ELECTRONICS AUSTRALIA

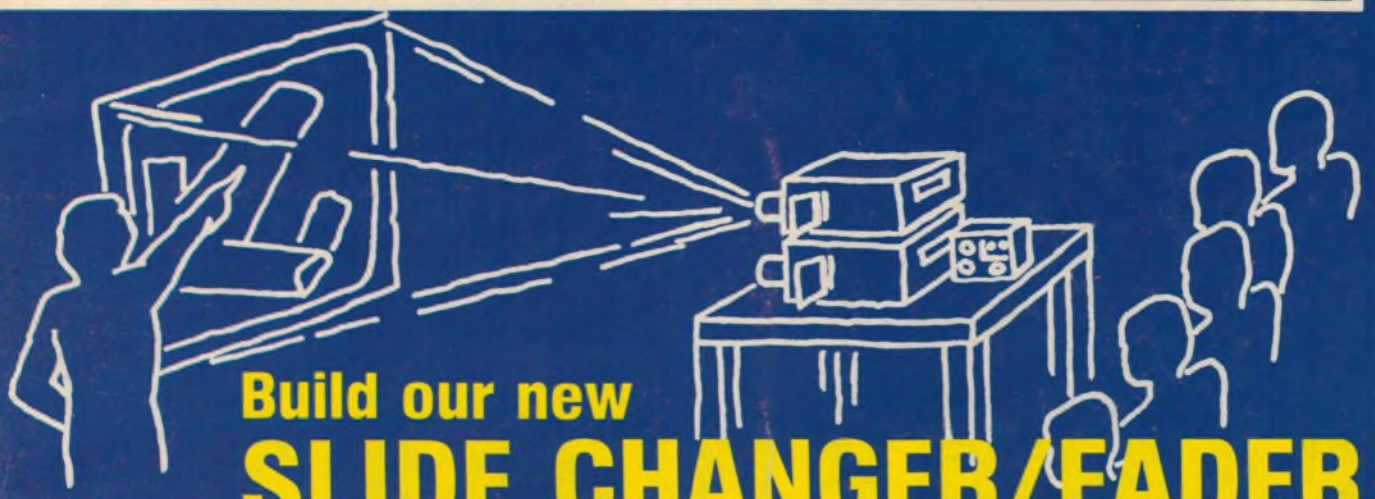
VIDEO, HIFI & COMPUTERS

NOVEMBER, 1981

AUST $1.80* NZ $2.00

How they work

POLAROID'S NEW ELECTRONIC CAMERAS



Build our new

SLIDE CHANGER/FADER

ELECTRONIC SANDGLASS • AUDIBLE TURN SIGNAL INDICATOR

SONY

Heavy.

Introducing another Sony only. The MDR series open-air headphones. The smallest, lightest stereo headphones available today. Or tomorrow.

With our lightest at 40 grams, you will barely know you're wearing them. Yet the sound is dynamite.

Through a remarkable new audio breakthrough, our engineers have succeeded in reducing big-headphone technology down to the size of your listening channels.

The MDR series headphones' airy spaciousness delivers absolute clarity through an ultra-small driver unit that produces more than three times the energy of conventional circuits. And a new high-compliance diaphragm accurately reproduces the 20 to 20,000Hz bandwidth and improves low-range response.

That means you can listen to the heaviest of music for hours. Lightly. And know that you're hearing every nuance of the original recording from deep bass to the highest treble.

Listen to our new MDR series headphones. They're light. And heavy.

STEREO HEADPHONES
MDR

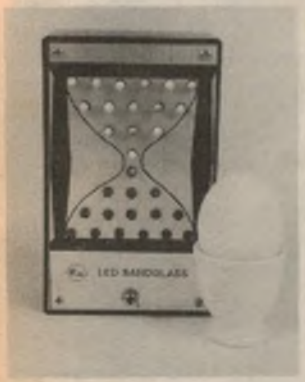
AP3528

ELECTRONICS AUSTRALIA

Volume 43, No. 11
November, 1981

AUSTRALIA'S HIGHEST SELLING ELECTRONICS MAGAZINE

This new electronic slide cross-fader provides smooth dissolves from one projector to another, initiates slide changing automatically and synchronises slide changes to a taped commentary. Details on p44.



Tired of clogged sand in your old sandglass eggtimer? This electronic version is the answer (see p62).

COMING NEXT MONTH! – Find out what's coming by turning to page 75.

On the cover

Electronics and Polaroid know-how have combined to produce two new colour cameras that are virtually foolproof. All the user has to do is aim and press the button (details on page 12). On a similar theme, our new cross-fader and auto-advance unit will enable you to put on really professional slide shows. We tell you how to build it on page 44.

FEATURES

HIFI, VIDEO AND REVIEWS

PROJECTS AND CIRCUITS

MICROCOMPUTERS

AMATEUR RADIO, CB SCENE, DX

COLUMNS

DEPARTMENTS

Turn it off at the gate

GTO

and turn on to a new world of power switching

Meet the 6.5A BTW58, the first in a range of unique power switches that use the new Philips gate-turn-off (GTO) technology. Like the thyristor and ASCR it can be turned ON at the gate. Unlike them it can be turned OFF at the gate as well. This means that when you use the BTW58 you get the fast easy-to-drive features of a bipolar transistor, with the added advantage that it can be directly driven by an IC. AND the usual high blocking voltage and high overcurrent capability of a thyristor.

It means that you open the door to a whole new world of fast power switching. A world where you can forget about commutation circuits, where a simple fuse gives you full device protection, where gate currents are low and where switching times are a fraction of a microsecond ..... a world where a dynamic dV/dT capability of 1000 V/μs is commonplace and where device ruggedness isn't limited by SOAR curves.

Send for full data on this unique device, the first in the Philips range of GTO power switches.

For more information phone:
Sydney 427 0888 **Melbourne** 544 2444 **Brisbane** 44 0191 **Adelaide** 45 0211 **Perth** 277 4199 or write to **Philips Electronic Components and Materials** P.O. Box 50, Lane Cove. N.S.W. 2066.
Or contact our distributors VSI, Soanar or Sycom.

	BTW58-1500R	BTW58-1300R	BTW58-1000R	
Max. repetitive peak off-stage voltage	1500	1300	1000	V
Max. working peak on-state current	6.5	6.5	6.5	A
Max. non-repetitive peak on-state current	50	50	50	A
Max. controllable anode current	25	25	25	A
Typical turn-off time at a gain of 5	0.5	0.5	0.5	μs
Min. trigger requirements: Voltage	1.5	1.5	1.5	V
Current	120	120	300	mA

PHILIPS Electronic Components and Materials

PHILIPS

AHEARNEL47

Editorial Viewpoint

The Cashless Society is coming . . . Ready or Not!

Just recently, the writer attended a seminar where the topic of discussion was "The Cashless Society". This was defined as a society which would have little use for legal tender, such as notes and coins and cheques, and where money can be transferred from one account to another at the touch of a button on a computer terminal.

As could be expected, one recent development which was discussed was that of electronic tellers and their acceptance by the public and bank staffs.

Another related topic was the introduction of bar-code readers and point-of-sale terminals in department stores and the eventual use of the Universal Product Code. It was surprising to find that most people present did not realise or believe that this development was imminent. My reaction is that they must be walking around with their eyes closed. Witness the large number of department stores and supermarkets who already have these point-of-scale terminals.

And just look at the very large number of items on supermarket shelves which are already marked with the UPC panel!

But if I was surprised at the number of people who did not realise that the introduction of UPC is not far off, I was staggered at the number who thought that the concept of the Cashless Society was just "pie in the sky". And this reaction was most strongly held by a represenative of one of the major banks. He expressed opinion to the effect that "the introduction of computers and Bankcard has been hard enough to swallow for the time being, so no one can seriously propose any more radical developments".

Talk about living in the Land of Nod. The fact is that the Cashless Society is a lot closer than most people think. Australians' acceptance of Bankcard and other plastic money may have been tentative at first but is now very enthusiastic. They love it! What prevents even greater use of credit cards for cash and cheques is the attitude of supermarkets, insurance companies, utilities and the banks themselves. But that is changing.

As soon as these bodies determine that the benefits of eiectronic funds transfer outweigh the considerable costs (and risks) of collecting cash and processing cheques, they will make the change. And introduction of the Universal Product Code is a force in favour of this change.

Already the NSW Government Insurance Office has announced that it will accept payments by Bankcard. Others are sure to follow.

Before too long dear readers, the only reason for carrying a substantial amount of cash will be to hand over to muggers!

Leo Simpson

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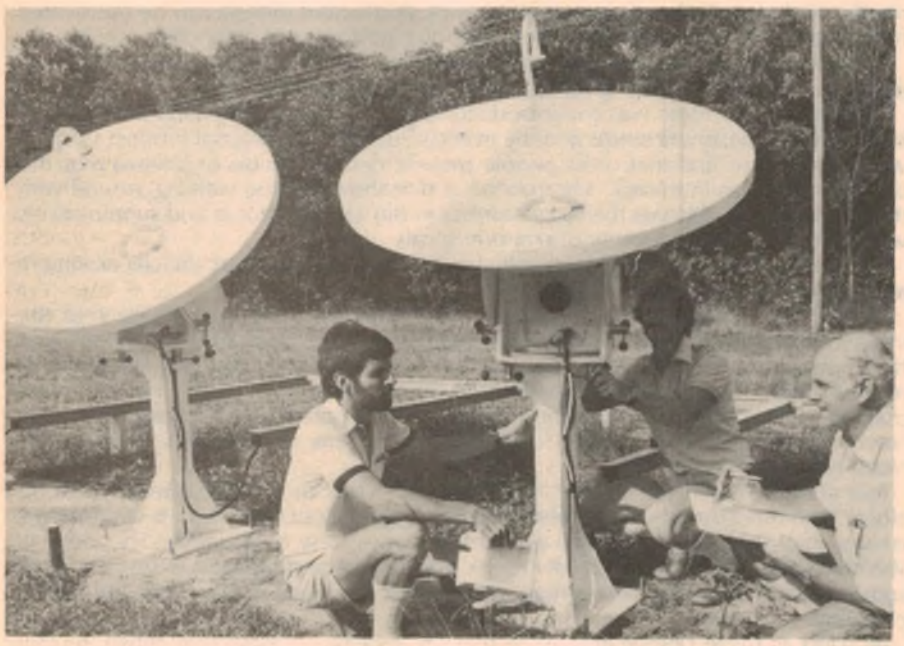
News Highlights

Tropical rainfall may washout satellite communications says Defence Department



Engineers of the Defence Science and Technology Organisation of the Australian Department of Defence are undertaking extensive research into the effects of tropical rainfall on superhigh frequency (SHF) satellite communications in the 7GHz band. The pioneering research is expected to improve the capacity of satellite transmission equipment and lead to the development of high quality, high capacity defence communications satellite systems for tropical areas.

Superhigh frequency microwave signals passing through rain are severely attenuated as the rain both absorbs and scatters the transmitted signal. The rain itself also increases the electronic background noise picked up by a receiving antenna.

Increasing the power of the transmitted signal during rain is the traditional answer to the problem, but this is wasteful of the satellite's limited power output. If an understanding of the effects of rain results in a saving of only 3dB in signal power, the traffic carrying capacity of a satellite communications system could be doubled.

Data on attenuation of microwave signals by rain is available from countries with moderate rainfall, but the Advanced Engineering Laboratory is the first body to seek long-term data on the effects of the much heavier and more concentrated rainfall in the tropics. In some parts of northern Queensland, rainfall rates can be as high as 30cm per hour, and the effect on signals in the 7GHz band has been found to be significantly different from those reported elsewhere.

Specially engineered equipment has been developed to withstand the corrosive effects of 10 years exposure to tropical weather. Three sensitive radiometers are used to monitor the signals in the centre of the band being studied. Information from the radiometers at Innisfail is fed to a microcomputer which records the data on magnetic disks and checks the performance of the equipment at the same time. Disks are then despatched to Salisbury for further analysis, producing a range of statistics on signal attenuation which are vital to the operation of satellite links in tropical areas.

Talking machines could say too much

"You are overweight" is an embarassing thing to hear at any time, but what if the opinion was offered by a set of scales in the local department store in the middle of a crowd of curious shoppers?

Talking scales are just one possibility opened up by National Semiconductor's DT1050 "Digitalker" board, an electronic speech synthesis system which produces natural-sounding high quality speech by compressing and digitising human speech waveforms. The technique makes low cost solid-state speech available for a host of products where information is conveyed to a user, a bystander or a casual passerby.

National Semiconductor has recently expanded the possibilities by the release of two new speech synthesis memories that add 131 new words to the Digitalker's vocabulary, giving a total of 274 discrete words. Words like "secure", "switch", "first", "floor" and "button" are now available for a vast array of commercial and industrial applications.

A complete kit, the DT1056, is available with the speech processor chip and the 65K bit speech ROMs. The DT1057 kit consists of the speech ROMs only and is easily interfaced to the original Digitalker kit released last year, providing access to all 274 words.

Customers can assemble their own phrases and sentences from the selection of words available. The kits will work with either mechanical switches or with a microprocessor system, and require only a simple amplifier and speaker for speech output.

Talking machines may soon be commonplace, with electronic speech synthesis finding applications in everything from watches to toys. Designing machines which can listen to human speech and understand it has been a much more difficult task however.

Reports from the United States indicate that speech recognition circuits are improving in accuracy and dropping in price. Until recently a good speech recognition system was priced at around $10,000. Units now coming onto the market in the US cost closer to $5000,

continued on p5

Australian Army field trials for new solar-powered battery charger

Australian Army radio operators may find their load much lighter following the successful development of a solar battery charger.

The defence Research Centre at Salisbury in South Australia conceived the development of the charger after the Special Air Service Regiment had asked for a means of relieving soldiers of the need to carry spare dry batteries on long-range patrols.

Five aluminium panels, each containing 18 silicon solar cells, make up the prototype charger. Each panel measures 12.5 × 25 × 0.4cm, and the five fold up like a map into their canvas backing. The complete kit weighs less than a kilogram and can fully charge the standard Army transmitter/receiver battery in four hours.

Philips Industries Ltd of Hendon, South Australia developed the charger, and with the assistance of the Defence Industry Development Branch is currently developing a final product which will be even smaller and lighter than the prototype.

"Just spread it out in the sun . . ."

Robots are coming ready or not

A move by the British Science and Engineering Research Council (SERC) to support robot research in Britain is gaining momentum after its initiation last year. The purpose of the SERC program is to support studies so that the country "Can take advantage of the intelligent robot as it emerges in the mid-'80s".

At present most of the "robots" in use are re-programmable manipulator arms, repeating the same task over and over. They generally have no visual or tactile sensors or means of independent movement, let alone intelligence.

A dozen projects have been approved by SERC in recent months and over $4 million allocated to teams which in each case are joint efforts between a university and a company interested in building or using robots. Research has been concentrated in five main areas; sensory systems, mechanical systems (manipulators), control, safety and diagnostic and error recovery procedures. The question of standardisation of parts and connection formats is also receiving attention.

The overall aim is to to produce robots which are flexible, reliable and accurate, and in particular able to cope with unexpected situations. At the moment a robot presented with the wrong part may try blindly to assemble the finished product in any case. SERC researchers look forward to the time when the intelligent machine will trundle off to the foreman (or head computer?) and request the correct part.

Closer to home, the CSIRO's Integrated Engineering Manufacture group has set up a project to study progress in robot manufacture and to undertake research and development as an aid to Australian industry.

As reported in the Pacific Computer Weekly, Dr Alex Holzer of the CSIRO told a recent meeting of the Australian Robot Association that the world trend towards industrial use of robots meant that Australian industry would soon be forced to invest heavily in robotics development. Because 75% of Australian manufacturing was based on small-batch production – 50 or fewer items – industry acceptance of robots will depend heavily on the development of flexible, re-programmable machines.

Australian manufacturing industry is ignoring robots in the same way as US manufacturers had until recently. The United States is now spending millions of dollars each year in an effort to match developments in Japan. In Japan, an estimated 150 companies are involved in the manufacture of industrial robots.

The CSIRO's research project is aimed at developing advanced automated systems by which production could be varied simply by changing software. Initial funding to set up an experimental production line will be provided by the CSIRO.

Talking machines . . . from p4

and some companies are predicting that prices will drop to $500 by as early as next year.

One United States company, Intrastate, plans to introduce the first single-chip speech recognition device later this year. Although it will only understand eight words spoken one at a time, it should bring the cost of speech recognition circuitry down to about $10.

Chips that can understand full phrases may be available by 1985, and by the end of the decade we may have television sets that turn on when spoken to, home appliances that respond to verbal commands and typewriters that take dictation. The only question is – will we have to learn to speak with an American accent so that our machines will understand us?

VHD video disc system release delayed

The consortium of four companies developing the Video High Density video disc system has announced a six month delay in the launch of the product due to difficulties in mass producing the discs required. As a result the VHD system is likely to fall even further behind the alternative RCA and Philips formats, which are already on sale in the United States.

Officials of Victor Co of Japan, Matsushita Electric Industrial Co, General Electric Co and Thorn EMI announced recently that they would postpone introduction of the VHD system until at least April, 1982, in Japan and June in the US. Apart from the consortium, 11 Japanese companies have bought production rights to the VHD system, and many have invested in production equipment. Some may have already begun production of the players, which are useless without discs to play.

STC-Cannon has Hitachi products

Mr Hiroshi Goto, Manager of Hitachi Semiconductors Australia, has announced the appointment of STC-Cannon Components Pty Ltd as a distributor for Hitachi semiconductors in Australia.

A full range of Hitachi's 6800 microprocessors and peripheral chips will be available "off the shelf" at all STC-Cannon sales offices.

Brian Maloney, director of marketing of STC-Cannon Components, stated that the Hitachi products would be a very significant addition to the already extensive range of semiconductors handled by the company.

Head office for STC-Cannon Components is at 248 Wickham Rd, Moorabbin, Vic 3189. There are also sales offices in NSW, 605 Gardeners Rd, Mascot, 2020, and South Australia, 66 Humphries Terrace, Kilkenny, 5009.

NEWS HIGHLIGHTS

Dick Smith introduces the first Australian "Shop by Computer" service and Leo Simpson gets a demo!

DICK: THIS FANTASTIC DISK DOES IT.
LEO: THAT'S INCREDIBLE!

DICK: AW C'MON LEO. HOW ABOUT 1000 RESISTORS AT 5c EACH?

TWO NANOSECONDS LATER (OR THEREABOUTS) THE GOODS ARRIVE.

Dick Smith has come up with yet another first. Australia's first "Shop by Computer" service is now open to anyone with a disk-based System-80 or Tandy-TRS-80 Computer with RS-232 port and a modem. With a disk program that Dick Smith has made available at a nominal cost of $5, you can type your order into your system, pick up the phone and at the touch of a key, your order is fed through to the Dick Smith Electronics computer and acknowledged immediately. You also learn of the latest specials on offer and your order is debited to your credit card account.

Because the disk program lets you type your order before you pick up the phone, you can use the computer buying service from anywhere in Australia for just the cost of a local phone call. And your order will normally be despatched within four hours together with a full printout of your order details. Dick Smith is very enthusiastic about the system and predicts that thousands of his customers will soon be using it. And Dick has stated that anyone purchasing a modem from Dick Smith Electronics during the month of November will receive the "Dick Smith Ordering System" program disk (cat. X-3764) free just by mentioning this article in "Electronics Australia".

HEY WHAT'S THIS DICK? YOU'VE CHARGED ME THE FULL PRICE!

You can be a part of the David Lewis Expedition to the Antarctic! You can become an Associate Technical Member of the Expedition.

As announced last month in these pages, Dr David Lewis of the Oceanic Research Foundation is to lead an historic expedition to the Antarctic. Our parent company, John Fairfax & Sons Ltd, and Dick Smith Electronics are sponsors and we will keep you posted on the progress of the expedition. You too can lend your support and become an Associate Technical Member of the expedition. You will be invited to the departure on December 15 and you will receive a commemorative envelope franked in the Antarctic, addressed to you as an Associate Technical Member.

Would you like to give your support to this exciting expedition by making a donation? Send no money now. Just fill in the coupon below (or a copy) and send it with a stamped, addressed envelope to the Oceanic Research Foundation Ltd, Dangar Island, NSW, 2253.

To Dr David Lewis c/- Oceanic Research Foundation Ltd, Danger Island, NSW 2253. I wish to become an Associate Technical Member of your Antarctic Expedition. Please send me details:

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EVEN MORE GREAT SPECIALS FROM JAYCAR!

ELECTRET INSERT

ONLY $1.49

SAVE NEARLY 40%

Electret inserts back on special!! For those who missed out in July. These are normally $2.45 each. Grab them now!!!

ETI 473 Moving Coil Preamp Kit Sellout!!

This is the original ETI design. Kit includes quality PRE-PUNCHED power supply and amp boxes and beautifully anodised and silk-screened front panels.
The Jaycar kit of the 473 normally sells for $95. We have only a few (and we mean that) left at only

$74.50 comp.
SAVE OVER $20!!!

8 CHANNEL MIXER KIT

We are completing work on our new 8-channel stereo mixer
A few specs:
- 19" rack or console mount
- Balanced inputs and 2 outputs
- Equalisation on each input
- Uses latest NE5534 Op amps
- Very low noise
- Effects (e.g. "Echo" etc)
- Foldback send
- Switchable line and mic. level inputs with separate attenuation control

Don't buy a mixer until you have seen this one!
Send SAE for more information. **P.O.A.**

Audio Adaptor Sellout.

We honestly think that some of our audio adaptors are so USELESS that we can't even imagine a use for them! They are very high quality solid metal types. If you want 'em – grab 'em! Maybe your imagination is better than ours!!

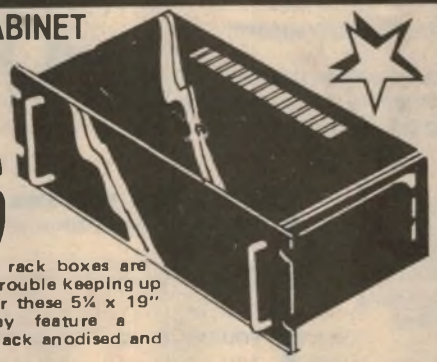
DESCRIPTION
6.5mm plug to 3.5mm plug (or vice-versa)
RCA socket to screw on microphone (or vice-versa)
6.5mm socket to screw on microphone (or vice versa)
6.5mm plug to 6.5mm plug (incredible but true)
6.5mm plug to RCA plug
6.5mm socket to 6.5mm socket (unbelievable!)
6.5mm socket to 3.5mm socket
RCA socket to RCA socket (could be handy)
3.5mm plug to 3.5mm plug (an ABSOLUTE must)
3.5mm plug to RCA plug
3.5mm socket to 3.5mm socket
RCA plug to RCA plug
3.5mm socket to 2.5mm plug
3.5mm socket to screw mic connector

No need to rush in folks, we have zillions of them.

ONLY 40c each

30c in mixed lots over 10

19" RACK CABINET



* * * * *

$45

19" black anodised rack boxes are back! We have had trouble keeping up with the demand for these 5¼ x 19" rack cabinets. They feature a magnificent 3mm black anodised and linished front panel.
BEWARE OF RACK BOXES THAT DO NOT CONFORM TO STANDARD RACK DIMENSIONS!!!!

AUDIO AMPLIFIER IC's SLASHED!!

TYPE	POWER	NORMALLY	THIS MONTH
TAA611B	2W	$2.50	0.50c
TBA810	6.5W	$4.50	0.95c
TBA651	AM Tuner IF	$6.50	0.50c

FREE DATA SHEET WITH EACH UNIT!

CERMET Trimmers in stock

Jaycar now stock high-quality Cermet trim-pots. T.C. 100 ppm values from 100 ohms to 100K. 5mm lead spacing. Neat, tiny & rugged! Old fashioned carbon trimmers are a very common problem in circuits – specially amps.
Why not upgrade to Cermet?

only 50¢ ea.

1% 50ppm Metal Film Resistors

We stock the E-24 SERIES (i.e. 24 values per decade – not just 12 like everyone else). The Jaycar Metal-Film resistor is a very high quality Mil-Spec style (RN-60) of part (MIL-R-10509F)
Why not upgrade the reliability and performance (i.e. much lower "noise") for what amounts to modest cost?
Price: 1–99 ONLY 8c each 100+ ONLY 6c each

THIS MONTH'S SNIP

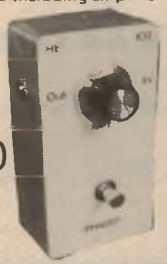
A 250 GRAM roll of solder for the price of a 200 GRAM roll.
ONLY $4.95 0.8mm
Hey! That's 20% more for no extra cost!!

POST AND PACKING		
$5 – $9.99		$1.00
$10 – $24.99	$100 up	$2.00
$25 – $49.99	$5.50	$3.00
$50 – $99.99		$4.00

Guitar Phaser Kit

Get great Phasing Effects from your Guitar or Synthesiser (or anything) at a fraction of the cost of commercial units. Easy to construct, this really effective Phaser gives a truly professional sound.
Based on Aug. '81 "hobby Electronics"
ONLY $26.50 including all parts

ONLY $26.50



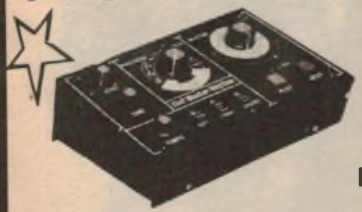
ARLEC SUPER SWITCH

SUPER XXXX SPECIAL!!
NORMALLY $23.50
NOVEMBER ONLY $17.50
BE QUICK

ONLY $17.50

* * AT LAST * *

programmable master rhythm generator



FULLY IMPORTED

This project was originally described in the UK publication "Practical Electronics". We have fully imported "Clef" kit
This attractive kit is presented in an attractive metal cabinet with silkscreened front panel.
The Master Rhythm can be programmed (in RAM) to play back:
– 24 Rhythm patterns 8 parallel tracks 12 instruments
It is also capable of sequence operation – the ULTIMATE UNIT

complete $199 LOW POWER BATTERY DRIVEN

SEND SAE FOR DESCRIPTIVE LEAFLET

HAVE YOU SEEN OUR $49.95 AUTO RANGING DMM?? IT'S A PRICE BREAK THROUGH

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DON'T FORGET OUR EA/ETI BELOW COST OFFER SEE OUR OCT. AD OR 'PHONE.

The Official Line

— from the Department of Communications

Work under way to restore transmitting station

Staged reconstruction of the cyclone-wrecked Radio Australia high frequency transmitting station on Cox Peninsula, west of Darwin, is proceeding satisfactorily and the work should be finished in 1984.

The site of the station on Cox Peninsula, a relatively unpopulated promontory, is about 25km as the crow flies from Darwin across Port Darwin Harbour. But to get there by vehicle means a journey of about 160km on a low-standard road, so access is usually by boat. Mains power is provided from Darwin via submarine cables.

The station was built in the late 1960s to improve the quality of the shortwave service provided in East and South-East Asia by Radio Australia, part of the ABC. It began operating in 1970 with three 250kW high frequency transmitters and five log-periodic (wide-band) transmitting antennas.

Transmitters at Shepparton in Victoria had previously provided these services via multi-hop modes of propagation. These gave Radio Australia low levels of signal when compared with those available to other countries operating from transmitting sites in South-East Asia. But the provision of single and double-hop propagation modes enabled the Cox Peninsula station to improve signal levels in target areas.

Damage inflicted by Cyclone Tracy in 1974 knocked out the station. Transmitting antennas were demolished and flying debris punched holes in buildings. This caused weather damage to transmitters and associated equipment. The cyclone battered the jetty, and access to the station was hindered. Later the submarine power cables failed, probably as a result of ships' anchors dragging across them during the storm.

As an interim measure, some Radio Australia services were restored by establishing a limited high frequency installation at Carnarvon in Western Australia, with other services being provided from Shepparton. While the Carnarvon area was suitable for a permanent station, the interim facility could not be developed further. So the decision was reached to re-establish the major transmitting station on Cox Peninsula.

The work is being undertaken in stages and on 1980 prices will cost about $10 million. In the first stage, the submarine cables were repaired so that the mains power supply could be re-established. Serviceable parts from the two original cables were joined to provide a single cable now in service. A second cable, completely new, will also be installed.

Repairs to the jetty, now under way, include additional facilities to allow residents use of the jetty. Restoration of buildings include repair of storm damage and minor upgrading to meet the cyclone building code introduced since Tracy struck.

The work should provide protection against damage by flying debris in any future cyclone. Restoration of technical facilities involves three 250kW transmitters and in general replacing the log-periodic antennas, the latter with "curtain" type arrays.

Indonesia, China, Japan, Malaysia/Singapore, Thailand and The Philippines are among areas the rehabilitated station will cover. Long-term development plans for Radio Australia include increasing the number of transmitters and antennas at Darwin, and redeveloping the station at Carnarvon. These works will enhance Radio Australia's ability to provide services into the areas mentioned and throughout Asia and the Middle East. They will give Radio Australia flexibility in responding to changes in the world situation.

Telecom Australia, as an agent for the Department of Communications will operate the transmitters at Cox Peninsula once the station is restored. When it is fully operational it will require a staff of 41 to provide a round-the-clock operation.

The Cox-Peninsula station is one of a network planned to provide the best possible quality of service in areas of particular interest to Australia. Further development plans for Radio Australia under consideration include replacement of obsolete facilities at Shepparton, and a new station near Townsville to improve signals in Papua New Guinea and the Pacific.

R. B. Lansdown
Secretary,
Department of Communications.

Forget cable TV says media expert

Australia is more likely to end up with a subscription television service rather than a cable system because it will be cheaper to install, according to advertising media consultant Mr Dennis Merchant.

Because the TV signal would be received through an antenna rather than a costly cable network a subscription system would have a much lower price tag, and hence more chance of being accepted here.

Speaking at an advertising seminar in Sydney recently, Mr Merchant raised a number of questions about cable television in the light of the coming inquiry into the subject by the Australian Broadcasting Tribunal. Lack of information on the local scene is highlighted by the issues raised.

Yet to be answered are questions such as who will use a cable television service, whether advertisers will be allowed time on it, program content and funding of the system and how much subscribers would be willing to pay for the service. Most importantly, will there be a sufficient market for a cable service in Australia?

Meanwhile, markets for satellite earth stations are "booming", according to a recent report from International Resource Development Inc, a United States market research and consulting firm. Shipments of earth stations in the US should exceed $80 million, with strong growth expected through the 1980's, says the report.

One spur to interest in private satellite networks has been the successful launch of the first Satellite Business Systems (SBS) satellite, but the increased use of satellite channels for TV transmissions has been responsible for most of the growth in the ground station market. In the short term says the report, it will be cable TV and subscription TV which will make most demands on the earth station market, particularly for receive-only stations.

Telecommunications will also remain an important use of the satellite network, with applications such as electronic mail, teleconferencing and data transmission.

Recently Comsat, the Communications Satellite Corporation, received approval from the FCC to establish a direct satellite-to-home television service. Studies done by Comsat indicate that at least 5% and perhaps 10% of US households would subscribe to the proposed direct satellite TV service, at a cost of $20-$30 a month. Approval of the final details of the scheme is expected by the end of the year and services could begin by 1985.

A CAREER with DICK SMITH'S can start in our Mail Order Dept.

Our policy of internal promotion has proved the Mail Order Department to be the training ground for future Dick Smith Executives. Our informal company structure means you'll be encouraged to prove what you can do. Besides advancement within the department, people have moved into our advertising, retail, service & accounts departments.

Our next Managing Director could start in one of these positions:

ASSEMBLERS, PACKERS, INVOICE CLERKS, STOCK CONTROLLERS, TRAINEE MANAGERS

Contact Ross Weeks, Mail Order Centre (02) 888 3200.

TRAINEE MANAGERS:

We need managers for the new stores we're opening right around Australia - and overseas. What better way to prepare for this than by training in a current Dick Smith Store. If you're between 18 and 30, have a hobby background in electronics and retail experience, give us a call. We'll probably place you in a store close to home (we have 21 stores - in most states).

Contact Mr Bob Johnson, Retail Supervisor (02) 888 3200 or ask your local store manager.

TECHNICAL SALES STAFF/ SPECIALISTS:

You could join our young sales team - or even be a specialist salesman if you have a particular interest. (Amateur Radio, Computers, etc). You'll be trained thoroughly in being a sales professional, and you'll be dealing with interesting people involved in electronics just like you are at the moment!

Contact your local store manager.

STOCK CONTROLLER:

We now have a vacancy for a stock controller in our Kit Department. The prospective applicant must have a basic knowledge of electronics, plus experience in stock inventory and stock movement. Must be self motivated and work without supervision.

Contact Mike Rogers, Kit Centre Manager (02)888 3200.

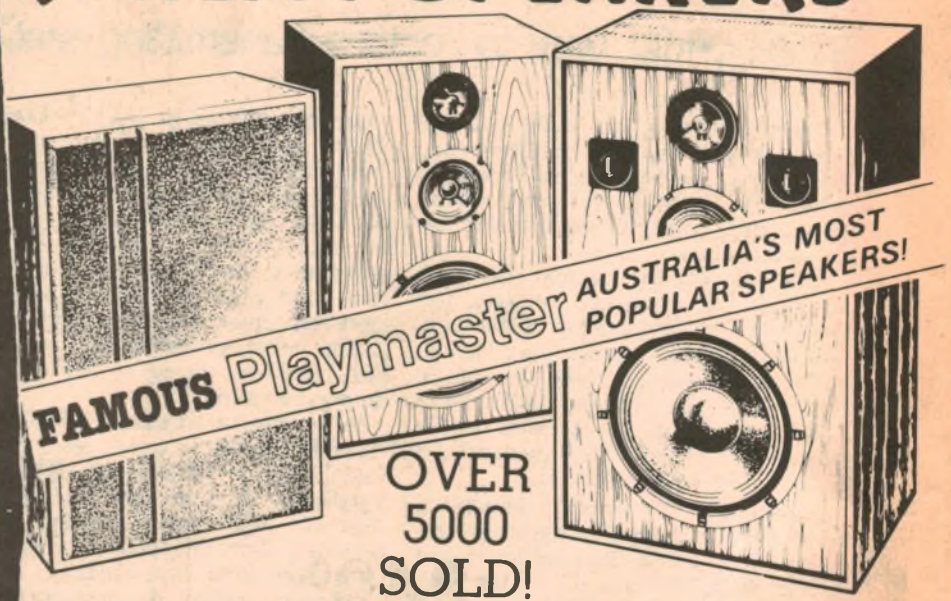
SERVICE TECHNICIANS:

Our North Ryde (NSW) service centre needs technical experts in all categories: audio, RF, digital ... the opportunities for promotion are very, very good for the right people (our current National Service Manager started 'on the bench' just a few years ago!)

You'll be working in air-conditioned premises, with the latest in service aids. The pace is hectic - so we want people who don't need continual supervision.

Contact Gary Crapp, National Service Manager (02) 888 3200.

SAVE $100s ON QUALITY SPEAKERS



OVER 5000 SOLD!

NOW LOOK AT THESE FEATURES:

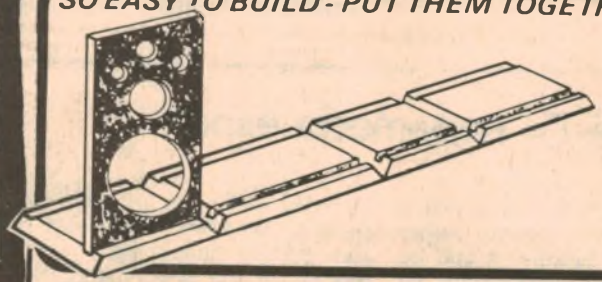
NEW Audio density board supplied with Innerbond 'wonder wool'.

NEW Heavy duty construction - ribbed woofer.

NEW Sealed mid range & tweeter to prevent cross frequency intermodulation.

Even though these new model speakers with infinite baffle cabinet construction cost us considerably more, we will not pass the extra cost onto our customers. YOU REAP THE BENEFIT!

SO EASY TO BUILD - PUT THEM TOGETHER YOURSELF!



You don't need special tools, materials or skills, just a screwdriver & a tube of wood glue! The Dick Smith 'Playmaster' kit has all you need - precision manufactured so that everything just about 'falls in place'! You're saving on high labour costs - & getting a superb speaker system. Kits come complete with detailed instruction manual.

THIRD OFF!

SPECIAL OFFER CLOSES 31st DEC.

ALL KIT PRICES PER PAIR!

200mm	250mm	300mm
NORMALLY	NORMALLY	NORMALLY
SPEAKER $89.50	SPEAKER $149.00	SPEAKER $175.00
KIT C-2046	KIT C-2044	KIT C-2042
BOX KIT C-2626 $82.00	BOX KIT C-2624 $115.00	BOX KIT C-2622 $139.00
TOTAL: $171.50	TOTAL: $264.00	TOTAL: $314.00
NOW $114.33	NOW $176.00	NOW $209.33

OPENING SOON IN DARLINGTON

WATCH THIS SPACE!

Did you miss out on our BELOW COST SPECIAL? LAST MONTH:

13pc. Drill Kit

ONLY $1.77 T-4800

WAS $2.95 SAVE $1.18

NEXT MONTH: ? ? ?

Don't buy an almost superseded 18 chan. CB Radio!

A recent announcement by the Minister for Communications recommends that 40 channel 27MHz CB radios be licensed from the 1st January next and that 18 channel units be phased out.

DICK SMITH NOW HAS 40 CHANNEL CB UNITS WITH HIS EXCLUSIVE 'LICENCE GUARANTEE'

All 40 channel units now being sold by our company are guaranteed to meet the new specification and be fully licensable from January 1st, 1982.

NOTE: If for any unforeseen reason the new 40 channel specification is changed, we will modify these units to the new specifications at no charge to the purchaser.

'PRO SPEC' SEMICONDUCTORS

Simply selling the cheapest semi-conductor doesn't always win you the most friends. Following many requests from hobbyists & professionals alike, we are now purchasing on quality rather than price.

Our prices are still way below most of our competitors & we are now confident on quality that we offer a 12 MONTH REPLACEMENT GUARANTEE (most others offer no guarantee on semiconductors).

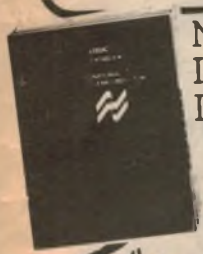
40,000 CB'S SOLD!

STALKER IX SSB 40 CHANNEL AND ONLY

D-1712

$249.00

The Stalker IX has everything you'd want from a transceiver: auto noise limiter and blanker (ANL & NB), a bright/dim switch, plus an RF gain control & much, much more. A super transceiver - at a bargain price!



National Logic TTL Data Manual

Full data on typical TTL devices. A handy reference manual - a must for the workshop!

ONLY $9.95 B-4022

FANTASTIC SAVINGS ON THESE SENNHEISER MICROPHONES

SAVE up to 30%

DYNAMIC OMNI

DYNAMIC CARDIOID MIC

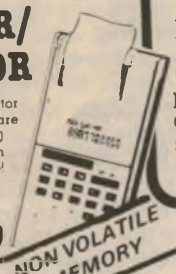
Both microphones represent outstanding value. Great for hi-fi or movie buffs. It's a better replacement for that old cassette microphone too! Complete with desk stand.

$19.95 EA.

C-1021 C-1020

NOW! POCKET SIZE

PRINTER/ CALCULATOR



This fantastic miniature calculator printer has Percentage, Square Root, Tab (floating decimal point) keys, Print/No print function etc. etc. Outstanding value! (Paper to suit 60¢ Q-3021)

ONLY $67 Q-3020

NON VOLATILE MEMORY

WAY BELOW MANUFAC. COST

STILL TIME TO TAKE ADVANTAGE

CRAIG LANGUAGE TRANSLATOR

SAVE UP TO $10 ON OUR NORMAL PRICE

This brilliant language translator is a must for the businessman & overseas traveller. A great way to learn a second language. Has normal calculator functions, plus metric conversion as well (WAS SELLING FOR $250).

Modules:

Japanese(Y-1342) $14.50, German (Y-1343) $16.50, Italian(Y-1344) $14.50, Bar & Wine Guide(Y-1345) $10.00, Calorie Counter(Y-1346) $9.50, Phonetics(Y-1347) $9.50, Spanish(Y-1348) $16.50

BUY 3 & GET BAR WINE OR CALORIE COUNTER FREE!!!

ONLY $59.95 Y-1340

LOOK AT DICK'S PRICE FOR A QUALITY METAL DECK

DOLBY DECK

We've made a huge scoop purchase of these incredible METAL cassette decks. Superb dolby sound on metal or chrome tapes. Features separate recording levels, LED VU meters PLUS MUCH MORE!

DON'T PAY $199 OR MORE!

ONLY $115 A-3503

MAJOR DICK SMITH RE-SELLERS

These re-sellers stock a large range of our products. However we cannot guarantee they will have all items in stock, or at the prices we advertise.

ATHERTON, QLD: Jue Sue's Radio Service
55 Main Street Phone 911 208

BENDIGO, VIC: Sumner Electronics
95 Mitchell Street Phone 431 977

BALLINA, NSW: A. Cummings & Co.
91-93 River Street Phone 862 285

BLACKHEATH, NSW: Goodwin Electronics
123 Station Street Phone 878 379

BROKEN HILL, NSW: Crystal TV Rentals
66 Crystal Street Phone 6807

CAIRNS, QLD: Thompson Instrument
79-81 McLeod Street Phone 512 404

COFFS HARBOUR, NSW: Coffs Harbour Elect
3 Coffs Harbour Plaza, Park Ave. Phone 525 684

DARWIN, NT: Kent Electronics
42 Stuart Highway, Phone 816 749

DUBBO, NSW: Dubbo Electronic Services
157 Brisbane Street Phone 829 355

EAST MAITLAND, NSW: East Maitland Elect
Cnr. Lawes & High Streets Phone 337 327

GERALDTON, WA: KB Electronics & Marine
201 Main Terrace, Phone 212 178

GOSFORD, NSW: Tomorrow's Electronics
68 William Street, Phone 247 248

HOBART, TAS: Aero Electronics
123a Bathurst Street, Phone 348 232

KINGSTON, TAS: Kingston Electronics
Channel Court Phone 298 802

LAUNCESTON, TAS: Advanced Electronics
5a The Quadrant, Phone 317 075

LISMORE, NSW: Decro Electric
Magellan Street & Brunner Hwy Phone 214 137

MACKAY, QLD: Stevens Electronics
42 Victoria Street, Phone 511 723

MARYBOROUGH, QLD: Keller Electronics
218 Adelaide Street, Phone 214 559

MORUYA, NSW: Coastal Electronics
43 Vulcan Street, 742 545

MT GAMBIER, SA: Hutchesson's Comm
5 Elizabeth Street, Phone 258 404

MUSWELLBROOK, NSW: Silicon Chip Elect
Suite 3, 98 Bridge Street, Phone 43 1096

NAMBOUR, QLD: Nambour Electronic Shop
Shop 4, Lawan House, Aon St. Phone 411 804

NEWCASTLE, NSW: Elektron 2000
181 Wharf Road, Phone 282 844

ORANGE NSW: M&W Electronics
173 Summer Street, Phone 826 491

PENRITH, NSW: Acorn Electronics
Shop 12 541 High St.(Phone not yet connected)

ROCKHAMPTON, QLD: Purely Electronics
15 East Street, Phone 21 058

SOUTHPORT, QLD: Amateur's Paradise
121 Nerang Street, Phone 322 844

TAMWORTH, NSW: Sound Components
70 Brisbane Street, Phone 661 303

TOOWOOMBA, QLD: Hunts Electronics
18 Neil Street Phone 329 877

TOWNSVILLE, QLD: Tropical TV
45 Fulham Road, Vincent Village, Phone 791 421

TRARALGON, VIC: Power'n Sound
147 Argyle Street Phone 743 038

WAGGA, NSW: Wagga Wholesale Elect
82 Forsyth Street

WODONGA, VIC: A & M Electronics
78a High Street, Phone 244 588

WHYALLA, SA: Mellor Enterprises
Sap 2, Forsythe Street, Phone 454 764

Dear Customer:

Quite often, the products we advertise are so popular they run out within a few days. Or, unforseen circumstances might hold up goods so that advertised lines are not in the store by the time the advert appears. Please don't blame the store manager or staff: they cannot solve a dock strike on the other side of the world, or even locate a shipment that has gone astray. What we are trying to say is that, if you are about to drive across town to pick up a particular line at a Dick Smith Store, why not give the store a ring first (addresses/phone numbers below) ... just in case! Thanks.

Dick Smith & Staff.

DICK SMITH Electronics

DSE A077RB

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Order Value	Charges
$5-$9.99	$1.20
$10-$24.99	$2.20
$25-$49.99	$3.30
$50-$99.99	$4.40
$100 or more	$6.00

These charges for goods sent by Post in Australia only — Not airmail, overseas or road freight.

Electronics does all the POLAROID'S

Electronics and Polaroid know-how have combined to produce two new one-step colour cameras that are virtually fool-proof. Forget about distance, forget about focus, forget about light level, light source, or whether or not to use flash. All the user has to do is to line up the subject in the viewfinder and press a button; the camera does the rest.

by NEVILLE WILLIAMS

Inside the new cameras, microelectronic circuitry assesses the picture taking conditions, in the very act of exposing the film, and makes appropriate and virtually instantaneous adjustments. According to Polaroid, the new cameras make up to 42 interactive decisions, thereby increasing considerably the chances of getting 10 good pictures for every 10 exposures.

In fact, at the recent press presentation at Sydney's Birkenhead Point Shopping Complex, a Polaroid executive told the reporters that, if they managed to come up with 10 failures, Polaroid would cheerfully take them back in exchange for a new film pack!

To emphasise the point, they had provided a number of sets, with lighting harsh enough to challenge photographic buffs, let alone writers handling unfamiliar and relatively inexpensive cameras for the first time.

The results left little room for doubt; but more about that in a moment.

From the time they first made their mark in the industry, Polaroid has concentrated on a special kind of amateur and industrial photography – dedicated to giving the user a print, in their hand, within minutes of taking a shot.

In the process, they've been prepared to cut right across the ideas of traditional photographic buffs – exotic lenses, fine grain films, special developers, darkroom equipment and books full of theory.

Polaroid's earliest instant-picture cameras and film packs were rather primitive but, over the years, the introduction of colour, plus progressive refinements, have culminated in the new "one-step" 600-System of instant photography for the amateur market.

At this point in time, the System includes the 640 fixed focus camera, the 660 autofocus model and 600 film pack. In use, the film pack is inserted into the appropriate slot in the camera. The protective cover plate is ejected automatically and an "exposures remaining" indicator sets itself to "10", the number of exposures in each pack.

To take a picture, the user merely frames the desired subject in the viewfinder and presses a two-step activating button. The exposed film is ejected immediately and begins to develop and fix itself – a process that takes about 90 seconds. The camera, meanwhile, is ready for the next shot.

There is no mess, no sign of chemicals. The pictures, measuring 88 × 108mm overall, are full gloss, ready to handle or to mount in an album. Picture quality is in about the same league as prints from 110-format colour negatives.

Developed expressly for the 600-System, the new 17-layer film is claimed to be the world's fastest rated colour print medium with four times the sensitivity of SX-70 Land film and a rating of ASA 600 or 29 DIN.

In addition to the 10 film sandwiches, each pack contains a 6-volt planar battery with ample capacity to power the camera solenoid and drive motor mechanism, the in-built electronic flash, and the complex electronic circuitry which makes the right things happen at the right time.

The 600-System film pack will sell in Australia for just under $11.

Availability of a very high speed film obviates the need for fast, exotic – and costly – lenses. The 600 System cameras use relatively inexpensive plastic lenses with a maximum aperture of F10 for the variable focus 660, and F14 for the fixed focus 640.

In turn, the limited aperture confers a greater natural depth of field, rendering focus less critical.

The easiest way to understand how the new cameras work is to follow the sequence of events, as a picture is actually taken. Let's do that for the more elaborate of the two cameras, the 660.

Raising the top/front of the camera exposes the lens and viewfinder optics and, on the left, an ultrasonic transducer. Within the lift-up section and facing forward is the in-built electronic flash involving the first of six silicon chips. It has a colour-corrected Fresnel lens.

To take a picture, the user frames the subject in the viewfinder and presses the red shutter release button in a two-step action.

As the button is pressed, a red LED glows in the viewfinder, indicating that the electronic flash is charging. This takes about five seconds, after which the red LED goes out and the camera is ready to take the picture – initiated by pressing the button fully in. Like most such flash systems, however, it will store a charge for a considerable time, and the flash can therefore be pre-charged, if desired, ready for an instant shot.

Unless deliberately bypassed, by using an alternative shutter release button, the flash operates for every exposure, providing an automatic fill-in for shadows in short-range outdoor shots, as well as providing total lighting where the ambient is very low. Use of the flash provides a valuable safeguard against inadequate or unbalanced exposure.

NEW SYSTEM 600

Pressing the shutter release button beyond the half-way point initiates the picture-taking cycle, involving the remainder of the electronic circuitry.

First off, a supersonic oscillator projects a burst of 50kHz energy from the transducer, mentioned earlier, in the direction in which the camera is pointing. If it strikes a subject within about three to four metres, the energy is reflected and sensed by the transducer and the associated circuitry. The elapsed time between the initial pulse and the return echo is translated into distance.

If the echo is delayed, or not sensed at all, the circuitry assumes that there is no object in the field of view closer than about four metres and the same lens setting can be used as for infinity.

This almost instantaneous determination of distance to the subject is employed in two ways:

Firstly, it governs the rotation of a disc, carrying four supplementary lenses, mounted just behind the f/10 front lens. As the disc latches into the appropriate position, it provides a two-element lens with a focal length to match the distance measurement: 90mm for 0.6-0.9m; 99mm for 0.9-1.5m; 105mm for 1.5-3.9m; 107mm for 3.8m to infinity.

In short, the supersonic rangefinder takes over completely one of the chores associated with a conventional camera – that of manually adjusting focus.

But, in addition, the distance information for the particular shot is stored, in digital form, in a tiny computer-like memory bank, ready for the next phase of the exposure.

Not that it has to wait for long; milliseconds, in fact, as the exposure button is still being pressed!

The shutter begins to open and a specially positioned photodiode samples the intensity of the average illumination around the centre of the image. This information on available light is also fed into the memory/logic system to control the aperture, shutter and the behaviour of the electronic flash. For example:

- If the subject lies in the range 3.9m to infinity, with high ambient light, the flash will make little or no difference, and the camera operates in normal automatic mode, with available apertures between f/10 and f/45, and speeds from 1/200 second to 1/3 second.
- If the subject is closer to the camera, with high ambient light the shutter mechanism provides a 75% exposure, at which point in the exposure cycle, the flash fires. But, before the flash has extinguished, and when the logic circuitry decides that the film has had 100% exposure, the shutter is closed. With poorer ambient light, the ratio changes automatically to favour a greater proportion of flash.
- If the subject is close to the camera, with minimal ambient light, the camera operates in pure flash mode, changing its aperture from f/10 for a subject distance of around 4m to f/51.7 for a subject distance down to 0.6m. In short, the camera goes through the familiar focus/guide number/aperture routine – but it does it automatically.

Polaroid point out that the use of fill-in flash is an accepted technique in professional photography but one that presents difficulties to the average amateur. By relying on electronics to provide, wherever possible, a 75/25 ambient/flash ratio, harsh shadows can be lightened without the finished picture taking on an artificial appearance.

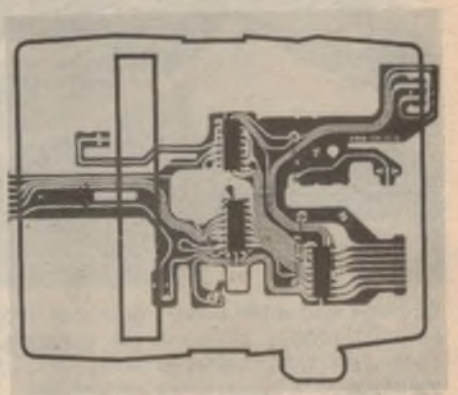
And it certainly seems to work out this way in practice. Indeed, there is another spin-off, in that areas of sky and background, which might tend to wash out in bright sunlight, are held back by the reduced exposure to ambient.

As a concession to photographers who may want to modify the end result, the 660 camera has provision to disable the flash and/or the supersonic rangefinder. A lighter/darker control is also provided to help cope with unusual backgrounds, e.g. dense and dark foliage, or snow.

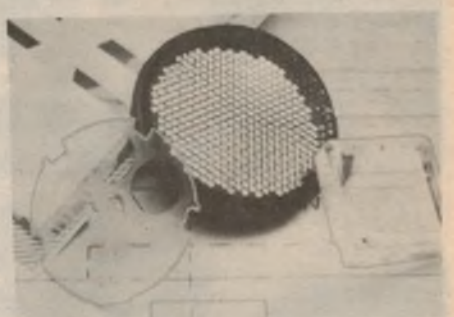
Considering the level of the technology involved, the price of the 660 camera is agreeably modest at $89.

The cheaper 640 model, retailing at $63, omits the supersonic rangefinder. Instead, it employs a fixed focus 109mm coated aspheric meniscus lens, which can cope with subjects at distances from 1.2m to infinity. Under electronic logic control, the aperture varies as necessary between f/14 and f/25, while the exposure speed range is between 1/200 and ⅓ second.

Being a fixed focus system, no information as to subject distance is available to



There are six ICs in the 660 camera and four in the 640. This P/C board, containing three ICs mounts directly on the shutter base plate, here depicted as an outline.



On the left is the disc carrying four supplementary lenses, on the right, the plastic lens for the viewfinder and, centre, the ultrasonic transducer.

The split filter in the 640 camera which allows the photodiode to sense separately normal ambient light and infrared light reflected by the subject from flash.

POLAROID'S NEW SYSTEM 600

As black and white copies of colour shots, these two pictures cannot convey the true differences between the originals. However, in the above picture, taken against the light, the faces of the two subjects are lost in shadow. With fill-in flash, the balance is much more acceptable.

When recorded through an infra-red filter, this picture of a girl seated on a gaily striped lounge emerges, virtually, in monochrome.

the electronic logic system. It copes, however, by employing a dual system of light measurement, which is able to distinguish between ambient light and illumination from the flash.

To achieve the distinction, a split filter is placed in front of the light sensing diode, one half tinted green, the other ostensibly black. The green segment allows ambient light to reach the photodiode, while the "black" segment blocks the ambient but transmits the infrared reflections from the flash.

Let's see how the electronic circuitry (or, if you prefer it, "logic", "computer", "brain") interprets this visible/infrared light information. Firstly, for a normal, outdoor scenic shot:

As the first step in the exposure cycle, the photodiode samples the ambient light and, using the information, the electronic circuitry manipulates the shutter mechanism to produce 75% or normal exposure. At this juncture, it fires the flash in an effort to achieve 25% fill-in.

However, being an outdoor landscape shot, there is no reflection from the flash and, reacting to this, the control circuitry allows the exposure to proceed for the additional time necessary to obtain the optimum image with 100% ambient lighting. Thus, in this situation, the camera operates in much the same manner as any other automatic type.

Now assume that, under similar lighting conditions, the user decides to take a shot of a person or a group. The exposure proceeds, as before, to the 75% point, at which moment the flash fires. If the main subject is now within three or four metres, a pulse of infrared is reflected back to the photodiode. The electronics instantly calculates the duration of flash required for 25% fill-in and, at the appropriate instant, quenches the flash and closes the shutter.

Yet again, if the initial measurement shows a very limited amount of ambient light, the electronic circuitry prolongs the flash to ensure adequate exposure.

In the extreme case, the photodiode may sense negligible ambient light. In this case, the mechanism blocks the green segment of the light filter, opens the aperture to f/10 and triggers the flash for flash-only exposure. The cell monitors the reflected illumination, decides when proper exposure has been achieved, then quenches the flash and finally closes the shutter.

Polaroid emphasise that the idea of monitoring the flash in the infrared spectrum has a particular advantage. Light sensing circuits can easily be misled by brightly coloured objects or scenes in the visible spectrum. Viewed by infrared, the scene has an almost monochrome appearance, with less chance of measurement error.

So that's the story behind Polaroid's 600-System. If you're one of those people whose photographic efforts always seems to end in failure, maybe you'd like to try your hand with the 640 or the 660.

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FOR IMPROVED PERFORMANCE.

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OTHER TAPE CARE ACCESSORIES INCLUDE: EDITING KITS, SPLICERS, DEMAGNETIZERS, ERAZERS AND MAINTENANCE KITS.

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PLUS HUNDREDS OF OTHER ITEMS!

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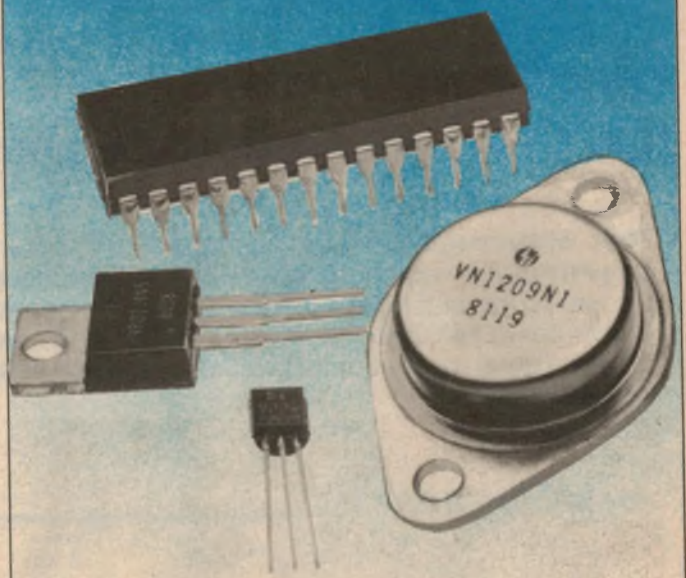
RAL1/81

SUPERTEX VMOS POWER FETS



P&N CHANNEL 10mA-50A 20v-800v

- **HIGH SWITCHING SPEED. (NO STORAGE TIME DELAY).**
- **DIRECTLY INTERFACES TO CMOS, TTL AND MOS.**
- **HIGH GAIN.**
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- **DRIVES INDUCTIVE LOADS.**
- **AVAILABLE IN T03, T0220, T039, T092 AND D.I.L. PACKAGES.**

Technical information available on request.

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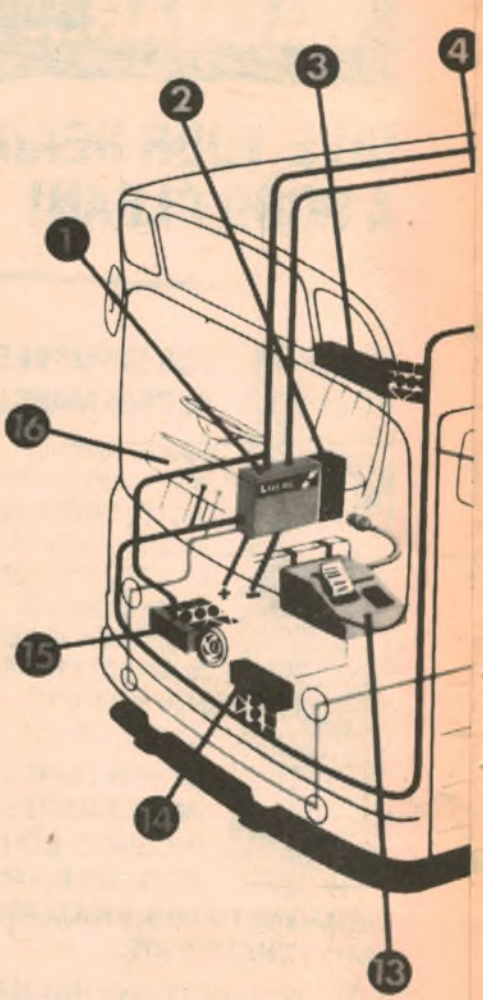
Car design: the electronic revolution

Electronic ignition and computer control

The widespread use of electronics in motor vehicles is just beginning. It is expected that within the next decade car design will be almost revolutionised by the use of electronic control systems. Computer-controlled engines, brakes and dashboard displays promise safer, more comfortable driving and a considerable saving in fuel consumption.

by BRIAN DANCE



In 1958 the world saw one of the first applications of electronic components in passenger vehicles – the regulation of the alternator voltages. Electronic fuel injection systems followed in 1967 and formed the first large scale application of electronics to vehicles.

In the early 1970's two types of transistorised ignition systems were developed, mainly as optional fittings for the enthusiast. The simple transistor-assisted ignition system used transistors to switch the coil current. Such a system has the advantage that the breaker contacts have a much greater life and the engine stays in tune for longer periods.

In the other early type of electronic ignition system, the contact breaker also controls a small current in a non-inductive circuit, but a more complex circuit is required. An inverter circuit charges a capacitor to some hundreds of volts and, when the contact breaker opens, this capacitor is discharged through the ignition coil primary so that the ignition coil acts as a pulse transformer. Capacitor discharge ignition is said to result in more complete combustion at high engine revolution speeds and easy starting even with dirty, fouled sparking plugs owing to the higher voltages available.

Transistorised ignition systems in which no mechanical contacts are employed followed in the mid-1970's. Ignition timing is effected by an optical shutter and a photosensitive device, by a magnetic coil used as a pick-up, or by a rotating magnet actuating a Hall Effect device or some similar system. Such contactless ignition systems are now fitted to a high proportion of cars manufactured in the USA.

However these developments were only simple beginnings when compared with the latest microprocessor units used to control the air-to-fuel ratio, ignition timing, etc which US manufacturers have found necessary to meet stringent exhaust gas emission standards and fuel economy regulations of that country. If one adds anti-skid braking systems, electronic theft alarms, possibly anti-collision radar systems at some future date, and complex microcomputer display systems to provide the driver with such information as his fuel consumption, distance he will be able to travel with the fuel available etc, one begins to appreciate the growing importance of electronics in the modern vehicle.

It is interesting to note that Toyota recently introduced what it claims is the first "talking car" which will tell the driver if his door is not properly shut, if his seatbelt is not fastened, if the handbrake is on, if he has left his lights on in the daytime or if his fuel is near exhaustion. The system was developed jointly by Toyota and Matsushita and is used with the latter's MN1599 microcomputer.

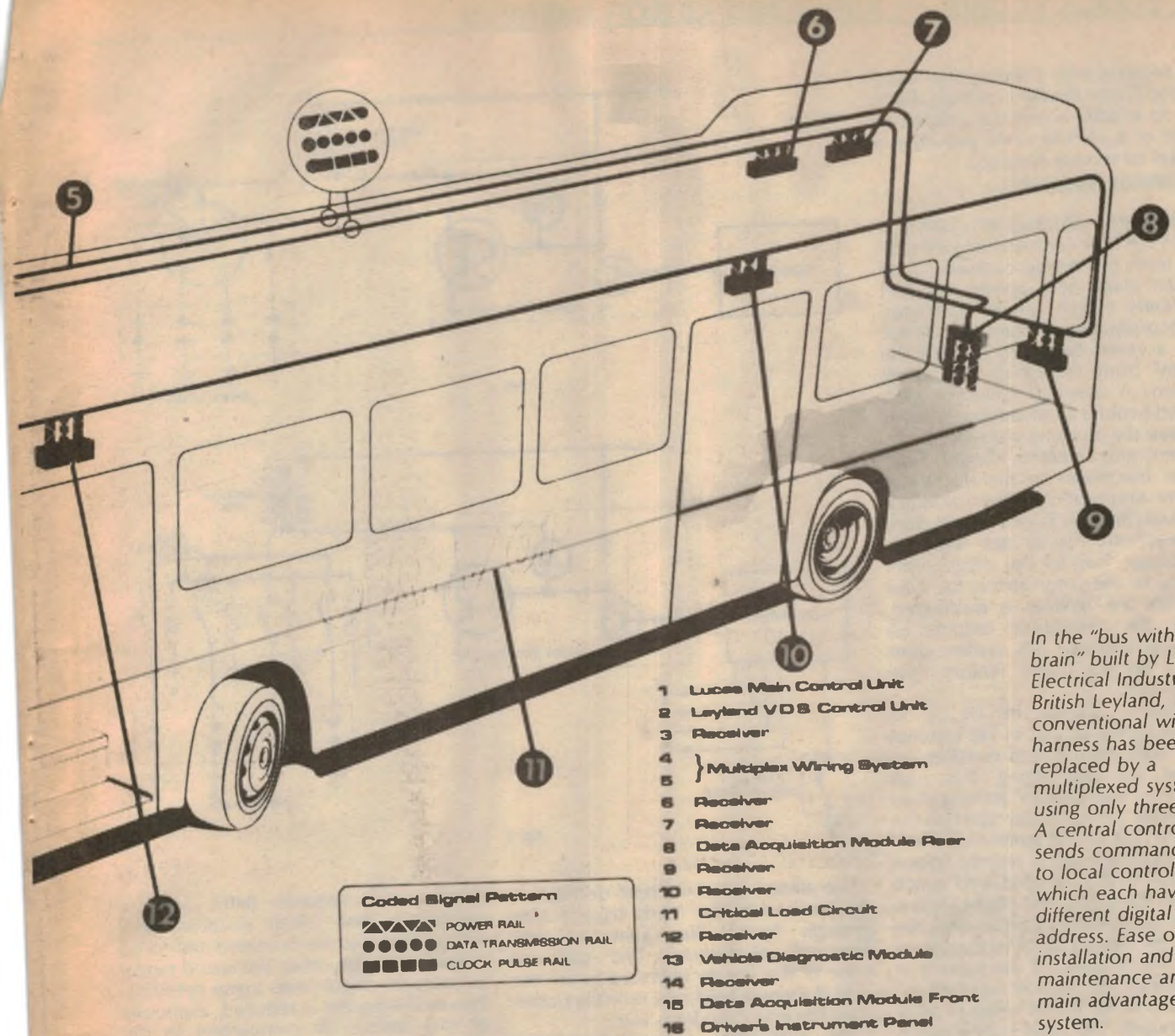
It has been suggested that cars fitted with voice-recognition computer equipment should be available by 1990. One can even imagine that if such a car is fitted with anti-collision radar and the major roads contain buried information transmitting cables, the car will respond to the owner's voice (and to no other voice) when told "Take me to . . . ." quite automatically!

Let's now take a look at a few recent developments from various manufacturers in more detail.

Ignition systems

British Leyland has recently produced reports about various types of ignition systems and the considerations governing the selection of one of these systems for a vehicle. The company states that so far it has not adopted electronic ignition except where its cost has been strictly justified by functional requirements.

Leyland feel it would be pointless to



In the "bus with a brain" built by Lucas Electrical Industries and British Leyland, the conventional wiring harness has been replaced by a multiplexed system using only three wires. A central controller sends command signals to local control units which each have a different digital address. Ease of installation and maintenance are the main advantages of the system.

invest in electronic ignition systems which they believe are already obsolete. They have therefore decided to jump what may be called the "first generation" electronic ignition systems and instead plan for much more advanced crankshaft triggered systems which offer far more benefits, especially as regards probable future exhaust emission and fuel economy requirements. Indeed, apart from any legislative requirements, one may hope that the fuel savings may pay for the additional cost of the system. Production costs may also be reduced if an ignition system is selected which simplifies the tooling required or speeds production.

Crankshaft triggering

The ignition systems of conventional engines are triggered by means of a camshaft synchronising system together with a high voltage distributor. The advantage of such a system is that it is relatively easy to provide mechanical speed and vacuum ignition advance and to adjust these in production. A contact breaker need not necessarily be employed, since close tolerances allow the use of one of the other types of sensor already mentioned. However, the distributor is a difficult and expensive item to tool, absorbs power and generates noise.

An alternative system involves triggering from the crankshaft. In such an engine, the expensive camshaft and its half-crankshaft speed drive mechanism is no longer required while the timing scatter between cylinders is much reduced over conventional systems. However, a sensor is required which will operate with large clearances to allow for tolerances and wear and further clearance is required due to tolerances in the positioning of the sensors on the various engine castings.

Crankshaft triggering systems can eliminate most of the timing errors which arise in conventional ignition systems employing a timing chain, helical and worm gears, where errors of several degrees are not uncommon.

It is interesting to note that British Leyland commenced fitting timing discs on the crankshafts of all Austin-Morris engines from their new "O" series in 1978. This enables light emitting diode checks to be carried out very accurately and conveniently, both in manufacture and in service, so that the timing can be adjusted and hopefully the vehicles will be run nearer to optimum engine efficiency. A "black box" memory unit is used in the production chain and is pre-programmed with the ignition advance characteristics so that both the dynamic and static characteristics can be tested together with the distributor advance mechanism. This light emitting diode

facility requires only a timing disc and a bracket to locate the light emitting diode probe, so it adds a minimal amount to the cost of a vehicle while providing a new level of service accuracy.

Distributor systems

A rotor arm distribution system is shown in Fig.1 for comparison purposes. Signals from the timing computer feed the driver stage of a power amplifier which feeds a high power Darlington stage incorporating a clamping device (usually a zener diode) to prevent the back emf from damaging the power Darlington. A standard ignition coil is employed (wound as an autotransformer to increase the sparking voltage).

The rotor arm operates about 0.5mm from the electrodes in the distributor which are connected to the individual spark plugs. Since it is not sealed from the atmosphere, this air gap results in some voltage loss to the plugs. Main advantage of the rotor arm is the ease with which the ignition is distributed. Although the distributor has to be correctly positioned, this system does provide a "get you home" feature if the computer fails.

