AUSTRALIA'S NUMBER ONE ELECTRONICS MAGAZINE

ELECTRONICS AUSTRALIA

VIDEO, HIFI & COMPUTERS

NOVEMBER, 1982 AUST $2.00* NZ $2.50

Registered by Australia Post — publication No. NBP0240.

DEPTH SOUNDER FOR BOATS

DATUM 6800 COMPUTER TO BUILD

SOLAR POWERED FOUNTAIN

Power you can taste.

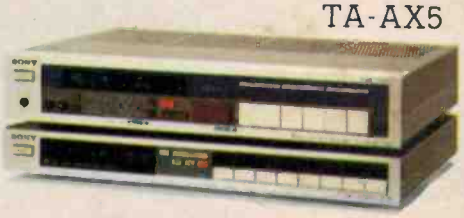
Sony's new TA-AX5 amplifier with memory is a high fidelity feast.

Its multiple memory lets you create your own acoustic "flavours." Bass and treble tone settings, turnover frequencies, high and low filter are all programmable.

At a touch you can instantly recall the recipe for bittersweet country, hot 'n' spicy rock, or a well-seasoned Stravinsky. And electronic displays graphically show you everything the amp is cooking up.

Sony's Audio Signal Processor means that every function is touch controlled. This knifes through the usual maze of audio circuitry for a streamlined design of the future. Pure and simple, it sounds delicious.

TA-AX5



ST-JX4

The ideal companion for this tasty new amplifier is Sony's ST-JX4 synthesizer tuner. Why not make a reservation for two?

SONY®
THE ONE AND ONLY

SON 0118

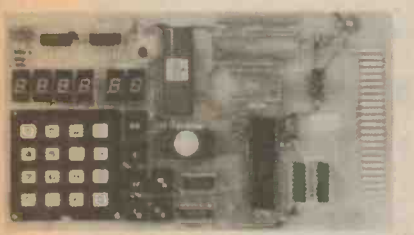
ELECTRONICS AUSTRALIA

Volume 44, No. 11
November, 1982

AUSTRALIA'S LARGEST SELLING ELECTRONICS MAGAZINE

Depth sounder for small boats

Build this depth sounder for your boat and forget about those pricey commercial units. Our unit has a range of approximately 100 metres and features a digital display and a depth alarm (see page 44).



Interested in learning about microcomputers? DATUM is a completely self-contained microcomputer system with everything needed to get you started. Details page 86.

COMING NEXT MONTH! – Find out what's coming by turning to page 128.

On the cover

Small fountains and rock pools have become very popular with Australian householders. Now you can add even more charm and interest to the garden by running the fountain from a solar cell array, as our article on page 58 explains. Cover design by Andrew Powell.

FEATURES

HIFI, VIDEO AND REVIEWS

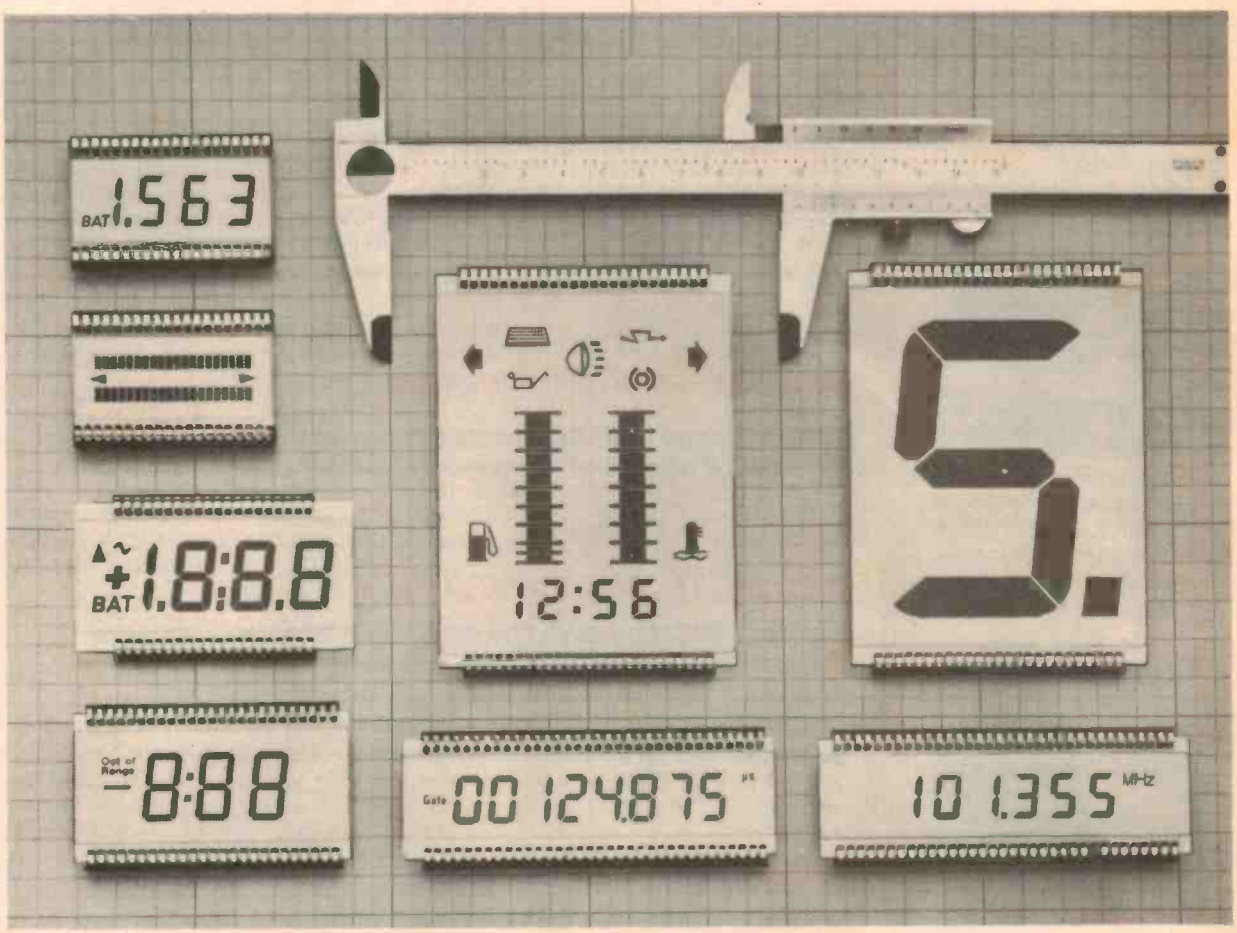
PROJECTS AND CIRCUITS

PERSONAL COMPUTERS

COLUMNS

DEPARTMENTS

Videlec® LCDs
when size is important



Now high quality, high contrast LCD's are available from Philips in an easy to read range up to 7.6cm tall . . . that even makes them suitable for time clocks.

Speaking of time, Videlec LCD's have a service life greater than 50,000 hours and are constructed to withstand a wide temperature range for harsh environments and industrial applications.

We think you'll see what we mean by our extensive range when you look over our Videlec LCD literature available at any of the offices listed below. It's as simple as LCD, call Philips Components.

Sydney 427 0888, Melbourne 542 3333, Adelaide 243 0155, Perth 277 4199, Brisbane 44 0191.

Videlec . . . another Philips Component.

PHILIPS

Electronic Components and Materials

PHILIPS

Editorial Viewpoint

There is no need to be modest . . .

As we approach the end of 1982 there must be many readers who regard the state of Australian manufacturing, particularly the electronics industry, as being at a low ebb. It is certainly true that over the last decade many thousands of jobs have been lost from the electronics industry but the situation is far from being as black as many people seem to believe.

Just consider the following propositions which could be drawn from the present Australian electronics scene: (1) Even though Australia has great potential for solar power, solar cells are not manufactured in this country; (2) Current model dishwashing machines are noisy, wasteful of power and water and are all imported into this country; (3) Even though Richard Small and Neville Thiele are regarded as being in the vanguard of loudspeaker design, there are no local manufacturers of loudspeaker systems or drivers who implement the principles developed by these two men; and (4) All television manufacture in this country has now ceased.

If you agree with any of the above propositions you are quite wrong. None of the above is correct but you can be forgiven for being uninformed because the companies concerned have done little to make their activities known.

This is a great shame because there is a host of Australian companies that produce a vast range of well-designed and manufactured products. A great many of them have stories which should be told. How many potential customers are there who do not know about these products and services? Much of the local electronics industry is paralleled in this regard by the electronics importers, as instanced by a letter featured in the Information Centre pages this month.

Many Australian companies do little or no advertising, either in this magazine or elsewhere. Nor can many be bothered with furnishing information about themselves to potential customers or the technical press. And of those that do, some produce incredibly amateurish and obscure press releases, without photographs!

The point of this editorial is that any company which experiences a downturn in business cannot complain if its products are not well-known in the marketplace. To put it more strongly, many companies who find themselves unduly affected by a recession in 1983 will do so because they have resigned themselves to it. In spite of having good products they will be "snatching defeat from the jaws of victory".

It is time that company managers stopped looking to the Government for help and roused themselves to action. They can start by making their companies visible in the marketplace.

Leo Simpson

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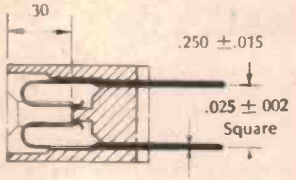
WE'VE DREDGED MORE GREAT BARGAINS!!

S 100 Socket Sensation



ONLY $4.95 each
10+ $4.45 each

A socket of this quality is normally around $12. Not this bottom of the harbor special! We dealt these from the mighty Yarra!

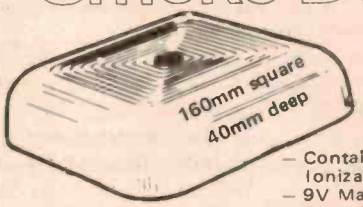
We have secured a bulk-buy of HIGH QUALITY S-100 card edge connectors. Remember! the S-100 Standard is a "queer" 0.125" pitch. Each connector features gold plated bifurcated contacts with wire wrap pins in a Diallyl Phthalate moulded body. If you want to solder into a PCB this is O.K., simply cut the pins down to suit.

Quantities strictly limited.

final runout of GE Consumer Products

WE HAVE SOLD OVER 1000 OF EACH OF THESE ITEMS. ONLY A FEW ARE LEFT NOW.
WHY NOT BUY ONE FOR YOUR MUM?

Smoke Detector



- Contains Americium 241 Ionization Chamber
- 9V Mallory Duracell included
- Contains very loud solid state buzzer
- 12 month factory warranty.

FROM $12.50

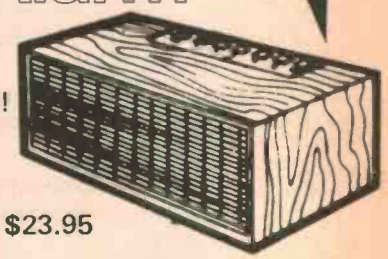
One of the greatest consumer flops of the last decade was the Ionization Chamber Smoke Detector. Even though it is a brilliant product (reliable compact, easy installation, fail-safe etc) it just did not sell. Human nature being what it is finds safety-oriented products just not worth the investment. We all know that accidents and fires never happen to US!! As smoke is the greatest killer in a fire, the market research gurus thought that such a product would have a wide appeal. When they were $49.50 no-one wanted them. The price fell to a very reasonable $29.50 and still they stayed on the shelf. We have now been instructed to clear them for less than ⅓ of $29.50.

QUANTITY PRICES
1-$14.50: 2-5 $13.50ea: 6-10 $13.00ea: 10 up $12.50ea

Burglar Alarm

GENERAL ELECTRIC

BURGLAR ALARM SLASHED!!!
HUGE SCOOP PURCHASE –
ONCE SOLD FOR OVER $100



FROM $23.95

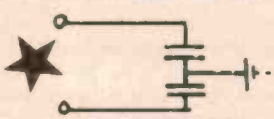
Amazingly low price for a full feature ultrasonic proximity/burglar alarm. + Completely self contained + 12 month manufacturer guarantee + Instant or delayed alarm + Handsome imitation woodgrain + Cabinet measures 180(w)x85(h)x100(d)mm + Programmable multi-code disable switch + Single 9V Alkaline battery* lasts one year + unit beeps when battery gets low + Contains receiver element designed for greater sensitivity without false triggering + Uses state-of-the-art LSI circuitry + Worth he money in parts alone + Comprehensive 24 page manual included + Comes complete with 4 window deterrent stickers + Absolutely no installation needed * Battery extra.

1-$29.50: 2-5 $25ea: 6-10 $24.50ea: 10up $23.95ea

Buy one for Mum for Christmas. . .

MainsWidget

Nifty little 2 x 0.1uF 250V ceramic which schematically looks like this:



PACK OF 4
$1.00

Ideal to mount across the mains chocolate block with the centre terminal going to earth. Helps prevent mains interference.
Found floating in the sea off Bondi!!

rotary mains switch 99¢

– A 20 year throwback.
These days all we do is flick our toggles. In the past a quick twist of the knob turned things on.
You can relive this experience with our DPST mains switch. Convenient bushing mount with ¼" shaft. Ideal replacements. Genuine 240V AC 3 amp rated.

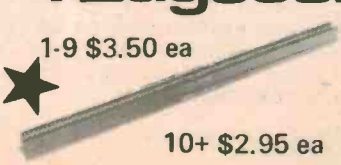
micro headphones

AS REVIEWED
SEPT EA Page 45
FEATURES:
MODEL MT310
Samarium Cobalt magnets
102dB/mW
Weight 15 grams
Response: 50Hz-20kHz
Impedance: 32 ohms

Unit fits into the cusp of your ear. Can be worn under motorcycle helmets. Unbelievably clean sound.

ONLY $19.50

-1 Edgeconnectors * *



1-9 $3.50 ea
10+ $2.95 ea

Collectors special. Made by UECL of England. Sold in quantity for over $10 each. Each Diallyl Phthalate moulded connector contains 170 heavily gold plated bifurcated contacts. (2x 85 way). Each contact is solder eyelet terminated. The connector is 217mm long but you can cut it down to any length you wish. Outstanding quality and they did not get wet after laying at the bottom of the Swan river.

X'TAL FILTERS

10.965MHz from $3.75

Narrow band-pass type – ideal for communications equipment. High quality multi-stage unit suitable for precision I.F. work. Incredible value: Manufacturers distress stock. YOU SAVE.
ONLY $5.00 each (1-9)
worth 4 times this amount.
Oscillator crystals to suit;
10.240MHz or 10.695MHz
ONLY $2.50 each
10 up on both – less 25%

BARGAINS

BIG MAL IS CALLING A ROYAL COMMISSION!!

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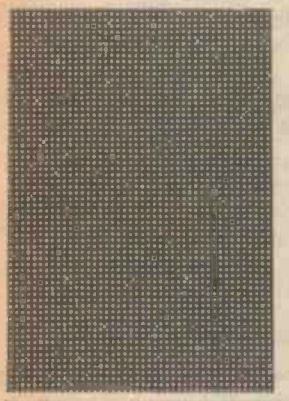
fibreglass matrix board

Not flimsy Bakelite junk. You will be able to use this board over and over again without deterioration. Measuring a massive 115 x 164mm and contains 2816 x 1.0mm diameter holes. Worth over $8 but our special for November only $2.95 each.
Source: Brisbane River.



$2.95
NOVEMBER ONLY

JUMBO SPEAKER CABLE

Now you can have super-quality cable without breaking the bank! Each conductor contains a MASSIVE 259 strands of 0.12mm wire!! It could carry 30 amps! Great for Hi Fi or high power amps.

Only $2.50/m
100m $2.00/m

Motorola Piezo Horns ~ back in stock

Model KSN 1005A
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top value

buy now

Model KSN 1038A
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Model KSN 1039A
50 WATT HI-FI
ONLY $13.00 EACH

Electric Eels??

No. One metre long 7.5A appliance cords. Each (black) cord has a moulded 3 pin approved mains plug on the end. Why so cheap? Well they ARE only a metre long. But consider this:
– Any benchtop piece of equipment only needs a short mains cord. A long mains cord gets in the way and is positively dangerous!!
– Ideal for power supplies or any bench or rack mounted audio or test equipment.
We have HEAPS. But we have said that before.
Buy in bulk and save. We doubt whether you will ever see mains cords this cheap again.

1-9pcs 69 cents each
10-24pcs 50 cents each
25-99pcs 45 cents each
100 up 39 cents each

GENUINE APPROVED cords from the Parramatta River

Walkie Talkies Sensational price for X'tal controlled units

Sensational price for CRYSTAL CONTROLLED UNITS!! Not your super-regen rubbish!!
Don't be fooled! These units actually do work – well in fact. Will transmit voice or morse over fairly respectable distance (over a mile in ideal conditions).
Fitted with proper transmit/receive crystal controlled superhet circuitry. DO NOT COMPARE with far inferior units that may only be a dollar or so cheaper anyway and almost always are a disappointment.
At only $12.50 each, how could you go wrong?
Place of origin: Botany Bay

only $12.50

Proximity Switch

1/2 price

$14.75

Shown this time the right way around. In August we advertised this product and the picture showed the 'bum' end facing you. It was sort of like having a sump-eye-view of a Ferrari – you didn't see the nice part.
They didn't sell in any case and we're not sure whether it was the photo or not.
So this month we've HALVED the price and showing it to you the right way round.
FEATURES: 12V powered unit. When metal object passes near to target face, output swings low. Ideal for Roller shutter doors, Burglar alarms or counting metal objects passing by.
Were $29.50 in August – NOW $14.75 and they have not suffered from their dunking in the Derwent!!

Factory Seconds ~

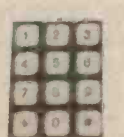
YOU COME FIRST...

We have secured a smallish quantity of 5 pin DIN to 4 RCA audio leads that are on the wrong side of the Q.C. Inspection. Shame though. Because the DIN plug is ALL METAL and GOLD plated. So are the RCA plugs. Problem is that the gold plating is bubbling on the gold DIN plug. (As far as we can see the 4 gold RCA's are PERFECT.)
An ordinary NICKEL PLATED lead set like this costs around $4.75. The gold versions normally are around $9.95. You can have one of these for $3.95 and that's better than Nickel any day!
Worth it for the 4 x RCA's alone!

value $3.95

NUMERIC KEYPAD ELASTOMERIC

Get in quick!! Only 35 available. High quality 12 button keypad. 0-9 with 2 extra push-buttons. As seen on U.S. style telephones.
Measures 76x57x10mm approximately. $4.95



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$25 $49.99 ($3.50) $50 $99.99 ($4.80)
$100 up ($6.20)

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Thurs night to 8.30pm

News Highlights

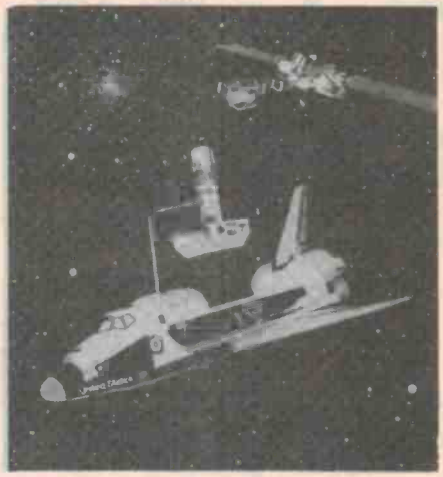
Go-ahead for Starlab space telescope

The Federal Government has approved the second phase of the joint Australian/Canadian/US Starlab project to put a one-metre telescope into orbit from the Space Shuttle in 1989. (See "Electronics Australia" August 1982.)

The Minister for Science and Technology, Mr David Thomson, announced that Starlab would receive $3.337m in the next two years. The funds are being made available under the public-interest project provision of the Industrial Research and Development Incentives Act.

The Mount Stromlo and Siding Springs Observatories (MSSSO) of the Australian National University developed the first phase of the project in conjunction with leading Australian companies. MSSSO and the Department of Science and Technology will be responsible for the second phase, and 80% of Starlab work will go to Australian industry.

Starlab has major scientific and technological implications. It will be able to see objects in 100 times more detail than the largest ground-based telescopes. It will allow astronomers to explore the origins of the universe, and observe stellar events which occurred more than 10 billion years ago.



One plan calls for Starlab to be placed on an orbiting Space Platform by the Shuttle.

As a co-operative academic/industry/government project, Starlab will open up opportunities to develop Australian space-age high technology. It will serve as a "seed project" from which an Australian space industry can develop the capability to design and build the next generation of satellites. The Government will make a decision in 1989 on the go-ahead for the final phase three of the Starlab project.

The Government has also agreed to provide $30 million over the next six years for the completion of the very large radio telescope array, to be known as the Australia Telescope.

The Australia Telescope will consist of three main elements; one a linear array of five 22 metre dishes at Culgoora, near Narrabri in NSW, a 22 metre dish at Siding Spring, Coonabarabran and an existing 64 metre dish at Parkes. Linking the three elements together by land line will form a radio telescope array equivalent to a single dish 300 kilometres in diameter.

The completed array could also be linked by satellite to radio telescopes in Hobart, Alice Springs and Carnarvon, WA, to span the entire 3000km of the Australian continent. The enlarged array would be the most sensitive high resolution radio telescope in the world, able to recognise features 1000 times smaller than those detectable by the most powerful single dish telescopes.

Japan looks to high-definition TV

Japan's television industry is pressing ahead with a high definition television system which it hopes, eventually, will be adopted worldwide.

Sony, Matsushita and Ikegami have already developed some of the equipment; Toshiba and the Japan Victor Company (JVC) are likely to announce products before the end of the year.

This new system will provide better picture quality than that available with today's technology and will allow the use of much larger television screens.

In the proposed system, each television picture is made up of 1,125 lines compared with 625 and 525 used in existing world broadcasting systems. This means that each television channel must have a frequency bandwidth of at least 30MHz, compared with about 6MHz for conventional television.

For high definition to be a success, however, it requires several other technologies to become well-established – direct broadcast television by satellite and cable systems. These have the extra bandwidth necessary to transmit high definition TV.

Japan's public broadcasting corporation, Nippon Hoso Kyokai (NHK) has developed the necessary hardware – transmission equipment, TV cameras, and television sets – in co-operation with the Japanese equipment manufacturers.

