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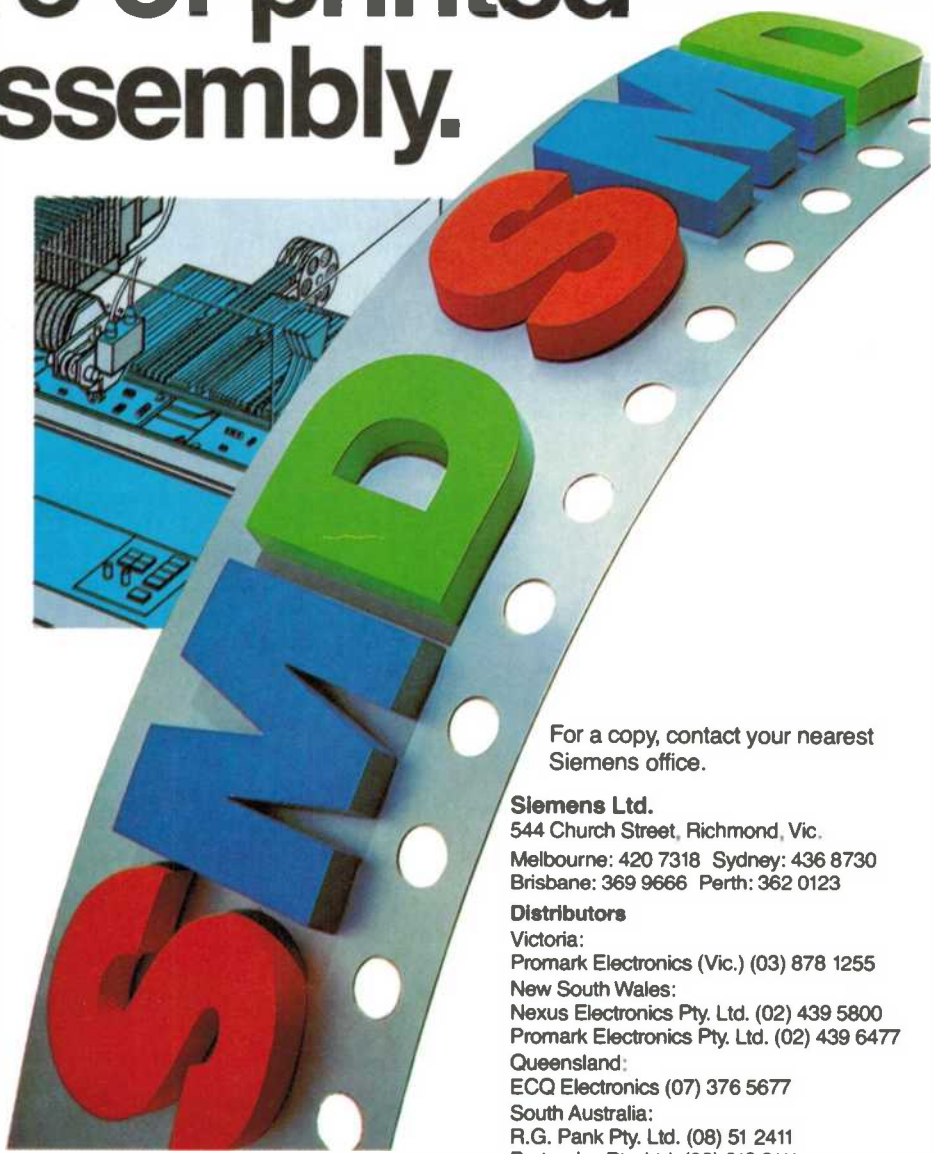

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COVER: Our modem architect S. K. Hui, product in hand. Photography by Glen Cameron.

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ETI READER SERVICE 5

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OTC: the new look

The overseas Telecommunications Commission (OTC) is looking for a new name as part of its plans for the year 2000. Also on the shopping list is the world's widest bandwidth optical fibre and one of the most interesting satellite-based communications networks.

Good news for local engineers and technicians is that OTC is commissioning most of the work for both systems in Australia. The optical fibre plans in particular should result in a world class manufacturing capacity.

The optical fibre link is Tasman 2. It will run across the Tasman, roughly duplicating the existing trans-Tasman coaxial link. It will operate at a wavelength of 1550 nm, and run at least at 280 Mbps, probably faster if it can be justified. The six fibres in the cable will carry at least the equivalent of 57,000 speech circuits. Current cables allow 1000.

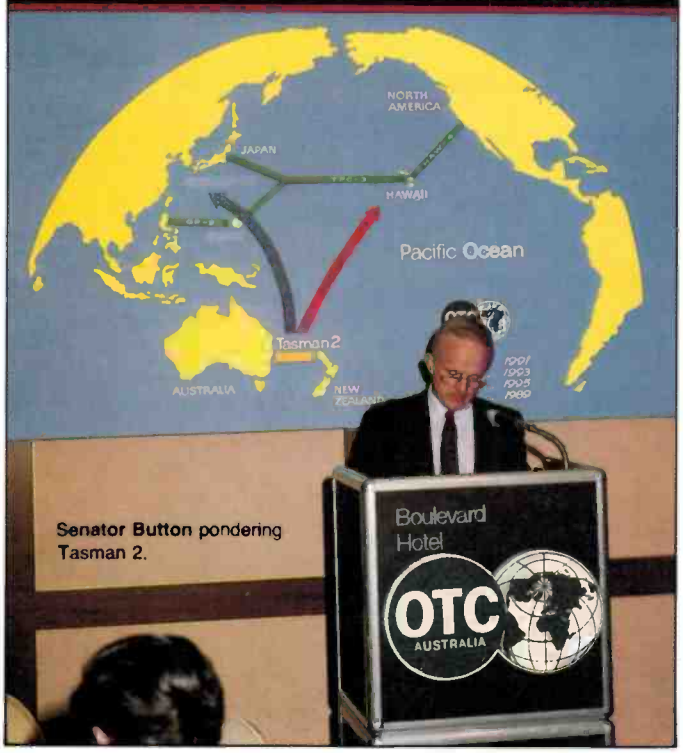
Tasman 2 is the first stage of a proposed trans-Pacific optical fibre network that will link Australia, New Zealand, the US and Japan. Current plans call for Tasman 2 to be in place by 1991, with the rest of the Pacific link in place by the year 2000.

At an industry briefing held in Sydney recently, OTC's chief of development, Murray O'Connor, made it clear that both OTC and the New Zealand Post Office (NZPO) are taking special steps to ensure that development work on Tasman 2 is done in one of the two countries.

This represents a considerable challenge to local industry. While 1550 nm operation has been demonstrated in the laboratory, no production cable capable of operating at this wavelength has yet been developed. Likewise, no commercial repeaters are currently available that operate at this wavelength.

The advantage of going to the 1550 nm cable is the capacity of such a system for increased bandwidth. In initial operation Tasman 2 will actually run more slowly than the Sydney-Melbourne cable due for completion by 1988, but it will have the ability to increase capacity many-fold during the life time of the cable.

The main competition to optical fibre systems in the year 2000 will undoubtedly come from satellites. OTC is gearing up for new look satellite operations as well. The new service is centred around micro earth stations manufactured by Equatorial Satellites of Melbourne.



Senator Button pondering Tasman 2.

Equatorial is 90% owned by Australian interests. The remaining 10% is held by Equatorial in the US, which also has a patent on the technology. The licensing agreement permits Equatorial to make and sell earth stations throughout Australasia using proprietary circuits.

The system uses spread spectrum transmission, a technique in which a pseudo-random, phase-modulated signal with a very wide spectral composition is used. The carrier typically needs to be only 10 dB above the noise for satisfactory transmission owing to the 'pseudo' random nature of the transmission. This is a decisive advantage in satellite systems where it is often noise limited.

According to Barrie Peters, Equatorial Australia's General Manager, a complete downstation will sell for about $3000. A central node, which is used for controlling the system, however, costs about $1m. The first customer will be the Queensland government's Qnet service. OTC is currently negotiating with the ANZ bank as well as other large corporations.


South Australian Centre for Remote Sensing.

Tech park's progress

The opening of Innovation House West, the second multi-tenant complex at Adelaide's Technology Park by the SA Premier cemented Adelaide's position as a technology development centre.

"When Innovation House, our first multi-tenant building, was completed a little over two years ago there was not one company established at the Park" said Barry Orr, Executive Director of the Technology Park Adelaide Corporation. "The Corporation was confident of the Park's future success but understandably there was scepticism in some quarters. Our persistence has been rewarded. Innovation House West is already fully tenanted and construction of a third building, Endeavour House, is underway," he said.

"The technology park can claim to be one of the fastest growing developments of its type in the world. Since its completion in 1984 an average of one company a month has joined" to bring up a total of 30 companies.

Barry Orr returned last month from the inaugural meeting of the International Association of University-related Research Parks in Arizona where he was an invited panel member.

The opening of the Innovation House West was followed by the official launch of the Technology Park Adelaide Corporation's newest venture, the Adelaide Microelectronics Centre by

Malcolm Raymond

Senator Button. The centre has been established to foster the use of modern microelectronics technology by South Australian industry. "We aim to provide a focus on microelectronics for industry and will use the existing centres of expertise rather than duplicate their services," said Malcolm Raymond, Manager of AMC.

"The main priority for the centre will be to provide comprehensive design, production and quality assurance advice to industry. We will also be putting a lot of effort into an awareness program, designed to convince managers of SA companies of the benefits of utilizing new microelectronics technologies."

The centre will also coordinate specialised courses in a wide range of electronics topics, and provide an information service to industry.

COMPANY NEWS

Laser Systems Pty Ltd has helium neon laser tubes operating at 632.8nm in powers of 0.5, 0.1, 2 and 5 milliwatts available ex-stock. Its address is 4 Remont Court, Cheltenham, Vic 3192.

Antenna Engineering has appointed Brisbane Aerial Service its Queensland distributor. BAS will stock all commonly used AEA antennas, clamps and low loss coaxial cable. BAE is at 398 Montague Road, West End, Qld. (07) 44-7566.

Aerospace committee

The South Australian Government has established an Aerospace Technology Promotion Committee in recognition of the vital role space technology will play in the management of Australia's natural resources and communication systems, and the subsequent potential for technological spin-offs to South Australian industry.

Existing trends suggest the international market in space systems will continue its rapid growth and offer significant opportunities for Australian and particularly South Australian industry participation.

South Australia has an historical involvement in Australia's early space efforts and industry, and Government institutions in South Australia are well placed to participate in future national and international space programs.

This was confirmed in the recent Report of the Australian Academy of Technological Sciences "A Space Policy for Australia" which detailed the depth of electronics, optics and communications expertise in industry and Government institutions in SA.

The Aerospace Technology Promotion Committee has been established to ensure a coordinated and cooperative approach to development of the space sector in SA. The Committee, which includes representatives of Government and industry has a full time Executive Officer based in the Department of State Development.

BRIEFS

Ericsson to export from Australia

Ericsson has established an Australian Export Division and expects to double export turnover by 1988. Locally developed products include the AXE Rural Exchange System and the Automatic Call (Queue) System.

Cheap calls

Coms Minister Michael Duffy says the price of local calls in metropolitan areas is to come down. The decision is the result of a parliamentary report called 'Ringing in the Changes' commissioned by the Minister. Trunk calls will also come down.

Outback calls

The ABC and Telecom are moving to remedy poor access for remote Aboriginal communities to electronic communications. Improved telephone access is underway, with current plans to provide telephone services to every Aboriginal community with over 400 people by 1988. The government has also funded the Central Australian Aboriginal Media Association (CAAMA) to develop Aboriginal programming.

Datacraft gets it

Datacraft has achieved Telecom self-certification. The Melbourne company supplies attachments to Telecom lines. Telecom Managing Director Mel Ward said the event was another milestone in Telecom's ongoing commitment to help local industry.

Australia

The CSIRO has set up an on-line information retrieval service. It can be accessed through CSIRONET or OTC's Midas service. There are currently 13 databases covering factual, bibliographic and research in progress information.

Supercalc

Supercalc has been released for the Apple IIc/e. The programs are produced by Sorcim/IUS and sold in this country by Computer Associates.

Fairlight shows off

There is still life in Fairlight's CVI. The computer video instrument was shown off at the recent PC 86 show with memory expansion modules, a large format graphics pad, user defined founts and the ability to store multiple sequences.

Penetration grows

According to a report from the Consumer Electronic Suppliers Association, VCR penetration in Australia is now 56% of households. This is the largest per capita penetration anywhere in the world. It amounts to some 560,000 units valued at $445m.

George Brown takeover

George Brown Group has been purchased by the GBS Falkiner Group, which has interests in sheep farms. The new Directors of George Brown include George Falkiner from the new owners and Bob Hardy, Bob Ford and Ron Whyte from the old company.

Arlec founder retires

David Anderson, who founded Arlec 40 years ago, retired last April after seeing the company grow to one that employs 500 people. He is succeeded by George Soanes, who founded Soanar electronics.

Space Test

A demonstration of the rising interest among electronic and aerospace engineers in space applications is the recent arrival in Sydney of Space Test, a Houston based consultancy company.

Space Test is looking for work among government departments and private companies with space-related products. Its particular speciality: getting the hardware into the shuttle.

Of course, the viability of much of the Space Test mission in Australia depends on the shuttle flying again. Company spokeswoman Lisa Deathridge suggested recently informed opinion among space contractors close to NASA was that it would fly again in 1988.

However, one of the most interesting parts of the Space Test phenomena is that it's a sign of the times: private enterprise is getting in on the act. In the US, information before the shuttle enquiry has demonstrated that NASA has turned into a gigantic, money wasting bureaucracy, in the final analysis putting lives at risk. The shuttle itself is also an economic failure, a point underlined with every launch of the European Ariane class rockets. Private enterprise groups have been looking for some time now at the practicality of buying and operating their own launch vehicles.

Whether private enterprise, especially US-style megacapitalism can do the job any better than NASA remains to be seen. Space Test certainly believes it can. To introduce itself to Australians, Space Test will be running a seminar in Sydney on September 10 and 11. Luminaries from Space Test, mostly ex-NASA staff, will be on hand, as will Barry Jones, the Minister of Science and Mary Skinner, Space Test's founder.

For further information call **(02)438-2955.**

CAD advance

The Department of Industry Trade and Commerce, (DITAC) has released details of a suite of computer aided design (CAD) tools developed by the Joint Microelectronics Research Group (JMRC), an organization based on the electrical engineering departments at the Royal Melbourne Institute of Technology and the University of New South Wales.

There are two main parts to the development: a collection of programs to suit the development of custom chips and one for more traditional printed circuit board layout. The custom chip development is based on AWA microelectronics technology and will run on Labtam equipment, plus some overseas equivalents. The pcb programs are being developed for IBM-clone type operations.

Currently DITAC is looking for someone to commercialise the product. According to spokesman, Trevor Andrews, DITAC is engaged in negotiations that will lead to a commercial release soon.

Long life of Oz transmitters

The construction during wartime of transmitting equipment by Amalgamated Wireless Australasia Ltd at Sydney included two 7500 watt units which are still being operated by the international service of Radio New Zealand.

These transmitters rank Radio New Zealand as the oldest shortwave service still using its original equipment. According to Bill McMillan, Superintendent in charge of broadcasting transmitter facilities at Titahi Bay, near Wellington and a former Superintendent of the Broadcasting Corporation of New Zealand Monitoring Station at Quartz Hill, these AWA transmitters have given sterling performance since they were officially opened for New Zealand's Shortwave Service on September 26, 1948.

It is obvious that with such low power Radio New Zealand cannot compete with highly funded international stations. Nevertheless the present transmitters built in 1944-45 have given exceptional service.

They were designed as multipurpose communication transmitters capable of operating on any frequency in the 4-22 MHz range. The transmitters needed little modification for broadcasting use. Although they are 40 years old and some wiring is certainly brittle, thanks to the efforts of the local maintenance staff the total program time lost from breakdowns is insignificant in comparison with time lost in the target reception areas, due to interference or propagation problems.

Depending on propagation and schedule requirements which are coordinated by Quartz Hill, the transmitters can be operated on any frequency in the 6, 9, 11, 15 and 17 MHz bands. Radio New Zealand serves the South Pacific, Australia and Papua New Guinea and operates 1830-2105 UTC on 11780, 15150 kHz; 2345-0145 UTC on 11780, 15150 kHz; 0330-0730 UTC on 9620, 11780 kHz; 1030-1215 UTC on 6100, 9620 kHz.

The aerial arrays used on the 11, 15 and 17 MHz bands comprise two bays and two tiers of halfwave dipoles with halfwave parasitic reflectors. On the 6 and 9 MHz bands three different types of aerial are currently in use, and these include a dipole and folded dipole. The arrays are on bearings of 30° (Pacific) and 285° (Australia). In the last few years most of the arrays have been rebuilt and four support masts have been replaced. There is continuous aerial maintenance due to the fact that the site is coastal with frequent onshore salt-laden winds.

Though Radio New Zealand on shortwave has no back-up transmitters, this is not the case for the mediumwave transmitters installed in the same building. Radio 2YA on 567 kHz uses two 50 kW transmitters feeding a combining network to produce its normal 100 kW output. Station 2YC carries the 'Concert Program' on 657 kHz, using 60 kW but its emergency transmitter is only 10 kW. The other transmitter is for 2ZB on 1035 kHz, a commercial station which has an emergency transmitter, while 2YB on 783 kHz which carries Access Radio and the 'National Program' when 2YA is on a Parliamentary relay, has no emergency transmitter. It is planned to replace all the mediumwave transmitters with solid-state units within the next few years.

The future of the shortwave service lies with the Government. In the meantime, concluded Mr McMillan, if our transmitters cannot be heard at any particular time, it is very much more likely to be due to reception conditions than transmitter or aerial failure.

— Arthur Cushen

SBS encoded

The encoding of SBS satellite transmissions came into force in June. SBS, the national broadcaster responsible for nationwide dissemination of foreign language films and documentaries, has been using the Aussat satellite for reticulation of signal to its terrestrial transmitters around the country. These signals have been received by people in remote areas using small television receive only TVRO dishes. Now TVRO users will be forced back to US-based commercial programming material coming down from the commercial satellite channel.

The decision to encode the signal was made on the eve of World Cup soccer broadcasts by the ethnic broadcaster, and resulted in howls of outrage from the TVRO fraternity. As a result, the Government relented to the extent of unencrypting the signal for the duration of the Cup.

The decision is yet another blow to SBS. Although set up by the Government, and funded by it, and although the Government is now paying millions to extend its network, a succession of decisions by Department of Communications has effectively reduced its audience, in some areas by as much as 1/3.

This is especially true in metropolitan Sydney, where numerous receivers were put out of action when transmissions on VHF ceased. It has always been Government policy to shift VHF broadcasters to the UHF band, and it has always been policy that SBS would be the first all-UHF broadcaster. But it now seems the Government will allow general VHF transmission to continue for much longer than planned.

A sign of the times is the recent move to rescind a decision that would have seen WIN4 in Wollongong transfer to UHF. The station resisted and last month the Government caved in. As a result WIN will be allowed to transmit on both VHF and UHF for the next 10 years. Thus Wollongong has two VHF and one UHF channel, and signs are that not many people will buy UHF gear simply for the pleasure of watching one channel.

Recent trends have been met with resignation by the SBS channel, which consistently has programs that fail to rate at all. This is in spite of having arguably the best news and current affairs shows in the country.

Space station design

NASA has finalized its 'baseline configuration' for the manned space station. This is a design package that will be used as a reference point for further design studies on the station. The decision is the result of more than a year of study by NASA.

The design features a 'dual hull' configuration. Two vertical keels 110 m long will be connected together by booms 44 m long. It's 153 m across at its widest point because of the various bits and pieces that will hang off the outside of the structure.

Accommodation is provided by two 14 m long, 4 m wide modules that will be lifted as one unit by the shuttle. One of the modules will function as a lab, the other as living quarters for up to eight people. There will also be two logistics modules, that will be turned around by the shuttle at 90-day intervals. Connection between the modules will be via airtight tunnels to allow a shirtsleeves environment inside.

The station will recreate a sea level atmosphere. Previous US manned spaceships have used an oxygen enriched low pressure atmosphere, but this has meant that life science experiments could only be done with special safeguards to allow for the strange atmosphere. It will also feature a closed loop life support system, in which washing water and urine will be recycled. Astronauts are reportedly happy that life scientists are not insisting on the recycling of faecal water as well. The only inputs into the life support system should be nitrogen and food.

There will also be a telerobotic servicer. This will be a remote controlled vehicle that will move all over the structure under the control of operators either inside or outside the structure.

Aussat: interest in second generation

Aussat Pty Ltd, owner and operator of Australia's national satellite system, is delighted at the response to its recent worldwide call for registrations of interest from satellite manufacturers and equipment suppliers for the manufacture of the second generation Aussat satellite system.

Mr Graham Gosewinckel, Managing Director of Aussat, said that more than 45 registrations had been received including 15 from the world's major satellite manufacturers.

"Aussat is particularly pleased at the response received from Australian industry," Mr Gosewinckel said. "Of the registrations received some 25 have been lodged by Australian companies or large overseas corporations with substantial operations in Australia," he added.

Mr Gosewinckel said that one of Aussat's prime objectives in the development of the company's second generation satellites is to achieve far greater Australian participation than had been possible for the first satellites.

"Australian industry has gained substantial experience in satellite and space industry related technology through the more than $120 million spent with Australian companies during the development of Aussat's first satellites and associated ground-based networks," Mr Gosewinckel said.

The registrations of interest from Australian companies are mainly for subcontract work associated with a prime contract for the development of the new generation satellites. "Aussat is committed to ensuring that Australian industry is given every encouragement and opportunity to participate.

"To this end we will be working closely with the Federal Department of Industry, Technology and Commerce to ensure that overseas industry is aware of Government offset policies and of the areas where Australian companies can best take advantage of the opportunities presented by Aussat's second generation program."

Whilst the date for registrations of interest has passed, Mr Gosewinckel said that Aussat was willing to receive representations from any Australian company which believed it had the capability to participate in the program at any time. A major industry brief in the Aussat second generation program will be held in Sydney late in 1986. Details of the briefing will be advertised extensively in both trade and mass media.

Growth strategy released

The Australian Electronics Industry Association (AEIA) recently released details of its report to Senator Button, Federal Minister for Industry, Technology and Commerce, on the future of Australia's communications equipment industry.

The report follows the Government's decision last October to reduce tariff assistance to the industry and to invite the Association to work with the Government in developing a long-term strategy for growth into the 1990s and beyond.

Entitled "A Growth Strategy For Australia's Communications Equipment Industry", the 150-page report is a detailed analysis of the factors limiting the industry's present growth and how future growth prospects can be best exploited.

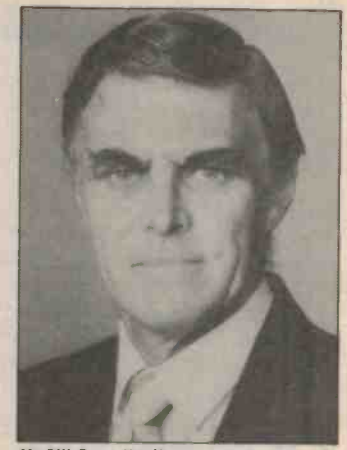
Mr Bill Page-Hanify, the President of the AEIA, said the report was a landmark for the industry and showed what could be achieved through the consultative process of Government and industry working more closely together. He said the communications equipment industry was undoubtedly Australia's only established high-tech industry of substance and the essence of the strategy was to build on these existing strengths.

Implicit in the AEIA's strategy was improved coordination of existing Government involvement with the industry, over and above the traditional support given by Telecom Australia. However, the AEIA stressed that industry self-help based on existing infrastructure was at the core of the plan.

The basic theme in the report is a need to expand into export markets. Past Government policies for this industry have concentrated on import replacement and have encouraged a concentration on the domestic market. As a result, the industry expected revenues in 1986 of around $1.5 billion, with the majority of this equipment locally manufactured and much of it designed here.

Under the AEIA's strategy, Telecom would play a greater support role for industry in export markets in joint bidding with industry for major overseas tenders; development of 'turn-key' packages incorporating Australian equipment; accreditation of equipment in support of export sales; and provision of market intelligence to industry.

A comprehensive technology plan has also been proposed by the AEIA which identifies key technologies required to develop export products and suggest how the present 'gaps' can be overcome. It also seeks an improved interaction with public institutions to more effectively coordinate R&D resources between the private and public sectors.



Mr Bill Page-Hanify

For further information contact **Mr R. Price on (062)47-4655.**

Giant telescope to honour Scottish physicist

The world's largest submillimetre wave telescope, being built by Britain and the Netherlands in Hawaii, is to be named after the Scottish-born physicist who discovered the laws of electromagnetism.

The British Science and Engineering Research Council (SERC), which is funding the new facility jointly with the Netherlands Organisation for the Advancement of Pure Research (ZWO), has said that it would be known as the James Clerk Maxwell Telescope (JCMT) in honour of his contributions to physics.

Maxwell was born in Edinburgh in 1831 and educated at the city's unversity. He later became the first Cavendish Professor of Physics at Cambridge University.

His contributions to physics spanned the whole of the discipline but his key contributions involved the theory of electromagnetism and the kinetic theory of gases. In the latter field, he discovered the velocity distribution of atoms and molecules in gas, known as the Maxwell Velocity Distribution.

Of greater relevance to astronomy he showed that light is a form of electromagnetic radiation.

The new telescope being built at the Mauna Kea observatory in Hawaii under an arrangement with the University of Hawaii will, when fully commissioned in 1987, open up the last of the wavebands still to be explored by ground-based telescopes — the millimetre and submillimetre wavebands.

These wavebands are expected to give ground-based astronomers an insight into the processes going on inside the dense regions of interstellar gas, which are the breeding ground of stars. These areas are opaque to optical radiation but transparent at infrared and millimetre wavelengths. By probing them with the JCMT, astronomers hope to gain a better understanding of the ways stars form.

Comms receivers cost less

New Zealanders are benefitting from a recent Government announcement which lifted import duty on many electronic items.

The initial announcement covered radio receivers but was too vague in its interpretation as it was found to include portables and cassette recorders which are made in New Zealand. The lifting of the duty was only for equipment not manufactured in the country.

After communication with the writer as to a suitable description of the type of shortwave receiver used by DXers the NZ Comptroller of Customs decided that an "imported communication receiver with continuous coverage" should be duty free.

This has been gazetted to allow any objections to the revised duty concession to be heard. Meanwhile, the price of communication receivers has dropped. The duty had, up to then, been 65% at importation, but full amount is not reflected in the retail sale. Nevertheless, an FRG8800 dropped from $NZ1960 to $NZ1485.

In the past radio amateurs have not had to pay import duty on their equipment, as it can be used for Civil Defence purposes, but the broadening of the field to allow shortwave listeners to also enjoy this preference will help to increase interest in SW radio listening in New Zealand.

The price in Australia of a similar receiver was often half that being charged to the New Zealand radio receiver buyer in the retail store.

— Arthur Cushen

SW LISTENING

— Arthur Cushen

One of the most popular features of the shortwave broadcasts from just about any country is the 'Mailbag' session. These programs answer readers' questions which can range from the length of the longest railroad in the country to statistical information on the population. Often the queries concern the radio station itself or some other aspect of shortwave broadcasting and reception.

Below is a list of these interesting sessions over frequencies receivable in Australia.

UTC DAY SUNDAY

AWR Portugal, 'Mailbag', 0900 UTC, 1st Sunday monthly, 9670 kHz.
Voice of Germany, Cologne, 'Mailbox', 2nd and 4th Sundays monthly on 0100 UTC, 9545 and 11780 kHz; repeated 0500 on 5960, 6120, 6130, 9690 and 9765 kHz.
Voice of Free China, Taipei, 'Mailbag Time', 0730 UTC on 5985 kHz.
Radio Berlin International, Berlin, 'Thank you for Writing', 0645 UTC on 17755, 21540 kHz; also at 0815 and 0945 UTC on 21540 kHz.
Radio Sofia, Bulgaria, 'Mailbag', 1830-1930 UTC on 11840 kHz.
Radio Beijing, China, 'Listeners' Letterbox' 0915 UTC and repeated at 1015 UTC on 9700, 11755 and 15440 kHz.
Radio Japan, Tokyo, 'Hello Australia & New Zealand', 0905 UTC on 11875 kHz.
Radio Voice of Vietnam, Hanoi, 'Sunday Studio' 1015 UTC on 9840 kHz; repeated at 1100 UTC on the same frequency.
Swiss Radio International, Berne, 'Grapevine', 1000 UTC on 15305, 15570 and 17830 kHz; also at 1100 UTC and 0830.
Radio HCJB, Quito, 'Ken McHarg Mailbag', 0815 UTC on 6130 and 9745 kHz.
Radio Korea, Seoul, 'Shortwave Feedback', 1130 UTC on 7275 kHz; repeated 2330 UTC on 15575 kHz.
Austrian Shortwave Service, Vienna, 'Postbox 700', 1830 UTC on 11670 kHz.
Radio Canada International, Montreal, 'Listeners' Corner', 1900-2000 UTC on 11945, 15325 and 17875 kHz.
Israel Radio, Jerusalem, 'Calling All Listeners', 2000 UTC on 9009, 9445 and 9815 kHz.
Radio Norway, Oslo, 'Letterbox' 1000 UTC 3rd or 4th Sunday monthly, on 9590 and 15235 kHz.
Radio Havana, Cuba, 'PO Box 7026', 1915 UTC on 11795 kHz.
Radio Prague, Czechoslovakia, 'Mailbag', 0730 UTC on 11855, 17840 and 21705 kHz.
UAE Radio, Dubai, 'Listeners' Letters' 0330 UTC on 11730 kHz.

MONDAY

Israel Radio, Jerusalem, 'Calling All Listeners', 0200 UTC on 9435 kHz.
Radio Moscow World Service, Moscow, 'Mailbag', 0230 UTC on 9655, 11845 and 12040 kHz; and 0630 UTC on 11675, 11690 and 11705 kHz.
Radio Prague, Czechoslovakia, 'Questions & Answers', 0300 UTC on 9630, 9740 and 11990 kHz.
Radio Sofia, Bulgaria, 'Answering Your Letters', 0430 UTC on 7115 kHz.
Radio Korea, Seoul, 'Shortwave Feedback', 0430 UTC on 15575 kHz.
Spanish Foreign Radio, Madrid, 'Radio Club America', 0515 UTC on 6055 and 9630 kHz.
BBC World Service, London, 'Letterbox', 0530 UTC on 5975 and 9410 kHz.
Austrian Shortwave Service, Vienna, 'Postbox 700', 0430 UTC on 5945, 6155 kHz; and 0830 UTC on 11480 kHz.
Radio Berlin International, Berlin, 'Thank You For Writing' 0815 UTC on 17755 and 21540 kHz; also 0945 UTC on 21540 kHz.
VOA, Washington, 'Morning Show', 2245 UTC and 2345 UTC on 15185, 17740 kHz (Monday to Friday).
Radio Sweden, Stockholm, 'Listeners' Questions', 0940 UTC on 15115 kHz (daily).
Belgium BRT, Brussels, 'PO Box 26' 0830 UTC on 9880 kHz.
All India Radio, Delhi, 'Sincerely Yours', 1015 UTC on 17870 kHz.
Radio Australia, Melbourne, 'You Asked For It', 1030 UTC on 6045 and 7215 kHz.

TUESDAY

Radio Beijing, China, 'Listeners' Letterbox', 0915 and 1015 UTC on 9700, 11755 and 15440 kHz.
Radio Finland International, Helsinki, 'Airmail', 0930 UTC on 11935 kHz.

WEDNESDAY

Radio Sofia, Bulgaria, 'Answering Your Letters', 0430 UTC on 7115 kHz.
Radio Australia, Melbourne, 'You Asked For It', 0440 UTC on 15160 and 15240 kHz.
Radio Moscow World Service, Moscow, 'Mailbag', 0630 UTC on 11675, 11690 and 11705 kHz.
Belgium BRT, Brussels, 'PO Box 26', 0830 UTC on 9880 kHz.
Radio Moscow World Service, Moscow, 'Mailbag', 0930 UTC on 11900, 13705 and 15485 kHz.
Voice of Vietnam, Hanoi, 'Writing and Listening To Us' 1000 and 1100 UTC on 9840 kHz.

THURSDAY

Radio Sofia, Bulgaria, 'Answering Your Letters', 0430 UTC on 7115 kHz.
Radio Australia, Melbourne, 'You Asked For It', 0110 UTC on 15240 kHz.

FRIDAY

Radio Moscow World Service, Moscow, 'Mailbag', 0230 UTC on 9655, 11845 and 12040 kHz; and 0930 UTC on 9700, 13705 and 15485 kHz.
Radio Sofia, Bulgaria, 'Mailbag', 0415 UTC on 7115 kHz.
Radio Beijing, China, 'Listeners Calling Fortnightly', 0915 UTC on 9700, 11755 and 15440 kHz.
Vatican Radio, Vatican, (monthly) 'Listeners' Letters', 2210 UTC on 9615 and 11830 kHz.

SATURDAY

BBC World Service, London, 'Letterbox', 0145 UTC on 9410 and 11955 kHz; and 2315 UTC on 9410, 9570 and 105070 kHz.
Radio Prague, Czechoslovakia, 'Mailbag', 0330 UTC 9630, 9740 and 11990 kHz.
Radio Tirana, Albania, 'Our Listeners' Questions', 0645 UTC on 7080 and 9500 kHz.
Radio Bucharest, Romania, 'Listeners' Letterbox', 0645 UTC 11940, 15250 and 17790 kHz.
HCJB, Quito, 'Musical Mailbag', 0700 UTC on 6130, 9745 and 11925 kHz.
Radio Prague, Czechoslovakia, 'Delving Into Our Mailbag', 0730 UTC on 11855, 17840 and 21705 kHz.
Radio Netherlands Hilversum, 'Shortwave Feedback', 0750 UTC on 9630 and 9715 kHz.
Radio Ulan Bator, Mongolia, 'Mailbag', 1215 UTC on 9615 and 12015 kHz.
Voice of Germany, Cologne, 'Yours Sincerely', 2110 UTC on 7130 and 9765 kHz.

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- Push-button ON/OFF power switch.
- Single 30 position easy to use rotary switch for FUNCTION and RANGE selection.
- 1/2" high contrast LCD.
- Automatic over-range indication with the "1" displayed.
- Automatic polarity indication on DC ranges.
- All ranges fully protected plus Automatic "ZERO" of all ranges without short circuit except 200 ohm Range which shows "000 or 001".
- High Surge Voltage protection 1.5 KV-3 KV.
- Diode testing with 1 mA fixed current.
- Audible Continuity Test.
- Transistor hFE Test.

SPECIFICATIONS
Maximum Display: 1999 counts 3 1/2 digit type with automatic polarity indication.
Indication Method: LCD display.
Measuring Method: Dual-slope in A-D converter system.
Over-range Indication: "1" Figure only in the display.
Temperature Ranges: Operating 0-C to +40-C
Power Supply: one 9 volt battery (006P or FC-1 type of equivalent)

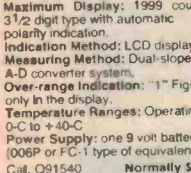
Cat. Q91530 Normally $99.95
SPECIAL $89.95

METEX 3530 MULTIMETER

Features...
- Push-button ON/OFF power switch.
- Single 30 position easy to use rotary switch for FUNCTION and RANGE selection.
- 1/2" high contrast LCD.
- Automatic over-range indication with the "1" displayed.
- Automatic polarity indication on DC ranges.
- All ranges fully protected plus Automatic "ZERO" of all ranges without short circuit except 200 ohm Range which shows "000 or 001"
- High Surge Voltage protection 1.5 KV-3 KV.
- Capacitance measurements to 1pF
- Diode testing with 1 mA fixed current.
- Audible Continuity Test
- Transistor hFE Test.

SPECIFICATIONS
Maximum Display: 1999 counts 3 1/2 digit type with automatic polarity indication.
Indication Method: LCD display.
Measuring Method: Dual-slope in A-D converter system.
Over-range Indication: "1" Figure only in the display.
Temperature Ranges: Operating 0-C to +40-C
Power Supply: one 9 volt battery (006P or FC-1 type of equivalent)

Cat. Q91540 Normally $129
SPECIAL $119



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Q10518	MU45 0-1A	12.50
Q10520	MU45 0-1A	12.50
Q10525	MU45 0-20V	12.50
Q10530	MU52E 0-1A	14.50
Q10533	MU52E 0-5A	14.50
Q10535	MU45 VU PMetre	14.95
Q10538	MU65 0-50uA	16.95
Q10540	MU65 0-1mA	16.95
Q10550	MU65 0-100uA	16.95
Q10560	MU65 0-20V	16.95

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only $79.95

With built in timer Cat. X14955
only $129

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Cat.R14400 ..... $16.95
Model 18-1-11 (1" x 1.75" Rect.)
Cat.R14405 ..... $38.50
Model 21-1-11 (1.82")
Cat.R14410 ..... $37.50

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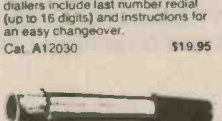

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Cat. No.	Description	Price
P10960	3 pin line male. Was $3.90	**NOW $2.70**
P10962	3 pin chasis male Was $3.00	**NOW $2.10**
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2764	$6.25	$5.95	$5.00
27128	$6.95	$6.50	$6.25
6116	$2.95	$2.75	$2.50
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6264	$6.50	$5.50	$5.25
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Cat. U21614 Normally $49.50
Save $20, SPECIAL $29.50

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Cat. No.	Description
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W11252	13/.12 TLD BROWN
W11253	13/.12 TLD ORANGE
W11254	13/.12 TLD YELLOW
W11255	13/.12 TLD GREEN
W11256	13/.12 TLD BLUE
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PRICES PER 100 METRE ROLL

1-9	10+
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W11260	14/.20 RED
W11261	14/.20 BLACK
W11265	14/.20 BLUE
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W11272	24/.20 BLACK
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COMING EVENTS

AUGUST

A series of **seminars on data communications is being organised by Housley Communications** in August.

A 1-day seminar covering LANs, wide area communications, host gateways, databases and bulletin boards will be held in Melbourne at the Windsor Hotel, August 13; in Canberra at the Lakeside Hotel, August 15; and in Sydney at the Boulevard Hotel, August 27.

A 2-day introductory, 3-day network design and 5-day combined course is scheduled for August 4-5 Melbourne, 18-19 Sydney; August 6-8 Melbourne and 20-22 Sydney; and August, 4-8 Melbourne and 18-22 Sydney respectively. The venues are the President Hotel Melbourne and the Gazebo Hotel Sydney.

Finally are the 2, 3 and 5 day Louis Pouzin seminars on data communications networking. Dates and venues for these are between 4 and 8 August at the Boulevard Hotel in Sydney; and between 28 July and 1 August at the Sheraton Hotel in Melbourne.

For more details and prices, NSW residents should ring (02)498-7877, interstate callers (008)22-6776.

AIEE '86, Australia's international engineering exhibition for 1986 will be held 18-23 August at the RAS, Sydney. Contact Thomson Exhibitions, 47 Chippen St, Chippendale, NSW 2008, (02)699-2411.

The 'Electrathon' electric vehicle endurance competition sponsored by Canon Australia, will be held on 24 August 1986 at VFL Park, Melbourne with over $5000 in prize money. Details are available from the Australian Electric Vehicle Association, 9 Washington St, Oakleigh Sth, Vic 3137. (03)570-5261.

A series of conferences under the auspices of IREE will lead up to **IREECON '87**. The details as we know them are: 25-27 August 1986, 'Second Australian Computing Engineering Conference' at the Sebel Town House, Sydney; 30 November to 4 December 1986 'Eleventh Australian Conference on Optical Fibre Technology' in Geelong, preceded by a series of workshops. In 1987 plans are for a 'Computing Systems Conference' in Brisbane in June, and for the "Sixth Annual VLSI Conference". More details are available from Heather Harriman, Executive Director, Institute of Radio and Electronics Engineers Australia on (02)29-4051.

AMS '86, an exposition and conference on advanced manufacturing systems is to be held in Singapore, 26-29 August. Contact BPI Exhibitions on (02)266-9799.

Entries are being invited for **the 9th Tokyo Video Festival.** The festival is open to both professional and amateur video makers in Japan and overseas. The Grand Prix Award is $US2500, a 15-day round trip to Japan, trophy and citation. For further information contact the JVC Hagemeyer office in your State or write to Linda Donald, Hagemeyer (Australasia) BV, 5-7 Garema Circ, Kingsgrove, NSW 2208. Entries close in Australia on August 31.

SEPTEMBER

The Small Business Trade Fair '86 will be held at Centrepoint in Sydney, 4-7 September. For details on displays or booths, contact Thomson Exhibitions, 47 Chippen St, Chippendale, NSW 2008. (02)699-2411.

The **Shepparton and District Amateur Radio Club** is holding its Communications Day on Sunday, 7 September 1986 at the Shepparton Showgrounds. For more information contact Peter O'Keefe VK3YF, PO Box 692, Shepparton, Vic 3630. (058)21-6070.

The eighth international conference for computer communication, **ICCC '86** will be held in Munich, 15-19 September. Contact Commercial Services Department, Telecom, 18th Floor, 199 William St, Melbourne, Vic 3000, (03)606-5152.

OCTOBER

Electronics 86, the Australian international electronics and computer technology exhibition and conference, opens from 7-9 October 1986 at the Royal Showground in Adelaide.

Pacex, an international process and control exhibition will be held 21-23 October in Melbourne. Contact Thomson Exhibitions, 47 Chippen St, Chippendale, NSW 2008. (02) 699-2411.

If surfacing finishing is your go, the **Asia Pacific Interfinish Congress and Exhibition** will be held 26-30 October in Hobart. You can get more details from the Australian Institute of Metal Finishing, 191 Royal Pde, Parkville, Vic 3052. (03)347-2562.

NOVEMBER

Infotex 86, a computer and electronics exhibition presented by the NSW Chamber of Manufacturers and the Australian Computer Society will be held 4-6 November in Canberra. For further details contact Atek Promotions, 131 City Walk, Canberra, ACT 2601. (062)49-7799.

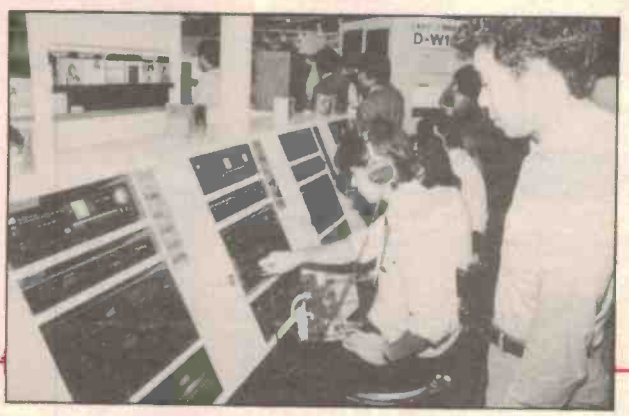
Munich will be the **host to Electronica '86,** the 12th international trade fair for electronic components and assemblies. Set aside 11-15 November. More details are available from the German Australian Chamber of Industry and Commerce on (02)29-3999.

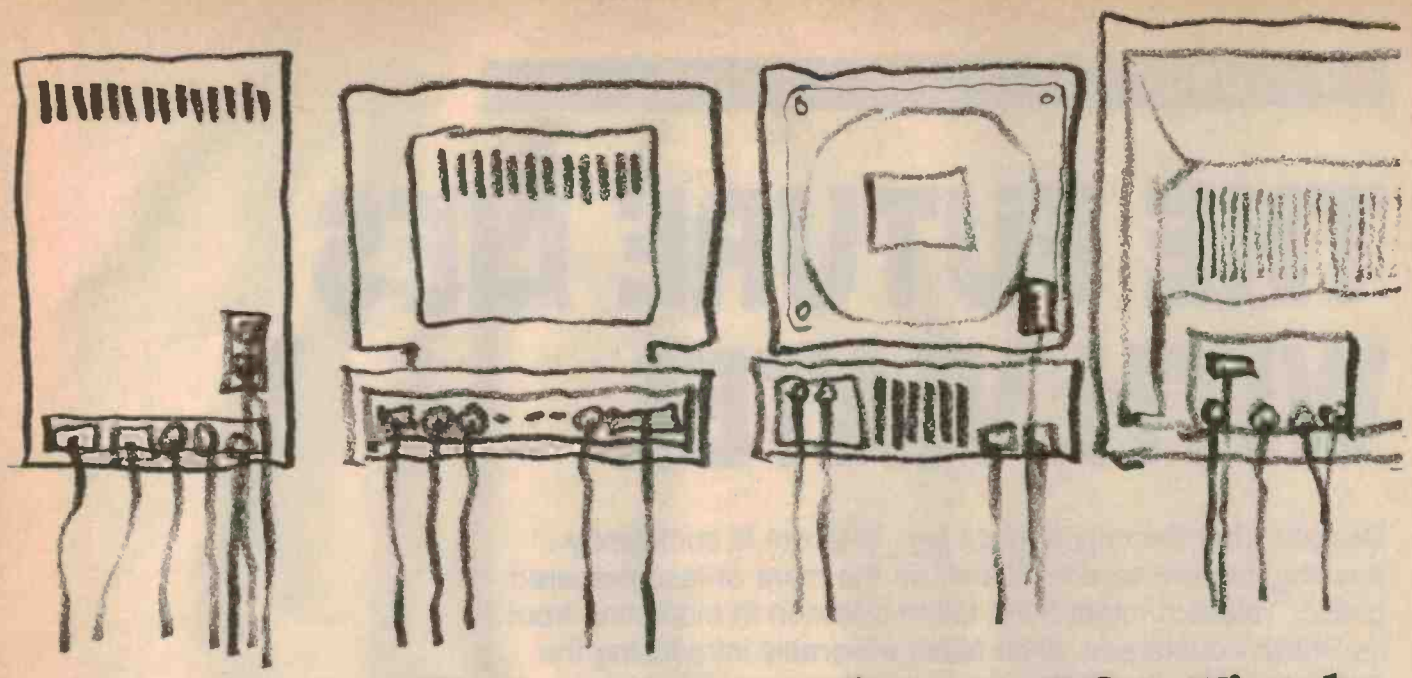
DECEMBER

The third 'mathematics-in-industry' study group will be held at Monash University, Melbourne, from 1 to 5 December 1986. Further information is available from Dr F.R. de Hoog, CSIRO Division of Mathematics and Statistics, GPO Box 1965, Canberra, ACT 2601. (062)82-2011.

MARCH

The dates and venues for the two PC87s are as follows: **Eighth Australian Personal Computer Show,** Centrepoint, Sydney, 18-21 March, 1987; and **Ninth Australian PC show** 'Communications 87', 'Office Technology 87', Royal Exhibition Building, Melbourne, 1-4 June 1987.

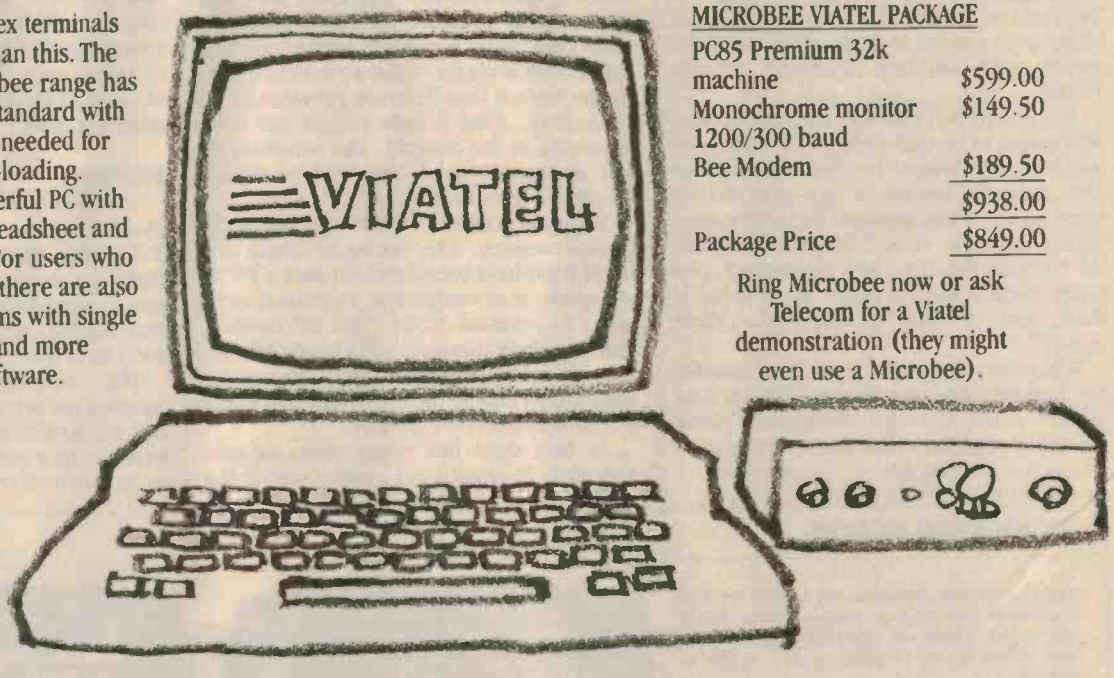




See what it will cost to upgrade your PC to Viatel.