The system shown in Fig. 2 is somewhat similar to that of Fig.1 except that four high voltage reed switches are employed for distributing the high tension to the appropriate sparking plug. A signal from the computer turns on the primary current to the ignition coil and simultaneously a signal is sent via a reed driver circuit to the required reed switch coil so that the associated reed switch is closed. At the required ignition time the computer provides a signal to the power amplifier which turns off the current in the primary of the ignition coil and the spark occurs at the correct plug. A short time afterwards the reed switch opens and the cycle is repeated for the next cylinder. Thus no spark can occur before the reed switch has closed no matter what the engine speed or ignition advance.

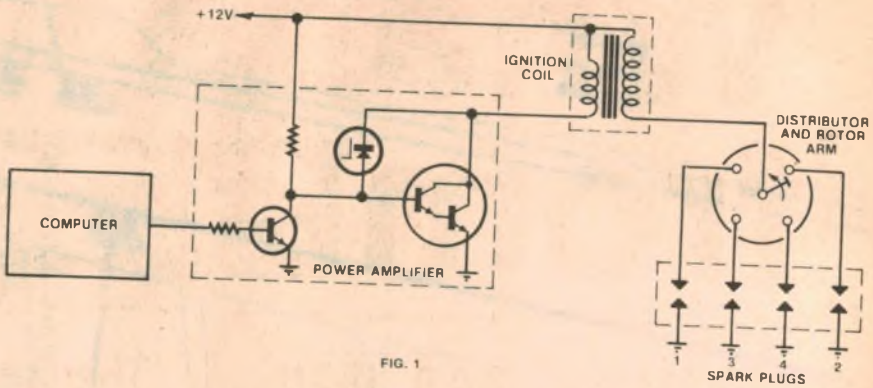


FIG. 1

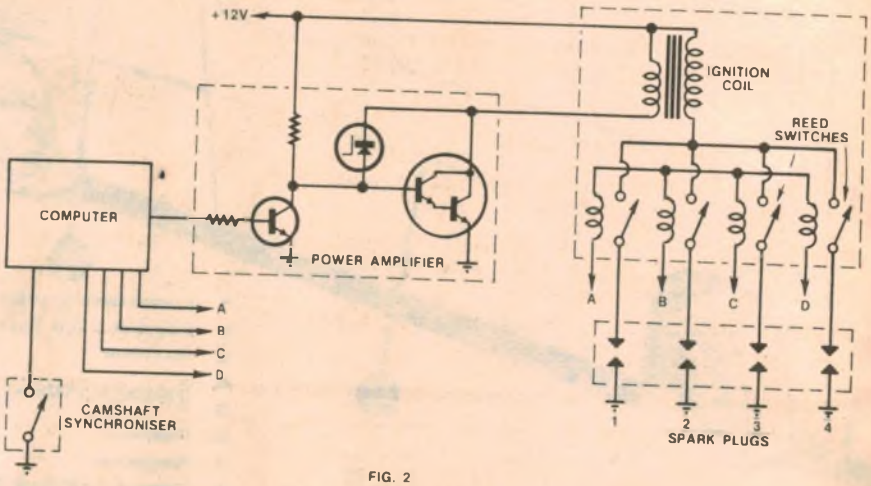


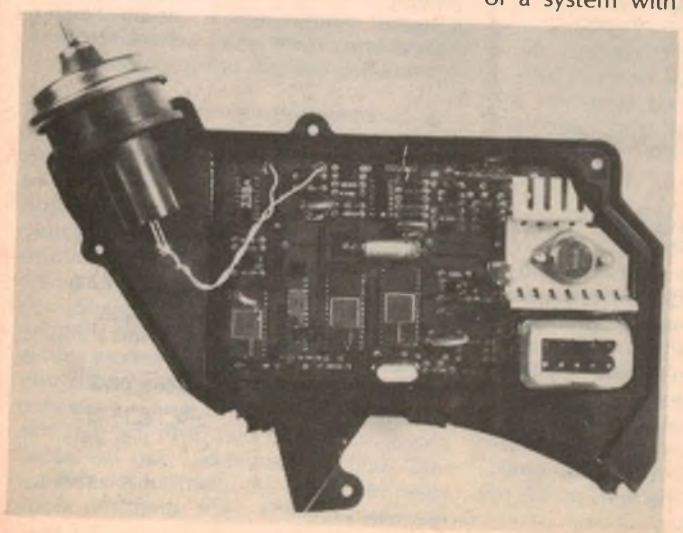
FIG. 2

The advantage of the reed distribution system is that the reeds have a long (though finite) life, generate little electrical interference, and consume none of the energy intended to fire the plug. If a single reed fails, only the power from the one cylinder is lost.

The availability of microprocessors (such as the Intel 8748 and equivalent custom LSI devices) seems likely to bring profound changes in engine design. Consideration must be given to the use of a system with programmable dwell time, which requires fairly complex electronics but which enables spark energy levels to be increased and to be maintained throughout the speed range, even in an engine with many cylinders. Power dissipation is reduced, especially at low speeds, in comparison to the inefficient fixed dwell angle systems.

To summarise, exhaust gas emission and fuel consumption requirements are making electronic ignition systems more attractive, if not essential, and such systems can also provide the higher energy required for the wider plug gaps needed for increased intervals between servicing. Many of the current ignition systems do not generate enough energy for optimum burning of the fuel or for starting with fouled plugs.

Siemens of Germany recently introduced a TLF 1492 16-pin dual-in-line device for use in transistorised ignition systems with dwell angle control. This device can be used to ensure that the primary current in the ignition coil reaches its maximum permissible value just at the point of firing so that the maximum energy can be delivered to the spark. The device compensates for changes in the number of engine revolutions per minute, the battery voltage and even the internal resistance of the ignition coil, which changes with temperature.



Chrysler's Spark Control Computer, the heart of their "Lean Burn" system. The vacuum transducer at top left senses manifold pressure and ignition timing is controlled by the switching transistor at right.

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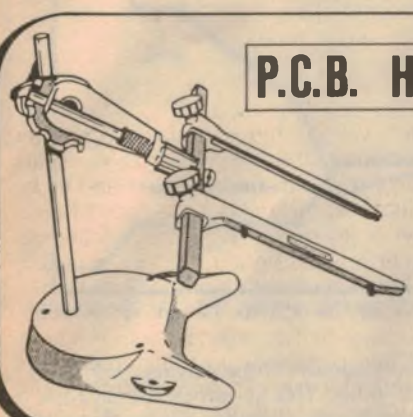

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Computer control reduces fuel consumption, lowers pollution

Anti-skid braking

Vehicle skids in wet weather are a prolific cause of accidents so work has been done to develop anti-skid systems to maintain stability and steering during emergency braking on any type of road surface. When the brakes of a vehicle are applied, only a rolling wheel provides lateral support at the optimum deceleration. A locked wheel cannot transmit lateral forces, so a car with locked wheels loses its steering control and stability and may skid or spin around.

Drivers are often advised to pump the brakes when stopping on wet roads, ice or snow, but few drivers can do this in such a way that they not only maintain control of the vehicle but also bring it to rest within the smallest practicable distance. Electronic systems can be used to sense whether a road wheel is locked or rolling and a suitable control system can momentarily release the braking force on any locked wheel so that control is regained. Such an electronic system can control the hydraulic brake pressure by means of electro-magnetic valves.

Anti-skid braking systems simulate the action of a driver pumping the brakes, but the control system maintains the pumping at a much higher rate than a human driver. A further advantage is that the system modulates the pressure at each of the wheel brake cylinders to obtain the optimum braking effect with complete stability.

One such system has been developed by the Robert Bosch Company, Stuttgart, West Germany. It uses three custom-designed microcomputers produced by AMU Microsystems. One of these monitors the sensors on the right front road wheel and on the drive shaft; another monitors the left front wheel and the drive shaft, while the third functions as a safety monitor to ensure that the system is functioning correctly.

If a system malfunction should occur, the monitor returns the braking to normal operation and flashes a warning on the indicator on the dashboard display.

It is claimed that the Bosch anti-skid braking system has safely stopped cars on all types of road surface, both on straight roads and on curves, whilst its use on dry roads is said to reduce tyre wear during emergency braking. The system is offered as an option on a number of types of European vehicles and is also being adapted for use on large commercial vehicles, but apparently no American car has yet adopted this system.

Microprocessor controls

As in many other fields, micro-processors are likely to make a larger and larger impact in vehicle systems during the 1980's. Fig. 3 shows the computer, command and control system which General Motors, is incorporating as standard equipment on all of its 1981 passenger cars. It controls such engine parameters as the air-to-fuel ratio, ignition timing, exhaust emissions and fuel economy. It also provides a diagnostic dashboard readout to help speed repairs. The microcomputer unit is about the size of a textbook within a thick screened casing and is made by Delco Electronics, a subsidiary of General Motors.

In addition to the general functions used on all of the cars to which it is fitted, the computer command and control module can be programmed to provide special additional functions on specific vehicles. Perhaps the most remarkable function is on a new model Cadillac with a six litre V8 engine which can be switched to a six cylinder 4.5 litre engine or a four cylinder three litre engine whenever all eight cyclinders are not required for the driving conditions at the time. This is almost equivalent to changing to a smaller car for those parts of the journey which do not need full power!

The system provides regulation not only for the engine but also for the other parts of the car, including air conditioning and the clutch mechanism on vehicles with automatic transmission. General Motors has made a major commitment to microprocessors in cars and has indicated its faith in this development by offering a five year guarantee (or 80,000km).

Microcomputers are also being produced for the dashboard display systems. For example Siemens offer a SAB 80215 which combines a computer based on the SAB 8021 with peripheral function units specially designed for motor vehicles – a clock in 12/24 hour format with alarm and stopwatch functions, three event counters for digital parameters, an analog-to-digital

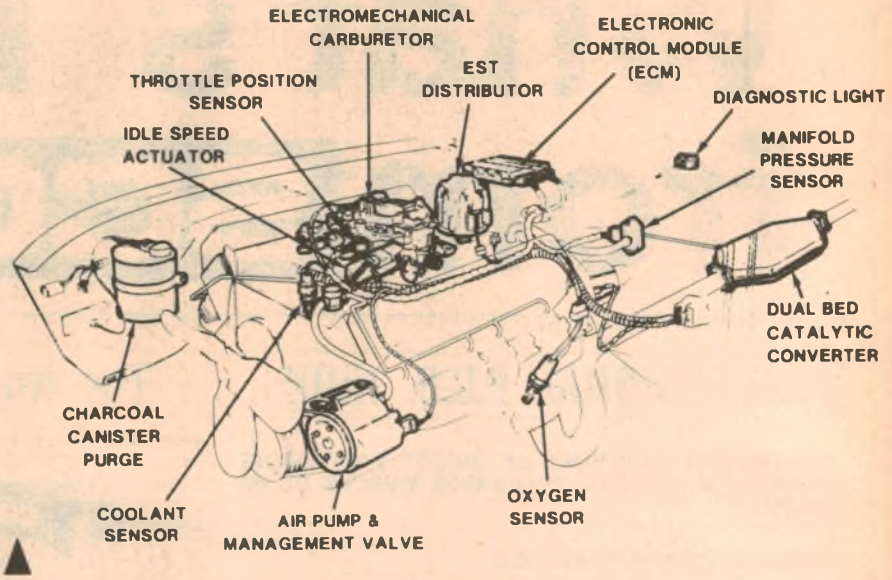
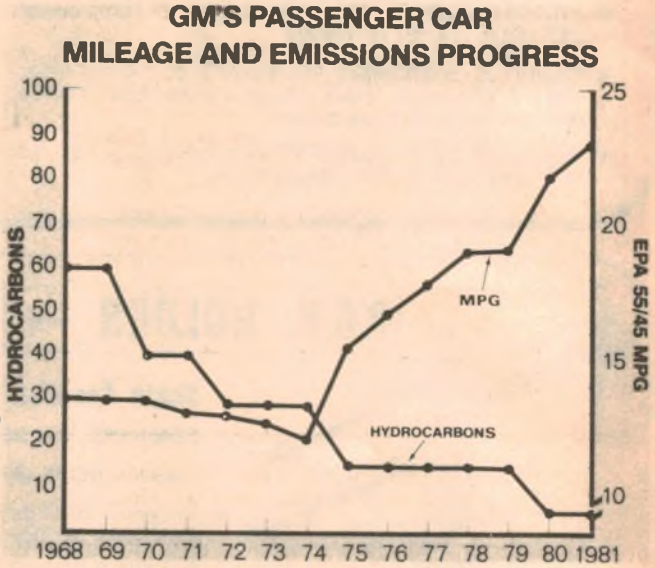


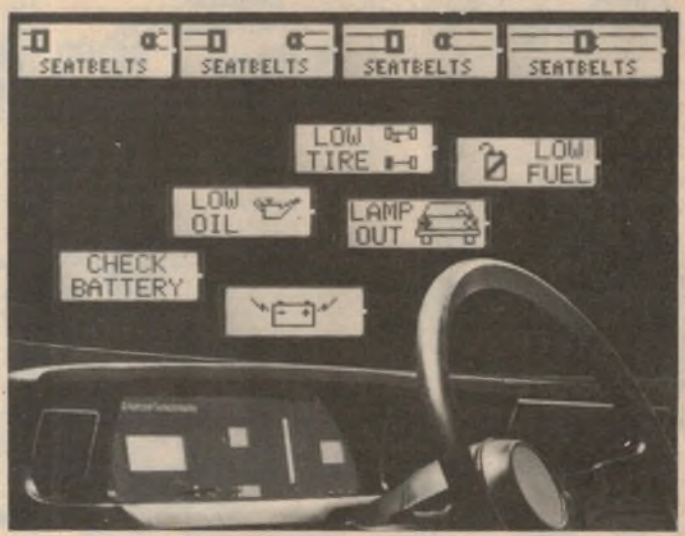
Fig. 3: General Motor's Computer Command Control unit, standard on all of their 1981 models, gives increased fuel economy while meeting stringent US exhaust emission standards.

Reduced fuel consumption and less pollution are not incompatible, as shown at right. If fuel consumption still looks a little high, remember that a US gallon is 3.785 litres.



New dashboard displays and cars that talk

Shown above is an electronic dashboard developed by the Italian firm Borletti. Functions monitored include oil and water levels, brake fluid level, water temperature, oil pressure, brake pad wear, locking of doors, vehicle lights functioning, and the length of time that the spark plugs, engine and gearbox oil and air filter have been in service. The trip computer on the right can be used to calculate average speed, average and instantaneous fuel consumption, elapsed time and distance to destination, etc. On the right is a prototype dashboard panel from National Semiconductor which uses animated liquid crystal displays and speech synthesis to indicate vehicle functioning. The system takes inputs from microcomputers controlling the car engine and uses synthesised speech to give warning messages such as low fuel, low brake fluid, open door or unfastened seat-belt.



converter with three multiplex inputs for the acquisition of analog data, and a multiplexed interface for 20 input and output functions. The storage capacity of this device is 2K bytes of ROM and 128 bytes of RAM.

Such an on-board computer can provide the driver with a great variety of information, ranging from time of day and stopwatch functions to outside temperature and frost warnings and the estimated time of arrival at the destination.

Microprocessor based instruments are used in the 1981 Chrysler Imperial. Vacuum fluorescent read-out tubes (similar to those in some calculators with green displays) are used to display the time, odometer readings, speed, the gear selected, fuel indicator, etc. Displays for engine parameters (such as radiator water temperature, oil pressure and battery system voltage) are incorporated, as are some less common functions such as door not correctly shut, brake problems, burned out indicator bulbs and any microprocessor malfunction. Two microprocessors are employed to accumulate the data from the various sensors and to compute and display the values of functions. Odometer readings are stored in an electrically alterable read only memory (EAROM) which can retain data for years without power.

Although dashboard lights are used in many currently produced vehicles to draw the attention of the driver to any system malfunctioning, it is expected that future vehicles will contain systems for providing warnings and problem diagnosis by means of synthetically produced voice announcements.

Intelligent bus

British Leyland Vehicles and Lucas Electrical Industries have completed the development of a bus "with a brain" which, it is said, will point the way towards greatly improved electrical systems for commercial vehicles.

On this prototype bus, the conventional wiring harness has been replaced by a Lucas Multiplex ring main wiring system which consists of only three wires, namely a power rail, a data transmission rail and a clock pulse rail. The ring main is connected through spurs and control units to the horn, the lights, etc and driver-operated switches cause a central controller with its microprosessor to send digital address and command signals along the data rail. Each of the local control units has a unique address code and only the unit addressed by the central controller will respond and actuate the required equipment.

Advantages claimed for this system include ease and simplicity of its installation, ability to incorporate interlock systems and the speed with which all electrical circuits can be checked using a diagnostic system developed by Leyland Vehicles.

The prototype, code-named REV-O1, cannot be driven away unless its doors are closed and provides the driver with an indication as to why he cannot drive it.

Similar checks are provided for all of the other driver-operated controls. The functioning of any lights which should be on is checked 20 times per second. One of the major advantages of the microprocessor based bus is the ability for fault diagnosis to be easily carried out. Electrical failures are responsible for a huge number of vehicle faults and Leyland has developed a system which can check all of the electrical circuits in the vehicle and produce a printed read out of the faults present.

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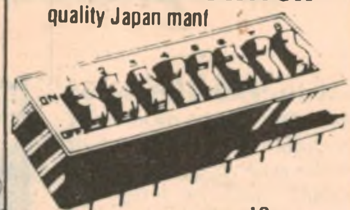

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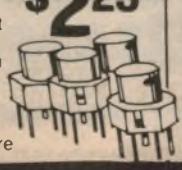

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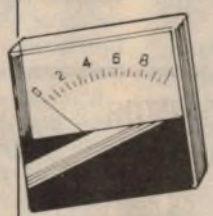

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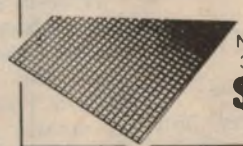

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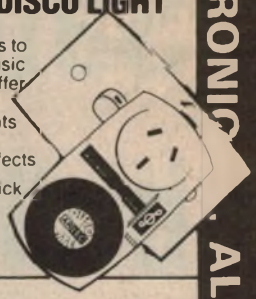

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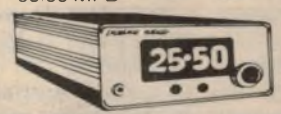

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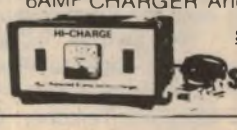

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Satellite TV station built at home

Construction of a television satellite ground station is definitely not a project for an idle weekend — but an increasing number of radio amateurs are taking up the challenge. In this article a reader from NSW describes his system, which has successfully received signals from the Intelsat IV satellite used to relay ABC television to remote areas of Australia.

by VICTOR G. BARKER VK2BTV*

The author's interest in receiving television transmissions from satellites dates back to the mid-70s when international use of Intelsat satellites increased to the extent that pictures could be received from overseas on a daily basis. CBC news services and sporting events from the USA were the most regular transmissions. Receiving these NTSC transmissions presented a small problem, finally overcome by building an NTSC video monitor.

Until last year Australia did not use satellites for the relay of domestic television programs, relying on coaxial cable "land-lines" and terrestial microwave links. This situation changed when the facilities of a transponder on board an Intelsat IV satellite was hired for domestic use.

Parked in a synchronous orbit above the equator at approximately 172° east, this satellite can be "seen" from almost all parts of Australia, as distinct from the Indian Ocean satellite that is in line of sight in an area beginning a little to the east of Ceduna, South Australia.

The central "footprint" of the Pacific Ocean satellite extends over most of Western Australia, South Australia, the Northern Territory, Queensland and the north-western corner of NSW. Transmissions from the satellite are beamed at central Australia, with Alice Springs in the centre of the prime reception area. Moving away from the centre of the beam (called the "bore sight") the signal level falls off at a predictable rate determined by the satellite's antenna radiation pattern.

The television channels are carried by the 36MHz bandwidth transponder. Both are ABC transmissions, with one originating in NSW and the other in WA. Local users of the transmissions can therefore chose between two time zones.

The Australian Government, through Telecom, has installed a number of TV Receive-Only (TVRO) ground stations to bring television to remote areas of Australia. Fifty-two of these stations are planned, with each re-transmitting the satellite signal to communities within a radius of 35km. From all reports the picture quality provided by the existing stations is excellent.

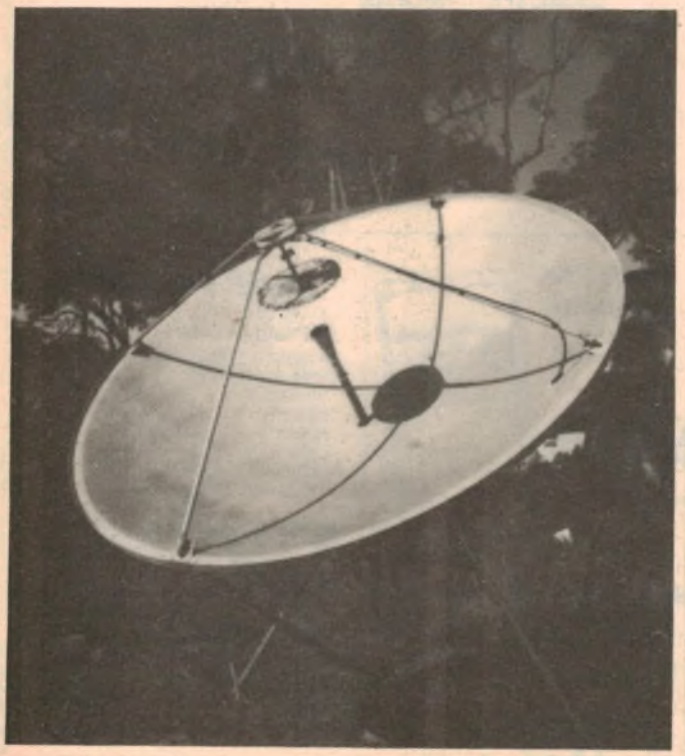
It is one thing for Telecom to undertake the design and construction of a TVRO, and quite another thing for the individual experimenter with limited resources. It can be done, however, providing one is prepared to spend the time to locate certain items which are absolutely necessary for the project.

Before going further lets look at the transmission parameters more closely.

Western Australian ABC transmissions are at a frequency of 3795MHz and NSW transmissions are on 3814MHz. In both cases the bandwidth of the signal is 17MHz. Polarisation of the satellite beam is circular in a right-hand direction. Transmitted power is given as +29dBW at bore sight, and the loss on the path to the receiving antenna is around 196.5dB.

The first requirements for a satellite ground station are a three metre (or more) parabolic reflector and an RF preamplifier with more than 25dB gain and a noise figure of 1.3dB or better, suitable for use at 4GHz. Although both items can be made at home the first requires extremely precise construction and the second a good knowledge of microwave techniques.

Luckily, the author was able to acquire a pair of three metre dish antennas at a government auction for a mere $30.00.



Three metre dish for the author's home-built satellite TV station came from a government auction. Other components were built at home, based on surplus equipment.

*41 Skyline Street, Gorokan, NSW 2263

One of them now resides in the backyard as the receiving antenna for his system. A 4GHz preamplifier was located which had a noise figure of 6dB and a gain of 10dB, but this has recently been replaced with a more satisfactory unit providing 50dB gain with a 1dB noise figure.

At bore sight with a unity gain antenna we would receive a signal equal to the transmitted power minus the path loss: 29dBW-196.5dB = −167.5dBW. Converted to dBm this equals −137.5dBm. A receiver with a 17MHz bandwidth and a noise figure of 1.3dB would require an input of −101dBm to equal the equivalent input noise power (assuming a unity signal-to-noise ratio). To produce a noisy but watchable picture a S/N ratio of 7-8dB is necessary, and taking 8dB as a realistic figure, our input signal requirement has now increased from −101dBm to −93dBm.

Referring to our received signal strength of −137dBm we clearly need a significant amount of antenna gain (−137.5 − 93 = 44.5dB). This gain can be obtained from a five metre parabolic reflector.

A 4GHz FM wideband receiver was built up next, starting with the 4.020GHz local oscillator. A single diode mixer stage was followed by a low noise IF preamplifier, with the entire unit being based on a piece of surplus 4GHz link equipment manufactured during the 60s by Marelli of Italy and widely used in Australia. A 4GHz bandpass filter was used ahead of the first mixer, providing a slight improvement in signal-to-noise ratio.

The output frequency of the mixer is approximately 200MHz, depending on the input frequency, which is of course determined by the TV transponder being received. A tunable 200MHz second mixer is used here with a 70MHz IF stage. At this point the video bandwidth of the signal is reduced to 12MHz. Despite the fact that the video signal has a bandwidth of 17MHz, the essential information is contained within about 9MHz of the carrier. Reducing the bandwidth of the signal results in an improved signal-to-noise ratio.

Completing the system is the second IF amplifier, demodulator, de-emphasis, energy dispersal clamp and baseband output amplifier. Two linear gain stages are used prior to demodulation. Initially six limiting stages were employed, followed by a Travis discriminator, but this was later changed to an NE564 Phase Locked Loop demodulator which incorporates a limiter ahead of the demodulator and appears to produce pictures from a lower signal to noise ratio than the Travis. The improvement is about 1.5dB, and the PLL requires no tuned circuits whatever, considerably simplifying construction and alignment.

The de-emphasis network was produced empirically and consists of an R-L-C network followed by a 7MHz low pass filter and a diode clamp to remove the 25MHz triangular energy dispersal waveform. By way of explanation, it is usual practice to shift the frequency of the FM carrier from the satellite up and down at a low rate, apparently to reduce the possibility of satellite transmissions interfering with terrestial microwave links. This dispersal waveform must be removed by the receiver.

Author's home-made cassegrain feed horn.

4GHz receiver is beneath the TV monitor.

Using the three metre dish with a home-made cassegrain feed system, home-made circular to linear feed hardware and circular to rectangular waveguide transition to suit the low noise amplifier, the passive gain of the system is close to 40dB.

Pictures received are quite noisy but do produce coherent colour lock and correct ident. Differential phase and gain is satisfactory. Sound demodulated at 6.2MHz is also noisy, but is usable.

The author's location in the Gosford area of NSW puts his receiving system so far outside the satellite coverage area that signal level predictions cannot be made. Suffice to say that professionally made equipment tested only 65km further south failed to produce identifiable pictures or sound despite the use of a five metre antenna. It would appear that there is plenty of scope left for the radio and TV amateur experimenter yet!

FORUM

Conducted by Neville Williams

Digital recording sparks off a resistance movement!

Despite the momentum which continues to build behind digital audio recording, protests against the system continue to be heard from a relatively small but highly vocal group. One is reminded of the "flat-earthers" and the anti-metric crusaders. It could even be that, somewhere, a modern-day electronic King Canute is preparing to re-enact the famous sit-in!

In so-saying, I must admit that there is a basic difference between the anti-digital group and the others. The convictions of King Canute, and the assertions of the flat-earthers and the anti-metrics can be assailed and/or defended using fairly transparent reasoning. On the other hand, the arguments of the anti-digitals currently rely heavily on subjective judgment and may only be resolved by the passage of time – one way or the other.

The fact is that, if an audiophile insists that he can hear something peculiar in a recording, which others think is normal, there is no easy way to prove or disprove his claim, and a stand-off situation frequently follows:

The unbelievers are likely to dismiss the objector as something of a crackpot – given to imagination, flights of technical fancy or even to grandstanding.

He, in turn, may scorn his critics as stubborn technocrats, with an eye for instruments but certainly no ear for real music!

Both groups tend to back away from any middle ground; that would be a sign of weakness. Both tend to relish and flourish published opinions which correspond to their own.

In fact, the reader mentioned in last month's Forum – "I have lunch with a girl named Alice" – proved quite zealous in this respect. Having expressed, by telephone his discontent with digital sound, he has since sent me various extracts from overseas magazines, drawing attention to heavy criticism of digital by certain audio professionals. I would judge that they have reinforced his own views to the point where he is now substantially convinced.

So be it!

For my own part, I have found their arguments open to considerable query.

Amongst the excerpts which reached me was one from "Absolute Sound" (Dec '80), detailing an interview with Douglas Sax, professional musician, professional recordist and founder of Sheffield Labs, well known for their activities in direct-cut recording.

With that background, Douglas Sax could probably walk right away from most of us in respect to practical experience in sound recording. And, because of his background as a proponent of the direct-cut system, his passionate condemnation of the now-ascendant digital approach may not be all that surprising.

Unfortunately, from the viewpoint of objectivity, the interviewers tended to reinforce rather than question Douglas Sax's opinions, so that the whole thing has taken on the character of a gripe session.

Nevertheless, the collective assertions have a certain familiar ring but a quality that I find less than convincing. For example, Douglas Sax chooses to quote seriously from discussion at a recent convention of the AES (Audio Engineering Society):

". . . if you take a low, sustained organ tone and slowly increase and decrease its level, so that you are asking the machine to decide what finite level to give it, it sounds like a motorboat!"

Does it, now?

I concede that one might expect this to happen if one took too seriously the pamphlet diagrams which show waveforms chopped into coarse digital steps, before being smoothed mysteriously back into their original shape. Fortunately, however the usual 16-bit digital system offers a great many more steps, or levels, than the diagrams typically suggest.

In fact, I have just got through listening to the latest CBS Masterworks recording of the Mormon Tabernacle Choir, mastered from a Sony PCM 1600 digital recorder. They use a 16-bit sampling system and specifically state that this provides "over 65,000" discrete sampling numbers (or levels).

If we accept the dynamic range of orchestral music as being, at most, 90dB, the steps are not going to be very coarse by the time the full range is divided into 65,000 increments. Even allowing that only a small proportion of the steps are actually used to represent a low amplitude signal, I boggle at the assertion that the quantising is so coarse that it "sounds like a motorboat".

And think about that organ note: isn't it likely that the level of an organ bass pipe will itself vacillate more than some tiny fraction of a decibel, due to vagaries of airflow and acoustics? Even with an electronic organ I suspect that, in actually attempting the suggested test, one would end up listening to the jumpiness of the organ swell, or the panel fader, or the operator's fingers rather than the digital sampling!

Just for the heck of it, I tested the assertion on a friend, an academic and a practical man, highly esteemed in the audio fraternity in this country. He wasn't convinced either. In fact, he produced the best belly laugh I had heard all the week!

A more restrained suggestion from one of the interviewers was to the effect that

indecision on the part of the sampling system might cause it to vacillate between (say) 999 and 1000 steps, going up and down a waveform, and that this could produce a subharmonic of the sampling frequency, unrelated to the music. It might be 70 or 80dB down, he said, but the effect of that misplaced bit might still be audible.

The overt assumptions are that: (1) it does happen; (2) single-bit indecision produces a resultant, in defiance of the low-pass filter and (3) the resultant is audible.

But, again, those doubts.

Why need there be a pattern of spontaneous "indecision"? If there is a chain of "999/1000" events, might they not be logically explained by residual noise riding on the signal? It would then boil down to how you prefer your noise – before or after digitisation!

In a practical situation, we are not concerned with recording (and counting steps in) a perfect sine wave from a noiseless signal generator. We are concerned with recording sound waves from practical sound sources, with vagaries affecting every single and successive cycle, and all of them emerging from a noise background which rarely has an SPL of less than 35dB.

I suspect that, in such company, the alleged stray quantising bits may have great difficulty in making themselves heard. But, again, it's just my gut feeling!

There are other statements in the conversation about noise that I don't understand:

"You can't hear below the noise floor of digital, but you can with analog."

"You have white noise, which we call tape hiss, and you record a pin dropping, way down below the level of the noise. With digital, I don't hear the pin drop."

THE MEANING?

One could put a number of constructions on these statements, all of them somewhat wobbly. It seems to me, however, that if digital recording provides at least another 20dB of dynamic range, weak signals – like Sax's hypothetical pin-drop – could be positioned above the noise floor, not below it.

After all, that's what extra dynamic range is all about.

On the other hand, they may be implying that the digital system is so inefficient at low sonic levels that it becomes virtually deaf to whisper-quiet sound. As a further implication, the noise only seems low because the system has bottomed out!

If such is the case, the promoters of the digital system stand accused of a giant confidence trick – something that would directly impugn the engineering brains of Soundstream, Sony, Technics, Sanyo and as many other major companies as are currently offering digital recording equipment.

And what of the rapidly increasing numbers of major recording companies which are swinging over to digital mastering now, and to an all-digital system in slightly longer term? And what about the video industry – here and overseas – exploring digital mastering as the likely way to go for stereo TV soundtracks?

Thousands of engineers are involved in this major technology shift. Given that a proportion might go along with it for commercial reasons, it is nevertheless unthinkable that major flaws would not be documented in professional journals, with facts, figures and curves – even for quite selfish reasons, like getting a paper published.

Nor are we talking just about digital's behaviour at low signal levels. Doug Sax also attacks industry claims about the ruggedness of a digital master tape and the validity of multi-generation copies:

THE TAPE ITSELF

"Probably the most severe limitation of digital systems that exist today, what bothers me most, is the deterioration in copies.

"Their biggest claim is their biggest lie."

Before the group is finished with the theme, digital audio tape is represented as being pushed beyond its inherent storage capacity. Bits of signal go amissing and, I quote:

"By the third copy it becomes a total joke and unlistenable."

Because multi-generation copies are unacceptable – according to Doug Sax – the "smart" computer-aided editing systems are also invalid. You still have to rely on the time-honoured razor blade.

And don't think you can store the digital masters, somebody says, at least with the formulations that are being used in America at the moment:

"Six dB of erasure and it's gone . . . We'll see how well it holds up in a few years."

I am not in a position to say that Doug Sax and his companions are right or wrong but, if he's right, then thousands of his fellow engineers are being incredibly naive. And a clutch of them are being incredibly unenterprising in passing up the opportunity to publish a shattering, fully documented paper nailing the audio industry's biggest ever "lie".

I almost forgot; there's one other thing they should look at, according to one of the interviewers. Despite the filter, in a sampling system:

". . . you have a continuous ripple function going back into the audio range."

How does that statement align with the CBS/Sony claim for frequency response: plus and minus 0.5dB from 20Hz to 20kHz?

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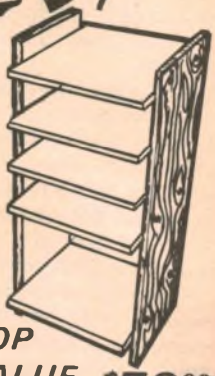

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One could go on, beyond the point of tedium, but let me make two other points. During the discussion, the group agreed that they could hear coherent sound well down into the noise floor of an analog tape system and that this added 10 or 20dB to the "perceived dynamic range". This leads to the further statement:

"But let's say 10dB . . . Similarly, when you go above the operating level of the recorder, you can get another 10dB on top of that, before get into trouble. If you have a 70dB system, that gives you 90, perhaps 100dB of perceived dynamic range."

The old biblical simile of "straining at a gnat and swallowing a camel" has nothing on this.

Having worked their way so diligently through the alleged shortcomings of digital technology, the group is quite relaxed about pushing the analog system down into 10dB or more of noise and up into another 10dB or so of top-end crushing.

This is compounded elsewhere by their rejection of half-speed disc mastering as unnecessary and even prejudicial to the end result. This, despite the fact that the producers of numerous audiophile discs, source notwithstanding, queue up to take advantage of RCA's and JVC's very considerable facilities and research in this area.

This easy rejection by the group of difficulties with the traditional way of doing things does not sit easily with conversations I have had with local recording engineers, also using the best analog gear available. They appeared to be very familiar with two problems:

- Getting high frequency transients on to the tape without crushing;
- Getting high frequency energy on to the disc, at the full desired amplitude, without burning up the cutting head.

These are the very problems which induced the technology which is currently under attack.

Last but not least, Doug Sax raises the bugbear of stress when listening to digitally sourced material:

"I'll work for three hours on a digital recording and I can hardly move out of the room. The fatigue: Digital is unique in my experience."

I've already had my say on this subject (Forum, August '81, page 26: "SAMPLED SOUND: You've been listening to it all your life").

It was also the subject of a presentation by Dr John Diamond at the May '80 Convention of the Audio Engineering Society in Los Angeles.

To say that the audience found the demonstration completely convincing would be the overstatement of the year — or so I gather.

The reason for this remark will be evident from a letter published in the journal of the AES (Vol 28 No. 9). It was written by Nelson Morgan, now with National Semiconductor but, at the time, with the Electronics Research Laboratory, University of California at Berkeley, USA.

I leave you to read it for yourself and to draw your own conclusions.

FOOTNOTE: To demonstrate his latest $5000 custom-built, gold plated deck in Sydney, Dr Nakamichi used a cassette copied directly from the D/A converter of his own digital master recorder!

That "stress" demonstration at the AES . . .

A recent talk[1] at the 66th Convention of the Audio Engineering Society featured the assertion that digital encoding of music caused stress in listeners. The speaker performed a demonstration intended to support his claim. While he did provide an interesting show (in which volunteers had their arms pushed down more easily by the speaker during the digitally recorded passages), he failed to use even the most elementary precautions to insure the significance of the results. Specifically, the following deficiencies were noted:

(1) The test was not double-, or even single-blind, that is, the experimenter was aware of which was which in his repertoire, and frequently stated the character of each recording.

(2) The demo did not employ selections that were identical except for the factor under test (digitisation); pair elements were only chosen to be similar.

(3) The stress criterion used was a highly subjective one (performed by the experimenter), and one not shown to be correlated with any more conventional measures of stress such as galvanic skin response (GSR) or electroencephalograph (EEG) measurements.

The speaker stated that he was aware of the informal nature of his presentation, and that it was only intended to spark interest in a heretofore unexplored area. Unfortunately, this does not excuse a total abandonment of scientific method; an "informal" test, well publicised, can influence public opinion at least as easily as a stodgy old controlled test.

This brings me to the main point of this letter. Due to the publicity and interest this matter had already drawn, I felt it was necessary to do a controlled test. Bart Locanthi of Pioneer Development Labs provided me with a tape of five pairs of musical selections. Each pair consisted of one tune that was transferred directly from disk, and one that had been passed through a 16-bit analog-to-digital and digital-to-analog converter. Both had been anti-aliased at 18kHz, so the only differences were due to digital encoding and decoding. The order within each pair was random, and was not revealed to me until I had completed all data collection. Subjects were chosen in pairs, so that one could do the arm pushing and the other be the subject.

Additionally, basal skin resistance and GSR were recorded for objective stress measurement. Each "pushing" subject was questioned after the session, and his comments recorded. While these people had not been specifically trained by Dr Diamond, they were given his general "pushing" instructions, and any noticeable change in arm compliance was noted.

When all the data were recorded and I was told which was which, a standard nonparametric (no assumption of Gaussian distribution) statistical test was performed, namely a sign test. The results showed no correlation between digitisation and stress by any of the three measures; typical scores were eight to seven or six to seven (the scores being counts of number of instances in which there was more stress for the digital versus more stress for the analog). Additionally, there appeared to be no correlation between the "pushing" stress measure and the skin resistance tests; it is open to question what such a test really measures.

I think that there is a lesson for us in this: scientific method is not a frill or a fetish, it is a necessary minimum to achieve meaningful results.

I wish to thank Bart Locanthi and his group for their time in preparation of the test tape, Alan Gevins and Bob Tannehill of the Langley Porter Neuropsychiatric Institute for their assistance with the measurement equipment and advice on the experiment, Dr Robert Morgan of San Diego State for help with the research design, and finally Eric Allman of the University of California, Berkeley, for doing most of the real work.

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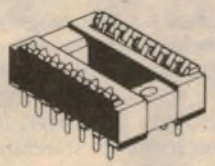

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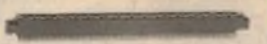

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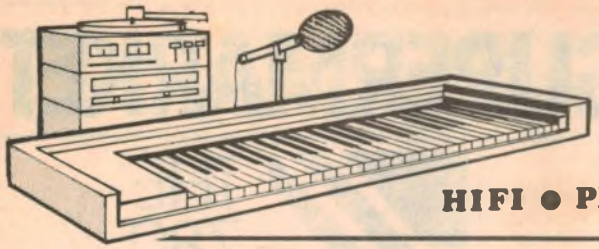

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BASF — Definitive answers about CrO2 cassettes

During a recent visit to Australia, from BASF, West Germany, Dr Manfred Ritter and Mr Wilhelmus (Bill) Andriesson were able to resolve some of the confusion that surrounds chromium dioxide coated audio tape — including the compensation that should be used with recently issued pre-recorded chromium audiophile cassettes. Many other interesting topics were covered in a wide-ranging discussion.

by NEVILLE WILLIAMS

Dr Manfred Ritter is currently sales support manager and product manager for audio products and, by coincidence, succeeds Heinz Ritter, author of the once very popular book "Tape Questions – Tape Answers".

I met Heinz Ritter personally in Ludwigshafen in 1977, and had a fascinating conversation with him about the early days of magnetic tape recording in Germany.

It was Heinz Ritter who gave me a cassette copy of the first major orchestral concert ever recorded on magnetic tape, in November 1935, featuring Sir Thomas Beecham and the London Philharmonic Orchestra. It was recorded in Ludwigshafen. (See picture.)

In his introductory remarks, Dr Manfred Ritter gave the audience an update on the massive scale of the BASF chemical works at Ludwigshafen and the tape factory at Willstadt. In fact, I had toured both complexes during my visit in 1977 and reported on them in our issues for December '77 and January '78. Four years on, the company is still expanding, with 292 subsidiaries, world-wide, and over 116,000 employees.

The second speaker, Wilhelmus (Bill) Andriesson is in a particularly favourable position to comment, from the inside, on the evolution of magnetic tape in general, and on compact audio cassettes in particular.

Born in the Netherlands in 1936, he received a degree in electrical engineering and then served for a period in the armed forces. He joined the Electroacoustic Division of Philips in 1964, being involved almost continuously with magnetic tape recording techniques. In this position, he was closely associated with the development of the compact cassette format and strongly supported the Philips policy of international standardisation.

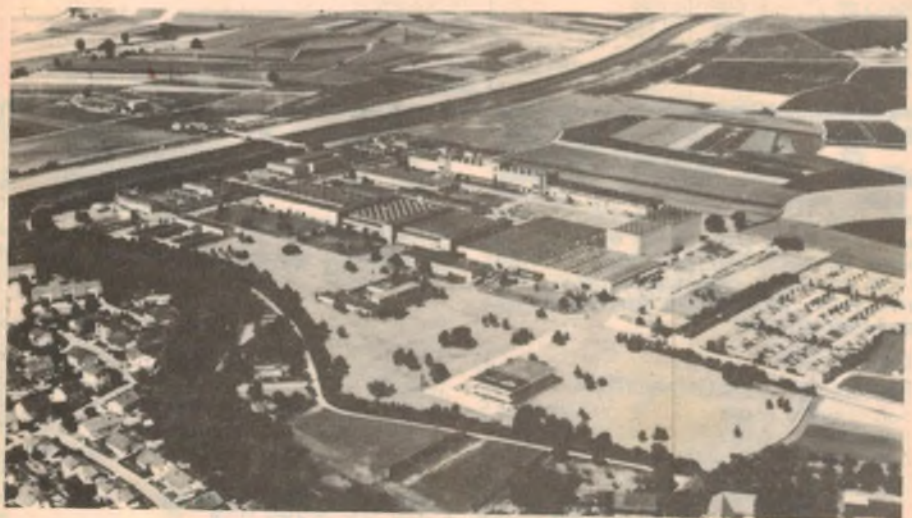
In 1970, Bill Andriesson moved across the border to join BASF AG at Ludwigshafen, West Germany, where he became laboratory leader for the evaluation of audio products. Since 1976, he has been Chief Applications Engineer for audio products at BASF.

As part of his activities, he was involved in developing and establishing measuring techniques for magnetic tapes generally, and especially in relation to reference and calibration tapes for the cassette system.

He said that, during the '60s, ferric oxide tapes available were anything but ideal for cassettes, with their very narrow tracks and low linear speed. Indeed the first available reference tape, produced by BASF in 1963/64 would now be considered as a reference for low output and high noise!

A second BASF reference tape produced in 1966 was much better and filled a recognised role for about 10 years. However, the limitations of ferric tape were still such that they provided the opening and the impetus for a new kind of audio tape using chromium dioxide as the magnetic coating.

Chromium tapes had come in for attention as early as 1967 and Bill Andriesson strongly supported their development while he was still with Philips Eindhoven. However, while accepting that they might need a higher bias and erase current, he maintained



Tucked into the junction of two rivers and surrounded largely by open land, the BASF magnetic tape factory at Willstadt, West Germany, is in an area with naturally low pollution. Even so, extensive further precautions are taken against the possibility of foreign particles contaminating the magnetic coating.

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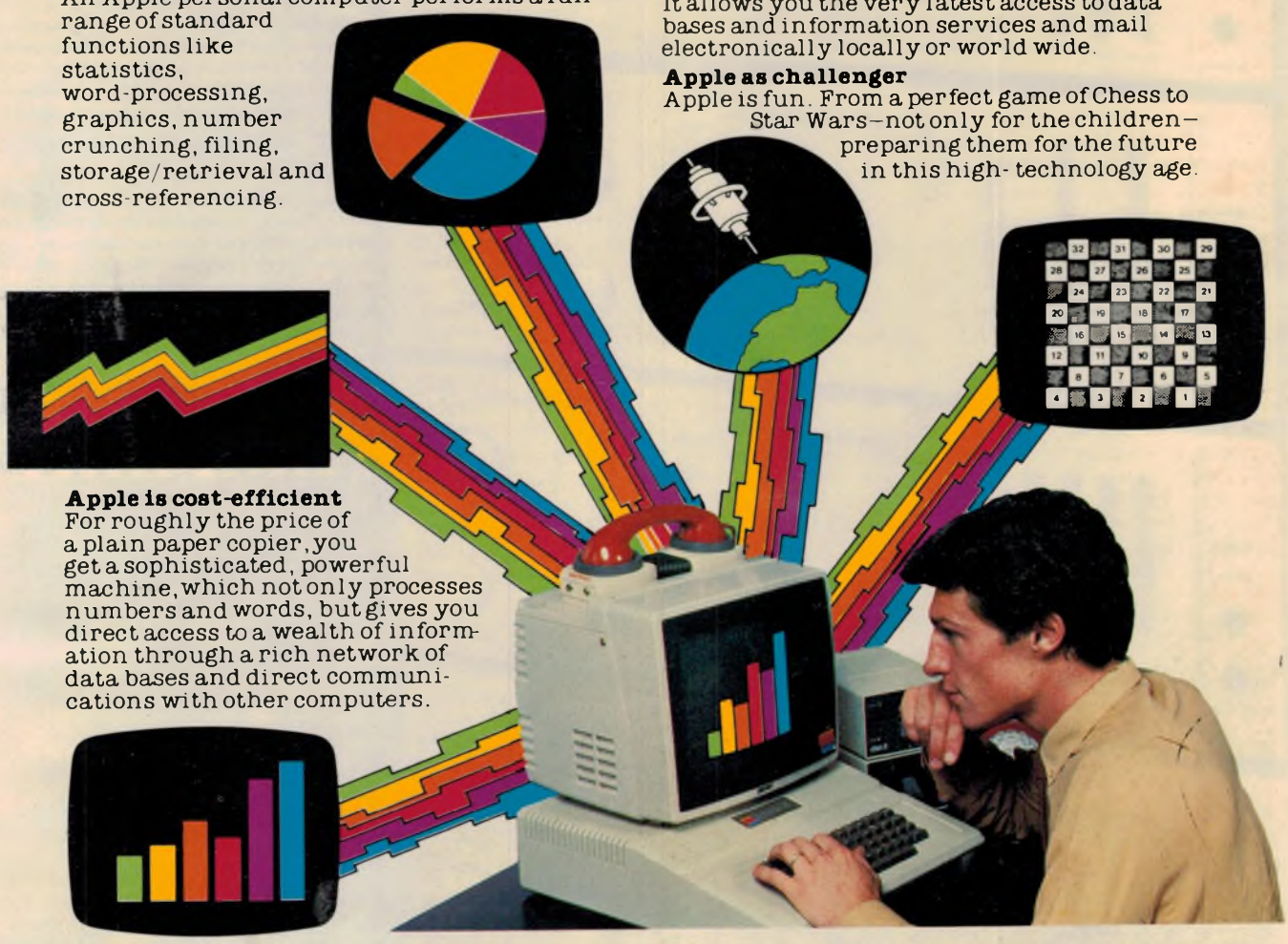

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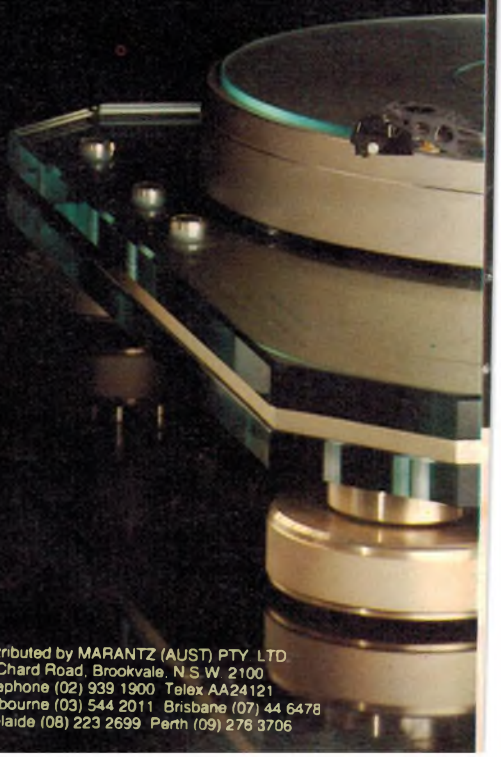

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that they should be designed for, and used with, the same 120μS compensation that already applied to ferric oxide cassettes.

As he explained to me over dinner, he was influenced in this attitude by the conviction that the yet-to-be-adopted Dolby-B system had the capacity to push down the noise floor by a significant degree, with either ferric or chromium tape. It should therefore not be necessary to take the additional precaution against noise of changing the compensation from 120μS to the proposed 70μS.

By retaining 120μS for chromium, he maintained, the full potential headroom of the new coating would be realised rather than compromised, yielding a better and more useable dynamic window.

Unfortunately, he said, many of his contemporaries did not share his enthusiasm for Dolby-B and his ability to argue to best advantage was compromised by his concurrent move from Philips in Holland to BASF in West Germany. In the event, the 70μS opinion prevailed and has since become a tradition.

My question:

"If it were possible to turn back the clock, would you still opt for 120μS as a standard for chromium dioxide tape?"

"Most certainly!"

"Would you advise enthusiasts to record their own chromium tapes in that fashion?"

"Many would not have the choice, because their decks have only a simple Fe/Cr switch. They cannot have chromium bias and erase – which is necessary – without also having chromium equalisation."

"What if they had separate switches?"

"They should certainly consider using Cr02 bias and Fe compensation – although some may be bothered by the idea of doing things in a non-standard way."

This led naturally to the question of pre-recorded audiophile cassettes which are now beginning to appear on chromium-dioxide tape. Some carry a specific statement about replay time constant (eg 70μS) while others ignore the matter and leave it open to rumour and argument as to which company does what.

For this, Bill Andriesson had a ready answer:

Because BASF is the principle supplier of chromium dioxide blank cassettes to the European market, music manufacturers sought their advice about the best compensation to use for the

The first-ever publicly recorded tape

An historic photograph: the first even public recording of orchestral music on magnetic tape, on November 19, 1936. it featured Sir Thomas Beecham and the London Philharmonic Orchestra in the Ludwigshafen Town Hall.

Don't judge today's cassettes by yesterday's figures

The American Company E. I. Dupont discovered the process by which chromium trioxide decomposes in the presence of water, under high temperature and pressure, to yield synthetic mono crystals of chromium dioxide. By nature, the crystals are small and uniform, long and thin in shape, and substantially free from deformities. This gives them a natural advantage, particularly in respect to noise.

For various reasons, Dupont concluded licensing arrangements for chromium dioxide tape only with BASF and Sony and this forced competitors to seek alternative formulations. Said Bill Andriesson: "As an employee of BASF, it is not for me to complain; had the positions been reversed, I would have done exactly the same thing!"

Over the years, ferric, modified ferric (high bias) and chromium tapes have all been progressively refined, with manufacturers claiming progressively better figures in terms of noise level and/or headroom. It is therefore easy to draw wrong conclusions from data which is out of date, or incomplete.

Thus, it is incorrect to base a judgment of dynamic range on MOL (maximum output level) alone; the noise level of the tape must also be considered. BASF claim that their latest Chromdioxid Super II has high output in the upper frequencies combined with a noise performance "unmatched by any other tape". It therefore offers outstanding dynamic range, provided the noise performance of the recorder itself is adequate.

Chromium substitute

BASF chromium

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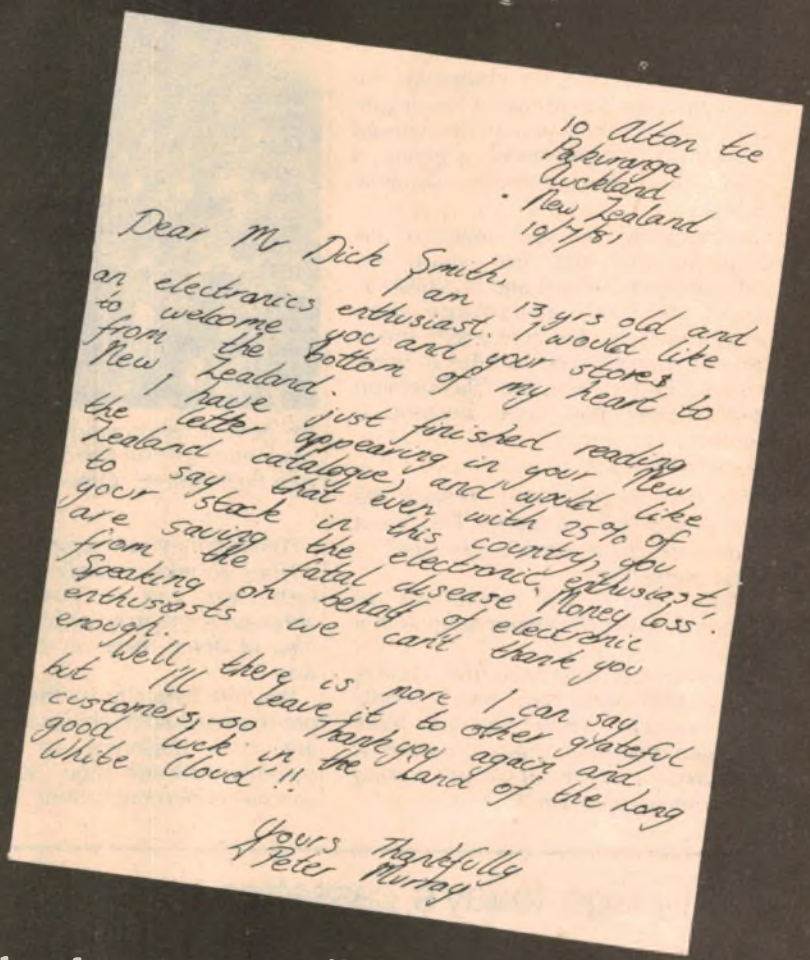

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new breed of pre-recorded audiophile music cassettes.

The answer they got (you've guessed it) was a strong recommendation for 120μS and this, by and large, is what they have adopted.

American music manufacturers, on the other hand, have tended to follow convention and to stay with 70μS for both record and playback. Included in this group is Mobile Fidelity Sound Lab. even though their cassettes are recorded on BASF chromium tape and marketed by BASF in Australia.

So, if you buy a pre-recorded chromium cassette, produced in UK/Europe, and not otherwise marked, assume that it will have been recorded to 120μS. Play it on the "Fe" or "ordinary" compensation setting as a first choice. Then, if it sounds over-bright, switch to 70μS (Cr02) or turn the treble control down about half-way.

If the cassette comes from the USA or Japan, do just the opposite. Try it first on the "Cr" compensation setting but, if too dull, switch to "Fe" compensation or turn up the treble by a notch or two.

Here's hoping, however, that the music manufacturers get their act together before too long, to remove this uncertainty, or at least brand their cassettes in a definitive manner.

IN OLDER DECKS

Just to complicate matters further – and by way of an aside – some older decks do not change the replay characteristic when switched for Cr02 tape. They increase the bias and erase level, as necessary, and change the record characteristic, but the replay characteristic remains the same for both modes.

To check whether a deck does or does not change the replay characteristic, insert a blank tape, operate in the play mode and turn the gain up so that the tape hiss is clearly audible. Now switch between Fe and Cr02 and listen for a difference. Switching to Cr02 should reduce the higher frequency components in the hiss. If there is no difference, there is evidently no provision for playback compensation.

If such is the case, and pre-recorded chromium cassettes sound over-bright, be prepared to turn the treble control down to obtain the most pleasing balance.

Of a more general nature, Bill Andriesson had some interesting things to say about tape standards, reference tapes, calibration tapes and the discrepancies which have occurred between European and Japanese practice.

He is in a favoured position to talk about this, being secretary of the working group in the IEC (International Electrotechnical Commission) which is concerned with audio tape recording. The IEC has the support of all countries which have a significant involvement in

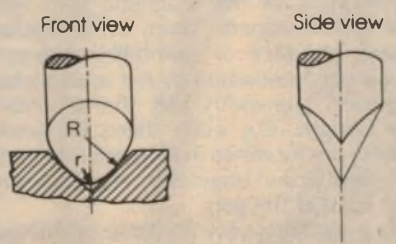
Six new Goldring cartridges

One of the companies which pioneered the development of lightweight microgroove magnetic cartridges, Goldring Products Ltd, have recently announced a complete new range, designated as the G900 series. There are six cartridges in all, from the top-of-the-line G900 IGC to the budget model G950.

While differing in specifications, all six of the cartridges employ a body of similar shape and provide for 12.7mm mounting in standard head shells. Vertical tracking angle is 24 degrees, except for the G950 and G950E, in which the designers have opted for 26 degrees. The individual models are distinguished by a range of body colours.

The green, top-of-the-line G900 IGC is equipped with a "van den Hul" stylus which, according to the sketches, has less-rounded shoulders than a normal elliptical — doubtless a variant of the well known Shibata stylus, originally developed for the JVC/RCA quadraphonic system.

With a cartridge weight of 4.25g, an equivalent tip mass of 0.32g and a static compliance of 40mm/N lateral and 20mm/N vertical, the G900 IGC is intended primarily for use in modern low-mass arms. Claimed frequency response is 20Hz to 20kHz, ±2dB, with other qualities to match.



The Van den Hul stylus shape, as depicted in the Goldring G900 series leaflet. They are fitted, as standard, to the three top-end cartridges. The others use elliptical or spherical.

For those who have well designed but higher mass arms, Goldring recommend the G910 IGC, which is essentially similar to the previous cartridge but with static compliance figures of 24 and 16mm/N, an equivalent tip mass of 0.45mg but similar figures for frequency response, channel balance (2dB at 1kHz) and channel separation (25dB at 1kHz). It is colour coded amber.

The 920 IGC, coloured coded blue, has ostensibly the same performance figures as the G910 IGC but has a van den Hul stylus with slightly more rounded shoulders, and marginally higher mass. Goldring see it as an appropriate choice for the hifi enthusiast who wants a not-too-expensive, general-purpose cartridge, but still with a high level of performance.

The Goldring G900 IGC cartridge, pictured much larger than life. In actual fact, the cartridges are smaller than most and of relatively low weight.

The G900 E, colour-coded black, uses an elliptical stylus in an aluminium shank, giving an equivalent tip mass of 0.7mg, a compliance of 24mm/N lateral and 16mm/N vertical and channel separation diminished somewhat to 20dB at 1kHz. However, the claimed frequency response is still 20Hz to 20kHz, ±2dB.

At the budget end of the range, the G950 and G950E are intended primarily for use in integrated turntable/arm systems, where the playing weight may lie in the range 1.5 to 5gm. Equivalent tip mass is 1.2mg, and the response ±2dB to 10kHz, or ±5dB to 20kHz.

In the time available, we did not have opportunity to listen to, or run tests, on the whole range but we did use the top of the line G900 IGC for several days in a home situation, reviewing records for our columns. We found it to be a highly acceptable cartridge, clean sounding and commendably free from colouration. At the recommended tracking weight of 1.25g, it handled the cannon shots in Telarc's notorious "1812 Overture", without any sign of discomfort. Shielding against induced hum was fully effective.

For further information on the new Goldring range of cartridges, direct your inquiries to Soundring Distributors Pty Ltd, 514 Miller St, Cammeray, NSW 2062. Phone (02) 92 1990. They have available a handsomely printed colour brochure and a price list.

SHARP 105: Yours for $2300

Previewed some time ago in Sydney, the Sharp Optonica System 105 should be available on the market by the time you read this. Sharp claim as a "world first" the provision of two built-in memories which allow the user to pre-set volume, tone and balance controls for the kind of level and balance that the user prefers for particular kinds of music. The settings can be implemented by pushing the appropriate button on a slim, hand-held remote control unit. Other buttons on the unit select cassette, phono or radio, and change radio stations. Sharp say that the design of the Optonica 105 substantially eliminates "swivel" controls, their function being taken over by digital circuitry mounted directly on the P/C boards. With all the performance and features expected of such a system, it will retail for about $2300.

DEFINITIVE ANSWERS ABOUT CASSETTES — Cont

sound recording, and includes western industrial countries, eastern bloc countries and the People's Republic of China. The working party seeks to respect and find common ground between national standards as, for example DIN (German Industry Norm), EIA (Electronic Industry Association of Japan), BSI (British Standardisation Institution) and SAA (Australia).

According to Bill Andriesson, the discrepancies between tape parameters optimum bias, etc, which developed between Europe and Japan, were not simply the result of one-upmanship, as has commonly been assumed. He said that there have been genuine problems of communication in a highly involved technical subject and, if the Europeans were puzzled by the attitude of the Japanese, the reverse was also true.

The position is now being rectified, largely through the IEC.

From the outset, according to Bill Andriesson, the policy of Philips, who pioneered the cassette format, is to concentrate the standards around the tape, leaving deck design to find its own level. For example, the equalisation time constants of 1590μS and 120μS were selected, by practical tests, as those most likely to be compatible with the characteristics of ferric tape in the particular role.

Much has happened since then but agreement still exists in principle: that tape recordings — in this case, cassettes — should be compatible and interchangeable around the world. Unfortunately, the principle is easier to state than to achieve.

A basic problem in standardising tapes arises from the fact that there is still no practical way to measure directly the depth of magnetisation of a tape coating, particularly at the higher frequencies (shorter wavelengths). The parameters of any given tape can only be deduced indirectly by a record/replay operation using heads which, for calibration purposes, are notoriously inexact.

The gap in record heads influences the penetration of the magnetic field into the tape magnetic layer, while replay heads produce a comb-like top-end response determined by the relationship between gap-width and the recorded wavelength. But even these expected effects are modified in all practical heads by physical and magnetic irregularities in and around the gap.

As a partial answer to these problems, the industry has resorted to the use of "reference" tapes — not necessarily as a standard of ultimate excellence but as a basis by which other tapes can be evaluated.

Using reference tapes, manufacturers around the world can identify those properties which determine compatibility: bias requirements, the frequency response contour and, to a degree, the sensitivity. Quality parameters are not inhibited, however, such as MOL, noise floor, modulation noise and freedom from drop-outs.

The starting point for an industry reference tape is disarmingly simple. It is merely a production batch which is selected as appropriate for the purpose. It never reaches the open market but is spooled and carefully stored by the particular manufacturer for release, on call, for research purposes. It even retains its original factory batch number!

The first such batch, was selected in 1963/64 after consultation between BASF and Philips. It was defined as BASF PES Batch 277581. Other reference batches followed in 1966/1973 and 1979, with a Cr02 reference in 1971. Sony has provided a reference batch for FeCr tape and deliberations are currently in progress to select a pure-iron batch.

Bill Andriesson stressed that present IEC tolerances are such that it is virtually not practical to control tape formulation tightly enough to precisely duplicate a reference tape. Even tapes from the original batch must be carefully stored and ultimately discarded after a certain amount of use.

This being the case, there is reason to question the validity of tape offered for sale as "reference" quality.

As distinct from reference tape, the IEC, in collaboration with BASF and TEAC, is currently seeking to evolve tighter standards for the production and use of calibration tapes. These are tapes pre-recorded to a precise flux/frequency response and reference level.

Their role is to facilitate the the design and production of heads and electronics

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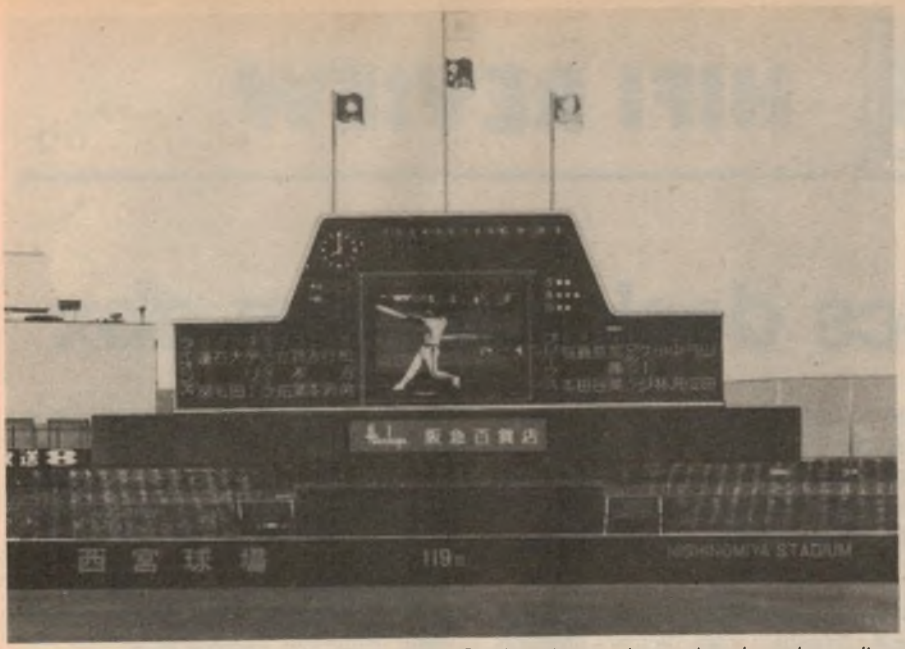
If you want wide-range stereo sound in your car, at up to 25W per channel, these new three-way loudspeakers from Dick Smith Electronics Pty Ltd can provide it. They come with detacheable brackets and can be mounted horizontally or vertically. Designated as catalog number A 7082, they sell for $89.00 per pair.



The Matsushita Electric Industrial Co of Osaka, Japan, have developed an ultra-large screen colour video display for use in stadiums, auditoria, or city locations where the idea is to attract the attention of passers-by. Screen size of the normal model is just over 8 x 6 metres and the image is created by a matrix of 180 x 210 special coloured globes, making 37,800 in all. The brightness can be adjusted to cope with any likely ambient, even full sunlight. Definition is sufficient to permit viewing from 50m or more, giving a relative picture size equivalent to viewing a normal 50-60cm screen from across a 4m room. Viewing is claimed still to be good at 150m.

which will ensure uniform playback of magnetic tapes, irrespective of the source of the deck. Once again, the objective is not to limit the quality of individual products but simply to obviate basic anomolies in system behaviour.

In short, the magnetic tape industry (with particular reference to cassettes) wants the medium to be no less predictable and universal than stereo phono discs.

In Brief . . .

MATSUSHITA ELECTRIC has unveiled its latest magnetic copier for duplicating VHS video cassettes. It uses the principle, developed years ago by the company, whereby the magnetic pattern on a special original tape is "printed" on to a blank tape when the two are passed through a bias field in intimate contact. The new "VTP" unit is completely automated and can produce up to 15 dupes from the master cassette without attention, and before the need to reload. Copying time for two-hour and four-hour cassettes is about four minutes or so, which is respectively 30 and 60 times faster than by the conventional method.

CONCEPT AUDIO PTY LTD advise that their DH-101 preamplifier, sourced from David Hafler, is still available and at the same price as announced on its release, two years ago. In kit form, it sells for $398, and fully built up for $498. The matching DH-200 power amplifier also continues at the original prices: $675 as a kit and $775 fully assembled. But, for those who may want a still larger power amplifier, the new Hafler DH-500 offers 225W per channel into 8 ohms, stereo mode, or 800W when bridged for mono. The kit version should sell for $1398 or $1498 built up. Details from Concept Audio Pty Ltd, 22 Wattle Rd, Brookvale, NSW 2100. Phone (02) 938 3700.

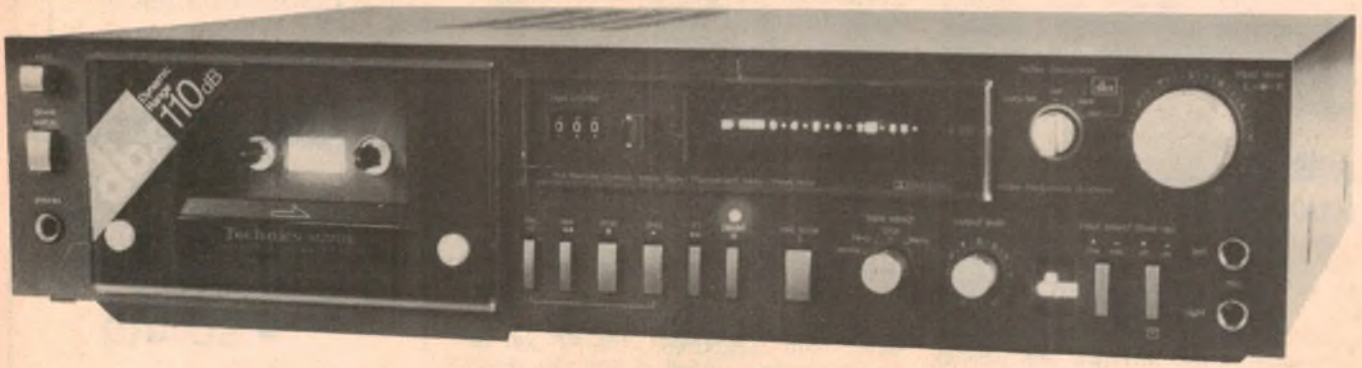
EMPIRE SCIENTIFIC CORPORATION, the makers of the well known Empire phono cartridges, unveiled three new models at the most recent Chicago Electronic Show, and all three are now available in Australia. The BC-100 replaces their BC-1, which is well established as a desirable model for broadcast stations and discos. The price is $45. Where higher quality is required but still combined with ruggedness, the BC-200 is recommended, priced at $79. The third cartridge is the 800UFR, a high performance design, offered with individual calibration, and intended for reference or laboratory use. For details: Concept Audio Pty Ltd, 22 Wattle Rd, Brookvale, NSW 2100. Phone (02) 938 3700.