It began its research 12 years ago; now the pace of development has increased because of the possibilities opening up with satellites and optical fibre cables.

High definition television is not new. France was one of the first countries to introduce – and eventually drop – a high definition system where each picture frame was made up of 819 lines instead of the 625 and 525 line systems used in other countries.

New work on electric vehicles

US company General Electric has been awarded a US$3.1 million contract by the Ford Motor Co to investigate power train components for electric vehicles.

The work will form part of an overall power-train project that Ford is conducting under a $6.8m research contract from NASA (which manages propulsion research for the US Department of Energy). Systems to be developed by Ford/GE will use an induction motor with an automatic gearbox and transmission unit in a common housing on the front wheel axle.

General Electric will design and build the AC motor, the power inverter needed to produce AC from batteries, and electronic drive control equipment. Ford will oversee the design of the power train as a whole and also the microprocessor based control system.

Videotext and teletext doomed says US report

Videotext and teletext are doomed in the US, say analysts at the Boston-based Yankee group who have undertaken long-term studies of the potential for such information services there. They believe that information services must be radically improved – by the addition of high resolution video pictures and perhaps even sound – before they will find a ready audience.

Despite such predictions, several major corporations continue to show interest. A T & T is involved in providing equipment for several trials of teletext and videotext in the US and has placed its support firmly behind the American standard.

Major publishers including Time Inc and Knight Ridder have made significant investments in teletext and videotext in trials in the US.

CBS and A T & T, working together, will soon begin a seven-month teletext trial in Los Angeles. Following the test and completion of FCC rule-making on teletext regulation, CBS plans to announce its regular teletext service. The broadcasting company remains convinced that there are profits to be made in the US in teletext and videotext as home information services.

Times-Mirror, a large Los Angeles based newspaper and cable TV group, is about to begin a trial videotext service in Los Angeles. Subscribers will be offered a "gateway" to established information services as well as the standard information retrieval and transaction services.

Also among the US companies investigating the potential of videotext are major banks who see the electronic services as potential cost savers.

Can they all be wrong? Yes, says Yankee group analyst Robert Wells who follows the information services industry. Looking to the UK experience, he declares that: "Prestel is a stunning failure."

As a consumer service, Prestel has failed, even in the UK, he maintains. Only 11 per cent of the UK subscribers use the service in their homes, and of those many are believed to be businessmen working at home.

(Financial Times, London.)

US gears for home satellite TV

Over 15 million rooftop home earth stations for reception of direct broadcast satellite transmissions will be installed in the United States by 1990, according to a report from US market research firm International Research Development Inc.

The report predicts that the rooftop terminals, designed for Ku band frequencies, will almost totally replace the present "backyard" terminals, which operate on C band frequencies.

After 1985, the report states, the rooftop terminal market will be boosted by the launch of high power direct broadcast satellites.

The high power broadcasting satellites will allow rooftop antenna dishes to be reduced in size to .75-1.25 metres. Combined with price reductions (to $350-$500 by 1990, says IRD), these developments will significantly expand the market for home satellite TV systems in the United States.

Launch date doubt for compact disc system

Despite the undoubted technical advantages of digital audio recording, its use so far has been confined largely to master production and copying in recording studios, with the end result a conventional – though better quality – analog disc.

The advent of domestic digital players and the discs to go with them seems to be a lot further off than the industry initially planned. The so-called "compact disc system" was originally to be introduced in the United States late this year, or early 1983, but reports from Japan and the US indicate that this is not now likely before 1984.

There are a number of reasons for the slow acceptance of the domestic digital system in the United States. Research organisation, Venture Development Corporation (VDC) conducted a market survey – "Professional and Consumer Digital Audio Equipment: A strategic Analysis" – and, while cautiously optimistic about the ultimate success of the product, point to a number of problems to be overcome.

The major one appears to be the traditional chicken-and-egg situation involving a shortage of software, ie, records. Recording studios are reluctant to embark on a costly program of installing digital recording equipment, unless there are sufficient digital players in use to guarantee a market.

On the other hand, consumers are reluctant to buy players until they have a reasonable range of records from which to choose and an assurance of continuing supply.

The survey went on to state that, while some 95 per cent of recording studios had used digital recording equipment to some extent, most work had been on an experimental basis using rented equipment. And many of these studios complained of reliability problems, editing difficulties and incompatibility.

NEWS HIGHLIGHTS

Multi-colour LCDs: new auto instrument panels

A quiet revolution in display technology is underway, with Japanese companies poised to release a range of multi-colour LCD panels. Alps Electric Company, Stanley Electric Company and Epson Corporation have all shown prototypes of LCDs using up to six colours and work is progressing on mass production techniques.

Applications being investigated include car dashboard displays, clocks and watches, consumer audio equipment and flat-screen computer displays.

Automotive displays are seen by many Japanese manufacturers as the chief application of colour LCDs. Conventional speedometers, fuel meters and indicators may soon be replaced by a single LCD panel that displays both digital read-outs and analog bar-graphs in a variety of colours.

Multi-colour LCD instrument panel from Epson Corporation, Japan. Five different colours are featured: blue, green, yellow, red and black.

Some problems remain to be solved, however. Many LCDs lack visibility in high ambient light because of inherently low contrast, and operating temperature ranges are still restricted.

Some Japanese manufacturers, too, are concerned at the automobile industry's failure to come up with standard formats for dash displays. Standardisation would allow successful mass marketing of a small range of colour liquid crystal displays.

BIG FUTURE FOR SOLAR POWER

By the end of the century, European manufacturers of solar photovoltaic cells will be making enough cells each year to generate 1000 megawatts of electricity, according to a recent study by the EEC Commission.

The results of the study were announced at a European Economic Community conference on solar electricity held recently in Italy. Mike Starr, a British engineering consultant who worked on the study, predicted that by the year 2000 solar cells would be producing 200,000 megawatts of electricity, around 10% of Europe's predicted consumption.

Starr warned however that the EEC's projections were made on the basis of continued government support for the photovoltaic industry. So far governments and private companies around the world have spent about one billion dollars on solar electricity research and development.

Starr made the point that Italy, host country for the conference, was a prime candidate for solar electricity production. In addition to sunny conditions, there are about 70,000 households in remote areas which are not connected to electricity grids.

Electricity presently used in these areas is generated by small diesel generators, at costs of up to 50 cents per kilowatt hour – more expensive than electricity from some present day photovoltaic generators.

Japanese plan "fifth generation" computer

The Japanese plan for a "fifth generation" computer that can think like a human being is attracting the attention of the British computer industry.

The project is still at the planning stage, and nobody has any clear idea of what kind of computer will result from the project. Funds amounting to around $1000 million have already been allocated or promised to the project in Japan by the Ministry of International Trade and Industry (MITI).

The fifth generation computer will be a general purpose "problem solving and inference machine", with users communicating in speech, graphics images or a "natural" language that simplifies ordinary speech just enough for a computer to understand.

The goal is to provide an entire computer system that reasons and solves problems in much the same way as a human being.

Where current computers can perform one to 10 million instructions per second, the goal for the 1990s is a network of parallel processors capable of performing around 100 to 1000 million instructions per second.

Battlefield system for Australian Army

The Australian Army is to develop a computer-based battlefield information system. The Minister for Defence, Mr Ian Sinclair, announced recently that tenders would be called for the first phase of a project to computerise battlefield command and control.

The first phase of the Australian Army Tactical Command and Control System – Project AUSTACCS – will require Australian industry to establish a test-bed computer facility at Headquarters, 1st Division, Enoggera, Queensland. It will also require industry to develop, with the Army, two representative sub-systems of AUSTACCS.

Subsequent phases, over a 10 year period, call for the development of three more sub-systems, and the acquisition of the final system.

The existing tactical command and control system relies on the manual handling of information. AUSTACCS will eliminate the slowness and potential inaccuracy of a manual system.

Development of the project will require close co-ordination with two other major projects – Raven, a single channel field communications system; and Parakeet a field trunk communications system.

The Parakeet sysem will be designed specifically to operate in the hot and dusty Australian environment and will include operation in the high frequency (HF) bands, which are not currently available in overseas systems.

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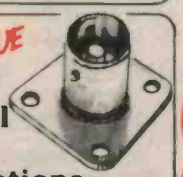

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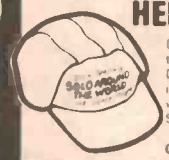

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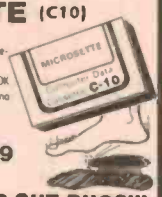

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DICK SMITH ELECTRONICS

See page 98 for store & re-seller addresses

Frequency modula the basic concepts

Following on from last month's article on the fundamentals of amplitude modulation, this article explains frequency modulation, as used in commercial broadcasting, two-way communications and television sound transmissions. What is frequency modulation, and what advantages does it offer?

One of the greatest disadvantages in using amplitude modulation for the transmission of information is that the modulated signal has to compete with background electrical noise. Quite often, it is difficult to distinguish between the desired information signal and the undesired background electrical noise. The noise signal generally shows itself as an additional amplitude variation of the original signal as shown in Fig. 1.

Both the desired information signal and the undesired noise appear as amplitude variations, and any attempt to reduce or eliminate the noise will affect the information signal as well.

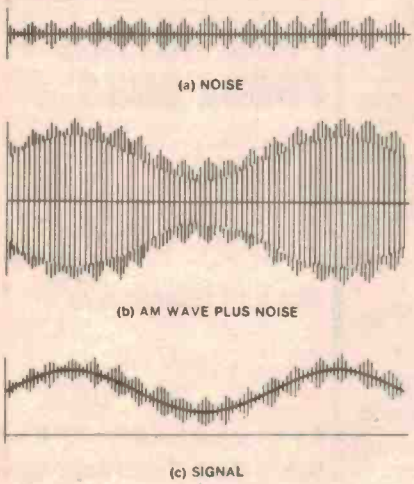

Fig. 1

Fig. 1, above, illustrates the effect of noise on an amplitude modulated signal. The noise appears as an additional variation in the amplitude of the signal and is reproduced by the receiver.

Fig. 2, at right, illustrates the effect of noise on a frequency modulated signal. Since the noise effects only the amplitude of the signal it can be eliminated.

The problem was studied by E. H. Armstrong in the 1930's and a reasonable solution was put forward. Instead of varying the amplitude of the carrier as is done in amplitude modulation, he placed the information on the carrier by varying the carrier frequency. That is, the frequency of the carrier is varied in keeping with the instantaneous amplitude of the modulation signal.

Fig. 2 shows the components of an FM signal and the effects of noise on it. Notice how at certain points the frequency has increased while at others it has decreased. The noise is shown at the top and bottom edge of Fig. 2b. The FM signal can now be put through a limiter in the receiving equipment which slices off the noise signal and leaves the FM signal as shown in Fig. 2c. We are able to do this in the case of FM, because it is the frequency variations we are interested in and not the amplitude variations as in AM. Figure 2d shows the modulation or information signal after it has been separated from the carrier.

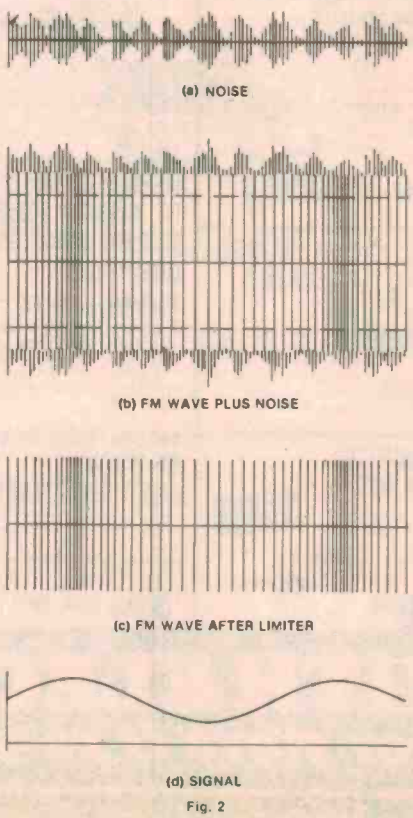

Fig. 2

Mathematical representation

Let us begin as we did in the case of amplitude modulation with a carrier wave, which we shall represent as follows.

$$Vc = A \sin 2 f_c t$$

It is now required to vary the frequency f_c in keeping with the modulating signal, which is represented as follows.

$$Vm = B \sin 2 f_m t$$

Using these two equations, it can be shown that the FM signal can be represented by an equation of the form

$$V_{FM} = [A \sin 2\pi (f_c + \Delta f_c \sin 2\pi f_m t) t]$$

In this equation, f_c, which represents the frequency of the unmodulated carrier, is called the rest frequench. Δf_c is the maximum frequency change the car-

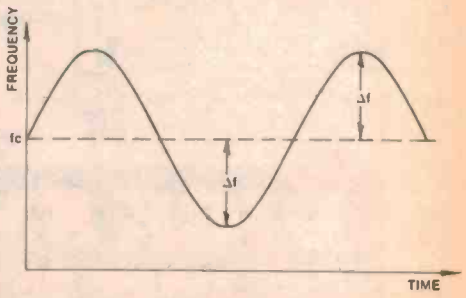

Fig. 3

Variation of carrier from rest frequency

tion:

by ELMO V. JANSZ VK7CJ

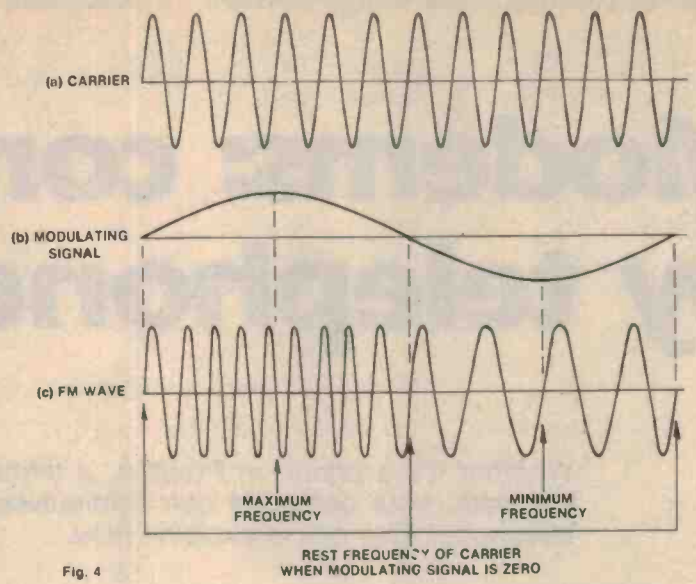

Fig. 4

A carrier frequency (a) modulated by signal (b) results in a frequency modulated waveform as shown in (c).

rier undergoes. The total frequency deviation from the lowest to the highest value is called the carrier swing. Fig. 3 shows the variation of carrier frequency from the rest frequency.

Modulation index

The frequency modulated wave is sometimes represented by an equation of the form

$$V_{FM} = A \sin (2\pi f_c t + \frac{\Delta f_c}{f_m} \cos 2\pi f_m t)$$

In this equation the quantity $\frac{\Delta f_c}{f_m}$ is called the modulation index and is normally designated by mf. In order that we do not lose the picture of the FM waveform in a lot of mathematical representation, Fig. 4 shows a carrier, frequency modulated by a sine wave.

Fig. 4a shows the unmodulated carrier. This is the rest frequency because no frequency modulation has taken place. Fig. 4b shows the modulating signal and Fig. 4c shows the resulting FM waveform. Notice that in Fig. 4c the frequency of the carrier increases in proportion to the amplitude of the modulating signal. That is, when the amplitude of the modulating signal reaches its maximum value so does the frequency of the carrier, and when the amplitude of the modulating signal reaches its minimum value the frequency of the carrier is at its minimum. This is what FM is all about.

Illustrative example

Let us illustrate the above ideas by working through a little problem. Suppose a 100MHz carrier signal is frequency modulated by a 4kHz audio tone, causing a frequency deviation of 25kHz. What are the highest and lowest frequencies that the modulated wave attains? Also find the carrier swing and the modulation index for this FM wave.

Frequency Deviation Δf = 25kHz.

Highest Frequency attained = $f_c + \Delta f_c$

= 100MHz + 25kHz = 100.025MHz.

Lowest Frequency attained = $f_c - \Delta f_c$

= 100MHz – 25kHz = 99.975MHz.

Carrier Swing = 2x Frequency Deviation

= 2 x 25kHz = 50kHz

Modulation Index $mf = \frac{\Delta f}{f_m} = \frac{25kHz}{4kHz}$

= 6.25

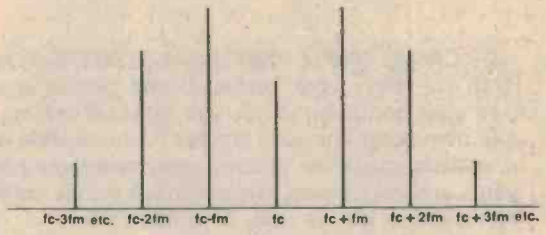

Fig. 5

A frequency modulated waveform consists of an infinite number of side-bands, although not all of them have enough power to be significant.

Frequency spectrum

Unlike an AM wave which consists of a carrier and an upper and lower side band, the FM wave consists of an infinite number of side bands as shown in Fig. 5.

Not all these side bands, however, have enough power to be significant. The amplitude distribution is clearly shown in Fig. 5.

Noise and modulation index

The modulation index of an FM system has a direct bearing on its ability to suppress noise. When the modulation index increases, the signal to noise ratio with respect to an AM system increases, for the same signal input to the AM receiver. The improvement in signal to noise voltage ratio is given by the formula

Improvement in dB =
$4.75 + 20\log_{10}$ (Modulation Index)

As an example, suppose the maximum frequency deviation of a transmission is ±50kHz and the modulating frequency is 15kHz.

$$mf = \frac{\Delta f}{f_m} = \frac{50kHz}{15kHz} = 3.3$$

Therefore, the signal to noise voltage ratio improvement with respect to an AM system

$= 4.75 + 20\log_{10} (3.3)$

$= 15.2dB$

Using higher values of modulation index would increase the signal to noise ratio, but this would require an increase in bandwidth for the transmission of the FM signal. A compromise value of modulation index is normally used so that a significant improvement in signal to noise ratio takes place, without unduly increasing the bandwidth.

Modems: computing by telephone

Whether it's a printer in Preston, a terminal in Tempe or a data base in Denmark, your computer can communicate with it using a modem and a telephone. This article explains how.

by SCOTT PARKER

LIFE CAN BE SIMPLE AND UNCLUTTERED IF YOU ARE CONTENT TO HAVE your keyboard and printer at arm's length from your computer. If you are satisfied writing and running your own programs, with contact to the outside world limited to reading magazine articles, purchasing pre-packaged programs and exchanging ideas with others via computer clubs, letters and/or phone calls, then that's fine.

But should you decide to expand your world, and tie your personal computer to a time-sharing system – or write your output to a distant printer or terminal – you suddenly are involved with data transmission and the need for a modem (Modulator-Demodulator). Your computer can send its data stream to a remote terminal over telephone lines with a modem at each end. The modem at your end converts the digital bits to a more convenient form to transmit over the phone lines, and another modem at the distant location restores the original stream of data bits.

Similarly, if you wish to make use of time-shared computer networks, such as the Source or "The Australian Beginning" a modem must be inserted between your terminal (or computer) and the telephone line.

Why are modems necessary? Why not simply route computer signals along the telephone wires to a peripheral device such as a printer or remote terminal?

Telephone lines were designed to carry audio signals in the 300Hz to 3500Hz range. Frequencies below 300Hz are attenuated and thus a stream of data pulses routed along such a line would suffer waveform distortion as shown in Fig. 1. Here a logic-pulse train of three 0's is followed by five 1's as shown in Fig. 1-a. If this pulse train were to be transmitted over the telephone lines, then attenuation would result as shown in Fig. 1-b. Many of the logic 1's transmitted over the telephone line would be recognised as 0's at the remote peripheral, with resultant errors.

Since the telephone line is optimised to handle the 300Hz to 3500Hz frequency range, it is practical to convert the data bits to sine waves or sinusoidal tones that can be transmitted without distortion. Computer data is in the form of pulses – a pulse represents a logic-1 level, the absence of a pulse represents a logic-0 level, as shown in Fig. 2. Thus, a pulse or digital signal has two distinct states with nothing in between.

An analog signal, or sinusoidal signal, is a continuously-varying voltage, as shown in Fig. 3; its frequency and amplitude remain constant as long as nothing is done to alter or modulate it. In that form, the sinusoidal voltage is termed a carrier and, since it is at a fixed frequency and amplitude, it conveys no information. However, if its amplitude were deliberately changed – such as reduced to zero for a few seconds – and then allowed to return to its original condition, it would convey information that some input had caused the change in the carrier.

As an example, the light beam in a photosensitive burglar

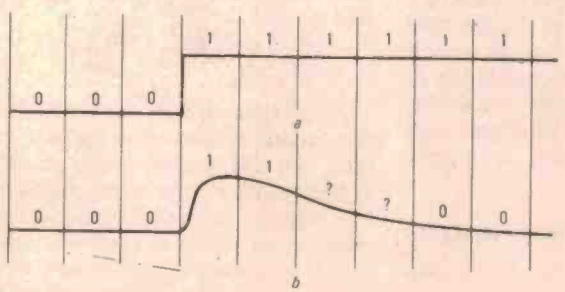

Fig. 1: a stream of data pulses (a) sent over a telephone line would be distorted by the line's limited bandwidth (b).

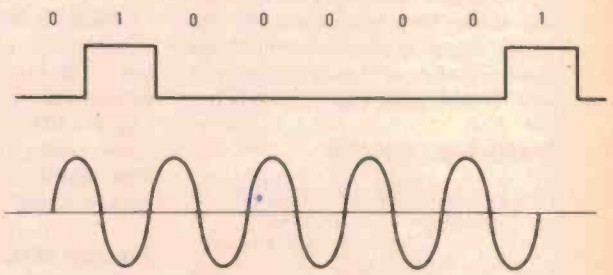

Fig. 2 (top): For digital data a pulse represents a "1" and the absence of a pulse a "0", while the frequency and amplitude of a sinusoidal signal remains constant unless modulated as shown in Fig. 3 (above).

alarm system sends a steady beam of light from a lamp, across a doorway, to a detector. The beam is a carrier that conveys no information until someone passes through the doorway, interrupting the light beam; the short duration during the absence of light at the detector conveys information that something has changed the carrier. Changing or altering the carrier is termed modulation.

