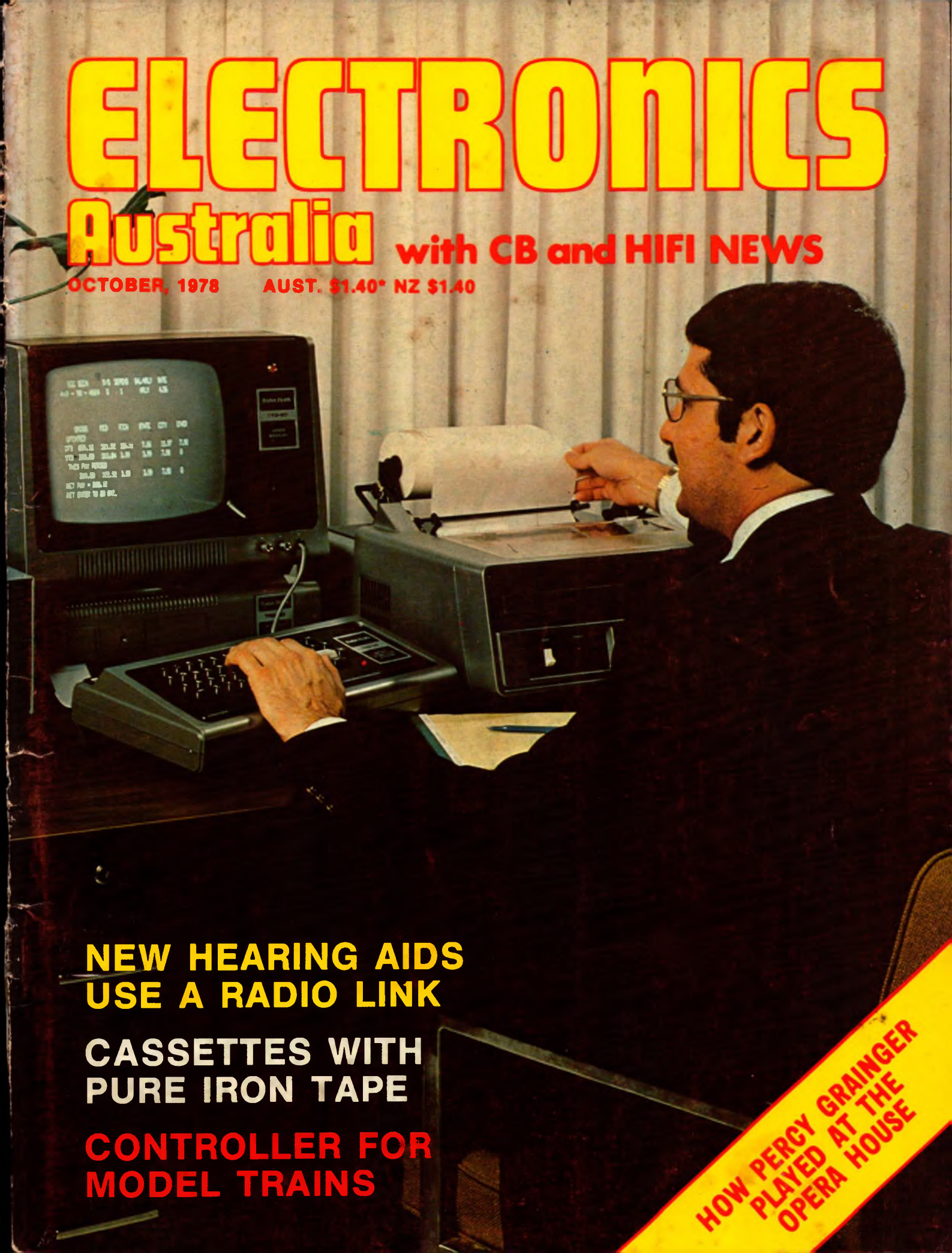
ELECTRONICS Australia with CB and HIFI NEWS

OCTOBER, 1978 AUST. $1.40* NZ $1.40



NEW HEARING AIDS USE A RADIO LINK

CASSETTES WITH PURE IRON TAPE

CONTROLLER FOR MODEL TRAINS

HOW PERCY GRAINGER PLAYED AT THE OPERA HOUSE

THE LOGICAL CHOICE

SONYS NEW TC-K7II

REDUCING WOW & FLUTTER TO LESS THAN 0·045%

Introducing the King of Sony's new K series cassette decks. The outstanding TC-K7 II with Sony's most advanced electronic and mechanical engineering.

This is a deck that not only has specifications that are superior to many open reel decks but features easy to operate, gentle touch, logic controls in all tape transport modes. There is no need to push the stop bar when changing modes and should the wrong mode be selected accidentally, no damage can occur to your tapes or your deck. All modes including "record mute" can be activated from the optional remote control unit (RM 30).

How do Sony achieve that incredibly low wow and flutter figure (0.045% WRMS). Firstly by using a two motor system, each designed to do a specific job. One motor is for reel drive and Sony's New Tri-Duty Motor handles the capstan drive. The Tri-Duty Motor is a superb piece of engineering and with its servo system,speed variations caused by either line voltage fluctuations or tape load are virtually eliminated.

The TC-K7 II features a "Double" integrated, recording and play back level indication system. Dual, high quality VU meters are augmented by three instant reacting LED peak level indicators, set at "0" and at +4 and +8 dB, so that the oversaturation of recording circuits can be prevented.

Naturally the TC-K7 II has Dolby but it also has an MPX filter defeat (Filter off) mode, a record mute facility and a three position memory rewind and replay facility. The tape select system has three step bias and three step equalisation selectors, giving nine possible positions, for optimum performance from a wide variety of tapes.

At the heart of this deck there's Sony's Ferrite and Ferrite head, hard and highly polished, like black diamond, to give years of head life.

The combination of Sony engineering and research with logic controls and Sony's new Tri Duty Motor produces a cassette deck that must be the choice of discerning Hi-Fi enthusiasts: A sound logical choice.

CHECK THESE EXCEPTIONAL SPECIFICATIONS

Frequency Response	20 Hz — 18,000 Hz (FeCr)
	20 Hz — 17,000 Hz (CrO2)
S/N Ratio	60 dB (FeCr, Dolby off, peak)
Wow and Flutter	0.045% WRMS
Harmonic Distortion	1.3%

SONY®

Research makes the difference.

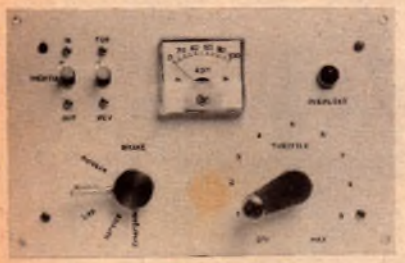
GAC S 9655

ELECTRONICS Australia

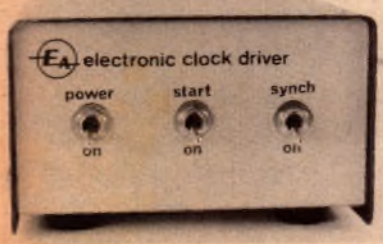
Australia's largest selling electronics & hi-fi magazine

On sale the first Monday of each month

VOL. 40 No. 7 OCTOBER, 1978



Reliable starting, a Westinghouse "air brake", simulated inertia and a speed indicating meter are the main features of this new high performance train controller. Details on p42.



This electronic clock drive unit will allow most battery operated analog clocks to be "steered" by the mains. Turn to p64 for the details.

On the cover

Released in Australia last March, Tandy's TRS-80 home computer system is proving a huge success. It is shown here with the recently introduced TRS-80 line printer. (Photo courtesy Tandy International Electronics).

Coming soon! . . . an article showing how to use the TRS-80 to plot biorhythms.

FEATURES

HIFI NEWS AND REVIEWS

PROJECTS AND CIRCUITS

AMATEUR RADIO, CB SCENE, DX

COLUMNS

DEPARTMENTS

Now. Two 3-way 40 watt speakers with nine tonal choices

Save about $50 per hour while you assemble them

Even if you didn't know them by number, you probably heard about the Philips AD12K12 MK11 Speaker Kits.

Because they are now a no.1 best-seller.

And here is the compact AD8K30, 8" 3-way compact system, with fine electronic and acoustic components (1" domed tweeters, 5" mid-range, super 8" bass drivers). Brilliant clean sound, with a frequency response closely following the ideal Bruel & Kjaer curve for hi-fi equipment measured in an actual listening room, using the "Third Octave Pink Noise Method".

Plus 9 combination tonal choices to adjust to the acoustics of your own listening-room.

You can assemble the AD8K30's in about two hours. You will get a professional result and save about $100 per pair over a comparable system.
Phone or send coupon now for full details of this and all our kits.

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Please send me full details and brochures on your loud speaker kits and a list of retailers who stock them.

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Editorial Viewpoint

Computers and unemployment

By the time you read this, the Telecom technicians' dispute will hopefully be over, and the nation's telecommunications network back into normal operation. But as I write the dispute is still in full swing, with both telephone and data link services severely disrupted. No resolution is in sight as yet.

Although the dispute has seriously upset communications and caused a great deal of inconvenience, it has perhaps had one worthwhile outcome already. More people than before seem to be thinking about the relationships between computers, automation and unemployment, and this is surely a good thing.

To be sure, the problems in this area are very complex; there seem to be no easy solutions. In fact, it is hard to say anything about them anymore that doesn't sound trite or superficial. Yet the implications are so profound that it seems irresponsible not to try and address oneself to them.

I often find that people assume, on finding that I am Editor of an electronics magazine and someone with an interest in computers to boot, that I must be wholeheartedly in favour of computerisation and automation ad infinitum. Quite the contrary. In fact, like other concerned electronics and computer people, I am not at all happy about some of the current trends in the use of computers and automated machines in our society. This despite the fact that from a purely technical point of view I find many aspects of computers quite fascinating.

Quite obviously, computers and automated machinery do have the potential to replace significant numbers of people in many work situations. And equally obviously there are strong economic forces in developed countries pushing both private and public employers to realise this potential. So the machinery is being introduced, as rapidly as available capital and technological achievements will allow. The motivation is almost purely economic, and there seems to be no real thought towards long-term social implications.

Without proper planning and regulation, this could easily lead to a situation where a very large proportion of people are both unemployed and unemployable, and where computers have reinforced social injustices and inequalities rather than benefited society as a whole.

If this is not to happen, I believe that representatives of employers, employees, government and the computer industry are going to have to get together and seriously plan a more just and democratic scenario. And they will have to do this soon, or it will be too late.

— Jamieson Rowe

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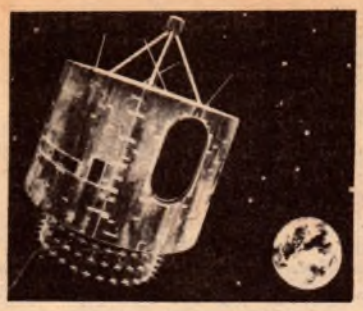


News Highlights

Japanese calculator patent to TI!

The Japanese Patent Office has issued a patent covering virtually all hand-held electronic calculators to Texas Instruments Incorporated, the Dallas-based electronics firm has announced. The patent is for personal size battery-operated calculators which have their main electronic circuitry in a single integrated circuit chip, and is based on US patent 3,819,921.

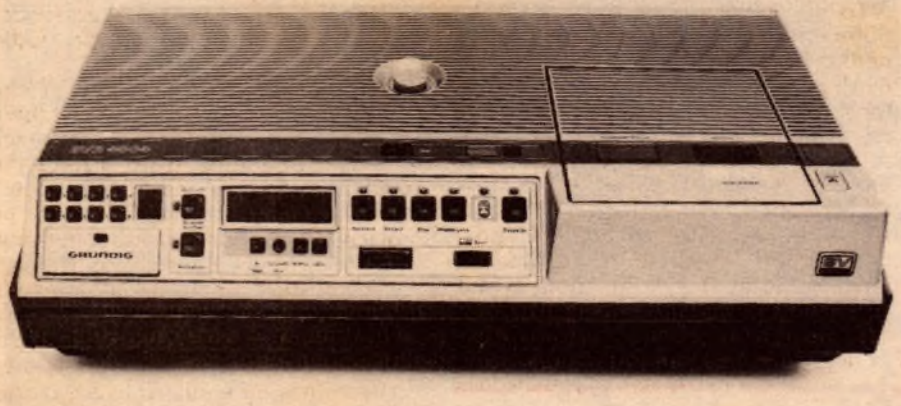
TI said that the Japanese decision represented a significant milestone because its calculator invention was subjected to stringent patent opposition from 12 leading Japanese calculator companies. The companies cited 25 references to back their argument that the TI invention was not patentable, an argument which the Japanese Patent Office was to reject.

Under the Japanese patent, Texas Instruments now has the right to claim royalties retroactively to August 24, 1974, the date its invention was officially published by the Japanese Patent Office. TI will actively seek to licence the patent.

The calculator described in the TI patent was the result of work done at TI in the mid-1960s. The US patent, filed in 1967, was for a miniature calculator based on a large-scale integrated circuit, an 18-key keyboard, and a thermal printer for printing out calculations of up to 12 digits.

Credited with the invention are scientists Jack S. Kilby, Jerry Merryman, and Jim Van Tassel. Kilby invented the integrated circuit in 1958, and was later awarded the National Science Medal for his pioneering work in integrated circuits.

Nineteen countries have now issued patents to TI for the calculator. Among them are four Latin American countries, France, the UK, Italy, Spain, Hong Kong, Singapore and Australia.



Probably the most advanced home video cassette recorder on the Australian market, the Grundig 4004 VCR features 5-hour recording time; a 10-day timer for automatic recording, switch-on and switch-off; remote control facilities; and pushbutton solenoid-actuated controls. Suggested retail price is around $1,695 (available from major video outlets).

New Scalar agent for WA

Scalar Industries Pty Ltd has announced the appointment of Everett International Pty Ltd as its exclusive agent in Western Australia. The complete range of Scalar communications antennas, screened enclosures, and products associated with RFI suppression will be handled by the company. Everett International Pty Ltd is located at 17 Northwood St, Leederville, WA 6007.

Teaching aid launches TI's voice synthesizer

Texas Instruments is said to be leading the way towards technology which will make it possible for home computers to speak.

"Say it COLOR: C-O-L-O-R", commands the voice in the orange plastic box as the letters appear on a blue fluorescent display. Called "Speak & Spell", TI's latest gadget is a word teaching device containing a new speech-synthesizing chip that reproduces words uttered by a male voice.

TI's new speech synthesizing chip is a special version of the TMS1000, 8-bit microcomputer, working with a pair of 128k ROMs. The new chip can produce a total of 200 seconds of sounds for a vocabulary of over 200 words, but is capable of accessing a lot more memory for more words — as much as 2.1 megabytes in fact.

Speak & Spell reads out its 200 words randomly for the various exercises, which are selected by a means of a keyboard. These exercises include pronunciation, spelling quizzes, and Hangman (a spelling game).

TI is not talking about a fancy price tag either. It plans to sell the Speak & Spell teaching aid in the US for less than $50.

World market for microwave leakage detector

The low-cost microwave leakage detector developed by the CSIRO is now being manufactured by two companies: Electrobits Pty Ltd, PO Box 232, Clayton 3168; and Birene Medical Supplies Pty Ltd, 29 Whiting St, Artarmon 2064. It will retail in department stores, electrical goods and hardware shops, and pharmacies for less than $15.

The detector contains a light emitting diode that glows red whenever it encounters microwave radiation exceeding the recommended safety level. It should prove particularly useful to owners of microwave ovens, to operators of microwave diathermy equipment, and in factories using microwave heaters operating at 2450MHz.

Users of microwave ovens will be able to check that the oven seals have not deteriorated and diathermy operators can check for stray radiation during treatment. As the eyes are particularly susceptible to radiation injury, accidental exposure of the eyes during irradiation of other parts of the patient's body should be guarded against.

One company, Birene Medical Supplies Pty Ltd, is seeking worldwide marketing agreements for the detector. The company said it was hopeful of sales of more than 250,000 units by the end of 1979. There are presently five million microwave ovens in the USA alone, so the overseas market is potentially huge.

Cadillac: the car with a computer

National Semiconductor has announced that its 16-channel 8-bit ADC 0816 analog-to-digital converter will be used in the Model Year 79 Cadillac Seville Trip Computer. National's A/D converter will provide the A/D interface for keyboard entry, fuel level monitor, battery voltage, engine temperature and various other analog signals.

The Trip Computer, manufactured by General Motors, is a pre-programmed system which computes and displays operational information in three separate Seville instrument panel areas. A digital speedometer above the steering wheel indicates current operating speed. The fuel gauge reads the amount of gasoline in the tank.

To the driver's right, the Trip Computer information centre offers pertinent driving information on command. By depressing one of the console buttons, the driver or front seat passenger can obtain: actual instantaneous fuel economy; average-fuel economy for the trip; average car speed; total elapsed trip time; driving range on remaining gasoline; miles to go to a predetermined destination; estimated arrival time at that destination, based on current driving conditions; time of day; engine RPM; engine temperature in degrees; and system voltage.

Wire cutters reduce wafer kerf

One factor that's been keeping solar cell costs up is the amount of silicon wasted when silicon ingots are sliced into wafers. Now one US company, Crystal Systems Inc, has come up with a way to reduce both the wafer thickness and the kerf, or cut, taken between the wafers.

Crystal Systems is currently using a modified Varian 686 ingot-slicing machine fitted with hundreds of diamond impregnated wires. These wires are supported at both ends in a frame that resembles a large egg-slicer. The wires are pressed against the surface of the ingot and moved back and forth so that they slowly cut their way through.

This method is said to give as many as 25 wafers per centimetre of silicon. Moreover, these wafers have been as thin as 0.1mm, with the kerf held to 0.15mm. By way of contrast, conventional slicing methods using a rotating blade produce wafers that are not much thinner than about 0.4mm, and with the kerf also about 0.4mm.

Crystal Systems says that as many as 40 wafers per centimetre could eventually be obtained by further refinement of the technique.

New advances in solar cells

Improvement of two types of solar cells, used to convert the Sun's energy into electricity, was reported recently by Bell Telephone Laboratories.

One of the new experimental cells (indium phosphide/indium-tin oxide) now has an efficiency of 14.4 per cent in converting sunlight to electricity. This is comparable to the efficiency of silicon solar cells currently used in such specialised applications as satellites and space vehicles. The second device, a semiconductor/liquid-junction cell, has a minimum efficiency of 12 per cent.

Since their invention 24 years ago at Bell Laboratories, silicon solar cells have reached an efficiency of 13.5 per cent for production models, with specialised cells reaching as high as 18 per cent. Multilayer gallium arsenide cells recently have shown efficiencies as high as 23 per cent.

Versatile IC for tape recorders

An integrated circuit that could significantly change the way both portable cassette and reel to reel tape recorders are designed has been developed by National Semiconductor.

Designated the LM1818, the device is a linear bipolar integrated circuit containing all the active electronics necessary for building a tape audio system.

One of the main features of the LM1818 is on-chip electronic switching between the record and playback modes of operation. This enables the standard multi-pole record/play switch now used in tape recorders to be replaced by a single pole double throw switch.

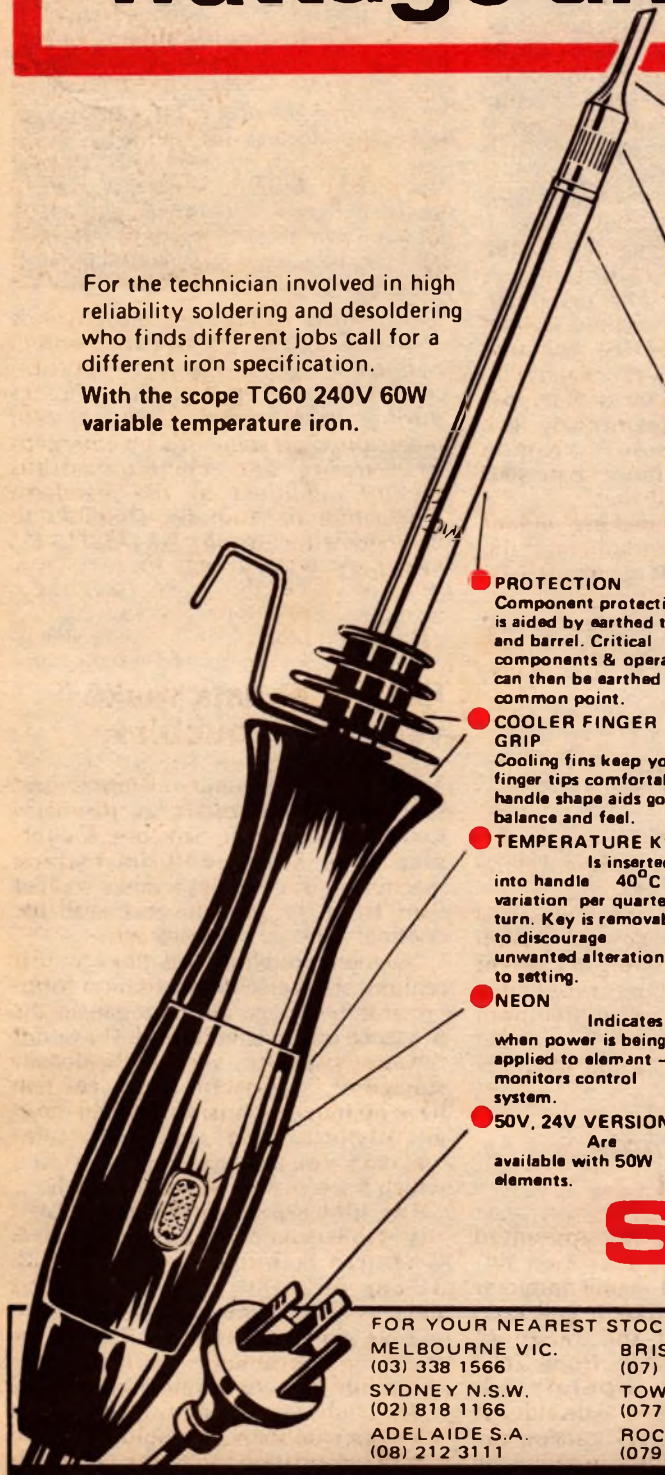
"This feature alone will allow significant reductions in the size of handheld portable tape recorders", according to NS Applications Engineer Chris Mason.

The chip itself contains microphone, playback, record and monitor preamplifiers; automatic level control (ALC) circuitry; and meter drive circuitry. Also included is circuitry to suppress clicks and pops when switching between record and playback modes.

Performance of the LM1818 is said to be better than that now generally available in portable tape recorders and medium quality cassette recorders, and to compare well with many reel type machines. Playback signal to noise ratio is typically 60dB (referenced to 1mV at 1kHz, and measured over a 20kHz bandwidth in an NAB responding circuit). Record signal to noise ratio in a flatband circuit, also referred to 1mV, is a very impressive 69dB.

A professional iron with adjustable temperature – wattage and tip size...

For the technician involved in high reliability soldering and desoldering who finds different jobs call for a different iron specification.
With the scope TC60 240V 60W variable temperature iron.



You specify exact temperature required without changing tip.
Dial any intermediate temperature 200°–400°C and make adjustment while soldering. This will be controlled with unusual accuracy ± 2% of set temp. You no longer need to invest in a range of tips just to vary temperature.

You specify exact tip profile required without affecting temperature.
Screw on any one of 14 tip shape and weight combinations from 0.8 mm to 6.4 mm all iron plated for long life. No need to buy up to 3 irons to span this tip range.

You specify that the desired wattage range lies between 10W–60W.
Then let actual wattage required for the job be determined by the iron's simple mechanical sensing and control system. Consisting of expansion rod and micro switch in the handle.

PROTECTION
Component protection is aided by earthed tip and barrel. Critical components & operator can then be earthed to common point.

COOLER FINGER GRIP
Cooling fins keep your finger tips comfortable handle shape aids good balance and feel.

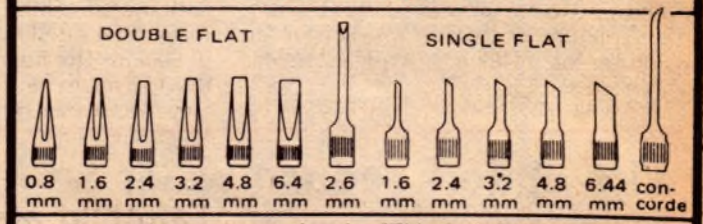
TEMPERATURE KEY
Is inserted into handle 40°C variation per quarter turn. Key is removable to discourage unwanted alteration to setting.

NEON
Indicates when power is being applied to element – monitors control system.

50V, 24V VERSIONS
Are available with 50W elements.

SOLDERING–DESOLDERING STATION

Long life tips for Scope TC60 iron.



Iron plated screw-on pre tinned. *This tip is fitted as standard.

SCOPE TC 60

The iron you completely adjust to your job.

FOR YOUR NEAREST STOCKIST RING:

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NEWS HIGHLIGHTS

Big sales predicted for graphics terminals

The increasing use of colour computer terminals in a widening variety of applications was highlighted recently by a visiting US executive.

In a speech and slide presentation Mr Joe Morris, vice-president, marketing, of Ramtek showed how Ramtek colour terminals were now being used in medicine, defence, weather forecasting, computer-aided design, process control, space research, financial analysis, and many other applications. California-based Ramtek Corporation is a leading computer terminal innovator in the US, and has pioneered the development of colour graphics terminals based on raster-scan technology.

The Ramtek 6200A "Colorgraphics" terminal features full colour graphics and alphanumeric capabilities, teletype compatibility, a 32cm colour monitor, and eight selectable colours.

Joe Morris predicted that sales of raster scan colour terminals would eclipse sales of terminals using other technologies (storage tube, plasma tube, stroke writer) by 1982. By 1985, it is projected that raster scan terminals will command nearly half of the estimated billion dollar plus market for computer graphics terminals.

One application highlighted by Joe Morris was the use of colour terminals in the medical field and, in particular, in radiology. Mr Morris said a trained radiologist could detect 64 different shades of grey on an X-ray plate.

However, by using one of Ramtek's new 9000 Series terminals, the radiologist could select from a "palette" comprising more than 4000 different colours and shades.

Other applications include colour analysis of space photographs, and the analysis of thermography (heat) patterns to detect breast cancer.

Ramtek Corporation is represented in Australia by Australian Video Engineering, 4 Euston St, Rydalmere, NSW 2116.

High resolution satellite photographs

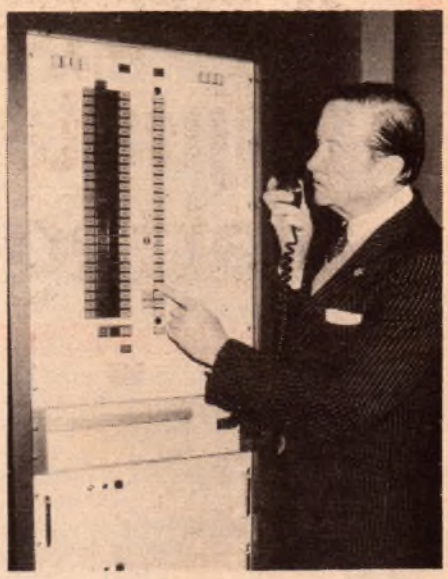
High resolution satellite pictures of weather conditions prepared at Dundee University, Scotland, have proven so commercially successful that they are to be improved still further. This picture of Britain, taken from an altitude of 1448km is typical. It was produced with aid of a high-performance tape recorder designed at the University

The service is shortly to be upgraded with the launching of a new generation of weather satellites orbiting at a height of 900km. The new pictures received at the University will cover an area from Newfoundland to Central Russia and from the North Pole to the bulge of Africa.

Fairchild appoints Total as agent

Fairchild Australia has appointed Total Electronics as a franchised distributor of Fairchild semiconductor products. The appointment will considerably strengthen the range of semiconductors available from Total Electronics, which operates in Melbourne, Sydney and Adelaide. A copy of Total's 1979 stock catalog can be obtained by sending a request, on company letterhead, to Total Electronics, 239 Bay St, North Brighton 3186.

Building evacuation control system



Developed by Planned Music Sydney Pty Ltd, this building evacuation system is designed to allow the orderly evacuation of people from high rise buildings during an emergency. The system meets the draft standards on emergency warning and communications systems published by the Standards Association of Australia. Enquiries to Planned Music Sydney Pty Ltd, 113-115 Broadway, Sydney 2007.

IBM scientists make very small bubbles

Using only present materials and technology, scientists at the IBM Research Division in San Jose, California, have succeeded in making magnetic bubbles eight times smaller than those in garnets now available commercially for data storage.

Magnetic bubbles are tiny circular regions of reverse magnetisation formed in thin-film garnet materials in the presence of a magnetic field. They offer the potential for very high density storage of information in devices that have no moving parts. This would mean an advantage in reliability over magnetic disc and tape storage devices, which have many mechanical parts.

The IBM experiments demonstrated that stable magnetic bubbles as small as 0.4um can be formed, compared with 3-5um bubbles used in present devices.This eight-fold decrease in bubble size provides for a dramatic increase in the amount of information that could be packed into a given area.

Thus, whereas a 25mm square garnet with 3um bubbles can hold 3 million bits of information today, the same area device using 0.4um bubbles could hold 100 million bits of information.

NEWS HIGHLIGHTS

Business Briefs:

● Due to growth and expansion in its activities, Electrical Equipment Ltd has moved to new locations. The company's head office is now on the 17th Floor, 456 Kent St, Sydney (telephone 290 2155), while accounts, service and stores are at 192 Princes Highway, Arncliffe (telephone 59 0291).

● Tasman Electronics has announced the opening of a new electronics store in Melbourne at 12 Victoria St, Coburg. The store will cater for Melbourne's far northern suburbs and will carry a wide range of components, hardware and kits.

● Tektronix has won an order from Queensland's State Store's Board for 114 D66A Oscilloscopes (manufactured by its Telequipment subsidiary) for use in the Technical and Further Education program. According to Tektronix, the order was won against intense competition in the low-cost market.

● J.A.S. Instruments Pty Ltd has recently established a sales and service division in Sydney at 15 Grove St, Eastwood 2122. The company is chiefly a supplier of instrumentation for automatic analysis in biomedical and clinical laboratories, and also represents many leading scientific equipment manufacturers. One interesting product line is the range of Delmhorst Instruments (USA) for the measurement of moisture in soil, timber, grain, cotton, paper and plaster.

New products, new staff for TBC

Claude Grech

In moves clearly aimed at expansion, TBC Pty Ltd (a local television, broadcasting and communications company) has introduced a new range of products in the broadcasting field, and added two important new people to its staff.

The new personnel are Claude Grech and Russell Ewart, both of whom have extensive experience in the electronics industry. Claude Grech takes up position as Marketing Manager at TBC's new Melbourne sales headquarters, while Russel Ewart will spearhead company activity at the Brisbane office.

TBC will shortly release an Australian-designed and manufactured range of FM broadcast transmitters. Enquiries on these should be directed to TBC Pty Ltd, PO Box 193, Blackburn, Victoria 3130, or to their offices in Sydney, Perth and Brisbane.

Offset order to Plessey

An offset order worth $150,000 has been awarded to the Electronic Systems Division of Plessey for the manufacture of aircraft navigation equipment for the RAAF's 12 new C-130H Hercules aircraft. The order was placed by the Aeroproducts Division of Litton Industries in California.

Under the terms of the order, Plessey will manufacture alignment display units which form part of the inertial navigation system.

AWA nav aid sale to Singapore

Amalgamated Wireless (Australasia) Limited has successfully completed another overseas contract for its internationally proven Doppler VOR (very high frequency omnirange) aircraft navigational beacon.

AWA, the largest Australian-owned electronics organisation, won the $250,000 contract last November to install the Doppler VOR beacon as an aid to air traffic using the Singapore International Airport at Paya Lebar. The contract was awarded by the Singapore Government to AWA against strong international competition from other major manufacturers of navigational aids around the world; including German, British, Canadian and Japanese companies.

Most of the equipment for the Singapore project was designed and manufactured at AWA's Engineering Products Division at North Ryde. Site works, including ground preparation, excavation and the laying of antenna foundations, commenced almost immediately the contract was won in November, 1977 with AWA supervising the work of a local contractor.

Doppler VOR beacons designed and manufactured by AWA are now in operation in Singapore, Britain, Portugal, Malaysia and Nepal (as well as in Australia), and are also being installed in Afghanistan and the Philippines.

Competition Winners . . .

Parameters/EA Grand Instrument Contest:

The winner of the Parameters/Electronics Australia Grand Instrument Contest No. 4 is Mr J. Burt, Tascott, NSW 2251. His prize is the Trio PF-810 Function Power Meter, reviewed in our August issue. And the correct SWR? . . . 1:1.95.

Dick Smith/Yaesu contest:

The winner of the Dick Smith/Yaesu "Win a Trip For Two to Tokyo" contest is Mr Ray Jessup. Ray, VK2NVJ, bought a Yaesu FT-7 transceiver from Dick's Gore Hill store in June, and uses it regularly to contact his son in New Zealand. He is currently studying for his full amateur licence.

Here is Ray's winning entry, as judged by EA Editor Jim Rowe:

"Promote amateur radio as an antidote to current frustrations confronting youth . . . Parents: Your life is easier if your kids have a good hobby. Amateur radio is a rewarding and challenging hobby, leading to: Practical application of maths, english and logic . . . Self discipline . . . Responsible citizenship . . . New and worthy friendships . . . Job opportunities . . ."

Dick Smith and Ray Jessup holding the winning entry.

Congratulations to Ray from Dick Smith Electronics and Yaesu!

THE HEATHKIT H11 DIGITAL COMPUTER

Two of the finest names in modern electronics, Heath and Digital Equipment Corporation (DEC) combine to bring you the world's first 16-bit computer priced within reach of the general public!

HEATH
Schlumberger

Heath and DEC join forces to bring you mini-computer performance at a microcomputer price! The H11 features a fully wired and tested DEC KD11F board that contains the 16-bit LSI-11 CPU, 4096 x 16 read/write MOS semi-conductor memory, DMA operation; and includes the powerful PDP-11/40 instruction set, PLUS Heath/DEC PDP-11 software.

The new Heath/DEC H11 personal computer is one of the most powerful and sophisticated units available today! It combines the advanced, performance-proven hardware and software of the LSI-11 with Heath's expertise in kit design and documentation to bring you a personal computer of almost incredible power and flexibility. Equivalent commercial versions of the H11 would cost twice as much, and you still wouldn't get the superior documentation and support of the H11!

POWERFUL HEATH/DEC PDP-11 SOFTWARE AT NO EXTRA COST!

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LINK-11S. Link editor which links the modules created by the PAL-11S into a load module ready for execution on the H-11. The module is loaded into the H-11 via the Absolute Loader.

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The new generation communications satellites are quietly revolutionising US business and government communications. But that's not all. By acquiring his own low-cost miniature earth station, it would be possible for the consumer to choose from a smorgasbord of TV signals direct from a satellite!

Satellite-to-you TV

is only one of the new comsat wonders

by SUSAN RENNER-SMITH

With a roar, the Conemaugh River flattened a 9-metre flood wall, then raged through the streets of Johnstown, Pa. (USA), July 1977. For the third time in a century numbed survivors began shovelling away the muck. But one thing was different this time. Though the phone service was chaotic as expected, rescue workers had a link to the outside world — via satellite.

A 1.2-metre dish antenna let Red Cross workers beam messages 36,000 km up to an invisible ear in the sky — the experimental Communications Technology Satellite. CTS, jointly funded by NASA and Canada, is today's most powerful comsat (communications satellite); it has a huge solar array that generates 1000 watts. The satellite picked up the faint signals from Johnstown's small dish, amplified them, and bounced them down to an earth station outside the disaster area, where they were patched into regular phone lines.

ATS-6 — 1974, NASA

Not only did the Red Cross request supplies (including 5000 shovels) via CTS, but Johnstown residents also used the satellite link to telephone relatives outside.

Only a few years ago, it would have taken weeks to install the huge antennas, transmitters, and other equipment needed for such a satellite hookup. But with the new generation of powerful comsats satellite communications are more flexible. Besides emergency applications, the startling possibilities include direct home reception of satellite TV transmissions. And today's technology also makes it possible to use the earlier generation of comsats in new ways.

The technology is developing so rapidly that, had the Conemaugh River rampaged just a few months later, rescuers could have talked via comsat without a 1.2-metre antenna.

"We now have the capability to provide two-way voice communication between terminals that fit in an ordinary briefcase," Sam Hubbard, NASA's Deputy Director of Communications, told me in his matter-of-fact way. But there was a hint of pride, even awe, in his quiet voice as he sifted through a stack of documents. Producing a photo of the new device he explained: "Two-way means we can put one of these briefcase terminals anywhere within sight of a satellite and it can talk to any other terminal that's also in sight of the satellite."

Since all of the continental US is "in sight" of ATS-6, this means rescue workers could communicate over distances far greater than those reached by conventional two-way radio. And, since satellite messages are beamed directly to and from the sky, they are not subject to interference from obstacles such as hills or buildings.

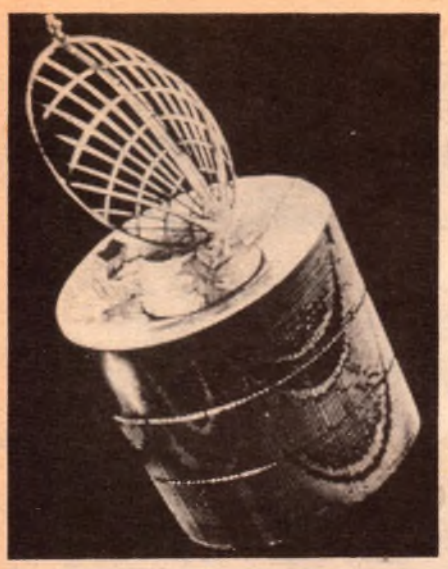
"We hope to conduct a number of public-safety type experiments," Jerry Freibaum, manager of NASA's Technical Consultation Services, told

Advances in satellite technology

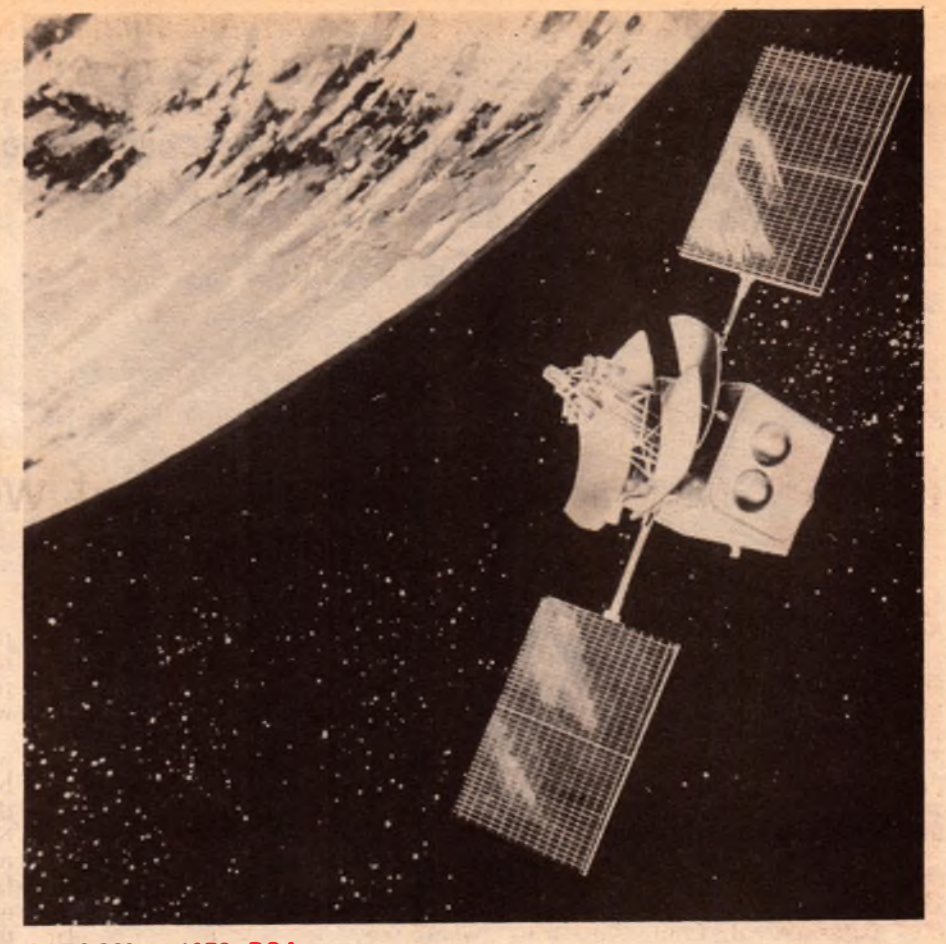
Remember Early Bird? It relayed 240 phone calls or one TV broadcast — a great achievement in 1965. Since then, communications satellites (comsats) have grown both in number and capacity. Today, there are about 30 comsats in orbit, and more are planned.

The US comsats shown illustrate the technological advances of the past few years. **Westar** (like most comsats) hovers in a geostationary orbit, 36,000 kilometres above the equator. There, the satellite's orbital velocity matches the Earth's rate of rotation, so it seems to hang stationary in the sky. Like Early Bird, Westar is a "spinner". Hydrazine-fuelled thrusters keep it rotating about its axis to stabilise it in orbit, so its "despun" antenna stays fixed on target. Solar cells on the drum-like body provide 262 watts for the Hughes-built bird. Westar can handle 7200 phone calls or 13 TV broadcasts. This traffic is relayed by 12 transponders that amplify the 6 gigahertz "uplink" carrier frequency from Earth and retransmit it as a 4GHz "downlink." Most signals are handled conventionally, with each message on the carrier assigned to a separate frequency. But use of new, ground-based digital transmission equipment will expand Westar's capacity. With signals converted to a digital form, pulses from each message can be sent in short bursts, leaving room to sandwich in pulses from other messages. Thus more than one signal can be sent simultaneously on a single frequency.

The first body-stabilized comsat, the experimental **ATS-6** built by Fairchild is kept oriented by a set of internal momentum wheels (flywheels). Based on information from onboard sensors, a computer directs the wheels to spin as necessary to adjust the spacecraft's attitude. Unlike spinners, which expose only about 40 percent of their solar



WESTAR — 1974, WESTERN UNION



SATCOM — 1976, RCA

me. "Emergency-services people could use the briefcase during natural disasters — tornadoes, floods — when all electricity fails. Set-up time for this unit is less than one minute so they could get messages out very quickly."

In the future, rescue workers won't even have to lug briefcases around. Back in November, I saw an impressively small, walkie-talkie-sized earth terminal capable of two-way voice communications via satellite. And now they've got a pocket-size, receive-only unit.

Even more dramatic than these miniature terminals are the small TV antenna and converter shown. With them, an ordinary home receiver can pick up TV signals broadcast via CTS.

This is new? Hasn't the US had TV programs via satellite since 1964, when the Olympics were broadcast direct from Japan? It is a breakthrough when you consider how we currently get "live via satellite" broadcasts on our home screens. From the point of origin, TV signals are carried by land links (cables or microwave towers) to an earth station some distance away. There, a powerful, 30-metre antenna beams the signals up to a satellite, which relays them down to the other huge antennas trained on it. From these earth stations, the signals again travel through land links to participating TV stations for re-broadcasting.

By contrast, the strong signals from CTS, transmitted at super-high frequencies, can home in directly on the mini-antenna.

"The FCC tested this terminal to see how it worked under conditions of a very high interference," Sam Hubbard told me. "They took it all over Washington; they set it up near the runway at National Airport; they even set it up under a railroad platform. In all cases, they were amazed at how little signal was lost."

With such a system, our TV diet could be much richer. We might choose from a smorgasbord of TV programs broadcast directly to us — via satellite — from all parts of the country. But commercial considerations and federal regulations make direct satellite TV unlikely in the near future — at least for US viewers. (Canada and Japan are planning experiments with the system.) The new comsat technology, however, is affecting our lives today, in less dramatic ways.

In fact, if you should have a heart attack in southern Mississippi, you'll find comsat technology quite dramatic. There, all cardiac cases and serious ac-

---

cells to the Sun at a time, **ATS-6** has a fixed solar array. Two curved panels on extended booms face east and west, so that at least one is always in sunlight. The 500-watt array, coupled with a huge (10m diameter) dish antenna, allows the comsat to transmit directly to smaller earth stations.

Satcom, today's only commercial, body-stabilized comsat, has a clock-controlled drive that keeps its two solar paddles facing the sun. The 7m² solar array generates 740 watts. Messages sent via this RCA-built comsat are polarized both vertically and horizontally (the wavefronts travel at right angles to each other). Satcom's curved antenna reflectors have overlapping grids to relay these polarized signals. With this system, two signals can be sent simultaneously on the same frequency, so that Satcom's 12 transponders handle 24 channels — double Westar's capacity.

The advanced **TDRS** (Tracking and Data Relay Satellite) will be one of the first comsats to be launched by Space Shuttle. It'll also be the largest of the modern comsats — 17.4m from tip to tip of its solar panels. These will generate 1700 watts for the TRW-built, body-stabilized satellite. Another first: TDRS can operate in three frequency bands reserved for commercial use and satellite tracking: the C-, K- and S-bands. Today's comsats share the C-band (6/4 GHz) with earth-based microwave communications, so most ground stations are located in interference-free areas. By contrast, the high-frequency K-band (14/12 GHz) is less congested, so earth stations can be placed closer to users. This super-high-frequency band also has more message-carrying capacity. The third, lower frequency, S-band (2.3/2.2 GHz) will be used by NASA for tracking and relaying data from the Shuttle to Earth (see text). To handle transmissions on these multiple frequencies, TDRS has a complex assortment of six antennas. A 30-element phased array at its hub can track 32 spacecraft simultaneously.

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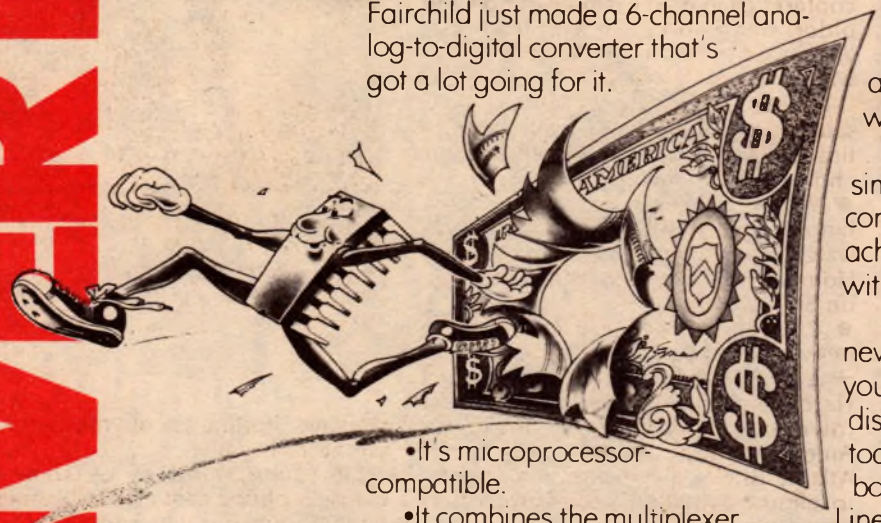

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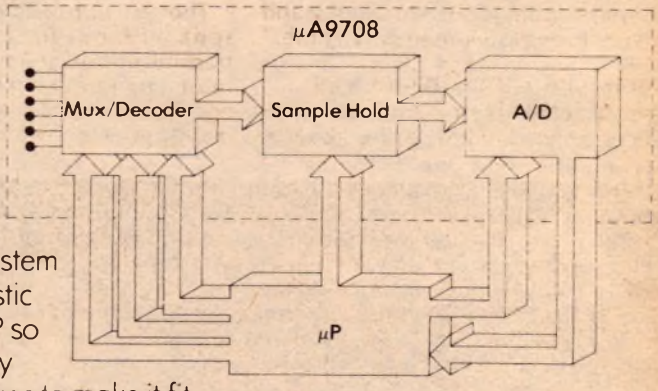

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cident victims from a seven-county area are rushed to one hospital — Forrest General in Hattiesburg. Because of the distances involved, the mortality rate is quite high. Now, one of the ambulances is testing a small, roof-mounted antenna that works with ATS-3, an older NASA satellite.

Sam Hubbard spoke with deep satisfaction as he described this lifesaving program. "While the ambulance speeds along, the attendants can transmit medical telemetry to the emergency room," he said. "And, through a two-way voice link, they can talk to the hospital staff."

If you check into a Veterans Administration hospital, you may also benefit from satellite technology. Via a satellite TV hookup, the staffs of 170 VA hospitals will receive regular briefings from medical specialists. And instead of just watching a televised lecture, these doctors and nurses could become active participants. A two-way video hookup would let them question the "visiting expert" and even present patients for examination. Other government agencies have already used CTS for video-conferences — NASA does it regularly.

"When we want to meet with NASA personnel in Maryland, Ohio, or California, instead of travelling, we can just walk down the hall to our teleconferencing room," said Jerry Friebaum. "From there, we can see and talk with three NASA centres at a time."

Commercial comsat advances

Use of comsats for business conferences is not limited to the government. Last October, for example, 2000 employees of Lanier Business Products attended their national sales meeting in Atlanta — without travelling there. A three-hour demonstration of the new product line was beamed, via Westar, to 12 Lanier offices across the nation. Though this was not a two-way video conference, it is an example of how the older generation of comsats, like Westar, are being used in exciting new ways.

In fact, though direct home TV via satellite may be commercially impractical, today's comsats are expanding our choices of TV viewing.

- Weary travellers can settle down before their hotel-room TV set and watch, via Satcom, a first-run movie on Home Box Office, or a nightclub revue on Showtime.
- Cable-TV subscribers can bypass the networks and tune in a "superstation" — a local station that's gone national via comsat. The first, Atlanta's WTCG (owned by Ted Turner, the zany America's Cup skipper) now sends Atlanta Braves games live, via Satcom, to almost a million cable subscribers across the US.
- Public TV sations in the US will have more to offer by 1979. That's when PBS will start transmitting four channels worth of programs via Westar — as compared to the one channel its present land-based network can handle.

Though more and more TV shows are sent via outer space, television transmission is actually a small part of most comsats' workload. Commercial communications satellites function mainly as giant switchboards in the sky, relaying hundreds of thousands of phone calls daily.

Sending to the sky, the giant (30-metre diameter) antenna at Cayey, Puerto Rico, relays messages overseas via Intelsat. Most earth stations are this size.

Of course, most of us know that overseas phone calls can be beamed by satellite. But did you know that when you call long distance to "share a smile" your smile may make a 72,000 km round trip up to the sky and back? Since 1976, AT&T has routed part of its long-lines traffic through two Comstars leased from Comsat General. These Hughes-built birds are an advanced type of spinner — each can handle 18,000 phone calls simultaneously.

Communications of the future

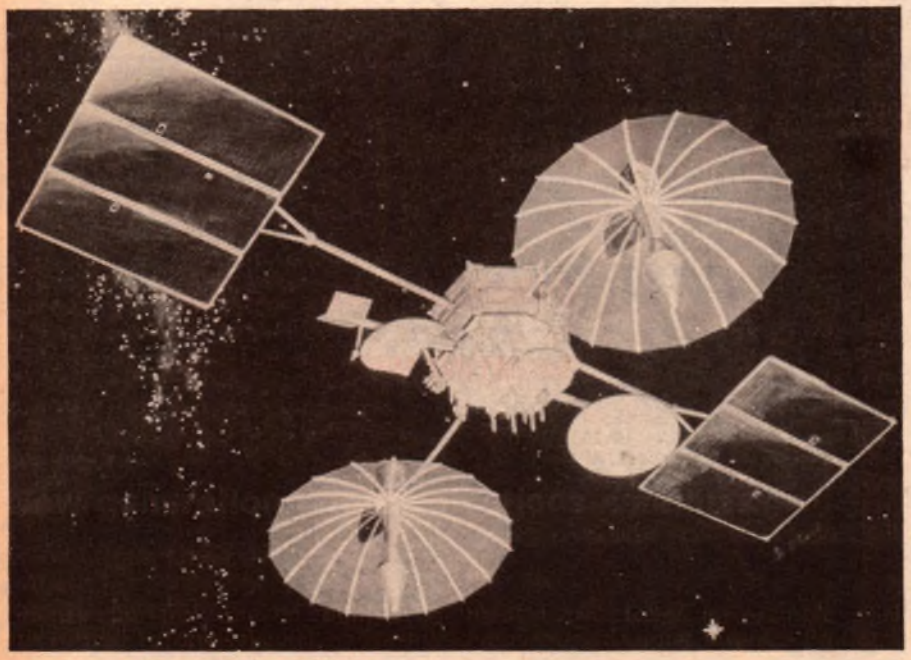
Comsats can also relay data from computers, teletypes, and facsimile copiers. Though data communications may seem more specialised than other comsat uses, this fast-growing field may soon subtly affect both our business and private lives.

Already, if you live in Florida, you can pick up today's copy of the Wall Street Journal — hot off the satellite. The paper is transmitted, page by page, from the Journal's own earth station at a Massachusetts typesetting plant, via Westar, to a printing plant in Orlando.

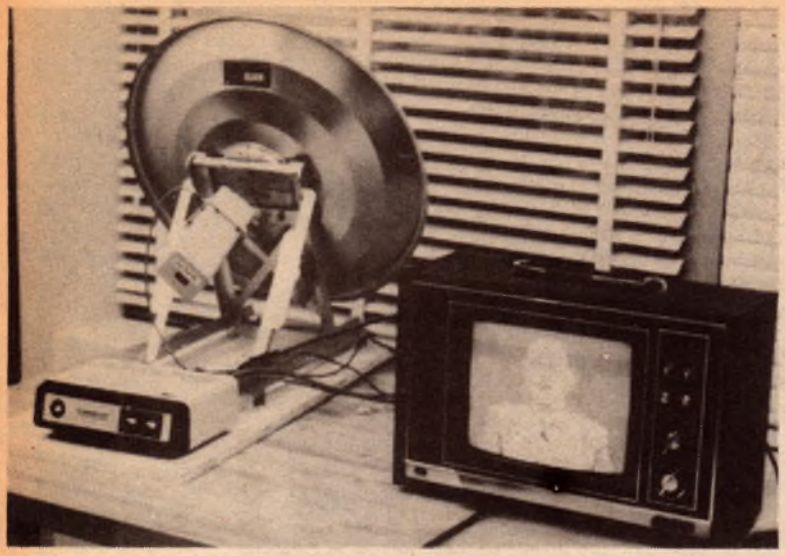
The news services, AP and UPI, are also planning satellite distribution. One reason: It's cheaper, if the distances are great enough. A hop up and back costs the same whether the data is being sent 100 or 5000 km. And the combination of improved techniques and advanced comsats will make data transmission more efficient.

Computers already talk to each other over satellite-linked phone lines, but soon they'll be talking directly via 4.5-metre antennas that can sit on an office rooftop or in a factory parking lot.

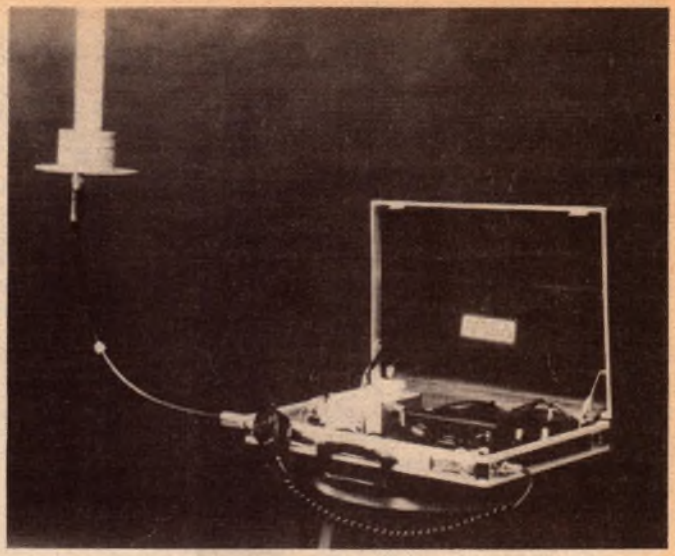
Later this year, such antennas will link computers at three Boeing Computer



TDRS — 1980, WESTERN UNION



Peering through the blinds, this tiny (60cm diameter) antenna picks up super-high-frequency TV signals transmitted via the powerful CTS experimental comsat. The frequency-converter box at front feeds the signals to an ordinary TV set.



Shrunk to the size of an attache case, this miniature earth station can both send and receive voice messages via satellite. The briefcase holds a converted two-way radio and battery pack. The antenna? . . . a sawn-off can and a wire-wrapped tube.

Services facilities and at two Sperry Univac research centres. American Satellite Co (a subsidiary of Fairchild Industries that rents transponders on Westar) will set up these comsat/computer links. "We're doing today what others are saying they'll do in the 1980s," commented Fairchild's Maston Jacks. "We've made major breakthroughs in digital transmission."

Digital transmission is both faster and more efficient. "It takes seven hours to transmit a reel of computer tape at the current generally available rate of 9600 bits per second," said P. N. Whittaker, president of Satellite Business Systems (SBS). "At digital transmission speeds of up to 1.5 megabits per second, it will take only three minutes."