VIDEO CASSETTES look like finding yet another role in the scheme of things, as distinct from recording video information and PCM audio. TEAC has come up with two data recorder models, providing a 7-track and 14-track potential on a standard VHS cassette. Kyowa have something similar but using Beta cassettes. Sony might follow but they would have to compete against their data recorder using the Elcast format.

New Technics deck features dbx

National Panasonic (Aust) Pty Ltd have just released their Technics RS-M270 X stereo cassette deck which includes both Dolby B and "dbx" type II noise reduction systems. With dbx II, a record/replay dynamic range approaching 110dB becomes possible, providing the ancillary equipment (program source, amplifier and loudspeakers) is capable of similar performance.

While the type I and type II dbx noise reduction systems have been around for some five or six years, to our knowledge this is the first domestic cassette recorder to have in-built circuitry for the dbx process. As is now generally well-known, the dbx systems compand signals on a 2:1 basis and, thus, potentially offer the largest increase in dynamic range of any of the commercially available noise reduction systems. Unlike the Dolby systems which can mistrack if encode and decode signal levels are not accurately matched, the dbx process is virtually unaffected by mismatching (even severe) of signal levels.



However, in common with competitive systems, the extended dynamic range cannot be achieved without incurring problems in other areas. And the side effect which is most likely to affect the dbx process, is variation in frequency response which exists in the record/replay chain. With dbx, any frequency response deviations are doubled (ie a 2dB error becomes 4dB, 3dB becomes 6 and so on). Thus it is essential for the associated recorder to provide an above average frequency response performance. Provided the specified cassettes, or their equivalents, are used on the Technics M270X, it easily fulfils the above requirement.

The M270X has the usual high standard of construction and finish that we have come to expect from Technics products, with the dark grey front panel having a satin anodised surface. Twin fluorescent bar-graph displays provide peak level indication of record and replay signals. In common with contemporary cassette deck design philosophy, soft touch pushbuttons trigger logic circuits which activate solenoids to perform the required transport functions.

Rotary selector switches provide facilities for selection of tape type (bias, level and equalisation), line output level, and noise reduction. This last switch has positions for Dolby B, "OUT", dbx (cassette record or replay) and dbx disc (decoding from line input signals of dbx encoded discs). Dual concentric controls serve for adjusting record levels, whilst a pushbutton switch enables selection of either line or microphone input sources. The usual 6.35mm phone jacks are provided for connections to headphones and microphones. Standard RCA phono sockets, for line inputs and outputs, are located on the rear panel.

As this unit is double-insulated (being identified as such by the international "double square" symbol), it is supplied with a two-core figure-8 mains cable and plug. Physical dimensions are 430mm wide × 97mm high × 350mm deep and mass is 6.2kg.

The bar graph meters each contain 18 segments, with each segment being covered by three vertical bars (54 in all). Eleven blue segments cover the range from −20 to 0dB, with seven orange segments for levels above 0dB. Between -5 and +5dB the segments function in exact 1dB steps, with the "spread" increasing both above and below the −5 and +5 points, such that the lowest segment is marked −20dB and the top segment actually reads +9dB.

A double "D" Dolby symbol is located at the +3dB segment; and the bar graphs indicated exactly this level when checked with a 200nWb/m Dolby-B test cassette. At maximum setting of the line output control the open-circuit output was 470mV per channel at this level. Thus, the 0dB metering point corresponds to a recorded level of 140nWb/m, and a maximum line output of 340mV. Output impedance of the line outputs is about 2.5kΩ, exact value being dependent upon the setting of the (line) output level control.

Tape speed accuracy was excellent, being only 0.1% slow. Peak wow and flutter was 0.07% DIN weighted — possibly the best figure we have ever seen from a cassette recorder. Fast forward and rewind times were of average duration, each taking 85 seconds for a C60 length cassette.

We checked the overall (record, rewind, then replay) performance of the M270X with several samples of IEC type I (ferric oxide), type II (chromium dioxide), type III (ferrichrome) and type IV (metal) cassettes. Of those specified in the Instruction Manual, such as Maxell UDXL1, Maxell XL1S, TDK AD, Technics RT-XA, TDK SA, Sony Duad FeCr, Technics RT-MX and TDK MA, we found that the fre-

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quency response of each of them was within better than ±1.5dB between 40Hz and 16kHz. Not only is this a very good performance, but it also ensures that the worst response deviations when using dbx will be within ±3dB, which is also a satisfactory performance.

However, it should be pointed out that we also tried several other cassettes (from reputable manufacturers, but not listed by Technics) and found that many of them were as much as 3 or 4dB up or down in response in the high frequency region. This would result in frequency response errors in the order of 6 to 8dB if dbx noise reduction were selected. To quote just one example – TDK released an improved Super Avilyn formulation (type SAX) some few months ago. On the M270X it produced a response which was about 3dB up in the region of 10 to 15kHz. So, although this SAX formulation is an improvement on TDK's SA formulation (which has been on the market for quite a few years), the SA tape performs better on the M270X.

This situation is brought about by the omission of a user-accessible HF bias control. If such a facility had been incorporated in the M270X then it would have been possible to align it to almost any of the currently available cassette types. Admittedly, a variable HF bias control should be supplemented by an (internal) oscillator and metering facilities (such as EA's Audio Test Set described in last month's issue) to enable the user to correctly set the bias level; but, for only a modest additional outlay, a variable bias facility greatly enhances the versatility of a cassette recorder.

Notwithstanding the above, the M270X is capable of superb audio performance. Using TDK type OD (not listed by Technics) as a typical IEC type I cassette sample, the frequency response was within ±1.0dB between 50Hz and 16kHz, and only 1.5dB down at 40Hz, falling to −5dB at 30Hz. Upper high frequency response was 3½dB down at 17kHz, and 7dB down at 18kHz.

As expected, the low frequency performance was essentially the same for all C60 cassettes, irrespective of brand or IEC type. Using Technics type RT-XA (listed by Technics) as an IEC type II cassette sample, the response was within ±1.0dB to 17kHz, and only 3dB down at 18kHz.

Changing to a TDK type MA (listed by Technics) for a typical IEC type IV metal cassette sample, frequency response was within ±0.5dB from 50Hz to 17kHz, and −3dB at 18kHz. As predicted, with dbx selected, overall frequency response was excellent with this cassette, being within ±1.0dB between 50Hz and 15kHz. Response was −5dB at 16kHz; falling rapidly at higher frequencies, due to the effect of an inbuilt (FM) multiplex filter, which is automatically switched into circuit whenever dbx or Dolby is selected.

With Dolby B noise reduction selected, the record/replay frequency response was also within ±1.0dB between 50Hz and 15kHz, when using TDK MA cassettes. Naturally, the tracking accuracy is once again affected by the combination of cassette and recorder, with those combinations which produce the flattest response in the "flat" mode performing best, when Dolby is selected.

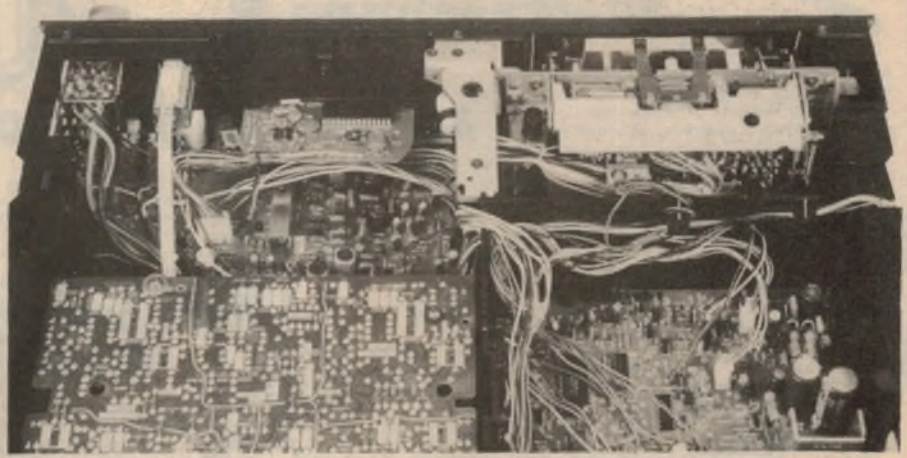
Technics are to be commended for retaining the Dolby B noise reduction circuity in the M270X, since owners will be able to replay any previously recorded "Dolby" cassettes which they possess, and also purchase any pre-recorded commercial cassettes they may desire, with the knowledge that they can properly decode such cassettes. The dbx facility – which provides a much extended dynamic range – may then be used for any fresh recordings which they wish to make.

A further addition to the inbuilt dbx system is the provision of facilities for decoding dbx encoded disc recordings. As yet, only a few small companies are manufacturing such recordings, and very few hifi enthusiasts possess the necessary dbx decoders. Having this facility included in the M270X saves the additional cost of a separate decoder for dbx discs.

Conforming with the previously measured performance parameters, the results obtained for distortion and noise were equally impressive. Unweighted signal-to-noise ratio below a level of 200nWb/m (Dolby reference level) measured 56dB for type I cassettes, 59dB for type II, and 57dB for type IV cassettes. Engaging Dolby improved these figures to 66dB, 69dB and 67dB respectively. With dbx selected, the figure for all three cassette types was essentially the same, namely 93/94dB. These figures enable one to appreciate the tremendous improvement to signal-to-noise ratio, which dbx can provide.

At 1kHz the total harmonic distortion measured 0.85% at 0dB input level, 1.7% at +6dB and 4.7% at +10dB when using type IV (metal) cassettes. Using type II (chrome type) cassettes, the distortion was essentially the same as for the metal variety.

With type I (ferric oxide) cassettes, the distortion was 0.9% at 0dB, 1.5% at +6dB and 3% at +10dB. These figures are equal to or better than we have ever previously obtained, and indicate that Technics have made a very good compromise between distortion and extended high frequency response in their design of this machine.



Above is a view inside the Technics RS-M270X. Part of the dbx PC board can be seen in the lower left corner.

Whilst the M270X cassette deck may lack refinements such as memory rewind, variable HF bias, internal test oscillator, separate record and replay heads (three-head system for A-B monitoring), and variable speed spooling with audible cueing, it is nevertheless very competitive in its own price group – bearing in mind the inclusion of the relatively complex dbx noise reduction circuitry. When all its performance figures (eg frequency response, distortion, noise, wow and flutter etc) are taken into consideration, it will be seen that its "practical" audio performance is probably better than that of any cassette recorder (with no price limitations) we have previously reviewed. But remember to only use the cassette types specified by Technics – or you may be disappointed.

At the time of writing the exact retail price of the M270X is unknown but is expected to be around $500. Further details can be obtained from high fidelity retailers, or the distributors – National Panasonic (Aust) Pty Ltd, 95-99 Epping Rd, North Ryde, NSW, 2113. (P de N).

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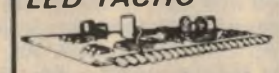

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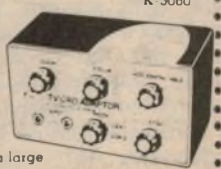

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For professional slide presentations

A slide cross-fader and auto-advance unit

Want to put on a really professional slide show? This new slide cross-fader can provide smooth dissolves from one projector to another, initiate slide changing automatically from an in-built variable timer, and synchronise slide changes to pre-recorded commentary or music on a tape recorder — all this at a cost far less than comparable commercial units.

by JOHN CLARKE

We've all suffered, haven't we? All of us at one stage or another have sat through a boring slide show put on by friends just returned form overseas. Whoops! . . . sorry, that one's upside down; or it's out of focus; or the sunset has gone pitch black through under exposure.

If the lights are out, you can always go to sleep and later claim to have only missed the last two slides. Often, however, one can only grin and bear it, before remembering that you had better rush home and turn off the tap that you accidentally left running in the bathroom.

Perhaps you're one of those dreadful "I-Have-Two-Hundred-Slides And We're-Going-To-Sit-Here-And-Look-At-Them-All-Night" people who have inflicted such torment upon friends (that is, if you still have any left).

But now, with your new "Slide Show", you can put on a really professional slide performance that's limited only by your imagination. All you need is a second remote control projector to go with your current unit and a stereo tape recorder. Slide Show lets you put a recorded commentary or music on tape and to synchronise slide changes with variable fade rate between the two projectors.

The main advantage to this method is that it can make for a really polished and entertaining commentary, with some slides left on for long periods and others changing rapidly in sequence. A slide illustrating plant cell structure could be left on for several minutes in biology class, for example, while a sequence showing a toddler eating dripping ice cream could be run in rapid succession – perhaps with suitable background music to achieve an hilarious effect.

In short, Slide Show can actually make your slide presentations interesting and entertaining. No longer will you be shunned by friends who suddenly have to rush off home for one reason or another.

At an estimated cost of around $80 – far cheaper than commercial units – we think that Slide Show will prove popular with photographic enthusiasts and those involved in professional audio-visual presentations alike. The unit is easy to build and can be used with virtually all types of projectors with projection bulbs rated from 24V to 240V AC. The projectors require only simple modifications and can be quickly restored to standard if required.

Slide Show can be used with virtually all types of automatic projectors. Features include three control modes, variable fade rate, and manual override.

Features & Controls

As can be seen from the photograph, there are three operating modes: Tape, Auto and Manual. In the Tape mode, the unit is controlled by tones recorded on one channel of a stereo tape recorder (the other channel carries the sound track). Operated in this way, the entire system is completely automatic and requires no human intervention until the end of the tape. As one projector lamp fades into darkness, the other simultaneously "fades up" to full brilliance.

Slide Show then activates a relay to change the slide in the dark projector, ready for the next cross-fade.

In the Automatic mode, an in-built timer automatically initiates the dissolve between the two projectors. The time period between changes is preset using the Auto Rate control and can be varied from about two seconds up to 100 seconds. Manual override is provided – pressing the Change button immediately changes the slide, while pressing the Hold button resets the timing cycle for

the displayed slide to zero.

Finally, in the Manual mode, slide changes can only be initiated by pressing the Change button.

In the Auto and Manual modes, the tone signal is automatically sent to the Output (To Tape) so that the sequence of slide changes is recorded on the tape ready for duplication in the Tape mode. The tape will record the slide-change points, whether initiated by the in-built timer or Change button. The fade rate is not recorded and is best left set at the same position in the Tape mode as when recorded.

The remaining controls – the Fade Rate, Slide Change Disable and Projector Change Over switches – affect all three modes of operation. The Fade Rate control simply varies the rate of fade (or dissolve) from one second to 100 seconds. Its period must be set for less than the Auto Rate period, otherwise a complete fade and slide change will not occur (a similar situation applies when using a tape recorder to control the unit).

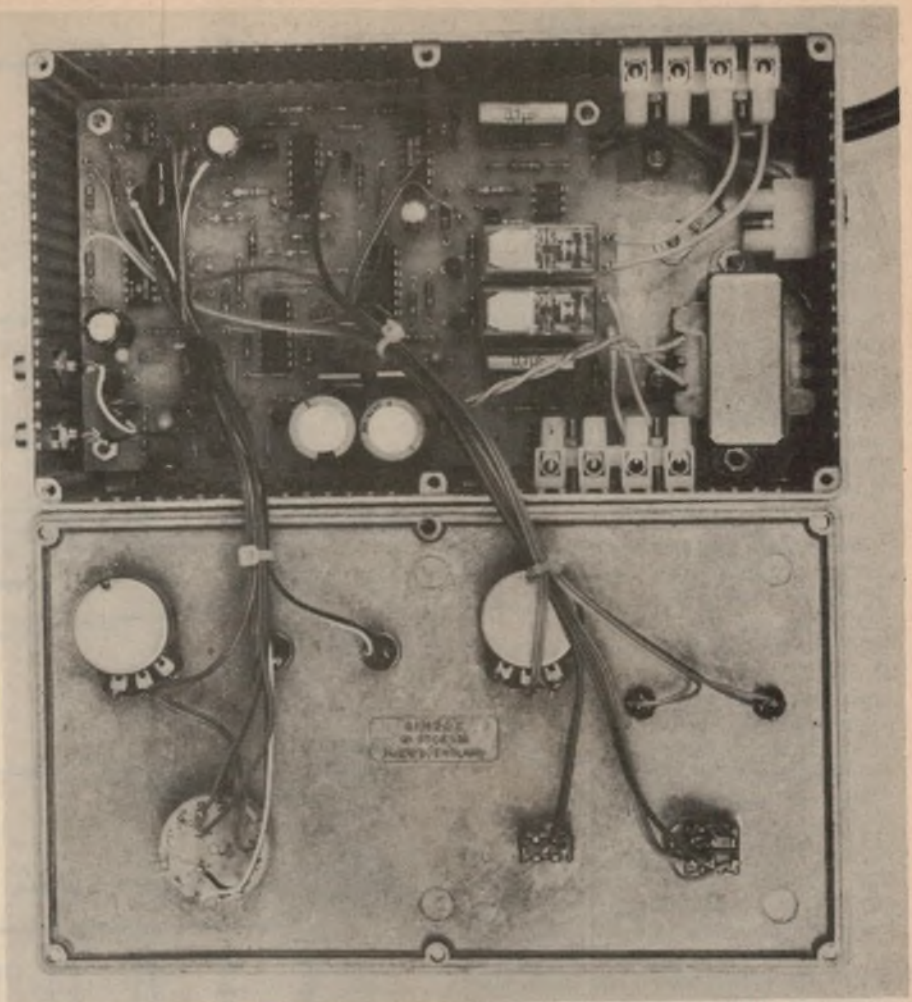
The Slide Change Disable switch prevents the slide in a given projector from changing when the projector lamp subsequently dims. Result – when the next cross-fade is performed, the slide will be repeated! The Change Over switch transposes the projector sequence; in other words, the bright light projector becomes the dim light projector and vice versa. This feature is useful when setting up the machines, as no particular attention has to be paid as to which projector has the first slide.

Two LED indicators are also located on the front panel and indicate which projector has the bright light. This indication is useful for setting up before the projectors are connected to the unit. The actual fading of the lamps is not represented by the LEDs since they tend to be either on or off and their brilliance varies little with changes in supply current – at least not as much compared to filament bulbs.

Four connections must be made to each projector to enable Slide Show to control the operation. Two leads from the normally-open relay contacts are connected to the "slide advance" switch in the projector instead of the normal hand-held remote control unit. The remote control is usually connected to the projector via a DIN plug and socket, so all you have to do is wire the relay leads to a DIN plug similar to that fitted to the remote control.

In short, the relay contacts take the place of the remote control contacts.

The other two leads are connected in series with the projector lamp and involve a simple modification to the projector wiring. All you have to do is disconnect one of the leads to the lamp and connect the extra leads in series with this lead and the lamp itself. Make sure you do the job neatly though, especially if the projector lamp is run directly from the mains. We recommend that you make the connections using a mains terminal block which can either be bound in insulation tape or, if space can be found, screwed to base of the projector case.



Use a metal diecast case and keep all mains wiring neat and tidy. Four-way terminal blocks facilitate connections to projector lamps and advance mechanisms.

It should be noted that for the best results from the Slide Show, automatic focus would be an advantage to prevent out of focus images. Alternatively, the remote control focus can be retained and operated manually for every slide.

The majority of remote control projectors operate their lamps from 24 volts AC. Consequently, with the 15A Triac used, lamps rated up to 350W can be accommodated. Due to the great variety of projectors available, we decided to "play safe" – it does not matter which way round the leads are connected to the lamp or to the slide change control.

In fact, connections to the projector could be at mains potential if an auto transformer is used to give the 24 volts rather than from a fully isolated transformer. These connections are fully isolated from the remainder of the Slide Show circuitry.

A separate transformer is used for the Slide Show power supply. We chose not to use a 24V AC rail from one of the projectors for three reasons:

- there could be mains potential on this 24V line;
- other connecting leads to the Slide Show could be at mains potential, so it is necessary to have an earth connection to the metal case. An earthed mains cable is the best way to provide this; and
- the voltage from a 24V transformer, when rectified and filtered, approaches the maximum allowable input voltage for the three-terminal regulators used and could damage them.

The Circuit

In all, 11 ICs are used in the circuit, including the two voltage regulators. Although at first glance the circuit may appear daunting, it is really quite straightforward and is best explained with the aid of the waveforms of Fig. 1.

Along the right hand side of the waveforms are marked the letters A to K. These designated waveforms correspond to the letters marked on the circuit diagram. Waveform A is the AC sinewave from the secondary of the transformer and is virtually in phase with the mains waveform. The voltage is clamped with two back-to-back diodes and squared up by IC5a, a 4136 op-amp connected as a Schmitt trigger. Conse-

quently a square wave in phase with the incoming sine wave is obtained (waveform B).

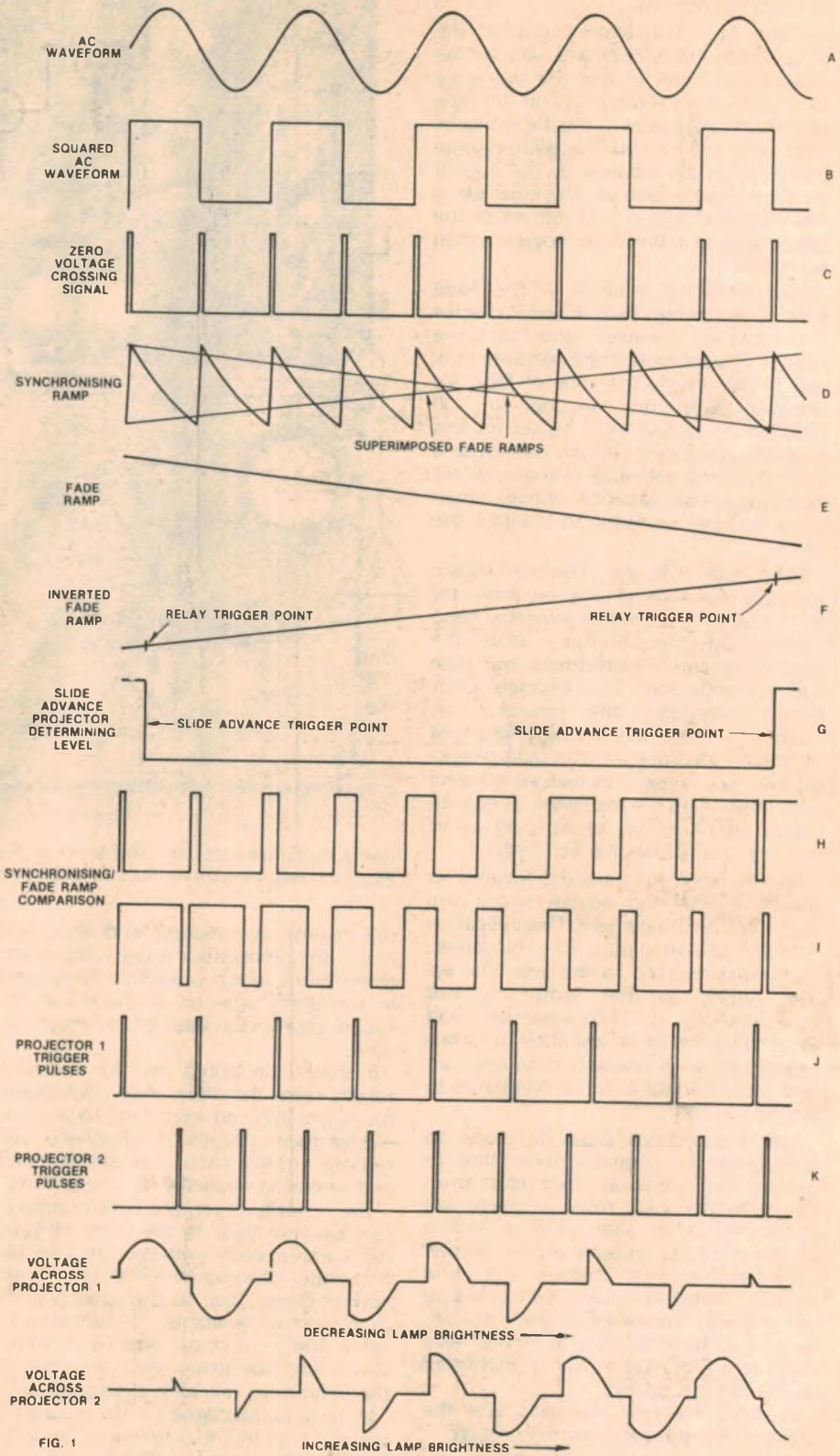
The square wave is then passed to IC3c, a 4030B exclusive OR (XOR) gate. One input is directly connected to the output of IC5a, while the other input is connected via an RC delay. When the square wave changes from one level to the other, the two inputs at IC3c are different for a short time, about 450μs, due to the RC time delay. The output of an XOR gate is high when the inputs are different and low otherwise, so a short high pulse appears at the output (pin 10) on every change in square wave level. This is seen as waveform C.

The voltage pulses from IC3c charge a .039μF capacitor via a series diode and, when the level goes low, the capacitor discharges via the 100kΩ resistor. This gives the familiar sawtooth waveform of D, which is a buffered version of the capacitor voltage. IC5c performs this high impedance to low impedance buffering of the capacitor voltage, preventing loading of the capacitor.

We shall now discuss the derivation of waveforms E and F. IC7 is a 4013 D flipflop which is connected in such a way that, upon each clock signal, the Q output changes logic level. If Q is initially high, the next clock pulse will cause Q to go low. The clock pulse is derived via switch S3c, which selects the Tape, Auto or Manual modes of operation. We shall discuss that part of circuit later since it has no effect upon the waveforms.

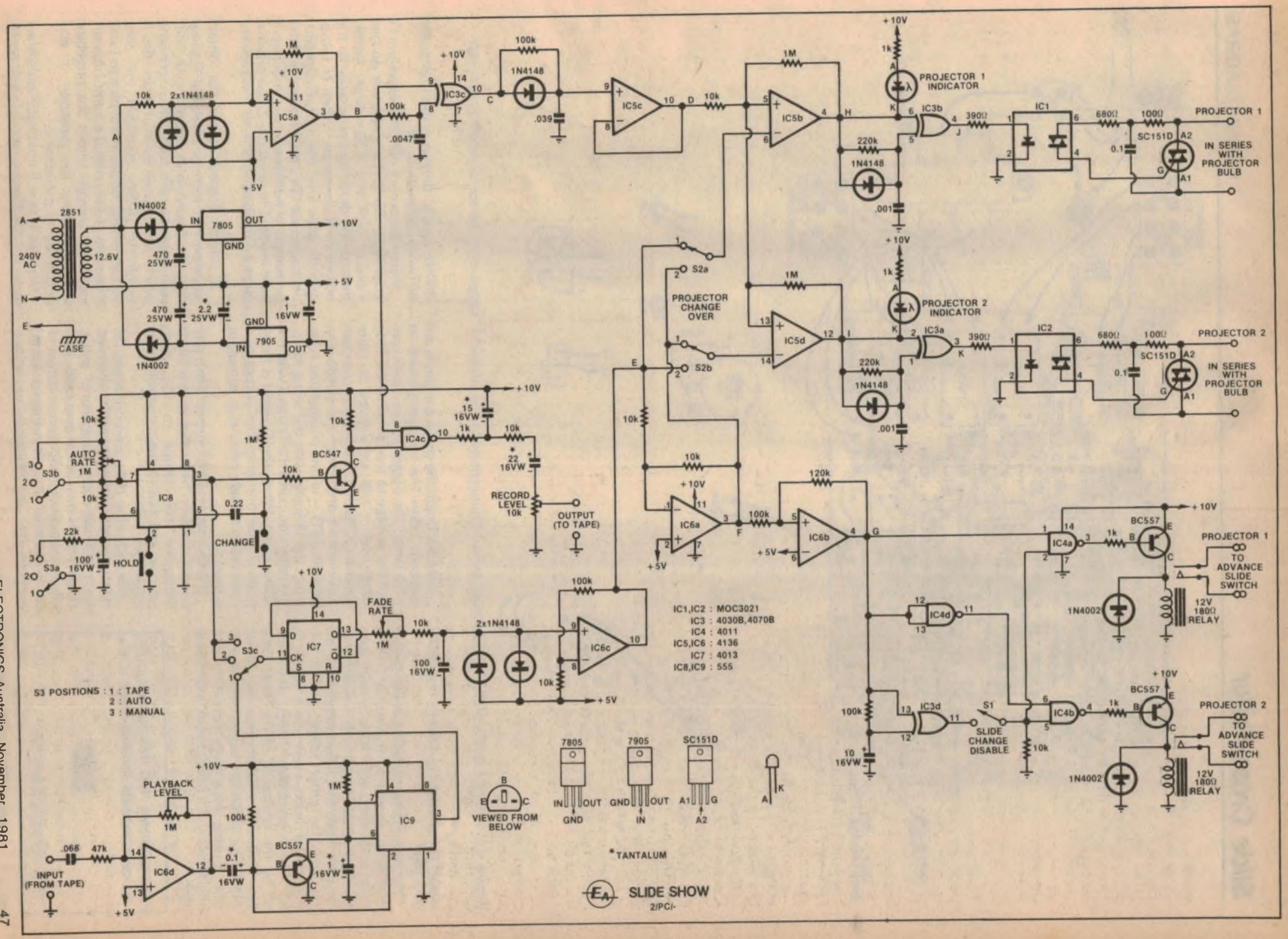
Each time the Q output changes logic level, the 100μF electrolytic capacitor charges or discharges via the 1MΩ Fade Rate potentiometer and the 10kΩ resistor. The actual level to which the capacitor charges or discharges is clamped by the two back-to-back diodes connected to pin 9 of IC6c – ie ±0.6 volts about the +5V rail. This charging and discharging voltage is buffered by amplifier IC6c, a 4136 op-amp wired with a gain of 11. With this gain, the output of the amplifier reaches the 10V and 0V supply when the capacitor is at +5.45V and +4.55V respectively – ie ±0.45V about the 5V rail, or just before the diodes begin to conduct.

Two questions arise from this circuit: first, why use diodes to clamp the capacitor voltage to such a small swing and, second, why give IC6c a gain of 11? The type of waveform that we want is a linear ramp that alternates between a rising ramp and a falling ramp at each clock pulse to IC7. To obtain a linear ramp by charging a capacitor, it is necessary to only use a very small percentage of the capacitor charging curve, which is relatively linear. The closer the capacitor voltage approaches the supply rails, the more non-linear the curve becomes. This is why we have amplified the linear ±0.6V swing.

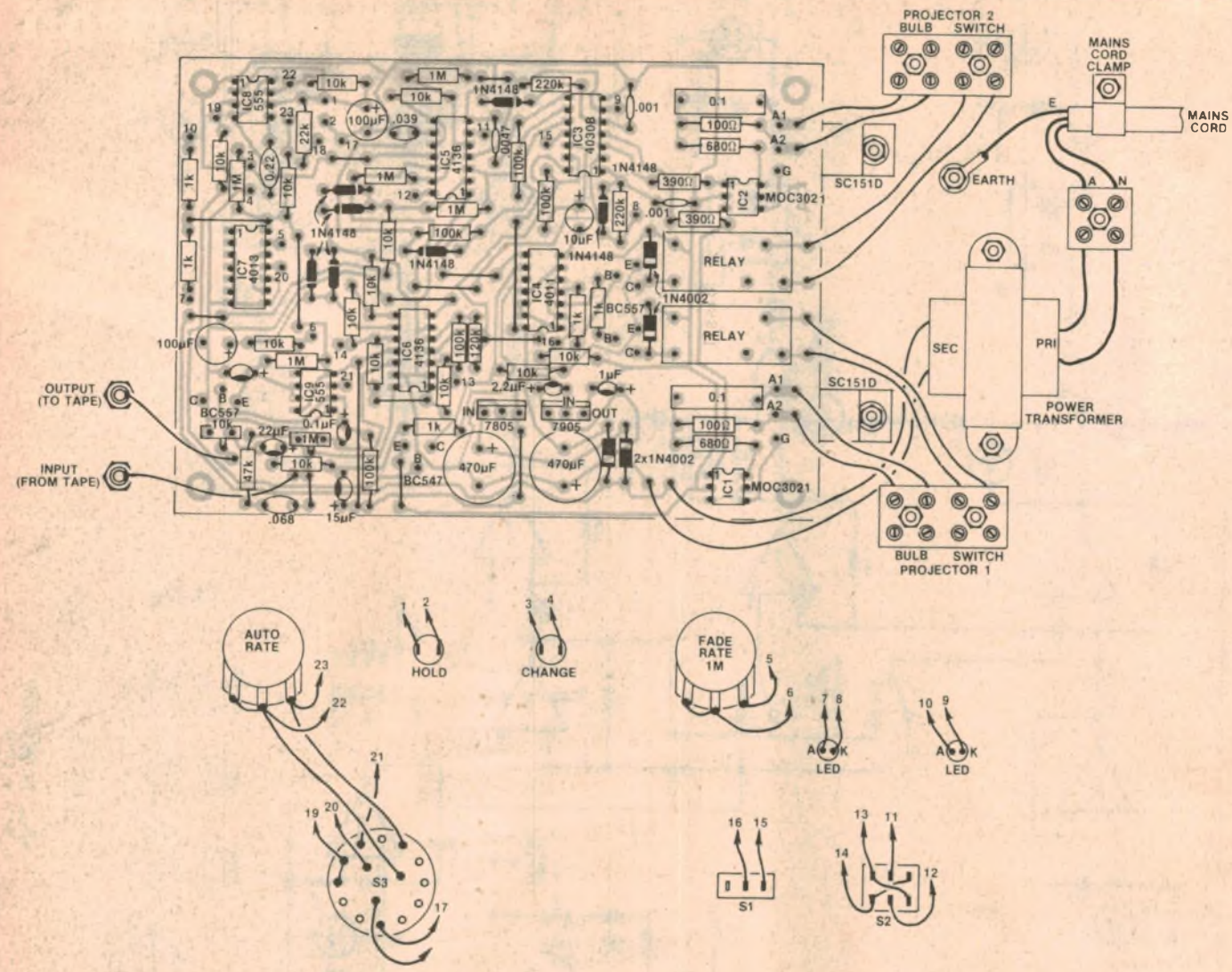


This diagram shows the waveforms at various points on the circuit at right.

Furthermore, if the capacitor were to continue charging or discharging to the supply rail then, when the Q output of IC7 subsequently changed state, we would have to wait until the capacitor reached the ±0.45V window voltage before any change in the ramp at the output of IC6c occurred. Consequently, we have clamped the capacitor voltage so that the ramp responds almost instantly to clock pulses to IC7 (the capacitor now only has to discharge


+10V
+5V
1M
10k
2x1N4148
IC5a
100k
IC3c
1N4148
.039
.0047
IC5c
IC5b
PROJECTOR 1 INDICATOR
IC3b
390Ω
IC1
680Ω
100Ω
SC151D
PROJECTOR 1
IN SERIES WITH PROJECTOR BULB
220k
.001
2851
240V AC
12.6V
1N4002
7805
7905
470 25VW
2.2 25VW
16VW
GND
CASE
S2a
S2b
PROJECTOR CHANGE OVER
PROJECTOR 2 INDICATOR
IC5d
IC3a
IC2
PROJECTOR 2
AUTO RATE 1M
S3b
IC8
BC547
IC4c
15 16VW
22 16VW
RECORD LEVEL 10k
OUTPUT (TO TAPE)
0.22
CHANGE
22k
100 16VW
HOLD
S3a
S3c
IC7
FADE RATE
IC6c
IC6a
IC6b
120k
IC4a
IC4d
BC557
PROJECTOR 1 TO ADVANCE SLIDE SWITCH
12V 180Ω RELAY
1N4002
IC3d
S1
SLIDE CHANGE DISABLE
IC4b
PROJECTOR 2 TO ADVANCE SLIDE SWITCH
S3 POSITIONS : 1 : TAPE
2 : AUTO
3 : MANUAL
IC1,IC2 : MOC3021
IC3 : 4030B,4070B
IC4 : 4011
IC5,IC6 : 4136
IC7 : 4013
IC8,IC9 : 555
PLAYBACK LEVEL
IC9
IC6d
.068
47k
INPUT (FROM TAPE)
VIEWED FROM BELOW
SC151D
A1
A2
G
*TANTALUM
SLIDE SHOW
2/PC/-

WIRING DIAGRAM



Follow this diagram when wiring up the Slide Show. Connections to the projector lamps must be run in mains-rated cable.

from 5.6V to 5.45V, or change from 4.4V to 4.55V).

The linear ramp obtained at the output of IC6c is shown as waveform E. This ramp is inverted with IC6a, a unity gain inverting amplifier, to give waveform F. Now we have two linear ramps, one rising and the other falling, which are transposed upon every clock pulse to IC7. The slope of these ramps, determined by the resistance of the 1MΩ Fade Rate control, is what controls the rate at which the projector lamps brighten or dim. A rising slope gives increasing light brightness and a falling ramp, a dimming light.

We estimate that the current cost of components for this project is

$80

This includes sales tax.

Just how bright the projector lamps are depends upon the voltage applied to each lamp. The trigger pulses which control the voltage to the lamps as the fade ramp rises or falls are derived by comparators IC5b and IC5d which compare waveforms E and F with the synchronising voltage D – ie one comparator compares the D signal with the rising ramp, the other compares the D signal with the falling ramp. When the D signal is more positive than the ramp, the output of a comparator is high; otherwise, its output is low.

Waveforms H and I depict the comparator outputs. Note that switch S2a,b transposes the ramps to the comparators and thus reverses control of the projectors.

The indicating LEDs are connected via 1kΩ current limiting resistors between the +10V rail and waveforms H and I. These waveforms, when averaged, provide a voltage which is representative of the brightness of each projector lamp. Since the LEDs are effectively run from a 100Hz supply, they give the impression of being continuously lit.

When the output of IC5b (waveform H) goes high, the .001µF capacitor on one input of XOR gate IC3b charges rapidly through the diode and no change to the output of IC3b occurs. When H subsequently goes low, the .001µF capacitor discharges via the 220kΩ resistor and the two inputs of IC3b are briefly at different logic levels. The result is a 220µs positive pulse on the output of IC3b – waveform J.

A similar process occurs to obtain waveform K. Note that as the E ramp falls, the J waveform pulses occur later with respect to the zero voltage crossing points and, as waveform F rises, the K waveform pulses approach the zero voltage points. Because waveforms J and K provide phase control for the Triac circuits, the voltage across the projector lamp increases for projector 2 and decreases for projector 1.

The way in which the trigger pulses actually fire the Triacs to provide voltage to

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Sansui

the projector lamps is as follows: the trigger pulses of J and K drive the internal LEDs of the opto-coupled Triac drivers, IC1 and IC2, via 390Ω resistors. The LEDs optically trigger silicon bilateral switches which, in turn, trigger the Triacs.

A 680Ω resistor in series with each Triac trigger limits the repetitive surge current to a safe value while a snubber network, consisting of a 100Ω resistor and 0.1μF capacitor, prevents false triggering due to fast rising voltages across the Triac. **If Slide Show is used with 240V projector lamps, the 680Ω and 100Ω resistors should be 1W types, while the 0.1μF capacitor should be mains rated at either 250V AC or 630V DC.**

The amount of power delivered to the projector lamps is thus controlled by "firing" the Triac at a set time or "firing angle" after the start of each mains half cycle. This is referred to as phase control and results in waveforms across the lamps as shown at the bottom of Fig. 1.

Slide Advance

The final waveform to discuss is the slide advance determining level, G. The F ramp is monitored by Schmitt trigger IC6b, which has a very large hysteresis level. The Schmitt trigger only switches state when the ramp is very close to the supply rails, within 0.05V to be exact. This large hysteresis ensures that the signal for the slide advance only occurs when a lamp is dim so that the slide change will not be noticed.

The slide change is activated by monitoring two signals: the positive pulse produced by XOR gate IC3d when G changes state, and the actual voltage level of G. The voltage level of G determines which slide is to change, in other words where the lamp is dim. This is decided by IC4a, IC4b and IC4d, which switch the correct relay.

When G changes state, a one second low pulse occurs at the output of either the IC4a or IC4b NAND gates. The pulse turns on a BC557 transistor which activates the relay.

The Slide Change Disable switch S1 inhibits relay operation – ie when the switch is open, no pulse is passed from IC3d and the relay driver transistors are held off. The diodes across the relay coils prevent inductive reverse EMF from destroying the transistors when the relays turn off.

Now for the remainder of the circuit. IC8, a 555 timer, is connected as an astable oscillator. The 100μF capacitor connected to pins 6 and 2 is charged via two 10kΩ resistors and the 1MΩ Auto Rate potentiometer up to 0.66 of the supply – ie 6.6V. During this charge time the output of IC8, pin 3, is high. Upon reaching this voltage, the output goes low, the capacitor is discharged to 0.33 of the supply and the cycle is repeated.

Several switchable modifications to the circuit alter the operation. First, the Change button brings pin 5, the threshold voltage, low for a brief period until the 0.22μF capacitor charges. This lowers the trigger point at which the 100μF capacitor will be discharged and so pin 3 immediately goes low. The Hold button discharges the 100μF capacitor and leaves a full charging period before the output goes low.

S3a and S3b respectively short out the Auto Rate potentiometer and connect a 22kΩ resistor across the 100μF timing capacitor when set to the manual mode. This prevents the capacitor voltage from reaching 0.66 of the supply voltage and so the output of IC8 remains high (unless the Change button is pressed to lower the threshold voltage). Actually, the capacitor voltage is held at about 5V, as set by the voltage divider formed by the two 10kΩ resistors and the 22kΩ resistor.

The output of IC8 drives a BC547 transistor via a 10kΩ resistor. At the collector of the transistor the signal is inverted, so pin 9 of NAND gate IC4c goes high when the output IC8 goes low. This gates through the 50Hz squared AC waveform B connected to the other input to give a 1s 50Hz tone each time pin 3 of IC8 goes low (ie at each cross-fade).

This 50Hz signal is filtered and AC-coupled to the tape recorder via a 22μF electrolytic capacitor. A 10kΩ Record Level trimpot is used to adjust the signal level to the tape recorder.

On playback, the recorded signal is fed to the inverting input of IC6d and amplified. The output from IC6d is adjusted by means of the 1MΩ Playback Level trimpot and coupled to missing pulse detector IC9. IC9, a 555 timer wired as a monostable, is triggered each time a low signal is applied to pin 2. At the same time, the 1μF timing capacitor is discharged by the BC557 transistor, so the pin 3 output remains high until the time between pulses is longer than the monostable time period (about 1s).

As a result, the output of IC9 is low

PARTS LIST

1 printed circuit board, 81ss11, 96 x 135mm
1 Scotchal front panel label, 204 x 114mm
1 2851 transformer, 12.5 volts at 150mA
2 SPDT 12V DC 180Ω relays with 1A contacts
1 3P3P rotary switch
1 SPDT switch
1 DPDT switch
2 momentary contact pushbutton switches
3 knobs
2 1MΩ linear potentiometers
2 RCA panel sockets
1 diecast aluminium case, 190 x 60 x 110mm
1 mains cord and plug
3 grommets
1 cable clamp
4 10mm brass standoffs
1 10-way mains terminal strip
1 earth lug
4 rubber feet

SEMICONDUCTORS
2 MOC3020 optically-coupled Triac drivers
1 4030B, 4070B quad exclusive OR gate
1 4011 quad NAND gate
1 4013 dual D flipflop
2 4136 quad operational amplifiers
2 555 timers
1 BC547 NPN transistor
3 BC557 PNP transistors
1 7805 three-terminal regulator
1 7905 three-terminal regulator
4 1N4002 1A 100V PIV silicon diodes
7 1N4148 small signal silicon diodes
2 red LEDs
2 SC151D 15A Triacs

CAPACITORS
2 470μF/25VW PC electrolytic
2 100μF/16VW PC electrolytic
1 22μF/16VW tantalum
1 15μF/16VW tantalum
1 10μF/16VW PC electrolytic
1 2.2μF/25VW tantalum
2 1μF/16VW tantalum
1 0.22μF metallised polyester
2 0.1μF metallised polyester
1 0.1μF/16VW tantalum
1 .068μF metallised polyester
1 .039μF metallised polyester
1 .0047μF metallised polyester
2 .001μF metallised polyester

RESISTORS (¼ or ½W, 5%)
5 x 1MΩ, 2 x 220kΩ, 1 x 120kΩ, 6 x 100kΩ, 1 x 47kΩ, 1 x 22kΩ, 12 x 10kΩ, 5 x 1kΩ, 2 x 680Ω, 2 x 390Ω, 2 x 100Ω
1 x 1MΩ 5mm vertical trimpot
1 x 10kΩ 5mm vertical trimpot

MISCELLANEOUS
PC pins, 1 metre rainbow cable, 240V AC rated double-sheathed hook-up wire, machine screws and nuts, solder.

NOTE: Components specified are those used in the prototype. Components with higher ratings may generally be used provided they are physically compatible.

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2716	$5.90	100 4116 at	$170.00
2708	$5.90	100 BC548 at	$9.00
4116	$1.95	100 Red Leds at	$9.00

DIP SWITCHES SPST		
P/N	No. Switches	Price
SD3	3	1.60
SD4	4	1.70
SD5	5	1.90
SD6	6	2.30
SD7	7	2.40
SD8	8	2.50
SD9	9	2.70
SD10	10	3.00

WIRE WRAP 3-LEVEL		
	1-9	10-25
8 Pin	.90	.82
14 Pin	1.10	1.00
16 Pin	1.20	1.70
18 Pin	1.50	1.40
20 Pin	1.80	1.60
22 Pin	1.90	1.70
24 Pin	2.00	1.80
28 Pin	2.20	2.10
36 Pin	2.60	2.40
40 Pin	2.90	2.70

COMPUTER GRADE ELECTRO		
2900uf	40V	6.50
6800uf	16V	6.40
10,000uf	16V	9.00
10,000uf	25V	9.50
10,000uf	40V	11.90
15,000uf	40V	12.00
2,000uf	25V	12.90
2,000uf	40V	23.00
7,000uf	35V	23.50
33,000uf	16V	23.50
68,000uf	16V	21.50
100,000uf	10V	28.50

MULTISTRAND RIBBON CABLE Price per metre		
	1-9	10+
10 Way	.70	.60
12 Way	.75	.65
16 Way	1.00	.90
20 Way	1.35	1.25
40 Way	2.70	2.50

CMOS	
4000	.40
4001A	.40
4001B	.40
4002	.50
4006	1.10
4007	.50
4008	1.00
4009	.80
4010	.50
4011	.40
4012	.50
4013	.80
4014	1.70
4015	.90
4016	.70
4017	1.50
4018	1.50
4019	.60
4020	1.20
4021	1.10
4022	1.05
4023	.70
4024	1.00
4025	.50
4026	2.20
4027	.60
4028	.90
4029	1.20
4030	.60
4031	2.20
4034	3.00
4035	1.30
4039	.70
4040	1.70
4041	1.05
4042	.70
4043	.70
4044	.70
4046	1.20
4047	1.20
4048	.60
4049	.60
4050	.60
4051	1.00
4052	.80
4053	.80
4060	2.00
4066	.80
4068	.60
4069	.70
4070	.50
4071	.80
4072	.50
4073	.60
4075	.60
4076	1.20
4077	.50
4078	.60
4081	.60
4082	.60
4089	1.00
4093	.80
4503	.60
4510	1.50
4511	1.50
4512	1.10
4514	2.50
4516	1.40
4518	1.50
4519	.55
4520	1.60
4522	1.25
4527	1.20
4528	1.25
4529	1.60
4539	1.60
4541	1.60
4543	2.00
4553	5.50
4555	1.00
40097	.95
40098	.95
40175	1.00
74C SERIES	
74C100	.40
74C02	.40
74C04	.40
74C08	.40
74C10	.40
74C14	.90
74C20	.40
74C30	.40
74C32	.40
74C42	1.10
74C48	1.55
74C73	.75
74C74	.70
74C76	.75
74C83	1.40
74C85	1.20
74C86	.80
74C90	.80
74C93	1.40
74C95	.95
74C107	.70
74C150	3.40
74C151	1.00
74C160	.90
74C192	.90
74C164	1.10
74C173	1.00
74C174	.80
74C175	1.00
74C192	1.20
74C195	1.00
74C221	1.90
74C373	1.80
74C374	2.00
74C901	.90
74C902	.90
74C905	11.20
74C906	.90
74C907	.80
74C915	1.50
74C922	3.80
74C923	5.00
74C925	5.50
74C926	5.90
74C927	5.90
74C932	5.50
80C SERIES	
MM80C95	.90
80C96	.90
MM80297	.90
80C98	.90
LINEAR	
LH0002	9.50
LH0022CD	16.60
LH0042CH	8.60
LH0070	12.70
LH0071	12.70
TL071	1.00
TL072	1.50
TL082	1.50
SAK140	2.20
UAA170	3.50
UAA180	3.50
TCA220	2.20
LM301	.50
LM301-H	.50
LM304-H	1.70
LM305-H	.80
LM307-CN	.40
LM307-H	.90
LM308	.70
LM308-H	1.20
LM310-N	2.20
LM310-H	2.60
311	.60
LM311	.60
LM311-H	1.20
LM318	2.80
LM322	3.90
LM324	1.20
LM325	3.10
LM329-DZ	1.40
LM334-Z	1.30
LM335	12.40
LM336-Z	3.20
LM339	.90
LM348	1.10
LM349	1.80
LF351-N	.70
LF356-AN	1.10
LF357	1.10
LM358	.70
LM373	4.10
LM374	5.40
LM376	.70
LM377	2.90
LM379	5.70
LM308 8PIN	1.30
LM380 14PIN	1.50
LM318A-N	2.40
LM318N	1.80
LM382N	2.00
LM383	2.70
LM384	2.40
LM386	1.00
LM387	1.30
LM391	1.80
LM393	.80
LF398	5.00
8038	6.00
NE530	1.10
OM350	9.90
555	.40
556	1.10
LM565	1.30
LM565CH	2.00
NE566	2.50
LM567	1.50
NE571	6.50
LM709 14PIN	.70
UA710CA	.60
LM710-CH	.90
711	.80
UA711-H	.85
UA716HC	6.25
723	.50
LM723CH	1.10
LM725	3.90
LM733	1.20
UA739	2.00
741	.25
LM741-H	1.20
UA747	1.00
UA747HC	2.20
UA748	.50
UA748HC	1.25
UA753	1.80
UA760HC	4.10
UA777	2.40
UA777HC	2.65
9334	1.70
UA743	1.80
UA760HC	4.10
UA796HC	1.70
LM802	1.10
LM1310N	2.40
1408	4.90
LM1458	.60
UA1488	1.50
UA1489	1.50
MC1495	7.30
MC1496L	11.40
LM1558	1.50
LM1596	1.40
LM1380	3.10
LM2902	1.40
LM2917 8PIN	2.80
LM2917	3.10
CA3028	1.80
LM3039	.90
CA3046	1.70
3065	.45
LM3080	1.20
LM3089	3.90
CA3130T	1.40
CA3130E	1.80
CA3140	1.40
3401	.70
3611	1.10
LM3900	.90
LM3909	1.00
LM3914N	3.90
4136	1.40
LM4250	1.75
UA4558TC	1.40
MM5837	2.50
LM7555	1.80
Mc10116L	.95
LF13741	.60
LF1374-1H	.70
DS75452	.60
76477	4.90
75451	.60
75491	1.40
75492	1.40
TTL (s)	
74S00	.80
74S02	.80
74S04	.80
74S10	.75
74S11	.75
74S32	.75
75S51	.75
74S74	1.20
74S86	1.40
74S112	1.20
74S135	2.20
74S138	3.20
74S157	2.95
74S158	2.95
74S182	3.30
7400 SERIES	
7400	.40
7401	.40
7402	.40
7403	.40
7404	.40
7405	.50
7406	.50
7407	.50
7408	.40
7409	.40
7410	.40
7411	.40
7412	.40
7413	.50
7414	.70
7416	.50
7417	.60
7420	.40
7421	.40
7423	.50
7425	.45
7426	.40
7427	.40
7430	.40
7432	.40
7437	.40
7438	.50
7440	.50
7441	1.00
7442	.50
7443	1.40
7444	1.20
7445	1.10
7446	1.00
7447	1.00
7448	1.00
7450	.50
7451	.50
7453	.40
8T26	2.20
9300	.60
9307	1.80
9308	1.20
7454	.60
7472	.60
7473	.60
7474	.60
7475	.60
7476	.60
7480	.65
7482	1.80
7483	.80
7485	.80
7486	.60
7489	2.60
7490	.70
7491	.55
7492	.60
7493	.60
7494	.90
7495	.45
7496	.80
7497	2.50
74107	.80
74109	.60
74116	2.20
74121	.45
74122	.65
74123	.60
74125	.55
74126	.60
74132	.80
74141	1.10
74145	.85
74147	2.00
74148	1.40
74150	1.20
74151	.60
74152	4.90
74153	.70
74154	1.20
74155	.90
8T28	1.60
9310	.65
9311	1.00
9312	1.35
74156	1.50
74157	.60
74161	1.00
74162	1.00
74163	.85
74164	.60
74165	.60
74174	.50
74175	.90
74176	1.10
74177	1.10
74180	.90
74181	2.30
74182	.90
74184	1.20
74185	1.20
74190	1.00
74191	1.50
74192	1.70
74193	.80
74194	1.10
74195	.65
74196	.85
74197	1.10
74198	1.10
74199	1.30
74221	.90
74290	.90
73293	.90
74365	.80
74366	.80
74367	1.00
74368	1.00
8T96	1.80
9314	1.30
9368	1.75
9370	2.00
74LS SERIES	
74LS00	.40
74LS01	.40
74LS02	.40
74LS03	.40
74LS05	.40
74LS08	.40
74LS09	.40
74LS10	.40
74LS11	.40
74LS13	.50
74LS14	.90
74LS15	.40
74LS20	.40
74LS21	.40
74LS22	.40
74LS26	.40
74LS28	.40
74LS30	.40
74LS32	.40
74LS33	.40
74LS37	.50
74LS38	.50
74LS40	.50
74LS42	.75
74LS47	.85
74LS48	1.00
74LS49	1.00
74LS51	.40
74LS54	.50
74LS55	.55
74LS58	.65
74LS73	.55
74LS74	.60
74LS75	.45
74LS76	.50
74LS78	.50
74LS83	1.00
74LS85	1.00
74LS86	.50
74LS90	.70
74LS92	.90
74LS93	.80
74LS95	.65
74LS96	1.55
74LS107	.60
74LS109	.60
74LS112	.60
74LS113	.65
74LS114	.50
74LS122	.50
74LS123	.75
74LS125	.50
74LS126	.70
74LS132	.80
74LS133	.50
74LS136	.50
74LS138	1.20
74LS139	.85
74LS151	.75
74LS153	.60
74LS154	1.50
74LS155	1.00
74LS156	1.00
74LS157	.90
74LS158	.70
74LS160	.85
74LS161	.85
74LS162	1.00
74LS163	.85
74LS164	1.30
74LS165	.50
74LS168	1.90
74LS169	1.90
74LS170	2.80
74LS173	.90
74LS174	.90
74LS175	.90
74LS181	2.50
74LS189	3.80
74LS190	1.30
74LS191	1.10
74LS192	.85
74LS193	.85
74LS194	.70
74LS195	.80
74LS196	1.25
74LS197	1.00
74LS221	1.10
74LS245	2.35
74LS247	.90
74LS249	1.30
74LS251	.80
74LS253	.90
74LS257	.65
74LS258	.50
74LS259	2.45
74LS260	.90
74LS266	.90
74LS273	1.60
74LS279	.65
74LS283	1.15
74LS290	1.10
74LS293	1.15
74LS295	1.60
74LS298	1.00
74LS352	1.30
74LS353	1.30
74LS365	.50
74LS366	.70
74LS367	.90
74LS368	.90
74LS373	1.50
74LS374	1.70
74LS386	.50
74LS670	2.70
81LS95	2.10
95H90	11.50
11C90	19.50
81LS96	2.10
81LS97	2.10

TRANSISTORS	
2N301	2.20
2N657	.60
2N930	.60
2N1613	1.10
2N1711	.50
2N1893	1.00
2N2219A	.60
PN2222	.20
2N2222	.30
2N2463	.35
2N2484	.65
2N2646	.70
2N2647	1.10
2N2894	.80
2N2904	.45
2N2905	.40
2N2906	.45
2N2913	1.20
PN2907	.30
2N3053	.60
2N3054	.90
2N3055	.90
2N3301	.40
2N3440	1.10
2N3502	.70
2N3503	.70
2N3563	.30
2N3564	.30
2N3569	.30
PN3565	.30
PN3566	.30
PN3567	.30
2N3568	.30
2N3638	.30
2N3639	.30
2N3640	.30
2N3641	.30
2N3645	.30
PN3642	.30
PN3643	.30
PN3644	.30
2N3646	.30
2N3692	.50
2N3693	.35
2N3702	.30
PN3694	.30
2N3704	.30
2N3709	.30
2N3713	2.20
2N3819	.80
2N3866	2.00
2N3904	.30
2N3906	.30
2N4030	1.10
2N4032	.55
2N4033	.90
2N4036	1.00
2N4037	.90
PN4121	.30
2N4233	1.60
2N4235	1.90
2N4236	2.20
2N4248	.30
PN4249	.30
2N4250	.30
2N4258	.30
2N4292	.70
2N4354	.30
2N4355	.30
2N4356	.30
2N4398	5.00
2N4401	.50
2N4402	.50
2N4403	.50
2N4416	1.00
2N4906	2.80
PN4868	.30
2N5088	.30
2N5089	.30
2N5179	1.90
2N5303	3.30
2N5320	.80
2N5401	.30
2N5458	.70
2N5459	.70
2N5461	.70
2N5484	.70
2N5485	.70
2N5486	.70
2N5769	.30
2N5770	.25
2N5830	.25
2N5831	.30
2N5856	.30
2N5873	1.10
2N5874	1.40
2N5961	.30
2N5963	1.10
2N6027	.60
3N201	.90
AC127	.70
AC128	.70
AC187	.70
AC188	.70
AD149	2.50
AD161	1.70
AD162	1.70
BC318	.30
BC319	.18
BC327	.15
BC328	.30
BC337	.30
BC338	.30
BC547	.15
BC548	.15
BC549	.15
BC549C	.40
BC557	.16
BC558	.16
BC559	.16
BC637	.25
BC638	.36
BC639	.40
BC640	.40
BCY70	.85
BCY71	.85
BD115	1.50
BD135	.78
BD136	.70
BD137	.70
BD138	.70
BD139	.70
BD140	.70
BD235	.65
BD234	.50
BD237	.50
BD262	1.20
BD301	.75
BD302	.75
BD263	1.25
BD435	.75
BD646	1.70
BD647	1.80
BD675	.80
BDV64B	4.50
BDV65B	4.50
BF115	.50
BF173	.70
BF180	.70
BF195	.30
BF198	.30
BF199	.30
BF336	.80
BF337	.80
BF458	.90
BF494	.40
BFX85	.75
BFY50	.90
BFY90	1.30
BSV17	1.00
BU126	3.00
BU208	3.00
BUX80	7.90
FT2955	1.40
FT3055	.75
MEL12	.90
BU326A	3.40
MJ2955	1.00
MJ4032	7.40
MJ802	3.40
MJ4035	6.90
MJ4502	3.70
MJE340	1.20
MJE350	1.70
MJE295	1.90
MJE8055	1.90
MJE3521	.60
MJ15003	4.00
MJ15004	4.00
OF102	.60
MPF131	1.40
MPSA05	.60
MPSA06	.60
MPSA12	.60
MPSA14	.60
MPSA42	.60
MPSA56	.80
MPSA92	.60
MRF475	4.40
TT31B	.90
TI3PIC	1.00
TIP32B	.90
TIP32C	1.00
TIP33A	1.10
TIP34A	1.20
TIP24B	1.50
TIP42B	1.10
TIP110	1.30
TIP120	1.30
TIP2955	1.20
TIP3055	1.20
VN88AF	2.50

MICRO CHIPS	
ADCO 800	12.00
DACO 080	2.00
2012 200 NS	2.00
2102 350 NS	2.00
2102 450 NS	1.40
2102 650 NS	1.40
2111	8.60
2114 150 NS	11.15
2114 300 NS	3.90
2114 450 NS	3.50
8-31	3.30
32 up	3.10
2513	14.50
2516	55.00
2532	69.00
2650	23.00
2708	8.50
2716	12.00
4116	5.50
5101	9.00
MM5204	12.50
MM5220	7.20
MM5307	18.00
MM5309	6.50
MM5312	8.50
MM5369	2.80
5387	8.50
MM5395	8.50
6502	10.50
6508	5.50
6520	5.50
6522	10.00
6523	17.00
6551	17.00
MC6900P	9.00
MC6802	13.60
MC6808	12.50
6810A	4.90
6820	5.50
6821	6.00
6850	5.15
6852	6.40
7106	12.60
7107	15.00
7210	13.20
Z80 CPU	14.00
Z80A CPU	16.00
Z80 P10	13.80
Z80A P10	16.50
Z80 CTC	13.80
Z80A CTC	16.50
Z80 DMA	40.70
Z80 S10/0	56.90
Z80 S10/1	56.90
Z80 S10/2	56.90
Z80A S10/0	63.00
Z80A S10/1	63.00
Z80A S10/2	63.00
8035	27.00
INS8050	15.00
INS8080	8.00
P8085	25.00
8155	22.00
8165	22.00
8205	5.00
P8212	4.00
8214	8.00
8216	5.90
8224N	5.50
8224	7.50
8226	5.90
8228	9.50
8238	8.00
8243	8.00
8251	14.00
INS8251	8.50
8253	19.50
8255A	8.60
8257	99.00
8259	99.00
8275	99.00
8278	99.00
8295	25.00
DM8578	3.50
Ay-5-2376	19.50
MM5104N	10.00
MM5106N	10.00
MM57160	7.50
8748A	99.00
8755A	99.00
MCT2	.80
MCT6	3.30
MCT275	1.50
MCC671	3.00
4N28	.85
4N33	1.20
4N26	.85
MM80C95	.90
80C96	.90
MM80C97	.90
8098	.90

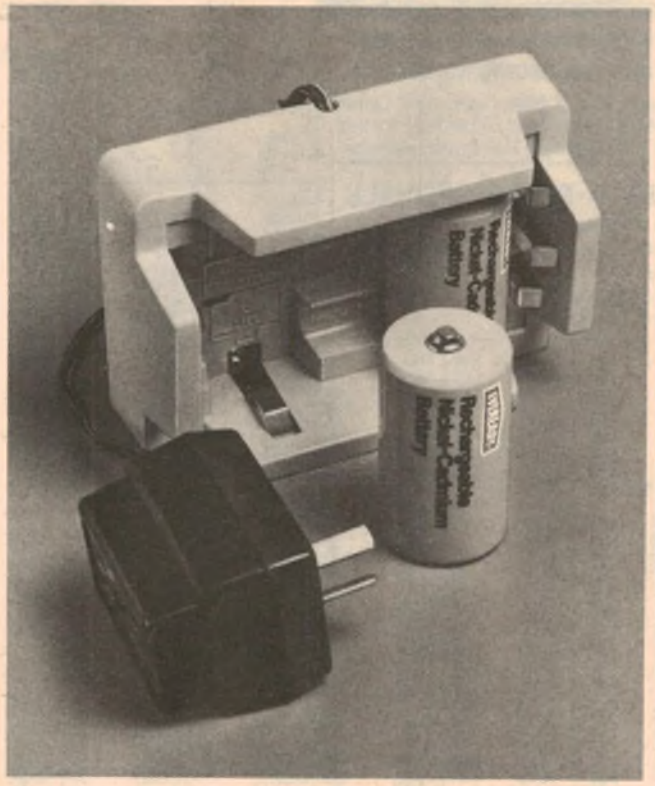
OPTOCOUPLERS	
MCT2	1.00
MCT6	3.30
MC275	1.50
MCC671	3.00
4N28	1.80
4N33	1.20
4N26	1.00

VOLTAGE REGULATORS	
78L05	.40
LM341P-5	.80
7805	1.00
7905	1.70
LM309K	1.20
7805K	2.10
LM323-K	6.90
78H05KC	8.50
LM341p-8	.80
78L12CP	.40
79L12	.65
LM341P12	.75
7812	1.00
7912	1.90
7812KC	2.15
7912KC	2.80
79H12KC	8.00
78L15	.35
79L15	.65
LM341P15	.80
7815	1.00
7915CT	1.80
7915KC	2.80
78H15KC	8.50
78L18	.35
7818	1.40
78L24	.35
79L24	.65
7824	1.10
LM371T	2.40
LM337T	3.80
LM317K	4.50
LM337K	5.90
LM350K	8.40
78HGKC	10.50
78P05	18.50

BRIDGES	
VM48	1.50
W02	.80
W04	.80
KHPC02	2.00
KBP602	2.50
KBP604	2.80
KBP606	2.80
KHPC1002	2.80
KBPC1004	3.20
KBPC1006	3.20
MDA3501	3.20
MDA3502	3.20
MDA3504	3.40

DISPLAYS	
MAN2A	6.30
MAN72A	2.20
MAN74A	2.20
MAN52A	3.40
MAN82A	3.40
MAN84A	3.40
MAN6740	3.60
MAN8610	3.30
MAN8640	3.30
TIL306	12.90
DL704	2.20
DL707	2.30
DL747	3.40
DL750	4.00
FND357	1.80
FND500	1.80
FND507	1.80

Plug into 'Eveready' rechargeables.



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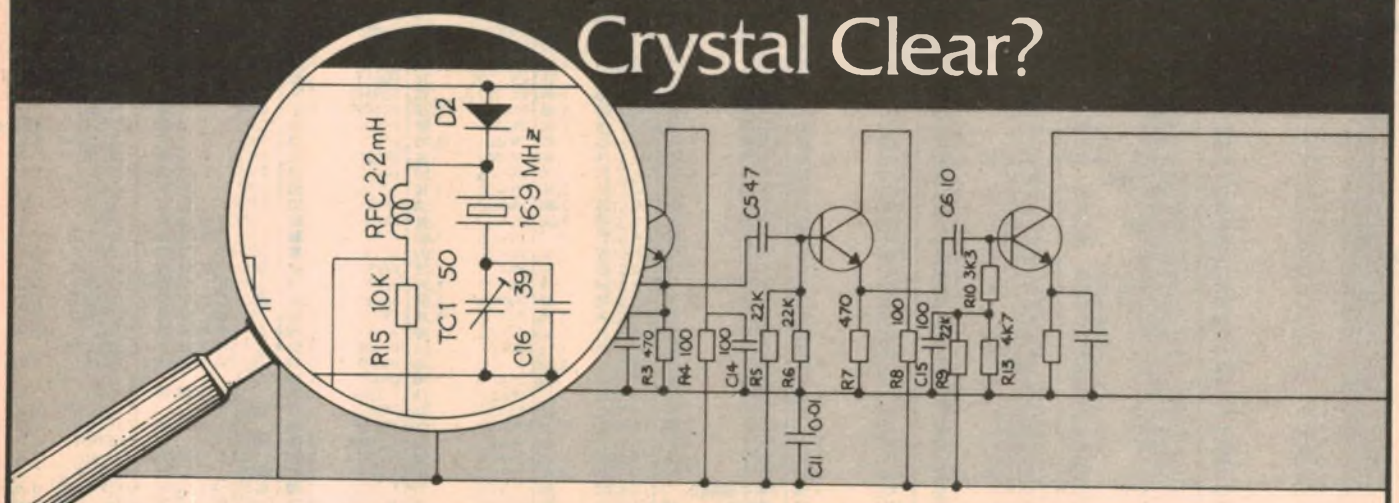

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when no signal is present at the input (from tape), and goes high for 1s each time a 50Hz tone appears. The signal can then be used to clock flipflop IC7 to initiate a cross-fade. Switch S3c selects either the tape, automatic or manual modes of operation.

Power for the unit is obtained from a single voltage doubler consisting of a 12.6V transformer, two 1N4002 rectifier diodes and two 470μF filter capacitors. This is followed by a 7805 positive 5V regulator and a 7905 negative 5V regulator to generate the +5V and +10V supply rails.

Construction

Despite the number of circuit elements, construction is really very simple. Most of the components are mounted on a printed circuit board (PCB) measuring 96 x 135mm and coded 81ss11. The board, along with the various controls, is mounted in a metal diecast case (190 x 60 x 110mm) fitted with a Scotchcal front panel.

Start with the PCB assembly. Use the component overlay diagram as a guide to mounting the components and pay particular attention to the orientation of polarised components (diodes, regulators, ICs, Triacs, LEDs, electrolytic capacitors and the transistor). Observe the usual precautions when soldering the CMOS ICs (IC3, 4, 7): don't handle the pins; connect the barrel of your soldering iron to the earth track on the PCB; solder the power supply pins (7 & 14) first to enable the internal protection diodes.