AM, FSK, and PSK

The three common techniques used to modulate or alter a fixed-frequency signal (carrier) are: amplitude modulation (AM), frequency modulation (FM), or phase modulation (PM).

With amplitude modulation, Fig. 4, the level or intensity of a constant-frequency sinewave is varied. For example, an increase in amplitude could signify a logic-1 level while a decrease in amplitude would signify a logic-0 level.

In frequency-modulation, shown in Fig. 5, the amplitude of the sinewave is kept constant but the frequency of the carrier is changed. For example, a logic-1 level could be represented by a carrier frequency of 1650Hz; a 1850Hz tone could be generated if the logic state changes to a 0. The term FSK (frequency-shift keying) is often used to indicate that the carrier's frequency is shifted between two distinct frequencies to designate logic 1's or 0's.

Phase modulation, shown in Fig. 6, involves instantaneous changes in the phase of the carrier relative to a fixed reference phase angle. A standard sine wave starts at zero amplitude and zero phase angle, rises to a peak positive amplitude at 90°, and drops to zero at 180° before returning to zero at 360° (see Fig. 3). It is possible to represent a logic-1 level as a signal with a particular phase angle and a logic-0 level as the same amplitude, same frequency carrier but displaced in phase by 180° (see Fig. 6). A phase-detector circuit can be used to detect the phase of the carrier and thus determine whether a logic 1 or logic 0 is present. That technique is called PSK or Phase-Shift Keying.

It is possible to combine amplitude modulation (AM) that has two states (high or low) with phase modulation, which can be extended to four phase shifts, to provide eight signal-state conditions; that technique is termed quadrature phase modulation. Using that technique, data rates as high as 9600 bits-per-second are achieved.

Frequency modulation or FSK is most commonly used for modems operating at 300 bits-per-second or less.

Parallel-to-serial interface

Letters or characters generated by a computer are generally coded in an 8-bit ASCII (American Standard Code for Information Interchange) set. ASCII is a 7-bit code with 128 combinations for letters, numerals, and control functions. During serial transmission, the ASCII code is sent as an 8-bit word, with the additional bit used for parity or error checking. Those bytes of information, containing eight bits or pulses, cannot be sent over the conventional two-wire telephone line; the parallel or simultaneous transmission of bits must first be converted to a serial transmission, with bits moving along the phone line one at a time. The necessary parallel-to-serial conversion is performed by an RS-232 serial interface.

Assume that the computer is transmitting the letter "r", represented by 01010010 in the ASCII code: The serial interface would accept the simultaneous group of bits and output them one bit at a time, as shown in Fig. 7. The string of bits are represented by voltage levels of 0 and +5 for a logic 0 and a logic 1, respectively. Those pulses are then fed to the modem that converts them into audio tones. Those audio tones are transmitted along the phone lines to the distant computer or terminal, where a receive modem converts or demodulates the audio tones to their binary equivalents.

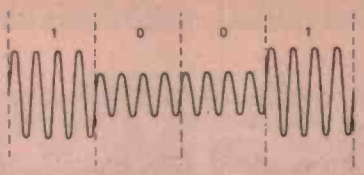

Fig. 4: In amplitude modulation (AM) data is represented by a change in the amplitude of the waveform.

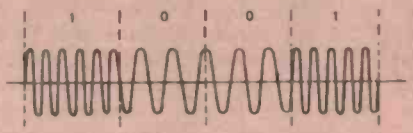

Fig. 5: In frequency modulation (FM), the frequency of the carrier is varied to represent data and the amplitude is constant.

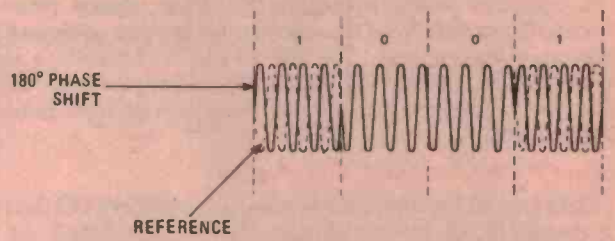

Fig. 6: Phase modulation (PM) represents a "1" by a signal with a particular phase and a "0" by a phase shift of 180°.

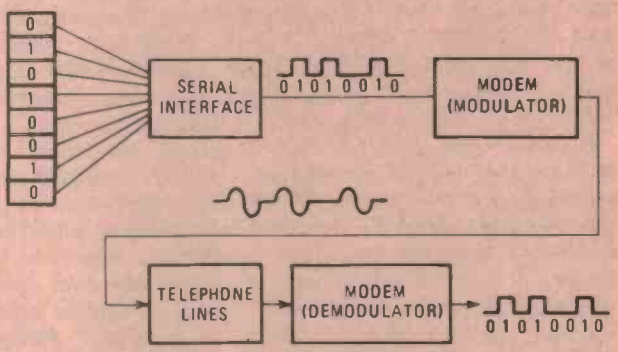

Fig. 7: The components required for serial communications are shown in this generalised block diagram.

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Modems: computing by telephone

The RS-232 interface standard, adopted by the Electronic Industries Association (EIA), is the equivalent of the international CCIT TV24 standard. The 25-pin connector arrangement used for modems involved with serial data transmission is shown in Fig. 8. Table 1 lists the pin functions for modems that are used for synchronous and asynchronous transmission.

Although EIA does not define how data is to be transmitted, it does define the control functions and their use. It also standardises the pin connections on a 25-pin interface connector; the computer or terminal holds the male connector while the modem uses the female 25-pin connector. Terminals can be connected to a computer if cable length is less than 20m; for lengths extending more than this distance errors due to lost bits or extraneous noise-pickup may compromise the system.

If distances within a building involving several terminals exceed 20 metres, line drivers may be used at each terminal and at the computer. The line driver is basically a signal converter to amplify digital signals routed from an RS-232 interface connector; twisted-pair wires can be used between line drivers.

Simplex, half-duplex, full-duplex

Data can be transmitted between a computer's I/O port and a peripheral device by simplex, half-duplex (HDX), or full-duplex (FDX) modems. Simplex modems allow transmission in one direction only and thus are not often used. In a half-duplex system, data may be sent in either direction but not simultaneously. With full-duplex modems, transmission can take place in both directions at the same time. With full-duplex, two telephone channels are required, while simplex and half-duplex modems require only one. Most modems are designed for either half-duplex or full-duplex operation.

Modems are available for long-haul (extremely long distances) or short-haul (relatively limited distances). Long-haul modems are capable of satisfactory performances over thousands of kilometres of standard telephone or leased lines. Short-haul modems, generally slightly less expensive than long-haul versions, are designed to operate over limited distances with short, leased lines. There is no specific industry standard or definition for short- or long-haul distances. Modems may be classified by the speed of operation with these definitions. Low-speed: up to 600 bits-per-second; medium-speed: up to 2400 bits-per-second; high-speed: up to 9600 bits-per-second; and wideband: above 9600 bits-per-second. It is common to refer to data-transmission speed as baud or bits-per-second; however, this is strictly true if the transmission system only involves two signal states (on or off), as is the case with a computer.

Peripherals, such as a slow-speed printer, must operate at the same baud rate as the modem. Thus modems with multiple transmission rates may include a switch (or wiring connections) to match the data-transfer rate of the modem to the printer. For most installations, modems are hooked up to a dial-up line in a standard telephone network or perhaps a Telecom leased line; for short distances, one or several twisted pairs of wires may be used. (When modems are used with the telephone network, signals are limited to a specified level to avoid line overload and interference). Modems carrying Telecom approval can be connected directly to the phone lines; otherwise, users must include a Telecom approved interface betwen the modem and telephone circuit.

Here's a simple example of how a modem would transmit and receive data in a full-duplex system (see Fig. 9).

The ASCII output from the computer, converted to serial form, is routed to the send modem that converts the logic state of 0 to a frequency of 1180Hz and a logic 1 to 980Hz.

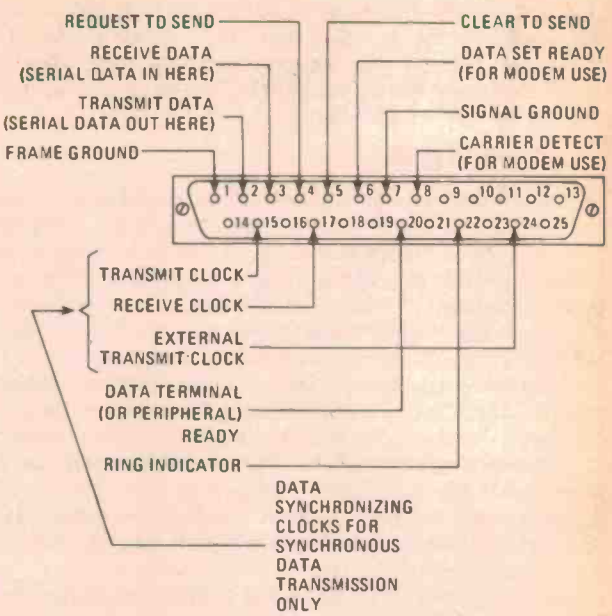

Fig. 8: Pin connections for the standard RS-232 interface. The 12V inputs shown in Table 1 have been omitted here.

TABLE 1—MODEM INTERFACE FUNCTION

PIN NUMBER	SYNCHRONOUS	ASYNCHRONOUS
1	Frame ground	Frame ground
2	Transmit data	Transmit data
3	Receive data	Receive data
4	Request to send	Request to send
5	Clear to send	Clear to send
6	Data set ready	Data set ready
7	Signal ground	Signal ground
8	Carrier detect	Carrier detect
9	---	+12V
10	—	−12V
15	Transmit clock	
17	Receive clock	
20	Data terminal ready	Data terminal ready
22	Ring indicator	Ring indicator
24	External transmit clock	

Table 1 shows RS-232 connections for both synchronous and asynchronous data interfaces.

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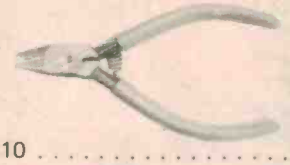

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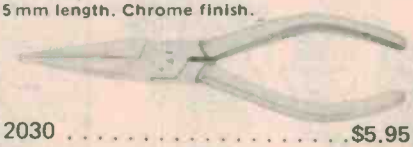

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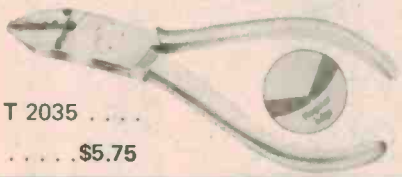

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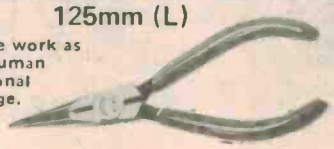

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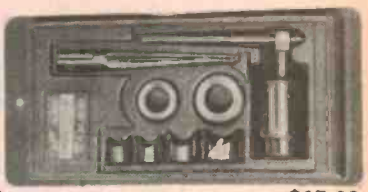

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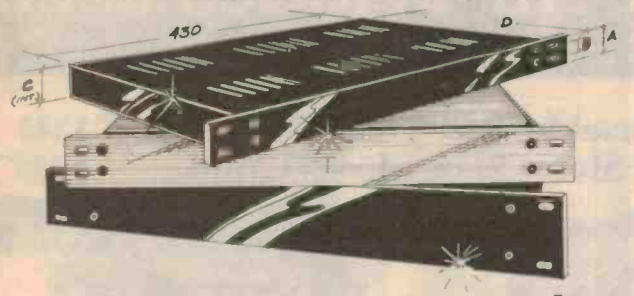

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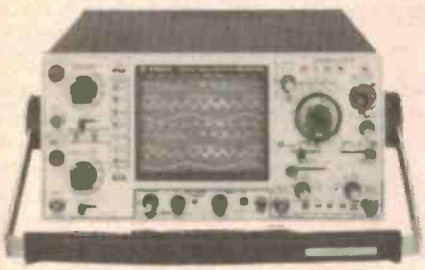

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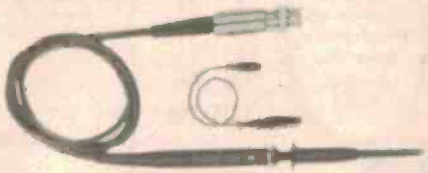

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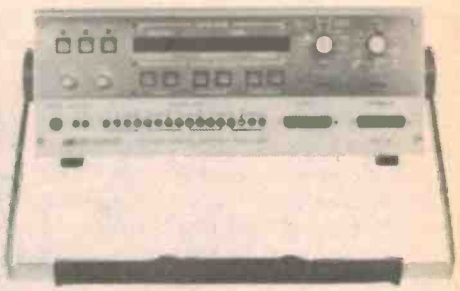

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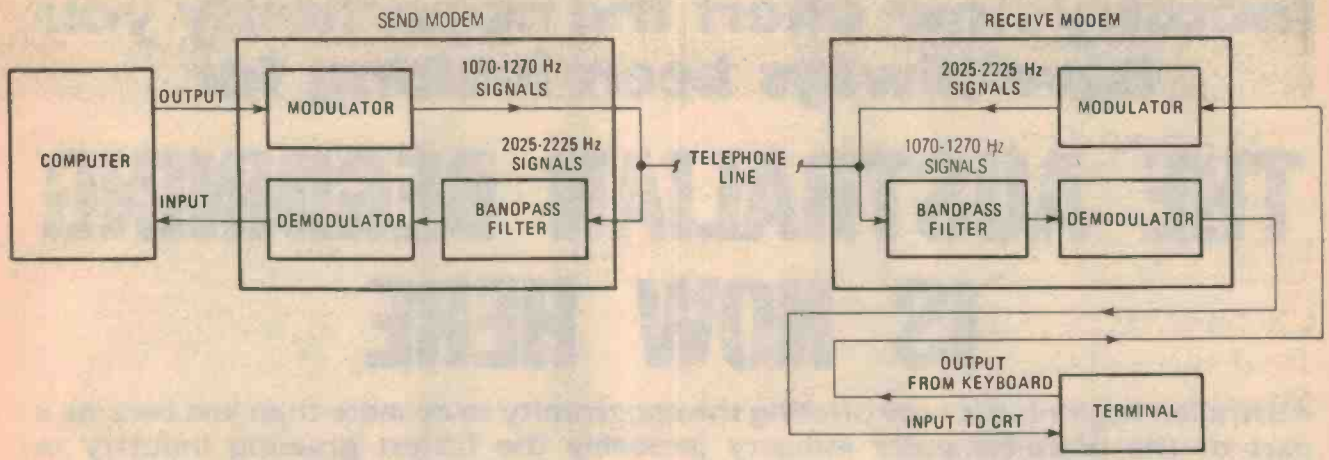

Fig. 9: A block diagram shows how a modem is used for bidirectional transmission in a full duplex system.

The frequency-shifted (or FSK) signals are then sent along the telephone lines to a distant location where a receive modem accepts the signals from the telephone line via a bandpass filter that passes signals in the range of 950-1200Hz and rejects all other frequencies. The 1180Hz tones are converted back to logic 0's and the 980Hz audio signals to logic 1's, restoring the original string of ASCII-coded pulses.

Now, the operator at the distant location may wish to send data or instructions back to the main computer to answer or respond. The keyboard output, in the form of ASCII-coded pulses, is fed to the modulator at the receiver modem where a logic 0 state generates a 1850Hz audio tone and a logic 1 develops a 1650Hz tone. Those audio signals are sent back, along the same telephone wires, to the main computer. At the main computer, a bandpass filter accepts the 1650Hz and 1850Hz signals and rejects other tones before they reach the demodulator. At the demodulator, the 1850Hz and 1650Hz tones are converted back to their logic 0's and logic 1's. Since two different sets of frequencies 980/1180Hz and 1650/1850Hz are used together, specially-designed bandpass filters are required to make the full-duplex system feasible using only one set of telephone lines.

Some modems on the market are available as originate only or answer only; although those units are less expensive than modems that include both originate and answer, they are obviously limited in performance.

An originate-only modem converts the logic 1's and 0's to the 980-1180Hz tones that are sent over the telephone lines. It cannot, however, receive tones in that frequency range. It can only receive the 1650-1850Hz tones. Therefore, two originate-only modems cannot talk to each other. Until recently this type of modem is the kind that you will probably use with your home computer to access dial-up data bases.

An answer-only modem converts logic 1's and 0's to the 1650/1850Hz tones, but it cannot receive these tones. It can only receive 980/1180Hz tones. Some answer-only modems have the capability to answer the telephone and connect the computer to the telephone line. A modem with answer and originate capabilities can both send and receive data on both tone pairs. That kind of modem can therefore, carry on a conversation with either an originate-only or an answer-only modem.

Synchronous vs asynchronous transmission

Data is in the form of a stream of logic 1's and 0's, representing letters, numbers, and symbols. As they are transmitted over the telephone lines, some method of synchronisation – either synchronous or asynchronous – at the sending and receiving ends is required to maintain the bit code.

Asynchronous transmission involves defining the beginning and end of each individual character or 8-bit byte sent over the lines. The word asynchronous can be misleading since it implies no synchronisation. Actually, a begin and end (or start and stop) bit is inserted between each 8-bit word to synchronise the transmitter and receiver; a parity bit is included to detect errors.

Synchronous transmission does not involve individual timing signals for each character; instead, timing signals are provided for long, lengthy stretches or blocks of data flow. Thus, there are no start and stop bits between characters.

Binary data transmission may be expressed as one of two conditions, mark for a binary 1 and space as binary 0, shown in Fig. 10. In asynchronous transmission, the transmitter rises to a mark condition at the end of each byte and remains at that level until the next byte is heralded by a space; thus, the mark at the end of the byte is the stop bit and the space at the beginning of the byte is the start bit. Those two synchronisation bits permit the receiver at the end of the line to lock in or sync with the transmitter. However, an 8-bit byte requires an additional two bits to signal when a byte is arriving and is completed; those bits do not convey data and thus the system is relatively inefficient. The clock or timing signals at the transmitter and receiver are synchronised or locked each time a byte arrives; there may be lengthy periods (in the fast nanosecond world of computers) when bytes are not transmitted. However, as a new byte appears, synchronisation will again take place. Asynchronous transmission of the letter "R" with start, parity, and stop bits included, is shown in Fig. 10. If data bits could be sent in a continuous stream, efficiency would be increased. For high-speed data,

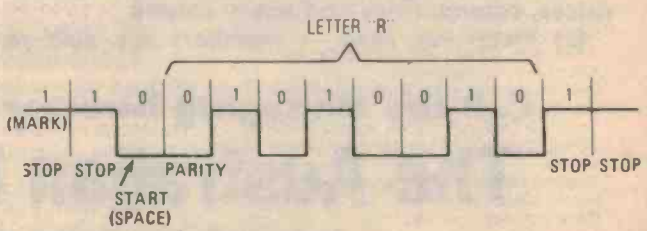

Fig. 10: Asynchronous transmission of the letter "R" in ASCII code with start, stop and parity bits.

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synchronous transmission is used whereby the transmitter clock triggers the receiver clock and is allowed to run for a lengthy sequence of bytes or blocks of data. Bytes are transmitted in a rapid, steady stream; in the event that gaps occur in the data flow, the transmitter must inject idle-bytes to maintain sychronisation. The synchronous transmission system is initiated by a predetermined bit pattern or code sent by the transmitter.

Direct connect modems vs acoustic couplers

Modems are available either as direct connect or acoustic coupled types. The hard-wired units are connected to the telephone lines directly by means of a plug fitted into the telephone's wall jack. An acoustic coupler, shown in Fig. 11, is designed to accept the telephone handset physically; the analog/digital signals entering and leaving the telephone lines are fed to the modem through tight-fitting, soundproof rubber cups to reduce external noise that might enter and upset transmission. ASCII input (in serial form) from the computer is fed to the modulator which converts logic-0's and 1's to either of two tones. FSK audio signals are converted to logic-1's and 0's by the demodulator to reproduce the ASCII coded information.

In use, the rubber cups are tightly pressed against the mouthpiece and receiver of the telephone handset; the audio tones are then transmitted along the phone lines. Assuming that a full-duplex system is used, incoming audio tones reach the earpiece of the handset, which is closely coupled to a microphone. The two-tone FSK audio signals are converted to logic 1's and 0's by the demodulator to produce the ASCII coded information sent by the distant computer or terminal.

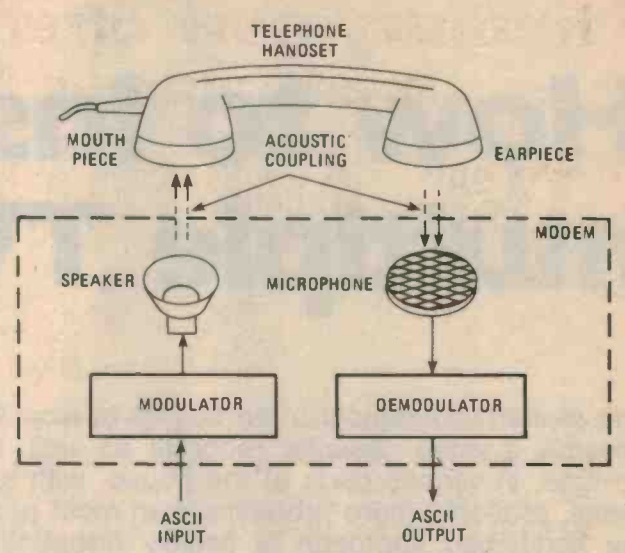


Fig. 11: An acoustic coupler accepts the telephone handset in rubber cups. They can be used with any telephone, but are susceptible to noise from external sources.

Until recently, direct connection modems were generally more expensive than acoustic coupled types; however the Dick Smith Electronics direct connect modem has reversed this relationship.

How to install multiple TV outlets

The modern household often boasts at least two TV sets, and possibly a video cassette recorder as well. Feeding all these devices, in various parts of the house, with a clean, strong TV signal, presents more problems than most people imagine, and the handyman approach is usually disappointing. This article discusses the problems and the practical solutions to them.

by JIM LAWLER *

When TV was introduced about 25 years ago few people had more than one TV set, and that usually lived permanently in the lounge room. Not until smaller, more portable sets became available did the need for two or more antenna outlets arise.

All sorts of signal dividers were in use, from simple parallel junctions to well designed signal splitters. With monochrome signals in ghost free locations almost anything worked, and most viewers were satisfied.