Then buy this Microbee package for $849 and keep the change.

Many Viatel/Videotex terminals cost much more than this. The new Premium Microbee range has Viatel/Videotex as standard with no extra software needed for software down-loading.
You also get a powerful PC with wordprocessor, spreadsheet and database software. For users who need more capacity there are also 64k and 128k systems with single or twin drives and more advanced software.



MICROBEE VIATEL PACKAGE

PC85 Premium 32k machine	$599.00
Monochrome monitor	$149.50
1200/300 baud Bee Modem	$189.50
	$938.00
Package Price	$849.00

Ring Microbee now or ask Telecom for a Viatel demonstration (they might even use a Microbee).

(Think of it as your Viatel access with a PC thrown in free)

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FEATURE

THE FUTURE LIES WITH VIATEL

Despite what the critics might cry, Telecom is confidently pushing its new service, Viatel, on the more or less prepared public. Telecom might have taken a lesson in marketing from its British counterpart whch failed miserably introducing the British system, Prestel; in any event it seems Viatel in Australia is all set to go.

Jon Fairall

VIATEL HAS BEEN a great success. Twelve months out, the punters are signing up like lemmings. According to Lindsay Cunningham, the Viatel Branch Manager at Telecom, the number of people who use Viatel is increasing at a rate of about 1000 a month, and has just rocketed through 15,000.

The one fly in Telecom's ointment at present seems to be that the number of service providers has almost levelled off at about 150. A steady stream of new providers is being more or less matched by people leaving the network. "It is," says Cunningham, "to be expected. It's a new technology, and many people are uncertain as to what it does, and whether it can make them money".

Whatever, the age of mass data transfer has arrived. The cognoscenti call it 'new media'. Australians are looking and liking what they see. So, where has it come from, how is it done and where is it going to?

Definition

Firstly, what is it? Viatel is a videotext service, a way of sending text and low resolution graphics down a telephone line. The fundamental structure of Viatel has users connected with a central computer. The connection is via the ordinary switched telephone service that Telecom provides to all subscribers. Cost is only a local call from anywhere in the country. The computer itself is located in a telephone exchange "somewhere in Melbourne".

The user connects with the computer from a terminal. This can be as simple as a small hand-held console which uses a TV as a display, or as complex as a personal computer in terminal mode. The PC needs a modem which transmits at 75 baud (bits per second) and receives at 1200, plus some software to enable the PC to display Viatel graphics characters correctly.

At first sight this might seem an odd standard; 75 baud is not exactly setting the world alight. In fact it makes very good sense for teletext services where the name of the game is to send lots of data one way, and very little the other. For the most part, communications from the terminal to the host computer consist of single keystrokes to select pages for viewing, answer yes or no, and so on. For this, a slow baud rate is quite adequate.

History

The first practical videotext system was Prestel, which was introduced by British Telecom in the late 70s. Although substantially the same as Viatel, its introduction was a resounding disaster. After an opening with fanfare and hyperbole, the Brits stayed away in droves.

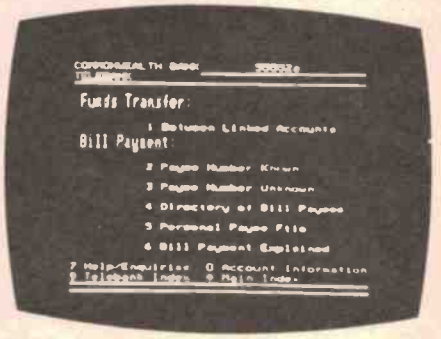
The international community had watched the introduction with great interest and the British disaster provided an object lesson in how not to do it. The lesson seems to be that it all revolves around the market-

COMMONWEALTH BANK

The Commonwealth Bank was one of the first information providers on Viatel. On day one it had a few frames up advertising its services, and within a few months a full range of services.

Services offered include transferring funds between your account and other accounts on the system, paying bills, balances, statements and cheque book orders. It's possible to pay phone, gas, electricity, land and water rates, Bankcard and American Express bills on the system.

The service costs $4 a month, apart from the normal Telecom charges.



ing of the system. The British assumed, not without reason, that there were millions of people just hanging out for the introduction of Prestel. The expectation was that British Telecom would be flooded with business. As a result, prices were set at a reasonably high level when the service was introduced, and no special effort was made to attract the right sort of information providers.

The silence was deafening. Chastened British Telecom managers, indeed, managers of potential videotext services all over the world, were forced to conclude that people really *did* need a reason to use data communications. To get people in, services have to exist, and of course, services are hard to provide in the absence of consumers. It's a new version of the old chicken/egg conundrum.

Telecom Australia solved the problem quite neatly by providing the service to consumers at a ridiculously low level ($2.50 a month) and encouraging some critical service providers to come on-line. One of the first was the Commonwealth Bank which provided some limited computer banking services. Other early service providers were orientated towards business and domestic computer users.

The world

The results have put Australia into the big league of videotext users in terms of per capita use of terminals. Currently we rank second only to France in market penetration, and the comparison is really not all that fair: the French give their terminals away to subscribers. We overtook the British long ago. The US doesn't really get a look in, primarily because of its difficulty in agreeing to a standard.

The Australian Viatel system is one of 30 level 1 videotext systems in existence around the world. Five levels are defined. Level 2 has somewhat better graphics and is based on Canadian Telidon technology. The US NAPLPS system is a good example. Level 3 is the French Teletel and level 4 is the Japanese Captain system. It specialises in Japanese kanji characters. Level 5 is represented by experimental services that use digital networks running at 64 Kbps, such as Telecom's proposed Integrated Services Digital Network (ISDN). Output from the system can be seen on page 26 courtesy of Syscorp.

How it works

The main players in the structure of Viatel are Telecom Australia, service providers, sub-providers, closed user groups (CUGs) and users.

Telecom provides the hardware, the lines, the exchanges and the central computer. It also provides a billing service (see box). It provides very limited editorial control, mainly towards ensuring that acceptable community standards are applied.

Telecom has little enthusiasm for its role as censor. To date, it has restricted itself to removing obscenities from various databases. However, Viatel is a medium that thrives on anonymity, so its potential for generating controversy should not be underestimated.

Escort services, brothels, dating services of both hetero and homosexual persuasions, and other somewhat racy organizations may all be expected to come on-line soon. In France, using Teletel as a dating service seems to be the latest sport.

Telecom's legal obligations seem somewhat uncertain. It would appear to have no right to deny anyone access to the network. On the other hand it has a duty not to cause public affront. For publicity-shy Telecom managers, the situation has all the ingredients of a nightmare.

Service providers (SPs) hire 'frames' from Telecom. Each frame consists of a Viatel standard screen. It's equivalent to about 500 bits of information, consisting of 25 lines by 40 columns. Graphics are available as blocks of colour filling one text position, definitely low resolution, but extremely simple to transmit.

SPs can compose their own frames from special editing terminals. A special editing password gives access to the system editor, which allows the user to produce new frames and amend or delete existing ones. Editing may be done in the on-line mode from an ordinary terminal, or in the off-line mode using an intelligent editing terminal. This means that the frames are composed on the terminals before the connection is made to Viatel, and then bulk uploaded at 1200 baud to the Viatel computer. It's much faster where large amounts of data are to be used.

SPs hire an initial 50 frames and then more as they need them. If less frames are required, an organization can approach another service provider and sublet a small number of frames as a sub-provider. A number of organizations have sprung up solely to provide this sort of umbrella facility. Typically they offer not only space, but also technical assistance and advice. Naturally they charge for this, but it can still be an attractive proposition for people interested in testing the Viatel water before making a major commitment. ▶

Another type of SP is one who already has a major commitment to a computer system. They might have a very large database containing company information, for instance. A connection can be established between the Viatel computer and the other computer via a 'gateway'. Usually the Viatel system then becomes completely transparent to the user, so that the way the system works is determined completely by the host computer. The advantage of the gateway system is that it makes long distance or public access to an existing database cheaper and easier.

The success or failure of the services offered by the SPs and sub-SPs is measured, by and large, by how many people try to access them. However, this is not always the case. There may be times when information is confidential as, for instance, in the case of a company with branch offices all over the country using the Viatel database for its inventory. In such cases it's possible to make access to particular frames available only to particular passwords. This then forms a closed user group, or CUG.

The user

The final player in the Viatel game is the user. Deliberately, their commitments to Viatel may be very low, yet it's their number, and the frequency with which they access the system that determines the success of the system. Who are they?

According to a survey by Paul Budde, the guru of videotext systems, the typical Viatel ▶

PRICES

	per month	frame rental	access	connect time	other
user	$12.50 bus $02.50 pvt	—	local call	0.08/min	0.05/frame
SPs	$255 for 50	$0.04 to 1000 $0.03 1000 to 5000 $0.02 over 5000	"	editing $0.12	5% of revenue
SSP	$35	—	"	"	"
CUG	$20	—	"	"	"
gateway	$300	—	"	—	—

INTRODUCING THE TIME-SAVER/MONEY-SAVER CIRCUIT-BOARD-ARTWORK SOFTWARE

For only $1,250 smARTWORK™ lets the design engineer create and revise printed-circuit-board artwork on the IBM Personal Computer (or equivalent).

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- ☐ Separate silk screen layer.

System Requirements (smARTWORK™ Version 1.20)

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- ☐ Pen-and-ink plotters: Houston Instrument DMP42, 52 Hewlett Packard HPGL 7470, 75, 7580, 5, 6.
- ☐ Microsoft Mouse (optional), and other compatibles.

This revolutionary software package originates from the U.S.A. where it has a proven record for reliability.

Entertainment Audio of Adelaide are actually manufacturing the product locally, which has obvious benefits:

- ☐ Quicker availability of new releases and upgrades.
- ☐ Experienced engineers available to help or answer enquiries.

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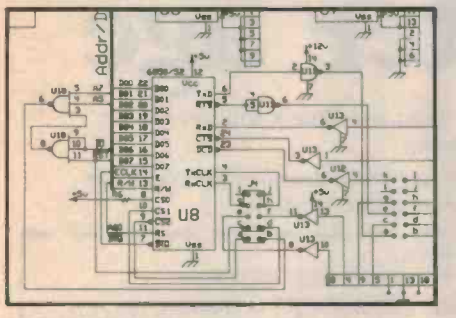

What is HiWIRE™?
A computer program designed to aid in the creation and drafting of electronic and electrical circuit diagrams.

Creating diagrams — the old way
The thoughts and ideas of the design engineer are hand sketched, tediously corrected and redrawn, resulting finally in an untidy, draft sketch, which must then be sent to a skilled draftsperson for the production of a drawing of satisfactory presentation.

Problems with the old way
The production of circuit diagrams is a common "bottleneck" as a result of the time needed to produce quality drawings.
Therefore an effective Computer Aided Drawing system can not only relieve this "bottleneck", but also provide the archiving of design efforts for the future.

Enter HiWIRE™!
HiWIRE™ is a circuit diagram capture program for the IBM PC or close compatibles.
HiWIRE™ may be used throughout the design and documentation stage of a design, yet it is as easy to use as pen and paper.

HiWIRE™ — How does it work?

- ☐ HiWIRE™ is a computer based drawing editor, with the ability to work with, and "understand" electrical connections. That is, HiWIRE™ allows the user to select and draw not just lines, but wires and wire busses.
- ☐ Symbols may be loaded from a library, and the drawing may be annotated with text labels.
- ☐ Objects can be moved, copied, deleted or rotated with the click of a mouse button.
- ☐ Symbols may be defined by the user.
- ☐ The display may be divided into windows, to permit simultaneous viewing of various portions of a drawing. Windows may be quickly panned, scrolled, or zoomed.
- ☐ The program can identify the connections of a complex circuit, including device pin allocations, and device information.
- ☐ Information concerning the part number, location and other attributes for each device may be quickly entered.
- ☐ HiWIRE™ will extract this information from a drawing, providing lists that may be used by other programs such as component loading and PCB layout generation.
- ☐ Versatile plotting and printing from a wide range of popular devices.

Hardware Requirements

- ☐ IBM PC, XT, or AT or 100% compatibles.
- ☐ Two disk drives.
- ☐ 320 K of memory.
- ☐ Microsoft Mouse or compatible Colour Graphics Adaptor and RGB monitor or; Enhanced Graphics Adaptor and monitor.
- ☐ DOS 2.0 or later.
- ☐ Plotters from Houston, Hewlett Packard or; Epson FX series printer or compatible.

Availability
HiWIRE™ is expected to be available in August 1986.

Entertainment Audio P/L
A VILLAGE ROADSHOW COMPANY
59 KING WILLIAM STREET,
KENT TOWN, S.A. 5067
Phone (08) 363 0454

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NON-TELECOM SERVICES

A side effect of the creation of the Viatel system has been the growth of complementary services. These use exactly the same protocols and structure as Viatel, but are operated independently by large firms. In fact, the first public access data base in Australia was of this type, run by Elders-IXL.

Frequently the motivation for creating a separate system has been security. In the case of the banks this is especially so. Not unnaturally, they take the view that they must be responsible for their own security. Whether Telecom's arrangements are satisfactory is beside the point. A recent trend has been the creation of gateways between the various systems. In the case of Westpac, for instance, it's possible to access the system either from Viatel or by ringing a separate number.

SOME USEFUL NUMBERS

Elders Agriservice: runs Elderlink and Sharelink. A very large data base, one of the first in the country. Access is via Austpac 01921 then *211113999# or *21108999# or direct on (02)221-6077 or (03)602-1544 or (08)212-5288.

DTX Australia: specializes in providing services for CUGs, but has some public areas. Messaging at $6.00 an hour is claimed to be the cheapest in town. Call on (02)957-4203 or (09)225-0444 or (03)614-5066.

Westpac: Westpac will be offering a home banking service later in the year. Currently, just some information frames tell you all about it. It will offer a gateway from Viatel, or a separate access number (02)266-0240. Currently, use 1# as ID and ## as password, and you can look around.

user is 35, earns more than $30,000, is well educated, likes new technology and is probably either in management or self employed.

Over 75% of Viatel users access the system via PCs. Manufacturers, scenting profits in the Viatel hills, have jumped on the bandwaggon. Virtually all now provide dedicated software for their particular machines. In addition many have secured space on the database. There are also a large number of suppliers of related products, Nashua (disks) and Microeducational (peripherals) for instance.

There is also a fund of public domain software available from organizations like Microtext666, which has hundreds of programs, and smaller organizations like Tango and Tastel. It's interesting to speculate on whether the trend by PC users towards Viatel will spell the end of the 300 baud bulletin boards that now dot the country. Some bulletin boards have provided gateways into their systems from Viatel, others studiously ignore it.

Security

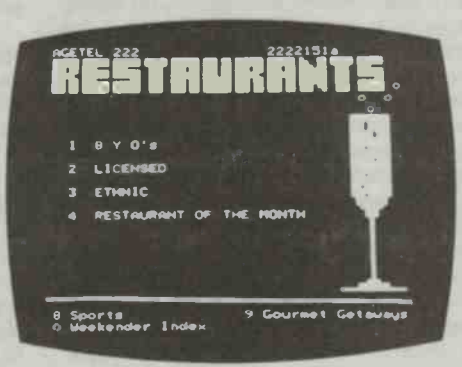
One of the most important elements of any public computer service is the security arrangements made to protect data. Service providers and Telecom claim their services are virtually tamper-proof. On the other hand, a string of articles has appeared in the popular press claiming that 15-year-old whiz kids are clambering all over the database writing grafitti on the walls.

The truth is a bit more prosaic. Actual

VIATEL SOFTWARE

Both suitable software and a modem are required to connect microcomputers to Viatel. The following companies have been identified as being involved with the supply of Viatel software suitable for use with commonly available personal computers. This is not a complete list by any means, but it does give some idea of the range of product available.

Apple (those indicated with * do Macintosh as well.)	
AAV	(03)699-1844
Netcomm Australia*	(02)498-5577
Rank Electronics	(02)449-5666
GEC	(02)887-6222
Computerland*	(02)745-4311
Eftec	(02)957-5788
Syscorp	(02)92-1907
Microcorp*	(02)27-1122
Visionhire	(02)92-0902
Thorn EMI	(02)439-7411
Techmedia*	(08)212-2168
Zephyr Products	(03)553-3266
Kurrawood Computers*	(045)78-2377
IBM	
Netcomm Australia	(02)498-5577
Rank Electronics	(02)449-5666
Dotsoft	(02)449-6923
GEC	(02)887-6222
Eftec	(02)957-5788
Sperry	(02)929-7800
Syscorp	(02)92-1907
Microcorp	(02)27-1122
Neologue	(02)487-2859
Visionhire	(02)92-0902
Thorn EMI	(02)439-7411
Techmedia	(08)212-2168
Zephyr Products	(03)553-3266
Computer Electronics	(02)428-3236
Computer Techniques	(057)21-8140
Avtec	(02)427-6688
Commodore (Vic 20 as well if indicated with *)	
Microtex 666	(03)531-8411
Dotsoft	(02)449-6923
GEC*	(02)887-6222
Visionhire*	(02)92-0902
Thorn EMI*	(02)439-7411
Zephyr Products	(03)553-3266
Rank Electronics	(02)449-5666
Modem Technology	(02)634-3988
Techmedia*	(08)212-2168
Megavision	(02)290-2655
Bail Electronics	(057)21-6260
Kurrawood Computers	(045)78-2377
Apricot	
Syscorp	(02)92-1907
Rank Electronics	(02)449-5666
Neologue	(02)487-2859
Aquarius	
Modem Technology	(02)634-3988
BBC	
GEC	(02)887-6222
Visionhire	(02)92-0902
Thorn EMI	(02)439-7411
Rank Electronics	(02)449-5666
Techmedia	(08)212-2168
Jacaranda Electronics	(062)82-5458
Burroughs	
Burroughs	(02)922-9300
Compac	
Techmedia	(08)212-2168
Netcomm Australia	(02)498-5577
Microcorp	(02)27-1122
Computerphone (equipped for Viatel is standard)	
Telecom Business Office	(see front of telephone directory)
Corona	
Netcomm Australia	(02)498-5577
Microcorp	(02)27-1122
Techmedia	(08)212-2168
Ericsson PC	
Netcomm Australia	(02)498-5577
Microcorp	(02)27-1122
Techmedia	(08)212-2168
Hewlett-Packard	
Hewlett-Packard	(02)888-4444
ICL	
GEC	(02)887-6222
Visionhire	(02)92-0902
Thorn EMI	(02)439-7411
Techmedia	(08)212-2168
ITT XTRA	
Netcomm Australia	(02)498-5577
Microcorp	(02)27-1122
Techmedia	(08)212-2168
Microbee	
Applied Technology	(02)487-2711
Applied Technology	(043)24-2711
NEC	
Neologue	(02)487-2859
OLIVETTI M24	
Netcomm Australia	(02)498-5577
Microcorp	(02)27-1122
Techmedia	(08)212-2168
Remington	
Remington	(03)699-4722
Netcomm Australia	(02)498-5577
Techmedia	(08)212-2168
Sigma Multitec	
Netcomm Australia	(02)498-5577
Techmedia	(08)212-2168
Sirius	
Rank Electronics	(02)449-5666
Syscorp	(02)92-1907
Sperry	
Sperry	(02)929-7800
Tandy	
Tandy	(02)675-1222
Paris Radio	(02)344-9111
Telic Alcatel	
AWA	(02)638-8444
Wang	
Neologue	(02)487-2859



The cultural scope of the new electronic lifestyle!

British Telecom's level 5 videotext system, Integrated Services Digital Network, can produce this sort of image (courtesy Syscorp).

VIABET-WA TAB

Out of the enormous range of applications available on Viatel, one of the more intriguing is the West Australian TAB. Punters can get the latest information on odds, horses and owners as well as place bets and see results. Best of all, the service is completely free except for Telecom charges. There's a cheque withdrawal system to get your winnings out and an account system to allow you to pay when required.

PROTOCOLS

Transmissions

	Forward	Backward
logic 1	1300 Hz	390 Hz
logic 0	2100 Hz	450 Hz

Data format

start bit	logic 0
bit 1-bit 7	character code
bit 8	parity (even parity)
stop bit	logic 1

10 bits

manipulation of the database from outside the system seems to be almost impossible. After 20 or so years of writing software for public databases, programmers have managed to trap most of the errors which once allowed access.

However, there is another type of crime that is gaining a lot more popularity than anyone, especially Telecom, would care to admit, and that is the type that involves perfectly straightforward manipulation of the database, but using stolen or fraudulently obtained passwords.

In Viatel, there are three codes that the system must receive, a customer identity number, a personal password and a Viatel number. The Viatel number is a low security number, used by any member of the public to address the user directly. This function is necessary for the messaging service. The personal password is a four digit combination originated by Telecom when the user first joins the system. However, you can change it at any time by using Frame 920. The customer identity number is a 10 digit number used mainly for billing purposes. It is confidential of course, but can't be changed without talking to Telecom.

When the user logs on to Viatel, it's necessary to enter both the customer identity and the personal password. The system compares them, and if they don't match will disconnect you after three tries. It should be a very secure arrangement, especially if, as Telecom suggests, you change your password often.

One method of defeating the password system, popular in the early days, was to use the computer to generate all possible combinations of the password and to try them in sequence. This has been effectively foiled by the disconnect facility. Of course, there is nothing to stop you using an auto dial modem to redial automatically, except the cost of calls and the length of time it would take.

In fact, on the assumption that it was necessary to search half the possible combinations before hitting the right one, and that it took 30 seconds to make a call and cycle through three options, and assuming that Telecom charges 15 cents for a call, some simple calculations show that it would take about 26 days and cost $11,000 to achieve. And all that assumes that no one would notice your auto dialler in action consistently for 26 days.

According to Telecom, even if you did get in, there wouldn't be a great deal you could do to damage things. This is illustrated by the "Robin Hood" case. Apparently, a person using the pseudonym Robin Hood acquired access to Viatel by stealing a password number. He managed to cause a great deal of unpleasantness by sending Telecom money to an Adelaide service provider.

This did no one any good at all, since the transaction was instantly recognised, traced and reversed. However, it did underline the vulnerability of the data base from stolen passwords. Telecom had been sufficiently relaxed in its attitude to security to allow prospective users of the system to operate terminals from Telecom business offices. Robin Hood apparently watched an operator key in a password, and was then allowed unsupervised operation of the terminal. He apparently accessed the frame where the 10-digit customer identity is stored, after which he had free access to the system.

Needless to say, Telecom has since changed its procedures. However, it would be silly to suppose that this will be the last incident of its type. Theft has been with us since private property was invented, and no doubt, will be until the millenium, and there is no reason why computer passwords will be any different. The ultimate defence, however, is already available. Change the password often.

The future

The future for Viatel seems secure. Leo Chessell of Syscorp, a major Viatel system vendor, says that progress in Viatel "has an inevitable quality about it," even if it seems to progress in fits and starts. In the short term the future for Viatel will undoubtedly consist of getting more and more people onto the system. As market penetration becomes greater the number of services will increase dramatically.

At the same time the growth of data transfer capacity over the next decade will improve the quality of the system. Progress on ISDN is well advanced, both in terms of exchange equipment and trunk capacity between exchanges (See June ETI for an account on optical fibre progress). With ISDN in place will come the ability to do photo videotext.

An experimental British version of 'phototext', for example, utilizes 64 Kbps to send its images around, and a rather small frame store to take in the received information. The definition is achieved by sophisticated compression techniques and digital-to-analogue conversion which removes the aliasing from the image. Even if Telecom doesn't go for this system, it is likely this is the level of definition we will be looking at in the year 2000. ●

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HIGH QUALITY HEAVY DUTY SOLENOIDS LOW PRICES!
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Complete and self-contained, just add siren or horn, auto reset, entry/exit delays, LED light.

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- Relay output -12Vdc
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- Suits all alarms

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CAR alarm model with 2 transmitters $110
Single OR Dual CHANNEL for home, alarms, garage doors, industrial control etc. These have extended range to 100metres, 12,000 programmable codes.
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25,000uF	20v	10,000uF	50v
15,000uF	25v	22,000uF	50v
50,000uF	25v	20,000uF	55v
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27128	$ 5.00	$ 4.50	$ 4.00	$ 3.50
2532	$ 7.50	$ 6.50	$ 6.40	$ 6.30
2732	$ 6.50	$ 6.10	$ 5.90	$ 5.50
27256	$11.00	$10.00	$ 9.00	8.00
6264	$ 5.50	$ 5.00	$ 4.50	$ 4.00
2764	$ 6.00	$ 5.00	$ 4.50	$ 4.00

Plus 20% tax where applicable

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Desc.	10-99	100+	Desc.	10-99	100+
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PN2222A	.10	.08	PN2907A	.10	.08
PN3463	.15	.13	PN3565	.12	.11
PN3566	.15	.13	PN3567	.10	.08
PN3569	.18	.16	PN3639	.18	.16
PN3640	.18	.16	PN3641	.10	.08
PN3642	.10	.08	PN3643	.10	.08
PN3644	.15	.13	PN3645	.15	.13
PN4250A	.15	.13	PN4355	.16	.14
PN4356	.16	.14	MPSA42	.23	.20
MPSA43	.23	.20	MPSA55	.15	.14
MPSA56	.15	.14	MPSA92	.22	.20
MPSA93	.22	.20	SC1410	.85	.75
BU126	1.50	1.25	BUX80	2.50	2.20
BU208	2.50	2.20	2SD350	2.75	2.40
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Cat No.		1-99	100+	250+	500+
S15020	AA 1.2AH	1.60	1.50	1.40	1.10
S15020	C 1.2AH	4.50	4.25	3.50	
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Cat. No.	Description	10+	100+	1,000+
R15705	0.47uF 63V	$0.12	$0.10	$0.09
R15715	1uF 63V	$0.12	$0.10	$0.09
R15725	2.2uF 63V	$0.12	$0.10	$0.09
R15742	4.7uF 25V	$0.11	$0.09	$0.08
R15745	4.7uF 63V	$0.11	$0.09	$0.08
R15761	10uF 16V	$0.12	$0.10	$0.09
R15762	10uF 25V	$0.13	$0.12	$0.11
R15765	10uF 63V	$0.15	$0.14	$0.13
R15792	22uF 25V	$0.13	$0.12	$0.11
R15794	22uF 50V	$0.17	$0.15	$0.13
R15812	25uF 25V	$0.13	$0.12	$0.11
R15815	25uF 63V	$0.17	$0.15	$0.13
R15831	47uF 16V	$0.16	$0.13	$0.12
R15832	47uF 25V	$0.16	$0.13	$0.12
R15835	47uF 63V	$0.22	$0.19	$0.17
R15841	100uF 16V	$0.18	$0.16	$0.15
R15842	100uF 25V	$0.18	$0.16	$0.15
R15845	100uF 63V	$0.27	$0.24	$0.22
R15851	220uF 16V	$0.17	$0.15	$0.14
R15852	220uF 25V	$0.21	$0.18	$0.17
R15855	220uF 63V	$0.50	$0.46	$0.40
R15871	470uF 16V	$0.27	$0.24	$0.22
R15872	470uF 25V	$0.29	$0.27	$0.25
R15873	470uF 35V	$0.75	$0.70	$0.60
R15875	470uF 63V	$0.75	$0.70	$0.65
R15885	1000uF 63V	$0.60	$0.58	$0.55
R15891	1000uF 16V	$0.39	$0.35	$0.30
R15892	1000uF 25V	$0.45	$0.40	$0.38
R15893	1000uF 35V	$0.70	$0.65	$0.55
R15894	1000uF 50V	$0.00	$0.00	$0.00
R15903	2200uF 35V	$1.20	$1.10	$0.90
R15904	2500uF 50V	$1.30	$1.20	$1.00
R15911	2500uF 16V	$0.59	$0.50	$0.40
R15912	2500uF 25V	$0.95	$0.90	$0.80
R15913	2500uF 35V	$1.10	$1.00	$0.90
R15914	2500uF 50V	$1.30	$1.20	$1.00
R15932	4700uF 25V	$1.90	$1.80	$1.60
R15933	4700uF 35V	$2.40	$2.15	$1.90

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5¼" DS/DD 5022-1000	3.40	3.05	2.85
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Have a look at these prices! These are 100% certified, prime spec. disks in labelled jackets. (Not like our opposition)

Desc.	Cat. No.	1-9 boxes	10+ boxes	100+ boxes
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D/S D/D	C12445	$16.50	$14.90	$13.50

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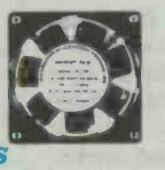

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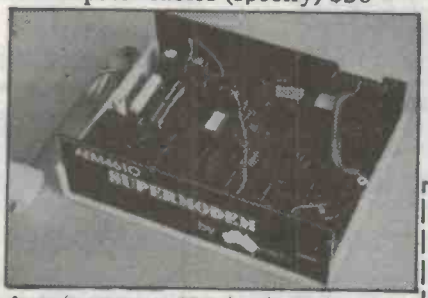

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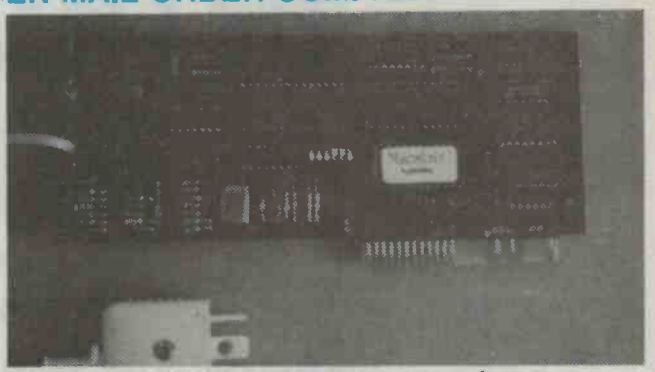

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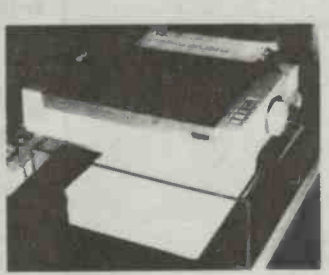

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INTELLIGENT MODEM

Part 6

S.K. Hui

The final part of our series on the intelligent auto answer, auto dial modem. This is the operations manual.

SO NOW YOU'VE built your modem — how does it operate? With the intelligence we have put into it, just knowing how to control it is not enough. It is capable of doing a lot of work without your supervision, so it is absolutely essential for you to know exactly what it will do for you. Since there are no switches and knobs on it, you can't just shout at the modem and expect it to understand your commands. One talent it does not have is knowledge of the English language!

Commands to the modem are given via a keyboard. Therefore, the first thing to do is to set up the modem with the same protocol as your terminal.

Anyone having difficulty in setting up the RS232C link should refer to the wiring diagrams given in the last issue or consult a kit supplier. Some personal computers have weird serial ports which are not compatible with RS232C. Commodore 64K owners should build the ETI-1601 (July 1986), Microbee owners should refer to the ETI-676 (Feb 84).

Initial setting up

When you set up the system for the first time, the system memory for storing important parameters is empty. It is necessary to initialise the parameters before operation.

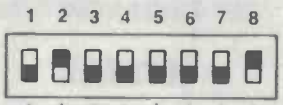
First turn the modem upside down and you will see the 8-way DIL switch on the bottom. Out of the eight on-off switches, four are used for selecting the baud rate between your modem and the terminal. Note that because of the independence of the two serial ports (ACIA) in the modem, the baud rate between the modem and the terminal does not have to be the same as that between the modem and the line. The modem can be transmitting 75 baud, receiving 1200 baud with Viatel and talking to your terminal at 9600/9600 baud at the same time.

Of the remaining four switches, three are for the protocol setting (number of data, stop bits and type of parity used) between the terminal and the modem. The last one tells the modem whether you are setting up the system for the first time or not. Table 1 shows the detailed arrangements of these switches.

Be careful with the switch numbering used in the Table. If the orientation of the DIL switch is reversed from that shown in the photograph* in the July issue (pin 1 nearest IC32), the switch numbers will be reversed from those specified in Table 1.

Furthermore, notice that the words ON/

TABLE 1. 3-WAY DIL SWITCH ARRANGEMENT.



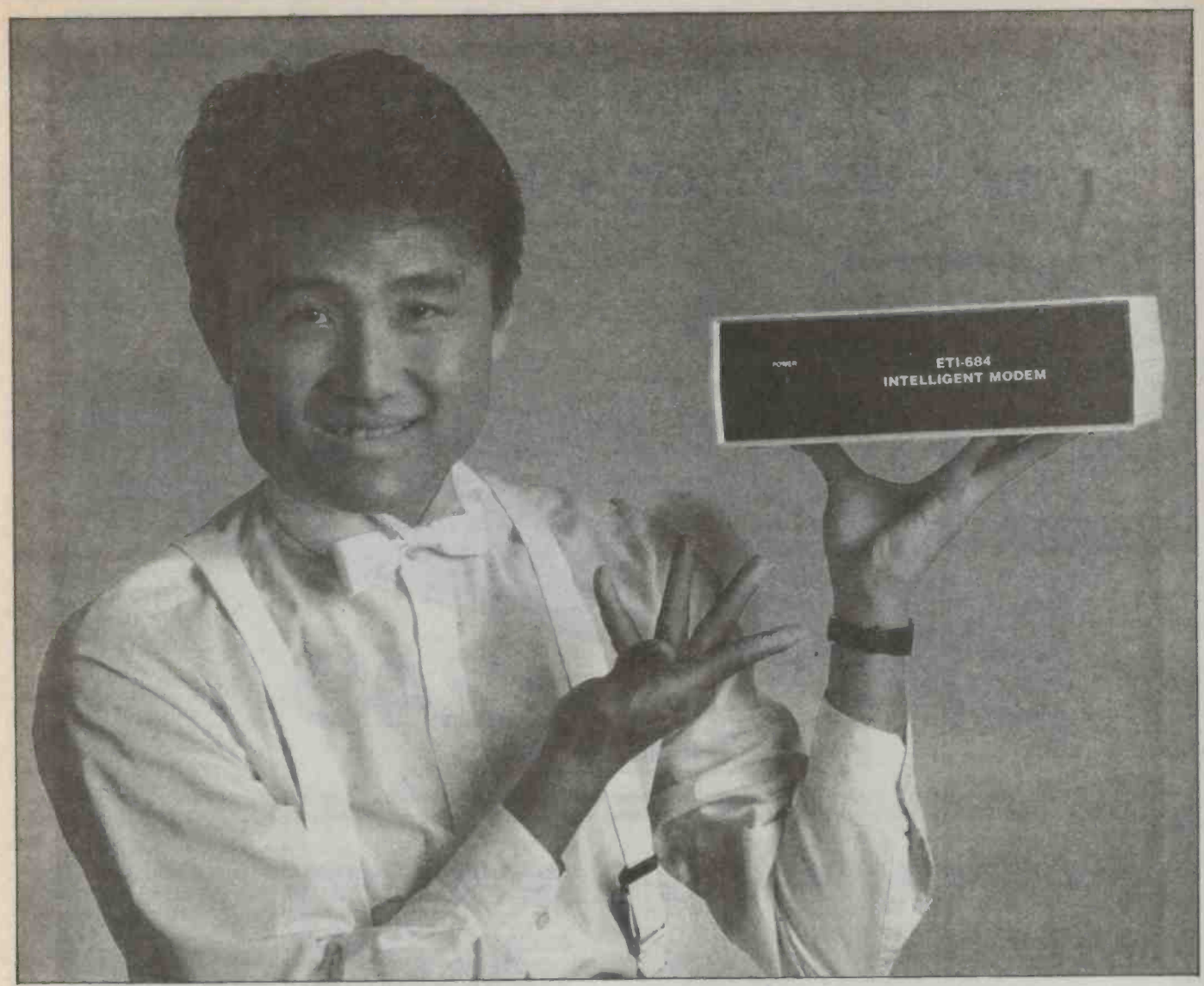
5	6	7	8	Baud Rate
0	0	0	1	9600
0	0	1	0	4800
0	1	0	0	2400
1	0	0	0	1200

1 = first time
0 = not first time

Switch No			Protocol Select		
1	2	3	data	stop	parity
0	0	0	7	2	even
0	0	1	7	2	odd
0	1	0	7	1	even
0	1	1	7	1	odd
1	0	0	8	2	none
1	0	1	8	1	none
1	1	0	8	1	even
1	1	1	8	1	odd

0 = switch open (off)
1 = switch closed (on)

* Not as shown on the component overlay.



OFF used in the article refer to closing and opening the contacts respectively,

If setting up for the very first time, flip switch 4 to ON. With your terminal off and the modem plugged into its power supply, turn on the power. The turn-on spike may wake up the modem in which case the red LED in the power supply will be off. Before you do anything, force the system to go back to standby by pushing the reset button on the modem. The modem power supply will go back to standby with its LED flashing on and off. This is our starting point to set up the parameters.

If the DTR line from your terminal has been hooked up to the system, turning on your terminal will automatically wake up the modem. If no DTR line is connected, press the pushbutton on the power supply once to wake up the modem. Turn on your terminal and wait (a few seconds) for the message to show up on the screen. The software in the modem will first check whether switch 4 is ON. If it is, the modem should display:

```
Your default choices are:
        Modem Baud Rate: Tx-1200 Rx-auto
        Modem Protocol: Data-8 Stop-1 None
        DTR OFF
        Ringing Period (1 < x < 99) ? : 10
        Number of Busy Re-dial ( 1 < x < 9 ) ? : 2
        Number of Non-data Call ( 1 < x < 5 ) ? : 2
        Intelligent Coding Mode ? n
Do you wish to change ?
```

Type y for yes and n for no; note that only lower case y and n are accepted. The modem will respond to any illegal key input by buzzing your terminal, displaying What ??? for a fraction of a second. It will then erase the response and the illegal key input.

Type y once and the screen should scroll up to display a more detailed menu on modem baud rate selections. You should now turn switch 4 off so that next time when the modem wakes up, it goes directly to command mode or handshaking mode, bypassing this menu.

The baud rate you select here is the one the modem will use to communicate with the line. This is not to be confused with the baud rate you set in your modem DIL switch to talk to the terminal. The modem baud rate menu is as shown;

```
Your modem baud rate
        1)Tx-1200 Rx-auto
        2)Tx-600  Rx-auto
        3)Tx-300  Rx-auto
        4)Tx-75   Rx-auto
        5)Tx-1200 Rx-75
        6)Tx-600  Rx-75
        7)Tx-300  Rx-300
        8)Tx-75   Rx-1200
        9)Tx-75   Rx-600
```

You select your choice by typing the number and hitting the return key once. The screen will scroll up and go to another detailed menu for modem protocol selection. If you only call a bulletin board which runs at 300 baud, you should select either 7 or 3. The difference between these is that when your modem is called by another modem, a selection of 7 will cause your modem to send the V.21 ANSW carrier only. That means a modem calling with 1200 baud will not handshake with your modem. If 3 had been selected instead, the auto bauding sequence would start to search for the correct carrier. Some of the carrier frequencies are very close to each other, so bear in mind that a full auto bauding sequence to cover all possibilities is not possible. As detailed ▶

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INTEGRATED AMPLIFIER KIT

Ref: Electronics Australia magazine - May, June & July 1986

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Frequency Response - Phone Inputs - RIAA/IEC equalisation within ±0.5dB from 40Hz to 20kHz. Line Level Inputs - −0.5dB at 20Hz and −1dB at 20kHz.
Input Sensitivity - Phone Inputs at 1kHz - 4.3mV (overload capacity at 1kHz - 140mV) - Line Level Inputs - 270mV.
Hum and Noise - Phono (with respect to 10mV at 1kHz) - 89dB unweighted, with typical moving magnet cartridge. High Level Inputs (with respect to 270mV) - 103dB unweighted with 20Hz to 20kHz bandwidth.
Tone Controls - Bass ±12dB at 50Hz; Treble ±12dB at 10kHz.
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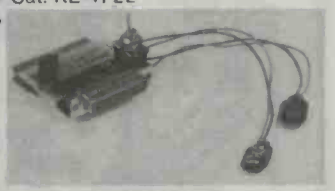
Ref: ETI July 1986
Supplied without Commodore edge connector.
Cat. KE-4722



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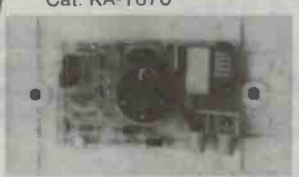

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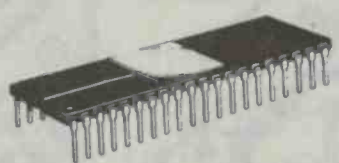

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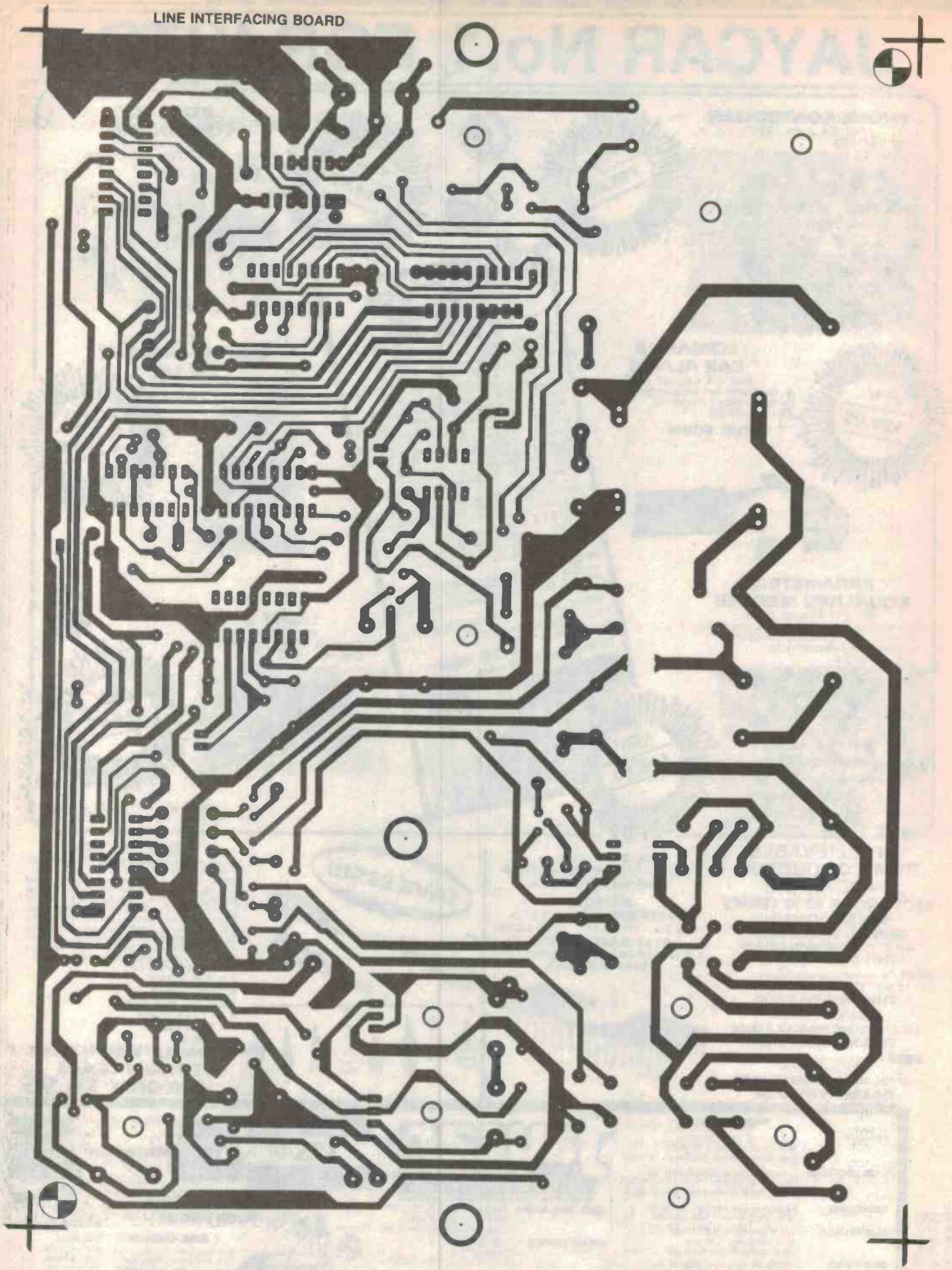


in my last article in the July issue, the auto bauding sequence will only look for the carriers sent from a V.21 ORIG or V.23 ORIG modem.

If the default value for the baud rate is already what you want, just depress the return key once for no change. The protocol selection menu will then show up as follows:

```
Your modem protocol selection
    1)Data-7 Stop-2 Even
    2)Data-7 Stop-2 Odd
    3)Data-7 Stop-1 Even
    4)Data-7 Stop-1 Odd
    5)Data-8 Stop-2 None
    6)Data-8 Stop-1 None
    7)Data-8 Stop-1 Even
    8)Data-8 Stop-1 Odd
```

As before, select your choice by typing the number and press return. Pressing return without giving a number means the existing value is not to be changed. If you selected incorrectly and need to go back to the baud rate menu, just press the space bar once. In fact, you can treat the return key as the control for going down menus and the space bar as the one for going up menus.

The next menu is for telling the modem whether you have the DTR line connected or not.

```
1)DTR ON
2)DTR OFF
```

Type 1 then press return if your terminal has such a line connected to the modem.

The next decision you must make is:

```
Ringing period (1< x <99)?
```

You can choose from 1 to 99 for the number of rings counted before the auto answer sequence begins. You are advised not to choose too small or large a number. Choosing a small number of rings such as 1 or 2 has obvious disadvantages, not the least of which is the keen competition between you and the modem to answer the phone whenever it rings. Furthermore, if a similar ETI modem is calling, it needs two rings to recognise whether the line is busy or ringing. I would recommend 15 to 20 rings if the modem is installed in a house, and three to five if the modem is to be used in an office with a dedicated line.

The number you select not only affects the number of rings, but also the tone detection routine when you dial out. As will be explained later, unless you put M after the dialling number, the modem will go into the automatic tone detection routine. If the line is ringing, the modem will count the number of rings, if no one answers after the nth ring, the modem will hang up and come up with the response no answer. This nth ring is the number of rings you select plus five to account for tolerances in the exchange.

In my software, an automatic tone detection routine is included tailored to detect Telecom's busy and ring tones. It takes the modem only two silent gaps between the rings to determine which tone it is and react accordingly. This is not guaranteed with internal PABXs since their tones can vary from brand to brand and model to model.

A busy tone will cause the software to hang up and wait two seconds before redialling the same number automatically. The number of automatic redials is preset by you as in the next menu:

```
Number of busy redial (1 < x < 9) ?
```

If the number of automatic redials has reached the preset number the modem will send a response message No luck, line is still busy to you and return to command mode.

The next menu is the number of non-data calls; maximum value is 5. A non-data call is a successful call, ie, the phone is answered without detecting a valid carrier. This would be the case if a person kept answering without connecting a working modem. This condition triggers a warning message of Sure your telephone no is right?. This is an advisory message only, so there is nothing to stop you dialling the same number again.

Select your number and press the return key to go to the next menu.

Intelligent coding mode?

As pointed out in previous articles, this facility allows you to reprogram the modem. Nothing has been implemented apart from a flag included in the software. The flag may be used to divert the flow of the program to a user-written routine but at the moment, whether you select the coding mode or not, it makes no difference to the modem.

After answering this question, the software will display all your selections and ask you Do you wish to change?

Typing y will go back through the selecting procedure I have just described. Typing n will signify the end of the parameters selection. The modem will jump to the command mode and display OK on the screen.