The Triacs are mounted on the copper side of the PCB and their leads bent so that the metal heatsink tabs can later be bolted (with mica washer insulators) to the base of the case. PC stakes are recommended for all external connections, as they enable to PCB to be mounted before the external wiring is commenced.

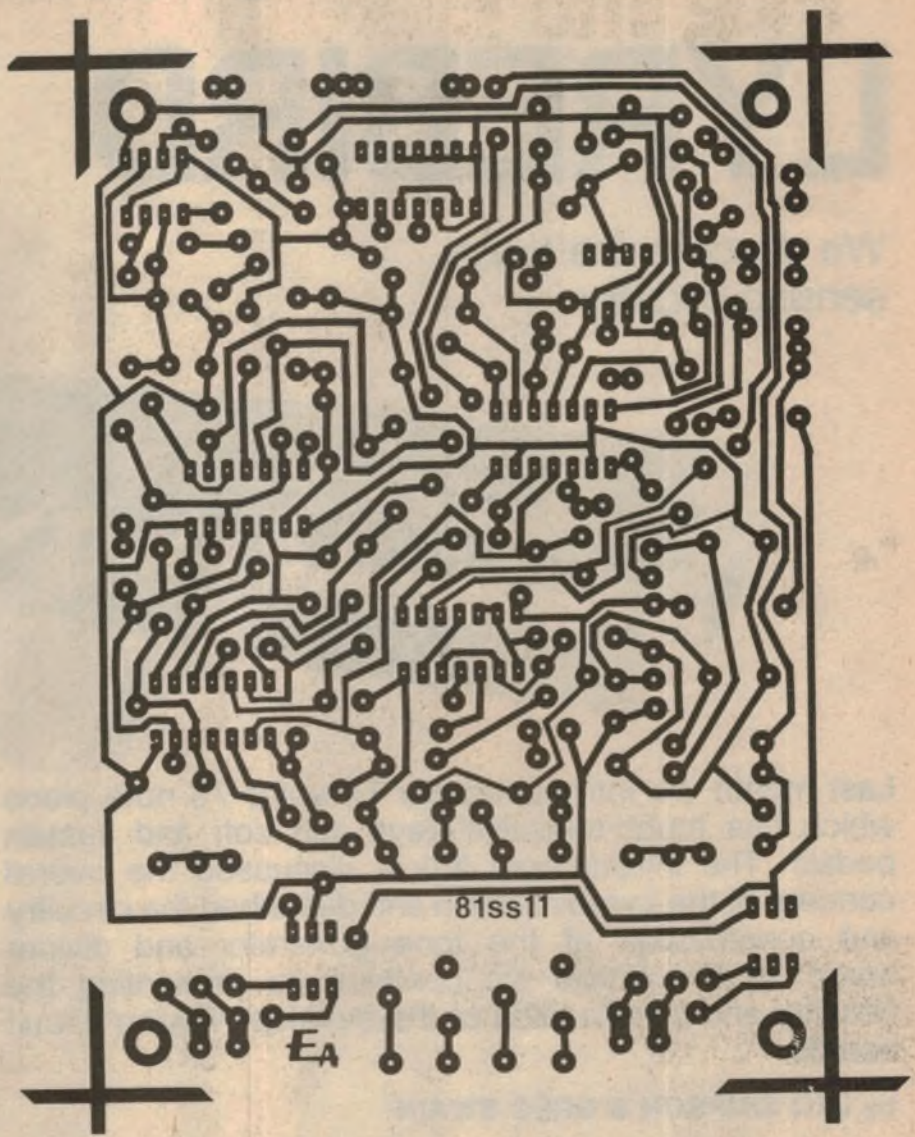
When the PCB is complete, go over your work carefully. Make sure that all components are correctly positioned and oriented, and look for solder bridges, dry joints etc.

Temporarily position the various components inside the case and mark and drill holes for the PCB, Triacs, mains cord grommet, earth lug, cord clamp, the transformer, the three mains terminal strips, and the tape output and input sockets. You will also have to drill two (or more) holes through which to run leads to the projector.

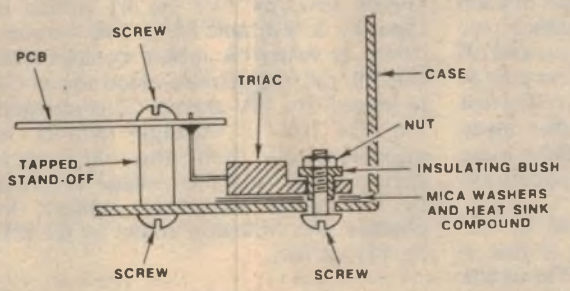
Deburr all holes with a large drill. The Triac mounting holes in particular must be free of any rough edges or swarf.

The PCB and Triacs are now to be bolted in position. It is absolutely essential that an insulating bush and mica washer be used to isolate each Triac from the metal case (see diagram).

ACTUAL-SIZE PC PATTERN



Actual-size PC artwork. Finished PCBs and "Scotchcal" aluminium front panels are available from the usual retail outlets.



This diagram shows the Triac mounting details. Note that the Triac must be fully insulated from the case.

Smear heatsink compound on the surfaces of the Triacs, mica washers and the case and then bolt the Triacs to the case using machine screws and nuts. Finally, use a multimeter to check that the Triacs are indeed isolated from the case.

The PCB is mounted using 10mm brass spacers which provide earthing for the 0V rail. If plastic spacers are used, the 0V rail will have to be earthed separately.

Next, drill holes in the lid of the case using the Scotchcal artwork as a guide. Before mounting the panel, apply a coating of hard-setting clear lacquer to prevent scratching. The panel can now be glued in position, the controls mounted and the front-panel wiring completed.

Tie up all wiring with cable ties to keep the front panel wiring away from the mains voltages at the Triac end of the case.

continued on page 139

Part two of this exciting electronic piano series

LYREBIRD

We describe the touch sensing circuitry

Last month we introduced our Lyrebird 73-note piano which has touch-sensitive keys and soft and sustain pedals. The introductory article discussed the overall concept of the Lyrebird piano and described the circuitry and construction of the tone generator and divider board. In this article we continue by presenting the circuitry and construction of the envelope keying circuit boards.

by LEO SIMPSON & GREG SWAIN

Since the Lyrebird has 73 notes, it has 73 individual sets of contacts which control the keying and envelope of each note. By "keying", in this instance, we mean turning the note source on and off and by "envelope" we mean the way in which the note rises suddenly when first struck (the attack) and then dies away rapidly or slowly (the decay), depending on whether the soft or sustain pedals are used.

The most interesting feature of the keying and envelope circuitry is that it actually responds to the speed at which the individual key is depressed and thus controls the loudness of each note. The mechanism of this action is described below. Refer to Fig. 1.

Each key controls a single-pole single-throw switch, Sk, which is normally connected to earth when the key is not being pressed. When the player presses the key down, the moving contact of the switch takes a finite time between breaking contact on one side and making contact on the other side, to the +30V rail.

It is during this time between breaking and making contact that C1 begins to charge towards +VT via R1 (which is typically 3.3kΩ) and R5, a 56Ω resistor. Then, as switch Sk makes contact with the 30V rail, the positive electrode of C1 is "raised" by 30V and so C2 is charged via D1 to a voltage which is approximately half the difference between 30V and the voltage reached by C1 before Sk made contact. In practice, the voltage reached by C1 will be 14V or less.

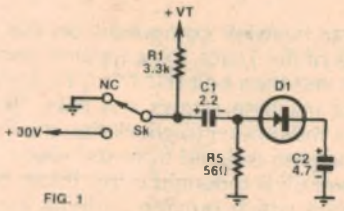


FIG. 1

Thus the charge received by C2 when Sk makes contact is inversely proportional to the time taken for the key to be fully depressed. The voltage on C2 then controls the initial amplitude of the signal fed to the voicing filters. It does this via R6, R7, D4, D5 and the two diodes providing each key output on the divider board described last month. This is shown in Fig. 2.

Remember that last month we stated that these pairs of "diodes and the envelope keying circuit actually form an AND gate for each key". Well it is actually R6 and the two diodes just mentioned that form the AND gate. Current flows from C2 via R6 and R7. When the respective Q outputs on the divider chip are low, the two associated diodes are forward-biased and the junction of R6 and R7 is pulled low. Similarly, when the respective Q outputs are high, the diodes will not conduct and the junction of R6 and R7 will be high.

From the foregoing, it follows that the higher the voltage on C2, the greater the amplitude of the signal fed to the voicing

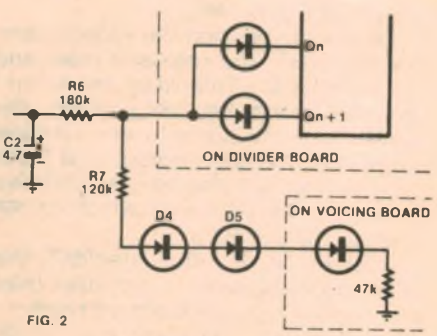


FIG. 2

board via diodes D4 and D5. These two diodes merely provide isolation between the individual keying circuits which feed into common voicing inputs.

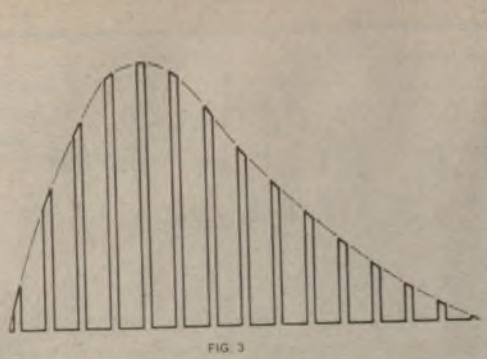


FIG. 3

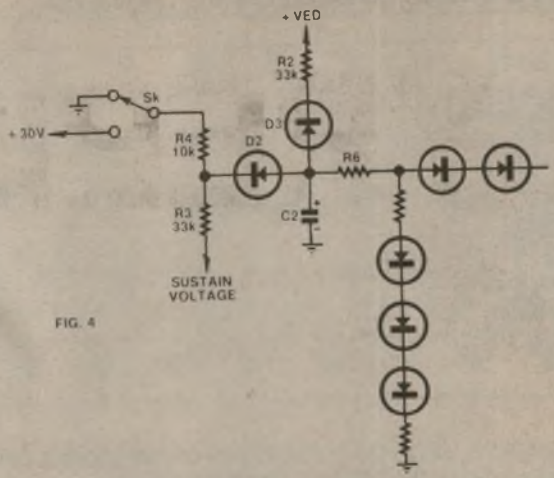


FIG. 4

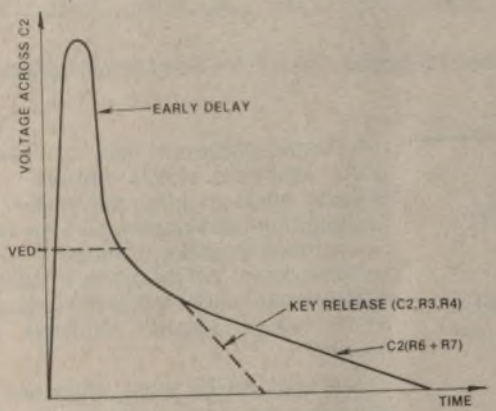


FIG. 5

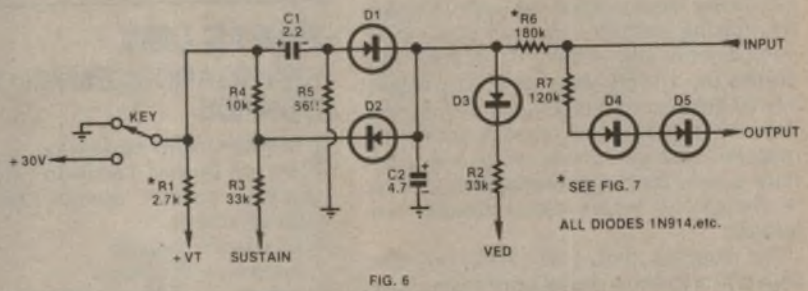


FIG. 6

Well so far we have seen that the circuit consisting of R1, R5, D1, C1 and C2 actually responds to the time taken for a key to be fully depressed and thus provides a voltage which controls the amplitude of the signal. Now we can discuss how the signal amplitude is made to decay. Fig. 3 shows how the signal fed to the voicing board rises and decays.

There are three ways in which the decay of the voltage across C2 is determined. They involve D3 and R2, D2, R3 and R4, and R6 and R7. This is depicted in Fig. 4. When the switch Sk makes contact with the 30V rail, C1 delivers its charge to C2. As soon as this current ceases to flow through C1 and D1, C2 starts to discharge via R2 and D3 to a preset voltage level labelled "VED", regardless of whether the key is held down or not.

"VED" is the "early decay" voltage which determines the percussive nature of the Lyrebird when keys are played in staccato fashion. When C2 discharges down to the VED level, it then continues to decay at a rate determined by R6 and R7, provided the key is still held depressed. While Sk is still connected to +30V, D2 is held in the reverse-biased condition so R3 and R4 cannot augment the discharge of C2.

If the key is released, C2 continues to discharge via D2 and the parallel paths provided by R3 (to the sustain voltage which is normally 0V) and R4 to 0V via Sk. On the other hand, if the sustain pedal is pressed, D2 is reverse-biased by D2, preventing discharge of C2 via this path and so the longer decay time set by R6 and R7 prevails.

The various waveforms generated by the discharge mechanisms described above are illustrated in Fig. 5 while the complete circuit is shown in Fig. 6. This circuitry is duplicated 73 times across the five envelope boards with R6 varying from 82kΩ to 270kΩ to give decay times from two seconds to about 6½ seconds.

(Some readers may be aware of the AY-1-1320 IC made by General Instrument Microelectronics for their electronic piano circuit. This IC performs the same function as the discrete circuitry we have just described, but does it for twelve notes, albeit with four external components per note. The Lyrebird circuit has the considerable advantage of using cheap and readily available components.)

CONSTRUCTION

As supplied for the Lyrebird, there are four envelope boards which accommodate 18 envelope circuits and one board which accommodates three circuits. One board will have to be trimmed so that it accommodates 16 circuits. This will accommodate the circuitry for notes one to 16 while the small three-way board accommodates the circuitry for notes 71, 72 and 73.

R1 and R6 vary across the five boards, as shown in Fig. 7. Note that the transition of the values of R1 and R6 takes place in the approximate middle of each of the four large boards.

Quite a lot of work is involved in the assembly of each 18-note board. It involves the installation of 18 links, 26 PC pins, 36 capacitors, 72 diodes and 126 resistors. Multiply that to give the total for all five boards and you have an

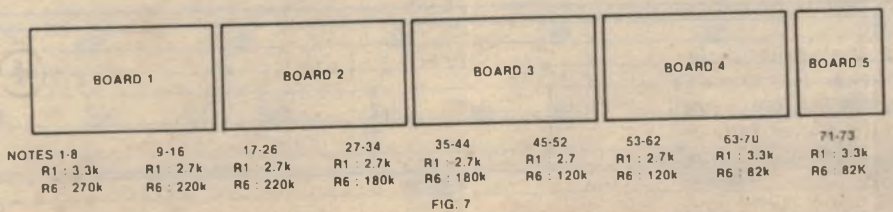


FIG. 7

This diagram shows how the values of R1 and R6 vary across the five envelope boards. R6 determines the decay time of each note.

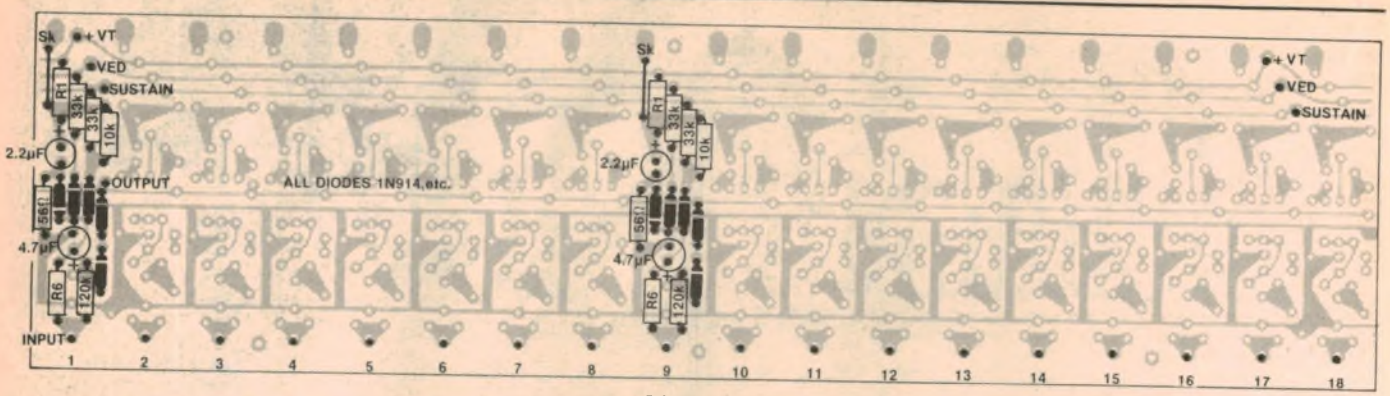


FIG. 8

For simplicity, only two of the 18 sets of components are shown on this envelope PC board. The VT, VED and Sustain points are linked across to the adjacent envelope boards.

extremely large number of opportunities for making mistakes in inserting wrong components and putting capacitors and diodes the wrong way round. You might like to amuse yourself by calculating just how many different combinations of mistakes that you could make but your time would be better spent in resolving to be careful when you assemble the boards.

We suggest that you work on one board at a time to avoid confusion. Start with board one which has to be trimmed to accommodate the 16-note circuit. Install the links and PC pins first, then the resistors and diodes. Remember that for notes one to 16, R1 is 3.3kΩ and R6 is 270kΩ. For notes nine to 16, R1 is 2.7kΩ and R6 is 220kΩ.

The links should be inserted and soldered so that they are about 1mm proud of the board surface. The links actually provide a soldering point for the contact spring associated with each note. While we mention the contact springs now, they are not to be soldered to the boards until the boards and busbars are assembled onto the keyboard chassis.

All the envelope boards should be very carefully inspected for assembly errors and poor soldering. Be very thorough as it is difficult to detect and correct mistakes once the boards are installed on the keyboard chassis.

KEYBOARD ASSEMBLY

The keyboard assembly requires a fair amount of mechanical work, so you can put away your soldering iron for the time being and take out your electric drill. But before you start brandishing the drill about, more mundane tasks beckon, such as disassembling the keyboard. Why do that when it is supplied in beautifully assembled form? Because the keyboard "action" is too light for a piano is why.

As supplied, the keyboard has one light spring to restore each key to its normal position when pressed. This gives such a light action that you need only brush a key to make a note sound. For a person used to the inertia and "feel" of a normal piano keyboard which requires some physical effort to play, this makes the keyboard virtually unplayable. Put simply, we have to make it harder to press the keys down. We do this by installing a layer of foam rubber under the keyboard which has a suitable thickness and density.

Each key can be easily detached by removing the small spring at the rear, detaching it from its lug on the keyboard chassis. Note that each key is labelled with a moulded legend such as B4/6 or whatever. This should be noted on a sheet of paper or on the keyboard chassis itself so that when you re-assemble the keys it will not be like a giant jigsaw puzzle. Having removed all the keys you can then proceed to take pencil and rule and mark up the underside of the keyboard chassis with the hole positions shown in Fig. 8.

All the hole positions should be centre-punched and drilled with a 3/32-inch drill bit.

PARTS LIST

KEYBOARD & ENVELOPE BOARDS

1 73-note piano keyboard
1 set of busbar hardware including spacers, contact springs and self-tapping screws
4 18-way PC boards
1 three-way PC board
1 metre of adhesive-backed foam, 15mm square (Engels)
4 hinges to suit keyboard
111 PC pins
73 2.2uF/25VW PC-mounting electrolytic capacitors
73 4.7uF/25VW PC-mounting electrolytic capacitors
365 1N914, 1N4148 small-signal silicon diodes
RESISTORS (10% tolerance, ½W rating) 8 x 270kΩ, 18 x 220kΩ, 18 x 180kΩ, 91 x 120kΩ, 11 x 82kΩ, 146 x 33kΩ, 73 x 10kΩ, 19 x 3.3kΩ, 54 x 2.7kΩ, 73 x 56Ω.

ADDING FOAM RUBBER

With drilling complete, you can install the busbar blocks and busbars, using self-tapping screws which are not longer than 25mm. With busbars in place you can then install the five boards using 6mm spacers and self-tapping screws. Then you can install the foam rubber. We recommend a foam weatherstrip measuring approximately 15mm square, made by Engels (normally used for weatherproofing of doors and windows). This tape is run along the front edge of

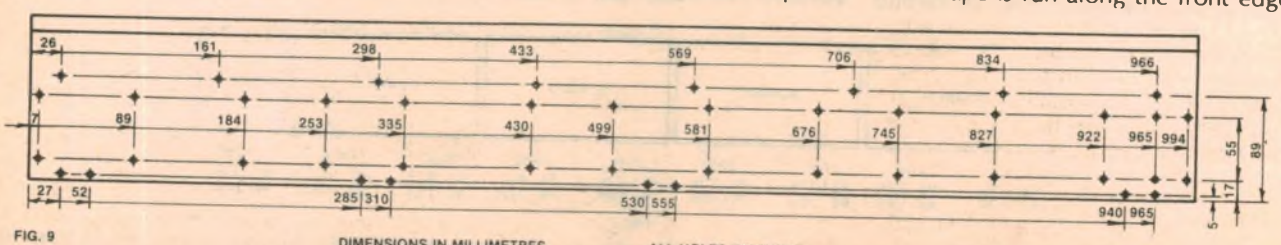


FIG. 9

DIMENSIONS IN MILLIMETRES

ALL HOLES 3/32" DIA.

This diagram shows the positions of all holes which need to be drilled on the underside of the keyboard chassis.

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VOICING AND EFFECTS GENERATOR KIT EVG-2 $58.50
Includes P.C.B. and all components including switches, knobs and output sockets.

HARDWARE & CONTACTS PACK KIT HCP-2 $47.00
Includes all nuts and bolts, wire and switch mounting brackets. The contact pack includes silver contact springs, gold plated rod, rod supports, spacers and screws.

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PEDAL ASSEMBLY KIT PA-2 $47.00
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Sustain 2 to 6 seconds
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Mellow Voice Select
Bright Voice Select
Harpsichord Voice Select
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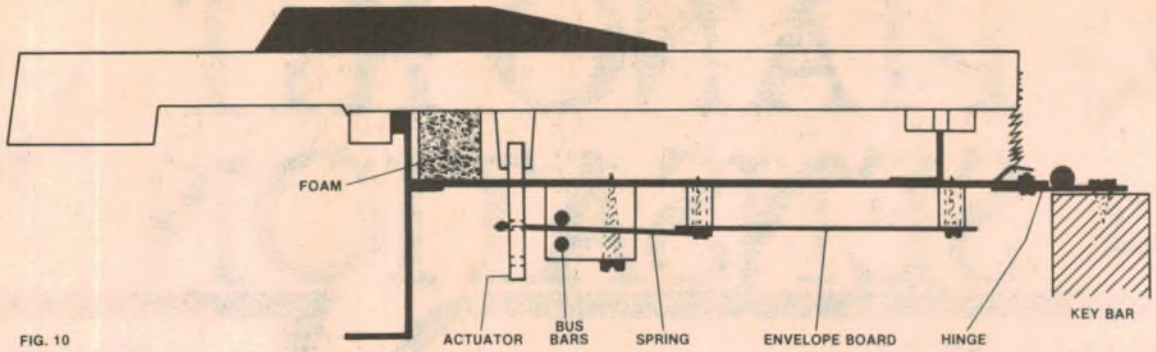
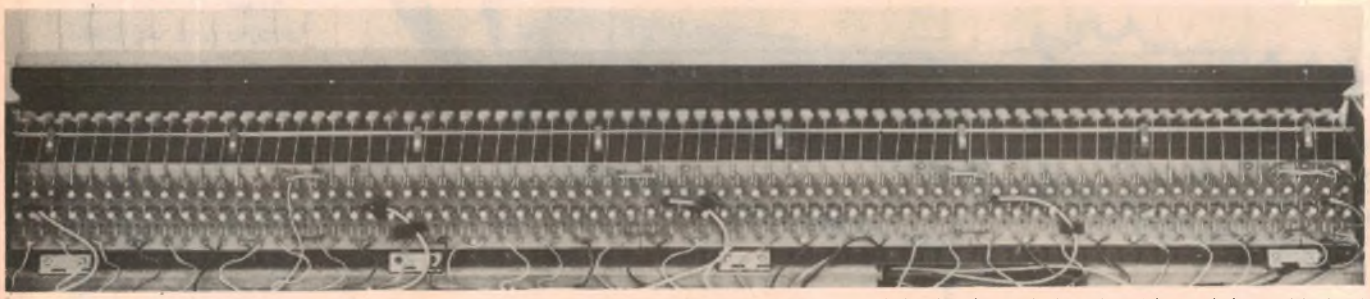
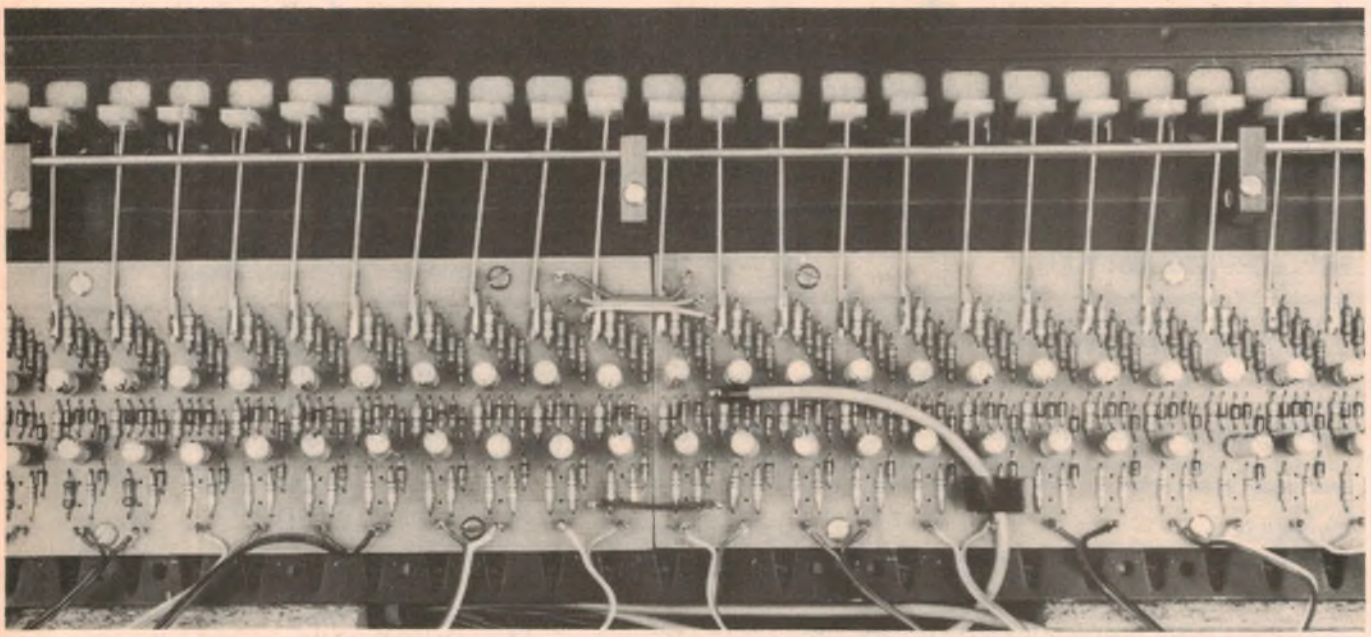


FIG. 10

This end elevation of the keyboard shows how the foam rubber is positioned and the mounting details of the envelope boards.



This photo shows the five completed envelope boards installed on the underside of the keyboard chassis with each board linked to its neighbour.



Detail of the envelope boards and busbar mounting. Note the long contact spring running from each link to each key actuator. Each envelope board should be very carefully checked for soldering and component positioning before it is installed on the chassis as it is difficult to make alterations once the contact springs are attached.

the keyboard chassis so that it sits just in front of contact actuators.

Now reassemble the keys and you are ready to solder the spring contacts to the envelope boards. As supplied, the springs are about 50mm long (in the unstretched state) and they have a formed head at one end. Position the spring so that its head just protrudes through the busbars and hold it temporarily against the appropriate link with a small alligator clip and solder the two together.

Now gently stretch the spring by hand and set the head into the key actuator recess. Do not use pliers for this task as you will damage the springs. Fig. 10 shows an end elevation of the keyboard showing how the boards and springs are assembled. Note that the spring should be in contact with the upper busbar when the key is in the rest position and should contact the lower busbar when the key is pressed. Make sure that the springs do not rub against the busbar mounting blocks. This should not normally be a problem.

Finally, you may trim away the excess spring from the boards, using a pair of side cutters. That is all for this month. Next month we shall describe the voicing filter circuitry and construction of that PC board.

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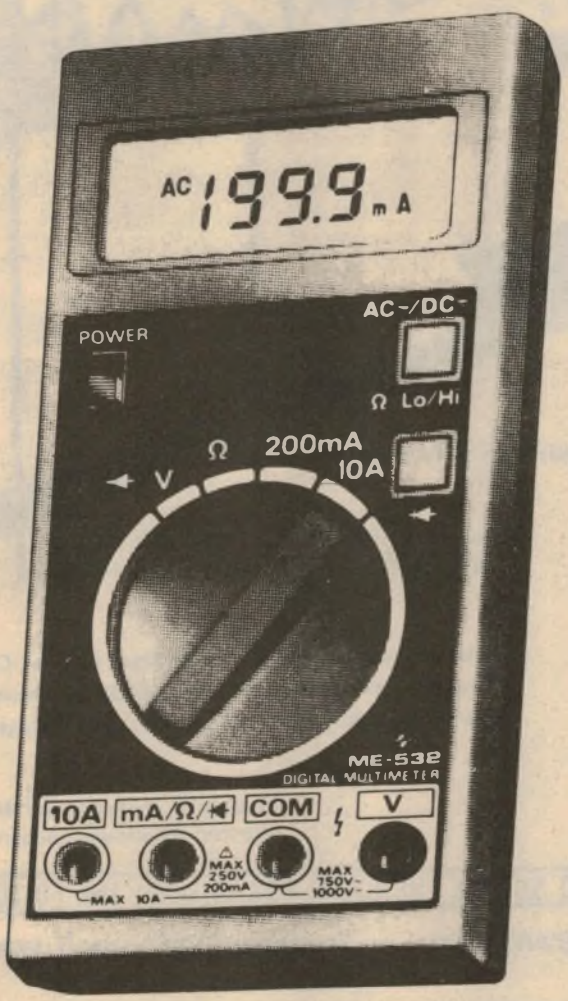

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The 'Super 80' offers a specification that we believe just cannot be bettered at the price. It uses the popular Z80 Microprocessor IC, a professional keyboard and has a direct RF output so that you can use the computer with any TV set (you don't need to purchase a special video monitor).

Easy to build.

Even though we would not recommend this kit to the raw beginner, this kit is extremely straightforward and easy to build. Any person who can use a small soldering iron and can solder neatly should have no difficulty in construction. This is because of the unique double side board design which means there is virtually no other wiring. The board is covered with professional 'solder mask'; this makes soldering much easier without the problems of bridges, etc. Once the components are soldered onto the board in their marked positions over 98% of the construction is completed. Even if you cannot get the completed kit to work, we have a special "Sorry Dick it doesn't work" repair service to assist you.

Lower price, higher specification - how is it done?

Most computers sold in Australia are manufactured in the U.S.A. where extremely high labour rates prevail - and you pay dearly for this on built up units. With this computer kit, you provide the labour and therefore save a fortune. And remember, this computer does not have a small toy-like calculator keyboard but a full size professional typewriter keyboard.

THE ABOVE PHOTO SHOWS THE BASIC BOARD WITH THE FOLLOWING

Advanced programming capability.

One of the most popular computers in the world (the Tandy TRS80 Level 1) only has 4K of BASIC. The BASIC we have with this unit is a large 9K. When you consider that our popular Sorcerer computer (over 2,000 sold) only has an 8K BASIC and sells for over $1,000, it is obvious that by building yourself, you are saving real money.

Electronics Australia/ Dick Smith design.

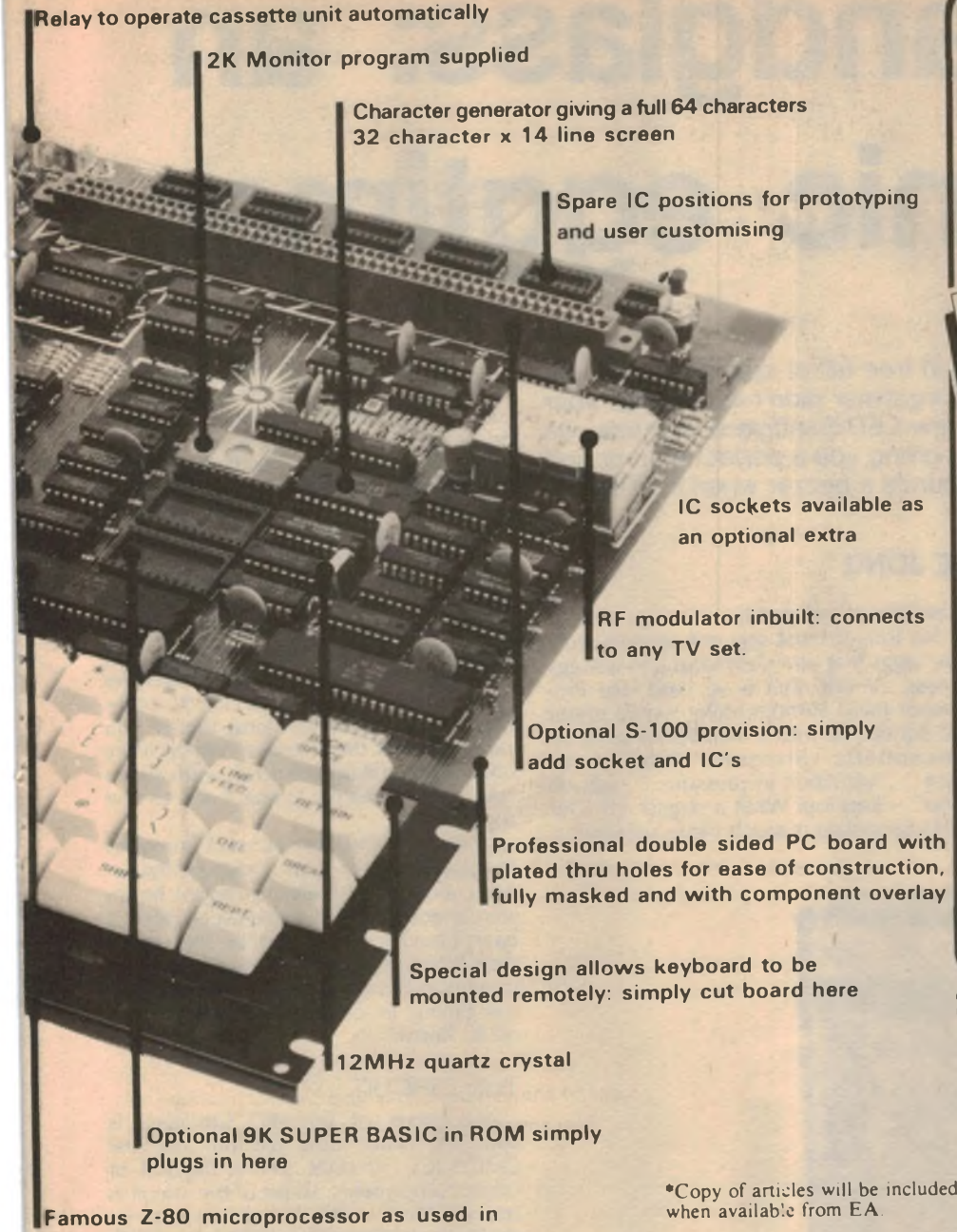
This is not a half baked design with no back up. The resources of Electronics Australia, Australia's most popular electronics magazine, and Dick Smith Electronics have combined to design and bring you this kit in the interests of computer enthusiasts actually building and not just buying. The design is fully Australian.

Imagine how much you will learn!

Most computer enthusiasts can program a computer but would have absolutely no idea of how to build one. By building this kit you will learn both the technical side of construction, how it works and then how to program. What a fantastic background for a future . . .

Sectional construction.

We have designed this kit not only for the serious computer user but also for first time users like the student or hobbyist. This is why we have a short form kit which may be added to as you build (and as you have the money!). For example, you may build the computer originally and operate it with 'BASIC on tape' and then add 'BASIC in ROM', add the S-100 and provide other parts at a later stage.



Comprehensive manuals available:

The construction details will be given in Electronics Australia magazine and full copy* of the EA article will be supplied with each kit. We also have available two very comprehensive manuals to assist in construction and programming:

Combined construction, assembly and technical manual.

Cat B-3600

$12.50

Cat B-3602

$14.50

Super 80 Basic does this:

Over 50 separate versatile commands. Features: arithmetic and integer functions user-defined functions, machine language routines, text editing, string operations. Also contains 25 error codes to assist you in programming.

'Super 80 Basic' reference manual

Short Form Kit

Designed for computer applications where 'Basic' programming is not required. Kit supplied with Eprom Monitor and 16K RAM. Cat K-3600 **$289.50**

*Copy of articles will be included when available from EA.

Add these items to make a fully operating computer system to your own requirements:

Transformer to suit	M-2325	**$22.50**
BASIC program (interpreter) on cassette	K-3602	**$24.50**
IC Socket set (recom.)	K-3603	**$12.50**
BASIC program in EPROM (set of 3 IC's)	K-3604	**$99.50**
S-100 Expansion	K-3606	**$19.50**

OPTIONAL EXTRAS ADDED: S-100 EXPANSION, IC SOCKETS, FULL 48K RAM

'Sorry Dick, It Doesn't Work'

All parts with this kit are guaranteed tested and new, but we cannot guarantee the labour content provided by you. If, after completion, your Super 80 fails to operate, you may take advantage of our 'Sorry Dick, It Doesn't Work' service.

Our Service Centre will check and repair your Super 80 for a lower than normal service fee. This fee includes any necessary replacement of components, etc.

If you send your Super 80 to us under the 'Sorry Dick, It Doesn't Work' service, **it must have been constructed using IC sockets.** If we receive a kit which does not use IC sockets, or if the kit is so badly constructed as to make effective repair impossible, we reserve the right to return your kit in the condition received, together with the service fee.

Under our 7 day satisfaction guarantee, you may return any kit in its original condition for a full refund of the purchase price. We cannot give a refund once construction has commenced, if any internal packs of components are opened or if the carton or kit is damaged.

7 DAY SATISFACTION GUARANTEE

Purchase this kit and inspect it for up to 7 days. If you do not wish to go ahead and construct this kit, simply return to us in condition as supplied and your money will be refunded in full.

Yes, this makes the full 16K computer with 9K basic on tape, transformer and IC Sockets — only — $349!

DICK SMITH Electronics

DSE/A019/LM

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SUPER 80 EXCLUSIVE TO DICK SMITH'S

LED Sandglass: an electronic eggtimer

Have you ever tried to boil an egg in free fall or during a lunar orbit and found that your old sandglass eggtimer didn't work? Well your problems are now over with our new LED Sandglass. It measures time intervals of up to five minutes, giving you a perfect hard or soft boiled egg every time, and even sounds a buzzer when it's finished timing.

by RON DE JONG

The old sandglass or "hourglass" is a convenient way to measure short time periods such as when boiling eggs (or timing TV programs between commercial breaks). Unfortunately it's hardly in keeping with all the advances made in electronics so we've come up with an electronic version that's completely solid-state, uses a LED display, and features a buzzer to indicate when the set time has elapsed.

No longer must you put up with "runny" eggs that turn your toast into a soggy mess, or one that is so hard that Professor Julius Sumner Miller would prefer to squeeze it into a milk bottle using atmospheric pressure ("fire goes out . . . reduction in pressure . . . egg on top" – kerplop! What a stupid ad). Our LED Sandglass is much more sensible.

As can be seen from the photograph, we have arranged 30 LEDs in the shape of a sandglass. When the unit is first turned on all the LEDs in the top "bulb" will be on. As time passes, the topmost LEDs will turn off in sequence and the corresponding LEDs in the bottom bulb will turn on, giving the impression of sand dribbling from the top bulb to the lower.

As an added feature we have included a mercury switch so that, at the completion of timing, the unit can be turned upside down just like a real sandglass. This automatically resets the circuit and the "sand" begins to pour back into the other bulb – figuratively speaking, that is! You can also reset the circuit in mid-cycle by turning the unit upside down, with all the "sand" immediately going back to the top bulb.

So in some respects our LED Sandglass is actually better than a real sandglass. After all, a real sandglass cannot be instantaneously reset in mid-cycle, doesn't have a buzzer, and cannot be seen in the dark! Mind you, we have yet to meet the person who wishes to boil an egg while free-falling in pitch darkness, but you never know!

THE CIRCUIT

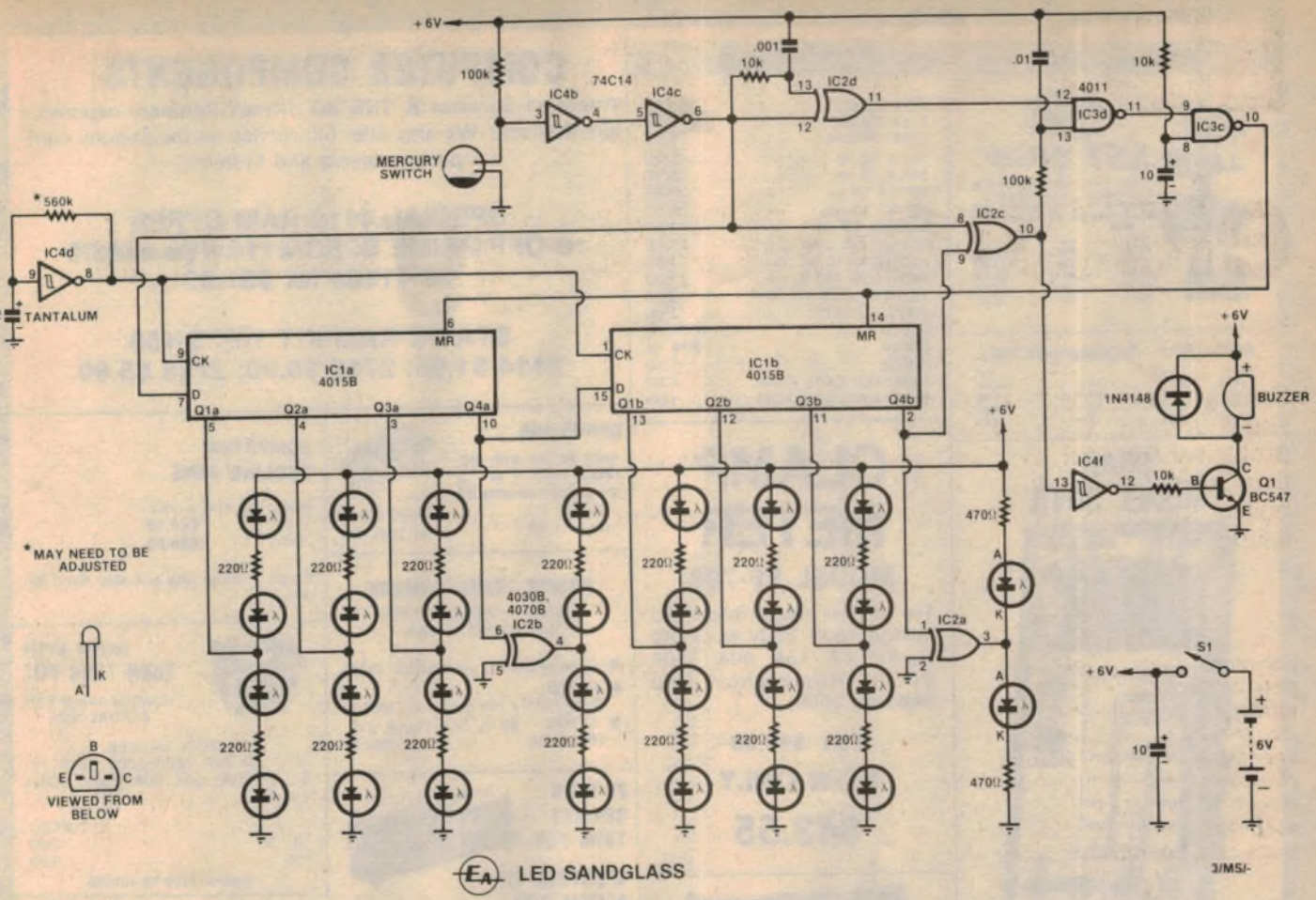
The circuit of the LED Sandglass is straightforward, using just four low-cost CMOS ICs, 30 LEDs, and a handful of other components. Heart of the circuit is the 4015B IC, which contains two independent 4-bit serial in/parallel out shift registers. Each shift register has a clock input, data input, reset and four parallel outputs.

We have wired the 4015B to form a single 8-bit shift register by connecting the clock and reset inputs together and the last output of the first shift register (IC1a) to the data input of the second register (IC1b). The eight outputs of the resulting 8-bit register, Q1A to Q4B, are connected to an array of LEDs, each output driving two LEDs to the positive sup-

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

$25

including sales tax.



The mercury switch provides an instant reset function and enables the LED Sandglass to be used either way up.

ply rail and two to ground via current limiting resistors.

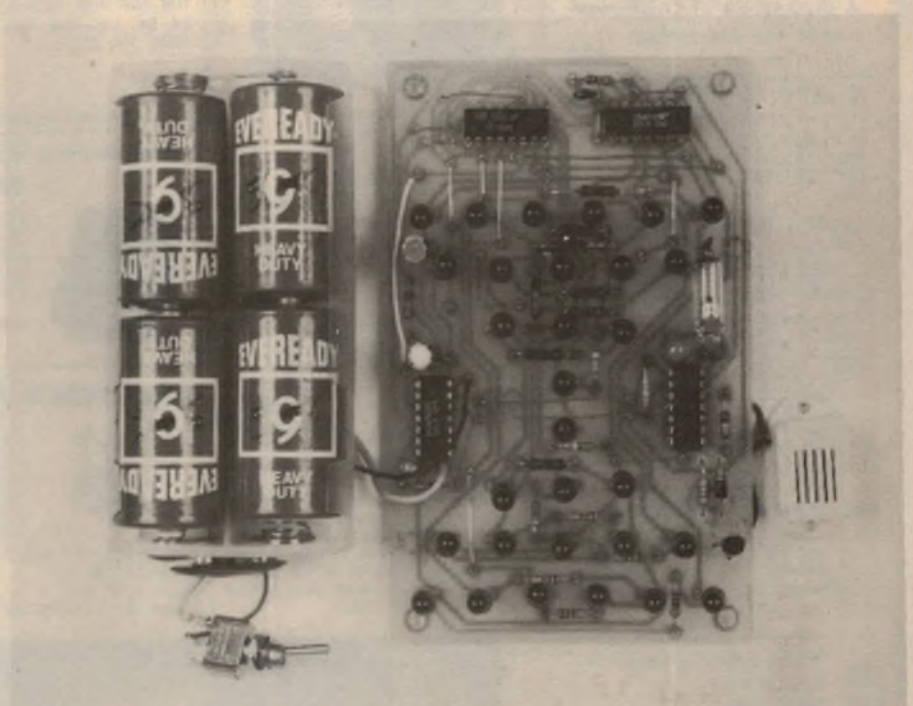
While the visual arrangement of LEDs on the circuit differs from the front panel layout, the basic scheme is really very simple: the LEDs going to the supply are arranged in the "top" bulb and those to ground are in the "bottom" bulb.

When the unit is first turned on a brief reset pulse is applied to the register, setting all the outputs to zero. This will cause all the LEDs connected to the supply to turn on, and those to ground to turn off – in other words all the LEDs in the top bulb are on and those in the bottom bulb are off. A logic high is then clocked into the shift register at the data input, pin 7 of IC1, which causes the first output (Q1A) to go high, turning two of the LEDs in the top bulb off and two in the bottom bulb on. Effectively two "grains" of sand have fallen from the top bulb to the bottom bulb.

As the shift register is further clocked the remaining outputs, Q2A to Q4B, will go high in sequence until eventually all the LEDs in the top bulb are off and all those in the bottom bulb are on.

What has happened is that the 8-bit register has been progressively filled up with logic highs (or ones). When the sandglass is subsequently turned over, the register is progressively filled up with logic lows (or zeros).

Whether zeros or ones are loaded into the register is determined by the data input, pin 7, of IC1a which is driven by Schmitt trigger IC4c. IC4c, in turn, is controlled by IC4b and a mercury switch. When the mercury switch is closed, the output of IC4c will be low, and when the switch is open the output of IC4c will be high.



The mercury switch is mounted so that it lies flat against the PCB.

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- 30 AWG wire
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- No stripping or slitting required—just wrap
- .025" square posts
- Built-in cut off
- Includes 50 ft. wire

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JUST WRAP Replacement Wire

Part No.	Color		Price
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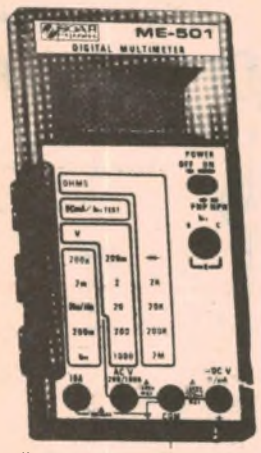
R-JW-Y	Yellow	50 ft. roll	4.99
R-JW-R	Red	50 ft. roll	4.99

SOAR MODEL 501A



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Spectrol model 534 ¼" shaft.
Price 1—9 $8.50
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Kit of parts as featured in Electronics Australia July, 1980. Programs 2708, 2716 and 2532. Use with TRS80, Sorcerer, and Compucolor. Kit does not include connector from the programmer to computer.

Complete Kit	$72.49
Kit without case	$59.99
Pack and post	$2.50

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Kit of parts featured in Electronics Australia March, 1980. Four digits.

Complete Kit	$52.49
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Pack and post	$2.50

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2114 RAMS	2.90
2708 EPROM	6.90
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555's 10 up	2.90
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BD140 10 up	5.50
SC141D 10 up	11.00
SC151D 10 up	21.10
RED LEDS 10 up	1.40
RED LEDS 100 up	11.00
YELLOW LEDS 10 up	2.30
8 PIN I/C SKTS 10 up	2.00
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BC549	0.19 ea
MJ802	3.60
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Build a working DPM in ½-hour with these complete evaluation kits.
Test these new parts for yourself with intersil's low cost prototyping kits complete with A/D converter and LCD display (for the 7106) or LED display (for the 7107). Kits provide all matrials including PC board, for a functioning panel meter ICL7106EV (LCD).

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SPECIALLY DESIGNED FOR MICROCOMPUTERS

- Good regulation electrostatic shield
- RI 810 8V@10A 2 x 15V@1A $24.50
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20 TURN CERMET TRIM POT

SPECTROL 43P ACTUAL SIZE

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

1—9	$1.40
10—99	$1.30
100	$1.20

Values may be mixed.

Hexadecimal Keypad

$26.50/each

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

Ideal for dream project

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Dials to suit 10 T Pots
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Muffin fan 4⅝" square

110V	$39.50
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Range of larger fans available. Send for details.

cermet single TURN TRIM POT

Spectrol model 63P ACTUAL SIZE

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

1—9	$1.00
10—99	0.90
100	0.80

Values may be mixed.

P.C. EDGE CONNECTORS

S100 gold plated wire wrap	$8.50
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43/86 gold plated wire wrap	$10.50

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ELECTRONIC AUSTRALIA MICROCOMPUTER PROJECT

Kit for main board (including programme 2708)	$109.00
Also available re-designed 6802 PCB	$11.90
PCB (Fibre glass) only	$10.90
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One other aspect of the shift register circuit which should be mentioned is that the pin 10 and pin 2 outputs of IC1 do not directly drive the LEDs but go via XOR gates IC2a and IC2b. This was done because the LEDs represent an appreciable load to the CMOS outputs, preventing them from switching to the correct logic levels to drive the data input (pin 15) of IC1b and (pin 9) of IC2c.

Actually the transition voltage of CMOS is ½Vcc and this, coupled with the output characteristics of buffered or "B" series CMOS, means that the circuit would probably still work. However, because we had the two XOR gates to spare, we decided to play it safe.

Note also that we have only used one LED to ground and supply on the Q4B output of the shift register. This is simply an artistic requirement since only 15 LEDs are required in each "bulb".

The oscillator connected to the clock input of the shift register is comprised of IC4d, a Schmitt trigger using just one resistor and a capacitor. Because of the very low frequency required we have to use correspondingly large resistor and capacitor values, in this case a 560kΩ resistor and a 22μF tantalum. To ensure that leakage current in the capacitor does not load the 560kΩ resistor, we have specified a tantalum or low leakage electrolytic.

Due to variations in the trigger levels of the Schmitt there may be some variation in the frequency of the oscillator from unit to unit. We therefore suggest that the unit be calibrated by timing and the 560kΩ resistor adjusted accordingly. The time taken for the sandglass to empty is proportional to the resistor value and increases with increasing resistance. On our unit, the values shown gave a time interval of three minutes.

So far we have a circuit that works as a LED sandglass. We now have to add additional circuitry to reset the unit when it is turned upside down in the middle of timing, ie while the "sand" is still flowing. First off, we have to detect when the sandglass has "emptied", and this is done using IC2c, an XOR gate. One input of IC2c is connected to the data input of the shift register and the other is connected to the output. When the data input and final output are the same, ie the register has fully shifted and the glass is empty, IC2c will go low.

Another XOR gate, IC2d, is used to detect when the unit is turned over. One of its inputs is connected to the output of IC4c which, as we mentioned earlier, is low or high depending on whether the unit is right way up or upside down (ie whether or not the mercury switch is closed). The other input of IC2d is also connected to IC4c, but via an RC delay network consisting of a 10kΩ resistor and .001μF capacitor. The effect of this is that when the unit is flipped over IC4cs output changes, changing the pin 12 input of IC2d immediately and the pin 13 input after the RC time delay. Since the output of an XOR gate is high when the two inputs are at different logic levels a brief high pulse will be generated by IC2d.

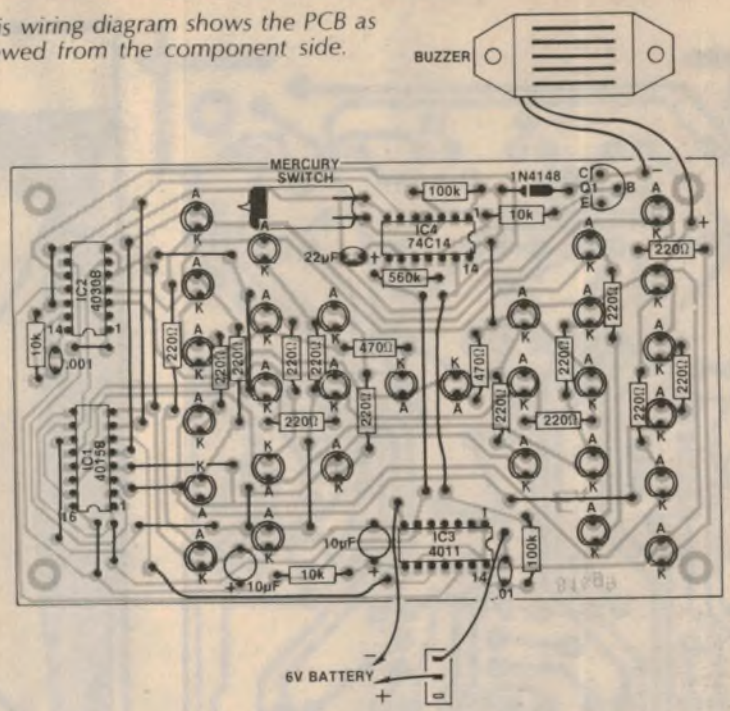
The two outputs of IC2d and IC2c are NANDed together by IC3d. Since IC2d goes high briefly when the unit is turned over and IC2c is high when the unit is still counting, the output of IC3d will go low when the unit is turned over during counting. IC3c effectively ORs this signal with a power on reset signal to pin 8 and generates a reset pulse which is applied to the master reset pins of the shift register. This "OR" function results because if either the output of IC3d or the power on reset is low, IC3c's output will go high causing a reset.

The power on reset circuit consists very simply of a 10kΩ pull-up resistor and a 10μF capacitor to ground. The 10μF capacitor is initially discharged so when power is first applied the low logic level causes the output of IC3c to go low, resetting the shift register. After a short period, given by the time constant of the resistor and capacitor, the 10μF capacitor will charge up to a voltage above the ½Vcc transition point and the pin 8 input of IC3c goes high.

Finally, we have added a buzzer which is turned on when the LED Sandglass has finished counting. This is done by connecting the output of IC2c to Schmitt inverter IC4f. IC2c goes low when counting finishes so the output of IC4f will go high, turning on transistor Q1 via a 10kΩ current limiting resistor. The transistor

WIRING DIAGRAM

This wiring diagram shows the PCB as viewed from the component side.



PARTS LIST

1 printed circuit board, 81sg9, 132mm x 82mm
1 zippy box, 159 × 95 × 51mm
1 mercury switch
4 1.5V "C" cells
1 battery holder for 4 "C" cells
1 SPDT miniature toggle switch
4 25mm brass standoffs
1 6V buzzer

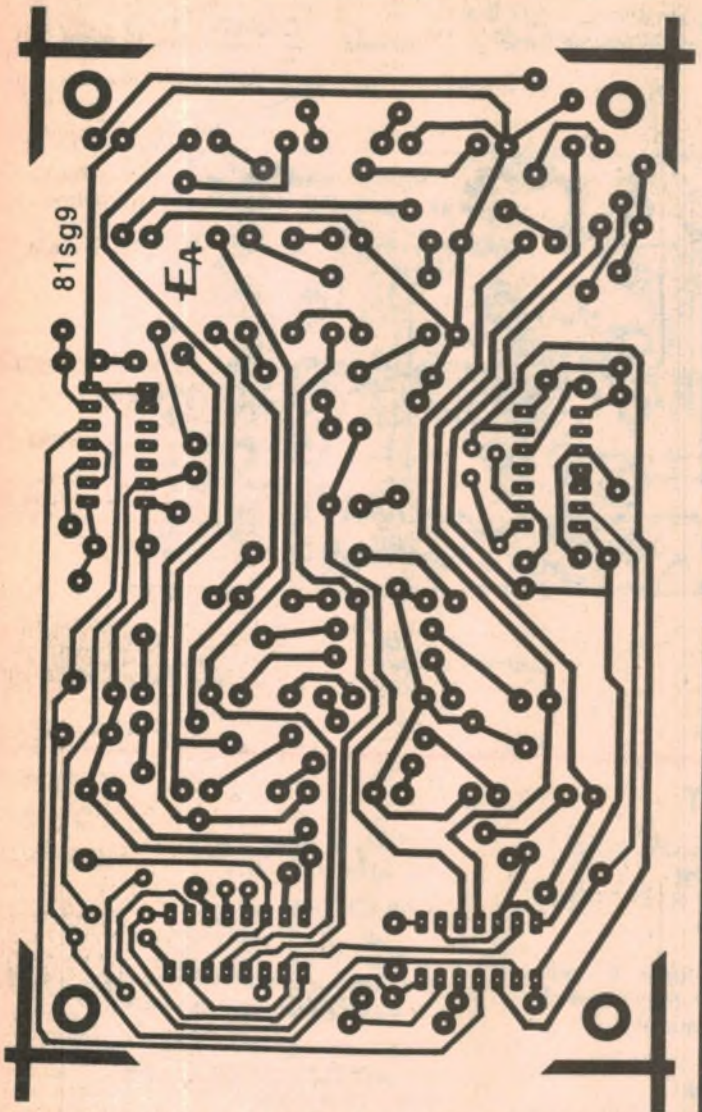
SEMICONDUCTORS
1 4015B CMOS dual shift register
1 74C14 Hex Schmitt trigger
1 4011 quad NAND gate
1 4030B or 4070B quad XOR gate
1 BC547 NPN transistor
1 1N4148 diode
30 large red LEDs

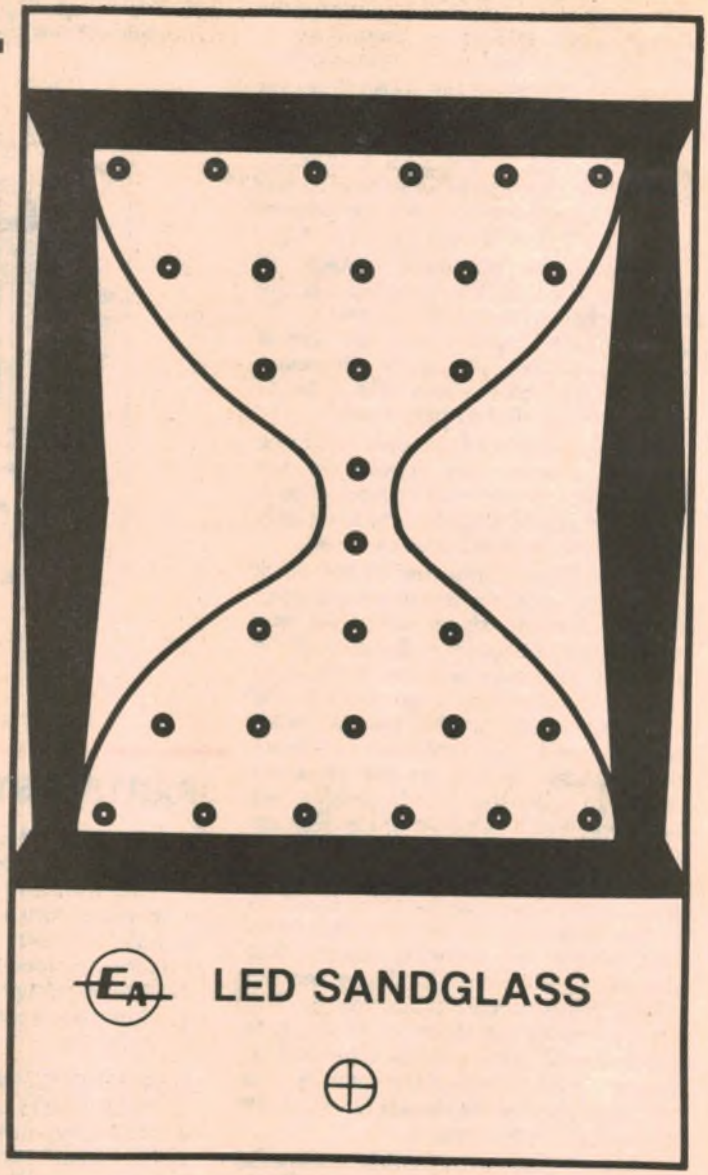
CAPACITORS
1 22μF 16VW tantalum
2 10μF 16VW electrolytic
1 0.01μF greencap or ceramic
1 .001μF greencap or ceramic

RESISTORS (all ¼W, 5%):
1 × 560kΩ 2 × 100kΩ, 3 × 10kΩ, 2 × 470Ω, 14 × 220Ω

NOTE: The "B" suffix on a CMOS IC part number indicates that it is a buffered device. Where specified, buffered devices must be used.

ACTUAL-SIZE ARTWORK





Actual-size PCB and front panel artworks. Finished boards and panels are available from the usual retail outlets.

drives a 6V buzzer, while a diode across the buzzer suppresses inductive spikes which could damage the transistor.

Power is obtained from four "C" cells and switched via S1. Current consumption of the unit is about 40mA, giving an expected battery life of about 80 hours or about 1600 hard-boiled eggs.

CONSTRUCTION

Construction of the unit is simplified by having most of the components including the LEDs, mounted on a single printed circuit board (PCB), coded 81sg9 and measuring 132mm x 82mm. Mount the resistors, links and capacitors first, leaving the CMOS ICs and mercury switch till last. Use the overlay diagram included in this article as a guide to component placement and orientation. Note particularly the orientation of the LEDs, remembering that the anode lead of most LEDs is slightly longer than the cathode lead and that there is a flat on the rim of the LED near the cathode.

When mounting the CMOS ICs take special precautions to avoid damage due to static electricity. Use an earthed soldering iron and solder the supply pins first (usually 7 and 14 or 8 and 16) to enable the internal input protection diodes. The mercury switch is mounted last of all, taking care not to break the glass bulb.

With all the components mounted the board can now be mounted inside a suitable case. We used a standard plastic zippy box measuring 159 × 95 × 51mm, and mounted the board using 25mm brass standoffs. Due to the height of the "C" cell battery pack, we had to add three nuts to the brass standoffs to clear the board from the batteries. The battery pack should be secured using a suitable clamp made from scrap aluminium.

Actual size artwork for a front panel is shown elsewhere in this article and can be used to produce a Scotchcal front panel. Finished front panels can also be obtained from the usual retail outlets.

After sticking the Scotchcal panel onto the aluminium lid of the box drill holes for the LEDs using a small diameter drill, then ream out the holes from the Scotchcal side of the panel.

Next mount the on/off switch and buzzer and complete the wiring to the board. Briefly recheck the orientation of the ICs, electrolytics and LEDs and also check for solder bridges between tracks. If all is well switch on the unit right side up. All the LEDs in the top bulb should initially be on and they should gradually turn off over a period of about three minutes with the corresponding LEDs on the bottom turning on.

If longer or shorter times than three minutes are required the 560kΩ resistor connected to IC4d should be increased or decreased proportionally.

So that's it. Now you can cook the perfect egg every time!

AMPLIFIER SENSATIONS!

Even our jaded and cynical staff are amazed. We have been absolutely swamped with orders for the new ETI 5000 Pre-amp and Power Amp.
One day all high quality Hi Fi amps will have MOSFET finals. If you can't wait until then why not look at this great ETI design?
We call the power MOSFET's "Bomb Proof". By this we mean that it is most difficult to destroy them by fair means or foul. Because they do not suffer from thermal runaway, (as bipolar transistors do) you don't need complex distortion - producing circuits to protect them. The MOSFETs don't suffer from secondary breakdown either.
The Pre-amp is now available (at last!) and we have had the opportunity to have a close look at it too. We believe that like the power amp, it offers the maximum performance available from current technology.
If you are a perfectionist or are just not happy with what you have got now this system could be for you. You owe it to yourself once in your lifetime to bestow upon yourself "the best".
In the case of amplifiers, this is it.

5000 POWER AMPLIFIER

The Jaycar kit of this project is being continuously updated in quality so that the constructor will benefit. We now supply metal film 1% 50ppm resistors in place of carbon film types. All Aluminium hardware (including heatsink bracket) is now anodised in black. (Incidentally there has never been a problem with instability with Jaycar kits. We have ALWAYS used high quality capacitors).
The original square-section chassis bars are used. And then there is the Superfinish frontpanel!

Specifications: Power Output — 100 watts r.m.s. into 8 ohms x2 Frequency Response — 8Hz to 20kHz, +0 −0.4dB. Noise — 116dB below full output. Input Sensitivity — 1V r.m.s. for 100 watt output. For full specifications see magazine article on this amplifier.

Ref: ETI Jan — April 1981

EXCLUSIVE!!!
- Metal film 1% resistors used
- All Aluminium panels now anodised
- Original daign chassis bars used
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- prewound output chokes
- Flux shorting straps on transformers
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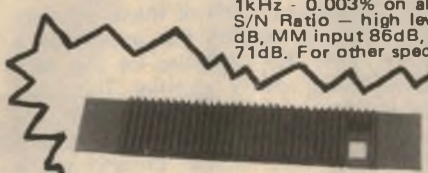
5000 CONTROL PREAMP

Control being the operative word. With this preamp you are in TOTAL CONTROL.
With 3 x phono inputs and 5 OTHER input facilities, you can dub to TWO (2) tape decks — say one cassette and one reel-to-reel. Once again we have used 1% 50ppm metal film resistors throughout — even where not specified by Dave Tillbrook.
For further information see the specifications summary below:

Frequency Response — 15Hz 130kHz @ +0, −1dB. Distortion 1kHz - 0.003% on all inputs. S/N Ratio — high level input 92 dB, MM input 86dB, MC input 71dB. For other specs see mag.



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EXCLUSIVE!!!
- English "Lorlin" switches used
- Metalwork exactly as per project
- description
- Special Nylon grommets used to insulate jacks
- Metal film 1% resistors used
- Specially imported solid Aluminium knobs
- FREE! Pair of GOLD PLATED RCA line plugs for low noise M.C. Input

only $245
+ $10 freight

Parts available separately

***Superfinish * * * * The Jaycar Front Panel**

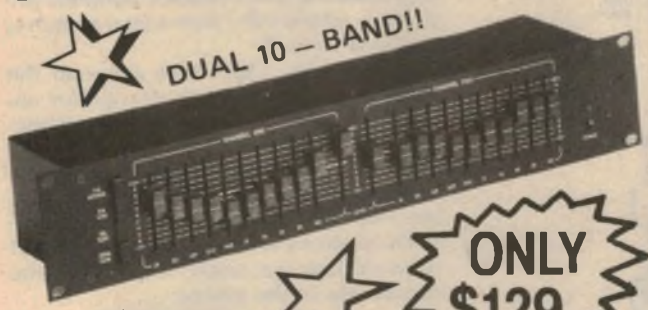
SUPERFINISH front panel. Special fine grain Aluminium machined, drilled and tapped and finished in special low-gloss black enamel. This panel stands up to a close inspection.