With the advent of colour TV, well designed and installed signal handling systems became essential. Systems that had passed monochrome signals without trouble still passed monochrome but not colour. Many people installed new antennas in the hope that this would cure their troubles. Most were disappointed. The faults lay in the connecting cables and had to be corrected before the system would work properly.

Recently, the introduction of video cassette recorders has led to a demand for even more complex signal distribution systems. The purpose of this article is to uncover some of the mystery surrounding the handling of VHF TV signals.

If you have only one TV set, your system can be represented as in Fig. 1. The three elements are the antenna, feeder cable and the TV set. If these are well designed and carefully installed, the system must work wherever there is sufficient signal. When you add a VCR to this system, no changes are needed. The antenna feeds the VCR which in turn feeds the TV set, as in Fig. 2.

If you already have two sets working off the one antenna, as in Fig. 3, the addition of a VCR is simple enough while you are content to watch the VCR replay on only one of the TV sets. The antenna signal is split two ways in the two-way splitter and one of the splits goes to the VCR as in Fig. 4. The difficulty with this arrangement comes about when you wish the play the VCR through either TV set. One idea is to feed the VCR output back into the antenna socket, as shown by the dotted line in Fig. 4. This is a "brute force" method and relies on the VCR being able to overcome the cumulative losses in the splitter.

*Professional TV serviceman, Geilston Bay, Tasmania, 7015.

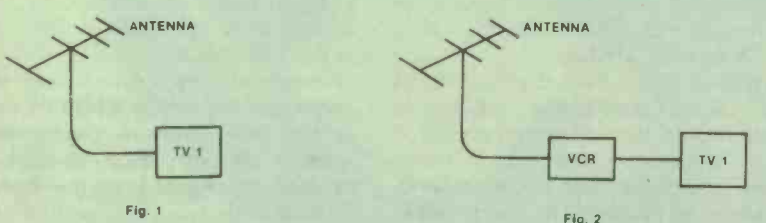
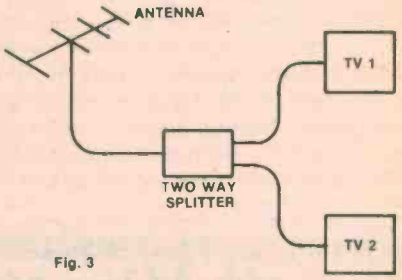


Fig. 2 shows how a VCR is added to a system with a single outlet.



A two way splitter is necessary to run two TV sets from a single antenna.

Better approach

A much better arrangement, although a more complicated one, is shown in Fig. 5. Here the VCR output is brought back to the antenna end of the system and mixed with the broadcast signals in a "combiner". The output of the combiner now contains all the available TV channels plus the VCR output and can be distributed as in the earlier examples.

Once the system reaches this degree of complexity a nasty gremlin called "loss" begins to make his presence felt. Each combiner and splitter takes a little energy out of the system and these losses accumulate. The result can be a weak, snowy picture. If time and energy are of no consequence, you can install the system and see if it works, but it's much easier to calculate the signal strength needed and to arrange an antenna capable of meeting the requirements.

Antenna signals are measured in microvolts (μV) and for a good, snow free picture most sets need about 1000μV at the antenna socket. To make the calculations easier, it's an advantage to convert the various voltages to

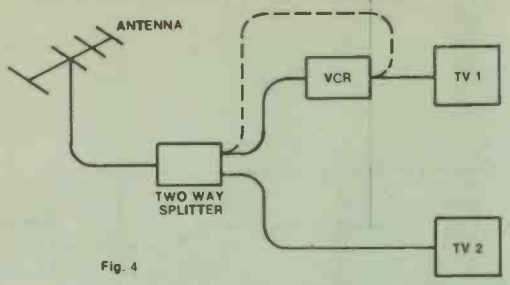


Fig. 4

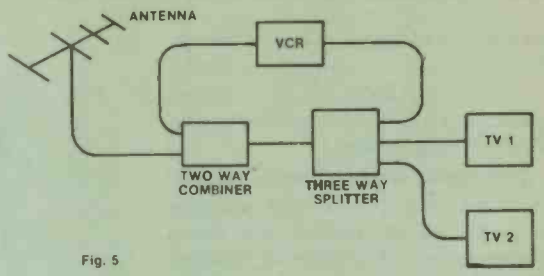


Fig. 5

How a VCR output can be made available to two TV sets. Fig. 5 is the preferred approach.

decibels (dB) above 1μV. Losses are then simply subtracted from the antenna signal to arrive at the level delivered to the set. 1000μV represents 60dB so the antenna must deliver this level plus all the losses in the system.

Using Fig. 5 as an example of the calculations, it will be seen that the TV sets follow a three-way splitter. A typical three-way splitter has one leg of minus 3.5 dB and two legs of minus 7dB. The set connected to the minus 7dB leg still requires 60dB so the level into the splitter must be 67dB. The combiner is actually a splitter working back to front and its losses are the same in either direction. The average two-way splitter or combiner has a loss of 3.5dB on each leg so, if it is to deliver 67dB to the following splitter, its input from the antenna must be 70.5dB. If the antenna delivers more signal you have no worries. If less, you will need an antenna with higher gain.

The only way to ensure that the antenna is delivering enough signal is to measure the level with a signal strength meter. If you can't borrow one, it is a wise economy to pay an installer to measure your signals. Once you know the level available the rest of the system can be designed with confidence.

One point that must be mentioned here is the balance of signals. That is, all channels available to the antenna must deliver approximately the same signal level. A difference of 10dB is acceptable provided that no signal gives less than 60dB at the TV set.

Intermodulation

In locations where a distant station is available but at a low level, some amplification must be provided before the signals are combined and split. Fig. 6 shows how this can be done. With this system a serious problem can arise. In spite of the fact that the high gain antenna may be pointing well away from the direction of the local channels, there will still be considerable pickup of local signals on this antenna. This will be amplified by the masthead amplifier and will cause intermodulation of the various signals in the system.

Intermodulation causes two distorted pictures to appear at the same time, often with a vertical black bar moving across the screen. It's a nasty problem and can only be prevented by keeping the high level local signals out of the amplifier. This is done by using a masthead amplifier designed for the channel of interest only, with heavy attenuation of all other frequencies. These are available to order and cost only a few dollars more than a conventional broadband amplifier.

At this point a few words about how a VCR handles TV signals is in order. Fig. 7 shows the internal arrangement of a typical VCR. The signal enters from the antenna and is passed through a broadband amplifier. This is provided to make up for the losses in the next stage, a two-way splitter. One split goes direct to the changeover switch on the VCR's RF outlet. The other goes through the VCR's signal processing circuits, then to the VHF or UHF modulator and onto the changeover switch. This arrangement allows you to watch one channel while the VCR records another.

The presence of a broadband amplifier in the VCR can cause similar problems to the intermodulation discussed earlier. If one of the local channels is much stronger than the others it can cause intermodulation in the VCR. This is rather harder to deal with than the antenna problem. It isn't possible to modify the VCR's internal amplifier, so some sort of external trap will be required to reduce the offending singal.

Fortunately, the offending signal is usually Channel 2 and ready made traps are available to cut this back to manageable levels. If one of the other channels is causing the problem, it will be necessary to have a trap specially made. The signal level measurements mentioned earlier will be a big help in specifying the attenuation, in dB, needed to bring the offending level back to balance with the other channels.

Getting complicated

Finally, there is the system shown in Fig. 8. This is about the biggest domestic installation imaginable and combines two separate systems at my home and backyard workshop. The input accepts local TV, VCR, and pattern generator signals. A three-way splitter after the combiner feeds two dual outlets on the service bench and a long trunk up to the house. There, a two-way splitter and a dual outlet feeds two TV sets and the VCR. To complete the system, the VCR feeds a trunk line back to the combiner in the workshop.

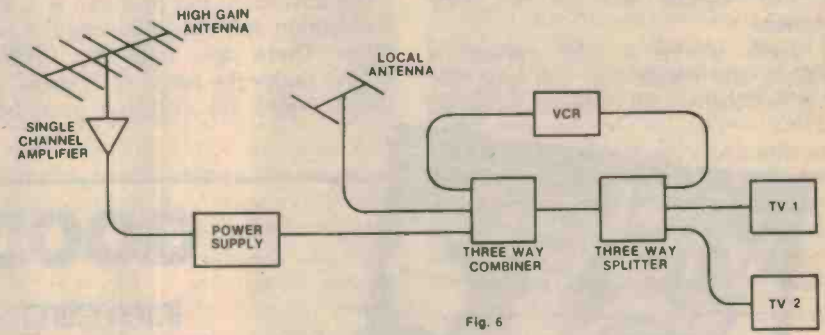


Fig. 6

This arrangement accommodates two antennas, a VCR and two TV sets.

Needless to say, a system such as this is very lossy and needs a healthy signal into the head end to make everything work. It also introduces another source of losses that hasn't been mentioned yet. Coaxial cable has a built in loss of about seven to 12dB per 100 metres at 200MHz. Thus my 25 metre trunk lines adds a 3dB loss to those introduced by

the combiner and splitters. In any design, a cable run of up to 10 metres can be ignored, but if the system has to feed sets at opposite ends of the house then cable losses can be important.

Up to this point we have been discussing systems for the VHF service on channels 0 to 11. At the present time there are UHF services in Adelaide, Melbourne and Sydney only, and a few other translators in some difficult locations. Also, there are some VCRs that output a signal on the UHF band. There are no UHF services in my location, so I have no direct experience of handling these signals. Nevertheless, good VHF practice will apply directly to UHF provided certain precautions are taken.

Firstly, all terminations must be perfect. A loose screw might pass VHF but not UHF. Splitters and combiners should be screwed up firmly then finished with a touch of solder. And they must be suitable for UHF. Most brands on the market now are designed for both bands and should work well, but older units designed in the days of monchrome TV are probably quite unsuited to UHF. Another cause of serious losses is in the cable itself. Coax losses increase as the frequency goes up, and UHF is up a long way. Cable runs should be kept as short as possible and if a long run is necessary, an amplifier will be required.

If a system is working well on VHF, the introduction of an amplifier to lift the UHF signals may cause intermodulation of the lower bands. Remember what has been said about balancing the available signals. Success will depend on keeping the VHF signals out of the UHF amplifiers.

In areas where a UHF service is available, the installation will look like Fig. 6, but with a UHF antenna replacing the high gain antenna and single channel amplifier. If you also get a distant channel the front end can become very busy. A four-way combiner will be needed to mix all the signals and these items are very lossy.

The answer to this problem is a small distribution amplifier following the combiner. These are made by Channel-Master under the name of "Vutron" and similar items are available from other manufacturers. The Vutron has a gain of about 12dB and this is just enough to overcome the losses in the combiner and splitter.

Having got all this gear installed and working, here is a word of warning. Don't play your R-rated cassettes when your mother-in-law is staying with you. The VCR output appears at every TV set, and Ma-in-law might not appreciate R-rated movies in her bedroom.

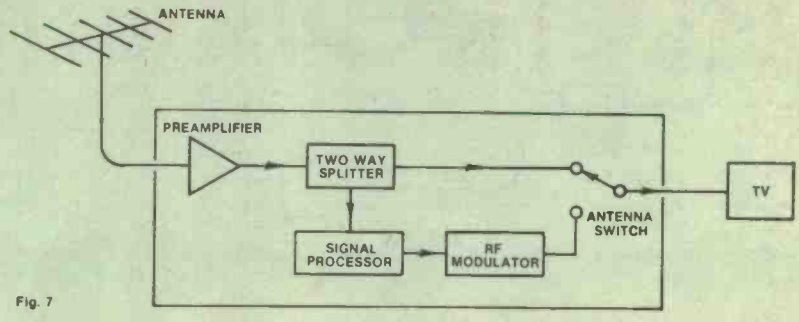


Fig. 7: internal arrangement of a typical VCR.

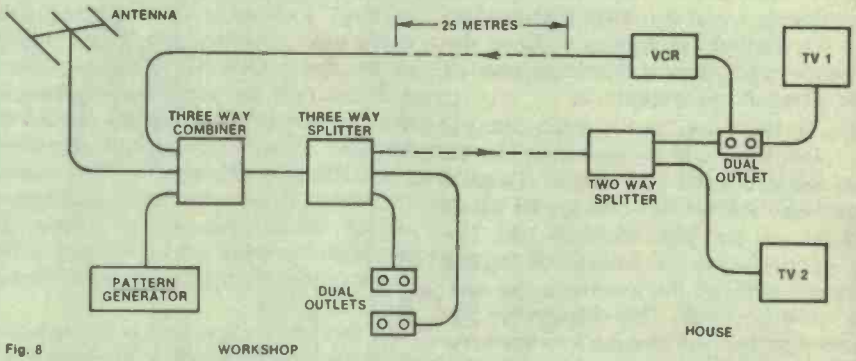


Fig. 8: this system provides multiple TV outlets for the home and workshop.

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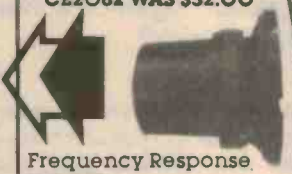

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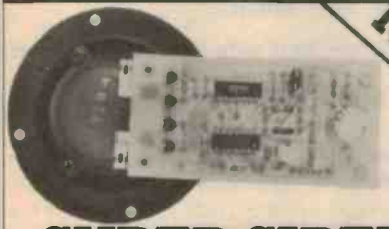

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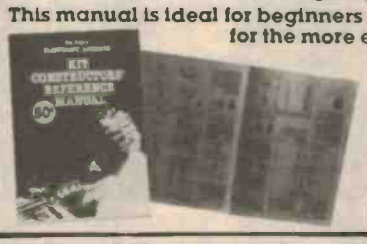

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FORUM

Conducted by Neville Williams

Tracking, thorn needles and assorted topics

Getting caught up in major themes, in these columns, has one inevitable result: smaller items tend to get passed over. So, in this issue, and perhaps the next, I plan to gather together some of the "loose ends". For starters, what about a limerick?

"Why a limerick?" you may ask.

For no other reason than, while sorting through the files, I came across a couple of pages from the January 1972 issue of "Hi-Fi News and Record Review", carrying the results of a limerick competition.

Some of the entries were "R-rated", or at least NRC but, having in mind past discussion about the dynamic range of recordings, trackability, etc, this one from a certain R. Mackenzie, seemed appropriate:

A stylus was told by a platter
To follow the groove and not chatter.
Came back the reply:
"I really would try,
"If only the platter were flatter!"

While we did have a fair bit to say about groove tracking, as recently as in the last issue, we have tended to "cool" prolonged debate on the two closely allied subjects – extended dynamic range and digital recording.

If not suitably inhibited, discussion of these topics can proceed at great length and with almost evangelical fervour – becoming tedious in the process.

WHY ALL THE FUSS?

By contrast, some choose to push aside all the ifs and buts, proceeding to a conclusion which may be as simplistic as it is summary. Take, for example, the following letter:

Re Forum articles on digital recording (Nov '81 and Jan '82). I agree that some of Douglas Sax's claims seem to be outlandish and to lack justification.

But aren't we getting away from the important issue, the end product of all this technical, theoretical debate – the record?

I challenge anyone to find a better recording, regardless of price, in either digital or analog format in terms of depth of detail, clarity, lack of surface noise, imaging, than the Sheffield Lab Analog series.

Surely this indicates that both conventional analog and digital records have room for improvement!

R. D. (Christies Beach, SA)

Simplistic? Summary?

The points which R. D. seems to be making might be summarised as follows:

- Argument about analog v digital is a waste of time. The Sheffield Lab series shows what can be achieved with conventional technology, given sufficient dedication.

- If other companies want to improve their product, what they need to do is to emulate Sheffield Labs.

The observations seemingly ignore the fact that the Sheffield Lab series is a relatively limited, hand-picked issue.

The criteria which are responsible for their claimed excellence may simply not be applicable over the broad spectrum of the artists, the venues, the occasions and the performances which have to be captured on record. All these can – and do – impose their own constraints, compromises and methods.

I'd prefer to express it this way:

The most meritorious recordings are not distinguished by one particular label or one particular combination of technology.

They are recordings in which there has occurred a coincidence of a top-line performance, a sympathetic acoustic environment, an excellent (even fortuitous microphone) placement, compatible levels and dynamic range, and so on right through to the final over-the-counter pressing.

The recordings that so qualify may happen to have a predominance of certain labels and certain technological approaches, but there will be plenty of exceptions. What's more, a label/engineer/technology that excels in one area of recording may be quite ordinary in another.

I agree with R.D. that one cannot logically argue the merit of recordings on the basis of analog v digital.

But I would contest any possible inference (I did not say implication) that Sheffield has a monopoly of recording wisdom.

Perhaps we could round this off with another limerick:

Some treat sampled sound with great caution,
Lest waveshapes get out of proportion.
And some tend to sneer
At what they can't hear
And at non-existent distortion!

GOLDRING MEMORIES

At the risk of getting stuck on the groove, I would like to include a couple of other "loose ends" to do with the subject of phono pickups. The first is by way of an interview with Gerry Sharp, the present Managing Director of Goldring (UK) published in a recent issue of "Gramophone" magazine.

He reminisces about his grandfather and great-uncle (the family name was then Scharf) who moved from their native Czechosolvakia to Berlin and entered the gramophone industry in 1906.

In 1933, Gerry Sharp's father and his uncle Fred Scharf moved to Britain and carried on the business from there. (It was Fred Scharf who later set up home in Australia and established a local branch of the British company).

During the interview, Gerry Sharp mentioned some of the matters to which I referred in last month's Audio-Video pages.

He quotes the tracking weight of one particular Goldring acoustic soundbox as four ounces or 113 grams – 75 to 100 times the tracking weight of a modern cartridge!

And he states that production of Goldring acoustic soundboxes continued right up to 1955. As we observed, last month: ". . . the shadow of the acoustic phonograph remained on the disc record industry right through until after World War II."

On the subject of phono cartridges, Gerry Sharp recalls the company's efforts with the magnetic principle (Oct issue, p37) and says of the first 700-series stereo cartridge: ". . . not a great success". It certainly wasn't and remains in my memory as the one cartridge which had a negative stereo separation characteristic. Towards the high frequency end, the left/right outputs actually crossed over!

Fortunately, Goldring have learned a great deal since then and their latest top-line cartridge not only has excellent performance figures but is so light that weight needs to be added to the headshell to allow it to be used in some arms.

THORN NEEDLES

The other item to do with phono cartridges also turns back the clock by 40 years or more, to the era when audiophiles used to argue the merits or otherwise of playing their beloved records with needles contrived from natural thorns. The following letter carries its own message, for which we thank the writer:

Dear Sir,

I wrote to you some months ago, asking if the Editor-in-Chief could remember the type of cactus plant which was used to make the "thorn" needles which we once used to play the old 78rpm phonograph records.

The Myrtillocactus proved to be the more suitable of the two, as its thorns were the correct diameter for needles and had only to be cut to length and sharpened. It is possible to get three needles from one long thorn.

I remember hearing once that the needles (or thorns) were oiled as part of their manufacturing process. This may have been done to relieve the thorn of any brittleness and tendency to fracture. It could possibly provide some lubrication, as well, and reduce record noise still further. A vegetable oil seemed to be the logical choice and, having some linseed oil on hand, I tried that.

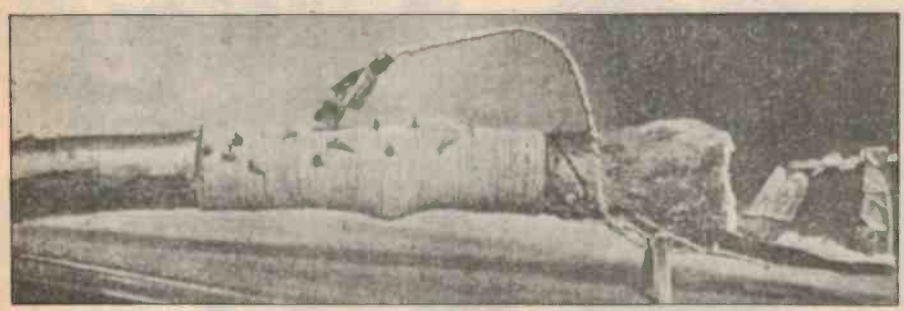
After a week or so of experimenting, I was satisfied that the needles I had made were entirely satisfactory and sounded quite the equal of my old remaining bought ones.

So, I returned to the nursery and bought a mature Myrtillocactus (about eight years old and one metre tall) which could be expected to have suitably hard spikes. So I am now the owner of my own private thorn needle manufacturing plant!

You may care to publish this letter, as it may interest those readers who, like myself, have a few old records that they might like to play on suitable occasions. The thorns are quieter than steel needles and can be resharpened. As such, they're a better proposition than spoiling the tip of a "permanent" stylus on a faulty disc. Save your permanent stylus for playing discs with a good surface.

R. O'D (Epping, NSW)

That letter stirs memories of the period when thorn needles were an everyday option for playing records. At that time, I, too, had my own cactus and a



In 1929, Mr C. Snelling built a crystal set on a piece of a plum branch. In 1982, they're accommodating receiver circuits on a single chip!

You may be interested to know that I now have the information that I was seeking. I paid a visit to a cactus nursery at Galston, Sydney, and found the lady there both interested and helpful. She had heard of thorn needles but had not associated them with cactus thorns.

After examining a few original thorn needles which I still had, she named two species which she thought would be the most likely to bear suitable spikes: one was the AGAVE, the other a MYRTILLOCACTUS.

miniature grinding-wheel sharpener made out of sheet brass and Meccano gears.

Growing happily in one corner of the back lawn, my cactus plant was the centre of considerable interest and comment. But then, as it grew from a spiny sprig to around three metres, sprouting arms on the way, it became quite a hazard to frolicking children!

If you're ever looking for an interesting odd job, try cutting down, sawing up and disposing of an overszie cactus, com-

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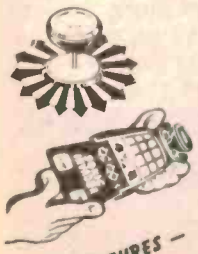

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Mr R. O'D of Epping may have a job ahead of him, in a few years time!

Still with a sense of history, but right away from phono records, a couple of reader's letters reach back into the '20s and '30s.