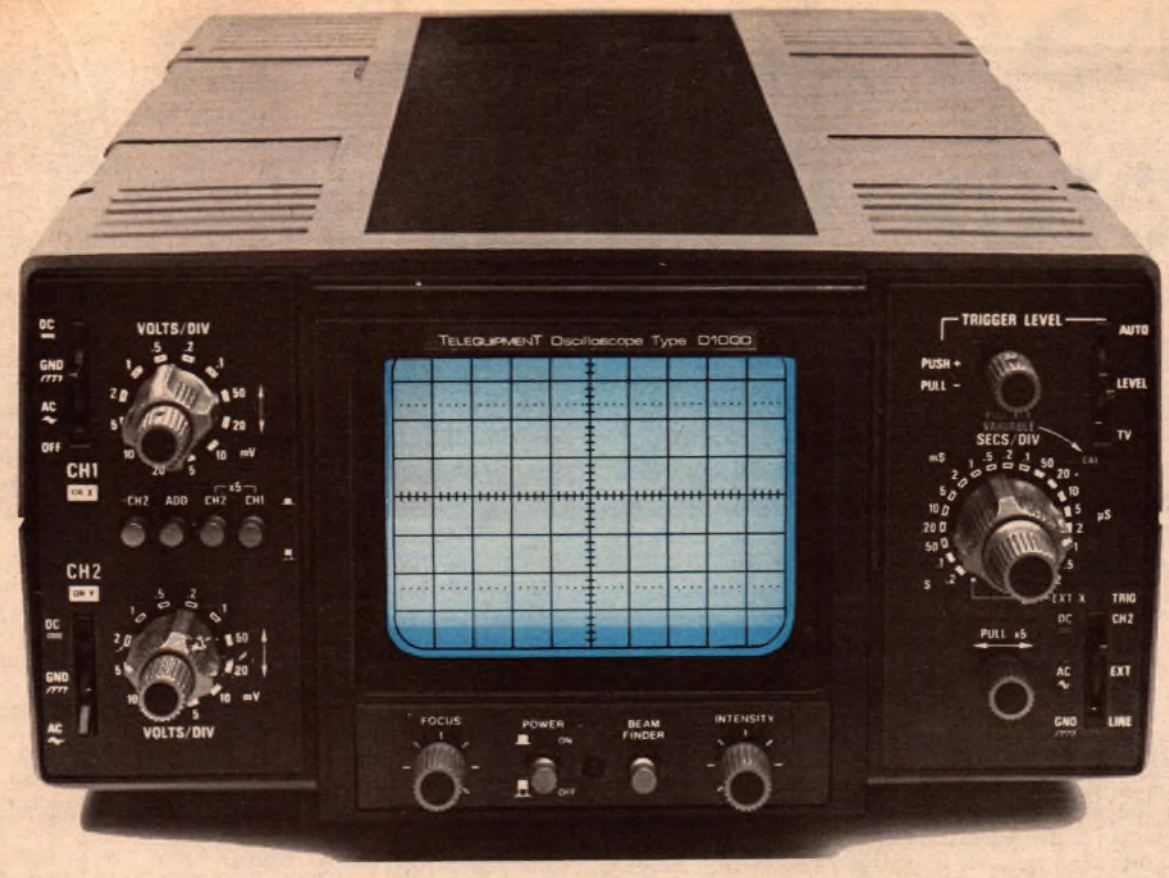
In 1980, SBS plans to launch a powerful, all-digital satellite that will operate on the higher, uncongested K-band frequency. Transmitting via a network of roof-top antennas, the SBS satellite will make possible a complex "total communications package" for businesses — including high-speed data transmission and two-way video-conferencing. SBS is now using the powerful CTS satellite in a series of tests of these projected services.

In 1980, AT&T and GTE may also offer satellite business communications services via Comstar. And, by 1980, Western Union will have TDRS.

Perhaps the most amazing satellite yet, TDRS will be the first double-duty comsat. Western Union will use it to replace the aging Westars and to set up an advanced communications network. And NASA will use it to track and relay data from low-orbiting satellites and the Shuttle. TDRS will "see" these spacecraft during 80 to 100 per cent of their orbits — as compared to present earth stations which can track each satellite for only 15 per cent of its orbit.

As comsats quietly revolutionise business and government communications, some of the advances might filter down to the average consumer. We may have little dish antennas on our TV sets sooner than we think.

Reprinted from "Popular Science", by arrangement.



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The return of Percy Grainger

Last June, the "ghost" of piano master Percy Grainger visited the Sydney Opera House for a live performance of Grieg's A-Minor Piano Concerto, with the Sydney Symphony Orchestra. It was all made possible by a new Australian-designed and built Vorsetzer, playing reproducing-piano rolls made in 1919. Here's the story on how this unique instrument works, written by one of the men who built it.

by PETER PHILLIPS

"Apprehension" was possibly the operative word to describe the feelings of patrons attending the 630 Series of concerts given at the Sydney Opera House in June, 1978. Advertisements stated that Percy Grainger was to be the featured soloist with the Sydney Symphony Orchestra, the two together performing the Grieg A Minor Piano Concerto. Grainger, of course, was long since deceased, having died in 1961 at the age of 79.

The understandable apprehension was soon turned to enthusiasm, as the audience heard the concerto unfold. The piano playing was unmistakably that of Percy Grainger's; all his tonal nuances, variations and additions led conductor John Hopkins and the Sydney Symphony Orchestra a merry chase. The two concerts were a triumph for John Hopkins, whose expertise held the deceased soloist and the very much alive orchestra together, and also for Australian reproducing piano enthusiasts Denis Condon and the author.

The reproducing piano, part of a bygone era, is now slowly re-emerging. An American company, SuperScope, recently unveiled an all electronic version of the reproducing piano, and this is available as both an inbuilt and Vorsetzer style mechanism.

The Vorsetzer style reproducer used to bring Percy Grainger back to the concert platform is an all Australian venture however, there being no connection with the SuperScope reproducers.

Denis Condon (left) and Peter Phillips at work on the Vorsetzer prior to its Opera House performance last June. Photo clearly shows the aluminium fingers.

The reproducing piano reached the height of its popularity around the 1920's. The Aeolian Company, US manufacturers of the Duo-Art reproducing piano, were the last of the three major companies to enter the small but lucrative market. The reproducing piano took the well known player piano idea to its utmost. Unlike the player piano, the complete expression with which the piece had originally been played was encoded onto the piano roll. The pneumatic internals of the playback mechanism were then given the immense task of making the reproduction sound as close as possible to the original performance.

Although very expensive, the reproducing piano was popular and this success caused most of the piano virtuosi of the day to make reproducing piano rolls. Thus, there exist today accurate recordings of such pianists as Rachmaninov, Paderewski, Busoni, Saint-Saens, Hofmann, Grainger etc.

Denis Condon is well known amongst enthusiasts of the reproducing piano for his collection of rolls, and of reproducing pianos. His collection of over 6,500 rolls is regarded as one of the most important in the world. It was Denis Condon's idea to build a Vorsetzer style Duo-Art reproducer based on modern components, as he felt that the original Duo-Art pianos were only partially successful in their reproduction of the Duo-Art rolls.

Further, Denis felt that the reproduction could be further enhanced if the Vorsetzer (German for "sitter before") was used on a modern concert grand piano. Most of the original reproducing pianos had the mechanism built into the piano, the Vorsetzer style only being marketed on a very limited scale by one company (the German company Welte, the inventors of the reproducing piano). It should be realised that rolls made by one company could not be played on a reproducer made by another.

The author, a lecturer in electronics at Wollongong Technical College, became interested in the project as a result of a visit to Denis Condon's house in 1976. At that time, Denis envisaged an all-pneumatic mechanism, with electric roll drive and electrically operated foot pedal solenoids being the only non-pneumatic sections. This idea was soon to change, the final design only incorporating pneumatics to play the notes. The remainder is all electronic.

At the time of the author's visit, Denis Condon had already restored the note-playing pneumatics. It was left to the author to design and construct most of the electronic and mechanical arrangements.

The basic principle of a reproducing piano is to simply control the amount of vacuum being used to collapse the note playing pneumatics (bellows). The greater the amount of vacuum, the more rapid the closing action of the pneumatic and hence the louder the note.

It can be appreciated that the vacuum regulator employed must be capable of changing the vacuum instantly, in accordance with instructions on the roll. Sudden or slow crescendos, note accenting, diminuendos, etc all have to be capable of being reproduced. The Vorsetzer has two vacuum regulators, one for the bass notes up to Eb above middle C, and another for the treble notes.

Fig. 1 shows the arrangement employed to play the piano keys. In all, it consists of some 83 cast aluminium fingers (designed by mechanical engineer Harold Ball), each connected to its respective pneumatic.

Fig. 2 shows, in block diagram form, how the expression control is achieved.

The concept of using a partly pneumatic, partly electronic system is perhaps unique. Other attempts to build improved versions of the reproducing piano have concentrated on either one system or the other. It was felt, however, that pneumatic operation of the keyboard fingers was essential, as the advantages inherent in pneumatic actuators far outweigh those of solenoid actuators. The main disadvantages have to do with the need for a vacuum pump and highly efficient vacuum regulators.

The expression on each side of the roll is encoded as two 4-bit binary numbers (holes 4, 5, 6 and 7 on each side of the roll). Two further holes (holes 3) form a 2-bit binary number. The latter determines which side of the keyboard is affected by which 4-bit binary number, and also forms part of the expression. There are up to 36 possible volume levels and four combinations of control.

For example, if the 2-bit binary number is 00, the 4-bit binary number on the bass side of the roll is made to control both vacuum regulators. If the 2-bit binary number is 01, the control is such that the 4-bit binary number on the bass side of the roll controls the bass side of the keyboard, and the treble side of the keyboard is controlled by the 4-bit binary number on the treble side of the roll. This value, when decoded, is incremented by 1.

Further, if the 2-bit binary number is 01, and the treble side expression is 0000 (something that only occurs occasionally), the control is altered so that both vacuum regulators respond to the bass side expression, with the treble regulator again incrementing by 1. Another sophistication is that if either 4-bit binary number equals decimal 3 or less, and the loud pedal is operated, the volume level is reduced by 1.

In order to cause uncovered control holes on the tracker bar to produce electrical signals, use had to be made of a pneumatic to electronic converter. The method devised uses small vacuum-actuated valves that move

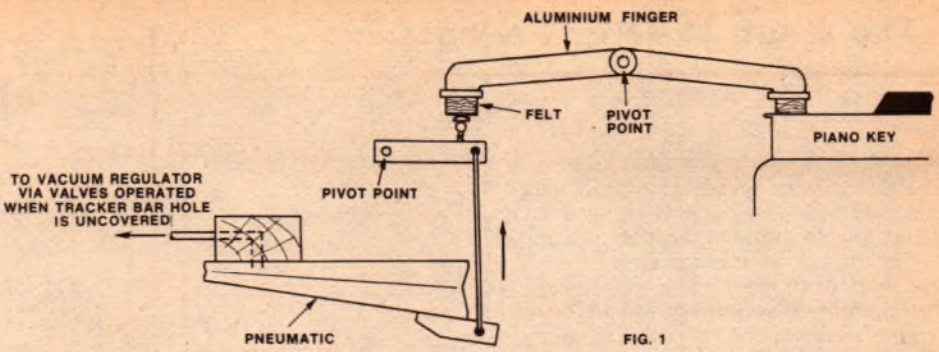


FIG. 1

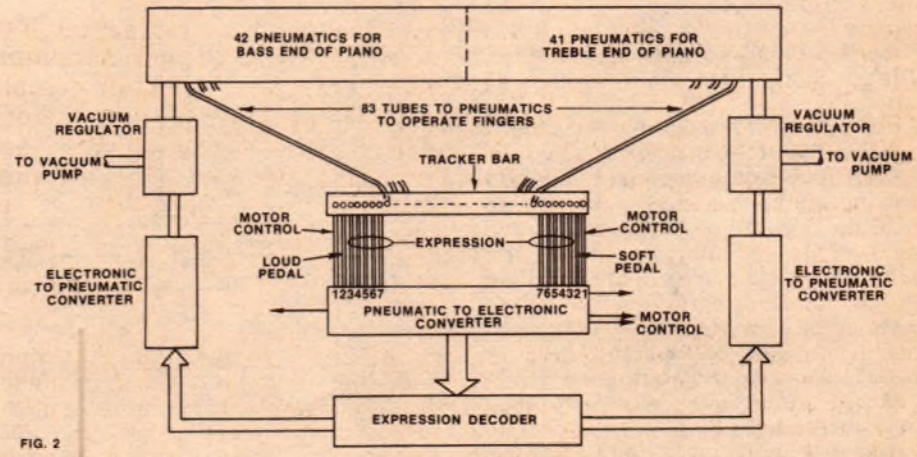
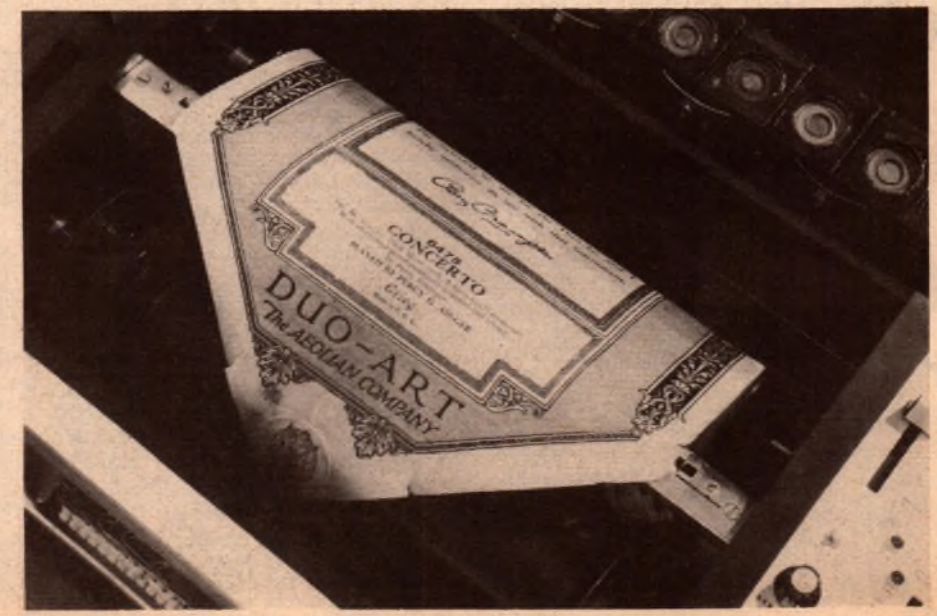


FIG. 2

Below: piano roll in position across tracker bar, ready for start. This is the roll used at the Opera House.



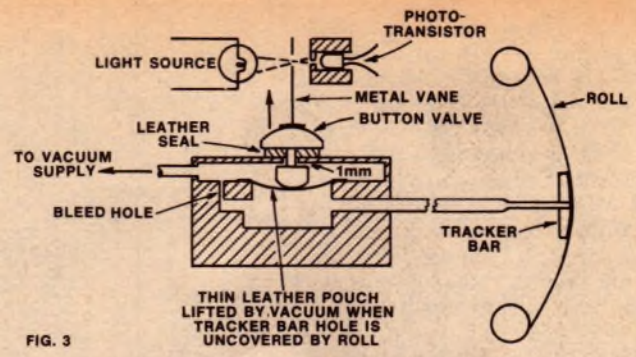


FIG. 3

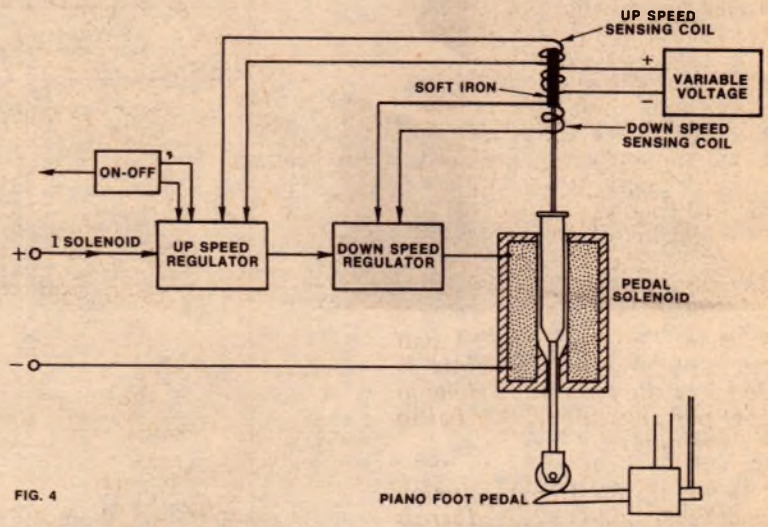


FIG. 4

Basic arrangement of foot pedal mechanism. Small sensing coils attached to the pedal solenoid are used to produce control voltages for the regulator circuits.

about 1mm when operated. Fig. 3 shows the arrangement employed, each valve lifting when the appropriate tracker bar hole is uncovered.

The output of each photosensitive transistor is amplified and inverted to give 5 volts when the valve is operated. The decoder incorporates CMOS bilateral quad switches, controlled by the 2-bit binary number to switch the various expression signals to appropriate binary to decimal decoders. The decoders drive, via transistors, 36 solenoid valves (18 per regulator), which in turn lift a rubber flap to uncover a 1.5mm hole.

Each hole is coupled via a common channel to the vacuum regulator, such that the more holes uncovered, the smaller the vacuum, and hence the softer the playing volume, of each note. In all, there are 10 button valves associated with the expression. Two more are used to operate the foot pedal solenoids, and another two control the roll drive motor and the machine switch off.

The foot pedal electronics form the most complex part of the entire electronics associated with the Vorsetzer. Good foot pedalling is essential to the performance, and considerable time was spent in designing a suitable arrangement. The final design incorporates 2 solenoids mounted on a framework that enables the solenoid plungers to operate directly onto the pedals.

An important feature of the foot pedal solenoids is the control available on the speed of operation. It can be appreciated that, left to its own devices, a solenoid will operate as fast as it can both on attraction and release, causing rather unmusical thumps at the end of its travel. The speed of operation of each solenoid is controlled here by the setting of 3 controls, one for attraction speed, one for release speed (both independent), and one which affects both directions of travel.

Fig. 4 shows how this has been achieved.

The basic elements form a closed loop control system. Small sensing coils mounted above each solenoid produce voltages that are proportional to the speed of an induced magnet attached to the solenoid plunger. These voltages are used to control auxiliary regulator circuits which in turn control the amount of current supplied to the solenoid.

The amount of control, and hence reduction of normal solenoid operating speed, is a function of the degree of amplification of the feedback signals. Overall speed control is achieved by varying the amount of magnetism induced in the soft iron.

Dissipation of the stored energy presented problems. A conventional flywheel diode across the solenoid could result in too slow a release speed, whilst removal of the diode spelt immediate destruction of the control electronics. A compromise resulting in 4 series connected diodes, rather than one, solved this problem.

The whole foot pedal arrangement has many mechanical adjustments to enable the apparatus to be fitted to any piano. Once fitted, it simply remains to adjust each solenoid so that the fastest speeds consistent with acceptable noise are obtained. The complete electronics for the foot pedals is housed in a small box that sits separately from the Vorsetzer, deriving the pedal on-off signals from 2 of the button valves previously described.

The final section of the electronics is that associated with the roll drive motor speed control, and the machine switch-off. The roll drive motor used is a Volkswagen 6V windscreen-wiper motor coupled to a closed loop control system. The motor is coupled to a small synchronous clock motor, the output voltage of which is nearly proportional to speed. After rectification, filtering (to prevent hunting) and amplification, this voltage and a reference voltage are fed to a 723 voltage regulator IC. This chip, although not intended for the task, is ideal as a motor speed control device, as a reference voltage is readily available, as well as all the circuitry to provide an error signal for control purposes.

There are several rather unique features associated with the motor speed control. The first is a cueing device.

When Percy Grainger made the piano rolls of the Grieg A-minor Piano Concerto, in 1919, he played the piano solo part first. Then, in order to make the concerto sound complete, he recorded on the roll an arrangement for piano of the orchestral part.

This meant that it was necessary to blank out all the holes associated with the orchestral part in order to use the rolls with a symphony orchestra. It was also necessary to arrange the roll so that the Vorsetzer would play the appropriate piano part and then stop, ready to be cued when a remotely held pushbutton was pressed. The Vorsetzer would then commence playing the next piano part, and so on throughout the performance.

To cue the roll meant that the roll had to be cut sections removed, and the roll rejoined. The cutout sections

Above: Denis Condon shows EA staff member Greg Swain how music is recorded onto the piano rolls. Holes in the paper pass over the tracker bar to produce the notes.

Right: setting up for a demonstration performance. Piano roll is placed across tracker bar, ready for attachment to drive spindle. Roll is re-wound after playing.

were, of course, those parts associated with the now unnecessary arrangement for piano of the orchestral part. Holes cut in the roll at appropriate spots then cause the roll to stop just prior to the next piano part, the roll instantly starting when the button is pressed.

The next feature is the use of 3 speed controls. Although not necessary for the Grieg Piano Concerto, other concertos often use several rolls, all running at different speeds. By the use of another hole in the tracker bar, the electronics is so arranged so that first one speed control is selected, then another and so on. Each speed change occurs when the appropriate tracker bar hole is uncovered. In this way, up to 3 rolls may be joined together, and by cutting a hole in the right spot on the end of each roll, the speed of the motor will automatically change when required, to speeds preset by the operator.

The remainder of the control electronics is that associated with switch-off of the Vorsetzer. At the end of a roll, either on play or re-roll, the whole thing (vacuum pump, all electronics etc) turns off. This part of the electronics caused some concern to the author, as it was considered possible that a decent mains transient could trigger the logic into the switch-off mode. The prospect of this happening prevented the author, and others familiar with the problems, from relaxing during the live performances given in June.

The success of the 2 live concerts given in June is now history, and it is gratifying to know that a recording of the Grieg Piano Concerto, made in May 1978, is scheduled for world wide release. This recording will make history as it will be the first recording made by the Sydney Symphony Orchestra to be sold outside Australia.

The Vorsetzer may perhaps be considered something of a gimmick. But it is still a most entertaining and highly musical device — a device which can resurrect the art of the masters by means of a mixture of old and new technology.

The next generation of computers may be introduced by Japanese companies, not American ones. Japanese industry has been government co-ordinated to take on the American computer giants, and the Americans are getting nervous, according to John H. Douglas:

Japan vs US in the great computer race

Tucked away in a quiet neighbourhood at the far edge of Kawasaki's industrial sprawl, the "Cooperative Laboratory, VLSI Technology Research Association" would appear instantly familiar to any American corporate scientist. Indeed, the only immediate difference that strikes a foreign visitor is that just inside the front door you must exchange your shoes for Japanese-style slippers, whose soft "pat pat" adds a homey touch to the otherwise sterile surroundings.

Yet this laboratory could not exist in the United States. It is a unique creation of "Japan, Inc" — a government-sponsored facility staffed with scientists and engineers on loan from seven private companies. Their purpose — to develop the basic technology needed for Very Large Scale Integration (VLSI) circuitry, the basis of the next generation of computers. And already the word is out — talk shared by engineers over beer late in the night — "This time we can beat the Americans".

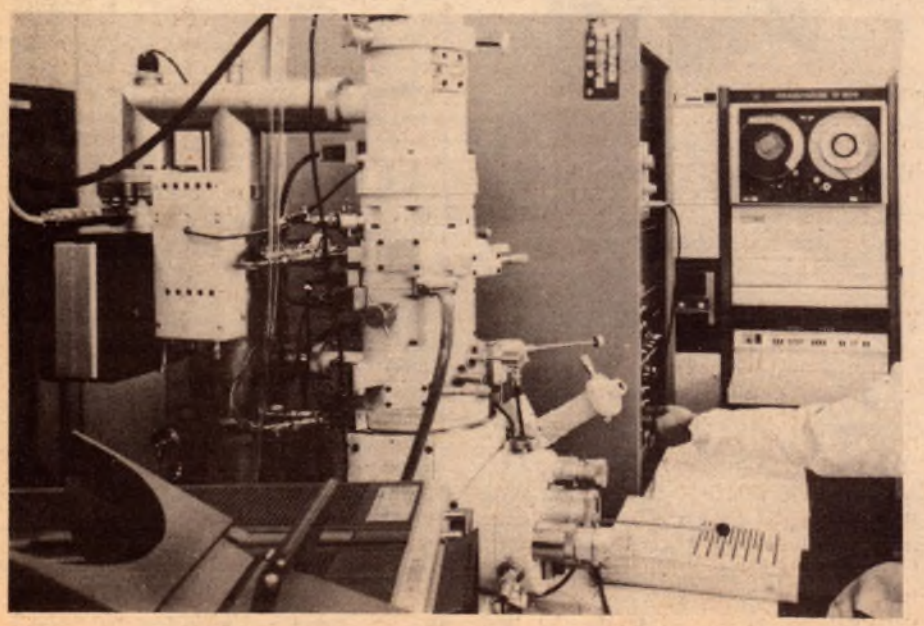
By daylight, however, in the formal reception lounge of the Cooperative Laboratory, director Yasuo Tarui pooh-poohs such speculation. He calls recent reports on the American trade press of billion-dollar funding and working goals of million-bit chips by the early 1980s "exaggerated". The total budget for the planned four-year government R&D program is only 70 billion yen, he says, about $280 million at today's rates. As for competing with the United States, he repeats his call to American colleagues, given recently at a professional meeting in Washington, "I hope we can explore the unknown field of microelectronics together." And he pledges to share all "academic results" gained from his laboratory's research with the rest of the world.

At the heart of the VLSI problem is the limitation imposed by today's technology on packing more and more circuits onto silicon "chips". These chips, which became familiar to most people when they led to the creation of digital watches and pocket calculators, reduce the calculating time and electrical power requirements of giant computers. Tens of thousands of transistors are now packed onto one chip, but if a way can be found to make that *hundreds* of thousands, another revolution of novel electronic devices and computer applications is foretold.

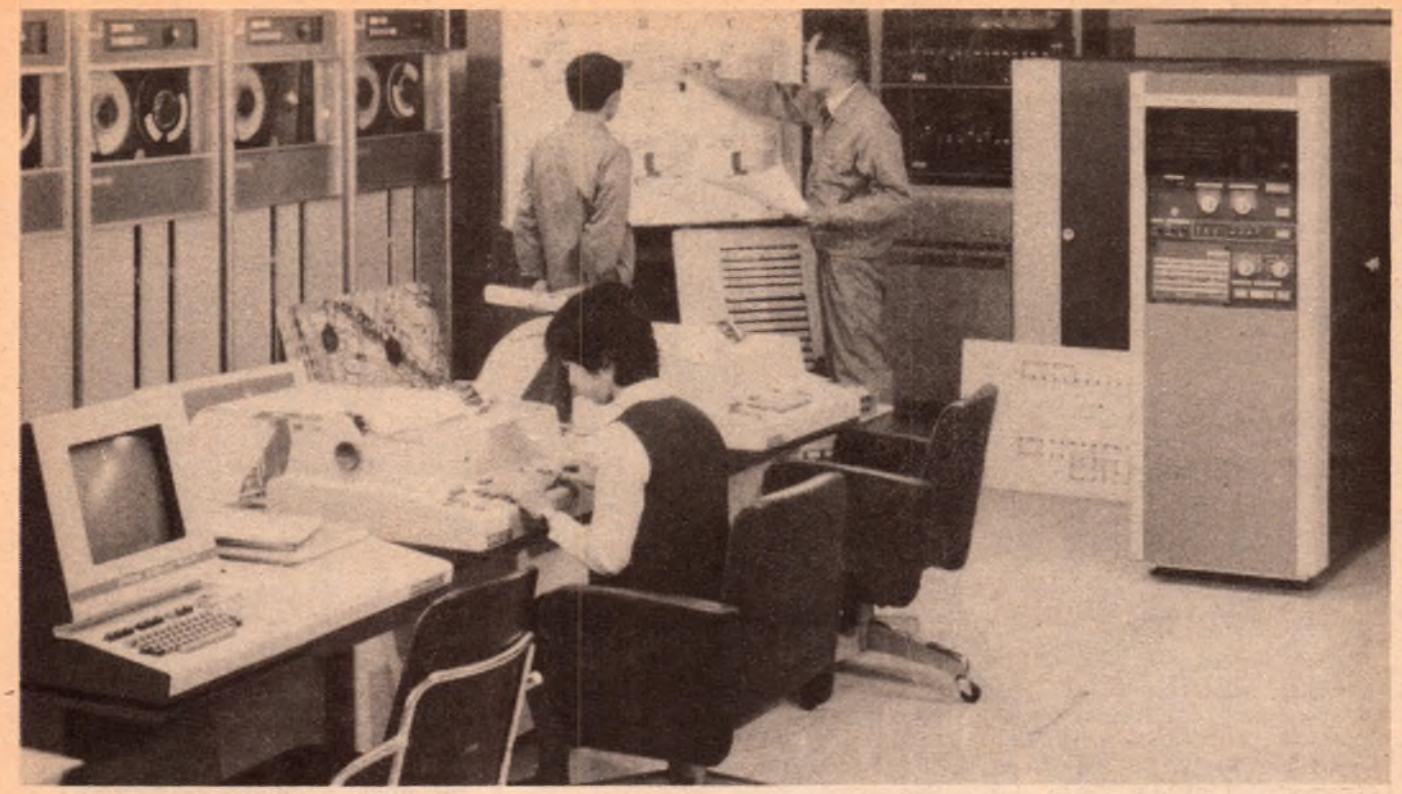
Although many applications will probably come as a surprise even to today's experts, an impressive number of potential uses are already awaiting development of VLSI circuitry. For example, the ability of single chips to conveniently store and process large amounts of data should permit transmission of pictures over ordinary telephone lines. This development could make picture telephones practical for home use and make facsimile transmission of the printed page cheap enough to bring about "electronic mail".

Combining the powerful chips into computers with unprecedented speed and storage capability should allow scientists to attack whole new categories of problems — such as developing a computerised model of the world's climate. For the average consumer, the new chips will mean that pocket calculators can become pocket computers, and that a home computing centre can be tied into a globe-spanning data network.

John H. Douglas is a Fulbright Research Journalist in Tokyo.



Electron beam apparatus at Japan's VLSI Cooperative Laboratory. Equipment such as this may contribute to the next generation of computers.



Japan is the only free-world country whose computer industry is not American dominated. And the average rate of computer usage in Japan is the world's highest.

For the Japanese, commitment to having an independent domestic computer industry has meant adapting to a new level of international competition. Although the original technology could be borrowed from abroad, an R&D effort of unprecedented sophistication had to be established at home to keep the Japanese companies from falling behind, particularly in developing the new VLSI circuits.

At first, the chances for success did not look good: such American giants as the General Electric Co. and the Radio Corporation of America had limped off the computer battlefield, and the three-nation European effort, Unidata, collapsed after only three years. But Japan's Ministry of International Trade and Industry (MITI) took the fledgling industry under its wing, and its success so far has been untarnished.

To counteract a division of effort among domestic companies that left them at the mercy of International Business Machines' wholly owned Japanese subsidiary — a situation industry observers liked to call "IBM and the Seven Dwarfs" — MITI first encouraged the computer companies to form three loose associations. Each association was to build computers capable of competing with IBM's System/370 series, and each would be based on a different (originally borrowed) technology: Fujitsu and Hitachi would make a series of computers compatible with IBM machines; Toshiba and Nippon Electric Company (NEC) would make a series based on Honeywell technology; and Mitsubishi and Oki Electric would make a series based on Univac technology.

As a result of this effort, Japan is now the only free-world country whose computer industry is not American-dominated. About two-thirds of Japan's installed computers (about 38,000, including minis) are of Japanese manufacture. And, according to Takeo Shiina, president of IBM-Japan, the average usage rate of computers in Japan is the world's highest.

Many Japanese industries, such as automobile manufacturing and steelmaking, are highly automated, using domestically made computers. And a nationwide computer network linking principal banks is effectively allowing Japan to pass directly from cash-and-carry business (checks never really caught on) to a "cashless society" of credit cards and automatic payment of bills through bank accounts.

The export situation

At present, only about 4 per cent of the world computer market is controlled by the Japanese, but their exports are increasing. The largest Japanese computer maker, Fujitsu Ltd, recently beat out IBM in head-on competition to sell a giant $36 million computer network to Australia (although the tendering has now been reopened). Earlier, Fujitsu sold its top-of-the-line M-90 computer to the Spanish National Telephone Co, and Hitachi has just received permission to export three large computers to mainland China for meteorological use. (The sale had been held up initially because of fears that the computers were big enough to allow China to design sophisticated nuclear weapons.) Some industry observers predict that the Japanese share of the world computer market could jump to 15 per cent within just five years.

But that will mean developing a VLSI capability completely on their own, and for this task MITI has again encouraged individual companies to pool their efforts. This time, two groups of companies will manufacture the final products (Mitsubishi has joined the Fujitsu-Hitachi group and Oki has dropped out). And all the major computer manufacturers, plus two smaller companies, have joined in the common effort to conduct a joint R&D program, forming the VLSI Technology Research Association, under MITI auspices. This association, in turn, shares technical data with another VLSI project, conducted by the Nippon Telegraph and Telephone Public Corporation, with help from the Ministry of Posts and Telecommunications.

Cooperative Laboratory director Tarui summarised the current state of the joint research effort. Present integrated circuits are manufactured by photolithography, which involves exposing a light-sensitive resist to light passing through a mask with the circuit

The computer race . . .

pattern etched on it. Most people in the industry believe that a circuit element size of one or two microns is about the best that can be achieved with photolithography. This would limit the amount of information that could be stored on a single chip to about 64 kilobits (64,000 binary digits) — a level the Japanese have already achieved. Tarui and his colleagues are thus concentrating on finding new ways to etch the microcircuits, using electron beams and X-rays, which should eventually produce chips with many times more circuit elements.

In May 1977, the VLSI Association announced that a variable spot electron beam technique had been developed that would cut the time required to etch a circuit pattern on a chip to one-tenth the time needed previously. Since the time needed for exposure is the main obstacle to commercial application of conventional e-beam equipment, considerable industry interest was stimulated by this announcement.

Tarui says that experiments are now being conducted to see which type of variable beam apparatus might be most suitable for commercial application — one using two apertures to shape the beam or another that forms the beam using a series of electrostatic lenses. Although these devices have been used to create test patterns on silicon chips, neither has yet been used to make a VLSI.

X-ray research

An alternative approach under consideration, Tarui says, is to expose sensitive materials under a mask to X-rays, which have a much shorter wavelength than light and could thus give finer definition of circuit elements. Current efforts, he says, are aimed at overcoming three major obstacles. First, a more powerful source of X-rays is needed, since present sources require long exposure times. Second, appropriate masks must be found that can be placed closer to the surface to be exposed than those in common use today. Third, aligning the mask and the exposed surface will be a problem, since the elements will be too small for optical inspection.

US companies, of course, are also experimenting with e-beam and other methods of producing VLSI circuits. IBM alone is reportedly spending more on VLSI research than the Japanese association as a whole. Both Japanese and American engineers interviewed agreed that American companies probably still hold a slight lead in R&D related to VLSI technology, but that the

Japanese may come out with a computer based on the new circuitry first, mainly because their companies can afford to be more adventurous.

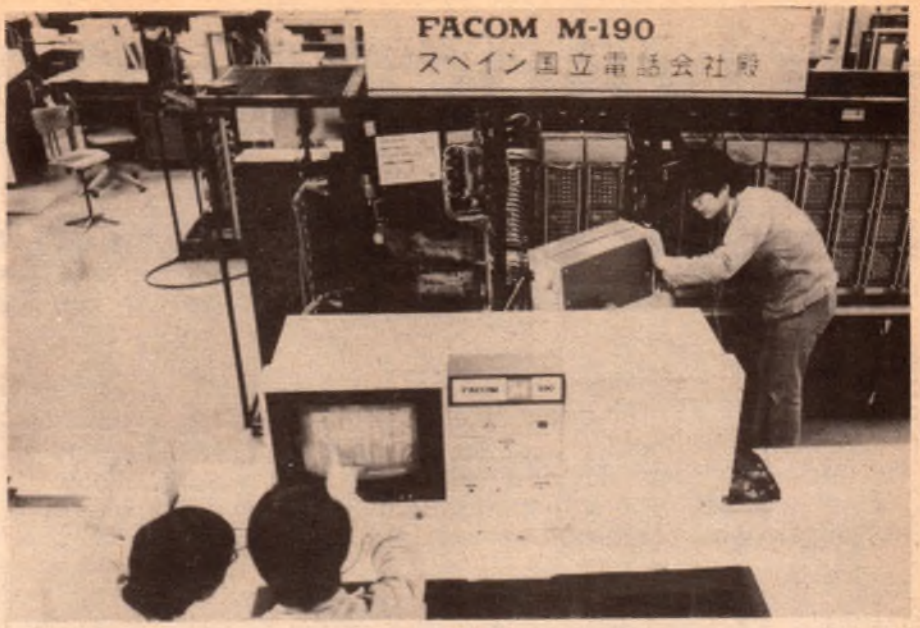
Consider the case of IBM. In 1963 the company introduced System/360 and instantly obsoleted the previous generation of computers. The designer was a brilliant engineer named Gene M. Amdahl, who immediately wanted to push ahead with even more revolutionary machines. Eventually IBM did market the advanced System/370, but Amdahl, not satisfied with the progress, set up his own company in 1970.

Amdahl versus IBM

His strategy was simple: Get the jump on IBM by using a higher scale of integration on the circuit chips, while the conservative giant plumbed older technology for what it was worth before finally introducing new circuits more slowly. By 1976, Amdahl had largely succeeded in his quest, having produced a computer that was two-and-a-half times faster than the comparable IBM model, and selling for 10 per cent less cost. And when he ran into financial difficulty, Amdahl, found an eager partner waiting — Fujitsu Ltd — which received in return for its support the rights to Amdahl's advanced technology.

Now play the scenario again. When IBM announced plans a few years ago to develop a "Future System" of computers, presumably based on VLSI technology, for introduction in the early 1980s, MITI organised the VLSI Technology Research Association to develop the circuits needed to compete. But this time, not only would the Japanese companies have to stand on their own — since access to another Amdahl seemed very unlikely — but by pushing ahead full speed, they just might beat IBM, if the latter took its usual conservative course. Said one influential Japanese financial newspaper, "This is our Apollo project."

As far as an outsider can tell, the great computer race is still wide open: IBM has had second thoughts about trying to introduce another revolutionary system all at once. Customer reluctance and problems with writing the software required for a new system led the company to announce a policy of introducing technology in small stages. On the other hand, IBM has just amassed the largest stash of ready money and marketable securities of any corporation in the country — $5.2 billion. While the company will not say what it plans to do with all that cash, vice-president for finance and planning, Dean P. Phypers, was quoted in "Business Week" as saying, "Suppose that there was a tremendous breakthrough in component technology and that, say, we had to write off and retool our component operations . . ." For that, VLSI competition from Japan seems to be the only likely candidate at the moment.



Above shows the Facom M-190, Japan's largest computer. Japan's share of the world computer market could jump from 4% to 15% over the next five years.

Clearly, the prospect of heightened competition from Japanese computer makers has worried smaller American companies even more. Among other things, the Japanese could sell and lease computers to developing countries on financial terms that the small American companies would have trouble matching. What advantage new technology may not give to Japanese companies, financing by friendly government banks can always supplement. Speculation has thus arisen in the industry that while IBM will not be particularly hurt by the latest Japanese initiatives, smaller American companies may be forced into joint ventures of their own in order to survive.

Pattern recognition

In addition to sponsoring development of computer systems competitive to IBM's 370, and underwriting research into VLSI technology, MITI is also investing heavily in another computer-related project — pattern information processing. Optical recognition of printed letters, numbers, kana (Japanese syllable characters) and kanji (the thousands of Chinese ideographs used in Japanese) has reportedly already been achieved. The first practical application of this system is expected within two years, probably at the Japanese patent office, where computers will aid in processing applications.

Experiments in voice and handwriting recognition are also being conducted. If successful, this project should give the Japanese companies a strong start toward future consumer applications of computers, such as electronic mail. Says one knowledgeable American observer, "This is what the Japanese really want, where their strength has always been, the vast potential home market."

Officially, the Japanese Government has been encouraging the domestic computer industry as a logical extension of its developing economy. As raw material shortages and foreign competition begin to cut into traditional export industries such as steel, the Japanese look toward computers as the key to a new era of high-technology exports.

But the prospect of developing a major new technology on their own — putting to rest forever the stigma of being technological "copiers"—is also a major motivation, at least at the level of individual engineers.

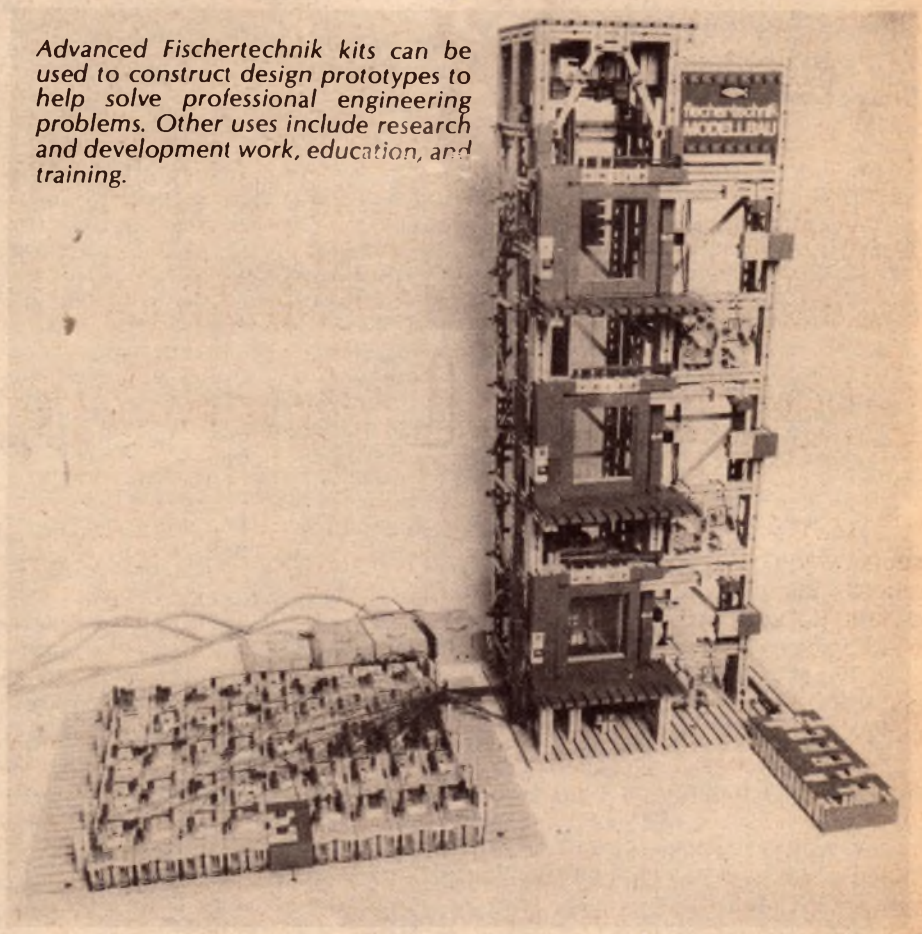
After a long evening of unusually frank exchange, I was standing in a subway station with one such engineer. As his train approached, he paused in our light conversation and suddenly turned reflective. "But I must say," he began hesitantly, as if just completing a long-considered thought, "IBM really does make a fine computer." He paused again as the train rumbled by, then smiled as he murmured almost inaudibly under his breath, "And I want to beat them!"

Reprinted courtesy Science News.

Advanced modelling with Fischertechnik

Many readers will remember that in June "Electronics Australia" we ran an introductory item on the recently released range of Fischertechnik scientific hobby kits. We hadn't realised just how far the concept could be extended until the equipment shown in the accompanying photograph turned up in our office!

by GREG SWAIN



Advanced Fischertechnik kits can be used to construct design prototypes to help solve professional engineering problems. Other uses include research and development work, education, and training.

Actually, the model pictured has rather an interesting history. It was built in Germany by Fischer — as part of a design and demonstration exercise for a full-scale working industrial lift system. This was done to aid in the design of the full-scale system and, as far as possible, to eliminate errors early in the drawing board stage.

By producing a working model of the proposed system, engineers were able to affect considerable cost savings in completing the final design. So Fischertechnik is not just a hobby toy. Advanced kits can be used to solve serious engineering problems and, by allowing engineers to experiment, eliminate subsequent re-design and assembly times.

The model itself is an intriguing "gadget". Basically, it consists of a three tiered lift structure with a lift, counterweight and drive motor, photo-electrically controlled sliding doors with automatic timers, and a master control box. A separate motor is used to drive each door.

Control circuitry for the lift system is made up of an array of relay and logic circuit modules, as shown in the photograph. In addition, mechanically actuated relays are used as limit switches for such functions as door travel, lift stop and overload detection.

The method of overload detection employed in the model is simple, yet ingenious. The lift-well pulleys are coupled to the roof via a spring-loaded mechanical arrangement which, under normal operating conditions, acts to keep the overload switch closed. When a condition of overload is encountered, the springs stretch to remove the mechanical stop from the overload switch, thus shutting down power to the drive system.

Best of all though, the model functions just like a real full-scale lift system. Apply power, and the structure lights up like an oil refinery in the dark! Now, by pressing the appropriate switch on the master control box the appropriate floor level number above each lift door will light up, the lift will automatically travel to the designated level, the lift door will slide open and, after a pre-programmed time, slide shut again.

The lift then travels to the next designated level or levels, according to the order in which they were programmed.

As with any decently designed lift system, the doors on the model will not attempt to slide shut against an obstructing object. This is achieved by means of a light beam/photocell arrangement on each door, which keeps the door open whenever the beam is interrupted.

And the cost? We really have no idea, though we imagine that it would run into several thousand dollars when one considers the materials consumed and the professional time involved. But it's the money saved in the long run that really counts!

Further information on the range of Fischertechnik kits is available from Dick Smith Electronics Pty Ltd, 24 Carlotta St, Artarmon, NSW 2064.

Forum

Conducted by Neville Williams

Induction field transmission: a new approach to hearing aid design

Discussion in the August "Forum" about noise and hearing aids prompted a totally unexpected response, with news of a novel type of hearing aid being pioneered in Australia by the CSIRO, the National Acoustics Laboratory and Plessey. But first, a few general remarks:

In a telephone conversation, a spokesman for the CSIRO (the Commonwealth Scientific and Research Organisation) expressed himself in complete agreement with our attitude to noise pollution in modern society. Noise is a very definite health hazard, he agreed, and the sooner we come to realise it, the better it will be for all concerned.

He also agreed with our reservations about the home construction of hearing aids, and made an additional point which we had not previously considered:

In their zeal to assist someone with seriously impaired hearing, an inexperienced person could inadvertently subject the sufferer's ears to sound pressure levels of around 100dB. This order of loudness was shown as the "Danger Zone" in our August table, being the kind of level in the immediate vicinity of a noisy transport vehicle, or a pneumatic rock drill, or inside a noisy transport vehicle, or a pneumatic rock drill, or inside a noisy metal working factory.

As far as the hearing mechanism is concerned, decibels are decibels, whether they are created by a rock drill or an earphone. Far from solving the problem, excessive zeal may well add to it!

On the subject of hearing psychology, another CSIRO officer pointed out that people cut off from a sonic environment can lose their ability to interpret everyday sound. If they are again exposed to it, there is every chance that they will be quite unable, initially, to make use of it. What to everyone else is obvious and coherent sound is, to them, just a meaningless jumble.

An inexperienced person is just not equipped to cope with a re-training situation.

Curiously, the loss of interpretive ability can even affect just one of a person's ears. A specific case quoted to me was of a woman who, for all practical purposes, had lost all natural hearing. Both ears were affected to about the same degree but she was able to obtain some help from a hearing aid which she has always worn in one particular ear. Now that it has become more practical to wear a double aid — one for each ear — she finds that the long unused ear and its associated brain functions are simply not able to decode sound waves. Presumably a process of complete re-education would be necessary for the unused ear, before it could contribute to comprehension.

On the subject of twin hearing aids, the spokesman emphasised that, where practical, they confer quite positive benefits. Especially if worn so that they turn with the head, they confer a limited stereo facility, giving the wearer some chance of concentrating attention on particular sound sources, as does a person with normal hearing.

Even apart from that, an input to both ears gives a more adequate listening experience, as will have been evident to anyone who has listened to a program on a single earphone rather than a pair.

However — and here we get to a whole new line of thinking — there is a practical limit to the usefulness of any conventional type of hearing aid, whether mono or stereo. It arises from the fact that the microphone is part of the hearing aid, worn by the listener and often remote from the source of sound. In reverberant or noisy situations, the wanted sound is cluttered by echoes or noise, or both, making it particularly difficult to resolve by a person with impaired hearing.

In such situations, the microphone should ideally be located close to the teacher, or preacher, or performer and it is usually arranged this way for "deaf aid" systems installed in lecture halls, churches or other public places.

In its most basic form, the source microphone is connected to an amplifier which feeds an array of outlets, into which headphones can be plugged. The scheme pre-supposes a fixed seating pattern, with the users having to sit in wired seats, whether or not they find it convenient to do so.

An inductive loop system overcomes some of these problems. Instead of conventional wiring, the microphone and amplifier feed into a wire loop running around the floor perimeter of the room or auditorium. An audio magnetic field is created by the loop, which can induce signals into small pickup coils built into special hearing aid devices or even into ordinary personal hearing aids. The wearers are free to stand or sit anywhere inside the loop area without fear of losing the signal.

Yet another approach, which has been exploited by Sennheiser and others, is to flood the audience area with invisible infra-red rays, carrying the audio signal. The rays can be intercepted by tiny battery powered infra-red receivers, which are typically

TRUCKIES HAVE THEIR PROBLEMS . . .

The following excerpt is from a paper prepared by Miss Dawn R. Linklater from the Traffic Accident Research Unit of the Department of Motor Transport of NSW. The title: "A Profile Of Long Distance Truck Drivers".

Miss Linklater says that the disabling effects of vehicle noise represent a pressing problem whose dimensions are probably not fully understood.

"The likelihood, that high noise levels (particularly in older models and cab-over-engine designs, if shielding has become inadequate over time) may have permanently damaged the hearing of some truck drivers is suggested by several interviewers reporting, in their post-survey interviews with the author, that the truck driver respondents appeared particularly hard of hearing compared with other motorists.

"Such hearing difficulty may make truck drivers unaware of the high noise levels under which they operate.

"It has become common knowledge that prolonged loud noise can cause hearing loss (permanent threshold shift).

"The regulations pertaining to trucks in Australia only refer to noise which is affecting those outside the truck."

integrated with headphones or hearing aid devices. Again, the user is free to move anywhere within the "illuminated" area. (Sennheiser is represented in Australia by R. H. Cunningham Pty Ltd).

While these various systems have a natural place in "audience" situations, they are of limited use where interaction is desired on a wider scale between people with impaired hearing.

A critical area, which workers at the CSIRO and NAL have been looking at, has to do with schools which cater specifically or in part for children (or young people) with impaired hearing. Assuming that they have some residual hearing capability, they need the clearest possible speech input in a wide range of situations — not just in a classroom.

To assist them, the Federal Government already provides hearing-impaired persons under the age of 21 with free, conventional hearing aids from the National Acoustic Laboratories (NAL), a Branch of the Commonwealth Department of Health. While a valuable contribution to their well-being, such hearing aids do suffer the problem mentioned earlier: the wanted sound tends to be masked in reverberant or noisy situations, often rendering them virtually useless. If a way round this limitation could be found, it would be a very valuable asset.

WORTH THINKING ABOUT . . .
In a family situation, one normally sets the sound level so as not to distress anyone vulnerable to aural overload. In shopping malls, auditoria, churches, &c, the same principle should apply. Consider the minority who may simply stay away. The majority will come anyway!

In fact, a good deal of thought has been given to the idea of supplementing personal hearing aids with a "wireless" facility of one kind or another.

In a one-way situation, a teacher, parent or other person desiring to communicate, would wear (or hold) a small transmitter, with the microphone supported deliberately close to their lips. The person (or persons) with impaired hearing would be equipped with a receiver and be able to hear what was being said with a minimum of interference from room echoes or noise.

A more complex situation might typically involve a number of students (or others) all with impaired hearing and requiring to communicate with one another, as well as with the lecturer. For this purpose, each could be provided with both transmit and receive facilities, using them in the manner of a 2-way radio, whenever the environment precluded reliance on ordinary acoustic aids.

On the assumption that short-range hearing aid communication would logically be effected in the VHF or UHF spectrum, Australia, the USA and various other countries have assigned frequencies for "radio auditory trainers", but such assignments have not been co-ordinated on an international basis. World-wide endorsement would obviously be a desirable objective, to allow hearing impaired travellers to use their aids in other countries.

However, in examining the whole idea of radio style hearing aids, officers of the CSIRO and NAL have become aware of severe drawbacks. These flow from the fact that a radio signal tends to take on the character of a "broadcast", with no sure way of confining it to the area which needs to be served.

In a school for hearing-impaired students, or other such situations where there could be a concentration of radio aids, an obvious problem would arise with mutual interference.

An automatic reaction, based on ordinary mobile radio practice, is to envisage the use of multiple channels, which would be allocated to class areas and to activities within those areas. In practice, however, this would involve a substantial increase in the cost and complexity of the equipment, demand a high degree of supervision in its use and, even then, have the potential for a lot of frustration and confusion for the users.

What has come out of work at the CSIRO is the idea of using induction field radio transmission and reception, effectively combining the mobility of a radio link with the very confined range of an induction loop.

Instead of feeding its signal to a conventional antenna, the transmitter section of an aid feeds into a ferrite rod antenna, very similar to the ferrite rod antenna in a portable radio. By appropriate design and using the right order of frequency, a strong induction field can be set up in the immediate vicinity of the rod, but diminishing to virtually nothing beyond about 10 metres away from it. A similar rod antenna, positioned within this field, can pick up a signal and feed it to a radio hearing aid operating in receive mode.

The most suitable frequency segment for the purpose is in the region 3 to 4MHz, which is high enough to permit frequency modulation with reasonable deviation, yet not so high that it tends to radiate in other than the inductive mode. At the frequency, it is also fairly easy to achieve a high degree of carrier stability.

Contrary to the usual practice, the rods are mounted vertically, which has the advantage of giving an omnidirectional pattern in the lateral plane, as well as minimising possible interference from other services in this part of the spectrum. The use of FM also offers a further degree of immunity.

FORUM CONTINUED: Induction field transmission

Reproduced by courtesy of the CSIRO and the "Sun-Herald".

FM has another important advantage because its "capture effect" complements the limited coverage of induction field transmission. If two people are talking (ie, transmitting) on the same frequency, say 10 or 12 metres apart, a person can listen to either one simply by walking towards them. By so doing, he/she will walk out of one induction field into the other; and even if both signals were theoretically available, the stronger will take over from the weaker by capture effect.

Work by the CSIRO indicates that it is entirely possible to design the equipment so that the radio range approximates normal acoustic speech range. Thus, people with a hearing impairment, and using an inductive field aids, could conceivably socialise in a fairly normal fashion, circulating or forming into groups, without having to worry too much about switching channels.

Those researching the inductive field aids forsee that, in a typical Australian school for the deaf, four channels would provide all the flexibility that might be needed. The activities in a given class would tend to concentrate in one selected channel, so that everyone would be party to what was being said. Student aids would most likely be arranged so that no other transmitter would come on if one was already active. The teacher, however, would have an over-ride facility.

Apart from what it could offer to the disadvantaged in school, domestic and social situations, induction field transmission could have important implications for industry and even for defence situations.

A person working in a very high noise area can be protected, in terms of their hearing, by carefully designed ear muffs. But the more effective the muffs, the more difficult it is to communicate with the person concerned. By building an induction field receptor into the earmuffs, one has only to walk within a couple of metres of the person to be heard.

Tests have indicated that, for noisy situations, a noise cancelling type of microphone is highly desirable, held or supported very close to the speaker's lips. A microphone at chest level can offer nothing like the same signal/noise ratio.

The frequency segment between 3 and 4Mhz, seemingly most suited for induction field FM, is already populated by amateurs and other services. However, tests to date indicate that mutual interference is not very likely. For example, a communications receiver quite close to an induction field transmitter remained blissfully unaware of the signal.

There was some evidence of extraneous penetration into an induction field receiver but only, for example, when it was deliberately taken close to the Dural transmitter of the W.I.A. during the course of an 80-metre transmission. In other circumstances, the receiver remained notably silent.

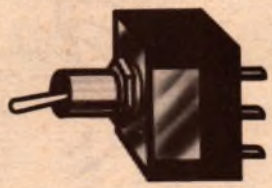
Preliminary information about the work is being circulated to other countries and a submission is being prepared for WARC 79 seeking an international allocation for induction field hearing aids in the 3 to 4MHz region.

In the meantime, Plessey have expressed keen interest in developing a viable induction field transmitter and receiver, with AWA and Philips both involved in the design of dedicated integrated circuits. The Federal Government has accepted the proposition that it should supply hearing aids incorporating induction field transmission links for the use of hearing-impaired children in Australia.

(Those immediately involved in the development of the induction field equipment are: Mr Graham Donald, National Acoustic Laboratories, 5 Hickson Rd, Sydney 2000; Tel. 02 20537 Mr V. R. Burgess, CSIRO, P.O. Box 218, Lindfield, NSW 2000; Tel. 02 4676419).

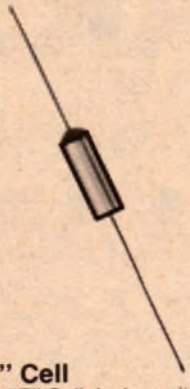
Plessey components. The complete range. (Well almost).

Switches
Rotary, lever key, toggle, thumb wheel, touch activated including illuminated.



Speakers – Foster & Fostex
Speakers ranging from guitar, woofers, mid range, tweeters, horns, full range and elliptical, all are available.

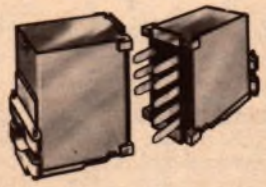
Optoelectronic devices
Including LDR'c, LED'c photodiodes, phototransistors, photocouplers and 7 segment, alphanumeric and cold cathode displays.



"E" Cell
The "E" Cell device suitable for a number of applications such as repetitive timing and control, pulse counting and memory, timing, current-time integration, use-time measurement.

Service and elapsed time indicator
For trucks and other vehicles, trains and stationary engines – where ever there's a suitable power source to indicate elapsed time and when service is due.

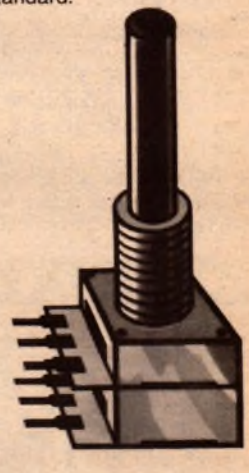
Sonalerts – Mallory
Electronic audible signals providing a startling innovation in warning devices, producing a penetrating sound by purely electronic means. Circuitry is all solid state for maximum efficiency, lowest current requirements, and highest reliability.