" OR $299 TOTAL WITH THE 5000 POWER AMP"

ETI485/JAYCAR 2010 EQUALISER NEW MkII model with QUAD-FETs

We have upgraded the performance of this popular kit by taking advantage of the new high technology J-FET input op-amps.
The MkII Stereophonic Equaliser now has a much lower noise floor, better T.I.D. performance due to the higher slew-rate of the J-FETs. Lower harmonic distortion also prevails.

DUAL 10 — BAND!!



+ $5.50 P & P

ONLY $129

FEATURES:
- New low noise J-FETs throughout - replacing Bipolar OP Amps
- Lower noise floor
- Lower harmonic distortion
- Lower transient intermodulation distortion
- Completely new assembly instructions
- Standard 3½" x 19" rack cabinet (prepunched) supplied
- Heavy guage anodised silk screened front panel

1/3 OCTAVE 28 BAND EQUALISER NEW MkII model at NO EXTRA CHARGE!!

We have made the same changes to the 2801 Equaliser but we have absorbed the EXTRA COST! Professional style bright yellow slider covers are now standard also.

+ $5.50 P & P

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Jaycar

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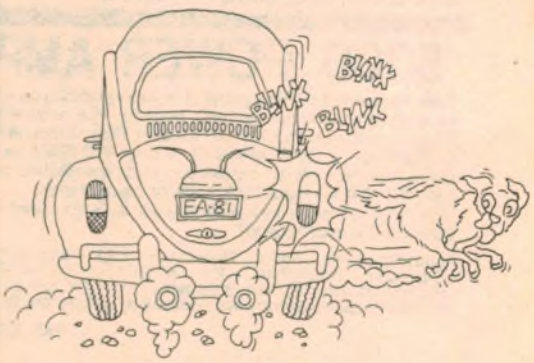
Jaycar Dealer: D.E.S. Electronics 157 Brisbane St. Dubbo Ph. 829355
See our other advertisements for post and packing charges

If you can't hear a click, try a bleep!

Fit this audible turn signal indicator

Have you ever had other motorists brandishing their fists at you because your traffic indicators didn't cancel? Fix that problem by building this audible monitor which gives bursts of 500Hz tone in unison with the traffic indicators.

by PAUL DE NOSKOWSKI



"Why doncher turn ya bl---y indicators off, ya -- --- mug!" Maybe this problem has happened to you. You might have been burbling down the bitumen with your latest cassette of Charlie and the Cockroaches bashing the ole eardrums, blissfully unaware of your uncancelled traffic indicators flashing merrily away. No wonder that passing motorist looked a trifle livid!

This simple circuit will solve that problem once and for all and you will not be accused of being deaf or having other inadequacies.

We spent considerable time investigating the ways in which vehicle designers have connected together the flasher, switch, signal lights, and interior repeater lights. To put it mildly, we were surprised. The number of combinations appears endless. Although all the designs are basically similar, it is the details where the differences occur. And this created problems for us in coming up with a unit which could have universal application.

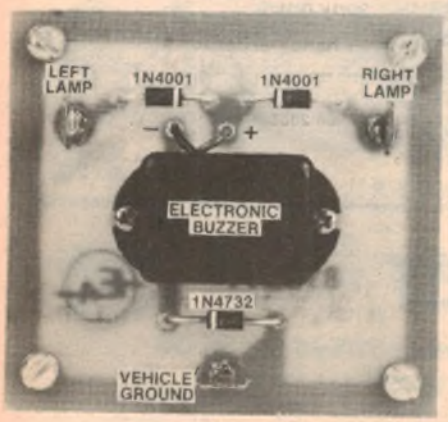
From our investigations it appears that the active conductors between the turn signal switch and the left and right front signal lights are the only connections which are common to all systems. Thus our unit is interfaced with these two conductors. Each of these conductors is connected to the anode of a diode, with the cathodes of the two diodes being joined together. This junction is taken to the positive terminal of a 9 volt electronic buzzer, whose negative terminal is returned to ground via a series 4.7 volt zener diode. The purpose of this zener diode is to both optimise the voltage across the 9 volt buzzer, and to offset the residual voltage across the turn signal lamps.

"What residual voltage across the lamps," did we hear you say? Well, during normal operation there is a residual voltage of some two to three volts across the flashing lamps during the visual "off" part of the signal; and it is provided by an internal circuit in the vehicle's flasher. The flasher contains a pair of normally-open contacts which are connected in series between the battery and the lamps. Paralleled across these contacts is a heating element which completes the circuit to the lamps, allowing current to flow and thus providing a residual voltage in the "off" part of the cycle.

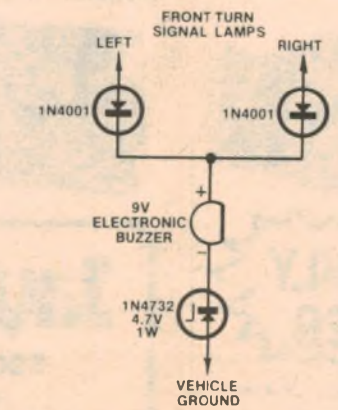
Operation of the turn signal switch initiates the above condition (flasher globes being preheated, and flasher heater warming up). After about a quarter of a second, expansion of the flasher heater reduces the spring tension holding the contacts apart, so that they now close; applying full voltage to the lamps, and de-energising the heater, such that it now cools. After a further quarter of a second, the heater has cooled sufficiently for the spring tension to be restored thus reopening the contacts. This extinguishes the signal lamps and reapplies power to the heater, with the cycle repeating itself. This will continue until such time as the turn signal switch is restored to "off".

It should be noted that although the residual current through the globes appears to be a by-product of the operation of the flasher, its presence ensures that the lamp filaments are always preheated prior to "flashing". Benefits are twofold. Firstly, the preheating provides a faster visual switch-on at the start of each flash. Secondly, it increases the service life of the globes.

As many of the readily-available small electronic buzzers operate down to voltages as low as three or four volts, it was necessary for us to offset the residual voltage, which could, in some circumstances be high enough to maintain continuous buzzer operation during



Construction is easy – just follow the above photograph. At right is the circuit.



EA AUDIBLE TURN SIGNAL MONITOR
3/AUI-

the visual "off" periods. Using a 4.7 volt zener diode provides an ample margin of safety, and provides a nominal 9 volts to the 9 volt buzzer; during normal vehicle operation where the system voltage is set to function at about 14 volts (note that the diode OR gates introduce an additional 0.6 volts offset, making a total offset of approx 5.3 volts).

CONSTRUCTION

We constructed the prototype on a printed circuit board measuring 61 x 56mm and coded 81au11. Standard auto electrical connectors are used for making connections to the board and to the vehicle's wiring harness.

Commence assembly by installing and soldering into place the three diodes. Follow the overlay provided to ensure that all diodes are correctly polarised.

PARTS LIST

- 1 *printed circuit board 81au11, measuring 61 × 56mm*
- 4 *18mm threaded spacers*
- 8 *10mm round head screws to suit spacers*
- 1 *miniature 9V electronic buzzer*
- 2 *8BA Screws and nuts for mounting buzzer*
- 3 *male auto-type ¼" flat blade terminals, Utilux H1170, H1188, H1189, H1925 or equivalent*
- 2 *1N4001 silcon diodes or equivalent*
- 1 *1N4732 4.7V 1W zener diode or equivalent*
- 3 *female auto-type ¼" receptacles, Utilux type H1071, H1072, H1956, H1961, H1972 or equivalent*
- 3 *insulating sleeves for female ¼" receptacles, Utilux type H1135 or equivalent*
- 2 *four-way female "bullet" adapters, Utilux type H862 or equivalent*
- 6 *male "bullet" connectors, Utilux type H852, H863 or equivalent*
- ½ *metre green 2.5mm auto cable*
- 3 *metres blue (or white) 2.5mm auto cable*
- 3 *metres yellow (or orange) 2.5mm auto cable*

Although current model vehicles use a negative ground system (and our unit is naturally designed to function with them), quite a few earlier model vehicles, such as Morris 850s and Mini de Luxes, operate on a positive ground system. For these vehicles you will have to reverse the polarity (ie, the connections) of all four components on the board.

Having installed the diodes, install and solder into place the three auto-type ¼" flat blade terminals. Depending upon the exact style of terminals supplied with your kit, it may be desirable to shorten the rear of the terminal so that the projection from the copper side of the board is no greater than 1 or 2mm. In ad-

dition, it will probably be necessary to fold over the "ears" on the rear of the terminals in order for them to pass through the 3.5mm clearance holes on the PCB.

Finally, attach the electronic buzzer to the PCB, with the aid of the screws and nuts provided. The buzzer has two "flying leads", one red, the other black, for connection to the circuit. Cut the positive (red) lead to length, and solder to the pad connected to the junction of the 1N4001 diodes. Likewise, cut the negative (black) lead to length, pass through the hole in the PCB, and solder to the pad connected to the cathode of the zener diode. To complete the PCB, screw the four 18mm threaded spacers to its base.

To check the board, connect one of its inputs to the positive terminal of a 12 to 15 volt DC supply (car battery or bench supply), and its ground terminal to the negative of the supply. The buzzer should sound. If OK, change the positive lead to the other input. Once again, the buzzer should sound.

INSTALLATION

Because of the many differences in mechanical construction and electrical wiring that are present in different makes and models of cars, we suggest that you borrow or buy a Workshop Manual for your particular vehicle to assist in locating and identifying the required cables, and other parts.

With the aid of a lead light or torch, investigate behind the dashboard and instrument panel to find a suitable place for mounting the completed board. Having decided upon a position, install the board.

Now, referring to your Workshop Manual, identify the leads connecting the outputs of the turn signal switch to the left and right front signal lamps. In most cases the Manual will provide the colours of the leads, and also the presence of all connectors between the turn signal switch and the signal lamps.

Having established the required colours, carefully inspect the wiring between the steering column and the bulkhead to try to locate and identify the desired leads.

Having established the lead colours to look for, carefully inspect the vehicle harness to find the best place to "break into" the circuit and connect the traffic indicator monitor. On some vehicles, the easiest place will be underneath the dash but on several we looked at, the easiest place is in the engine compartment, at connectors (or branch off points) just behind the headlights.

To cover such situations we have specified, in the parts list, that the two lengths of 2.5mm auto cable should each be 3 metres long.

Having identified the two leads, and decided upon the most convenient place for the junction to be made, cut each in turn and fit male "bullet" connectors to the cut ends. Using four-way female bullet adapters, reconnect the severed leads by pressing the bullet connectors into opposite ends of the appropriate four-way adapters.

At this point test the left and right turn signal indicators for normal "flashing" operation. Should there be a problem, check the connection of the cables to the four-way adapters. Correct the error and on no account proceed to the next step, before having solved the problem.

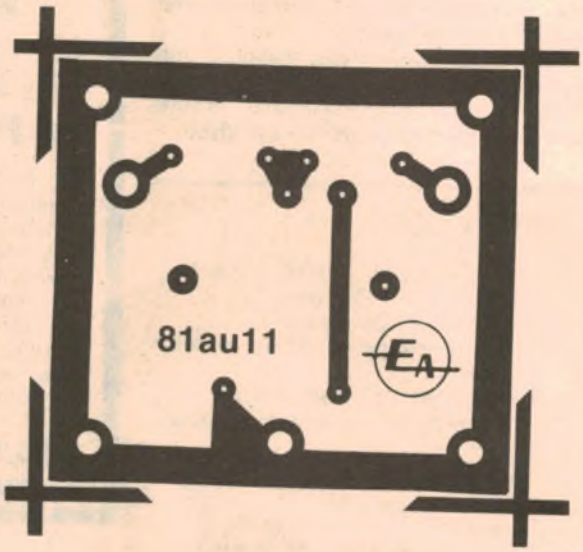
Now join one of the ¼" quick-connect female receptacles to one length of 2.5mm auto cable. Place an insulating sleeve on the cable prior to making the joint. If you have access to a suitable crimping tool, crimp the receptacle to the conductors; otherwise solder them together. After completing the electrical joint be sure to bend the end tabs over the cable insulation, so that any mechanical strain is taken by the sheath rather than the conductors. Repeat the above procedure with the other length of 2.5mm auto cable.

Attach these two cables to the PC board's input circuit by firmly pressing them onto the ¼" flat blade terminals. Lay the cables neatly with the original equipment wiring behind the dash – either using lacing or cable clamps – and take them to where you have previously installed the four-way bullet adapters. Leaving sufficient cable to form two small "goosenecks", cut the cables and fit male bullet connectors to the cut ends. Press one connector into, say, the four-way adapter feeding the left side signal lamps; and the other bullet connector into the adapter feeding the right side signal lamps.

Join the remaining ¼" quick-connect receptacle to the green 2.5mm auto cable, as described for the previous two receptacles. Press this receptacle onto the "ground" terminal of the PC board. Find a suitable nut and bolt behind the dashboard (or on the bulkhead) to which the other end of the green cable can be secured (to provide an earth return for the audible monitor).

This completes the installation, and the unit may be tested by operating the turn signal switch (with the ignition on, or in the "accessories" position). You should hear bursts of 500Hz tone synchronised with the visual flashes from the front and rear signal lamps. Voila! Happy motoring.

Above: the Audible Turn Monitor is connected into circuit using male "bullet" connectors and a 4-way female "bullet" adapter. Two adapters are required, one for each of the front lamps.



At right is an actual-size reproduction of the PC artwork.

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

$7.50

including sales tax.

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SAVE ON THE 'NO FRILLS' FT107

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$850.00
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Here's your chance to up-date to one of the best transceivers in the world, at a true bargain price!

Dick Smith has just made a scoop purchase of the entire manufacturer's stock of the famous FT107M transceivers - at an incredible discount.

They have all the outstanding features that have made the FT107M Australia's most popular top-line transceiver, and include all of the current legal amateur bands. (They don't have the new WARC bands included - but why pay hundreds of dollars more for bands we may NEVER get to use?)

Hurry: stocks are strictly limited - and as we bought the entire manufacturer's stock, this offer can NEVER BE REPEATED!

D-2863

SPECIFICATIONS:

Frequency coverage: 160, 80, 40, 20, 10
Modes of operation: LSB, USB, CW, AM, FSK
Input power: 240W DC (SSB), 80W DC (AM, FSK)
Sensitivity: 0.25uV for 10dB S/N (SSB/CW/FSK), 1uV (AM)
Selectivity: 2.4kHZ (-6dB), 4kHZ (-60dB) SSB, cont. variable from 300 to 2400Hz
Carrier Suppression: better than 40dB
Spurious radiation: better than 50dB below rated output
Power requirements: 240V & 13.5V supplies built-in

THE MANY BENEFITS OF BUYING YAESU FROM DICK SMITH

- *We sell more Yaesu than anyone else: so we have the best stocks, at the best prices (tell us if we're wrong!)*
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More Yaesu FRG-7's are in use throughout the world than any other communications receiver. Check these outstanding features

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- Operates from 100/120/220/240V AC or 13.5V DC
- Weighs only 2kg, size 34 X 15 X 29cm
- 21C, 22 transistor & 16 diode circuitry

D-2850

~~WAS $[illegible] LAST YEAR!~~

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Yaesu's brilliant FRG 7700/SW

There's not much we need to say about this outstanding receiver: let the features speak for themselves

- 2MHz - 30MHz continuous!
- All mode - including FM (great with converters)
- Digital frequency readout, with digital clock
- Superbly easy to operate: set pre-selector, then tune!
- Timer for tuning receiver on/off, plus control of external equipment eg. (tape recorder)

D-2841

EXCLUSIVE TO DICK SMITH

NEW

ONLY $499.00

OPTIONAL MEMORY UNIT

Gives you single button recall of any of 12 chosen frequencies. Great for monitoring, 'skeds', etc. Simple connection, instructions inc. **$149.50**

D-2842

Antenna Tuner $71.50

The FRT 7700 is an ultra compact antenna tuner. Designed to operate from 150kHz - 30MHz, it will provide the proper impedance for the receiver, rejecting unwanted signals. Also has a built-in 60dB max attenuator plus a two-section lowpass filter and for rejection of strong signals above 2MHz.

D-2843

FRV 7700 VHF 2-6 metre converter

Increase the listening range of your FRG-7700 with this high performance frequency converter. You'll be able to listen to all the amateur activity 'up top', plus aircraft & land mobile stations, etc. Makes great VHF listening!

ONLY $124.50

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TOP OF THE RANGE SSB/HF transceivers

FANTASTIC FT-107 DMS

This has to be Yaesu's finest transceiver. A masterpiece of solid state engineering - you only have to take the cover off to see the thought & care that has gone into its design. Full band coverage, of course - in all modes (FSK included). A massive 240W PEP input, with features like RF speech processor, variable bandwidth, superb noise blanker. PLUS 12 channel memory. The FT-107 is everything you want from a transceiver and a little bit more.

D-2871

ONLY $1328

Antenna Coupler FC 107

D-2873

Problems with antenna mis-match on your FT-107? Not with this superb coupler. Designed to match the 107 styling, but just at home with any transceiver. Huge meters for power output and SWR. Superb quality!

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FT-902D our most popular HF transceiver

D-2853

The FT 902D has just about everything you've ever wanted in a transceiver. All modes (yes, even FM - great with transverters), & all bands from 160 to 10M (including WARC). You get digital readout, RF speech processor, rejection tuning, 180W PEP input, etc etc. So come in to one of our stores & check it out & ask for your free brochure.

ONLY $1195

Antenna Coupler FC 902

This coupler can feed anything from a random length of wire to a beam. Match the load perfectly so you can deliver more power up there where it's wanted! Suits all bands, has built-in SWR/pwr meter as well. 50 or 75 ohm system, 500W rating.

ONLY $265

D-2855

DICK SMITH Electronics

Australia's largest supplier and Yaesu factory approved distributer & service centre.

NEW!NEW!NEW!

VHF Handy FM Transceiver FT-208R

- The FT-208R transceiver brings a new flexibility to today's active 2M operator. An easy to read LCD display is coupled with a 4-bit microprocessor, bringing 10 memories & a scanning function. Only with Yaesu can you get these features at such an economical price. Check it out NOW!

INC. CHARGER Cat D-2889

ONLY $368

MOBILE CHARGER

D-2894

The Yaesu PA-2 is a mobile charger, come pwr supply. Suited for the FT207R & FT208R. Uses the power from your 12V battery when mobile. Also recharges nicads in your battery pack.

ONLY $29.95

Mobile or base

WARC

D-2869

FT707

Yaesu has used the 'state of the art' technology & put it into such a tiny package. Yes, it's the brilliant FT-707. This little wonder contains all the outstanding features that most big rigs lack. It's a full power, all HF band (inc WARC) multi mode transceiver. You get digital readout, LED S/power meter, push button operation all the things the amateur needs for safe reliable operation. You've waited a long time for a rig like this, so take the splurge now, it's well worth the money.

ONLY $795

Antenna Coupler

Get the most from your FT-707, use the Yaesu FC-707 antenna coupler & ensure your transceiver always delivers the power it should. Has all the features you need: pwr/SWR meter, in-built dummy load, all band coverage (including WARC), less than 0.5dB insertion loss.

D-2875

ONLY $149.50

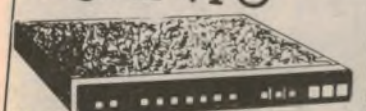
Base operation?

Just add the FP-707 mains supply & you're away. You get fully regulated 13.5V at 20A. Has plug-in connections so you can't cause problems, plus you get an extra speaker - for greater clarity.

D-2895

ONLY $175

Digital VFO



Long'n slim - intended to sit under the 707. 12 memories, up/down scanning in 10Hz steps & receiver offset tuning. Power by FT-707.

D-2896

ONLY $299.50

Mobile bracket

Don't let your valuable 707 jump all around the car. Fit it in this superb mounting bracket for safety & security. Also holds the digital VFO. A must for the serious mobile operator.

D-2897

ONLY $36

Economy HF/SSB
The FT 101Z

WARC

D-2862

Here is one of the finest transceivers in the 101 family: the FT-101Z. This brilliant performer is packed with a host of features, that the more expensive radios lack. So why pay more when you can get features like RF speech processor, variable IF bandwidth, all current HF bands (inc WARC) 180W input (SSB/CW) & AM/CW/SSB operation & many other features to numerous to mention. So do yourself a favour and check it out NOW at a store near you!

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FT 101ZD

STOCK LIMITED

Remember the famous FT-101B? And the 101E? Here is one of the most popular of the 101 series. It has all the features of the famous 101Z but includes digital frequency readout. Stocks are limited so ring the nearest store & check if they have stock left.

D-2859

ONLY $910.00

NEW! FT 101Z FM

Now you can have the features of the renowned FT-101ZD with the benefit of FM. Get crystal clear reception & trouble free interference. It makes a great combination!

$885

D-2872

DC-DC Inverter

Want to go mobile? Add this superb DC/DC inverter to your car battery. (13.5V nominal). Don't tie yourself to your shack - get out to where the DX is - great!

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ONLY $77

FL-2100Z 1.2kW Linear Amp.

If you want a linear amp. built like a 'power house' that gives you a clean, strong signal, try the new WARC FL-2100Z. Australian amateurs can be assured that at our maximum legal limit of 400W PEP the FL-2100Z is just 'coasting' - resulting in years of extra life. It features twin cooling fans for reliable operation & gives plate voltage, VSWR & DC readings from its two large meters. Suits virtually all amateur transceivers on the market.

ONLY $580

D-2548

Yaesu Fan

Give your FT-101Z a break by installing a cooling fan. Comes with all the fittings, 110V operated (runs from a tap on the transformer).

ONLY $29.95

D-2865

Yaesu's top 2 metre FT 480R has FM/CW & SSB

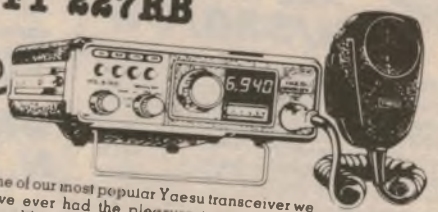
10% OFF

Yaesu call this their 'total performance VHF computerised transceiver'. And total performance it is! As the top-of-the-line Yaesu 2M family you'd expect a lot. You get FM, SSB & CW over the full 2M band, with two VFO's, four memory channels, scanning, digital readout, hi/lo power switch & much, much, more. To sum it up in one word, superb!

ONLY $525

D-2887

PLL scanning 2 metre FT 227RB



One of our most popular Yaesu transceiver we have ever had the pleasure to operate, the incredible FT-227R. The PLLL scanner will take you anywhere within the 2M band instantly - just press the scan button on the microphone. Has four memory channels, power output of 50W, & the receiver has better than 0.3uV sensitivity (10dB S/N). It operates on 13.5V DC, with protection against reverse polarity & high antenna SWR. For value-for-money, it's hard to go past the FT-227RB.

ONLY $319

D-2891

SPECIAL OFFER

FREE If you purchase a D-4100 base with resonator, we will give a **FREE** 2M stub (D-4102) worth $11.25 at no extra charge.

When you buy the gutter mount base & 2M stub, you're on the air on 2M immediately. As you want the HF bands, simply buy that band resonator/antenna whip & screw it into the 2M stub. You only have to buy the whips for the band you want. Go mobile with Yaesu.

RSE - M - 2 GUTTER MOUNT Cat. D-4100	$24.95	RSL - 7 40M ANTENNA Cat. D-4112	$25.50
RSE - 2A 2M STUB Cat. D-4102	$11.25	RSL - 14 20M ANTENNA Cat. D-4114	$25.50
RSL - 145 6M/2M ANTENNA Cat. D-4104	$27.50	RSL - 21 15M ANTENNA Cat. D-4116	$25.50
RSL - 3.5 80M ANTENNA Cat. D-4110	$25.50	RSL - 28 10M ANTENNA Cat. D-4118	$25.50

DICK SMITH WILL BEAT ANY GENIUNE ADVERTISED PRICE ON YEASU EQUIPMENT.

SAVE $100

D-2868

NOVICE POWER HF/SSB

There aren't many transceivers available in Australia which are particularly suited to novices - but wont disgrace themselves either. The Yaesu FT-7B suits the novice as well as the full call amateur. Gives you all the current HF bands with power output up to 50W. You also have the option of AM, CW or SSB with the choice of VFO or a crystal locked channel. The FT-7B is ready when you are, hook up your power & antenna & away you go!

NOW ONLY $549

NEW! NEW
2 METRE PORTABLE
FT 290R

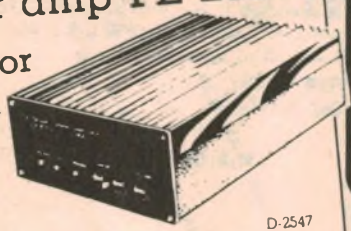
ALL MODE FM/SSB/CW

The FT-290R is a highly sophisticated compact multi-mode transceiver for the 2M amateur band. Featuring PLL sythesis in 100Hz, 1KHz, 5KHz, or 10KHz steps. The FT-290R utilizes a Liquid Crystal Display for digital readout for the operating frequency. 10 memories, scanning of the band or memory channels, two VFOs, & receiver offset tuning makes the FT-290R a significant breakthrough in technology.

ONLY $395.00

NEW! NEW
VHF Power boosted linear amp FL-2050

Ideal for all 2M rigs



D-2547

Add this to your hand held for real mobile power. Also suitable for SSB, CW, AM etc. Operates from 13.6V DC up to 15W input for maximum power. Includes 12dB receiver pre-amp, with automatic transmit receive control.

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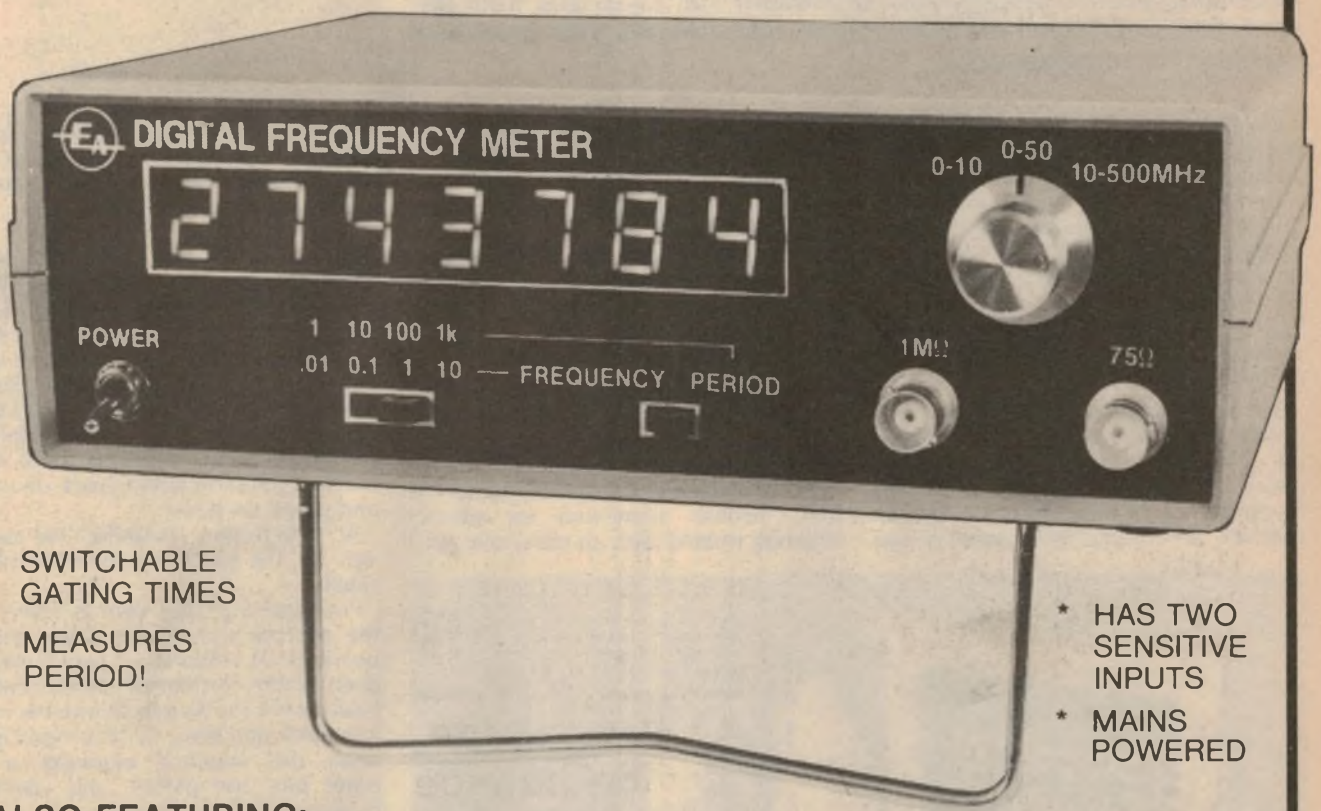

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* Our planning for this issue is well advanced but circumstances may change the final content. However, we will make every attempt to include the articles mentioned here.

KEYNOTE SCIENCE FEATURE ARTICLE:

Should Australian high technology industry be supported by the Government? Dr Clive Googan of the CSIRO writes on this controversial subject with considerable authority, in the December issue.

ELECTRONICS AUSTRALIA

Our December issue will be on sale Wednesday, Dec 2nd

Give your projects a touch of class

make your own Scotchcal front panels

Making your own front panels from Scotchcal photosensitive aluminium is easy and inexpensive. This article tells you what you need and gives a step-by-step procedure that takes you from artwork preparation to the finished panel. Why not give your projects a professional appearance?

Regular readers will know that "Electronics Australia" has published actual-size front panel artwork along with project descriptions for some years now. This artwork has been published to assist readers familiar with 3M Scotchcal photosensitive products to produce their own front panels, as an alternative to buying a commercial panel. After all, there is a certain amount of satisfaction in "rolling your own".

But there are other advantages in producing your own front panels. For example, you can produce custom panels to your own design or you can save money if you build a lot of projects; or you can produce an "on-the-spot" panel if you are in a hurry. But what if you've never produced a Scotchcal panel before?

More to the point, what materials are needed, how long does it take, and how is the artwork used? We'll answer your questions here by describing the procedure used at "Electronics Australia" to produce front panels for projects.

What is Scotchcal?

Scotchcal is a registered trade name of the 3M Company and refers to a range of photosensitive materials and related products used to produce decorative labels and panels. A Scotchcal panel is a thin, flexible aluminium (or plastic) sheeting treated with an ultraviolet (UV) light-sensitive coating. When exposed through an artwork to untraviolet light, an attractive and durable panel is produced.

The finished panel has a matt aluminium finish and is easily attached to any flat surface using the self-adhesive backing. It can be produced with either black lettering on a silver (natural aluminium) background or silver lettering on a black background. In addition, aluminium panels can be ordered in red or blue colours, while plastic labels can be red on white, black on white, black on clear, blue on white, black on yellow and green on white.

At "Electronics Australia" we usually opt for the black on silver aluminium labels.

Provided that due care is taken with the artwork and in processing, the appearance of a Scotchcal panel will rival even factory produced panels. But the best part of the Scotchcal process is that it is quick and easy. All you need is artwork, the Scotchcal materials, a few other bits and pieces, and you're in business.

The material you need to make Scotchcal panels and labels: artwork, a glass printing frame, Scotchcal photosensitive aluminium, Scotchcal developer, and clear gloss spray.

What you need

The Scotchcal materials required to make black on silver panels are:

- 8007 exposure film;
- 8005 sensitised aluminium;
- 8500 developer; and
- 3900 Gloss or 3930 Matt aerosol spray coating (see text).

In addition, you will require the following items and materials:

- A printing frame (this may be improvised using two sheets of plate or float glass

clamped together with two bulldog clips);

- Twin fluorescent light fitting (batten) with 20W actinic blue tubes – Philips TLA-05 or Sylvania F20T12BL; and
- Artwork materials – rub-on lettering, model makers knife (X-Acto etc), Bishop stick-on pads and tapes, clear plastic film etc.

The 8007 exposure film consists of a clear plastic base that has been coated with an orange UV light-sensitive emulsion. Make sure that you only open the film indoors under subdued lighting conditions (ordinary incandescent lamps don't have any adverse effects). Never open the film outdoors or in any environment where UV light is present (eg near fluorescent tubes), otherwise the film will be ruined.

The same precautions must be observed for the 8005 sensitised aluminium which has a black UV light-sensitive coating.

The 8500 developer is a "universal" developer for the Scotchcal range, and is used to develop both the exposure film and the aluminium panels. Again the user must follow a few simple precautions. 8500 developer is hightly inflammable and must never be used near a naked flame. In addition, fumes from the developer are toxic, so make sure that it is used in a well ventilated area.

Keep these two basic points in mind and you'll have no problems.

Artwork

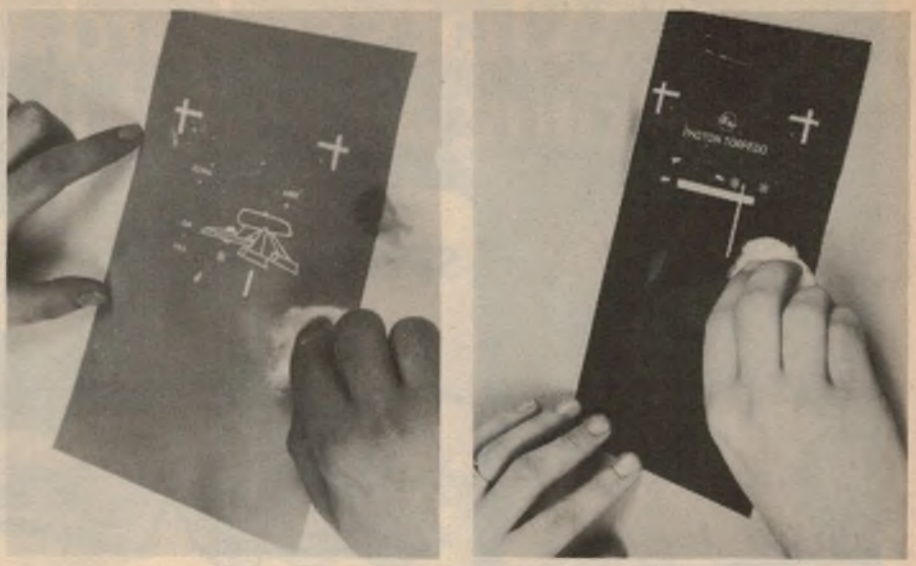
Artwork composed of opaque lines or letters on a transparent or translucent base may be used to produce Scotchcal panels. High contrast photographic negatives or positives give the best results and require the lowest exposure times. Translucent artworks require longer exposure times, but still produce good results provided there is high contrast between the base and the art.

One area that can cause confusion is the difference between artwork positives and negatives. For those readers who are not quite sure, we will explain in detail since this is an important part of the whole process.

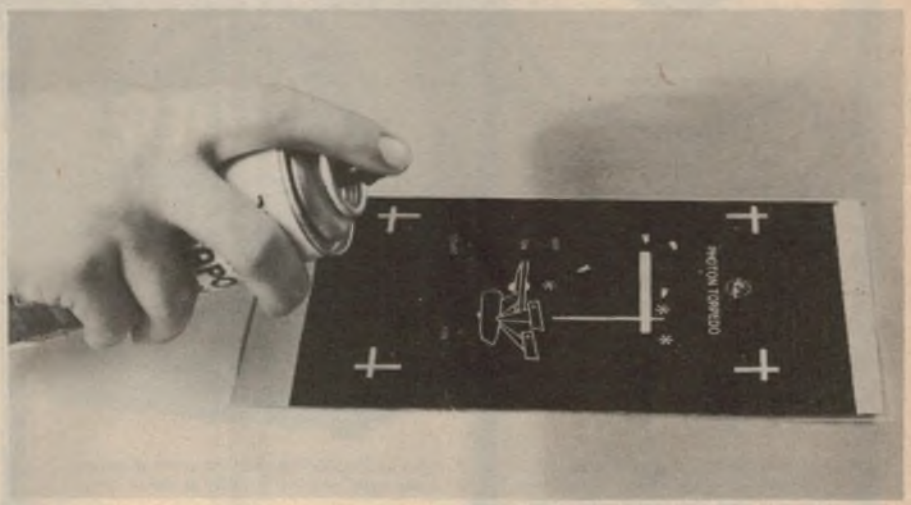
When artwork is prepared at "Electronics Australia", we use black lines and lettering on a white background. This master artwork is called a positive. A photographic negative of this artwork has the lines and background reversed. In other words, all lines and lettering are now light, and the previously light background is now black. The photograph showing the completed panel and the original artwork clearly illustrates this point.

To use artwork published in the magazine, you will need to have access to a plain-paper photocopier. Most public libraries have these machines installed.

Make a photocopy of the artwork from the magazine and check to see that you have good contrast by holding the copy up to a light. This photocopy is going to be your master artwork, and will be used to produce a film negative.



Three steps in making a Scotchcal panel (clockwise from top, left): 1. developing the negative; 2. developing the Scotchal panel; 3. coating the finished panel with clear lacquer.



If you decide to make your own master artwork, then we recommend that you use one of two methods. The first is to prepare the artwork on drafting quality tracing paper. "Letraset" (trade name) rub-on lettering and stencils will help you achieve a professional result, while all lines should be inked in using Indian ink. Also available from Letraset is a range of special symbols to turn even the most ham-fisted artist into a Rembrandt!

The second method is to prepare artwork on clear plastic film using rub-on lettering and precision slit tapes. The tapes, from Bishop Graphics of the USA, are made of black crepe paper, are self-adhesive, come in a range of widths, and are commonly used to produce printed circuit board patterns.

The exposure setup

There are two sources of UV light at your disposal: the Sun and special actinic blue fluorescent tubes. To use the Sun, you first have to prepare everything indoors and, when you are ready, expose the photosensitive material to the sunlight. The main drawback with using the Sun is that the UV intensity varies widely, necessitating the use of test strips to determine the correct exposure on each occasion.

Actinic blue fluorescent tubes are a more convenient and predictable light source. The main advantage of these is that exposure times are predictable since the UV intensity is constant and does not depend on the weather or time of day. There's just one disadvantage: the fluorescent tubes cost you money as opposed to sunlight which you get for free!

There are two types of fluorescent tubes suitable for use with Scotchcal products: the Philips TLA-05 (but NOT the TLA-03) and the Sylvania F20T12BL. Both types are rated at 20W and, for best results, you will need at least two tubes mounted in a suitable batten. The batten should be mounted in a wooden frame so that when the artwork and the film, clamped between the two sheets of glass, are laid under the tubes, the exposure distance is about 50mm.

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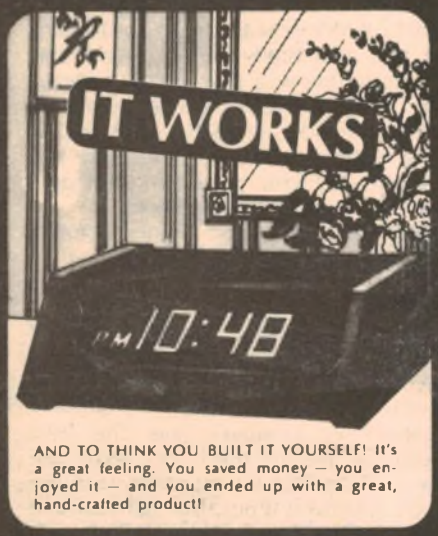

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This spacing is about optimum for correct exposure. If the artwork you have is so large that it cannot be evenly illuminated by two tubes, then you will have to add additional tubes.

Making the negative

To make the aluminium panel, we first need to make a negative from our master artwork. The procedure is really very simple – the artwork and a suitable piece of 8007 exposure film are clamped together in the printing frame and the film exposed through the artwork to the UV light. In more detail, here is the procedure step-by-step:

(1) Place the exposure film emulsion side down onto one sheet of (clean) plate or float glass. To determine the emulsion side observe both sides of the exposure film. The dull side is the emulsion. Important: the system will not work if the exposure film is exposed to the wrong side.

(2) Place the artwork face up on the exposure film and clamp the two together between the two sheets of glass using the two bulldog clips. (Note: if you are using photocopied artwork, place the image side in contact with the exposure film. This is to prevent light from dispersing through the thickness of the paper. All other artwork should be face up).

(3) Exposure: expose film through the artwork to the UV light. Exposure time will vary according to the light source and the artwork. Typical exposure times are one to two minutes for artwork on clear film, three to four minutes on tracing paper and around 20 minutes for photocopied artwork. Exposures to direct sunlight are approximately the same.

(4) Development: lay exposed film emulsion side up on a flat, clean surface (not plastic) and wipe 8500 developer liberally across the surface with cotton wool until the image is clearly defined. Then allow to dry.

The result will be a photographic negative of the original artwork.

Making the Scotchcal panel

The procedure used to produce the panel is almost exactly the same as that used to produce the negative:

(1) Place the negative over the Scotchcal label blank and clamp the two together in the printing frame. Make sure that the negative is the right way up otherwise the image on the aluminium will be reversed, with all the writing back-to-front.

(2) Exposure: expose Scotchcal through negative to UV light. Exposure time is typically around seven minutes using fluorescent tubes, while test exposures should be taken if using sunlight.

(3) Development: wipe 8500 developer liberally across the surface of the Scotchcal with cotton wool until the image is clearly defined. Allow label to stand for 15 minutes to dry. Note: if the image breaks down during development, increase exposure; if image does not develop at all, decrease exposure.

The resulting image on the aluminium panel will be a copy of the master artwork, with all black lines being the same as the original. If, on the other hand, you want a reverse image on the aluminium (ie silver lines on a black background), you simply make a second negative from your first negative. You then expose the Scotchcal through the second negative.

Alternatively, you can produce a reverse image by directly exposing the Scotchcal through the master artwork, provided the artwork is laid out on a clear base.

Protective finishing

The final step is to coat the finished label with a clear protective lacquer. If this is not done, the emulsion remaining on the panel will gradually fade, while markings adjacent to control knobs can rub off due to repeated finger contact.

To protect the panels, use either Scotchcal brand 3900 Gloss or 3930 Matte coating (available in aerosol cans), or Estapol clear gloss made by Wattyl Paints. Place the panel on a flat surface and wipe gently with a lint free cloth. Now spray a uniform coating onto the label and leave it lying flat until dry.

Average drying time is five to 10 minutes for the 3M coatings and about 30 minutes for Estapol.

Once the panel has dried, it can be trimmed to size, ready for use on your new piece of equipment.

A simple way of trimming the aluminium is to score it with a sharp art knife, and then bend it along the score line. After bending backwards and forwards a few times, the aluminium will break away, leaving a clean edge.

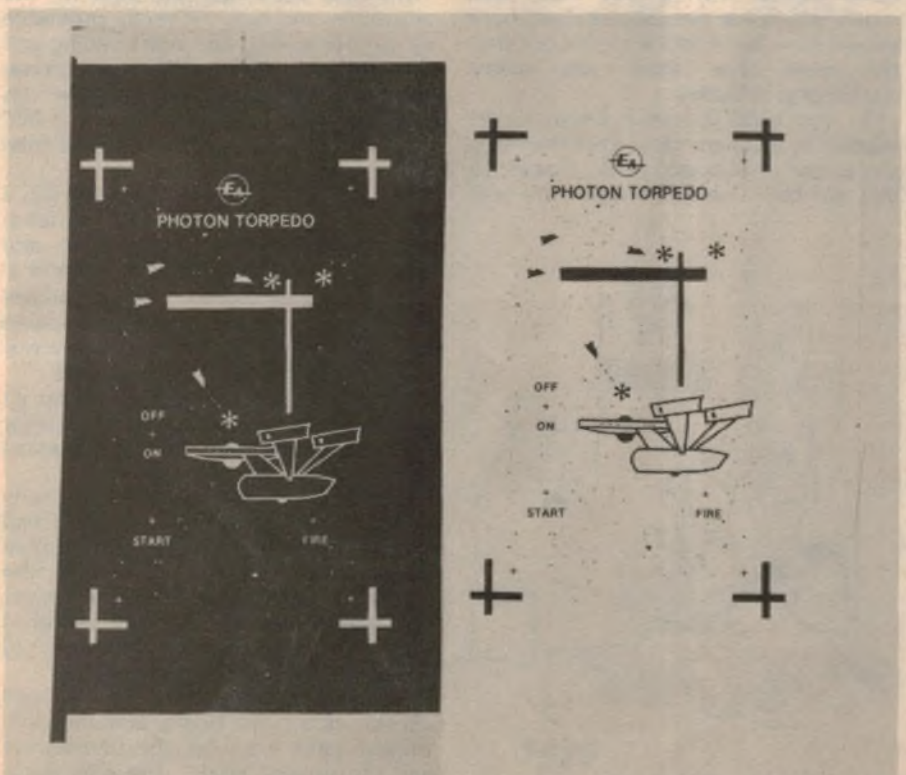
The surface to which the panel is to be attached should be thoroughly cleaned with methylated spirits to remove dirt and grease, otherwise the panel might not glue properly. Finally, remove the backing paper from the panel, carefully align it in position, and press it into place. Do this carefully though – once the panel has stuck, it is impossible to remove without damage.

Where to buy Scotchcal

Scotchcal products are available from the following outlets:

- Radio Despatch Service, 869 George St, Sydney 2001;
- Dick Smith Electronics – all stores;
- Circuit Components Pty Ltd, 383 Forest Rd, Bexley, NSW 2207.

So now you know why we bother to publish full size artwork of front panels. It gives you the choice of making your own panel or buying one from one of the kitset suppliers. And now that you know how to do it, why not have a try at making one of your own panels from scratch? The result can be very satisfying.



A finished Scotchcal panel (left), together with the master artwork. The reverse image was obtained by exposing the Scotchcal directly through the artwork.

The Serviceman

Servicing problems from the "Apple Isle"

It is contributors' month this month and somebody else's stories should provide an interesting change from my own. In fact, it is good to be reminded that not all the queer situations and funny (peculiar) faults happen to yours truly; most servicemen have had at least one experience in the "That's Incredible" category. Have you?

This month's contributor is Mr J.L. of Tasmania, who has submitted more stories than I can present in one issue, so some will have to be held over. But they are all stories worth telling and I will present them in due course.

In the meantime, here are the first ones I have selected, told more or less in J.L.'s own words.

This concerns a Clarion car radio cassette unit, model PU664, which developed the habit of changing programs spontaneously during one winter, only to clear itself of the fault in the following spring. I was called in when the problem re-appeared during the next winter.

The customer provided the vital clue when he mentioned that the fault only started after the car – not the radio – had been running for about 10 minutes. On the bench it was easy to create the fault by directing a heat gun on to the station select circuit board. Replacing the two transistors on this board cured the fault, and no amount of heat could induce it to reappear.

On replacing the unit in the car, the real cause of the problem became obvious. The unit mounted in the dash directly above the car heater and a gap in the hot air line to the demisters directed a stream of hot air on to the radio case. Naturally, the owner used his heater only in the winter so, ergo, the fault showed up only in the winter, and after the car had been running for about 10 minutes!

The next story relates a series of misfortunes for both the customer and myself. It seems that the children of the household were arguing, and one threw a glass marble at his brother. Fortunately, it missed but hit the TV set's colour tube, going right through the screen and hitting the shadow mask.

The child's mother, enraged by what he had done, threw a wild "punch" at him, missed, and hit the TV set which fell over on its back, breaking the picture tube neck board and the cabinet back. I was asked to make good the damage and, in due course, I fitted a re-gunned tube, a new neck board, a new cabinet back, set everything up, and returned the set to the customer.

About a week later I received a call saying that the picture had vanished and the set was making a buzzing noise. A quick glance showed that there was more light inside the cabinet than there should have been and it turned out that the neon type spark gaps were discharging brilliantly.

On removing the neck board I was startled by a violent spark from the focus pin to the neck board earth. It seemed that we had a short between the final anode and the focus electrode, meaning that the "new" tube would have to be changed.

Unfortunately, the supplier had no replacement in stock and asked me to return the faulty tube to be reworked. As I removed the convergence yoke the whole neck and gun assembly came away with it – the weld had failed but nothing had moved because the yoke was holding it in place.

It was several weeks before I acquired a new tube, but the faulty one was replaced under warranty with no arguments, and the new one has shown no sign of failure. (Most regunning organisations prefer not to regun a tube which they have not let down to air themselves. Ed.)

"Sorry – I must have dozed off!" (From "Radio-Electronics")

NEXT STOP, THE TIP!

The next story was expensive for the customer, and only indirectly profitable to me. He arrived late one evening and asked if I had a reasonable monochrome set he could buy. He added that he was sick and tired of his colour set – it had cost him "two fortunes" and he had "had it".

He went on to tell me about the set, a Luxor. It had been serviced nine times in two years, by three organisations, and that six of the service calls had been in the previous six months. The set had just failed again, with a loud bang that scared his wife and kids half to death, and it was going to the tip the next weekend!

I suggested he tip it in my workshop; if I couldn't fix it, I would make him an offer for it on the basis of what components I felt I could salvage from it.

The cause of the bang was clearly apparent; the main filter capacitor had spread its contents over the whole interior of the cabinet . . . In detail, the rest of the story would take many pages but, briefly, over the next nine months I replaced the chopper transistor 10 times, the thyristor three times etc.

I replaced all the diodes, resistors, and capacitors on the board and the only original parts left were the transformer and the printed board. The set's distributors suggested several modifications, but these had no effect. I cut tracks to

measure currents, and hung meters on every conceivable part of the circuit. New parts were replaced with more new parts and still the set would not work for more than about two weeks without failing. Of course, all this took place at irregular intervals, as spare time permitted.

Eventually, the owner rang to tell me that I could have the set, at no cost, so long as I did not give him an account for the work I had done. I was happy with this arrangement, as the picture tube was a common one, and in good condition.

A few months later, a colleague from another city called in to yarn about work in general, and spotted the Luxor gathering dust on the shelf. It turned out that the Luxor was very popular in his area and, as power supply faults were common, he had built a jig to bench test them. He offered to give my unit a going over.

Later, he told me what had happened. After he set it up it failed several times in the next few days. He then removed the chopper transistor and its heat sink from the board, connecting it via extension leads, in order to gain better access to the board.

In this configuration the supply ran perfectly, even under blankets, or when blasted by a heat gun. But, on re-assembly, it failed again within minutes. At this point he noticed a very slight bend in the printed board and soon established that, by trying to straighten the board, he could create a failure.

He obtained a new board from the distributors for the grand sum of 78c and transferred my parts onto the new board. The set has now run for a year without any sign of trouble and has become a family set, replacing the old monochrome set which graced our spare room for what seems like 100 years! (That must be the board fault to end all board faults!)

DRY JOINTS AGAIN

Another tricky problem I encountered recently involved a Kriesler 59-1 chassis. The customer's complaint was no colour, and the first thing I noticed was that he was using only a set-top antenna in a poor signal area. So the first thing to do was to give him an adequate outside antenna.

This provided a partial cure, because we now had colour but it was intermittent; more on than off, but obviously not good enough. Checks around the chrominance/luminance control unit board (CU401) showed everything much as it should be, so a change of IC seemed to be indicated.

I didn't have the appropriate IC with me, so I returned the next day with the IC, and also a CRO to make sure everything was set up properly. After this the set seemed to behave quite normally and I would have been ready to believe that it was fixed, except for a brief colour dropout just as I was leaving.

The customer was not particularly worried by this – after all, he was enjoying more colour than he had seen for weeks – but I knew that there must still be something wrong. Hopefully, it would fail completely within a reasonable time and give me a chance to get to grips with it.

Sure enough, the owner was on the phone again a couple of days later. But it wasn't just the colour this time – he had lost the picture completely. It transpired that the whole line output stage was inoperative, and there was no voltage on the collectors of the line output transistors.

I eventually discovered a dry joint at pin 12 of the line output transformer (T750) and this prompted me to check the other pin connections to this transformer. This revealed one more, on pin 1.

On checking the circuit I realised that pin 1 feeds a pulse back to pin 14 of the chrominance luminance control unit. (Via PL/SKT 704, pin 3 and PL/SKT 502, pin 3.) During the previous visit I had recorded this pulse as present at 28VPP, not much below the specified value of 35VPP.

I had assumed that the pulse was adequate and had gone on to look for the failure elsewhere. It may well have been adequate too, had it remained at that level, but with a dry joint in the circuit it could have varied from 35V all the way down to zero. Anyway, with the pin resoldered, that pulse was exactly 35VPP and there have been no further dropouts.

SCHEMATIC PROBLEM

And, finally, the story which I feel is the most interesting of them all. In the January 1981 issue, the Serviceman described the tribulations of a reader over a Rank 2601 colour set. He had tripler, vertical, and video problems and eventually solved them all. I feel that my story is interesting because it almost duplicates this earlier one, but adds a twist that is the proverbial trap for young (and old) players.

My problem concerned a Rank 2251, which uses almost the same lineup of boards as the 2601, with one apparently minor difference. It has a separate board fitted in place of the network around D558, 562, etc.

The set came to me with "no picture". The owner, a retired university technician, reported that the tripler had broken down and he had replaced it himself. The EHT came up, but no picture. At this point he was out of his depth and called me.

Like your January correspondent, I found the voltages around TR706 to be quite wrong. The transistor was biased hard off and the video signals disappeared at the base. And, like him, I found that I could brute force a signal

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Front panel Cat. HE7800	$15.00
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SUPER SPECIAL IC SOCKETS
18 pin PE3278 40¢ was 65¢
22 pin PE3280 NEW 50¢
24 pin PE3338 was 90¢ 50¢
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40 pin PE3348 was $1.10 70¢

ETI5000 Pre Amp **$245**

Come in and hear the fantastic combination of the ETI5000 power amp & preamp playing through the ETI4000/1 and 2 speaker systems.

ETI Power Amp

The front panel is now better finished than ever, and has no holes visible. The fins themselves are tapped from the rear. Complete kit price is just $295. Remember – our kit has the specially designed professional folded case and the super finish front panel at no extra charge.

ONLY $295

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See Oct EA

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Cat. KE6601 Keypad to suit includes 18 keys and Scotchcal™ labels for keys.	$32.00
Cat. KE6602 Colour option	$13.50
Cat. KE6603 Video RF modulator including die-cast box.	$14.50
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Walkabout cassette with phones

The latest in mobile music. Fantastic sound – save up to $20 on other brands. Cat. AE5000

$79 Save $20 on others

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A range of top quality wide range speakers

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Power handling 25W RMS
Resonant frequency 35Hz
SPL @ 1W @ ½m 94dBSPL
Frequency resp 45-15kHz
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10WR
Power handling 25W RMS
Resonant frequency 35Hz
SPL @ 1W @ ½m 95dBSPL
Frequency resp 50-14kHz
Cat. CE2345 **$18.95**

12WR
Power handling 25W RMS
Resonant frequency 30Hz
SPL @ 1W @ ½m 93dBSPL
Frequency resp 50-14kHz
Cat. CE2355 **$21.95**

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Ideal for all applications needing a super compact wide range speaker. Cat. AE8130 **$4.95**

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Connect your TV to your hifi system – without bad side effects. 1 3.5mm plug connects to TV, 2 RCA plugs to amp, 2m lead. Cat. HE5293

$7.95

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CA3140 (DIL)	ZE5140 $1.10
BF469	ZE0445 70¢
BF470	ZE0455 70¢
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Glover & Assoc	ELAG/28
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LATEST KITS

ETI Low ohms meter
Accurately measures very low resistances – measures critical cable resistances and emitter resistors etc that a multimeter couldn't cope with. ETI158 Nov. Cat. KE1877 **$29.50**

EA Sand glass
The solid state egg timer to end all! Intriguing 'hourglass' design has the character of the traditional timer – with the accuracy of electronics. See EA Nov. Cat. KE1027 **$23.50**

EA Traffic Buzzer
If you have trouble hearing your indicators – in open cars, bikes, over loud stereos or if it just isn't loud enough – here's the answer. Easy to build and install. See EA Nov. Cat. KE0193 **$7.50**

Photon Torpedo
The low cost alien exterminator! Great way to kill time (and aliens!) on boring train trips etc. Compact, self contained game. See EA Sept. Cat. KE1010 Complete kit $23.50

Scratch & Hiss filter
From Hobby Electronics October. Super simple, super cheap way to cut hiss on your cassettes. Cat. KE1085 Includes PCB, switch, components only $9.95

A big thankyou

Thank you for such a fabulous response to our catalogue. We are trying to hold the catalogue prices as long as possible – but due to the sales tax increases some prices may have to go up – we're sorry to go up.

through by putting a 10k pot between the 19V rail and chassis, with the slider connected to the TR706 base.

Remembering the January story, I looked for D562 on the circuit diagram and, at this point, the stories seemed to diverge. The model 2251 has no D562, no D558, and no resistors or capacitors in that particular part of the set. In fact, the line from plug G3 on the deflection-out board is shown as going straight through that board to pin 2 on another plug coded MS, ie, MS2.

Briefly, the basic difference between the two circuits involves the G3 line. In both cases it picks up a vertical blanking pulse and feeds it to the 2nd video amplifier (TR704) which is direct coupled to the 3rd video amplifier (TR706). In the 2601 this pulse is picked up from the vertical output transistors, TR409 and TR412, and finds its way through a network of resistors, capacitors, and diodes to the G3 line and thence to the video-out board.

DIFFERENT SYSTEM

The 2251 arrangement is quite different. The pulse is picked up at an earlier vertical stage (TR410) and taken directly to the extra board on which is a simple two-stage amplifier. The output of this auxiliary amplifier comes back on to the deflection-out board via the aforementioned MS2 connection. Thus, the only role the deflection-out board plays in this part of the circuit is to provide a short link between the MS and G plugs.

Since there were no other connections to this line it seemed that the fault had to be on the auxiliary amplifier board. This has only half a dozen components on it, so I dismantled it completely and carefully checked everything. Everything was perfect, so this board was not causing the wrong voltage on the G3 line. But there were no other components on the line, so where to now?

The G plug has several other lines connected to TR704. Both G4 and G5 enter the same network as G3, so they were checked back thoroughly, with no results. Line G2 biases the limiter TR705 and, although only loosely associated with the video amplifiers, it was worth checking. It was no surprise when this proved fruitless. So it was back to G3.

As already mentioned, the circuit shows G3 on the deflection-out board connected directly to MS2 without any resistance or side branches. So the two points should show a dead short between them, and a check with the meter confirmed this. But while the plugs were off the video and auxiliary amplifier boards I decided to check the line's resistance to chassis.

Here I struck oil. The line showed only a few ohms to chassis, yet the diagram said it should have infinite resistance. The G3 to MS2 circuit consists of only two lengths of wire connected together via the track on the deflection-out board.

The MS plug on the deflection-out board connects right under the G plug, in a fairly crowded part of the circuit. Might there be a stray strand of wire causing a short? Close examination showed not only the short track connecting MS2 and G3, but also a long wandering track going off to the other side of the deflection-out board. And there, at the end of the track, was D562. Needless to say it was short circuit, and a replacement cured all the troubles.

I wonder why the diode was fitted when the circuit diagram clearly indicates that it is not there. Or, why does the circuit not show parts that are obviously in the set?

Needless to say, the customer paid for only a fraction of the hours that went into finding this fault. I can only console myself with the knowledge that I am now very familiar with this part of a Rank 2251.

Well, those are J.L.'s stories and I, for one, found them extremely interesting; they certainly provide an insight into how the other half lives. I hope you enjoyed them too.

In regard to the last story, I can only concur with J.L. when he asks why the circuit diagram did not show an important component which was actually in the set. In fact, remembering the January story, it would seem that the Rank organisation could well tighten up on their circuit diagrams. That contributor reported two serious errors in the 2601 circuit, plus the fact that he had to make do with model 2201 waveform diagrams because there never were any 2601 diagrams.

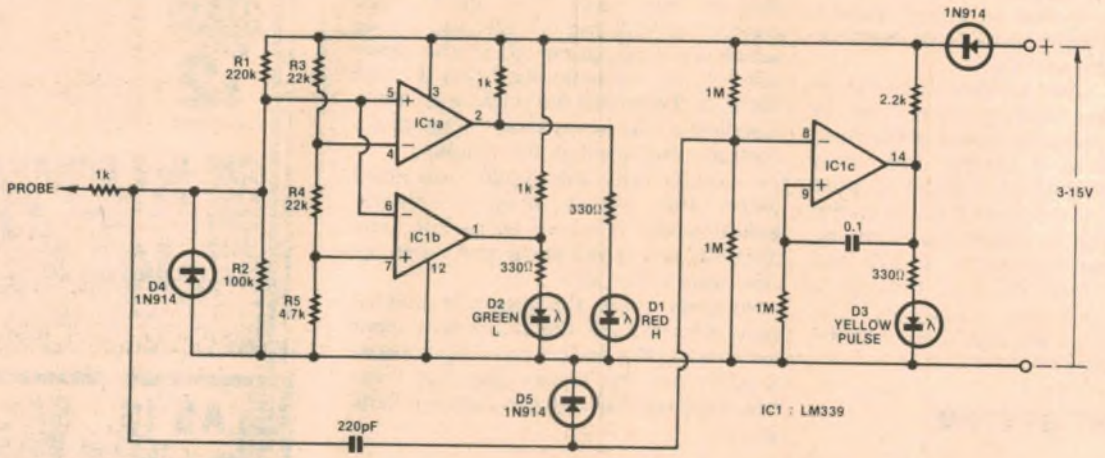
Which really isn't good enough.

"That's the third beard he's shaved off tonight!" (From Electronics Weekly)

Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.

Single IC Logic Tester



This Logic Tester requires only one IC to provide visual indication of the three normal states (high, low and pulse) which may exist in a digital circuit. It works equally well on either TTL or CMOS. The design is based on a circuit originally published in "Popular Electronics" as an audible logic probe but has been modified to include a pulse stretcher by the contributor of this item.

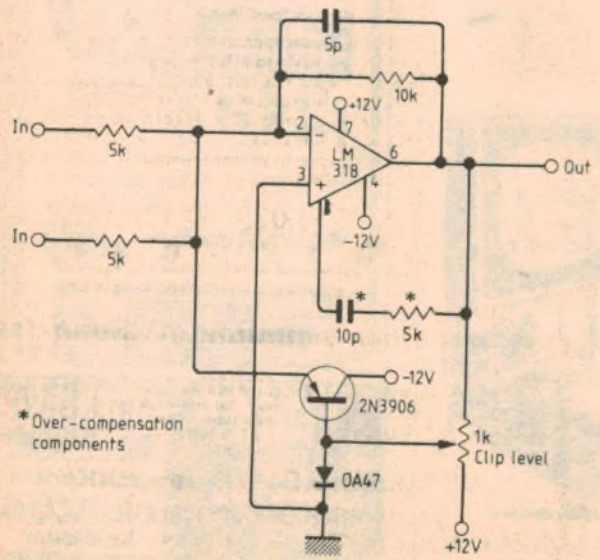
Resistors R1 to R5 form a biasing network for the inputs to the voltage comparators, IC1a and IC1b, such that their outputs are held low; with LEDs D1 and D2 being extinguished. If the input is taken high, the output of IC1a goes high, thus energising D1, a red LED, which indicates a high state. And if the input is taken low, the output of IC1b goes high, energising D2 a green LED, thus indicating a low state.

Pulse indication is provided by a yellow LED D3, which is driven by the pulse stretcher circuit formed by IC1c and capacitor C1. Whilst it gives a short flash whenever the input probe is touched onto a steady high or low state, D3 only remains on if there is a steady train of pulses in the circuit being monitored. It indicates both positive and negative pulses.

Diodes D4 and D5 were included to protect against any high voltage spikes that may be applied to the input. Diode D5 also lengthens the pulse stretcher indication.

C. A. Syms,
Flynn, ACT.

Simple Video Summing Amplifier



A video summing amplifier and limiter with a bandwidth adequate for modest CCTV applications can be constructed around one LM318 high speed op-amp.

To avoid overloading the Monitor, a sharp cut-off is required; to achieve this, the base-emitter junction of a PNP transistor is used as the limit sensing element. Emitter current is $(\beta + 1)x$ base current, provided by the clip-level potentiometer, which reduces the limiting slope by the factor β.

Due to the wide bandwidth (15MHz) of the LM318, it is recommended that the tracks to the LM318 be kept short. Also, the 10kΩ feedback resistor should be mounted across the top of the IC, and the 5pF capacitor mounted underneath the board.

Output capability is such that the LM318 can drive directly into a 75Ω load.

From "Wireless World",
July, 1981.

Handy Calibrator for DC Meters

A mercury cell gives very close to 1.35 volts almost throughout its life. Thus six cells in series would produce 8.1 volts, which is useful for checking the accuracy of the DC 10-volt range of a multimeter.

Paul Smith, Neutral Bay, NSW.

(continued on p 87)

MORE QUALITY KITS AT A LOW PRICE = JAYCAR!

INFRA RED REMOTE CONTROL BARGAIN

Refer "Electronics Australia" May 1981
We've slashed the cost of this great COMPLETE as specified kit. We need the cash so you get a bargain!

WERE $65 for complete kit
NOVEMBER ONLY $50!!!

SAVE $15

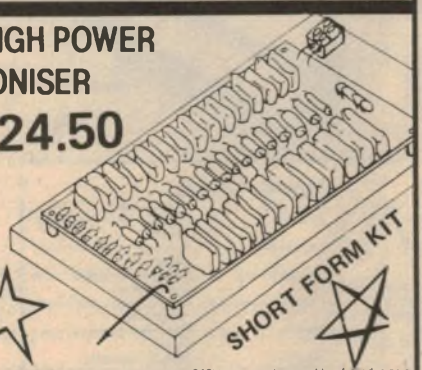
SOUND LEVEL METER

ONLY $32

SAVE $7.50

(Ref: EA May 1981)
A must for audio or enviroment - conscious people. This unit has specifications which are only matched by meters costing up to hundreds of dollars more!!!
GREAT VALUE AT ONLY $32. . . . . (They were $39.50)

HIGH POWER IONISER $24.50



The Jaycar ionizer runs directly from the 240V mains and is capable of producing a high intensity electric field. Output voltage of the unit is around 7.5KV.
This remarkably low cost ionizer has been produced for the enthusiast who wishes to experiment with the effects of ionized atmospheres. We must emphasise that whilst this ionizer can be made to produce small quantities of ozone it will not do so unless you specifically configure it to do this.

CMOS Specials Back!!

We have bought the entire stock of the mail order company 'Micronics' of Randwick NSW. They wanted to get out of the business so their loss is your gain!
Most of the CMOS below are the 'AE' type (NOT B but they are prime spec. brand new stock.

PART NO.	NORMALLY	THIS MONTH
4000AE	0.40	0.25
4002AE	0.48	0.25
4006AE	1.10	0.50
4012AE	0.35	0.20
4014AE	2.50	1.00
4018AE	1.50	0.50
4023AE	0.28	0.15
4026AE	2.20	1.00
4028AE	1.18	0.50
4029AE	1.25	0.55
4035AE	1.30	0.50
4047AE	1.20	0.50
4050AE	0.60	0.30
4051AE	0.95	0.40
4055AE	2.55	1.00

COMPLETE IONISER KIT

BY POPULAR DEMAND
Based on the Jaycar High Power Ioniser short form kit (see left).
This unit has redesigned PCB, HIGH EFFICIENCY EMITTER HEAD that fits inside a high quality moulded ABS box with matching lid. The whole ioniser fits INSIDE the box with only a 2-core figure-8 mains flex protruding.
If you want a COMPLETE ioniser this is it!!

— WHY PAY WELL OVER $80 FOR AN INFERIOR UNIT?

ONLY $45

MUSICOLOR IV

ONLY $94.50

(Ref: EA August 1981)
This is our third production run! Remember our kit uses the originally specified box (which means that the front panel fits!). Don't forget also that this is a chaser (4 channel) AS WELL AS a 4 channel Musicolor!!
Great lightbank to suit above unit ONLY $29.50 (Check last months ad for details).

ETI current trip car alarm

(Ref: ETI July 1981)
A great kit that is easy to install and has inbuilt false-trigger preventative mechanism. This kit has been held up due to non-availability of the LM394 I.C. This device is now becoming available.
Kit in Diecast box (complete)

ONLY $24.50

Light up your life

We know that it's crazy but we're doing it anyway. For the month of November ONLY we have gone crazy with panel lamps. If you buy ANY Jaycar panel lamp that uses an incandescent (i.e. Lilliput or MES) bulb we will give you

And that's 50% off the best price anyway!!!

* 50% OFF!!

We have about the biggest range of panel lamp bezels in Australia. So call in!!

$7.50 ME-533 MULTIMETER CURRENT SHUNT

Hand made. Plug into your meter.
Measures up to 20 AMPS with direct meter readout.
VERY ACCURATE
See our other ads for this great DMM - $49.95

Useless Pushbutton Switch Sellout

We have zillions of innocuous little pushbutton switches. They can be used for many purposes (i.e. like a bell-push etc) but are basically too large for electronic games or computer projects.
If you can figure out a use for them you will save a FORTUNE in November
They are normally $1 but November only
15c each! 1-off
10c each! 10+
(Ask us for a higher quantity price!!)

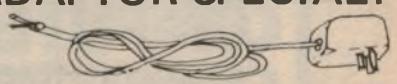
PHOTON TORPEDO KIT ONLY $24.50

Ref: EA Sep. 1981

Complete kit including special panel with deep Space Background and Star-Trek Warship!!
ONLY $24.50!!!

STOP PRESS: EA CDI ref: May '75
Normally $35 NOW $25 SAVE $10

FERGUSON PLUG ADAPTOR SPECIAL!



Fully Australian approved Plug Pack type PPA 1024.
Can supply 30V r.m.s. AC @ 250mA!!
We still have a few left despite massive sales when they were on special in September. These units normally sell for $8.50 — be quick to get one before they are out of stock!
SORRY — due to weight, personal shoppers only or $2.00 post and packing.