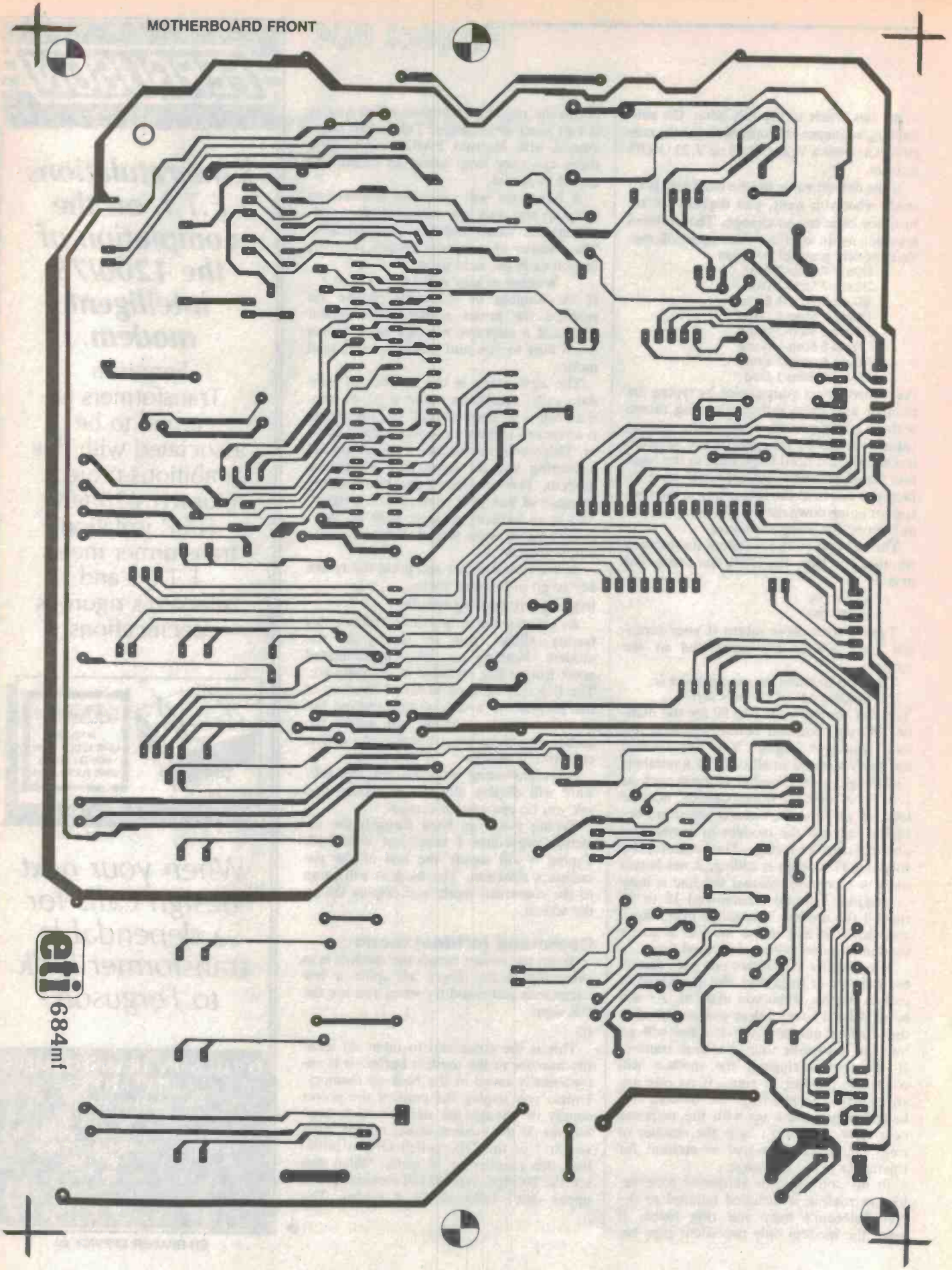
Command (offline) mode

OK on the screen means the modem is in command mode. There are quite a few commands you could try when you see the OK sign.

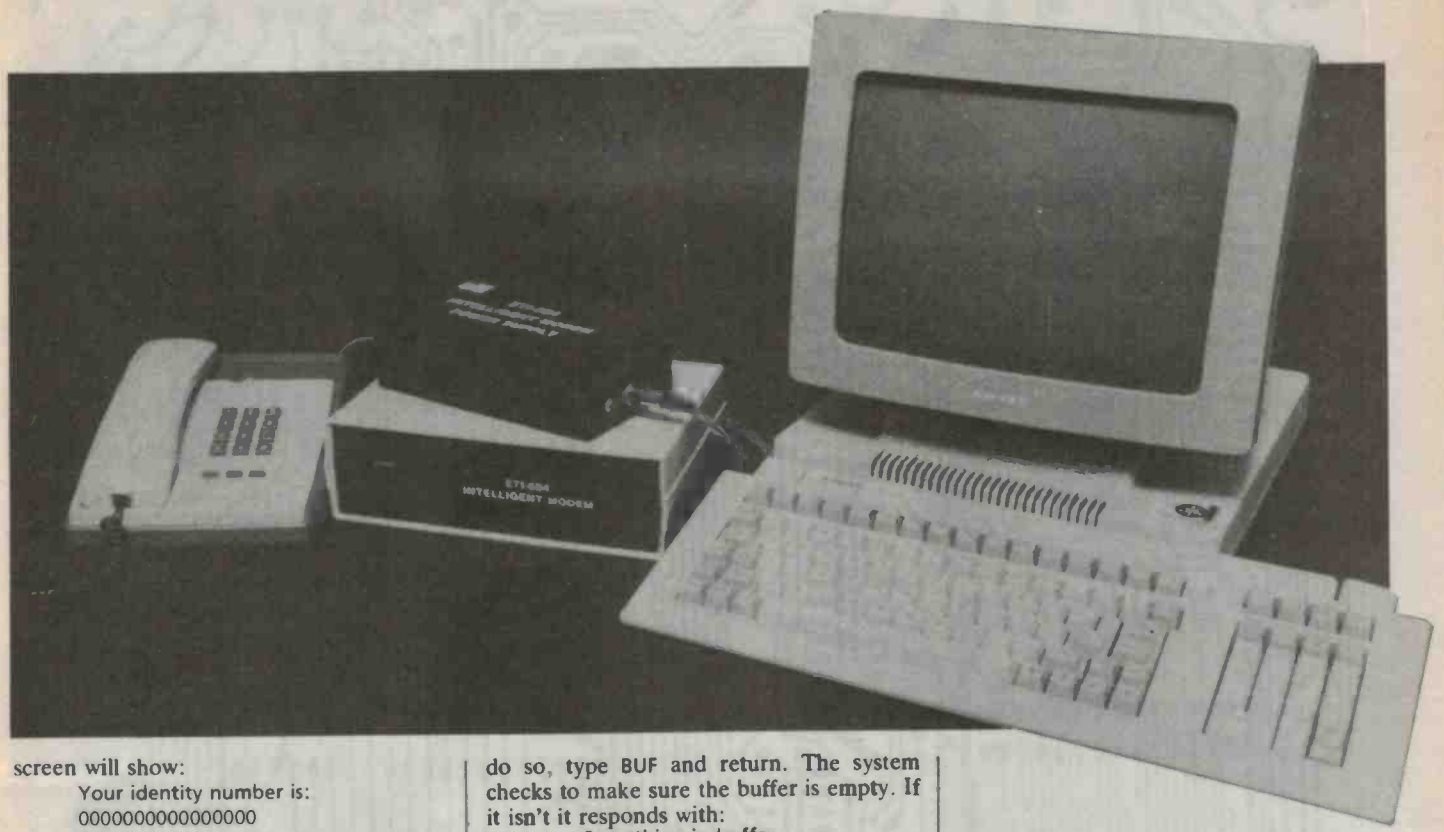
ID

This is the command to input an identity number to the modem buffer. It is automatically saved in the back-up memory. Unless you unplug the cord of the power supply or change the number, it is kept forever. If the modem wakes up and finds switch 4 of the DIL switch ON, it initialises this number to 16 zeros. When you see the OK sign, type ID (all commands are upper case) followed by a return. The

MOTHERBOARD FRONT



eti 684mf



screen will show:

```
Your identity number is:
0000000000000000
Do you wish to change?
```

The number may be any alphanumeric combination up to and including 16 digits in length. Use the return key once to terminate your input. The system will respond with:

```
Verify?
```

As before, enter n for returning to command mode and y to cause the system to display the number.

CSO, CSF

Turns the tape recorder on or off by toggling the remote pause line.

BUF, NEWS and SENDF

These are the three commands necessary to handle the buffer. When you turn on the terminal (with switch 4 turned off), the modem will check to see if any messages have been sent to the buffer from the line. If there are, it displays:

```
You have news
OK
```

To see the message, type NEWS and it will be displayed continuously until the end. Hit the return key once if you want to look at the message again or q (lower case) to quit the news command. It responds with:

```
Erase?
```

Type y to erase and n to keep it in the buffer. If you want to interrupt the display press the control and S keys together (control S). This stops the screen scrolling giving you two options: you can either quit by typing q or restart the display by control Q. Other keys are ignored.

However, the buffer can also be filled from the terminal under your direction. To do so, type BUF and return. The system checks to make sure the buffer is empty. If it isn't it responds with:

```
Something in buffer
Are you sure?
```

n sends you back to command level. Responding y prompts the next query:

```
Echo?
```

This causes output from the keyboard to be displayed on the screen. If you answer n you will have to type blind.

Either way, you can use this facility to fill the buffer. To end, you must send the modem control Z. Then, after you have established a call, the contents can be sent to line using SENDF.

To use SENDF, you must first offline the modem using +++ so as to send the command to the modem and then wait. The modem will automatically send the contents to the buffer down the line. When it encounters the control Z it will stop transmitting and return to control mode with a beep.

SENDI (send identity)

This command will send out your prestored identity number automatically and return to the command level. There is a similar option in the dialling command, but with a big difference. With the SENDI command, the identity is sent out regardless of what is happening at the other end. The command must be input manually to the modem in the offline (command mode). A typical way to use this command is when the bulletin board or the bank computer tells you to input your identity or transaction number on the screen. To operate you offline the modem with the +++ command and type SENDI (followed by a return) to send the transaction number. You can get back to online with the ATO command.

KILL

This is the log off command. The software will hang up the phone and check if there is anything stored in the buffer. If there is, it comes up with the message:

```
Something in buffer
Are you sure?
```

If you want to keep the buffer contents, type n then simply turn off your terminal.

If you respond with a y, the system will generate a short delay time (a few seconds) before it shuts down the power supply.

There is, however, one catch. A terminal with a DTR line connected to the modem will not allow shutting down the power supply if the terminal stays on. You must turn off your terminal within a specific delay period (a few seconds) generated by the software. This is done because the turn-off spike from your terminal may retrigger the modem power supply.

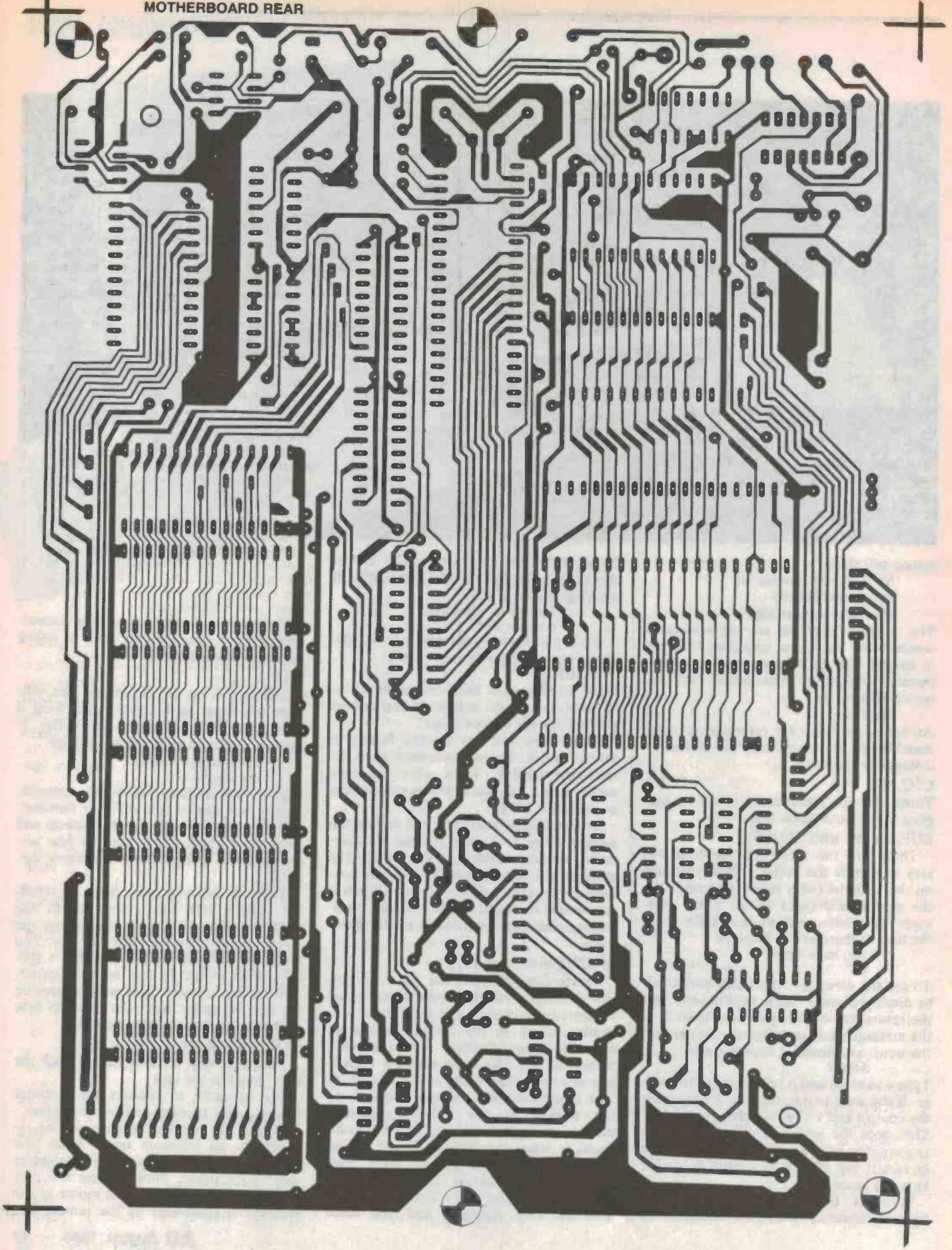
PYBK (playback from tape)

This command controls playing back the files stored in the tape.

It's advisable to connect the recorder before power is connected to the modem.

Adjust the playback volume on the recorder to an optimum level. What that should be is hard to say, since recorders vary. Experiment. Now depress the play button on the recorder. The motor in the recorder is controlled by the remote and ▶

MOTHERBOARD REAR



should be stationary at this stage. Go back to your terminal and use CHDF to change the modem protocol to be the same as the message in the tape when it was recorded. Don't use auto baud because the PYBK will come up with a warning message. After you have altered the baud rate and the protocol, return to the command mode and type PYBK followed by a return.

The motor in the recorder should start turning and characters appear on the screen. Any key on the keyboard will terminate the command. The recorder motor is turned off and the system jumps back to the command level.

As soon as PYBK is executed, the software turns the recorder on and waits for the carrier to appear, just as it does when communicating with a bulletin board over the phone. If the tape you have chosen to playback is not of the same protocol or baud rate or there is no recording on it, the modem will display a message of No carrier after 2 or 3 seconds. The motor stops and you are returned to command level.

If the Viatel standard was used during recording in the first place, the message from the tape should keep on scrolling up the screen until the screen is full, then stop. You can look at the next page by hitting the return key or quit the PYBK command by hitting the space bar.

If the Viatel standard was not used during the recording, on playback the message will keep moving up the screen till the end. The software senses the loss of carrier, stops the motor and returns to command mode.

If you want to terminate the playback before the end of the message, simply hit any key on the terminal once.

M0, M1, M2 (speaker control)

The above are all Hayes compatible commands to control the loudspeaker. When the modem wakes up the default is M1. With M1, the loudspeaker is normally off. It automatically turns on when you want to dial out, so you can actually hear the dial tone, ring tone, etc, from the loudspeaker. It stays on until the carrier is detected, then turns off automatically.

To keep the speaker off all the time, type M0 followed by a return. M2 will keep the speaker on.

Q0, Q1 (Response Message Control)

Q0 enables the sending of the response message to the monitor and Q1 disables the response messages. The default is Q0.

ATH (hanging up)

This command is used to hang up the line. Note that with the hardware arrangement, hanging up the modem means the line is connected back to your phone. If you pick up the handset on the phone before you type the command you will hold onto the line.

PARALLEL CONNECTIONS

This box discusses all the different situations which might occur after you have installed the modem in parallel with your phone.

CALLING OUT

Just pick up the handset as usual, wait for half a second and dial the number. The modem will wake up and the LED on the power supply go out. Ignore the modem completely because after a short while it will return to standby by itself.

ANSWERING

There are four possible situations that might occur when your phone rings. If you answer the phone before the modem you might either encounter a human voice or a carrier tone on the line. If it's a voice call, the modem will automatically return to standby after a short while. If instead a tone is heard, you have to alert the modem. There are two similar ways of acheiving this depending on the hardware set-up. If you have a DTR line connected to the modem from your terminal, simply turn on your terminal and hang up the phone. The ETI-684 immediately goes into handshaking mode. Just wait until you see the message 'Carrier detected!!' on the screen. If there is no DTR line, turn on the terminal quickly and type any key on the keyboard once. Again, just wait until you see the carrier message.

If the modem answers the phone itself, it assumes no one is at home. The modem first sends out the echo suppressor tone (2100 Hz) followed by the Mark carrier tone for the CCITT standard you set in the modem. In the case of auto baud, the modem will send out the V.21 ANSW Mark tone for about 10 seconds then the V.23 ANSW Mark tone for 10 seconds. If no carrier is detected, the modem will switch off its own carrier tone and turn on the cassette recorder. If you leave your recorder REC and PLAY buttons depressed before you leave the house, you now have a telephone answering machine. This saves you $200! Anyone who rings up can start to talk as soon as the carrier tone on the line stops. Notice that this is not a proper answering machine, since you can't set a message. Still, it will work well for people who know your system. As soon as the ETI-684 senses a silent period of about 20 seconds, the modem stops the tape recorder, hangs up the line and returns to standby.

If a valid carrier is detected during the handshaking period, the modem sends a message 'No operator around' to the other end. Any character sent from the other end will be put into the RAM buffer. Your modem will hang up if there is a loss of carrier (because the other end has hung up) or if it receives a control Z character which signifies the termination of the message. In order to keep the RAM buffer energised to save electronic mail, your modem will not return to standby after hanging up.

ATO (go to online)

Quite often you have to offline the modem to command mode to execute commands. One example is the SENDI command. To get back to the online mode, type ATO followed by a return.

+++ (go to offline)

The opposite of the above command, it is used to leave the online mode. Do not type anything on the keyboard for 1 to 2 seconds. Type +++ three times consecutively and wait. The OK sign should come up on the screen and you are back to offline (command) mode.

Note that it is important to wait. The software expects a pause before and after +++, so it does not confuse the command with three plusses in the text.

A/ (redialling command)

In the ETI-684, this standard Hayes Command is only for repeating the dialling command, not any last command. Whether the last command was a dialling one or not, it still redials the last telephone number supplied.

The redial command will echo the number on the screen before dialling, so you know what's going on.

ATD (dialling command)

This is another standard Hayes command for dialling. The general format is as show below:

ATDn,n.n.nnnnnnkkk (return)

ATD is the dialling command; n represents one digit in the telephone number; kkk are the options. A comma between the digits will cause the software to check for the dial tone. A full stop between the digits will generate a pause before dialling the next digit. Any illegal characters are ignored. The dialling process can be terminated by hitting any key on the terminal.

Options:

M

Stands for manual tone detection. It is useful if you are dialling through an internal PABX or to overseas where the tones may be quite different from an ordinary exchange.

When this option is used, the loudspeaker is turned on after dialling the last digit, regardless of the status of M0. You should be able to hear the tone from the line through the modem speaker. Hit the space bar if you want to hang up. If the line is ringing, you should wait until the other end offhooks its line. As soon as you hear the answering carrier, hit the return key to trigger your modem into handshaking mode. The modem sends out its carrier tone and waits for the valid carrier to be sent back from the other end. This carrier detection period is about 30 seconds to allow enough time for the other modem to auto baud.

You could, if you do not want to wait, terminate this carrier detection period, ▶

TERMINAL

RESET

POWER REMOTE RECORD PLAY

LINE

hang up the line and return to command level by typing any key. If there is valid carrier on the line, the modem will come back with a message Carrier detected!!, and go to online mode. If no valid carrier appears at the end of 30 seconds, a response message of No carrier is displayed and the system returns to offline mode.

Note that if M is not included, the software will go to automatic tone detection routine. If it finds busy, it redials the number of times you pre-defined. If it finds ring tone, it waits for five more rings than the number you set for the ringing period and automatically jumps into its handshaking mode if the other end offhooks the phone before the waiting period expires. If the other end offhooks the phone but the modem does not receive a valid carrier signal within 30 seconds, the modem hangs up and redials automatically.

B

This is an option to transmit what is in the buffer after the carrier is detected. It echos every character transmitted onto the screen for verification. The last character, control Z, in the buffer will also be transmitted before the system returns to the command level without hanging up.

R

This is an option for the V.21 standard. If you selected Tx-300 Rx-300 from the main menu and dialled out without the R option, the system will put itself into V.21 ORIG mode. Including R in the dialling command will cause the modem to put itself into V.21 ANSW mode as soon as the handshaking sequence starts.

#

This is the option used with the dialling command for automatic transmission of your identity or transaction number.

;

The semicolon is the automatic return to command mode. However, note that # has a higher priority than ;. It will be executed before the ;. For example if you have options ;#B in your dialling command (their order in the command does not matter), the software will first check for the valid carrier, wait for the ENQ from Viatel, then send the identity number and the content of the buffer. Finally the software executes the ; option and returns to command mode.

Example

The following is an illustration to set up the parameters in your modem and call Viatel from an internal PABX with automatic tone detection and identity transmission.

```
Type CHDF <CR> for changing the default
     parameters to;
Tx-75 Rx-1200
Data-7 Stop-1 Even
DTR (ON or OFF) depending on your set up
Ringing period 10
Number of busy redial 2
Number of non-data call 2
Intelligent coding mode n
```

Here is another example in which you call up a friend using manual tone detection without automatic transmission of identity number.

```
OK
Type ATD123456m; (cr)
```

Hit the return key as soon as the other modem offhooks the line. Wait until the message Carrier detected!! shows up on your screen. Then you should see another OK displayed to indicate the system has jumped offline. Type the command SEND <CR> to go back to online if more communication with your friend's modem is desired. Type ATH <CR> if you want to hang up and terminate the call. To log off, just input KILL <CR> and turn off your terminal. ●

REMOTE TAPE RECORDING

A special routine is implemented in the modem software to detect a standard Viatel escape control sequence for storing data on tape. Every character received by the modem from line is checked to see if it is an ESC character (hex 1B) . The first ESC character will alert the software to check the next incoming character from line. It is expecting the next character to be either a 5 (35H), a 6 (36H) or a 7 (37H). If the next character is none of these, the modem will transmit the ESC and the following character to the terminal. Effectively, the modem is transparent to any other escape control sequence except the tape recorder one.

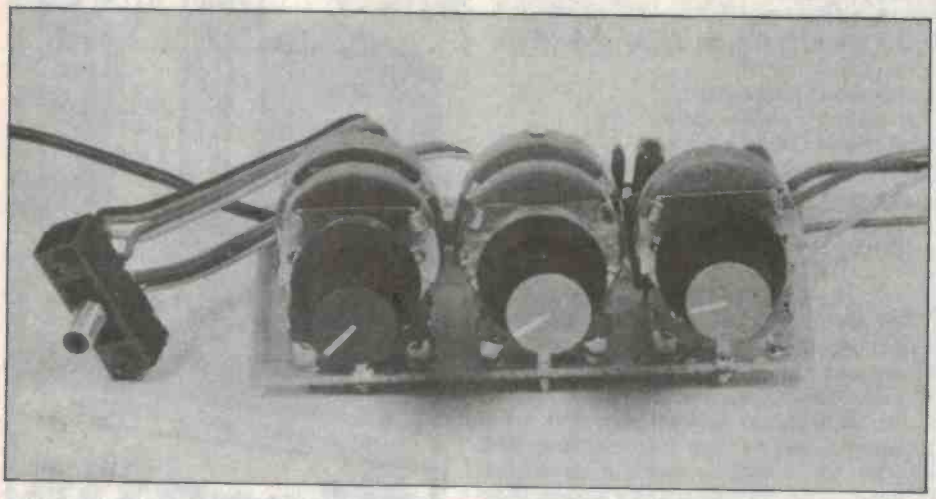
Character 6 tells the modem software to turn on the tape recorder. Provided your recorder is plugged into the modem and has its record and play button depressed, the software starts the motor for recording. Viatel will not send anything down for about two seconds. During this time, all you are recording is just the Mark carrier. This is useful during the playback mode to allow the system to have enough time to detect the carrier before any message appears. A page of information is then downloaded onto your screen as well as into the tape. At the end of the page, Viatel sends ESC followed by character 5.

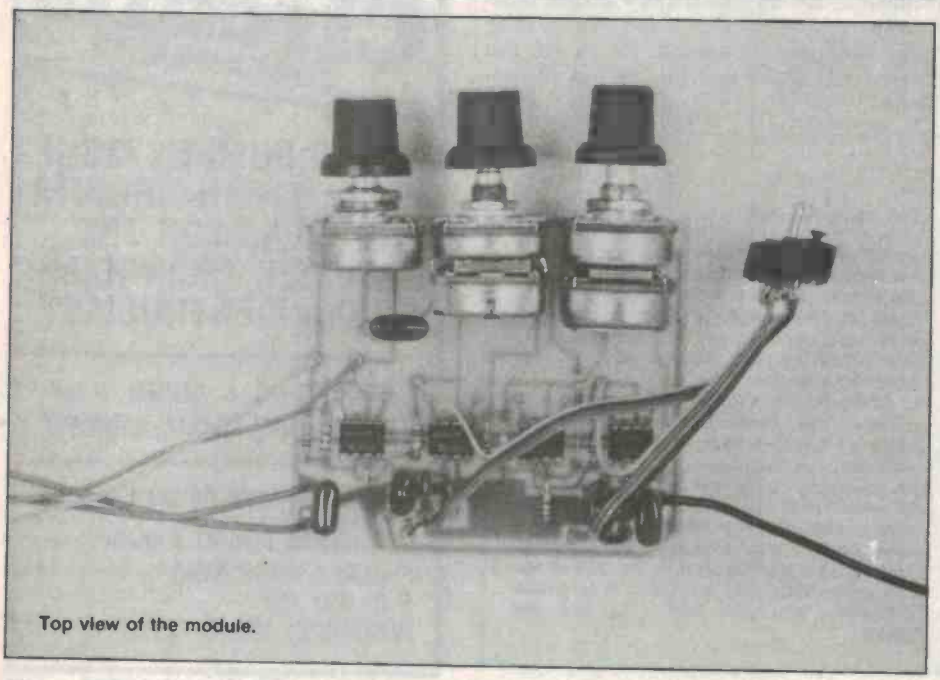
Character 5 causes the recorder to pause. The modem software actually achieves that by turning off the motor in the recorder. Another page of information can be requested by the user if # is typed. Viatel sends ESC followed by a 6 to start the motor, waits for two seconds before commencing the second page of downloading. This process carries on until the end of the last page. Viatel will send ESC 5 to pause the motor and then ESC 7 to stop the motor.

PARAMETRIC EQUALISER

Does your music system want a new frequency response? Does your guitar or keyboard need some equalisation to brighten the sound? Well, here is a module which can be used by itself on individual instruments or ganged to equalise your music system.

Neale Hancock





Top view of the module.

GRAPHIC EQUALISERS are widely used and accepted by audio enthusiasts as a means of correcting the acoustic deficiencies of a listening space. They are also used (probably by the majority of us) to make a stereo system sound better, by making the bass thump and adding more sparkle to the treble. The graphic equaliser is one way of optimising the frequency response of a music system to give our ears what they want.

Equalisation is not a process solely used in hi-fi applications. It's also used in public address systems as a way of eliminating feedback and in recording studios as a way to give an instrument a desired sound. In recording situations the parametric equaliser is a very versatile instrument, because it can be cascaded to give overall equalisation of a recording or used individually on separate instruments.

Both graphic and parametric equalisers use active bandpass filters to achieve equalisation. But whereas graphic equalisers use a number of preset bandpass filters called 'gyrators' (one for each slider on the front panel), parametric equalisers are tunable bandpass filters. This use of tunable bandpass filters in parametric equalisers allows each band to be more effective, thus reducing the number of bands required. And the increased efficiency allows a multiband parametric equaliser to be modular in design, with one bandpass filter in each module, making it more versatile than the graphic equaliser in the studio.

However, the ETI-1406 parametric equaliser module is designed to be used in any application where equalisation is required. These modules can be used independently or connected in series to form a multiband equaliser. The unit requires a signal of 100 mVrms line level or greater (up to 700 mV) to drive it, and runs from a ±15 volt supply. Casing details are left up to the user.

FREQUENCY RESPONSES (see text).

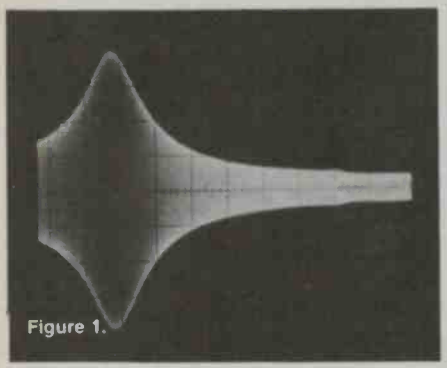


Figure 1.

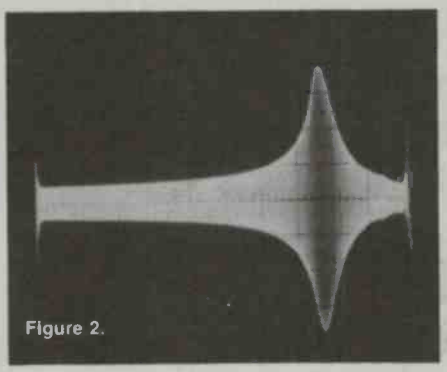


Figure 2.

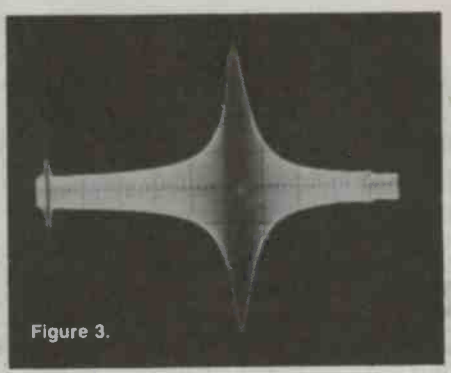


Figure 3.

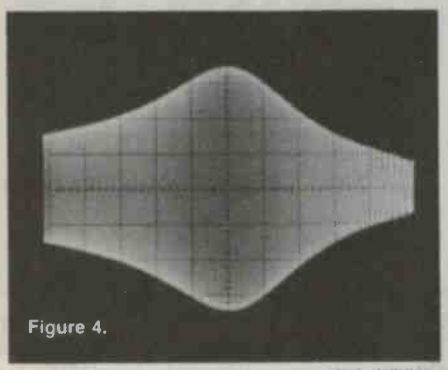


Figure 4.

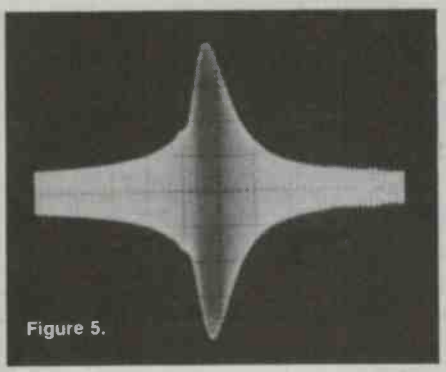


Figure 5.

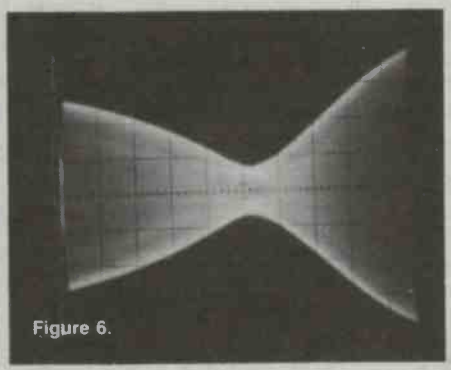


Figure 6.

TABLE 1. PERFORMANCE OF ETI-1406

Range of centre frequencies	20 Hz to 19 kHz	Continuously adjustable
Range of Q	1 to 10	
Cut	−23 dB	
Boost	+18 dB	
Roll off	15 dB/octave	
Dynamic range	100 dB	measured at maximum gain and maximum Q
S/N ratio	90 dB	measured at maximum gain and maximum Q
Distortion	0.005%	measured at maximum gain and maximum Q

Measured at 1 kHz and a signal level of 500 Vrms.

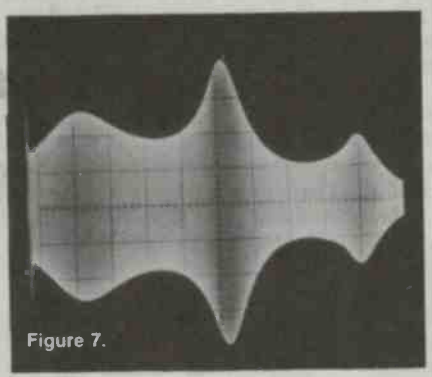


Figure 7.

Circuit concepts

As I mentioned earlier, the parametric equaliser modules consist of tunable active bandpass filters. To make a bandpass filter tunable, parameters such as centre frequency, bandwidth and the amount of cut and boost are made adjustable. Graphic equalisers have the centre frequency and width of the band preset, with only the cut and boost variable.

The accompanying series of photographs shows the effect on the frequency response of changing the tunable parameters. All the photographs show the same range of frequencies being swept, with the lower frequency on the left (2.6 kHz) and the higher frequency on the right (7.5 kHz).

Figures 1 and 2 show the effect of shifting the centre frequency of the parametric equaliser. Figure 1 shows the parametric equaliser set on a high frequency which would result in a boost of the frequencies around the peak. Figure 2 shows it set to a lower frequency.

Figures 3 and 4 illustrate the effect of increasing or decreasing the width of the passband. This is also referred to as the Q. In Figure 3 the circuit has a high Q, thus a narrow range of frequencies around the peak is emphasised. Figure 4 has a low Q and shows a broad range of frequencies being emphasised.

Figures 5 and 6 show boost and cut of the range of frequencies. In Figure 6 the signal was amplified vertically so that the cut could be more closely observed.

The circuit for the parametric equaliser is based on a state variable filter circuit. This type of filter features low pass, high pass and bandpass outputs. They are also capable of providing a high Q and they can be readily tuned.

To convert a state variable filter into a parametric equaliser, the circuit has to be modified to so that its Q, centre frequency and gain are all variable. Q can be varied by replacing the pair of resistors used to set it with a dual-ganging potentiometer. The centre frequency can be tuned by using a switch to select the range and a dual-ganging potentiometer to tune the centre frequency of the filter within that range. The range is selected by switching in different capacitor values and the dual-ganging potentiometer replaces the resistor pair used to set the centre frequency.

To enable the filter to have variable gain or attenuation (boost or cut) at the centre frequency, a gain stage is added to the state variable filter circuit. This gain stage allows the filter to have bandpass or band reject characteristics.

The circuit has been designed using high performance op-amps, such as the NE-5534AN and the TL-071. Of these two op-amps the NE-5534AN gives the best results for noise and distortion, but at a higher component cost. The specifications for the ▶

circuit using NE-5534AN op-amps are listed in Table 1. The circuit can also use the good old 741 op-amp, however higher levels of noise and distortion can be expected when using this device.

Construction

Commence construction by examining the pc board for broken tracks, and bridges between tracks. The first components to be mounted are the resistors, capacitors and the link. Next mount the ICs, but first check their orientation with the overlay. To supply the voltage rails of the modules, the +15 and −15 volt power supply is used. The ETI-581 dual power supply would be ideal in this case.

To keep the number of flying leads in the project to a minimum I have used pcb-mounting pots. The only hassle involved in using these pots is that you may need to drill 2 mm mounting holes in the pc board to accommodate their pins. After the mounting holes have been drilled the pots can be mounted on the board.

The triple-throw toggle switch can now be connected to the pc board. The best way of connecting the switch is to use ribbon cable as it makes the wiring neater and simpler. Try to obtain the thicker gauge cable as it is easier to work with in this case.

The wires connecting the input and output sockets and the power supply to the pc board can now be connected. It is best to leave these connections until you have decided what case to use.

The type of case used to house the parametric equaliser depends largely on how you want to use it. For instance, if you use a single module as an independent unit, it should be housed in a case by itself. However, if you are constructing a multiband parametric equaliser or integrating the modules into a music system, you will have to drill out your case to suit.

The component overlay shows the purpose of each pot, and what frequency range is selected by each position on the triple-throw switch. The overlay also shows how to connect the modules in series, using switched 3.5 mm or 6.5 mm phono jacks, to create a flexible multiband parametric equaliser. The use of switched jacks between each module allows them to be used independently.

Using it

When using individual parametric equaliser modules to modify the sound of a musical instrument, first set the Q control to the centre position, the frequency range selection switch to its centre position and the cut/boost control either fully clockwise or fully anticlockwise.

Play a sustained note (preferably middle C) and turn the centre frequency control until you hear the sound of the note change. If the cut/boost control is turned fully anti-

HOW IT WORKS — ETI-1406

As mentioned in the text, the circuit is based around an active state variable filter. The op-amps in this filter are ICs 1, 2 and 3. The output from IC1 is high pass, the output from IC3 is low pass and the output from IC2 is bandpass. The output from IC2 goes into the gain stage, which consists of IC4, R6, R9 and RV3.

The centre frequency of the parametric equaliser is determined by resistors RV2, R5 and R10 and capacitors C2 and C7. The frequency range is selected by switching in a pair of capacitors using a dual-pole triple-throw switch, SW1. The frequencies within the range are determined by the resistor pair R5 and R10 with the dual-ganging potentiometer RV2. The equation which sets the centre frequency, fc, is:

$$fc = 1/2\,(RV2 + R5)Cx$$

where Cx can be C2, C3 or C4.

This equation could also be written using R10, C5, C6 and C7 since all these components are the matching pairs of those in the equation.

C2 and C5 select the frequency range of 2 kHz to 20 kHz, C3 and C6 select the range 200 Hz to 2 kHz and the pair C4 and C7 selects the range 20 Hz to 200 Hz. The frequencies within the ranges are obtained by using a dual-ganging potentiometer RV2.

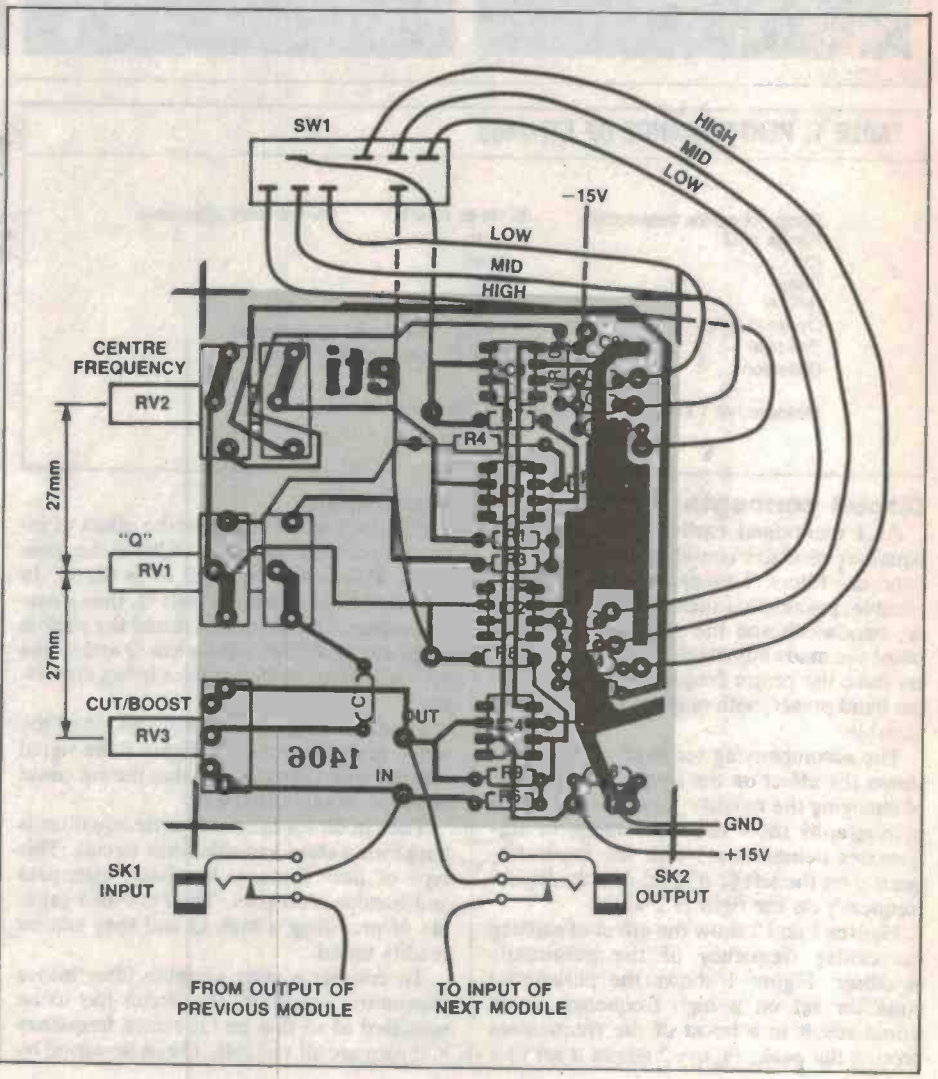
The highest frequency in the range is obtained when RV2 is turned fully clockwise, making RV2 equal to zero in the equation above. Therefore, R5 and R10 set the high end of the frequency range. When RV2 is turned fully anti-clockwise its value is equal to 100k in the equation above, thus setting the low end of the frequency range.

The Q of the parametric equaliser is set by the combination of R2, R4 and RV1. The equation used to determine the Q of a state variable filter is as follows:

$$(R4 + RV1)/R2 = 3Q - 1$$
$$1 + (R4 + RV1)/R2 = 3Q$$
$$(1 + (R4 + RV1)/R2)/3 = Q$$

By substituting in the values of R2 and R4 as well as the maximum and minimum values for RV1, a maximum value for Q is 10 and a minimum value for Q is 1.

The gain stage gives the parametric equaliser circuit the ability to cut or boost the frequencies to which the filter is tuned. RV3 gives control over the amount of cut or boost while R6 and R9 set the overall gain of this stage. The capacitors C8 and C9 are there to remove high frequency noise from the supply rails.



PARTS LIST — ETI-1406

Resistors ..... all ¼W, 5%
R1, 7 ..... 100k
R2 ..... 3k9
R3-6, 8, 10 ..... 10k
R9 ..... 22k
RV1, 2 ..... 100k dual-ganging linear with pc mounting pins
RV3 ..... 10k linear with pcb mounting pins

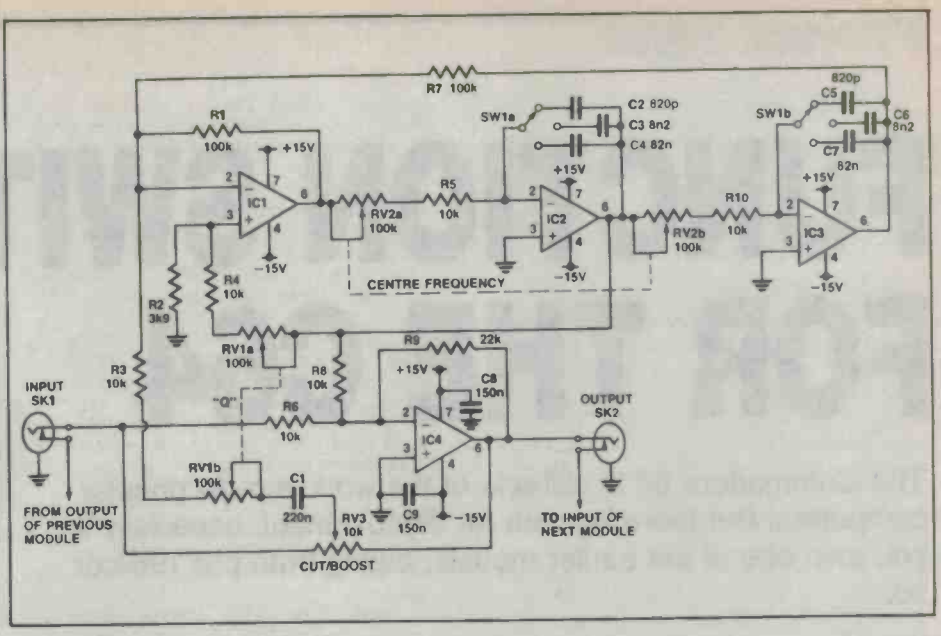
Capacitors
C1 ..... 220n greencap
C2, 5 ..... 820p ceramic
C3, 6 ..... 8n2 greencap
C4, 7 ..... 82n greencap

Semiconductors
IC1-4 ..... NE-5534AN or TL-071 (see text)

Miscellaneous
ETI-1406 pc board; 3 x potentiometer knobs; 2 x switched phono sockets; dual-pole triple-throw switch; hookup wire; case to suit.

Price estimate: $22-$33*

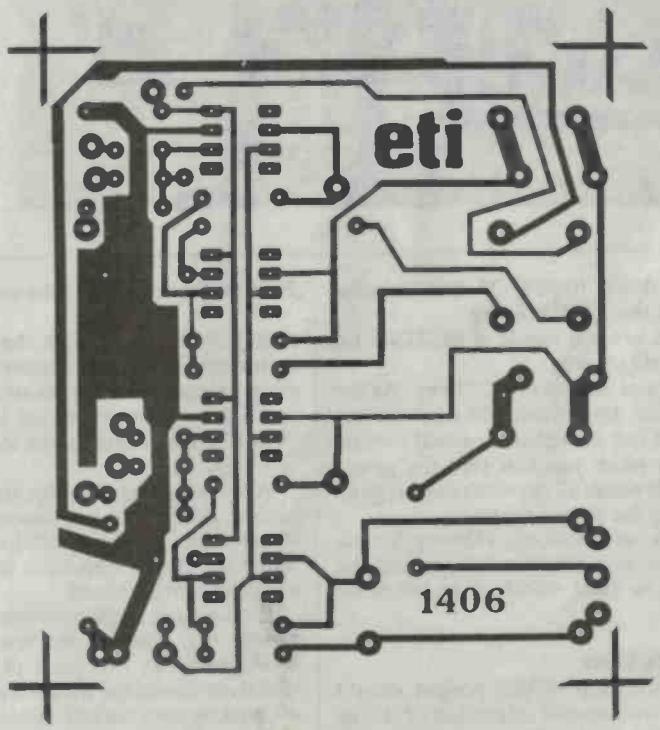
*The lower figure corresponds to the circuit using TL-071s.



clockwise, the effect will be a dulling of the note, alternatively the sound will be brighter if the cut/boost control is turned fully clockwise. By turning the Q control clockwise the range of notes dulled or brightened will be reduced. When it is turned anticlockwise the range of notes will be increased.

A good multiband parametric equaliser can be created by using three or four modules in series. Using such a multiband equaliser on orchestrated music would require a similar procedure to that outlined above. The only differences are that the input into the equaliser is different and that there are more bands to tune.

When using a number of modules in series each one increases the gain and the Q of the system. Make sure that the first module in the system does not have a high gain or Q; this applies to a lesser extent to each successive module. If the gain or the Q of the system is too large the result will be excessive distortion of the musical signal. ●



FUNCTION SWITCHES FOR THE C64

The Commodore 64 is still one of the world's most popular computers. But there is room for improvement, especially if you own one of the earlier models, dating from pre 1984 or so.

Jeffrey Rose

From the top it looks just like a bought one.

AFTER STUDY OF the workings of the C64 circuit, it was found that function switches could be added to enhance the C64's operation, so that only one switch need be pressed to initiate a command to the computer.

The LOAD switch will cause the screen prompt LOAD . . . PRESS PLAY ON TAPE to appear. This means that by pressing the play button on the datasette you can make the program self-load and run ready for use. The normal sequence of events is to type in LOAD, PROGRAM NAME after which the screen prompts: PRESS PLAY ON TAPE. The C64 finds PROGRAM NAME and loads the program. You type in RUN hit the return key and the program is now ready to use.

The AUTOLOAD function makes short work of all that, by replacing it with one key stroke.

Next we have the MR switch. When pressed, the computer will operate as if you had held down RUN/STOP and simultaneously hit the RESTORE key.

The GRS key is a mimic of RESTORE for games cartridges only.

Last but not least is the CSU key. As the name implies, this switch will reset the entire C64. In fact it duplicates a cold turn on as happens when you first turn the power switch on. It clears all previous data without interrupting the power supply.

Normally, at switch on, U20 toggles the reset line so as to initialise all parts of the machine. The GSU switch does the same thing.

Construction

The construction of this project should commence with careful inspection of the pc board, looking for hairline cracks in the foil or miniscule short circuits. Once you have satisfied yourself that your board is ready to assemble, start with the resistors, followed by the diodes, paying particular attention to their polarity. Next place the capacitors in their respective holes. Observe CMOS handling procedures when mounting both IC1 and IC2 and note where pin 1 is located on both ICs. Do not solder the four switches at this stage.