Batteries – Saft
Nickel cadmium (rechargeable) cells and batteries, for domestic, heavy industrial, emergency power, military and aviation.

Connectors
A multitude of connectors including the Multicon range consisting of 2, 4, 6, 8, 10, 12, 18, 24, and 33 pole. Also the 159 range of plugs and sockets ranging from 7 to 71 poles. Gold flash on contacts and solder tags for long term protection against tarnishing. Also the 22 range of marine and aviation connectors.

Potentiometers
Moulded carbon track and wire-wound of both commercial and professional standard.



Capacitors
Capacitors for a wide variety of applications, ranging from tantalum, chip ceramic, long-life and electrolytic.

Lamps and indicators
Consisting of filamentary, neon and LED styles designed for all general illumination applications.

Dry reed inserts and relays
Suitable for most switching functions the inserts have proven extreme reliability, long life, and the ability to operate in grossly unfavourable environments.

Speaker Enclosures
One of the range of Plessey Foster and Fostex speaker enclosures.

PLESSEY

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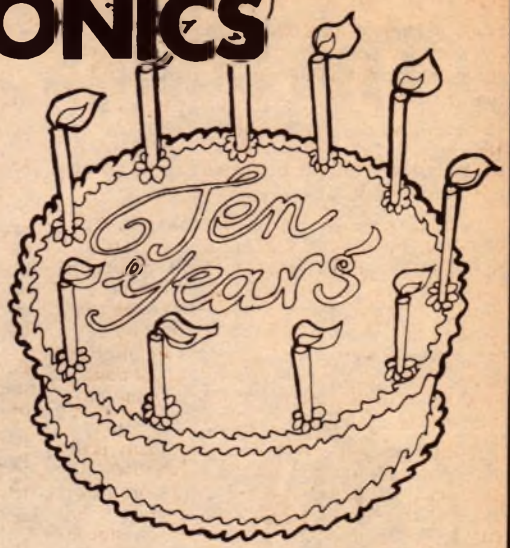
Components Division
Christina Road,
Villawood NSW 2163
Telephone 720133 Telex 20384
VIC: Plessey Australia Pty. Ltd.
North Melbourne 3290044;

AD 105

DICK SMITH ELECTRONICS

TEN YEARS YOUNG...



It's hard to imagine a time when the ubiquitous Dick Smith, or the company he heads, Dick Smith Electronics Pty Ltd, were not around. The two seem to be as eternal as the rock . . .
But there must have been such a time, for this year marks the tenth anniversary of the Dick Smith group.
From a tiny car radio business 'buried' under a shopping centre car park to the multi-million dollar wholesale, retail and importing group of today, giant advances have been made in those ten years.
How does a success story like this happen: we'll let the Dick Smith group tell their own story . . .

We're 100% Australian owned and controlled — and proud of it!

We're also dedicated to serving the needs of the Australian electronics hobbyist.

It's hard to think that we've only been around for 10 years — it seems that the name 'Dick Smith' has become so well known we tend to forget we are really a 'young' company.

Remember the good old days? When a young Dick Smith ran a small, but successful car radio business in Neutral Bay, Sydney (and later at Gore Hill)?

Remember the old 'bomb' parked in a golf club car park where it caught everyone's attention on one of the major arteries into the city (it also caught the attention of the club secretary. Staid old Roseville wasn't ready for the likes of Dick Smith!)

Remember those adverts where the copy said absolutely nothing . . . some in Latin, some upside down, but all complete gobbledegook!

Those ads didn't sell anything — except the name Dick Smith.

But it wasn't all fun and games. There was a lot of hard work. Several technicians were busy installing car radios, while the salesman, secretary, coffee maker and delivery boy kept the customers happy (only thing was, the salesman, secretary, coffee maker and delivery boy were all one person: Dick Smith!)

Despite the success of his car radio business, Dick decided to take a plunge. He could see that electronics enthusiasts and hobbyists weren't really getting the treatment they deserved — and he knew he could do better.

So he sold the car radio side of the business and converted the premises at Gore Hill into a shop. (This was where the present car park is now).

After a few early set-backs, Dick's business grew and grew. People started to realise they could get the parts they wanted plus service from the bloke up at Gore Hill. Dick put out his first catalogue in 1974 — a massive 42 pages (and compared to today's catalogue, quite a crude effort!)

But it served the purpose — and the increase in enquiries from country customers led to the formation of the Dick Smith Mail Order Centre — soon this was the most important part of company operation.

At last, people everywhere could get what they wanted, at the right price, and in a short time.

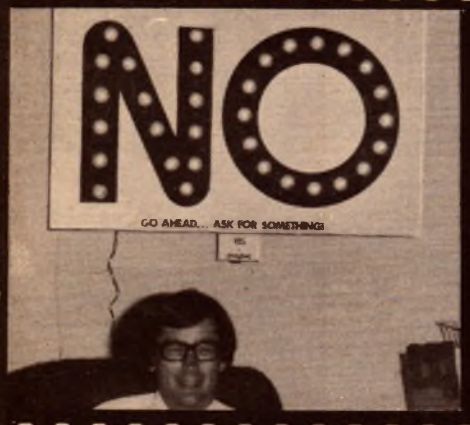
As the business grew, new shops were added — the first in Bankstown in 1974. This shop was only recently closed and moved down the highway to Chullora. The reason: no-one dreamed back in 1974 that the business could grow so large. Bankstown was literally bursting at the seams. The new Chullora store is around 5 times the size of the Bankstown store!

An importing section was formed — to cut out the 'middle man' and so keep prices to a minimum. Even with the way currency fluctuates, having our own importing section plays a major role in keeping price rises down.

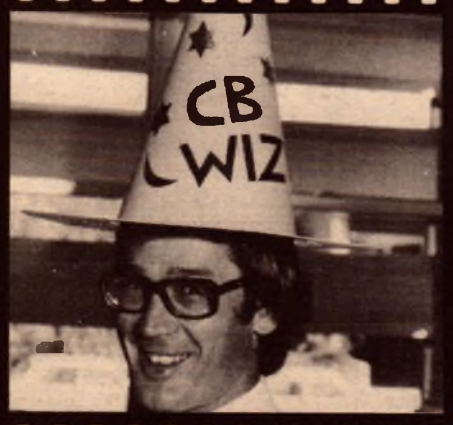
Even though we import over 80% of our total goods, we buy as much as possible from the Australian electronics industry. Despite Government action which has forced the closure of most of this industry, we always buy locally if we can be assured that you, the customer, will not be dis-advantaged by this.

As business kept growing, so did our outlets — first of all York St, Sydney (at present undergoing a major facelift and expansion), then Brisbane and Richmond, Melbourne, then came Parramatta, Adelaide and Melbourne City. And there are more to come!

At the same time as opening new stores in our own right, we established a wholesale division,



You certainly know what the answer is — particularly if it is 'NO!' A 10" fireman's bell also helps get the message across . . .



Dick was given the title 'CB Wiz' and was presented with this witch's hat (or is it dunce's hat?) as a momento.

Here's the latest Dick Smith store — 147 Hume Hwy, Chullora. It's only a stone's throw from the old Bankstown store.

enabling a new network of dealers to be set up right across Australia.

Many of these dealers came into being on the crest of the 'CB wave' – and many have stayed as very successful dealers selling a lot more than just CB radio.

Other dealers have come and gone – but those who have stayed with us are the ones counting their blessings now. Many of the dealers who left us have simply disappeared!

To handle the huge volume of stock, plus distribution, invoicing, credit control, etc, Dick had the foresight to install an IBM computer back in 1976. Because of the phenomenal growth of the company, this proved to be too small – so early this year was replaced by a larger IBM system 34. This has greatly increased capacity and functions – and so should cope with the expected growth of the company in future years.

A measure of the growth of the company is the fact that we have had to move warehouses twice in three years. Originally, the Gore Hill store doubled as a warehouse – when we moved first into a 4000 square feet warehouse we wondered what we would do with all the room. Five months later – it was full to overflowing.

There was nothing to do but move – this time to a 27,000 square feet warehouse a short distance away. That was two years ago – and within a few months we will have to move again. For the last year we've been operating under hopelessly crowded conditions. Next step: 50,000 square feet!

How long will this one last???

Our advertising budget is huge – after wages, the highest payment made by the company. But we know how much our organisation depends on advertising: a couple of years ago we decided to change our ads by removing the black borders. We certainly heard your screams – and back on went the black borders! (Have you noticed lately how many people are copying our style and putting on black borders?)

But Dick Smith Electronics is more than a few shops selling components. It's more than a lot of dealers.

It's Jumbo Jets flying tourists to the South Pole in aid of charity.

It's searching for (and finding!) lost historic aircraft in the Northern Territory

It's towing fake icebergs into Sydney Harbour on April Fool's day

It's having a 'Lovely Legs' competition among the male staff members

It's a gigantic 'NO' sign above Dick's desk for
(a) employees who want pay rises
(b) insurance salesmen
(c) entrepreneurs with fantastic deals he can't possibly refuse . . . (he can!)

Which brings us up to the present . . . and to the future. Where do we go from here?

It depends on a lot of things, of course . . . Like the government and the economy, like electronic technology, like the weather (Dick can't fly if the weather is too bad . . .) And it depends on YOU!

We're thankful for your patronage and support over the last ten years – and we look forward to serving you in the next ten years. We have some pretty exciting plans for improvement and expansion – perhaps into other areas of operation – but there is one basic aim we still have in mind, just the same as it was when we started ten years ago:

We can only continue to expand – indeed survive – if we give you what you want. Quality components and gear at the right price, with the back-up and service you expect.

And that's what we'll continue to do.

Dick played a large part in having CB radio legalised in Australia. His submission was largely adopted to become the basis for the CB regulations.

A common sight around Sydney – the Electronic Dick. It upsets little old ladies, gets the driver propositioned – and delivers the goods to the stores!

April Fool's day will never be the same! The stunt to beat them all was Dick's fake ice-berg. In the early morning fog and mist it looked so realistic!

At last, he found it: The remains of the 'Kookaburra' historic aircraft lost in the Northern Territory. Dick led two expeditions to search for this plane.

DICK SMITH ELECTRONICS

SYDNEY 125 York Street, SYDNEY. Ph. 29-1126
147 Hume Hwy, CHULLORA. Ph. 642-8922
162 Pacific Hwy, GORE HILL. Ph. 439-5311
30 Grose Street, PARRAMATTA. Ph. 683-1133

MELBOURNE 399 Lonsdale Street, MELBOURNE. Ph. 67-9834
656 Bridge Road, RICHMOND. Ph. 42-1614

BRISBANE 166 Logan Road, BURANDA. Ph. 391-6233

ADELAIDE 203 Wright Street, ADELAIDE. Ph. 212-1962

MAIL ORDERS P.O. Box 747, Crows Nest, N.S.W. 2065.

MAJOR DICK SMITH DEALERS: *While there is not enough space to list all our dealers, shown below are the names and addresses of dealers who stock a large range of our products:*

Overland Communications	11/53 Wollongong St, Fyshwick, ACT. Ph 80-4307
Trilogy Elect. Supplies	52 Princes Hwy, Wollongong NSW. Ph 83-1219
Sound Components	78 Brisbane Street, Tamworth NSW. Ph 66-1363
Hitel Hi Fi	145 Queen Street, St Marys NSW. Ph 623-4442
Don House Electronics	2 Merriwa Street, Gordon NSW. Ph 498-1398
DGE Sales	44 Brown Road, Newcastle NSW. Ph 69-1222
M&W Electronics	48 McNamara Street, Orange NSW. Ph 62-6491
Double Diamond	18 Russel Street, Goulburn NSW. Ph 21-5440
G. M. Electronics	99 Fitzmaurice Street, Wagga NSW. Ph 21-3044
Rivercom	9 Copland Street, Wagga NSW. Ph 21-2125
Brian Bambach Electronics	68 William Street, Gosford NSW. Ph 24-7246
Capital Coast Electronics	Unit 11, Commercial Centre, Ford St Moruya NSW. Ph 74-2545
GCG Communications	385 Mulgrave Rd, Cairns QLD. Ph 54-1035
The Elect. Hobby Centre	1045 Gold Coast Hwy, Palm Beach QLD. Ph 34-1248
Premier Sound	239 Musgrave St, Rockhampton QLD. Ph 27-4004
Sumner Electronics	97 Mitchell Street, Bendigo VIC. Ph 43-1977
Aero Electronics	123A Bathurst St, Hobart TAS. Ph 34-8232
Devon Electronics	45 Ashburner St, Devonport TAS. Ph 24-4216
Advanced Electronics	5A The Quadrant, Launceston TAS. Ph 31-7075
A.E. Cooling	Town Centre, Peoples St Bldg, Elizabeth SA. Ph 255-9196
Hutchesson's Commun.	5 Elizabeth Street, Mt Gambier SA. Ph 25-6404
Altronics	105 Stirling Street, Perth WA. Ph 328-1599
BP Electronics	11 Duke Street, Albany, WA. Ph 41-2681

Introducing THE BOOM BOX.

It's like listening with your whole body.

You know how good a live bass feels. It talks to you through your chest.

So you know how tough it is to get that sound – and that feeling – when you're listening to records.

But now, you can get fast, fast relief from pale bass. Just hook up one dbx Boom Box. And stand back.

In just milli-seconds the Boom Box goes to work so you can feel all the vibrant, low frequency energy of live bass. Because the Boom Box recreates the low frequency sound that's often deliberately left out in the recording studio.

You actually feel the blast of air a real bass note produces.

The Boom Box does this by seizing the lowest notes, instantly creating new notes an octave lower, and then realistically putting them back into your music. Low frequency notes surge through your hi fi system.

The Boom Box works on any music system that has a tape monitor switch. And it not only makes modest systems sound expensive, it makes expensive systems sound unbelievably real.

Hear the Boom Box. Feel the Boom Box. At your dbx dealer. You'll experience an all-time "low" in musical enjoyment.

dbx

dbx,
32 Cross St,
Brookvale, NSW 2100.
(02) 939 1900.

COMPACT CASSETTES: A MEDIUM THAT WON'T STAND STILL!

Hardly had the ink dried on the release sheets for the latest super-ferric and super-chrome cassette tapes than an entirely new word appeared in the vocabulary: "Metafine" pure iron coated tapes. Nor is it an advertising catch-cry; Metafine may well revolutionise tape thinking and further entrench the compact cassette format as a home music source.

by NEVILLE WILLIAMS

Just before you drop the magazine and rush off to buy your first "Metafine" cassette, we'd better warn you that you won't find any in the shops for a while yet. Metafine tapes are still in the laboratory and pre-production stage. What's more, they wouldn't work too well with your present deck, because it takes about double the bias and signal levels to magnetise the new tape, and double the erase energy to clean it off again! But the signal on playback has much more to offer in just about every respect.

For the time being, if you're looking for top cassette performance, you'll have to pick your way through the latest "conventional" tapes.

Convoy International, for example, are putting a lot of push behind the TDK "AD" (Acoustic Dynamic) cassette, which they claim to be the very best choice for recordists who prefer — or need — to use a pure ferric oxide tape.

In an independent report on this tape, the Louis Challis organisation offered this conclusion:

"The release of the AD tape, which simultaneously enhances frequency response, dropout characteristics, linearity and, most significantly, distortion, is obviously a better way (to optimise performance) particularly in the majority of machines which have neither a chromium dioxide nor a ferrichrome capability".

For those machines which do have extended bias and compensation facilities, Convoy recommend TDK's cobalt-doped oxide tape designated as "SA" or "Super Avilyn". It is formulated to make use of the higher bias and modified top-end pre-emphasis originally provided for chromium based tapes.

Other distributors, of course, are no less keen to recommend their own "state of the art" tapes, of one kind and another.

A TDK "AD" (Acoustic Dynamic) cassette, distributed in Australia by Convoy International. A product report by Louis Challis credits it with very low dropout, low inherent distortion, a good noise characteristic and a response that tends to peak and roll at about 12-13kHz in a typical deck with ordinary Fe bias.

Amongst them is BASF, which is emphasising two cassette tapes in particular. The first is their Ferro Super LHI which was foreshadowed and explained in an exclusive story in our November 1977 issue. It was the result of a research program by BASF in Germany, which sought to establish an average coercivity for available Japanese cassette tapes and presumed by Japanese deck designs. BASF's Ferro Super LHI cassettes are optimised for this "average", even though it is well away from the original and official European DIN standard. They should be well suited to most cassette decks currently used in Australia.

For the top end of the market, BASF are offering their Chromdioxid Super cassettes, with signal-noise ratio and dynamic range both in advance of normal single-layer chromium dioxide tape.

BASF claim that many tape manufacturers have sought to develop and promote substitutes for chromium dioxide tapes primarily because they were unwilling to pay the royalties due to duPont; however, despite their efforts, chromium dioxide technology maintains its lead, says BASF, and this is being confirmed by its increasing use for colour video tapes, where the demands for information storage are very high indeed.

On the subject of head wear, BASF claims that "campaigns" to discredit chromium dioxide on this account have had to be withdrawn in the face of research data that "proved that the head wear properties of the chrome dioxide tapes were even superior to those of the LH cassette tapes, which are nowadays sold the world over and which are very popular for the production of music cassettes."

It is not surprising that major manufacturers are competing so vigorously for a share of the world cassette market in the light of figures published recently by BASF A.G. of Germany. Research by the Company suggested that the total world market for cassettes in 1976 (blank and pre-recorded) amounted to 850,000,000 units. The figure rose to 1000 million units in 1977 and is heading for 1150 million units during 1978.

There will undoubtedly be big sales again in 1979 but, by then, a new factor may well have entered the market, as already mentioned: compact cassettes with tape coated with pure iron particles, rather than any kind of oxide. Given a suitable deck, cassettes

Two of the latest cassette tapes from BASF: the ferro super LHI, apparently aimed at the same market as TDK's "AD". The other is the Chromdioxid Super, reportedly a double-layer chromium dioxide tape and possibly the pace setter for existing oxide technology.

A major independent research company proved that the ADC XLM MKII incurred no perceivable record wear over the life of your records!
Since then ADC's massive research programme has created a new state-of-the art, top of the line model–the ZLM Aliptic–designed for ultimate stereo performance combined with the concept of zero record wear.

Greatly reduced tip mass

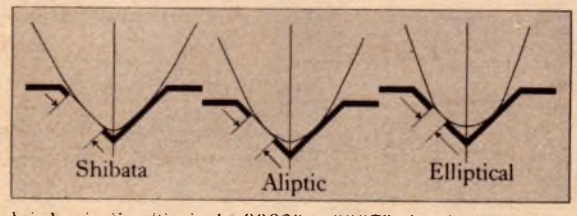
The ZLM has a tiny nude diamond with a ·004" x ·008" rectangular shank.
This achieves more lateral strength than the fashionable ·006" square shank, plus a 10% reduction in mass.
The diamond is mounted on a new tapered stylus, which again reduces mass.
In fact, the ZLM has only half the tip mass of the famous ADC XLM MkII.

Less mass by patent

The patented ADC Induced Magnet system, where the magnet is suspended over the moving stylus arm instead of being attached to it, inherently means less mass for the record groove to move. This, coupled with major innovations in the pivot block stylus suspension (which have solved deficiencies in the old system), has resulted in greatly improved frequency response characteristics.

New low-wear ALIPTIC shape

The ZLM has a new tip shape that combines the advantages of the elliptical and Shibata shapes, while eliminating their disadvantages.



It is basically elliptical (·0003" x ·0007"), but its bottom radius has been modified to extend the vertical bearing surface on the groove wall by 100%.
Large enough to greatly reduce record wear, while still small enough to prevent dirt particles being reproduced.
This new shape is called ALIPTIC.™

The best polish available

We decided it was worth the extra cost to get the ultimate polish for the ZLM.
The method involves a cam action to shape and polish evenly while forming the elliptical surfaces simultaneously with the other radii. This Pathe-Marconi method is expensive, but the result makes another important contribution towards reducing record wear.

Spatial sound

You'll notice a distinct difference in sound quality.
Words such as 'open,' 'spatial,' 'uncoloured' and 'true' spring to mind. Individual instruments are easily identified, and there's no hint of listening fatigue.
That's strictly for the competition with its peakier response.

The new ZLM Aliptic

The culmination of all ADC's research has resulted in the new ZLM Aliptic.
Its specifications below are some of the most impressive around, and with each cartridge you receive an individual, signed, frequency response testimonial.
Certain ZLM's fall within a range of ±½db 10Hz to 20kHz and ±1dB out to 26kHz.
These rare cartridges are called ZLM Select and are only available on special order.

The best cartridge we've ever made

The ZLM is without doubt the best cartridge we've ever made, but it's well worth taking a closer look at the new ADC XLM III which incorporates all of the reduced mass accomplishments of the ZLM, but with a tiny elliptical diamond. This also includes an individual specification.
Complementing the range, we have the new four-cartridge QLM Mk III series, incorporating our new design criteria and exciting innovations like the Diasa (diamond + sapphire) elliptical tip.

ZLM Aliptic specifications

Diamond tip	Nude Aliptic
Tracking force	½ to 1¼ gram
Frequency response	10Hz to 20kHz ±1dB 20kHz to 26kHz ±1½dB
Output	1.0mV per cm/sec
Output balance	1dB max. diff.
Channel separation	30dB at 1kHz/20dB at 10kHz
Inductance	580mH
Resistance	820 Ohms
Load resistance	47,000 Ohms
Load capacitance	275pF
Cartridge weight	5.75 grams
Accessories	Stylus brush, screwdriver, all mounting hardware and signed frequency response curve.

Please write for our illustrated brochure.

The new ZLM Aliptic™ cartridge. The difference between playing your records and wearing your records.

ADC

Audio Dynamics Corporation,
A Division of BSR (A'asia) Pty. Ltd., Anne Street, St. Mary's, NSW 2760.

METAFINE: WHAT THE CURVES SHOW

loaded with the new tape will offer much higher fidelity at the existing speed, or acceptable reproduction at half speed or even less! They will inevitably have a big impact on the whole domestic tape scene.

Rumours of a radically different high-performance tape have been around for a couple of years, from areas as diverse as Europe, Japan and America. However, the story was broken officially by the 3M company on June 1, at New York's St Regis Hotel. Tandberg were also in the act with a prototype of their TCD340AM cassette deck, providing the appropriate orders of signal, bias and erase.

According to a press release from 3M, their own research into pure iron coatings began in 1965 but initial progress was slow. However, by 1972, the project had reached the stage where they felt they should talk to equipment manufacturers and seek their cooperation in exploring the new medium. It was clear, for example, that new heads would need to be developed which, together with matching electronics, could cope with a coating of significantly higher coercivity and remanence.

Altogether, about 100 audio and video equipment manufacturers were provided with samples for evaluation and development purposes.

Work during the next four years tended to confirm that expectations of the pure iron coating were justified, but a variety of problems would need to be solved before it would become economically feasible.

For example, the tiny particles of pure iron were highly prone to oxidisation, leading to the prospect that one might make a superb recording only to have it destroyed by rusting within a short time!

A paper by 3M engineers in 1974 indicated that corrosion and stability problems had been brought under control and, by 1976, tapes had been produced using the pigments and formulation which could be regarded as representing 3M's production objective.

With this release, what had been known as XRM4 (experimental recording medium) became "Metafine", ready to be mated with the prototype recorders that had been developed to use it.

In speaking about the new product, Del Eilers, a technical service supervisor at the New York Conference, said that the Metafine tapes exhibited a retentivity (or remanence) of 3400 gauss, as compared to 1500 gauss for his company's own Scotch "Master II" tape. The Metafine coercivity figure was 1000 oersteds, compared to 550 for Master II.

The high remanence produces an increase of about 5dB in playback output across the spectrum, compared with the best conventional tapes.

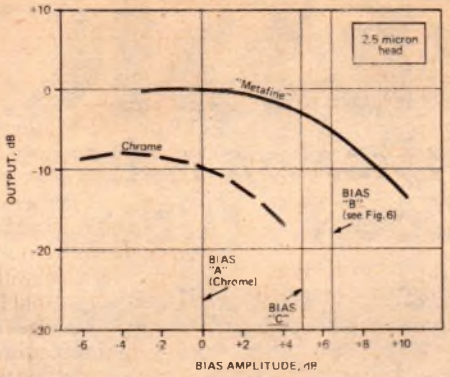
The high remanence and coercivity both contribute to greater output at the high end of the spectrum, compared with the best conventional tapes.

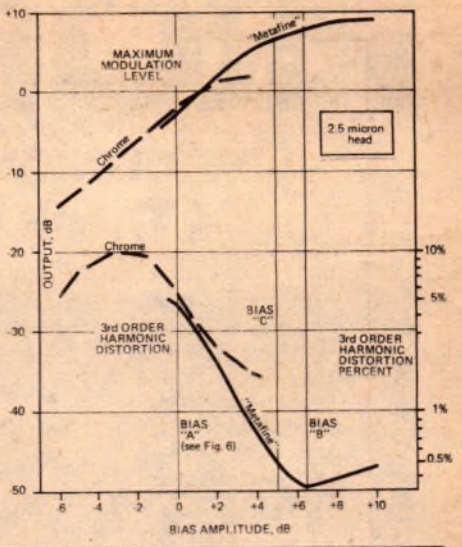
The high remanence and coercivity both contribute to greater output at the high end of the spectrum, with far less tendency for transients to saturate and crush.

But, of course, it is these same figures which demand an increase in both magnetising and erase currents. With the appearance of chromium dioxide and "pseudo chrome" tapes, decks had to be re-styled, to provide an increase of 5 to 6dB in the level of erase and bias. With the appearance of pure iron coatings, a new generation of deck will be needed, providing the option of yet another 5 to 6dB of bias, erase and signal current.

There has to be more to this than merely beefing up the electronic drive circuitry, because the most likely result of so doing would simply be to saturate the heads rather than the tape. Head materials, head configuration and gap dimensions will all require close attention.

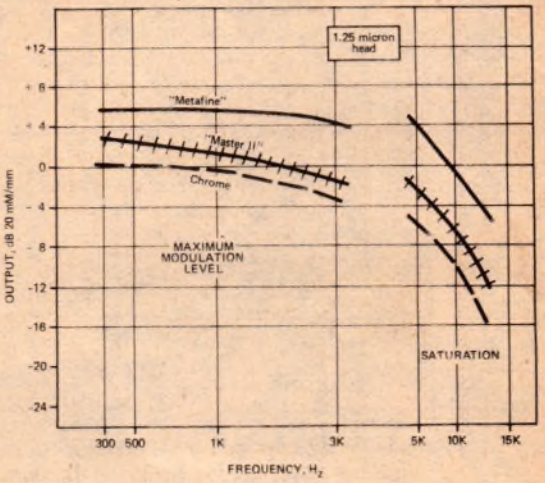
In terms of frequency compensation, pre-production Metafine cassettes carry the endorsement "70us", indicating equalisation similar to that for chromium tapes. This would suggest that while Metafine cassettes could not be adequately recorded on existing





Above: The maximum output level at 12.5kHz, as a function of HF bias, for Scotch "Metafine" and a standard chromium dioxide tape. Note the essential 5 to 6dB increase in bias level for Metafine tape.

Top right: Metafine offers a dramatic decrease in harmonic distortion with optimum bias. For a 3% figure, maximum modulation level of Metafine is claimed to be up by 9db.



Right: Two 3M "Scotch" brand tapes compared with a typical chromium dioxide cassette.

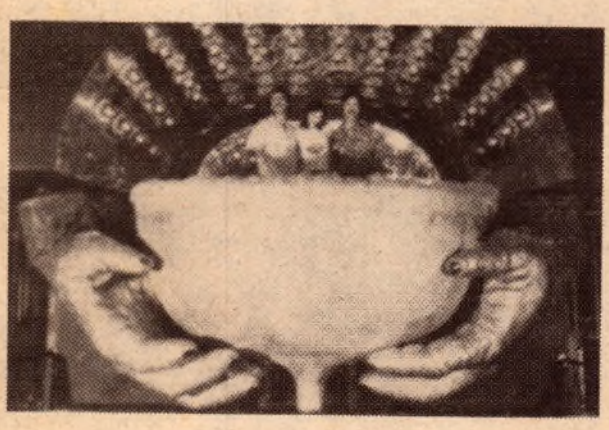
Using a standard chromium dioxide tape as a reference, 3M compiled this table to show the relative performance characteristics of their Master II pseudo-chrome tape and the new pure iron Metafine tape.

RECORDING HEAD GAP		1.25 MICRON (2-head type)		2.5 MICRON (3-head type)		
TAPE	CHROME	MASTER II	METAFINE	MASTER II	METAFINE	
BIAS REFERENCE POINT	0	0	+6	+1.3	+6½*	+5#
Sensitivity, dB						
S_L-333 Hz	0	+3	+2½	+3	+3	+3
S_H-12.5 KHz	0	+2½	+2½	+2	+½	+3
Maximum Modulation Level (MML) at 333 Hz, in dB	0	+2½	+5½	+5½	+10	+9
Maximum Output Level (MO_H) at 12.5 KHz, in dB	0	+4	+11	+3	+5	+7
Distortion Level (HDL_3), in dB	0	-6½	-10	-11½	-23½	-21

*Biased for minimum distortion ("B" on graph)
#Biased for flat frequency response ("C")

PROFESSIONAL

On location: Stanton is there where TGIF (Thank God, It's Friday) is filmed.



Go to the Club called *Osko's* in the Los Angeles Area. Revel in the sound around you, supplied to Osko's by Sound Unlimited Systems, Inc., a prime packager of Disco systems. They have supplied 90 systems to Stationary facilities and 60 to Mobile operations.

Sound Unlimited swears by Stanton's 500AL because they have used it for many years until Stanton came out with the 680 EL. Now they use this model exclusively in all of their installations, and endorse it without reservation.

Whether your usage includes recording, broadcasting, archives, Disco or home entertainment, your choice should be the overwhelming choice of the Professionals in every field . . . Stanton Cartridges.

P.S. "Thank God It's Friday" has turned out to be a dynamite film starring Disco Star, Donna Summer.

STANTON!

And remember, you can't get the best out of your Stanton Cartridge unless you use a genuine Stanton Stylus.

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LER 214

decks, pre-recorded Metafine cassettes could be played back successfully, carrying their inherent advantage of high output, low noise and a potentially wider response and dynamic range.

At the New York Convention, Tandberg had set up equipment which showed the peak energy output from Metafine tape, compared with Scotch Master II pseudo-chrome, representing a modern conventional tape. The 5dB improvement overall and the even greater improvement in the high frequency output was evident for all to see.

Subsequently, they copied tracks from direct-cut discs on to Metafine with equally impressive results.

It would appear that, with the new tape and using Dolby-B processing, the dynamic range from an optimised cassette recorder promises to be at least 70dB and this, together with the indication of excellent performance criteria in other directions, should stem any tide of doubt about the quality potential of the compact cassette.

Tentative proposals to produce double-speed cassette decks would lose much of their point.

Metafine tape may also put the lid on the Elcaset, which has been struggling, anyway. It would be seemingly much easier to design and market a new generation of compact cassette decks, compatible with millions of existing standard cassettes, than it would be to instal a new format and displace the old.

There may even be a breath of cold air over traditional domestic reel to reel machines, as their advantages become less obvious.

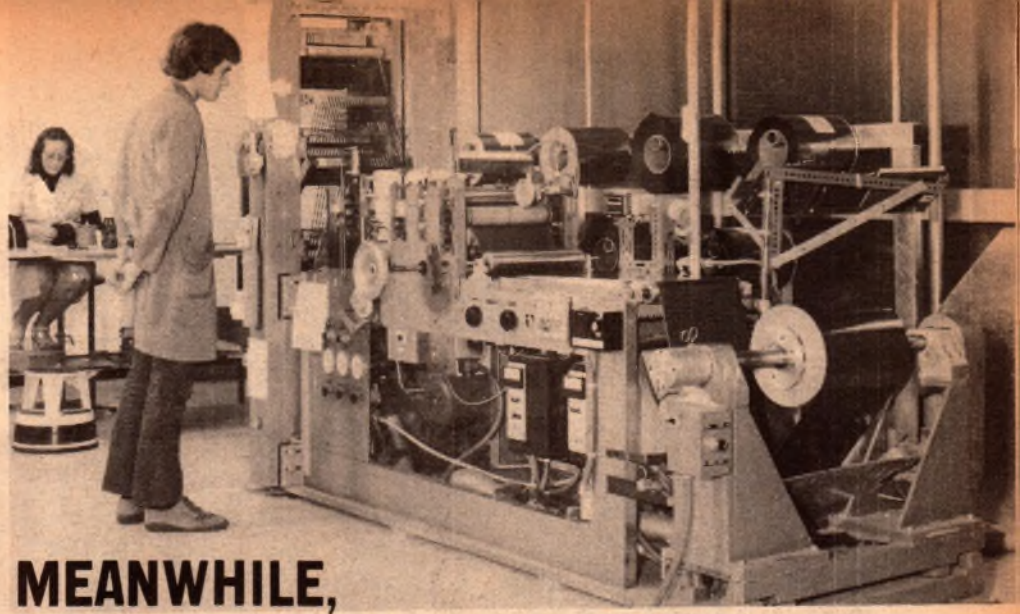
Some observers are tipping that the revolution will not end there.

EXTRA PLAYING TIME

They point out that many domestic users are perfectly happy with present-day cassette decks — and tapes — in part because of the limited ability of the average adult ear to resolve either extreme treble, or low-level tape hiss. For them, an improvement in either direction would be a largely academic exercise.

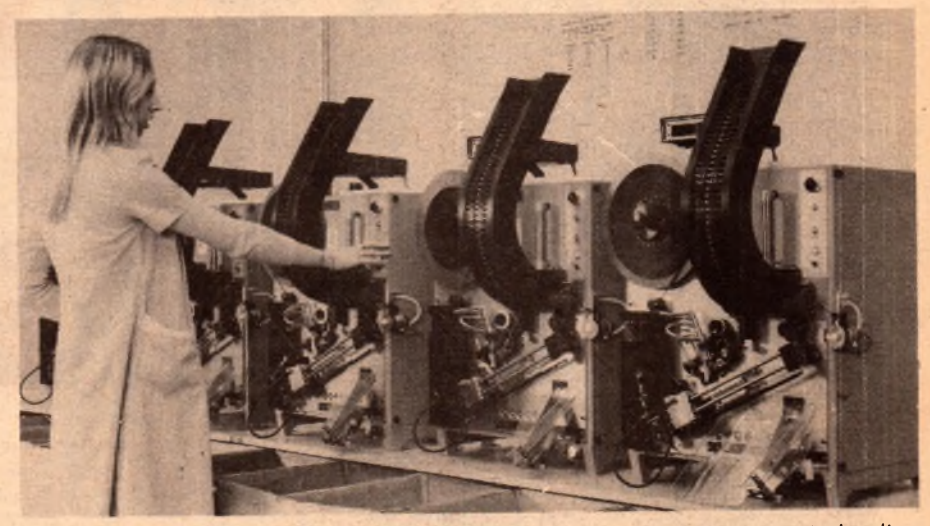
They might be more impressed, however, by the ability to operate a Metafine cassette at half speed, retaining something like the present standard of reproduction but doubling the playing time. Even a quarter-speed option may not be unthinkable for background music, talking books, etc, adding up to 6 hours of program on a C-90 style cassette!

Controlling tape movement at such low speeds, and minimising wow and flutter would present formidable problems — but probably no more formidable than was the task of getting

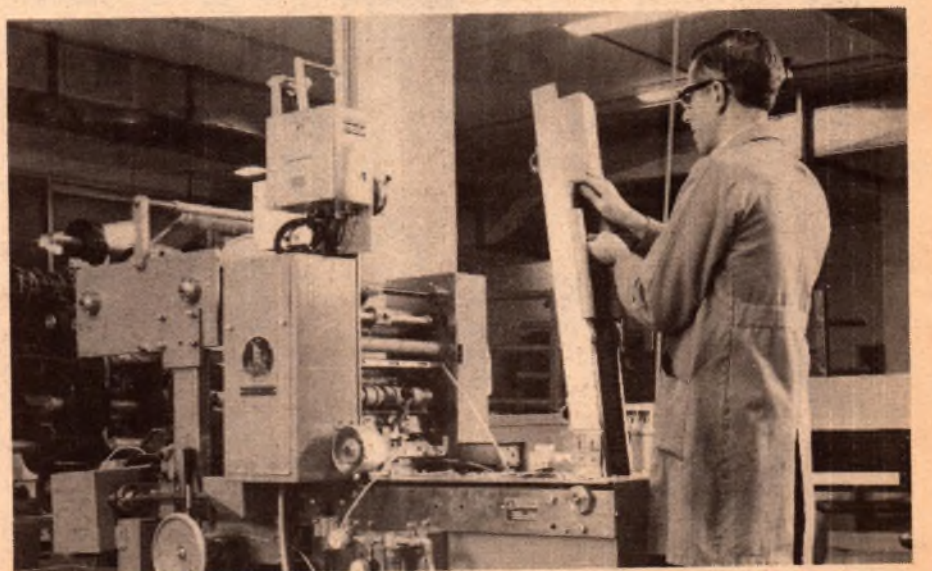


MEANWHILE, IN SYDNEY . . .

. . . Ampex Australia Pty Ltd, of 4 Carlotta St, Artarmon, NSW have set up their own local tape plant. As shown above, the oxide coated webs are slit to cassette width on a precision slitting machine.



Cassette tape is loaded into screw-assembled shells on King automatic loading machines. The 364 20/20+ series is the top of the line Ampex cassette.



Cassettes are packaged after each one is tested for mechanical properties. All tapes pass through a degausser prior to bulk packaging and shipping.

Music gets you up. Our new AD cassette will take you higher.

Music should be white hot, clear through to its soul, like live music. If your music at home doesn't cook like the real thing, check your cassette – the high frequency sounds, where lead guitars, synthesizers and the like really live, and probably getting lost or distorted. ■ Our new AD is designed to deliver those critical highs. The lows, mid-range and highs open up, your music breaths all the way through. ■ AD performs its magic in any cassette recorder, at home, in the car or portable, with or without a 'Normal' bias/EQ setting. AD's ultra-reliable super precision cassette comes in 45, 60, 90 and 120 minute lengths.

TDK AD

The machine for your machine.

Convoy International Pty. Ltd.
4 Dowling Street, Woolloomooloo, N.S.W. 2011. Tel. (02) 358 2088

our current decks down to their present, impressive figures!

Where it will all end up will depend on many factors but one thing appears to be certain: thanks to continuing development, and now to the promise of a new class of tape, the compact cassette still has plenty of places to go!

Intended for the more serious recordist, this Teac PC-10 portable stereo cassette deck offers performance specs better than many mains-powered decks. Its features include Dolby noise reduction, 3-step mic input attenuator, switchable bias and equalisation, peak limiters, a peak level LED in addition to the twin VU meters, and an inbuilt mono monitoring amplifier and speaker. It runs from either six internal "D" cells or a mains power pack (supplied). The PC-10 is not in good supply, but you can find it in the larger hi-fi retailers.

AUDIOSOUND ELECTRONIC SERVICES have added a new medium size monitor loudspeaker to their "80 Series" range. Identified as the Minuett 8033, the units pictured employ two small drivers with a special crossover network using only air-cored inductors and polyester capacitors. Audiosound claim that the networks are fully phase

and impedance equalised and that the enclosure itself conforms precisely to design parameters laid down by Thiele and Small. Fifty of these units were supplied recently to the Australian Broadcasting Commission, which also has over 300 LD40 PM stereo monitor amplifiers in service supplied by Audio Sound Electronic Services. The company's address is 148 Pitt Road, North Curl Curl 2099. Telephone (02) 938 2068.

A "SELF GUIDING SYSTEM" formerly known as the "Cave System" has been installed to guide tourists around the 10 feature buildings in the historic Lachlan Vintage Village, at Forbes, NSW. The $20,000 project was funded by the NSW Government through its Department of Tourism.

Designer of the system, Mr Darryl Petrie, is a special projects engineer attached to the Technical Services Branch of the NSW Government Stores Department.

While supervising final commissioning of the system, Mr Petrie explained that the equipment was designed originally for use in caves, such as at Wombeyan, NSW. However, the system at the Lachlan Vintage Village is capable of expansion to operate in conjunction with audio-visual equipment, such as closed circuit TV, multi-screen projectors and even automatic theatrettes. Similar equipment was finding application in National Parks and Wildlife Centres throughout the state.

At the heart of the unit is a bank of 10 cartridge playback units fitted with endless loop tapes. These are activated when a visitor presses the relevant button; after dispensing the recorded information, the players stop automatically and await the next call. The information is played through hidden loudspeakers powered by 35W amplifiers, using a 100-volt line distribution system. Appropriately, the electronic equipment for the network is housed in the Black Ridge Telegraph Office building.

STUDIO ELECTRONICS PTY LTD are offering the "Sensomatic 400 System" which is designed to take the hassle out of Ni-Cd batteries for those who use them in portable audio and

photographic equipment, etc. In their literature, Studio Electronics stress that Ni-Cd batteries present a number of practical problems to the user, such as determining the state of charge, a suitable rate of charge, when charge should be tapered or terminated, whether a cell will exhibit the anticipated A-H capacity, how well it matches other cells in a battery pack, and so on.

The Sensomatic system senses the true condition of a cell during the low point in the charging input cycle so that it can be used safely with cells that have had either a shallow or deep discharge, or whose state of charge is unknown. It can charge battery packs from 5V to 30V and with cell sizes from 2Ah to 10Ah.

As an extension of the Sensomatic charging system, Studio Electronics can also supply matched batteries in a variety of standard packs. The address is 3 Burwood Rd, Burwood, NSW 2134. Tel (02) 747 5686.

AUDIO TELEX COMMUNICATIONS PTY LTD have announced a new range of amplifiers for public address and sound reinforcement. Designated as the "DI Series", they are said to offer all the most needed facilities at an attractive price level. The DI series are fitted with XLR microphone sockets, low impedance balanced mic inputs, auxiliary inputs, bass and treble controls and a variety of output provisions — different voltages, impedances and even for 600 ohm line. The amplifiers are rated for 35 watts output (as pictured) 60 watts and 100 watts, with a 100 watt booster also available.

Shown in the lower picture is a 160 plus 160 watt dual channel power amplifier manufactured by Techcraft. Using silicon transistors and fully overload protected, the amplifier has a rated response from 10Hz to 20kHz

with a total harmonic distortion of .05%. A smaller model offers 75 watts per channel but with similar response and distortion ratings.

For details of the above amplifiers: Audio Telex Communications Pty Ltd, 54 Alfred St, Milsons Point, NSW 2061. Tel (02) 929 9848. Also in Melbourne and Brisbane.

Teac A-2300SX stereo tape deck has solenoid control

Teac's A-2300SX has been around in the same basic form for around five or six years. It is a three-head, quarter-track solenoid-controlled deck which is now available at a very attractive price. It also offers two-speed operation, mic/line mixing and facilities for a remote control and external timer.

Compared with other reel-to-reel tape decks and with cassette decks in particular, the Teac A-2300SX is notably clean and simple in appearance. Partly this is because elaborations which are commonly found (and expected) on current generation cassette decks are not present. These include Dolby noise reduction, memory rewind, Led overload indicators, and a multiplicity of bias and equalisation switches.

On the Teac reel-to-reel, your money goes for three-head operation, ruggedly engineered transport and all-solenoid control. So while it possibly looks less complicated, it is potentially capable of doing a better job in certain respects.

Another contrast with the cassette medium is in the weight and size of the deck. While it may not look particularly big or cumbersome, it is a brute to carry for anything more than a short distance, because it has no handles. Dimensions of the deck are 440 x 392 x 210mm (W x H x D) and mass is 18kg.

The deck can be used horizontally or vertically but, either way, ventilation around the machine must not be restricted, as it pumps out quite a fair amount of heat. Power consumption is 95 watts.

Six push-buttons control the operation of the deck transport. The buttons actuate micro-switches which, in turn, control the three motors and the various solenoids via a bunch of relays. By pressing the Record and Pause buttons you can put the heads into the recording mode without starting the tape. The recording can then be made by pressing the Play button for start and the Pause button for stop.

The deck stays in the recording mode until the Stop or fast-wind buttons are pressed — or the tape runs out.

Interlocked with the Record and Pause buttons are the two toggle switches under the righthand recording meter. These select left and right channels to be recorded; if they are both off the deck cannot be set in the recording mode.

Two-position toggle switches are provided for bias and equalisation settings. The settings are simply marked "1" and "2" which tells you nothing. You must refer to the manual where Teac have provided a list of popular tapes and recommended settings. While this is reasonable, we think the switch settings could be more self-evident.

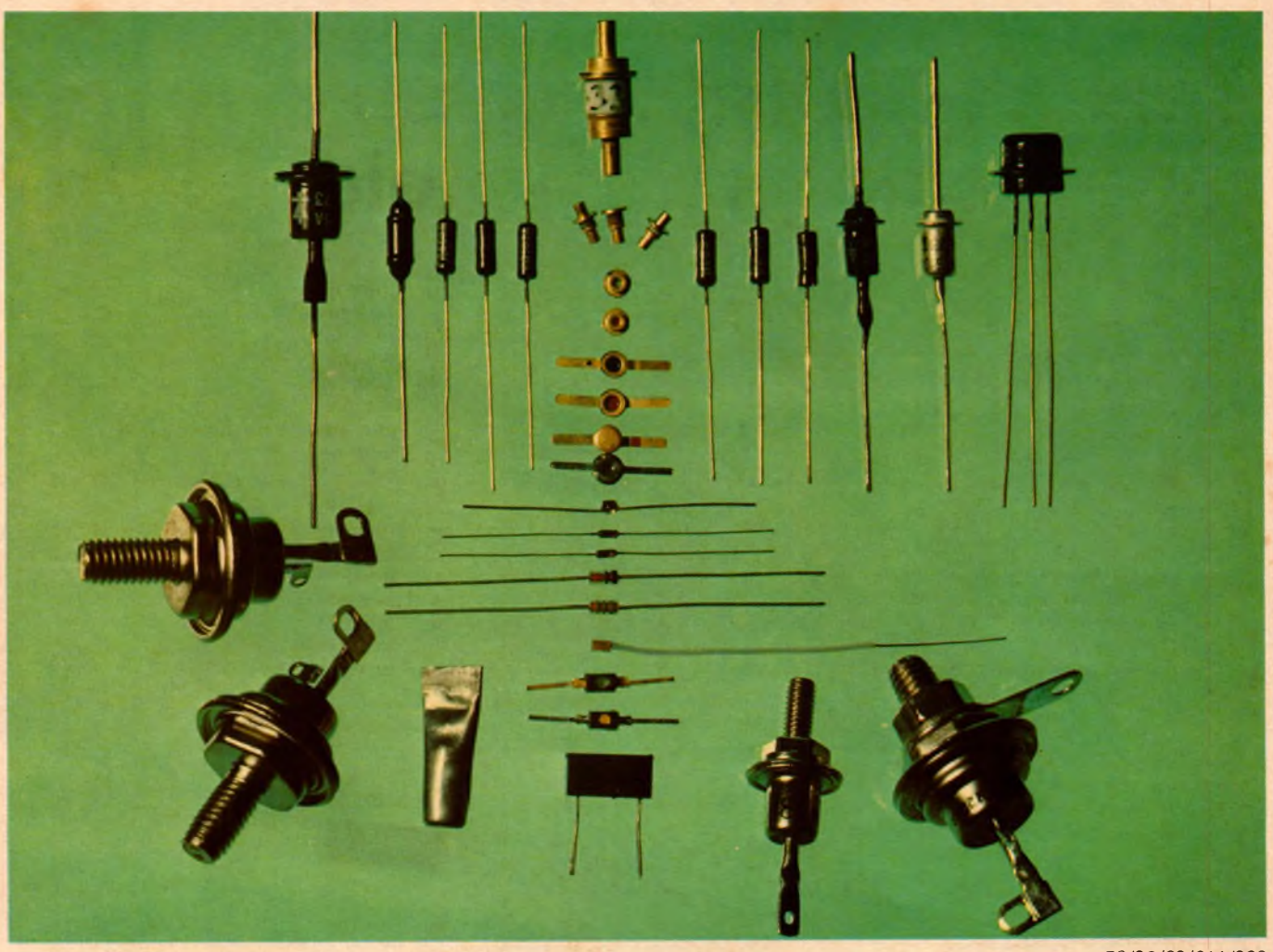
We are also of the opinion that the switches do not provide enough flexibility and would prefer to see a continuously adjustable bias control to enable optimum settings to be made.

Separate knobs are provided for microphone and Line input mixing. Independent control of each channel is possible, with the knob halves friction-coupled for normal stereo recording. The Output level control adjusts both the Line Out and Headphone levels and monitoring can be done off the tape or from the source being recorded.

High speed monitoring can be performed while fast winding is in progress for quick program location. This is done with the aid of a small lever associated with the capstan. This lever moves the tape lifters so that the tape touches the heads while fast wind is in progress. Normally the device should be defeated so that undue head wear does not occur.

A resettable four-digit revolution counter sits below the left-hand reel. This is not the best position for it as it can be obscured, depending on your

Need reliable circuitry?



78/90/39/611/929

Install Elorg semiconductor devices that benefit from USSR space travel technology.

Germanium and silicon transistors for low (up to 300mW), medium (up to 1.5W) and high (above 1.5W) power ratings, and for low (up to 3MHz), medium (up to 30MHz) and high (above 30MHz) frequencies. Germanium and silicon diodes including rectifiers and pulse, backward, SHF, multi-purpose and tunnel diodes. Breakdown diodes and varicaps. Light-emitting diodes. Gate-triggered and non-controlled thyristors. The ELORG export program includes some five hundred types of semiconductor devices.

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How BASF turn iron

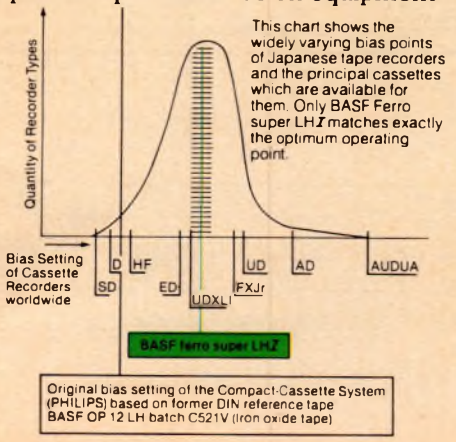
Man has always dreamed of the magic Midas touch that turns everything to gold. In the middle ages they searched for the philosopher's stone but nobody ever found it.

In 1934 in the world of sound, gold was discovered and BASF found it. In that year BASF produced the first magnetic tape and have built an international reputation for 'golden' technology and 'golden' sound.

In goes the iron, out comes the gold.

BASF have developed the finest possible quality Ferric Oxide cassette tape. The new BASF Ferro Super LH *I*.

This tape gives the best possible performance on equipment with Japanese bias setting and has the least background noise on the market for the iron position.
A higher recording volume is possible without interference. So when you play the iron you'll listen to the gold.

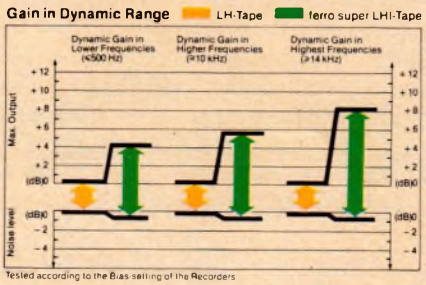


So what's in a new name?

Well, BASF put it this way.

BASF stands for the best possible cassette.

Ferro stands for the ferric oxide particles of equal shape that are evenly distributed over the mirror finish tape surface.



Super stands for the result, because you'll get more output over the entire frequency range.

L stands for Low Noise.
H stands for High Output.
I stands for One.

How else would you describe this cassette's superior place amongst its competitors?

The quality of the sound depends on more than the tape itself.

When the mechanical parts of a cassette let you down, you really feel let down. BASF have developed SM cassette tapes so you can rest assured this will not happen.

SM stands for Security Mechanism. Security mechanism to guide the tape accurately from one spool across the tape head and onto the other spool. Inside a BASF cassette there are two moulded and slightly curved plastic arms which guide the tape and accurately place every layer of tape on top of the last. The result is no 'wow' caused by the tape dragging on the cassette walls or being stretched by snagging tensions. And even when the cassette is dropped the tape is not disturbed inside.

SM
Security Mechanism
Patents Pending

and chrome into gold.

The quiet, efficient purring of the cassette inside its specially constructed shell makes for your listening enjoyment outside.

Switch over to chrome and switch into 'gold'.

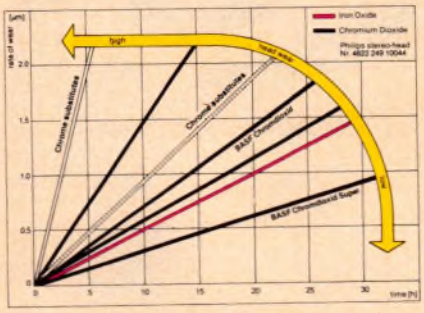
BASF have now launched their Chromdioxid Super cassette which has been produced from the best possible cassette technology in the world.

Golden sounds in anybody's language.

A great amount of controversy has surrounded chrome and it has usually been put out by manufacturers who can't produce the same quality themselves.

Head Wear of Cassettes

CrO, and other tapes recommended for CrO, bias setting and 70 µs equalization



The fact of the matter is that chrome dioxide gives a performance as good as a record. The tape surface is the same as used on videotape. And, BASF should know because they make videotape and no better tape surface is known at present.

When you play a BASF Chromdioxid Super cassette turn the switch of your equipment to the chrome setting and you'll hear really pure, original sound.

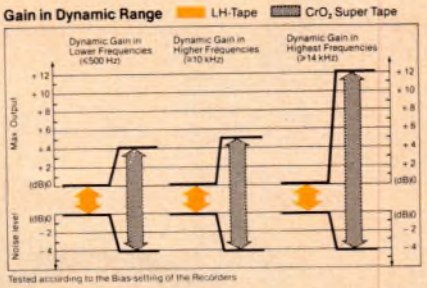
BASF Chromdioxid Super is simply the best possible quality cassette on the market for the chrome position.

What the Mercedes-Benz is to cars, this cassette is to cassettes.

When you have a reputation like BASF's you get used to people trying to copy your successes. But the true test is in performance which is where the BASF Chromdioxid Super really shows up.

As you can see in the diagram there is a considerable gain in the low, high and especially very high frequency dimensions.

Gain in Dynamic Range LH-Tape CrO_2 Super Tape



Tested according to the Bias-setting of the Recorders

This extends the useable frequency spectrum. The result is that the original recording keeps original and the BASF Chromdioxid Super uses the full capacity of the high quality recorders.

So, for equipment with the chrome switch this is the ultimate tape.

The BASF 'golden' story comes to life when you try the cassettes themselves. If you want the best from your cassettes you'll need BASF. BASF Ferro Super LH*I* and BASF Chromdioxid Super.

That's how BASF turn iron and chrome into gold.

BASF

BASF Cassettes.
Purest quality across the range.

De-soldering problems?

The new Weller power vacuum desoldering station for printed circuit board repair. Famous Weller closed loop temperature control protects sensitive components while soldering or desoldering. See-through solder collector is easy to clean or replace. Non-burnable cord sets afford safety and longer life. Low voltage tool inputs give added safety margins. High impact resistant tool handles and stainless steel barrels mean longer tool usage.

Also there's now cordless soldering from Weller – (see right).

Soldering was never easier than with the Weller cordless kit, consisting of iron charger, solder, 4 different tips and a handy screwdriver.

Other products from The Cooper Group include Crescent, top quality electronic pliers; Lufkin, measuring equipment; Nicholson, precision files; Xcelite, professional hand tools and Wiss shears and scissors.

Whatever your requirements, you can choose Cooper products with confidence.

The Cooper Group

CRESCENT · LUFKIN · NICHOLSON · WELLER · WISS · XCELITE

The Cooper Tool Group Limited,
P.O. Box 366, Nurigong Street, Albury NSW 2640, Australia. Telephone: 215511 Telex: 56995

COOPER INDUSTRIES

eye level with respect to the machine. A better position for the counter would have been the space between the reels.

Maximum reel size is 18cm (7 inches). This constraint is set by the timber side panels and the position of the reel hubs with respect to the head block. It seems a pity that Teac could not have rearranged the reel motors slightly to enable the larger 26cm NAB reels to be used. Maybe Teac feel that way too!

At the rear of the deck is a panel accommodating the input and output sockets plus a large socket for an optional remote control or timer.

A three-core mains cord with moulded three-pin plug is fitted to the machine.

Removal of the perforated rear cover reveals the rugged interior of the Teac A-2300SX. Much of the space is occupied by the three large motors and the hefty power transformer which is mounted at the top. It might be thought that with this concentration of mass at the top of the machine that it is top-heavy, but this is not the case.

Most of the deck electronics is accommodated on printed circuit boards in the bottom of the chassis, away from any fields which might be radiated from the motors and transformer.

Included with the owner's manual are circuit diagrams for the preamplifiers, oscillator and transport section. This is commendable and means that the owner is more likely to be able to obtain servicing of the instrument in the future. Besides which, its good to know what is actually in that fancy-looking box.

Accessories supplied with the A-2300SX include an empty 18cm reel, input-output cables fitted with RCA phono plugs, cleaning stick and pads, cleaning fluid, spare fuse, splicing tape and rubber feet. The rubber feet fit on the timber side panels and enable the deck to be used in the horizontal position.

A worthwile accessory which is not available for this deck (as far as we know) and many other decks, is a perspex dust cover. It is assumed that these decks will be used in an air-conditioned environment?

Performance tests on the Teac were made using TDK Audua tape, one of the types listed in the owner's manual. The tests were performed at —10VU rather than the less stringent —20VU requirement for cassette deck frequency response. Even so, the frequency response of the A-2300SX is considerably more extended than for typical cassette decks.

Frequency response at 19cm/sec was a little unusual in that it showed a "plateau" of 3dB above 12kHz which was maintained to beyond 20kHz. This effect might have been reduced with a slight adjustment to the bias, had it been available. At the low frequency end, response was minus 1dB at 30Hz.