Prompted by an article in our April issue, G. Snelling of Granville, NSW, searched through his family relics and penned the following letter:

Recently you published information about crystal sets.

I have enclosed a "photocopy" of the Daily Telegraph Pictorial, dated May 2, 1929, showing the front page depicting "Freak Radio Sets at the Town Hall Exhibition."

My father, who was 18 at the time, won 2nd Prize with a crystal set made from a branch of an old plum tree.

He won 2nd Prize for the "Most Novel Crystal Set", and 1st Prize for the Best Crystal Set.

At that time, he was a member of the Granville and District Radio Club.

I still have the "Plum tree branch" crystal set and also a copy of the Newspaper's front page, which is a bit yellowed with age.

Trusting the above information may be of interest to you.

G. Snelling (Granville, NSW)

The occasion was identified by the Daily Telegraph Pictorial as the 1920 Radio and Electrical Exhibition. Apparently, the best that the industry had to offer was on show but the freak crystal sets took the photographer's eye, sufficient to win front-page display.

Pictured were crystal sets built into an upright telephone (1st prize, T. Cleverley); on to a plum tree branch (C. Snelling); into a dolls' house (A. Keough); and into an old boot (W. Hawkins).

Quite a feet, that last one!

Another reader, from Kingsford, NSW, is also keen to document the activities of his father, this time in connection with amateur band television in the '30s. His letter is accompanied by a copy of a QSL card, as pictured below, itself an interesting item:

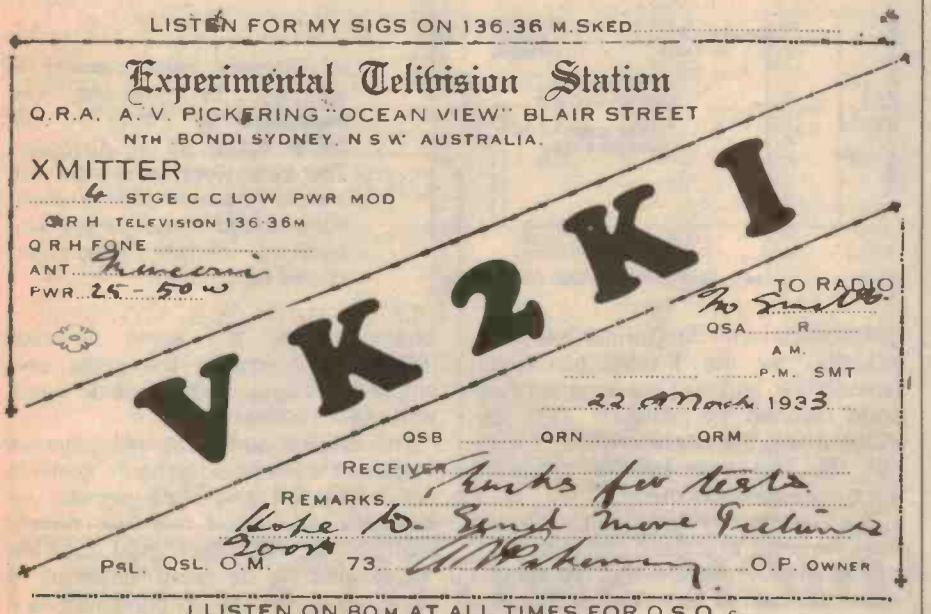
I would like to relate the experiences of my late father, Richard Ernest Smith, with radio and television from 1920 to 1940.

In March, 1933 we received television pictures from experimental television station VK2K1 – A. V. Pickering, Blair St, North Bondi. The pictures were received in black and white using the scanning disc driven by 1000rpm home-made synchronous motor. The light waves were transmitted through a neon lamp, then white frosted glass, and magnified with a 4-inch diameter lens.

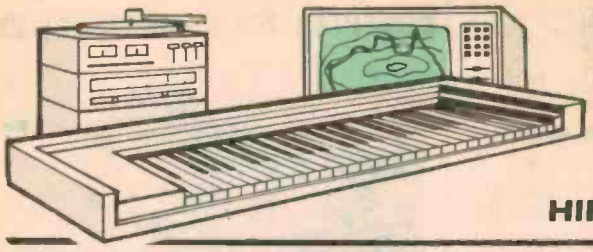
The pictures were transmitted from Blair St, North Bondi to 289 Darley Rd, Randwick. My father was a member of the Waverley Radio Club, along with Gordon Wells and A. V. Pickering. He also gave lectures at the club. One I can bring to mind was electric accumulators using Vegemite jars as cell containers.

The Technological Museum in Harris St, Ultimo has the motor and other parts of the television set used on this occasion.

P. E. Smith (Kingsford, NSW)



While John Logie Baird in England was doing a lot of pioneering work on television, Radio amateurs in Australia were following hard on his heels. This card, verifying reception of experimental TV transmissions, is dated March 22, 1933.



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TV Stereo Sound: on-air tests in Australia

Stereo sound for TV is very much in the news these days, particularly in Japan, the USA, and Europe. There are no less than four different systems currently in operation, more or less experimentally, in these countries. Australia has not made any official moves in this direction yet, but one TV channel is showing an interest.

by PHILIP WATSON

One of the systems, developed in Germany, and the subject of this article, is currently being investigated in Australia. Sydney's TV station channel 9 (TCN) has been conducting experimental transmissions, under special licence, since July of this year.

In the United States the FCC has had three of the proposed systems under review for some time, with a view to nominating a US standard. One is Japanese and two are American. The Japanese system, sometimes known as the EIAJ system, uses a 31.47kHz FM sub-carrier superimposed on the normal TV sound carrier. The normal sound channel carries an L+R signal, and the sub-carrier an L—R signal.

One American system, the Telesonics system, uses a double sideband suppressed carrier AM subcarrier, which carries the L—R signal. The other American system, the Zenith system, is similar in most respects, the main difference being in the choice of pilot signal frequency, which both systems need to restore the suppressed carrier at the receiving end.

The German system appears to have a number of advantages over these systems and a brief description of how it operates should interest readers.

Rather strangely, perhaps, the stimulus for the development of TV stereo systems was as much the language problems encountered in many countries, particularly Japan and Europe, as the straightout stereo requirement.

Films made in other languages, and intended for showing in these countries, have new dialogue dubbed in to suit the country of destination. However, where the population is mixed, many viewers can understand, and would prefer to hear, the original dialogue.

So, if two channels are available, one can carry the dubbed dialogue and the other the original sound track, or even a second dubbed track where this may be appropriate.

The German system is a relative latecomer. It was introduced at the International Radio Exhibition, in Berlin, in September 1981. Prior to that, one German TV network had been transmitting stereo sound, on an experimental basis, using the Japanese system.

The new system was developed, in collaboration with the German television industry, by the Institut fur Rundfunktechnik, and was put to air via a second German TV network, ZFD, coincident with the opening of the Exhibition. By that time suitable receivers were on sale in Germany.

The German system is quite different from the other proposed systems, all of which employ multiplexing techniques with a sub-carrier superimposed on the existing sound carrier. The German system simply adds a second sound carrier adjacent to the original sound carrier. (See Fig 1).

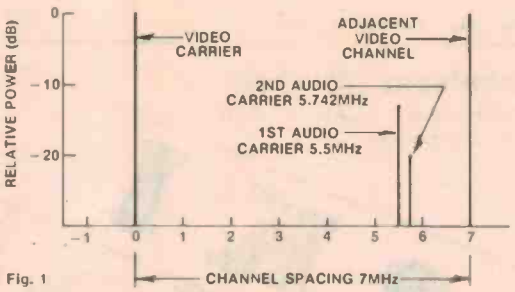

Fig. 1

In Germany, video carriers in adjacent TV channels are separated by 7MHz — the same figure as in Australia. The new German system for stereo TV sound adds an additional sound carrier as shown, involving double intercarrier sound reception.

The channel spacing used in continental Europe is identical with that used in Australia, making this system particularly attractive for this country. The original sound channel is spaced 5.5MHz from the vision carrier, producing a 5.5MHz IF sound signal in the receiver. The new sound carrier is 5.742MHz from the vision carrier, producing a 5.742MHz IF in the receiver.

The separation between these two sound channels, 242.1875kHz, is an odd multiple of half the horizontal line frequency, to minimise interference to the vision signal.

The original sound carrier normally runs some 13dB lower than the vision carrier, and the new carrier is lower again by a further 7dB. This is to minimise any risk of adjacent channel interference. In spite of this reduction the second channel performance is still satisfactory in fringe area reception conditions.

Apart from the reduced power, both channels are given identical characteristics, the same deviation (50kHz in Australia), the same pre-emphasis (50μs), and the same bandwidth (40-15000Hz).

The original audio channel (channel 1) carries a left-plus-right sum signal in which the left and right signals, individually, are set at half their normal level so that, when combined, they will not exceed the deviation limitations of the system. Also, when combined as a mono signal in a conventional receiver, they will produce the same recovered audio as would a normal mono signal.

The new carrier (channel 2) carries a

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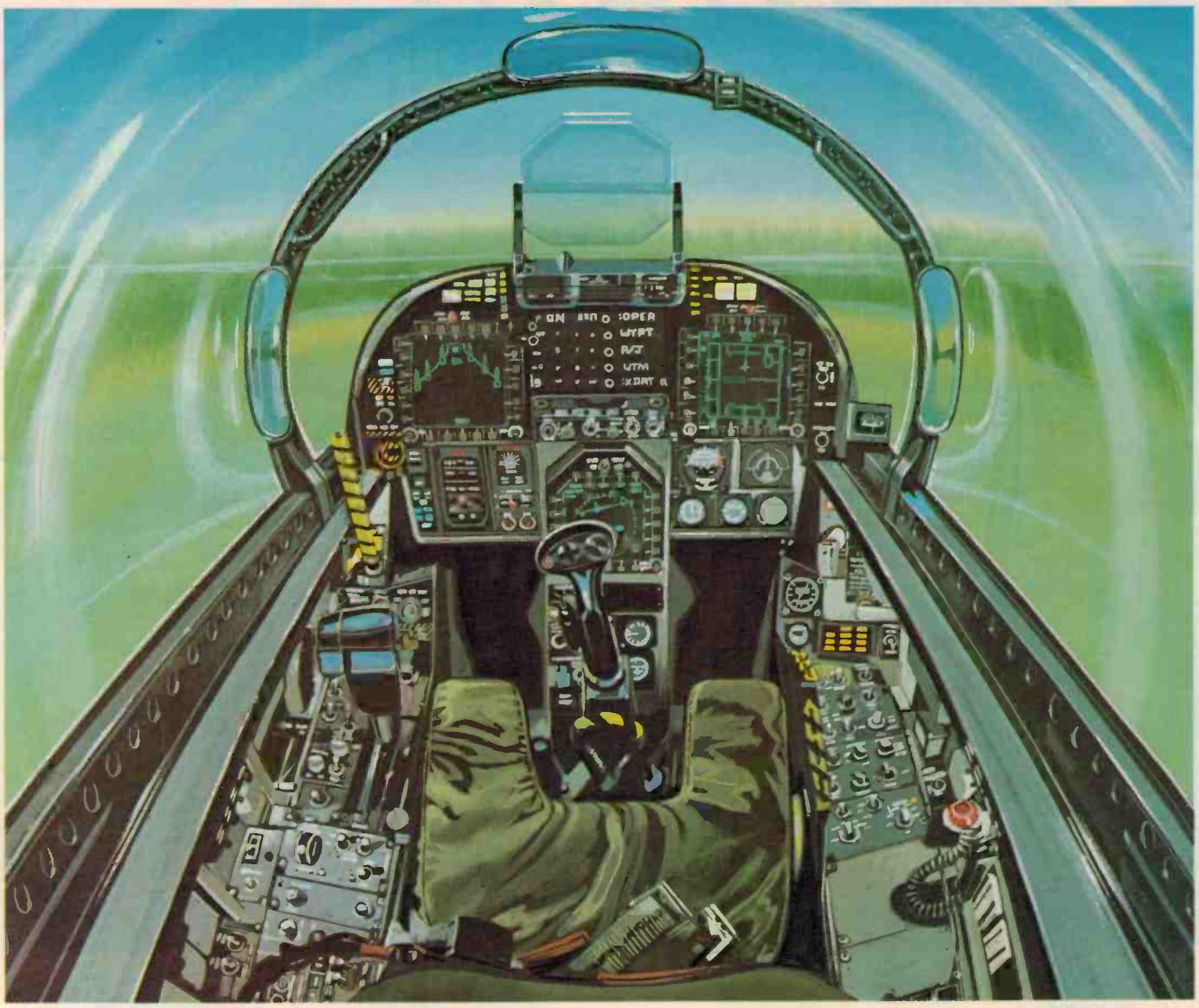

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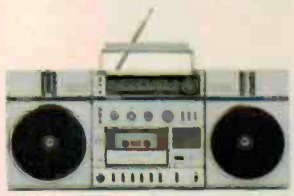
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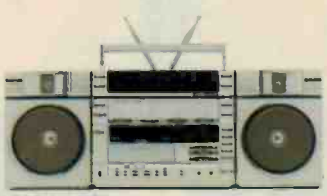
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PH480K


PH492K

In addition, Sanyo are now distributors in Australia for Fisher Equipment, and we are pleased to announce their new range of portable Stereo Radio/Cassette Recorders, with detachable speakers.

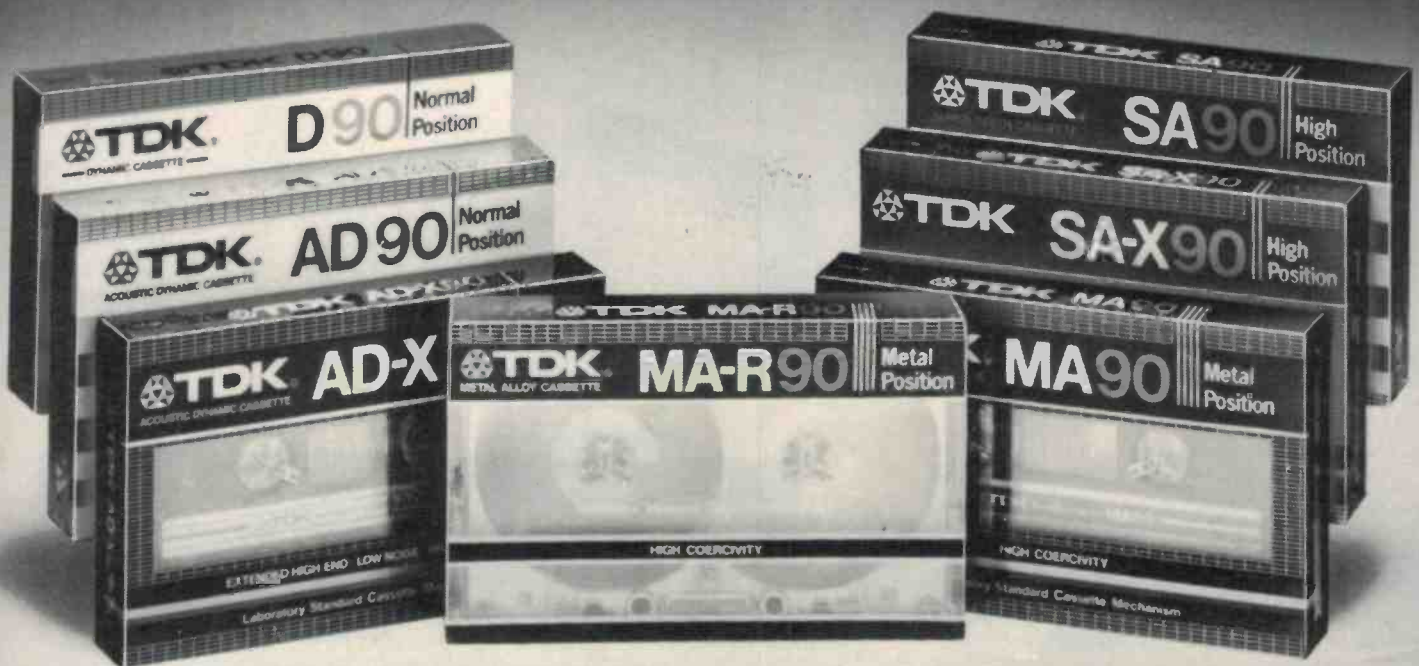
Obviously, there's not enough room here to go into details, so we'd like to suggest you see your nearest Fisher retailer.

As they say, hearing is believing. But, that's life.

FISHER

Distributed by Sanyo Australia Pty Ltd

TDK'S NEW CASSETTES. HEARING IS BELIEVING.



The lab data supporting the just-released line-up of new TDK cassettes is impressive, and detailed objectively on other pages. But to fully appreciate the dramatic difference between these new tapes and any others you are using, ours included, you should hear for yourself. Choose from new MA-R and MA for metal position, new SA-X and SA for high position and new AD-X, AD and D for normal position. Also, we would be delighted to send you our free 26-page Guide to Better Recording. Just write to:
TDK (Australia) Pty. Ltd., Unit 5, Level B South, 100 Harris Street, Pyrmont, NSW 2009.

TDK

Now TDK does even more amazing things to your system.

hifi

Note: Any person practising tape-recording should observe the provisions of the Copyright Act 1968.

John Bevins TDK/09

right-only signal, plus a pilot carrier on 54.7kHz. The pilot carrier is modulated with audio tones according to whether the transmission is stereo, mono, or twin channel (bi-lingual). The pilot tone frequency and its audio tones, are also related to the line frequency to minimise interference to the vision signal.

Because channel 2 carries only one audio signal, this can be allowed to drive the carrier to full deviation. This means that the recovered audio from the R signal in channel 2 will be 6dB higher than the R signal in channel 1, but this presents no serious problem.

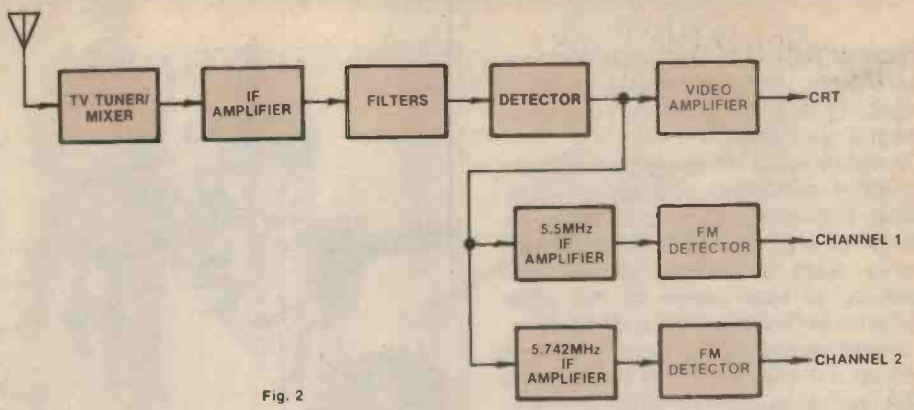


Fig. 2

The most basic type of stereo sound TV receiver would have an extra intercarrier sound channel following the video detector. More elaborate systems could be expected in higher technology designs.

RECOVERY PROCESS

To recover the separate L and R signals the R signal from channel 2 is simply attenuated by 6dB and then mixed with the L+R signal from channel 1 in opposite phase so as to cancel the R content of channel 1. Thus, channel 1 is left with an L-only signal and channel 2 with an R-only signal.

(Alternatively, the L+R signal from channel 1 can be amplified by 6dB before mixing, if this is more convenient in terms of the receiver design.)

There are, in fact, a number of ways in which the TV receiver can be designed to handle the new signal, but the block diagram in Fig. 2 shows one possible approach. (Existing receivers would simply ignore the extra carrier and deliver an apparently normal mono signal.)

In this arrangement the signal path remains much the same as for a conventional set, up to the video detector, and beyond to the video amplifier. But whereas a normal set takes a 5.5MHz sound IF carrier from the detector, for subsequent IF amplification, the new set would take off two such signals, one at 5.5MHz and one at 5.742MHz, and feed them to separate IF amplifiers.

After IF amplification the signals would be detected, producing an L+R audio signal out of the 5.5MHz IF and an R-only audio signal out of the 5.742MHz IF. These would then be passed on to the matrixing circuit to separate the L and R signals. (See Fig 3.)

Fig. 3 also shows the pilot tone decoder and, in order to understand how this works, it is necessary to go back to our mention of the pilot tone and expand the modulation details.

If the transmission is stereo the pilot carrier is modulated at 117Hz, but if it is bi-lingual the modulating tone is 274Hz. For mono transmissions the pilot carrier remains, but is unmodulated. These codes are used to switch the audio channels in the receiver to appropriate configurations.

Thus, if a 117Hz tone is detected the L and R signals are switched, separately, to the left and right audio amplifiers, giving full stereo reproduction. If a 274Hz signal is detected the inputs to the two amplifiers are combined and one of the two audio signals fed to it, as selected by the viewer via a manual switch. If there is no modulating tone the two amplifier inputs are combined to give mono operation.

And what are the advantages of the German system? The main ones are lower noise and, most important, far better separation between channels. The multiplexed sub-carrier systems, when used in a TV system, suffer from increased noise, with more noise on one channel than the other. In the German system the noise is equal in both channels and some 8dB lower.

The improved separation is important because of the bi-lingual application. The other systems — and most FM radio stereo systems — achieve a separation of no more than about 40dB, and as low as 30dB in some cases. This is quite adequate for the stereo application and is actually better than that achieved by most pickup cartridges.

BI-LINGUAL SEPARATION

But the bi-lingual application is much more demanding. When one particular language is selected there must be no noticeable background of the other language. The German system can provide at least 56dB of separation, and this is more than adequate to meet this requirement. At the same time, the better separation does no harm to the normal stereo function.