After removing the three frontal securing screws, gently lift the keyboard to reveal the rf cover foil. Unclip the foil and gently remove the 20-pin connector from the main computer circuit board.

Now we are ready to commence wiring. Mostly it is done on the rear of the keyboard with the exception of three wires, which are connected with pcb pins and sockets directly onto the left corner of your C64.

The following connections need to be made:

(a) The violet wire from (A) goes to the right hand end of R50 (1M) on the C64 pcb.

ETI-1602 — PARTS LIST

Resistors.....all ¼W, 5% unless noted
R1, 9, 10, 11, 12, 13, 14 .....82R
R2, 4 .....10k
R3 .....470k
R5, 6 .....100k
R7, 8 .....1k

Capacitors
C1 .....1µ, 63 V ceramic
C2 .....22µ 10 V electrolytic
C3 .....47µ 10 V electrolytic

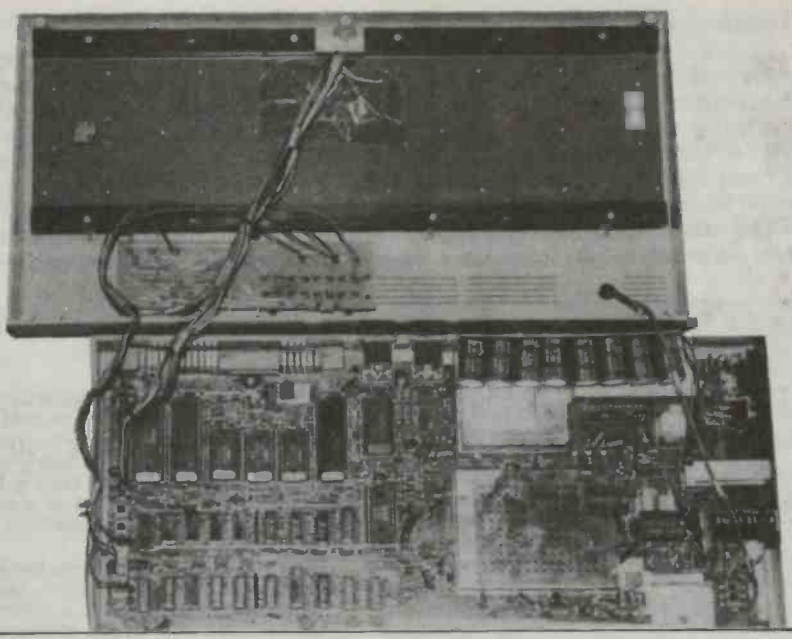
Semiconductors
D1, 2 .....1N4148
IC1 .....HEF 4001 BP quad NOR gate
IC2 .....HEF 4066 BP quad bilateral switch

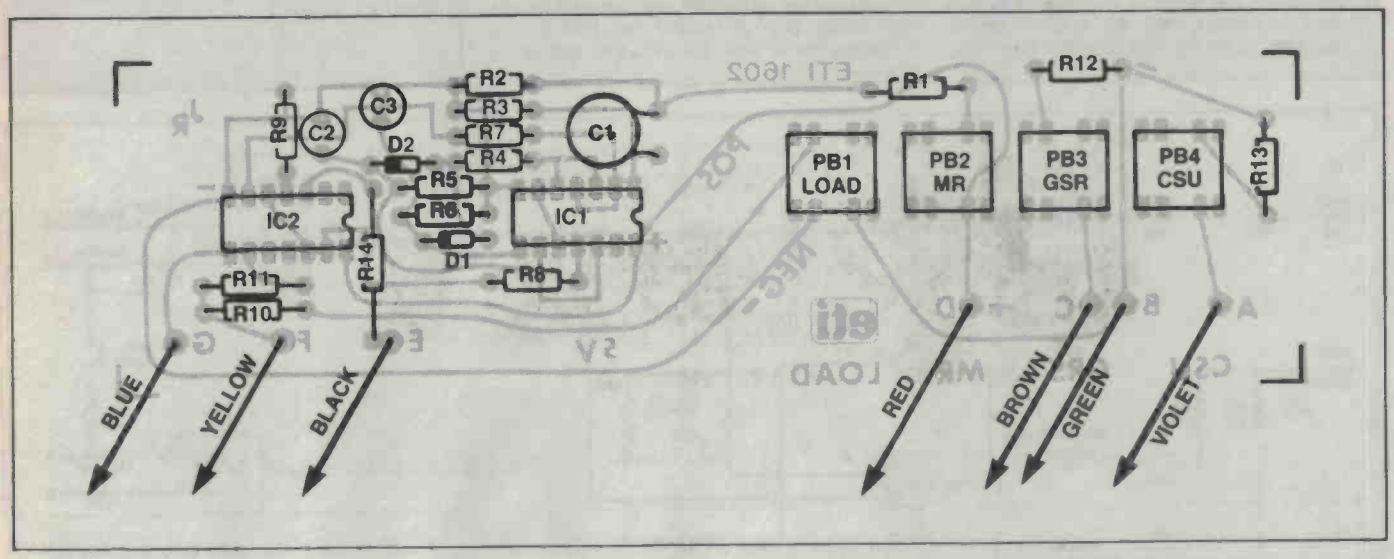
Miscellaneous
PB1-4 .....The prototype used Unimec modular switches composed of part nos 15.500, 16.310, 16.300, 16.413 and 1 x matrix board.

ETI-1602 pc board; 3 x male pcb pins; 3 x female pcb connectors to suit male pins; 3 x cable ties; blue, yellow, black, red, brown, green, violet hookup wire.

Price estimate: $18-$20

Wiring. From the solder side of the module pc board, three wires land on the left of the Commodore pc board, and four go into the keyboard wiring loom.





(b) The green wire from (B) goes to wire 1 (white) on the keyboard loom which is 0 V.
(c) The brown wire from (C) goes to the right hand end of R41 (1M) on the C64 pcb.
(d) The red wire from (D) goes to the left hand end of R33 (47k on the C64 pcb, = +5 V).
(e) The black wire from (E) goes to wire 3 (black) on the keyboard loom.
(f) The yellow wire from (F) goes to wire 9 (yellow) on the keyboard loom.
(g) The blue wire from (G) goes to wire 20 (brown with white trace) on the keyboard loom.

The method employed to secure the wires to the keyboard loom was the strip, solder and insulate method, secured into place with a few cable ties. Remember, that red, brown and violet are the three wires that must have female connectors fitted to slip over their male counterparts attached by solder to the C64 pc board.

The next job is to cut holes in the top of the C64 to accommodate the switches.

You will notice that four vents can be viewed from under the keyboard. The one nearest the Commodore 64 logo was chosen for the cut out. The top vent has five plastic ribs; only four need to be cut and filed, to accommodate the switches. The job was done with fine wire cutters, a sharp mini cutter knife and a safe edge file.

To begin, measure and mark out on the top side, scoring the four ribs of plastic with the fine cutter knife very carefully. Take your time scoring until you have cut through to the inside, then use the cutters to nibble bit by bit till the hole is almost to size. Finish off the job with the file.

Since the switches are made to order, so to speak, I chose brown surrounds with yellow pushbuttons, for aesthetic reasons only. There are many other colours available from the supplier.

Before you assemble the switches, take time out to consider what letters you would like to appear on each individual switch. Use steel wool to prepare each switch. Clean before applying your lettering then coat with a good quality quick drying lacquer to preserve your efforts.

Now that you have your set of four switches mounted in the lid or keyboard you should carefully fit the pc board onto the four switches, then solder into place all pins. Reconnect the 20-way connector along with the three separate red, brown and violet wires to their respective male pins. With all connected, the testing procedure is next on the agenda. ▶

Testing and setting up

First test the LOAD function. This is easily done by inserting a cassette into your datasette, and pressing the LOAD button. The screen will prompt with PRESS PLAY ON TAPE. Do so, and the program should not only load, but run ready to use, a most useful feature.

The second test is MR. This facility can reset the program to the 'just loaded' mode. To run, type RUN/RETURN and the program will re-run itself ready for use. This does not destroy the contents of the RAM.

The third test, GRS is actually a mimic of RESTORE for games cartridges only. When it's pressed, a games cartridge will restart.

The last test is of the CSU. As with turning the computer off, all data is lost, so the same rule applies in cold start ups. ●

Note: as I do not possess a disk drive I have not been able to test any of the functions to see what effect, if any, these functions would have on the disk drive operation.

HOW IT WORKS — ETI-1602

When the MR switch is closed, the network comprised of R1, R2, C1, and R3 causes a 5 ms pulse to be placed on pin 1 of the flip-flop formed by IC1a and 1b, all part of a 4001. Output from the flip-flop drives two inverters formed by the remaining elements of the 4001, IC1c and 1d. Between the output of the flip-flop and the inverters are two RC networks that provide a time delay equal to R times C.

One of the inverters feeds the reset pin of the flip-flop, thus ensuring monostable operation. The effect is to cause both outputs to change state for a short period. However, since the time constant formed by C2 and R5 is shorter than that formed by C3 and R6, when the Q output goes low IC1d will change state before the flip-flop.

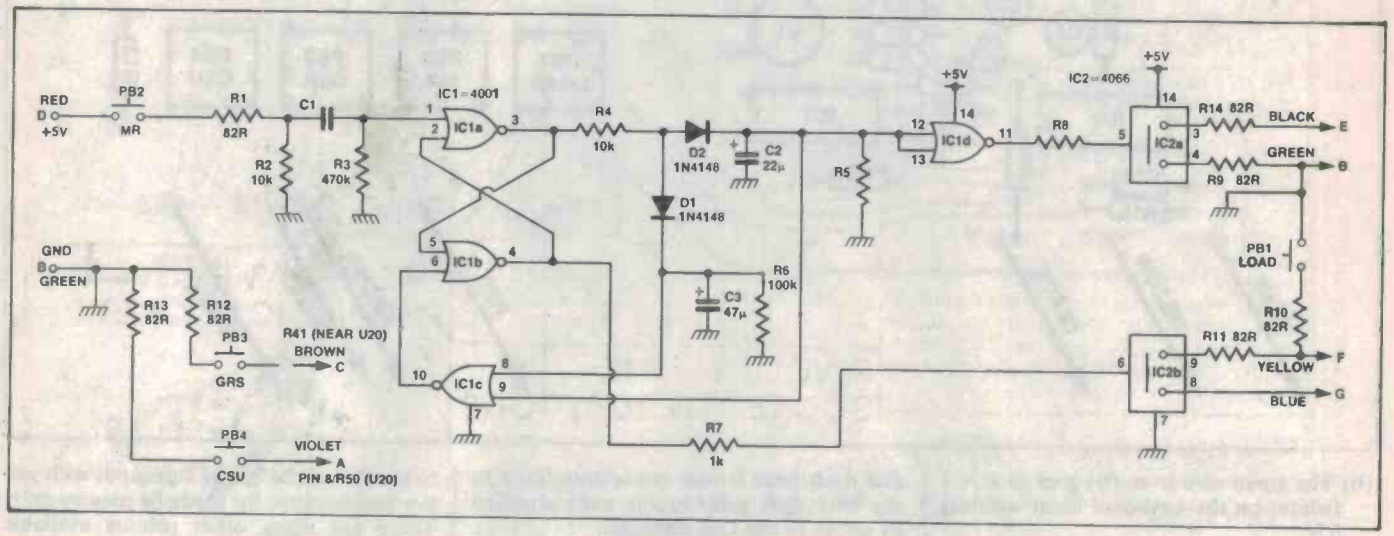
So, the sequence of operation is that IC2b closes, then IC2a closes, then IC2a opens then IC2b opens. This simulates the effect of closing the RUN/STOP and RESTORE keys.

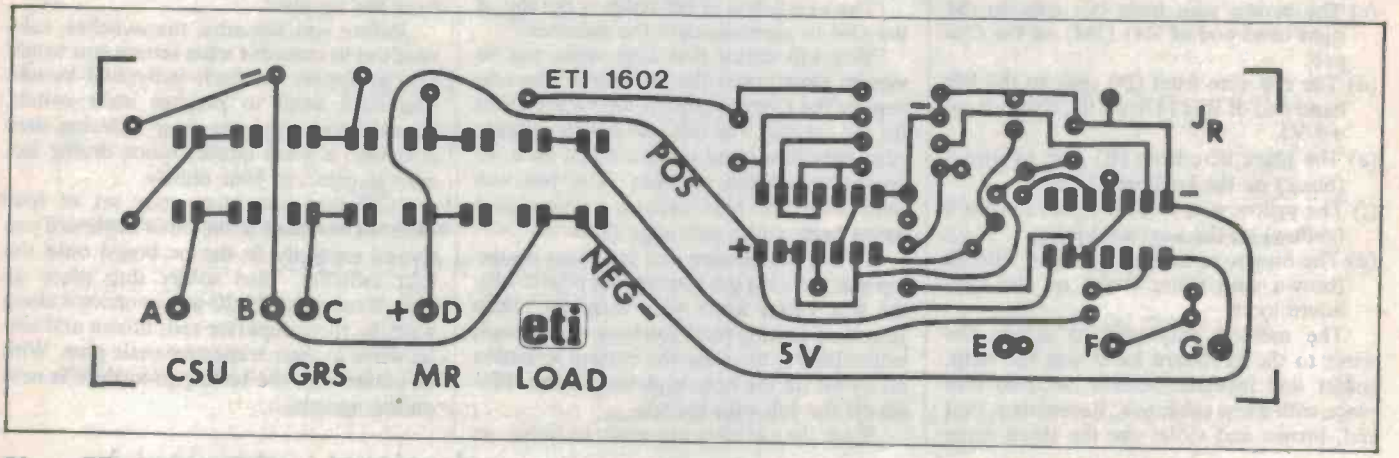
The GRS key operates by grounding the trigger pin of one of the ICs on the Commodore board. This is U20, a dual 555 timer called a 556. The output of this timer controls the non-maskable interrupt of the CPU.

When GRS is closed the NMI line is pulled low in both the CPU and one of the interface adaptors, U2. The effect is to restart any cartridge present in the games port.

CSU, similarly, triggers the other side of U20 which controls the reset line of the computer. This causes the CPU to go to its reset vector, clear all the memories and reinitialises all the ports. The only other way to effect such a complete restart is to turn the machine off.

LOAD pulls PB7, one of the keyboard lines on the computer's C1A, down to ground.





DISK DRIVES

One of the most familiar accessories of the PC is the floppy disk: that thing we stuff into the computer when we want it to work. And this is the story of what's behind that moving magnetic surface of memory.

Phil Cohen

Example of a hard disk.

IN AN EARLIER article I mentioned disk as a medium of storing information — be it programs, text or numerical data — in such a way that the computer could change the stored information at will.

There are two main species of disk: hard disks and floppy disks. Both use the same principles, and differ only in their implementation.

In a hard disk drive ('drive' refers to the machinery that surrounds the disk itself), a disk with a magnetizable coating similar to that found on audio tapes is spun at high speed continuously. A head is held in place close to the disk, and so is presented with a continously moving magnetizable surface.

Like the recording/playback head in a tape recorder, the disk drive head can magnetize spots on the disk, and later read back which spots have been magnetized. In this way, information can be stored on the disk and later read back into the computer.

In order to make better use of the area of the disk, the head can also be moved in and out from the centre, covering as it does so (and as the disk spins underneath it) most of the surface of the disk. There are a limited number of possible head positions for non-overlapping use of the disk area known as 'tracks' (like the tracks on a record).

Sectors

Tracks are further broken up into 'sectors', each a banana-shaped part of the disk area.

Some hard disks have two heads — one on the top of the disk and one on the bottom, doubling the disk capacity (the amount of information that can be stored on it).

Other even more sophisticated systems use multiple disks on a common spindle, with a set of heads which move in and out in a group. Each head is in contact with one surface of the pack of disks.

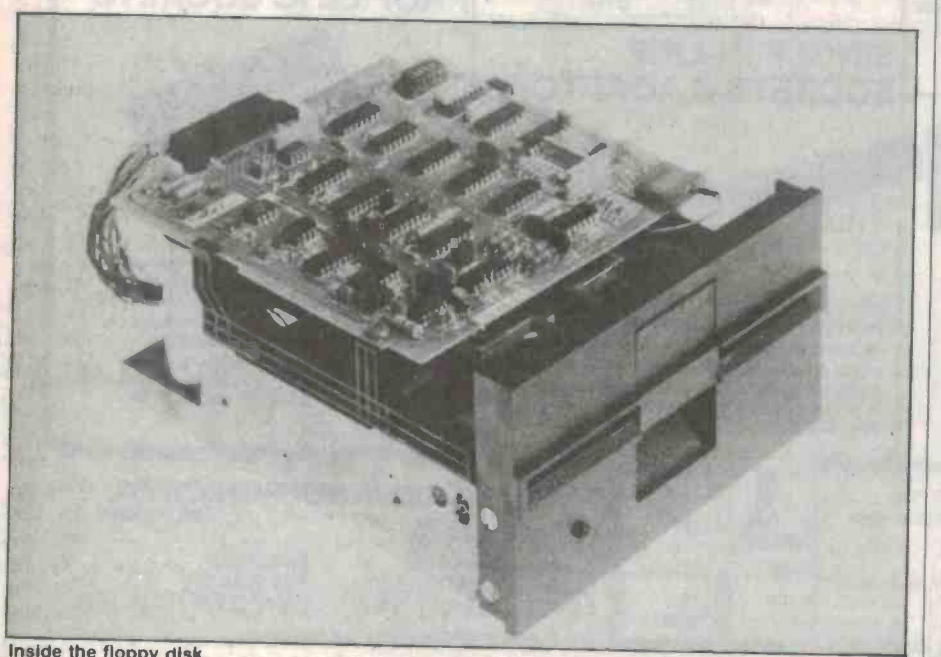
In most cases, the disks are fixed inside the disk drive and cannot be removed, making the hard disk (sometimes known as a 'fixed disk') a place inside the computer where a large amount of information can be stored — and remembered when the computer is turned off.

Other, larger designs feature a combination of fixed and removable disks, so that part of the disk pack can be replaced easily with another identical one. This arrangement is used primarily to provide an easy way to back up the fixed disk, making a copy of the information on the fixed part of the drive in case it is accidentally destroyed or erased.

In general, hard disks are expensive, heavy and fragile. It is *very* bad practice to move a hard disk drive while it is running (imagine those heads very close to a highly-polished, fast-spinning disk). Some cannot even be moved safely when they are not operating; and some are noisy.

But the capacity of a typical microcomputer hard disk is around 5000K to 10,000K, or 5M to 10M. One 'M', or megabyte is 1024K. This is enough for almost any small application such as a mailing list or accounting system, and compares very favourably with the capacity of a typical floppy disk drive, at around 360K.

Hard disk drives cost anything from $500 upwards, and are generally provided as an extra to the personal computer, whereas floppy disk drives are cheap and usually supplied as standard.



Inside the floppy disk.

Floppy disks

Floppy disk drives were originally designed for use in minicomputers. Manufacturers needed something 'cheap and nasty' (by their standards) on which to store their equivalent of ROM programs in a micro — the so-called 'bootstrap' routines.

These bootstrap routines were programs that got the computer up and running, and allowed it to read from its tape drives and main (hard) disk drives. They were called bootstrap because the machine seemed to be pulling itself up by its bootstraps, from its state at turn-on (in which it could do nothing but read the bootstrap) to a fully up

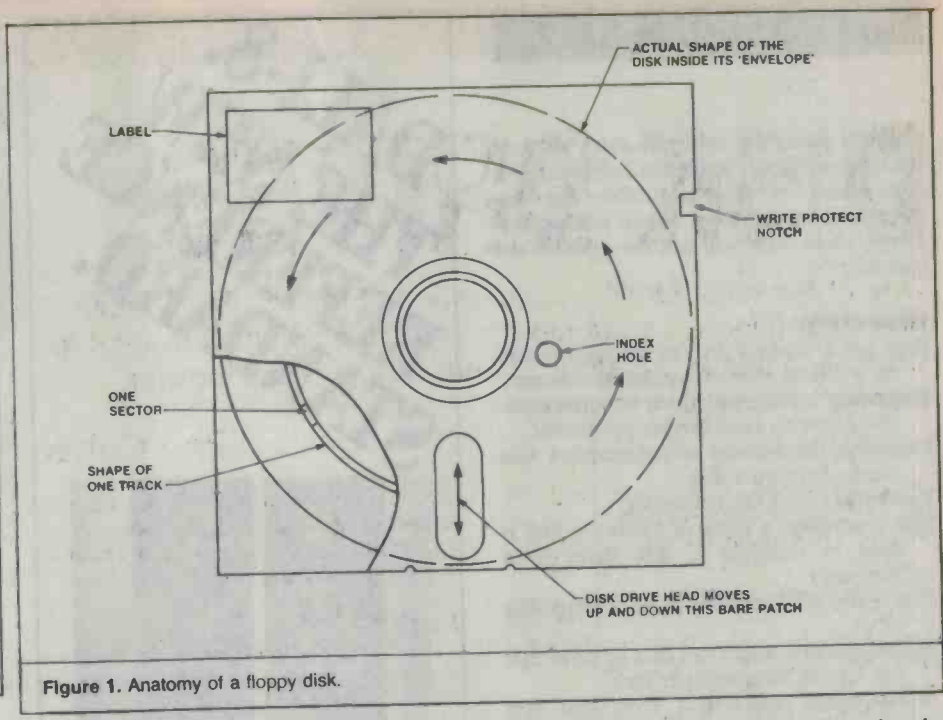


Figure 1. Anatomy of a floppy disk.

and running computer.

The reason minicomputers didn't use ROMs was because the programs were so complex, and the numbers of machines so small, that to put the program into ROM (which effectively fixed it permanently) was considered too risky. Floppy disks could be sent through the mail, so that computers all over the world could be kept supplied with software that was as free from faults as possible.

Anyway, the floppy eventually became the saviour of the microcomputer industry, forming a perfect stepping stone between the original medium used (cassette tape) and the very expensive professional alternatives such as digital tape drives.

A floppy disk drive is similar in operation to a hard disk drive, the main difference being that the disk spun in the drive is made out of flexible material, much the same as audio tape. The head is actually in contact with the surface of the disk, and this reduces both the possible speed of rotation and the life of the disk.

The reduced speed of rotation in turn reduces the speed at which the computer can move information to or from the disk. Hard disks are many times faster than floppy disks — which at the bottom line means faster programs.

In order to reduce the amount of wear, the disk drive will only start the disk spinning when the computer calls for its use. At the same time a light illuminates on the front of the drive which tells you that it is in use.

The original floppy disks were eight inches in diameter (I make no apologies for using imperial units, as this field is still dominated by the American market) and are still in common use in a number of older micros.

They were replaced by the five-inch disk (actually, five and a quarter) which is more manageable and cheaper.

Recent years have seen a fight for standardisation on an even smaller size; the main contender seems to be the three and a half-inch disk.

For the moment though, the five-inch floppy reigns. The disk of brown floppy material is encased in a plastic cover which has a hole in the middle (for the disk drive spindle to fit into) and a bare stripe down both sides for the disk drive head to move up and down.

Index hole

The disk cover also has a small hole near the central one, with a corresponding 'index' hole in the disk. This is used by the drive to detect the position of the disk within its sleeve (ie, for finding out which sector is the first one). A notch near the label can be covered with another sticky label to make the disk 'write-protected'. This has exactly the same effect as breaking the record protection tabs on the back of an audio cassette.

Before the disk can be used for information storage, it must first be 'formatted' by putting it in the drive and running a special program. This puts a pattern of magnetic spots on the disk which allows the drive to find out what part of the disk it is in at any given time — if you like, it is laying down a series of street signs on the disk. Formatting the disk in this way generally also destroys any information that may have been stored on it previously.

Although there are many different microcomputers that all use the same type of five-inch disk, most machines have different ways of formatting disks, and different ways of organising the information on them. For this reason, although a disk from an Apple, for example, can be put into the drive of an IBM-PC, the information written by the Apple cannot be read by the IBM, and vice versa.

Surprisingly, the computer industry's standardisation campaigners did not perform that badly with eight-inch disks — they all work with any (CP/M) microcomputer!

Some floppy disk drives have only one head, while others have two; there are also differences in the number of tracks per inch across the disk. For this reason, there are a number of different grades of floppy disk — for single- or double-sided use, and for 48 tracks ('single density') or 96 tracks ('double density') per inch.

Like tapes, disks must be treated with due care and attention. They are sensitive to magnets, heat, dust, damp and almost everything else (except perhaps bad language). Even if you treat them perfectly they still wear out after a while because of the constant rubbing of the head.

So it is necessary (not just advisable) to make a copy of any information stored on disk from time to time (usually, once per working day for information that has changed that day). This is called 'backing up', and it means that you will always have to buy twice as many disks as you thought you needed.

It is normal to have either two floppy disk drives, or one floppy and one hard disk drive on a computer. The provision of two floppy drives means that in making backups all you have to do is to put the original in one drive and the copy in the other. The alternative (with just one floppy drive) is tedious, and involves copying parts of the disk into memory, taking the original out and replacing it with the copy and then copying from memory to disk again. I did it for two years, and have never regretted spending the extra cash on that second drive.

In order to fit a disk drive to a computer, ▶

you will generally need an extra card of electronics that fits inside the computer — a drive controller. Most controllers can handle two or more drives. When pricing disk drives, make sure you ask the price of the controller!

Glossary

Back up: to make a copy of the information on a disk in case of accidental damage.
Bootstrap: a program which tells the computer how to read further programs.
Capacity: the amount of information that can be held on a disk.
Controller: see Disk controller.
Disk controller: a piece of hardware that is used to interface a disk drive to a computer.
Disk drive: see Hard disk drive, Floppy disk drive.
Double-density: refers to a disk or drive that can handle 96 tracks per inch.
Double-sided: refers to a drive that uses both sides of the disk, or to a disk that can be used in such a drive.
Drive: see Disk drive.
Fixed disk: usually the same as a hard disk.
Floppy disk: a flat piece of magnetizable material in a special plastic envelope, onto which a disk drive can record information.
Floppy disk drive: a device that can record or read information on a floppy disk.
Format: to record a fixed pattern of magnetic areas onto a disk.
Hard disk drive: a device that can store a large amount of information on a disk of hard magnetizable material.
Hard disk: a hard disk of magnetizable material which forms an integral part of a hard disk drive.
Head: part of a disk drive that records and plays back information from the disk.
Index hole: a hole in a floppy disk which tells the drive the disk's current orientation.
M: Megabyte.
Megabyte: 1048576 bytes, or 1024K.
Pack: a collection of hard disks inside a hard disk drive.
Removable disk: a hard disk which can be removed from its drive.
Sector: part of a track; a banana-shaped area on the surface of a disk.
Single-density: refers to a disk or drive that can only handle 48 tracks per inch.
Single-sided: refers to a drive that only uses one side of the disk, or to a disk that is suited to that type of drive.
Surface: one side of a hard disk, usually in a pack.
Track: circular part of the area of a disk, covered without the head moving.
Write-protect notch: a cut-out near the label of a floppy disk that, when covered, prevents the drive from altering the information on the disk. ●

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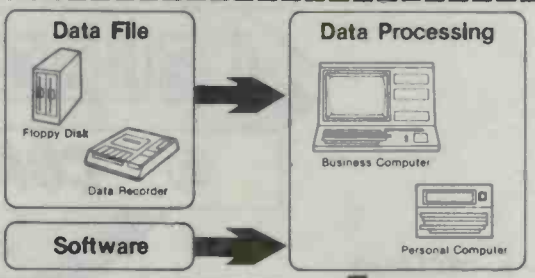

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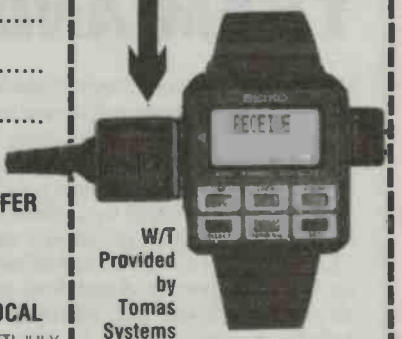

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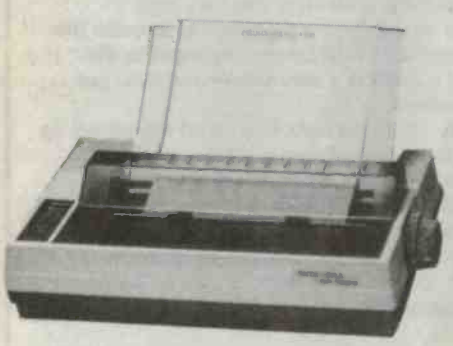

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Features of BP5200

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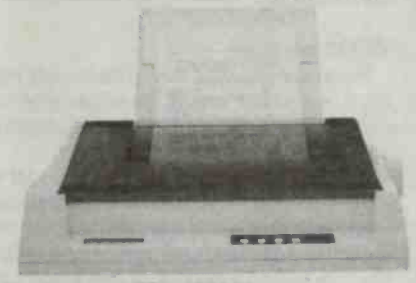
NEW RELEASE



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THE 1986 SECONDARY SCHOOLS ELECTRONICS COMPETITION

K. J. McLean

THEM AND US

In the spirit of education that lurks behind these 'schools pages', we present a learning experience with a microprocessor.

IN HIS BOOK *Future Shock* Alvin Toffler likened society to a runaway express train with a few boffins in the cab and the rest of society in the caboose throwing a party. In this interesting analogy the author elected to have some demons operating the railway switch points. In reality, today those points will probably be controlled by a microprocessor.

The person missing in Toffler's analogy is the humble teacher. This poor bugger is thrust out of the caboose from time to time, tin whistle in one hand and drink in the other, in the general direction of the cab with instructions to report back on what the hell is going on.

So it was that I came to be confronted by a group of HSC electronics elective students demanding to know about, "computer cruise controls on cars and stuff like that". I winced. Aptly I suppose they reminded me of 'Evil' in that memorable Python movie 'Time Bandits', with his hang ups about computers, technology and subscriber trunk dialling. The equipment review that follows is the outcome of that confrontation.

What we got

What we got was the Unilab 1-bit microprocessor teaching kit. It is a single board, stand-alone stored program MOS controller capable of handling eight inputs and eight outputs on a one-at-a-time basis.

The inputs, outputs and bus lines all have buffered LED indicators and there are a series of 'blue chip' plug-in interface cards you can add if you wish. These other cards, digital-to-analogue and analogue-to-digital relay drivers and the like, constitute a system of electronics which emphasises the 'black box' approach to the subject.

The unit comes complete with a book *Inside the Micro* by Dave Thompson from Welbeck College (UK) which is good for the students, and I recommend purchase of the Motorola MC14500B industrial control unit handbook for the teacher.

System description

The on-chip quarter MHz clock in the MC14500 cycles the program counter through the 256 bytes of RAM. What comes out of the memory is a sequence of 4-bit instructions for the ICU interleaved with I/O addresses for the 4512 and 4099 chips. The instruction codes are put out on the rising clock edges and the I/O addresses on the other phase. This interlacing limits the maximum possible program to 128 instructions in length.

The ICU communicates with its interface chips via a 1-bit bidirectional data bus, by writing selectively to the chip enable pins. In addition the MC14500 sources four flags in separate pins for external control purposes.

The unit has four debounced press buttons for memory input and three for program start, stop and single step.

Because the board lacks a 'filo' stack the system makes no use of the ICU jump and return instructions. Instead it uses a looping control structure where an internal register jams the write pin effectively disabling selected blocks of code for IF-THEN-ELSE type branching.

Using the unit

In many ways the system is configured to mimic a programmed logic controller (PLC) with many of the examples for instruction usage in the Motorola handbook using ladder diagrams to illustrate their points. However, this does not detract from its efficacy as a teaching machine for novices. As far as they are concerned it is a block of clocked logic consisting of a program in memory, a processor to execute the code and a group of interface chips for connecting it to the outside world. Granted a 4099 is a very simple PIA/VIA, but you have to start somewhere.

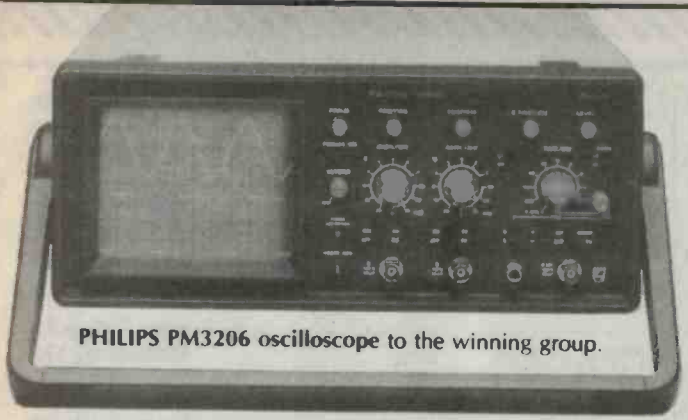
With a choice of only 12 instructions this board represents an excellent introduction to the use of computers in decision/command oriented tasks. It has a very low hours overhead for user familiarisation, with students writing programs with branching in less than four hours. I wish I had a dollar for every time I've seen someone spend days getting to know a multibit processor, only to use it in a manner akin to taking a sledge hammer to peanut shells.

Value for money

At $258 (we got ours from Labax) the board might sound expensive for something with only 14 chips on it. But it is a complete system. With the addition of a 5 V supply you're up and running. No VDU, keyboard or software to buy.

Conclusion

It is routine now to see articles in ETI where a micro operates a darkroom controller or a small robot. Unfortunately the apparent simplicity of the construction details belies the complexity of such projects. The hex listing on the back half of these articles' last pages may replace kilograms of hardwired logic and could have been hundreds of hours to write. With a 1-bit micro at least you've made a start.



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Groups representing their schools should submit the attached registration form which itself brings no obligation. Entry forms and suggested project designs will be forwarded to the groups on receipt of the registration form. Entrants are required to build an electronic device to their own or one of our designs and write a report on its operation, construction (and design) and the group's involvement. The device and report must be lodged with us by 15 September, 1986. State, Territory and New Zealand finalists will be announced on 19 September, 1986. The competition winner will be announced 26 September, 1986.

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1	26	51	76	101	126	151	176	201	226	251	276	301	326
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3	28	53	78	103	128	153	178	203	228	253	278	303	328
4	29	54	79	104	129	154	179	204	229	254	279	304	329
5	30	55	80	105	130	155	180	205	230	255	280	305	330
6	31	56	81	106	131	156	181	206	231	256	281	306	331
7	32	57	82	107	132	157	182	207	232	257	282	307	332
8	33	58	83	108	133	158	183	208	233	258	283	308	333
9	34	59	84	109	134	159	184	209	234	259	284	309	334
10	35	60	85	110	135	160	185	210	235	260	285	310	335
11	36	61	86	111	136	161	186	211	236	261	286	311	336
12	37	62	87	112	137	162	187	212	237	262	287	312	337
13	38	63	88	113	138	163	188	213	238	263	288	313	338
14	39	64	89	114	139	164	189	214	239	264	289	314	339
15	40	65	90	115	140	165	190	215	240	265	290	315	340
16	41	66	91	116	141	166	191	216	241	266	291	316	341
17	42	67	92	117	142	167	192	217	242	267	292	317	342
18	43	68	93	118	143	168	193	218	243	268	293	318	343
19	44	69	94	119	144	169	194	219	244	269	294	319	344
20	45	70	95	120	145	170	195	220	245	270	295	320	345
21	46	71	96	121	146	171	196	221	246	271	296	321	346
22	47	72	97	122	147	172	197	222	247	272	297	322	347
23	48	73	98	123	148	173	198	223	248	273	298	323	348
24	49	74	99	124	149	174	199	224	249	274	299	324	349
25	50	75	100	125	150	175	200	225	250	275	300	325	350

For a prompt reply: Post today!

POST TODAY!

Letters to the Editor

Esperanto flourishes

I WAS VERY interested in Arthur Cushen's article about broadcasts in Esperanto that may be heard in Australia (ETI Jan '86). Others, of course, are directed towards Europe, the Far East and South America.

For radio hams there is the International League of Esperantist Radio Amateurs with regional representatives in: North America, W2CIL, E. Lindberg, Buffalo; South America, PT2CAE, Alves Silva, Brasilia; Asia/Pacific, JR1ISG, K. Nakazima, Hatiozi, Japan. There is also a DX organization in Munich.

For those interested in electronics, there are electronic representatives in Belgium, Brazil, Czechoslovakia, Israel, Japan, Portugal and the USA.

They can all communicate in the one international language, Esperanto.

Worth thinking about, isn't it?

Nelson Hill
Wellington, NZ

Defence of CD

I NEVER CEASE to be amazed by the comment and aggravation stirred up by the compact disc.

The strength and fervour with which some people defend the vinyl record frequently gives the debate a significance well out of proportion to the issues involved.

Not wishing to place Gary Fitzsimmons (ETI March 1986) of the "Consumer Electronics Suppliers Association" necessarily in this category, he is an example of an ardent "vinyl record man". He argues (correctly as of a year ago) that 80% of CD releases were from analogue masters and cannot therefore claim the full potential CD dynamic range. But he fails to point out that over the next few years all new recordings will be digitally mastered. As this progresses only the CD can realistically reproduce the original material over its full dynamic range.

He further refers to a "misrepresentation" by the "proponents" of the CD that they cannot be scratched or affected by dirt. The so called "proponents" were an ill-informed section of the media. But the manufacturers of CD(s) have never claimed this and in fact include handling instructions with each disc that recommend they be treated the same as conventional records (except when cleaning).

But it is Mr Fitzsimmon's last point that is the most amazing. He states that the CD lacks "ambience" and appears to have lost "harmonics" and "depth of sound". An amazing statement when one considers this is the exact accusation levelled at the vinyl record when it was first introduced. Without going into the technical aspects, suffice to say loss of harmonics and "depth of sound" are due largely to dynamic range compression. With digital mastering and CD reproduction the highly trained ear attached to a truly unbiased listener may well notice the improvement. (I suspect the unbiased listener may be harder to find than the trained ear.)

In closing let me make one final point. In my own experience a *new* well cut vinyl record when compared to a CD on a *good* hi-fi system does sound "slightly different". As to which sounds better, I have never managed to find a group of people who can agree. The most interesting comparison comes when you try the same test 12 months later. The 'crackle and pops' of the record due to its steady deterioration with age make it so easy to pick the record from the CD that no comparison is possible.

It was the fact that a CD never wears out that I regarded as most significant when I purchased by CD player. It is this *fact* more than any other that marks the difference between the record and the CD and which is important to the true hi-fi listener. Superfluous arguments about "presence", "ambience", and "depth of sound" do not count for anything when the quality of the record deteriorates with age. Even the most ardent "vinyl record" supporter would never claim a grooved record would sound better than an optically encoded disc in 10 (or even five) years time, (or would they??).

A. Burton, B App Sc
Melbourne, Vic

Widening education resources

I WAS VERY interested to read your editorial in the April issue because it comes close to a dream of my own.

Your idea of using the channel bandwidth that ABC TV wastes transmitting a test pattern to distribute lecture material has considerable merit. Just imagine how much more effective that course material would be if combined with computer-aided-instruction software such as is available from the TeleLearning organization in the USA.

TeleLearning is the brainchild of an ex-Commodore executive who pursuaded a number of universities to provide microcomputer-based educational software and to each recognise studies done at any of the other universities.

The use of 'machines' to teach has been dismissed by teaching 'experts' with the argument that some topics require human-to-human contact. I would not argue with that for a moment but that still leaves at least some topics that can be taught with computers, and most certainly some of those can be taught better by computers. Research has proven that beyond dispute. It amazes me that even the academics that I respect are so close to the subject that they cannot see the wood for the trees — they see computers as things to teach about and as tools for other people but not as tools for themselves to teach with.

My idea of a 'national open university' goes a little further than yours. Lecture material for it would be prepared and distributed as you suggest and would cover at least the core subjects for the main undergraduate majors, wherever the subject material lent itself to mechanised teaching. Anybody could tape and watch that material for their own private use and corporations could use it on payment of a copyright fee.

For those persons wishing to receive academic credit there would also be microcomputer-based educational software and assistance such as TeleLearning provides. Price would depend on the student's means. Corporations would be encouraged to use the teaching software for in-house staff training on a similar basis to the taped lecture material.

Local educational colleges would be obliged to give credit for all that is appropriate to their own courses and would build on that.

I hope that academics would be convinced that off-loading basic introductory parts of their courses returns the individual colleges to their status of yesterday: as true higher education institutions where the staff can get on with research into advanced topics and not just function largely as the vocational training facilities that they have become over recent years.

Gordon Drennan
Ultimo, NSW

ABC retarded

I WOULD like to make a couple of points regarding your comments about the ABC (Editorial April '86). The open university idea is an excellent one, and from that point of view I applaud your comments. But from my observation, there are presently some practical technical and organizational diffi-

culties with the implementation of such a system.

Most of the country ABC TV transmitters (Telecom operated, DOC owned) are still manned during their operation, chiefly because most of them are pre-1965 all-valve jobs that are not reliable enough to run remotely controlled. Given present staffing levels, the stations must close down (as a rule) during the wee small hours.

This situation will only be remedied by the installation of new transmitters and running them by remote control. At present the necessary infrastructure such as Aussat receivers, service centres, module repair shops, etc, is being established at normal government department pace. My gut feeling is that it will be at least three, perhaps six years before the old transmitters are in the minority, opening the way for open university programs.

Name supplied

Measuring rf

I HAVE SOME queries regarding measurements in "How good is your transceiver?" (August '86) and also the review of the Yaesu FT726R transceiver in the same issue.

The article defines the 'noise floor' as the minimum discernible signal (MDS) for a given bandwidth: 3 dB (S+N)/N. In the review of the transceiver the MDS is stated as −132.3 dBm for 3 dB (S+N)/N at 52 MHz, for 146 MHz, however, the MDS is stated as −132 dBm (0.054 μV). I assume that this is also for 3 dB (S+N)/N.

Things get a little more complicated with the 430 MHz specification. Here the MDS is stated as −135.3 dBm for −12 (S+N)/N but the frequency is not mentioned. Is this a typographical error? Do I assume 3 dB (S+N)/N is intended?

I am a little confused with the 'noise floor' (MDS) specification, being more used to noise figure, noise factor or noise temperature. If the noise floor for 3 dB (S+N)/N is given, would it be correct to assume that the actual noise of the system is 3 dB less than the level stated? Is this the same as the (thermal) noise power of the receiver? I am particularly interested in relating the noise floor (MDS) with the noise figure.

If it is assumed that the noise power is 3 dB less than the MDS measurement then this formula can be used to find the noise figure:

Si = noise figure + noise power + S/N

Where Si is the required input signal level in dBm for an SNR at the output of 'S/N'.

For example, according to the review of the transceiver at 146 MHz a signal level of −128.5 dBm will give a (S+N)/N of 10 dB. Substituting in the above formula:

−128.5 = noise figure + (−132−3)+10

gives a noise figure of 3.5 dB.

Is this correct?

Andrew Keir
VK2XKK
Seven Hills, NSW

In response

IN ALL OUR tests MDS is defined as the signal power required to produce a 3 dB (S+N)/N.

In this case, the residual (thermal) noise power of the receiver is equivalent to the input signal power, eg, −132 dB at 146 MHz.

This was adopted in preference to noise figure as it is a more physically realiable figure and more easily grasped in terms of performance.

Mr Keir's assumption that the noise power is 3 dB less than the MDS is therefore incorrect.

Noise figure may be used as an indicator of system performance. It has the advantage of being bandwidth invariant, unlike MDS which is better in a narrower bandwidth due to the reduced noise bandwidth. They are, however, related.

MDS (dBm) = −174 +10 log BW noise + noise figure,

which leads to:

nf = 174 + MDS (dBm) −10 log BW noise,

where 174 dBm is the noise power in a 1 Hz BW at 290 and BW noise is the noise bandwidth which may be approximated by the 6 dB IF bandwidth.

In Mr Keir's example, let BW noise = 3000 Hz. Therefore:

nf = 174−132−10 log 3000

nf = 7.2 dB

This may, of course be converted to other forms as desired.

Noise factor can be found:

$F = 10^{(nf/10)}$

which, in the above example, leads to F = 5.28.

A noise figure of 3.5 dB as obtained by Mr Keir would be very good for a total system.

The test frequency at 70 cm was 435 MHz and at 146 MHz, the MDS as for a 3 dB (S+N)/N. The 12 dB (S+N)/N shown along-side the MDS for 70 cm SSB should not be there. The 12 dB (S+N)/N referred to 70 cm SSB sensitivity figures to allow direct comparison to the manufacturers specifications.

David J. Williams
B Eng, MIREE, MIEEE, UK3YIZ

DSE plugpack

YOUR MAY issue, page 84, carried an "idea for experimenters" suggesting the disassembly and modification of a Dick Smith plugpack Cat No M9525 to "improve regulation".

We wish to advise that we believe the regulation from this plugpack is quite suitable for most consumer equipment. (When a test unit was loaded with 10 Mohm the output voltage fell from 11 V to 4 V within 1.5 seconds when the output was switched from the 9 V position to the 3 V position.)

We are most surprised that a magazine of your reputation would condone, by way of accepting and printing such a detailed account, disassembly and modification of a sealed plugpack. As you may be aware the technical standards with which such units must comply before being offered for sale are set by the various electrical authorities in each State and are based primarily on safety considerations. By encouraging the public to modify such units these considerations are compromised. Should such a modified unit be commercially displayed it is quite likely to be considered a breach of the various *State Electrical Safety Acts* and certainly a breach of the *Trademarks Act*.

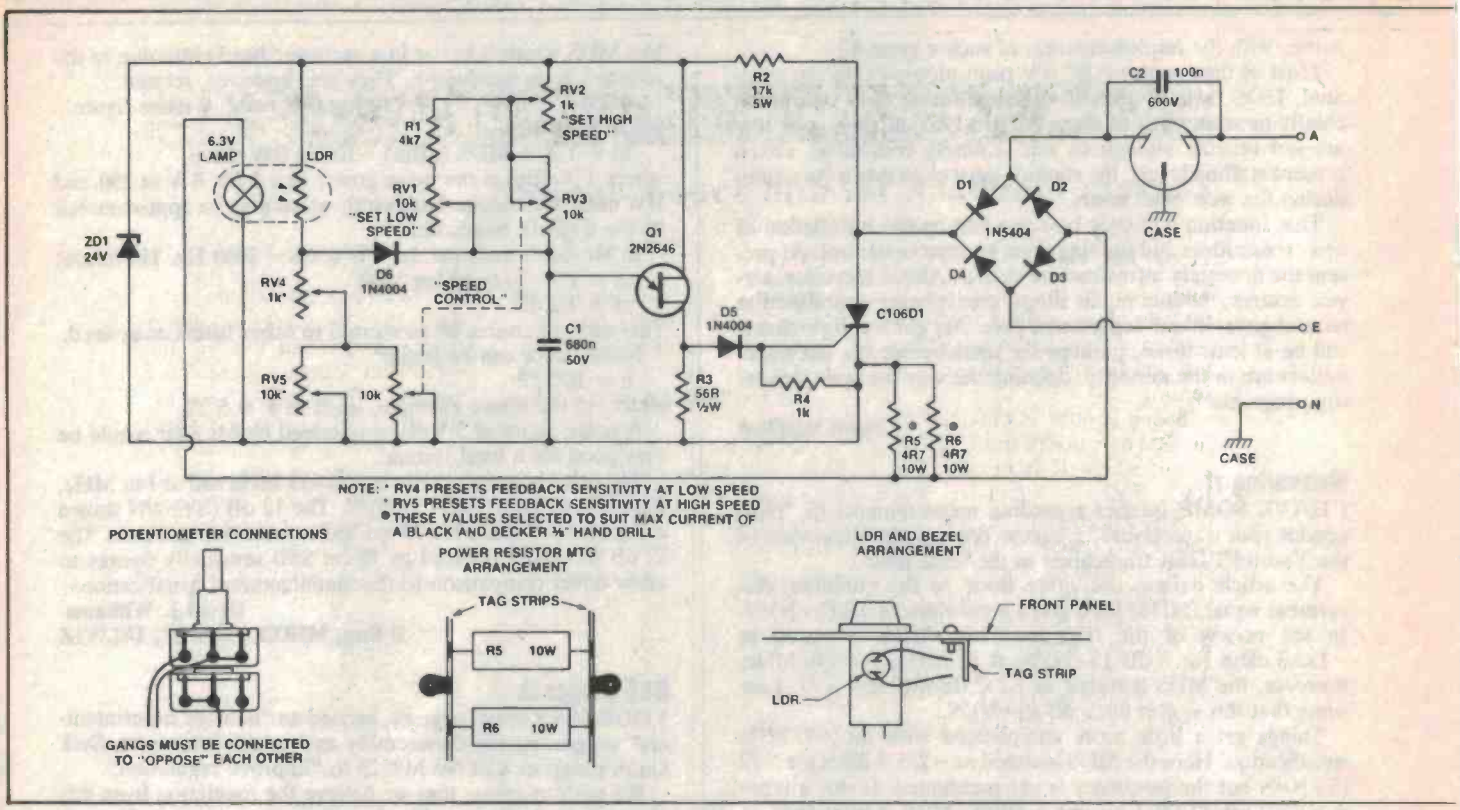
Gary Crapp
General Manager
Technical Products
Dick Smith Electronics

Perhaps it is timely to reiterate the editorial policy of these Feed Forward pages.