At 9.5cm/sec the response was more conventional, —4dB at 18kHz and —2dB at 30Hz, although there was a broad peak of 6dB centred at about 10kHz. Channel balance was within 0.5dB over the whole range from 20Hz to 20kHz.

Signal-to-noise ratio with respect to OVU was specified at 58dB with no qualification as to whether the figure was weighted or not. Our measurements yielded a figure of 50dB unweighted which is quite unremarkable and not redeemable, as with most cassette decks, with the aid of Dolby noise reduction.

Figures for separation between channels were 46dB at 100Hz, 47dB at 1kHz and 43dB at 10kHz and were the same in either direction. These are commendable figures. Harmonic distortion at OVU was 0.65 per cent at 100Hz. 0.7% at 1kHz and 3.5% at 10kHz. At +6dB above OVU, the THD figures increased to 3 per cent at 1kHz and 6 per cent at 10kHz. Using this as an upper limit, the effective dynamic range is 56dB which is not particularly wide.

Wow and flutter at 19cm/sec was 0.035 per cent and at 9.5cm/sec was 0.09 per cent (DIN 45507). Both these figures are very good.

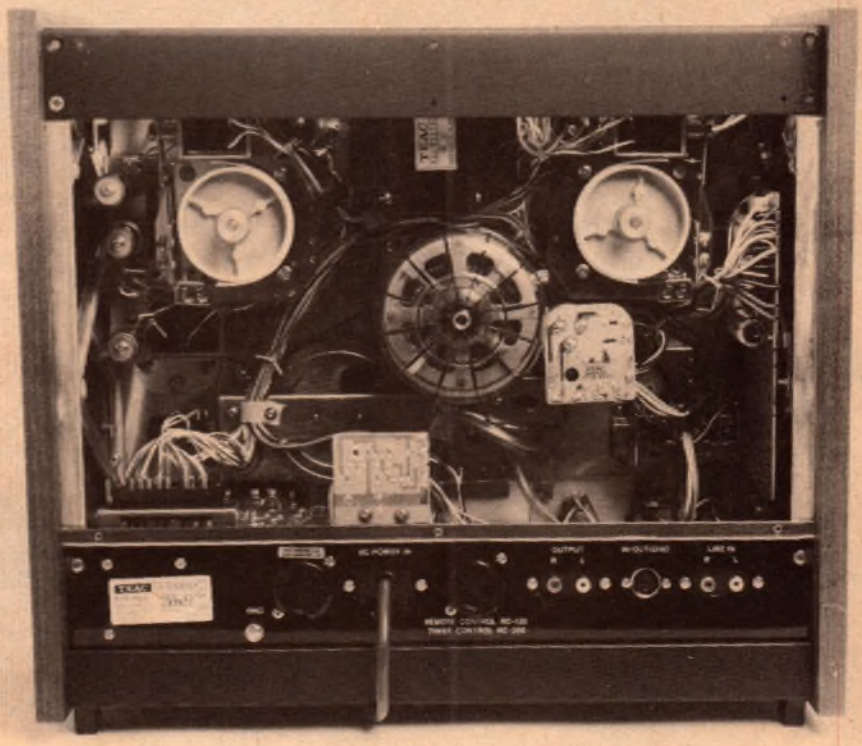
Rewind time for 366 metres of tape (1200 feet) was around 90 seconds which is quite satisfactory and not too fast for even spooling. In fact, we found the transport operated eminently satisfactorily at all times. Apart from the "clunk" of the solenoids, the deck works very quietly when playing or during fast wind.

Listening tests were performed with source material from the local FM stations and from high quality discs. Differences noted at both speeds were slight but could be summarised as a slight brightening of the sound quality (by the Teac) and some increase in the background hiss. The degree to which these effects were notable depended on the nature of the program material.

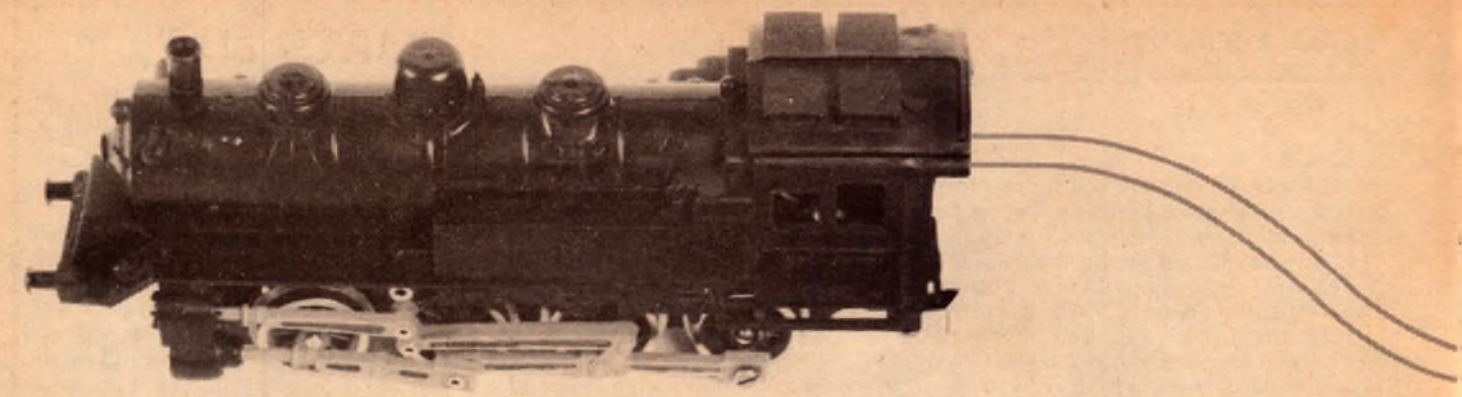
Our conclusions on the Teac A-2300SX are mixed. On the one hand it is undeniably ruggedly designed and well made. It is cleanly styled and easy to drive with a fool-proof solenoid control. Frequency response with different tapes could be optimised if there was further bias adjustment available. As it is, the user must tweak the machine to suit a particular tape or (as a corollary) find the tape which performs best. Signal-to-noise ratio is but modest.

Still, with a recommended retail price of just $449.00, the Teac A-2300SX must be a very attractive consideration for any reel-to-reel tape enthusiast.

Further information on the Teac A-2300SX and other recorders in the range can be obtained from high fidelity retailers or from the Australian distributors for Teac equipment, Teac Australia Pty Ltd, 165 Gladstone Street, South Melbourne, Victoria. (L.D.S.)



Rear view of the A-2300SX. Note that massive capstan flywheel.



High performance model train controller

by PETER STUART*

Utilising pulse width modulation techniques, this high performance train controller is designed to overcome the limitations of conventional controllers. Its main features include reliable starting and low speed running, a Westinghouse "air brake" (with optional air sounds), simulated inertia, and a speed indicating meter.

If you were to ask a model railway enthusiast where his greatest operating problem lay, he would most certainly point to the train controller and tell of its inability to reliably produce smooth starts and stops, and slow running speeds.

Over the years, a number of electronic circuits have been devised to overcome these difficulties, including transistorised and thyristor controlled types. In addition, circuits have been developed to artificially introduce inertia effects for starting and stopping; and simple braking facilities have been provided to work against the inertia effect.

Although they are a vast improvement over simple rheostat controllers, these circuits still leave something to be desired when it comes to starting and slow running This is because they are still locked to the waveform generated by a full wave rectifier on a 50Hz supply. Fig. 1(a) shows a typical rectified 100Hz half sine wave; Fig. 1(b) the output of a transistorised controller at low speed; and Fig. 1(c) the output of a thyristor controller.

* 24 Carmen Drive, Carlingford, NSW 2118.

It can be seen that neither of these control circuits presents full voltage pulses to the track at low speed.

Full voltage pulses are obviously an advantage where there is the slightest trace of contact resistance at the wheels or the pickup brushes, as usually happens at starting. A recent transistor controller presented in "Electronics Australia" featured a "kick in the pants" circuit, designed to deliver a short pulse at full voltage to the track to aid starting. It occurred to the writer that if a series of such pulses were to be continually generated, the locomotive motor would always be supplied with full voltage to overcome contact resistance. Speed could be controlled by varying the width of the pulses. In short, this would be a true pulse width modulation speed controller, as depicted in Fig. 1 (d).

As a first step, the circuit shown in Fig. 2 was constructed and tested. The circuit consists of a basic relaxation oscillator using IC1, a voltage comparator using IC2, and a Darlington pair transistor output stage. The relaxation oscillator produces a triangular waveform at pin 2 of the IC, of average value Vcc/2 (i.e. half the supply voltage) and with an amplitude of ± 2 volts. The

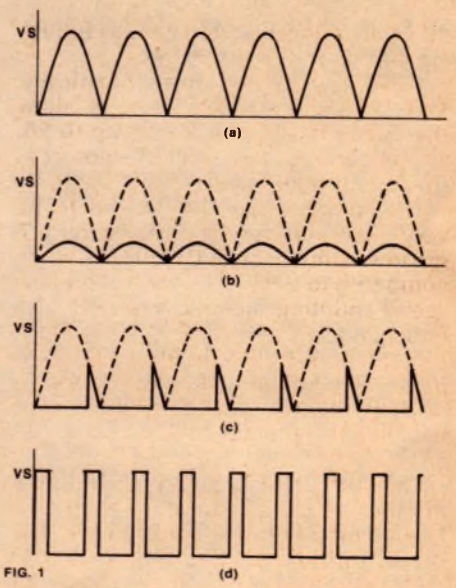
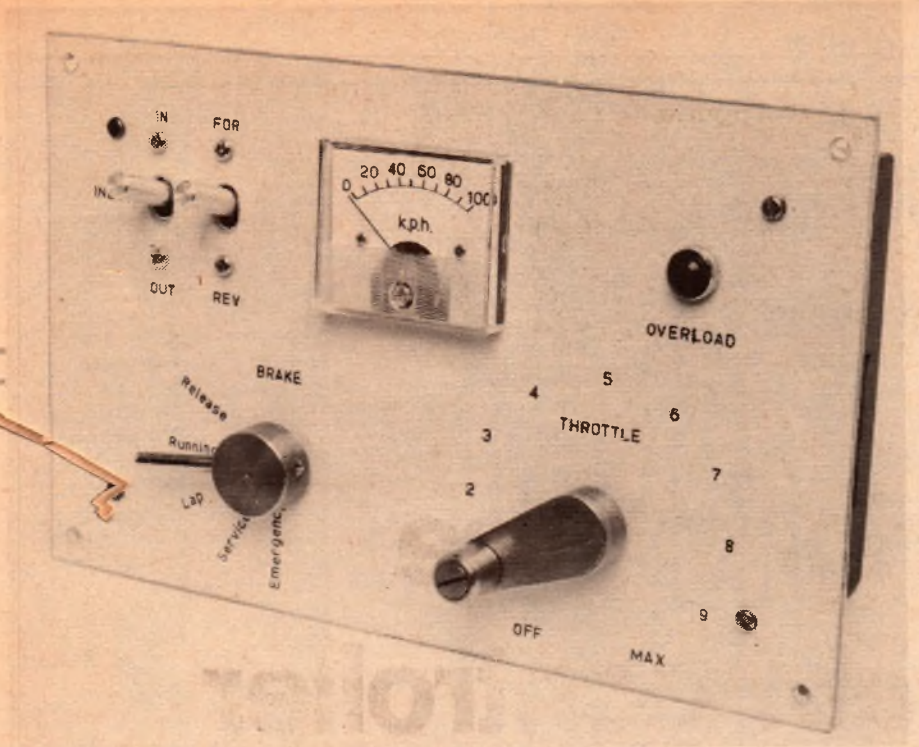


FIG. 1

frequency of oscillation is determined by the R1, R2, R3, C1 network.

The triangular pulses are fed to the inverting input of IC2, while the non-inverting input has a variable DC control voltage applied to it from the throttle pot R4. IC2 acts as a voltage comparator, the output of which swings low or high each time the triangular waveform goes more than a few millivolts below or above the control voltage. By varying the control voltage, IC2 can be made to change state at any point on the triangular waveform. Hence the pulse width at output can be



An oversize front panel allows the unit to be flush mounted on the railway board. Control knobs were specially made by the author.

PARTS LIST

1 PC board, 78mc10, 190 x 105mm
1 plastic case, 196 x 113 x 60mm
1 perspex sheet, 226 x 143mm
1 panel meter, 50uA
1 12V 60/45W auto globe
1 red lamp bezel
2 DPST toggle switches
1 2 pole five-position switch
1 relay, Davall 21/2C5 185 ohms, or similar
1 5-way terminal block
4 35mm metal spacers
4 46mm metal spacers

SEMICONDUCTORS
1 2N3055 NPN transistor
1 BFY50, TT801, 2N3053 or similar NPN transistor
2 741 op-amp ICs
1 IN5624 silicon diode
9 EM401 silicon diodes

CAPACITORS
2 5000uF 25VW electrolytics
2 100uF 25VW electrolytics
1 0.1uF polyester

RESISTORS
(½W, 1% tolerance)
1 x 820 ohms, 4 x 1k, 1 x 4.7k, 1 x 6.8k 2 x 56k, 1 x 100k, 1 x 150k, 1 x 10k linear pot, 1 x 5k trimpot, 1 x 10k trimpot, 1 x 47k trimpot, 1 x 220k trimpot, 1 x 2.2M trimpt.

controlled linearly from zero to full cycle width.

Fig. 3 depicts this diagrammatically. The Darlington pair transistors allow the pulses to switch currents up to 5A, and so control most small DC motors as used on model railways.

The simple controller proved to be very successful under test, yielding a greater number of reliable starts when compared to a thyristor controller. Low speed shunting manoeuvres were also enhanced.

Incidentally, this circuit can be used in any low voltage DC motor application such as in model boats, windscreen wipers and fans, up to a maximum of 5A.

The complete circuit incorporating a number of extra features is shown in Fig. 4. The difference between this and other controllers is the requirement of a filtered DC power source. Diode D1 and capacitor C1 form a low current DC supply to the ICs and control stages. D2 and C2 form a high current supply for the relay and output stage.

With 10,000uF of capacitance, ripple on the output is negligible for currents up to 2A. At 4A the ripple did not appear to affect train running, although a CRO showed it to be superimposed on the internally generated rectangular wave output. Diodes D1 and D2 are necessary to isolate the two supply lines from each other, and from any other controllers sharing a common supply. They also offer protection against accidental reverse polarity.

It should be noted that the diodes do not obviate the need for a full wave bridge rectifier and transformer, supplying around 15V DC to the controller.

The rest of the circuit is based on the simple controller of Fig. 2, but with some additional circuitry for inertia and braking added to the throttle pot. Since the triangular pulses being fed to pin 2 of IC2 have minimum and maximum values of approximately 5 and 9 volts, the throttle voltage must also cover this range and ideally a little more. R6, R7, R8 and R9 form a potential divider across the supply so that R7 has a range of 4 to 10 volts, with the lower end being adjustable using R9.

The inertia capacitor C4 is connected between the wiper arm and the earthy end of R7, in series with inertia resistors R10 and R11, the brake switch S1(b), and the relay contacts. Assuming the relay contacts are closed, the brake in the 'running' position and the throttle opened wide, C4 will charge through R6, R7, R10 and R11 from 0 to 6 volts in approximately 40 seconds and discharge through R7, R8, R9, R10 and R11 in 30 seconds when the throttle is closed. Because C4 is floating at approximately 4V above earth, the voltage at pin 3 of IC2 rises from 4 to 10 volts when the throttle is opened. If instead of floating, the capacitor was earthed, considerable time would elapse after opening the throttle before C4 reached the minimum 5V required for output at IC2, and hence train motion.

To understand the operation of the brake circuit, a brief explanation of the

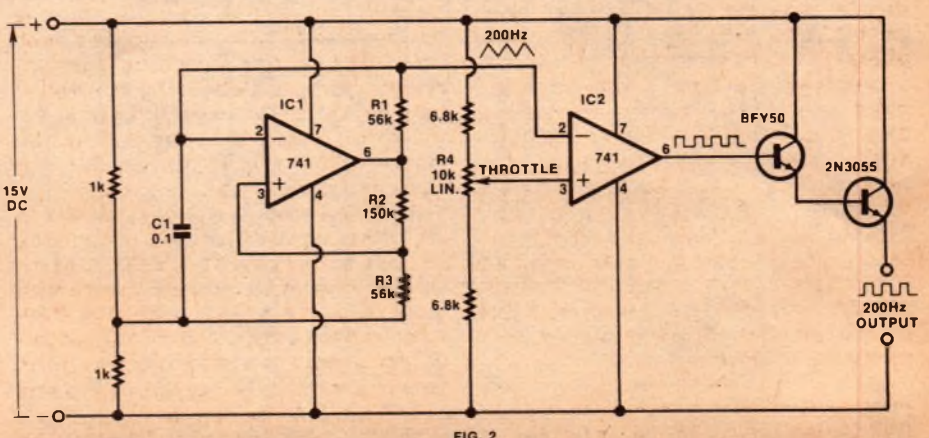
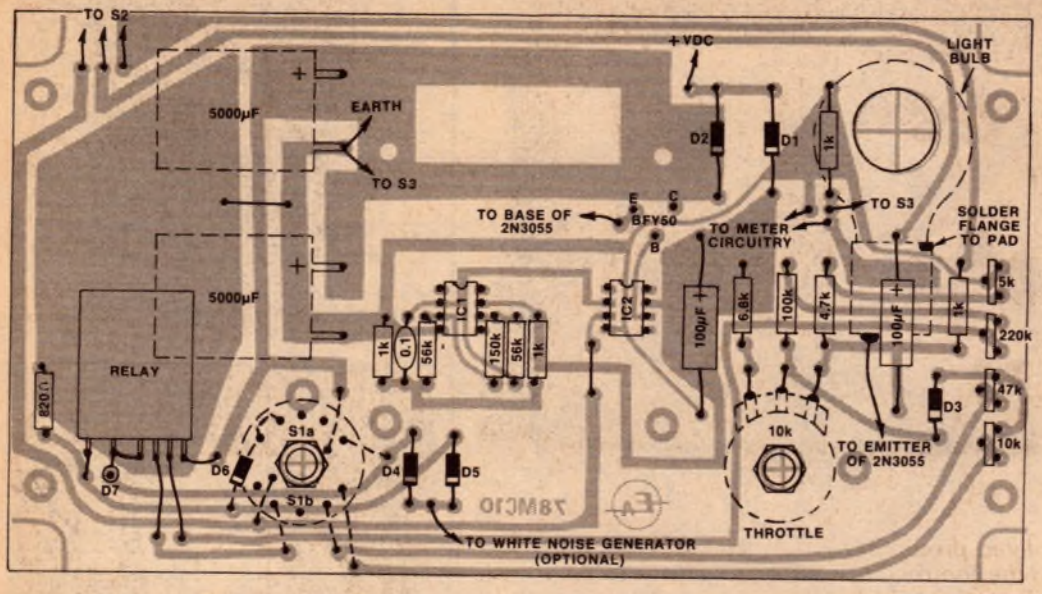


FIG. 2



The overlay pattern shows the PC board from the component side. Components shown dotted are mounted underneath the board; relay is glued to top of board. Make sure that the overload lamp is correctly aligned with its board cut-out.

Diagram illustrating how pulse width output from IC2 is varied by varying the control voltage to the non-inverting input. Triangular pulses are fed to the inverting input of IC2, which acts as a comparator.

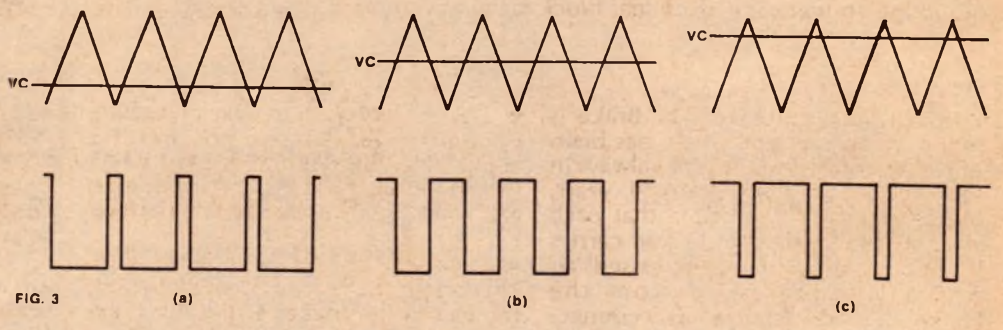


FIG. 3

Below is the complete circuit diagram of the new model train controller.

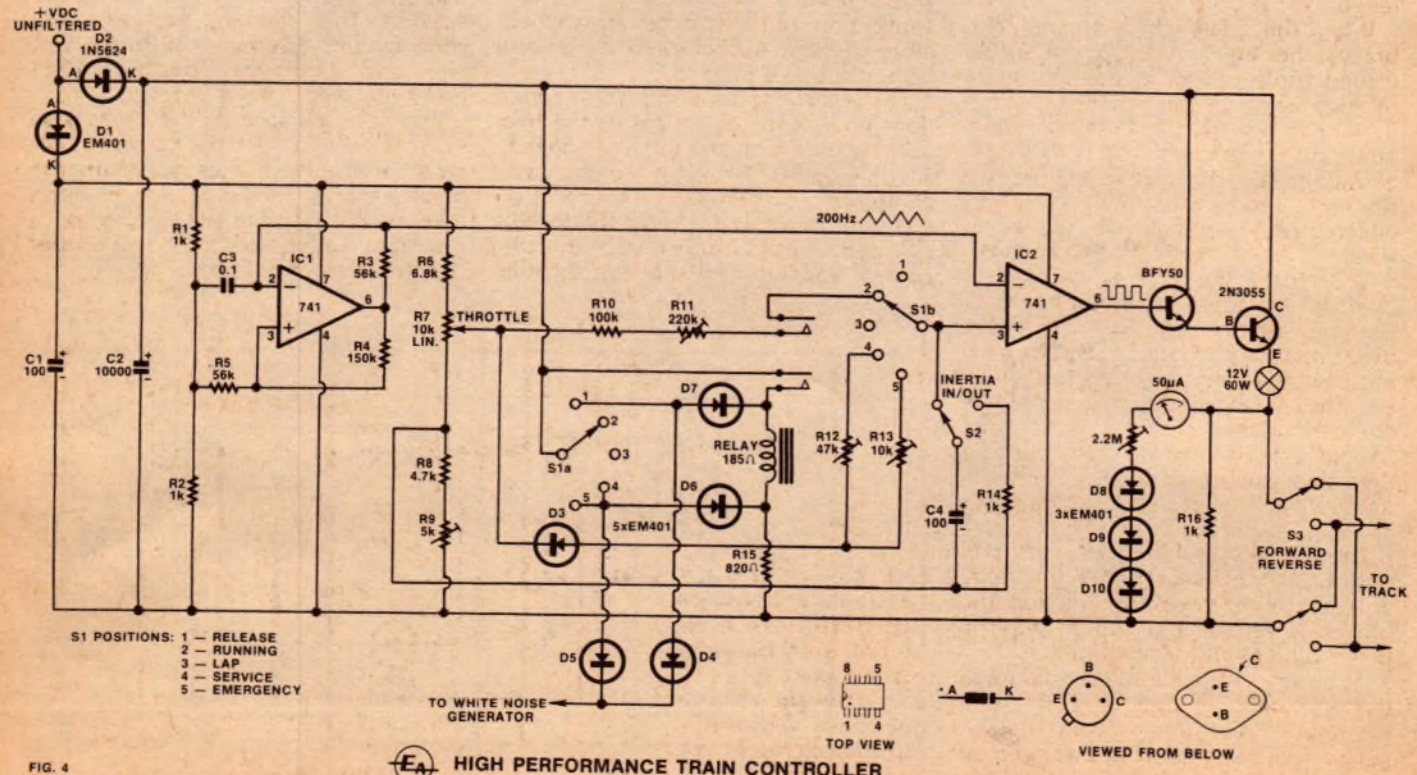
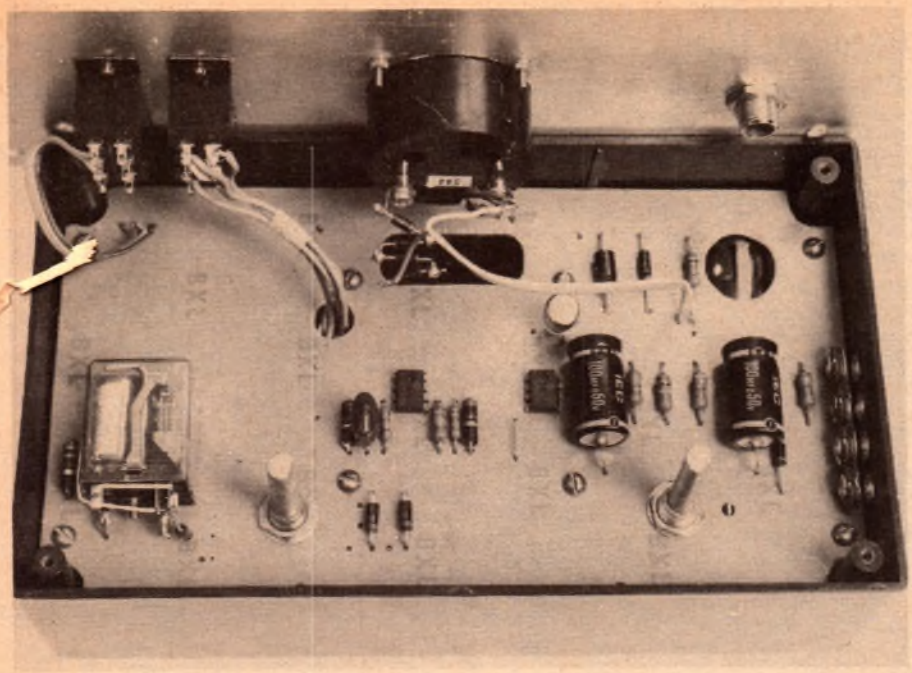
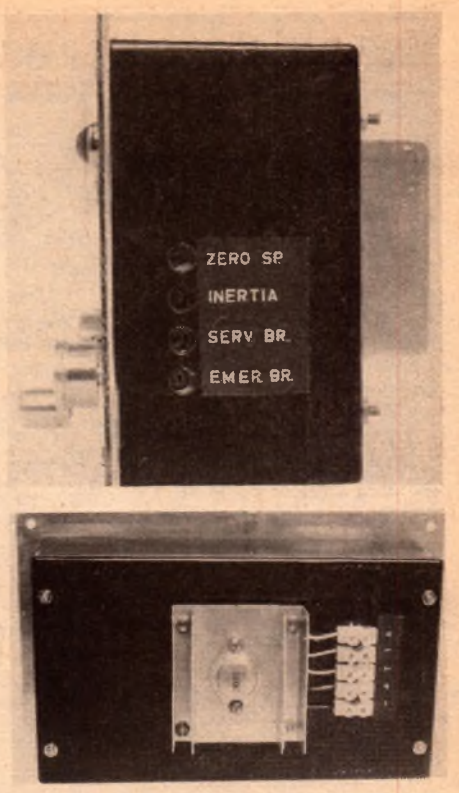


FIG. 4

E4 HIGH PERFORMANCE TRAIN CONTROLLER

2/MC/-





Above: view inside the completed prototype. A few detail changes have been made to the PC pattern around the control pot and switch since the unit was built. Photos at right show trimpot adjustment holes in side of case, and power transistor mounting arrangement. Terminal block facilitates external connections.

Westinghouse Automatic Air Brake is required. This system, which has been in almost constant use by all railways in the world for more than 50 years, makes use of the principle that each waggon and carriage in a train carries its own reservoir of compressed air which is replenished from the locomotive's compressor via a connection to a brake pipe running the full length of the train.

When the driver wishes to apply the brakes, he 'signals' to special valves (called triple valves) in every waggon by exhausting air (and thereby reducing the air pressure) in the brake pipe. This causes the triple valves to move, and admit air from each waggon's air reservoir into its own brake cylinders, which push brake pads onto the wheel rims.

To release the brakes, the driver "signals" the triple valves back to their running position by restoring brake pipe pressure. The latter move also permits the air reservoirs to be replenished. The advantage of this seemingly complex system is that it is fail safe. Should any part of the train become detached, the brake pipe hose connections will sever, exhausting air and thus applying the brakes.

The driver's brake handle has five positions, each with a specific function:

- Release — used to release the brakes by admitting air rapidly into the brake pipe to restore pressure;
- Running — the handle should be in this position at all times while the train is running. Brake pipe pressure is maintained near maximum, and waggon air reservoirs are replenished;
- Lap — a position where nothing happens; the brakes are neither applied nor released. It is used when the driver has made a brake application and wants to maintain the rate of slowing;
- Service — normal brake application. The longer the brake is in this position, the harder the brakes go on. Air is exhausted from the brake pipe;
- Emergency — similar to service application, but the brakes are applied more quickly. Air is rapidly exhausted from the brake pipe.

The controller duplicates these functions realistically by means of the two pole rotary switch and the relay. Switch S1(b) causes braking to be accomplished by switching either R12 or R13 into circuit to discharge the inertia capacitor. It also affects the throttle control voltage such that the throttle will only operate if the brake handle is in the running position.

The other half of the switch S1(a) operates the relay. One set of relay contacts affect the throttle such that the relay must be energised for the throttle to operate. The relay can only be energised by briefly releasing the brakes whence the relay latches on through its holding contacts. The relay will drop out whenever the brakes are applied. This happens because S1(a) short circuits the relay coil in the service and emergency positions. R15 limits the short circuit current.

The sole purpose of the relay is to make it necessary for the driver to correctly release the brakes by moving the handle briefly to the release position then to the running position, as on a real train. Failure to do this will render the throttle inoperative.

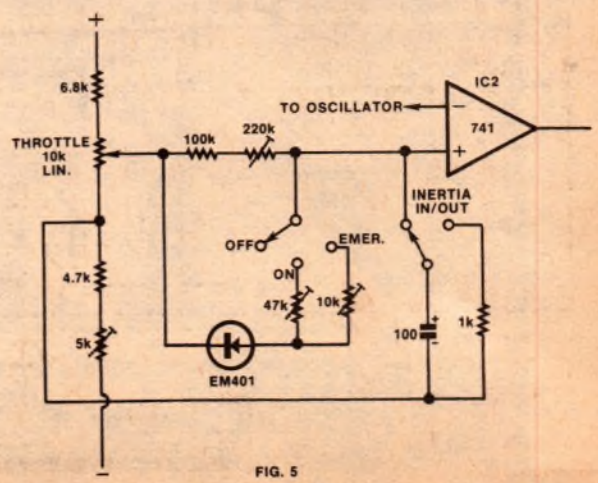


FIG. 5

Simplified braking circuit using a 3-position switch. This circuit may be preferred by some readers since it eliminates the relay and does away with the throttle interlock arrangement.

For additional realism, a white noise generator and amplifier can be connected where shown to S1(a) to produce realistic air brake noises in the release, service and emergency positions. The output is a 15V DC supply suitable for driving a white noise generator through a relay. The load should not exceed 10mA. Suitable white noise generator cricuits appeared in "EA" in October 1972 and April 1978.

The inertia in/out switch simply isolates inertia capacitor C4 and discharges it through R4. Train control is then by throttle only. The brake must be in the running position and the relay energised (by releasing the brakes).

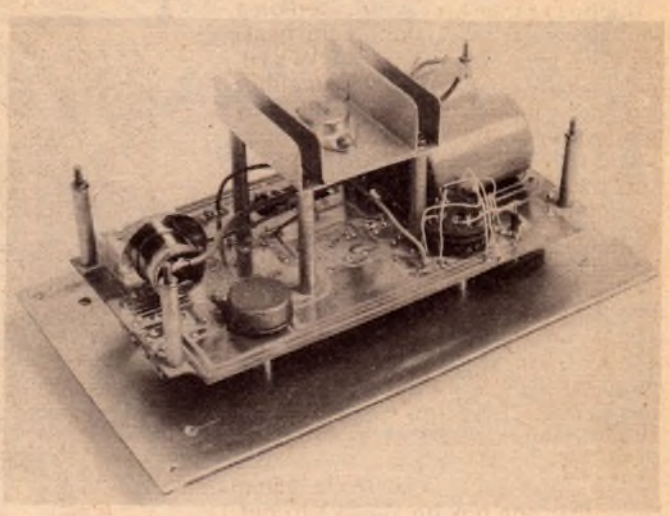
For those who may find the complexity of the braking circuit a little overwhelming, a simple circuit featuring a 3 position brake is shown in Fig. 5. The positions are: off, on and emergency; and there is no interlock with the throttle. The relay is eliminated.

The speed meter is an optional extra which is particularly recommended for the serious modeller. Considerable enjoyment can be achieved by driving trains to set speeds on different sections of track, speeding up for some and slowing down for others.

The meter is a small panel type of 50uA FSD, although other ranges may be suitable. It is connected as a voltmeter across the output and scaled 0 — 100kph. Resistor R17 is used for calibration and diodes D6, D7 and D8 are utilised to delay meter movement until the average output voltage has risen to around 2V. Most locos will not begin to move until track voltage exceeds 2V.

The globe in series with the output is a 12V 60/45 automotive type, with only the 60W filament being used. The globe will limit any overload condition to about 5A and provide visual indication of the overload through a red lensed bezel.

Using the component values shown, IC1 will oscillate at about 200Hz. This frequency was found by experiment to produce smooth low-speed running without the loco motor emitting an an-



This view clearly shows how components are mounted on the back of the PC board. Note again that the PC pattern has been modified since the prototype was built. Cutotuts at corners of board are to clear mounting pillars in box.

noying audio whine. For those interested, changing any of the components R3, R4, R5, C3 will vary the frequency, although this will not have any affect on the speed regulating nature of the output pulses.

The power transistor is mounted on a homemade 20 SWG aluminium heatsink. This measures 60 x 70mm (W x H), and has two 20mm wide fins on either end. It is supported off the PCB by 46mm spacers which also serve to supply collector voltage to the transistor. The heatsink protrudes through a 65 x 75mm cutout in the base of the box.

Construction of the controller is quite straightforward, and is open to modification by individual constructors. The author's unit utilised a printed circuit board measuring 190mm x 105mm, upon which most of the components, including the throttle pot, brake switch, relay and overload lamp, are mounted. The PCB is supported in a plastic box on 35mm spacers.

The front panel was made 15mm larger than the box on all sides to permit flush mounting on the railway control board. The panel consists of a sandwich of 18 SWG aluminium and a sheet of white card with black lettering, topped by a 1.5mm thick clear acrylic sheet (perspex). This makes a professional looking, hard wearing panel which is relatively easy to manufacture. Panel lettering can be done with Letraset for a professional finish.

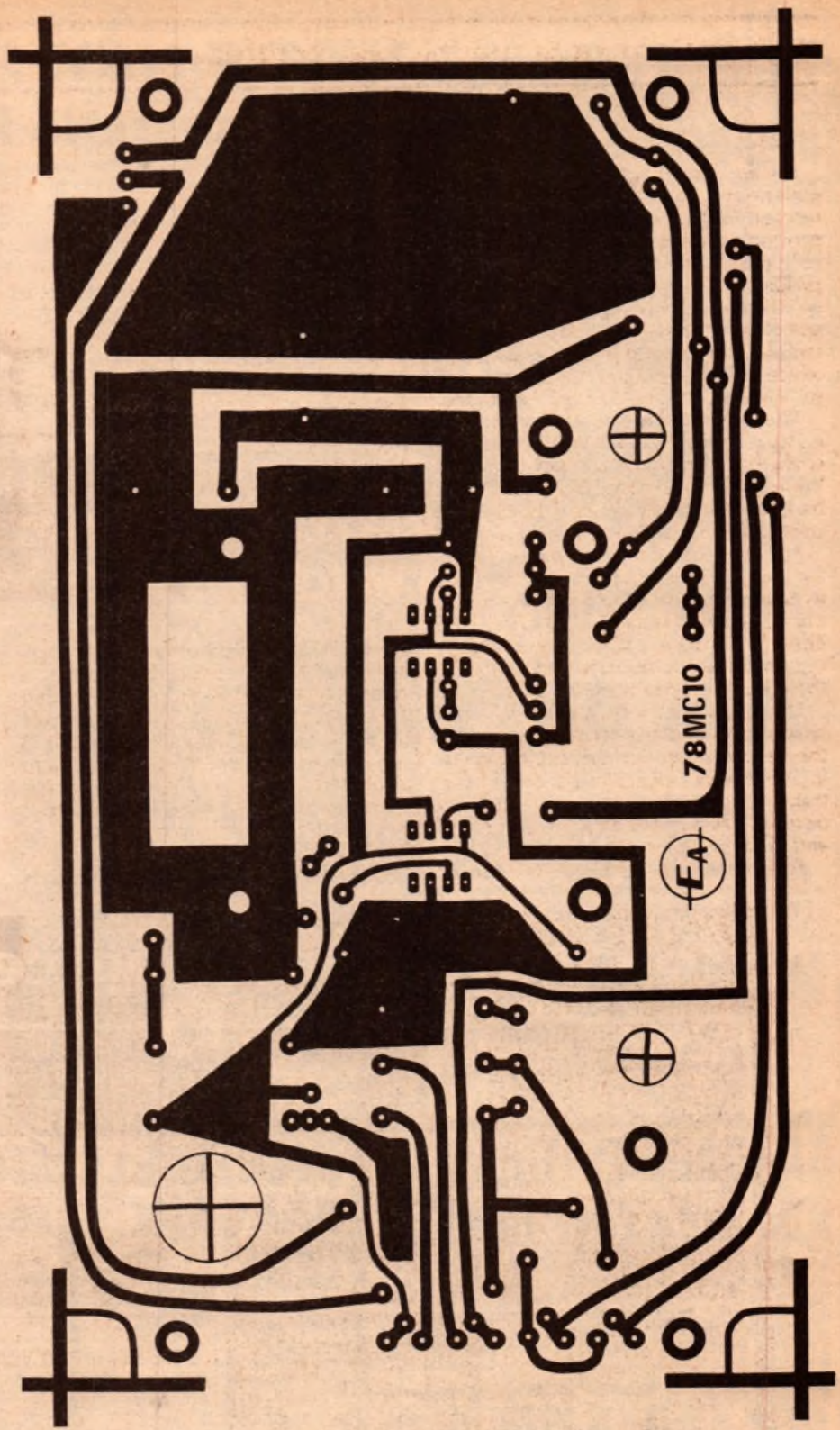
Construction should commence with the PCB which is etched in the usual manner. After drilling, clamp the PCB to the front panels so that the various holes which they share in common can be drilled through. This will ensure accurate alignment later on.

Solder all minor components to the PCB, then mount the pot and switch. The pot connections are soldered directly to the board while the switch requires individual lead wires as shown on the component overlay diagram. The relay is simply glued to the top surface of the board. The overload lamp must have a flat cut into its flange and the nickel plating filed off nearby, ready for soldering. Provide a generous fillet of solder on both sides of the flange and onto the copper pad.

Mount the meter, bezel and switches and connect the respective wiring. The trimpot and diodes associated with the meter are mounted on the back of the meter in such a way that they will not foul the sides of the rectangular cut-out in the PCB on final assembly. The power transistor can now be mounted and wired up, and the hole in the back of the box can be marked and cut out. Finally, mark out and drill the four pot adjustment holes in the side of the box.

At this stage, it is advisable to thoroughly check all wiring. If all is well, connect the controller to a 15V DC source and to a loco. Switch the inertia out and release the brakes. The relay should be heard to pull in. Move the brake to running, then open the throttle and observe the loco motor running.

Switch the inertia in, and set the four trimpots to half way. Check the operation of the inertia and brake functions on the loco. After braking to a stop, adjust the zero speed control so that the motor is just short of starting.



Actual size reproduction of the PC artwork. To keep board costs down, we recommend that the board cutouts be left to individual constructors.

The controller can now be mounted in its box, the loco put on the tracks, and adjustments made to the rate of inertia and braking, as desired.

I wish you happy constructing and even happier driving. Just remember that all the electronic tricks in the world can't compete with clean tracks and clean wheels.

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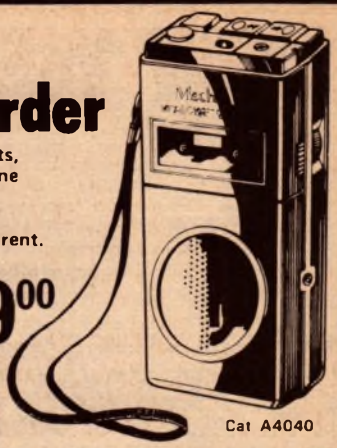

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Fully built audio modulator .. Cat K-6042 .. $4.50

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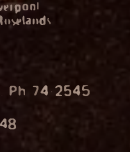

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Electronic eraser for mag film & tape

Here is a handy little unit for those who edit recording tapes or movie film with magnetic stripe sound tracks. You can use it to erase splicing clicks and other unwanted sounds on the tape or film, cleanly and quietly. With a little practice you can also use it to create artificial sound fades.

by JAMIESON ROWE

The impetus to develop this little unit came one Sunday afternoon not long ago, when I sat down to edit some rolls of super-8 sound movie film. These had been taken with one of the modern direct-sound cameras, and had lip-sync sound already recorded.

One of the things I soon discovered was that when various scenes were cut and re-joined, the splices were often quite audible due to the sudden change in sound level. There were also irritating "clicks" here and there at the end of scenes, where the camera had been stopped and re-started for the next scene.

The clicks tend to occur 18 frames before the end of the picture for a scene, because the sound leads the picture by that spacing. It is therefore not always desirable simply to cut off the section of film containing the click, because this sacrifices the last second of the picture.

As I edited the rolls of film, it became evident that what was needed was a magnetic equivalent to the "blooping ink" used to remove clicks and other unwanted sounds from optical sound tracks. Something which would allow you to erase the recording for a short distance, with a minimum of fuss.

How about a small bar magnet? I tried this, and it certainly seemed to work, although you virtually had to rub it along the track and I was concerned about damaging the film or the track or both. the magnet leaves the track magnetised, too, which means that the erasure is not completely quiet.

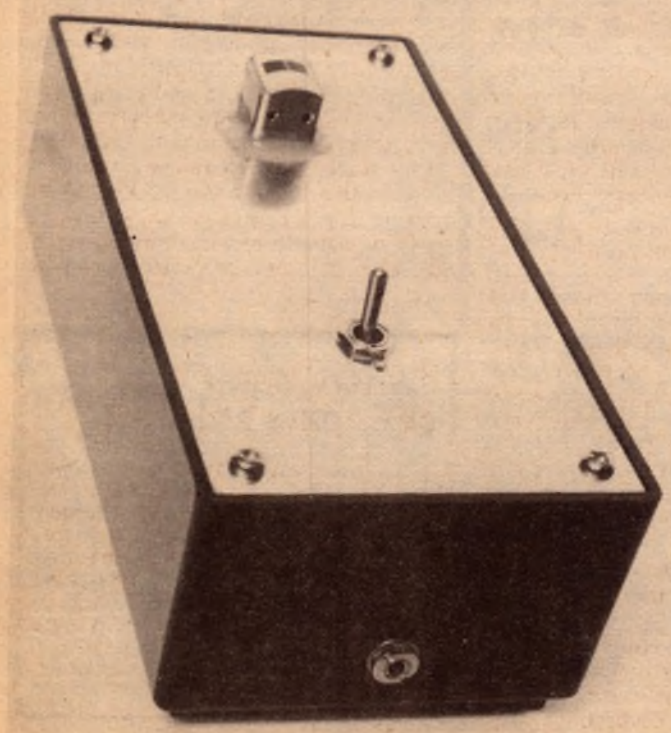
The real answer seemed to be to make up a small supersonic eraser, as used in all the better quality tape recorders. So I bought a small replacement-type tape erase head, and made up a small two-transistor oscillator working at about 66kHz.

When I tried it out, the results were very good indeed. I could erase unwanted clicks and plops completely, leaving the track dead quiet. I also found that by lightly "rocking" the track across the eraser head I could create a smooth "dip", which became inaudible.

In short, the eraser has turned out to be a very handy little device for editing magnetic sound films, and I suspect it would be just as handy for editing recording tape. This being the case, I thought readers would like the details.

As you can see from the circuit, there is very little in it. Two low-cost transistors form the basis of the oscillator, which uses the erase head itself as the inductor. The circuit is well established, having been used in one of our previous tape recorder designs. With a 9V supply it produces around 24V peak-to-peak across the low impedance erase head, due to the voltage magnification of the series resonant circuit.

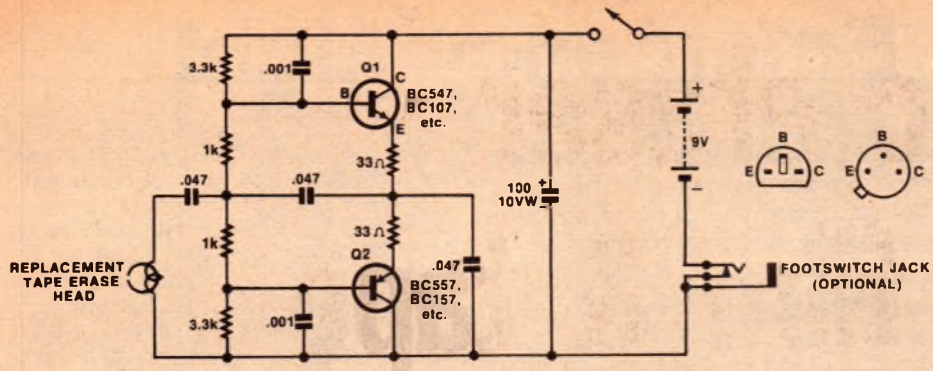
The replacement erase head I used came from Radio Despatch Service, of



It may not look very impressive, but it can be very handy when you are editing sound films. The small jack is for an optional foot switch.

PARTS LIST

1 PC board, 45 x 35mm, code 78eo9
1 Plastic/metal case, 130 x 68 x 41mm
1 Replacement erase head (see text)
1 216-type 9V battery & connector lead
1 Miniature SPST toggle switch
1 2.5mm jack socket, shorting type (optional)
1 BC547, BC107 or similar transistor
1 BC557, BC157 or similar transistor
Half-watt 5% resistors: 2 x 33 ohms, 2 x 1k, 2 x 3.3k
2 .001uF LV polyester capacitors
3 .047uF LV polyester capacitors
1 100uF 10VW PC-type electrolytic
Mounting screws and nuts, connecting wire, piece of scrap aluminium for battery clamp, rubber feet for box, etc.



EA FILM STRIPE/TAPE ERASER

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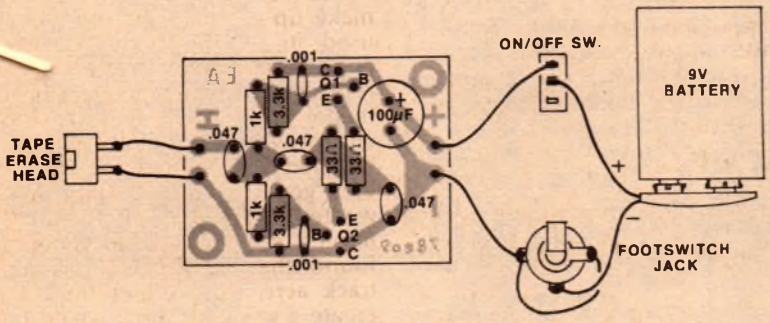
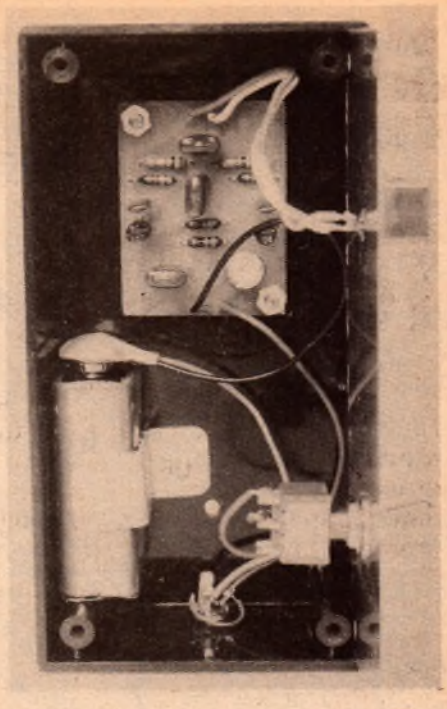
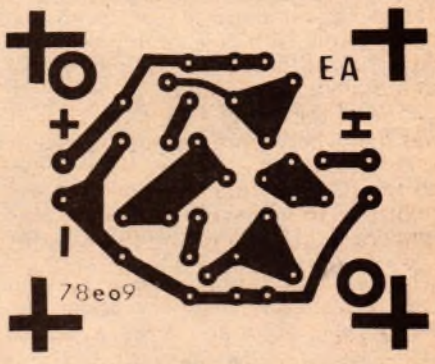






As you can see from the circuit at top, there isn't much in the eraser. You should be able to wire it up easily using the wiring diagram above and the photo at upper right. For those who like to make their own PC boards, the pattern is reproduced at right, actual size. Commercial boards should be available shortly.

869 George Street, Sydney. However I understand that it is a stock item imported by Indeva Pty Ltd, and should be available from many parts stockists.

Current drain of the circuit is around 15 milliamps, and as it is used for only a few seconds at a time I have used one of the small 9V batteries (216 type) for power. In addition to the power switch I have fitted a small jack so that the eraser can be controlled by a footswitch, for "no hands" operation. This can be omitted if you wish, but I have found it very convenient.

A small PC board is used to implement most of the circuit. It measures a mere 45 x 35mm, and is coded 78eo9. The PCB pattern is reproduced actual size for those who "roll their own", although boards should be available from commercial suppliers shortly.

Wiring the board up should be easy if you use our wiring diagram as a guide.

I housed the prototype in one of the small "Zippy" boxes, measuring 130 x 68 x 41mm. It is listed in the Dick Smith Electronics Catalog under the number H-2753, but many other firms have them as well.

As the erase head I used had mounting holes only on the side, I cemented it to the front panel of the box using epoxy cement (Araldite). Before doing so a small slot was cut in the panel, to clear the two head connection pins.

I used a small toggle switch for the power switch, and a miniature 2.5mm jack socket (with shorting contact) on the end of the box for the optional footswitch. This allows the eraser to be used without the footswitch connected, if desired. My footswitch consists of a heavy-duty microswitch mounted on a small base of 18mm-thick particle board, and actuated by a hinged pedal made of the same board.

Well, there it is. It may look a little strange with the head simply facing up at you on the top of the box, but I have found this the most convenient in use.

To use it, I first use the sound reader on the film editor to locate the exact location of the click or plop to be erased. This is marked lightly with a soft wax pencil, at the extreme sprocket-hole edge of the emulsion side of the film (which is uppermost in the editor and sound reader).

Then the film is drawn out of the reader, and looped around in front to the eraser. The marked spot is then placed over the eraser head, with the sound track only pressed into intimate contact. The footswitch is then pressed, applying power. The finger applying pressure to the film is then released, and the film lightly rocked back and forth lengthwise by up to about 10mm either side, to provide a smooth "fade" into and out of the erased spot. Finally move the film up and away, and remove power.

With a little practice you can use this technique to make virtually inaudible erasures. It is even possible to erase a section of track, either completely or in a smooth fade, once you get the hang of it.

The main thing to watch is that you don't rub the picture part of the film against the head. Although it is polished, the head poles themselves are ferrite and still tend to produce faint scratching. So hold the film at an angle laterally, so that only the main magnetic track touches the head surface.

One final point: if you use a wax pencil to mark the film where it is to be erased, don't forget to wipe off the speck of wax afterward. Otherwise you may clog up your projector gate with wax!

"Where can I get a film striped?"

We have received some enquiries from readers asking if we know where they can have a magnetic stripe applied to their existing silent films. A firm we can recommend for this is Magnatrack Laboratories (Aust.) Pty Ltd, of 8 Nelson Parade, Hunter's Hill NSW 2110 (P.O. Box 22), who do high quality liquid striping at very reasonable cost: $3.20 per 100ft for standard or super-8 (min. order $5.50), plus postage.

Automatic Emergency Light

This article describes a simple circuit which can provide automatic changeover from one lighting circuit to another. It can be used either as an emergency lighting system to cope with blackouts, or in caravans to simplify switching between mains and battery.

by PHILIP WATSON

The system was originally built a few years ago when industrial trouble threatened serious blackouts in the Sydney area. In the event it was not needed, but the concept may be useful in another role.

Basically, it is a 12V back-up lighting system, using a car battery and appropriate 12V globes. The refinement is that it will sense whether the mains operated light is switched on and, if it is, it will turn on the emergency light in the event of a power failure. It will perform the reverse function when power is restored.

The advantage of this arrangement is that only one switch, nominally the 240V switch, is needed, and that operating it will always produce light — from one source or the other.

It would seem to be particularly appropriate for caravans, which are normally wired for both 240V and 12V lighting. It not only ensures that the switch will always produce light — whether in a suburban caravan park, or on the roadside half way across the Nullabor — but it also protects against the vagaries of caravan park distribution systems.

It appears that these systems are sometimes quite crude, and interruptions common; people trip over extension cables, cables are pulled out to insert yet another double adaptor, and so on. A blackout in a caravan may be more than inconvenient; it can be actually dangerous if it happens while preparing a meal and when hot liquids are being handled, particularly if young children are present.

The system is quite simple and anyone familiar with automotive wiring should have no difficulty building it. The only change to the 240V wiring involves replacing the normal single pole lighting switch with a double pole variety.

It is most conveniently built around a battery charger, which is normally needed anyway. As can be seen from the circuit, it employs two relays; a light duty one R/1 having a pair of normally closed (NC) contacts, and a heavier duty one R/2 with a pair of normally open contacts.

Relay 1 is connected to the charger transformer secondary via a half wave rectifier and shunted with a filter capacitor. The transformer is connected permanently to the mains so that R/1 is energised while ever mains voltage is present. While energised, its normally closed contacts are held open.

The other relay, R/2, controls the 12V light. It is energised from the battery via the normally closed contacts of R/1 and the extra set of contacts provided by the double pole lighting switch. Thus, R/2 can turn on the 12V light only if (1) there is a 240V failure and (2) the 240V light switch is in the "on" position.

The components needed should not present any special problems, but a few comments may be helpful. Relay 1 can be any small relay having at least one set of normally closed contacts. One of the cradle type with a DPDT contact arrangement, and a 185 ohm coil, would be suitable.

Relay 2 needs heavier contacts. Depending on the size of the emergency lamp used — probably between 40W and 60W — it will need to carry around 4A continuously, but with a switch-on surge of six or seven times this figure.

We used a relay from the junk box, but suitable relays are available. One of the best we have seen is the "Keyswitch" model KMK3, available from Radio Despatch Service. It is actually a 24V AC relay, but will pull in quite reliably on 10V DC. There are three change-over contacts, at 10A, which could be paralleled for increased reliability. The price should be about $2.00.

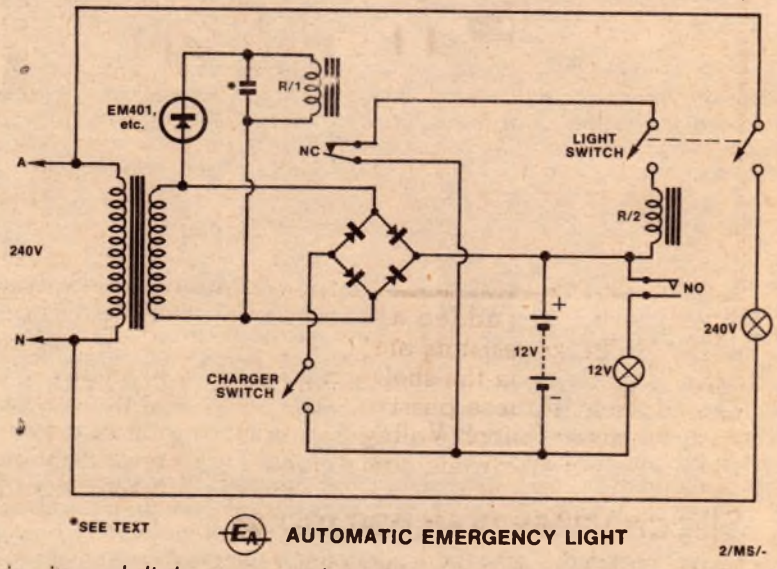
The double pole switch may not be readily available in the conventional tumbler form, but is available as a larger, heavy duty tumbler type, or as a "standard" size toggle switch. The writer used the latter, mounting in on the rectangular plastic plate salvaged from the discarded switch.

The extra cable from this switch can be light duty, such as twin bell wire, and as such is fairly easily coaxed through wall cavities etc. However, at the point where it joins the switch it would be wise to enclose it in a length of insulating tubing, of adequate rating, as a precaution against accidental contact with a mains lead, should it come adrift from the switch.

The wiring to the lamp may be already installed but, if it has to be provided, it should be as heavy as is convenient, and all runs kept as short as possible. Heavy automotive cable, or insulated earth wire as used by electricians, make a good job.

The filter capacitor value may need to be determined experimentally, on the basis of the smallest value which will eliminate chattering.

And that is about all there is to it. Simple though it is, it should provide a great deal of convenience in any situation which calls for emergency lighting.



The circuit needs little comment, but note the charger switch, needed to control the charging function, as the power is permanently "on". Below are two "Keyswitch" relays, the smaller suitable for R1 and the larger for R2.