As far as Australia is concerned it is far too early to get excited about the prospect of TV stereo sound in your lounge room. The current tests at TCN channel 9 are just that; tests to evaluate the good and bad points of the system

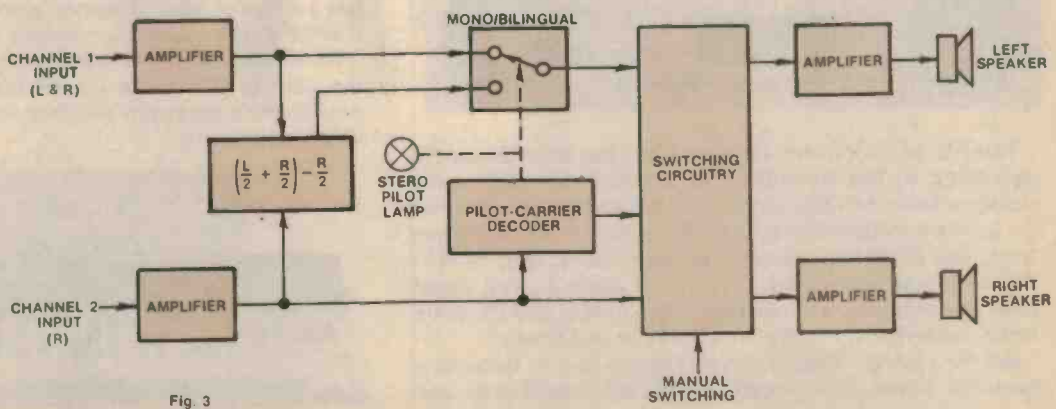


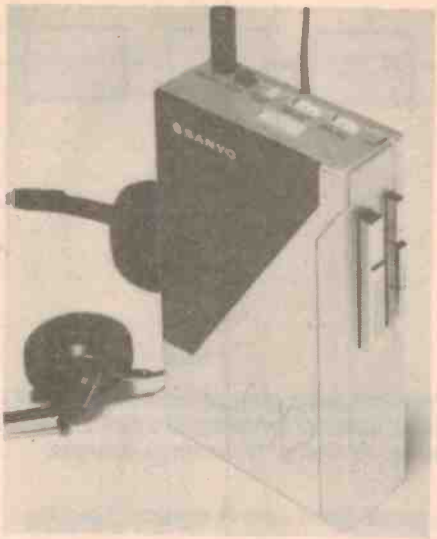
Fig. 3

In block schematic form, the matrixing and decoding system which switches the receiver automatically for mono, stereo or bi-lingual sound. In the last case, manual switching selects the required language.

and how they fit in with Australia's requirements. (Do we need a bi-lingual capability in this country or could we use it if we had it?)

It would seem inevitable that both the licensing authorities and other TV industry interests, including set manufacturers as well as other TV networks, would want a chance to test and evaluate at least some of the other systems before reaching a decision.

Nevertheless, TCN's work has put us well up with the rest of the world — the USA has yet to make its decision — and should ensure that we do not lag behind. In the meantime, a little patience will enable us to benefit from overseas experience and make a wise choice.



In brief . . .

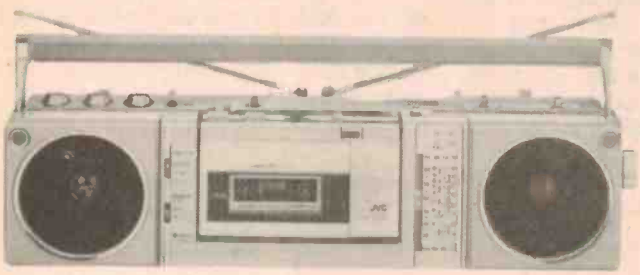
SANYO AUST PTY LTD have a suggestion for anyone who might be wondering what to buy as a Christmas present for that rather special person. What about their new M-G12 mini stereo cassette player? It weighs only 400 gms and measures only 136 x 85 x 34mm, but is nevertheless capable of excellent stereo performance. It has locking controls for fast wind or rewind plus auto stop, LED battery indicator, tone control and anti-rolling mechanism to minimise motion-wow effects. A belt grip is provided for hands-free operation. RRP is $79. For details; W. Fabiszewski, Sanyo Aust Pty Ltd, 225 Miller St, North Sydney 2060. Phone (02) 436 1122.

WHARFEDALE, one of the oldest and best known of the British loudspeaker manufacturers, has won a new lease of life. Founded some 50 years ago by the late Gilbert Briggs, the company was sold to the Rank organisation in 1958. For a while, it pursued its original hifi ideals but they did not always align with hard-headed commercialism. Finally, the organisation fell victim of the malaise which has affected much of Britain's electronic industry and, on July 23 last, Rank announced that the factory would be closed — almost a personal bereavement to generations of hifi enthusiasts. Now comes the news that an independant company, Tradewest Ltd, has bought the factory, plant, R&D facilities and, most importantly, the tradename. They plan to restart the operation, with the same models and re-employing many of the original key personnel. Who can possibly fail to wish them well?

MAJOR PROMOTION BY JVC

Under the guidance of Group Managing Director, Hans Went, Hagemeyer (Australasia) BV have embarked upon a major sales promotion for JVC products. Much of the promotion is to be centred around the visit of the English cricket team for the 1982/3 Centenary Cricket Season. Hans Went (left) is pictured with Doug Thompson, Australian Sales Manager of Major Media Promotions.

To give point to the promotion, Hagemeyer have assembled an impressive array of JVC equipment ranging from consumer audio/radio, through hifi audiophile components, to domestic and commercial video equipment. All has about it a certain "state-of-the-art" distinction.



The JVC RC-S55 stereo cassette-radio has been designed, according to the brochure, for people who can't quite decide whether to buy a personal player with headphones or a more conventional cassette radio! In its complete form, the RC-S55 is indeed a cassette radio, with AM-FM and shortwave coverage, 3W+3W of audio power, metal tape compatibility, and operable from mains, 12V DC or internal batteries. It comes in a silver or red finish.

But the cassette section can be slipped out, to become a personal stereo player for use with hifi headphones and operating from its own batteries.

Another intriguing item is the JVC Keyboard KB-500. Suitable for use with a stereo hifi system or headphones, it has a range of musical voices, auto chord, auto percussion, ensemble effects, and a memory system.

Those are just two novelty items which catch the eye but the current JVC range covers tuners, amplifiers, graphic equalisers, a spectrum analyser and an extensive range of video equipment.

Great Products- LOW Prices!

low cost I.C. inserters/ extractors

Up until now these have cost a fortune!!
Features:
- CMOS SAFE conductive plastic
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- Ground strap can be connected.
- One hand operation.

INSERTERS

CIT820	8–20 pin	ONLY $5.95
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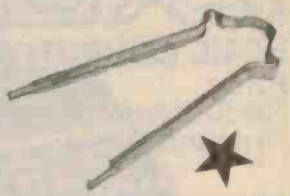
from $2.95

EXTRACTOR
Deceptively simple looking device. One piece metal construction. 8-40 pins
ET–840 ONLY $2.95
IMPORTANT!!
Don't be conned into buying a non conductive inserter/extractor. The possible static damage to your MOS I.C.'s could cost you a fortune!!



REED SWITCH/ MAGNET ASSEMBLY

Grab some of these before the Canberra boys grab the shirt off your back!!
A bulk buy of these has enabled us to pass on great savings!!
Quality dry reed insert in tough plastic housing with screw terminations. Matching magnet assembly closes SP-ST reeed contacts when near reed.
- 10 million operations
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- Double sided foam tape Inc.
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Staggering value.
Jaycar has a complete range of Burglar alarm components — call in!!

1-9 $1.50 ea
10-99 $1.40 ea
100+ $1.25 ea

spring reverb

We have purchased a small quantity of high quality US-made spring reverb units. This 3-spring model is the one used in such amps as 'PEAVEY" etc. Grab a spare now or build a complete reverb system with free circuit supplied.

A FEW LEFT $34.50

AM/FM STEREO CAR CASSETTE

Unbelievably low price! (Pre Budget tax) That's right! An AM/FM Stereo Radio and Cassette! Features:

• 2 x 7 watts • One lever operation (fast forward and eject) • Tape run indicator • FM Stereo indicator • Auto stop • Adjustable pitch controls • Mounting hardware included.

STAGGERING VALUE ONLY $69.50

TELEPHONE DIGITAL DIALLER

Much easier than wearing the top of your finger off. Remembers last number called for 12 hours. SAVE $10 — $29.50

CRADLE RELAYS SLASHED!!!

SAVE A FORTUNE!!
Top quality relays. Gold flashed contacts, 1 AMP rating. As used in Telecom equipment. Professional quality.

COIL VOLTS	IMPEDANCE	SWITCH CONFIG	PRICE
6	—	4 C.O.	$4.50
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24	1100	2 C.O.	$4.50
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Relay socket: 2 C.O. 75 cents 4 C.O. 75 cents
UP TO 50% OFF NORMAL PRICES!!

EXPERIMENTER BREAD-BOARDS

WBDN 100 holes $2.50
WBTN 640 holes $8.95
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WB4N 1680 holes $24.50
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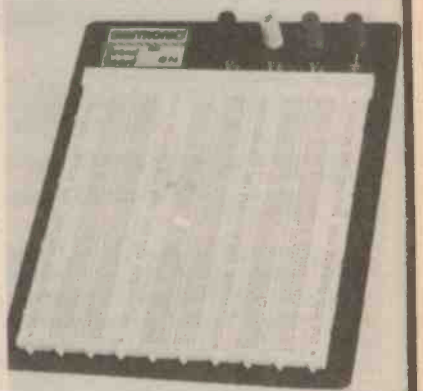
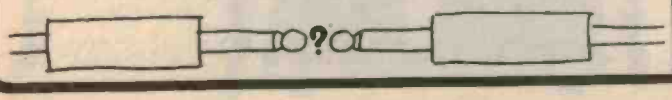
Ample stocks of these boards plus the range has been extended.



"Useless" Adaptors

A FEW PACKS LEFT

We have double female. We also have the opposite! And some weird combinations in between. Each adaptor is solid metal and high quality and we can't see the reason why some were over made and we're sick of looking at 'em.
You get 12 in a bag and if you only use ONE once they will owe you nothing. Once sold for $3 each, but we won't insult you by claiming $36.00 'value'. A bag will cost you $3.95.



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Telex: 72293

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$100 up ($6.20)

NEW SHOP HOURS
Mon Fri 8.30 to 5.00pm
Sat 8.30 to 12.00pm
Thurs night to 8.30pm

MR ACOUSTICS announce three new products, imported from QED Audio Products, UK. One is the Protech SP150T loudspeaker protection unit which, they claim, can protect expensive loudspeaker systems from accidentally applied DC, excessive HF content and transients. C38 is the type number of the second product — a loudspeaker cable having extremely low losses. The third product is a conductive record sleeve which is intended to combat the build-up of static charges on frequently used demonstration records. At about $1.50 each, the sleeves may be too expensive for general collections but MR Acoustics see ready application for them in hifi demonstration rooms. For details contact Col Robertson, MR Acoustics. PO Box 165 Annerley, Qld 4103. Phone (07) 48 7598 or 284 6764.

Pioneer's SC-5 "Sound Creator"

Pioneer Electronics has released an unusual new stereo system that, they say, "can turn an ordinary suburban living room into a sophisticated recording studio.

"It opens up a whole new world of do-it-yourself music for the budding musician, composer or recording engineer."

The "Sound Creator" is made up of an SA-05 Sound Mixer/Amplifier, SG-05 Graphic Equalizer, CT-05 Double Cassette Deck, TX-05 Tuner, PL-05 front loading automatic turntable, a DT-32 digital tuner and a CS-05 three-way speaker system.

The heart of the system is the SA-05 Sound Mixer/Integrated Amplifier, which can be transformed at the touch of a button from a powerful 70 watts per channel amplifier into a versatile home studio mixer.

It has multiple input jacks for microphones, keyboard instruments, electric guitars, &c, faders, panpots and reverberation. Budding vocalists can have live accompaniments or sing along with pre-recorded music.

The SG-05 graphic equaliser has seven bands per channel each providing 10dB of boost of cut. It can be used to compensate for listening room defects, to achieve special vocal emphasis, optimise tapes for in-car listening, minimise tape hiss, &c.

Not surprisingly, the cassette deck provided is a double-function double-Dolby unit with a play and a record/play section. When used in conjunction with the mixer, it can provide mixing, sound-on-sound, dubbing and copy-plus-edit.

Other items included in the SC-5 Sound Creator system include a TX05L digital synthesiser tuner with presets for eight AM and eight FM stations. The turntable is a front-loading fully automatic unit with automatic sensing of record size. A DT-32 timer can turn equipment on and off from one minute to 24 hours in advance.

All this equipment is housed in a moveable rack, as illustrated, which also provides a jack system for external inputs and storage space.

For further information, contact Ron Ward, Audio/Video Products, Pioneer Electronics Aust Pty Ltd, 178-184 Boundary Rd, Braeside, Vic 3195. Phone (03) 580 9911.

From Audio Telex Communications

Telex Communications Inc have announced this new high-speed audio tape duplicating system, model 6120. They say that it is an entirely new generation of equipment, operating at speeds that reach the practical production-line limits for in-cassette duplication. The model 6120 represents the culmination of 20 years experience in the tape duplicating business. It is based on modules for both open-reel and cassette duplication, which can be ordered initially or acquired later, as necessary, simply plugging into a common control centre.

Either two or four channel configurations are available, while the hubs accept either 178 or 267mm reels, to operate at either 152 or 305cm/sec. The cassette modules operate at 76cm/sec or a 16:1 speed relationship. On this basis, both sides of a C-30 cassette can be duplicated in less than one minute. With a full complement of 11 cassette slaves, it adds up to a production rate of 350 C-30 duplicates per hour.

For details of this and other tape duplication systems, contact Audio Telex Communications Pty Ltd at 1 Little St, Parramatta, NSW 2150. Phone (02) 633 4344. (Branches in Melbourne and Brisbane).

LUCAS AUDIO IN AUSTRALIA

Lucas Industries Australia Ltd has introduced a range of car audio products to meet the needs of the Australian audio market. Whilst the UK parent company has been successfully marketing Lucas audio for many years, every unit in the range introduced for Australia has undergone a series of stringent tests to ensure that quality and performance meet Australian conditions.

Lucas has upgraded the often neglected AM section of all tuners to ensure fade-free reception, even in country areas, and quality componentry and robust construction to ensure durability.

The range includes AM radios, AM/FM-stereo radios, AM/FM cassette units, graphic equaliser, combination units, speaker systems and enclosures and a range of aerials from basic lockdown to fully automatic types. All aerials incorporate low-loss cables to ensure that the maximum signal reaches the radio.

Also in the range are three personal headphone units: a stereo cassette player, a stereo cassette player with built-in FM-stereo radio, and an AM/FM radio. All have dual headphone outlets.

Lucas are represented Australia-wide but their National Headquarters are at 300 Lower Dandenong Rd, Mordialloc, Vic 3195. Phone (03) 586 8209.

CLAMP METER

MODEL YF-700

Top of the range model AC Voltage 150V 300V 600V AC Current 6A 15A 60A 150A 300A. Resistance 5kΩ (Midscole 200Ω)

was $49.99

NOW ONLY

$43.55

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PRINTERS	
ITOH 1500 PARALLEL (DAISYWHEEL)	$1515 + TAX
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ITOH 8510 PARALLEL	$910 + TAX
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RITRON COMPUTER GRADE P/S

+5V reg 10a 16V unreg @ 1A.
KIT $79.95 inc
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INTERSIL LCD $38.50 3½ DIGIT PANEL METER KITS

Build a working DPM in ½-hour with these complete evaluation kits.
Test these new parts for yourself with intersil's low cost prototyping kits complete with A/D converter and LCD display (for the 7106) or LED display (for the 7107). Kits provide all matrials including PC board, for a functioning panel meter ICL7106EV (LCD).

P.C. EDGE CONNECTORS

S100 gold plated wire wrap	$8.50
S100 solder tail	$7.90
D2 Motorola bus 43/86 solder tail	$8.50
43/86 gold plated wire wrap	$11.50

10 TURN POTENTIOMETERS

Stock resistance values

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

Spectrol model 534 ¼" shaft.
Price 1—9 $9.90
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Ideal for use with flat ribbon cable or to mount components on

14 pin $1.50 24 pin $2.90
16 pin $1.90 40 pins $5

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SPECIALLY DESIGNED FOR MICROCOMPUTERS

- Good regulation electrostatic shield
- RI 810 8V @ 10A x 15V @ 1A $31.00
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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	$1.80
10—99	$1.60
100	$1.30

Values may be mixed.

Hexadecimal Keypad $32.50

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

Ideal for dream project

MULTIDIALS

Dials to suit 10 T Pots

Model 21 1.8" dia	$16.50
Model 16 9" dia	$12.50
Model 18 1" x 1.75" dia	$21.50

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.

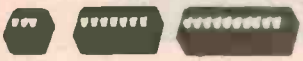
1—9	$1.20
10—99	$1.00
100	$0.90

Values may be mixed.

DIP SWITCHES SPST

P/N	No of 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

DIP SWITCHES SPST



TEXTOOL ZIP* DIP 11 SOCKETS

16 Pin Zip* Dip 11	$11.50
24 Pin Zip* Dip 11	12.50
40 Pin Zip* Dip 11	17.50

*Zero Insertion Pressure

INCREDIBLE MEMORY AND DISC DRIVE PRICES

	1-9	10-25	25+
2708	4.90	4.00	3.90
2716	4.90	4.20	3.90
2732	8.00	7.50	7.00
4116 (200nS)	1.95	1.80	1.75
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M58725P (2K x 8) Static	10.00	9.00	8.50

(As used in new 64K Static S100 PCB)
ALL PRICES INCLUDE SALES TAX

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MPI 51 $275.00 + 17.5% ST.
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MPI 91 $415.00 + 17.5% ST.
MPI 92 $515.00 + 17.5% ST.

Mitsubishi 8"
$625 including tax.
Microline 80 $499 inc tax

RS232 & "D" TYPE CONNECTORS

PART NO	DESCRIPTION	1-9	10-25	25+
DE-9P	9 PIN MALE	$3.50	$3.50	$3.10
DE-9S	9 PIN F/MALE	4.50	4.20	3.90
DE-9C	9 PIN COVER	2.20	2.10	1.90
DA-15P	15 PIN MALE	4.50	4.20	3.90
DA-15S	15 PIN F/MALE	5.10	4.90	4.70
DA-15C	15 PIN COVER	2.30	2.10	2.00
DB-25P	25 PIN MALE	5.90	5.60	5.10
DB-25S	25 PIN F/MALE	6.90	6.60	6.10
DB-25C	1 pc Grey Hood	2.40	2.20	2.00
DB-25C2B	2 pc Black Hood	2.80	2.70	2.50
DB-25C2G	2 pc Grey Hood	2.70	2.50	2.40
DC-37P	37 PIN MALE	7.90	7.50	7.10
DC-37S	37 PIN F/MALE	10.90	9.90	9.10
DC-37C	37 PIN COVER	4.90	4.50	4.10
DH/S	Hardware set (2 Pairs)	2.10	1.90	1.80

BUILD YOUR OWN SPEAKERS WITH PHILLIPS

PART No	PRICE
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AD01605-T8	$16.54
AD0162-T15	$18.78
AD0162-T15	$13.03
AD0162-T8	$13.77
AD0210-SQ8	$42.00
AD02160-SQ8	$45.00
AD02161-SQ8	$33.46
AD10100-W8	$52.72
AD12100-HP8	$85.10
AD12100-M15	$79.11
AD12100-M8	$79.11
AD12100-W8	$53.99
AD12200-W8	$73.12
AD12250-W8	$83.00
AD12650-W8	$59.00
AD2273-T8	$5.03
AD4060-W8	$19.06
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AD5060-SQ8	$22.05
AD5060-W8	$17.59
AD5061-MB	$17.08
AD70601-W8	$22.00
AD70620-M8	$21.54
AD7063-M8	$20.78
AD70630-M8	$20.78
AD70650-W8	$26.96
AD7066-W8	$26.96
AD80601-W8	$20.24
AD8061-W8	$20.24
AD80652-W8	$26.20
AD8066-W4	$27.66
AD8081-M8	$9.81
AD9710-M8	$41.11
ADF1600-8	$19.44
ADF500-4500-8	$19.44

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	10-99	100+
IN4001	6c	5c
IN4002	6c	5c
IN4004	7c	6c
IN4148	5c	4c
IN5404	30c	25c
IN5408	35c	30c
IN4007	12c	11c

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High Thermal Capacity Black Anodised

	1-4 $	5-9 $	10-49 $	50-99 $	100-499 $	500 plus $
HS1 — 38mm	1.85	1.75	1.50	1.35	1.00	0.90
HS2 — 75mm	3.00	2.90	2.50	2.00	2.00	1.50
HS3 — 150mm	5.80	5.40	4.90	3.80	2.90	2.70
HS4 — 225mm	8.10	7.60	7.10	5.90	4.50	4.30
HS5 — 300mm	8.90	8.40	7.90	6.50	4.90	4.60

Unanodised

HS11 — 38mm	1.40	1.20	1.00	0.90	0.80	0.70
HS12 — 75mm	2.50	2.20	1.90	1.60	1.25	1.20
HS13 — 150mm	4.90	4.50	4.00	3.20	2.45	2.40

BLANK CASSETTES T.D.K.