They are an opportunity for members of the electronic community to exchange views and ideas. They do not necessarily reflect the editorial policy of this magazine. In particular, circuits published in this section have not been tested by ETI staff and programs normally have not been executed. In the nature of the case, inclusion in these pages cannot be taken as a guarantee that the circuit or program works as described.

With regard particularly to Mr Shawcross' contribution, no criticism of DSE should be inputed to ETI. We have not tested the device, and have neither the time nor inclination to do so. We do, however, notice the performance limitations on the device admitted by Mr Crapp, and suggest anyone using it should familiarize themselves with these before use.

— Jon Fairall, Ed.



Idea of the Month

Current feedback for drill speed control

Chris Barber,
Forest Hill, Vic

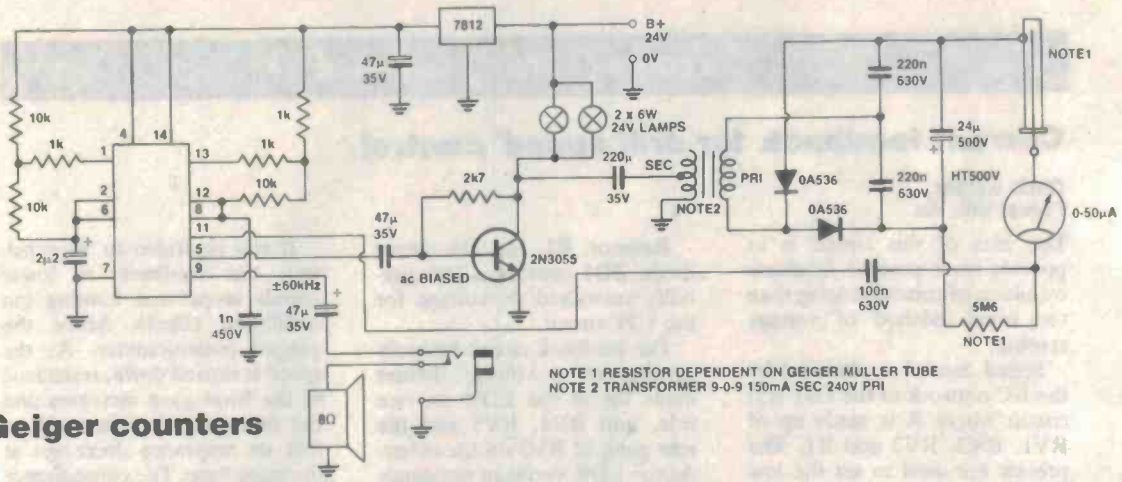
The idea of this circuit is to provide more positive feedback by means of current sensing than the usual method of voltage sensing.

Speed control is obtained by the RC network of the UJT (Q) circuit where R is made up of RV1, RV2, RV3 and R1. The presets are used to set the low and high speed settings with RV3 controlling speed within this range. The low setting ensures that the low speed end of RV3 the motor will start and run reliably; the high setting ensures some resistance remains in RC when the minimum firing angle is reached.

Resistor R1 and the zener diode ZD1 provide a low partially smoothed dc voltage for the UJT circuit.

The feedback circuit basically consists of a voltage divider made up of the LDR on one side, and RV4, RV5 and the rear gang of RV3 on the other. As the LDR varies in resistance this directly affects the charging rate of the UJT timing capacitor, C1. Thus when the load on the motor increases, the incandescent globe shines more brightly, LDR resistance drops and C1 charges more quickly causing the SCR to fire earlier in the cycle.

It was desirable to 'de-sensitise' the feedback at lower speeds to prevent hunting (an oscillation effect), hence the ganged potentiometer. As the speed is slowed down, resistance of the front gang increases and the rear gang is connected so that its resistance decreases at the same time. The consequence of this is that the voltage across the lower portion of the voltage divider is kept lower. This restricts the effect of the feedback circuit on the charging of C1 having less effect on the firing of the SCR. The presets are used to fine-tune the feedback circuit.



Geiger counters

This circuit is built around an old Geiger-Muller tube that M. Chick of **Wangaratta, Vic** located.

The circuit consists of an HT and a modulation section.

The circuit for the HT is relatively straight forward. One half of the 556 provides the signal and ac bias for the driver transistor. As the transformer can only handle 150 mA, capacitive coupling from the 2N3055 ensures that it only gets ac. Oscillation is very slow but that's the way it worked best.

Feeding the transformer via the 4.5 V tapped secondary gave a healthy 250 V ac on the primary. Rectification is by voltage doubler. It takes a few seconds, but climbs to 500 V. This is not a great handicap as consumption is 50 µA in the worst case. (Tube variable).

The pulse is fed from the Geiger-Muller tube into the other half of the 556, which functions as a pulse-width modulator. The speaker is a mechanical low pass filter.

Maths

R. Wilkinson,
Nelson Bay, NSW 2315

```
00010 CLS
00020 PRINT" NAME -- ' M A T H S .'--  R.Wilkinson. 18/12/84"
00030 PRINT [A50 126]
00040 PRINT\"This Program gives you the SQR,CUBE,RECIPRICAL,"
00050 PRINT" SQR ROOT, LOG. & DEGREES (expressed in RADIANS)"
00060 PRINT"                  of any number"
00070 PRINT"                 ================"
00080 PRINT"HIT ZERO to END"
00090 UNDERLINE:PRINT\ "WHAT NUMBER    "[:NORMAL
00100 INPUT""N1[
00110 IF N1=0 THEN END
00120 PRINT
00130 PRINT\"SQR        ="[:PRINT TAB 15[  N1*N1
00140 PRINT\"CUBE       ="[:PRINT TAB 15[ N1*N1*N1
00150 PRINT\"RECIP.     ="[:PRINT TAB 15[ 1/N1
00160 PRINT\"SQR ROOT   ="[:PRINT TAB 15[ SQR(N1)
00170 PRINT\"LOG        ="[:PRINT TAB 15[ LOG(N1)
00180 PRINT\"DEGREES    ="[:PRINT TAB 15[3.141594N1/180[
00190 PRINT"  RADIANS."
00200 PRINT
00210 GOTO 90
00220 PRINT
00230 END
```

Bank reconciliation

```
00010 REM    Date         16 - 10 - 1983.    R.Wilkinson.
00020 REM     **** BANK RECONCILIATION ***
00030 CLS
00040 INPUT "Opening Balance    $" [B1
00050 UNDERLINE :INPUT   "Add Deposits        $"[C1
00060 NORMAL
00070 PRINT TAB(20)  B1+C1
00080 UNDERLINE: INPUT"Bank Charges        $"[K1
00090 NORMAL: PRINT TAB (20) B1+C1-K1
00100 UNDERLINE: INPUT "Less Cheques        $" [X1
00110 NORMAL:PRINT "Closing Balance    $"TAB (20) B1+C1-K1-X1,
00120 UNDERLINE:INPUT "Floating Cheques  $"[Z1
00130 NORMAL: PRINT
00140 UNDERLINE: PRINT "Actual Balance     $"B1+C1-K1-X1-Z1
00150 PRINT
00160 NORMAL
00170 INPUT "WHAT ABOUT YOUR PIGGY BANK      $"[P0    '
00180 UNDERLINE
00190 PRINT "THE BIG TOTAL      $"B1+C1-K1-X1-Z1+P0
00200 NORMAL: PRINT
00210 PRINT "Hit SPACE BAR to start again or BREAK to END"
00220 G$=KEY$
00230 IF G$=" " THEN 220 ELSE 30
00240 END
```

T, Pi & O attenuators

Chris Hayes,
Richmond, NSW 2753

I recently needed an attenuator at work and not being able to find one readily available I decided to make one up.

The first step was to find the formulae to make the calculations. I found various formulae and worked them out.

This program calculates the correct values needed for the attenuation and substitutes two common 1, 5 or 10% tolerance resistances in parallel to get the precise required value.

Two types of attenuators widely used are the T attenuator and the Pi attenuator. These are only good for unbalanced attenuators. The O type attenuator is good for a balanced type attenuator.

These are the three I've designed the program around.

The program listing has numerous REM statements to help you understand its flow.

```
100 REM ********************************
110 REM **   ATTENUATOR PROGRAM       **
120 REM **   WRITTEN BY CHRIS HAYES   **
130 REM **          FEB 1986          **
140 REM ********************************
150 PRINT"□"
160 DIM TL(96,2),P1$(20),TE$(20),BA$(20)
170 GOSUB 2470
180 POKE 53281,6:POKE53280,6
190 PRINT"□          ATTENUATOR PROGRAM BY"
200 PRINT"              CHRIS HAYES"
210 PRINT"                FEB 1986"
220 PRINT:PRINT"      RESISTANCE NUMBER REQUIRED"
230 PRINT:PRINT" ■□□ = T  ATTENUATOR UNBALANCED"
240 PRINT" ■□□ = PI ATTENUATOR UNBALANCED"
250 PRINT" ■□□ = PI ATTENUATOR BALANCED"
260 PRINT
270 GOSUB 2450
280 TYPE=VAL(A$)
290 ON TYPE GOTO 300,500,430
300 REM **** T ATTENUATOR
310 GOSUB 710:REM **** GET 1.1% IMPED
320 GOSUB 740:REM **** GET 0.1% IMPED
330 GOSUB 800:REM **** GET RATIO
340 GOSUB 770:REM **** GET TOLERANCE
350 GOSUB 840:REM **** CALC
360 GOSUB 2380:REM **** GET OHMS
370 GOSUB 870:REM **** CALC TRUE R1
380 GOSUB 900:REM **** CALC TRUE R2
390 GOSUB 930:REM **** CALC TRUE R3
400 GOSUB 1440:REM **** GET & PRINT
410 GOSUB 1370:REM **** PRINT TYPE
420 GOTO 330:REM **** ANOTHER
430 REM **** BALANCED PI ATTENUATOR
440 GOSUB 710:REM **** GET 1.1% IMPED
```

```
450 GOSUB 740 REM **** GET O/P IMPED
460 GOSUB 800 REM **** GET ATTEN
470 GOSUB 770 REM **** GET TOLERANCE
480 GOSUB 840 REM **** CALC K
490 GOSUB 2380 REM **** SET BANDS
500 GOSUB 960 REM **** CALC TRUE R1
510 GOSUB 1000 REM **** CALC TRUE R2
520 RB=RB/2
530 GOSUB 1030 REM **** CALC TRUE R3
540 GOSUB 1440 REM **** GET & PRINT
550 GOSUB 1590 REM **** GET & PRINT R4
560 GOSUB 1370:REM **** PRINT TYPE
570 GOTO 2330:REM **** ANOTHER
580 REM **** PI ATTENUATOR
590 GOSUB 710:REM **** GET I/P IMPED
600 GOSUB 740:REM **** GET O/P IMPED
610 GOSUB 800:REM **** GET ATTEN
620 GOSUB 770 REM **** GET TOLERANCE
630 GOSUB 840:REM **** CALC K
640 GOSUB 2380:REM **** SET BANDS
650 GOSUB 960:REM **** CALC TRUE R1
660 GOSUB 1000:REM **** CALC TRUE R2
670 GOSUB 1030:REM **** CALC TRUE R3
680 GOSUB 1440:REM **** GET & PRINT
690 GOSUB 1370:REM **** PRINT TYPE
700 GOTO 2330 REM **** ANOTHER
710 REM **** INPUT IMPEDANCE
720 INPUT" ENTER INPUT  IMPEDANCE";IA
730 RETURN
740 REM **** OUTPUT IMPEDANCE
750 INPUT" ENTER OUTPUT IMPEDANCE";IB
760 RETURN
770 REM **** TOLERANCE
780 INPUT" ENTER TOLERANCE REQUIRED 1,5,10 %";TA
790 RETURN
800 REM **** ATTENUATION
810 INPUT" ENTER ATTENUATION REQUIRED IN DB";ATT
820 IF ATT=0THENATT=.01
830 RETURN
840 REM **** CALC K
850 K=10↑(ATT/20):NA=K↑2
860 RETURN
870 REM **** CALC TRUE R1 T ATTENUATOR
880 RA=(IA*((NA+1)/(NA-1)))-(2*(SQR(IA*IB)))*(K/(NA-1)):RA=ABS(RA)
890 RETURN
900 REM **** CALC TRUE R2 T ATTENUATOR
910 RB=(IB*((NA+1)/(NA-1)))-(2*(SQR(IA*IB)))*(K/(NA-1)):RB=ABS(RB)
920 RETURN
930 REM **** CALC TRUE R3 T UNEQUAL
940 RC=(2*(SQR(IA*IB)))*(K/(NA-1)):RC=ABS(RC)
950 RETURN
960 REM **** CALC TRUE R1 PI UNEQUAL
970 NC=SQR(IA/IB)
980 RA=IA*((NA-1)/(NA-(2*K*NC)+1)):RA=ABS(RA)
990 RETURN
1000 REM **** CALC TRUE R2 PI UNEQUAL
1010 RB=((SQR(IA*IB))/2)*((NA-1)/K):RB=ABS(RB)
1020 RETURN
1030 REM **** CALC TRUE R3 PI UNEQUAL
1040 RC=IB*((NA-1)/(NA-(2*(K/NC))+1)):RC=ABS(RC)
1050 RETURN
1060 REM **** LOOK FOR 1ST NEAR VALUE
1070 FORJ=1TO10
1080 FORI=1TOS:D=TL(I,Q)*MT(J)
1090 IF D>=R THEN 1110
1100 NEXTI,J GOTO2560
1110 REM **** CALC PARALLEL OHMS C
1120 FORJ=10TO1 STEP -1
1130 FORI=STO1 STEP -1
1140 B=TL(I,Q)*MT(J) C=(D*B)/(D+B)
1150 IF B<D THEN 2560
1160 IF D*300<B THEN B=0
1170 REM **** CALC % E
1180 E=(R/C)*100
1190 IF E>=M(0) AND E<=M(1) THEN 1210
1200 NEXTI,J:GOTO2560
1210 REM **** GOTO CORRECT PERCENTAGE
1220 RETURN
1230 PRINT"■■■■■■■■■",IA,TAB(34),IB
1240 REM **** PRINT R1 VALUES
1250 PRINT"■■■■■■■■■■■■■■■■■■■■"SPC(35)
1260 PRINT"■■■■■■■■■■■■■■■■■■■■■■R1 ="D;
1270 IFB<>0THEN PRINTTAB(14);"PARALLEL WITH"B:RETURN
1280 PRINT:RETURN
1290 REM **** PRINT R2 VALUES
1300 PRINT"R2 ="D,TAB(12);
1310 IFB<>0THEN PRINTTAB(14);"PARALLEL WITH"B:RETURN
1320 PRINT:RETURN
1330 REM **** PRINT R3 VALUES
1340 PRINT"R3 ="D,
1350 IFB<>0THEN PRINTTAB(14);"PARALLEL WITH"B:RETURN
1360 PRINT RETURN
1370 PRINT"■■■■■■■■■■■■■■■■■■■■■■            ",ATT," DB PAD";
1380 PRINT TAB(12),TA," % TOL"
1390 RETURN
1400 REM **** PRINT R4 VALUES
1410 PRINT "R4 ="D,
1420 IF B<>0THEN PRINTTAB(14);"PARALLEL WITH";B:RETURN
1430 PRINT:RETURN
1440 REM **** GET VALUES & PRINT
1450 PRINT"■" IF TYPE=1THENFORI=1TO16:PRINTTAB(5),TE$(I):NEXTI
1460 IF TYPE=2 THEN FORI=1TO15 PRINTTAB(5),PI$(I) NEXTI
1470 IF TYPE=3THENFORI=1TO16 PRINTTAB(5);BA$(I):NEXTI
1480 R=RA
1490 PRINT"■■■■■■■■■■■■■■■■■■■■■■"TAB(15)"PLEASE WAIT"
1500 GOSUB 1060 REM **** GET R1 VALUES
1510 GOSUB 1230:REM **** PRINT VALUES
1520 R=RB
1530 GOSUB 1060:REM **** GET R2 VALUES
1540 GOSUB 1290:REM **** PRINT VALUES
1550 R=RC
1560 GOSUB 1060:REM **** GET R3 VALUES
1570 GOSUR 1330:REM **** PRINT VALUES
1580 RETURN
1590 R=RB
1600 GOSUB 1060:REM **** GET R4 VALUES
1610 GOSUB 1400:REM **** PRINT VALUES
1620 RETURN
1630 DATA 100,102,105,107,110,113,115,118
1640 DATA 121,124,127,130,133,137,140,143
1650 DATA 147,150,154,158,162,165,169,174
1660 DATA 178,182,187,191,196,200,205,210
1670 DATA 215,221,226,232,237,243,249,255
1680 DATA 261,267,274,280,287,294,301,309
1690 DATA 316,324,332,340,348,357,365,374
1700 DATA 383,392,402,412,422,432,442,453
1710 DATA 464,475,487,499,511,523,536,549
1720 DATA 562,576,590,604,619,634,649,665
1730 DATA 681,698,715,732,750,768,787,806
1740 DATA 825,845,866,887,909,931,953,976
1750 REM ***** 5% TOLERANCE
1760 DATA 10,11,12,13,15,16,18,20,22,24
1770 DATA 27,30,33,36,39,43,47,51,56.62
1780 DATA 68,75,82.91
1790 REM ***** 10% TOLERANCE
1800 DATA 10,12,15,18,22,27,33,39,47,56,68,82
1810 REM MULTIPLIER FACTOR
1820 DATA 0.001,0.01,0.1,1,10,100,1000,10000,100000,1000000
1830 REM T ATTENUATOR EQUAL Z
1840 DATA"          T ATTENUATOR"
1850 DATA" "
1860 DATA"  ┌─────────┐        ┌─────────┐"
1870 DATA"──┤   R1    ├───┬────┤   R2    ├─"
1880 DATA"  └─────────┘   │    └─────────┘"
1890 DATA"                │"
1900 DATA"                │"
1910 DATA"    I          ┌┴┐          O"
1920 DATA"    N          │ │          U"
1930 DATA"    P          │R│          T"
1940 DATA"    U          │3│          P"
1950 DATA"    T          │ │          U"
1960 DATA"               │ │          T"
1970 DATA"               └┬┘"
1980 DATA"                │"
1990 DATA"────────────────┴──────────────"
2000 REM PI ATTENUATOR EQUAL Z
2010 DATA"          PI ATTENUATOR"
2020 DATA" "
2030 DATA"          ┌─────────┐"
2040 DATA"──────┬───┤   R2    ├───┬──────"
2050 DATA"      │   └─────────┘   │"
2060 DATA"     ┌┴┐               ┌┴┐"
2070 DATA"     │ │               │ │O"
2080 DATA"    I│ │               │ │U"
2090 DATA"    N│R│               │R│T"
2100 DATA"    P│1│               │3│P"
2110 DATA"    U│ │               │ │U"
2120 DATA"    T│ │               │ │T"
2130 DATA"     └┬┘               └┬┘"
2140 DATA"      │                 │"
2150 DATA"──────┴─────────────────┴──────"
2160 REM PI ATTENUATOR BALANCED
2170 DATA"  BALANCED PI ATTENUATOR"
2180 DATA" "
2190 DATA"          ┌─────────┐"
2200 DATA"──────┬───┤   R2    ├───┬──────"
2210 DATA"      │   └─────────┘   │"
2220 DATA"     ┌┴┐               ┌┴┐"
2230 DATA"    I│ │               │ │O"
2240 DATA"    N│ │               │ │U"
2250 DATA"    P│R│               │R│T"
2260 DATA"    U│1│               │3│P"
2270 DATA"    T│ │               │ │U"
2280 DATA"     │ │               │ │T"
2290 DATA"     └┬┘               └┬┘"
2300 DATA"      │   ┌─────────┐   │"
2310 DATA"──────┴───┤   R4    ├───┴──────"
2320 DATA"          └─────────┘"
2330 REM **** ANOTHER GO
2340 GOSUB 1370
2350 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■          ANOTHER Y/N"; GOSUB2450
2360 IF A$="N"THEN END
2370 GOTO180
2380 REM **** SET TOLERANCE BANDS
2390 TA=ABS(TA) TA=INT(TA)
2400 IF TA=1 THEN S=96 Q=0 M(0)=99.8:M(1)=100.2 GOTO2440
2410 IF TA=5 THEN S=24 Q=1 M(0)=99 M(1)=101 GOTO2440
2420 IF TA=10 THEN S=12 Q=2 M(0)=98 M(1)=102 GOTO2440
2430 TA=10 GOTO2390
2440 RETURN
2450 GET A$ IFA$=""THEN 2450
2460 RETURN
2470 REM **** LOAD DATA
2480 L=96 FORI=1TOL READ TL(I,0) NEXTI
2490 L=24 FORI=1TOL READ TL(I,1) NEXTI
2500 L=12 FORI=1TOL READ TL(I,2) NEXTI
2510 FORI=1TO10 READ MT(I) NEXTI
2520 FORI=1TO16 READTE$(I) NEXTI
2530 FORI=1TO15 READPI$(I) NEXTI
2540 FORI=1TO16 READBA$(I) NEXTI
2550 PETURN
2560 PRINT" CANNOT FIND A NEAR ENOUGH VALUE" GOTO2330
```

Lunar Lander

Philip Pulle,
Lethbridge Park, NSW 2770

This is the classic Lander game with half tone graphics. The program is intended to run on any Microbee with MicroWorld BASIC. Instructions are included with the programs.

```
00100 REM Lunar Lander. Version 4. Update 12/12/1985
00110 REM        Author Philip Pulle'
00120 REM try fuel values of 5000 and I A rates of-0.24 first
00130 SD(6)
00140 GOSUB 770
00150 CLS
00160 LORES
00170 FOR T=63488+1008TO63488+1024STEP2:POKE T,85:POKE T+1,170:NEXT T
00180 PLOT 0,0 TO 127,0 TO 127,47 TO 0,47 TO 0,0
00190 GOSUB 460
00200 FORT=0TO1000:NEXT T
00210 A1=.63
00220 G1=.36
00230 Y=46:X=INT(RND#1001+10
00240 D2=.23
00250 CURS 1,16:PRINT"                              "
00260  PLOT X-5,47 TO X-5,40:PLOT X+5,47 TO X+5,40
00270 FORT=10TO0STEP-1:CURS2,16:PRINT"C O U N T D O W N"+(I3 T)1:PLAY 1:PLAY0:NE
XT T:PLAY 24,4
00280 T1=T1-01
00290 IFPEEK(258)=26 THEN LET T1=T1+A1: OUT2,0: OUT2,255:F2=F2-20-ABS(T1#30): S2
=S2-5
00300 IFPEEK(258)=46THENLETF1=5:R1=1:D1=D2;S2=S2-5:F2=F2-2
00310 IFPEEK(258)=44THENLETF1=-5:R1=-1:D1=-D2:S2=S2-5:F2=F2-2
00320 IF F2<0 THEN PLAY 9)8)7)6)5)4)3)2)1)0,2:CLS:CURS 15,7:PRINT"You ran out of
 fuel.Guess what?.....Your dead":GOTO640
00330 IF F1<0 AND R1>0 THEN LET F1=0:R1=0:D1=0
00340 IF F1>0 AND R1<0THENLETF1=0:R1=0:D1=0
00350 F1=F1-R1:R1=R1+D1
00360 RESET X,Y:RESET X,Y+1:RESET X-1,Y-1:RESET X+1,Y-1
00370 IF F1<0THENLETO1=-.5ELSELETO1=.5
00380 IF T1<0THENLETO2=-.5ELSELETO1=.5
00390 X=X+INT(F1+01):Y=Y+INT(T1+02)
00400 GOSUB 740
00410 IF X<1 THEN LET X=1 ELSE IF X>126 THEN LET X=126
00420 IF Y<1 THEN LET Y=1 ELSE IF Y>46 THEN LET Y=46
00430 IF POINT(X,Y) THEN GOTO 550
00440 SET X,Y:SET X,Y+1:SET X-1,Y-1:SET X+1,Y-1
00450 GOTO 280
00460 I=20
00470 P=INT(RND#80)+24
00480 FORT=0TO127
00490 IF T>P AND T<P+10 THEN PLOT T,J TO T,0:SET T,J+3:PLOT P,J TO P,J+3:PLOT T
,J TO P+9,J+3:GOTO530
00500 J=J+(INT(RND#3)-1)
00510 IFJ<3THENLETJ=3ELSEIFJ>40THENLETJ=40
00520 PLOT T,J TO T,0
00530 NEXT T
00540 RETURN
00550 IF X>P AND X<P+10 THEN 680
00560 IF T1<-2 THEN PLAY3)2)1:GOSUB700
00570 GOSUB 700:CURS15,3:PRINT"No you don't land here":PLAY20)2)20)2)1)2)3)4
00580 K=INT(RND#5)+1:ON K GOTO 590,600,610,620,630
00590 CURS 15,4:PRINT"Another new crater on the moon. Good job":GOTO640
00600 CURS 2,4:PRINT"I don't think you really passed pilots school. Did you?..."
:GOTO640
00610 CURS 2,4:PRINT"Bang,...Crash,...Smash....Guess who's lost a lunar lander":
GOTO640
00620 CURS 15,4:PRINT"Look where your going next time":GOTO640
00630 CURS 10,4:PRINT"You crashed. Any new inspiring pilots out there"
00640 CURS 2,15:PRINT"      Another try (Y/N)       "
00650 A1$=KEY:FORT=1TO10:NEXTT
00660 A1$=KEY:IFA1$=""THEN660
00670 IFA1$="y"ORA1$="Y"THENCLEAR:GOSUB 910:GOTO150ELSEPLAY24)24)24)24:CLS:END
00680 IF T1<-1 THEN CURS 15,2:PRINT"At least you found the pad.":GOSUB700:PLAY24
)1)2)2)3:GOTO 580
00690 CURS 15,1:PRINT"Brilliant you landed the craft correctly":GOSUB720:PLAY 3)
3)7)9)24)24)24)1)5:SETX,Y:GOTO640
00700 G=X-5:W=Y-5:FORT=1TO10:OUT2,0:OUT2,255:PLOT) INT(RND#10)+G,INT(RND#10)+W T
O INT(RND#10)+G,INT(RND#10)+W:NEXTT:RETURN
00710 RETURN
00720 PLOTR P+1,YTOP+8,Y:SETX,Y:SETX,Y+1:SETX-1,Y-1:SETX+1,Y-1:SETX-2,Y-2:SETX+2
,Y-2
00730 CURS 25,16:PRINT"SCORE="S2)
00740 CURS2,16:PRINT(A62 32))
00750 CURS2,16:PRINT"FUEL="F2)(CURS25,16:PRINT"SCORE="(S2):CURS43,16:PRINT"ACCEL
ERATION="(T1)
00760 RETURN
00770 CLS:LORES
00780 PLOT 0,0 TO 127,0 TO 127,47 TO 0,47 TO 0,0
00790 B=24
00800 FORT=1TO20
00810 A=A+6:PLOT 0,0 TO A,B:PLOT 127,0 TO A,B:PLAY 1
00820 NEXT T
00830 CURS 15,7:PRINT"L  U  N  E  R   L  A  N  D  E  R"
00840 CURS 27,14:PRINT"Written By.."
00850 CURS 25,15:PRINT"Philip Pulle'"
00860 CURS 2,2:PRINT"I - Instructions   P - Play"
00870 A1$=KEY:IFA1$=""THEN870
00880 IF A1$="I" OR A1$="i" THEN GOSUB 980:GOTO 910
00890 IF A1$="P" OR A1$="p" THEN 910
00900  PLAY 1:GOTO 870
00910 CLS
00920 PRINT\\,"How much fuel do you wish to start with":INPUTF2:IFF2<OORF2)1000
OTHENPLAY4)1)CURS15,16:PRINT"COME on be serious"):PLAY0,4:CURS15,16:PRINT(A30 32
)):GOTO 910
00930 CLS:PRINT\\,"Initial downward acceleration"!!INPUTT1:IFT1)0THENPLAY4)1):CUR
S15,16:PRINT"Negative numbers please":PLAY0,4:CURS15,16:PRINT(A30 32)):GOTO930
00940 S2=10000-F2
00950 PLAY 15)18)20:PRINT,,"Thank you....."
00960 PLAY20,4:RETURN
00970 GOTO 970
00980 CLS
00990 PRINT"You are the pilot of the newest lunar lander developed by the"
01000 PRINT"Terran Federation. Your task is to deliver cargo and passengers"
01010 PRINT"to the moonbase on the moon."
01020 PRINT"Use the < and > keys to steer your craft and the 'Z' key to "
01030 PRINT"apply thrust. Remember that the forces of gravity and your use"
01040 PRINT"of fuel are acting against you."
01050 PRINT"Next I will ask you for the amount of fuel you wish to start"
01060 PRINT"with. The less fuel more points however it's harder to play"
01070 PRINT"Good luck....."
01080 PRINT"Press any key"
01090 A1$=KEY:IFA1$=""THEN1090
01100 RETURN
```

Feed Forward needs your minds. If you have ideas for circuits that you would like to enter in our idea of the month contest, programs for the computing columns or just want a word with the editor, send your thoughts to:

Feed Forward
ETI, Federal Publishing,
PO Box 227,
Waterloo, NSW 2017

Contributors can look forward to $20 for each published idea/program which, should be submitted with the declaration coupon below.

Programs MUST be in the form of a listing from a printer. You should indicate which computer the program is for. Letters should be typewritten or from a printer, preferably with lines double spaced. Circuits can be drawn roughly, because we have a draughtsman who redraws them anyway, but make sure they are clear enough for us to understand.

COUPON

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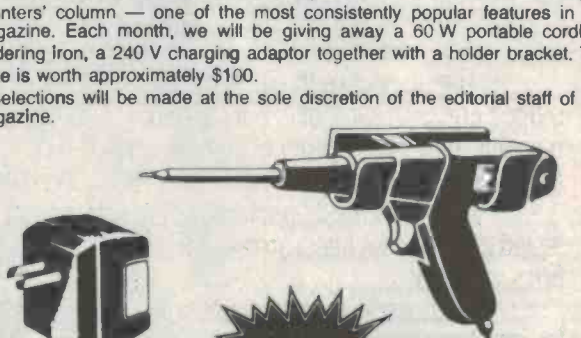

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ETI READER SERVICE 27

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AUGUST '86

RESERVED JUDGMENT — on the ATS-803 receiver

If you're after a radio alarm on your scanning receiver, along with FM stereo you should take a look at the ATS-803. It is a receiver of unexpected features and curious operations.

Peter D. Williams

Peter Williams is Director of Associated Calibration Laboratories in Melbourne.

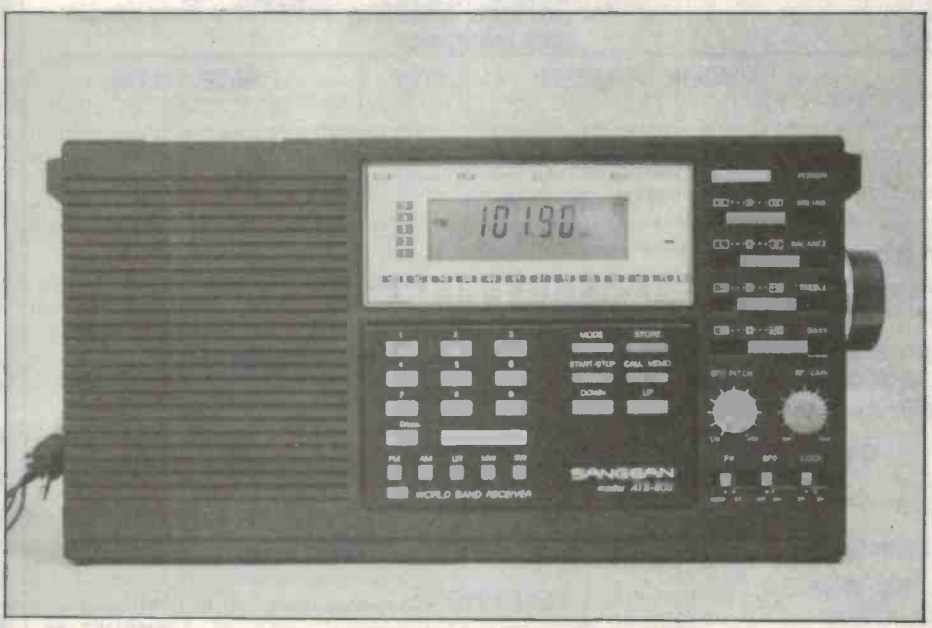
REVIEWERS TRY TO be objective in their evaluations of equipment. However, it's easy to make comparisons and thus be overly critical of something which doesn't quite meet one's standards. I offer this foreword in an attempt to rationalise my thoughts on this low priced AM/FM/SW receiver from an unknown (to me anyway) manufacturer.

The Sangean model ATS-803 is, as far as can be established, made in Taiwan, although its birthright is not clearly stated. We puzzled over the name 'Sangean' without attaching any significance to it, and could only conjecture whence it commeth! It doesn't trip off the tongue!

The machine seems to be an attempt to provide the market place with a receiver that doesn't cost a fortune yet has the features of which its more expensive counterparts boast (cf Sony ETI December 1985).

Design

The ATS-803 covers longwave (LW) 150 to 281 kHz, mediumwave (MW) 520 to 1620 kHz, FM 87 to 108 MHz, shortwave in 12 bands from 2.3 MHz to 26.1 MHz in continuous coverage. The inclusion of the 150-281 kHz band is presumably for the European market as the majority of its AM broadcast stations operate in this part of the spectrum.



What do you get? Well, the frequency coverage has been mentioned. To get it, five tuning functions are available: direct frequency key-in from the keyboard, manual and auto scanning, memory recall of up to nine frequencies and the usual rotary tuning.

Radio, clock and alarm are available to automatically turn on a preset station at a preset time. Conversely, you can be 'lullabied' to sleep with a switch-off playing time adjustable from 10 to 90 minutes.

Probably the most pleasing feature on radios of this type is the stereo function for FM broadcasts. You are obliged to purchase a set of phones, of course, which connect to a jack on the left side panel. Strangely, the user manual makes little comment of this facility, only casually mentioning it under the heading of "stereo indicator light".

For the reception of single sideband there is a BFO (beat frequency oscillator) control. It's a rather crude method of resolving SSB signals by producing a carrier at the appropriate frequency to replace the carrier that was removed at the transmitter. Single sideband signals are used by amateurs and commercial stations in the interests of more efficient use of the spectrum and because SSB signals are capable of producing good signal-to-noise ratios in the receiver. Watt for watt SSB can be heard under more diffi-

LABORATORY TEST: SANGEAN RECEIVER MODEL ATS-803 SERIAL No 073059

FREQUENCY RANGE

FM: 87.5 MHz-108 MHz
(or 76 MHz-108 MHz on model for certain areas)
AM: 150 kHz-26100 kHz
(or 150 kHz-29999 kHz on model for certain areas)
LW: 150 kHz-281 kHz
MW: 520 kHz-1620 kHz
SW: divided into 12 shortwave bands

120 m	2300 kHz- 2500 kHz
90 m	3200 kHz- 3400 kHz
75 m	3900 kHz- 4000 kHz
60 m	4750 kHz- 5060 kHz
49 m	5800 kHz- 6200 kHz
41 m	7100 kHz- 7500 kHz
31 m	9500 kHz- 9900 kHz
25 m	11650 kHz-12050 kHz
19 m	15100 kHz-15600 kHz
16 m	17550 kHz-17900 kHz
13 m	21450 kHz-21850 kHz
11 m	25600 kHz-26100 kHz

SENSITIVITY

Lab test: 0.46 μV (−113.7 dBm) for 10 dB S/N
Spec: Usable sensitivity 20 dB S/N is −101 dBm
FM @ 97.50 MHz (wideband)
Lab test: 0.54 μV (−112.3 dBm) for 10 dB S/N
50 kHz deviation 1 kHz tone
Spec: −98 dBm
AM @ 3.6 MHz
Lab test: 1.2 μV (−105.4 dBm) 30% mod 400 Hz tone
Spec: −98 dBm

"S" METER SENSITIVITY at 97.5 MHz

S1 = 0.95 μV (−107.5 dBm)
S2 = 1.06 μV (−106.5 dBm)
S3 = 1.34 μV (−104.5 dBm)
S4 = 1.69 μV (−102.4 dBm)
S5 = 2.38 μV (−99.5 dBm)

NOTE: You don't need big signals to show that your receiver is active! (No mfr's spec.)

NOISE FLOOR (minimum discernible signal)

AM: result 0.1 μV (−127.0 dBm) at 3.6 MHz
FM: result 0.37 μV (−114.0 dBm) at 97.5 MHz
SSB: result 0.16 μV (−123.2 dBm) at 9.5 MHz
(No mfr's spec.)

IF REJECTION

Frequency 97.5 MHz with 10.7 MHz IF
Lab test: 75 dB
Spec: 60 dB
Frequency 3.6 MHz with 55.845 MHz IF
Lab test: 58 dB

IMAGE REJECTION

FM Frequency ±2 IF with test frequency of 97.5 MHz, will be at 118.9 MHz
Lab test: 35 dB IF rejection
Spec: 36 dB
AM with test frequency of 3.6 MHz image will be at 115.29 MHz
Lab test: 80 dB

AUDIO FREQUENCY RESPONSE

Tone control set for zero (centre); FM has pre-emphasis; measured at 6 dB points
Lab test: AM 27 Hz to 3400 Hz
FM 15 Hz to 5 kHz
SSB 670 Hz to 1600 Hz
Spec: AM 150-2200 Hz
FM 150-3.2 Hz
NOTE: Spec written with tone controls at minus and no pre-emphsis

AUDIO OUTPUT POWER

Impedance 8 ohms
Lab test: output power 1.1 W for 10% distortion
Spec: 1.2 W

AUDIO DISTORTION

0.7% min

CURRENT CONSUMPTION

108 mA at 9 V — no signal

NOTES

1. Sensitivity figures are good especially on FM.
2. Signal strength indicator will always show some action even on weak signals.
3. IF rejection is good.
4. No spurious signals were found.
5. As reported, the synthesiser noise inherent in the design and when tuning is objectionable.
6. Sensitivity to strong adjacent signals means that intermodulation and interference generally would be noticeable.
7. Image response on AM is good and on FM is satisfactory.
8. Audio frequency response on FM is not particularly good considering that stereo reception of FM is possible.

DIMENSIONS

Size: 29.2 cm x 16.0 cm x 6 cm
Weight: 1.7 kg without batteries
Receiver — courtesy of Dick Smith Electronics, Sydney.

cult reception conditions than ordinary AM signals.

The handbook/user's manual says that international shortwave bands will adopt this technology to combat interference. It's an optimistic pronouncement at best. Any large scale usage of SSB by Radio Australia or the BBC is, to the best of my knowledge, still only a talking point.

The display panel shows comprehensively what the electronics are up to. It has the dual function of showing frequency and time, after manipulating the appropriate controls. On the left hand side, LED indicators show signal strength. Another indicator shows the band selected from FM, LW, MW or SW. When on shortwave, the received band is shown. If the channel required is selected from any one of the nine memories, it is displayed on the LCD.

The right hand side of the front panel has slider controls for volume, bass and treble together with a balance control for FM. These are a nice touch as close listening through phones very often requires adjustment to tonal qualities.

Below the display panel is the control panel with frequency digit keys. Below that are band selector keys. Access to SW requires a bit more effort as the shortwave segment between 2.3 MHz and 29.9 MHz has been divided into 12 bands. This corresponds with the international conventions for shortwave broadcasting.

Depressing the SW button gets you one of the shortwave bands. Repeated pressings are required to get the other standard bands.

For coverage of other frequencies not shown in the specifications, you have to select AM, enter the frequency of interest, and turn on the BFO to resolve sideband, if this is found necessary.

The makers of the ATS-803 seem to put great store in getting the time angle sorted out, and it does a good job after the operator has mastered the intricacies of setting it up. Having set up a frequency on the display, the LCD reverts to telling the time after one minute. Further manipulations of buttons are required to bring back the frequency in case you have forgotten where you were.

Tuning is done by any of five methods:

1. Direct tuning by selecting the band, by entering the frequency on the keyboard executing, and then fine tuning by means of the tuning knob.

2. Automatically scan tuning, by selecting the band and pressing the start-stop key to search for stations. Scanning will stop on a signal with sufficient strength; it will also stop on noise or other forms of interference and is not particularly satisfactory.

3. Manually scan tuning, which requires selecting the band and pressing the up/down keys to search for stations in steps. Steps of either 9 or 10 kHz can be set by a small switch inside the battery compartment, and are in line with accepted frequency spacings for broadcast stations.

4. Alternatively manual tuning involving selecting the desired band via the keyboard. Frequency tuning can be effected via the tuning knob.

The faster you tune the knobs the faster the frequency steps. Fast tuning gives you increments of 100 kHz; slower tuning reduces this to 1 kHz. This 'rate control' tuning is used on a variety of receivers — even professional ones, but in this case I found ▶

the steps too coarse, even when tuning slowly. It's difficult to tune signals, especially on sideband.

5. Last but not least, preset tuning which means that if you have a required station in memory, pressing the CALL MEMO key and a number 1 to 9, will produce the frequency you had in memory.

In operation

It was unanimous opinion in the laboratory that the receiver had a few shortcomings in practice. Most of these emanate from the method of tuning and the difficulty in resolving signals. I have mentioned the rapid tuning rate. Coupled with this is an unbelievably high level of noise out of the speaker as the synthesiser selects its steps and locks in. Running a ruler along a picket fence gives you some idea of the noise created when rotating the tuning control knob.

Noise from the synthesiser is also evident in the speaker when tuned to a frequency and using the keylock. (The keylock locks the receiver on a desired frequency so that all other frequency controls are non-functional, preventing changes by accidentally moving the tuning knob.)

I found tuning sideband signals a very fiddly task. Tuning the BFO knob is a primitive way of resolving SSB. Coupled with a noisy and unstable synthesiser it does nothing to make listening to these stations a pleasure. More work needs to be done on this part of the receiver to make it useful to the newcomer. Our suggestions for improvement would seem obvious; if SSB is a desired mode then a product detector of some sort is mandatory, together with a slower tuning rate at slow speeds. It's strictly back to the drawing board with the synthesiser.

I have mentioned the reversion to 'time' after one minute of punching up a frequency display. This is extremely irritating. A change could be made to provide for a switchable function.

Functionally, the layout of the front panel and placement of operating controls is good. However, the external headphone plug and cable supplied are mono, although the jack in the radio is stereo.

Unfortunately, the difficulty with tuning took the edge off searching for signals on the shortwave band. Again coupled with the noisy synthesiser, this degraded the quality of the received signals. Nevertheless, audio quality was quite good.

The quality/workmanship inside is fair to average, technically the receiver has no unusual circuitry and is in the main relatively simple.

The manual suffers from the usual communication breakdown when translated to English. I also felt that instructions were, at times, confusing. It took some time to learn how to drive it.

In conclusion, I would say that operating this receiver may give a newcomer a jaundiced view of shortwave listening. However, it's adequate for FM and the broadcast band. On the other hand I am not at all certain that for $330 RRP (February) you could find an alternative with all these features.

If infrequent indulgence in scanning or tuning shortwave bands is your game, while also wanting a reasonable BC and FM unit, then the ATS-803 should be considered. ●

SEMICONDUCTOR PROCESSING ADVANCES

Driven by the principles 'small is better' and 'more is better', various techniques for etching semiconductors are being developed, tried and adopted. While plasma etching is still something of a favourite, the advantages of using laser techniques and of MOCVD have caught the researchers' attention.

Dr Keith Ryan,
Senior Principal Research Scientist, CSIRO

ONE AREA WHERE surface modification technology is developing very rapidly is the etching of semiconductors for the fabrication of microelectronic devices.

The never-ending desire to pack greater numbers of circuits on to one chip has required pattern definitions to approach the submicron (that is less than one-thousandth of a millimetre) range. This has resulted in the abandonment of traditional wet chemical methods because of the inherently low resolution of those processes.

Plasma etching

The solution being applied now to this problem is the technique of plasma etching. A wafer containing more than 100 chips is placed on an electrode inside a radio frequency discharge (see Figure 1). The electrical energy consumed by the discharge is used to generate a range of active species in the gaseous plasma.

A very important feature is that the charged species (ions and electrons) are constrained to move in the direction of the field and impact the wafer at normal incidence.

The photoresist is chosen to be impervious to attack, but those areas not covered by the resist are stimulated by ion bombardment, thus initiating chemical attack. This provides a mechanism for the evolution of a pattern with vertical side walls.

One intriguing aspect of plasma etching is the rapidity with which the technological advances have been made, notwithstanding how little is known about the underlying science. The spectacular progress which has been achieved so far has arisen mainly by empirical approaches with most attention being paid to silicon-based semi-conductors.

To find an explanation for the relative merits of various gas mixtures, which have been found effective in etching one silicon compound selectively in the presence of another, is quite difficult. It is acknowledged that progress will be limited ultimately by the lack of scientific understanding of the problem.

The major difficulty is how to unravel the complex processes that occur both in the gas phase and at the gas-solid interface.

We have taken the view that the gas phase chemistry controls the indentity of the species which arrive at, and etch, the surface. Thus a knowledge of the chemistry allows one to focus attention on the gas-surface interaction mechanisms of clearly identified species.

Our work has provided very encouraging results. Potentially important gas-phase reactions were studied under carefully controlled conditions so that the rate of each of these reactions could be established. Armed with this vital experimental information, it has then been possible to build up a model which reproduces conditions employed for the etching of silicon.

Work from this laboratory has done much to remove uncertainties associated with gas-phase phenomena and is complemented by work in progress in other laboratories aimed at understanding the reactions of selected species on the surface.

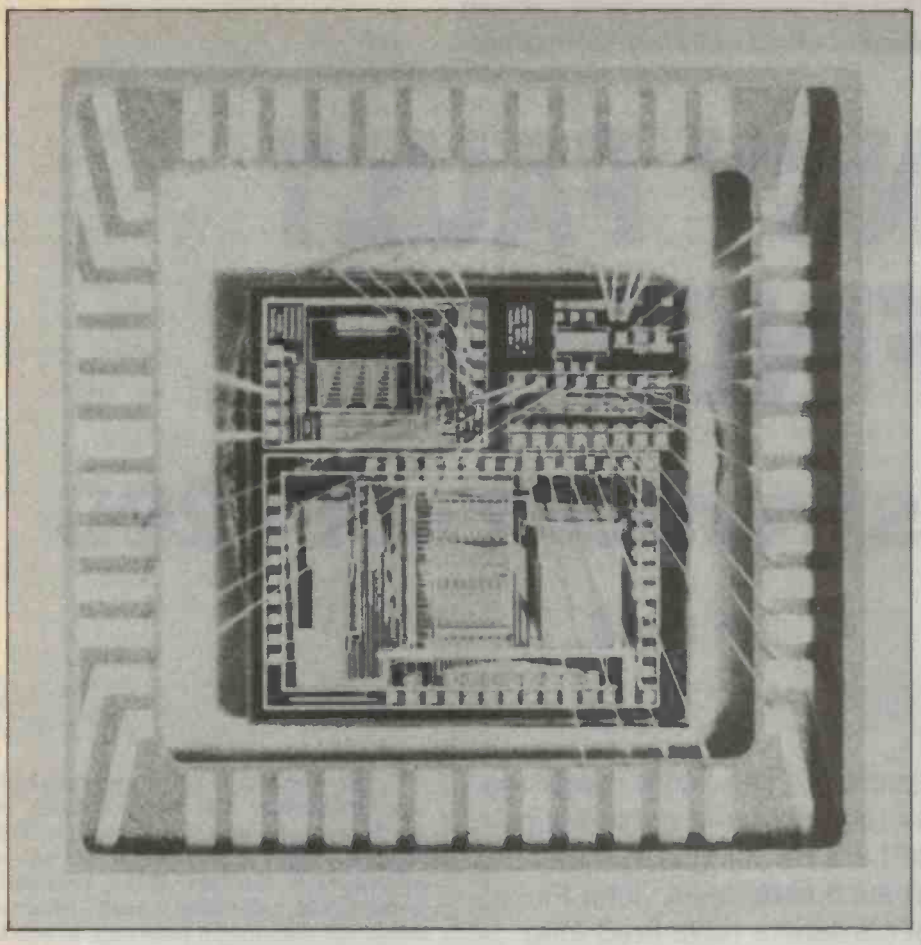
There are many exciting scientific problems in the future of semiconductor processing. For example, the increasing preoccupation with gallium arsenide technology is certain to require a much better understanding of its etching chemistry.