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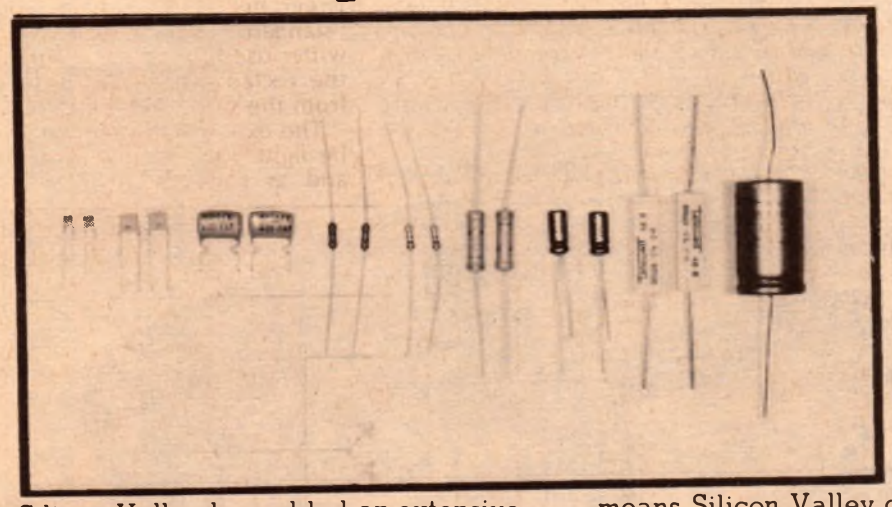

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3-TRANSISTOR "ALL-WAVE" RECEIVER

During the past 50 years, countless enthusiasts have "cut their teeth" in the electronic sense on small multiband regenerative receivers. Present-day beginners can build a modern counterpart of those receivers with the aid of a complete boxed kit available from Tandy Electronics.

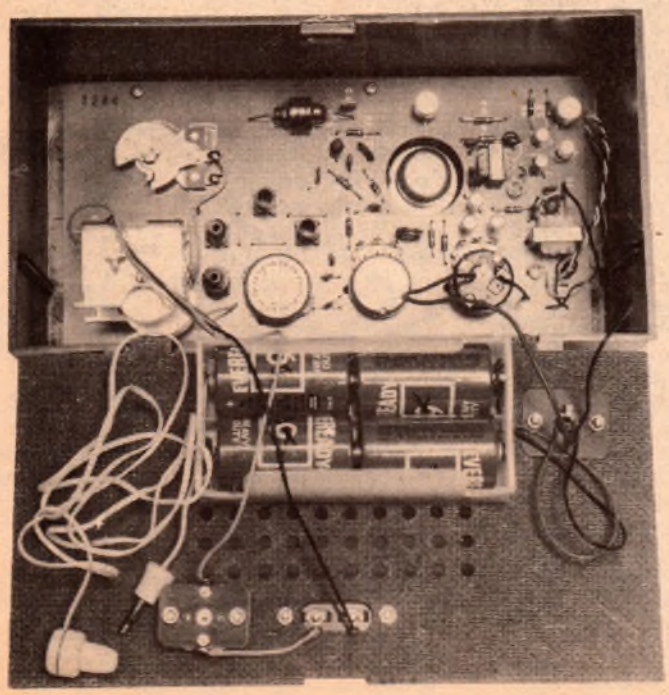
by WALTER NEVILLE

The Tandy kit, which is marketed under the name "Science Fair Globe Patrol" contains all the necessary components, including the cabinet, wire and solder, and requires only the provision of four 1.5V cells to get it into operation.

An instruction manual, packaged with the kit, lists and illustrates the various components for the guidance of the uninitiated and goes on to provide step-by-step instructions covering assembly and wiring. It is rounded off by hints for operation and adjustment, troubleshooting, an explanation of the various bands and frequencies and, finally, an explanation of the circuit.

The clear intention of "Science Fair" is that the receiver should be capable of construction by individuals knowing nothing about electronics, although the writer always has some hesitation about extending this to include people who have no rapport with hand tools, let alone a soldering iron! However, it should present no special problems for a handyman (sorry, "handyperson") who can follow straightforward instructions.

If there is someone available to give advice, so much the better. Or, if the prospective constructor has already fiddled with a few wires and components, this project should round out that experience.



At the top of the page is the completed receiver and on the left, an inside view with the rear lid popped open. Most of the components are mounted on a single printed circuit board, with the copper pattern on one side and a component guide on the other. Construction would typically involve a couple of evening's work.

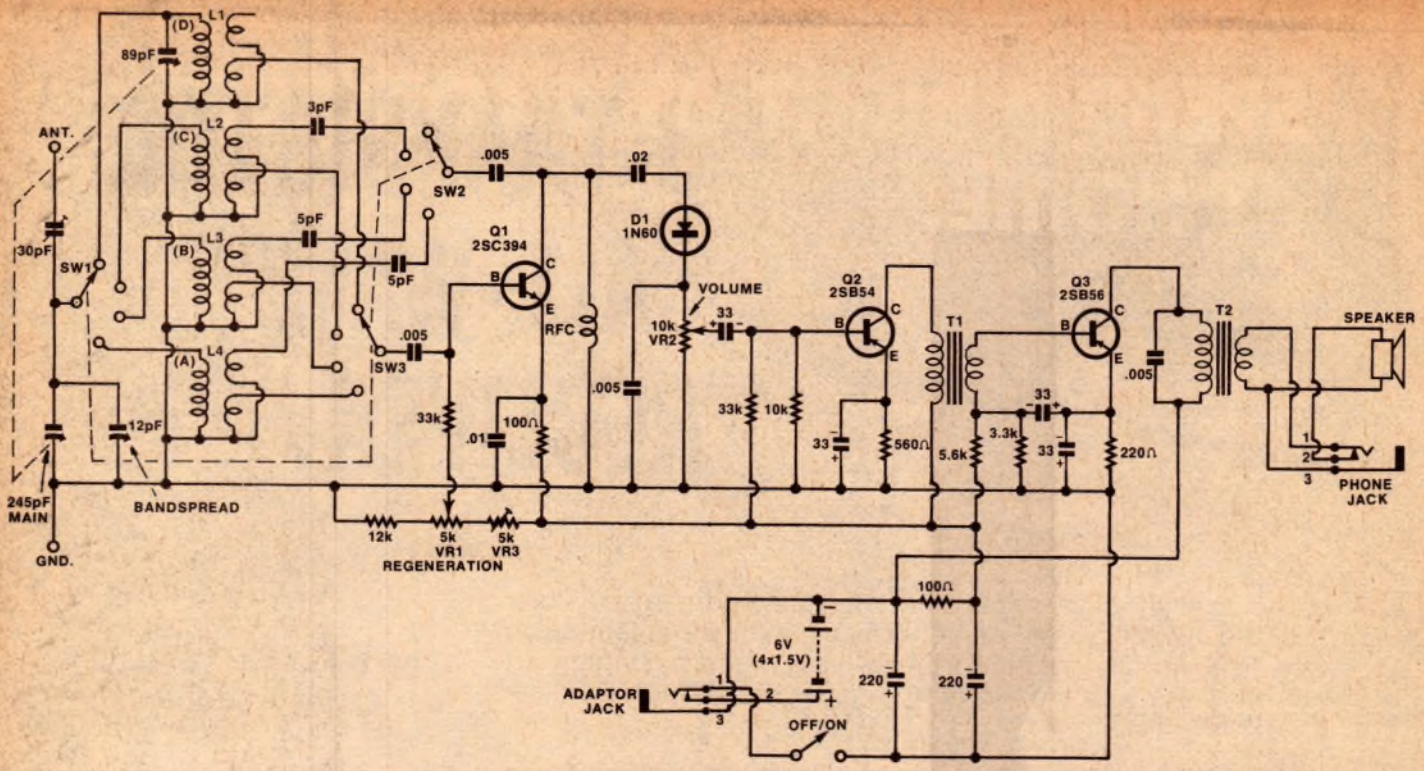
As will be apparent from the photograph, the kit is styled in the manner of a communications receiver, covering the frequency range from 550kHz to about 30MHz in four bands. It provides a main tuning dial and a "bandspread" dial for vernier tuning, plus a bandswitch, a volume control, a regeneration control, and the option of listening by loudspeaker or earphone.

However, it would be unreasonable to expect a very simple receiver like this to bear comparison with a fully fledged communications receiver covering the same frequency range and costing typically 10 times as much. If you want a multiband receiver with the sole objective of DXing, you would be better advised to put the $35-odd towards the best commercial model you can afford.

Like countless basic receivers that have preceded it, the whole point of the "Globe Patrol" is the pleasure it can afford in building and learning, and what it has to teach about coaxing results from a simple circuit.

The roots of this type of receiver go back to the '20s, when a very common form of receiver comprised a triode valve detector with regeneration (then called "reaction") followed by two further triodes as audio amplifiers. With the development of tetrode and pentode valves, somewhat better performance could be achieved and it was fairly common to provide for plug-in tuning coils, making possible short-wave as well as broadcast band coverage. Better still, some designs provided for switched coils, as in the present "Globe Patrol".

The appearance of transistors ushered in a new era of simple receivers, much smaller and more economical, in terms of battery drain, than their valve counterparts. However,



Here is the circuit diagram of the "Globe Patrol" reciever, redrawn in our own style. There is no reason why it could not be mocked up using substitute components, providing you can devise suitable tuning coils. But, whether or not you become involved as a constructor, the circuit typifies a class of regenerative receiver which has been a favourite with valve and transistor experimenters for fifty years!

the early transistors performed indifferently in elementary receivers, particularly at the higher frequencies — the short-wave bands.

You need have no fears about the "Globe Patrol" on this score, judging by the one which the writer built and tested. It worked from the moment of switch-on and, with only a few feet of antenna and no earth, logged quite an array of local broadcast and overseas short-wave stations. For sure, it had to be tuned carefully and critically, and the antenna had to be fiddled to stop the receiver being swamped by a local broadcast station, but that is par for the course. Even a seasoned campaigner like the writer got a kick out of nudging the regeneration control to the critical setting which lifted the weaker signals out of the murk!

As a matter of interest, the circuit of the "Globe Patrol" is reproduced above and readers may care to follow it through as an example of this general class of receiver.

The antenna connects via a small adjustable "trimmer" capacitor to the active side of the main tuning capacitor. If the trimmer is set towards its maximum capacitance of 30pF, the antenna is coupled "tightly" to the tuned circuit. This ensures a maximum signal input but it also tends to compromise the efficiency of the tuned circuit and to swamp the first transistor with too much signal. The art is to adjust the trimmer so that the tuned circuit receives just sufficient signal from the chosen antenna, while retaining as much selectivity as possible.

A small 12pF variable capacitor is shown connected in parallel with the main 245pF tuning capacitor. The 12pF unit is intended to provide a "bandspread" facility allowing the user to tune across a narrow band of frequencies much more easily than is possible with the main tuning dial.

One section of a four-position rotary switch (SW1) selects which of four tuning coils (or tuning "inductors") is to be connected across the capacitors. Depending on the coil chosen, the receiver will tune across the broadcast band or one of three short-wave bands, extending to 30MHz (or 10 metres).

A small secondary winding on each of the coils picks up some of the signal from the respective tuned primary windings, making it available to another section of the switch, SW3. Typically, when L1 is in use, the signal is coupled via SW3 to the base of the first transistor, a silicon type 2SC394.

Contrary to usual practice, this first transistor is not used as a regenerative detector but as an RF amplifier stage, amplifying the incoming signal and passing it via an RFC (radio frequency choke) and a .002uF capacitor to a germanium diode detector type 1N60.

The RF amplifier stage is regenerative, however, with a proportion of the signal at its collector being fed back via SW2 to the particular tuning coil in use. The amount of regeneration so produced is affected by the gain of the transistor which can be controlled, in turn, by the preset potentiometer VR3 and the front panel regeneration control VR1.

Correct setting of the regeneration control is essential for good results from a regenerative receiver. Best selectivity will be obtained with the control advanced to just short of actual oscillation. If the sound is too loud, reduce it with the volume control.

At the diode detector, the radio frequency signal is "detected" or "rectified" and becomes an audio signal which is applied across the volume control VR2.

Depending on the setting of the volume control, a greater or lesser proportion of the audio signal is passed to the base of the next transistor, a germanium PNP type 2SB54, serving as the first audio amplifier. It has a normal system of base and emitter bias, and the collector runs back to the negative supply line through the primary winding of an interstage transformer.

From the secondary of this transformer, the audio signal passes to the base of a second PNP germanium transistor, a 2SB56, serving as an audio output stage. Its biasing arrangements are also conventional and its collector is fed, through an output transformer, from the negative supply line.

The secondary of the output transformer feeds the loudspeaker voice coil, but this connection is broken when the earphone is plugged into the phone jack.

The use of germanium transistors and coupling transformers brands the circuit as one that has been around for quite a few years, but it has obviously stood the test of time and it still typifies this class of simple receiver!

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The Serviceman

Tracking down ghosts with maps and measurements

While overseas experiments with circular polarisation and built-in ghost suppressors promise eventual relief from this annoying TV problem, it may be several years before these become practical, or available to the Australian viewer. In the meantime solutions remain limited to traditional techniques.

In trying to exorcise a ghost, one is frequently hampered by not knowing exactly what is causing it or, more subtly, by imagining that it is being caused by object "A" when, in fact, it is being caused by object "B", which someone has rejected as being " . . too far away".

Is it possible to pin-point the source of a ghost, using measurements made on the TV screen and, if so, is such an exercise worthwhile? Putting it another way, when you've found the cause, can you do anything about it?

Having faced up to such a problem recently, and conducted a very interesting exercise as a result, I thought it might prove useful to readers to discuss the whole subject.

When the present situation first arose I recalled that I had written a few pars on the same subject some years ago, and began delving into my scrap books to find it. It came as something of a shock when I did find it to realise that it was in the October 1959 issue — 19 years ago!

The basis of the discussion then, as now, was whether it is possible to nominate the location of, or distance to, a reflecting object, simply by measuring the amount of image displacement on the screen.

The present exercise was started by a visit from a friend who lives in the Sydney suburb of West Ryde which, for the benefit of interstate readers, is on the northern side of Sydney and about 25km inland from the coast. It is also within about 10km of the Artarmon/Gore Hill area where the TV transmitters are located.

On the other hand, it is a long way from my location; too far for my friend to be a regular customer and too far for me to know very much about the problems which TV viewers in his area might experience. In fact, because of their proximity to the stations I have tended to believe that they don't have very many.

My friend's complaint was that his set — a colour set — displayed a slightly lighter area in the form of a vertical band "several inches" wide and slightly to the right of centre screen. While not always obvious, it did show up on one of his favourite programs, Pot Black, when there were large areas of green billiard table baize filling the screen.

His query as to the cause was prompted mainly by curiosity, the more so because, while he initially imagined it was a set fault, he subsequently discovered that several of his neighbours had observed the same effect. A little questioning also revealed that it occurs, with minor variations, on all channels.

While it wasn't much to go on, I took the first opportunity to raise the matter with a colleague who is much more familiar with the area than I am. It turned out that he was quite familiar with the phenomenon, which he described as a ghost of the horizontal blanking period. He added that, for some reason he could not explain, it always appeared as a negative, hence the lighter area.

I phoned my friend with this information — the first of many such calls as it turned out — and, once told what to look for, he soon confirmed that faint negative ghosts of the video content could also be discerned when the picture content was favourable.

Having solved that much of the mystery my friend then raised the matter of the cause. He suspected that it might be one of several broadcast station masts some distance away in the Homebush Bay area, and he wanted to know whether I thought the distances involved would support this theory. On the other hand, I suggested the Harbour Bridge, but he felt that this would be too far away.

It was then that I remembered my original article and began to recall some of the figures and mathematics discussed at that time. Briefly, it boiled down to this; by measuring the displacement on the screen, and knowing the time needed to complete a horizontal trace, it is possible to calculate the delay time producing the ghost and, from this, the increased path length of the ghost signal.

But note that this distance is only the increased distance involved; not the distance to the offending reflector. (These two distances can be the same, but this is a matter of pure chance.)

The problem had me intrigued by now and I knew I wouldn't rest until I had settled it one way or the other. So I nominated the various measurements he should make of the screen images and suggested that he call me again when he had this information.

In the meantime I went over the figures for horizontal scan time, speed of light and radio waves, etc. A single horizontal line occupies 64us, of which 52us is used for actual video information, and 12us for the sync pulse and retrace blanking period. The signal from the transmitter travels at 300 000km per second, or 0.3km in 1us. (The microsecond is the unit of most interest to us in these calculations.)

One of the measurements I had requested was the width of the offending band. His screen was 45cm wide and, on the basis of 12us, and allowing for a little overscan, I had calculated that it should be nearly 11cm wide. Confirmation of this should support both the general theory and my calculations.

It was a bit of a shock, therefore, when my friend produced a figure of about 4.5cm. It wasn't until I fished out an old copy of the TV standards and refreshed my memory of the waveform that the penny dropped. The blanking period consists of about 5us of sync pulse and the remainder retrace period. A few calculations confirmed that the 5us fitted the 4.5cm almost exactly and that the ghost was really that of the sync pulse rather than the whole retrace period.

This created another problem. The measurements my friend had made were no longer valid. I needed a measurement from the left hand edge of the picture to the end of the retrace period, not the end of the sync pulse. Fortunately, it was possible to calculate the extra distance quite accurately, knowing the ratio of pulse time to retrace time.

In fact, I was able to tell my friend where this part of the ghost should be, assuming that he was able to see it. Thus primed he was able to find it, though it was very faint. It confirmed my calculation.

And so, from all these deliberations, I eventually collected a set of data which were, hopefully, sufficiently accurate to allow the likely possibilities to be either confirmed or ruled out. But the next question was how best to employ the data. Simply making measurements on a map and looking for a likely culprit to fit a set of figures can be tedious to the point of impracticality.

I fished out a district road map of the metropolitan area and pin-pointed the sites in question. The TV station sites were marked and I knew my friend's street and his location in it. However, I found it a help to refer a larger scale map in a street directory, since a certain amount of interpolation was necessary on the road map.

I found a scrap of plywood large enough and fastened the map to it with a few strips of sticky tape. I pushed a drawing pin through one of the transmitter sites and an ordinary sewing pin through the receiving site. Then I turned to my pocket calculator to work out the increased path length.

I took the Channel 9 figures first. These gave a displacement of 30cm on a nominal 45cm wide screen. Since I happen to know that this set has only a minimum of overscan, I settled for 46cm of actual video. I divided the 30cm by 46cm and multiplied the result by 52(us) to give me the delay time of the ghost. This worked out at 33.9us.

Since the signal travels 0.3km in 1us, I multiplied this by 0.3 to give the increased path length. This worked out at 10.2km, as rounded off. Next I divided this by 2, giving 5.1km. Then I returned to the map and, laying a rule against the two pins, I measured off 5.1km behind the receiving site. Another sewing pin marked this point, which represented the position of a hypothetical reflector which could produce the observed ghost.

Next I made a loop of strong thread around the two outer pins, securing it at the drawing pin by winding the two ends several times around the pin in opposite directions. Then I slipped a pencil in behind the hypothetical reflector pin, pulled the latter out, and proceeded to draw an ellipse around the other two pins.

If you think about it for a moment you will realise that every point on the ellipse represents a possible ghost producing site to satisfy the 10.2km extra path length. And, while it still leaves a lot of possibilities, it rules out a great many more.

For example, it immediately ruled out the radio masts, swinging far too wide of this area. In fact it crossed Parramatta Rd around Flemington, ran roughly parallel with it through to Camperdown, then turned up towards

THE SERVICEMAN

the city, and I thought it was heading for the Bridge, which would have supported my theory.

But I was wrong. It went through the centre of the city, the GPO, Farm Cove and across the Harbour to Mosman. I carried the pattern on through the northern suburbs, but these proved to be of little interest.

In fact, I found the results rather puzzling, since they did not seem to indicate any readily recognisable object. I decided to plot another ellipse and see how it compared and whether there was a common pattern.

This brought me back to my friend's figures and, in deciding which set I should use next, revealed another puzzling fact. The displacement for Channel 2 was 30cm, the same as for Channel 9, even though the two aerials were about 1.3km apart. But the figures for Channel 7 and Channel 10 were even more puzzling. Channel 7 was similar to 2 and 9, with 30.5cm, whereas 10 was 37cm.

The point about the 7 and 10 figures is that these two channels share a common mast and, therefore, should have produced identical ghosts. I rang my friend again and, explaining the anomaly, asked him to double check his measurements. This he did, and confirmed that they were correct. However, he added that, knowing what to look for, he had discovered a very much fainter Channel 7 ghost in the same position as the Channel 10 ghost.

This provided a partial explanation, but still left part of the mystery unsolved. All I could do was plot the remaining patterns and see what happened. I chose Channel 2 next, and was surprised to discover that it crossed the Channel 9 pattern in the heart of the city. Well at least that was some kind of a pattern.

I plotted the Channel 10 pattern next and, in spite of the 7cm difference, it also finished up within a whisker of the GPO, the different transmitting site offsetting the increased path length.

Finally, I plotted the Channel 7 pattern. I knew this couldn't land in the same place, but I was curious to find out where it would go. In fact, it finished up less than 200m from the Harbour Bridge.

So where did that leave me? Three of the patterns — four if I counted the faint Channel 7 ghost — had come together in the heart of the city, while the predominant Channel 7 ghost pointed to the bridge.

The best conclusion I can come to is that the heavy concentration of high rise buildings which now dominate the city skyline is acting as a very efficient reflector, probably more efficient than the Bridge which, though it dominates the skyline, is of relatively open construction.

As to why it appears to be the dominant reflector on Channel 7 I can only speculate. One engineer with whom I had an opportunity to discuss the problem pointed out that reflectors can be frequency selective; a good reflector for Channel 7's signals may reflect Channel 10's signals very poorly.

So, having been through the exercise, what are the answers to the questions I posed at the beginning? Is it possible to pin-point the source of a ghost in this way and, if so, is it worthwhile?

To the first part of the question I think the answer is, yes, but — the "but" being that it isn't necessarily simple and that there are traps.

For a start one needs a decent map, preferably better than the one I used, which had a scale of about 11.5mm/km. But a better scale means a bigger map, plus somewhere to set it out. Also, the problem becomes greater as the distance between transmitter and receiver increases.

My exercise was simplified by the fact that the transmitter/receiver distance and increased path length were comparable. It is quite a different matter where the receiver may be 25 or 30km from the transmitter, and the increased path length only a kilometre or so. Such a situation requires, on the one hand, a large scale map to permit pin-pointing local landmarks but, on the other hand, still needs to encompass both the transmitter and receiver sites. As a result, it could be inconveniently large.

Another problem is to measure a ghost displacement accurately. Even a ghost which seems prominent from a normal viewing distance, can be become quite ethereal when viewing the screen close-up. Also, use a fabric tape measure (dressmaker's style). It will cope with the screen curvature, without the risk of scratching the screen. (But watch the metal clips at the ends.)

Then there is a factor already referred to briefly; overscan. This is a variable which may be difficult to allow for in some cases but, if it is practical to temporarily reduce the horizontal scan, to bring it inside the mask, then this would seem to be the best way. Alternatively, familiarity with a particular test pattern will provide at least a measure of indication. In any case, make due allowance, if it is not known precisely.

Plotting an ellipse as described can also produce another surprising result; two, or even more, likely reflectors may all appear on the same plot. Which simply means that, if they are all at the right distance, they are all probably contributing to the same ghost.

Assuming that we can cope with these problems, there is still the question as to whether it is worthwhile or what can be done about it. At first glance it may appear that there is usual-

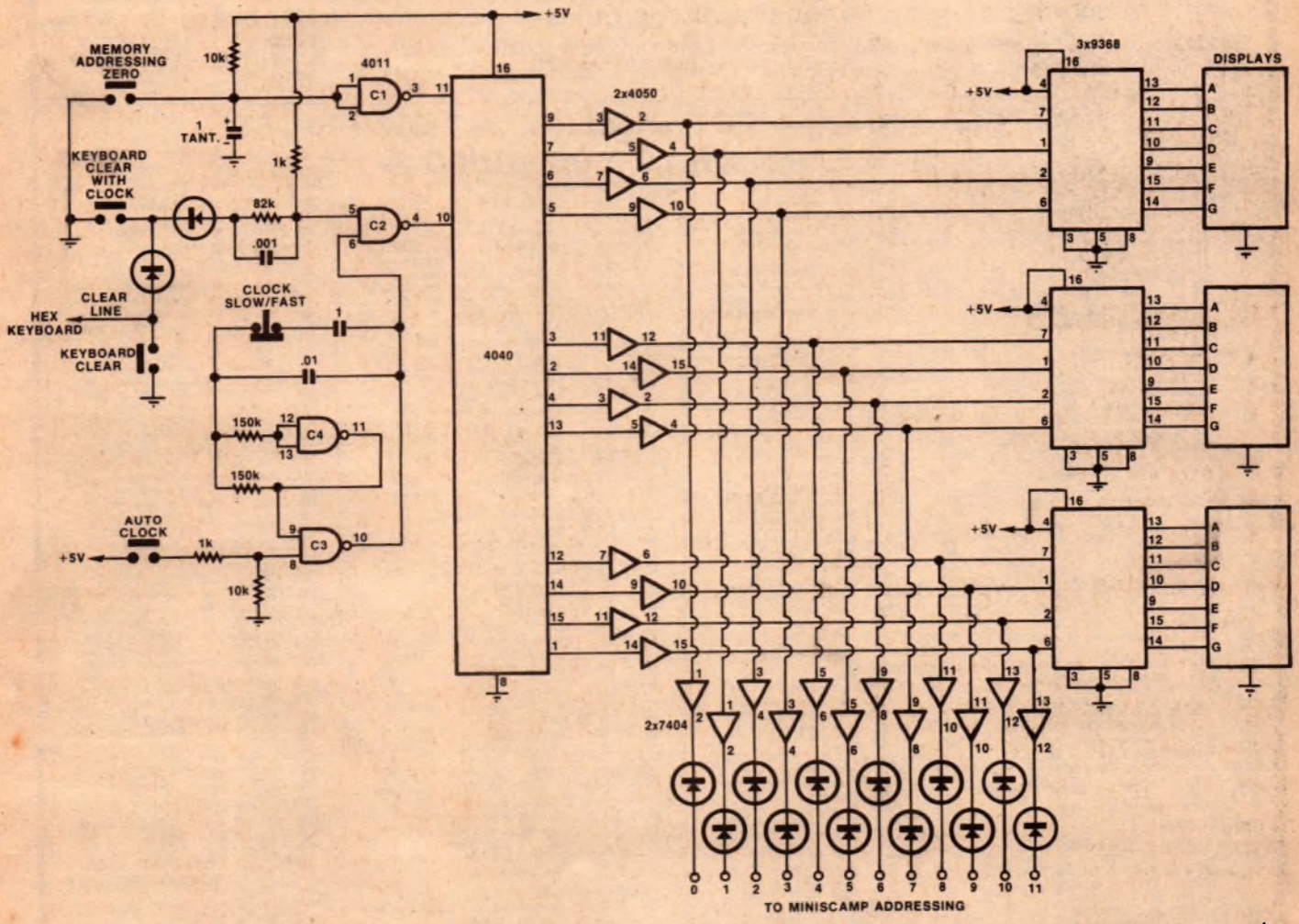
Continued on page 118

Circuit & Design Ideas

Conducted by Ian Pogson

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

Address counter for hexadecimal keyboard



After reading the article A Hexadecimal Keyboard in the August 1977 issue, I decided that although the keyboard made it easier to feed in a program than using the original switches, the address of a particular instruction still had to be fed in via the front switches. In my opinion, this still made feeding in a program rather tedious. The circuit herewith produces an instruction address code automatically as soon as the previous instruction is cleared. Also, it is possible to run the address code through to a particular address in order to start the program from any point other than from 000, or feed in program changes quickly. Using this device it is possible to address up to 4k of memory, 000 through FFF.

The circuit consists basically of a 12-stage binary counter, a gated clocking system, buffers, non-inverting for display decoding and inverting for interfacing with Mini Scamp. This is done by wiring the outputs in parallel with the original address coding switches. The 9368 decoder/drivers decode the 4 bit hexadecimal numbers and feed three common cathode displays. The diodes in the output lines are only for protection of the unit against inadvertent operation of the original switches on the front panel of Mini Scamp. If you are building Mini Scamp from scratch and intend incorporating this approach, then the diodes would be unnecessary.

On the control side of the address counter clock, there is a reset for the counter provided by G1 (one gate of a 4011). A clocking pulse is produced out of G2 every time the "clear/clock" switch is depressed, and a continuous clock when the "clock start" switch is depressed, fast or slow depending on the position of the "fast/slow" switch. Using this device together with the hexadecimal keyboard programming is as fast as one can press four switches, first the hexadecimal instruction "single byte", the "computer deposit" switch and lastly, the "keyboard clear". You can check progress via the memory address readout and in my case, the hex readout on the computer. The "keyboard clear" switch is depressed when the last instruction fed into Mini Scamp requires correcting.

To give some idea of program feed in

speed, I was able to program the "music tune" program including all the hex numbers for the test tune in about five minutes. This compares with about two hours using the front panel switches. This latter time of course includes the time required to write out the program in binary before feeding into Mini Scamp.

The prototype is constructed on a PC board, along with the hexadecimal keyboard which is also on a PC board. I find that a PC board is better than Veroboard, as the PC board has less stray capacitance, especially important when using CMOS. The current consumption of this device, together with the hexadecimal keyboard is about 600mA at 5V, so a separate power supply may have to be provided. Alternately, uprating the Mini Scamp supply to about 2A may be a possibility.

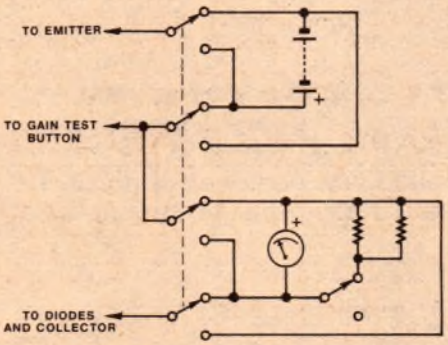
(By Mr R. G. Scott, 31 Parkway Avenue, Raymond Terrace, NSW 2324.)

Improvements to the Simple Transistor Tester

I have built the Simple Transistor Tester which has most recently been described in July, 1978. However, I found that there was some room for improvement and I thought that other readers may be interested in what I did.

When the meter reads 10mA the 279.91 ohms resistance of the meter and the protective resistor produces a voltage drop of 2.8V, so that the base current is not 100uA but only 75uA. That means that the DC gain at full deflection of the meter is in fact 132, not the indicated 100. If the 2-pole NPN/PNP switch is replaced by a 4-pole switch, the base current can be derived directly from the battery and the inaccuracy of up to 32% can be eliminated.

Another modification which I made to the instrument was the deletion of the protective resistor, because I use an external FET meter which happens to

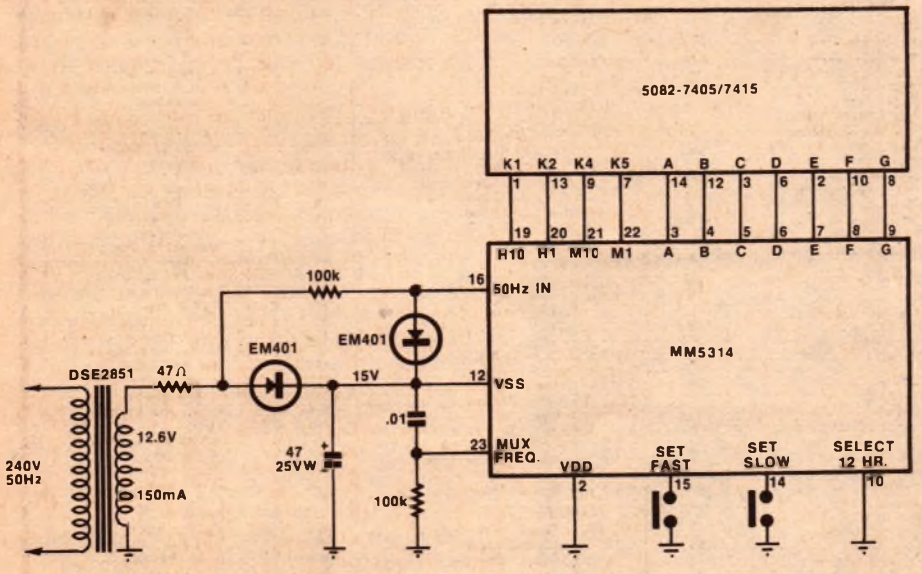


be fully protected, and this measures the voltage across a load resistor which replaces the 1mA meter. This makes it possible to combine the transistor tester in one very small box with the excellent capacitance meter described in October, 1976. They both use the same battery voltage and so one box, two meters and one battery are saved, nearly the cost of an external multimeter.

One other worthwhile improvement is to use 2mm sockets instead of the usual 4mm ones. Rather than using test prods to check small transistors I insert into the sockets three 2mm plugs with the insulating part replaced by miniature plastic-enclosed crocodile clips (see "jumper lead kit", Dick Smith catalog page 38). The crocodile clips are soldered to the 2mm plugs and they fit as though they were designed for this purpose. The advantage of the 2mm sockets is that they can be mounted much closer together and the leads of small transistors like the BC109 easily reach the tips of the crocodile clips. The spacing of the sockets is 11mm.

(By Mr V. A. Chadim, 8 Parker Street, Curtin, ACT 2605).

A simple desk mains digital clock



The National MM5314 clock chip can drive small LED displays directly at reasonable brightness. This eliminates the usual digit and segment drive transistors.

The LED readout used is a miniature 5-digit common cathode display and as shown is connected for a 4-digit time display with the centre digit unused.

The display is satisfactory for viewing distances up to about half a metre. With care, the unit can be accommodated in a "zippy" box measuring 103mm x 54mm x 41mm (Dick Smith Catalog H-274).

By Mr C. S. Fisher, 18 Langdale Avenue, Revesby, NSW 2212.)

Electronic drive unit for battery clocks

Battery operated, transistor switched "analog" clocks have become very popular, and a recent addition to the market is a local/world time model made specially for radio amateurs by Yaesu Musen. Most of these clocks are capable of good timekeeping, but this can be improved noticeably if they are "steered" by an external reference such as the 50Hz mains frequency, or from a quartz crystal. The unit to be described was designed specially for the Yaesu Musen clock but it will suit many other brands as well.

by IAN POGSON

Amateur radio operators, short wave listeners, people interested in travel and many others are interested in the time of day at places in various parts of the world, in addition to the time at one's own location. Of course, the time may be calculated provided one has the necessary information in order to do so, but this effort may be avoided by the use of a clock specially made to show the time across the globe. Such a clock is made by Yaesu Musen, designated Model QTR-24.

This clock is available from Dick Smith Electronics stores and other outlets for amateur radio equipment. The clock comes in an attractive black round case, with a black face and white lettering. It has the usual dial with hour, minute and sweep second hands and these are usually set for local time. There is also a rotating outer disc, calibrated in 24 hours. The first half of the scale is white with black numbers and the other half has a black background with white numbers, to signify day and night. Outside the disc are prominent world place names right across the time scale.

The clock is equipped with a slot at the back so that it may be hung on the wall. Alternatively a fold out stand is provided so that it may be stood on a desk or table, similar to a framed picture.

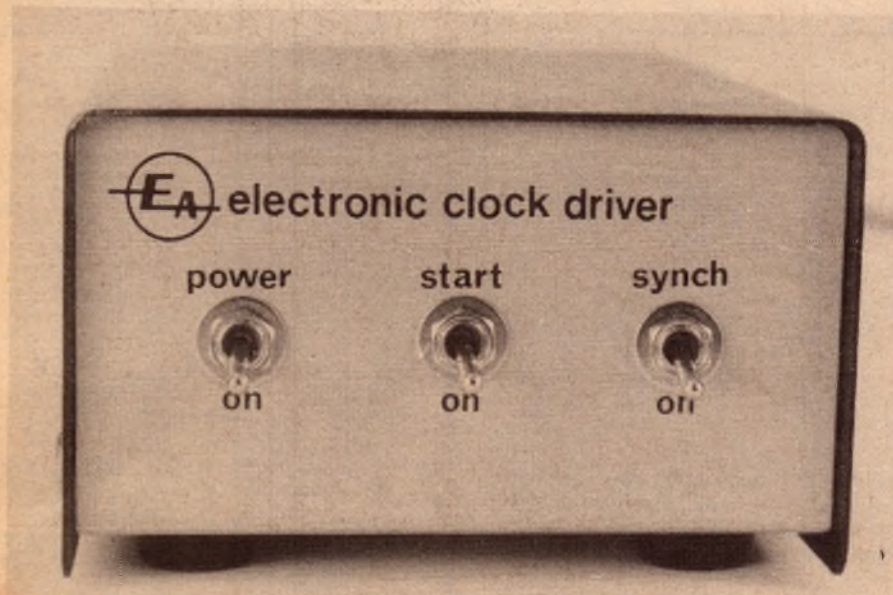
The movement of the clock is very well made and follows the now well established design making use of a balance wheel arrangement, switched by a transistor and powered from a 1.5 volt dry cell. This type of movement is very reliable and is capable of keeping quite good time. The term "quite good time" is relative of course: good time keeping to one person may be considered little less than terrible by another, according to individual ideas and points of reference.

A minute or so per week is quite typical, and may not need to be improved upon for many applications. However, for short wave listening, amateur satellite activities, etc., the minute or so of error could make the difference between success and failure. With this in mind, I thought it would be a good idea to show how to synchronise it from an external source, such as a crystal or the 50Hz from the mains.

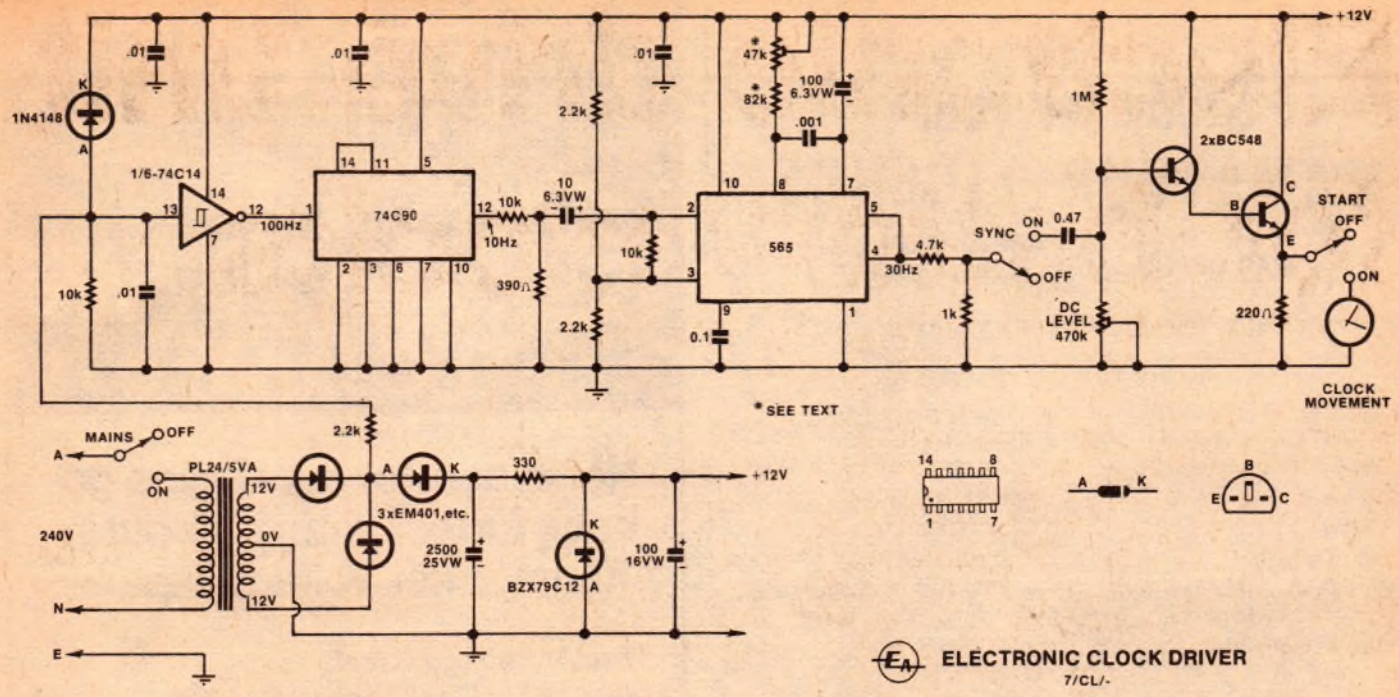
Dick Smith Electronics kindly made a clock available for investigation. The movement is self-starting, as soon as the 1.5V cell is fitted. This is claimed to be a feature of this unit, as most other clocks of similar type need some means of giving the balance wheel an impulse to start it. Further investigation showed that the balance wheel made six beats per second rather than the more usual five beats per second.

The six beats per second does make it a little harder to synchronise it. Whereas five is easily fitted into the usual decade divider scheme, six is not so readily coped with. After some thought, it occurred to me that it could still be done by picking off 10Hz from a divider, and using the 10Hz to control a phase locked loop on 30Hz, which could then be used to synchronise the clock movement. This has proved to be quite a satisfactory way around the problem.

In the course of development, the self-starting feature proved to be another problem. However, this has



The prototype clock drive unit, built into a small utility case.



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7/CL/-

also been successfully solved and more will be said about it later on.

At this stage, the simpler approach seems to be to make use of the 50Hz mains as our reference source. However, whatever reference is used, we need to derive 10Hz, after which the rest of the circuit will remain the same. Let us have a look at the circuit to see how it is done.

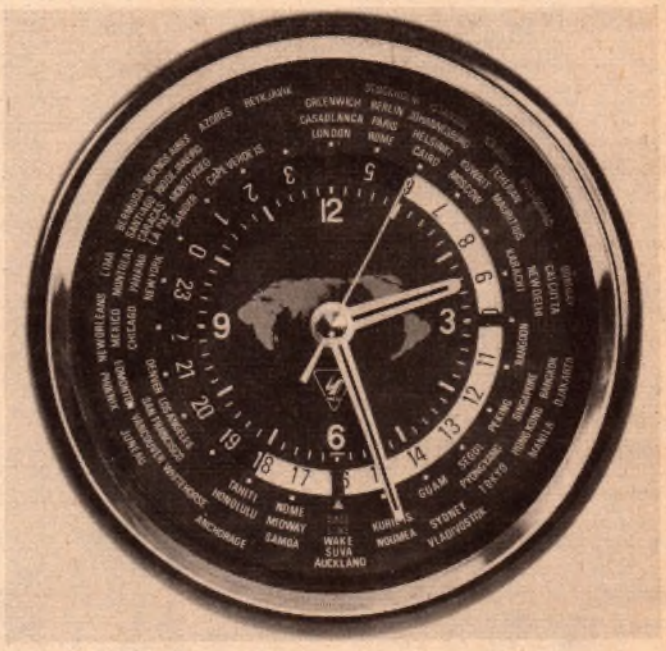
A Ferguson transformer, type PL24/5VA is used for the power supply and also as the source of 50Hz. Full wave rectification is achieved with two silicon diodes, the output of which are pulses at a 100Hz rate. These are isolated from the filter capacitor by another silicon diode. The 100Hz pulse signal is fed via a voltage divider into a Schmitt trigger, from which it emerges as a 100Hz rectangular wave. The .01uF capacitor and the 1N4148 silicon diode are used to protect the Schmitt trigger against random spikes which may find their way in from the supply.

Only one section of the six Schmitt elements in the 74C14 device is used. The five unused inputs are automatically grounded on the board.

The 100Hz rectangular wave drives a 74C90 CMOS decade divider. The resulting 10Hz square wave output is then used to synchronise a 565 phase locked loop at 30Hz. It may be worth noting here that the third harmonic of the 10Hz square wave is used to synchronise the phase locked loop. The correct level for this purpose is set by the voltage divider consisting of the 10k and 390 ohm resistors.

The 30Hz from the phase locked loop is to be used to synchronise the clock movement, but the level is much too high. About 1 volt peak-to-peak is required and this is set by the voltage divider consisting of the 4.7k and 1k resistors.

ABOVE: A Schmitt trigger, a decade divider (74C90), and a phase locked loop (565) form the heart of the drive unit.



RIGHT: The Yaesu Musen clock used with electronic drive unit. This clock movement is designed to show the time right across the globe, and should be of particular interest to amateurs and DXers.

The clock movement requires a DC component to replace the normally used dry cell, with the 30Hz synchronising signal superimposed on the DC. These requirements are met by using a Darlington pair. The DC component is set by the 470k potentiometer in the input, with the 30Hz coupled capacitively from the phase locked loop. The composite output appears across the 220 ohm resistor in the emitter circuit.

It may be seen on the circuit and on the picture that there are three toggle switches. One is used for switching the mains, another is labelled "start" and the third, "synch". Subsequent experience has shown that the "synch" switch is not necessary and may be omitted. On the PC board the switch position will be replaced with a link.

The filtered DC from the power supply rectifier is regulated to 12 volts with a 330 ohm resistor and BZX79C12 zener diode, and further filtered with a 100uF electrolytic capacitor.

All of the circuitry is included on a printed circuit board which is housed in a small metal cabinet, measuring 103mm wide x 61mm high x 150mm deep. I should mention here that provision has been made on the board for input of an alternative source of 100Hz. There are extra holes around the Schmitt trigger to accommodate this, but they are left vacant if this facility is not used.

No difficulty should be experienced in obtaining all of the components. As

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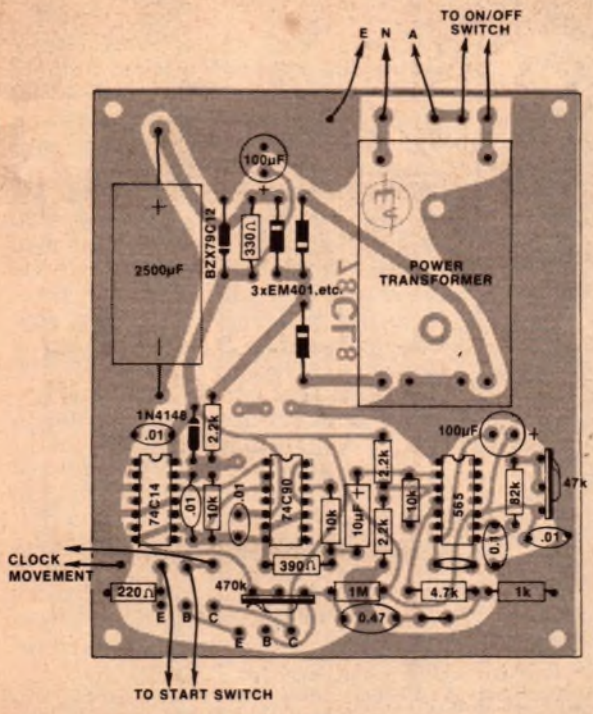
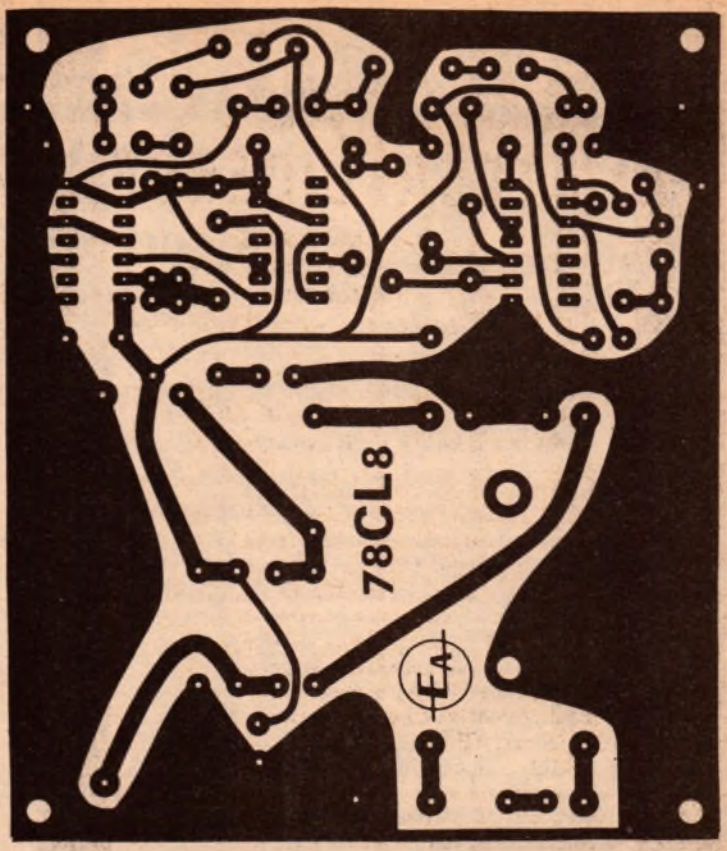
Electronic clock driver



Take care to ensure correct orientation of polarised components when assembling the PC board.



Actual size reproduction of the PC pattern. Overall dimensions are 94 x 110mm.

already mentioned, the transformer is made by Ferguson and should be available from all of the usual outlets. The printed board was kindly supplied by RCS Radio, but in due course boards will no doubt be available from other manufacturers as well. The case is a low-cost unit from Dick Smith Electronics. An important point to bear in mind when obtaining the components, is that the CMOS ICs should be kept in their protective packages until the time when they are actually fitted to the board.

Building up the board is fairly straightforward and is made easy with the aid of the component layout diagram. Assembly is best done by starting with the small components such as resistors, diodes and capacitors. Then follow with the IC sockets, transistors and finish with the power transformer.

The usual precautions apply. Make sure that you have a good, clean, hot soldering iron and be careful to make good soldered joints. At the same time, care should be taken not to overheat components. If you use sockets for the ICs, they should be soldered in without the ICs plugged in. As the pins are very close together, you will need a very small bit on the soldering iron and considerable care must be taken to avoid bridging with solder across adjacent pins. After soldering, each joint should be carefully inspected to make sure that it is a good one.

If you do not wish to use sockets for the ICs, then the above precautions will still need to be observed. In addition, the CMOS devices should only be soldered in place with the barrel of the soldering iron connected with a clip lead to the earthy copper on the board.

Another point which also should be mentioned relating to the assembly of components on any printed board, is that items such as transistors, diodes, electrolytic capacitors and ICs should be fitted with due respect to polarity.

Before leaving the board assembly, one point which some readers may wish to incorporate relates to the time constant on the 565 phase locked loop. This consists of the 0.1uF capacitor at pin 9 and the resistance made up of the 82k resistor and the 47k potentiometer in series. Checks which I have made would indicate that the resistance adjustment is really not necessary and the combination can be substituted with a 100k resistor. This must be connected between pin 8 and the supply rail, as reference to the circuit will show.

With the board completed, it only has to be fitted to the case, together with the toggle switches, RCA outlet socket and power flex. The power flex and the outlet socket are on the back panel and the switches on the front. The board is stood off the base of the case with ½in long spacers. If you use the same case as that on the prototype, you will find it necessary to fix the board towards the back. This is because the mounting screws would otherwise foul the case mounting feet.

The final assembly should be done with the interconnecting leads in mind, so that all soldered joints may be made without problems of access.

With the unit finished, it is ready for testing and final setting up to drive your clock movement. It is always wise to make a thorough check to make sure that there are no errors or omissions in the assembly. Satisfied that all is well, turn off the switches and plug into the power point. Then switch on.

Switch on the power switch on the front panel and with a multimeter check the DC voltage across the 2200uF electrolytic. It should be about 17 to 18V. Now check the voltage across the 220 ohm resistor. It should be set to 1.0V by the 470k trimpot. This voltage may need to be altered by a small amount later on.

The audio coax cable, with the RCA plug on one end and the crocodile clips at the other should be plugged in. By the way, make sure that the red clip goes to the centre conductor and the black clip to the braid. This is very important. If you have a CRO you may now connect the lead to the CRO and observe the 30Hz square wave. The "start" switch should be switched on to do this.

If you are fortunate enough to have a CRO with two traces available, then

you may check the 30Hz waveform against the 10Hz which is fed into the phase locked loop. With the timebase properly adjusted, the two waveforms should be seen synchronised with each other. In the event that you have included the 82k resistor and the 47k trimpot in the time constant referred to earlier, then you are in a position to adjust the trimpot to obtain phase lock. Alternatively, if you have fitted these items and do not have a CRO, then the trimpot should be preset to give a total resistance of 100k.

For the clock movement to be synchronised satisfactorily, before attempting to run it from the driver unit, I suggest that you fit a normal dry cell and run it for a few days. It should keep time to say within 10 seconds per day. Indeed, it would be a good idea to try to regulate it as closely as possible to correct time keeping. Even so, it may be necessary to regulate the movement again after connecting it to the drive unit.

We are now ready to connect the clock movement to the driver. Use the coax cable fitted with RCA plug at one end and crocodile clips at the other end, plugged into the driver and connected to the movement. Make sure that the correct polarity is observed.

With the power switch already on, switch on the start switch. The movement should start after a delay of one to two seconds. In the unlikely event that the movement does not start, increase the DC voltage at the output of the Darlington pair to slightly above 1V but not beyond 1.25V and try again. Keep the DC voltage as low as possible, consistent with reliable starting.

Typically there is a delay of one to two seconds on starting, and when the movement is switched off it may take up to 30 seconds to stop. These points should be taken into account when setting up the clock for correct time.

So, arrange to have the second hand stop as close to 60 as possible. Then ideally a continuous time signal such as VNG on 7.5MHz, 12MHz (day), or 4.5MHz (night) should be used to set the clock accurately to time. If this type of time signal is not available to you, then the best use will have to be made of a time signal on the hour from one of the broadcast stations, or the Telecom telephone time service.

Start the clock as previously described. The 30Hz superimposed on the DC component serves to "steer" the clock movement in sympathy with the mains frequency.

I have used the word "steer", rather than "synchronise" for a very good reason. As many readers already know, the mains frequency is nominally 50Hz and in the long term, averages out to

50Hz. However, in the short term, the phase varies according to loading and other conditions, with the 50Hz either advancing or retarding in phase at any moment.

A chat with a representative of the NSW Electricity Commission was quite helpful and revealed what might be expected from the mains supply frequency. It was pointed out that the endeavour at all times is to keep the frequency as close as possible to exactly 50Hz. Inevitably, there would be variations and this was generally kept in the range 49.9 to 50.1Hz. However, deviations as much as 49.8 to 50.2Hz were not uncommon and on some occasions where loading was heavy and variable, it could drop as low as 49.6Hz. The frequency could even drop below this figure in extreme cases where machines had to be dropped off for one reason or another.

In terms of time keeping, every effort is made to keep clocks within plus or minus two seconds of the correct time. However, this can sometimes deviate by as much as plus or minus 4 seconds. Also, it is possible for the time to vary by as much as one second per hour.

As a matter of interest, the Commission maintains clocks to check on the mains frequency performance. Obviously, they keep synchronous clocks running from the mains. These are compared with one of their own clocks stabilised by a quartz crystal. Also, the time is checked against pulses from the Sydney Observatory.

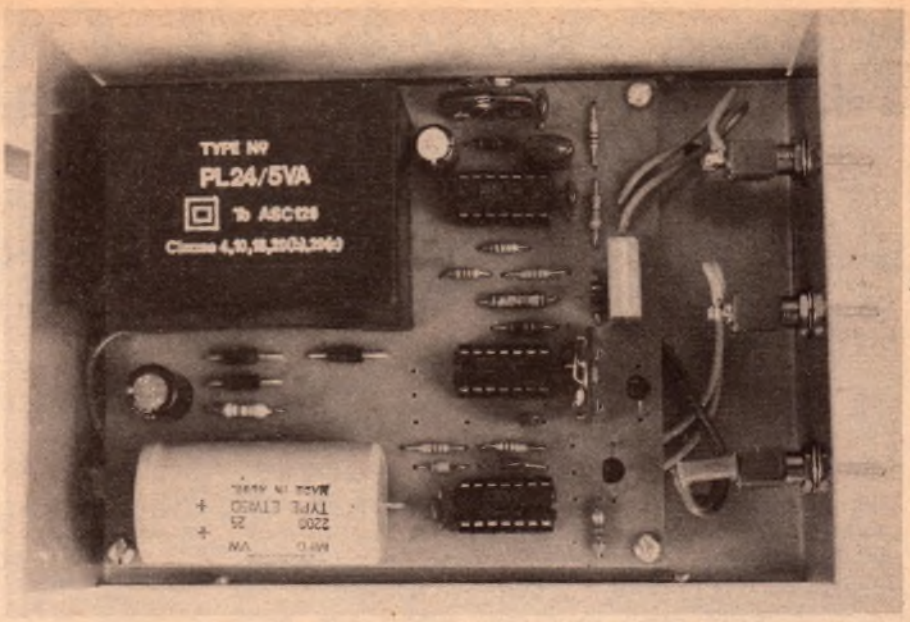
It is also interesting to note that in spite of the effort made by the Commission to maintain frequency as closely as possible, they are under no legal obligation to do so. However, it is to the Commission's advantage, as well as the consumer's, to maintain the close frequency tolerance.

From this information we can see how a clock which is controlled by the mains frequency can deviate a little one way or the other from the true time at any given instant.

Having got your clock running, I suggest that you check its time at a particular time of day, preferably 7 o'clock in the morning and then check it again at the same time each day. If it stays within two seconds in any one day, then it should be left. On the other hand, it may gain or lose several seconds in a day and the calibrated regulator at the back of the movement should be adjusted accordingly.

After a day or two devoted to regulating the prototype against the VNG time signals and then letting the system run without interference, it is keeping time to within two seconds per day. Although at the time of writing the test has not been very long, it seems that the system will stay within a few seconds over a reasonably long period.

Earlier, I mentioned the possibility of controlling the clock movement from a crystal, as well as from the mains. Perhaps the simplest way of using crystal control would be to use a crystal as used in American colour TV receivers. These crystals are on approximately 3.58MHz and they are available quite cheaply. Also, there is an IC available which can be used to divide the crystal frequency down to 60Hz, and this could be used to control the type of clock movement which we have been discussing. This includes movements which tick at either five beats of six beats per second. I hope to look more closely at this possibility for a possible future project.



View inside the completed prototype. Make sure that the mains cord is clamped securely just inside the case, and that mains wiring to the PC board is well clear of any metalwork. Use of IC sockets is optional.