TDK ADC60	1 for $3.60	10 for $26.00
TDK DC60	1 for $2.10	10 for $18.00
TDK DDC60	1 for $3.50	10 for $31.00
TDK SAC60	1 for $3.50	10 for $31.00
TDK SAXC60	1 for $5.70	10 for $46.00
TDK DC90	1 for $2.40	10 for $21.00
TDK ADC 90	1 for $3.50	10 for $30.00
TDK SAC 90	1 for $4.20	10 for $39.00
TDK DDC90	1 for $4.70	10 for $45.00
TDK SAXC90	1 for $5.50	10 for $49.00
TDK DC120	1 for $4.50	10 for $37.00
TDK ADC120	1 for $5.40	10 for $46.50

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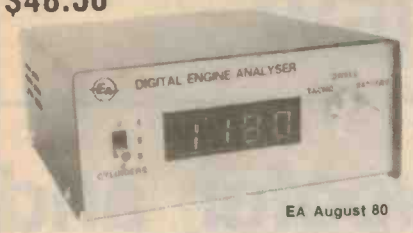
$48.50



EA August 80

DIGITAL CAPACITANCE METER **$45.00**

Here is an inexpensive Digital Capacitance Meter which measures from 1pF to 99.99uF in just three ranges. It's simple to use and features a big bright four-digit display with automatic updating and decimal points. EA March 80

ELECTRONIC DUMMY LOAD
$99.00

With this unit you can test power supplies at currents up to 15 Amps and Voltages up to 60 Volts. It can "sink" up to 200 Watts on a static test and you can modulate the load to perform dynamic tests. ETI 147 October 80

SELECTALOTT
$22.00

"Who wants to be a millionaire . . .?" I do. "Selectalott" could help. It will select random numbers without superstition or bias . . . It could be you. EA December 80

PHOTON TORPEDO GAME

EA September 81

$24.50

7-SLOT S100 MOTHER BOARD

ETI May 80

$85.00

FUZZBOX **$19.90**

Simple Fuzz Box for electric guitars. The no fuss, no nonsense Fuzz Box. Confused — So are we. Seriously though if you want a sound with a difference, build this project and you can distort the waveform. It produces a sound which is buzzy (like politicians at election time). EA February 81

150W MOSFET POWER AMP
$79.00

Plus Transformer **$43.50**

Plus Heatsink Drilled, Tapped and Black Anodised **$42.50**

A general purpose 150W Mosfet Power Amp Module. Here's a high power, general purpose Power Amplifier Module for guitar and PA applications employing rugged, reliable Mosfets in the output. ETI 499 March 82

CYLON VOICE EA December 80
$19.95

Sound like Darth Vader

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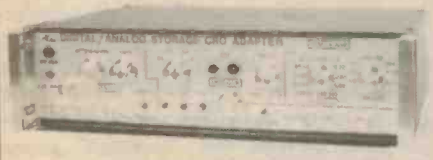


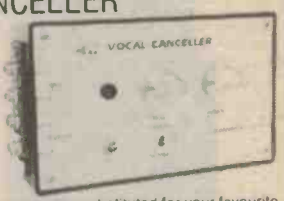
Store and record non-repetitive Analogue Signals. EA March 81

TV CRO ADAPTOR **$38.50**

Includes Plug Pack. EA August 80

VOICE CANCELLER

$22.50

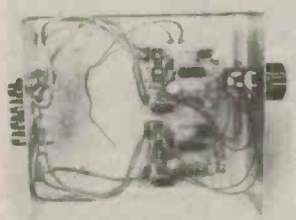


Ever wondered how your voice substituted for your favourite vocalists would sound, well now its possible! You can cancel out the lead vocal on almost any stereo record and substitute your own voice or musical instrument. EA April 82

ETI 471 PREAMP KIT ETI June 79 **$49.50** Extremely versatile pre-amp kit

LOUD SPEAKER PROTECTOR

ETI 455 March 80



$32.50

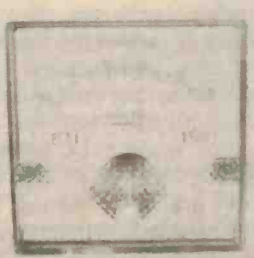
CAR ALARM
$29.00

This Car Alarm uses the battery earth strap as a sensor to detect when a "courtesy" light or other electrical load occurs when a thief enters a vehicle. The circuitry is simple and immune from false triggering problems. ETI July 81

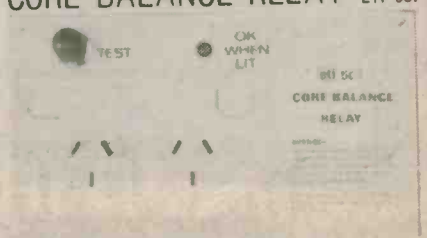
10-15V EXPANDED SCALE V-METER

ETI 159 December 81

$26.50



CORE BALANCE RELAY ETI 567

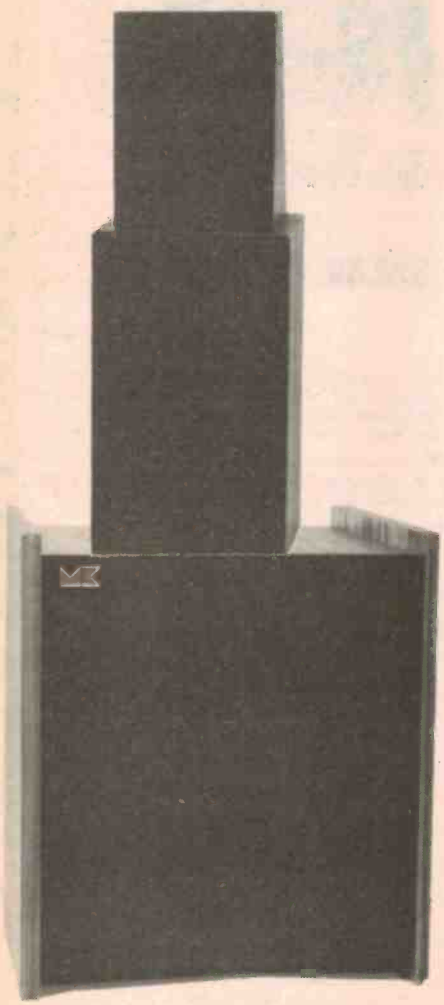


$44.50

Miller & Kreisel Volkswoofer and Satellite-1A loudspeakers

Unusual features such as an internal 60 watts amplifier and 14 possible midrange-trebel equalisations combine with high power handling and a response to 18Hz in this subwoofer-satellite speaker system from Miller and Kreisel.

Despite the Germanic sounding name, the Volkswoofer and Satellite-1A loudspeaker system has American origins. It is manufactured by the Miller and Kreisel (M&K) Sound Corporation in California. The speakers we reviewed were finished in genuine woodgrain veneer and had been assembled in New Zealand.



The unusual shape of the loudspeakers can be seen here. Pictured is the Volkswoofer and one Satellite -1A.

The appearance of the Volkswoofer-Satellite loudspeaker system is a little unusual at first sight. Instead of the usual two speaker boxes there are three. A cubic woofer box measuring 458 × 421 × 458mm (H×W×D) and two smaller midrange-treble boxes measuring 546 × 196 × 190mm (H×W×D).

The woofer box contains a single 250mm driver and each satellite contains a pair of 125mm cone midrange drivers and a pair of 25mm soft dome treble drivers.

Frequency response of the Volkswoofer-Satellite system is claimed by M&K to be within ±3dB over the range 18Hz to 22kHz.

Connecting the loudspeakers to the amplifier is a little different to normal practice and no attempt should be made to do so until the instruction books have been thoroughly read and understood. Two instruction books are provided, one for the Volkswoofer and one for the Satellite-1A's. To connect the loudspeakers four heavy gauge figure-eight speaker leads are provided.

Connections are made by running the output of both channels of your normal amplifier into two pairs of input terminations located on a metal panel on the back of the Volkswoofer. Midrange-treble signals are then taken from two pairs of output terminations on the back of the Volkswoofer, and fed to the satellites, one pair of terminations being used for each satellite.

The woofer, or more accurately the subwoofer, has its own 60 watt amplifier and power supply built into the enclosure. Crossovers attached to the amplifier filter the incoming signals from your regular stereo amplifier, and bass signals below 100Hz are fed to the 60 watt amplifier. Frequencies higher than 100Hz are passed onto the satellite speakers via the output terminations on the Volkswoofer rear panel.

Also on the rear panel is a LED power indicator, a fuse, a level control and a three-position room variation switch. The level control is used to match the output of the Volkswoofer to the output of the Satellites. The room variation switch changes the response of the Volkswoofer to suit certain rooms or music. Additionally the metal rear panel is used as a heatsink for the 60 watt amplifier.

Nominal input impedances are 200Ω for the Volkswoofer and 4Ω for the Satellites. Power handling for the Satellites is 200 watts rms with unclipped peaks up to 400 watts.

Each Satellite box has four input terminals instead of the usual two. Various combinations of these input terminals together with a small kit of resistors allow the user to alter the midrange-treble balance and produce 14 different "sounds". Three of these have been given names by Miller and Kreisel, the "English" sound, the "German" sound and the "American" sound.

These sounds supposedly typify the type of sound produced by the majority of loudspeakers manufactured in the respective countries.

The backplate of each satellite speaker contains connection details for producing six sounds, however recourse to the instruction booklet is necessary for details of the additional variations provided by the resistors.

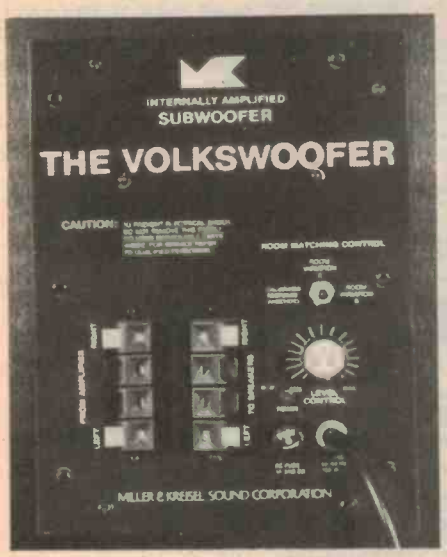
The Volkswoofer is mounted in what seems to be a small box for a speaker with a response to 18Hz (–3dB). This response appears to be achieved by a combination of a very heavy speaker cone (with a low resonance), filling the enclosure with damping material to make it acoustically larger and using feedback from a second voice coil on the woofer to control the cone excursion.

The use of feedback also reduces woofer distortion by placing the cone excursion under direct control of the amplifier. This arrangement is much bet-

ter than simply relying on the damping factor of the amplifier to control the speaker.

Under sinewave testing a small amount of frequency doubling became evident below 25Hz but it was of such a low level it was almost unnoticeable. The bass response was certainly good. It went down lower than what our test instruments could measure. M&K's claims of a response to 18Hz appear to be well justified. The room variation switch on the back panel of the Volkswoofer switches in filters which roll off the response of the Volkswoofer below 30Hz.

At the same time a slight emphasis is applied to frequencies around 60-70Hz. This gives the effect of a more "punchy" bass, a sound preferred by some people when listening to rock or disco music.



The metal rear panel of the Volkswoofer showing the comprehensive facilities.

Listening tests were done with the satellites connected in the configuration referred to by M&K as the "high efficiency low tweeter level subdued 'German Dome' sound". A new Telarc digital recording of Beethoven's Appassionata Sonata and Sonata Number III was used as one of the principal program sources to test the loudspeakers.

In this configuration piano came through as being slightly muffled or veiled. There also appeared to be a dip in the response around 100Hz possibly caused by phase cancellations between the output signals of the Volkswoofer and the Satellites.

The high pass and low pass crossover filters employed to cross between the Volkswoofer and the Satellites have different slopes, resulting in a phase difference between the speaker outputs at the crossover frequency, 100Hz. This might be corrected by careful positioning of the Volkswoofer and may not be a problem in a normal household situation.

Bear in mind though that the range of Volkswoofer positions will be limited by the lengths of the connecting speaker leads and the power cord.

We also tried listening to the speakers in other configurations in order to see if we could obtain an improvement in the piano reproduction. To our ears we could not seem to get an even balance between the midrange and treble portions of the spectrum. In one configuration the mid-range would be too bright, in another too subdued. Maybe we need an Aussie sound variation!

The Volkswoofer has a solidly built enclosure and no discernible colourations from vibrating panels were evident in the listening tests. The enclosure dimensions are too small to support standing waves at frequencies handled by the woofer so enclosure resonances caused by standing waves do not occur.

A problem in reviewing these speakers is that there are so many possible combinations of sounds (42 in fact) it is difficult to compare each possibility against all the others. A good deal of time spent listening and comparing between preferred sounds is essential if the best is to be obtained from this system.

In summary, we are reluctant to come to a conclusion about the Volkswoofer and its Satellites. The large number of possible variations would seem to cast doubt on the veracity of the system. After all, could not the designers themselves discover what was the "right" sound and settle on that. We certainly had problems in this regard.

The Satellite-1A's and the Volkswoofer are also available separately so anyone wishing to upgrade the bass response of their speakers could investigate this possibility.

The Volkswoofer-Satellite loudspeaker system we reviewed was supplied to us by HiFi City. At the time of review, retail prices were $600 for a pair of Satellite-1A's including stands and $630 for the Volkswoofer. Further details about the speakers can be obtained from any HiFi City store. (J.S.)

A view of the loudspeakers with grilles removed. Paired midrange and treble drivers boost the efficiency of the Satellite-1A's.

MAGNIFICENT! NEW 5000

DAVID TILLBROOK HAS DONE IT AGAIN!! 5000 SERIES 1/3

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

5000 SERIES GRAPHIC EQUALISERS

Latest addition to the thoroughbred 5000 Series stable! David Tillbrook has once again produced a 'No Compromise' design. This new component, a 1/3 octave equaliser, gives you ABSOLUTE CONTROL over the acoustics of your particular listening enviroment. You get 3 SEPARATE CONTROLS for every octave of audio bandwidth to virtually eliminate the subtle nuances that are particular to your listening area.

1/3 octave equalisers have been used by professional engineers in Recording Studios and live concerts for over a decade now. It is no accident that the advent of the 1/3 octave equaliser and studio quality live sound have gone hand-in-hand. BUT THERE'S A CATCH. One of these equalisers is not enough. You will have to buy 2 (for stereo). Quite a lot of money – but worth it if you want the best.

For those whose budget does not extend to $389, may we suggest the 2010MkIIA octave (10 band) equaliser. This unit is rack mounted and in the same format as the 5000 series equaliser. It is stereo (in one 3½" cabinet) with one slider per octave. Basically an upgrade of the ETI 485 graphic, it represents outstanding value for money at only $139.00.

The Jaycar kit includes a fully prepunched plated chassis, prepunched heavy gauge front panel with silkscreened front panel to match the other 5000 components. It is absolutely original. You can purchase the kits one at a time for $199 ea. or, for two, $389 – a $10 saving. If you are one of the hundreds of happy 5000 users we are convinced that you will be just as delighted with this unit.

BUY 2 AND SAVE $10 – ONLY $389

only $199

"BLACK MONOLITH"

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ONLY $299

Once again, imitation is the sincerest form of flattery. The Black Monolith 5000 Mosfet Power Amp has the following EXCLUSIVE features:

- Beryllium Oxide (Space Age ceramic) TO-3 washers. (Not flimsy mica)
- Jig drilled and extruded heavy gauge, anodised heatsink bracket.
- SUPERFINISH front panel. STILL THE BEST now with blind tapped holes.
- New heavy duty heatsinks for the driver transistors. 100's extra heatsink area and black anodised for greater efficiency. (Not in original design).
- Ventilation holes in metalwork at critical points. (Not in original design).
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IF YOU THINK THAT YOU CAN SAVE MONEY ON THESE KITS ASK YOUR SUPPLIER IF HE WILL GIVE YOU ALL OF THESE FEATURES AT THE PRICE. MAKE SURE THAT YOU GET IT IN WRITING!!

A PRICE RISE ON BOTH KITS (i.e. SALES TAX AND METALWORK ETC.) IS EXPECTED SOON! BUY THE BEST FOR NO MORE.

Write in (SAE) for a new glossy leaflet on both amps.

SPECIFICATIONS

POWER OUTPUT	Around 100W RMS into 8 ohms
FREQUENCY RESPONSE	8Hz to 20kHz, +0 – 0.4dB 2.8Hz to 65kHz, +0 – 3dB Note: these figures are determined soley by passive filters
INPUT SENSITIVITY	1V RMS for 100W output
HUM	– 100dB below full output (flat)
NOISE	– 116dB below full output (flat, 20kHz bandwidth)
2nd HARMONIC DISTORTION	<0.001% at 1kHz (0.0007% on prototypes) at 100W output using a ±56V supply rated at 4A continuous
3rd HARMONIC DISTORTION	<0.003% at 10kHz and 100W
TOTAL HARMONIC DISTORTION	<0.0003% for all frequencies less than 10kHz and all powers below clipping
INTERMODULATION DISTORTION	Determined by 2nd harmonic distortion (see above) <0.003% at 100W (50Hz and 7kHz mixed 4:1)
STABILITY	Unconditional

"BLUEPRINT"

5000 PREAMPLIFIER

★

"One Swallow does not make a spring"
– Neither does a few gold RCA sockets!

Several of our competitors are imitating our "Blueprint" preamp by adding a few bits and pieces, notably gold plated RCA sockets to their standard kits. Unfortunately they have missed the point. We supply gold plated sockets in our "Blueprint" preamp but only where it makes sense to do this, i.e. on the inputs – NOT the outputs. 16 gold sockets are provided by us. This, however, does not make a "Blueprint". THIS DOES:

- Low capacitance screened cable - 12 metres of it. NOT Taiwanese cable as supplied in other kits. Our cable costs us NEARLY 5 TIMES MORE than the Taiwanese stuff.
- Original ETI designed front panel. Not an "ADAPTION". Our front panel is by far the nicest.
- Factory pre tinned PCB's to reduce chances of dry or noisy solder joints.
- Quality LEDs, polished finish, multicoloured display.
- IC sockets on line amp board.
- Special rear panel.
- Special low noise selection LM394H NOT CH device in M.C. preamp.
- Thermalloy (U.S. made) heatsink on 7805 regulator.
- English Lorlin selector switches.
- Apart from the 16 gold RCA's we throw in a pair of gold plated line RCA plugs – worth $5.
- Special Nylon rear panel grommets.

So don't "Swallow" the facts before they are properly digested!!

You can't make a silk purse out of a sow's ear. Send SAE for full specs.

BLUEPRINT $275

★ SPECIFICATIONS

Frequency Response	High level input: 15Hz-130kHz, +0,–1dB Low level input – conforms to RIAA equalisation +0.2dB (see detail on Phono specs.)
Distortion	1kHz 0.003% on all inputs (limit of resolution on measuring equipment due to noise limitation)
S/N noise	High level input, master full, with respect to 300mV input signal at full output (1.2V) 92dB flat 100dB A-weighted MM input, master full, with respect to full output (1.2V) at 5mV input, 500 ohm source resistance connected 86dB flat 92dB A-weighted MC input, master full, with respect to full output (1.2V) and 200µV input signal 71dB flat 75dB A-weighted

ETI-478MM Moving Magnet input stage			
Gain	36, 1kHz		
Frequency Response	Conforms to RIAA Equalisation +0.2dB		
Total Harmonic Disorder	0.001%, 1kHz, 10mV RMS input		
Headroom	28dB with respect to 5mV RMS input signal, i.e. 135mV RMS		
Noise	Total equivalent input noise, 122nV 'A', input shorted, 216nV flat, input shorted		
S/N ratio		1mV 5mV 10mV	
	Flat	73dB 87dB 93dB	
	A-weighted	78dB 92dB 98dB	
ETI-478MC Moving coil input stage			
Gain	74		
Frequency Response	7Hz – 135kHz +0, –1dB		
Total Harmonic Disorder	0.003%, 1kHz, 30mV input		
Noise	Total equivalent input noise 83nV flat, input shorted 42nV 'A', input shorted 56nV flat, after RIAA Eq. input shorted 34nV 'A', after RIAA Eq. input shorted		

SERIES COMPONENT

OCTAVE GRAPHIC EQUALISER – BRILLIANT!!

FROM $495

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EX-STOCK
CALL IN AND SEE WORKING

8 CHANNEL MIXER KIT

The Jaycar 8002 Mixer was originally conceived to be the successor to the very popular ETI414 Master Mixer. The 414 was basically configured as a 'stage' mixer and suffered from a number of severe technical limitations – notably poor signal-to-noise figures. Enormous advances in Audio IC's have occurred since the 414 was designed. Jaycar engineers have taken advantage of this. The incredibly low noise and distortion figures of the 8002 are a testimony to the sound basic design of the mixer coupled with the performance capability of these IC's. Whilst the 8002 is the ideal 8 channel compact stage mixer, other applications have been kept in mind.

AS A "STUDIO" MIXER. The prime requirement of a studio mixer is that it must be quiet – i.e. have good S/N. Due to the fact that the "miracle" 5534 IC's are used in the 8002 studio applications are entirely feasible. In addition to this, metal film resistors are used in critical signal areas.

AS A DISCO MIXER. The balanced input feature of the 8002 is not really necessary for disco use. This section can easily be bypassed with either a moving magnet (Dynamic Cartridge) preamp, or a moving coil preamp The sensible format of the 8002 and tremendous equalization facilities should make this mixer popular for disco use.

- Balanced (600 Ohm) Mic. Inputs/Line Inputs.
- Cannon Connectors included in the price.
- Bass, Mid & Treble Equalization on each Input.
- "Effects" (i.e. Echo etc.) capability.
- Foldback and Stereo Pan on ALL 8 Inputs.
- 60mm Slide Faders used throughout.
- 19" Rack Mount capability (or Console Mount).
- Professional Black Front Panel with Format borders & multi-coloured knobs to assist function identification.
- VU Metering.

Send SAE for full details + details on use as stage mixer

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

WIRELESS GUITAR LINK
— low cost breakthrough!

NOT A KIT COMPLETELY BUILT AND TESTED

ONLY $149.50

SPECIFICATIONS	
EFFECTIVE RADIATED POWER OF TRANSMITTER	30mW
RELIABLE RANGE	Over 50 metres
INPUT SENSITIVITY	Variable down to 15mV (RMS)
SIGNAL TO NOISE	60dB with typical tuners
TUNABLE FREQUENCY	88–100 MHz (a low (unused) part of FM band)
FREQUENCY RESPONSE	10Hz to 16kHz (Flatter than most tuners!)
FREQUENCY STABILITY	Similar to the frequency stability of high quality FM tuner or you can space many link units within 1MHz band without interference to each other
DIMENSIONS A COMPACT 40 x 40 120mm	
BATTERY LIFE	25 hours continuous (alkaline)
FACILITIES	Nicad charging socket low battery indicator LED mounting clip

Now you can roam almost anywhere without the hassle of a trailing cord back to the mixer or amp. The Musolink simply clips to either your belt or guitar strap and transmits back to any FM tuner. IT works on the largely unused section of the Australian FM band The FM tuner then connects to the PA direct or thru a mixer. The results are spectacular and reliable. The transmitter is very stable. The massive price reduction is due to the fact that you don't need a special crystal controlled receiver, just your FM tuner.