One inherent disadvantage of plasma etching (apart from the complex chemistry mentioned above) is that damage can occur to the device because of ion bombardment. This can be more of a problem for devices with dimensions of less than 1 micron and has prompted the search for other methods. One possibility which is receiving a lot of attention is the use of lasers.

Laser chemistry

Laser microchemistry offers a number of new methods that have advantages over plasma processes for altering the morphology (shape and contours) of a solid surface. One of the major attractions of this approach is that, with a suitable choice of materials, the chemistry is much less complex than when plasmas are used. Basically there are two different ways in which lasers can be used to induce surface reactions — pyrolytic and photolytic.

In the pyrolitic method the laser is focused on the surface where intense heat in-



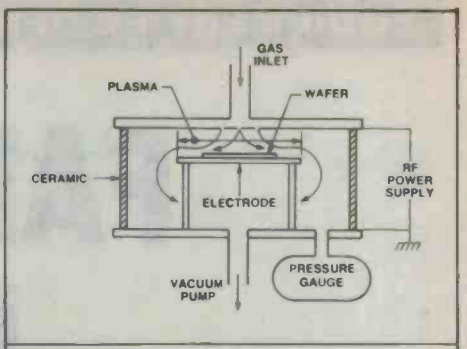


Figure 1. Plasma etching equipment. Active species (ions and electrons) generated in the gaseous plasma move in the direction of the field and impact the wafer.

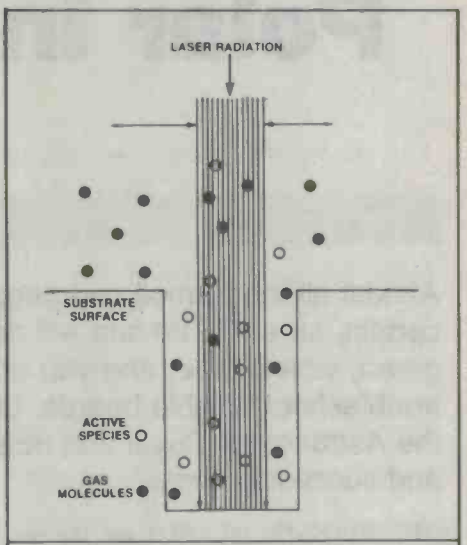


Figure 2. Photolytic laser etching. A focused laser beam interacts with gas molecules forming active species which diffuse to the surface where etching occurs. The mean distance over which the active species survive outside the irradiated zone is dependent on the density of bulk gas molecules.

duces reactions between surface species and impinging gas molecules. The spatial resolution that can be achieved depends both on the size of the laser-heated spot and the thermal properties of the heated material. By using a pulsed laser of short duration compared to the relaxation time of the irradiated material, high spatial resolution can be obtained.

Most examples of laser-induced pyrolytic deposition so far have been adaptations of known chemical vapour deposition processes. These older processes have been used predominantly for growth of thin films and large surface-area coatings.

Lasers provide the opportunity to select a small portion of the surface and to deposit with high precision. Laser-induced pyrolitic deposition is clearly a powerful extension of existing coating methods.

Perhaps of greater potential are those deposition and etching processes which depend upon photolysis. In the photolytic method a focused laser beam interacts with gaseous molecules above the substrate surface (see Figure 2). Careful choice of the gas species, the pressure and the laser wavelength ensures that only the required free radicals are produced and survive to interact with the surface. Active species generated in the laser pulse diffuse to the surface where etching occurs. Resolution is defined both by the focusing of the laser and the effect of a buffer gas which controls the diffusion of the active species.

Because silicon compounds and many fluorine-containing compounds that react with silicon absorb strongly in the infrared, the etching of silicon and silicon dioxide is particularly suited to investigation by infrared laser photochemistry.

Laser photolysis is equally powerful as a means of selective deposition. For example, cadmium, tin, aluminium, zinc, and germanium have all be deposited on ceramic substrates following laser photolysis of the metal-alkyl (that is, metal linked to single-bonded hydrocarbon group) compounds.

Using a laser operating at 275 nm, photolysis produced a supersaturated metal vapour near the surface of the substrate. Metal-alkyl molecules adsorbed on the substrate are also dissociated and act as a nucleation centre for metal atoms arriving from the gas phase. Because this nucleation increases dramatically the sticking coefficient of the impinging metal atoms, the initially adsorbed molecules are an important factor in achieving highly localised decomposition.

MOCVD

One can attempt to predict important future developments in technology by examining how technologies, which are being established now, have themselves developed. In the semiconductor field, rapid and intense technological change is occurring through the application of metalorganic chemical-vapour deposition (MOCVD) of III-V compounds (that is, those formed from elements of Groups III and V in the Periodic Table, eg, $Ga_{1-x}Al_xAs$).

These materials are used to produce lasers, solar cells, quantum well lasers, bipolar heterojunction transistors, photocathodes and pin detectors.

The interest in MOCVD arises from the fact that, of all the known epitaxial techniques, it has been demonstrated that MOCVD has the capability to grow the widest variety of III-V compounds with excellent uniformity.

The pioneering research in this area was performed in the late 1960s. It seems quite evident that important advances in this and related areas will come from the application of laser-induced photochemistry. Those communities which invest the scientific effort now will be in the best position to exploit the technology later. ●

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FANCY FAULT FINDING:

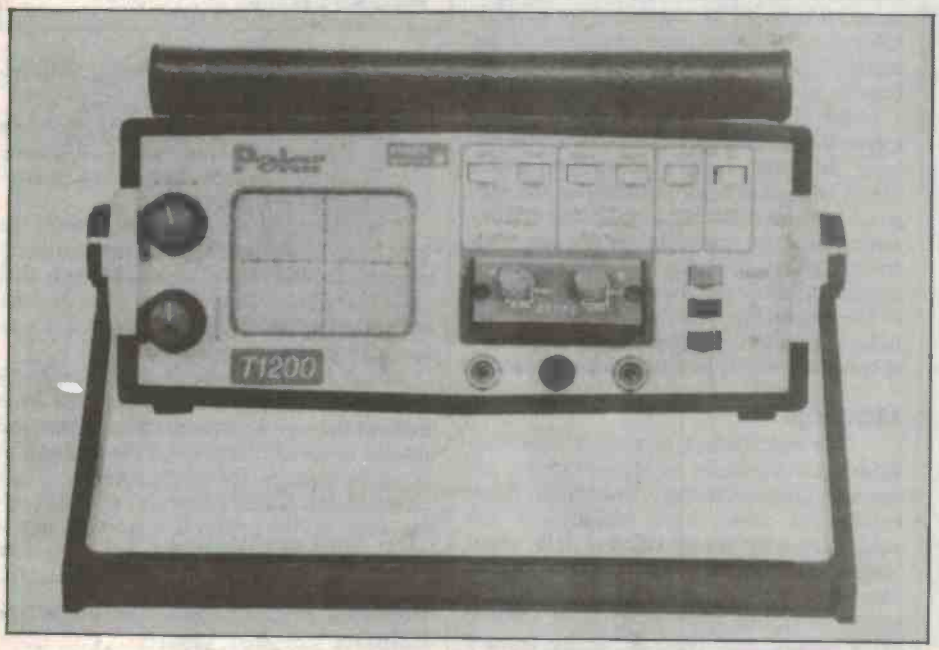
Polar Instrument's T1200

Jon Fairall

Amidst all the turmoil and perplexities of life, some things are certain, surely? The sun will rise tomorrow, the grass will be green, violets blue, and you and I will be using a multimeter to troubleshoot bolshie boards. On such certainties, John Fluke, the Astronomer Royal and most gardeners have lived long and successful lives.

THE CHANNEL ISLANDS are the unlikely home of a company that wants to change some of these certainties of life. Polar Instruments is the outfit. It has established a considerable reputation over the last few years as manufacturer of some innovative test gear. The latest device is the T1200, and it is aimed at the repair shop market for multimeters. Actually, it's aimed at parts of both the multimeter and CRO markets.

Consider basic test strategy. There are two ways of testing it. You can proceed with the device under test powered down, in which case one uses an ohmmeter. The ohmmeter puts a low current through a component in the hope that a resistance measurement will reveal a fault. Alternatively, one does it with power on, in which case one uses a CRO or a voltmeter to check for voltage.



Both have problems. Resistance measurements are all but useless where capacitors, inductors or semiconductors are concerned. Voltage measurements, on the other hand, require very careful interpretation by the operator. Even then, it might not be possible to finally isolate a fault without actually disconnecting the suspect part from the rest of the circuit.

Polar has come up with a device that tries to solve both these problems. It uses a cathode ray tube (CRT) to draw voltage versus current diagrams for the circuitry between its probes. Since all passive components (and many active ones) have quite distinguishing current/voltage patterns, the machine is capable of revealing details of resistance, capacitance and semiconductor activity. This is even true when the components are in parallel.

The T1200 works by putting a 50 Hz voltage stimulus across a component via two probes. The 50 Hz is derived from the mains, and has switchable peak amplitude of either 12.5 V or 60 V. The current is limited by a series resistor to 125 mA on low voltage or 12.5 mA on high voltage.

The voltage that is applied to the component is also used to drive the horizontal deflection plate of a CRT. With no other activity, the result on the screen would be a single straight line. However, the current that flows between the probes is turned into

a voltage by a low value series resistor and allowed to drive the vertical deflection plates of the same CRT.

The result is a plot of current versus voltage across the screen. A resistor is a straight line, a beautiful statement of Ohm's law. A capacitor, changing phases by 90 degrees, gives an oval. So does an inductor, and if you are a little smart, you might notice that one oval slopes a different way from the other. All of a sudden, semiconductors reveal themselves. Diodes have knees, zeners collapse at the correct voltage and transistors show their characteristics.

Playing with the device for a few minutes gives one a quick feel for how it works. The important thing here is the pattern created, not value. The graticule on the screen is marked out so that you can theoretically take readings directly off the screen, but I can't imagine anyone ever actually doing so. A DMM will always give readings faster and more accurately. As I say, pattern is all important.

This importance of patterns is revealed by the fact that the T1200 is optimised for comparing boards. The idea is that one should do the test with a good board next to the dud one. To assist in this, there are two channels which allow the user to select one or the other or both. If both channels are selected the unit switches back and forth at a rate of once a second.

Two things brought home the power of the instrument. One was checking capacitors. Caps are the bane of any board repair man. There is no simple and effective way of detecting an open circuit capacitor (the most common failure), so most technicians adopt the practice of replacing all the relevant caps if they suspect such a failure. This is obviously time consuming and wasteful. The T1200 checks IT beautifully.

The other powerful function was the ability of the unit to check components in parallel, without taking them out of the board. For instance, a resistor-capacitor circuit or one including a zener and a capacitor would be hard to make sense of with a DMM. With the T1200, both resistance and capacitance are elegantly displayed.

Given the volt/current display, characteristic curves for transistors are a natural extension of the basic machine, and indeed, the T1200 comes with a transistor tester facility. Characteristic curves are graphs of collector-emitter volts versus current, for a given value of base-emitter current. To draw the curves, a specific current is put into the base and a reading taken of the collector volts and current. Then the base current is increased and the procedure repeated. The result is a family of curves.

The T1200 makes a superb troubleshooter. If you can get a good price out of Emona Instruments, the local agents, it's a worthwhile investment. ●

THE SOUNDEST MOVE — KEF GT200 automotive speakers

For the most part, speakers are fitted into cars with the least inconvenience, using whatever spaces the car might suggest. KEF has challenged this approach with its GT200 loudspeakers and designed a system incorporating bass loading arrangements and requiring some particular installation considerations.

KEF GT200 AUTOMOTIVE SPEAKERS

Dimensions:	
Subwoofer:	*285mm (wide) x 285mm (high) x 134mm (deep) plus 115mm diameter extended flexible connection pipe*
Satellite:	*145mm (wide) x 224mm (high) x 42mm (deep) (including grille)*
Weight:	*4.6kg each side*
Manufacturer:	*KEF, Maidstone, UK*
RRP:	*$999*

AS YOU MAY have noticed in the last five or six issues of the magazine, we have been increasingly aware of the issues of automotive hi-fi, as it has become a major commercial avenue (and in some cases salvation) for the many Japanese, American and European manufacturers of hi-fidelity equipment.

Almost everybody realises that a car is an inappropriate venue for true hi-fi listening. The first problem is that the 'on the road' signal-to-noise ratio suffers from the combined effects of engine, road, tyre and wind noise, quite apart from passenger conversation. Even when stationary, you are likely to find that the noise attenuating properties of the body and windows are unequal to the task of excluding traffic noise.

The next problem is (or rather was) that most manufacturers of car radios, cassette players and the like don't really take all relevant aspects of the task of automotive hi-fi seriously. Of course, the limited space around the dashboard of your car, inside the doors or even behind or under the rear parcel tray is really not adequate for conventional loudspeaker systems, worthy of the title 'hi-fidelity'.

The realisation that there is a big market out there of well-heeled potential buyers, able to afford 'perfection' has caused a number of speaker manufacturers to re-evaluate the problem. The development of the automotive CD player has provided even greater impetus for 'total systems' with hopefully a 'total capability'.

Fortunately, problems of this type are soluble in many different ways. KEF in the UK, not previously known for its involvement in automotive hi-fidelity, has brought to bear its innovative research resources to produce the GT200 automotive speaker system.

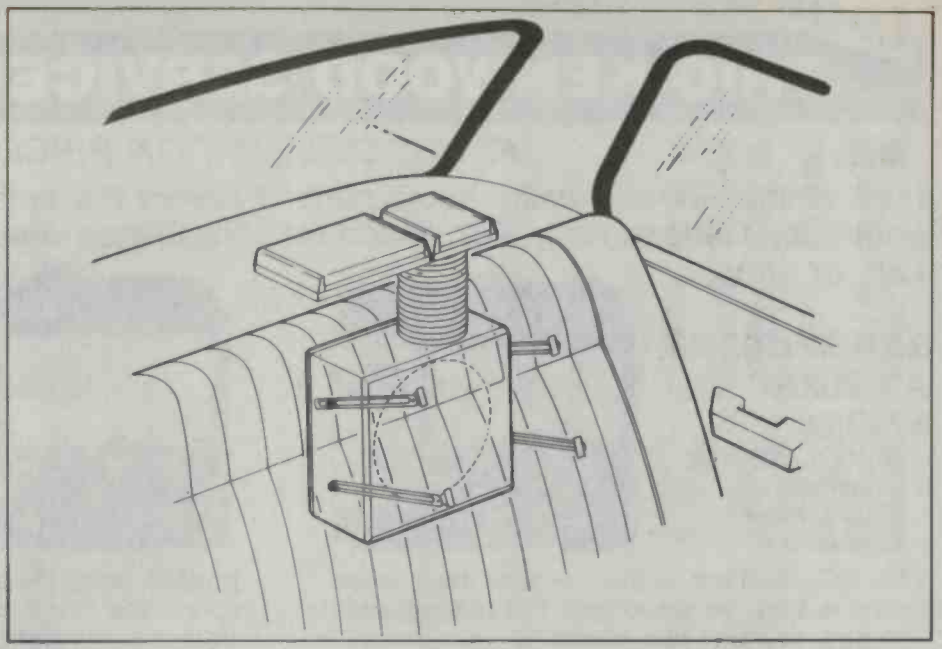
Design

The GT200 three-way speaker system is based on the simple placement of each of the combined midrange and tweeter enclosures (satellites) at an appropriate place near the rear of the car. The subwoofer units are then treated as two remote loudspeaker enclosures, which are placed in the boot space immediately below. (This, of course, presumes that the car has a rear boot; and presumably a front boot would work just as well.)

The subwoofers are then acoustically coupled to the parcel tray of the vehicle by means of a pair of circularly stiffened plastic flexible ducts. A protective grille is placed over their outlets to ensure you don't fill the speaker up with peanuts, sweets, change or other assorted debris, which tends to accumulate on rear parcel trays.

Each subwoofer unit is installed in a black particleboard enclosure with the 200mm diameter speaker mounted firmly and screwed against a cloth-covered mounting panel on one side. The acoustical coupling pipe is connected to the top rear of the subwoofer cabinet, which happens to be the most convenient spot for such connection.

The inside of the enclosure is lined with 25mm thick open cellular urethane foam on the remaining four and a half faces. Part of the cross-over network is also installed within the enclosure. The primary input terminals for connection to the amplifier's output are a pair of colour-coded universal terminals on the top of the enclosure. Between these terminals is a 400mm long interconnection cable, the outer ends of which are terminated in a pair of polarised quick-re-



Louis Challis

lease automotive type terminals ready to interconnect to the satellite speaker system above.

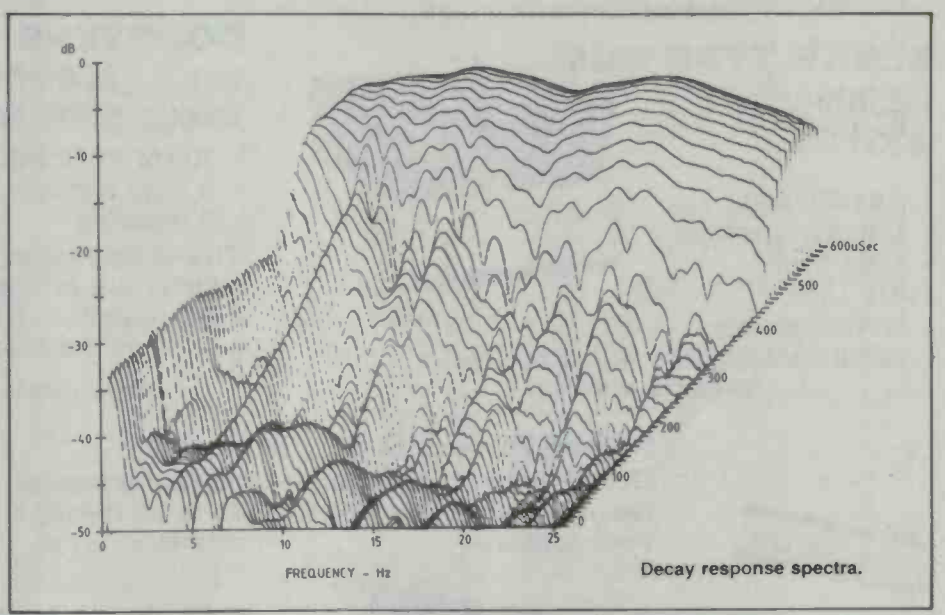
The satellite speakers are neatly finished in black, each with a small label "KEF Automotive Series" modestly fixed on one side. These satellite speakers are fabricated as a pair of plastic moulded enclosures and the exposed tops are covered by a solid perforated metal grille. The two primary lower edges of these covers securely clip into recesses on the two elongated sides of the enclosure, so that they will not vibrate or resonate during the playing of music or when travelling on rough roads. The grille simply unclips to provide access to the mounting screws, which are recessed deep in the front panel.

The midrange speaker is 100mm diameter with a 25mm voice coil. Its diaphragm uses what appears to be a plastic covered Kevlar or similar esoteric cloth, terminated at its outer edges with a plastic bonded rolled foam surround. The tweeter uses a woven copolymer soft dome 25mm diaphragm located at the base of a tapered recess in the moulded front panel of the system.

The rear protective cover of the midrange drive extends beyond the mounting line defined by the edge of the back panel so that a 120mm diameter cutout would need to be provided to facilitate its flush mounting on the parcel tray. (So, you'll have to leave the speakers in the car when you trade it in!)

A significant proportion of the cross-over and associated protective circuitry is installed on a printed circuit board located underneath the tweeter and, for good measure, the larger components are solidly strapped to this cross-over to minimise the possibility of vehicular vibration damaging them.

The correct (or optimal) positioning of the speakers will present the intending purchasers with a number of possible problems, not the least of which is the placement of the subwoofer unit in the rear of the vehicle.



Decay response spectra.

KEF has tacitly acknowledged that a problem exists by simultaneously releasing a GT100 automotive speaker system which can compliment the system at the front of the vehicle. Our evaluation and testing was primarily restricted to the assessment of the GT200 system, but I did carry out a subjective assessment of the GT100, about which I will have more to say later.

Objective testing

When you are faced with evaluating a loudspeaker system intended for automotive use, some of the normal testing procedures are obviously difficult to implement and may well be of questionable relevance.

A speaker system intended for mounting on a parcel tray with some components on the surface and others mounted on its rear is hardly the sort of system that you would place in the middle of an anechoic chamber to evaluate its frequency response. This system theoretically requires both the acoustical separation provided by the parcel tray, as well as the coupled volume provided by the boot to achieve a significant portion of its low frequency performance. The variability of boot volume, quite apart from the variability of flanking sound transmission paths in the design of a given vehicle, will obviously play a major role in determining what you hear in your vehicle.

My initial approach to this problem was to open the door of our anechoic room and insert a stiffened sandwich panel with polystyrene core to replace the door and wedges in the open aperture. The GT200 satellite speaker was mounted on the inner face of the panel and the GT200 subwoofer was then positioned outside the chamber and ▶

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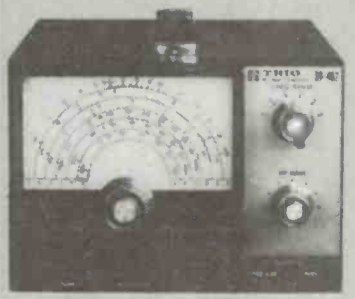

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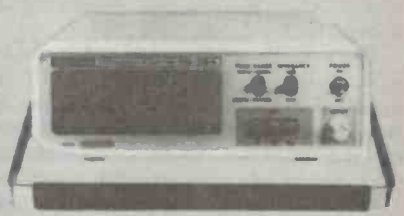

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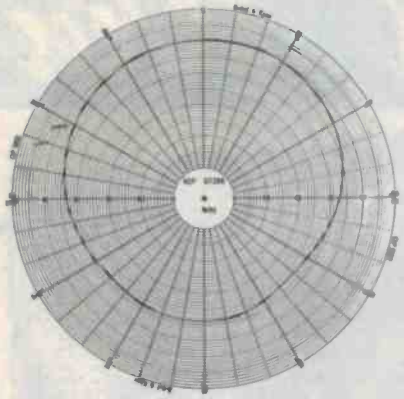
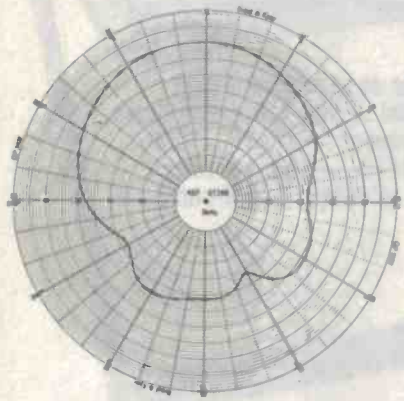
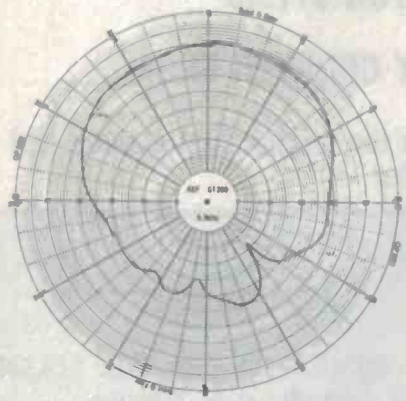
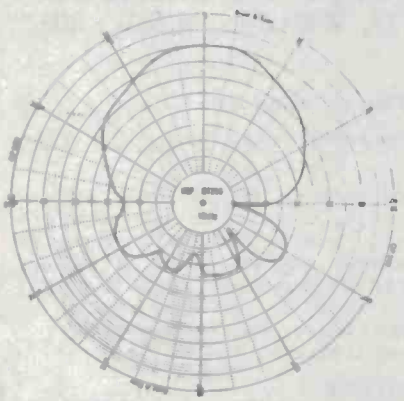
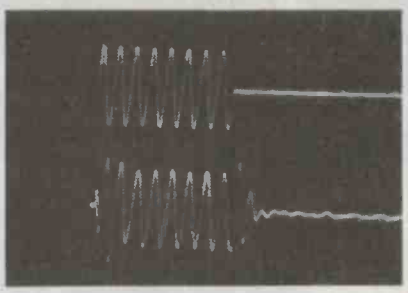
Polar response plots.



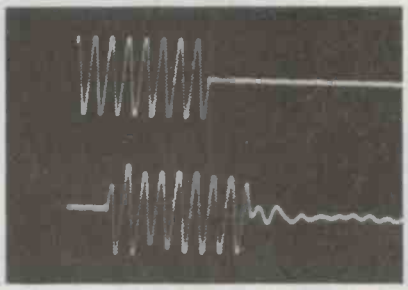




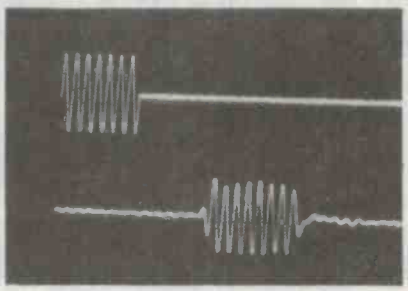




100Hz (20ms/div)



1kHz (2ms/div)



6.3kHz (0.5ms/div)

Tone burst response of the KEF GT200 (for 90dB steady state SPL at 1m on axis.) Upper trace is electrical input; lower trace is loudspeaker output.

connected to an aperture cut in the face using the special template provided by KEF with the installation kit. This provided a simple and direct measuring set-up, but one which obviously does not (necessarily) duplicate the intended automotive environment.

The frequency response measured at 2m on axis is extremely broad, extending from 40Hz to beyond 20kHz with a series of fairly deep troughs observable in the region of the cross-over frequencies between the subwoofer and the midrange speaker.

The magnitude of these troughs is to a large measure a direct result of the testing configuration. The breadth of the low frequency performance is substantially better than that offered by any other automotive speaker system I have seen or tested, whilst the high frequency performance is positively exciting.

By reversing the leads on the satellite system, some of the trough effects could be directly cancelled and it was obvious that the configuration and acoustical interaction between the subwoofer and the satellite section are very important in terms of impact on the resulting frequency linearity. The reversal of the leads in this manner results in other cancellation effects, the most important of which occurs at 880Hz.

The measured frequency response of the satellite speaker evaluated in isolation was extremely smooth, matching its polar plots at 1kHz, 3kHz, 6.3kHz and 10kHz. At 10kHz, the effective arc to the −6dB point is only 65° wide and the narrowness of the arc appears to be the result of the steeply tapered well into which the tweeter has been recessed. It should be noted, however, that the satellite system is intended to provide primary reflection off a sloping rear window in the vehicle and consequently the output of the tweeter would be redirected towards the driver and the passenger in the front seat.

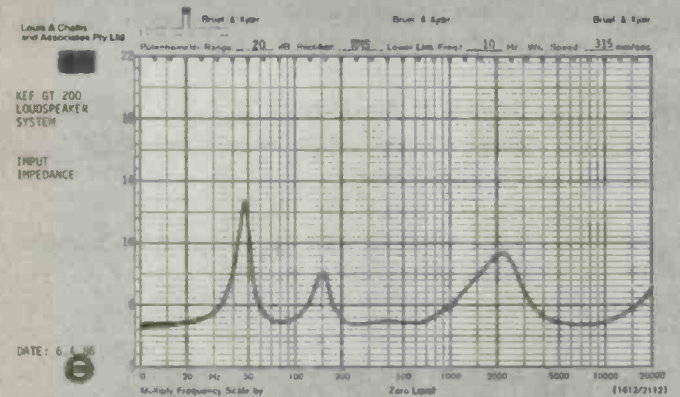
The low frequency directional characteristics of the system are generally of far less significance as you are located within the coupled volume which the speaker system is directly 'pressure driving'.

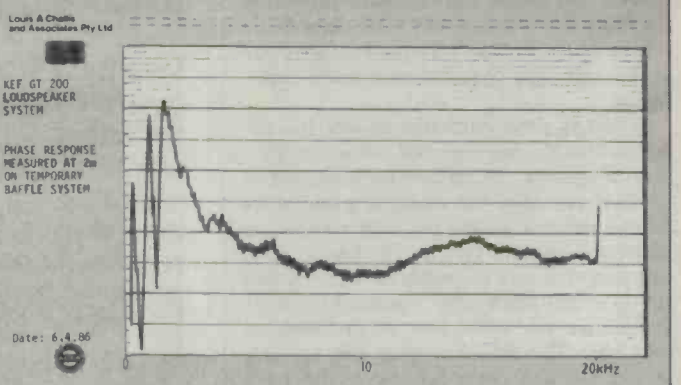
Following the same principles applied to the 104 series speakers, KEF has set the input impedances at just above the 4 ohm level to extract the greatest possible energy from the power amplifier. The fundamental resonance which occurs at 48Hz results only in a modest impedance peak of just under 13 ohms. This impedance curve is so smooth it would not create any problems with any normal automotive FM/AM/cassette players or conflict with the manufacturer's claim that the speaker system has been designed to handle up to 100W of peak input power.

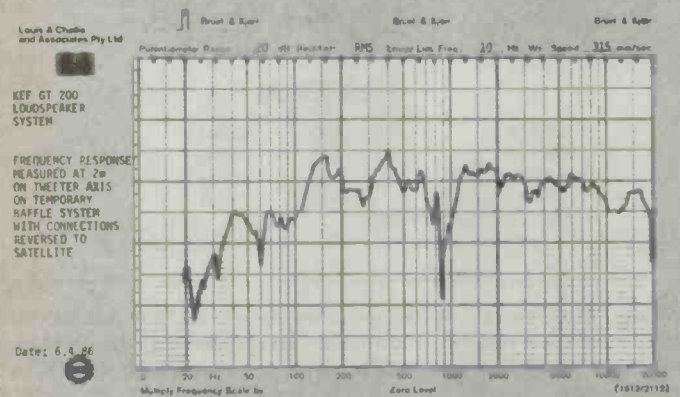
The phase response of the system is also extremely smooth, while the decay response spectra are even smoother over the early decay portion, but our initial test set-up displayed a significant resonance in the 4kHz region. This, however, may well be entirely attributable to the supporting panel system which we conveniently used to conduct that particular test.

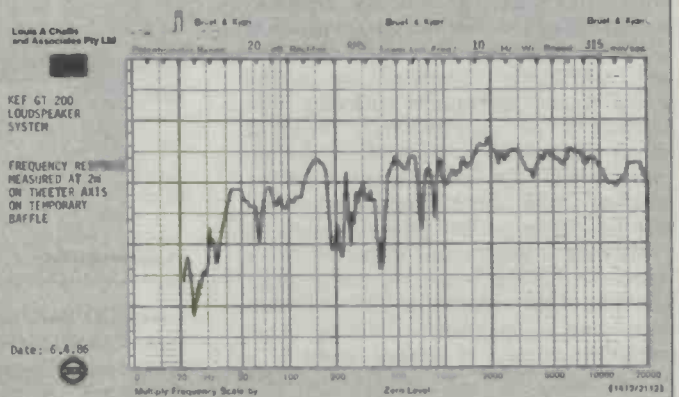
Apart from this one significant resonance, the other decay response characteristics are remarkably smooth and relatively clean. This indicates that the system should provide a good transient performance with minimal colouration.

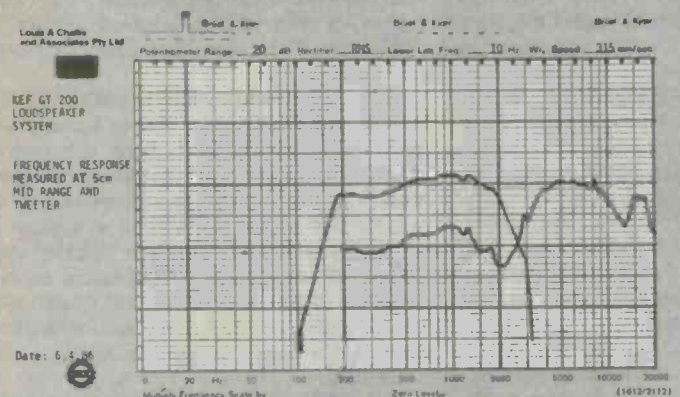
The measured harmonic distortion characteristics of the speaker system were initially measured on the temporary polystyrene core baffle, whose lack of stiffness and appropriate bracing started to concern me. Although the distortion measurements at 100Hz and 6.3kHz were particularly low at 0.63% and 0.3% respectively, the distortion at 1kHz was a whopping big 4.8%. I retested the satellite speaker again with it mounted on a special test stand located just above the grid floor of the anechoic chamber, (without the polystyrene core panel ▶

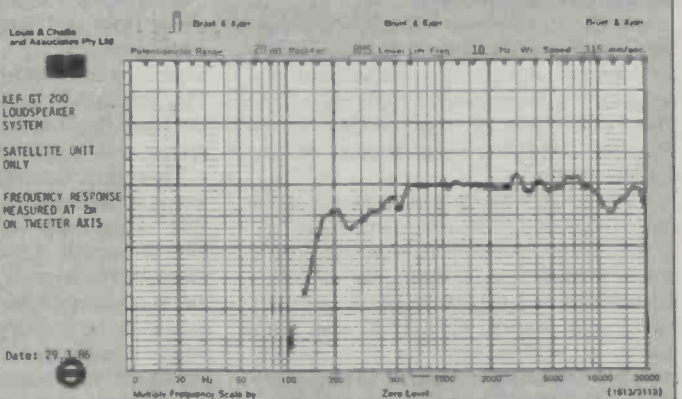


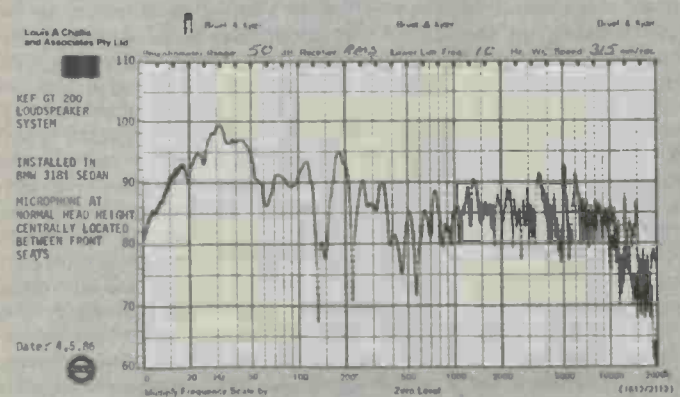












and without the subwoofer). Under these revised conditions, the measured distortion dropped down to a much more reasonable 0.6%; whilst the high frequency distortion at 6.3 kHz also dropped to a much lower figure.

Based on these particular results, it is apparent that the resonant roll in the decay response spectra, which can be observed at 2kHz is probably the result of panel resonances rather than the result of resonances within the speaker system. Obviously, if we can find this sort of problem with the test set-up in our laboratory, you might equally experience the same sort of problems in your car. The moral is with this speaker system (or any other for that matter) the resonance characteristics of the mounting configuration have the potential to generate unwanted frequency resonances which are only adequately minimised by careful mounting and appropriate stiffening. The application of supplementary damping panels immediately in front of, or alternatively behind, the chosen location for the speakers might also be considered if you wish to achieve the best possible results.

My overall impressions of the objective tests were that this speaker system is somewhat out of the ordinary and that KEF has once more applied lateral thinking in an unusual way to achieve unusual results.

Subjective testing

In order to carry out the subjective testing, I gave a plaintive plea for help to the local agents who soon responded, but as a result of confusing advice from my office, fitted out one of its representative's cars with the GT100 system instead of the GT200 system.

Rather than send the rep away, I took his car for an hour's drive and carefully listened to the GT100 system. This unwanted situation nevertheless suggested to me that even if I couldn't fit a GT200 system in my car I could really consider the GT100 as an alternative; its performance was both exciting and very refreshing compared to any of the other automotive loudspeaker systems I had previously heard.

The GT200, together with a Sony model CDRX-7 and a Proton P250 at 50 watts per channel (in a BMW 318i sedan) duly arrived from Ryda Car Radios, Sydney, and I could both test the system and experience the sound the only way that one should — in the car!

Ryda Car Radios is one of Sydney's longest established retailers and installers of automotive radios and hi-fidelity equipment and clearly knows its job well. With the Sony CDRX-7 combined CD player and AM/FM radio, the ability to play superlative programme content was further enhanced.

I started by playing a series of carefully selected CD discs including "Bachbusters" (Telarc CD-80123) which provides a range of frequencies beyond that provided by normal musical instruments, and Telarc's "Time Warp" (CD-80106) with orchestral music from the Cincinnati Pops Orchestra with frequency content that is just about as wide as you will find in any modern music. The results were positively electrifying to the point that I decided that my existing car system would just have to go!

This music was followed by more conventional music from "Porgy & Bess" featuring Ella Fitzgerald and Louis Armstrong (Verve records 827 427-2) which was provided by Phonogram, Sydney. This enabled me to appreciate the subtle differences between the same disc played at home using a proper monitor system from the characteristics of the automotive loudspeaker system.

I noticed much more bass content inside the car than I have ever experienced at home. Obviously when travelling on the open road, there would be no difficulty in overriding the low frequency noise generated by the vehicle to achieve an appropriate signal-to-noise ratio. By monitoring the signals produced with a precision sound level meter, I was surprised to find peak levels of up to 120dB, and even at these levels the distortion sound was much lower than I would have expected.

I then took the car back to the laboratory and proceeded to measure the frequency response with a 12mm Bruel & Kjaer type 4134S pressure microphone installed at a series of different positions between the front two seats, with the doors closed and the windows closed. As you will see from the attached level recordings, the frequency response over the range 50Hz to 15kHz is remarkably good (allowing for the effects of the car's internal resonances). The low frequency rise in the response between 20Hz and 50Hz is neither disturbing nor unwanted.

The deep notches which occur at 130Hz, 215Hz and 570Hz are a simple function of the vehicle body and boot resonance characteristics and were not at all perceptible. The microphone was protected by a windscreen which resulted in a drooping frequency response between 10kHz and 20kHz. A subsequent measurement in the anechoic chamber revealed the magnitude of this droop, so the curve has been corrected by a dotted line shown on the level recording.

The KEF GT200 three-way speaker system is a truly exciting development in the field of automotive hi-fi. Although the manufacturer only claims a frequency response from 50Hz to 20kHz, such data has been derived from anechoic chamber testing and ignores the low frequency boost provided by driving a coupled cavity in the typical sealed volume of a sedan. This provides a dramatic improvement in low frequency response enabling the GT200s to provide a low end response which most purchasers will find stimulating and an overall response which is positively exciting. At this point of time, there is nothing I have yet encountered in automotive speaker systems which approaches the performance capabilities of the KEF GT200. ●

LOUDSPEAKER DATA SHEET

MEASURED PERFORMANCE OF : KEF GT 200 AUTOMOTIVE SPEAKERS

SERIAL NO : GT 200 Subwoofer 2553B
GT 200 Satellite 2520B

FREQUENCY RESPONSE :

Anechoic Chamber : 35 Hz to 20 kHz +6 -13

"As Installed" : 10 Hz to 20 kHz ±15 dB (see level recordings)

CROSSOVER FREQUENCIES: 150 Hz ; 2.4 kHz

SENSITIVITY:

(for 96dB average at 1m) 8.1 V r.m.s. = 16.4 Watts (nominal into 8 Ohms)

Peak output 'as installed' 120 dB sound pressure level

HARMONIC DISTORTION: (for 96 dB at 1m)

	100Hz	1kHz	6.3kHz	
2nd	-50.9	-50.0	-61.2	dB
3rd	-46.8	-46.0	-53.3	dB
4th	-55.2	-71.7	-69.5	dB
5th	-50.9	-60.2	-	dB
THD	0.63	0.60	0.23	%

INPUT IMPEDANCE ONE TEST: 100Hz/7kHz 4:1

100Hz	5.2	ohms
1kHz	5.8	ohms
6.3kHz	4.8	ohms
Min at 6.3 kHz (see level recordings)	4.8	ohms

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*DMMs with **ROTARY SWITCH** range selection:*

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EDM-1111A $98
3½ digits — 0.5% — 9 functions: DCV, ACV, DCA, ACA, DHM, Capacitancé, Diode Test, Buzzer, Transistor Test.

*DMMs with **PUSH BUTTON SWITCH** range selection:*

EDM-1346A $240
4½ digits — 0.05% — TRMS — 8 functions: DCV, ACV, DCA, ACA, OHM, Frequency, Diode Test, Buzzer, Data Hold.

EDM-1135 $140
3½ digits — 0.1% — Peak Hold — 6 functions: DCV, ACV, DCA, ACA, OHM, Diode Test.

EDM-1118 $119
3½ digits — 0.5% — TRMS — 8 functions; DCV, ACV, DCA, ACA, OHM, dB, Diode Test, Buzzer.

EDM — 1116A $100
3½ digit — 0.5% — 9 functions: DCV, ACV, DCA, ACA, OHM, Capacitance, Transistor Test, Diode Test, Buzzer.

EDM-1105A $79
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PHILIPS

PHILIPS

VZ SOFTWARE MODIFICATIONS

Fast Graphics on a VZ200/300? It can be done! Here is the good oil!

Chris Griffin

I BOUGHT A VZ200 soon after they were released as an 'upgrade' from my old 6800-based CHIP-8 machine. But it soon became obvious something was missing. It seemed I could get speed or high resolution, but not both. I wanted something that was fast *and* took full advantage of the 128 x 64 dot colour graphics; so, 'VZChip-8' was born.

VZChip-8 is a 'low memory' interpreter (about 1.5K all up), designed for VZ200s/300s with only 8K of memory. Figure 1 shows a memory map of a typical VZ computer running my Chip-8 'system'. Notice the presence of an editor. This is used to write your Chip-8 program and can also be used to write machine code programs. It is a separate program in its own right — a stand-alone component in the CHIP-8 system, so I have decided to discuss it first.

The Chip-8/machine code editor

This program is about 1K long and allows you to work entirely independently of BASIC. In fact, it allows you to talk directly to the central processor. Programs are written in hexadecimal — or base 16, and consist of a string of op-codes and arguments. If you don't understand you should get hold of a book on machine code programming for the Z80.

The basic requirements of an editor are that it be able to write, run and modify programs, print listings and save to tape or disk. I have included a few extras because I find them helpful, but otherwise, the editor consists only of these things.

Editor commands consist of a single letter. Its features revolve around the memory pointer. This is just like an arrow, pointing to a particular place in the VZ's memory. The editor uses the arrow to indicate where it is to store or retrieve the information it needs. For example, if you want to list a program beginning at memory location 8260, you first set the memory pointer to 8260, then instruct the editor to list. How do you do all of these things? Easy; using the following commands:

A prints out the ASCII value of the next character typed.
B returns to BASIC; this is used for saving to disk and loading from tape or disk.
D converts a hexadecimal number to its decimal equivalent.
G is used to run machine code program.
H help, prints out a message to remind you of something.
L lists memory to the screen, beginning at the memory pointer.
M sets the memory pointer to a particular place.
O outputs (saves) a program to tape; produces B programs which run automatically when you CLOAD them.
P puts data to memory, beginning at the memory pointer position. This command is used for writing and modifying programs.
S searches for a particular byte (or two), and points the memory pointer to the place where a match occurs.
T type; the same as list, except to the printer.
V vector; places the pointer at the memory location which is stored at the present pointer position.
X eXtension; allows for user defined commands, and others; an extension is used to activate Chip-8 programs.

Command extensions: X

Commands beginning with X are two characters long: the second character is a

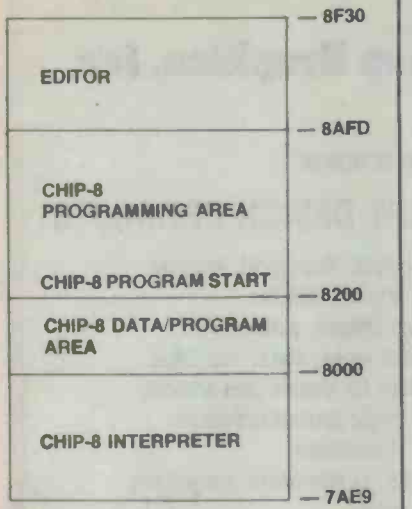


Figure 1. Memory map of an operational VZChip-8 programming environment.

```
8000 ??M
ADDRESS = 3450
3450 ??M
ADDRESS = 8678
8678 ??S
VALUE = 5677
FINISH =
0CE5 ??L
0CE5 = 56 77 7A 23 0D 20 F9 78
0CED = D6 08 FE C0 20 E6 C3 78
0CF5 = 07 05 21 1C 79 CD 97 0D
0CFD = B7 F2 F6 0C 78 B7 28 09
0D05 = 21 24 79 86 77 D2 78 07
0D0D = C8 3A 1C 79 B7 FC 20 0D
0D15 = 21 25 79 7E E6 80 2B 2B
0D1D = AE 77 C9 21 1D 79 06 07
0CE5 ??M
ADDRESS = 0097000
7000 ??P
7000 = 48 45 4C 4C 4F 20 29 20
7008 =
7000 ??X
EXTENSION #D
```

Figure 2. Some of the editor commands in operation.

number (between 0 and F). Some X commands are already defined:

XO prints out a message beginning at the memory pointer position; (all messages use the byte 00 to signify the end).

XD directs all output to the video screen.

XE directs all output to the printer; for instance, Figure 2 was generated in this fashion.

XC We shall use the XC command to activate the Chip-8 interpreter but since it hasn't yet been installed XO just clears the screen. The process of adding your own X commands will become obvious when we discuss connection of the Chip-8 interpreter.