LIST OF COMPONENT PARTS

1 Case, 103mm wide x 61mm high x 150mm deep
3 Miniature toggle switches, SPDT
1 RCA socket, single hole mounting
1 Rubber grommet for power flex
1 Transformer, Ferguson PL24/5VA
1 Printed board, 94mm x 110mm, code 78CL8
4 ½in spacers, tapped ⅛in Whitworth
1 74C14 IC
1 74C90 IC
1 565 IC
3 Sockets, 14-pin DIL
2 Transistors, BC548, BC208, etc.
3 Diodes, EM401 or similar
1 Diode, 1N4148 or similar
1 Zener diode, BZX79C12
1 Philips large trimpot, 47k
1 Philips large trimpot, 470k

RESISTORS (all ½ watt)
1 220 ohms
1 330 ohms
1 390 ohms
1 1k
3 2.2k
1 4.7k
3 10k
1 82k
1 1M

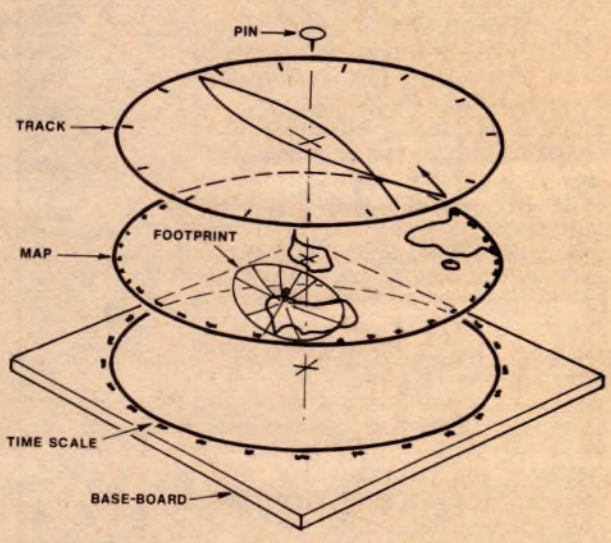
CAPACITORS
1 .001uF greencap
4 .01uF greencap
1 0.1uF greencap
1 0.47uF 50V polycarbonate
1 10uF 6.3VW electrolytic
1 100uF 6.3VW electrolytic
1 100uF 16VW electrolytic
1 2200uF 25VW electrolytic

MISCELLANEOUS
Hookup wire, solder, 8 ⅛in Whitworth screws for spacers, 3-core power flex, 3-pin plug, flex clamp, audio coax cable, RCA plug, 2 crocodile clips.

Note: Resistor wattage ratings and capacitor voltage ratings are those used in the prototype. Components with higher ratings may generally be used provided they are physically compatible. Components with lower ratings may also be used in some cases, provided the ratings are not exceeded.

Keep track of OSCAR — with OSCARTRACK

The recent launch of the amateur satellite OSCAR 8, the continuing performance of OSCAR 7, and talk of Russian amateur satellites, has created an increasing awareness of the satellite scene. And, as more people become interested, more questions are being asked; What equipment is needed? What aerials? What modes? And, most important, when are they within range?



by PHILIP WATSON

This interest need not be confined to amateurs. While they are the only ones who can work into the satellites, many short-wave listeners already have suitable equipment, and can share the experience of listening for signals from space.

Either way, a major requirement for the satellite enthusiast is some convenient means of knowing when a satellite will be within range of his location. To solve this problem is the purpose of this article.

AMSAT, the organisation responsible for developing and launching the satellites, prepares basic tracking information which is distributed through amateur organisations, such as the Wireless Institute of Australia. The WIA publishes this information in its monthly journal "Amateur Radio" and also via divisional broadcasts.

This basic information nominates the commencement of each "satellite day"; the first south-to-north equator crossing after midnight, UTC. (Universal Co-ordinated Time, formally GMT.) It is given as the time in UTC, and the crossing point in degrees west of Greenwich, eg, 0008UTC/60.2°W.

In itself this basic information is of limited value. It simply serves as a starting point for a series of calculations involving such satellite factors as orbital time, inclination (from a true polar orbit), height (for coverage) etc.

Converting this into practical information — when the satellite will pass within range of Sydney, Adelaide, or Perth, for example — calls for extensive calculations. These can range all the way from paper and pencil to computer readouts, and include a number of ingenious schemes. One American amateur coupled a globe to a 24-hour clock and surrounded it with an "orbit" of sequentially gated LEDs, showing the satellite's position every few minutes.

Paper and pencil calculations can be tedious — and subject to error — particularly when it is realised that such auxiliary data as antenna bearing and elevation may have to be extracted as well. Again, computer facilities are not always to hand, and mechanical globes beyond the resources of most.

A popular approach overseas involves a calculator consisting of a special map with a number of transparent overlays. With it, it is possible to determine quickly the exact path of all satellite passes for the day, the exact time of each pass, the area covered by each pass (relative to the user's location), and the antenna bearings and elevations needed during the pass.

At least two of these have been produced in the US, one by the ARRL, called "OSCARLOCATOR", and one by the magazine 'Ham Radio", called "SATELLABE". Unfortunately, these relate only to the northern hemisphere and are of little value to amateurs in the southern hemisphere.

To fill this gap we have produced our own version, as portrayed in the accompanying drawings. From these, any amateur should be able to make his own calculator, following the simple instructions we will give later. Alternatively, we understand that Dick Smith Electronics will be reproducing our artwork in kit form, and this should greatly simplify the operation.

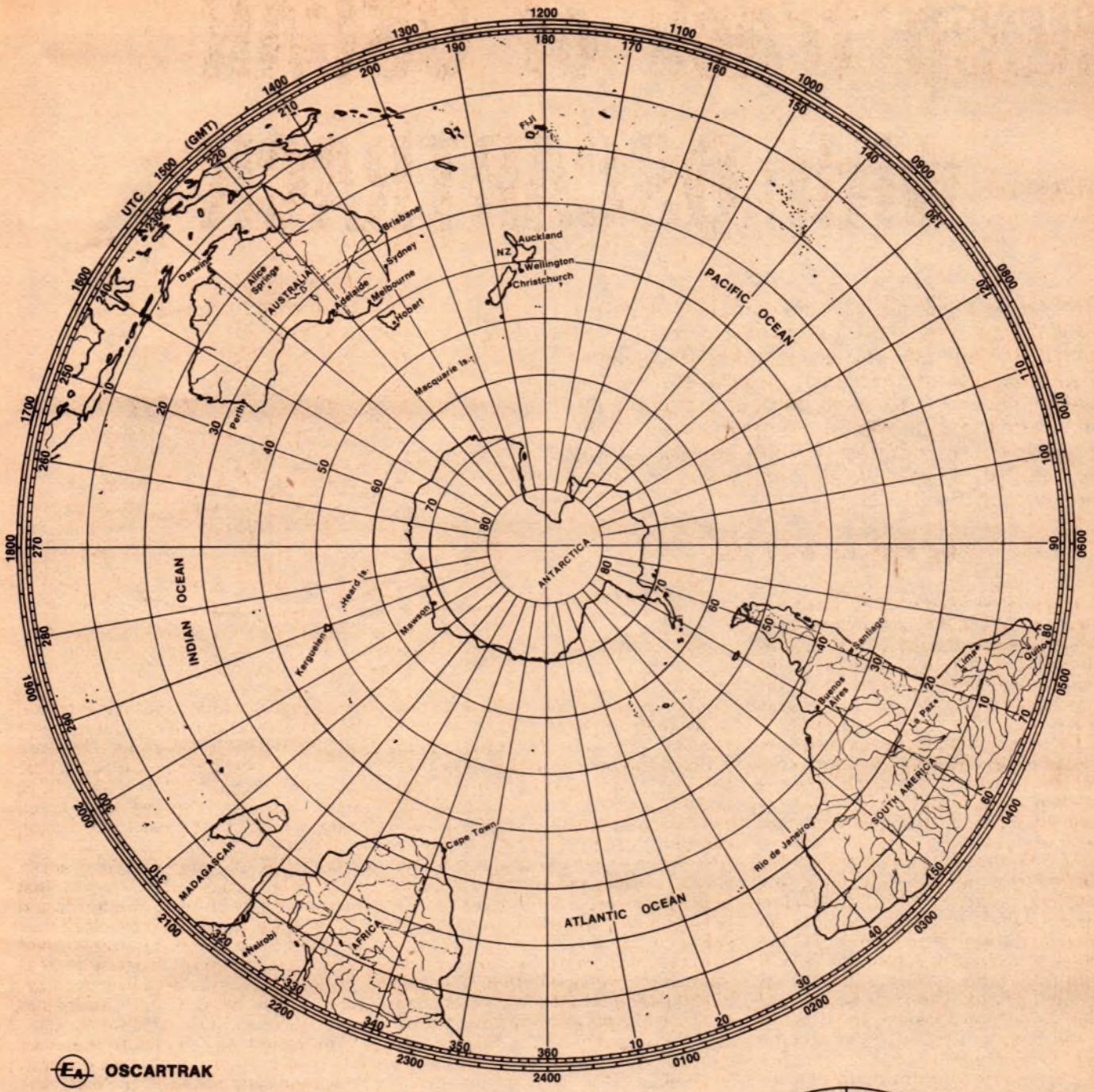
At this point a few words about satellite behaviour, and some typical figures, should give the reader a clearer picture of what it is all about. There are two active satellites in orbit at the time of writing; OSCAR 7 and OSCAR 8. Some Russian satellites have been proposed, but little factual information is available.

Both OSCAR 7 and OSCAR 8 are in near polar orbits, which means that they pass very close to the north and south poles. The amount by which they deviate from a true polar orbit is called the inclination and is given in degrees relative to the equator; a true polar orbit would be 90°. OSCAR 7's inclination is 101.7010° and OSCAR 8's is 98.99°.

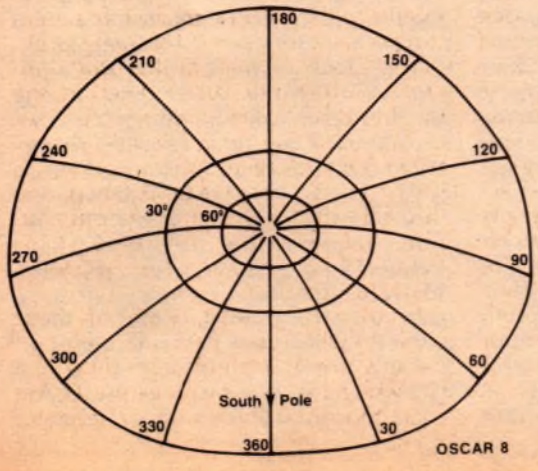
The easiest way to picture these orbits is as a fixed circular track within which the earth rotates. If the earth was stationary, the satellite would cross the equator at the same point on every orbit. But, since the earth rotates, the satelite will cross the equator at a point further west for each subsequent orbit.

The exact distance of the orbital increment depends on the period the satellite takes to make one orbit. If we can state this period in minutes, we can convert it to degrees by simply dividing it by four. To convert to distance, one degree equals 111.2km at the equator. The orbital time for OSCAR is 114.94478 minutes, and for OSCAR 8, 103.23162 minutes.

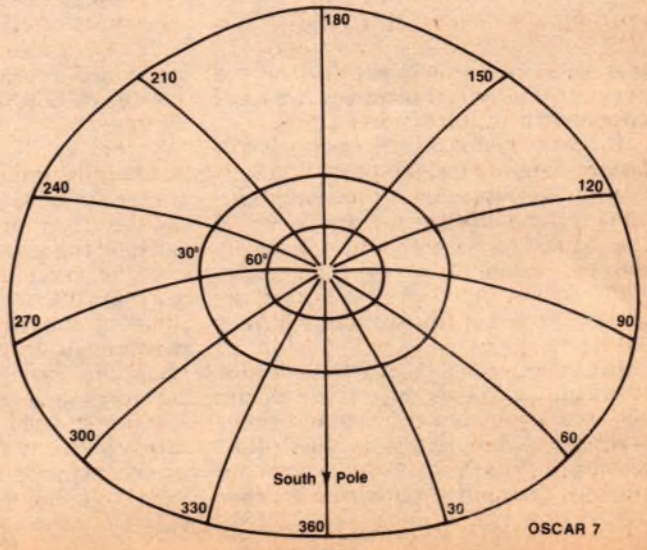
In theory, at least, each of these satellites will cross a particular point on the equator at a predictable time — a fact which makes long range prediction charts possible. Due to minor variables



OSCARTRAK

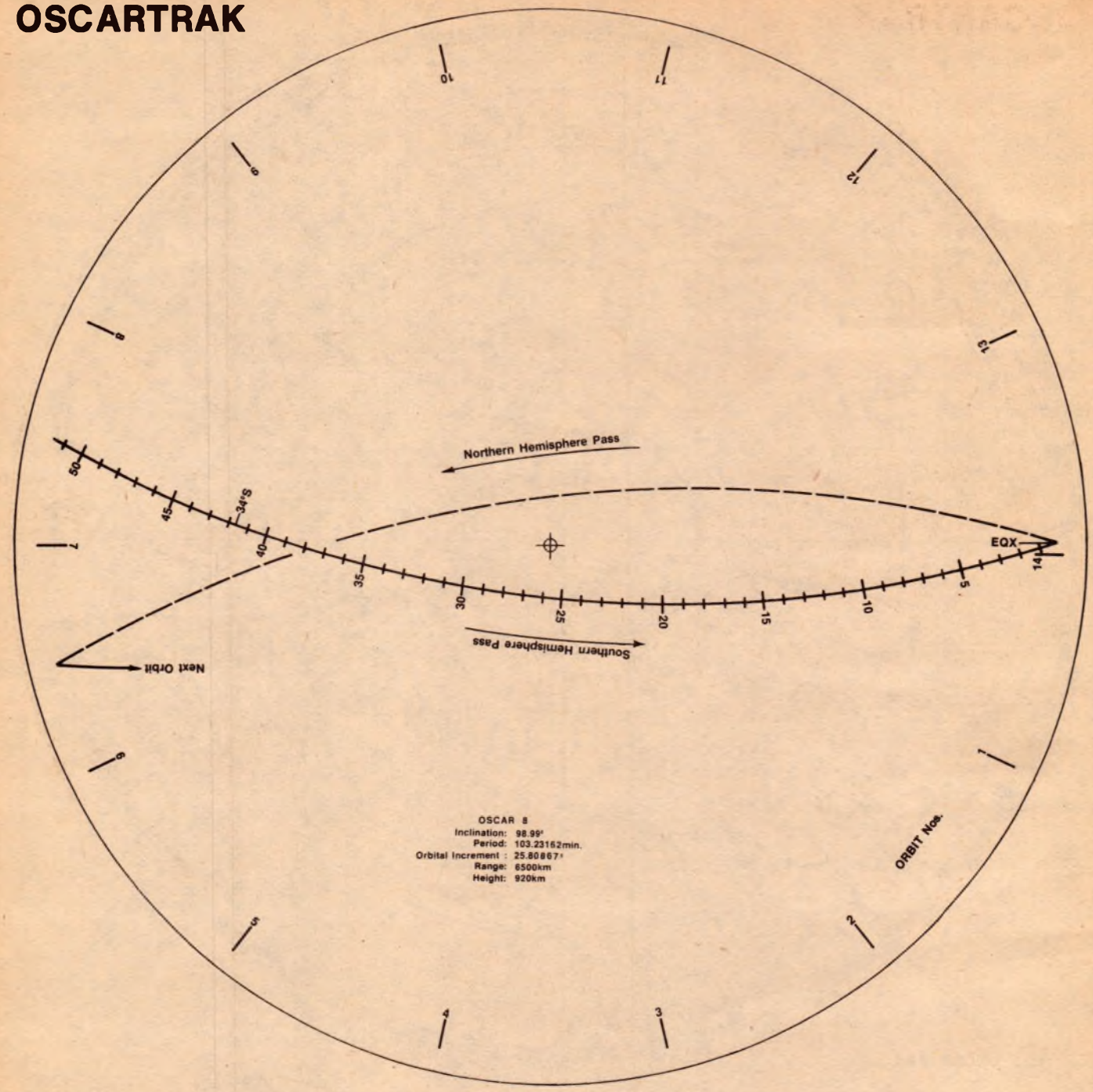


OSCAR 8



OSCAR 7

OSCARTRAK



there may be some slight drift over a period of months, but this will be accounted for in the AMSAT tables.

The height of the orbit is one of the factors determining the orbital period. It also determines the coverage of the satellite; the higher the satellite, the greater the coverage and the longer it will be within range of a particular earth station. OSCAR 7 orbits at an average height of 1455km and OSCAR 8 at 920km.

The area covered by a satellite can be portrayed by a circle drawn on a globe. For OSCAR 7 this circle would have a diameter of 7800km and for OSCAR 8, 6500km.

The basis of the calculator we are considering is an aizmuthal equidistant projection (great circle) map based on the south pole, and extending to the equator.

To this we add several scales; a time scale, a satellite track scale on a transparent overlay, and smaller transparent overlays giving the satellite's coverage, plus aerial headings in azimuth and elevation.

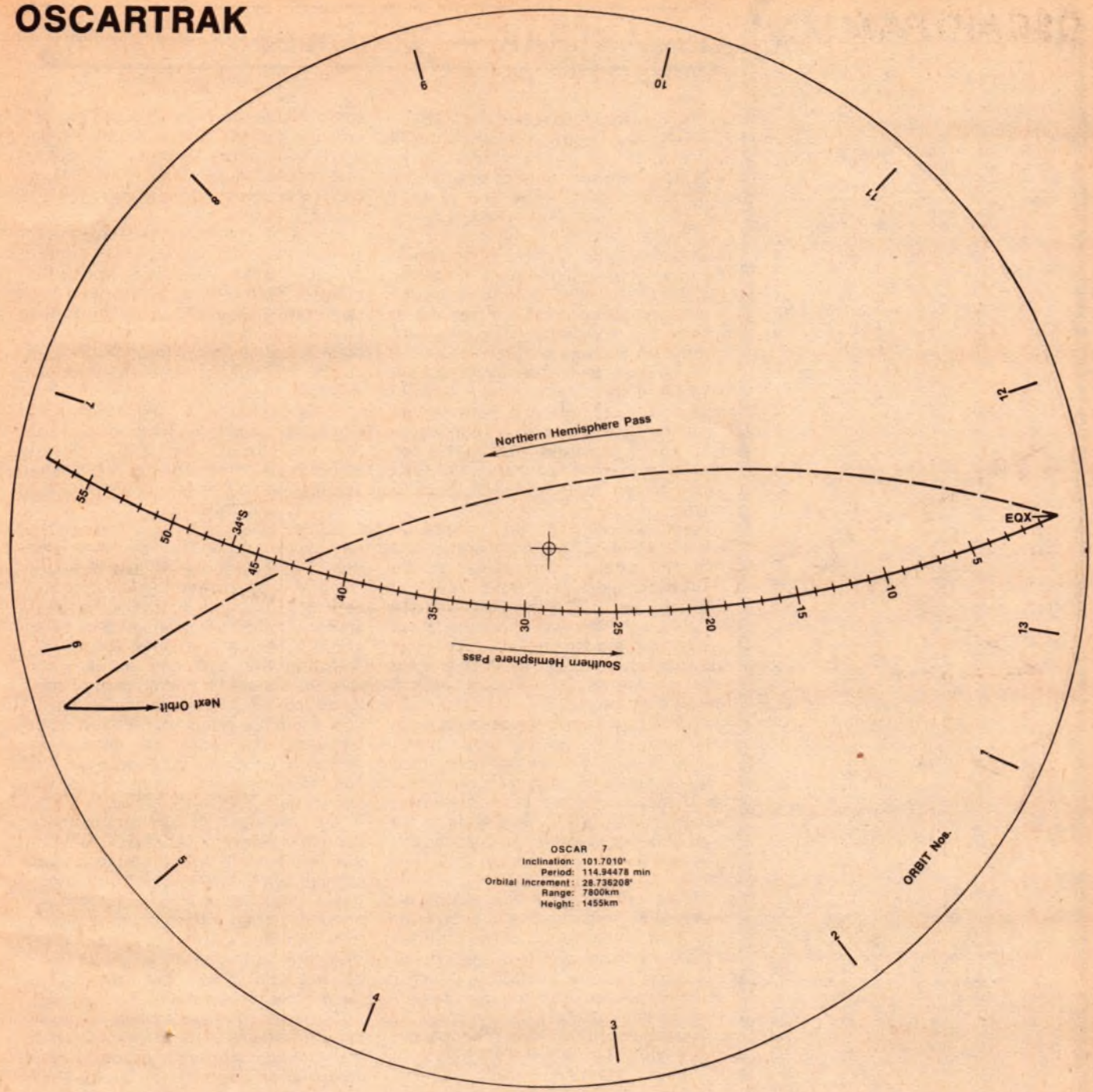
In our calculator the time scale is fitted to the basic card or board on which the calculator is built. It is a 24-hour UTC scale, but there is room to add local time to suit any locality.

Inside the circumference of the time scale we fit the circular map. It is pivoted on the south pole so that it can rotate relative to the time scale. The equator is marked from 0° to 360°.

Over the map goes the satellite track overlay, pivoted on the south pole. As well as the main (southern hemisphere) pass we have added (dotted) the continuation of the orbit across the northern hemisphere and back to the equator where it will commence the next southern hemisphere pass. This can be used to determine subsequent passes, but is intended mainly to complete the mental picture of the orbit.

The main track is divided into time intervals, the total time being equal to half the orbital period. One end is marked "EQX" (equator crossing) and is the reference point from which all passes are calculated.

This overlay also carries a series of orbit numbers, representing a 24-hour



period. They are spaced apart by one orbital period, in degrees, and are used to identify all orbits for the day, once the first orbit has been determined from published tables.

The final overlay shows the coverage and antenna directional data. The satellite's coverage is circular, and could be shown on a globe as a circle. On our great circle map, however, its shape is more like an ellipse, though it is not a true ellipse. Further, because of the changing scale of the map, such a pattern will be strictly accurate only for the latitude for which it is drawn. A separate pattern is needed for each satellite, because of their different radius of coverage — often referred to as their "footprint".

Our patterns are based on Sydney (34°S approx.) and were produced by drawing a circle of appropriate diameter around Sydney, on a great circle map based on Sydney. The points on the circle were then transferred to the satellite map, using co-ordinates. The antenna headings were produced in the same way.

Although based on Sydney it would be accurate for any other place on the same latitude, such as Cape Town, and near enough for Adelaide, Perth, Valparaiso, and the north of New Zealand. The error would not be serious for Melbourne, Brisbane or other places on these latitudes, but would become optimistic at points further south, and pessimistic towards the equator.

Readers in locations significantly removed from these latitudes can make their own pattern, as we did, if they have a great circle map suitable for their latitude. It does not have to be for their location. However, when centring it over your location, make sure that it is correctly orientated towards the south pole, as marked.

The method of using the calculator is best envisaged by imagining that it has been assembled, as per instructions later in the article, and then working through the exercise from a typical set of AMSAT figures. With this in view, we might consult an OSCAR 7 table and extract a crossing time of 0008UTC at 60.2°W.

OSCARTRAK — Continued

The first step is to rotate the map until these two figures coincide, then fix the map in this position. Because this will be a semi-permanent setting, it is worthwhile taking some care to get it right. It can be cross-checked by referring to the prediction figures for any number of other orbits, which should be in very close agreement. Be aware, however, that the published figures have been rounded off and may exhibit minor discrepancies. If necessary, choose an average setting.

To secure the map we suggest folding a piece of sticky tape in two, with the sticky side out. Place it between the time scale and the map, a little way in from the edge of the latter. If it is ever necessary to move the map, simply slice through the tape fold with a razor blade.

Next, we set EQX on the satellite track to 0008UTC. The track now tells us that the satellite will pass over the Northern Territory and Western Australia on its way to EQX, and the time scale on the track shows that it will cross the Northern Territory coast about 53 minutes before EQX and the Western Australia south coast about 47 minutes before EQX.

At the same time, the area coverage overlay (or "footprint") shows that it would be within range of Sydney from approximately 56 minutes before EQX to 37 minutes before EQX. If we have added a local (EAST) time scale to the UTC scale we can see that the available time would be from 9.12am to 9.31am EAST.

When a pass is as far west as this, it is worthwhile investigating the previous pass. Note the position of the orbit No. 1 mark and reset EQX to this point. This will show the previous orbit, which is actually the last orbit for the previous satellite day.

This is a very interesting orbit, passing only slightly east of Sydney. Its EQX will be about 8.12am EAST and it will cross latitude 34° approximately 46 minutes before this, or at 7.26am.

(Note: When working ahead of EQX in this manner, be aware that mode changes may occur at EQX and that it is necessary to observe the mode for the previous (UTC) day.)

In practice, the satellite schedules fall into a pattern of morning passes, which approach from the north, and evening passes which approach from the south. Those referred to above were two such morning passes.

To find the evening passes we simply rotate the track through approximately 180° until it is once again in the region of Australia. Then we place the nearest orbit number, say 5, on the original EQX at 0008UTC.

This orbit — note that it approaches from the south — will pass over the south island of New Zealand before crossing the equator at about 7.40pm EAST. Subtracting 15 minutes from this puts it over New Zealand at 7.25pm EAST. It would then be within range of Sydney stations.

The next orbit, No. 6, passes through central Australia, and crosses almost directly over Adelaide about 12 minutes before EQX at 9.35pm EAST. Orbit No. 7 would be over the Indian Ocean at about 11.18pm. While of limited value to Sydney stations, it could be of interest to Western Australia.

The area overlay, as well as indicating when the satellite is within range, and for how long, also indicates the azimuth bearing for a directional antenna, as well as the elevation if this facility is available.

Let us take orbit No. 7 from the previous example. The overlay shows that a Sydney station should acquire the satellite approximately 22 minutes before EQX, and that a directional antenna should be orientated to 30° in azimuth, with a horizontal elevation.

During the next ten minutes the antenna should be moved progressively towards 60° in azimuth and 30° elevation. From this point on, for a further 10 minutes, the antenna should be progressively orientated to about 160° and the elevation returned to the horizontal.

Just how much of this antenna information is relevant depends largely on the beam width of the antenna concerned. Some amateurs use omnidirectional antennas, in which case it is not needed, while others use relatively broad, modest gain beams. In the latter case the information is useful in a general kind of way, but may not call for precise interpretation.

Only one important piece of information remains to be provided. Once the satellite is within the ground station area, stations outside this area, which can also see the satellite, become available. What the user needs to know is what area, outside his own, is available during a particular pass.

In simple terms, the solution is to provide a second, movable, area overlay which can be centred on the satellite track and moved along it. The centre of this represents the satellite and, when this point moves into the ground station area, stations within the satellite coverage, but outside the ground station coverage, become available.

The problem is to nominate what shape and size this coverage pattern should be, since we have already shown that this varies with latitude, due to the changing scale of the map. At the south pole a circle is correct while, at the equator, we require an ellipse-like

pattern with major/minor axis ratio of about 1.5/1.

In practice, a circle can be used between the pole and latitude 60° with an error of no more than about 5%. Beyond this a separate pattern for each 10° would be about the most practical compromise, and an ellipse would probably be close enough. Fairly obviously, a repeat of the 34° latitude pattern could be used between 30° and 40°. (The minor axis must always point to, or cross, the south pole.)

The major/minor axes ratio would be:

50°	1.07/1
40°	1.10/1
30°	1.17/1
20°	1.27/1
10°	1.35/1
0°	1.51/1

The minor axis dimension is constant, and is the same as that for the 34° patterns shown. We leave it to readers to decide how accurately they wish to pursue this phase of the exercise.

How you go about making up the calculator depends on whether you decide to use our published drawings, or to buy a kit. The latter approach should be easier, but is not essential.

In fact, it is best to aim at making two calculators, one for OSCAR 7 and one for OSCAR 8. While it is possible to switch overlays over the basic map, this can become a tedious operation and one likely to discourage full use of the device. We understand that the kit to be supplied by Dick Smith will contain enough material for two complete calculators.

As published, our main drawing consists of the map surrounded by the UTC time scale. Although we have had to print them as one drawing, for reasons of space, it will be necessary to separate them for the finished product.

We had originally envisaged that readers would be able to cut out the drawings and paste them on stiff card. However, on reflection we realised that there were several objections to this, not the least which being that most readers seem unwilling to mutilate their copies. There is also the practical difficulty that separating the two scales without damaging at least one of them calls for a lot of care.

A far better approach is to make photocopies of our drawings, and this should not present a serious problem these days, when almost everyone has access to a photocopying machine by one means or another. This not only simplifies the job, but allows everal calculators to be made if desired.

For each calculator, it will be necessary to make two copies of the main drawing. One is pasted on a piece of heavy card to form the base with the time scale. This base should be thick enough to support the pin on which the scales will pivot.

The other copy then provides the map. It should be pasted onto card also, but of a lighter weight.

Having made up the map and time scale combination, it remains to make the overlays. These can be traced from our drawings onto transparent material of some kind. Sheets of transparent Mylar, or similar material, is available from most draughting material suppliers.

Circuit Components (A/asia) Pty, Ltd, of 38 Forest Rd, Bexley, NSW stock a suitable material, called clear inking polyester film. It is available in two cut sizes; 216mm x 280mm and 280mm x 430mm. Both are 0.1mm thick. The larger size costs $1.10 per sheet, and should be adequate to cut the two large and two small overlays.

(The map really needs some reinforcement where it is pivoted at the south pole, otherwise it will tear. A small scrap of overlay film cemented to the centre serves the purpose well.)

The pattern may be traced with a felt pen, but better results will be obtained with Rotring K or TT inks. Be aware, however, that some inks, known as "foil etching inks" will attack plastic drawing pens. Rotring K is in this category, and should be used only with metal pens. Rotring TT is known as a "bonding ink" and is safe in plastic pens and gives good results on coated films, such as the type mentioned above.

And that is about all there is to it. Whether you make your calculator from our artwork, or from a commercial kit, you will find it a fascinating and useful device. Nor will it be outdated if other (Russian?) satellites are launched. New track and area overlays can be produced for the basic map and either substituted for one of the OSCARs, or used to make another calculator.

SIMPLE WAY TO DRAW AN ELLIPSE

Drawing an ellipse to a given major/minor axis ratio is fairly simple, using a pins and string technique. First draw the major and minor axes to the specified dimensions. Then set a drawing compass to half the major axis length and, using one end of the minor axis as a centre, scribe two arcs through the major axis.

These intersection points are the two foci of the ellipse. Push a drawing pin through each, and another pin through one end of the minor axis. Make a tight loop of thread around the three pins, remove the one from the minor axis, and substitute a pencil. The pencil and loop can now be used to trace out the ellipse.

Microcomputer News & Products

New FDC chip

Western Digital Corporation has announced a new floppy disc controller/formatter chip, the FD1791. This is described as the "end result" of the established FD1771 and FD1781 products. It provides for both single and double density modes of operation, with IBM 3740 compatibility in single density mode (FM) and System 34 compatibility in double density mode (MFM).

The FD1791 offers all of the features of the FD1771, together with the added functions necessary to read, write and format a double density diskette. These include address mark detection, FM and MFM encode and decode logic, window extension, and write precompensation.

Price of the FD1791 in 1-24 quantities is $62.00 plus tax. It will be available from Daneva Control Pty Ltd in Melbourne, E&M Electronics in Sydney, Baltec Systems in Brisbane, Rogers Electronics in Adelaide and Micro Controls in Perth. Further information is available from Michael Mote, Daneva Control Pty Ltd, 70 Bay Road, Sandringham, Victoria 3191. Telephone (03) 598 9207.

Low cost software

The range of microcomputer software produced by Technical Systems Consultants, Inc of Indiana is now available in Australia from Southwest Technical Products Australia. The range includes programs for the M6800, the 6502 and the 8080. Primarily they come as full assembler listings, with hex code and comments, although longer programs are also

available in cassette or paper tape hex dump form.

The programs available include utility software like a disassembler, a relocator, a micro BASIC, a text editor and a mnemonic assembler; maths and diagnostics routines; and games such as "Space Voyage" and "Battleship". The prices have been kept as low as possible to make them attractive to the hobbyist.

Enquiries to Southwest Technical Products Australia, P.O. Box 380, Darlinghurst NSW 2010.

IEC/IEEE interface

An LSI chip designed to perform most basic functions required for the IEC 66C002 and IEEE 488-1975 bus interfacing systems is available from Philips. The device, known as the HEF4738V, is made using the LOCMOS process and has inputs fully compatible with 4000-series CMOS. The only IEC function not provided is the controller (C) function.

The HEF4738V comes in a 40-pin DIL package, and operates from any supply voltage between 4.5 and 12.5V. To connect digital instruments and programmable equipment to an IEC/IEEE bus it is only necessary to provide the device with inverting bus transceivers, level converters and multiplexers.

Further information is available from the components and materials division of Philips Industries, 67 Mars Road, Lane Cove NSW.

Miniature cassette

A low cost miniature digital cassette transport operating from a single 12V DC supply is now available from MACE. The type MD3 measures only 83 x 53 x 52mm and weighs only 160g, making it small enough to be mounted directly on a PCB. Data storage capacity is 480 kilobits, with 400 bits per inch and a data transfer rate of 1500 bits/second. Start and stop times are 30ms, and rewind takes 50s.

The unit has a fast forward search mode and sensing for beginning and end of tape, cassette presence, cassette side and file protect. When supplied with the M3C custom programmed one chip microcontroller (in a 40-pin DIL package) the unit is 8080 and 6800 bus compatible.

Further information from Measuring and Control Equipment Co Pty Ltd, PO Box 78, Epping, NSW 2121. Telephone (02) 86 4060.

Japanese shows

The following information on recently released microcomputer products in Japan was kindly sent to us by Mr K. S. Wilkinson, from Tokyo. He reports that the products were displayed at two recent shows, one being the Business Machines Exhibition.

NEC has released a new "Basic Station", which consists of a do-it-yourself kit with an 8080 chip on a PC board with a hex keyboard. It has a separate alphanumeric keyboard, video and cassette interfaces, and runs a 4k

Tiny BASIC with Peek, Poke and graphics commands. It costs about 200,000 Yen (about $795). A more powerful Level-2 BASIC is apparently due to be released around July-August, but this will not be compatible with the Level-1. It will handle strings, subscripts and arrays, standard maths functions and alphanumeric names with up to 18 characters.

A small company named INPEX has released an 8085-based kit which has a novel keyboard allowing machine-language programming. It has a large keyboard (about 16 x 17 keys), with each key corresponding to a different operation code. Cost is about 80,000 Yen (about $320).

Panafacom has released the C15, a 16-bit machine with resident BASIC, touch key-board, CRT display, 15ips cassette, and 16K memory. A printer and 16K memory expansion are options. The BASIC has commands for graphics, strings, matrices (options), cassette tape control and an IEC bus interface option. There is also a do-it-yourself kit with colour graphics. Prices start at around 700,000 Yen (about $2800).

Mitsubishi have released a new 4-bit microprocessor, the M58840, which features an on-chip 8 bit A-to-D converted with 5% accuracy.

Finally, the Sharp Corporation are featuring a new programmable calculator, the PC1300. This features magnetic card program storage (256 steps), 26 memories, and 16-character wide display and alphanumeric printer. Two levels of subroutine nesting are allowed, and the numeric format is 10 digits with 2-digit exponent.

Size of the PC1300 is 44 x 123 x 221mm, with a mass of 680g. List price is about 100,000 Yen, or about $398.

IREE micro group

At a recent well-attended meeting, over 130 people formed the IREE Sydney Microprocessor Group. Aim of the Group is to foster greater knowledge of micros and to improve links between programming and hardware people. Non-members of the IREE are welcome to join.

Further information is available from Dr Barry Madden, honorary secretary, C/o School of Chemical Technology, University of NSW, PO Box 1, Kensington, NSW 2033.

16K static RAM

Texas Instruments has announced a new 16 kilobit static RAM chip, the TMS4016, which is organised as 2048 x 8 bits and socket compatible with the industry standard 2716 EPROM. This allows the system designer to vary the RAM/ROM/EPROM mix of a system much more readily than before.

The TMS4016 operates from a single 5V supply and comes in a 24-pin DIL package.

Introductory unit comes as a kit . . .

Mk 14 Micro Computer

Designed around the SC/MP microprocessor chip, the MK 14 Micro Computer from Science of Cambridge Ltd (England) is a fully functional microcomputer system for the novice. Main features of the unit include 256 bytes of RAM and 512 bytes of ROM, with room for expansion of the RAM to 512 bytes. An 88-page Training Manual is included in the basic price.

by GREG SWAIN

The Mk 14 Computer is based on the SC/MP chip, an 8-bit microprocessor made by National Semiconductor. It comes as a kit of parts and is primarily intended for training and evaluation.

One objective of the kit, as implied in the accompanying Training Manual, is to introduce the novice to microcomputers and programming. Just how successfully the system does this we shall see later on in the review. Let's first take a look at what you get with the kit, and how it all goes together.

As supplied, the kit includes all the parts needed to make a complete working microcomputer Standard hardware includes the SC/MP chip, 256 bytes of RAM (2 x 2111s), and 512 bytes of ROM which houses a resident monitor program. There is provision on the board for expansion of the RAM capacity to 512 bytes, should this amount of memory be required.

Provision is also made on the board for the Mk 14 to accept a 40-pin RAM I/O device, type INS8154N. This device can be added without any additional modification, and provides the user with a further 128 bytes of RAM and a set of 16 lines which can be used utilised as inputs or outputs in any combination.

These 16 lines are divided into two groups, designated Port A (8 lines) and Port B (8 lines). Both are brought out to an edge connector.

Clock requirements for the Mk 14 are met by a 4.43MHz crystal connected across the on-chip oscillator contained in the SC/MP microprocessor. The display consists simply of a small 9-digit 7-segment LED readout of the type often found on electronic calculators. Only eight digits are available for use.

Assembly of the kit is fairly straightforward, although the construction notes are rather sparse and, in some places, a little confusing. For example, resistors R4 and R6 are specified (in the component list) as 1.2k. These may in fact be any value between 1k and 15k, and 5k types were supplied in the case of the kit we assembled.

Again, nowhere in the construction procedure does it tell you to solder in the crystal. And resistors R11 — R14 are wrongly labelled on the component placement diagram. They should be labelled R12 — R15.

All components, including the keyboard and the display, mount on a double-sided, plated-through fibreglass PC board measuring 115 x 255 mm. Assembly is greatly simplified by the fact that the board is coded and pre-tinned, and it only took us about 2 hours from unpacking to switch-on. Our unit worked as expected, but only after we thought to go back and make the corrections set out in the amendment slip!

We suggest that you carry out the corrections first to avoid being caught like we were.

Most of the parts supplied in the kit seem of good quality. However, in our opinion this is not the case with the keyboard assembly. This consists of four parts: a keyboard separator made of self-adhesive clear PVC, a contact sheet of conductive silicon rubber, a legend sheet, and a keyboard panel. These components are held sandwiched together on the PC board by four plastic "press-fit" buttons.

In use, the conductive silicon rubber is meant to make contact with PCB pads through a hole in the keyboard separator whenever a key is pressed. This arrangement makes the keyboard both tiring and difficult to use. A great deal of pressure must be exerted on the key to ensure reliable contact, and key "feel" is virtually non-existent.

In our case, the press-fit buttons also proved inadequate for the task of holding the keyboard assembly firmly in position, and we had to substitute machine nuts and bolts. If you choose to do the same, make sure that the nuts don't foul the copper pattern on the underside of the PC board.

All in all, we believe the keyboard assembly can only be described as "crude". It detracts considerably from an otherwise neatly presented product.

Power supply requirements for the Mk 14 are +7V (minimum) at 400mA for the basic kit. A further 50mA is required to drive the optional RAM I/O IC, while the optional RAM complement would require another 30mA.

With the unit "up and running", we proceeded to the "Usage Familiarisation" chapter in the Training Manual. Here the user is shown how to examine the contents of the monitor program, and is introduced to some basic keyboard exercises. A step-by-step procedure is used to show how data is keyed and placed in RAM, and how the various RAM locations are stepped through and the contents checked.

The chapter rounds off by showing the user how to enter and run a small program.

One of the things we discovered in this part of the manual is that there is an error in the section on examining the monitor program. When the "MEM" button is first pressed after siwtch-on the address displayed is location 0001, not location 0000 as stated.

Other chapters in the Training Manual describe the basic principles of operation of the Mk 14, give the architecture and instruction set of the SC/MP microprocessor, and provide brief program notes. This is where the novice is likely to become frustrated. Many of the concepts introduced are not adequately explained; nor is the would-be programmer told how to use them.

Th novice is unlikely to know what happens, for example, when you in-

The Mk 14 Micro Computer and its accompanying Training Manual. We recommend that a heat sink be fitted to the regulator IC, as this can become quite hot.

struct the system to "Load AC from Extension" (load accumulator from the extension register). Nor the circumstances in which the instruction is used, or why you would want to do it.

As a novice myself, I was puzzled as to how the pointer registers are used, and for what. Further, why should the "add" instruction be preceded by an instruction to clear the CY/L? What is a base code modifier? Why does Op Code = Base + m + ptr + disp? None of these questions was answered

So don't think that the Mk 14 system will have you writing programs painlessly and quickly. It won't!

Of course neither will any other microprocessor evaluation system currently on the market, as far as I have been able to find out. So I guess we shouldn't be too hard on the Mk 14; it's no worse than the others. Perhaps all I'm really expressing is disappointment, that it's no better.

I must comment about the strangest chapter of all in the Training Manual. This is chapter 7, entitled "Mk 14 Language — Binary and Hexadecimal". Would you believe that this chapter makes no reference to hexadecimal numbers at all, other than in the title?!

Part 2 of the 88-page manual is far more useful. It begins with a complete listing of the monitor program, and follows with no less than 22 applications programs. Some of the programs are as follows: multiply, divide, digital alarm clock, single step, Moon landing, duck shoot, mastermind, function generator, organ, and reaction timer.

The Moon landing game for example, simulates the landing of a spacecraft on the Moon. The displays represent the control panel and give a continuously changing readout of altitude (3 digits), rate of descent (2 digits), and fuel remaining (1 digit). The object of the game is to touch down gently, and to achieve this the player has control over the thrust of the rockets.

We fed the Moon landing program and several other programs in the Training Manual into the Mk14, and all worked as expected. A couple of small points about the Moon landing program though. First, the value of the delay constant at location 0F3A should be increased from 02 to 07 for a 4.43MHz crystal (the value listed in the program is suitable for a 1MHz clock). Second, the memory location listed as 0FBC should read 0FBD.

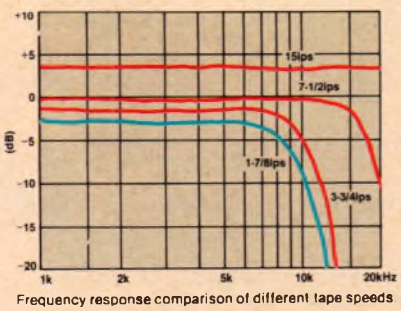
Our overall reaction to the Mk 14 system is somewhat mixed. On the one hand, it provides an easy introduction to some of the basic terminology and to practical keyboard use. The novice is quickly taught how to enter, correct and run programs, and, in some cases, how to alter certain program parameters. Full marks here.

On the other hand, the system fails to dispel many of the real mysteries of program writing. That is something that will only come to the user gradually, and after a lot of hard work. Some basic exercises on programming, together with detailed explanations, are needed to keep the novice progressing at a satisfactory rate.

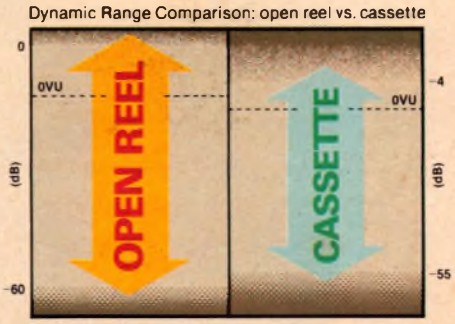
Th Mk 14 Micro Computer is available from Consolidated Marketing Corporation, 208-312 High St, Kew 3101. Price is just over the $100 mark.

The advantages of open reel are open ended.

The serious audio fan already knows how much convenience and performance he can expect from cassettes. But there's an extra measure of performance and versatility offered by the open reel format that can change your whole stereo system. Here's why:

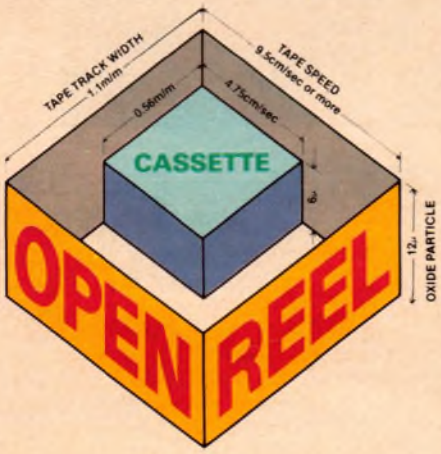


Frequency response comparison of different tape speeds.



More tape particles for each note.

One of the biggest differences between open reel and cassette systems is track width. With an open reel deck each track is twice as wide as cassette. What's more, the oxide coating on the tape is twice as thick (12 microns instead of 6), to give you four times as many oxide



particles for each note. And that's not all: open reel speed is twice or even four times as fast as cassette, so the music gets up to *16 times greater* recording density. Here's what it means:

Fuller Frequency Response.

Since the tape travels faster with open reel, the shorter high-frequency wavelengths are more easily captured by the playback head. The result is extended high frequency response, and more linear, balanced fidelity throughout the whole range. It's a difference you can hear when you switch to open reel.

Full Dynamic Range.

Obviously, with more area to record on, the signal is stronger. That means a drastic improvement in dynamic range. And since the recorded signal can be much higher than the tape's inherent noise level, you get a better signal-to-noise ratio for every type of music. Give it the ear test.

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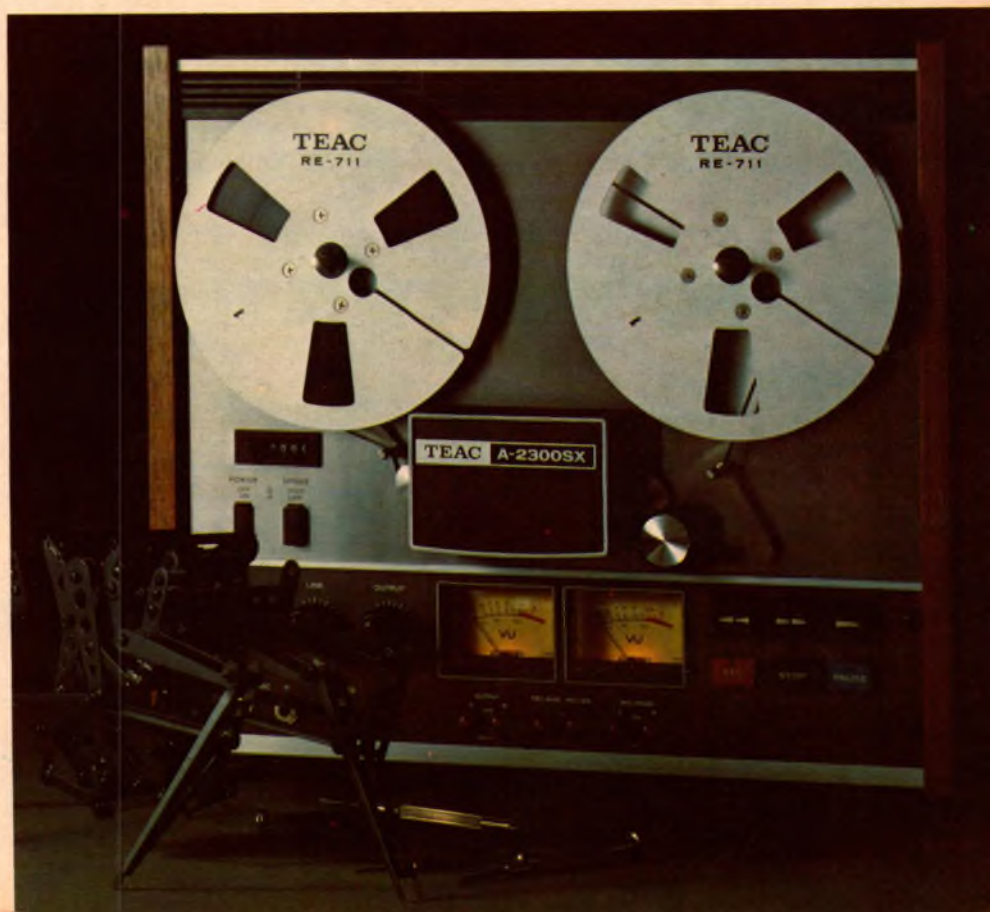

No. 2 in a collection

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AMPEX the professionals

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Why blame your tape recorder for problems caused by your tapes?

Every day people all over the country go into hi fi dealers with complaints about their tape recorders.

When in reality what they should be complaining about is their tapes.

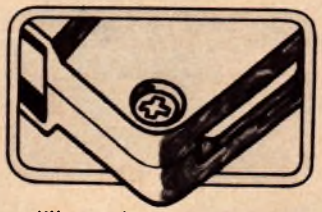
Because the fact is, a lot of the problems that plague tape recorders can be attributed to bad tape.

HEAD WEAR IS CAUSED BY YOUR RECORDER. OR IS IT?

If you have to clean your tape heads more than usual ... for example ... it could be that your tape doesn't have a special nonabrasive head cleaner.

Maxell has one.

If your recorder jams, it can be any number of things. Maxell does something to prevent all of them happening.



We make our cassette shells of high impact polystyrene. And then so they won't crack even after years of use, we finish them to tolerances as much as 60% higher than industry standards.

JAMMING IS CAUSED BY YOUR RECORDER. OR IS IT?

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If your tape recorder frequently suffers lapses in sound, it could be the tape is of inferior quality.

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So if you're having problems with your recorder, try a Maxell cassette, reel-to-reel tape.

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WT80/78

Improved decoding for the low cost VDU

The designer of the low-cost VDU described in our February and April issues employed a few "short cuts" in the circuit, in order to keep its cost to an absolute minimum. Generally these don't cause problems, but just occasionally they can be troublesome. Luckily they can be overcome quite easily, as this short article explains.

by DAVID JONES, VK5ZSJ/NSJ 40 Topaz Crescent, Salisbury East, SA

I recently completed building the low-cost VDU which was described in the February and April 1978 issues, and connected it up to my Motorola 6800 microprocessor system to test it. I wrote a test program to output a character string consisting of the complete ASCII set, and this brought to light a few shortcomings of the VDU design.

Firstly, the Motorola literature informed me that on system reset the Mikbug monitor program should send an asterisk (*) to the terminal. Instead what was displayed on the VDU was "T@@@*". I discovered that this was due to the fact that the VDU as originally described does not suppress the display of control characters other than CR, LF and backspace. As it happens the Mikbug routine outputs filler control characters after a carriage return, to allow mechanical teleprinters to return the carriage before the first character arrives for the new line. It was these filler characters which were being displayed. It seems to me desirable for the VDU to be modified to inhibit display of such control characters.

Secondly it also became apparent that although most of the codes for lower-case alphabetic characters were being correctly displayed as the upper-case equivalents, lower-case A was displayed as "!" rather than "A". Since I want to use my system for text editing, it would be very desirable to have "a" displayed as "A".

The third thing I discovered was that the carriage return, line feed and backspace functions could be evoked by control character codes additional to their correct codes.

I realise that none of these shortcomings is likely to be much of a problem for many applications of the VDU, which was after all a low cost design with minimum frills. However having gone to the trouble of modifying the design myself to remove them, I thought other readers may care to have the details, so that they too can make the modifications if they wish.

The modification required to convert lower case alpha into upper case is shown in Fig. 1. The circuit functions by inhibiting the storage of bit 6 if bit 7 is set to a 1. This converts lower case to upper very neatly, as bits 6 and 7 are both 1 for lower case, while bit 7 is 1 and bit 6 zero for upper case.

Fig. 2 shows the changes required to inhibit the display of control characters. A control character has both bit 6 and bit 7 set to 0, so its presence can easily be detected on the original circuit at pin 13 of IC22. Since a backspace requires a storage cycle to write a blank (space code 40) into memory, however, we must not treat this the same as the other control characters. The presence of a backspace can be detected at IC13 pin 12. By ANDing these two signals we get a signal which is then used to gate the signal from IC21 pin 3 going to IC4 pin 13. This in turn inhibits the gating of the strobe at IC4 for non-backspace control characters.

Fig. 3 shows the additional gating I have used to fully decode the backspace, line feed and carriage return codes, to remove the ambiguity. IC12 in this circuit is a spare three-input NAND gate on the original VDU board.

As you can see, there are only three extra ICs required to perform all of the modifications. The NOR gates are provided by a 7402, the inverters by a 7404 and the AND gates by a 7408. I built these onto a small piece of Veroboard, and then used ribbon cable to interconnect it with the main VDU board. The Veroboard layout is shown for those who may care to use the same approach.

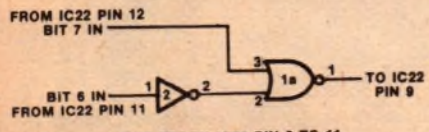


FIG. 1 CUT TRACK IC22 PIN 9 TO 11

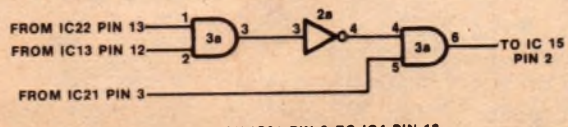
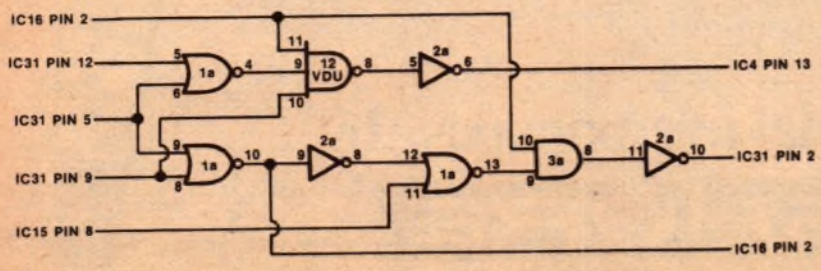


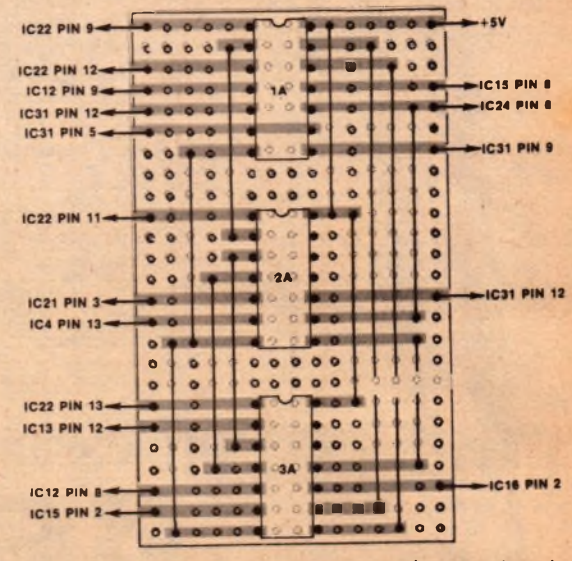
FIG. 2 CUT TRACK IC21 PIN 3 TO IC4 PIN 13



CUT TRACKS FROM IC15 PIN 8 TO IC16 PIN 2
FROM IC15 PIN 1 TO IC15 PIN 2
FROM IC24 PIN 5 TO IC24 PIN 6

ADD LINKS FROM IC31 PIN 2 TO IC12 PIN 11
FROM IC31 PIN 9 TO IC12 PIN 10

FIG. 3



At left are details of the three circuit modifications required to improve the VDU decoding. Above is the wiring diagram.

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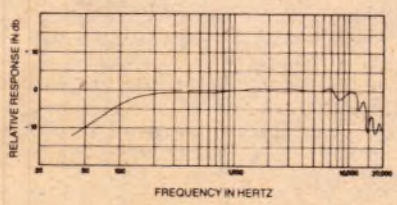

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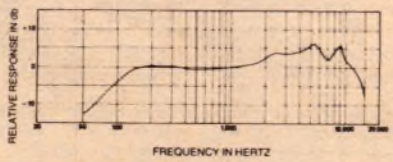

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Classical Recordings

Reviewed by Julian Russell

Beethoven, Mozart: sheer perfection of sound

BEETHOVEN — "Funeral" Sonata in A Flat, Op. 26. "Waldstein" Sonata in C Op. 53. Hans Kann (piano). Audio Lab Stereo ALC 1024.

MOZART — String Quartets in D Minor, KV421, and C Major, KV465. Mari Iwamoto String Quartet. Audio Lab Stereo ALC 1038.

I have been sent, by M. R. Acoustics of Brisbane, the first examples of Japanese classical record production I have ever come across. Technically, they are superb examples of the record maker's art. On the handsome — and solid — sleeves, the names of the compositions and performers are printed in English. But the west stops there. Inside the covers, all information is in Japanese, leaving a westerner in perplexed ignorance of the matters discussed.

Fortunately, I was well acquainted with the contents of the first two discs I played — the first a recital of Beethoven Piano Sonatas, the second two Mozart String Quartets. The brand name — in English — is Audio Lab Record, and if you can't find pressings in music shops the distributors are M. R. Acoustics, Box 110, Albion, Brisbane, 4010.

The price of each stereo disc is — wait for it — $14. For this you will acquire technical productions of superb quality and fidelity, whatever you may think of the performances.

The soloist in the Beethoven Sonatas is Hans Kann. His technique is clean but he has, to me, a heartless kind of style. The result is rather like a blueprint of the work, exact in detail and scale but a bit too monochromatic for my taste. In the matter of tempos, "fast" to him seems to mean precipitous. This makes even the "Funeral" Sonata sound almost cheerful as he plays it or, at best, a bit impatient and impersonal.

But there is no ignoring the perfection of the reproduction which many who are not worried by Kann's style will find impossible to resist — if they can afford it.

The Mozart String Quartets, played by the Mari Iwamoto String Quartet, also offer faultless recording. By this I mean faultless in balance, intonation and unanimity of execution and thought. The phrasing is immaculate and the melody always passes with the utmost smoothness from instrument to instrument.

That the performances are note perfect goes without saying. Importantly, the leader does not dominate the performances unduly. Indeed the effect is of one mind directing the eight hands and the thoughts behind them. The inflections are of the utmost subtlety. But, if you're looking for schmaltz you wont find a bar of it.

To my western ears, emotion to the players seems rather less important than accuracy and style, the latter impeccable. A facile answer to this would be legendary "Japanese restraint," a mistaken idea since I have Japanese friends who, while always formal, are anything but unemotional. Indeed an evening spent with them is invariably pleasurable.