ONLY $3.00!! SAVE OVER 60%

We now stock ELLISTRONICS plug-in Experimenter Boards!

OTHER KITS

ETI (In no particular order!)	
446 Audio limiter (short form)	$9.00
480/50 watt Module	$23.00
480/100 watt Module	$27.00
480.2 Input preamp/mixer (short form)	$30.00
466 300 watt amp module	$70.00
477 100 watt MOSFET module (inc. bracket)	$59.00
473 Moving Coil preamp absolutely complete	$74.50
735 UHF convertor complete	$32.50
458 Peak level meters NOT $37.50 BUT	$29.50
480/100 complete slave P.A. inc. P/S and box	$130.00
581 +/-15V Power Supply	$15.50
445 General purpose preamp	$7.99
JAYCAR'S OWN KITS	
88 note (7¼ octave) electric piano kit	$589.00
4-voice polyphonic string synthesiser	$445.00
3002-SP Speaker protector 2 channel	$15.50
3002-PM Power meter (LED) 2 channel	$15.50
ELECTRONICS AUSTRALIA KIT	
Fuzz box complete EA Feb	$19.50
(See above for other EA kits)	
ETI 729 UHF Masthead Amp	$35.00
EA 'Le Gong'	$14.95
EA 'P.C. Birdies'	$14.95

parts for new kits

(Once again in no particular order)
ETI (ALL pcb's are fibreglass)

330 Car alarm PCB	$2.50
729 UHF masthead amp PCB	$2.50
735 UHF convertor PCB set	$2.50
458 Peak reading meters PCB	$3.55
446 Audio limiter PCB	$3.50
5000 Preamp metalwork set	$99.00
478mc Moving Coil cartridge PCB	$3.50
478mm Moving Magnet cartridge PCB	$3.50
5000 Power amp heatsink front panel	$49.50
5000 Power amp complete metalwork	$99.00
EA	
75CD-7 Cap Discharge Ignition PCB	$2.50
81GA-3 Graphic analyser PCB	$9.50
81CC-5 'PC Birdies' PCB	$2.50
81AO-6 Audio oscillator PCB	$3.70
81SP-5 Sound pressure meter PCB	$3.00
81RC4A	
81RC4B 2 channel IR control	$1.50 each
81RC4C	

P.S. We have lots of 'vintage' ETI PCB's. See our 'Specials' ad last month or call in!

POST AND PACKING: $5–$9.99 ($1.00): $10 – $24.99 ($2.00): $25 – $49.99 ($3.00): $50 – $99.99 ($4.00) $100 up $5.50

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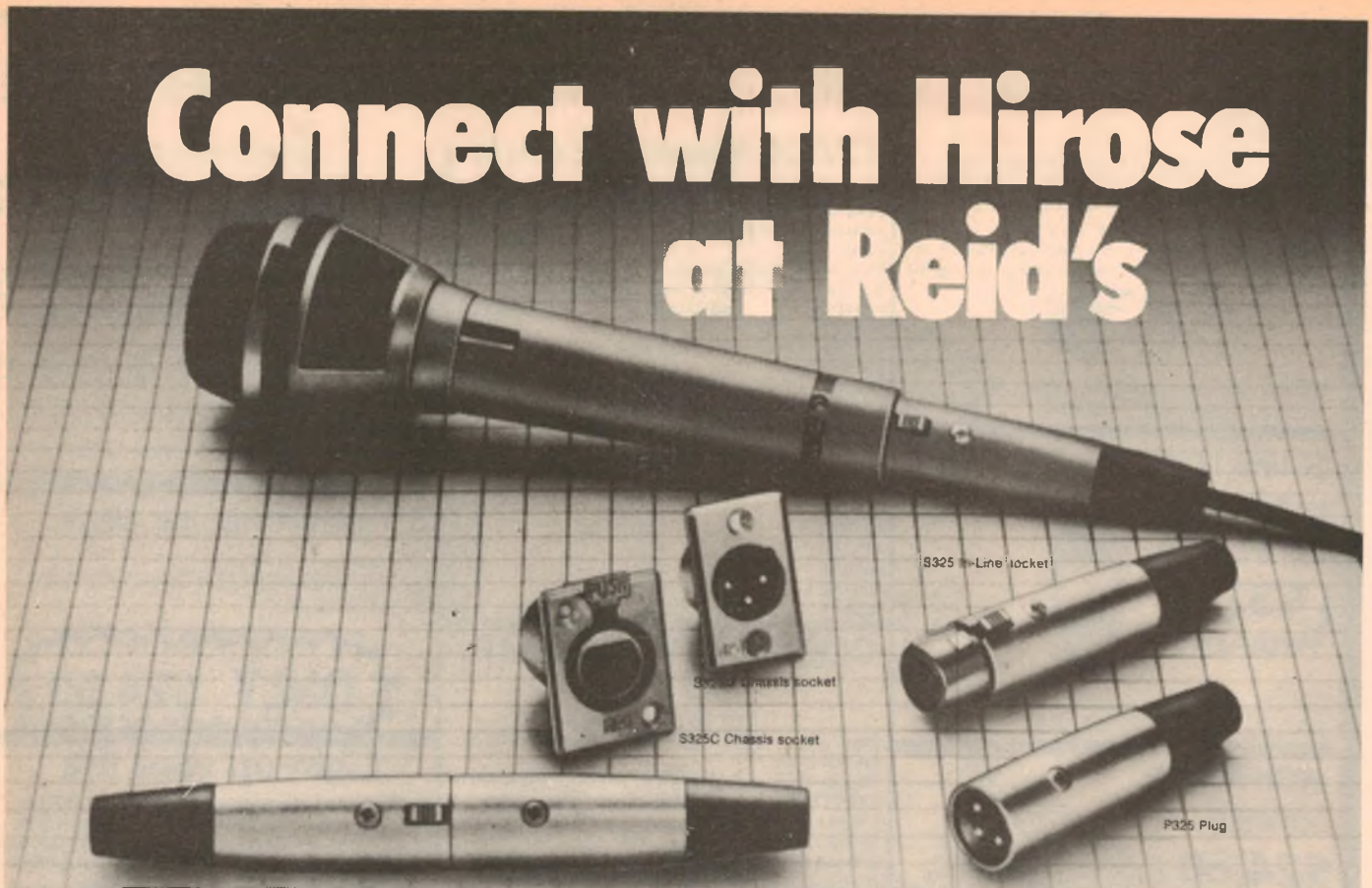


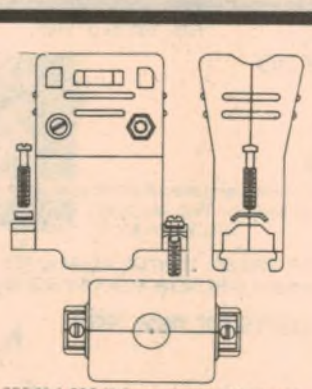
PROFESSIONAL AUDIO CONNECTORS

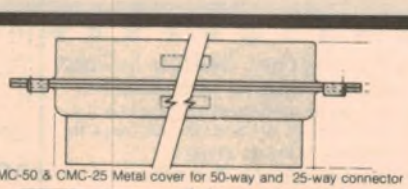
Connectors equipped with latch-locks which make them ideal for use with audio equipment such as microphones, microphone mixers, broadcasting equipment etc!
All have supplementary grounding mechanisms which dispose of incoming noise and are compatible with Amphenol & Neutrik ranges.

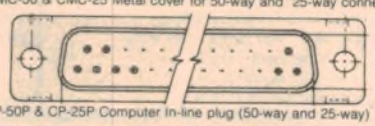
Electrical & Environmental		Material and Finish	
Contact resistance	5mΩ MAX. at DC1A	Plug shell	Stainless steel
Insulation resistance	1000MΩ MIN. at DC500V	Plug body	Zinc alloy. Matte finish nickel plated
Withstand voltage	AC1400V for a minute	Jack body	Zinc alloy. Matte finish nickel plated
Rated voltage	AC130V. DC180V	Receptacle shell	Aluminium alloy. Matte finish nickel plated
Current rating	15A	Plug-Receptacle shell	Aluminium alloy. Matte finish nickel plated
Insertion force	8 kgs MAX.	Molding	Glass-filled polyamide. Grey colour
Humidity	10MΩ MIN. in high humidity at 40°C. 95% for 96 hours	Male pin	Brass. Silver plated
Vibration	10-55Hz at 0.75mm amplitude	Female pin	Phosphor bronze. Silver plated
Shock	50G. 9 times	Metal clamper	Brass. Solder plated
Durability	10MΩ MAX. at 1000 time insertion	Hood	PVC

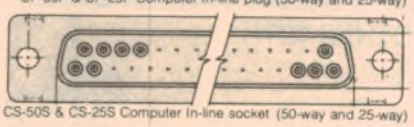
HIROSE COMPUTER CONNECTORS

Popular, high quality 50-way and 25-way plugs and sockets mainly for connecting computer peripherals to CPUs. (They are direct replacements for Amp and Cannon and feature solder style pins for ease of assembly!)


CPC-50 & CPC-25 Plastic cover for 50-way and 25-way connector


CMC-50 & CMC-25 Metal cover for 50-way and 25-way connector


CP-50P & CP-25P Computer In-line plug (50-way and 25-way)


CS-50S & CS-25S Computer In-line socket (50-way and 25-way)

NORRIE 1306

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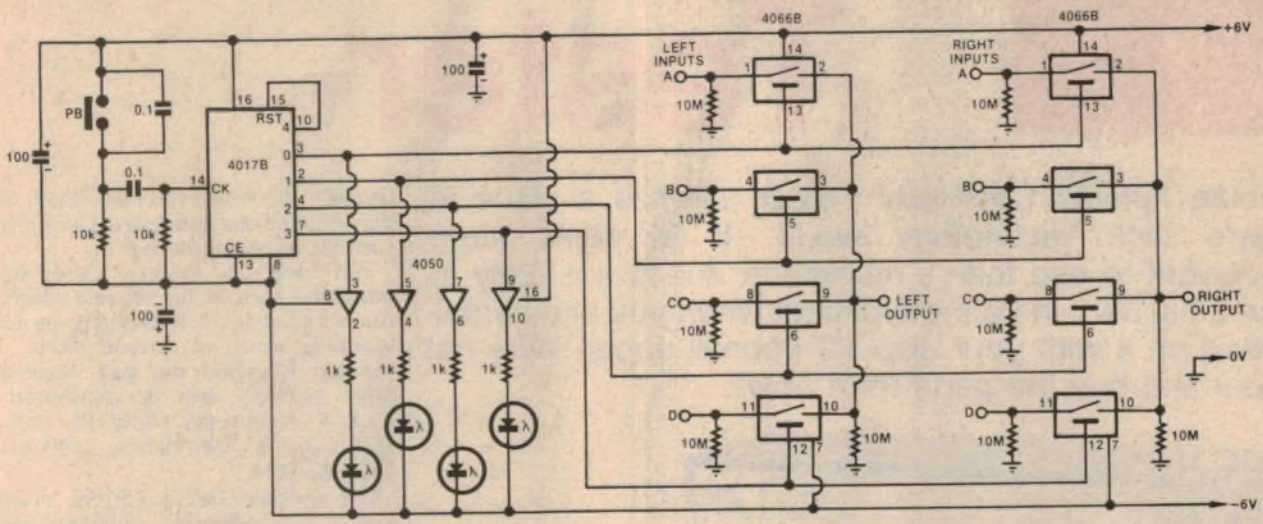
Single Button Sequential Switcher



Here is an idea which permits the selection of any one of four different stereo audio input signals, yet uses only one pushbutton to perform the task. Basis of the idea is the use of two CMOS quad bilateral switches, controlled by a CMOS decade counter set to count to four.

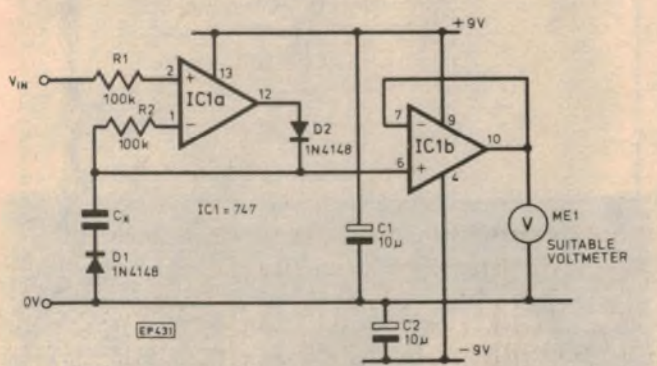
Operation of the pushbutton puts a momentary high on the clock input of the 4017 decade counter, which thus advances one count for each activation of the button. When the count reaches four, the "4" output (pin 10) resets the counter to "0". Outputs "0" to "3" are separately connected to the paralleled control inputs of two 4066 quad SPST switches, such that as the count progresses from "0" to "3" pairs of "contacts" are made in sequence. The four "output" contacts on each 4066 are connected together, so that each 4066 functions as a four-position single-pole switch.

One 4066 serves to select any one of four "left" inputs to the left output, whilst the other 4066 does likewise for the right inputs and output. Symmetrical power supplies are required, with the maximum peak-to-peak input voltage being limited to just under the total power supply voltage. The inputs and outputs of the 4066s should be ground referenced – hence the 10 × 10MΩ resistors. However, if the inputs and outputs are already ground referenced, these resistors may be omitted. Note that 4066s are intended for low power, low voltage, medium to high circuit impedance switching and must not be used for high voltage, high current switching.

Four units of a 4050 hex non-inverting buffer are paralleled across the four output busses of the 4017, such that each buffer is simultaneously driven with the CMOS switches. The outputs of the buffers are connected to four LED indicators via suitable series resistors. For a 12 volt supply a value of 1.8KΩ should be about right. For other supply voltages adjust the values as required.

N. Oxley,
Moruya, NSW.

True Peak-Reading DC Voltmeter



The accompanying circuit shows a simple method of reading the "peak" rather than the average value of a varying DC waveform. It may also be used for AC signals, provided the signals are rectified prior to applying them to the input of this circuit. A 747 dual op amp is specified, but two separate 741's could be used, if more convenient.

IC1a functions as a comparator (with essentially unity gain), and signal is applied to its non-inverting input. Output voltage peaks are stored in capacitor Cx, which is charged via diode D2. D2 prevents discharge of the charge in Cx back into IC1a output, while D1 restores the DC offset created by D2. Whenever comparator IC1a detects that the input level exceeds that stored in Cx, Cx will be charged to the new level.

Functioning as a voltage follower, IC1b maintains the effective leakage resistance (shunting Cx) at a high value. If Cx is 0.22µF, the practical time constant will be about 1.5 seconds. By increasing the value, say, 100µF (tantalum) a "peak-hold" effect will be obtrained, as the time constant extends to several minutes. Use of a dual BI-FET op amp (such as a LF353 or TL072) should increase the time constant still further.

Total current drain is only about 4mA, which is low enough for the unit to be energised from small batteries.

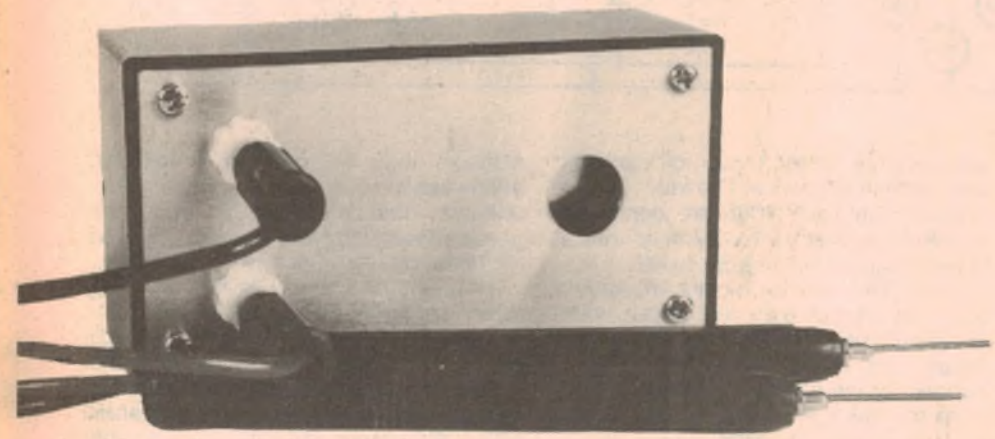
From "Practical Electronics", December, 1980.

PSSST! Got any neat circuit ideas? Why not send 'em in to us? We pay between $5 and $20 per item, depending on how much work we have to do to publish it.

Basic Electronics

Continuity Tester

Ye olde humble Continuity Tester still has a place in today's high technology world. It is often more convenient to use than a multimeter and is not likely to make a big dent in your paypacket when you accidentally tread on it with your size-12 hobnail boots. Why not nip out and buy the parts for it now?



We have seen many different designs for Continuity Testers in the past but the best type has an audible buzzer or alarm transducer. That way you can concentrate on placing the probes correctly on the device being tested and not have to look at some visual indicator.

One drawback of some of the old buzzer-type Continuity Testers is that their relatively high current drain made them unsuitable for checking semiconductors such as transistors and diodes. At the same time, they were really only suitable for checking quite low resistances. This new design (even though it's entitled "Ye Olde Humble Continuity Tester") has low current drain from its internal battery and is suitable for checking semiconductors as well as resistances up to as high as several megohms.

This Tester gives essentially the same level of output with resistance up to 1kΩ or so, with diminishing output for resistances above that. But even with high values up to several megohms it will give a very weak output. You can even test your own skin resistance and see the result of wet skin versus dry skin!

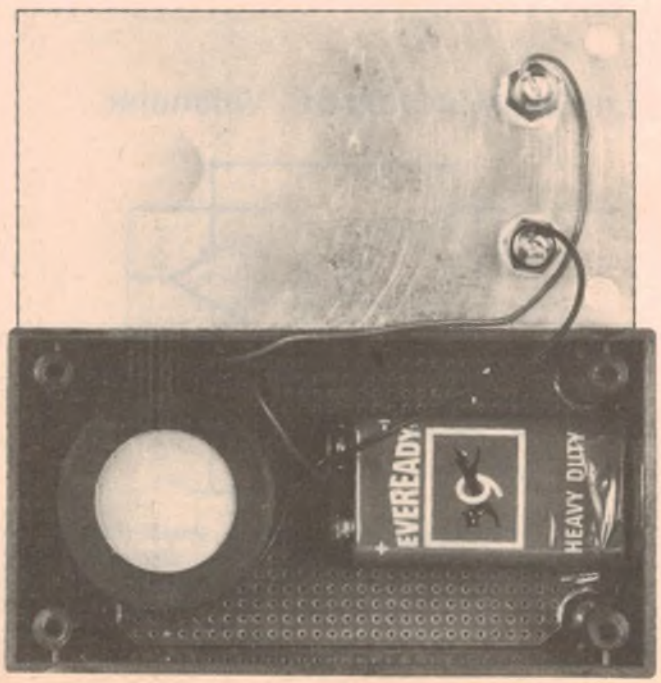
Actually we must admit that the idea for this Continuity Tester is not ours. It came from Geoff Wood, of Radio Despatch Service, 869 George Street, Sydney. Geoff showed us a neat little continuity tester that he had just built up. "What a neat little doo-hickey", we thought, or words to that effect. After very little persuasion (truly), Geoff parted with his prize and here it is.

The Continuity Tester is based on an electronic piesolectric module which will run from five to 16 volts and gives a loud warbling tone, at around 1kHz. This module is called the Bell Audiolarm, type 2321-2-5 and is distributed by C. & K. Electronics (Aust) Pty Ltd, 2/6 McFarlane St, Merrylands, 2160 phone (02) 682 3144.

The module has a current drain of about five milliamps when connected directly across a nine-volt battery but will function on the proverbial "smell of an oily rag" and continue to give a very faint output even when fed by resistances of as high as several megohms.

The circuit of this Tester is so simple that a diagram is really unnecessary. You can draw your own with the Audiolarm unit connected in series with a nine-volt battery and two banana plug terminals. There is no on-off switch. The circuit is completed when the two tests prods are applied to a resistance and the Audiolarm sounds.

The prototype was housed in a small black plastic case (zippy box) measuring 102 x 54 x 42mm. Three holes need to be drilled in the aluminium lid, two for



What could be simpler? A zippy box, piece of Veroboard, alarm and battery plus a few other bits. Wire them together and you have a neat little Continuity Tester!

the banana terminals and one to let the sound out!

The Audiolarm itself is mounted on a piece of Veroboard measuring approximately 96 x 50mm with the tracks running across the board. The corners of the board are cut away so that it presents a neat fit into the case. Solder the Audiolarm to one end of the Veroboard and cut away the track that shorts out the positive and negative terminals.

Solder the black (negative) lead from the battery connector to the black terminal on the lid and the red battery lead to the positive (+) connection on the Audiolarm. Then take a short length of hookup wire and strip the insulation from both ends. Solder one end to the negative (–) connection on the Audiolarm and the other end to the red terminal on the lid. Now check your connections and connect the battery to the circuit.

Now connect a high value resistor, say 100kΩ, across the terminals. The Audiolarm should give out with a weak pulsed bleat, as though it was being strangled. If it doesn't make any sound, it's probably dead already or you have connected the battery the wrong way around.

When you have sound output via the resistor you can then connect a short length of wire across to test the full output. Deafening isn't it? But it is not so loud when you put it in the zippy box. This you can now do. Install the board in the box along with the battery and use some foam rubber to hold it all in place when the lid is screwed down.

Well there you have it. A useful tool which you will find yourself using surprisingly often in the future, instead of reaching for your multimeter.

PARTS LIST

1 Audiolarm, type 2321-2-5
1 zippy box, 102 x 54 x 42mm
1 piece of Veroboard, 90 x 50mm
2 banana plugs, one red, one black
2 banana plug sockets, one red, one black
1 Eveready 216 9V battery or equivalent
1 battery connector to suit
2 meter prods, one red, one black
1 500mm length of red hookup wire
1 500mm length of black hookup wire
Plus solder and scrap foam rubber.

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

$12.90

This includes sales tax

In the world of personal computers there is just one that is known as the best: the PET

NOW 16K RAM AT 8K PRICE $999

The Commodore PET has become the standard for the Personal Computer Industry.

The Pet is completely integrated, with the processor, memory, keyboard and visual display unit contained within a robust housing, allowing easy transportation with no interconnecting cables necessary. In order to retrieve and save your data and programs, a storage device is used which operates like a cassette recorder, with your information recorded reliably on standard cassettes. The PET has 16k bytes of RAM. Optional equipment permits expansion to 32k. Also, it has 14k bytes of ROM.

The Pet communicates in BASIC— the easiest computer language. Easy to learn and easy to use, BASIC has now become the standard for personal computers, with literally thousands of programmes available. The PET is also programmable in machine language, allowing more efficient use of the system.

The full-size keyboard is capable of producing letters, numbers and graphic symbols. Upper and lower case is standard. Characters appear on the screen in a pleasant green colour designed to reduce eye fatigue and may be displayed in normal or reverse print.

PET's IEEE-488 Bus- just like H.P.'s mini and full size computers — permits direct connection to over 200 pieces of compatible equipment such as counters, timers, spectrum analysers, digital voltmeters and printer plotters from H.P., Philips, Fluke, Textronix and others.

The full range of Commodore Disk Drives and Printers are plug-compatible with the PET and a comprehensive range of cassette and disk based programmes are available through the extensive network of Commodore Dealers.

APPLICATIONS

The Commodore PET is a creature of many faces. Its applications are limited only by the user's imagination.

The future of the PET is virtually unlimited: its present capabilities are already many and impressive. As a personal computer, the PET can teach languages and mathematics; play games; create graphic designs; store meal recipes and change number of portions; maintain budgets, personal records and checkbooks; operate appliances and temperature controls.

As a management tool, it delivers the information the executive needs, in the form he can use, and available to him alone. Trend analyses charts and graphs can be almost instantly available.

The professional may use the PET for maintaining appointment schedules, recording income and expenditures and filing all the specialized information and forms he may need to make his work more efficient — from medical records for a doctor to income tax computations for an accountant.

The engineer, mathematician, physicist, has a tool far superior to the very best programmable calculators yet developed... at a cost that is comparable...and with almost infinitely greater versatility.

And the businessman has a computer that can maintain inventories, keep payroll records, operate accounts payable and receivables, issue cheques and handle correspondence.

Commodore PET 4016 Computer Technical Specifications.

Computer/Memory

Read/Write Memory (RAM) 16K bytes available to the user
Read Only Memory (ROM) 14K bytes in total, divided into:
8K BASIC interpreter available immediately you turn on your PET.
5K Operating System
1K Test Routine
The 6502 micro-processor chip makes the PET one of the fastest and most flexible BASIC systems. Significant features of Commodore BASIC are:

- 960 simple variables
- 960 integers
- 960 string variables
- 960 multi-dimensional array fields for the above 3 types of variables
- Up to 80 characters per program line with several statements per line
- Upper/Lower case characters and graphics capability
- Built in clock
- 9-digit floating point binary arithmetic
- True random number generator
- Supports multiple languages; machine language accessibility

Keyboard

74-Key professional keyboard
Separate calculator/numeric pad
Upper-case alphabetical characters with shift key to give 64 graphics characters.
Can be set for lower case and shifted upper case characters.

Screen

40 characters wide by 25 lines (1000 characters in 8 × 8 dot matrix)
23 cm screen phosphor screen.
Brightness control.
64 ASCII plus 64 graphics characters.
Blinking cursor with full cursor control, including programmable control

Screen editing capabilities

Full cursor control (up, down, left, right).
Character insert and delete.
Reverse character field.
Overstriking.
Return key sends the entire line to the CPU regardless of cursor position.

Input/Output

8 bit parallel input/output port.
IEEE-488 Bus (HP-IB and IEC Bus) allows up to 12 other peripherals to be connected.
Two cassette ports.
Video signals for additional displays.
Serial output port.

Technical Data

Dimensions: Height 355 mm (14"), Width 419 mm (16.5"), Depth 185 mm (18.5"). Shipping Weight 20.9 kg (46 lbs).
Power requirements 240V + 10%, Frequency 50 Hz, Power 100 Watts.

Commodore BASIC

APPEND	GOSUB..RETURN	STOP	SPC
BACKUP	IF..THEN	SYS	LEFT$
CLOSE	INPUT	VERIFY	RIGHT$
CLR	INPUT #	WAIT	MID$
CMD	LET		CHR$
COLLECT	LIST	SGN	ASC
CONCAT	LOAD	INT	LEN
CONT	NEW	ABS	VAL
COPY	ON..GOSUB	SQR	STR$
DATA	OPEN	SIN	TI
	POKE	COS	TI$
DEF/FN	PRWT	TAN	ST
DIM	READ	ATN	DS
DIRECTORY	RECORD	LOG	DS$
DLOAD	REM	EXP	+
DOPEN	RENAME	AND	−
DSAVE	RESTORE	OR	*
END	RUN	NOT	/
FOR/NEXT	SAVE	TAB	↑
GET	SCRATCH	POS	=

Commodore microcomputers

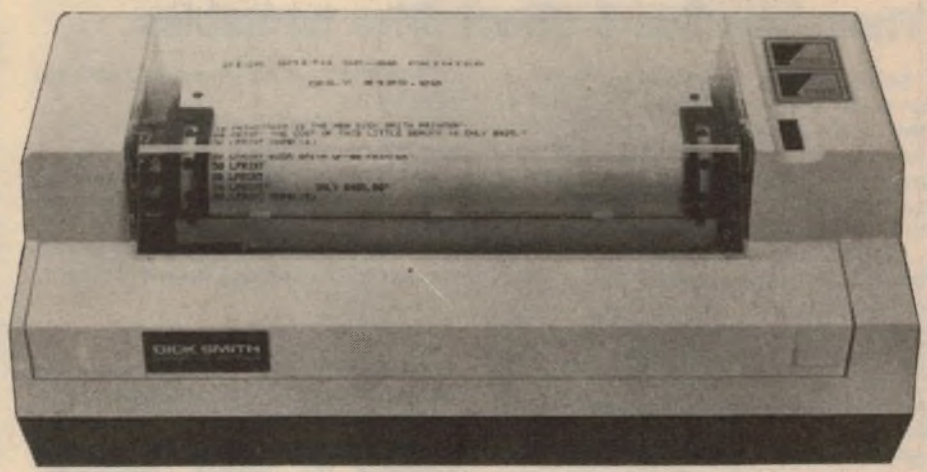
For details of your local dealer send to: Commodore Information Centre, Box 336, Artarmon, NSW 2064, Australia. Phone (02) 437 6296

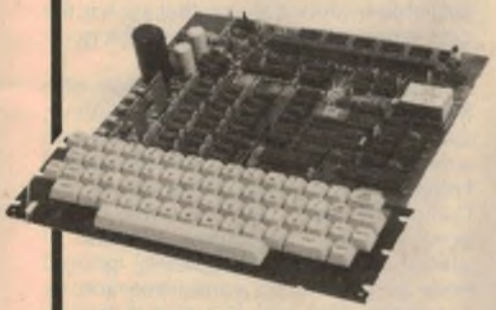
MIvI 469

WIN A PRINTER!

for yourself or your school

To celebrate the runaway success of the Super-80 computer featured below, Dick Smith Electronics is sponsoring a competition with two DSE GP-80 printers as the prizes. (We reviewed this printer in our July 1981 issue and found it to be a little beauty.) If you have an interest in the Super-80 or computers in general you could win one of these nifty printers which have a retail value of $495. Win one for yourself or one for your school.





Conditions & what to do:

WRITE A PROGRAM to suit the Super-80 Computer. The program can be a game, control system, graphics display or anything you want. The program can be any length as long as it will fit into the maximum of 48K RAM on the Super-80 board.

SEND A C60 CASSETTE with one copy of your program on each side and WRITE a covering letter to tell us what it does.

COMPLETE the entry panel on this page or, in states where this requirement is illegal, make a clear, same-size photostat copy of the panel and enclose it with your program cassette. You may enter as an individual or on behalf of your school group.

POST YOUR ENTRY so as to reach our editorial office no later than 5pm on February 15, 1982.

POSTAL ADDRESS: Endorse your entry "Super-80 Competition" and post to Electronics Australia, PO Box 163, Chippendale 2008. Our street address: 57 Regent Street, Chippendale (near Central Railway).

JUDGING will be performed by the editorial staff of Electronics Australia. Chance will play no part in determining the winners. The judge's decision will be final and no correspondence will be entered into and no interview will be granted.

THE WINNERS will be notified accordingly and names will be published in the April 1982 or a subsequent issue of Electronics Australia.

THE PRIZES will be supplied to the winners, by arrangement, by Dick Smith Electronics, Cnr Waterloo and Lane Cove Roads, North Ryde, NSW 2113.

OTHER CONDITIONS:
Entry to this competition is open to all residents and school groups in Australia and New Zealand with the exception of employees and their immediate families of Magazine Promotions, John Fairfax & Sons Ltd, Dick Smith Electronics and their associated advertising agencies and publications.
You may enter as many times as you wish. All entries become the property of Electronics Australia. The prizes are not redeemable for cash.

NAME .....

ADDRESS .....

CITY ..... **STATE** .....

COUNTRY ..... **Please tick appropriate box**

☐ **Individual entry** ☐ **School entry**

Letters to the editor

Thorn needles & direct drive turntables

Some time ago the Editor-in-Chief, in an audio article, mentioned the name of the cactus plant which bore the thorns for the old "thorn needles" we used many years ago. I have looked back but cannot seem to find the article, so I thought it might be quicker to write.

I still have a few needles left from all those years ago, together with a thorn needle sharpener which I bought in the 1930s, but I may need some more if a project I'm building succeeds. You might be kind enough to ask him if he can remember the cactus type, and would he know if and where any might still be obtained; needles – not cactus.

Secondly, a bit of interesting but useless information. Mr Williams, in another article on modern direct drive turntables, mentioned some early turntables which were of direct drive type, such as spring driver and the old induction disc motor. There was another one, which he didn't mention – perhaps space prevented it – that I think was the best of all for home use, and that was the "Simpson" 78rpm Synchronous Turntable – an ancestor of Leo? It may of course, be known to you, even though it wasn't mentioned.

It consisted of a rather weighty 12" (not 30cm) turntable with an underslip cavity of some 6" diameter around which were spaced 38? small bar magnets. It was supported by a single tapered shaft which spun in an adjustable nest which could be raised or lowered to eliminate all slack or wear.

This was, of course, the rotor. The stator was formed from two discs placed one each side of a single field coil, the outer edges having had teeth formed and folded to make north and south poles. This stator was single hole mounted to the base board and the turntable was lowered over the stator – just the two parts. It formed a simple inductor motor, and although it only drew five watts, the torque at 6" diameter took some stopping.

As it was not self starting, you had to give it a flick in the right direction, and it would pull into synch with no trouble owing to a cunning form of oscillatory suspension of the stator works. It was silent – no gear noise, no governor whirr, constant and correct speed. Magnetic pickups didn't like it though, because of the radiated field. With a good crystal pick up of the era, thorn needles, and a Simpson turntable, you were well set up. No needle scratch, no record wear.

(Not many highs either but we didn't miss it then. No low pass filters either.)

I still have an induction disc motor, but I wish I'd kept by two Simpsons from the 1930s.

Best wishes to the magazine from one who has been reading it from Vol 1 No 1.

R. J. O'Dea,
Epping 2121.

COMMENT: We don't know the botanical name of the particular cactus but we first noticed them in old cowboy movies – four metres high or more, decorating the Mexican "sandscape". Then we found some in Sydney's Botanical Gardens. The thorns are about 3cm to 4cm long. We haven't seen thorn needles for sale for decades. We remember the name "Simpson" but you have filled in the details.

Copyright: a lack of understanding

I read with great interest your Editorial in your June '81 issue, as well as the "Forum" article on copyright problems. May I apologise for the delay in writing to you, but unfortunately I sometimes do not see the magazine for several months; however, I feel the subject calls for some comments, despite the delay.

It is interesting, and, I think, significant, to note that the answer to most of the social problems which abound today boil down to proposals to increase the price of some article or service. In this case it is to be the price of recording tapes, but in many other cases it could be the price of, say, some item of food because of the need to pay for some generally unwanted bureaucratic interference, or possibly the imposition of some new or larger tax. I cannot recall one single case in which the proffered solution involved the reduction of a price or a tax. Why is that so, particularly in view of the fact, so obvious in the case of copyright, that it is primarily the existence of high prices which either gave rise to the problem in the first place, or at least exacerbated it.

No reasonable person who is in possession of the required amount of money to purchase a copy of a recording would go to the additional trouble to make his or her own copy, particularly as the means of doing so is unlikely to produce a copy of comparable quality. Every shred of evidence supports the contention that this problem is purely financial, and nothing else. This being so, two important points emerge – first, raising some price or tax even further cannot do anything other than make the matter worse, and, secondly, no solution is even remotely possible in the absence of a clear understanding of the financial mechanism which led to the problem.

Unfortunately such understanding is not only difficult to find, but is carefully excluded from all officially recognised courses of study in subjects such as economics. It is as though a study of electronics was conducted under the deliberately imposed condition that Ohm's law was not only never to be mentioned but was to be ridiculed and discredited by any available means, logical or otherwise. It is impossible to believe that any technical subject such as electronics could be so much under the control of subversive influences that such a ban could be sustained, yet all available evidence shows that such is the case when it comes to finance. The question is – Why?

I enclose with this letter a copy of a book published last year which outlines some aspects of the subject. This book was a submission to the Financial System Enquiry, more generally known as the Campbell Inquiry. It is indicative of the presence of a conspiracy at least of silence that it was completely ignored both by the Inquiry committee and by politicians. The very fact that it was ignored is in reality a tacit admission that it cannot be dismissed by logical argument.

Although the authors make no claim to infallibility, it is not too much to say that this book contains the seeds of a concept of finance without which no social problem has any chance of being resolved. I have long respected your ability to get to the core of a problem in your writings on any subject except finance – may I hope that you will give these words, and the enclosed book, careful attention.

J. D. Malan,
Cleveland 4163.

"ICS helped take me from fish and chips to silicon chips."

— A true ICS student story

It's a long way from the counter of a take away food bar to an electronic technician's work bench. But that's what George Raftou achieved in under three years with ICS training. This is his story.

"I wanted a career, but I'd left school early, so I didn't have much hope. I couldn't afford to go on apprentices wages. And because of my education they wouldn't even have me at tech."

That was three years ago, about the time George saw the International Correspondence Schools coupon in a magazine.

"I don't know why I picked electronics. I just figured with all the stereos and TV's around there seemed to be a lot of opportunities."

Study on full wages.

"The best thing about ICS was that I could study when it suited me and earn good money at the same time."

ICS guided study helped George progress quickly. Systemised lessons, study notes and the guidance of a tutor make ICS programs one of the most personalised methods of learning. You learn at your own pace, taking time over difficult areas, rushing through subjects known to you.

After just one year, George passed his first PMG exam. This enabled him to join an electronics school that normally wouldn't take anyone who had left school so early.

"I joined halfway through the year, but was right up with the class," George told us.

Today, George Raftou works with a leading electronics company servicing calculators. He hopes the next promotion will see him in the company's computer division. All that achieved in less than three years.

Turn your hobby into a career.

Like George Raftou you can use ICS training to enter the world's fastest growing industry.

Check the ICS electronics courses listed below then nominate a specific course in the coupon. We'll send you information without cost or obligation.

1. Basic Electronics.
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International Correspondence Schools (A'sia) Pty Ltd. 400 Pacific Highway, Crows Nest, N.S.W. 2065 Tel: (02) 43 2121.

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Sydney: 400 Pacific Highway, Crows Nest, N.S.W. 2065 Tel: (02) 43 2121.
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Brisbane: 131 Elizabeth Street, Brisbane, QLD. 4000 Tel: (07) 221 0178.
Adelaide: 28 Grenfell Street, Adelaide, S.A. 5000 Tel: (08) 219 4154.
Perth: P.O. Box D157, Perth, W.A. 6001 Tel: (09) 321 8530.
New Zealand: 45 Courtenay Place, Wellington 1, N.Z. 0152

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Books & Literature

Data Acquisition

DATA ACQUISITION FOR SIGNAL ANALYSIS, by K. G. Beachamp and C. K. Yuen. Published 1980 by George Allen & Unwin, London. Hard covers, 241 × 160mm, 257 pages, many diagrams. Price $57.50.

I must admit to doing a double-take when I saw the price of this book. While it may seem excessive, it does reflect the high cost of publishing textbooks which will have a relatively small print run. That is unfortunate because it is potentially a very useful reference for people working in diverse fields, whether or not they have a good background knowledge in electronics.

Perhaps the best way to give an idea of the content of the book is to discuss the various chapters. Chapter One gives some insight into this term Data Acquisition and we learn that it involves sampling and quantisation, terms that are more familiar to readers of electronics' magazines in the concept of analog-to-digital conversion. The chapter also talks about typical signals, such as biological and environmental signals (eg, wind, temperature) and also discusses data logging and gives a brief but good introduction to digital computers and logic elements.

Chapter Two talks about data mesurement in terms of typical transducers such as strain gauges, venturi tubes, thermocouples and so on. Chapter Three continues with pre-processing of signals as performed in operational amplifiers (differential, summing, sample-and-hold), filters and gives a good discussion of digital filters and the process of decimation of a digitised signal.

Chapter Four is entitled data acquisition and we learn that this really means data recording such as on chart recorders, XY plotters, analog tape recorders. it goes on to give a good description of the elements of analog (read audio) tape recording and its limitations, and mentions FM recording as employed in instrumentation together with an outline of the IRIG standards for FM systems. Also mentioned are digital recording methods such as RZ and NRZ (non return to zero).

Chapter Five gives a detailed discussion of the theory of digitisation and talks about aliasing, and quantisation noise. Analog-to-digital encoders are discussed, starting with the electromechanical methods such as the Gray shaft encoder and going on to electronic methods such as ramp-and-hold, successive aproximation and parallel conversion. Chapter Six continues with discussion of data acqusition systems which includes a general outline of the general purpose interface bus (GPIB) originally developed by Hewlett-Packard.

Chapter Seven deals with microprocessor hardware and talks about memory, program counters, branches and condition codes, stacks, direct memory access and so on. It also spends a few pages on software development and interfacing.

Finally, Chapter Eight deals with remote sensing with passive devices such as light and infrared sensors and with active systems such as radar and lasers. There is also discussion of telemetry and telecommunications which includes a short discussion on modems.

In conclusion, this text can be regarded as a useful reference for the scientist or research worker in fields other than electronics and could be recommended for purchase by libraries. Not too many individuals will be able to afford it. (L.D.S.)

Microwave Antennas

REFLECTOR ANTENNA ANALYSIS AND DESIGN, by P. J. Wood. Published by Peter Preregrinus Ltd, London, 1980. Hard covers, 223 × 146mm, 226 pages, many diagrams and a few photos. Price in UK £13.

The preface of this book begins with the statement that the various facets of the electrical design of a reflector antenna are usually tackled by a judicious combination of (a) empirical methods, (b) scalar aperture and Fourier transform theories, (c) vector electromagnetic models of the antenna diffraction processes. That should leave you in no doubt that this is text intended mainly for engineers working in the field of antenna design.

Unless you are fully familiar with integral calculus and vector analysis, the material in the book is likely to be of little use. Assuming that you are, the chapter headings are as follows:

(1) Introduction.
(2) Diffraction theories applied to reflector antennas.
(3) The spherical wave expansion method.
(4) Field correlation methods.
(5) Numerical models for reflector antenna feed systems.
(6) Crosspolarisation in reflector antennas.
(7) Shaped Cassegrain design.
(8) Focal plane patterns.
(9) VSWR of reflector systems.

In summary, a book by an engineer for specialised engineers. (L.D.S.)

Audio projects

AUDIO PROJECTS, by F. G. Rayer, TEng (CEI), Assoc IERE. Published 1981 by Bernard Babani Publishing Ltd, London. Stiff paper covers, 92 pages 180mm × 108mm, illustrated by diagrams. Price in Australia $5.85.

Unless I'm much mistaken, author/writer F. G. Rayer has been around for as long as I have. And, unless I'm further mistaken, I've seen something very like this book before. Perhaps its July, 1981, dateline indicates a revision.

The book is seemingly directed at experimenters who like to fiddle with simple circuits – in this case to do with audio.

After some introductory remarks on power supply requirements, the author suggests circuits for six preamplifier and mixing stages, followed by 13 power amplifiers involving both discrete components and ICs. Here and there, some hints are given about layout but, for the most part, this is largely left to the constructor.

Later sections in the book deal with tone controls, matching and connectors, with 10 simple projects collected in a final "Miscellaneous" section.

As I said, a good book for those who like fiddling with gadgets and circuits. Our copy came from the Technical Book and Magazine Co Pty Ltd, 289-299 Swanston St, Melbourne, 3000. Phone (03) 663 3951. (W.N.W.)

Electric motor control

ELECTRIC MOTOR CONTROL by Walter N. Alerick. Published 1975 by Delmar Publishers, Albany, New York. Soft covers, 226 pages, 260 × 200mm. Illustrated with photographs and many diagrams. Price $9.50.

Intended as text for American trade courses, the book gives a very comprehensive treatment of control gear for all types of electric motors used in industry. The approach is strictly practical rather than theoretical and each section is brief and concise.

The book is split into eleven sections, with section one being introductory and section two treating devices such as relays, contactors, float and pressure switches. Sections three and four are

devoted to basic control circuits while section five talks about reduced voltage starters such as tapped resistors and autotransformers. Sections six, seven eight and nine talk about controllers for three-phase, wound rotor, synchronous and DC motors. Section 10 is about braking while section 11 talks about various types of drive such as gearboxes, belts and magnetic clutches and drives.

I was disappointed to find no mention of electronic control gear involving thyristors but I would still regard the book as useful. A basic knowledge of DC and AC motors is assumed, although most of the fundamentals are alluded to in various sections of the text.

Our review copy came from McGills Authorised Newsagency Pty Ltd, 107 Elizabeth Street, Melbourne, Victoria. (L.D.S.)

BASIC Games

INSIDE BASIC GAMES: By Richard Mateosian. Papers covers, 178mm × 226mm, 324 pages. Published by Sybex Inc, USA, 1981. Price $17.50

Despite its title, this book is not a collection of game programs, nor is its primary purpose idle amusement. Rather, the author has chosen games as an ideal example for use in teaching programming style in Basic. Any reader who studies "Inside Basic Games" will indeed be able to design games programs, but more importantly they will learn to design clear, structured programs for any application.

The first five chapters of the book are more or less standard for this type of programming text, although perhaps more clearly expressed than most. Arithmetic games, guessing games, games with timing programs and calendars are covered in separate chapters, with the emphasis on explaining and understanding the design of the program rather than on playing the game.

To illustrate the techniques of programming and the flow of control in the programs the author uses his own idiosyncratic code called "free Basic", a type of pseudo-code combination of Basic and Pascal.

As explained in the book, "free Basic" was developed to free the Basic programmer from the requirement of line numbers in program listings and to allow structured programming techniques (specifically the avoidance of GOTO constructs) to be applied to Basic. Each program in the book begins with a free Basic listing and is then translated into standard Basic expressions for use with computers such as the PET, TRS-80 and Apple II.

"Free Basic" itself is an interesting attempt to introduce structured programming to users of Basic. With its use of lower case letters, indentation and control structures such as Repeat, Do while and Case statements it is similar in form to Pascal, while maintaining strong con-

(continued on page 137)

AMATEUR RADIO

by Pierce Healy, VK2APQ

Amateur radio — a new world for the disabled

The International Year of Disabled Persons has highlighted the desires, ambitions, and achievements of the disabled, as well as the handicaps they endure. Amateur radio has always offered the handicapped a very worthwhile activity; one which even the severely handicapped can enjoy to the full, and one which may change their whole way of life.

Throughout the world there are many individual amateurs and amateur groups who make a special effort to instruct and, in other ways, assist handicapped people to enjoy amateur radio. They thus provide them with a worthwhile, absorbing, and long lasting hobby, and one which also increases the academic and practical knowledge of our electronically orientated world.

And, once established, many disabled amateurs make their own contributions to the technical scene. Your writer (VK2APQ) can recall vividly the knowledge and technical expertise passed on by an amateur permanently confined to a wheel chair. Together with others, I recall many interesting discussions with an amateur who spent a major part of his life in an iron lung. There are many other cases where the amateur operator was totally blind or had a serious sight handicap, or confined to bed due to an accident of protracted illness.

One such contact was with a blind operator in Dublin, Ireland. After a lengthy contact he revealed his handicap and that he had recorded my comments and questions with his braille typewriter and so was able to converse freely without his unseen contact being aware of his disability. Another instance can be recalled where an amateur in southern Queensland maintained almost daily contact with a severely handicapped young paralytic in the USA. Those contacts were maintained for several years.

In some areas handicapped amateurs have formed their own clubs and meet on the air, offering mutual advice, help, companionship, and encouragement to each other. A fact of amateur radio is that only a very small percentage of those making contact over the air ever meet in person. Therefore, it is not possible to even estimate how many are handicapped in a multitude of ways — be it in general health, movement, speech, hearing or eyesight.

Many attachment aids or gadgets have been devised to assist disabled operators. Details of some have been published, probably many more could be.

These are instances where amateur radio has become part of the life of a disabled person, and these illustrate the role that amateur radio can play in assisting the handicapped.

It should not be assumed that amateurs are doing everything that is necessary. This is a continuing and long term activity that should be fostered, and not simply forgotten at the beginning of 1982.

So what about those who may not have heard of amateur radio — its fascinating aspects and the companionship it can offer to counter the loneliness and lack of contact with the world as a whole.

In New South Wales, one amateur has taken on the task to promote and provide co-ordination between amateur radio and disabled persons.

He is Jim Saunders, VK2BNY, who is himself disabled. In July, 1981 Jim was appointed Wireless Institute of Australia co-ordinator for the disabled in New South Wales.

There are several aims which he hopes to achieve with the co-operation of anyone interested, be they disabled or not. Being actively interested in amateur radio over several years has given him an enthusiasm to encourage others to participate in the hobby.

Firstly, he would like to see amateur radio as a common meeting ground for disabled persons, not necessarily through on-air nets, as many disabled people are reluctant to discuss their disability. However, many disabled people have been assisted by gadgets attached to various pieces of equipment as learning aids, operate on the air, or listen to amateurs and short-wave stations. If any person would like to contribute ideas or circuits for the formation of a central library of such ideas, Jim will be pleased to hear from them.

Secondly is the important facet of making people aware that disabled persons are often very self-reliant and like to keep their independance. These people may have high intellectural ability but are physically handicapped in varying degrees.

The third aim is to make the public aware that amateur radio can be a godsend to a disabled person when they discover the thrill of listening to an overseas station or speaking to one and then receiving a QSL card.

It can open a new world for them.

If you would like to help or are disabled and would like to comment or pass on information then write to: Jim Saunders, VK2BNY, Co-ordinator for the Disabled, 19 Wallis Avenue, Toukley NSW 2263; or telephone during business hours (043) 96 4714.

If a member of your family, or a friend, is disabled, and you feel that amateur radio may help, pay a visit to the Museum of Applied Arts and Sciences in Harris St, (off Broadway) Sydney.

The Museum has a demonstration amateur radio station, VK2BQK which is manned by qualified operators each Saturday and Sunday afternoons. Information on general aspects of amateur radio can be obtained from the operator.

RADIO CLUB NEWS

An explanation: If information supplied by your club did not appear and no publicity was given in these notes for events planned during September and October, the omission was due to mail handling delays in Australia Post centres.

For example, June issue of the WIA South Australian Division "Journal", was received August 21, as was the June issue of Moorabbin and District Radio Club "APC". Similarly, information from other clubs. The July issue of "Amateur Radio" was received later in August after the August issue had arrived. However, by some strange quirk bills seemed not to be delayed.

L. E. CHAPMAN

122 PITT ROAD, NTH CURL CURL.
MAIL ORDERS: BOX 156, DEE WHY, NSW. 2099.
TELEPHONE 93-1848.

RESISTORS

150 ohm 5W	20c
10 ohm 5W	20c
12 ohm 3W	20c
2.5 ohm 3W	20c
33 ohm 3W	20c
8 ohm 10W	25c
4000 ohm 10W	25c
220 ohm 5W	20c
5 ohm 5W	20c
220 ohm 10W	25c
950 ohm 3W	20c
115 ohm 5W	20c
10 ohm 5W	20c
1k ohm 5W	20c
5000 ohm 5W	20c
6.8k ohm 3W	20c
3300 ohm 10W	25c
6800 ohm 10W	25c
1500 ohm DUAL 21W	50c
50 ohm 5W	20c
1k ohm 5W	20c
820 ohm 5W	20c
12 ohm 10W	25c
470 ohm 7W	20c
4700 ohm 4.5W	20c
5000 ohm 10W	25c
8.2 ohm	5W
3.3K	7W
27 ohm	5W
10K	7W
2.5 ohm	3W

CAPACITORS

0.56 250V	40c ea
2000 MFD VDcw25	75c ea
0.0039uF 1500V	20c ea
6N8 1500V	20c ea
0.0068uF 1500V	20c ea
1200PF 400V	10 for $1
0.068uF 400V	5 for $1
2200PF 630V	10 for $1
0.47uF 250V	10 for $1
0.10uF 400V	5 for $1
0.082uF 160V	10 for $1
26k 250V	10 for $1
0.041uF 400V	10 for $1
0.033uF 250V	5 for $1
0.027uF 100V	20 for $1
220uF 10V	10 for $1
1uF 350V	10 for $1
470uF 40V	5 for $1
1000uF 16V	25c
2.2uF 200V	10 for $1
0.047uF 1500V	50c
47uF 25V	4 for $1
680uF 40V	50c
22K 100V	20c
330uF 25V	25c
2.2uF 200V	30c
470uF 40V	50c
680uF 35V	50c
0.015uF 250V	25c
1uF 100V	25c
1000uF 16V	50c
220uF 16V	50c
2000uF 63V	$1
0.47uF 400V	50c
680K 250V	25c
012 250V	25c
15NF 250V	10c
120K 250V	20c
10uF 315V	25c
0.056 250V	10c
500 MFP 10 VOLT	5 for $1

SPEAKER TRANSFORMERS FOR VALVE RADIOS

5,000-15 ohm	$2.50
7,000-15 ohm	$2.50
10,000-15 ohm	$2.50

TV Stick Rectifiers 20SC $1.00

Slide Pots

250K 50K	3 for $1
Dual 500K	3 for $1
1 Meg	3 for $1
2 Meg	3 for $1
Including Fancy Gold Knobs	
25K dual	2 for $1

SPECIAL

100 mixed resistors, all useful	$2
100 mixed capacitors, fresh stock	$2

AUDIO LEADS

3.5m to 3.5m, 7ft	75c
3.5m to 6.5m, 7ft	75c
6.5m, 7ft	50c

MICRO SWITCH
5A, 250V AC 75c ea

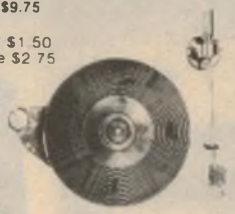
TUNING CAPS

2 and 3 gang	$1 ea
Min 2 gang	50c

SUPER SPECIAL

GRAMOPHONE motor and pickup 3 speed **stereo balanced arm.**
240 volt $9.75

PP NSW $1.50
Interstate $2.75
WA $4



SUPER SPECIALS
FM STEREO TUNER KITS

Sets of 3 modules include FM tuner, decoder and IF detector. Circuit diagram supplied. Can be used with amp modules.

ONLY $22
P&P $1.00

SPEAKER SYSTEMS

Inc one 6 x 4 speaker, 5W RMS, $4.75 ea
P&P: NSW $1.80; Interstate $2.80; WA $4.
(For singles or pairs.)

Complete deflection boards to suit $35.
P&P NSW $1.60 INTERSTATE $2.80

Power supply boards to suit $50
P&P NSW $2.50 INTERSTATE $4.50

P&P NSW $1.60 INTERSTATE $2.80

COLOUR FRONT END COMPLETE PUSH BUTTON TUNER SECTION
TO SUIT PHILIPS, PYE, KRIESLER ETC. **$25**

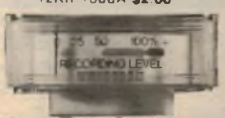
$27.50
PORTABLE 4 speed RECORD PLAYER

P&P
NSW $1.60
INTERSTATE $4.00

VU & BALANCE METERS

STEREO VU **$3.00**

12Kn 100uA **$2.00**



Recording Level Meter $2.50

Power leads and sockets 240 volt, suit most tape recorders, radios, etc. $1 each.

455KC IF Transformers for valve radios. $1 each. Also OSC coils, 75 cents each.

SPECIAL TRANSISTORS

AD 161-162	$2.50 pr
BSC 901A	$1.50 ea.
BC 548	10 for $1
AD 149	$3 pr
OC9554	50c
BD202N	50c
BD135	50c
2NC055	$1

ELECTROS

470uF 25V	5 for $1
400uF 10V	5 for $1
47uF 63V	5 for $1
350uF 16V	2 for $1
27uF 160V	5 for $1
25uF 63V	10 for $1
22uF 160V	10 for $1
47uF 16V	5 for $1
47uF 200V	5 for $1
220uF 10V	10 for $1
68uF 16V	10 for $1
100MFD 350V chassis mount	$1
Circuit Diagrams supplied	

- Telescopic aerials, $1.50
- 6 inch ferrite rods, 75c
- Rainbow lead, 5 strand, 20c per metre
- Line output transformers
- Line output transformers, 1200 to 3/ohm, 5 watt, $1
- Power supply units, filtered, 240 to 20 volt, $12

FUSES

0.5A, 2A, 3.25	10 for $1
In line fuse holders	30c
RCA jack plugs and sockets	40c pair
1A, 10 for	$1

HOR Drive 3021 transformers for colour TV	$2
TV Colour Convergence Units 11270 44 x 6	$3

PILOT LIGHTS

Screw in 6.3V	10 for $1.50
24V	10 for $1.00
Pilot light holders	10 for $1.00

- Car radio suppressors, 3 for $1
- 3 position slide switch, 50c
- Toggle switches, 25c
- 2 position push button switch, 50c
- 6 position push button switch, $1
- 4 position push button switch, 75c
- Transistor ear plugs & leads, 3 for $1
- In-line fuse holders, 4 for $1
- 4 pole 2 position rotary switches, 50c

POTS ROTARY

½ Meg	30c
1 Meg	30c
100K	30c
100K Switch	50c
50K Double Pole Switch	50c
7,500	30c
10K Switch	50c
250K	30c
50K	30c
20K	30c
10K Min Pots	25c
50/ohm	50c
½ or 1 Meg Switch	50c
½ 1 meg dual Concentric tapped at 100K	$1
2 meg ganged double pole switch	$1
1.5 meg dual ganged	50c
2 meg ganged log	$1
1 meg dual ganged	$1
½ meg dual ganged LIN	75c
25K 50K dual ganged Concentric double switch	$1
200K single line	30c
20K wire wound	75c
dual log 10K	75c
100K dual ganged linear pots	75c
10K sub min log pots	50c
250K ganged pots	75c
25K lin ganged pots	75c

2 Min Transistor 450 IF KC Coils Plus 1 Min Oscillator Coil	3 for $1

TV EHT Leads
4'6" in length 50c each

Pick up Cartridges BSR universal type	
Ceramic Stereo	$5
Diamond stylus stereo magnetic	$12

DIODES

OA 626	4 for $1.00
OA 662	4 for $1.00
EM 410C	4 for $1.00
DS 150A	50c
DSY 130YO	50c
OA 636	50c
HR 15	50c
Diodes BYX 55, 300	30c
BY 188	30c
DIODES BAV20 10 for $1	
Valve sockets 7 pin	10c
Valve sockets 9 pin	10c
OCTAL	10c
09478	5 for $1.00
BZX79	5 for $1.00

Power transformers 240V, 117V, 2/25V Tapps 6.3 — $7.00

SPARK GAPS 500 volt 20 cents
THERMISTERS 20 cents

PICK UP ARMS
Mono $3.50
Inc Ceramic Cartridge & Stylus
TRIMPOTS

200 ohm	10c
5K	10c
100K	10c
47K	10c
10K	10c
470 ohm	10c

Miniature speaker and drive output transformers $1 pr

Special mixed tag strips 10 for $1

SPEAKER SPECIALS

5 inch in 3.5, 8 or 15 ohms	$3.50
15 ohm 4"	2 for $2
6 x 9 15 ohm	$5 ea
5 x 7 15 ohm	$4 ea
8 x 4 15 ohm	$4 ea
6 x 4 15 ohm	$3 ea
6 x 4 27 ohm	$4.50 ea
6 x 3 27 ohm	$3.50 ea
5 x 3 27 ohm	$3.50 ea
5 x 3 47 ohm	$3.50 ea

TRANSISTORS

2N3055	$1.20	AC187	50c
SE1002	4 for $1	2NC3055	50c
BF 459	50c	2SB407	$1.00
B544 DE6	50c	BC549	5 for $1.00
C106 F1	50c	25C154B	50c
TIP 110	50c	OC968	5 for $1.00
608EK	4 for $1	608EK	5 for $1.00
BCS548	10 for $1	DS113AG	75c
2SB186	50c	BD236	50c
2SA101	50c	BD139	50c
B0263	50c	BD135	50c
BSB405	50c	25A240	75c
2SB77	50c	BF469	50c
2SB303	50c	BD235	50c

AMATEUR RADIO

To ensure that details of forthcoming events can be included, copy deadline must be considered. This is a minimum period of seven weeks prior to the first Wednesday in the month which precedes the event. This is necessary to allow time to read mail received and prepare copy for production deadlines.

SOUTH AUSTRALIAN DIVISION WIA: Mentioned in the preamble of these notes was the SA Div journal. This bi-monthly publication has a format that encourages retention for future, maybe historical, reference, rather than disposal after a cursory scan through the pages. This aspect seems to encourage members to take an active interest in the Division, a point gleaned from the 1980/1981 president's report and the number of members' names associated with the various Division sections and the articles published in the June issue. Also, the successes in the WIA Remembrance Day Contests achieved by the Division.

On the historical aspect here is a note taken from the June 1981 issue:

"To refer to the early days, Elizabeth Geisel was definitely a pioneer. Elizabeth, or Betty as she was known to many, was licensed as VK5YL, at the age of 16 years in 1936, and went on to hold a First and Second class certificate.

"Elizabeth had to construct all her own equipment from whatever was available and at the outbreak of World War II relinquished her crystals along with other equipment.

"Elizabeth did not return to amateur radio after the the war, but has retained her interest in electronics through her teaching in maths and science over the past 20 years.

"Elizabeth's certificates may be seen in the Telecom Museum in King William Street, Adelaide SA."

The cover of the Journal features an artist's sketch of the SA WIA Div headquarters, The Burley Griffin Building, West Thebarton Road, Adelaide SA. Division meetings are held on the fourth Tuesday of each month at 7.30pm. Visitors are welcome. Postal address is Box 1234, GPO, Adelaide 5001.

BLUE MOUNTAINS AMATEUR RADIO CLUB: The club extends an invitation to amateurs, their families, and friends to attend their annual Field Day on Sunday November 15, 1981.

The venue is the Springwood High School, Chapman Parade, Springwood. Activities will be 8.30/9.00am to 4.00/4.30pm.

There will be field events together with events for the ladies and children. Trade displays and sale of food and drinks will be available.

For further details contact John Belshaw, VK2VPG, Telephone (047) 39 3615.

BRISBANE AMATEUR RADIO CLUB: Changes have been made to the meeting place, postal address, and net activities of the club.

Meetings are held at the State Emergency Service "C" group Headquarters, Corner of School and Ipswich Roads, Yeronga, Brisbane Qld. Club nets are – Monday 7.30pm on 28.450MHz and 8.30pm on 3570kHz. Wednesday 7.30pm on 146.550MHz. Club call sign is VK4BA.

Postal address is PO Box 300, Darra 4076, Brisbane Qld. Contact secretary, Don Johnman, for details of club activities.

WEST AUSTRALIAN VHF GROUP (INC): Here are two ideas for Gamma match capacitors which should interest VHF operators.

"Can't find a small air variable capacitor! Then use a tubular capacitor. Strip the outer covering and braid from a piece of RG-8 coaxial cable. The remaining conductor and insulating sleeve, when slipped into a 10mm outside diameter aluminium tube, makes a simple capacitor . . . for 2m the length of the tube should be about 150mm.

"Simple gamma capacitors can be constructed from double-sided printed board. Initially use a small variable capacitor to determine the correct value, and then trim a piece of board to replace the variable capacitor.

"If you want to gamble and avoid the variable capacitor substitution method, the following sizes will be more than enough and can be easily trimmed on the spot to give minimum SWR. For 6m, 26 × 26mm, and 2m, 26 × 13mm of printed board."

EASTERN ZONE VICTORIAN DIVISION WIA: Information from the secretary, Stewart Mair, VK3BSM states that there is no amateur radio club separate from the WIA in the area. The Eastern Zone covers West, Central and Southern Gippsland.

Meetings are held on the last Monday evening of the month at the Latrobe Valley Airfield. Nets are conducted at 2330UTC Sundays on 3622kHz and in conjunction with the East Gippsland Zone at 0930UTC Sundays through repeater VK3RML.

The Zone has embarked on an active program to develop UHF FM and ATV repeaters in the area. Also a 2m beacon on 144.530MHz.

The "Wildcat Award", sponsored by the Zone, is awarded to overseas amateurs who have five confirmed HF contacts with Zone members. The award is also given for five VHF contacts, other than through repeaters, to Australian or overseas amateurs. Applications should be sent to the Awards Manager, David Scott, VK4DY, 174 Johnson Street, Maffra, Vic. 3860.

For further information on the Eastern Zone, contact Stewart Mair, VK3BSM, Box 339, Moe, Vic. 3825 or telephone after hours (051) 27 4229 or through the Latrobe repeater VK3RLV.

WAGGA AMATEUR RADIO CLUB: A change has occurred in the production of the club's newsletter "QRM". Due to difficulties in publishing the South West Amateur Radio Society bulletin "Feedback", as from August, 1981, "QRM" will incorporate SWARS news. Also at the annual meeting of WARC, Rex Black, VK2YA accepted the position as editor of the club newsletter.

The annual meeting appointed Jeff Brill, VK2KBK president; Allan Wheaton, VK2KAW vice-president, and Russ Read, VK2AZR secretary.

Tests have been carried out by members at Temora and Mount Bethungra as possible sites for a repeater installation. This will be on 147.700MHz in and 147.100MHz out. More tests were being planned.

WARC meetings are held in the Wagga Rescue Club headquarters, Bolton Street, Wagga, NSW. For details of all activities contact the secretary, Russ Read, VK2AZR, 14 Urana Street, Wagga, NSW. 2650 or telephone (069) 25 1324.

ILLAWARRA AMATEUR RADIO SOCIETY: The society's UHF repeater, VK2RUW is now fully operational from a site south east of central Wollongong, NSW. The channel number is 8225, and the frequencies are 433.225MHz in and 438.225MHz out. Coverage around that city appears very good especially in the northern suburbs which are shadowed from the VHF repeater VK2RAW.

Meetings of the society are held on the second Monday of each month (except January) in the Congregational Hall, Corner of Coombe and Market Streets, Wollongong, commencing at 7.30pm. Visitors are welcome.

Radio clubs and other organisations, as well as individual amateur operators, are 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.

The Australian CB SCENE

CB problems: We talk with the Qld Police

Hopefully, the unpleasant episodes between mobile CBers in the Brisbane area and over-zealous police officers may soon be a thing of the past. This comes in the wake of telexes exchanged with Mr Ross Ramsay of the Department of Communications, and a meeting sought with the Queensland Commissioner of Police, Mr Terry Lewis.

As planned, I telephoned Commissioner Lewis' office and requested a meeting with him, but was told that he was very busy and was asked if it would be all right if his secretary rang me back at a later date. I must confess to thinking: "It's the old don't ring us, we'll ring you put-off."

So, you can imagine my surprise when I was asked an hour later to ring Commissioner Lewis' office for the appointment. I did this, and arrangements were made for me to meet with Assistant Commissioner Atkinson the next morning.

I must say that I was well received by Assistant Commissioner Atkinson, who seemed to be prepared to go out of his way to reach some mutually satisfactory arrangement between the police force and the NCRA.

I explained the situation to Mr Atkinson, who said that he felt that his officers were confused about the 23-channel equipment aspect of the problem. I pointed out to him that this seemed highly likely but that the threat of confiscation of equipment on the spot seemed out of place, as a person has 48 hours to produce a driver's licence, when challenged, and that surely that was a more important matter than the possession of a CB licence. I added that, at the very least, a CB operator should be given the same latitude as a driver in the same circumstances.

Mr Atkinson has agreed to allow a CB operator 48 hours to produce a CB licence, if challenged to produce it by a police officer. He pointed out, however, that any CBer so challenged, who does not produce his licence, will find himself in trouble.

I also re-stated the facts involved in the 23 channel/18 channel set issue. Mr Atkinson had both the telexes photocopied and the issue of my column in which I first raised the matter. These will be appearing in the monthly police gazette, so as to ensure the widest possible circulation of the information within the Queensland Police Force.

Mr Atkinson suggested that CB operators should carry a photocopy of their licences with them in the car, when mobile, in case they are challenged to produce it. We both agreed that this would save a lot of the hassles and I seriously ask all operators to endeavour to comply with this request. I mentioned to Mr Atkinson that, as far as I and the NCRA knew, Queensland was the only state where the matter was being pressed.

Subsequent to this meeting, Ross Ramsay telephoned Chris Tooley, the NCRA National Treasurer, asking us to try to come up with a solution to the problem. One of the alternatives, which Ross suggested, was that we revert to the system of one-set one-licence, with the appropriate reduction in licence fees, of course. This and other options are currently under consideration by the National Executive.

CONVENTION POSTPONED: Because of a shortage of funds, at this time, the planned 1981 NCRA Convention, due to be held at the Auburn Motor Inn, Sydney, on the weekend of October 31/November 1 has had to be postponed until a date to be advised. It is hoped that affiliates will realise the problem and forward their fees as soon as possible. The funds which are on hand at the moment are being conserved so that the Association can be prepared for its coming submission on the CBRS Inquiry. This submission must take precedence over other matters because it is, after all, the basic reason for the NCRA's existence.

WRONG PHOTOGRAPH: I must apologise to Bernie and Peter Bischa of Olbis Industries, Oxley, Brisbane who were the sponsors of our recent, most successful competition. The photograph which appeared at the head of the September column carried the caption that it was of Bernie Bischa. The fact is that it was a photo of Peter Bischa. I hasten to add that the fault does not lie with the magazine: As it turns out, the guys are already talking of what prizes to offer for another competition next year.

COMPETITION WINNERS: I was delighted to receive letters from both Angie and Mark, the winners of the OLBIS competition and, as it turned out, both letters arrived on the same day. Both Angie and Mark expressed their thanks to myself, the editor, the magazine and, of course, to OLBIS Industries for running the competition and providing the prizes. Thank you both for taking the trouble to write.

HELP FOR DISABLED: The International Year of the Disabled has been given a special meaning by the Hotel Tango CB club of Brisbane. "Parkhaven", in the suburbs of Brisbane is a home for those who, in today's vernacular are described as sub-normal people. Personally, I prefer the term "special people". Anyway, the club members have set the home up with CB equipment and every night, between 6.30 and 7.30, you can hear them on channel 16 (Australian) teaching the patients how to use the sets. Breakers are always welcome, and I sometimes wonder just who is teaching who! My most heartfelt congratulations to the members of the Hotel Tango club and all those who are assisting them in this marvellous work.