LISTING 1. USING THE EDITOR.

```
0 ' CHIP-8 INTERPRETOR PART I
1 ' EDITOR PROGRAM
2 ' DON'T BREAK THIS PROGRAM ONCEIT
3 ' BEGINS RUNNING...
4 '
5 CLS:PRINT@200,"PLEASE WAIT!!"
10 GOSUB50:IFA$="XX"THENGOSUB50:D=X:GOSU
B50:D=D*256+X:GOTO10
15 IFA$="22"THENPOKE30863,112:POKE30862,
0:GOTO20
20 POKED,X:T=T+X:D=D+1:GOTO10
50 READA$:IFA$="XX"DRA$="22"THENRETURN
51 X=ASC(LEFT$(A$,1))-48:B=ASC(RIGHT$(A$
,1))-48
60 X=(X+(X>9)*7)*16+(B+(B>9)*7)
65 RETURN
70 IFT=118309,PRINTUSR(1)
75 CLS:PRINT"AN ERROR HAS BEEN MADE, CHE
CK "
80 PRINT"THE LISTING CAREFULLY"
99 'MAIN PROGRAM LISTING
100 DATAXX,20,00,01,30,04,21,00,72,11,FD
,8A,ED,B0,C3,FD,8A
110 DATAXX,72,00,C3,E5,88,7C,CD,05,8B,7D
,F5,1F,1F,1F,1F,CD,0E,8B
120 DATAF1,E6,0F,C6,30,FE,3A,38,02,C6,07
,18,18,E5,C5,CD
130 DATAF4,2E,B7,20,FA,CD,F4,2E,B7,28,FA
,0E,30,10,FE,0D
140 DATA20,FB,C1,E1,C9,E5,C5,CD,E4,8E,36
,20,CD,2A,03,2A
150 DATA20,78,36,AF,C1,E1,C9,E5,C5,F5,CD
,50,34,F1,18,E7
160 DATAE5,C5,CD,1A,8B,47,FE,0D,28,0B,FE
,30,38,F4,FE,3A
170 DATA30,10,E6,0F,21,3E,80,F5,7B,CD,44
,8B,F1,FE,80,C1
180 DATAE1,C9,FE,41,38,DC,FE,47,30,D8,D6
,07,18,E4,1A,B7
190 DATAC8,CD,32,8B,13,18,F7,CD,00,8B,11
,A0,8B,CD,7B,8B
200 DATA06,0B,3E,20,CD,32,8B,7E,23,CD,05
,8B,10,F4,3E,0D
210 DATAC3,32,8B,20,3D,00,CD,7B,8B,3E,20
,CD,32,8B,21,00
220 DATA00,06,00,ED,4D,8B,C8,29,29,29,29
,85,6F,04,18,F3
230 DATA21,E9,7A,22,F9,7B,21,07,8F,22,8E
,78,2D,CD,F6,8E
240 DATAAF,32,9C,78,3E,11,32,3B,78,32,00
,68,3E,03,32,39
250 DATA78,21,00,80,22,10,78,C9,F3,31,FF
,8F,CD,BD,8B,11
260 DATADD,8D,CD,7B,8B,2A,10,78,CD,00,8B
,11,2D,8C,CD,78
270 DATA8B,CD,1A,8B,FE,41,38,F9,FE,5B,30
,F5,47,CD,44,8B
280 DATA3E,00,CD,32,8B,21,31,8C,7E,FE,FF
,28,D8,23,B8,28
290 DATA04,23,23,18,F3,5E,23,56,D5,E1,CD
,2C,8C,18,C6,E9
300 DATA20,3F,3F,00,4C,59,8C,4D,65,8C,47
,6F,8C,53,79,8C
310 DATA50,BD,8C,56,27,BD,41,32,BD,44,53
,BD,4F,64,BD,48
320 DATA46,8E,42,4C,8E,54,57,8E,58,98,8E
,FF,2A,10,78,0E
330 DATA08,CD,84,8B,0D,20,FA,C9,11,04,8E
,CD,A3,8B,22,10
340 DATA78,C9,11,0E,8E,CD,A3,8B,78,B7,C8
,E9,11,16,8E,CD
350 DATAA3,8B,78,B7,C8,FE,03,F5,30,01,65
,E5,11,1E,8E,CD
360 DATAA3,8B,ED,5B,10,78,13,78,B7,20,03
,2A,10,78,C1,1A
370 DATA13,B8,20,0F,F1,38,06,F5,1A,B9,20
,07,F1,18,ED,53
380 DATA10,78,C9,DF,20,E9,11,27,8E,C3,78
,8B,00,00,00,00
390 DATA2A,10,78,06,00,CD,00,8B,11,1D,8D
,CD,7B,8B,3E,08
400 DATAF5,3E,20,CD,32,8B,CB,78,20,2D,CD
,1A,8B,FE,22,28
410 DATA1D,00,00,CD,18,8D,28,14,87,87,87
,87,F5,CD,4D,8B
420 DATAD1,28,09,B2,77,23,F1,3D,20,D6,18
,27,F1,C9,CB,F8
430 DATA3E,41,CD,FF,8E,18,CF,CD,1A,8B,FE
,22,20,06,CB,B8
440 DATA3E,AF,18,EE,F5,CD,44,8B,F1,18,D9
,E5,C5,C3,52,8B
450 DATA20,3D,00,3E,0D,CD,32,8B,18,98,2A
,10,78,7E,23,66
460 DATA6F,22,10,78,C9,11,32,8E,CD,7B,8B
,CD,1A,8B,F5,CD
470 DATA44,8B,3E,0D,CD,32,8B,11,16,8E,CD
,7B,8B,F1,CD,05
480 DATA8B,3E,0D,C3,32,8B,11,40,8E,CD,A3
,8B,11,16,8E,CD
490 DATA78,8B,CD,AF,0F,18,EA,11,39,8E,CD
,7B,8B,21,9D,7A
500 DATA06,10,CD,1A,8B,F5,CD,44,8B,F1,FE
,01,C8,FE,0D,28
510 DATA04,77,23,10,ED,36,00,3E,11,90,32
,D6,7A,11,0E,8E
520 DATACD,A3,8B,E5,11,1E,8E,CD,A3,8B,F3
,0E,F1,CD,5B,35
530 DATAD1,CD,A3,8D,F3,C9,D8,01,9A,01,0B
,79,B0,20,FB,DD
540 DATA21,23,78,7B,CD,11,35,DD,77,00,AF
,DD,77,01,7A,CD
550 DATAD7,8D,7D,CD,D7,8D,7C,CD,D7,8D,CD
,E8,3A,D8,1A,13
560 DATACD,D7,8D,DF,20,F4,E5,C3,FA,34,CD
,11,35,C3,8E,3B
570 DATA1F,56,5A,2D,32,30,30,20,48,45,58
,20,45,44,49,54
580 DATA4F,52,0D,56,45,52,20,32,2E,31,0D
,28,43,29,20,43
590 DATA47,27,38,35,0D,0D,00,41,44,44,52
,45,53,53,20,3D
600 DATA00,53,54,41,52,54,20,3D,00,56,41
,4C,55,45,20,3D
610 DATA00,46,49,4E,49,53,48,20,3D,00,4E
,4F,54,20,46,4F
620 DATA55,4E,44,0D,00,43,48,41,52,20,3D
,00,4E,41,4D,45
630 DATA20,3D,00,48,45,58,20,3D,00,11,64
,8E,C3,7B,8B,F8
640 DATACD,7A,1E,ED,7B,E8,78,C3,19,1A,21
,9C,78,36,01,E5
650 DATACD,59,8C,E1,36,00,C9,43,4F,4D,4D
,41,4E,44,53,20
660 DATA41,52,45,0D,41,2C,42,2C,44,2C,47
,2C,48,2C,4C,2C
680 DATA4D,2C,4F,2C,50,2C,53,2C,54,2C,56
,2C,58,0D,00,45
690 DATA58,54,45,4E,53,49,4F,4E,20,23,00
,11,8C,8E,CD,7B
700 DATA8B,CD,4D,8B,C8,87,C6,AF,6F,26,8E
,F1,CD,4E,8D,C3
710 DATA22,8C,DA,8E,E4,8B,E4,8B,E4,8B,E4
,8B,E4,8B,E4,8B
720 DATAE4,8B,E4,8B,E4,8B,E4,8B,E4,8B,C9
,01,D5,8E,CF,8E
730 DATAE4,8B,3E,01,32,9C,78,C9,AF,32,9C
,78,C9,ED,5B,10
740 DATA78,CD,7B,8B,C3,4E,8D,2A,20,78,47
,3A,9C,78,B7,78
750 DATAC8,FE,80,D8,C6,20,E6,7F,C9,21,FC
,8A,22,B1,78,2D
760 DATA18,12,32,40,8B,3E,01,C3,44,8B,F3
,31,FF,8F,CD,CD
```

Using the editor

Key in the listing given (Listing 1), save a copy of it, then run the program. You will have to wait a while, until everything is set up. If an error results, check the listing carefully. An introductory message will be printed when the editor is installed. Save a copy in this form to tape or disk. To do this tape users should type: OVZEDITOR (cr) 8AFD (cr) 8F30 (cr), where (cr) means the RETURN key. The last (cr) is not typed until the tape recorder is on and in record mode.

Alternatively, type BBSAVE "VZEDITOR",8AFD,8F30('cr'). Both Bs are essential. The first is needed to exit the editor. This step eliminates the delay from occurring every time the editor program is run. It saves the machine code part, produced by Listing 1, to the relevant medium.

Commands

Now, try out some commands: particularly M,L,H and T (if you have a printer). It is a good idea not to use the G or K commands just yet.

You will find that many commands prompt for ADDRESSes, START locations, STOP locations, etc. The answer accepted by the computer consists of the *last* four digits of whatever is typed in. If you meant to type 8BD8, and instead, entered 8BE, just type in the right response and the problem is fixed, so that 8BE8BD8 is interpreted as 8BD8. This is important because the editor is *not* equipped with a backspace facility.

The P command, as I said before, allows you to put data in memory. To test it out, set the memory pointer to 7080 (use M7080 (cr)) and type P. Now, type in the following data: 48454C4C4F (cr). Notice that the word HELLO appears on the screen as you type. You have stored the ASCII values for HELLO at location 7080-7084, which is in screen memory.

How did I know to use 4845 . . .? I looked it up; but that's a laborious task if you want to enter lots of words into memory. Instead, you can use an easier form: type M70C0 (cr) P", the " (shift 2) allows for character data entry — the computer does all of the conversions for you! (Notice that while in this mode, the normally blue cursor turns into an 'A'.) After typing in the required word, pressing another " returns the cursor to blue again, so you can enter hexadecimal data as usual.

S is used to search for one or two bytes, depending on what you type in, from the memory pointer to the end position (which you also type in). If a two-byte search is required, make sure the search string is more than two digits long. For example, to search for 6A00 in the region of memory 8200 to 8500, type M8200 (cr) S6A00 (cr) 8500 (cr). The message NOT FOUND means that 6A00 could not be found anywhere between locations 8200 and 8500. ●

IMPORTANT EDITOR MEMORY LOCATIONS

The editor has a small collection of useful subroutines. These can be used when prototyping a Chip-8 program or when writing machine code programs. Care should be taken to ensure that calls to these subroutines are not present in the final program, unless the editor is to be included in the final program.

Location	Description	Registers altered
8AFD	Jump location, COLD START.	HL,BC,DE,AF
8B00	Show HL register pair as a hexadecimal value.	AF
8B05	Show A register as a hexadecimal value.	AF
8B1A	Wait for a key press, A contains the ASCII value of the key that was pressed.	AF
8B32	Show the character stored in A.	none
8B44	Show character in A, and beep.	none
8B4D	Get a hexadecimal key (0-F, or (cr)) and put the value in A, A equals 80 if (cr) is pressed.	AF
8B7B	Show a string using DE as the pointer, up to the character stored as 00.	DE,AF
8BA3	Shows a message off DE, and gets a two-byte number from the keyboard; the number is stored in HL, while B contains the number of keys pressed.	HL,B,DE,AF

The following locations contain prompt messages used by the editor. Each message consists of a string of ASCII characters ending with the byte 00. These messages can be changed to suit your own personal requirements.

Location	Length	Description
8DDD	38	Introductory message; this is the heading displayed when the editor first begins.
8E64	39	Help message; the 39 characters here are reserved for a simple memo which is called up by pressing H.
8C2D	3	Prompt string, normally consists of a space and two question marks.

Example: to change the help message, type:

M8E64 (cr) P"this is the new message (cr) "00 (cr)

Make sure that whatever you type as the message is less than the maximum size of 39 characters.

Next month: the CHIP-8 interpreter.

SECURITY: WHERE YOU'RE VULNERABLE

Richard Kopf

In the year 1983-84, 272,793 cases of breaking, entering and stealing were reported Australia-wide, an uncomfortably high number. With a burglar alarm, of course, your chances of becoming one of the burglar's victims are considerably reduced. But you're not guaranteed. Alarm systems are vulnerable, and it is best to be forwarned where.

BURGLAR ALARMS fall into two categories, local alarms and silent alams. But they share three common features: (1) control, (2) detection and (3) communication.

The user has to be able to control the system, to turn it on and off, either wholly or in part Once an area is secured, unauthorised entry must be recognised. Then the system must do something about it.

The local alarm

The local alarm system terminates in a siren or bell, possibly with the addition of flashing lights. Such an alarm has the advantage of being cheaper than silent alarms in both installation and upkeep. Its disadvantage is that the end result stops on the site. Granted, it takes some nerve for a burglar to continue his nefarious business with a 100 dB siren wailing. The point to consider is what the odds are of his being frightened off or apprehended.

Consider this scene: you have had a local alarm installed in your home and confidently go to the theatre one evening. An hour after you leave, the break-and-enter professional arrives. He forces a bedroom window and proceeds to look for jewellery and money. Perhaps he finds the lolly and proceeds into the lounge room, where a motion detector senses his presence and sets off the siren mounted under the eaves.

Your home is in a nice residential area, on a large block, with a great deal of foliage obscuring the house from street view. Your neighbour hears the siren, what does he do? Several possibilities spring to mind: (1) he grumbles that it is another false alarm; (2) he calls the police; (3) he decides to investigate.

Ignoring false alarms for the moment, we find that there is a significant time lag between calling the police and the arrival of a patrol car, possibly enough for the cool pro to effect his escape. Even worse; your neighbour decides to wander over and see what is happening. He walks up the driveway to be confronted by a masked man with a torch, who promptly smashes it over your neighbour's head. Perhaps he has already loaded his van with your colour telly and CD, stereo, etc. You return home to discover property loss, an injured neighbour and face your insurance man.

The silent alarm

Instead of triggering the control panel to sound a local siren, a silent alarm signals a monitoring service, either by means of a telephone dialler or over a leased Telecom line.

On receipt of the alarm, the board operator communicates to the police dispatcher to alert the nearest patrol car. Secondly, the monitoring service will radio one of its own patrol vehicles. In a few minutes, one or more cars arrive on the scene and hopefully the villain will be apprehended — if he's still around!

'Silent alarm' is a relative term. In the quiet of the night, the click of a miniature relay sounds improbably loud. Walk-test lights that function at all times tell the crim more than he needs to know.

Start looking round the shops you trade in. If you can spot the alarm system, so can the villains. The more they learn from observation, the easier for them to effect counter measures. Apparent evidence of an alarm system will deter many burglars but cause others to put on their thinking caps.

Detection equipment

Similar detection gear may be used on either type of alarm. Broadly speaking, there are two ways of detecting an intrusion: using perimeter protection and by space monitoring.

Devices used for the perimeter security may be as simple as magnetic door switches, window tapes or doorway pressure mats which signal entry. It is seldom feasible to protect every door and window. Magnetic switches are cheap enough but multicore cable and installation labour charges are not. In any case, a magnetic switch on a door is rendered impotent if the burglar kicks out a panel and crawls in, and it is sometimes possible to defeat a magnetic switch by placing a heavy-duty magnet adjacent to the contact location. This holds the contact closed, despite the door being forced open.

Motion detectors, on the other hand, offer a far greater challenge to the criminal genius. Whether they monitor a volume of space using ultrasonics, microwaves, UHF radiation, photoelectric beams, or utilise the passive infrared technique, all look for a disturbance of steady state conditions. Each has its applications and limitations.

Ultrasonic detectors

These active units come in many varieties. There are self-contained transmitter-receiver units; types with one transmitter and two or more slave receivers; and master control systems with each of the heads treated as slaves.

Usually working the range of 26 to 40 kHz, they flood an area with an ultrasound carrier and look for phase changes caused by objects in motion, whether they be the so-called man-sized target or accidental problems. Some of these unwanted things that may be detected are swinging objects like large hanging display signs such as mobiles in shops, etc. Ultrasonics react to sudden movement of air masses, thus a fan heater switching on in the dead of night can create enough air turbulence to set off the detector.

Ultrasonics can also be triggered by acoustic noise, generally of high frequency or high intensity such as an external Telecom bell with its strong harmonics. If they are mounted on a flimsy partition wall they may be falsely triggered by vibration. The hissy sound of wind whistling through the crack of a porly-fitted double door, can also

cause false alarms. Moving machinery starting up — air compressors, freezers, fan blades — can create further problems.

Additionally, stand-alone units, even if crystal controlled, can drift relative to one another, as night time ambient temperature decreases.

Photoelectric beams

The simplest of photoelectric beams consists of a transmitter using a flashlight globe and a separate receiver with some form of photocell. Breaking the beam triggers the alarm. However, as they are basically a line-of-sight device, they can be observed and defeated.

More sophisticated units rely on infrared solid state emitters and detectors. Advances in technology have led to wide-beam, multiple receiver types which cover much more than line-of-sight and thus are much harder to beat. Still, a portable transmitter can be inserted in the signal path, allowing a villain to move about at will.

Beams can be set off falsely by transient flashes of sunlight. Even the most sophisticated IR receiver, working on a low energy density, may be temporarily sealed by a stray reflection rather than its own transmitter. One situation was found in a warehouse in which the transmitter had been knocked out of alignment. The receiver was held secure during the day by reflection from a nearby piece of equipment. When the sun went down, so did the system.

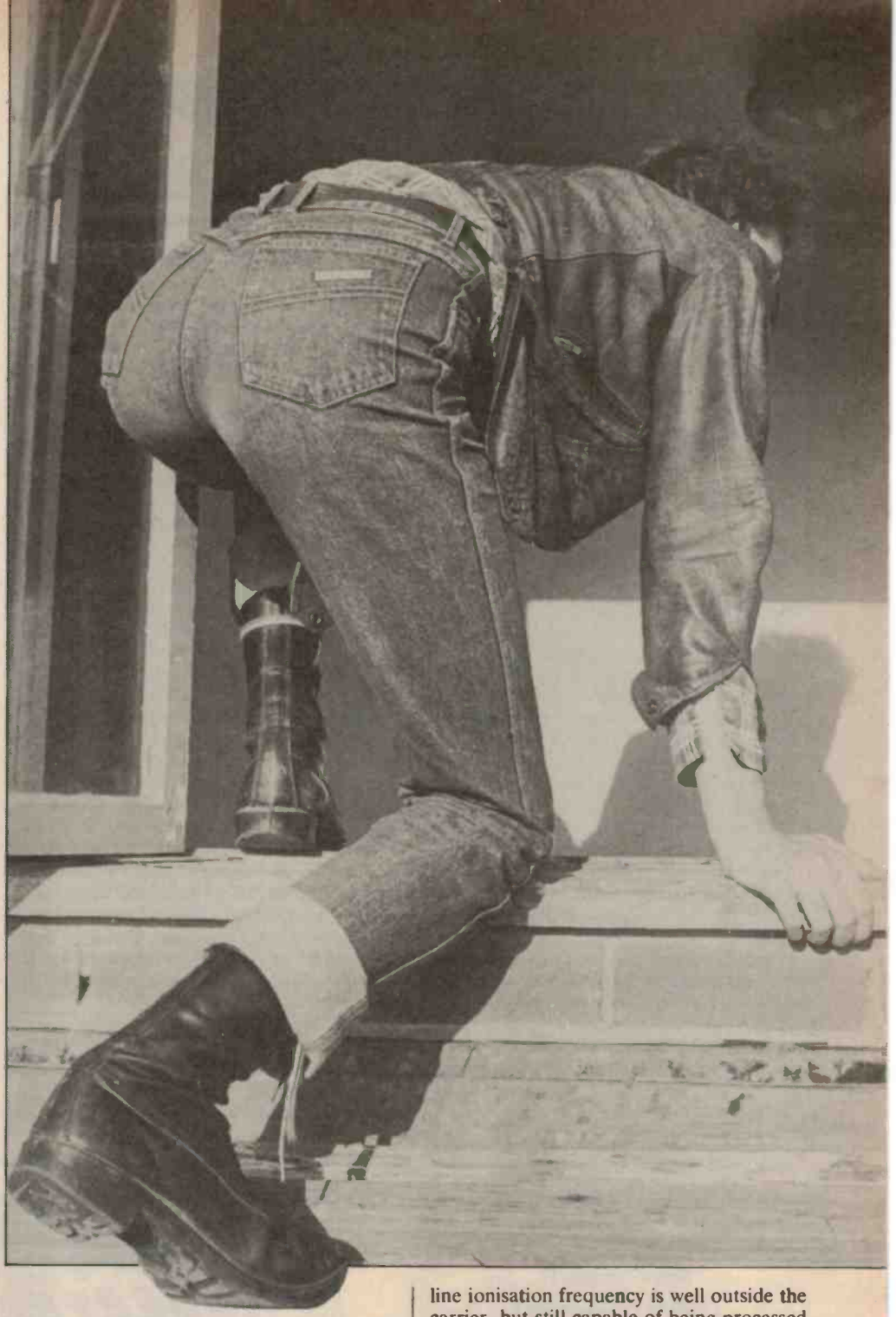
And other bugs exist. Spiders have been known to crawl into transmitters and obscure the emitter in spinning a web sufficiently to cause a false alarm.

Passive infrared detectors

While the beam is an active device, transmitting energy and receiving same, the passive IR unit monitors the ambient infrared energy in an area. Passives self-adjust to this ambient heat (even in a wintry room at night there is some IR) and sense motion of an intruder as a transient change in the distribution of energy.

But they, too, can react to extraneous bursts of visible light. An example I know of was one installation that worked perfectly for seven nights and six days, consistently. Every Sunday morning, however, the system went into alarm. The watching company patrolman attended the site repeatedly finding no intruder. Each Monday morning, a technician checked the system. Only when a supervisor visited the site early on a Sunday morning and waited for something to happen did the cause become obvious; a goods truck turning a corner caught the sunlight, reflecting it into the second floor window where a passive detector reacted to it. Questioning the driver elicited the facts of his regular Sunday schedule. Repositioning the detector solved the problem.

However, be warned that the police take a dim view of such situations. After half a dozen attendances attributed to false alarms, your premises will probably rate a very low priority in future.



Microwave units

These active devices working in the gigahertz region rely on Doppler shift. They come in a large number of patterns, both long range, narrow beams and shorter but broader types.

The greatest false alarm hazard for microwave detectors is vibration. A unit mounted on a thin partition wall will probably react to everything and anything.

Another problem which might surprise you is fluorescent lights. The twice power line ionisation frequency is well outside the carrier, but still capable of being processed as a Doppler shift, sometimes resulting in an alarm.

Generally speaking, the smaller the hazard the more noticeable its effect on a microwave: higher frequency, shorter wavelength. Metal filings on a machine shop floor can seem like a man-sized intruder, due to imperceptible movements caused by air currents. Large overhead space heaters cycling on and off develop a resonance vibration in the metallic housing which is sufficient to cause an alarm.

Microwaves pass quite easily through glass, unlike ultrasonic energy. A distant lorry in line-of-sight through a window or ▶

glass foor becomes the equivalent in total energy reflection to the ideal target much closer. Conversely, a water pipe a few inches from the head can reflect better than 60% of the emitted energy.

Antenna loading

A remarkable UHF detector utilises the principle of antenna loading in situations where a large amount of partitioned coverage can be handled by one detector. The UHF energy passes through most building materials. The distributed field is disturbed by an intruder, altering the monitored SWR (standing wave ratio). Whilst this ability to 'see through walls' gives good economy, one must be cautious that passers-by outside the premises do not cause false alarms.

Monitoring services

If you opt for a silent alarm, the detection equipment must communicate to the monitoring service or central station. The first alternative requires a telephone dialling control unit where the burlgar alarm equipment interfaces to your existing telephone line.

This necessitates several considerations: The dialler and supporting gear must be Telecom approved. Telecom must fit a special connection socket, which you will pay for. The security equipment *must* take priority on the telephone line. This means that if the dialler decides to operate, an on-going telephone call will be instantly disconnected.

Other problems can ensue. Suppose you run a supermarket and have a freezer thermostat alarm fitted and tied to the security system. Depending on the control system, you could well find your office calls terminated several times a day as the freezer cycles, even though the burglar alarm, as such, is not active.

The weak link with a dialler, of course, is the line itself. If the telephone line into the building is cut, no-one in the outside world will ever know it, certainly not the security central station!

There are exceptions such as the automatic status reporting types. However, although these may log in one or more times a night, each report costs the same as a normal telephone call, and sums can mount up surprisingly quickly.

Naturally, a dialler costs considerably more than a local alarm panel. Telecom gets its piece of the action. Installation charges are greater and there will be a 'monitoring and service' fee, probably quarterly.

Monitored line systems

The dedicated line, leased from Telecom, offers higher level security at a greater cost than the dialler. The control system is likely to cost more, installation will also be correspondingly higher, and the quarterly service charge for monitoring will reflect this too.

A number of different systems exist. The older style goes directly from customer to a central station, albeit through one or more Telecom exchanges, and relies on various levels of direct current to report status. Later versions are sequentially scanned, looking for equivalent direct current value.

More or less state-of-the-art equipment uses sequential line scanning and some form of data transmission. Some of these systems are more economical than others, in that the selector equipment can be installed in the field, minimising the line cost to the individual subscriber.

Make no mistake about it: these directly monitored line systems *do* offer high security. Yet even so they can be beaten by a clever crook. Consider the situation where a villain has bought a set of the equipment in question from the manufacturer, posing as a new security firm. He obtains illicit Telecom information; once he knows the line pair assigned to your firm and has found a place he can tap it, he monitors its status with an induction meter.

Since this is a multiplex system, your premises are vulnerable to such meddling except at the moment your individual line is scanned. The first two scans tell the crim what ID number your equipment is and the average time he has to swap over. By the time the central station has scanned a third time, his dummy control panel is on-line, reporting a secure status, and your goods are quickly disappearing into his van.

On completing his work, he re-swaps the line back to your panel at the appropriate time and no-one is any the wiser, until the burglary is discovered. Granted, this scene requires some inside information, but it is easy to get!

Even an old-style direct current system can be defeated with a meter, a potentiometer, and a pair of side cutters. The changeover will reveal itself as a so-called 'flick' alarm by the central station operator. He will test the line, see a normal reading and probably assume Telecom exchange work has caused the momentary disturbance.

One would be amazed at how vulnerable large office buildings and shopping centres can be to unauthorised access of Telecom equipment and lines. Few crooks will go to such lengths, but one must recognise the possibility of such events.

This catalogue of defects or vulnerable points should give you some things to consider if you are installing or have installed a security system. Obviously nothing is perfect but it may pay to be aware of the possible flaws. ●

SHORTWAVE RADIO FOR THE DISABLED

Most of us take our reading ability for granted, as indeed is natural. But many of our compatriots, don't have this capacity for gleaning information or entertainment. In its place, they have discovered the services of the spoken word on shortwave radio.

Arthur Cushen

MORE THAN 10 per cent of shortwave radio listeners are disabled.

Blindness and numerous other physical handicaps often mean peole are unable to read newspapers or to turn pages. For these people, Radio for the Print Handicapped and other means of spoken information fill what would be a big gap in their lives. Even folk who are bedridden and cannot turn the knob of a radio receiver can now, using keypad tuning, simply 'touch tune' the station of their choice or even use a bank of memories which have been pre-set to their favourite radio programmes. In this way shortwave radio provides information and entertainment to pass away many otherwise lonely hours.

Radio for the disabled has boosted the morale, ingenuity and independence of countless people. The Handicapped Aid Programme, established by Radio Nederland in 1974, has been responsible in many countries for helping disabled listeners in the community become aware of radio as an avenue of entertainment. Previously, many of these people were oblivious to the fact that they could listen to London, Washington, Moscow and many other world capitals right there in their own homes as well as get news quickly and clearly.

On its inception the Handicapped Aid Programme issued a special verification card with details in Braille. Since then the institution has flourished and is today active in North America, Europe, Australia, New Zealand, India and some other countries. In the main the funds have been gathered as a result of auctions at various conventions. Sam Barto in the United States has been instrumental in raising a large amount of money through the sale of T-shirts, stickers, badges and other radio mementoes to those keen collectors throughout the world who have an interest in this type of memorabilia.

In the early days the Handicapped Aid Programme in Australia was promoted by Robin Harwood of Tasmania and in recent months by the Blind Citizens Group in Melbourne. In New Zealand it has been sponsored by the New Zealand Radio DX League and HAP members receive complimentary copies of magazines and other aids for their listening pastime.

Radio for Print Handicapped has expanded rapidly in Australia, and this year the first Radio for Print Handicapped is expected to commence operation in New Zealand. Many sources of information are available on cassette, including talking books and material from computers which is available on special programmes. In some parts of the world the latest radio information can be received by dialling a special telephone number.

The Premier of Victoria, the Hon John Cain, talks on air with Arthur Wilkins during a recent visit to the studios of 3RPH, Radio for the Print Handicapped, at the Association for the Blind, Kooyong, Melbourne.

Special equipment

The problems facing the disabled are many, and specialised equipment is often necessary to overcome the handicaps to op- ▶

Marilla Cooper, a volunteer with 3RPH, operating the control panel.

3RPH Volunteer Joyce Godfrey recording a report for programming.

erate a radio receiver. Blind listeners use Braille scales and other aids to find stations, while those with physical handicaps to limbs or other parts of the body generally fit large knobs to their receivers which are easier to grip for tuning the dial of the radio.

In the late 1970s there were many developments in improving the commercial appeal of radios in so far as ease of tuning is concerned. One ingenious radio amateur in Dunedin, New Zealand, made a prototype of a receiver which had four coin like controls, which tuned in the frequencies.

This idea was put into commercial operation by Dymek with the DR22 model receiver which used a similar system but updated. The four frequency control knobs altered the digital readout display. The first one on the left covered 0,1,2 which gave the listener the tens of thousands figure, the next control 0-10 gave the thousands, the next the hundreds and the final knob the units in 5 kHz segments so that it was possible to tune from 0-29995 kHz. With each knob having a special mark, it was easy to find the frequency quickly; when all knobs are in the upright position (or 12 o'clock on a clock face) all frequencies are at zero.

When the Sony Corporation introduced the ICF 2001 in 1979 little did it realise that its keypad tuning with operations similar to a pocket calculator was the greatest move for independence of the blind radio listener! As a bonus, there were memories which stored the listener's favourite station frequency.

The new design was mainly aimed at world travellers, who only needed to know the frequency to which they wished to listen and radio tuning would be easy. Sony was followed quickly by many manufacturers which have all adopted this type of dial operation.

The latest outcome has been the introduction of the Icom ICR71 with a built-in voice chip which announces the frequency to which the receiver is tuned. This application of voice and keypad operation has brought radio listening into the homes of many disabled people who could not find the station or operate the controls of the older radio receiver.

There are other accessories of help to the blind listener and two of particular assistance. The talking block gives the time every minute and can be used as a stopwatch; the time announcement can be set exactly to the second. An extension of this is a talking calculator which gives the time, the date and the year, as well as acts as a pushbutton calculator.

Radio for the print handicapped

Australia has established a network of radio stations for the print handicapped on the east coast, with operations in Brisbane, Sydney, Canberra, Melbourne and Hobart. A similar station has operated in New Zealand since May.

These stations are operated primarily by voluntary staff who provide a tremendous service for those visually handicapped. Typical of the stations in operation is 3RPH in Melbourne. According to Lindsay McMillan, Station Manager of Radio for the Print Handicapped, 3RPH operates from 7 am to 11 pm daily on 1629 kHz. The station reads newspaper material in depth and with greater coverage than provided by any other radio service. For instance, in Melbourne one hour's reading may be taken from a morning newspaper and then information from another source, and usually alternate announcers read each item so the presentation is easy to follow and has variety for broadcast appeal.

As well as the visually handicapped many others who use this service include the quadraplegic who cannot hold a newspaper, those with dyslexia who are unable to read the print because of their reading problems, those who suffer from muscular problems which do not allow them to hold a newspaper, and those who are illiterate and cannot read. And of course there are many without disabilities of this type who use the service because they do not buy a daily newspaper!

Pre-recorded publications in the form of books and magazines are available in Braille and on talking book cassettes, but the appeal of Radio for the Print Handicapped is that it is an immediate service.

Station 3RPH has around 350 volunteers, the major proportion of whom are readers, while others are engaged in research and technical operations. Four staff members are also employed by the station. The problem of maintaining the broadcasting hours from 7 am to 11 pm requires a large number of voluntary readers as most of the radio service is live.

The frequency of 3RPH, 1629 kHz, is outside the top end of the mediumwave band, and the station uses power of just 500 W. Despite this low power the signal is not only heard in eastern Australia, but nightly in New Zealand at good strength.

The station was costly to put into operation due to the high cost of equipment and if it were not for the voluntary staff it could not remain in operation. The Australian Government gave an establishment grant to get the station operating but there has been no further support from federal quarters, though discussions are underway with the authorities on a national level to help fund all stations operated for the print handicapped. The future seems to move towards closer co-operation between print handicapped stations to achieve a national coverage and it is also hoped that other countries will follow the Australian idea of providing such a radio service.

The five radio stations for the print handicapped are at present operating in Australia on:

kHz	Station	City
1620	1PHR	Canberra
1620	4RPH	Brisbane
1620	7RPH	Hobart
1629	2RPH	Sydney
1629	3RPH	Melbourne

Their power is 500 W and reception reports from listeners are being verified to give Radio for the Print Handicapped an indication of its coverage on this power. ●

FUTURE INDICATIVE

The only shortwave programme designed for the disabled listener, which covers all aspects of disabilities, is 'Future Indicative' heard on the shortwave service of Radio New Zealand. The programme is broadcast on National Radio, each Sunday at 0100 UTC and is compered by Helen McConnochie. The transmission is carried on 15150 and 17705 kHz for reception in Australia and the South Pacific.

The programme includes interviews and discussion on all manner of disabilities, and has been broadcast over the New Zealand domestic service for more than 20 years. In the early days it was known as 'Listening Post' and was a monthly programme for the blind. Later the session was extended in scope and broadcast on a weekly basis. The programme is recorded in the Wellington studios of National Radio and is carried internally on that network.

ETI-1601: Commodore RS232 adaptor (July 1986)

This project was simplicity itself, essentially just a couple of drivers on a board, with some clever track work. Kits are available from **Jaycar** in **Sydney (02) 745-3077** and **All Electronic Components** in **Melbourne (03) 662-3506.**

ETI-174: Frequency standard (July 1986)

This is another simple little circuit for those of you with a need for a super accurate 1 MHz signal. It uses the Rubidium standard of TV sync pulses as its fundamental reference, which are accurate to one part in 10^9. It's available in kit form from **All Electronic Components, Melbourne (03) 662-3506.**

ETI-684: Modem

The only difficult part of this modem is the EPROM. You must either approach us directly or buy a kit. If you want us to do it, send $15 plus a SSAE to **ETI-684 EPROM, Federal Publishing, 180 Bourke Road, Alexandria, NSW 2015.** Allow about a fortnight for us to amass a whole bunch of them, to do in one go. For kits approach **Jaycar (02) 745-3077** or **Unitronics** (see ad on page 44) or any other kit supplier.

Notice also that the modem RAM buffer is made up of 6264 8K memories. Only one is necessary, the rest are optional in spite of having sockets for them on the board. Since six 6264s will add considerably to the price of the project we suggest you think carefully about whether you need them and, secondly, look at the prices carefully before you buy. You can pick them up from **Rod Irving (03) 543-7877** for $6.50 each on mail order, slightly cheaper at **Ellistronics, Melbourne (03) 561-5844** if you're in town.

Artwork

For those constructors willing and able to make their own pc boards and/or front panels, we can supply same-size film transparencies of the artwork, positives or negatives as you require. From the list given below, select what you want and address your request/order to:

'ETI-xxx Artwork'
ETI Magazine
PO Box 227
Waterloo, NSW 2017

When ordering, make sure you specify positives or negatives according to the process you use. Your cheque or money order should be payable to 'ETI Artwork Sales'. Prices for the artwork for this month's projects are as follows:

ETI-174 front panel	**$4.87**
pc board	**$3.60**
ETI-1406 pc board	**$3.75**
ETI-1601 pc board	**$2.70**
ETI-1602 pc board	**$3.50**
ETI-684 front panel	**$3.03**
rear panel	**$3.03**
pc board	**$13.93**

You might also care to know that almost every pc board (and most front panels) ever published by ETI may be obtained from:

RCS Radio
651 Forest Rd
Bexley, NSW 2207

For pc boards produced in recent years, the following suppliers either keep stocks on hand or can supply to order:

Jaetronics
58 Appian Drive
St Albans, Vic 3021

Jaycar
117 York St
Sydney, NSW 2000

Jemal Products
PO Box 168
Victoria Park, WA 6100

Mini Tech
PO Box 9194
Auckland, NZ

Rod Irving Electronics
425 High St
Northcote, Vic 3070 ●

FUNCTION GENERATOR

This Function Generator with digital readout produces Sine, Triangle and Square waves over a frequency range from below 20Hz to above 160Hz with low distortion and good envelope stability. It has an inbuilt four-digit frequency counter for ease and accuracy of frequency setting.
(EA April '82. 82A03A/B)
Cat. K82040
Cat. K82041 $109

COMPACT DISC PLAYER ATTENUATOR

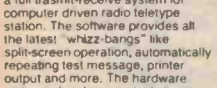
If you have just purchased a compact disc player your amplifier could be in trouble! CD players seem to have standardised on a 2V output level where as most Hi-Fi amps have a 500mV sensitivity for full rated output.
In order to overcome this you may need a CD Antenuator. It does not distort the signal in any way. It is inexpensive and simple to construct, making it an ideal beginners project.
(EA '86)
Cat. K $7.95

MUSICOLOR IV

Add excitement to parties, card nights and discos with EAs Musicolor IV light show. This is the latest in the famous line of musicolors and it offers features such as four channel "color organ" plus four channel light chaser, front panel LED display, internal microphone, single sensitivity control plus opto-coupled switching for increased safety
(EA Aug. '81) 81MC8
Cat. K81080 $99

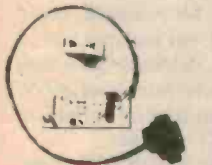
VIDEO FADER CIRCUIT

to your video movies with this simple Video Fader Circuit. It enables you to fade a scene to black (and back again) without loss of picture lock (sync) or colour.
(EA Jan '86, 85tf10)
Cat.K86010 $19.95



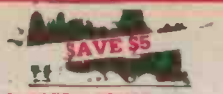
COMPUTER DRIVEN RADIO-TELETYPE TRANSCEIVER

Here's what you've been asking for, a full trasmit-receive system for computer driven radio teletype station. The software provides all the latest "whizz-bangs" like split-screen operation, automatically repeating test message, printer output and more. The hardware uses tried and proven techniques. While designed to team with the popular Microbee, tips are avalaible on interfacing the unit to other computers. (ETI Nov. 84) ETI 755)
Cat. K47550 $139



RADIOTELETYPE CONVERTER FOR THE MICROBEE

Have your computer print the latest news from the international shortwave news service. Just hook up this project between your short wave receivers audio output and the MicroBee parallel port. A simple bit of software does the decoding. Can be hooked up to other computers too. (ETI Apr. '83)
Cat. K47330 $19.95



ELECTRIC FENCE

Mains or battery powered, this electnc fence controller is both inexpensive and versatile. Based on an automative ignition coil, it should prove an adequeate deterrent to all manner of livestock. Additionally, its operation comforms to the relevant clauses of Australian Shnd 3129. (EA Sept '82) 82EF9
Cat. K82092 Normally $19.95
SPECIAL, ONLY $14.95

LISTENING POST

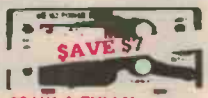
This device attaches between the audio output of a shortwave receiver and the input port of a computer. It allows decoding and printing out of morse code, radioteletype (RTTY) and facsimile (FAX) pictures using the computer. It has been designed from all readily available parts. Details for writing the software program are included.
(AEM 3500, July '85)
Cat. K93015 $37.95

AEM DUAL SPEED MODEM

The ultimate kit modem featuring 1200/300 baud, case etc. Exceptional value for money!
(AEM 4600 Dec '85)
..... $169

STROBE KIT

Includes perspex cover!
(AEM 9500)
Cat. K93018 $59.95



30 V/1 A FULLY PROTECTED POWER SUPPLY

The last power supply we did was the phenomenally popular ETI-131. This low cost supply features full protection, output variation from 0V to 30V and selectable current limit. Both volatage and current metering is provided. (ETI Dec '83) ETI 162
Cat. K41620 Normally $54.50
$47.50

LAB SUPPLY

Fully variable 0-40V current limited 0-5A supply with both voltage and current metering (two ranges: 0-0.5A/0-5A). This employs a conventional series pass regulator, not a switchmode type with its attendant problems, but dissipation is reduced by unique relay switching system switching between taps on the transformer secondary.
(ETI May '83) ETI 163
Cat. K41630 $199

15V DUAL POWER SUPPLY

This simple project is suitable for most projects requiring a dual voltage. (ETI 581, June '76)
Cat. K45810 $19.50

PHONE MINDER

Dubbed the Phone Minder, this handy gadget functions as both a bell extender and paging unit, or it can perform either function separately. (EA Feb. '84) 84TP2
Cat. K84021 $27.50

HUMIDITY METER

This project can be built to give a readout of relative humidity either on a LED dot-mode display or a conventional meter. In addition it can be used with another project as a controller to turn on and off a water mist spray in a hothouse, for example. (ETI May '81) ETI-256 (Includes humidity sensor $19.50)
Cat. K52460 $29.50

PH METER KIT

Build this pH meter for use with swimming pools to fish tanks to gardening, this pH meter has many applications around the home. This unit features a large 3½ digit liquid crystal display and resolution to .01 pH units, making it suitable for use in the laboratory as well.
(EA Dec '82) 82PH12
Cat. K82123 ..... $135

DUAL TRACKING POWER SUPPLY

Built around positive and negative 3-Terminal Regulators, this versatile dual tracking Power Supply can provide voltages up to 2A. In addition the Supply features a fixed +5V 0.9A output and is completely protected against short circuits, overloads and thermal runaway.
(EA March '82) 82PS2
Cat. K82030 ..... $109

LOW OHMS METER

How many times have you cursed your Multimeter when you had to measure a low-value resistance? Well with the "Low Ohms Meter" you can solve those old problems and in fact measure resistance from 100 Ohms down to 0.005 Ohms.
(ETI Nov. 81) ETI 158
Cat. K41580 $39.50

300 BAUD DIRECT CONNECT MODEM KIT

Think of the advantages of having your own modem!!

- Can't afford a floppy disc? Use your telephone to access one for the cost of a call.
- Bored with your old programs? Download hundreds of free programs.
- Want to get in touch with fellow computer enthusiasts? Use 'electronic mail'.
- Ever used a CP/M system? CP-DOS? UNIX? Well a modem will make a your computer a remote terminal on some of the most exciting systems around.

Save on ready built modems.
(ETI 699, May '85)
Cat. K46990 Normally $129
SPECIAL, ONLY $109
(Short form without phone)

TRANSISTOR TESTER

Have you ever desoldered a suspect transistor, only to find that it checks OK? Trouble-shooting exercises are often hindered by this type of false alarm, but many of them could be avoided with an "in-circuit" component tester, such as the EA Handy Tester. (EA Sept. '83) 83TT8
Cat. K83080 Normally $18.95
SPECIAL, ONLY $14.95

VOCAL CANCELLER

If you have ever imagined yourself as lead vocalist/musician with a famous band, here is your chance to "audition"! You can cancel out the lead vocal on almost any stereo record and substitute your own voice or musical instrument.
(EA April '82, 82vc3)
Cat. K82042 $22.50

AEM ULTRA FIDELITY PREAMP

The latest, definative preamp from David Tillbrook, the man who designed the famous Series 5000! Just as his Series 5000 were an enormous leap forward 5 years ago, so too is his latest AEM 6000 Series, especially in regard to Compact Disc signal processing.
"The input noise figures subsequently obtained are significantly better than the best op-amp designs and exceed the specifications of the best commercial amplifiers" -David Tillbrook, AEM October '85
Cat K **$289**

PLAYMASTER FM/AM STEREO TUNER

The new Playmaster FM/AM stereo tuner will out perform anything presently available on the market, regardless of price. As well as including a FM tuner section which is every bit as good as any other synthesised design, it is also the only unit featuring a genuine wideband, low distortion AM stereo tuner. Naturally, it has a digital readout, 12 station memory, automatic seek and an optional infrared remote control.

SPECIFICATIONS:

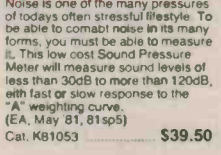
AM TUNER.....
Turning range: 522 to 1611kHz
Frequency Response: −3dB at 5.5kHz
Harmonic Distortion: Mono; 0.4% at 30% modulation
Stereo; ·1% at 30% modulation
Audio Output: 450mV RMS into 4.7 ohm load at 100% modulation
Stereo Separation: Typically 30dB
AGC Range: 40dB for a 6dB change in audio output
Signal to Noise Ratio: 70dB with respsect to full output for signal levels of 9 and 10 on bar graph display; better than 60dB with respect to full output for signal levels greater than 6
Usable Sensitivity: 350uV at −6dB audio level

FM TUNER.....
Tuning Range: 87.9 to 107.9 MHz
Frequency Response: −1dB at 20Hz, −0.5dB at 15kHz
Harmonic Distortion: **Mono;** 0.15% (100Hz); 0.15% (1kHz); 0.2% (6kHz)
Stereo; 0.4% (100Hz); 0.4% (1kHz); 0.4% (6kHz)
Audio Output: 450mV RMS into 4.7 ohm load at 100% modulation
Stereo Separation: 34dB (50Hz); 34dB (1kHz); 36dB (10kHz)
Subcarrier Product Rejection: 48dB
19kHz Rejection: 62dB
(EA Dec. '85 Jan-Feb '86 85tu12)

Cat. K86020 ..... **$499**

FAST NICAD CHARGER

This project is specifically designed for modellers and photographers who make heavy demands on Nicad betteries quite routinely. Theres nothing more frustrating than having your remote control model run out of juice as it runs/flies out of sight, or your flash run out of flash at an inappropiate moment. If you use Nicads and need a quick charge then this project is a must for you.
(ETI 274, July '80)
Cat. K45630 $79.95



SOUND PRESSURE METER

Noise is one of the many pressures of todays often stressful lifestyle. To be able to combat noise in its many forms, you must be able to measure it. This low cost Sound Pressure Meter will measure sound levels of less than 30dB to more than 120dB, with fast or slow response to the "A" weighting curve.
(EA, May '81, 81sp5)
Cat. K81053 ..... $39.50

MODEL ENGINE IGNITION SYSTEM

Get sure starts every time, without glow plug burnouts on your model engines.
(ETI June '83) ETI 1516
Cat. K55160 ..... $49.50

ELECTRIC DUMMY LOAD

With this unit you can test power supplies at currents up to 15 Amps and voltage up to 60 Volts. It can "sink" up to 200 Watts on a static test and you can modulate the load to perform dynamic tests.
(ETI Oct. 80) ETI 147
Cat. K41470 $129

PRINTED CIRCUIT BOARDS

ETI 044	$2.95
ETI 163	$7.95
ETI 164	$2.95
ETI 183	$6.95
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All sales tax exempt orders and wholesale inquiries to RITRONICS WHOLESALE, 56 Renver Rd., Clayton
Phone (03) 543 2166

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Clones for sale

Three new PC compatible computers have been released on the Australian market recently. Most notable, and most surprising has been one from Microbee Systems, much beloved by patriotic Australians as one of our few successful computer companies. Microbee is in the midst of launching its Gamma, a new high performance PC incompatible, which makes the decision to launch a PC compatible unexpected.

The machine is been made by Taipei-based Mitec corporation, and badged here. According to Microbee MD, Owen Hill, the launch of the two computers so closely on each other is not coincidental. Microbee is negotiating a reciprocal agreement with Mitac, in which Microbee will distribute the clone here in return for Mitac distribution of the Gamma in SE Asia.

Such a move would give Microbee unprecedented clout in the fiercely competitive Asian market. Even a small market share would lift the economics of the Australian manufacture.

In Australia the Mitac is sure to create interest in its own right. It is boxed in a case that makes it look like an Apple IIc, and is classified as a portable, although it still needs mains power to run.

It uses a 16-bit CMOS processor, the 80C88, along with 256K of memory as standard, with 640K available on sockets on the main board. It uses the Phoenix Basic Input Output System (BIOS), the most widely used BIOS in the world, and comes with a single disk drive built in.

Swedish exchange maker Ericsson has also joined the fray with the Ericsson portable PC. It looks more like a portable than the Mitac because it comes with an electroluminescent screen as standard, but is still restricted to 240 V supply. It features an 8088 from Intel with 256K of RAM as standard, expandable directly to 512K. A single 5¼" disk is also available as standard, with space for a second.

The third maker to enter the fray, Epson, has released a machine called the PC+, driven by an 8086 running at 7.16 MHz. Standard is 649K RAM, as well as a 360K disk drive. A 1.2M hard disk is an option. The Epson also comes equipped with a three-way video board as standard, which can do colour graphics as well as black and white.

For more information contact Microbee on **(02)888-9866,** Epson on **(02)451-0251** or Ericsson on **(03)301-1313.**

Radio data modem

Manufactured by GFS Electronic Imports of Mitcham, the CPU-100 Intelligent Radio Data Modem is designed to provide data communications over any standard voice bandwidth radio system.

GFS claims a special byte-control protocol was developed for use in the CPU-100 to enable data flow in both directions on the radio channel, whilst retaining full error correction. Known as BECSP (block exchange compelled sequence protocol) it frees the user from the restrictions inherent in existing systems. These include the high error rates that must be accepted especially on high frequency long haul channels.

An important feature of the SDX-PKT version of the CPU-100 according to GFS, is its ability to operate as a duplex data link over a single radio channel or two-wire line. This feature has been achieved by alternatively sending then receiving the data in blocks.

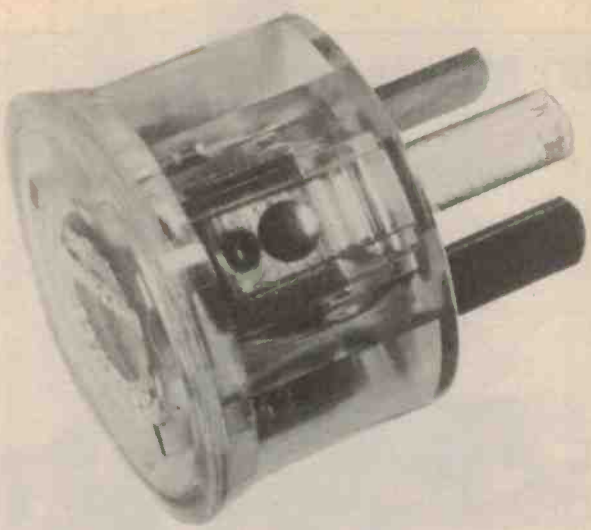
Automatic transmit/receive changeover of the radio equipment is performed by the CPU-100. Radio Link baud rates of up to 2400 baud are possible on VHF/UHF circuits with 600 to 1200 baud being realized on HF circuits.

Interfacing the CPU-100 to the host data equipment is via a standard RS232 port with either Xon/Xoff or RTS/CTS flow control available. Connection to the radio equipment goes via the 'audio in', 'audio out' and PTT lines.