Yet both quartets reviewed here have a slightly alien quality, perhaps due to the unvarying, I nearly wrote mechanical, perfection. But in spite of all this I still found the playing enjoyable if not particularly moving.

I still have two more discs to review in my next column, one of which features an orchestral ensemble, but which I have not yet played. In the meantime, in spite of some of my minor disagreements with the players, the sheer perfection of the sound could not be denied by the most critical buyer.

Strauss: Macbeth & Metamorphosen

STRAUSS (RICHARD) — Symphonic Poem Macbeth. Metamorphosen (for 23 solo strings.) Dresden State Orchestra conducted by Rudolf Kempe. World Record Club Stereo S/5605.

Macbeth is one of the earliest of the Strauss tone poems, and was composed before the composer had developed his famous wide-ranging melodies which stride through several octaves. But promise of them is in the work, together with an occasional sudden modulation into a remote key, so characteristic of his later works but used here with some hint of timidity. But in evidence already is Strauss' driving energy. He also later boasted of having been able to get a feeling of hyprocrisy into Lady Macbeth's theme which you may or may not spot. I didn't.

But then Strauss, despite his great gifts, was given to boasting, although not without grounds. One of the world's greatest orchestrators ever, he could describe, in musical terms, events in the most graphic way. He once boasted (again) that he could describe a glass of lager in orchestral sound.

I don't think Macbeth has ever, or ever will achieve the popularity of such later works as Tod und Verklarung, Don Juan, Till Eulenspiegl, Ein Heldenleben, or perhaps the greatest of them all, Don Quixote. Although some of his themes sound a little short-winded when one remembers his later achievements, his name is already written across the work.

There is, of course, plenty of turmoil — battles, clashes of will and so on — to interrupt the more lyrical passages. This disc will be useful to Straussians to complete their collection of the tone poems, though I think a complete edition is already available (I cannot recall the label). But there is little about this side of the disc under review that is memorable if you except the superb playing of the Dresden Orchestra under Rudolf Kempe and the splendour of the engineering.

I must confess that it gave me only a little of the feeling of the atmosphere of Shakespeare's great play, which has innumerable changes of mood and violent — but subtle — action. Although I am devoted to much of Strauss' music I cannot imagine myself repeating Macbeth very often.

The reverse side is a different matter altogether. It is the composer's last orchestral work — though for 23 solo strings only — and was started when he was 81, towards the end of the second World War. Germany was being overrun by the Allies, all his favourite

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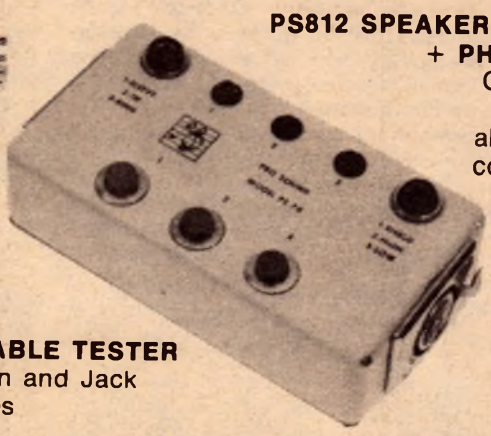

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concert halls and opera houses had been destroyed, and Metamorphosen was conceived in a mood of deepest sorrow, but without resignation. It is in the same autumnal mood as his famous Last Four Songs.

Yet there is nothing facile in his obvious grief. Indeed, you come across some amazingly passionate passages. And Kempe and his orchestra make you share this grief with him.

The work consists of one long stream of beautiful melodies set down by the unfaltering hand of a master — an old, tired, disillusioned but by no means broken man. Strauss can sometimes be justly described as vulgar, but never in this highly refined work.

It might be worthwhile to record an incident around this period that has always remained in my mind. Strauss lived in a handsome villa on a hill in the small Bavarian town of Garmisch — Partenkirchen. This was in the American zone and when the Americans arrived the captain in charge saw the villa on the hill and thought it would be a good place to quarter his men. They were met at the door by a tall but straight-backed old man who pronounced only one sentence; "I am the composer of Der Rosenkavalier." The captain just saluted and left him in peace.

A final remark. Listen carefully to the closing bars of Metamorphosen and you will hear a whispered quotation of the theme of the funeral march from Beethoven's Eroica Symphony. Here is a work that still gives me very great pleasure every time I hear it.

☆ ☆ ☆

MOZART — The Impressario. Comedy in one act with music. Lo Sposo Deluso. Opera Buffa in 2 acts. Felicity Palmer, Ileana Contrubas, Ruth Welting, Anthony Rolfe Johnson, Robert Tear, Clifford Grant and the London Symphony Orchestra conducted by Colin Davis. Philips Stereo Cassette 7300 402.

I wonder how many readers of this column have ever heard the fragmentary bits of music that make up Mozart's opera Lo Sposo Deluso. Not many, I think, and you can count me among them. Still, you can console yourselves in the knowledge that you haven't missed much.

This curious little work hasn't even the excuse of being a youthful indiscretion since it was scribbled down between The Impressario and one of his finest operas, The Flight from the Harem. There are only two items in any way worthy of the true Mozart — a comic quartet and a soprano aria beautifully sung here by Felicity Palmer. Colin Davis seems to have taken more trouble about the performance of these than over the rest of the pieces, too.

In them he successfully distinguishes between the true pathos of the one and a comic imitation of this emotion in the other. For the rest, he seems not to have taken the trouble to imbue the music with the true spirit of Mozart, forsaking the not too funny humour for an alien abruptness. By the way, the unfinished bars were admirably scored by Eric Smith.

I have only seen The Impressario once, many, many years ago at the Sydney Conservatorium of Music under the direction of Eugene Goossens. I found it pretty tedious even then. It consists, for the most part, of a competition between two sopranos who vie with each other for a part in a new opera and is often interrupted by lots of very tiresome dialogue (happily omitted in this cassette). Ruth Welting's performance is anything but ingratiating (perhaps purposely). Competing singers are often not very nice people.

But her voice is unnecessarily hard and unmusical and her coloratura passages only just get by. When you listen to her rival, Ileana Contrubas, you will have no doubt as to who should be the winner. Hers is a true Mozartian style and her voice is always pleasing.

Strangely, Davis seems to be too serious about the whole production, missing the lightness of touch that would have added enjoyment to these inconsiderable trifles. Nor is the recorded sound up to Philips' customary high cassette standard. Unless you wish to acquire the cassette to complete your Mozart collection, I cannot recommend this production with any enthusiasm.

Durufle: brilliant, original and unusual

DURUFLE — Requiem, Op. 9. Danse Lente, Op. 6, No. 2. Kiri Te Kanawa (soprano), Siegmund Nimsgern (baritone), with the Ambrosian Singers, Desborough School Choir, and the New Philharmonia Orchestra conducted by Andrew Davis. CBS Stereo Cassette RC 881. Also on disc.

I find this Requiem difficult to write about. There is nothing operatic about it like the Verdi. For the most part it inclines towards the tranquility of the Faure. But while the Faure remains on a more or less set level of serenity throughout, the Durufle occasionally bursts into passages of very forceful statement indeed. However it never loses its liturgical quality.

It is scored for a large orchestra — not approved by the Roman Catholic Church — but two other versions exist, both from the pen of the composer. One of these has an organ accompaniment, while the other is arranged for an orchestra smaller than the one used in the version under review. By the way, the scoring is exquisitely French — not surprising when one learns that Durufle was a pupil of Paul Dukas.

There is no doubting the organist-composer's reverence. By the way, there is no Dies Irae in either of the two Masses, so that the fearsome turmoil of that movement of The Verdi setting is missing.

Unfortunately there are no explanatory notes of any kind provided with the cassette, although you will find extensive comments accompanying the disc version. However, I imagine that CBS would be happy to provide a copy of them on request to buyers of the cassette.

Durufle belonged to what might be roughly described as the Debussy-Ravel school and his music identifies closely with it, but without any copying or plagiarism from other composers of the period.

Kiri Te Karawa's solo in the Pie Jesu is most beautifully sung and she was in glorious voice when she recorded it. I am not so keen on the baritone soloist, Siegmund Nimsgern, who uses a more operatic vocal pressure not altogether in keeping with the character of the work. The chorus is always outstandingly good and the orchestral subtleties most ably handled by the conductor, Andrew Davis.

An occasional broadened vowel is the only fault I could detect in the otherwise excellent French pronunciation used by all concerned, whatever their nationality. Anyone with a moderate knowledge of the language will spot them, especially when the word "plus" crops up as it often does. Despite the Requiem's many beauties, I think it will appeal more to those interested in church music than to the general record buying public.

But this does not apply to the strangely original Danse Lente which is on the same cassette — and disc. This is not a bit like what one might expect from the title. True, it starts slowly, but later it turns into what might well be described as a saturnalia. It has all the atmosphere of some ancient rite which could perhaps be best described as of pagan origin.

The scoring is again brilliant, with some passages strongly reminiscent of Ravel's Daphnis and Chloe. Debussy, too, has his say here there though, as I wrote above, with never a hint of plagiarism. There are two exciting full-blooded climaxes which add to, by way of contrast, the cool elegance of the whole.

Both works are unusual and highly original, despite the occasional reminiscence noticed. I recommend them chiefly to those musicians devoted to the pre-Boulez-Messaien school of French music.

Lighter Side

Reviews of other recordings

Devotional Records

I'D RATHER HAVE JESUS. George Beverly Shea. Stereo, RCA VPLI-7157.

It's quite a while since I listened to an album by the veteran and highly esteemed soloist from the Billy Graham Gospel Team — Bev. Shea. And I must say that I enjoyed listening to it, as a reminder of the "old school" of Gospel singers. Considering his years, he is in remarkably good voice.

He is backed in this album by an excellent vocal group, the Nashville Sounds, and by a small instrumental combination as he sings ten numbers which will be sure to appeal to his many supporters: I Want To Be Ready — Just As I Am — Reach For the Hand Of The Lord — Ivory Palaces — There Were Only A Few — I'd Rather Have Jesus — O Lord, I Am Not Worthy — I Will Praise Him — Sweet Hour Of Prayer — Will The Circle Be Unbroken.

Incidentally, "I Will Praise Him" was written in collaboration with his daughter, whom I would take to be the lass pictured on the cover. The notes suggest that the album has been inspired from a family background for family listening. I Agree. (W.N.W.)

☆ ☆ ☆

DEUS EX MACHINA. David Rumsey plays a "State of the Art" organ. Stereo, MBS-1. (From the Music Broadcasting Society Coop Ltd, 76 Chandos St, St Leonards NSW 2065).

This album has been available for some time but, mainly due to oversight, has not been mentioned to date in these columns. As will be apparent from the title par, it was produced in association with the Music Broadcasting Society, best known as the operator of station 2MBS-FM in Sydney.

Notes on the jacket and inner sleeve introduce David Rumsey as the Chairman of the department of Organ and Church Music at the Sydney Conservatorium, and Australia's first participant in the international Organ Festival at Westfallen-Lippe in Germany. During that visit, he discovered the splendid, modern Fuehrer organ in the Church of the Redeemer, Wittenfull justice. The recording to, is excellent and a world away from so many other organ recordings which rely for their impact on the quantity, rather than the quality of sound. Get yourself a copy. (W.N.W.)

Annen, near Cologne.

He chose it to give expression to his aim: to make the "machine" speak of the God in traditional church music. And the music: Prelude and the Fugue in G minor (Buxtehude); Variations on "Ach, du Feiner Reiter (Scheidt); Mit Fried Und Freud Ich Fahr Dahin (Buxtehide), Ciacona in F Minor (Pachelbel); Voluntary in D Major (Heron); Prelude and Fugue in C Major (J.S. Bach).

One doesn't have to listen for long to appreciate why David Rumsey selected this particular organ; the sound is clean and sharp, without ever being piercing or harsh or unmusical, and David Rumsey does the instrument and music

☆ ☆ ☆

SHARING. Pearl Sumner. Stereo, Audio Arts Enterprises IMA-787. (From Audio Arts Enterprises, P.O. Box 248, Gladesville, 2111).

Although not known to me personally, Pearl Sumner is very active in Australia and overseas in connection with the Christian Foundation for the Blind. She, herself, has a severe visual handicap. Her husband, Peter, is General Director of the Foundation and much of their time is taken up with speaking and singing engagements.

She is backed here by musicians drawn from the Christian "Sonlight" Group in Sydney but I was not impressed by the end result. Despite their individual talents, the accompaniment seemed to lack the variety and sensitivity so essential for this kind of material, with the piano being particularly assertive. Perhaps that was why Pearl Sumner seemed not to be as relaxed as I would have expected in singing:

Day By Day — I Shall Know Him — If Heaven Was Never Promised — He Lifted Me — Thine Lord — Deep Down In My Heart — I Cannot Hide From God — Shepherd Of Love — You Can't Stop God — Will You Stay.

In presenting these numbers, Pearl Sumner is obviously communicating a strong personal conviction and this will commend the record to those who know her. A note on the jacket indicates that sales of the album will assist the Christian Foundation for the Blind at 256 Riversdale Rd, Hawthorn Vic 3122. (W.N.W.)

Instrumental, Vocal and Humour

GREAT CLASSICAL FAVOURITES. IMAGE ILP-770. Astor release, Stereo.

The Vienna Festival Orchestra, under Professor Hans Hagen, provides an enjoyable sampling of seven very well known pieces in the classical repertoire. They are: Don Giovanni Overture (Mozart) — Anitra's Dance, Arabian Dance (Grieg) — Piano Concerto No 1, E flat major (Liszt) — Largo from Xerxes, (Handel) — Die Fledermaus Overture (Johann Strauss) — Fruhlingslied (Mendelssohn) — Polonaise & Waltz from Eugen Onegin (Tchaikovsky).

Apart from the piano playing of Suzanne Hesters in the Liszt work, which sounds a little muffled and remote, the overall quality is pleasing, making a record that could provide a starting point for somebody's popular classical collection. The sleeve carries a few biographical notes on each of the composers. (N.J.M.)

☆ ☆ ☆

101 STRINGS Play More of Todays Hits and Other Original Hits. Astor Records. Stereo S5345. Also on cassette 4S5345.

According to the sleeve notes, many of the instruments used by the 101 Strings Orchestra are more than 200 years old. One violin, made in the year 1735 by the Cremonese master violin maker Joseph Del Gesu, is valued at $80,000 alone!

The album itself features some of the most popular hit tunes of recent years, together with a few older hits thrown in for good measure. All are played in the competent, relaxing style that is now a

Reviews in this section are by Neville Williams (W.N.W.), Jamieson Rowe (J.R.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), David Edwards(D.W.E.), Greg Swain (G.S.), and Danny Hooper (D.H.).

trademark of the 101 Strings Orchestra. All in all, it adds up to a very enjoyable listening session indeed.

Track titles are: Feelings — Evergreen — Captive Dreams — Goodbye Yellow Brick Road — Solitaire — Southern Nights — Don't Cry for Me Argentina — Don't Let the Sun Go Down on Me — Summer Serenade — Goodtime Feelin'.

The review album was of excellent quality. (G.S.)

☆ ☆ ☆

FOREST MURMURS. Orchestral Masterpieces of Wagner. George Szell conducts the Cleveland Orchestra; Eugene Ormandy conducts the Philadelphia Orchestra. CBS stereo GM 513.

Anyone looking for some quiet restful music should not be misled by the title of this album. It is anything but restful. On the other hand, if you are on the lookout for some brilliant orchestral pieces to show off your system, then this is the record to buy. The recording quality is particularly good and both the featured orchestras are in fine form.

Track titles are as follows: Tannhauser Overture — "Dawn" and Siegfried's Rhine Journey" (from

Gotterdammerung) — Fest March (from Tannhauser) — Magic Fire Music (from Die Walkure) — Ride of the Valkyries (Die Walkure) — Forest Murmurs (from Siegfried). (L.D.S.)

☆ ☆ ☆

LATIN GUITAR FAVOURITES. The Latin Guitar Ensemble. Astor Records. Stereo FBAB 5319. Also on cassette (4FBAB5319).

If you fancy a lively session of latin guitar music, then this album should fill the bill. It is the first album to be released by The Latin Guitar Ensemble, and the group certainly has the ability and flair to capture the spirit of the latin theme.

Most of the tunes listed are familiar "oldies". If you want to sample the record before buying, have a listen to the rendition of "Danny Boy". It's one of the most unusual I have heard.

Track titles are: Cachito — Isle of Capri — Tango of Roses — Blue Tango — La Cumparsita — You Belong to My Heart — Estrellita — Besame Mucho — Quizas, Quizas — Comin' Through the Rye — Danny Boy — Dark Eyes.

Recording quality is well up to standard, with negligible surface noise. Recommended. (G.S.)

☆ ☆ ☆

TOM & JACK. THE ALEXANDER BROTHERS. Stereo, Astor SPLP-1529.

Introduced on the jacket as "Scotland's foremost international entertainers", the Alexander Brothers have been featured as far afield as London's Albert Hall, New York's Carnegie Hall and the Sydney Opera House.

Perhaps it's this introduction which leads to the expectation of a Scottish national type of program. But it's much more varied than that, with some Scottish numbers interspersed with songs by Kris Kristofferson, a couple of devotional numbers and a couple of accordion tracks featuring Tom Alexander, the Scottish open champion on the instrument.

The tracks: Mull of Kintyre — Any Dream Will Do — The Oil Rigger — Loving Her Was Easier — One Day At A Time — Scotland, Scotland — He Bought My Soul At Calvary — The Pipers Waltz — Come By The Hills — Please Don't Tell Me How The Story Ends — Snow Train Shuffle — Farewell My Love.

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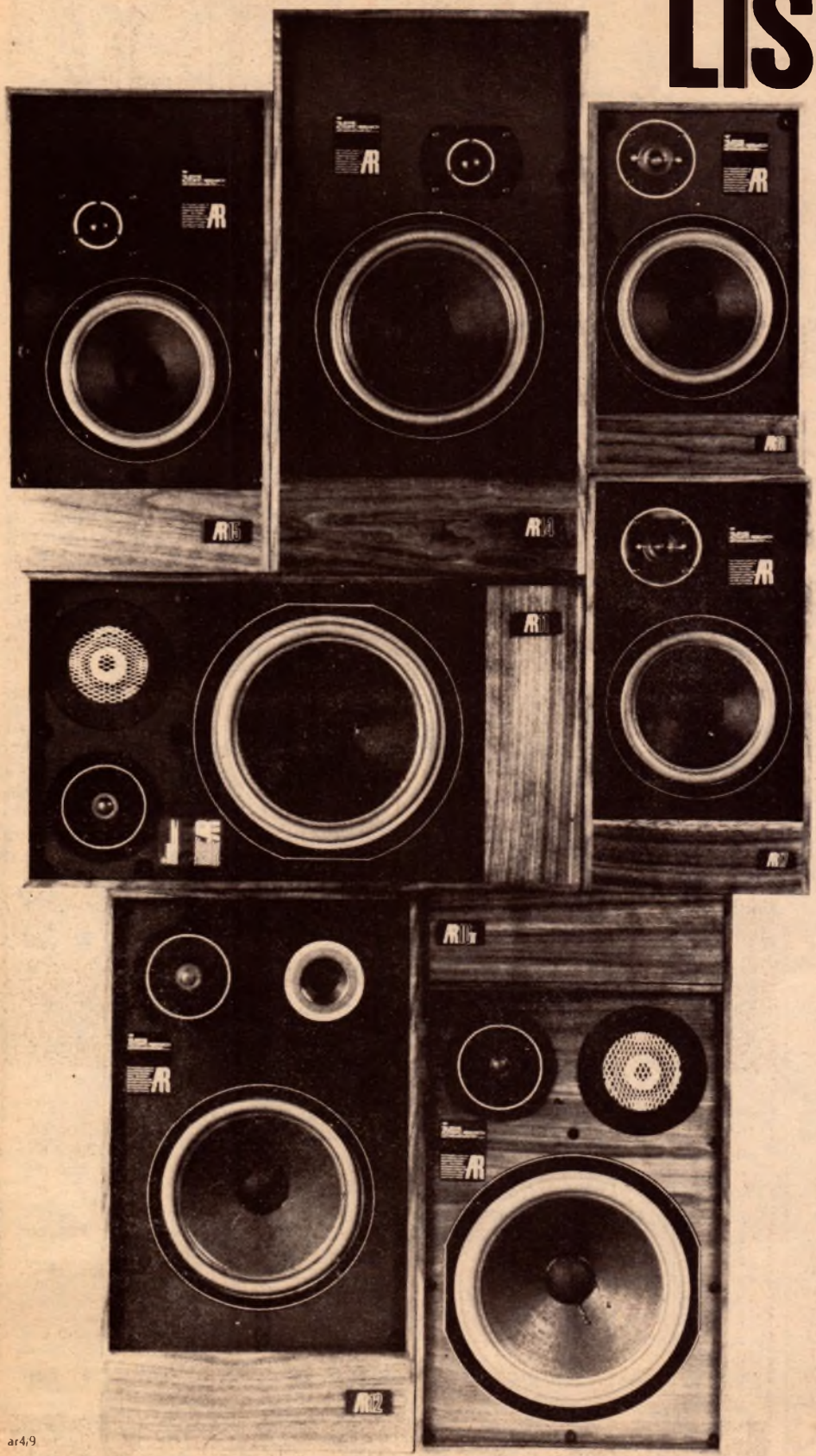

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THE LIGHTER SIDE — continued

It's a pleasant program and one that should appeal particularly to those who have seen the Alexander Brothers on stage. Technically, the sound is clean and well balanced. (W.N.W.)

☆ ☆ ☆

CLOSE TO NATURE. The Whistling Jan Lindblad. Stereo, RCA Victor VPL1-7168.

Not everyone might fancy listening to a complete album of whistling — at least of the ordinary variety. But Jan Lindblad is no ordinary whistler. As a producer of nature and travel TV documentaries, he has developed the art of mimicking the sound of birds from aound the world. And he does it so well that there is not the slightest hint of artificiality in the sound, as heard.

On this album, an orchestra provides the basic melody for the ten tracks, to which Jan Lindblad adds a mix of very musical human whistling, plus appropriate bird calls.

If I've made it sound unduly contrived, I have done Jan Lindblad an injustice. It's a simple, pleasant, happy sound which is not at all hard to take in our increasingly complicated environment.

The track titles: Sailing — Pa Dangens Vingar — A Nightingale Sang in Berkeley Square — Raindrops Keep Falling on My Head — Shenandoah — Swedish Spring At Dawn" — El Condor pasa — Danzante Del Destino — Ave Maria — Listen To The Ocean.

If you want to sample Jan Lindblad's skill before you buy, listen to his "Swedish Sping At Dawn" in which he uses multi-recording to create a complete bird Chorus in stereo. (W.N.W.)

☆ ☆ ☆

THE SOUND OF ROSNY. The Rosny Childrens Choir and the Tasmanian Symphony Orchestra conducted by Vanco Cavdarski. Move Records, stereo, MS-3015. Also on cassette MC-3015. (Move Records, Box 266, Carlton South, Vic 3053. STD 03 419 1503)

If you haven't caught up with the Rosny Childrens Choir, you have a listening pleasure ahead of you. Founded, trained and directed by Jennifer Filby, the fifty children in the choir have progressed from an impromptu group in 1966 to world class — and this is not an idle phrase.

Just a few of the fifty members of the Tasmanian Rosny Childrens Choir.

From their home city of Hobart, Tasmania, they toured mainland Australia and went on to compete at Llangollen in Wales, thereafter touring Britain and making their first recording in Westminster Abbey.

In 1975, they were selected by the Australian Government to represent Australia in the first cultural exchange with China — delighting the audiences with three chinese songs which are included in this album.

A bracket of songs of other lands adds: "Jamaica, Farewell", Chiapanecus", "Summer Sunshine" and "Sing A Rainbow". Australian songs follow: "Click Go The Shears", The stock Rider's Song" and "Song Of Youth".

On side 2 are four songs from the cantata "Folk Songs of the Four Seasons" (Vaughn Williams) plus five from "Songs of Come and Gone" (Don Kay).

Recorded in the Hobart Studios of the Australian Broadcasting Commission, the sound has a nice ambience and a professional quality to go with the program, so delightfully presented by the Rosny Choir and the Tasmanian Orchestra. In all, a recording that must carry the final word: "Recommended". (W.N.W.)

☆ ☆ ☆

GOLDEN CLARINET Henry Arland. Stereo, Image (Festival) ILP-4969

There's always something very easy on the ear about a well played clarinet, and Henry Arland, can indeed play the instrument as cool or as hot as you're likely to want it. If you're really keen, you may even listen straight through to all fourteen numbers on this generous program:

Feelings — The Most Beautiful Girl — Baby Clarinet — Let It Be — Sweetheart Valentine — Apache — After Tea — Attila — Dolannes Melodie — Henry's Charleston — Orfeo Negro — Delicado — O My Darling — I Found My Love.

The backing orchestra provides a modern rather than a traditional

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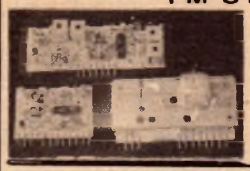

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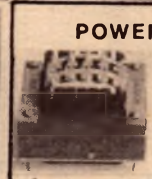

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backdrop for the solo clarinet, featuring rhythm and guitars rather than sentimental strings. Style and tempo varies from track to track, to help maintain the interest. Pleasant, middle of the road Music, cleanly recorded. (W.N.W.)

☆ ☆ ☆

HITPARADE. Die Echten Karlsbader. Image stereo ILP 4971. Distributed by Astor Record Pty Ltd.

Astor have done themselves and their customers something of a disservice in the way they have released this record. Of German origin, it has no sleeve notes and the titles will remain largely a mystery to anyone who cannot read the language. So the average record buyer will probably pass over what is a very good band record in the best "oompah, oompah" tradition.

Recording quality is very good. Have a listen, for example, to the first track on side one, "Rosamunde". (L.D.S.)

☆ ☆ ☆

MAGIC CAROUSEL. The Magic Organ. Stereo, Interfusion L-25310. Festival release.

In case you haven't caught up with the "Magic Organ" series, all the tracks are in the style of a strict tempo mechanical fairground instrument — except that they are created by a very capable artist, in the person of Jerry Smith, on a very modern electronic organ. That the formula has proved a popular one is indicated by the fact that eight other companion albums are listed on this latest jacket.

I can't imagine that anyone would want to collect and play all of them and some may even feel that the dozen stylised tracks are a bit much for one sitting. But that certainly won't go for everyone. The track titles:

The Magic Carousel — My Happiness — Those Were The Days — Yellow Bird — Autumn Leaves — Peppermint Polka — Rose Garden — Scarborough Fair — Snowbird — Eidelweiss — Boogie Woogie Magic — Ballroom Waltz.

As with all the Magic Organ albums I have heard, the sound on this one is clean and well balanced and, as part of the formula — miked close-up with a minimum of reverberation. Worth a hearing, if you haven't heard the Magic Organ to date. (W.N.W.)

☆ ☆ ☆

RAY THORNLEY IN YAMAHA MUSICLAND. Featuring the Yamaha E-70 Electone Organ. Stereo, Audio Arts Enterprises IMA-789. (A division of Soundbank Pty Ltd, P.O. Box 248, Gladesville 2111).

I remember being quite impressed by an earlier album from Australian organist Ray Thornley, noting his feel

and facility for simulated orchestral sound. The same quality comes through strongly on this new album, performed entirely on the Yamaha E-70.

Not being equipped with more than the usual number of hands and feet, Ray Thornley has obviously had to make use of multi-tracking, but without any obvious penalty in the way of added noise or distortion.

The Yamaha E-70 offers a wide variety of sound and effects — a combination of organ, piano, synthesiser, plus imitative voices, wah-wah, glide, percussion and so on. As such the E-70 has left the "organ" concept far behind and is way into the area of a self-contained entertainment unit.

The track titles: What I Did For Love — Yamaha Theme — I Write the Songs — Theme From "Star Wars" — Send In The Clowns — Pop Corn — Aria in D Major (Air on a G String) — Theme From "Rocky" — Smoke Gets In Your Eyes — Country Road — Evergreen — Paloma Blanka.

Technically, the sound is well spread and well balanced, with a generous share of solid bass. A very listenable record for those who like middle-of-the-road music, with added fascination for those who like middle-of-the-road music, with added fascination to those for those who appreciate how far the electronic organ has moved since the days of the early Hammonds! Recommended. (W.N.W.)

☆ ☆ ☆

SHADOW DANCING. Andy Gibb. ATA Records. L 36578. Festival release.

This second album released by Andy Gibb appeals to me as far better than his first release. Six tracks were written by Andy Gibb, two by Barry Gibb and two by Andy and Barry in collaboration.

All ten tracks are characterised by very clear vocal arrangements with excellent instrumental backing. The opening track, "Shadow Dancing", is his third consecutive No 1. hit in the United States, and "An Everlasting Love" his fourth single will probably hit the top as well. The album can be described as "soft" disco, and the following tracks are very good: Shadow Dancing — An Everlasting Love — Don't Throw It All Away.

All in all, this album is an outstanding release and is a good buy. (D.H.)

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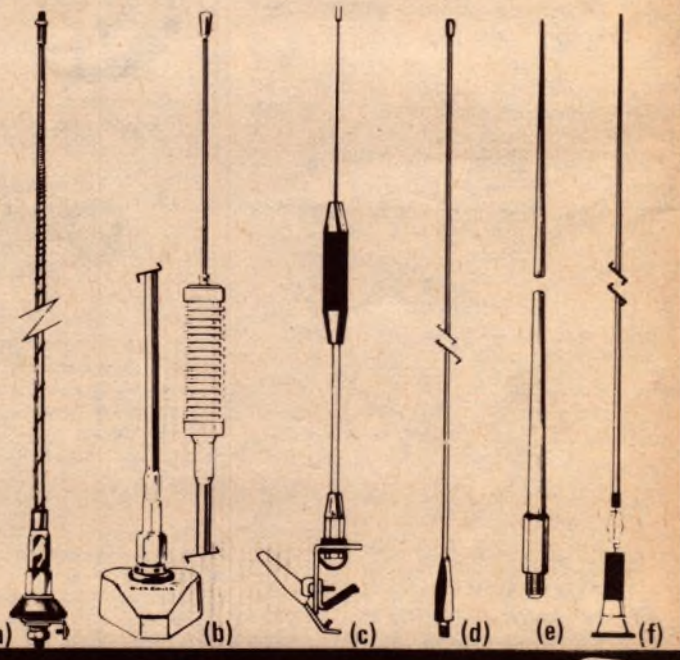

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DICK SMITH ELECTRONICS

The Australian CB SCENE

EA, CB AND BRITAIN'S HOUSE OF LORDS!

Last March, Jim Rowe "shot an (editorial) arrow in the air". It "fell to earth", of all places, in the British House of Lords, in support of the case as to why Britain should not accept the idea of Citizens Band Radio. It is interesting to note what was said and why it was said.

The editorial was written in the first place, purely for local consumption. It was pointing to the abuses of CB radio that had become evident and was making a plea for responsibility and restraint on the part of all concerned; in other words, voluntary self-regulation. It went on to warn:

"If this is not done, the backlash against CB may build up to such a level that the authorities may be forced into attempting complete suppression. Or perhaps, worse still, we could see the growth of self-appointed CB vigilante groups, using violence to exert their will on CB users."

The editorial caught the eye of members of the Radio Society of Great Britain — the country's prime amateur body — who quoted from it in their publication "RadCom". It came to the notice of Lord Wallace, immediate Past President of the RSGB, who happens to be very active in British parliamentary affairs.

Hence its appearance in Hansard, which was brought to our notice by R. F. (Roy) Stevens, G2BVN. We quote the excerpt in full, partly by reason of its content, and partly as a glimpse of the debate in Britain's most august House:

CITIZEN BAND RADIO:
PUBLIC AVAILABILITY

2.58 p.m.

Lord TANLAW: My Lords, I beg leave to ask the Question which stands in my name on the Order Paper.

The Question was as follows:

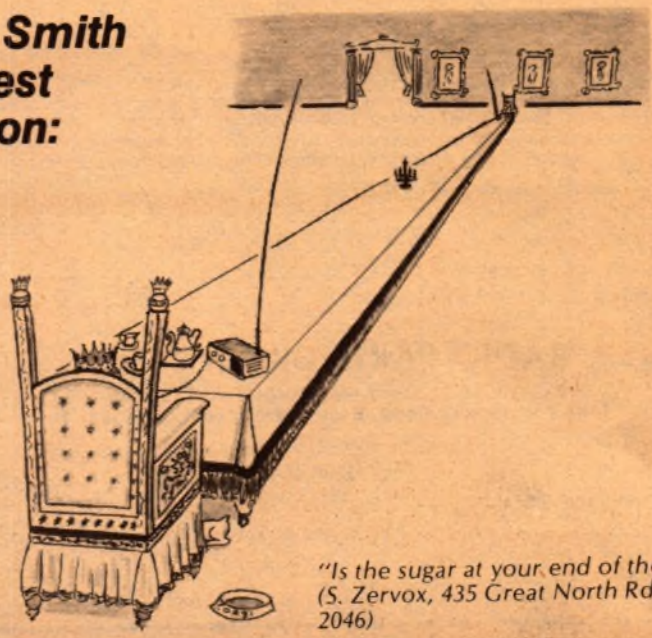
To ask Her Majesty's Government whether they will accept a recommendation of the National Electronics Council to improve public communications by allowing individuals access to the radio spectrum for A to B communication.

Lord WELLS-PESTELL: No, my Lords. We have given careful consideration to the report of the National Electronics Council on citizens band radio, but remain of the view that the advantages of introducing such a service would be outweighed by the disadvantages.

Lord TANLAW: My Lords, I thank the noble Lord the Minister for his reply. Has he conveniently overlooked the simple matter of physics, which is that the radio spectrum ignores all national boundaries and is governed only by the law of nature? If the noble Lord recognises this scientific fact, can he justify his reply, when there is no legal or constitutional basis for any nation State to claim a part or the whole of the magnetosphere, or to prevent an individual from having access to it? Will he then say why the United Kingdom is one of the few democracies outside the Communist bloc that has not allocated a frequency over which members of the public can communicate freely with one another? Finally, will he now confirm that it is still his Government's intention, as a matter of policy, not to provide the British public with a citizens band frequency?

Lord WELLS-PESTELL: My Lords, as I understand the position, it is the view of the Government not to provide citizens band radio for a whole variety of reasons, which, if I may say so with great respect, are far too many to go into at Question Time. The Government have taken advice and have looked at what has happened in other countries. There are many competing demands by the necessary users of radio, by mobile radio and by commercial industrial firms. There is also widespread evidence of abuse and misuse in countries that have this. Then there is the fact that it is almost impossible to effect control. If the noble Lord has read the issue of *Radio Communication* for July 1978, he will have seen that it includes an editorial from the March issue of *Electronics Australia*, in which these words appeared,

Dick Smith Contest cartoon:



"Is the sugar at your end of the table, dear?
(S. Zervox, 435 Great North Rd, Abbotsford, 2046)

The Australian CB SCENE

"Listen on the citizens band channels in almost any of our larger cities and you will discover what I mean by going on criticising it. You will hear everything from school kids swopping dirty yarns, to planning gang escapades, to prostitutes touting for business and, in the daily papers" —

it really is not funny, my Lords —

"stories of the abuse of citizens band radio are becoming more frequent. It seems possible that citizens band may even have played a key role in a recent murder".

The editorial goes on to say:

"In short, citizen band radio is becoming notorious, so much so that there is a growing backlash and many people are seriously suggesting that the authorities should reverse last year's decision and try to suppress it altogether".

America is experiencing this, and so also are other countries. We see no reason to introduce the possibility of that kind of thing here.

Lord TREFGARNE: My Lords, is the noble Lord aware that his answer will cause considerable disappointment? Is he further aware that it is possible to regulate the citizens band perfectly well and that this is done in many countries outside the United States, which I believe is the only country where there is unfettered use of the band? Is the noble Lord also aware that if a citizens band were to be introduced here it would bring forth a splendid industry to manufacture all the equipment for it, to the general advantage of all concerned?

Lord WELLS-PESTELL: My Lords, we would not accept what the noble Lord first said: that this can be controlled. It might be controlled in some measure but not in a satisfactory measure. I do not think one could argue — at least I hope we would not argue — that in order to produce an industry we should saddle ourselves with something that is very unacceptable.

Lord HAMNETT: My Lords, is the Minister aware of the conversational devastation caused in America on long distance lorries by citizens radio?

Lord WELLS-PESTELL: My Lords, I could have given your Lordships a number of examples which would have justified the Government's action. I did not do so because this is merely a Question. However, I agree with what my noble friend has said.

Lord TANLAW: My Lords, is the noble Lord prepared to say that the examples which he gave do not take place over the telephone system?

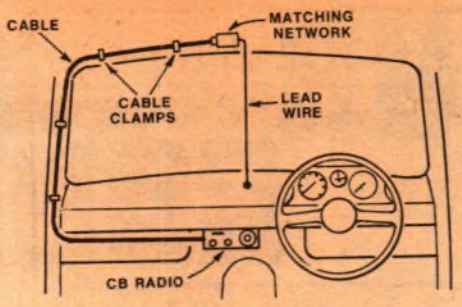
Lord WELLS-PESTELL: My Lords, I do not think that the two are to be compared. I do not suggest that no improper conversations take place

The Australian
CB SCENE

A NOVEL IDEA FROM SCALAR

For those who would like to operate a mobile CB unit without any kind of external CB antenna, Scalar Industries suggest that you try the new "Intenna", which exploits the radiating slot principle.

While for best efficiency, there is nothing to equal a large resonant whip mounted on the roof of a (hopefully) large vehicle, Scalar accept that not everyone aspires to decorate his/her car in that particular manner. Nor is everyone keen on a loaded whip, as the next most obvious option.



Besides the matter of aesthetics, the presence of a CB antenna on a vehicle advertises to everyone around that it carries a CB transceiver — always a temptation to break in when the vehicle is unattended.

A possible answer to the problem, suggests Scalar, is their new "Intenna", or even two Intennas, if you want to create more like an all-round radiation pattern.

The accompanying literature starts off by drawing attention to the traditional "slot" antenna, which takes the form of a narrow rectangular slot cut into a plane metal sheet or cylinder. The slot is cut to such dimensions as to exhibit resonance at the appropriate frequency and may be trimmed by a small capacitor across the centre of the narrow dimension. It is also orientated to give the appropriate polarisation and directivity.

Having made the point, the manufacturers of the Intenna suggest that the glassed areas of a normal metal-bodied vehicle represent potential slot antennas, with the front windscreen being the one which lends itself most obviously to exploitation.

From the literature, it would appear that the Intenna comprises an 8ft coaxial cable which plugs into the CB transceiver, in the normal way; it runs thence around one side of the windscreen (inside the car) to a matching unit which is screwed to the metalwork of the car, near where the rear vision mirror usually mounts. Cable clamps are supplied with the kit.

From the matching unit, a feed wire runs vertically down to the metalwork adjacent to the bottom of the windscreen, so that the RF energy is applied across the centre portion of the windscreen aperture. After installation, the matching unit is adjusted to obtain the lowest possible SWR.

It is claimed that the Intenna picks up less noise interference than conventional antennas, making it inherently quiet in operation. For details: Scalar Industries Pty Ltd, 18 Shelley Ave, Kilsyth, Vic 3137.

EA, CB AND THE HOUSE OF LORDS — cont.

between two people and are not necessarily heard by a large number of people.

Lord TORPHICHEN: My Lords, has the noble Lord considered the ill-effects on other alternative services of not allocating such a band? For instance, does the noble Lord think that it is wise that casual, would-be users of radio communications should be forced to use either the already overloaded Post Office radio telephone network or, worse, to misuse the amateur frequencies?

Lord WELLS-PESTELL: My Lords, I tried to make it perfectly clear at the beginning that the Government have to make a choice as to whether this is desirable or undesirable. They have studied very carefully citizens band radio in other countries and have come to the conclusion that the advantages are more than outweighed by the disadvantages.

☆ ☆ ☆

So there it is: an inadvertent body blow for the CB protagonists in the U.K. But, is "Electronics Australia" to blame for the fact that its editorial was so used?

No way!

Editor Jim Rowe was merely commenting on a situation that CB users themselves were creating.

In fact, his warning of what might happen was only too justified, as evidenced by the fact that, within a matter of weeks, ugly provocation, confrontation and vigilante type actions had become a reality. This was the subject of further comment in the June issue.

The standing of CB radio in the community continues still to be very poor, with outbursts in the press every couple of weeks about the latest misdemeanours. While ever it remains thus, the Australian CB experience will continue to be quoted as a reason why other countries should hold off.

AMATEUR RADIO

by Pierce Healy, VK2APQ

Amateurs, Scouts & Guides in Jamboree-on-the-Air

Once again it is time for the Jamboree-on-the-Air. Boy Scouts and Girl Guides will, through the medium of amateur radio, be able to exchange greetings with their counterparts in other countries of the world. This is the 21st year in which amateur radio has provided this community service.

Over the weekend 21st-22nd October, 1978, amateurs again have the opportunity to participate in a community service on an international scale. Participation as a Jamboree-on-the-Air station will demonstrate to those in your area some of the very attractive aspects of amateur radio. One is to illustrate the friendship and understanding that exists between our own society and other nationalities who share a common interest in modern day technology, as applied to communication.

It can also introduce the rising generation to an exciting hobby, and a possible career in the electronics industry. But the immediate aspect is to give Boy Scouts and Girl Guides an opportunity to exchange greetings with those sharing similar interests and activities, whether in Australia or overseas.

It is stressed that J-O-T-A is not a contest, but a friendly get-together on the air. It provides opportunity, through amateur radio, to learn first hand something of the cultural and other activities of young people who share a common interest.

The opening ceremony will be broadcast live from the grounds of Government House, Canberra, by the official Scout station, VK1BP. The broadcast will commence at 2pm (0400UTC) on saturday October 21, 1978, and will be on 7.090MHz and 14.290MHz

Addresses will be given by the Chief Scout of Australia, Sir Zelman Cowen, Governor General of Australia; Mr Bruce H. Garnsey (Chief Commissioner of Australia — Scouts); and Mrs Charlotte Renshaw-Jones (Chief Commissioner of Australia — Guides). These will be supported by messages from the World J-O-T-A, Organiser, Commissioner Len Jarrett (World Bureau Headquarters), and Les Mitchell (United Kingdom) founder of J-O-T-A.

The addresses will be followed by call backs in which nominated amateur radio stations, acting on behalf of branch headquarters in each state, will be invited in to talk to the Chief Scout and Chief Commissioners. The call backs will be in the following order — NSW (VK2), Vic (VK3), Qld. (VK4), SA (VK5), WA (VK6), Tas. (VK7) and NT (VK8). At the conclusion of the call backs any other station calling will be acknowledged and invited to talk to those present at VK1BP.

The basic rules covering J-O-T-A remain unchanged:

1. Observe national licensing regulations — branch organisers or amateur radio friends can advise on these.
2. Use only authorised frequencies and modes of transmission.
3. Advise branch organisers of your intention to participate.
4. Ensure that a report of your activities is sent to the branch organiser for inclusion in the official report.

This year, the World Bureau, in conjunction with Scouts from Switzerland, neighbouring France and from the Boy Scouts of America Alpine District, will operate from a special international camp established at the Centre Scout de Satigny, a small village 15km from Geneva. With the co-operation of operators from the CERN Amateur Radio Club, it is planned to operate several stations simultaneously on all bands. It is planned to include equipment for slow scan television, radio teletype, and OSCAR operation. The call sign will be HB9S/portable.

Amateurs who wish to offer their services may obtain further information from:—

National Organiser — Commissioner Noel Lynch, VK4ZNI/VK4NKP, 15 Noeline Street, Dorrington, Qld. 4060.

NSW: Scout — Eric Van De Weyer, 101 Francis Street, Bondi 2026. Guide — Mrs Valda Lambert, 4 Joffre Street Hurstville 2221.

Vic.: Scout — Asst. Branch Commissioner Radio and Electronic Activities, Max Dawkins, VK3TR, 74 Springvale Road, Nunawading, 3141. Guide — Mrs Joy Kellett, 54 Marianne Way, Mt. Waverley, 3149.

Qld.: Scout — Commissioner Les Weller, 110 Cardiff Road; Darra, 4006. Guide —Mrs A. Fletcher, 25 Station Road, Sunnybank, 4109.

SA: Scout — Geoff Taylor, VK5TY, 16 Fairmont Street, Black Forrest, 5035. Guide — Mrs E. D. L. Thomas, Flat 2, 15 Brook Street, Torrens Park, 5062.

WA: Scout — Commissioner Peter Hughes, VK6HU, 58 Preston Street, Como 6152. Guide — Mrs June Retallick, 224 The Strand, Bedford, 6052.

Tas.: Scout — Colin Walker, 41 South Street, Bellerive, 7018. Guide — Miss Sue Wyatt, C/O Teachers Hostel, Frederick Street, Cygnet, 7112.

Amateurs are also invited to arrange with their local Scout or Guide group to participate in the 1978 J-O-T-A.

A comment from the official Australian report on J-O-T-A 1977, by Commissioner Noel Lynch, reveals the interest in the event.

"It is interesting to note that in the past 20 years of J-O-T-A in Australia some 10,000 amateur radio operator services have been provided on behalf of J-O-T-A with something like 200,000 Scout and Guide participations in 100,-000 radio contacts. There must have been a lot of Scouting and Guiding friendships promoted throughout the world."

A fact worthy of reiteration is that, at the 25th World Scout Conference, a resolution titled "Cooperation with Amateur Radio Services" was carried requesting all member organisations to —

1. Urge their governments to resist any

Radio clubs and other organisations, as well as individual amateur operators, are cordially invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits. All material should be sent to Pierce Healy at 69 Taylor Street, Bankstown 2200.

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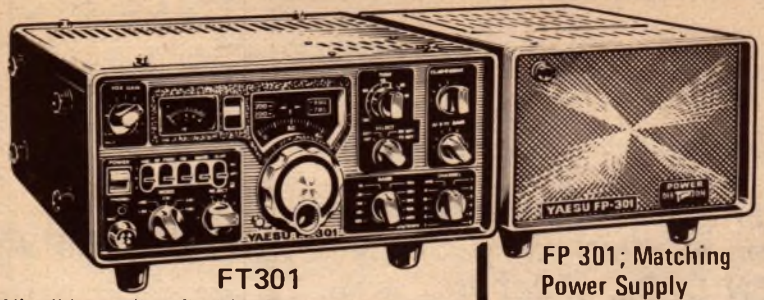

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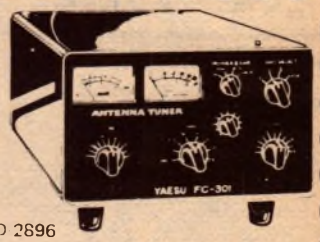

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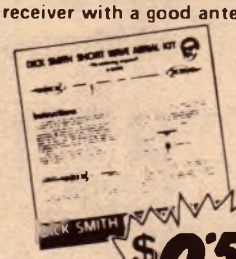

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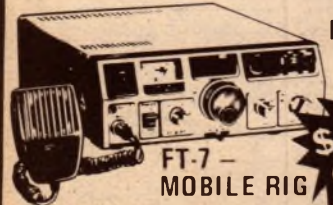

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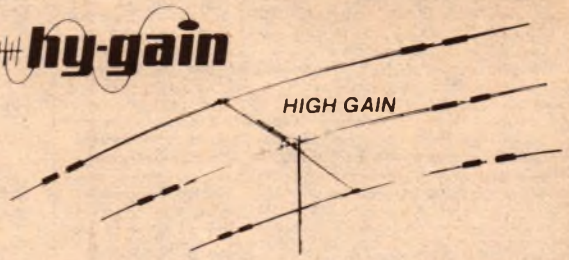

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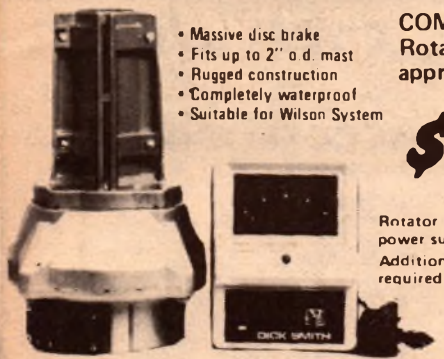

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COMPLETE UNIT – Rotator, control unit and approved power supply:
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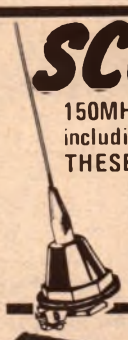

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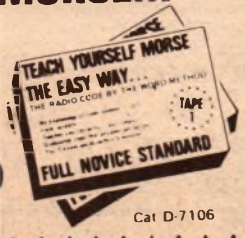

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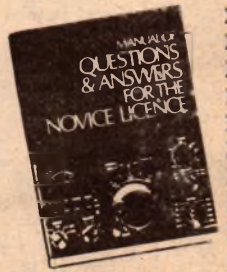

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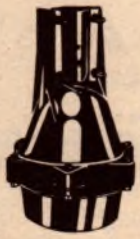

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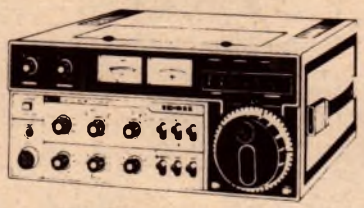

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88/70cM, 18.5 dBd gain, 88el, length 3.98M	$102.00
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AMATEUR RADIO

attempt to reduce the number and size of frequencies presently allotted to the amateur radio service.

2. Cooperate with their national amateur radio organisations in actions designed to this end.

In view of this aspect amateurs are urged to offer their services even for short periods over the weekend. Remember, this is probably the last opportunity for amateur radio to be demonstrated and identified as a national community service before the World Administrative Radio Conference is held at Geneva in 1979.

REMEMBRANCE DAY CONTEST

The 1978 Remembrance Day Contest was opened with a recorded address by His Excellency the Governor of Western Australia, Air Vice-Marshall Sir Wallace Kyle, patron of the Western Australian Division of the WIA. Here is a transcript of the address, which was broadcast over WIA official stations.

"CQ RD, CQ RD — this will be a familiar sound in Morse code and radio telephony to thousands of amateur radio operators and short-wave listeners throughout Australia and New Zealand during the next 24 hours of the Remembrance Day Contest.

"As patron of the Western Australian division of the Wireless Institute of Australia I commend to you this thirty-first contest. It has the dual purpose of enthusiastic participation in an enthralling hobby and the opportunity to pay tribute to those of your own fraternity who offered their skills and their services, and in some cases their lives, in time of need.

"Indirectly of course, it serves another very important need these days. It brings together fellow enthusiasts, regardless of colour or creed, and it makes a positive contribution to world fellowship.

"The speed and accuracy of communications will improve technically with time and this will happen whatever we do. But understanding is something which needs the constant and active attention of all men and women and I believe that the friendly but highly competitive spirit of this contest is just such a positive contribution.

"As you go forward into the next 24 hours, pause briefly to reflect on this contest as a splendid memorial to those 35 members of the amateur radio service who died in serving their country in World War II.

"Having done that, enjoy this contest; for I am sure they would wish you to do. Be enthusiastic about it, as they would have been had they still been with you.

"It is in this spirit that I now have great pleasure in declaring the 1978 Remembrance Day Contest open.

"73 to you all."

GOLD COAST SAFARI

During the past few years a lot has been heard about the friendly Gold Coast repeater VK4RGC. In fact reports on this Gold Coast Radio Club project have been given in these notes.

Being a cold early August in Sydney, it seemed a suitable time to investigate GCRC claims about winter time virtues of their area.

After consulting the Queensland Tourist Bureau in Sydney, Coolangatta was chosen as the base for a week. The trip commenced with an overnight train journey to Murwillumbah, thence by coach to Coolangatta. An ICOM 215 two metre transceiver was packed with other necessary travelling items.

On arrival at the motel in Coolangatta, the first item to be retrieved from the luggage was the ICOM, to check access to repeater VK4RGC (channel 2) about 40km away on Mount Tamborine. Using only the 170mm helical antenna and three watts inside the motel room it was established that VK4RGC had very good ears and radiated a very strong signal.

Almost immediately I was in contact with a very old friend, Don Soraghan, VK2PU, who left Sydney some years ago to live at Kingscliff about 10km south of Coolangatta. Don brought me up to date on some of the local activities, including the morning news to amateurs at 8am through VK4RGC. I also learned that pips on the repeater signal indicated that it was running on battery power during a mains failure due to an industrial dispute. The pips also indicated that the repeater should be restricted to emergency use. The evening meal was by candle light before power was completely restored later that evening.

Next morning at 8am, Pat Irwin, VK4FI, operating through the repeater, gave details of the GCRC and the two metre and 70cm repeaters located on Mount Tamborine, 15km west of Surfers Paradise. There was also a local weather report and a welcome to visiting amateurs, inviting them to use the repeater and submit their log to the GCRC awards manager for the Gold Coast Award. Then followed reports from local stations who extended a very friendly welcome to visitors like myself. Participation in this morning net took place for the next seven days of my stay.

During that week, in addition to enjoying various attractions of the Gold Coast, 83 contacts were made through the VK4RGC repeater for a total of 39 different call signs. These included VK2's, VK3, VK4's and a VK6.

Yes, the claims made for the repeater are fully justified. Stations worked were in Brisbane and Budrin to the north, Ipswich, Toowoomba and Warwick to the west and Kingscliff, Murwillumbah, Hasting Point and Ballina to the south. But these are not the extremes of the repeater area.

Personal visits included Don, VK2PU with Martin Willems, VK4ZIL, to learn of Don's achievements through the OSCAR satellites and to recall two metre activity in the 1950's and compare them with present day techniques. Also, a visit to the Amateurs' Paradise at Southport to meet and spend an hour with Ken Ayers, VK4KD and Arthur Burton, VK4FE, discussing amateur radio and equipment. Another pleasant interlude as was a visit by Dave Davies, VK4ZC (formerly from Newcastle then VK2BZ) and his wife on the last evening in Coolangatta.

AMATEUR RADIO

Finally, on arrival at Murwillumbah for the return overnight train to Sydney, we were met unexpectedly by Ian Dunlop, VK2AVS, and taken for a tour of the district and met Bill Campbell, VK2ZY, busily planting his next season's crop of sugar cane. Thus ended a very enjoyable visit to northeast VK2 and southeast VK4.

Yes, the winter on the Gold Coast is much warmer than in Sydney. The hospitality of the amateur fraternity and the friendly Gold Coast repeater has to be experienced to be appreciated.

Thanks to new and old acquaintances for making the brief visit so enjoyable. Such is amateur radio.

AMATEUR RADIO WEEKEND

Yes it is on again; the get-together at Katoomba between amateurs, students, and newcomers to amateur radio. This weekend of learning and operating commences on Friday 21st October, 1978 at 8pm and continues until 4pm Sunday 23rd October, 1978.

The venue is the St Marys Education Centre, Great Western Highway on the Sydney side from Katoomba Railway station.

All meals and accommodation will be provided for $17, plus $10 for wife and $5 each for children. Separate rooms or dormitory facilities are available for 160 persons.

The weekend is organised by the WIA, NSW Division education service.

Full details and bookings:— contact Bill or Mildred Newton, 64 Valley Road, Epping, NSW 2121 or telephone (02) 85 6321.

WIA NEWS

On Friday 28th July, 1978 at a reconvened special general meeting an amended constitution was adopted for the NSW Division of the WIA.

In addition to bringing the constitution into line with current companies act requirements, the qualifications for ordinary membership and voting rights are now applicable to persons attaining AOCP, AOLCP or AONCP. In addition there is provision for club conferences to act as a policy making advisory body of the Division.

WICEN EXERCISES

On Sunday 13th August, 1978, Sydney's annual "City to Surf" foot race was run. Almost 21,000 persons took part, some 6000 more than in 1977.

The Wireless Institute Civil Emergency Network was used by the race organisers to provide safety and medical communication during the event. Comprehensive networks were established at the start, in the city, and at the finish 14km away at Bondi Beach.

A third network of nine check points along the route of the foot race was also used. A WICEN repeater on channel 1 was used as the primary traffic frequency, with a backup repeater (channel 2) in the event of failure of primary equipment.

A monitor and relay station receiving on 80 metres and 10 metres, linked to the VHF system, catered for special purpose traffic and also provided an alternative to the VHF system.

In addition to messages reporting the progress of the runners, several minor emergency requests for medical attention were handled, enabling prompt assistance to be obtained.

RADIO CLUB DIRECTORY

Has your club accepted the invitation to be included in the "Amateur Radio Club Directory"?

Check now and make sure. Closing date 20th October, 1978. Format same as last year.

In all 69 members of WICEN took part with very gratifying results for amateur radio proving itself in the public service area.

The race organisers have expressed themselves as being extremely happy with the service WICEN was able to provide, and have requested that they provide a similar service for next year's race.

Another WICEN exercise involved a marathon run from Brisbane to Sydney on behalf of a charity appeal. The run was sponsored by the Lions Club to raise funds for a new cardiac wing for St Vincents Hospital. Ten runners took part, all from the OTC. Each runner enlisted several sponsors, typically at a rate of 1c per kilometre.

The Lions Club organised the run, and provided drivers for the three vehicles used. St Vincents Hospital provided food, medical supplies, and a physiotherapist. A second physiotherapist was provided by a private practitioner. WICEN provided communications for safety, medical, and organisational traffic.

The run commenced at the Brisbane Town Hall at 10.01 am on Tuesday, October 22, 1978, and finished at the Sydney GPO at 5.58 am on Saturday, October 26; 91 hours 57 minutes later.

The run was a 24-hour-a-day event, each member running for approximately 45 minutes, each seven hours. Part of the seven hour period was for sleep, but a lot of back-up work had to be done.

One of the three vehicles was a chase vehicle to protect the runner from traffic and provide light at night. The second was a caravan which parked at regular intervals for sleeping breaks, and the third was an intermediary vehicle which moved between the other two, as needed.

All were equipped with 2-metre sets. Channel 40 was used for inter-vehicle traffic, and various repeater channels to contact amateurs in areas through which the team passed.

High frequency equipment was carried, as a back-up in case of accident in an area remote from 2-metre con-

tacts. In the event, no emergencies occurred.