If there are any other clubs or individuals doing the same type of thing, please let me know so that we can acknowledge the work you are doing, and thereby encourage others to follow suit.

"IS THAT JAN OF EA?" I had a pleasant surprise, the other night when Terry (National Director of the NCRA) and I were discussing the Inquiry Interim Report Recommendations on air and I had occasion to call in a breaker. He asked for more information so I filled him in. Then he asked me if I was the Jan who writes for "Electronics Australia". I admitted that it was. We had a bit of a chat and then he went clear. The following day the same thing happened, only this time the breaker was female. She wished me well in the column before she signed clear. I hope that this means that more and more CBers are reading this magazine. If you do happen to hear Terry (99) or myself (51) talking at any time, please feel free to break in and talk to us. We are usually on at around 7.30-8.00am and then at 4.30 to 5.00pm each day Monday to Friday.

OLD TIMERS REAPPEARING: More frequently, these days, I am hearing voices from the past, and I mean that literally. It seems that a lot of the initial operators are coming back on air, and that is good to see. I hope that the trend continues. Meanwhile, the skip is still coming in loud and clear here in Brisbane. I was talking to a friend, while waiting for Terry to come on air after work the other morning, and called in five breakers: three from South Australia and two from New Zealand. Don't forget that we are allowed to talk to overseas stations provided that we do not initiate the contact. I would like to say a special "hello" to New Zealand readers, too.

Well, that seems to be about all for this month. In the meantime, don't forget to let me have any interesting snippets of information, which we can share. Send it to me c/- The Australian CB Scene, PO Box 406, Fortitude Valley, Qld 4006. So cheerio . . .

Jan Christensen.

SHORTWAVE SCENE

by Arthur Cushen, MBE

Radio Sweden: a variety of programs in 7 languages

Radio Sweden International broadcasts in English to Australia every day 1100-1130UTC on 21,610kHz. A variety of program material is covered, including news, commentary, music and interests such as stamp collecting and shortwave listening.

Our first verification from Radio Sweden was in 1938, when the 5kW transmitter was located at Motala. In 1947, power was increased to 12kW and two transmitters were in use. Transmissions were in Swedish except for one hour a day in which broadcasts in English, French and German were transmitted.

Today Radio Sweden uses three 500kW transmitters located at Horby (two transmitters) and Karlsborg, and the transmissions are in seven languages – English, French, German, Portuguese, Russian, Spanish and Swedish. Each program is 30 minutes duration, and they are transmitted to all parts of the world.

During the writer's visit to Stockholm in 1969 he was able to persuade the Swedish Broadcasting Corporation to commence a daily transmission to Australia and New Zealand.

Radio Sweden is publicly financed and is part of the Swedish Broadcasting Corporation. Under the agreement with the Swedish Government the Corporation makes its own decisions on program content.

On weekdays all transmissions from Radio Sweden start with a news bulletin with the emphasis on events in Sweden and the other Nordic countries. Radio Sweden also presents daily reviews of Swedish press comment on events at home and abroad. A current affairs magazine contains reports and commentary on events in Sweden. There are special programs for DX enthusiasts and stamp collectors. Sport is also covered while on one day at the weekend entertainment and popular music predominate.

Radio Sweden is housed in a modern concrete and glass structure which was built in 1963. In the grounds of the complex is an 18th century stables which has been converted into a restaurant for the employees of Swedish Radio and Television. The lower floor of the studio block contains a shopping plaza, while excellent facilities are provided for visitors to view some of the huge studios being used for orchestral performances.

SWEDEN CALLING

The weekly broadcast of Sweden Calling DXers is now the longest running program of its type. Radio Sweden's program commenced a few months after Radio Australia's first DX session in 1949, but with the closing of Calling DXers on Radio Australia a few months ago Radio Sweden takes the honour. Radio Sweden's program differs from similar programs on other stations in that it is based entirely on listeners' contributions. Every week the station receives between 60 and 100 letters with material for the program.

Arne Skoog retired from the program during the 30th anniversary of Sweden Calling DXers and was succeeded by George Wood. The session is heard on Tuesdays in English, German, French, Spanish and Portuguese, and on Fridays in Russian. The English transmission to Australia of Sweden Calling DXers is heard on Tuesdays at 1115UTC on 21610kHz.

NEW RELAY BASE

After some months of testing, the new BBC Relay Base in Lesotho, southern Africa is now operating on a regular schedule relaying the World Service. This new Relay Base will cover Mozambique, South Africa and other areas in southern Africa. The schedule is 0400-0915UTC (Saturdays and Sundays to 1015UTC) on 9515kHz, 1030-1745UTC on 11830kHz and from 1800-2030 on 6190kHz. The new base will give much better reception of the World Service in southern Africa as in the past reception has been either direct from the United Kingdom or from the Relay Base on Ascension in the South Atlantic.

According to the World Radio & Television Handbook Radio Lesotho has plans to install a 100kW medium-wave transmitter on 639kHz, and three 50kW transmitters for a shortwave service.

RMI PROGRAMS

Radio Monitors International, a program for shortwave listeners, is broadcast over the Sri Lanka Broadcasting Corporation on Sunday 1100-1130UTC. The program is compiled in the Poona Studios in India by Adrian Peterson and the best reception is on 11835kHz. According to an advance schedule of broadcasts during November the feature will include a look at the Voice of Free Asia on November 1, while on November 15, the features include a visit to BBC Brookmans Park and a Radio Canada International program on language recognition. This will be followed by a look at a broadcasting in Benin on November 22 and on November 29, the Solomon Islands Broadcasting Corporation.

The transmission is carried on three frequencies, 11835, 15120 and 17850kHz. The program recently ran a competition in which listeners were asked to answer questions about identification signals and Bryan Marsh of Auckland, NZ was the winner.

NEW FRENCH RELAY

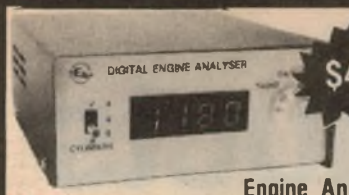
Further details concerning the new relay base being built for Radio France International in Guyana have been released. It has been decided to use transmitters of 500kW for the long range services to West Africa, North America and part of South America. For the shorter range services half power will be used on the 500kW transmitters. The transmitting centre will be equipped with multi-band curtain antennae to provide a wide coverage of frequencies.

The initial installation will be three transmitters each of 500kW, and four groups of high gain curtain antennas. The initial cost of the project will be spent during 1982 and 1983 and the overall expenditure is over 100 million francs including the transmitters, antenna towers and living quarters.

Radio France International has also announced plans to build a transmitter in New Caledonia to provide better coverage of their service throughout the South Pacific area. Radio France International is already using the transmitting facilities of Africa Number One in Gabon to serve their listeners in Africa.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill NZ. All times are UTC (GMT). Add eight hours for WAST, 10 hours for EAST and 12 hours for NZT.

KITS KITS KITS KITS KITS KITS KITS KITS



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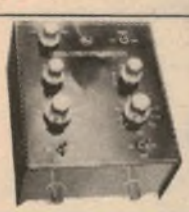

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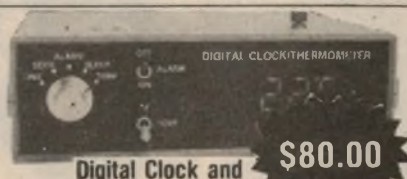

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KITS

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ETI 471 PREAMP KIT of parts	$45.00
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ETI 470 60W Kit of parts (without heatsink)	$24.00
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ETI 084 Car Alarm KIT	$22.50
EA TV CRO ADAPTER KIT	$11.50
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ETI 576 ELECTROMYOGRAM KIT	$89.00

Please note we attempt to have all kits available to our customers. Provided of course we have the required information from the mags in time. Where a component is unavailable we may use a substitute or credit this cost so as to prevent delay.

EA Power Saver
August EA, an interesting approach to power savings. Kit of parts **$32.50**

ETI147 OCT 80 ELECTRONIC LOAD
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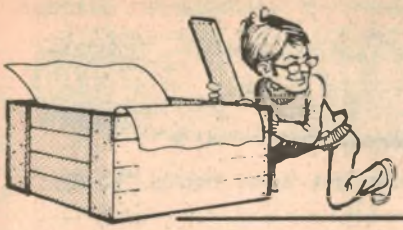
KITS KITS KITS KITS KITS KITS KITS KITS



New Products

Telephone Dialler from Dick Smith Electronics

At left is the new telephone dialler from Dick Smith Electronics. Above, the Stalker IX AM/SSB transceiver, which fully meets the new government requirements for marine use.

If you have a list of people to whom you make regular telephone calls, the newly released Telephone Dialler from Dick Smith Electronics may be just what you need. Using the dialler it is possible to store up to 28 different numbers including STD and ISD numbers and recall any one of them at the touch of a button. When the appropriate button is pressed the telephone number is displayed at the top of the dialler.

The dialler can operate as a pushbutton telephone and has a last number recall feature for use when the number called is engaged. On pressing the re-dial button, the dialler will call the number again.

Battery back-up is included so that stored numbers are not lost if the mains power fails. Note that the device is not Telecom approved, and should only be used with private networks.

Recent revision by the Department of Communications of the 27MHz On-shore Boating Radio Communication Service now provides for the use of SSB transmission on 27MHz. As a result, Dick Smith Electronics, one of Australia's largest wholesalers of 27MHz marine equipment, now has available a fully approved AM/SSB transceiver which meets the new government requirements and costs only $249.00.

The Stalker IX transceiver, Cat No. D 1715, comes fitted with the maximum number of allocated channels and provides for further expansion to 12 marine frequencies. In addition, the set complies with the boating industry list of recommended features with automatic distress frequency surveillance on unused channels and AM transmission on 27.88MHz.

Standard features include a public address facility, fully variable microphone gain, RF gain control for overload protection, and receiver clarifier control. The receiver is supplied with mounting bracket, power cord, microphone bracket and comprehensive instruction booklet.

Technical specifications are as follows: PPL synthesised; TX output 4W (AM), 12W PEP (SSB); RX sensitivity 0.25μV for SSB, 0.6μV for AM; RX clarifier range ±1.25kHz.

Also from Dick Smith Electronics is a heavy duty instrument case for project builders. Constructed from high impact ABS plastic in tan with black insert panels, the case provides for mounting circuit boards vertically or horizontally, with provision for a handle if required. Both front and rear panels slot into the case for easy assembly.

Measuring 205mm x 64mm x 159mm (W x H x D), the case is said to be ideally suited to bench and portable instruments such as frequency counters, DVMs and other test equipment. Price is $19.95.

Another new product from Dick Smith Electronics is a compact rotary cooling fan designed for power supply and transmitter applications, although suitable for a wide range of uses. The cooling fan is 11cm in diameter and can be mounted either internally or externally. Seven plastic fan blades are encased in a metal frame for rigidity and the fan can be built in to new equipment or added to existing gear. It operates on 240V AC.

Further information is available from your nearest Dick Smith Electronics store.

NTK low impedance electrolytic capacitors

Soanar Electronics Pty Ltd, the Australian agent for NTK of Japan, has recently introduced a new style of low impedance electrolytic capacitor to the Australian market. FTE Series capacitors were designed specifically by NTK for use in switching regulators requiring extemely low impedance at frequencies between 10 and 100kHz.

The capacitors use a newly designed element structure and a square section plastic case with a low profile for PCB mounting. Ripple current at high frequency is reduced compared to ordinary to ordinary electrolytic capacitors because of the low series resistance of the FTE capacitor, and even

products continued p109

IN WIRE-WRAPPING ok HAS THE LINE...

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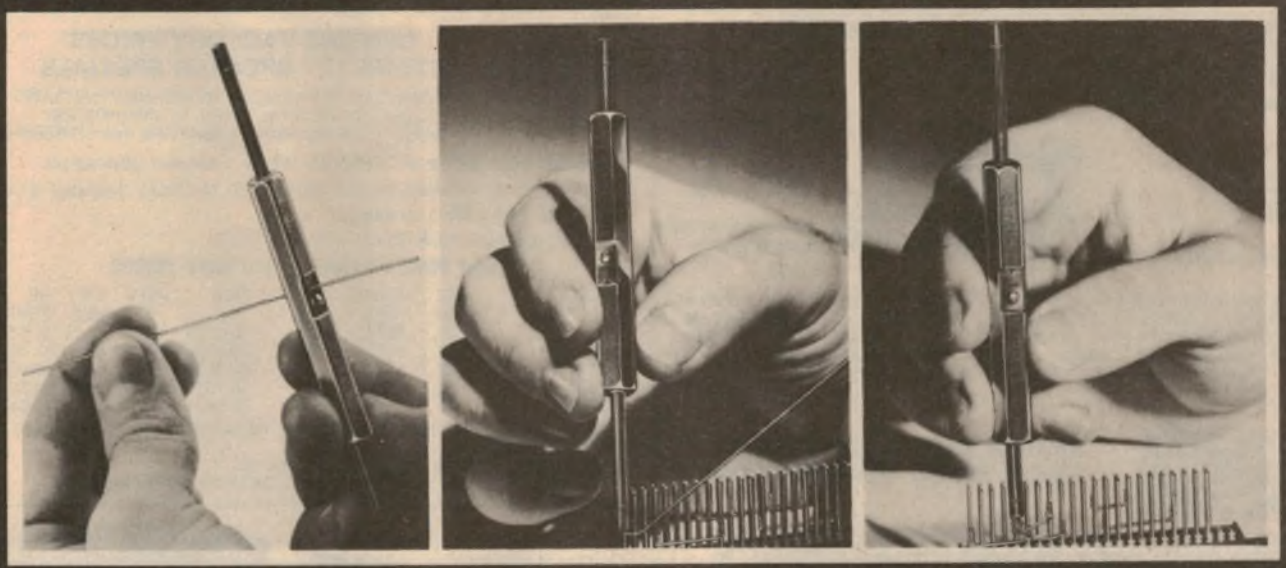

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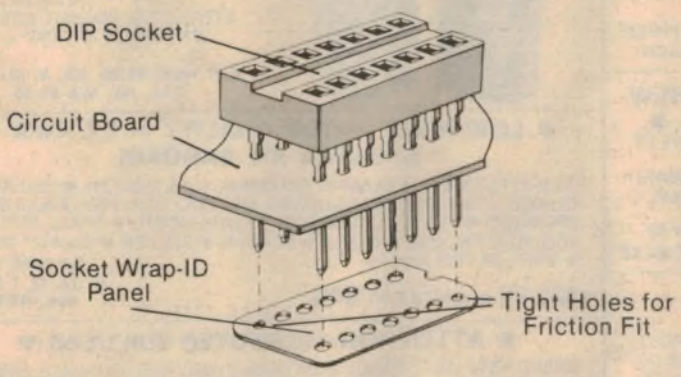

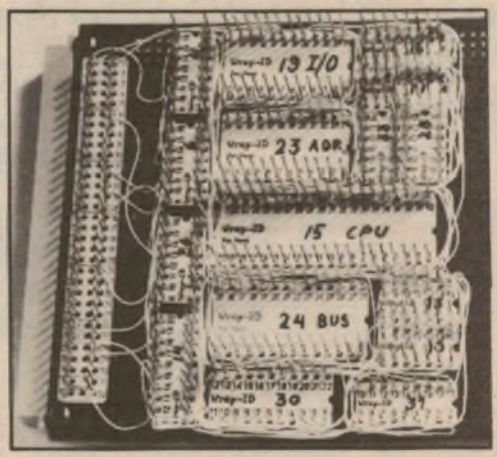

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NSW Applied Technology. 487 2711 Jaycar. 264 6688 Radio Despatch. 211 0191 Sheridan Electronics. 699 5922 **NSW Country Area:** Newcastle: Elektron 2000. 26 2918 **VIC:** Ellistronics. 602 3282 Ritronics. 489 8131 **QLD:** L. E. Boughen. 36 1277 N. S. Electronics. 36 5061 **SA:** Computer Imports. 268 8065 Electronic Components & Equipment. 212 5999 **WA:** Altronics. 328 1599 Reserve Electronics. 275 2377

New Products

from p106

when operated at the maximum temperature of 105°C the components are guaranteed for 1000 hours.

Values available range from 100μF to 22000μF with working voltages between 6.3V and 200V DC. Soanar is not stocking the full range at present but will take orders for any value of capacitor in minimum quantities of 1000.

Further information and technical specifications are available from Soanar Electronics Pty Ltd, 30 Lexton Rd, Box Hill, Vic 3218.

New catalogue covers Kikusui oscilloscopes

Kikusui of Japan, through their Australian agents the Dindima Group Pty Ltd, has recently published a catalog of their range of oscilloscopes, including the new Model 5520.

The Kikusui Model 5520 is a 20MHz dual channel oscilloscope with standard timebase facilities, built-in calibration signal, selectable triggering modes and operating modes. Input attenuators are switchable in 11 ranges in a 1, 2, 5 sequence from 10V/cm to 5mV/cm, and a x5 magnification feature provides input ranges of 2V to 1mV/cm at 10MHz.

Complete with probes, the 5520 is an economical, high performance instrument for servicemen, schools and the well-heeled hobbyist.

Further information is available from the Dindima Group Pty Ltd, PO Box 106, Vermont, Vic 3133.

Jaycar wraps it up with OK Machine Tool Co

Rapid development of microprocessor and LSI technology has encouraged the development of the now well-established "Wire Wrap" connection technique. First used by Bell Telephone Laboratories as a reliable means of producing strong wire terminations, wire-wrapping has since come into its own in the construction of prototype circuits and "one-offs". The electrical reliability of wire-wrapped terminations is actually better than solder joints, and the strength of the joints increases with age.

Wire-wrapping tools are well within the reach of the hobbyist. Jaycar, in Sydney stocks a range of tools produced by the OK Machine Tool Company of the United States. Heading the range is the BW-630 battery powered "Hobby-Wrap" gun, a motor driven wrapping tool. Also available is the "Just Wrap" hand wire-wrapping tool and spare wire.

These and many more products for the hobbyist and home constructor are available from Jaycar's showroom at 380 Sussex St, Sydney, NSW 2000. A mail-order service is available.

Bang & Olufsen expands test instrument range

Latest addition to the Bang & Olufsen range of electronic measuring equipment is the NM1 Signal to Noise ratio meter, an instrument incorporating many unique features.

Signal to noise ratio measurements can be made to any of eight standards, including DIN 45405, ANSI S1.4 and IEC179. The meter can be used to make stereo output level measurements from 0.4nW to 140W, and up to 1000W with an external dummy load connected. Detectors for true RMS values, peak and mean measurements are also included, and alternating voltages from 20uV to 370V can be monitored from 4Hz to 1.5MHz.

Inputs can be configured as 2Ω, 2 x 4Ω, 2 x 8Ω, and 16Ω for power measurements. As an audio voltmeter, input impedance is 1MΩ.

The multi-function NM1 is suitable for measurements of signal noise in amplifiers, AM/FM tuners, tape recorders, hearing aids and all types of audio frequency equipment. Operation of the instrument is simplified by pushbutton selection of ranges and test functions and the provision of outputs for an external loudspeaker and analog control voltages.

For further information contact Denis Cale at GRD Group Pty Ltd, 698 Burke Rd, Camberwell, Vic 3124.

Total Electronics has TRW opto-couplers

Total Electronics now has available the TRW Optron OPI125 series of high voltage opto-couplers. Each device contains a gallium arsenide infrared emitting diode coupled to a monolithic circuit incorporating a photodiode, linear amplifier and a Schmitt trigger. The OPI125 can drive up to eight TTL loads directly at data rates up to 250kHz and rise and fall times of 25ns. Input to output isolation is given as 15kV.

Additional information from Total Electronics, Suite 5, 1 Johnston Lane, Lane Cove, NSW, 2066, or Suite 231, 20 Duncan St, Fortitude Valley, Qld, 4006.

Documents around the world in 20 seconds

National Panasonic's new facsimile transceiver is said to be the most compact machine of its type available. The Panafax UF-520EX machine is built to Group III (facsimile) standards of speed and clarity, and can send an A4 typed sheet to a compatible machine anywhere in the world in just 20 seconds.

Panafax is based on transceivers built by National's parent company Matsushita for the FBI, who use them for transmission of fingerprints. Matsushita machines are also used to send weather maps to Australia from the weather satellite receiving station in Japan.

The facsimile transceiver uses an electrostatic printing system which allows received documents to be reproduced with clarity and also enables the machine to be used as a high speed copier. It is able to send blueprints, computer print-outs, pencil notes, coloured documents and half-tone material, using ISD and STD lines to transmit five times faster than tape-fed telex machines, without set-up time or operator error.

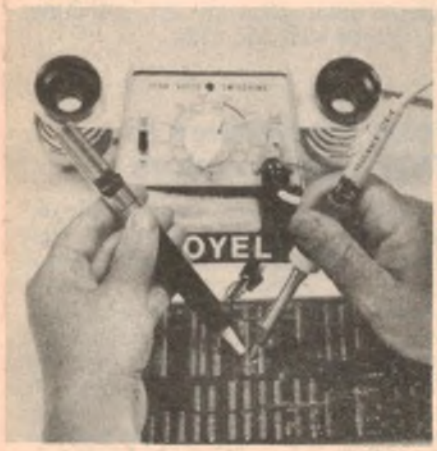
The Panafax UF-520EX is fully compatible with other Group III and Group II facsimile machines manufactured to international CCITT standards.

For more information contact National Panasonic (Australia) Pty Ltd, 95-99 Epping Road, North Ryde, NSW, 2113.

New Products

Soldering gear and demonstrations from Royel

Now that the use of printed circuits and miniature solid state devices is almost universal, both the techniques and equipment for soldering and handling electronic components are a much more critical part of the assembly process. Uncontrolled or unknown soldering temperatures and high voltage static electricity are the two chief threats to sensitive devices. Sensitive components can be destroyed or, worse still, damaged in such a way as to cause breakdown in service.



Desoldering with Royel's new temperature controlled soldering station.

Major organisations are already familiar with the latest developments in manufacturing and assembly, and now smaller organisations and individuals are being catered for with a series of demonstrations conducted by Royston Electronics.

Covering both the theory and practice of component handling, soldering and desoldering, the first demonstration was held over two days at Radio Parts' Spencer St (Melbourne) store. Reasons for the development of techniques were explained, the techniques were demonstrated and a wide variety of equipment was on display. Further demonstrations are to be arranged, and more information can be obtained by contacting Royston Electronics.

Royston Electronics uses the trade name "Royel" for many of its product lines, and now has a new 36 page catalog available covering products used for the assembly and repair of electronic equipment. Everything from pliers, cutters and tweezers to circuit board holders, wave soldering machines and test gear is included.

Also available from Royel is a range of static dissipating desk and bench covers called "Stat-Mat". The soft vinyl covered conductive mats are protected from damage by water and cleaning solvents and will not shed particles, so they can be used in clean rooms. The covers are available in widths of 60cm and 120cm, cut to any length up to 30 metres.

For further information contact Royston Electronics, 27 Normanby Road, Notting Hill, Vic 3168 or 15/59 Moxon Road, Punchbowl, NSW, 2196.

Optoelectronics kit from Heathkit/Zenith

Heathkit/Zenith Educational Systems has announced the introduction of a new course in its Advanced Electronics Series, the EB-605 Optoelectronics Course. The course teaches optoelectronics in depth, covering basic terms and concepts, light sources, displays, light sensitive components such as photo-diodes and solar cells and fibre optic theory and operation.

Designed specifically for learning in groups led by an instructor, the student workbook contains a series of experiments to be performed by students to gain hands-on experience of the many circuits covered. The textbook series includes the student textbook, the workbook, a kit of parts for the experiments and an instructor's guide.

Heathkit/Zenith are major suppliers of educational material to schools and industry. Further information can be obtained from W. F. Heathkit Centre, 220 Park St, South Melbourne 3205.

New BIFET op-amps

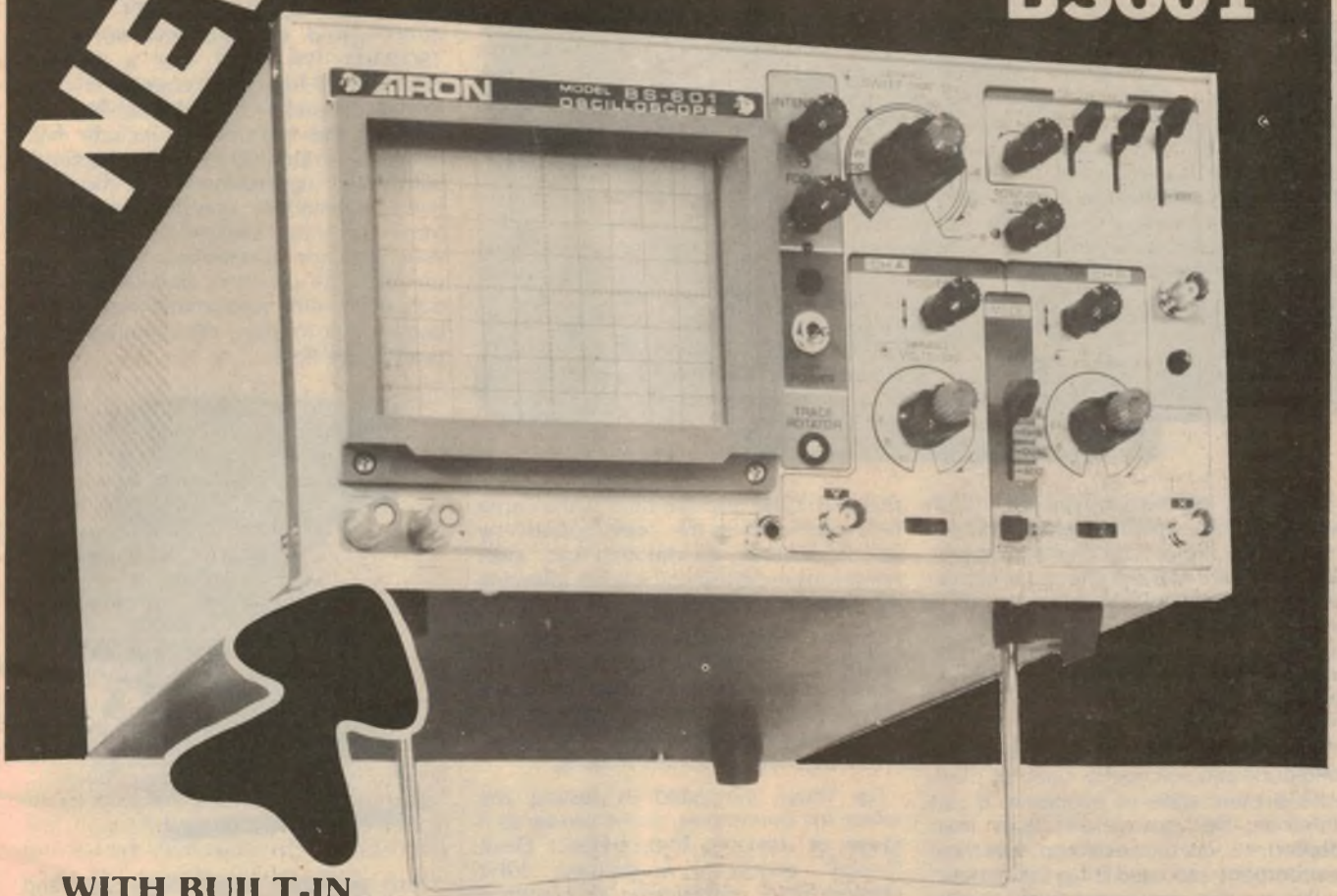
A low power BIFET operational amplifier has been introduced by National Semiconductor. The LF441 single, LF442 dual and LF444 quad operational amplifiers are an addition to National's advanced LF400 series, and feature extremely low power consumption (typically 150 microamps per amplifier) and high impedance JFET inputs – typically 10^{12} ohms.

When compared with standard non-BIFET op amps, National's new devices have a much higher input impedance while maintaining a gain bandwith of 1MHz, a slew rate of 1V/us and high gain (25V/mV minimum).

Current requirements are said to be from a quarter to a tenth the supply current of other op amps, and the devices are pin compatible with standard parts, so that they can be substituted in existing equipment for an immediate reduction in power consumption.

For further information contact National Semiconductor, cnr Stud Road and Mountain Highway, Bayswater, Vic.

NEW! 20MHz/5mV BS601



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- *150mm bright rectangular CRT with internal parallax-free graticule*
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- *T.V. sync*
- *Front panel trace rotate*

Aaron Corporation (formerly Application Inc) have a wide range of scopes. Send for a copy of our 8 page scope guide describing other models up to 40MHz and a full range of accessories.

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The BS601 is sold and serviced by ELMEASCO and leading electronics suppliers.

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21-23 Anthony Drive, Mt. Waverley, Vic. 3149
Phone: (03) 233-4044. Telex: 36206
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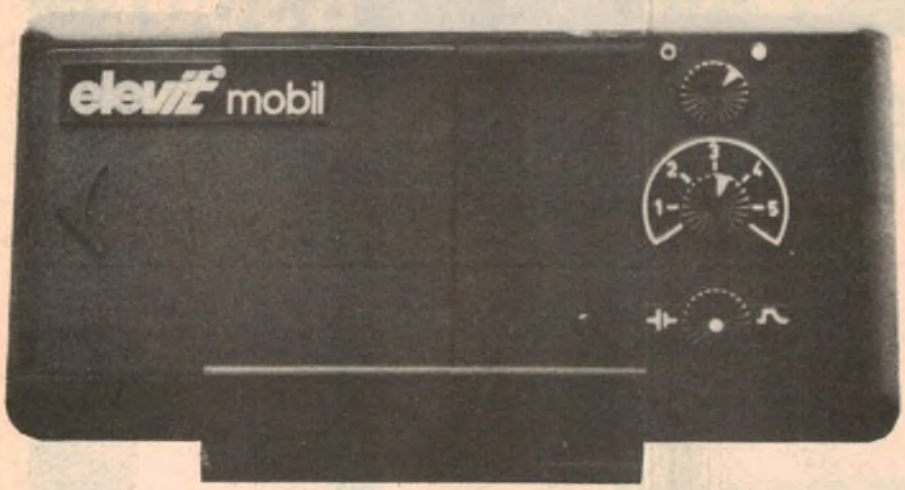
Brisbane : (07) 229-3161

New Products

Elevit "electro-climatisation" equipment



Our article on microwaves last month quoted findings which suggested that extremely low frequency electromagnetic fields can have marked effects on human beings. Experiments quoted in the article indicated that people isolated from the extremely weak low frequency fields produced by the earth itself experience disruptions of their circadian (daily) rhythms and sense of time.

"Man adapted to his environmental conditions and still needs many of them in his present state of evolution. It can therefore be postulated that man adapted to his atmospheric electrical environment and used it for his benefit" – or so the argument runs. Some researchers claim to have shown that the extremely low frequencies, in the range 1-100Hz, have specific biological effects.

One company which accepts this viewpoint is Elevit Australia Pty Ltd, who manufacture a range of "electro-climatisation" equipment called Elevit impulse field generators. Elevit is not a negative ion generator, and does not produce ozone. It produces an electrostatic field and a superimposed 10Hz modulation. The company claims that this 10Hz impulse field is the same field produced in the open country by good weather conditions, and cites numerous experimental studies affirming the benefits of the field.

Claims made for Elevit generators include a 10% increase in efficiency in offices where they are used, improved subjective well-being, increased concentration and a 22% reduction in errors in driver simulator training.

For those interested in testing the effect for themselves, Elevit produces a range of devices. The compact Elevit "Mobil" produces a defined 10Hz impulse field, reproducing air electrical conditions as they exist in nature. The device is powered by batteries and is effective up to two metres. It is suitable for use in cars, offices and similar environments where natural electromagnetic fields are screened out or overlaid with static fields produced by air conditioners, and other man-made electrical equipment.

"Mobil" costs $149, and is available from Elevit Australia Pty Ltd, 47 Huntingdale Road, Burwood, Vic 3125.

Programmable Autowire simplifies production

The Autowire programmable wiring and testing system developed in Australia by EMI Electronics is now in full production. Potential markets include all electronic and electrical assembly and test operations, where it has already demonstrated significant production gains for manufacturers of wiring harnesses and circuit board assemblies.

Based on EMI's modular microcomputer, the wiring system features easy set up of instructions via a keyboard and video display, floppy disk storage of all wiring data and test procedures, software interlocks which prevent errors in the assembly process and an optional printout of instructions and test results.

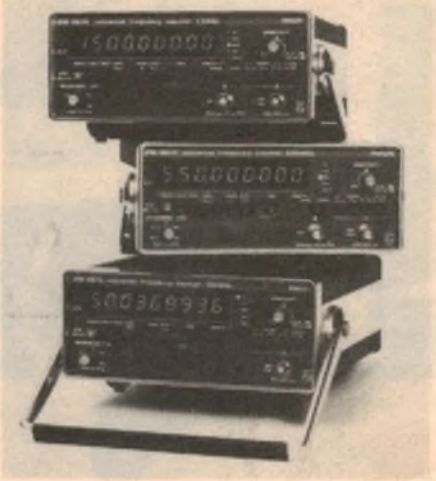
Autowire is presently being used as a production tool at the Salisbury plant of EMI Electronics, where it has demonstrated major gains in productivity and cost reduction.

For more information contact EMI (Australia) Ltd, 301 Castlereagh St, Sydney, 2000.

New test instruments from Philips

Philips Test & Measuring Instruments has released a range of compact frequency counters which are microprocessor controlled for high resolution and accuracy. The 120MHz PM 6673, 500MHz PM 6674 and the direct gated 600MHz PM 6675 and 1500MHz PM 6676 use a custom-designed LSI frequency counter chip for lower cost and increased reliability.

All of the instruments include high resolution counting, error free triggering with noise suppression and a choice of five high-stability crystal oscillators. Maximum input sensitivity is 10mV. A wide selection of options is available for use with the counters, including an IEC 625 (IEEE 488) instrument bus and a battery unit to allow the counters to be used in the field.



Also available from Philips Test and Measuring Instruments is the PM 3310 dual-channel digital storage oscilloscope. With a clock rate of 50MHz, a 60MHz bandwidth for repetitive signals and four memories, the PM 3310 can provide good representations of fast single shot signals to 5MHz. Single shot bandwidths of up to 25MHz can be achieved with using computer analysis of the data fed from the oscilloscope via an IEC instrument bus interface.

Digital storage offers many advantages, particularly long storage times with no signal degradation, but the analog to digital conversion required becomes very expensive at high frequencies, especially above 10MHz. The PM 3310 eliminates the need for a costly high-speed A/D converter by using a P²CCD ("profiled peristaltic charge coupled device") to convert high frequencies to a lower frequency before conversion.

In addition to the waveform, separate LED displays indicate the attenuator and timebase settings at the time of recording.

For further information contact Philips Scientific and Industrial Equipment, 25 Paul St, North Ryde, NSW, 2113.

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Wireless Weekly 3d

November, 1931

Ras Tafari, Emperor of Abyssinia, recently laid the cornerstone of a new radio station which his Government is erecting at Addis Ababa.

☆ ☆ ☆

A new broadcasting station, to be conducted on behalf of the Roman Catholic Church, will shortly be established in Sydney. The enterprise has been undertaken by the Catholic Broadcasting Company, Ltd, which was formed for the purpose, and a contract has been made with Amalgamated Wireless (Australasia), Ltd, for the construction of a modern broadcast station. It is expected that the new station will be on the air before the end of this year.

Monsignor Meany, chairman of directors of the Catholic Broadcasting Company, Ltd, who, it will be recalled, had charge of all the broadcasting arrangements in connection with the Eucharistic Congress in 1928, states that the intention is to broadcast church services on Sunday, and during the rest of the week present high-class programs of general interest.

The Catholic broadcasting station will be known as 2SM (indicating St Mary's). It has been licensed to use a power of 1000 watts in the aerial, which is the maximum allowed to "B" class stations, and which will give 2SM a range and power closely approximating that of the "A" class stations.

☆ ☆ ☆

The BBC has been running an interesting series of talks under the title "Escape". These concerned mainly the escapes of prisoners during the recent war; not only English escapees but Germans who escaped from English prison camps were prevailed upon to excite listeners with thrilling stories of their adventures.

☆ ☆ ☆

No more records? The prohibition against the broadcasting of records issued by the manufacturers last week will have a serious effect upon radio programs if a compromise between the differing parties is not arrived at.

In the past, broadcasting stations have had almost unrestricted use of records, paying a flat rate weekly for copyright. This privilege, the record manufacturers claim, has been abused to such an extent that their sales have dropped and the whole industry is threatened. Whether or not this is due to the prevailing depression or whether it is a manifestation of the general tendency for radios to supplant gramophones are points which the record manufacturers are not going to wait to see proved.

☆ ☆ ☆

Bagdad may soon have a broadcasting station, and it is reported that studios and rooms are being made available for it in the city's telegraph office. The programs would be announced in Arabic and English, as there are many English dwellers round Iraq who would welcome the service. Of course, the question of a censorship of Arabian Nights' Entertainment . . .

☆ ☆ ☆

"Radio City," New York, which is being financed by Mr Rockefeller, has begun to be excavated for, and is expected to be ready in a few days. It is to enjoy the delights of landscape gardens, for which land in the middle of New York, worth £3,500,000 has been set aside. The roofs of the 10 buildings, which go to make the city, will also be gardens. The completed scheme will cost £100,000,000. This includes seven acres of waterfalls, fountains, pools, trees, formal flowerbeds, and statuary. A curved waterfall, with a 50ft spillway, will spill cascades into a reflecting pool, from forty feet above the roof of the 16-story wing of the centre building.

RADIO TELEVISION AND HOBBIES 1/6

November, 1956

TV telephone comes nearer. A telephone that transmits pictures along with sound has taken a big step toward commercial feasibility, according to information released by the Bell Telephone Laboratories whose engineers have used an experimental "Picture-phone" system to transmit recognisable pictures over short and long distances, even as far as from New York to Los Angeles.

Experimental pictures vary in size from one by one and a half inches to two by three inches, and are viewed from one to two feet away. Unlike television, a new picture is displayed every two seconds. It has good black-and-white contrast and the person at the other end of the line is recognisable. Head and shoulders can be seen and facial expressions are readily apparent.

Soviet television may look primitive to an American, but in its way it's a good deal more advanced than household plumbing, country roads or some other adornments of this country's much advertised way of life, says the New York Times.

There are said to be a total of one million television receivers on the Soviet Union today, compared with only 4000 in 1950. The Government promises to manufacture about one million more this year.

Soviet screens are generally smaller than those on American sets. They range from 11 by 14 centimetres (4.4 by 5.6 inches) to 24 by 36 centimetres (9.6 by 13.4 inches).

According to Moskovskaya Pravda, stores in the capital will sell 10 types of television sets this year with different screen sizes and exterior finish. They range in price from 1200 to 2400 rubles (£150 to £300) today.

☆ ☆ ☆

The world's first circular office building. A feature of the Hollywood landscape is this newly completed building which houses the headquarters of Capitol records, a company now owned by EMI. It is claimed to be the first of its kind in the world.

The building is round for functional reasons, as well as design. The round structure results in less outside surface in proportion to the usable interior area. This reduces the outside wall surface which saved in construction cost and in air-conditioning operation cost.

At the top of the spire is a beacon light, which will be lighted each night and will flash in Morse Code the word "Hollywood". In the Penthouse on top of the building is the elevator machinery, various fans and blowers, and a cooling tower.

☆ ☆ ☆

Farnborough show the way. This year's emphasis is on engines. The show suggests that Britain will, in the next five years, make an indisputable claim to be the master aero-engine builder. And the returns are staggering. Few people appreciate that the power-plant for, say the transport version of the Boeing 707, will cost far more than a World War II heavy bomber.

Farnborough showed that engine development in the past two years has been really extraordinary. At the head of a long list of new arrivals I place the Bristol "Orion". This engine's wonderful quality is its ability to compensate automatically for increases in altitude.

As a trim turbo-prop it is meant to work at 5150 horsepower. A major design feature has been power-limitation and its supercharge qualities permit full rated take-off power to be obtained at 15,000 feet. Maximum rating does not fall before 25,000 feet. BOAC has purchased 60 complete "Orion" installations for their long-range Britannia 312s.

REVIEWS OF RECENT

Records & Tapes

CLASSICAL ● POPULAR ● SPECIAL INTEREST

FREMAUX — and the music of four French composers

IBERT — Divertissement for Chamber Orchestra.
POULENC — Les Biches.
HONEGGER — Pacific 231.
SATIE — Gymnopedies 1 and 3.
City of Birmingham Symphony Orchestra conducted by Louis Framaux. World Record Club Disc R 06196.

Louis Fremaux followed the late van Otterloo as resident conductor of the SSO and has maintained the high standard set by his predecessor, even though the two men's styles are entirely different. Whereas Otterloo was Dutch, Fremaux is French — very French. His work has true Gallic elegance and much Gallic wit.

Before coming here he was resident conductor of the City of Birmingham (England) Symphony Orchestra which he conducts in this recital of music by four French composers. (I know that Honegger was of Swiss descent but he spent most of his life in France and was one of Les Six who were so active in Paris during the 20s and 30s of this century.)

Fremaux starts with Ibert's Divertissement, a witty and often exhuberant suite of short pieces, originally composed as incidental music for a French comedy.

I thought Fremaux' introductory bars a little straight-laced for such unbuttoned jollity. But, leaving that behind him, everything goes famously. The second item, a Cortege, starts as a solemn procession but soon develops into a mocking allegro, finishing with a travesty of Mendelssohn's Wedding March. Then comes a nocturne, very original in form but always deliciously nocturnal and — I cannot avoid using the word again — elegant. In any case elegant applies to the whole suite, even when the music is at its most sardonic.

The next, a waltz, is, like all good parodies, a close but ironic copy of its victim, this time the Viennese school. Then comes a Parade but, this time, the victim is military. The Finale is ushered in with a lot of meaningless splashing on the piano, leading into a sarcastic gallop.

The next piece, Pacific 231, was named

after the composer had written some music illustrating motion, gradually increasing in speed, and not to describe the famous American train of that name. It had a great vogue as a piece of "realism" during the 20s and 30s after its portrait resemblance to a railway train had been noticed — and not contradicted by the composer. Indeed, the opening does sound so much like the giant sighs that locomotives used to give on starting, that the mistake can be readily forgiven. Those not in the know attributed all kinds of passing scenery during its progress. How easy it is to be wrong!

Les Biches was commissioned by Diaghileff from the 24-year-old Poulenc for a never very successful ballet. By the way, there is a mistake in the sleeve notes. They state, I quote: "untranslateable title (The Darlings) refers to the damsels with whom Louis XIV chose to frolic in his parc aux biches." End quote. I am afraid I must point out that the king was Louis XV and his setting the parc aux cerfs.

Although the ballet enjoyed only a mild success, the music, already typical Poulenc is, well worth preserving. Indeed, it deserved a better fate. It is full of high spirits and shows a total lack of respect, interspersed with some enchanting, sugary tunes. It is beautifully played and recorded and the French conductor never leaves a point unmade, moving without warning from mood to mood — gay, irreverent, mocking and always wonderfully professional. Flippant? Perhaps. But what does that matter?

The recital ends with two Gymnopedies by Erik Satie orchestrated by Debussy. Nowadays Satie, though a sort of godfather to Les Six, is better remembered for what he said, usually wittily, than for the music he wrote. This, despite its search after novelity, never quite lost a dry, austere quality. (J.R.)

BRAHMS/ARRAU . . . "Sorry"

BRAHMS — Piano Concerto No. 1 in D minor. Claudio Arrau (piano) with the Concertgebouw Orchestra conducted by Bernard Haitink. World Record Club Stereo Disc 6580 302.

The World Record Club have recently been issuing records in what appears to be their original covers — I mean the original covers by, for example, Philips or DGG. But this cover is something else again for in addition the big U (for Universo) in the left top corner, there is a Philips trademark in the top right hand corner and a DGG in the bottom left!

But I am afraid I cannot offer my customary enthusiastic welcome to an Arrau recording in this example. Indeed, I have heard him play the work much

more convincingly in the Concert Hall. It is as difficult to describe the shortcomings of the performance as it is to find reasons for them, for Arrau is one of our greatest present-day pianists and he has the formidable support of the Concertgebouw under Haitink.

The first movement can be dismissed as almost pedestrian when one considers the usual form of the performers. It lacks drive in the orchestra and aggression in the piano part. Perhaps this is the

Reviews in this section are by Julian Russell (J.R.), Paul Frolich (P.F.), Neville Williams (W.N.W.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), Greg Swain (G.S.), and Danny Hooper (D.H.).

way the two principals worked it out but, if they did, it just fails to come off. In the slow movement, Arrau's customary lyricism is sadly absent. Instead, we have playing that might almost be classed as wooden.

On the other hand, the Finale comes close to sounding a bit overdone, perhaps because one has by then become used to the reverse style in what preceded it. Nor is the performance helped much by the engineering, which might well be dismissed as very ordinary. That I admire both Arrau and Haitink so much made it all the more difficult for me to have to write so unkindly about them. (J.R.)

☆ ☆ ☆

LISZT — Faust Symphony. Royal Philharmonic Orchestra conducted by Sir Thomas Beecham.

LALO — Symphony in G Minor. French National Radio Orchestra conducted by Sir Thomas Beecham. World Record Club Stereo. R 06184/5. Two discs.

This is a welcome reissue of one of recording technology's finest achievements, considering that it was one of the first stereo discs to be publicly available when it was originally released. The sound (the processing) has been refined a little since then and is quite acceptable nowadays.

What you have is a great if presently neglected piece of music, played by an orchestra fired by the genius of its conductor who was a great admirer of the work. It has never been equalled since and the best I can do in a short space is to advise you not to miss any opportunity to acquire it.

It is a two-record set, its companion being a Symphony in G Minor by Lalo played by the French National Radio Orchestra, also conducted by Beecham.

Despite the freshness Beecham brings to this latter work and the obvious enthusiasm — if nothing else — of the French orchestra, there is little I can find to recommend in it. But the Liszt makes the issue of both discs well worth while. (J.R.)

THE RITE OF SPRING

STRAVINSKY — Le Sacre du Printemps. Sydney Symphony Orchestra conducted by Willem van Otterloo. ABC Stereo Record ABCL 8101.

The Australian Broadcasting Commission has recently been issuing some excellent recordings under its own label. One of the most notable of their features has been the first class recording techniques, many of the records having been produced by that experienced and always sensitive old-timer at this discipline, Eric Clapham.

I am not able to review the many I have received for the usual space reasons, so have picked what I consider not only one of the most successful but one which shows that the Sydney Symphony Orchestra has now developed into an organisation worthy of international recognition.

Much of the credit for this is due to the demanding periods when Sir Eugene Goossens and Willem van Otterloo lent their outstanding gifts — and patience — to its careful nurturing.

The work I have chosen, Stravinsky's Rite of Spring, is far from easy to bring off as well as it is done here. It has been described — rightly in my opinion — as the watershed dividing the Romantic period from the present and often rather confused, contemporary.

Both the engineering and the playing stand up well to comparison with the world's best, the recording making audible much relevant detail in the score. The performance under Otterloo is really first rate, one eminent feature being that important aspect of the work — violently marked and often changing rhythms.

Also, the players have no difficulty in dealing with the extremes of pitch which the composer often demands of them. The whole goes to show how lucky we were to have had so fine a conductor as Otterloo among us for such a long time. The tragedy of his death, so soon after he had retired, is still remembered with sorrow by the orchestra who loved him so well. I have no hesitation in writing that the whole production would be considered worth of issue by any of the world's giant recording organisations. (J.R.)

☆ ☆ ☆

HOLST — The Planets. Suite for large orchestra. London Symphony Orchestra conducted by Andre Previn. World Stereo Cassette. C 05296.

The Planets must be just about the sturdiest survivor of the music suites composed during the early years of this century. But, for the benefit of those to whom it is new, I had better explain that its composer chose to illustrate musically the old astrological significance of the planets.

Gustav Holst was an Englishman born in Cheltenham, despite his foreign sounding name, his Swedish ancestors having settled in England a couple of generations before his birth. Oddly, Holst chose the trombone as his orchestral instrument and became very proficient in its use. As an example of Holst's scheme, the first item, Mars, is subtitled the "Bringer of War". And that is exactly what it sounds like. It starts quietly and advances like an evergrowing menace. It is war of the old type, that proceeds juggernaut-like to trample on all it meets.

ORFF: CARMINA BURANA

". . . delightfully vulgar!"

CARMINA BURANA, Carl Orff.
SYMPHONIC METAMORPHOSIS, Paul Hindemith.
Robert Shaw, the Atlantic Symphony Orchestra and Chorus and the Atlanta Boy Choir. Stereo, two-record set, digitally mastered. Telarc DG-10056/57. [From PC Stereo, PO Box 272, Mt Gravatt, Qld 4122. Phone (07) 343 1612].

Although there are up to a dozen versions of Carmina Burana in the catalogues, Telarc claim that this is the first to occupy three full sides, thereby removing any artificial restrictions on frequency response and dynamic range. It is certainly a deluxe presentation and, as is usual for Telarc, there are generous notes on the composers and the works. For good measure, the words for Carmina Burana are provided in the original Latin, plus a free translation into English.

The starting point for Carmina Burana was basically a collection of highly irreverant songs, celebrating the life of the flesh and recorded for posterity — perhaps unwittingly — by a group of hard-drinking, hard-loving clerical dropouts from the medieval monastery system. Maybe some things haven't changed all that much in six centuries!

For the most part, the work is choral, with soprano; tenor, baritone and chorus singing 25 songs on the three sides. But while the texture of sound is formal, the rhythmic pattern and the pronounced intrusions by the orchestra serve as a constant reminder that the underlying theme is certainly not so. To borrow a phrase from one overseas reviewer, it is all "delightfully vulgar".

And, apart from a bit of suspect balancing at the beginning, the sound from the Telarc recording is delightfully transparent, with long passages of whisper-quiet mood — choral punctuated by enormous poundings on the drums. It needs dynamic range and it gets it!

As to the performance itself, the orchestra and chorus are highly disciplined in the Shaw manner — perhaps a little too much so for the aforesaid goings-on!

On side 4, Hindemith's Symphonic Metamorphosis — a transcription of themes by Carl Maria von Weber — comes off well and is first-rate audiophile fare. It could provide the incentive — and reward — for those who might be a little hesitant about Carmina Burana on its own. (W.N.W.)

There is a middle portion, quieter but full of pain that might well be descriptive of the wounded. But the piece finishes as ruthlessly as it began.

Previn handles everything vitally, whether the scoring is at its most opulent or as frail as you will hear in Saturn, the "Bringer of Old Age". The sound throughout is great and, importantly, there is plenty of silence between the seven pieces that make up the suite.

To contrast with war Holst chose Venus, the "Bringer of Peace", for his second item. It is a masterpiece of quiet, unruffled beauty, always cool at its most ecstatic. Next, Mercury slips by as fleetly as one would expect of the "Winged Messenger of the Gods" — its subtitle. Then comes rumbustious Jupiter, its main themes as sturdily English as anything Elgar ever wrote. He is subtitled the "Bringer of Jollity". Themes from Jupiter were used to open and close the wedding ceremony of the Prince and Princess of Wales recently.

For information on World Record Club albums, contact the club at 605 Camberwell Road, Hartwell, Victoria, 3124. Tel. 29 3636.

Another contrast follows in Saturn, the "Bringer of Old Age", fragile boned with blood scarcely stirring through narrowed arteries. And, by no means apologetically, I should like to mention that I am not being innocently fanciful in my descriptions. Saturn is quite without emotion and has a middle portion that might express the recall of some memory — one in the far distant past. The scoring here is quite pallid as the music trudges to the end of its weary journey to peace.

The mischievous fellow Uranus, the "Magician" next enters with the nearest thing you can get to a "Hey Presto!" in music; there is a grand march in the middle section. The final item is Neptune, the "Mystic", opening coldly on the bass flute and getting colder as it goes along. The music becomes more and more remote and wraithlike until it sounds like it is drifting in from light years away.

The whole suite is most picturesquely played with the London Symphony at its formidable best. I have only a couple of niggling comments to make — the wordless women's chorus in Neptune could have been made to sound more distant until it fades into inaudibility and the extra long run-off at the end of Side 2 could have been put to better use than silence. (J.R.)

☆ ☆ ☆

MARTINU: Symphonies Nos. 3, 4 & 5. Czech Philharmonic Orchestra, conducted by Vaclav Neumann. Supraphon quadraphonic two-record set 1410 2771-72.

Bohuslav Martinu, born in a small Bohemian town in 1890, fled from Paris, where he had lived for many years, just a step ahead of the Gestapo and managed to get away to the United States, where

THE "PURIST" APPROACH

JACQUES BONDON, Le Soleil Multicolore, for flute, harp and viola.

CLAUDE DEBUSSY, Sonata No. 2, for flute, harp and viola. The Carter Chamber Ensemble. Stereo, Sound Storage SSR-2020. [From M. R. Acoustics, PO Box 165, Annerley, Qld 4103. Phone (07) 48 7598].

Both sides of the inner jacket for this recording are taken up with technical argument in favour of "purist" microphone placement and the rewards of extreme care at every other stage in the production. Fair enough, but they do lay it on a bit thick!

Fortunately, they make amends on the rear cover by introducing the members of the ensemble, all from the San Francisco music scene: Anne Adams, harp; Rebecca Friedman, flute; James Carter, viola.

Jacques Bondon was born in 1927 and has a strong following in Paris, particularly as a composer. His "Le Soleil Multicolore", in three movements, was composed to commemorate man's first walk on the moon in 1969.

Claude Debussy, born in 1862, composed the "Sonata No. 2" — Pastoral, Interlude, Finale — in 1916, at a time when he had consciously reverted to a traditional classical form. Death from cancer in 1918 prevented him from composing more than three of the planned six sonatas.

If you are not familiar with the music, you will find it eminently and gently listenable, with the emphasis on the interplay of the insruments rather than musical dynamics.

And, of course, this does make it easier to accommodate the music within the dynamic range of the system. Not surprisingly, therefore, the sound is clean and unstressed, with excellent separation between the instruments. If the contents appeal, you'll enjoy it. (W.N.W.)

he remained for most of the rest of his life (he died in Switzerland in 1959). Although relatively unknown at the time, his genius and originality were quickly recognised by American musicians and his stay in the New World proved very fruitful. From 1942 to 1946, his output was augmented by a symphony a year — the last three of these appear on this set, superbly performed and recorded.

Although there are many minor signs of Dvorak, Smetana and Czech folk music throughout Martinu's works, he is even harder to classify than Janacek — the only other Czechoslovak composer of comparable stature. Virgil Thomson described his music as ". . . wholly lovely and doesn't sound like anything else . . . the instrumental complication is a part of the musical conception, not an icing laid over it" and this remains true. The third symphony, in three grand sweeping movements, is a tragic work, full of the dark moods of 1944, often wild and quite savage in its sadness — profoundly moving music.

The fourth symphony, written at the time of Germany's defeat and the liberation of Bohemia is full of joy, overflowing with happy slavonic rhythms and with quotations from Smetana's "Vltava" and the Czech national anthem.

The fifth, dedicated to the Czech Philharmonic (who previously recorded the work under Karel Ancerl, also for Supraphone) returns Martinu to his compositional freedom — there is constant change in moods and tempi, mystery alternates with lyricism, excitement with moments of deep peace. All three works, in their completely different ways, are most rewarding and should give many hours of pleasurable discoveries to genuine listeners. (P.F.)

STEPHANE GRAPPELLI At The Winery. Stereo, Concord Jazz, released through Festival L-37560.

In the July issue, I reviewed another Concord Jazz record "Great Guitars At The Winery". The locale in question is the old Paul Masson winery on the hills outside Saratoga, USA. It was a happy, good-natured performance, with the audience bursting into spontaneous applause from time to time.

On this disc, jazz violinist Stephane Grappelli takes the feature spot, backed by guitarists John Etheridge and Martin Taylor, and by Jack Sewing on bass.

In a performance loaded with talent but easy on the ear for those with only a superficial knowledge of the jazz idiom, the group presents a generous program: You Are The Sunshine Of My Life — Love For Sale — Angel's Camp — Willow Weep For Me — Chicago — Taking A Chance On Love — Minor Swing — Let's Fall In Love — Just You, Just Me.

The jacket carries an excellent portrait of Stephane Grapelli on the front and biographical notes on the back. Add some excellent sound, albeit punctuated by audience response, and you have a fine memento of a musician who's been up front for more than 50 years. Recommended. (W.N.W.)

☆ ☆ ☆

THE JEWELS OF THE MADONNA. The Geoff Love Orchestra conducted by Robin Stapleton; Robert Docker, piano. Stereo, EMI EMC-2709. Released through the World Record Club.

This album would have been classified as middle of the road — before the road was shifted bodily pop-ways! Included

YE MEDIAEVAL MUSIK

THE CAPTIVE UNICORN. The Renaissance Players. Cherry Pie CPF 1036 2. Two-record set.

The Renaissance Players are a group of singers and instrumentalists under the direction of Winsome Evans, a lecturer in the Music Department at the University of Sydney. The group was founded in 1966 and normally numbers about nine musicians. As can be guessed from their title, the group specialises in mediaeval music. I have been present at one of their concerts which are presented in period costume together with poetry, dancing, miming and generally clowning about. And while the music sometimes lacks interest, tending toward monotony, (much the same can be said about a great deal of modern music) the overall variety of the performance adds up to an enjoyable concert.

Without the visual content, the album suffers a little. I must admit my interest flagged somewhat before I got to record two. (But I did listen to all four sides.) By far, the most outstanding feature of the album is the very good sound quality on all tracks. However, on several tracks I did feel that the vocalists were too far "forward" and were drowning out the instruments.

The program consists of French, Spanish, English and Latin songs and dances from the 11th to the 14th century. Some of the instruments featured include: Indian leg bells, finger cymbals, claves, castanets, tambourines, shawms (a double-reed wind instrument), recorders, Celtic harp, flute, fiddles, bass viol and a portative organ. Lyrics are included for all the songs on a printed insert with the album.

In short, worth buying but don't try to listen to the whole two-record set at one sitting. (L.D.S.)

"AUDIOPHILE" DEVOTIONAL

THE POWER AND THE GLORY. The Mormon Tabernacle Choir, and the Columbia Symphony Orchestra directed by Jerold Ottley. CBS Masterworks digitally mastered disc DBL-36661.

This is the first CBS Masterworks Digitally sourced disc that I have encountered personally, and it is a very good one indeed. An imported pressing, it carries sleeve notes in English, French and German.

The Mormon Tabernacle Choir is undoubtedly one of the best known choirs in the world and, while the items here are all from their well-known and extensive repertoire, the recordings are fresh performances, dated 1981, expressly for digital.

Adding up to a generous program, the track titles are: Awake the Harp (Haydn) – Jesu, Joy Of Man's Desiring (Bach) – Gloria in Excelsis Deo (Mozart) – Ave Maria (Schubert) – Hallelujah (Handel) – A Mighty Fortress is Our God (Bach) – Rise Up, Arise (Mendelssohn) – Onward Christian Soldiers (Sullivan) – The Lord's Prayer (Malotte) – The Battle Hymn Of The Republic.

Mastered on a Sony PCM 1600 digital recorder, with back-up Sony editing equipment, the sound is very clean, and the pressing and packaging first rate. For those who like devotional choral music, this could be a "must", with the added attraction that it qualifies for CBS' description on the jacket "audiophile". Recommended. (W.N.W.)

are snippets from the light classics plus bits from the ballroom: Neapolitan Nights – Scene from "Swan Lake" – La Cinquantaine – Kannenoi-Ostrow – Fur Elise – Over The Waves – In A Persian Market – Intermezzo from "Jewels Of The Madonna" – A Maiden's Prayer – Liebestraume No. 3 – The Skater's Waltz.

Prominent in the operatic scene, conductor Robin Stapleton wins some excellent sound from the substantial Geoff Love Concert Orchestra. The recording itself is of normal quality although my sample recording – hopefully an aberration – did exhibit a noise patch on the first track of side 2.

But there's a generous helping of tuneful melodies and, if you're one of those to whom they appeal, you'll enjoy this album (W.N.W.)

Dionne Warwick

HOT, LIVE AND OTHERWISE. Dionne Warwick. Arista Records L45895/6. Festival release.

This double album captures Dionne Warwick at her best, featuring live concert performances of all her solid gold classics.

The songs on this album set include: Alfie – I'll Never Love This Way Again – Deja Vu –Walk On By – Anyone Who Has A Heart – The Look Of Love – What The World Needs Now – Promises Promises and many more.

The recording quality is excellent and this album set would be a memorable experience for Dionne Warwick fans, as it contains a matchless string of hits that span almost 20 years. (D. H.)

☆ ☆ ☆

20 TOP INSTRUMENTS. Frank Pourcel and His Orchestra. Two-record set. Stereo. World Record Club R05834.

Recorded by EMI for the World Record Club, this two-record set from Frank Pourcel and His Orchestra makes for a relaxing musical interlude. Twenty top musicals are featured, all played in competent – if not spectacular – style:

Tico Tico – Stranger On The Shore – Tequila – Petite Fleur – Wheels – Pink Panther – Lax Playa – Brazil – De Guello – Winchester Cathedral – Ebb Tide – Delicado – Misty – La Petite Valse – Blue Moon – Caravan – Maria Elena – Holiday For Strings – Blue Tango – Summer Place.

Recording quality is only about average. You can contact the World Record Club at 605 Camberwell Road, Harwell, Victoria 3124 (G.S.)

☆ ☆ ☆

BRAZILIAN SOUL. Laurindo Almeida and Charlie Byrd. Festival Records L-37587. Stereo.

Anyone with a feeling for jazz, particularly with a Brazilian flavour, will find a place for this album in his collection. In "Brazilian Soul", Laurindo Almeida and Charlie Byrd combine on guitar to produce what the jacket notes describe as "the first bossa nova flavoured guitar duo".

The music, for the most part, is comprised of pre-1940 pieces, the most notable exceptions being "Stone Flower", "Don't Cry for Me Argentina" (from the musical "Evita"), and Charlie's own composition "For Jeff". Other track titles are: Carioca – Naquele Tempo – Cochichando – Luperne – Tomoso – Choro II – Brazilian Soul.

To record the album, Byrd chose the Kohna 30, a highly-regarded Japanese classical guitar, while Laurindo plays a unique instrument of his own design with a cutaway to permit greater access to the higher tones. The two guitar sounds blend together perfectly.

In summary, an album for those who prefer classical guitar to noisy dynamics. Recording quality is well up to standard (G.S.)

Australia's Fastest Selling Home Computer

DICK SMITH'S SYSTEM 80

In just a few short years, operating a computer will be as much a part of everday life as the calculator and TV set are today.

And it's the people that have a knowledge of computers today that will certainly have the best chances in tomorrow's highly competitive and technical world.

What is a home computer?

The ultimate multiple TV game. An untiring tutor who will teach you almost anything and at your own speed. A way of familiarising yourself with computer technology.

How does it do this?

With the help of computer programs available on common audio cassettes.

What programs are available?

Virtually an infinite range: from us, and from thousands of other suppliers.

Everything from teaching the kids to read properly, teaching yourself to type . . . right through to programs which will help you run your business and even do your income tax calculations for you!

And, as we said before, once you understand your computer, you'll be able to write your own programs to do just what YOU want to do!

The Dick Smith System 80. Great Value at only $750.00

This is just a sample of the wide range of software available for use on your System 80.

Are they difficult to use?

Lets answer that question by asking you a question: Do you use a cassette recorder in your home?

The Dick Smith System 80 home computer is just as easy to use. You turn the computer on (just like turning on the cassette), pop in the program cassette, press the 'play' button (just like on your hi-fi cassette) and you're ready to go computing. You tell the program to run by typing the letters 'RUN' and you're away! The program itself generally tells you what to do next.

It couldn't be easier!

Why is the System 80 Australia's fastest selling computer?

Simply because it offers, by far, the best value for money for a practical computer system.

A 'practical system' quite simply means one that **you** can use (and that includes program availability).

There are cheaper computers, no-one is disputing that. But you need to be a boffin to work some of them out. Others have little or no programs available.

Yes, there are a lot of computers to choose from at the moment. Just like the early days of colour TV. Where have they all gone now?

Some computers are being offered as various bits and pieces. This is quite okay: as long as you understand what you are buying! The System 80 computer, as it comes to you, is a fully operational computer. You don't need to buy another thing to make it work: plug it in to a TV set and a power point – and it works.

Many other computers are little more than fancy plastic boxes: until you start buying the 'add-ons' to make them work, they're not much use to you.

Beware of seemingly attractive 'computer only' prices. Make sure you take into account the 'add-ons'!

And it's over $500 cheaper than the Tandy TRS-80!

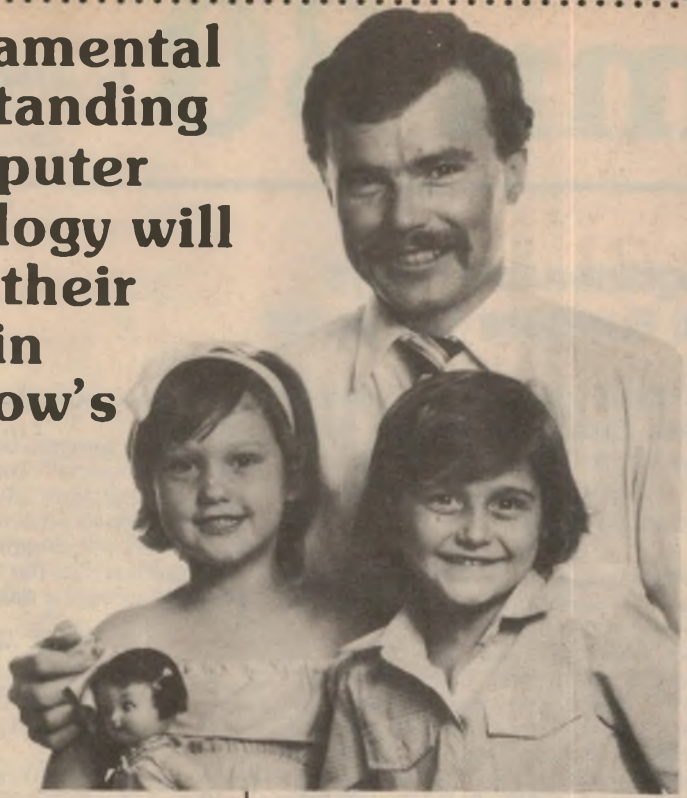
If you buy the Dick Smith System 80, you'll save over $500 on the current Tandy computer.

The closest equivalent current model Tandy Computer is the TRS-80 model III, with 16K of memory, monitor, but no cassette recorder. Add a cassette recorder and the system sells for over $1450. We do not compare the System 80 against the TRS-80 model I as it has been discontinued in the USA, the country of manufacture and no longer sold here.

The Dick Smith System 80 is supplied with 16K memory and built-in cassette recorder. It doesn't need a separate monitor, as it will plug in to any TV set. If you do add a separate monitor, the price is only $899.

So you can save a bundle by buying the Dick Smith System 80 — and still have access to the huge range of software for the TRS-80!

A fundamental understanding of computer technology will secure their future in tomorrow's world.*



Want to know more?

We've prepared a detailed brochure showing you just what the Dick Smith System 80 Home Computer can do for you. All you have to do is ask for a copy.

Call in to your nearest Dick Smith store — have a chat with the helpful computer specialist in the store — or drop us a line and we'll gladly send you a copy free of charge.

Or even better . . .

Take advantage of our exclusive trial offer below. There's nothing better than 'hands on' experience! And you're under no obligation.

How will a home computer help my children?

From what we've said, you might imagine that a computer might make us lazy.

Far from it! Teachers report that students with access to computers at home are usually much more receptive to learning, and they learn faster. Consequently, they get better grades.

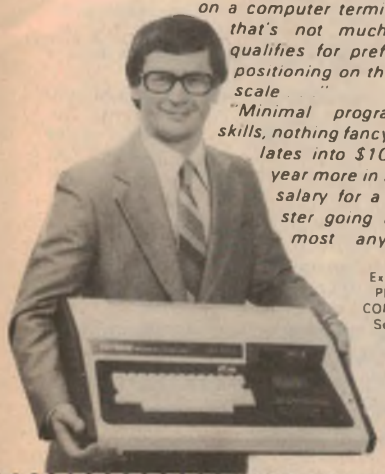
But a computer can do much more than this for your children. It can teach you to read better, understand English or Mathematics easier, learn spelling, even teach you to touch type or read music. And much, much more.

Very quickly, your children will learn how a computer works. What makes it go. You'll find that they're even writing their own programs after a few weeks. And the more they learn, the more they want to learn. Because they can see the results of their learning immediately, it's enjoyable, so they want to learn more and more!

*Read what a leading US magazine says:

"If a youngster graduates from school with no particular skills and applies for a job with Pacific (the local utility and telephone company) and if on the application he can claim 10 hours experience on a computer terminal and that's not much — it qualifies for preferential positioning on the hiring scale."

"Minimal programming skills, nothing fancy, translates into $1000 per year more in starting salary for a youngster going into almost any job."



Extract from PERSONAL COMPUTING September 1981

This is a list of private companies and Government departments who have chosen the System 80 computer above other brands.

Australia Post
Sydney University
Blue Metal Industries
A.I.S. Port Kembla
Lysaghts
RAAF Base Williamtown
Department of Navy
Department of Home Affairs
Philips Comsumer Products
University of Adelaide
Department of Health
Macquarie University
Philips Consumer Products — Clayton
NSW Police Department

EXCLUSIVE 14 DAY TRIAL OFFER

If you've been thinking about a home computer for your family, but haven't quite been able to make up your mind, here's an offer you shouldn't miss out on, for your family's sake.