GFS says the SDX-PKT version is capable of networking up to 64 different terminals or stations. These, for example, could be mobile or out stations within the network. Additionally a high error immunity broadcast mode is available as a user option on the SDX-PKT version.

For further information contact **GFS Electronic Imports, 17 McKeon Rd, Mitcham, Vic 3132. (03)873-3777.**

Spike protector



Bowthorpe Australia has released a voltage transient protector called the Bowthorpe Spike Protector Button for the protection of personal computers, videos, hi-fi equipment, VDUs, telephone exchanges, telex machines, cash registers and other sensitive electronic equipment. It eliminates surges and spikes caused by lightning, power network switching, spot welders, electric motors and other industrial spike-producing equipment.

The device can be used on a piggyback plug or a free position on a multi-gang power outlet. It will protect all equipment plugged into the outlets on the same branch circuit.

It employs metal oxide technology and will dissipate 150 joules of electrical energy with a response time of 10 nanoseconds. The device consumes no power except when the surge is present, operates almost instantaneously and resets automatically without operation. It protects on all modes, ie, line-neutral, earth-neutral, neutral-earth and is maintenance free.

Hi speed LeCroy

Oscilloscope maker, LeCroy, has released a pc-based version of its product called the waveform catalyst. It's a waveform digitizing and transient recording oscilloscope which uses the display and control functions of the PC to achieve extremely high sampling rates.

According to LeCroy, the waveform catalyst can sample at 200 Msamples a second. Once this information has been caught by the digitizer it can be manipulated in computer memory to provide output to normal output devices like plotters, printers and so on.

To operate, the user simply connects the box to the PC via a GPIB interface. The catalyst program starts immediately and presents a CRO type display on the screen. All the normal oscilloscope functions are available from the keyboard as single keystroke operations.

The catalyst allows the user to write programs for the manipulation of data in Fortran, Pascal or assembly language. Other programming packages permit Fourier transforms, convolutions, filtering and so on. Provision is also made for the storing and subsequent display of data on the computer's mass storage devices, whether they be floppy or hard disks.

The exact capability of the machine is determined by how it is optioned up. It consists of a mainframe which handles all the communications, power and so on, and a number of optional modules. For example, two different amplifier/trigger modules are available, three memories and four digitizers. These may be inserted in a number of different configurations to give a machine with totally different capacities.

For more information, contact the local agents, ETP on **(02)858-5122.**

Disk system from Webster

Webster Computer Corporation, the Australian minicomputer manufacturer, has added a new dimension to its family of products with the announcement of a range of packaged disk subsystems targeted at PDP11 and MicroVAX 2 users in Australia.

Users can now extend the capacity of these systems from 50 Mb up to 1000 Mb of disk storage. The cost is less than that of a new system.

Corporate Sales Manager Greg Macdonald believes another attraction will be the extremely fast access time of the controllers — typically 5 ms as against the 25 ms industry norm.

The packaged configuration comes in a console cabinet which can either be connected independently to the PDP11, or has plenty of room inside to rack-mount the MicroVAX 2.

The subsystems will use the new Webster ESDI (enhanced small device interface), and SMD (storage module drive) disk controllers released late last year.

Drive supplier for the SMD subsystems (formatted capacities 150 Mb, 300 Mb, 400 Mb and 600 Mb) will be Fujitsu Australia. Fujitsu supported Webster's R&D department in the development of its controller and supplied Webster engineers with both the SMD and ESDI drives around which the new boards were designed.

According to Macdonald, Fujitsu is the acknowledged world leader in SMD Winchester disk drives, and these, when coupled with a controller, will dramatically increase the storage capacity of a MicroVAX 2's maximum 71 Mb.

He says that there is a vast market of MicroVAX 2 and PDP11 users, all hungry for a faster, larger capacity disk which, until the Webster/Fujitsu 'marriage', had not been available.

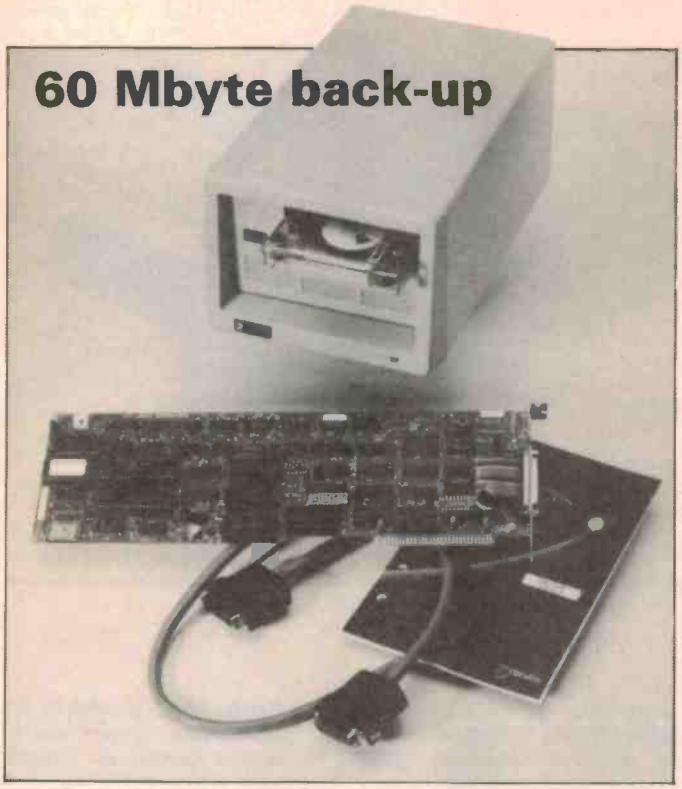
While Webster will offer the subsystem only in Australia, Macdonald said that other system builders throughout the world were excited at the prospect of combining the Webster controller and Fujitsu drives in similar configured packages to customers wishing to upgrade.

The unique feature of the controller which enables it to out speed all competitors in access time is the incorporation of one Mb of cache memory into the board (both SMD and ESDI controllers have this feature).

Webster has already about 10 orders for SMD subsystems. Pricing starts at $14,342 (168 Mb), and $29,420 for the 690 Mb.

Pricing for the ESDI subsystems is $11,985 (171 Mb), and $19,905 (380 Mb). Fujitsu will be one of several manufacturers to supply drives for the systems which will be aimed at upgrades complementing systems with already existing 5¼" ST506 disk drives.

60 Mbyte back-up



A device called the Megafile Q60 has been designed by Daneva Australia to overcome the necessity of providing an individual tape drive for each hard disk equipped IBM-PC, XT or AT workstation.

The Megafile Q60 stores up to 60 Mbyte on a ¼-inch tape cartridge.

Connection to the workstation is made via a cable plugged into a controller board mounted in the computer.

The Q60 may also find use where there is no room inside the PC for additional drive hardware. By using it to back up the popular Western Digital Filecard (hard disks on a card) current PC installations can be fully upgraded without throwing away existing drives or carrying out physical alterations to the workstation.

Megafile Q60 is supported by its own internal power supply to reduce the impact of power supply overheads in the host computer.

For more information contact **Daneva Australia, 47 Falcon St, Crows Nest, NSW 2065.**

Sound level meter

Bruel & Kjaer's new precision sound level meter Type 2235 is designed for general purpose measurements and a wide range of applications including building acoustics, audiometer calibration and frequency analyses. It measures sound pressure levels from 24 dB up to 130 dB, a range which can be extended to 150 dB with the addition of the 20 dB attenuator Type ZF0020.

The Type 2235 can measure the maximum or instantaneous sound pressure level with automatic (1 s) or manual reset in accordance with IEC and Japanese standards. Measurements can be made with rms or peak detector modes, with slow, fast or impulse time weighting, and with A, C or lin frequency weighting. Measurements are displayed with 0.1 dB resolution on a digital display which also indicates overload conditions (in which case the measurement is suppressed) and depleted batteries.

Alternating current and direct current outputs are provided for chart or tape recordings and audio monitoring of measurements. The linear free-field frequency response of a microphone can be corrected to give linear diffuse-field measurements in accordance with IEC or ANSI standards. The polarization voltage can be set to 0 V or 200 V to suit a wide range of microphones, allowing the Type 2235 to be used in a variety of applications.

Filter sets Type 1624 and 1625 can be added to the Type 2235, providing 1/3-octave or 1/1-octave frequency analysis of sound pressure levels. Using one of the filter sets and a Type 4144 pressure microphone, the Type 2235 is a handy instrument for audiometer calibration.

For more information, contact **B&K on (03)370-7666.**

RS232C transmitter and receiver with single +5 V

Maxim Integrated Products has introduced a device that meets EIA RS232C specifications while operating from a single +5 V supply.

The MAX232 consists of two transmitters, two receivers, two on-board voltage converters and +5 V to +10 V, and +10 V to −10 V charge pump voltage converters. The device is designed to replace the ±12 V power supplies and two interface ICs commonly used in RS232C communication links.

The MAX232 simplifies system design through onboard generation of the additional power supplies required to meet the RS232C specification for output voltage swing. The result is a significant saving in board space and system cost.

The ±10 V charge pump voltage converters use four external electrolytic capacitors, and the converters' chopping frequency is internally set to 16 kHz. The dual transmitters are CMOS inverters that are powered by the ±10 V internally generated supplies. The transmitter inputs are TTL and CMOS compatible, with the logic threshold set at 1.3 V for a +5 Vcc.

The slew rate of the MAX232 outputs is limited to less than 30 volts per microsecond. The powered down output impedance is a minimum of 300 ohms with the Vcc at zero volts and ±2 V applied to the outputs. The outputs are fully protected for continuous short circuits to ground.

The MAX232 is available in a 16-pin plastic, 16-pin CERDIP and 16-pin wide surface mount (SO) packages. The device is available in commercial temperature range (0°C to +70°C), extended industrial temperature range (−40°C to +85°C) and military temperature range (−55°C to +125°C).

For further information contact **R&D Electronics, 4 Florence St, Burwood, Vic, 3125. (03)288-8911.**

BRIEFS

Emona catalogue
Emona Instruments has its new 48-page catalogue available., Emona distributes Kikisui CROs as well as a range of other test and measuring instruments.

More SMDs
Siemens has reconfigured the S 042P, a symmetrical mixer with bandwidth of 200 MHz into surface-mount packaging. The device is now called the TBB 042 G.

Multifunction calculator
Datron Instrument has released its model 4700 autocal multifunction calibrator through the Dindima Group. The device will calibrate 5½-7 and 6½-digit DMMs to better than 10 ppm.

Breakout box
A new RS232/V24 communications tester has been released by Motivation Plus. It's called the Comtest, and includes tristate monitor on all 23 signals. It breaks and redirects all 25 lines and has a two level "open circuit voltage" test between DCE-DTE. Another feature is a four-level bidirectional current loop test for use with RS-232 contact, short haul modems or any other current loop.

High class monitors
Alfatron has become the agent for British based Compuser Ltd which has produced a range of high resolution monitors with 12, 14 or 16-inch screens. Interfaces include TTL, RGB, and analogue.

Tek spec
Tektronix has released the 495, portable 100 Hz to 1.8 GHz spectrum analyser. It can download measurement programs into non-volatile on-board memory to provide measurement sequences on the move.

All in one
Alfatron has released a universal programmer for EPROM/PROM/PAL and single chip micros. On board memory is 64K, and the unit comes equipped with a two-line, 24-character screen for stand-alone operation.

Fibre-vue
US company OFTI has released an optical fibre inspection tool through IFS called the Fibre-vue. It provides a means of inspecting the fibre with vertical or back illumination, or a combination of both.

MD110 mod
Ericsson, the Swedish phone giant, has released news of modifications to the MD110 PABX. The package is called PCMAS, and allows users to change the configuration of their network using an IBM-PC.

Video speed sample and hold
Elmeasco is distributing the SHM-40 which features 40 ns acquisition time, and 40 MHz bandwidth sample and hold. It contains input buffer, analogue switch, hold cap and two output amps.

B&W cabinet technology
New Matrix speakers from the British speaker maker are claimed to give superior results due to a honeycomb structure which provides an extremely rigid cross section of the box. According to the makers, high mass attenuates high frequencies, high damping eliminates midrange resonance and high panel stiffness gives accurate bass transients.

Signal processing

Hewlett-Packard has announced the 3565S Signal Processing System, an integrated, multi-channel system for signal characterisation and stimulus-response testing in the time, frequency and amplitude domains from dc to 51.2 kHz.

A complete system is comprised of HP-VISTA Signal Processing Software, configurable measurement hardware, and an HP 9000 Series 300 technical computer workstation. The HP 3565S can monitor and measure as many as 61 signals simultaneously.

The system is well-suited for applications involving signal characterization, waveform analysis, and device testing. Advanced multiple-input, multiple-output (MIMO) frequency response measurements allow all paths through multiple-input systems to be measured simultaneously. One-time events may be viewed and analyzed on-line or stored directly to an external disk drive for off-line analysis in the time and frequency domains.

HP VISTA (virtual instrument software for testing and analysis) is the software link between the HP 9000 computer and the measurement hardware. It provides a user interface for performing signal acquisition, measurements, analysis and documentation.

HP 3565S measurement hardware is modular and expandable. A basic system is comprised of one mainframe, an interface and processing module, input modules, and a signal source. Each mainframe accepts up to eight plug-in modules; eight mainframes can be interconnected to provide up to 64 module slots.

The system software runs on the HP 9000 Series 300 technical computer under the HP-UX operating system. These modular workstations offer expandable memory and input/output, a 16- or 32-bit processor (68010 or 68020), mouse or keyboard input, colour or monochrome monitors, and a broad array of HP peripherals. The HP-UX 5.1 operating system allows a user to simultaneously perform measurements, plot results, write reports, and receive electronic mail from a local area network.

For more information contact **HP on (02)888-4444.**

Video display

A patented new technology for a cathode ray tube with a perfectly flat, virtually reflection-free faceplate has been developed by Zenith Electronics Corporation.

At the Society for Information Display's annual symposium held in May, Zenith scientists revealed design details of the new ultra-high resolution 'flat tension mask' (FTM) tube. It can offer up to 80% higher brightness or up to a 70% increased contrast ratio when compared with conventional displays, and virtually eliminates 'doming' discolouration.

Both the new FTM tube and conventional colour CRTs use a shadow mask. This thin metal sheet with hundreds of thousands of perforations helps direct beams from the tube's electron gun to the screen, where they excite red, blue and green phosphors, creating the video image.

In a conventional CRT, a curved shadow mask is supported by a frame and suspended by springs inside a tube. As the electron beam strikes the mask, it heats up and moves.

In an FTM, the shadow mask is stretched flat and held under tension directly behind the tube's flat glass faceplate. The mask does not move at all under most display conditions, even at much higher brightness levels that cause discoloured images in conventional tubes.

For more information contact **Anitech on (02)648-1711.**

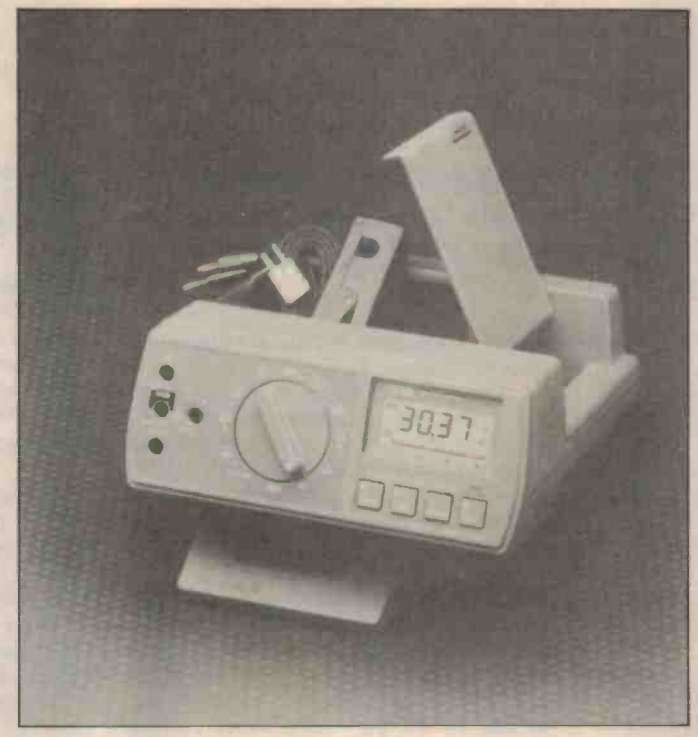
Fluke 37

John Fluke Inc has announced the introduction of a new multimeter. The new Fluke 37 features the combined analogue/digital display pioneered in the Fluke 70 Series, and the accuracy and input overload protection found in the Fluke 20 Series. The unit is backed by a two year warranty.

The front panel features a 15 degree slope for optimum visibility and switch access. A large storage compartment built into the rear half of the case allows the user to store test leads and small accessories inside the meter. A built-in carrying handle (moulded into the case) offers portability when needed.

Fluke advertises 0.1% basic dc accuracy and wide bandwidth ac response for the Fluke 37. It also claims that internal design and construction techniques provide exceptional shielding against electro-magnetic interference.

The Fluke 37 features a 'touch-hold' feature which freezes the display, both min-max and relative recording modes, autoranging with manual range selection, and an easy-to-hear continuity/diode test beeper. The Fluke 37 operates from an internal 9 V battery (1000 hour typical battery life), or from line power using an optional Fluke battery eliminator.

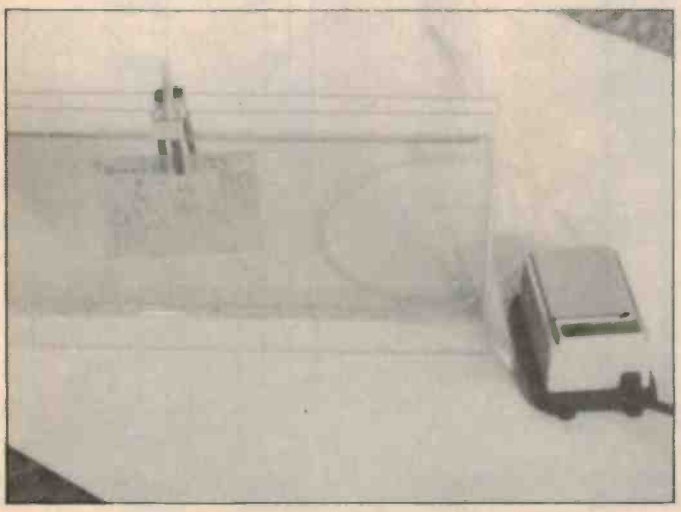


The unit is designed to meet all requirements of UL Standard 1244. All current ranges including the 10 A range are protected by high-energy fuses. The resistance function is overload protected to 500 Vrms, and both ac and dc voltage functions are protected to 1000 Vrms.

For more information contact **Elmeasco on (02)736-2888.**

Bubble-etcher for pc protos

Designed to etch printed circuit prototype boards hands free, and with minimum usage of etching material, the Bubble-etcher is a clear acrylic tank which holds 500ml of etchant, in a ½" wide slot, into which bubbles are driven by a small air pump.



The pc board is suspended vertically in the etchant and the movement of the fluid washes away the dissolved copper, leaving the board etched clean in four or five minutes.

The Bubble-etcher is suitable for all etchants, but is best used with ammonium persulphate as this clear solution allows you to see the etching taking place.

The kit includes the air pump, hose clamps, silicon glue, and precut tank parts to suit boards up to 9" x 4½". Larger sizes can be supplied.

The bubble-etcher is priced at $54 plus sales tax. For a free catalogue contact **Sesame Electronics, PO Box 452, Prahran, Vic 3181. (03)527-8807.**

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LAUNCHING THE SECON

Aussat is already planning its next generation of satellites. One of the most important decisions is how to get the bird up there. In the year 2000, there will be a lot of competition for satellite launch business.

THE COST AND RISK associated with delivering a satellite to its required position in space is often equal to, if not greater than, the cost of the spacecraft itself. Consequently, although the launch phase is relatively short, it is important to be aware of the state-of-the-art in this rapidly developing area of space technology.

At this time, there is a substantial world-wide reorientation in the business of launching spacecraft. This is due to a variety of reasons but the following appear to be particularly prominent:

1. National launch system programs — which traditionally have been only for domestic use — are now being developed with greater emphasis on world-wide commercial application. Because of this trend, there are likely to be at least three more countries able to supply commercial launch services by the year 2000 in competition with the existing US and French 'monopolies'.

2. The advent of the US led, but internationally supported, space station and the development of orbiting transportation systems to complement that facility opens new vistas for commercial satellite users.

3. The likely development of new, multi-mode, propulsion systems makes a re-usable single stage to orbit, aerodynamic launch vehicle far more viable than before. Actual launch costs can be expected to plummet once these vehicles become operational.

Background comments

Our primary concern is with launch systems which are capable of delivering a satellite of at least 700 kg to a geostationary earth orbit (GEO) above the equator. Depending on the particular launch system, the intermediate stages of low Earth orbit (LEO) and geostationary transfer orbit (GTO) may also be utilised.

A significant amount of energy is required to change the inclination of an orbit and it is therefore desirable to use a launch site as close as possible to the equator for a GEO mission. Figure 1 shows one example of the large change in payload, as a function of inclination. The latitude of the launch site used by some of the vehicles referred to in this paper is given in Table 1 for comparison.

Launch vehicles

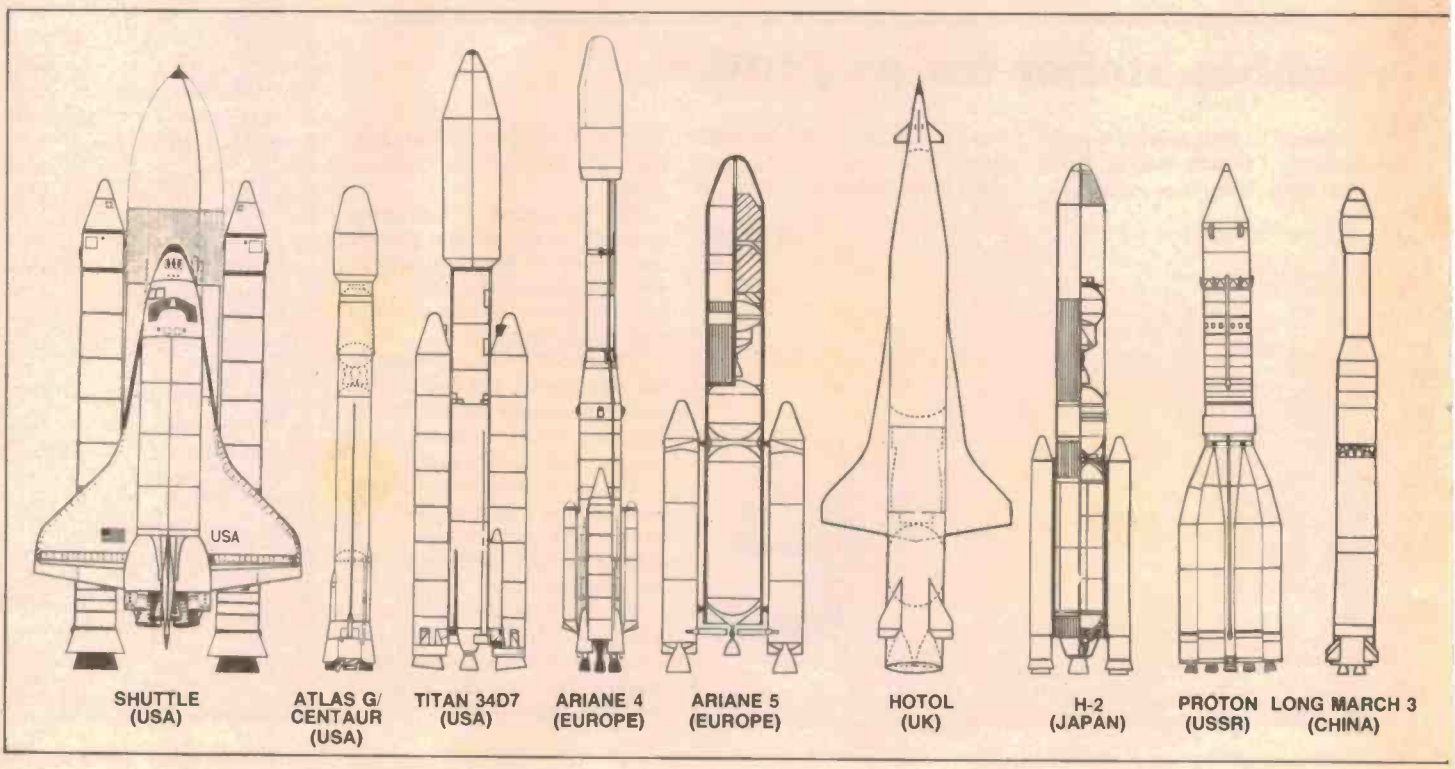
Classifying the likely evolution of launch vehicles by country is convenient because it usually corresponds to political and commercial acceptability as well as technological sophistication.

The United States

Shuttle

As the Western World's premier launch system, the STS (space transportation system or space shuttle) had flown 23 times by the end of 1985 and deployed 27 spacecraft bound for GEO. In addition, five major satellites were recovered or repaired by crew members after failing soon after deployment.

Despite the tragic loss of the shuttle mission 51-L in early 1986, this record emphasizes the chief asset of the shuttle in that it is beginning to meet the goal of being a true space transportation system with the flexibility and reliability of a manned system at a commercially acceptable price. From a communications satellite operator's point of view, the shuttle does, however, have a number of shortcomings. Some of these are summarized :



D GENERATION

G. Pike

Dr G.H.S. Pike, PhD, is Manager of the Mechanical Systems and Launch Vehicles section of Aussat. This article is an edited version of a speech he gave to the 2nd National Space Engineering Symposium in Sydney earlier this year.

1. The shuttle is only capable of LEO missions in its current configuration.
2. The stringent safety requirements of a manned vehicle frequently add complexity to the spacecraft requirements.
3. Even before the Challenger disaster, there were many concerned expressions from both military and commercial users of the shuttle that the fleet of four orbiters plus recently ordered major spare parts were inadequate to support the launch obligations they had undertaken for the shuttle. Even if funding for a replacement orbiter is made available, there will still be little spare capacity available to fulfil commercial requirements once the US Strategic Defence Iniative and space station programs get underway in the early 1990s.

It seems likely that the current shuttle design will be with us at least until the year 2000, albeit with a series of modifications aimed at updating the early 1970s technology seen throughout the vehicle and increasing the payload.

Looking further ahead, the next generation shuttle is undergoing conceptual definition at this time.

Due for introduction in the late 1990s, the new designs are concentrating on vehicles with a capability similar to that of the current shuttle (ie, 30,000 kg to LEO). However, launch costs are expected to be substantially less.

ELVs

Two US manufacturers of expandable launch vehicles (ELV's), General Dynamics and Martin Marietta, have recently introduced upgraded versions of vehicles which have been used for many years. Both companies are confident that they will be able to offer competitive launch services with these vehicles for at least the next decade — if not longer. However, in both cases, their long term future depends on the pricing policy of the US Government for the shuttle. If the US taxpayer continues to subsidise STS missions at the current rate, then neither vehicle is likely to be commercially viable.

The Atlas/Centaur is a three stage ELV marketed by General Dynamics and has a history dating back to 1962. The current version (Atlas G/Centaur D1A) is capable of injecting 2360 kg into GTO.

In spite of a recent failure, the reliability of the Atlas/Centaur is high with only one failure in the last 33 missions.

Martin Marietta is under contract to the US Air Force to produce 10 of the latest versions of its Titan family, the 34D7. This is a three stage ELV with two solid rocket boosters as the first stage and hypogolically

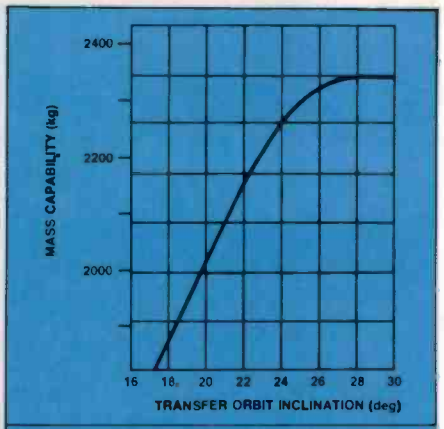


Figure 1. Launch vehicle mass capability (Atlas/Centaur).

fuelled second and third stages. The available size inside the fairing roughly compares with the size of the shuttle orbiter cargo bay (4 m) and half its length (10 m). It is also considered extremely reliable.

Europe

Ariane

Beginning in 1986, the European Arianespace will begin phasing in the Ariane 4 version of the Ariane ELV. This will be the latest member of the Ariane family which has offered the only significant competition to the shuttle for commercial launch sales in recent years.

The Ariane family is the first of the new generation of ELVs in that it has modern propulsion and guidance systems and owes little to the older ICBM-based vehicles (eg, Atlas and Titan). In addition, its launch site in French Guiana is the closest of any of its competitors' to the equator. This translates into a significant extension of the on-station fuel life for a typical communications satellite.

Offered in six versions, the Ariane 4 will be capable of launching up to three spacecraft with a combined mass of about 3700 kg into GTO using a variety of first stage boost motors and spacecraft adaptors.

Looking further ahead, work has recently started on the Ariane 5 launcher to be introduced in 1992. This is a three stage vehicle with a choice of two third stages. Up to three spacecraft with a combined mass of 8000 kg could be launched into GTO by this high performance launch vehicle.

HOTOL

Britain was the first country to publicly announce its intention to proceed with advanced design studies of a fully re-usable manned/unmanned satellite launch vehicle called HOTOL (HOrizontal Take Off and Landing). Using Concorde as an aerodynamic basis and a new bi-mode engine under investigation by Rolls-Royce, HOTOL would deliver a 10,000 kg payload to LEO using essentially conventional airport facilities for take off and landing.

Because HOTOL would not require major capital investments in launch facilities, it would not be tied to fixed launch ▶

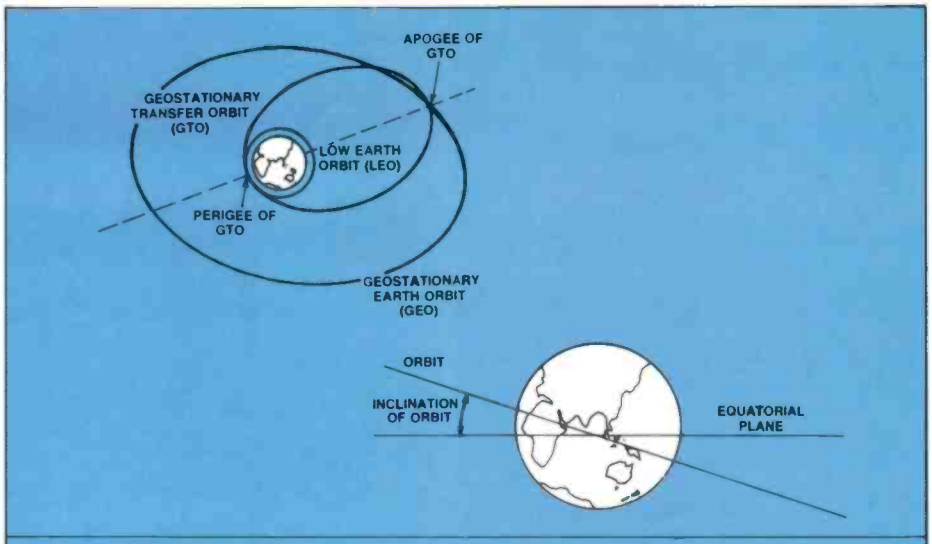


Figure 2. Orbit nomenclature

TABLE 1. LAUNCH SITE LATITUDE

Site	Latitude (North)	Vehicles
Kourou (French Guiana)	5° 14′	Ariane, HOTOL
Xichang (China)	27° 50′	CSL-X3 (Long March 3)
Kennedy Space Centre and Cape Canaveral (Florida)	28° 30′	Shuttle, Atlas, Titan
Tanegashima (Japan)	30° 23′	H-2
Tyuratam (USSR)	46° 5′	Proton

sites. It could, therefore, be deployed to sites which are optimally located for the required mission (ie, close to the equator for the launch of a spacecraft destined for GTO).

Clearly, such a quantum leap in technology as HOTOL represents would not come easily and it is to be hoped that this program receives the support it requires to achieve operational status before the year 2000. While having much in common with some of the second generation shuttle concepts, HOTOL would benefit from being free from the military requirements and so be sized more for the commercial spacecraft market. Substantial cost, performance and flight availability benefits would certainly follow.

Japan

Following the successful N and H-1 family of ELVs, Japan has announced its intention to develop the H-2 which it expects to introduce in 1992. Unlike the earlier vehicles, the H-2 will use no components imported from the US and so will be free from an existing US embargo on sales to third countries in competition with American ELV suppliers. Consequently, the Japanese are thought to be planning a strong interna-

tional sales drive when the H-2 is introduced.

The H-2 is to be an Ariane 4 class vehicle with a capacity to GTO of 3800 kg or 2000 kg to GEO.

USSR

Since the mid 1970s, the Russians have made occasional attempts to sell launches on the Proton ELV to Western satellite users. These have not been successful. It is, however, clear that the Soviets are keen to market launch services and an evolving political and commercial climate might well make this a viable propostion in the future.

Apart from the Proton, it is thought that a new medium class vehicle is under development and both would be candidates for offering to the West at an extremly attractive price.

Proton is known to have a capability of 2500 kg to GTO, albeit at a very high inclination due to the latitude of the Tyuratam launch site (46°N). No doubt much of this inclination could be removed by the launch vehicle at the expense of payload mass.

China

After their initial success in launching indigenous communications satellites on modified military launch vehicles, the Chinese are developing the CSL-X3 (or Long March 3) ELV to launch satellites of up to 1400 kg into GTO. This is a three stage vehicle in the Ariane 1 class and has had at least three mainly successful flights to date.

Commercial sales are obviously being considered as China is reported to have appointed a marketing company in the US to sell launch services on the CSL-X3 at a price some 20% below competing US and European launch systems. There is also a long term plan to develop a launch complex in conjunction with Indonesia. This would be located on Indonesian territory — virtually on the equator — and places China in a very attractive position to launch medium size spacecraft into GTO in the 1990s.

Money

The current prices charged by launch vehicle suppliers generally bear little resemblance to their real costs. Launch vehicles are regarded more as national research and development tools than commercial products and, as such, are immune from conventional economics.

However, it seems that current technology vehicles (ie, the shuttle and ELVs) will need to be marketed at about $28,000/kg to GTO (1983 US dollars) in the mid 1990s in order to be competitive. If the fully recoverable vehicles (ie, second generation shuttle and HOTOL) fulfil their promise, the price should fall to less than 30% of this figure upon their introduction into service.

One fly in the ointment could be insurance. Following some dramatic disasters over the last few years, several companies have pulled out of the business. As a result launch vehicle suppliers (especially Arianespace and General Dynamics) are developing schemes to offer some insurance provisions as part of the basic launch contract.

The pooling of risk over a fixed number of launches is emerging as a promising solution to the current situation. But this is not the only scenario and other options are being pursued by virtually all major parties in the communications satellite industry.

For instance, in their bid to launch Inmarsat satellites on the Proton vehicle, the Russians offered a low price (50%) relaunch following a launch vehicle or early satellite failure.

All current launch vehicle suppliers are examining variations of this scheme at this time and it seems likely that something along the lines of the Soviet proposal will be the norm by the 1990s. ●

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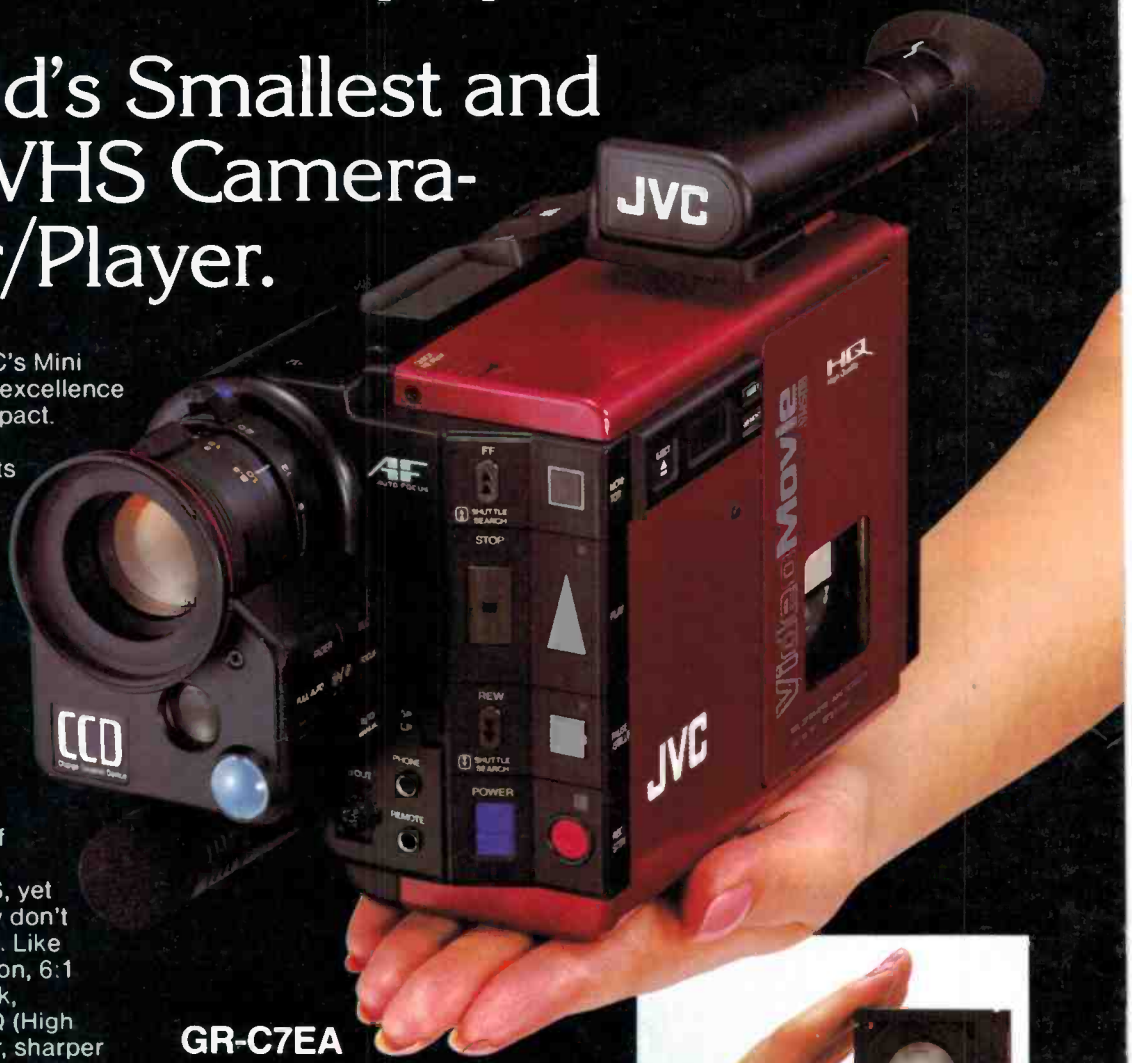

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ICOM
The Frequency of Ideas.

ONE OF THE roles assigned to the hack in this office is to process all the dead trees that descend on our tiny warren in the form of 'press releases'. Sorting through this lot is like watching the current state of US-Soviet relations, it can drive a man to drink. However, even in this slough of despond there is the occasional glimmer of hope, humour or just plain bloody silliness, sufficient, in fact to make one want to get out of bed in the morning. Consider:

Computer literati take note that you will rise in the esteem of your friends if you now begin to use the following terminology:

cyberphile: one who loves computers;
cyberphobe: one who hates computers;
cyberphilliac: one who wants to do unspeakable things to computers.

Current mythology has it that cyberphobes turn into cyberphiles on close acquaintance, but a more intimate relationship can easily turn into cyberphilia. This happens regularly at 2 am after a disk crash.

A tale of biological warfare and beeshit

US President Ronald Reagan is currently seeking NATO assistance in basing his new breed of horror weapons in Europe. These are the so called binary weapons, a new name for biological warfare devices. Part of his strategy has been to convince European leaders that the Soviets have done it all before. It has been suggested that yellow rain has been used in Afghanistan and South East Asia. 'Yellow rain' is a cocktail of toxins usually spread from aircraft. In support of the claim, US Government officials gave European agencies a vial of material claimed to have been collected in Afghanistan, and to be of Soviet origin.

However, research at the British chemical centre at Porton Downs has embarrassed both British and American Governments. According to *New Scientist* magazine, parts of the specimen were placed under an electron microscope to see what the particles looked like close up. Astonished researchers found they were looking at contaminated pollen. A little more research showed that the 'yellow rain' is in fact deposited by the giant South East Asian honeybee as it goes from flower to flower. In fact the yellow rain particles are nothing more than bee faeces.

It is not known how the US officials could have made a mistake like this.

Definitive bionics

Moulded plastic circuit boards may soon wrap around the human body creating a new form of artificial intelligence. Advances in circuit board fabrication technology will lead to the possibility of designing custom made intelligence enhancers that will wrap themselves around parts of the human body in a new form of symbiosis. In fact, eventually, as these computer systems become more and more intelligent, the human body itself may be viewed as parasitic by the new life form moulded in the image of ourselves.

This is but one of the startling conclusions of a report published by International Resource Development, an American market research firm.

Advances in the fabrication of circuit boards have enabled manufacturers to create flexible boards, some of them made by moulded plastic injection. These advances have extended the realm of electronics to include shapes previously thought impossible.

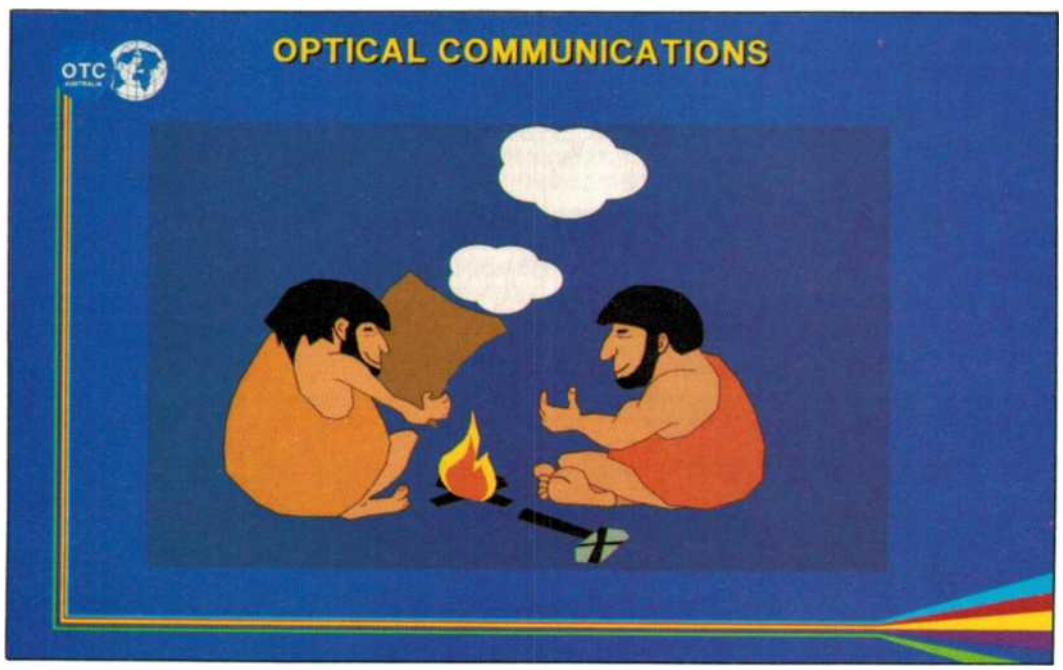
Systems that can wrap around or into human skin itself are becoming technically feasible. Intelligence is already built into common objects, and will soon be built into the human body. In the meantime, these electronic systems will increasingly be considered as 'high-tech clothes', rather than as artificial encumbrances says the report.

Definitive disasters

New studies of the hazards posed by asteroids or comet nuclei colliding with the Earth, based on analyzing old craters on the Earth and Moon, have been announced by astronomers researching for NASA.

In two papers delivered at the annual meeting of the American Geophysical Union, scientists said that a collision by a large asteroid could be catastrophic. The chances of such an event occurring in the next century, however, are extremely remote. They estimate that the odds of an asteroid or comet nucleus one-third mile in diameter or larger hitting the Earth in the next 100 years are only 1 in 1000.

A scenario of greater concern, they said, would be a far more probable encounter with a smaller object, a large meteoroid. Objects of that size explode when they enter the atmosphere. Such an explosion could be mistaken by some of the world's less technically advanced nations for a nuclear attack, prompting undesirable political consequences. ●



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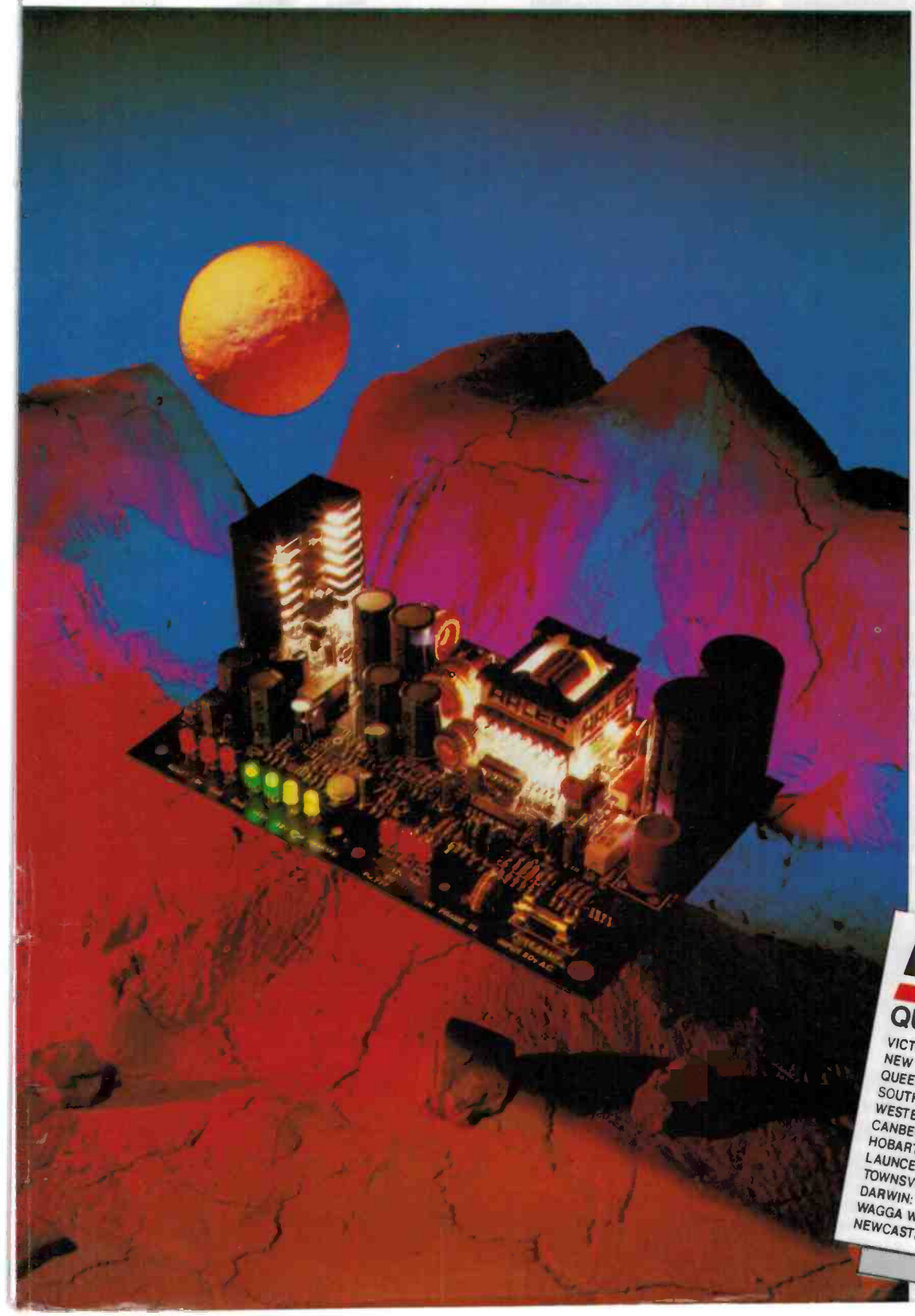

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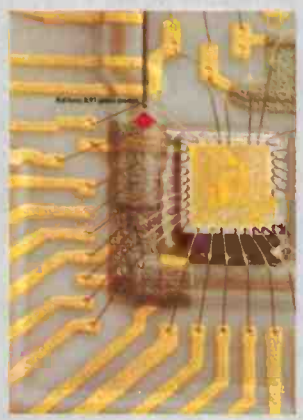

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