While it is impossible to mention all who helped, WICEN and the organisers would particularly like to thank the following:

The Queensland Police, for their help in clearing a path through the Brisbane traffic. The OTC who provided time off for the runners and paid their air fares to Brisbane.

Many amateurs along the route, especially Lewis, VK2LS of Port Macquarie; Geoff, VK2BGF, of Old Bar; Bruce, VK2YCG, of Taree, and Lynn VK2ABV, of Sydney.

Lewis and Geoff provided continuous monitoring while the team was within range. Bruce provided coffee and light refreshments at Taree, and also monitored the channel until nearly 4 am on Friday. Their efforts were a great boost to morale.

Lynn handled important organisational traffic from the Newcastle area, via the channel 6 repeater. There were also numerous amateurs on the Dural and Gosford repeaters who vacated these channels to assist the team in its later stages.

Overall, the WICEN exercise was a complete success, both technically, and as an example of community service. Without it the run may not have been possible.

There are many community organisations that can benefit from the facilities that amateurs can provide. The WIA, through its WICEN committee, coordinates the resources of the amateur radio service for community and emergency purposes.

To find out more about this public service write to the Secretary, WICEN Committee, 14 Atchison Street, Crows Nest, 2065.

NEW TEN — TEN CHAPTER

The Welcome Stranger Chapter of Ten — Ten International Net, Inc. was founded by ten metre enthusiasts within the Ballarat Amateur Radio Group. The chapter's on-air activity commenced at 0100GMT on Sunday 23rd July, 1978 on 28.530MHz. During the first hour it received applications for membership from the United States, New Zealand, and Japan.

The chapter takes its name from the 2,280 ounce lump of solid gold, now known as the Welcome Stranger, that was found in the area in 1869. It is also thought the name expresses the high ideals of amateur radio.

The Welcome Stranger net operates at 0100GMT each Sunday on 28.530MHz. There are four awards available. Details from the awards manager, Leo McPherson, VK3NIQ, PO Box 247, Ballarat East, Victoria 3350, Australia.

RADIO CLUB NEWS

RADIO 2GB 870kHz. For the latest news on the amateur bands listen to Sydney commercial radio station 2GB at three minutes past the hour, midnight to 2 am.

Daily reports are telephoned to the station on a roster basis by a group of amateurs headed by Sam Voron, VK2BVS. If you would like to help in this excellent public relations service, contact Sam on telephone (02) 407 1066.

LIVERPOOL & DISTRICT AMATEUR RADIO CLUB. Meets at the Liverpool Public School, Cnr. Bigge and Moore Streets, Liverpool on the 2nd Tuesday of each month at 7.30pm.

Lectures and demonstrations of interest to amateurs and younger members are a feature of the meetings.

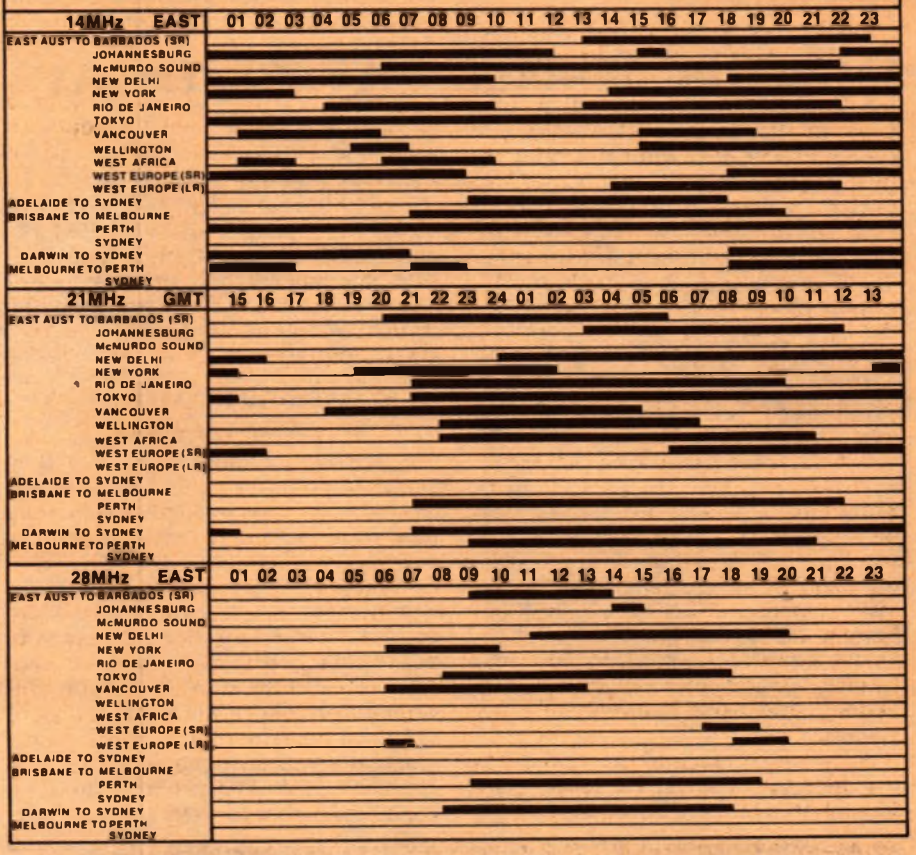
Courses at AOCP, AONCP and YRS level are conducted on Tuesday evenings and Saturday mornings. Currently, about 50 students are attending these courses. Already six members have recently gained their novice licence and are taking turns to act as control station for the club ten metre net. The net is held every Monday evening from 7.00pm to 7.30pm on 28.52MHz USB.

A Morse code training session is conducted from 7.30pm to 8.30pm each Monday evening on 146.55MHz. This is followed by the VHF net on 146.5MHz FM and 52.075MHz USB until 9.30pm. The club station call sign is VK2AZD.

For club information telephone (02) 607 6261 or attend a meeting. Visitors are welcome.

IONOSPHERIC PREDICTIONS FOR OCTOBER

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Department of Science. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). Black bands indicate periods when circuit is open. 10.78



RTTY NEWS

At a meeting on the 4th August 1978 the name of the NSW RTTY Group was changed to, "Australian National Amateur Radio Teleprinter Society". The committee is to seek affiliation with the W.I.A. The change was made with the full approval of the NSW W.I.A. Divisional Council.

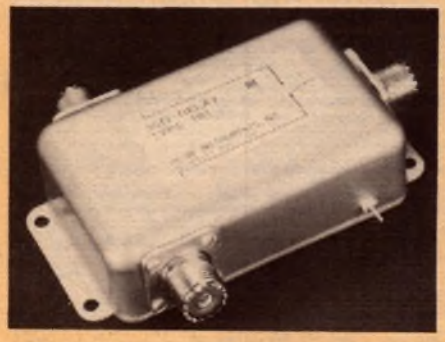
News broadcasts are made on 7045kHz, 14090kHz, and 146.6MHz at 10.30am each Sunday morning, and on 3545kHz and 146.6MHz at 7.30pm each Sunday evening.

All amateurs are requested to keep these international RTTY channels clear of other transmission modes.

AMATEUR AERIALS, FILTERS, RELAYS ETC

CO-AXIAL RELAY

A heavy duty co-axial relay, made by Inline Instruments Incorporated of U.S.A., is currently available from Dick Smith Electronics. It is a robust unit, completely waterproof, and suitable for outdoor mounting.



It is rated at up to 550MHz with a power rating of 750W at this frequency, and higher at lower frequencies. Insertion loss is less than 0.1dB, insertion SWR less than 1.05, operate time 5ms, and operates from a control voltage of 9 to 18. Operating temperature is from −55°C to +85°C.

The unit is very well made, and the makers give a life expectancy of 10 million operations.

Catalog No., D5210. Price, $45.50

YAESU MUSEN AERIALS

Yaesu Musen have added another item to their range of HF and VHF whip aerials; a combined 6-metre quarter-wave and 2-metre five-eight wave aerial.

Details of the new item were supplied by Dick Smith Electronics, who also handle the complete range of HF whips.

The basis of the original system is a gutter grip base onto which is screwed a short section which, alone, forms a 2-metre quarter-wave aerial. Onto this can be screwed any one of five loaded whips; one for each amateur band from 3.5 to 28MHz

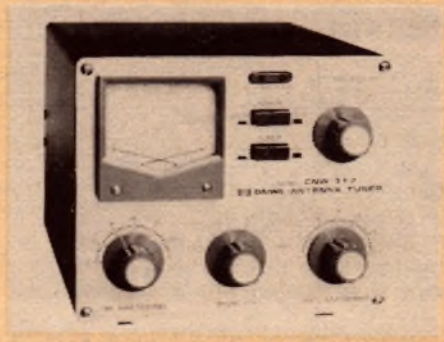
The combined 2-metre/6-metre aerial is a complete aerial in itself, which replaces the basic quarter-wave section used with other aerials.

The price of the gutter grip base is $32.50 and the basic 2-metre stub $10.95. The 3.5 and 7MHz loaded whips are $19.95 each, the 14, 21, and 28MHz whips are $20.95 each, and the combined 6-metre and 2-metre aerial is $23.95. Catalogue numbers are in the series D4100 to 4118.

SWR/POWER METER & ANTENNA TUNER

Vicom International advise that the Daiwa Corporation of Japan have released a new range of antenna tuning units with built-in SWR and power meters. Two models are available, one rated at 500W PEP and one at 200W PEP.

Both units are designed to cover from 1.8 to 30MHz, without frequency discrimination, and with negligible insertion loss. They can work into antenna loads from 10 to 300 ohms.



The indicating meter is a twin needle unit, one for forward power and one for reverse power. There is a choice of two power levels (20W and 200W in the smaller unit), two matching controls, and a three position antenna selector switch, to suit different types of aerials.

Further information from Vicom International Pty Ltd, 68 Eastern Rd, South Melbourne, Victoria, 3205.

LOW PASS FILTER

Dick Smith Electronics' range of communication accessories now includes a professional quality low pass filter for control of TVI. It is made by Wm. M. Nye Co Inc, of the U.S.A.

It is a four section filter adjusted for maximum attenuation near TV channel 2, but having at least 75dB attenuation above 54MHz. The filter is rated at 5kW PEP and is designed for 50 ohm impedance cable. It is fitted with standard SO-239 sockets.

It is a well made unit housed in an aluminium cylinder 230mm long x 60mm dia. No adjustments are needed to put it into operation.

Catalogue No., D7086. Price, $37.50.

ANTENNA TRAP COILS

Scalar Industries Pty Ltd announce that they can now supply the Reyco range or aerial traps designed to provide multi-band operation from a single HF dipole.

These traps are parallel tuned circuits designed to resonate at appropriate amateur band frequencies. Four types are available, designated KW40, KW20, KW15, and KW10, being resonant in the 40, 20, 15, and 10 metre bands respectively.

They are wound with aluminium wire on a polystyrene former, use aluminium fittings to minimise corrosion, and are completely waterproofed. They are 46mm in diameter, 140mm long, and weigh 170g.

A typical, and popular, model is the KW40, resonant in the 7MHz band. As a high Q parallel resonant circuit it presents a very high impedance at this frequency. Inserted at the correct point in a longer aerial, it will isolate that section which resonates at 7MHz.

It also functions as loading coil to shorten the additional wire needed for 3.5MHz while, at 14, 21, and 28MHz the 7MHz section functions as 3/2, 5/2, and 7/2 wavelengths respectively.

Diagrams for this and other aerial configurations are available with the coils. (Note that the dimensions for the 3.5MHz band are based on the U.S. band of 3.5 to 4MHz, and may need to be modified for Australian conditions.)

The price of all models is $26.20 a pair, plus sales tax. Further details from Scalar Industries Pty Ltd, 18 Shelley Avenue, Victoria, 3137.

SHORTWAVE SCENE

by Arthur Cushen, MBE

BBC Masirah opens new short-wave service

Ten years ago, the BBC established a relay base on Masirah Island in the Persian Gulf, which operated on medium-wave. Now four 100kW short-wave transmitters have been put into operation at the base.

The establishment of the BBC relay base in Masirah follows the operation of other bases in the region. These included bases in Somaliland and on Perim, which had to be closed when these areas gained independence. The BBC then decided to build a relay base on Masirah and in 1969 two 750kW medium-wave transmitters were put into operation. These outlets operated on 701kHz with the language services of Asia, and on 1410kHz with the World Service.

Plans were then drawn up to expand the base by installing four 100kW short-wave transmitters. Then, on June 13, 1977 a hurricane struck the Island. Despite enormous damage to the short-wave transmitter building, the internal roof remained intact and the four newly installed transmitters were unharmed. Following repairs to the buildings, these became operational last month.

The four transmitters are being used on a variety of frequencies. Of special interest to Australian and New Zealand listeners is the fact that the base is being used to carry the World Service to this area on 15310kHz from 0900-1515GMT. The World Service is also carried from Masirah on 11780kHz from 0700-0815GMT, 15130 from 0700-0815 and 17770 from 0900-1330. These frequencies are all beamed to the India-Pakistan area.

VATICAN FREQUENCY CHANGE

The Vatican Radio, which operates on regular transmission to Australia and New Zealand in English 2210-2225GMT daily, has replaced 7235kHz with 15120kHz. This new channel is not a good outlet as it suffers from jamming from 15115, while 15120kHz is also used by the Voice of America in Greenville, broadcasting in French to Europe.

Two other outlets, 9615 and 11705kHz, also carry the same program. These two frequencies give much better reception in this area although 11705kHz suffers some interference from Radio Sweden in Stockholm, broadcasting to South America.

NEW AUSTRIAN FREQUENCIES

The Austrian Radio in Vienna has introduced a new schedule which includes the use of the 13-metre band for two transmissions. The service to Australia and New Zealand is broadcast daily from 0400-0600GMT on 17740kHz; 0600-0700 on 21470; 0700-0900 on 17720 and 0900-1300 on 21715kHz. These are new frequencies for the Austrian Radio. The program includes French at 0800 and English at 0830GMT.

The Austrian Radio began its foreign language broadcasts in 1955, using a 4kW transmitter in upper Austria. In 1967, the Austrian radio commenced regular transmissions world-wide on higher power from a new site 25km south of Vienna at Moosbrunn. Four 100kW transmitters have been in use since 1969.

GABON'S HIGHER POWER

Four transmitters of 500kW have recently been installed in Gabon and have now been heard testing on 6030, 7200, 9650 and 15300kHz. The test period has been from 0700 to 1900GMT, according to Richard Ginbey of South Africa.

The frequencies all suffer from some degree of interference and though transmissions have been noted, it is hoped new frequencies will be allocated to enable better reception of this interesting station.

The transmissions are beamed from a site near Franceville on 6030kHz to the Congo, 7200 West Africa, 9650 Middle East, and 15300 to Europe. The station has requested reception reports, and these should be sent to PO Box 270, Franceville, Gabon.

Gabon, a former French colony on the Atlantic seaboard of Africa, has been heard for some years with local and regional programs on 4777kHz with 100kW. The National network is carried on this frequency in French and local languages.

RADIO NEW ZEALAND

Last month, Radio New Zealand celebrated its 30th anniversary of short-wave broadcasting and made some frequency changes to its schedule. Two new frequencies are now in use: 15345 replaces 15380 and 17860 replaces 17710kHz.

The present schedule is as follows: to the Pacific 1800-2105GMT on 11960kHz; 1800-0245 on 15345; 2115-0730 on 17860; 0300-0515 on 15280; 0530-1030 on 6105; and to Australia 0745-1030 on 9620.

On October 28, 9620 will be replaced by 6105kHz.

ISRAEL UPGRADES SERVICE

Israel Radio has upgraded its service to Australia and New Zealand with the introduction of additional frequencies, according to Larry Magne who is a monitor for the Israel Radio. The broadcast from 0500-0515GMT in English and 0515-0530 in French to Australia and New Zealand is being carried on 11655kHz and on 17855kHz. Transmitter power is 300kW.

Reception reports from listeners should be sent to the Israel Broadcasting Authority, PO Box 7139, Jerusalem.

NEW LYBIAN SIGNAL

A new signal from Radio Lybia is being heard on 5960kHz with a broadcast in Arabic from 1800-2000GMT. According to the Arabic announcements, as translated by the BBC Monitoring Service, this station is called the "Mediterranean Relay Station". The transmission is thought to originate from Malta, from where it is beamed to North Africa.

The signals are very strong, although

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, NZ. All times are GMT. Add 8 hours for WAST, 10 hours for EAST and 12 hours for NZT.

SHORTWAVE SCENE

there is some interference at 1900 and 2000GMT from Radio Tirana, Albania, which also uses 5960kHz. This is the first time that the Malta transmitter (actually owned by Deutsche Welle) has been officially used by the Lybian Radio. The transmissions on 5960 are in addition to the normal broadcasts from Lybia and the studios in Tripoli.

CANADIAN CHANGES

Radio Canada International, with its service to North America and secondary coverage to the South Pacific, has replaced 11940kHz with 9755kHz. In the past winter period, the transmissions on 11940kHz suffered severe interference from Radio Bucharest and this is the reason for the frequency change.

The broadcasts in Enlgish are 0200-0227GMT on 9535 and 11845kHz; 0300-0327 on 5960, 9535, 9755 and 11845; 0400-0427 on 5960, 9535 and 11845.

The Monday broadcast includes "DX Digest", which provides information for short-wave listeners. This is broadcast in two parts, with part 1 at 0320 and part 2 at 0420GMT.

MEMORIES RECALLED

Our recent article on the 50th anniversary of the Happy Station of Radio Nederland, and on the late Edward Startz who broadcast on the station for 40 years, brought back memories for one reader. Mr Edward Yates of Perth, Western Australia, recalled how he first met Edward Startz in Singapore in 1934.

At the time, Mr Yates was operating the only broadcasting station in Singapore, under the call-sign ZHI. Prior to leaving Holland, Mr Startz intimated that he would like to pay a visit whilst passing through Singapore to Java, and it was Mr Yates' good fortune to meet and entertain him. Later in the morning Mr Yates took him for a flight around the island in one of the flying club's sea planes, a flight which pleased Edward Startz immensely.

Mr Yates, in common with many who knew Edward Startz, had a high regard for this broadcaster and his long association with short-wave radio. It is fitting in the year of the 50th anniversary of the Happy Station that Edward Startz's part in the broadcasts be remembered.

WYFR ON 21675kHz

Family Radio station WYFR, with studios in Oakland, California, is using the 13 metre band frequency of 21675kHz for its broadcasts to Europe. This channel is well heard till close down at 2255GMT. 15440kHz carries the same program at the same time. The transmissions originate from the new transmitting site at Okeechobee, Florida, as well as from a site in Massachusetts.

WYFR has recently been appealing for letters from listeners, and plans to operate a mail bag session in which mail from listeners around the world is answered. The station address is WYFR, Family Stations Inc, 290 Hegenberger Road, Oakland, California 94621, USA.

CYPRUS FREQUENCY CHANGE

Cyprus Broadcasting Corporation, which broadcasts a program in Greek for listeners in the United Kingdom, has made a frequency change from 9690kHz to 9695kHz. The transmission is on the air Friday, Saturday and Sunday from 2215 to 2230GMT, and the new channel suffers from jamming. The old frequency of 9690kHz was better received in this area. The transmission is also broadcast on 6155 and 7190kHz.

The broadcast, which is all in Greek, opens with an interval signal, then full frequency announcement and 15 minutes of news for Greeks living in the United Kingdom. Close down is around 2227GMT.

The address of the station, which verifies reception reports with a large card, is The Cyprus Broadcasting Corporation, PO Box 4824, Nicosia, Cyprus.

NEW ATHENS FREQUENCIES

The Greek Radio has added an additional frequency to some of its transmissions, according to the BBC Monitoring Service. The broadcasts are: 0400-0450GMT in Greek to the Arab World on 7215, 9655 and 11760kHz; 0500-0615 in Greek to Turkey, Cyprus and the Middle East on 6140, 9655 and 11760kHz; 0800-0850 in Greek to Azores on 7215 and 9655kHz; and 1400-1450 in Greek to the Arab World on 7205 and 9760kHz.

Athens has two daily transmissions to Australia: 0900-0950GMT on 9655 and 15160; and 2100-2150 on 6140, 9655 and 9760kHz.

LATIN AMERICAN NEWS

COLOMBIA: Radio Melodia has returned to 6140kHz after being silent, according to Peter Bunn of Melbourne, reporting in "ADXN". The station has been heard around 0730GMT with Latin American music and commercial announcements for Bagota stores. Radio Sutatenza HJGC has been noted by John Lewry of Newport, Victoria, at 1000GMT on 5075kHz.

CHILE: Radio Universidad de Concepcion, which operates on 6135kHz, has been heard at 1100GMT. This station verifies with a letter, card and pennant from Carlos Godoy Rocca, Director. Radio Agricultura, which formerly operated on 9630kHz, has been heard at 1100GMT on the new frequency of 9675kHz.

GUATEMALA: The new Adventist World Radio station plans to be operating this month. The station is keen to set up a group of monitors in various parts of the world to supply regular reception reports on its broadcasts. Inquiries should be sent to Mr R. Folkenberg, Adventist World Radio, Apartado, 35-C, Guatemala.

IF YOU WANT TO LEARN ABOUT ELECTRONICS, TODAY'S AIR FORCE IS ON THE RIGHT WAVELENGTH.

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Please tell me more about being an apprentice Radio Technician in Today's Air Force.

Name.....

Address.....

.....

State..... Postcode.....

Date of birth.....

AFAPILFP 88

YOUR FUTURE'S IN TODAY'S AIR FORCE.

Auth by Director-General Recruiting Dept Defence

New Products

AWA G233 Ultra-low distortion oscillator

Designed and manufactured in Australia, the AWA G233 may possibly be the lowest distortion oscillator available anywhere in the world. Covering the range 10Hz to 110kHz, it has a typical harmonic distortion figure of .0003% and a frequency response of better than ±0.05dB.

In these times when the Australian industry is said to be defunct, it is refreshing to find a locally-made product which can and does compete in world markets. Nor is it unique. The G233 oscillator is just one of a range of locally made AWA products with up-to-the-minute specifications.

Compact and unassuming in appearance, the G233 is housed in a low-profile case measuring 205 x 99 x 275mm (W x H x D) including knobs and rubber feet. The case has a tilting bail to prop it up for a better view of the control panel. The instrument is mains powered and has a removeable three-core mains cord. It conforms to IEC and Australian safety requirements.

Frequency coverage is from 10Hz to 110kHz in four push-button selected ranges. The frequency dial has a calibrated range of 1 to 11 and the resulting frequency accuracy is quoted as better than ±3%. Maximum output level is 3 volts RMS, which can be attenuated in 20dB steps to 60dB by push-buttons. In addition, there is a continuously variable attenuator.

Output impedance is 50 ohms ±2% when any of the attenuator buttons is selected or 0 to 50 ohms on the 0 to 3V range. As an option, the instrument is available with an output impedance of 600 ohms.

On the rear panel, there is a BNC socket which provides a 1 volt RMS square signal. This can be used for synchronising oscilloscopes or driving frequency counters. The instrument case is earthed back to the mains via the cord and the signal earth is internally connected to the mains earth via a 10 ohm resistor and .047uF capacitor in parallel, to obviate the effects of ground loops.

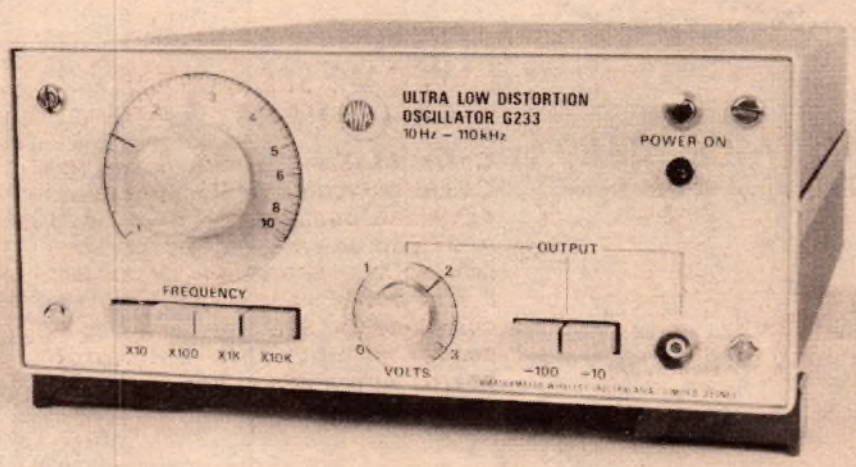
Removing four screws in the rear panel allows the wraparound case to come away in two halves. There is no chassis as such. The front and rear panels are connected together by rigid square-section rods to which the large PCB is also secured. This gives good access to all components. Internal wiring is negligible. Even the power transformer (made by Ferguson) is mounted on the PCB.

The circuit is the tried and proven Wien bridge configuration but a highly refined one at that. The oscillator itself employs discrete semi-conductors but there are a number of op-amps and other integrated circuits to provide the envelope stability control system and sync output.

The oscillator circuit employs a double differential pair at the input and a push-pull Darlington output stage running under what appears to be class-A conditions. That part of the circuit alone consists of eleven transistors. The output of the oscillator is fed off to the output attenuator and also to the sync circuit and level control circuit. The sync circuit consists of an op-amp buffer driving an ECL monostable which provides an approximate square wave.

The level control circuit measures the oscillator output with a peak detector which drives a comparator and integrator. The integrator output is amplified and fed to a LED, which controls a photocell in the feedback network of the oscillator. This provides excellent envelope stability.

Our only criticism of the G233 is against the vague specification for distortion in the handbook. This takes the form of a distortion vs frequency graph which shows the specified limit and the typical performance. The specified line shows the limit up to about 30kHz at .001% then rising to .01% at 100kHz. At least, that is our "guesstimate" of what the specification is supposed to be.



The typical distortion performance is shown as .0003% up to about 10kHz, rising to .003% at 100kHz.

We attempted to measure the harmonic distortion of the G233 with our Sound Technology 1700B. Needless to say, the measurements coincided with the residual distortion of the measuring instrument. The G233 is ultra-low distortion! We are impressed.

Price of the G233 oscillator is $365 plus sales tax where applicable. Further information may be obtained from Amalgamated Wireless (Australasia) Ltd, Engineering Products Division, 422 Lane Cove Road, North Ryde, NSW 2113. (L.D.S.)

New Products

Microwave frequency counter

A new option for Hewlett-Packard's Model 5342A Microwave Frequency Counter extends its measurement range to 24GHz! This new option, Option H10, guarantees a —15dBm sensitivity from 18 to 24GHz, thus giving radar and microwave communications equipment users and designers a low-cost, accurate measurement instrument.

The basic Model 5342A was introduced in November 1977 and features simple keyboard control. It comes in a field-portable package and measures frequency from 10Hz to 18GHz with a resolution of 1Hz on an 11-digit LED display. Price of the basic instrument is $5670, while Option H10 costs an additional $441.

Other features include the ability to measure frequency and amplitude simultaneously, and high FM tolerance. An optional digital-to-analog converter converts any three digits to analog voltages for plotting. Any desired frequency and amplitude offsets can be set from the front panel.

For further information contact Hewlett-Packard Australia Pty Ltd, 31-41 Joseph St, Blackburn, Victoria, 3130.

Compact pocket pager

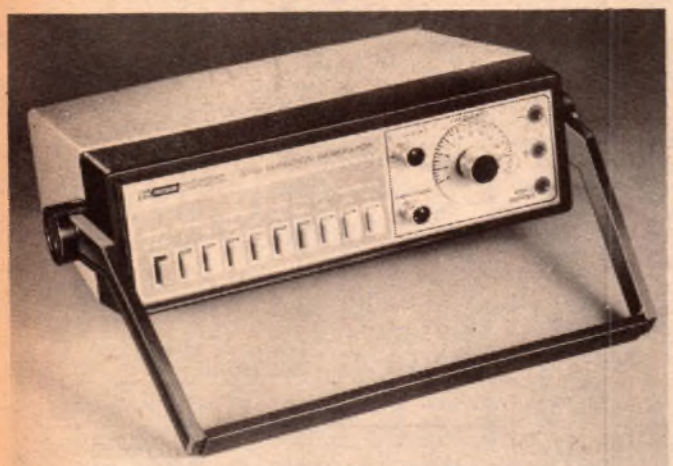
Philips has released a new "Pocket Pager" for busy people who need to be contacted when away from their office, anywhere in the metropolitan area. The unit has been approved by Telecom Australia for use in the city-wide Telefinder Paging Service, now operational in all Australian capital cities, including Canberra.

The Philips Pocket Pager (the RF2150) has been designed specifically for the Telefinder system and provides many excellent features as standard, including both single and dual address capability.

It is electronically and mechanically rugged in design, and its extremely sensitive receiver circuits guarantee reliable reception within the Telefinder service area. Standard features include a volume control, memory mode, battery saver circuit for long battery life with a standard penlite battery, low battery alarm, and a langard clip.

New Products

1MHz function generator



The new B & K Precision Model 3010 Function Generator provides sine, triangle and square wave outputs from 0.1Hz to 1MHz in six ranges. Each range is covered by a 100:1 linear frequency control, and range and function selection are by pushbutton controls.

The internal VCO (voltage controlled oscillator) of the 3010 can be varied either by the front panel or by a 0 — 5.5V ramp applied to the VCO external input. By applying such an input ramp, the 3010 can be used as a sweep generator for response measurements in audio and IF circuits. If an audio signal is applied in place of the ramp, the 3010 will produce a direct FM output.

Other features include variable DC offset voltage control, less than 1% (typically 0.5%) sine wave distortion from 0.1Hz to 100kHz, 99% triangle wave linearity at 100kHz, and fixed TTL and variable amplitude outputs for square wave operation.

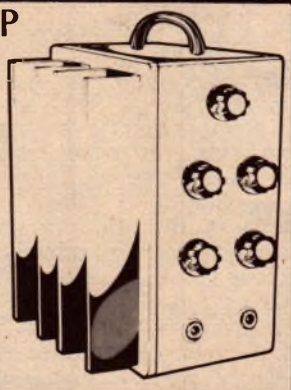
Further information is available from Parameters Pty Ltd, 68 Alexander St, Crows Nest, NSW 2065.

Car enthusiasts will be interested in a new transistor-assisted ignition system called Bi-tronic Electronic Ignition. The electronic components are encapsulated in a cylinder measuring 37 x 75mm. It is mounted, by means of two spring clamps, to the existing ignition coil. No modifications are required to the car electrical system apart from bypassing the ballast resistor. Available from Consolidated Marketing Corp, 312 High Street, Kew, 3101 at $49.50.

DON'T JUST SIT THERE: BUILD SOMETHING!

IT'S EASY WITH A DICK SMITH KIT — AND THINK OF ALL THE MONEY YOU SAVE AND THE FUN YOU HAVE BY DOING — IT — YOURSELF.

BUILD A 100 WATT GUITAR AMP FOR LESS THAN $100.



This rugged, reliable guitar amplifier delivers a massive 100 watts RMS with a wide frequency response and low distortion that put it well into the hi fi class.
Complete kit Cat. K-3020 .. .. $85.00

The optional pre-amp may be built into the case (as illustrated) or used as a separate mixer console. In standard form has inputs for 600 ohm low impedance microphone and 47k ohm high impedance mike or guitar input. Extra inputs can be easily added.
Complete kit Cat. K-3030 .. .. $13.50

AUDIO & AMPLIFIERS

UNIVERSAL MIXER
(E.A. September '78)
A must for home movie and recording enthusiasts.
Cat. K-3492 .. .. $49.95

PLAYMASTER 40/40 STEREO AMP.
(E.A. December '76)
Our most popular kit ever. Thousands sold. Easy!
Cat K-3411 .. .. $129.50

PLAYMASTER TWIN 25 AMPLIFIER
(E.A. May '76)
Similar to above, but less power. Also a great kit.
Cat K-3410 .. .. $105.00

ETI480 100W POWER AMP MODULE
(E.T.I. December '76)
100 watts for $25.00? Unreal, man! (mono module)
Cat K-3442 .. .. $25.00

ETI480 50W POWER AMP MODULE
(E.T.I. December '76)
As above, but 50W. Easily extendable to 100W version.
Cat K-3440 .. .. $19.50

ETI480PS POWER SUPPLY MODULE
(E.T.I. December '76)
To run either 1 x 100W or 2 x 50W modules
Cat K-3438 .. .. $17.50

MUSICOLOR MK 111 COLOR ORGAN
(E.A. September '76)
Turns your music into light! Just add the lights.
Cat K-3140 .. .. $59.90

SPRING REVERBERATOR
(E.A. May '76)
Adds life to your music— amateur or professional!
Cat K-3424 .. .. $15.50

ETI 601 MINI ORGAN
(E.T.I. August '76)
YOU can play your favourite tune in style
Cat K-3430 .. .. $24.75

LOUDSPEAKER PROTECTOR
(E.A. June '76)
Eliminates turn-on and turn-off surges from most amps.
Cat K-3425 .. .. $11.95

GENERAL PURPOSE PRE-AMPLIFIER
(E.T.I. July '76)
Stereo unit, variable gain, suits cartridge, tape, aux, etc.
Cat K-3427 .. .. $7.50

COMPUTERS, ETC

2650 MINI COMPUTER (E.A. May '78)
ALL parts, case, front panel, power supply, etc — not a 'part' kit. 1k of memory — a powerful mini system.
Cat. K-3447 .. .. $115.00

LOW COST VIDEO DISPLAY UNIT
(E.A. February '78)
Mates with above. Communicate with a computer!
Cat K-3460 .. .. $97.50

VIDEO MODULATOR for use with VDU
(E.A. April '78)
Allows above VDU to be used with any TV set.
Cat K-3462 .. .. $4.50

ASCII KEYBOARD ENCODER
(E.A. April '78)
Uses our standard keyboard (Cat X-1180)
Cat K-3464 .. .. $39.50

CASSETTE INTERFACE
(E.A. April '77)
Use any cassette player to communicate with computer.
Cat K-3465 .. .. $24.50

PAPER TAPE READER
Another fascinating aspect of computer technology.
Cat K-3466 .. .. $95.00

DIGITAL LOGIC TRAINER
(E.A. July '77)
Want to learn logic? Here's a great way. Teach yourself!
Cat K-3010 .. .. $69.00

TEST EQUIPMENT

UPGRADED 40 Mhz FREQUENCY METER
(E.A. August '78)
Latest design. Coverage simply extended to 200 Mhz.
Cat. K-3437 .. .. $99.50

NEW MODEL TRANSISTOR TESTER
(E.A. July '78)
Checks most transistors and FETs quickly and easily.
Cat K-3052 .. .. $17.90

R-L-C BRIDGE
(E.A. March '78)
Ideal project for the beginner. Handy to have around!
Cat K-3468 .. .. $34.50

AUDIO OSCILLATOR
(E.A. June '78)
Outstanding value for a valuable service aid.
Cat K-3469 .. .. $25.00

TV GAMES

10-GAME VIDEO GAME
(E.A. July '78)
Features 4-way bat control, many combinations of bat sizes, ball speeds, angles, etc.
Cat K-3491 .. .. $49.50

STUNT MOTORCYCLE GAME KIT
(E.T.I. June '78)
Play 4 different games; motocross, enduro, drag and stunt. Easy to build!
Cat K-3474 .. .. $29.50

AMATEUR, CB, ETC.

NOVICE TRANSVERTER
(E.A. April '76)
Use any 27MHz 'CB' on the 80 metre band. 30W out.
Cat K-3134 .. .. ~~$99.50~~ $89.50

MORSE KEYER
(E.A. April '78)
Perfect Morse code — electronically generated. Inc. paddle.
Cat K-3470 .. .. $37.50

VK POWERMATE
(E.A. May '78)
Short form kit — no metalwork, mains wiring etc.
Cat K-3449 .. .. $32.00

CB POWER SUPPLY
13.8 volts at 2A continuous (4A peak) complete kit.
Cat K-3448 .. .. $29.50

45 WATT VHF AMPLIFIER
F'glass PCB, 13.8V operation. Req. 8 — 12W of drive.
Cat K-3132 .. .. $27.50

30 WATT 80 METRE AMPLIFIER
Ideal for the novice. 13.8V. Adaptable to 50W output.
Cat K-3133 .. .. $34.95

MISCELLANEOUS

6 DIGIT 240V CLOCK KIT
Hours, minutes & seconds display. Short form w/o case:
Cat K-3364 .. .. $19.75
Handsome case to suit: Cat H-3192 .. .. $5.00

CAPACITOR DISCHARGE IGNITION
(E.A. July '75)
Save on petrol; end ignition troubles. Pre-wound coil.
Cat K-3280 .. .. $25.75

DRILL SPEED CONTROL Mk 2
(E.A. July '76)
Suits 240V 'universal' motors (not electronically switched or controlled types) A must for the home handyman.
Cat K-3080 .. .. $11.50

HIGH POWER STROBE
(E.T.I. August '71)
A real blast — ideal for parties, discos, etc. Dazzler!
Cat K-3150 .. .. $27.95

TV MASTHEAD AMPLIFIER
(E.T.I. August '71)
Can turn an unwatchable mess into a brilliant picture.
Cat K-3230 .. .. $29.95

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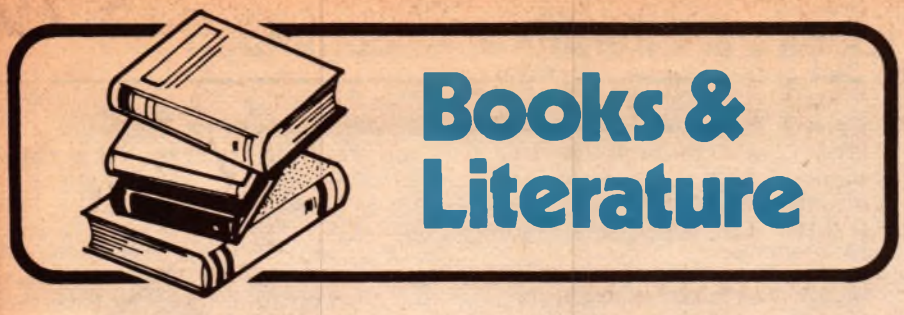
DICK SMITH ELECTRONICS



Books & Literature

Amateur Radio

A GUIDE TO AMATEUR RADIO by Pat Hawker. Seventeenth edition, published 1978 by the Radio Society of Great Britain. Stiff paper covers, 118 pages 180mm x 240mm, freely illustrated by diagrams and photographs.

If past form is any indication of future performance, the new seventeenth edition of "A Guide To Amateur Radio" should find wide acceptance. The type has been completely reset and, in the process, updated and brought into line with the format of other RSGB publications.

As the title suggests, it is intended to serve as an introduction to the hobby but goes much further than merely trying to market the concept. It does this in the first chapter but carries right on to convey the technical background to amateur radio. It virtually becomes a mini study course which would be invaluable to anyone seeking to qualify for an amateur licence.

Chapter titles are: This Is Amateur Radio — Getting Started — Communications Receivers — Transmitters — The Antenna — Amateur Radio Equipment — Workshop Practice — The Licence Examinations — Operating An Amateur Station — The RSGB And Amateur Radio — International Amateur Radio Organisations — Index.

Some of the material relating to amateur radio in Britain would not apply in detail to Australia but, other than that, it is a very useful book. Our copy came direct from the publishers. (W.N.W.)

Fiber optics

FIBER OPTICS IN COMMUNICATIONS SYSTEMS by Glebn R. Elion and Herbert A. Elion. Published 1978 by Marcel Dekker Inc., 270 Madison Ave, New York N.Y. 10016. Hard covers, 264 pages 235mm x 155mm, illustrated by diagrams. Price in USA $19.50.

Herbert A. Elion is Managing Director of Electro-Optics at Arthur D. Littel Inc in Cambridge Massachusetts, and the author of over 100 papers and 16 books on the subject of electro-optics and instrumentation. Glenn R. Elion is his son, with a Ph.D. from Princeton University and currently associated with Sumitomo Industries Ltd. In Yokohama, Japan.

The publishers claim that this is the only available text which covers the fiber optics communications industry in the present state of the art — 1978. Certainly, it does have the appearance of having been hurried into print, having apparently been set completely on an electric typewriter, in the manner of lecture pre-prints. Printing and binding, however, is well up to standard.

There are 6 chapters, in all: Fibers and Cables; Couplers, Connectors and Splices; Light Sources and Modulators; Photodetectors and Repeaters; System Design; Economics and Applications. An appendix lists symbols, constants and conversion factors, basic definitions, fiber optic test methods, and company addresses and products. The appendix is followed by a general index.

The material in the book is presented at a practical and descriptive level, freely supported by tables and diagrams. As such, it should open up to the reader a subject about which most of us still have only a very scattered knowledge.

Our review copy came direct from the publishers. (W.N.W.)

Solar energy

SOLAR ENERGY. An Economic Approach to Solar Energy, by Wolfgang Palz, Ph.D. Hard covers, 292 pages 252mm x 195mm illustrated by photographs and diagrams. Published 1978 by Butterworths, Price in Australia $38.50.

Although the preface states that the opinions in the book are not necessarily those of UNESCO or The Commission of the European Communities, it is clear that the inspiration for its production came from that general source.

Following a brief introduction, chapter 1 offers an "Energy Overview". It looks dispassionately at the changing pattern of energy useage, electricity, the status of conventional power sources and the rising problem of thermal pollution, as a by-product of our energy usage.

Chapter 2 deals with Solar Energy in the broad sense — its distribution over the World's surface, principles of conversion to solar heating, and typical practical applications.

The conversion of solar energy to electrical power is covered in

A survey of science and technology

SCIENCE FACT. Edited by Prof. Frank George. Published 1977 by Topaz Books, England. Stiff paper covers, 540 pages 181mm x 11mm, all text. Price in Australia $4.50.

The Editor of this book, Prof. Frank George can hardly be accused of standing around idle. Educated at Taunton School and Sidney Sussex College in Cambridge, he served as a Spitfire pilot during World War II. He later became active in a number of learned societies, and held visiting professorships in a string of American and Canadian universities, prior to his present post as Head of the Dept. of Cybernetics at Brunei University in Britain. He has published about 100 scientific papers, written about 30 books, featured on radio and TV — and found time recently to promote this present book in Australia.

After the Editor's general introduction, invited authors carry on with a discussion of computers, artificial intelligence and electronics. Successive chapters take a forward look at medicine, genetic engineering, psychology and mind control, the paranormal, defence and weapons R&D, astronomy and space, transport and communication, the living sea, energy, resources and population, materials and conservation. A final chapter is headed simply "Conclusions".

While I did not have the time to read the whole book, sample passages which I did read were written in basically journalistic style, seeking to communicate what is going on in the various fields, and to speculate in regard to future developments. While some of the chapters do suggest references and texts for supplementary reading, one has largely to take the writers' word for what each chapter contains.

This is not meant to condemn the book but merely to emphasise what it is: an attempt to give a broad, readable view of scientific and technological development which will, at the one time, inform and challenge. As one commentator on radio said: "at first glance it looks like science fiction but it is substantially what its name says; Science Fact".

Our copy came from Angus & Robertson Publishers, 102 Glover St, Cremorne Junction NSW 2090. (W.N.W.)

Books & Literature — continued

chapter 3, the largest in the book. The Author works through the various methods, looking back to some of the early attempts and methods, as well as forward to possible future developments.

The final chapter is entitled "Prospects of Solar Power For Large-Scale Electricity Production". This is followed by an Appendix section and a general index.

The book is written in a clear, easy-to-read style and could be followed easily by the technically inclined reader who merely wants to be well informed. However, there is enough statistical data in the many tables and curves to stimulate anyone wishing to probe more deeply.

Our copy came from Butterworths Australia, 586 Pacific Highway, Chatswood 2067. (W.N.W.)

Microwaves

MICROWAVE ATTENUATION MEASUREMENT by F. L. Warner, E. Eng., F.I.E.E. Hard covers, 338 pages, 225mm x 140mm. IEE Monograph 19, published by Peter Peregrinus Ltd, PO Box 8, Southgate House, Stevenage, Herts SG1 1HQ England. Price in Britain £14.00

In the introduction, the author points out just how critical transmission line loss (or attenuation) is in the operation of microwave systems, whether for radar, satellite reception or any other application. However, coverage of the subject has been provided mainly by scattered papers or by isolated chapters in textbooks, which tend to be inadequate or out of date, or both.

The author has sought to correct this situation by producing this special book, developed largely from lecture notes generated for symposia and university lectures. In accordance with the title, it details various measurement approaches, but it also contains a variety of supplementary information.

While intended for use by graduates and practicing engineers, it is essentially a book for those who intend to specialise in the subject. As a non-specialist, this reviewer is prepared to accept the IEE endorsement and the qualifications of the author as a veteran of Britain's Royal Radar Establishment and, since 1968, chief designer of relevant instrumentation of the National RF and Microwave Standards Division.

Alerted to the release of the work, interested readers can contact the publishers for a copy of the jacket notes which spell out the coverage in detail. Our copy came direct from the publishers. (W.N.W.)

For DX listeners

WORLD DX GUIDE. Edited by Jim Vastenhoud of Radio Nederland. Published by the World Radio Television Handbook Co, Copenhagen, Denmark. 208 pages.

For many years a publication known as "How to Listen to the World" was published in Denmark, in which invited contributors were asked to cover their specialised listening hobby. Since this publication ceased, there has been a need for a book covering the hobby, and this new publication fulfills the demand.

It traces the DX hobby for the beginner in its first section and looks at getting started in the hobby, operating your listening post, tape recording of reports, interference and antennas and other matters of interest to the new listener.

The second section is aimed at the more advanced listener, with such subjects as shortwave propagation, sunspots and fading, jamming, and similar topics. The third section contains a variety of subjects written by guest writers including shortwave broadcasting, the management of the radio spectrum, and audience research. The final section covers reference material including tables on various radio radio subjects and TV system in use around the world.

The book certainly covers a comprehensive field, and those keen to learn of the hobby in more technical terms will find it a welcome publication. Some sections may be rather advanced for the novice enthusiast but they will have value in the longer term. In the reference section, for example, there is an English-Spanish conversion list of important terms which should assist those interested in listening to latin America.

The book is obtainable from book stores in Australia. Alternatively, a brochure can be had from the sole New Zealand agent, Arthur Cushen, 212 Earn Street, Invercargill, New Zealand. (A.T.C.)

Letters to the editor

Wind power

I have several topics to comment on. The main one is the articles on wind power. While I agree in principle with the idea of using wind power, I see several drawbacks with the use of wind power to replace fossil fuels in Australia, at least in the foreseeable future. Certainly it will be, and is being, used to supply small amounts of power in remote areas.

To explain myself, I will go through the state by state review in your July issue. South Australia is, as Andrews says, the best candidate for wind power. However, the statement that gas supplies will be severely depleted by the 1990s needs some explanation. Gas accumulations in the Cooper basin in SA are small compared with those for example in Gippsland. This means that once reserves for 10-15 years are proven, there is little reason for any commercial enterprise to explore enthusiastically — try calculating the interest at current rates on your exploration money for this length of time, and you will see why. For this reason, the SA government is currently financing (successful) exploration for gas which will not be used until the 1990s. West Australia will need to compare the cost of technology such as wind power with the use of the very extensive gas reserves in the Carnarvon and Dampier basins. There is a pipeline to Perth already proposed.

The remainder of the mainland states fall into similar situations — NSW and Queensland have literally vast reserves of technically mineable coal. The published reserves are those proven by drilling. These are only a very small proportion of those known as geophysical work (mostly carried out for oil exploration). While much of this coal would cost a lot to mine, it could still be cheaper than replacing existing power stations with wind generators plus a new distribution network. For reasons similar to those given for SA gas, Victoria's brown coal reserves are probably substantially larger than the present known reserves. Because of the large size of individual deposits, the known reserves extend much further into the future.

As indicated, the Northern Territory is the home of solar power, not wind power, although because of the low population density any centralised power generation is probably uneconomic. The way of the future here is probably shown by the solar powered Telecom repeaters.

Tasmania I notice does not get a mention. For good reason, however — it has more actual or potential hydroelectricity than can be used for many years. In fact, the export of power to Victoria (and NSW) may well be more feasible than wind power in the SA mainland.

In view of the above, particularly if the present electricity use were not exceeded, or even reduced, there would seem to be NO reason to waste money on wind power for central supplies, except possibly for South Australia. I might point out that exactly the same reasoning applies to the use of nuclear power in Australia. Small wind power plants are, however, definitely worth improving, particularly in the areas of cost, reliability, and, primarily, energy storage.

The second point I wish to make is that you have fallen into a common metric conversion trap in a recent article. You converted the proposed resources limit of 200 miles to 320km. It isn't. It is 370km, because the miles are nautical miles, which shouldn't be converted anyway, since the International Nautical Mile is an SI unit.

(Name and address supplied, but not published by request.)

Metric queries

I have one or two comments and queries arising from Peter O'Neill's timely article "Electronics and the metric system" (July issue).

Firstly, "The plural of henry is henrys". If we are referring to Mr Henry and family we are talking about the Henrys, but when the word has become a common noun, spelt with a small h, should it not be subject to the same rules as other common nouns ending in y and be spelt henries? Oxford and Webster's dictionaries allow both endings but give first preference to henries.

Secondly, how should we pronounce weber? Is it "vayber" as Wilhelm Weber himself pronounced it, or should we anglicise it to "webber"?

The pronunciation of kilometre is a vexed question. In spite of TV and radio newsreaders, the man in the street insists on saying "klommeter" and eventually common usage could cause this to be accepted pronunciation. Admittedly it rolls more easily off the tongue, but to be consistent the m.i.s. should be saying kiLOLitre and kiLOCycle, cenTIMetre and milLIMetre.

And speaking of consistency, why is the symbol for a kilo a small k while mega, giga, tera, etc take the capital letter?

A. R. White,
Coopers Plains, Queensland.

COMMENT: We must confess that the lower-case "k" prefix for "kilo" irritates us, too, because of its inconsistency. However we understand that it is to avoid confusion with the symbol for temperature interval and absolute temperature, the kelvin (K).

INFORMATION CENTRE

DIGITAL PHOTO TIMER: I recently purchased a kit to build the Digital Photo Timer described in the April 1978 issue. I have had this kit assembled by a qualified technician, but there seems to be a problem which I hope you can help me solve.

The timer works OK, except that the displays cannot be set to any number involving 9. However, when counting down, 9s are counted and displayed correctly. Another thing I have noticed is that when the switches are set to the position that should display 00 the displays show random numbers.

The next position on the switches, which should read 11 shows 00, and so on up to 88. The technician who assembled the unit is a qualified TV technician, so I believe it has been assembled correctly. His suggestion is that either we have a faulty component, or there is a basic design problem. (I.C., Townsville, Qld.)

● From your description of the operation of your timer, it would appear that the wiring between the PCB and the rotary switches is incorrect. Check carefully that the unit has been wired in accordance with the circuit and overlay diagrams. Note that the numbering of the switch contacts on our diagrams may not agree with the contact numbering (if any) of the actual switch you are using.

MEMORY, MUSICOLOUR: Is it possible to use a 2114 1024 x 4-bit chip to expand the memory of the Miniscamp and why can't it be expanded to more than 1024 bytes of RAM. (2 x 2114 would work out cheaper than 8 x 2112).

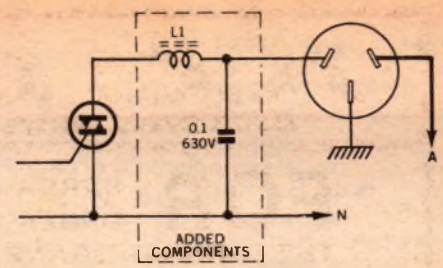
I have just finished putting your Musicolour III together, tested it with my 3 watt portable (Centrex RX888) and find that I must have it rather loud to even start to drive the lamps. I have checked everything nearly a hundred times and come up blank. Just out of interest, the lights are 40 watt spots from GEC. (S.M., Braybrook, Vic).

● It is possible to use 2114 chips to expand the memory of the Miniscamp, but we regard expansion to more than 1024 bytes as impractical. The resulting system would be unwieldy to operate. Extra buffers would be required to connect additional memory chips to the SC/MP chip.

The Musicolour may possibly be insensitive because of a malfunction in the compressor stage. This stage can be disabled by shorting the FET between source and drain with a jumper lead. If this noticeably increases the gain, then the FET is defective. As we indicated in our article, any amplifier capable of 100 milliwatts or more can drive the Musicolour.

MUSICOLOUR III: I am writing to ask where I might get a kit for suppression of the Musicolour III featured in the September 1976 issue. (File No 2/PC/23). The article informs that it can be done but it is expensive and the chokes are rather large. By suppression, I mean getting rid of the buzz caused by the triacs' switching the bulbs. (E.B., New Plymouth, N.Z.)

● We think you have slightly misinterpreted our remarks on suppression components. As you will see from the accompanying circuit, the components are neither particularly bulky nor expensive. A choke and capacitor is required for each triac.



L1 : 18 B&S EN CU WIRE CLOSEWOUND ON 2·1 / 2" LENGTH OF 3 / 8" DIA. FERRITE ROD AND INSULATED WITH 3 LAYERS OF INSULATION TAPE.

The circuit may or may not give an improvement in your particular situation. However, if the problem is one of breakthrough into your audio amplifier, it is unlikely to help.

If the interference is coming directly into your amplifier, then you should try adding suppression components to the input and output leads to your amplifier. You could try the idea of winding the loudspeaker leads (all four of them) through a large ferrite toroid measuring 30 to 40mm outside diameter. This idea was first described in the June 1974 issue of this magazine in an article entitled "Toroid Filter Minimises Radio, TV Breakthrough" (File No 2/LF/7).

As a further measure, you could try the RCA plugs with inbuilt filters marketed by Tecnico Electronics of 53 Carrington Street, Marrickville, NSW 2204.

Notes & Errata

200MHz FREQUENCY METER Mk II (August, September 1978, File Nos 7/F/23,25): The parts list should be amended as follows; 5 x 10uF PC electrolytic, 1 x 10uF/25VW tantalum electrolytic, 8 x 0.047uF ceramic or metallised polyester. Add 1 x .001uF ceramic or polystyrene, delete 1 x 47 ohms. Do not use 74LS73 in the timebase as it may not function reliably in this position.

CRYSTAL LOCKED MUSICAL TONE GENERATOR (August 1974, File No 1/EM/33) and **PLAYMASTER 760 ORGAN** (March 1976, File No 1/EM/37). The AY-1-0212 top octave divider specified has a maximum frequency limit of only 1.5MHz. For correct operation, the premium device, coded AY-1-0212A should be used.

A RECEIVER BUILT INTO HEADPHONES (August 1978.) The circuit, as supplied with the kit contains an error. Capacitor C3 is shown connected to the base of Q2. It should connect to the lower side of the base (T1) winding. This appears to be simply a draughting error which does not effect the performance of the set as made up from the kit.

If you are unable to complete an "Electronics Australia" project because you missed out on your regular issue, we can usually provide emergency assistance on the following basis:

PHOTOSTAT COPIES: $2 per project, or $2 per part where a project spreads over multiple issues. Requests can be handled more speedily if projects are positively identified, and if not accompanied by technical queries.

METALWORK DYELINES: Available for most projects at $2 each, showing dimensions, holes, cutouts, etc., but no wiring details.

PRINTED BOARD PATTERNS: Dyeline transparencies, actual size but of limited contrast: $2. Specify positive or negative. We do not sell PC boards.

PROJECT QUERIES: Members of our technical staff are NOT available to discuss individual projects, either in person at our office or by telephone.

REPLIES BY POST: Limited to advice concerning projects published within the past two years. Charge $2. We cannot provide lengthy answers, undertake special research or discuss design changes.

BACK NUMBERS: Available only until our stocks are exhausted. Within three months of publication, face value. Four months and older, if available, $2. Post and packing 60c per issue extra.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" may be submitted without fee, for reply in the magazine, at the discretion of the Editor.

COMMERCIAL, SURPLUS EQUIPMENT: No information can be supplied.

COMPONENTS: We do not deal in electronic components. Prices, specifications, etc., should be sought from advertisers or agents.

REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Beaconsfield, 2014.

THE SERVICEMAN

(Continued from page 60)

ly little that can be done, short of blowing up the Harbour Bridge, or water tower, or whatever is the cause, but this is not strictly true.

There is always a possibility that a better aerial, altered aerial orientation, or both, may be beneficial. The important point is to know whether it is worthwhile attempting such an exercise, if so what is the best approach, or whether it can be ruled out as a waste of time.

The situation which started this story is a typical example. Had I accepted the original suggestion that it was due to the broadcast station masts, I might well have suggested an aerial with a better back-to-front ratio, since the ghost would have come from behind the aerial.

In fact, such an exercise would have been a waste of time and money, since there seems little doubt that it is coming from in front of the receiving aerial. Granted, this means that, most likely, little can be done about it, but at least the customer has been saved from a futile and expensive exercise.

And remember, once the main sources of ghosts in your area have been determined, it becomes basic information which will serve many customers.

Marketplace

FOR SALE

DISCONE ANTENNA HUB: Machined disc and cone only $30; complate hub (with insulator and 50' coax skt $45. J. L. HARLAND. 83 King Edward Ave. Albion 3020.

PAGE PRINTERS. MOD 15 $30 to $60 READERS $20. Studio 20 Sales 367 Bourke Street. DARLINGHURST 2010. Tel. 31 3383

AUSTRALIAN RADIO DX CLUB for 14 years the club for both MW and SW Dxers throughout Australia. Our monthly magazine is packed with the latest DX information. For further details write to P.O. Box 67, Highett, Vic. 3190 or P.O. Box 79 Narrabeen, NSW 2101. Enclosing a 30c stamp for reply

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NUTTAL DISC CUTTING LATHE. Grampian cutter head. Grampian RA7 and RA4 amplifiers with equaliser, power supply and rack $650. Unison Productions (02) 82 5158, 82 2021.

SPEAKER BOXES. Hand-made, excellent acoustically. Write: Sherwood Electronics, PO Sherbrooke 3789.

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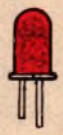

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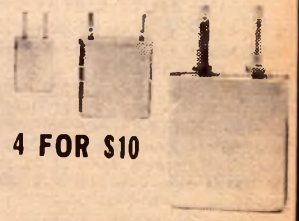

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ADVERTISING INDEX

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KD-65

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