Buy a Dick Smith System 80 and use it in your own home for up to 14 days. If you're not completely happy, you may return it (as long as it is in original condition and packaging) for a full refund of the purchase price — no questions asked!

You can even charge it to your Bankcard if you wish: for extended credit should you require it.

With your System 80 computer, we'll send you a free pamphlet detailing the programs currently available from Dick Smith Electronics. And remember — there are literally thousands of other programs available that will run perfectly in your System 80 computer.

DICK SMITH Electronics

MAIL ORDER CENTRE: PO Box 321, North Ryde, 2113.
Phone: (02) 888 3200

Yes! I recognise the need for investing in the future. Please rush me a System 80 computer (Cat. X-4005). I understand I can return it within 14 days for a full refund.
I include $760 ($750 plus $10 insured road freight anywhere in Australia)

Name .....

Address (not a PO Box!) .....

..... Postcode .....

Method of payment:

☐ Cheque enclosed

☐ Postal Order enclosed

☐ Please charge to my Bankcard

Bankcard No. .....

Expiry Date .....

Signature .....

DSE/A061/LM

Column 80

by JAMIESON ROWE
Technical Director,
Dick Smith Electronics

About the "software programmable" keys on the System-80 Mark II Business Computer

Like other computers intended for day-to-day use in business applications, the System-80 Business Computer provides some special "software programmable" keys on its keyboard. These keys seem to puzzle quite a few people, so here's a quick rundown on what they actually do and how they can be used.

Since the System-80 Mark II Business Computer was released a few months ago, the feature most frequently asked about – both by intending customers and by our own store staff – has been the "software programmable" function keys. The other features, like lower-case letters, numeric keypad, inbuilt communications terminal program and so on seem to have been accepted quite easily, but fairly obviously many people find the concept of these keys hard to grasp.

The funny thing is that the keys are really very simple in operation, as I'll now try to explain. In themselves, they don't do anything very special at all – in fact they do no more than any of the other keys. But when you understand what they do, and write a program to look for the codes they generate, they can be made to do almost anything you like!

Well then, to begin. First of all, as you probably know, the keyboard of computers like the System-80 is software-scanned. That is, the actual keyswitches are connected between the "row" and "column" wires of a grid or "matrix", and the computer itself is used to scan the rows and columns, to detect which key is being pressed at any time.

This is done by connecting one side of each key to one of eight "column" lines DK0-DK7, as shown in Figure 1(a), while the other side of each switch is connected to one of eight "row" lines AK0-AK7. The column lines are connected (via gated buffers) to the computer's data bus, while the row lines are connected to the eight least significant address lines. The net result of this is that the rows of switches effectively occupy certain "addresses" in the computer's "memory space".

To "scan" the keyboard, the computer simply "reads" these memory addresses in turn, under the control of a small subroutine built into the BASIC ROMs. If any key is pressed, an appropriate code will be read into the computer's accumulator register. The subroutine is then arranged to compare this code with a "lookup table", also in the ROMs, to find the corresponding ASCII code for the key concerned.

So when you use the "INPUT" or "INKEY$" statements in the computer's BASIC, this is what really goes on. The result is that when you press a key, your program ends up with the ASCII code corresponding to the key you pressed (expressed in decimal). If you press the "A" key you get 65, the "3" key produces 51, the space bar produces 32, and so on.

Now for the special keys. Notice from Figure 1(a) that not all of the row positions are occupied in the keyboard matrix of the basic System 80. In fact the AK7 line is almost empty, with only the two shift keys connected, while the AK3 line has only three of its eight available positions used for the "X", "Y" and "Z" keys.

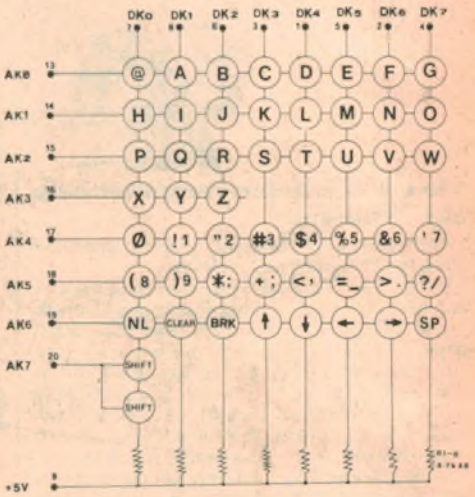
Compare this with the keyboard for the System-80 Business Computer, shown in Figure 1(b). As you can see, four more keys have been added to the AK3 line. These are those mysterious "software programmable" function keys, F1-F4. So far, they don't look all that special, do they? They just look like four additional keys . . .

Actually that's all they are! Just four more keys, over and above those required on the normal keyboard to generate all of the basic alphabetic, numeric and punctuation character codes. The only difference is that the keyboard scanning routine is arranged so that when any of these keys is pressed, the ASCII code generated is one not normally available from any of the other keys.

The codes generated when each key is pressed are shown in Table 1, in three forms: binary, hexadecimal and decimal. Also shown is the conventional ASCII character corresponding to these codes, for reference.

As you can see, the keys themselves simply produce the codes for four seldom-used punctuation symbols. So if your program pays no special significance to these codes, the keys will simply produce the corresponding symbols.

But if your program is arranged to look for these "special" codes whenever it accepts input from the keyboard, they can be made to do almost anything you like. When the program sees the "95" code produced by the F1 key it could be arranged to save a data file on disk, for example, or print it out on the printer. When it sees the "93" code produced by the F3 key, it could be arranged to abort itself and call in another program from the disk, and so on.



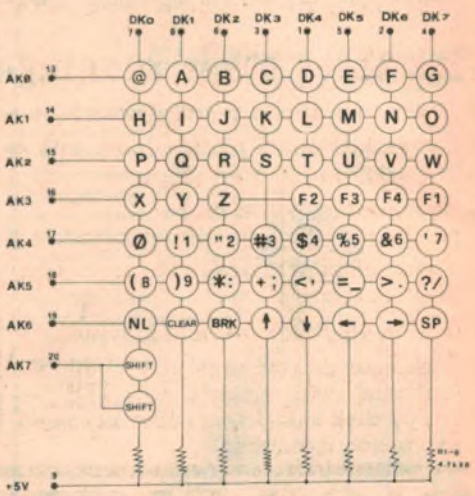


Fig. 1 (a), above, is the System-80 Mk I keyboard, while Fig. 1 (b), below, is the System-80 Mk II Business Computer keyboard.

(Continued on page 137)

THE MOST POWERFUL MICROCOMPUTER

SORCERER NOW HAS 32K RAM AT NO EXTRA COST!

Yes! With every 16K Sorcerer computer, we now include at no extra charge, an additional 16K of RAM! Here's your chance to buy the superb Sorcerer, and save money at the same time.

Plus these other winning features:

- Built-in serial and parallel ports — standard!
- 2 cassette control ports — both with motor control!
- Powerful graphics capabilities.
- Expandable to 48K on board.
- Uniquely versatile ROMPACS™ — instant change to dedicated processor, and back again!
- Built-in 4K ROM resident monitor.
- Economic disk storage now available (optional) with Exidy's new FDS — floppy disk subsystem (does not need expansion interface).

All this for only $1395
including 32K memory and standard BASIC ROMPAC™
Cat. X-3002

ROMPACS™

Give the Sorcerer its incredible versatility

One moment it's a word processor. Then it's a production controller. Or a standard computer running a program. All you do is plug in the Rompac™. The Sorcerer does the rest!

Word Processor Pac™
Not only more powerful than most other systems, it's far cheaper! It features auto text wrap-around, auto checking of drastic commands, a search function, auto commands & macro programming etc etc (X-3085). **$279**

EPROM PAC™
Designed for users who want to use the Sorcerer for a dedicated job & can program their own EPROMs to do it. Up to 16K of ROM available. (X-3095) **$75.00**

Development Pac™
A powerful dedicated development tool: contains a debug, text editor, linking loader, assembler & I/O routines. Complete with 90p manual. (X-3090) **$139.50**

Standard BASIC
(Supplied with Sorcerer computer in basic price - not available as a separate item).

UTILITY SOFTWARE ON CASSETTE

Z-80 DISASSEMBLER $17.95
This program 'disassembles' Z-80 machine language programs i.e. it translates them back into easier to follow assembly language. It is a BASIC program, but may be used to examine any machine language program in the Sorcerer's memory. X-3622

DEBUG $17.95
Designed to make it much easier to troubleshoot Sorcerer machine language programs. Lets you run programs one instruction at a time, examine contents of processor registers & insert breakpoints into the program wherever needed. X-3624

DUMB TERMINAL $9.95
Allows your Sorcerer to act as a 'dumb' communications terminal for communication with a larger computer or with other terminals via the RS-232C serial port. Allows both duplex & half duplex operation. X-3637

DISK UTILITIES FOR FDS & MICROPOLIS

EXIDY CP/M with EXBASIC $445
Supported by Exidy CP/M, EX-BASIC is an extended disk version of Microsoft™ BASIC-80. Complete with comprehensive documentation. X-3710

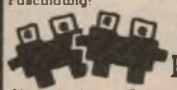
DSKCITOH/PPRINT (Hard Sector). $99
Disk driver & proportional printing driver for the Sorcerer Word Processor. Check these features: ability to save & load word processor files on disk, perform proportional spaced printing. (Needs CP/M). X-3725

MICROSOFT EXT DISK BASIC FOR FDS. $350
The most extensive version of BASIC available for Z-80 based computers. Features full line editing, all normal disk facilities & commands, & much, more! X-3712

SORCERER GAMES SOFTWARE ON CASSETTE

Tank Trap


A enemy tank is on the rampage. Your job is to build a wall around it - without getting run over. Fascinating! X-3628 **$14.95**

Martian Invaders


Very similar to 'Space Invaders'. A very challenging game, requiring skill & a fast mind. X-3625 **$17.95**

* Voodoo Castle HALF PRICE!
An action packed adventure in the Voodoo castle. Hours of fun! But beware of the Voodoo Man. X-3636 **$8.25**

* Wilderness $12.50
Here you trudge through the uncharted wilderness fighting foul monsters of many types. Great fun! X-3639

*The Count $12.50
One of the most challenging games ever written! You awaken in a bed in Transylvania. You don't know why you're there but you'd better solve the puzzle before it's to late! X-3638

Magic Maze $14.95
Ten levels of play. You wander through a maze trying to stay on the right path and avoid pitfalls. Fantastic! X-3620

* LIMITED STOCKS

DICK SMITH Electronics

Mail Order Centre: PO Box 321, North Ryde 2113. Phone (02) 888 3200

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	818 George St	BROADWAY	211 3777
	531 Pittwater Rd	BROOKVALE	93 0441
	147 Hume Hwy	CHULLORA	642 8922
	162 Pacific Hwy	GORE HILL	439 5311
	396 Lane Cove Rd	NORTH RYDE	888 3200
	30 Grose St	PARRAMATTA	683 1133
	125 York St	SYDNEY	290 3377
	173 Maitland Rd	TIGHES HILL	61 1896
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	414 William St	PERTH	328 6944

DSE/A080/LM

Glass fibres transmit coded laser pulses

Australia's first optical fibre network

As this issue goes to press, work is proceeding on the most ambitious distributed computing network ever constructed in Australia. A CDC Cyber mainframe computer and hundreds of smaller computers and terminals will be linked into a single network, joined by optical fibres capable of data transmission speeds of up to 1000 million bits per second.

The Computing Centre of the University of Sydney is in the process of installing an optical fibre system which will eventually link all the University's computers and terminals into one network. The system is the first large scale optical fibre network in Australia, and is one of the most sophisticated such networks in the world – a unique combination of recent advances in electronic technology.

In the first stage of the installation, optical fibre links capable of carrying around 1000 million bits of information a second have been installed between the University Computing Centre and the Faculty of Engineering. The 10mm diameter cable contains two duplicate bi-directional links, each capable of carrying information equivalent to 200 separate television signals.

When completed the network will have a total length of about three kilometres. The first stage involved the laying of 700 metres of cable. A team of four designers and technicians from the University Computing Centre constructed the optical transmitters and receivers for the network, using infrared diodes and LSI communications protocol controller chips. At present, the completed section of the network is being tested, running at a conservative one million bits a second (1 megabaud, in contrast to the 19.2 kilobaud transmission speed available using copper cables and modems).

Computing Centre Manager Mr Brian Rowswell demonstrates that laser light shining into one end of the fibre optic cable is clearly visible at the other end.

Users of small computers anywhere on the University campus will eventually be able to access larger computers where necessary via the network. In addition to the convenience of this approach, huge savings will result from the avoidance of duplication of equipment. Any computer or peripheral device linked to the network will be available from any other terminal on the campus.

Another advantage is that the University's 200 plus video and printing terminals will be operated at much higher transmission speeds, avoiding the lag in response time which is now sometimes evident when many of the terminals are being used simultaneously.

The main computing power of the network will be provided by the University's CDC Cyber 177-30 mainframe computer. At present, users of the Cyber must travel to the Computing Centre to pick up print-outs of the results of calculations made by the computer. When the network comes into full operation, inexpensive printers can be placed in individual buildings, making print-outs available directly to the workplace.

When the link to the Department of Computer Science is completed by a cable laid in a duct under a main road that traverses the University campus, the network will provide a path to CSIRONET, the Australia-wide computer network of the CSIRO, and through OTC satellites to overseas networks, allowing large international data-bases to be accessed directly.

Besides a much higher bandwidth, or information carrying capacity, one of the advantages of optical fibre is that it can carry a digital signal, unlike telephone wires which carry analog signals. With the previously installed telephone links, modems at each end of every cable converted between digital and analog signals, introducing a time delay and a potential source of errors.

Apart from its technical advantages, the network will save the University hundreds of thousands of dollars in rental costs of signal processing equipment.

PARIS RADIO ELECTRONICS

HARDWARE DESCRIPTION

S/09 6809 Computer w/128K Memory
/09 6809 Computer w/56K Memory
6540 Printer 132 characters
8212 12" Terminal w/monitor
DMF 2 Disk System w/2.5m Capacity
CDS-1 Winchester Hard Disk System
MP-09A 6809 Process/Board (assem)
D5-2 double side/double density 720KB
3809 128K Memory Expansion for S/09
MP-LA Parallel Interface
MP-L2 Dual Parallel Interface
MP-N Calculator Interface
MP-R Eprom Programmer
MP-S Serial Interface
MP-64 Memory board 64K
MP-S2 Dual Serial Interface
MP-SX Serial Interface Expansion
MP-T Interrupt Timer
S-32 Universal Static Memory Card
MB 68XX 6809 Mother Board

SOFTWARE TSC

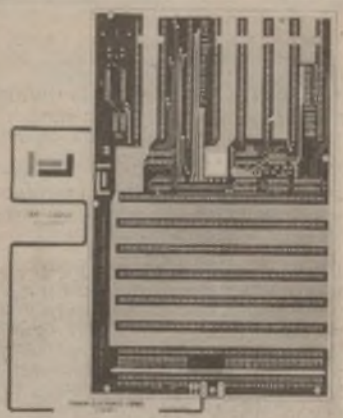
ASM09 Optimizing Assembler (5" or 8")
Flex 09 ver 2.8.1w/manual
Inventory Program
Mail List Program.
Word Processing Editor & Text Processor
Word Processing Editor
Text Processor
SP-09-2 Text Editing System
SP-09-3 Mnemonic Assembler
SP-09-4 Basic
SP-09-5 Debug Package
SP-09-6 Extended Basic
SP-09-7 Standard Precompiler
SP-09-8 Extended Precompiler
UniFLEX Multi-tasking BASIC
SP-09-10 Sort/merge
SP-09-11 Utilities
Uniflex Operating System
Uniflex Basic
Uniflex Pascal
Pascal for Flex 09

Microware Systems Corporation
OS9 Level I Operating System
OS9 Level II Operating System
Basic 09
Stylograph Word Processor
OS9 Macro Text Editor
OS9 Interactive Assembler
OS9 Interactive Debugger

D-5 Two double sided, double density, 5" disk drives with a total on line capacity of 720,000 bytes of data. Includes cabinet, power supply, connecting cable and controller. Controller will operate up to four drives. This is an ideal disk system for small stand alone word processing systems, or for businesses that do not work with large inventories.

DMF-2 Double sided, double density, dual eight-inch disk system with an on line capacity of 2,400,000 bytes. Our "top of the line" disk system features a DMA type controller for fastest possible data transfers. This drive was designed for larger businesses and multi user installations. The DMF-2 will provide the fast operation necessary for systems running multiterminals under the UniFLEX operating system. Complete with a heavy duty 1/8 inch metal cabinet, power supply, connecting cable and controller. The controller will operate up to four drives.

MB-68XX MOTHER BOARD
The MB-68XX Mother Board is an extremely versatile and universal mother board for SWTPC and similar SS-50 based systems. It provides 8 slots for full sized (SS-50) boards and 8 slots for I/O sized (SS-30) boards. Its main features are:
1. Switch selectable 6800/6809 I/O addressing.
2. Switch selectable 4/16 addresses per I/O slot.
3. Baud rate generator for SS-50C and S/09 compatability.
4. Schmitt trigger buffers on all data, address & control lines to I/O bus.
5. Physical size & mounting replaces existing SWTCP 6800/09 mother boards.
6. Extra thick 3/32" Epoxy board.
7. High quality double sided plated through holes.



Talbot Microsystems
t Forth, t Forth +, Firmforth

Computer Systems Centre
Dynamite Disassembler
6800/6809

Universal Data Research Inc
Data Base Manager for Flex
for Uniflex
Payroll, General Ledger
Manufacturers Inventory
Accounts Receivable, Accounts Payable.

Washington Computer Services
Record Management System
Data Base Management

GIMIX INC.
HARDWARE

32K Static Ram Board
16K Static Ram Board
Expandable to 32K
6809 Plus CPU Card
5/8 Single Density Controller Board
5" Double Density Controller Board
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BRING MAINFRAME POWER INTO YOUR HOME OR OFFICE

WE ARE PROUD TO ANNOUNCE THE LAUNCHING OF AUSTRALIA'S FIRST MICROCOMPUTER INFORMATION UTILITY

The AUSTRALIAN SOURCE is Australia's first microcomputer information utility, aimed at giving the average microcomputer user access to the computer data banks and also massive storage space previously only available to large Mainframe installations. The era of home computers has now officially begun in Australia, now that the AUSTRALIAN SOURCE is here; as now, any small businessman or student can have on his desk for an extremely small cost, a system that has the level of storage power and access to data banks for which only a few years ago, government departments and large private users were paying millions of dollars.

The AUSTRALIAN SOURCE can be accessed through a number of 'approved' personal computers, and terminals, by use of an accoustic coupler or modem.

Users will receive a number of benefits which will include:

INFORMATION SERVICES

Members will have access to a number of information sources which will include the latest news, sports results, financial reports, and farm information.

NATIONWIDE ELECTRONIC MAIL

Members will be able, also, to communicate nationwide with other AUSTRALIAN SOURCE members through our electronic mail system.

THE AUSTRALIAN SOURCE RECOMMENDS 3M DISKETTES

SOFTWARE BANK

Users will have access to a myriad of computer programs that will include entertainment, educational aids, programming and diagnostic tools, and financial applications.

MAINFRAME POWER

Users will have the capability to make use of the Mainframe's huge storage capacity by using any of our large programs, or storing your large programs on our system.

SHOP AT HOME

You can take advantage of our 'shopping by computer' system to get the best prices on a number of popular consumer items.

EXTREMELY EASY TO USE

You do not have to be a computer programmer to make use of the AUSTRALIAN SOURCE. All of the instructions are in everyday English, so that even the younger members of your family will be able to operate the system.

LOW COST

While services like these used to cost tens of thousands of dollars to the government departments and large corporations who used them, they are now available to you for less than the cost of a packet of cigarettes a day for the 'average' user.

You can join the AUSTRALIAN SOURCE by paying a one–time joining fee (normally $100) and a small hourly user charge (normally $10 an hour 8 a.m. – 6 p.m. and $4.50 an hour 6 p.m. – 8 a.m.).

SPECIAL CHARTER MEMBER OFFER

Joining before 1st February, 1982, qualifies for CHARTER MEMBER status; substantial discount off the normal $100 joining fee; and a lifetime percentage discount off the normal hourly user charge.

TO FIND OUT MORE ABOUT THESE EXCITING SERVICES OF THE AUSTRALIAN SOURCE AND HOW WE CAN TURN YOUR OWN MICROCOMPUTER INTO A MAIN–FRAME, PLEASE COMPLETE THE COUPON, BELOW:

INFORMATION REQUEST

Please send me your free information package on the services available from the AUSTRALIAN SOURCE and how I can join.

☐ I have a computer

brand..... model.....

☐ please send me information on low cost equipment packages I can use to take advantage of the AUSTRALIAN SOURCE'S SERVICES.

NAME.....

ADDRESS.....

CITY.....

STATE..... POSTCODE.....

PHONE.....

Mail to:
THE AUSTRALIAN SOURCE
(A Division of Tergo Quen Pty., Ltd.)
364 Latrobe St.
Melbourne, Victoria 3000
(03) 329–7998

Previously, smaller computers and terminals throughout the University were linked to the Cyber by telephone cables and modems rented from Telecom. Modems must be connected to each end of the telephone cable, and each of the University's terminals required a separate cable.

In addition, Telecom's modems are designed to carry a strong, unbroken signal over long distances – from Sydney to Perth if necessary. With transmission distances of a only a few kilometres, the University was paying for more powerful equipment than it really needed.

In the optical fibre network the modems are replaced by "node computers" at either end of the line. A node computer, typically an LSI II minicomputer with specialised interfaces, can receive information from dozens of different terminals and send them down a single cable to a second node computer at the other end. The receiving computer separates the signals from each terminal and forwards them to their destinations.

The node computer accumulates characters typed into a terminal until the line is complete then sends the information down the high speed trunk-line as a single "packet" of information in digital form. Each packet contains the addresses of its source and destination and a cyclic redundancy check (CRC) code which insures the integrity of the data. The packet is passed from one node to another until it reaches its destination and, as a safeguard, the node computer will request a retransmission of the packet if the CRC code indicates that an error has occurred.

Welcome though these advantages are, even more dramatic changes are in store in the future – changes which will affect the very nature of computing in the University. Mr Brian Rowswell, Manager of the University Computing Centre, says "This is probably the most interesting aspect of the network, and the hardest to predict".

Cable laying required special equipment

Technical Officer Mark Phillips checks a board which interfaces a node computer to terminals. All interfaces for the network were built at the University.

In recent years the emphasis of large scale computer design has turned to distributed processing – two or more processors operating in parallel and sharing the work load. One of the major drawbacks of this approach is the degradation of processing speed caused by excessive delays as one processor communicates with another. Overhead times incurred by communications protocols and management of remote resources can reach a point where adding more processors to the system actually results in a decrease in the amount of work done by the system in a given time.

Very high speed data paths are one way around this problem, but up to now such data paths have been available over short distances only. The optical fibre network will provide an extremely high speed data path which will span the whole University campus.

The result is that ideas of distributed processing now seen only in the design of a single computer can now be applied to the network as a whole. Every computer in the University will eventually become part of a single distributed processing facility, a giant computer spread through many buildings, with specialised peripherals available for particular tasks and main-frame computer power available to every user.

Brian Rowlands gives an example: "a laboratory computer which is monitoring the results of an experiment in X-ray diffractometry could request a large host computer to analyse a set of data and then, depending on the results, take a different set of measurements, perhaps using a different scan to get measurements of greater accuracy. That same small computer could then request a processor controlling disc storage to update a result file."

The duplication of the optical path within each cable means that even if one path fails completely, the node computers at either end will still be in complete communication with one another. If a node computer fails, only the devices connected to that node will be affected. Critical devices such as the Cyber are connected to two nodes.

All of the major components of the optical fibre network are sourced locally. Research and development of the optical fibres used in the system was carried out at the North Ryde, NSW, Research Laboratories of Amalgamated Wireless (Australasia) Ltd. Olex Cables Ltd of Victoria assembled the optical fibres into a shielded, waterproof cable containing strengthening strands to protect the fibres from strains imposed by the laying process.

Telecom Australia laid the cable for the University, using special equipment built at the University's engineering workshops. Experience gained by Telecom in this installation will contribute to further applications of optical fibres in Australian telecommunications.

Radius of curvature of the cables must be no less than 100mm, to prevent possible fracturing of the optical cladding, and no more than 100kg strains must be imposed by the laying process. Tests of the completed sections of the network by AWA show that the transmission characteristics of the fibre have been unaffected by the laying procedure – answering an important question for future applications.

Other organisations with computers and terminals scattered through many buildings will be watching the progress of the University work with great interest. As pioneers of the high speed optical fibre computing network, Sydney University is likely to become a showplace for those wishing to improve the utilisation of their currently installed computers.

Microcomputer News & Products

New computer designed in Australia for school use

A new microcomputer, designed in Australia specifically for school use, was released recently in Melbourne by Professional Australian Systems Pty Ltd. Shown above with the Dyad "Dragon" computer are the company's Managing Director, Mr Neil McKellar (left) and Mr Bill Penrose, Technical Director.

At the launch of the new machine, Mr Penrose said that the Dragon had been designed to compete by price and quality against the best the overseas manufacturers can produce.

Designed and developed as a modular system, the computer is said to meet the requirements of any school for both computer education classes and school administration. The modular design allows a school to purchase a basic system which may be expanded as the curriculum develops.

The basic system will retail for under $2500 and includes a central processing unit, a card reader, card hopper feed, 16K of RAM, video display, keyboard and cassette interface. It is based on the 6802 microprocessor running at a clock speed of 2MHz.

An expanded system includes 48K of RAM and 630K of disk storage on two quad density Micropolis disk drives. Printers and other peripherals can be interfaced through two in-built RS 232 serial ports.

As described to us, the Dragon has some interesting features. The card reader can handle up to 60 cards a minute, either fed by hand or automatically by the card hopper. Basic, Pascal and test data cards can be read.

Remote programming on university type cards, batch processing and automatic abort of program errors are some of the features offered by the card reader.

The video display is controlled by software in ROM which allows the size of the display to be varied to suit the television used (both 16 x 64 and 24 x 80 display formats are available for example). Medium resolution graphics are available in eight colours, and flashing characters and reverse video are also featured.

Upper and lower case ASCII characters and 32 special characters can be displayed.

Formats for the 300 baud cassette interface are also under software control and can be either Kansas City standard or Apple II or TRS-80 compatible.

Extensive software is available for the Dragon in addition to the 14K Dyad Basic in on-board ROM. Disk-based systems use the FLEX operating system – the industry standard for 6800 and 6809 systems. Pascal, FORTH and Lisp can be used with the system, as well as alternative versions of Basic.

Software conversion packages for Apple and Tandy programs can also be supplied, although we don't have details. The Dragon's Computer Assisted Instruction (CAI) library includes programs for teaching maths and algebra, and word processing and accounting packages are available off the shelf for school administration use.

Because the Dragon is designed and manufactured in Australia all purchasers will be able to communicate directly with the manufacturers. Software support is also offered by PAS. All Dyad equipment carries a 12 months warranty on parts, labour and return freight if service is necessary.

The Dyad Dragon is distributed by Zephyr Products, 70 Batesford Road, Chadstone, Vic 3148.

Australian Source computer network service

A new company, Australian Source Pty Ltd, has announced the launching of the "Australian Source" – Australia's first dial-up computer information service. With "Australian Source" microcomputer users have access to computer data banks and storage space previously only available to large mainframe installations.

"The launching of the Australian Source microcomputer network in Australia is probably the most singularly important event yet to take place in the microcomputer industry in this country," according to a spokesman for Australian Source Pty Ltd. "For the first time the world of huge data banks and massive computer power previously only available to large corporations and government departments can now be put into any office or home."

A number of "approved" computer systems, including the Apple II, System-80, TRS-80 and Atari machines can be connected to Australian Source. Users will have access to information services including news, sport and financial reports, and will be able to communicate with any other user of the network through their computer.

Micronews Continued ►

CAN YOU AFFORD NOT TO SUBSCRIBE TO MICRO-80?

MICRO-80 is a monthly magazine dedicated to users of SYSTEM 80 and TRS-80 microcomputers. Owned and produced entirely in Australia, each issue of MICRO-80 contains at least six programs, articles, useful hints and answers to readers' problems; all designed to help YOU get the most out of your SYSTEM 80 or TRS-80. Since MICRO-80's first issue in December 1979, we have published over 80 major pieces of software and 10 hardware projects. Most of the programs and articles are written by our readers to whom we pay publication fees thus enabling them to make their hobby pay. MICRO-80 readers can save money by buying Tandy products at 10% discount from an authorised dealer – for details see any issue of MICRO-80. Our sister business, MICRO-80 PRODUCTS, sells Australian designed and produced software and high quality, imported goods at low, sensible prices. We repeat, if you own a SYSTEM 80 or TRS-80,

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If you do not have enough time at the keyboard to type in the program listings which are published in MICRO-80 each month, then you need a cassette subscription. As well as MICRO-80 magazine, you receive a cassette each month containing all the programs listed in the magazine.

SPECIAL OFFER TO ALL NEW SUBSCRIBERS TO MICRO-80

A FREE cassette containing 6 programs (3 Level I + 3 Level II), together with complete documentation, will be sent to every new subscriber to MICRO-80.

Suspicious of mail order? Then send $2.50 for a single copy of MICRO-80 and see for yourself that this is the magazine for you!

Daisy Wheel Typewriter/Printer

MICRO-80 has converted the new OLIVETTI ET-121 DAISY WHEEL typewriter to work with the TRS-80 and SYSTEM 80 or any other microcomputer with a Centronics parallel port (RS 232 serial interface available shortly). The ET-121 typewriter is renowned for its high quality, fast speed (17 c.p.s.), quietness and reliability. MICRO-80 is renowned for its knowledge of the TRS-80/SYSTEM 80 and its sensible pricing policy. Together, we have produced a dual-purpose machine:- an attractive, modern, correcting typewriter which doubles as a correspondence quality Daisy-wheel printer when used with your micro-computer.

How good is it? - This part of our advertisement was typeset using an ET-121 driven by a TRS-80. Write and ask for full details.

ONLY $1995 INC. S.T.

MPI DISK DRIVES

MPI is the second biggest manufacturer of mini floppy disk drives in the world. They produce a family of high quality 5¼" drives with super-fast track-to-track access times (5ms!)

40 TRACK SINGLE HEAD $339
40 TRACK DUAL HEAD $449
80 TRACK SINGLE HEAD $499
80 TRACK DUAL HEAD $599

Dual head drives use both sides of the disk and occupy two drive positions – it is like having two drives for little more than the price of one!

Prices quoted are for bare drives. Add $10 per drive for a cabinet and $30 per drive for a power supply.

DISKETTES FOR TRS-80

NASHUA 40 track single side . . . .$4.50 ea
VERBATIM 40 track double side. .$5.90 ea
VERBATIM 77 track single side . .$5.90 ea

THE FABULOUS
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ND-80 . . . . . $149

The disk operating system that gives:

- New basic commands that support variable record lengths up to 4095 bytes long.
- Mix or match disk drives – supports any number of tracks from 18 to 80. Use 35, 40 or 77 track 5" mini disk drives or 8" disk drives, or any combination.
- A security boot-up for basic or machine code programs. User never sees "Dos-ready" or "Ready" and cannot "break" clear screen or issue any direct basic statement including "List" . . .
  . . . and much, much more

77 TRACK DISK DRIVES
DOUBLE YOUR CAPACITY

DD-7S $775

Micropolis Floppy Disk, 77 Track, 100% larger capacity than most mini-floppy drives, complete with cable, power supply, chassis, and includes NEWDOS '80

SYSPAND 80 FOR THE SYSTEM 80 $119.00

SYSPAND 80 is a self-contained module which connects to the expansion port on your SYSTEM 80 and gives you a CENTRONICS parallel port to drive a printer PLUS the TRS-80 40 line bus. SYSPAND 80 allows you to connect all Tandy peripheral, including the expansion interface, disk drives, MICROTEK MT-32 memory expansion unit and the fabulous EXATRON STRINGY FLOPPY

TRS-80 MEMORY EXPANSION UNIT
MT-32 ... $149.00

The MT-32 is manufactured by MICROTEK Inc., USA. It provides a CENTRONICS printer port and sockets for up to 32K of dynamic RAM. It comes complete, ready to plug into the expansion port of your Level II 16K machine. (Will also work with your SYSTEM 80 via SYSPAND 80)

MT-32A without RAM $149.00
MT-32B with 16K RAM $204.00
MT-32C with 32K RAM $249.00

16K MEMORY EXPANSION KIT
ONLY $30 incl. p&p

These are prime, branded, 200 ns (yes, 200 ns!) chips. You will pay much more elsewhere for slow, 350 ns chps. Ours are guaranteed for 12 months. A pair of DIP shunts is also required to upgrade the CPU memory – these cost an additional $4.00. All kits come complete with full, step-by-step instructions, no soldering is required. You don't have to be an electronic type to instal them.

DISK DRIVE HEAD CLEANING DISKETTES
$29.00 plus $1.20 p &p

Disk drives are expensive and so are diskettes. As with any magnetic recording device, a disk drive works better and lasts longer if the head is cleaned regularly. In the past, the problem has been, how do you clean the head without pulling the mechanism apart and running the risk of damaging delicate parts. 3M's have come to our rescue with SCOTCH BRAND, non-abrasive, head cleaning diskettes which thoroughly clean the head in seconds. The cleaning action is less abrasive than an ordinary diskette and no residue is left behind.

AUSTRALIAN SOFTWARE

We have a wide range of Australian software available. Send for a free catalogue

To: MICRO-80
P.O. Box 213, Goodwood, S.A. 5034

Please rush me the items checked below:

- ☐ 12 month subscription to MICRO-80 and my free software cassette $24.00
- ☐ 12 month subscription to MICRO-80 and the cassette edition, plus my free software cassette $60.00
- ☐ The lastest issue of MICRO-80 $2.50

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TRS 80 and SYSTEM 80 OWNERS

TRS 80 and SYSTEM 80 OWNERS

The most important feature of a small computer...

...is where you buy it.

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Filling this vital role was the concept behind ComputerLand. Our purpose is to provide you with ready access to the entire world of microcomputing. Today we represent over 50 different manufacturers and suppliers. But no matter what brand or type of equipment you purchase or lease from ComputerLand, you get an extra feature no one else can offer — the resources of the world's largest network of computer stores.

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Choice. ComputerLand has the widest selection of small computer products you'll find anywhere. And every product we offer has been evaluated and approved by our expert product selection committee.

We have no ties to any single manufacturer, so we don't have to try to sell you any single brand. We can combine computers, accessories, and programs from several different sources to meet your specific needs. You don't have to adapt your needs to fit our system. At ComputerLand, you have complete freedom of choice. Because we do. And as your computer needs expand, we have the add-ons and programs that can make your computer expand as well.

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We give your equipment a complete checkout before it leaves the store. We can do most repairs in-store so you don't have to wait while your equipment makes a round trip to the manufacturer. And if the equipment is needed for business, we can provide priority service. So come to ComputerLand and let us introduce you to small computing. We want to be your computer store.

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Perth	—	5 MILL STREET (ACROSS FROM THE HILTON) PHONE 321-4671
Sydney: Bondi Junct.	—	119 OXFORD STREET PHONE 389-4466
Burwood	—	31 BURWOOD ROAD
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Microcomputer News & Products

from p128

Programs including games, educational aids and diagnostic tools will also be available to users as well as the central computer's huge storage capacity.

Hardware required consists of an approved computer and an acoustic coupler (modem). The user will be charged a one-time joining fee and an hourly charge. According to Australian Source Pty Ltd charges for the average user should work out at less than $1 a day, and in return the user will in effect have a mainframe computer on his desk.

For further information contact Australian Source Pty Ltd, 364, Latrobe St, Melbourne, Vic, 3000.

Computer science course admissions limited

As reported in Pacific Computer Weekly for September 11, student quotas in computer science courses at tertiary institutions are to be greatly reduced for 1982.

The NSW Institute of Technology will be accepting only 100 full-time students, as against 180 this year and 48 part-time students, compared to 120 this year. Other institutions said to be examining cuts in student intake include Melbourne, Monash and Sydney Universities.

Reasons for the reduction in student intake are many. Increased numbers of students at NSWIT in 1981 meant that student/staff ratios in computing science were twice those of other courses. Large numbers meant that it was very difficult for students to gain "hands-on" experience with the limited amount of hardware available.

Even if more funds were available for computers and terminals, shortage of teaching staff would remain a problem. Industry demands for computing science graduates and the small numbers graduating each year result in all available graduates taking positions in industry.

Versatile development system from Philips

Philips' PM4421 microcomputer development system was shown for the first time in Australia at IREEECON '81. It is a powerful tool for increasing efficiency in the design of microprocessor based systems, and can provide significant savings in time and cost throughout the development of a new product.

PM4421 provides the software designer with development aids such as a text editor, assemblers and high level languages. Design of hardware is eased by the provision of facilities for real-time in circuit emulation, program tracing and signal state analysis. When the time comes to put the software and hardware together the development system can test the completed device under actual operating conditions before final production decisions are made.

Software for the PM4421 includes Philips' "Instrumental Basic", which allows the computer to be used for control of monitoring and measuring instruments. Programs written in Basic can be used to operate various instruments and peripherals with optional IEC instrument bus or V24 interfaces. Instrumental Basic is an enhanced version of ANSI Basic that also simplifies programming and contains a wide range of error messages for easy program debugging.

Pascal is also available for use with the development system. Philips believe that Pascal's combination of control structures, powerful data typing and ease of use make it ideal for microcomputer development applications.

Philips enhanced Pascal complies with international ISO recommendations and offers users of the development system the advantages of clarity and portability of programs between different systems. Pascal compilers are available for several popular microprocessors including the 8080, 8085, Z80 and 6809, and programs written in Pascal can be run on any of the processors simply by loading the appropriate compiler from disk.

Using the development system's linking facility, programs written in assembly language can be added to Pascal programs.

For further information on the PM4421 microcomputer development system contact Philips Scientific & Industrial Equipment, 25-27 Paul Street, North Ryde, NSW, 2113.

TRS-80 Whisperdisc

CISA Microcomputing has announced that they have been appointed agents for the Olympia range of electronic Whisperdisc computer terminal/typewriters. The Olympia Whisperdisc can act as either a stand-alone daisy wheel typewriter or a printing computer terminal with a printing speed of more than 200 words per minute.

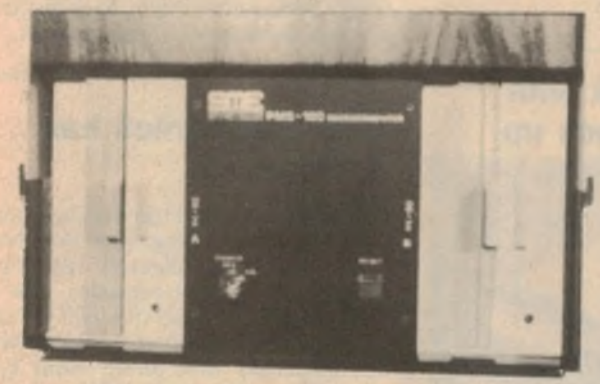
CISA is introducing the Whisperdisc with a $2200 price tag – inexpensive in comparison with other daisy wheel

Micronews Continued ►

S100-Z80 MICROCOMPUTERS

PMS100

Introducing the PMS100 by SME Systems, an all new package microcomputer based on a Z80 CPU. This system will suit all users ranging from computer technicians, programmers and small to medium company accounting requirements.



Technical specifications are as follows.

4 Mhz Z80 CPU, 64K Dynamic memory with bank select to allow up to 8 pages of 64K each, and up to 256K of RAM on a single board, RS232 serial port and 8 bit parallel ports. Up to 16K EPROM which can be switched out after power up to allow a full 64K of user RAM per bank. Dual QUME 8" d/sided drives running at single or double density. Density selection is automatically chosen by the use of double or single density formatted disks. External Mini drives can also be interfaced to the controller. The DOS supplied is compatible with standard CP/M and CDOS to allow a wide selection of software to be used, such as MBASIC, CBASIC, COBOL, ALGOL, PASCAL, FORTRAN, ASSEMBLY LANGUAGE, WORD PROCESSING, MULTI-USER, MULTITASKING, AND ACCOUNTING PACKAGES. All of which can be supplied from SME Systems.

The PMS100 is AUSTRALIAN designed and built and can be supplied as a basic system or as a complete turnkey system including terminal, printer and software.

DATASOUTH DS180

The Datasouth Printer is a 180 cps dot matrix printer with a long list of features — bi-directional/logic seeking, 1000 character buffer, 9 x 7 dot matrix, expanded characters, 1 to 6 paper copies, 96 ASCII char. set, 132 column print width, tractor feed (adjustable), top of form, 6/8 LPI, parallel & serial interface, perforations skip-over, self test, floor mount stand & paper holder.

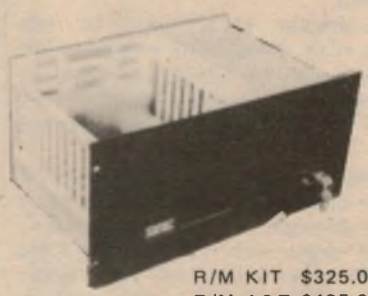
$2995.00

TELEVIDEO TVI-950

The Televideo TVI 950 terminal is a smart 80 x 25 display with detached keyboard and a host of features — advanced editing with wraparound, smooth scrolling, 15 baud rates, printer port (RS232), protected fields, underlining, split screen, programmable function keys, 15 special graphic characters, non-glare & tiltable screen.

$1595.00

S100 CARD CARE



R/M KIT $325.00
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B/M KIT $365.00
B/M A&T $465.00

Available in rack mount or bench mount. Built in power supply 8v @ 15 amps + & — 16v @ 2 amps, key switch, reset switch, fan cooled power supply, 11 slot mother board, supplied with 5—S100 edge connectors, all power supply rails are fuse protected. Also available in 6800 format.

CARTRIDGE DRIVE 5 + 5 MBYTE

This is the way to bring mainframe storage to the micro's. It allows hard disk advantages with built in back up. We have software & hardware to interface to S100, Apple & Tandy systems. Easy to install & operate, removable media, built in 512 byte buffer, high speed LSI controller, can daisy chain up to 4 drives.

$6250.00

DUAL 8" DRIVE

A new product from SME is a dual drive package available in a bench mount or rack mount style. It uses dual 8" double sided, double density compatible drives, in a low profile cabinet. Built in power supply, line filter & cooling fan. Drive interface is via a 50 way centronic type connector. This unit is supplied assembled & tested.

RACK MOUNT $1800.00
BENCH MOUNT $1750.00

SBC-100

Z80 single board computer, 4MHz, 16K EPROM, 1K RAM, 16K EPROM, 1 serial port, 1 input & 1 output parallel port, power on jump, 2K monitor, 2716, 4 channel counter/timer, software controlled baud rate generator, modem look alike, vectored interrupt.

KIT $395.00 A&T $465.00

DRC-II

Bank select, 200 nS chips standard up to 4MHz speed will accept 64K rams to give 256K per board, switch selectable boundaries, invisible refresh, phantom output disable, standard S100 plated thru holes, solder resist, components overlay.

KIT $650.00 A&T $750.00

FDC-II

Operates with single & double den, single & double sided drives & 8" or 5" drives in any combination of 4 drives simultaneously, phase lock loop data recovery, with SDOS operating system you can run all CP/M and CDOS programmes.

KIT $395.00 A&T $465.00

SPC-29

Dual serial ports with RS232 & TTY outputs, nine programmable parallel ports, wire wrap cross link area for parallel I/O, switch selected, plated thru holes, solder resist.

KIT $205.00 A&T $245.00

2708 Eprom card K $85, A&T $98; Extender card K $35, A&T $48; Extender/Terminator K $85, A&T $105; Wire wrap card $38.50; FDC-1 Disk controller K $295, A&T $345; Eprom programmer K $255 A&T $295; 8024 M. M. Video card K $315 A&T $385.

SME SYSTEMS

Melbourne: Ph (03) 874 3666.
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PO Box 19 Doncaster East, 3109.
Telex: AA37213.

DEALER: Adelaide — 267 5277

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Microcomputer News & Products

printers. The price includes a selection of type fonts and all the cables and software required to connect the printer to a TRS-80 disc-based computer system.

As with all CISA microcomputer peripherals the Whisperdisc carries a full 90-day parts and labour warranty.

For further information contact CISA Microcomputing Pty Ltd, 159 Kent St, Sydney, NSW, 2000.

EPROM programmer from QT Computer

Qt Computer Systems (Australia) has released a universal EPROM copier/programmer called the QT Uniprog. Designed specifically for the amusement machine industry, the programmer is portable and specially adapted for "on-site" conversions and adaptations of pre-programmed equipment.

No computer is required to use Uniprog in its stand-alone copier mode although it can be easily interfaced to any computer through two parallel ports for use in a software development system.

Uniprog is small enough to carry in a briefcase or tool-box and can be used to program all popular types of EPROMs – the 2708, single and triple supply 2716's and 2532 types made by Intel, texas Instruments and Motorola. The type of EPROM to be programmed is selected by a plug-in "personality module".

Using the Uniprog it is possible to copy to and from different types of EPROMs and to combine two different types. For example, it is possible to combine the contents of two 2K 2516 EPROMs into one 4K 2532, depending on the personality module used. Provision is made for checking that an EPROM is fully erased before programming and for verifying the correctness of programmed data.

Software is also available to run the programmer under CP/M when it is used in a computer system.

For more information on the Uniprog portable programmer contact QT Computer Systems (Australia) Pty Ltd, 283 Clarence St, Sydney, NSW, 2000. The postal address is PO Box 26, Kensington, NSW, 2033.

10MB hard disk with in-built tape back up

INCA Data Systems Pty Ltd have announced the arrival of the Irwin 510 disk/tape drive, which combines a 14cm Winchester disk drive with integral tape cartridge backup. Features of the new drive include an average access time of 25ms and a cost of 17c per thousand bytes of storage.

Total storage capacity of the "micro-Winchester" is 12.3 megabytes unformatted and 10.02 megabytes of formatted data – almost thirty times as much as a standard minifloppy disk.

The tape cartridge backup system is fully integrated with the drive and the complete system is contained in a package no bigger than the standard minifloppy. All 10 megabytes of formatted data can be dumped or restored in less than four minutes on the backup tape cartridge, and the cartridge can be removed for storage.

INCA Data Systems maintain a disk support facility in Sydney to assist manufacturers in incorporating the Irwin drive in their products. Available interfaces announced include LSI 11, Multibus and S100 standards, with more to follow. In OEM quantities the drives will cost $2215 each.

Datatel Pty Ltd, of 3 Raglan Street, South Melbourne, 3205, have been appointed distributors of the product.

CGF Electronics has Archives III

Archives III, a desktop microcomputer with a built-in 5 megabyte Winchester disk drive, was released recently in Australia by CGF Electronics. The Archives system consists of a Z80 CPU running a 4MHz, S100 bus, a double-sided, double-density disk drive, 30cm green phosphor video monitor and a detachable Honeywell keyboard.

The design of the computer allows for easy expansion, with S100 slots available for graphics and communications peripherals.

A range of locally produced and imported software is available for the system, including accounting packages and the well-known Wordstar word processing program.

Mr Gower Smith, General Manager of CGF Electronics, says "Until now the lack of storage has forced many small businesses into the minicomputer area. This system offers unequalled value for money and removes one of the major barriers that has prevented the micro entering medium-sized businesses. The inbuilt Winchester incorporated in the unit offers ten times the speed and storage without compromising the unit's micro size and reliability".

Most of the supporting software for the Archives III computer has been prepared by the Australian firm Integrity Management Services, and includes Version 3.0 of the IMS integrated accounting system.

For more information on the Archives system contact CGF Electronics, 4th Floor, 520 Collins St, Melbourne, Vic 3000.

Memories — has the magnetic bubble burst?

Just two months after Texas Instruments announced that it was ending production of all bubble memory devices, National Semiconductor has also announced that it is dropping out of the bubble memory market.

Both National Semiconductor and Texas Instruments have spent millions of dollars developing bubble memory systems, but research costs have proved too high for the potential return. Alternative memory technologies such as Winchester disks, video disks and non-

Micronews ctd p137

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volatile semiconductor memories have taken over many of the planned applications for bubble memories.

Charles Sporck, President and Chief Executive of National, said "We recently announced a review of expenses during this period of slow semiconductor business activity. To keep spending in line with sales, and since the bubble memory business is not projected to reach previously anticipated levels, National is discontinuing production of bubble memory devices." National's sales of bubble memories had been under $1 million annually, says Sporck.

Motorola and Intel are continuing to produce bubble memories. Motorola has obtained details of National's 256K bit and one megabit memory designs and controllers through a technology exchange agreement with National. The company still sees a viable market for the devices, but will be content with relatively minor returns.

Intel sees significant uses for bubble memories in military applications. The memories are more rugged than alternative types, and can withstand harsh environments more readily. In applications where equipment is subject to vibration and changes in temperatures, such as in aircraft, the bubble memory may still be the best solution.

Club news

● A FORTH Interest Group has been formed in Melbourne. Meetings are held on the first Friday of each month at members' homes. The Group has FORTH running under CP/M and would like to hear from anyone interested in the language. More information can be obtained by contacting FIG, PO Box 103, Camberwell, Vic, 3124.

● "Micro User News" is a monthly circular produced by Adelaide Micro Users Group, who have a particular interest in TRS-80 and System-80 equipment. The September issue includes, among other things, hints and tips on the TRS-80 Model III and some details on using modems. More information can be obtained by writing to the club, 36 Sturt St, Adelaide, SA, 5000.

● Readers who use Sorcerer computer systems will be interested in the newly formed Sorcerer Computer Users Group of the Australian Capital Territory. The Group is closely associated with the Sorcerer Computer Users of Australia Group of Victoria.

For details of membership and information on forthcoming activities, interested readers should contact Mr G. T. Dick, 31 Creswell, St, Campbell, ACT, 2601.

Column 80 ctd from p122

This is quite easy to do, particularly in a BASIC program. All you need is something like:

```
200 C$=INKEY$:IF C$="" THEN 200
ELSE IF C$=CHR$(95) THEN . . .
```

The CHR$(nn) function allows you to look for any desired ASCII code "nn", using the IF . . . THEN . . . decision-making pair.

It's a little more complex to do this in assembly or machine language, but not much. Our new "WORP-9" word processor program does this, and gives the four keys some very handy special functions. The F1 key becomes the master code-changing key, to change between text entering/editing and command mode, the F2 key becomes the text inserting/closing up key, F3 becomes the "indent paragraph" key, and F4 the underline enable/disable key. This avoids a lot of the special key combinations which you have to remember with other word processors.

So as you can see, there's nothing very mysterious about those "software programmable" keys after all. In fact the keys themselves are very mild-mannered and unassuming – it's your programs that can turn them into "super keys".

Key	Binary	Hex	Decimal	Character
F1	1011111	5F	95	_
F2	1011100	5C	92	\
F3	1011101	5D	93	]
F4	1011110	5E	94	^

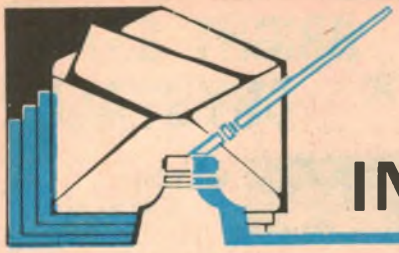
TABLE 1

Books ctd from p97

nections with standard Basic. Throughout the book much emphasis is placed on the design of clear, easily understood programs by the use of structured techniques.

"Inside Basic Games" concludes with three further games, or rather chapters on the design of the games. Each chapter includes suggestions for additions and improvements to the programs presented and a summary which stresses the general programming concepts to be learnt through the game described. The result is an excellent textbook on structured programming in Basic, although with the ready availability of Pascal on many small computers this might not be as necessary as it once was.

Our review copy came from McGills Authorised Newsagency Pty Ltd, 187 Elizabeth St, Melbourne, Vic, but we understand the book is also available from the Technical Book & Magazine Co 295-299 Swanston St, Melbourne. (P.V.)



INFORMATION CENTRE

LEDS & LADDERS: I have recently assembled the LEDS and Ladders Game (EA Aug 80) as a kit from Dick Smith Electronics and have found some trouble in "climbing" up the ladder. The first LED will come on when the climb button is pressed and flash at a reasonable rate. On pressing the climb button further the LEDS do not climb.

So out came the DVM and I connected it to the .470uF capacitor. The capacitor responded as described in the magazine. The highest charge I could reach was approximately 5.6V with one eye on the LED and the other on the DVM. I think the charge was high enough for a climb well up the ladder.

So I replaced the UAA-170 IC with the help of IC sockets and tried again, but without luck. So could you please help me! I assume that the 4011 IC is OK by the flash rate and capacitor chargings. (R.W., Blair Athol, SA).

● We suspect that the voltage divider feeding pin 11 of the UAA170 has the wrong value resistors. In particular, the 1MΩ resistor from pin 11 to the OV line is probably 100kΩ instead of 1MΩ. The list of voltage readings attached to your letter confirms this.

FREQUENCY COUNTER FIX: Some time ago I constructed the 200MHz frequency counter featured in the August 1978 issue of "Electronics Australia". I found that on the ×1 range the maximum count was to 2MHz whilst on the ×10 range the max count is to 19MHz. A 4MHz input has been fed to the 10116 ECL stage and normal operation on the ×10 range occurred but on the ×1 range miscounting and random readings have resulted.

A friend built the same counter and his counts to 40MHz easily. Do you feel that the fault is in the ECL stage or elsewhere. (R.G., Melton South, Vic).

● It seems likely that the reason for the maximum count of 2MHz is due to a low spec 74C926. These have a guaranteed minimum maximum clock frequency of 2MHz and a typical maximum clock frequency of 4MHz. It appears that you have been unlucky because we have not come across the problem before. You may be able to gain an easy cure by swapping the 74C926 chips around. Otherwise, you may have to buy another 74C926.
(Editor's note: This letter is reproduced here at R.G.'s suggestion as a new 74C926 did solve his problem.)

CAPACITOR DISCHARGE IGNITION: I know your Capacitor Discharge Ignition project is quite old now, but as it is still available and very popular, especially from Dick Smith, I am writing in the hope that you may be able to help me with a hint or two about a problem.

I was very happy with its performance, as my car (1977 2.0L Escort) was undrivable in cold weather until the installation of the CDI. But after about 2000km the points were burnt and pitted beyond redemption. The same happened to my father's car, on which I also installed a CDI. So far, on my car, I have burnt out two breaker point sets and the capacitors across the points.

I am hoping you can give me some assistance with clues for trouble shooting, even though I have carried out the methods described in the assembly manual. I have had a little training in electronics servicing. (I.P.T., Woodville, SA).

● We should point out that even though the CDI design that we published in July 1975 is still available from Dick Smith it is no longer one of our recommended designs. We stated the case against CDI quite strongly in our article on the Transistor Assisted Ignition with Dwell Extension in our December 1979 issue (File No 3/TI/15). One of the reasons why we are against CDI is that they are not as reliable as the transistor assisted system and more people have trouble getting them going.

Having said that, yours is the first case we have come across where the points are badly burnt and the points capacitor itself is damaged. This latter fact suggests that the points are wired up incorrectly and are somehow switching the 1uF reservoir capacitor's charge through the coil. In other words, the points are doing the job of the SCR. We are really at a loss to understand how you have managed this feat. We suggest that you very carefully check out your method of connection to see that it agrees with the circuit. If that fails to solve the problem then you should seek the assistance of a qualified technician.

DIGITAL ENGINE ANALYSER: I made a Digital Engine Analyser which works well, but does have one small problem in that one LED display operates only very dimly. It is not the one particular display, as the position of the fault alters with the various functions. It is always the digit just before the decimal point. (R.H., Munglinup, WA).

● From your description of the fault R.H., we would guess that the resistor driving the decimal points via switch S1d is a lower resistance than specified. This would cause undue loading on the associated digit driver transistor and hence dim that particular digit. The specified resistor value is 47Ω, so check that it is indeed this value.

100 WATT SPEAKER SYSTEM: Looking at your January 1981 edition of "Electronics Australia" I saw a speaker box that I have been looking for for a long time, but the only problem was with the 300W speaker specified. I am not in need of such a powerful speaker and only need a 100W speaker system.

I was wondering if you could tell me what speaker would be suitable to fit in the box with a frequency response of between 5Hz to 50kHz at ± 1dB. It also needs to be suitable for an electric guitar. Also it needs to be able to take up to 100W RMS. Can you help me please? (D.P., Lower Templestowe, Vic.)

● The 300W speaker system to which you refer would be entirely satisfactory for use with a 100W amplifier particularly because of its high efficiency. If the price scares you, we suggest you contact the JBL distributors, Harman Australia Pty Ltd, Unit 13A-2, 6-8 Byfield St, North Ryde, NSW 2133, (02) 887 3233, for details of a less expensive driver and accompanying cabinet. Alternatively, you could also contact local manufacturer Etone Pty Ltd, at 53 Stanley Street, Peakhurst, NSW 2210 (02) 534 3569 for details of a 100W system.

Concerning the required frequency range, there are no speaker systems that are ±1dB from 5Hz to 50kHz. Typical speaker systems for electric guitars would provide a frequency response from 50Hz to 6kHz. Note that a really low frequency response is probably not desirable since the large low frequency signals which can be generated by an electric guitar could 'blow' the speakers.

GRAPHIC ANALYSER: I recently constructed the EA Graphic Analyser (March 1981) and am impressed with its performance in conjunction with the EA Playmaster Graphic Equaliser on my hifi system.

Unfortunately, with pink noise selected, I am unable to get a flat display within ±1dB on all bars. A number of these pulsate in time with the rhythmic pattern of the pink noise. Would increasing the value of C1 reduce this fluctuation?

For the present. I have assumed the

peak position of the bar to be the correct height when setting up the equaliser.

It is also interesting to note the difference in setting from one channel to the other due to the room shape and acoustics.

I have also used it to evaluate two different commercial loudspeaker systems for a friend. The resulting graphs reinforced our previous subjective listening tests and allowed him to make a confident decision between the two systems. (B.D.C., Gunnedah, NSW).

● Some variation in the amplitude of the bars for a "flat" display is to be expected. This can be due to either variations in the filter component values of the pink noise filter or bandpass filters. From the figures you have given for your unit, most bars are within ±1dB which is quite acceptable since the overall frequency response of a typical speaker/room combination would be considered very good if it actually was within ±1dB.

The fluctuation in the level of the display bars is due to the cyclic nature of the pink noise generator and the time constant of the rectifier/filter. If desired the value of C1 in each filter can be increased hence reducing any fluctuations but the display would then become too slow to use as a dynamic program display.

TV-CRO ADAPTER: Recently, I constructed the TV-CRO Adapter from the Dick Smith kit. My unit works well in the vertical mode, but in the horizontal mode any trace is nothing but an incoherent pattern of short lines (not dots) and sync control reduces this to faint dots in either mode. I later realised I was operating the unit from a 9-volt plugpack rather than 12V. Do you have any suggestions that might assist me?

Also, do you have any plans for VHF converters that use a CB receiver as the tuneable IF?

Please continue with your excellent work in the magazine. (C.M., Wollongong, NSW).

● From your description of the fault it would seem that the sync is not working. If the sync does work in the vertical mode then the most probable fault would be the wiring to switches S1a and S1c or the 47pF capacitor. However if the sync doesn't work in either mode then the fault could involve IC4, IC2a,b or IC1a. Check the PC board in these areas for solder bridges or hairline cracks in the copper pattern and check the associated wiring.

We have not published a converter suitable for your purpose.

MUSICOLOUR/CHASER: As a very satisfied owner of Musicolour 111 and a light chaser, I believe the Musicolour IV described in the August 1981 issue of "Electronics Australia", has one great drawback — you can't work both together. Very disturbing in the middle of a dance if the unit goes on the blink. No lights no dance. Our last dance limped home with just a chaser and fixed floodlights when the Musicolour devoured a transistor.

The front panel lights on the Musicolour IV are a great idea and essential to the operation. How can I fit such lights to the individual controls of my Musicolour III?

Also our friendly electronics shop has queues of Musicolour owners replacing Triacs. Could it be that your insistence on using high wattage lamps is the cause? An unending surge of initial current must surely make the toughest Triac give up eventually. In any case, bright

Dolby-B Noise Reduction

DOLBY NOISE REDUCTION: Often, when a new cassette deck is brought out, one of the main selling points is a Dolby noise reduction system. Could you tell me how it works?

Also, do you have any plans for a HF transmitter with SSB capability and covering at least three novice bands? Ten watts would be sufficient power, and it should have as few extras as possible for cost efficiency. (C.L., Surfers Paradise, Qld).

● Dolby noise reduction and other noise reduction systems, such as dbx and Hicom II are all aimed at one particular objective, that of improving the signal-to-noise ratio. All magnetic tapes will exhibit a certain amount of inherent noise due to the granular structure of the magnetic material, remnant magnetism, etc. This noise is more pronounced in the upper frequency regions of the audio spectrum. Consequently, the higher the level we record on the tape, consistent with keeping distortion low, the better the S/N ratio and the less prominent will be the background noise.

Obviously, we cannot just set the cassette recorder to record at a high level for all signal levels or there will be no dynamic range left in the recorded signal. All the recording would be at a similar sound level, the higher level signals being clipped either by saturation of the tape or limited by inbuilt limiting circuits.

This is where the Dolby-B noise reduction steps in. Here frequencies mainly in the region above 1kHz are electronically controlled such that if the signal level during recording drops below a predetermined level, the system would automatically increment the gain, and therefore the level of signal being fed to the tape. For play back, the system operates in reverse, automatically lowering the gain for those signals which had been artifically boosted.

Using this process also reduces the level of any tape hiss which might be present, thereby improving the S/N ratio and the dynamic range of the system as a whole. It is important to note that for a tape recorded with Dolby it must be played back with Dolby. If the Dolby-B system is used properly an improvement of about 10dB can be expected in the S/N ratio.

At present, we have no plans for the transmitter mentioned.

Slide Cross-fader

continued from p53

The mains cord enters the unit through a grommeted hole and must be securely clamped. Terminate the active (brown) and neutral (blue) wires in an insulated terminal black and solder the earth wire (green or green/yellow) to the solder lug bolted to the case. Finally, terminate the transformer leads and complete the wiring to the output terminal blocks.

Important: leads run to the projector lamps must be mains rated and double sheathed. Use 7.5A mains rated cable with 150W 24V and any 240V AC lamps and 15A cable for 300W 24V lamps.

Testing the unit simply involves plugging it in and trying it out. Check first for correct supply voltages, then switch the Auto mode and set the Fade Rate control to minimum (do not hook up the projectors at this stage). The unit should now fade from one LED to the other and the appropriate relay should activate when one LED goes dim.

Check also that the Change and Hold button operate correctly.

If all is well, you can now attempt to record the cross-fades on tape. Hook up the tape recorder using screened RCA to RCA cable and set the record level trimpot to mid position. Record a series of cross-fades and play them back. You will probably have to adjust the playback level trimpot for correct operation — if the gain is too high, noise will trigger the system; if the gain is too low the system will not work.

If satisfactory results cannot be obtained, increase the record level (potentiometer clockwise). Note that the record level on the tape recorder should be set for satisfactory recording of the music or commentary.

You can now hook up the projectors and give the unit a test run. The lamps should fade smoothly from one to the other during a cross-fade and the relays should trigger the slide change mechanism. In some case, the 1s time for which the relay contacts are closed may prove too short to activate the projector. If this happens, increase the capacitor value at pin 12 of IC3d.

That's it! Slide Show is your opportunity to put an end to boring slide presentations. We think you will find the unit invaluable.

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5mm	Red LED's	8c	7c
BZX83C12V	12V 250mW Zener Diode	10c	25c
BZX96C4V7	4.7V 1.5W	30c	20c
ITTRD7B	7.1V 1.1W	25c	8c
NEC ZD	5.6V 200mW	10c	80c
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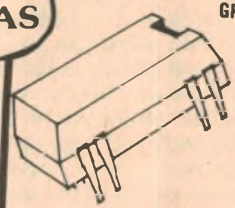

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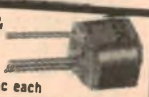

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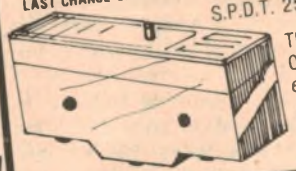

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.039	160		13c	11c
.039	400		18c	13c
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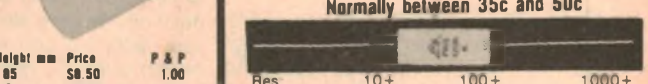

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lights are not desirable at today's dances. (P.M., Mount Chalmers, Qld.)

● Many readers suggested that the Musicolour and Chaser should be combined so this is what we did in the Musicolour IV which is considerably cheaper than two separate units with four channels each. We agree that a failure of equipment at a dance could be a disappointment.

One way to avoid these problems is to give your equipment a long "heat soak" before a scheduled dance. Let the gear run for say 24 hours with music signals driving it. That should sort out any doubtful components before the event.

We do not insist that readers use high power although the facility is there if you want it. In fact, we do not recommend the use of individual lamps of higher than 100W rating because of the risk of a lamp blowing the associated Triac. We should add that we have not had complaints about continual blowing of Triacs in the past so we wonder if your local mains supply does not have excessive surges on the line.

Perhaps the easiest way of adding the indicator lamps is to use neon bezels, with integral limiting resistors, wired across the output sockets for each channel.

DIGITAL CAPACITANCE METER: I have recently built the EA designed Digital Capacitance Meter (EA March, 1980) and have run into difficulties. All of the LEDS light up and the LED on the right flickers. When a test capacitor is applied, the right hand LED remains steady but resumes its flickering when the capacitor is removed, all of the other LEDs segments are lit up no matter what adjustments or tests are carried out. I have changed all of the ICs but with no avail. I would be interested to hear of your opinion on the above defect. (R.R.E., Pannawonica, WA.)

● From your description of the fault we assume that the display actually reads 0000 with the right hand digit flickering between 0 and 1. If this is the case then the most probable fault is that the reference oscillator is not working. Check the PC board in this area for solder bridges or hairline cracks in the pattern and check the wiring to switch S1b.

STEREO INFRARED REMOTE CONTROLLER: I have completed the Stereo Infrared Remote Controller (October 1979) and now find that after considerable testing I cannot get the receiver to work as described in the article.

All that appears to happen when power is applied is:

(a) No. 1 LED is illuminated;

(b) 12 & 5V supplies appear to be OK;

(c) Operation of transmitter has no receiver response.

Could you please advise if there have been any subsequent alterations to circuit and/or components, if not, any helpful hints on how to get it working would be appreciated. (R.C.G., Greenwood, WA.)

● There have been no alterations to the circuit or to component values. The only trouble shooting procedure we can advise is that you carefully check the orientation of the ICs, diodes and electrolytics and also look for any solder bridges between tracks or pads on the PC board.

PLAYMASTER MOSFET STEREO AMPLIFIER: I refer to the publication of your Playmaster Mosfet Stereo Amplifier project design.

I firstly wish to compliment you on the very fine job you have done in detailing both the circuit operating philosophy and construction details of the amplifier.

Your closing comments on page 51 of the January '81 edition are, however, a little mystifying, ie construction details of the 14 microhenry chokes.

You have suggested the use of a "special grade of ferrite rod", and that "ordinary ferrite rod used for AM radio antennas is not suitable".

I would appreciate you advice regarding the most suitable grade of ferrite and the name(s) of any possible suppliers.

Thank you once again for a most interesting project. (T.J.D., Lilli Pilli, NSW).

● Most grades of ferrite are not suitable for use at audio frequencies. It is necessary to use a grade which will have reasonable permeability and Q-factor at frequencies down to at least 20kHz. However, we have hesitated to specify a particular type because this can cause supply problems. Instead, we have left it to kitset suppliers to either arrange for the supply of wound chokes or a suitable ferrite. Either way, that solves the problem for the kit-builder.

If you wish to wind your own you should contact the distributors of Neosid products, Watkins Wynne Pty Ltd, 32 Falcon Street, Crows Nest, regarding the type and availability of a suitable ferrite. In the meantime, we understand that most kit suppliers do have the chokes in stock.

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ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Chippendale, 2008.

Notes & Errata

ON SCREEN GRAPHIC ANALYSER (March 1981, File No. 1/SC/11): Due to the propagation delay of IC5b a glitch may be generated in the horizontal sync pulse. This occurs just after the colour burst and may result in loss of colour on the TV display. The solution is to connect a .001uF capacitor between pin 6 and pin 7 of IC1b to delay the signal from IC6f.

EXPOSURE METER FOR ELECTRONIC FLASH (January 1980, File No. 3/EF/16): connections to the solar cell are shown reversed on the component overlay diagram. The circuit diagram is correct.

SUPER-80 COMPUTER (August, September, October 81, File No. 2/CC/62,63,65); Dick Smith Electronics has advised that a small number of these computers have exhibited a fault in the display whereby a column of "@" characters appears. Readers experiencing this fault are advised to contact the Dick Smith Electronics Computer Hotline on (02) 888 2002.

CYLON VOICE (January 1981, File No. 1/MS/22); The 4.7uF capacitor connected to pin 3 of the 741 op-amp is shown reversed on the overlay diagram. The circuit diagram is correct.

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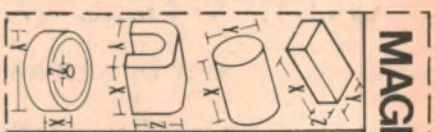

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