertical adjustment suits all types of levelling. In leather case **$90**.

P + P A$1.75 B$3 C$3.60.

MARCONI SIGNAL GENERATOR

Brand new type TF801A-1 Range 10 to 310MHz AM Continuous. Complete in original case — with instruction book, power leads, spare valves, etc.

$600 value!
only **$195**

$2.00 cartage to rail. Freight payable at nearest attended railway station.

16MM SOUND PROJECTORS IN GOOD WORKING ORDER

240 volts operated complete with Speaker and Amplifier.

SIEMENS **$375**
BELL & HOWELL **$195**
$1 Cartage to Rail. Freight payable at nearest attended Railway Station.

SELSYN MOTORS MAGSLIP

TRANSMITTER 3" MK2 $20.00

Post Packing A $1.75, B $3.00, C $3.10

MAGNIFYING GLASSES

4" Magnifier suspends from neck and rests on chest, leaves hands free ideal for mum or gran, sewing, etc. **$6.30**

4" Hand held	$5.95
3" Hand held	$3.80
2½" Hand held	$2.65
3¼" Rectangular	$4.25
4" Magnifier on stand leaves hands free	$10.75
Illuminated 10 x power magnifier	$6.60

Postages $1.30 extra

Deitch Bros.

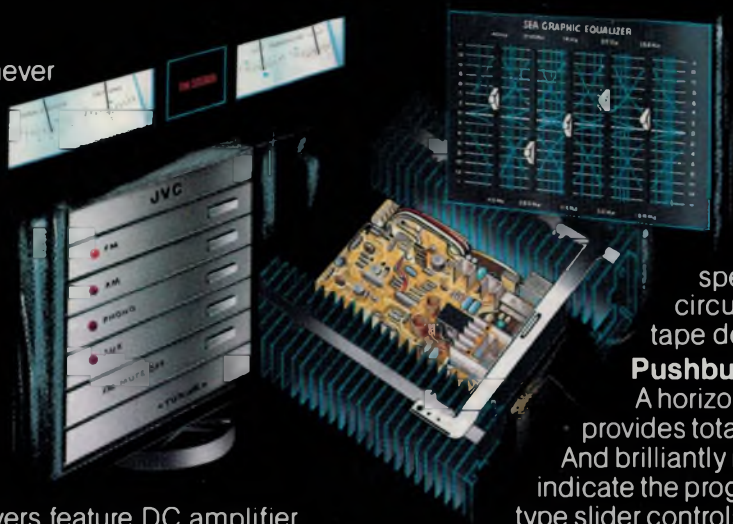
70 OXFORD STREET, SYDNEY 2010

SORRY NO C.O.D.

ADVERTISING INDEX

THE JVC RECEIVER.

Every bit as revolutionary as they look, and then some.



In our case, looks are never deceiving. Because all our new DC integrated stereo receivers combine unprecedented, revolutionary styling with unique electronic design features that reflect JVC's more than 50 years' experience in audio development and innovation.

DC Power Amplifier Design

All four new JVC receivers feature DC amplifier circuitry. They offer virtually distortion-free performance (0.03% THD) throughout the entire audible spectrum. As a result, the sound you hear is clearer, cleaner and crisper. In addition, your speakers are protected with the Triple Power Protection circuit and you can monitor output wattage with dual power meters. Choose from 120, 85, 60 and 35 watts/channel.*

SEA all the way

All four receivers offer JVC's exclusive built-in SEA five-zone graphic equalizer for more complete control of the music spectrum than conventional tone controls. You can attenuate or accentuate any of five separate musical bands, and as an added feature, we've incorporated a special button so that the SEA circuit can be switched to your tape deck.

Pushbutton Source Selectors

A horizontal panel of pushbuttons provides total control over all functions. And brilliantly illuminated LEDs instantly indicate the program source. Professional-type slider controls set volume and balance. Combine all these exclusive features with high sensitivity and tuning precision, thumb control tuning wheel and accurate dual-metering and you'll see just how revolutionary the new JVC DC integrated stereo receivers are. Play one at your JVC dealer soon.

For details on all JVC Hi-Fi Equipment, write to JVC Advisory Service, Box 307, North Ryde, N.S.W. 2113.

For pure Hi-Fi entertainment!

JVC

the right choice

JR-S 401 (top), JR-S 201 (bottom left) & JR-S 301 (bottom right).

JR-S501 * @ 8 Ohms, both channels driven from 20Hz-20 KHz, with no more than 0.03% THD.

Technics Q Series.
We can't say they're perfect. You will.

Nobody's perfect, but Technics quartz-locked direct-drive Q Series turntables come incredibly close.

With speed drift a miniscule ±0.002% – that's 99.998% accurate; wow and flutter of only 0.025% WRMS and rumble of -78 dB (DIN B) it's no wonder that Technics is the choice of top broadcasting stations and discos throughout the world.

The Q Series: the SL-Q3 automatic and SL-Q2 semi-auto both have soft-touch front panel controls for operational convenience. To help overcome any possibility of acoustic feedback they are mounted on a base made of Technics unique non-resonant compound.

The highly sensitive, low mass S-shaped tone arm features a genuine gimbal suspension. The one-piece moulded aluminium headshell has gold plated contacts for maximum conductivity.

You might think you have to be rich to afford Technics Q Series. You don't. Your Technics dealer can advise how surprisingly reasonable they are.

Technics

T.79.35

Technics Advisory Service, P.O. Box 319, North Ryde, N.S.W. 2113