KITS from EA ETI

EA KITS	
Le Gong – Electronic Doorbell Ref: EA3/81	$14.95
PC Birdies – Duelling Canary Sound Ref: EA5/81	$14.50
Gudlipp Cricket – Circuit drives you crazy Ref: EA2/82	$12.50
Vocal Canceller – Insert your voice onto records Ref: EA4/82	$19.50
VOX Relay – Open doors with a handclap Ref: EA4/82	$14.50
Metronome – Stick to the beat when learning Ref: EA2/82	$16.95
Fuzzbox – Funky guitar sound Ref: EA1/81	$19.50
EPROM Programmer – Cheap EPROM programming Ref: EA1/82	$59.00
Guitar Booster – Play your guitar on the Hi Fi Ref: EA6/82	$14.50
Onscreen Graphic Analyser – a must for the audiophile EA9/81	$105.00
Cassette Deck Audio Test Unit Ref: EA10/81	$45.00
Musicolour IV – Coloured lighting for your Hi Fi.	$85.00
Photon Torpedo – Alien invaders game Ref: EA9/81	$29.50

ETI KITS	
445 – General Purpose Preamp	$8.50
449 – Balanced Microphone Preamp	$9.50
581 – +15V @ 200mA Power Supply – Tranny included	$17.50
330 – Car Alarm – works well	$29.50
492 – Sound Bender – Dalek!!	$24.50
446 – Audio Limiter	$12.00
479 – Bridging Adaptor ETI3/82	$9.95
499 – 150W MOSFET P.A. Amplifier ETI3/82	$79.50
498 – Preamp for above	$39.50
480/50 – 50W Economy amplifier – quality version	$23.00
480/100 – 100W Economy amplifier – quality version	$27.00
158 – Low Ohms Meter ETI11/81	$29.50
729 – UHF Masthead Amplifier	$35.00
735 – UHF Convertor	$32.50
477 – 5000 Series MOSFET Module – Quality	$59.00
478MC – 5000 Series Moving Coil Preamp	$29.50
478MM – 5000 Series Moving Magnet Preamp	$19.50
458 – 5000 Series Peak Reading Level Meter	$29.50

Ref: EA 11/82

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What will they think of next???! Sensational project that detects the current drawn by one appliance to switch on up to 4 others – AUTOMATICALLY!
Great for computers, component Hi Fi etc. when you have to normally switch on several items in a system. Will switch total load of 240V 10A.
Complete kit including outlets, box, mains relay etc. ONLY $39.50

'super siren'

Incredible CMOS circuit drives a Motorola piezo horn (KSN 1038A) to achieve extremely high sound pressure levels. Makes a great alarm and only draws – would you believe – 5mA average?
Runs for ages on a 9V battery. You can get the electronics including the PCB for only $5.00. KSN1038A only $17 extra.

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Gives echo soundings to 100 metres

Digital depth sounder for small boats

Pleasure craft of all types are fitted with depth sounders these days and these are an invaluable safety aid. This easy-to-build unit features a digital display, an alarm depth function, and has a range of approximately 100 metres.

by COLIN DAWSON

Depth sounders on pleasure craft are primarily used for simply measuring water depth although some more elaborate (and expensive) models can locate fish or even produce a scan of the sea bottom so that reefs and other sunken objects can be located. The unit described here falls into the former category and, as such, is designed to be easy to construct and to operate.

After all, what could be easier than reading a few numbers off a digital display?

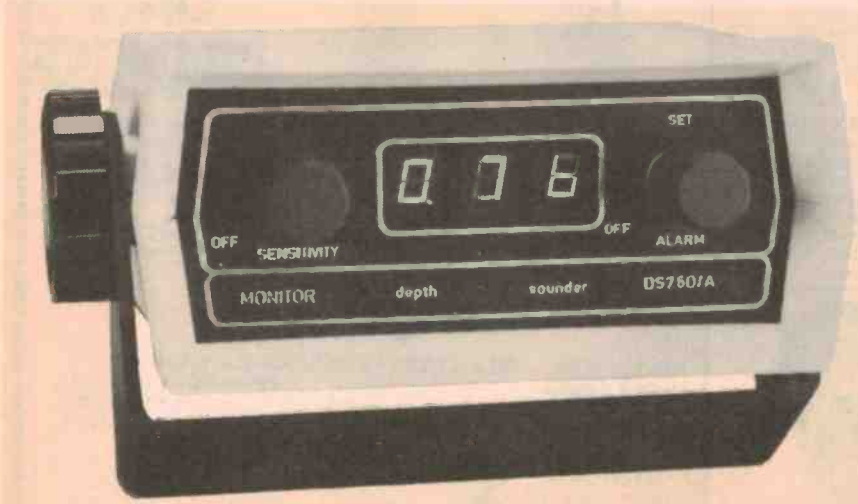
Actually, "Electronics Australia" cannot claim any credit for the design of this project. Instead, the circuit was developed by Sydney engineer Neville Harleck whose company, Monitor Instruments, will be supplying complete kits for the project. Our role simply involved assembling the unit depicted here, and presenting the constructional details.

Once assembled, the kit certainly looks the part. Two printed circuit boards – a display board and a main board – accommodate virtually all the electronics, and these are housed in a white moulded plastic case. Overall case dimensions are a compact 125 × 140 × 58mm (W × D × H).

While the case is not water tight, it is reasonably weatherproof and should stand up well to the rigours of the marine environment. Its compact size also means that you should have no difficulty in finding a suitable mounting position for the device, regardless of the type of boat you own.

Other features include a bright 3-digit LED display, a sensitivity control, an alarm depth set control, and a feet/metres switch mounted on the rear panel. Naturally, we assume that readers will set the display to read in metres now that there are no such thing as feet (at least not in a measurement sense)! A U-shaped mounting bracket allows the case to be tilted to provide a convenient viewing angle.

The audible alarm function is a particularly useful feature. When selected, it sounds whenever the water depth decreases below a preset level, thus eliminating the need for continuous visual monitoring. The danger of running aground is never greater than when the fish are biting, or you are otherwise preoccupied!



The depth sounder is housed in a weatherproof plastic case.

Basic principle

The principle on which a depth sounder operates is quite straightforward. An ultrasonic sound pulse is directed into the water and the time taken for the signal to be reflected from the bottom is measured. Since the speed of sound in water is reasonably constant, the distance the sound pulse has travelled, and hence the water depth, can be easily calculated.

Fig. 1 shows the essential elements of a depth sounder system.

First, the transmitter generates a short pulse of 200kHz energy and, at the same time, starts the clock. The receiver subsequently detects the reflected signal and produces a pulse that stops the clock. If the clock is counting at the correct rate, then the display will indicate the water depth directly in the appropriate units (metres or feet).

Most of the important functions of the transmitter and receiver circuits are incorporated into a single IC made by National Semiconductor. This IC, designated the LM1812, has been around for some years now and greatly simplifies the design task for a practical depth sounder. Fig. 2 shows the block diagram of the complete unit, and should be studied in conjunction with

the cirucit diagram in order to under stand how the instrument operates.

Circuit description

Our circuit description starts with IC1a, which functions as the timebase clock. This generates a 1ms pulse approximately every 800ms and this pulse activates the transmitter and resets the display and alarm functions.

IC1a, part of an MC3401 quad op amp, is wired as an astable multivibrator which functions as follows: at switch-on, both the non-inverting input (pin 2) and the output (pin 4) are high. The 1μF timing capacitor now charges via diode D4 and its series 3.3kΩ resistor and, when the voltage across the capacitor (and hence on pin 3 of IC1a) reaches a critical level, the output of IC1a goes low.

Since diode D4 is now reverse biased, the timing capacitor discharges via the 1.2MΩ resistor into pin 3 of IC1a. When the voltage on pin 3 goes low enough, pin 4 switches high again and the whole cycle is repeated. The 10MΩ resistor between pins 2 and 4 provides positive feedback to speed up the switching transitions.

The output of IC1a thus consists of a train of short positive going pulses. These pulses are coupled to ultrasonic transceiver IC3, counter IC4 and to the non inverting input of IC2a which controls the alarm function.

IC3 is the LM1812 transceiver chip referred to earlier. Both the transmitter and receiver sections share a common tuned circuit, consisting of L1 and the .001μF capacitor, which makes for easy tuning. Readers are referred to the National Semiconductor Linear Databook for a detailed description of this IC, as only a general description of its operation will be given here.

The timebase pulse from IC1a is applied to pin 8 of IC3 via a 10kΩ resistor. This causes the transmitter to "fire" at a frequency determined by the tuned circuit, the output signal appearing at pin 6. This is coupled to the transducer via L2, a parallel 3300pF capacitor, and a .01μF blocking capacitor. The signal appearing across the transducer thus consists of a 1ms burst of 200kHz energy of about 150-200V peak-to-peak.

At the end of the 1ms clock pulse, IC3 reverts to the receive mode.

Signals picked up by the transducer are coupled into the first receiver stage at pin 4 via a 100pF capacitor. Following amplification, the signal appears at pin 3 and is coupled into the next amplifier stage via VR1, the sensitivity control. It is this stage that is tuned by the LC network on pin 1.

As far as the user is concerned, the signal is not seen again until it appears at pin 14, and by this time it has been amplified, detected, shaped, clamped and clipped so that we get a nice clean negative-going pulse from the supply voltage to ground.

The functions of a few other pins on IC3 should also be considered before moving on to the next section. It will be

Virtually all the circuitry is accommodated on two printed circuit boards. Unit provides alarm settings to depths of 30 metres (approx).

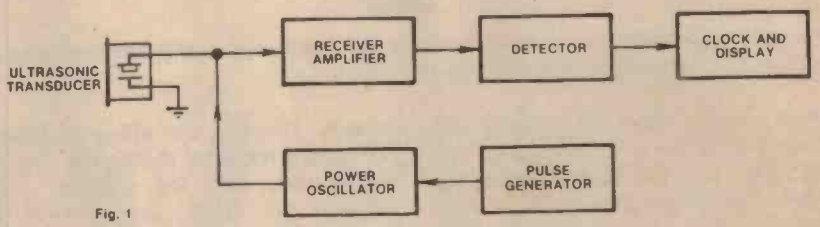


Fig. 1

Basic scheme for an ultrasonic depth sounder circuit.

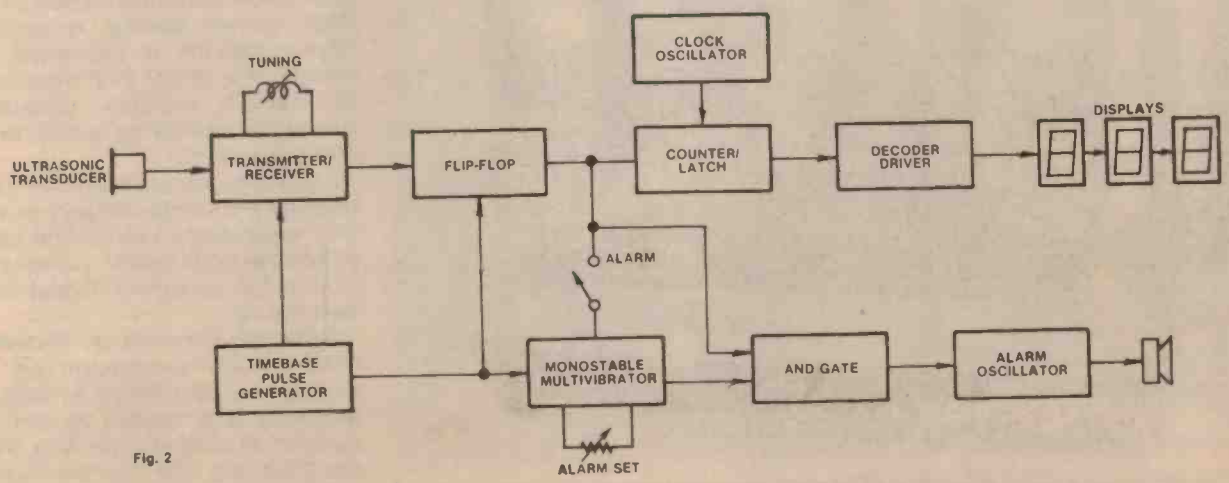
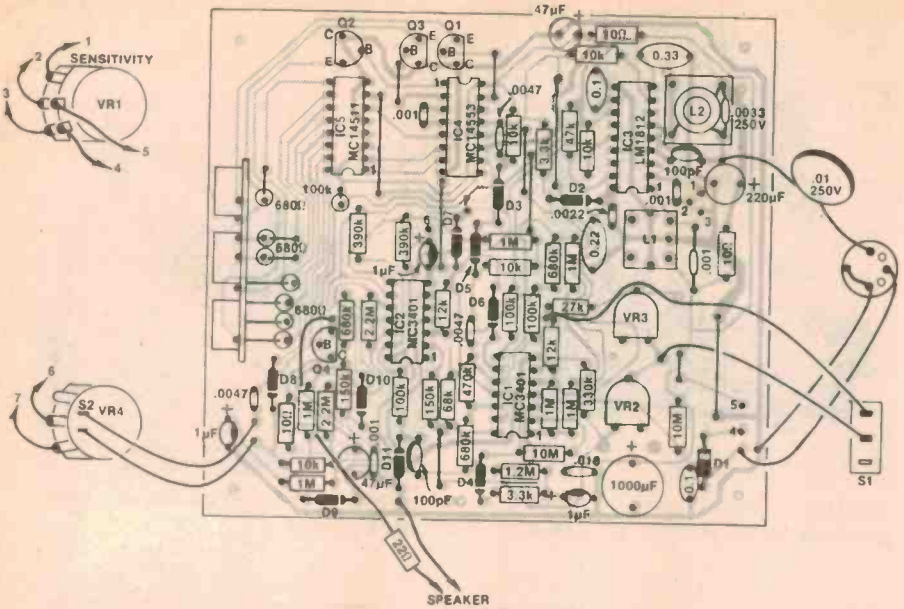


Fig. 2

Block diagram of the complete depth sounder circuit. The transmitter/receiver is based on a single IC.



Parts overlay diagram for the depth sounder. Take care with component polarity and note that IC4 is oriented differently to the other ICs.

noticed that the timebase pulse is also fed into pin 18 via a 3.3kΩ resistor and series diode D2. This is done to inhibit the detector during the transmit time, and thus prevent a false output signal appearing at pin 14. The 47kΩ resistor and 0.22µF capacitor connected to pin 17 provide a measure of impulse noise rejection.

The 0.33µF capacitor on pin 9 is charged during the transmit period, and serves to inhibit the second stage of the receiver. As the voltage across the capacitor falls (at the end of the transmit period), the gain of the second stage increases. This has the effect of filtering out signals received during the first few milliseconds after the transmit pulse. Without this effect, echoes from the boat's keel or rudder could falsely trigger the display circuitry and cause an incorrect reading.

The output signal appearing at pin 14 is coupled to IC1c which functions simply as an inverter. The inverted signal is then fed to IC1d which is connected as a monostable and functions as follows.

Pins 9 and 4 of IC1 are normally low and, because of its 470kΩ feedback resistor, IC1d will be latched either high or low. When a timebase pulse occurs, pins 12 and 10 are forced high, and the feedback resistor latches the device in this state. When an echo is subsequently received, it produces a positive pulse at pin 9 which is coupled to the inverting input of IC1d and hence forces pin 10 to go low.

Thus the time that pin 10 stays high is the time from transmit pulse to received echo. Note that pin 10 stays low until the next transmit pulse, which means that any echoes occurring after the first have no further effect on IC1d. Multiple echoes are thus ignored.

The signal at pin 10 of IC1d is differentiated and the negative going pulse coupled via diode D5 to the latch enable input (pin 10) of counter IC4.

IC4 is an MC14553 3-digit BCD counter with multiplexed outputs. The counter is reset to zero by the timebase pulse on pin 13 and the trailing edge of this pulse is used to enable the latches in the chip (thus displaying 000); ie, the timebase pulse is differentiated by a .0047µF capacitor and a 10kΩ resistor, and the resultant negative going pulse coupled to the latch enable input of IC4 via D3.

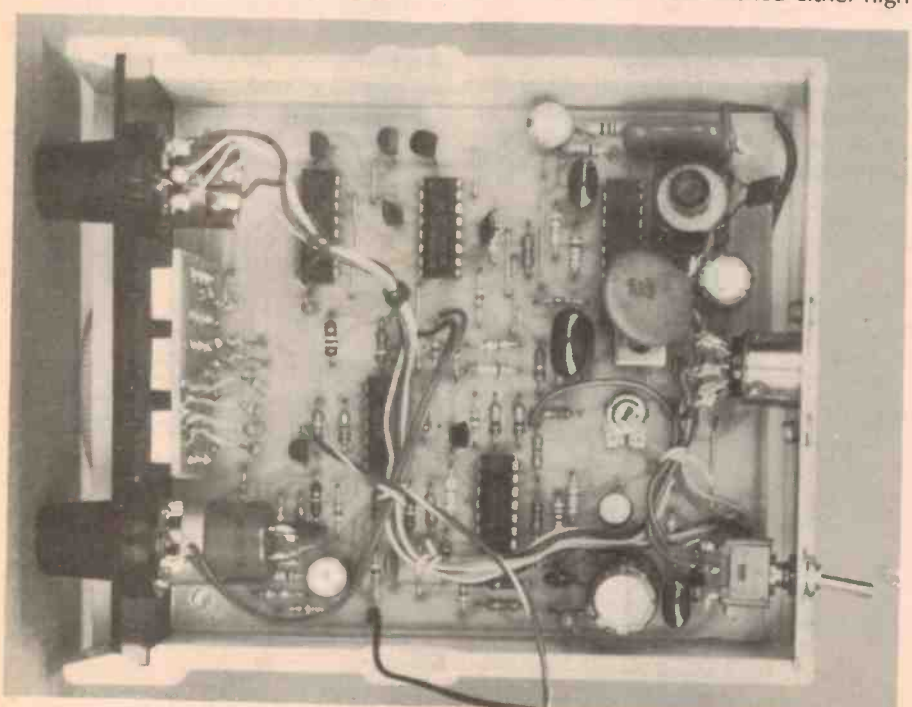
As soon as the reset pulse has finished, the counter starts counting clock pulses from IC1b. When an echo is received, a negative going pulse is coupled through to pin 10 via diode D5 as above, and the counter data is transferred to the latches for decoding and display. The next transmit pulse again resets the counter and displays to zero and the cycle is repeated.

Note that if no echo is received, the displays will remain on zero. This is because a latch enable pulse must occur before data can be transferred to the latches.

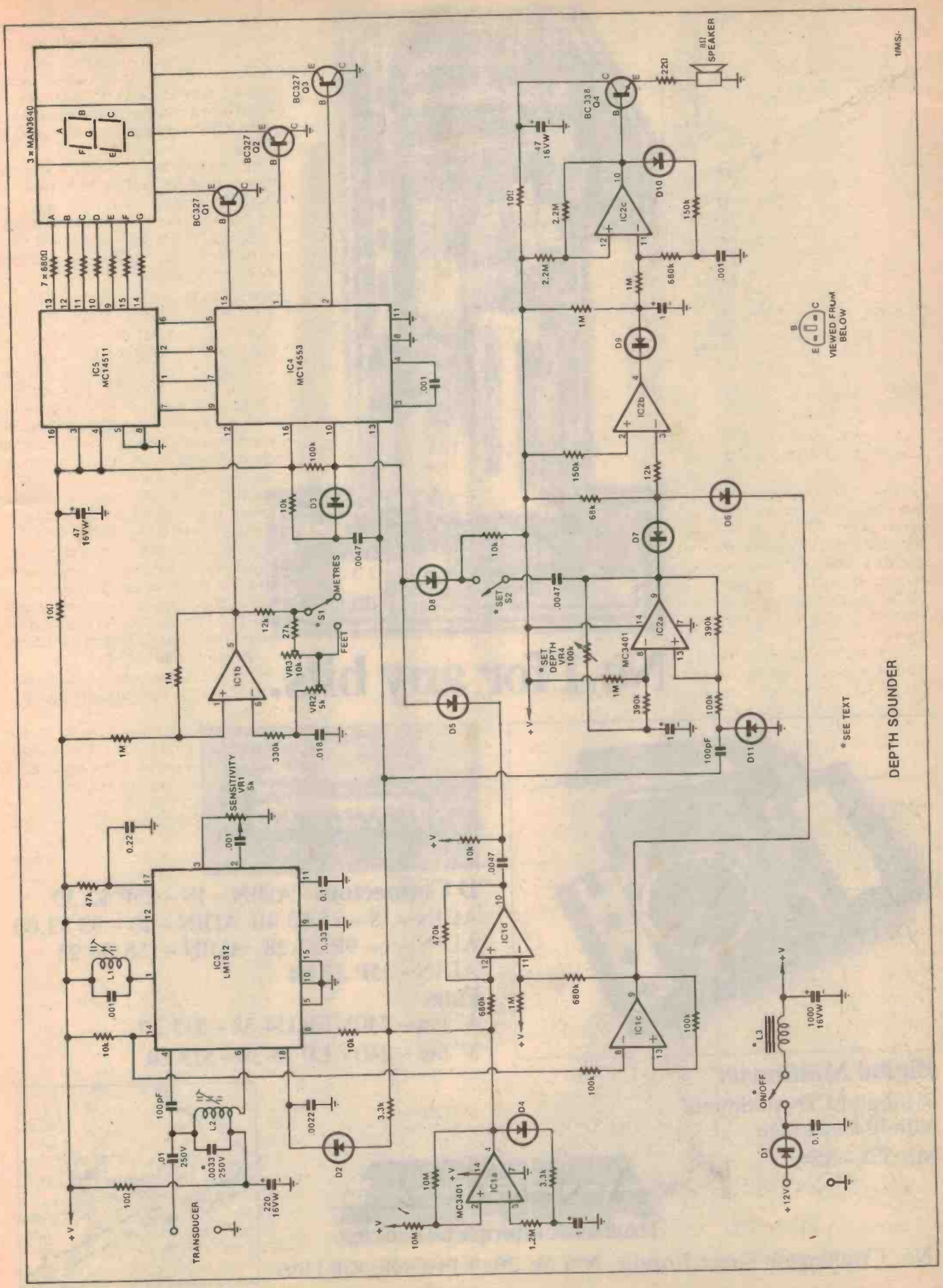
IC5 is a BCD to 7-segment decoder/driver chip which decodes the binary data from IC4 to drive common cathode 7-segment LED displays. Since the displays are multiplexed, the corresponding anodes are wired in parallel and connected to the outputs of IC5 via 680Ω current limiting resistors. Each display cathode is connected to the emitter of a BC327 PNP transistor (Q1, Q2 and Q3), and these transistors are turned on and off by signals from the multiplexer in IC4.

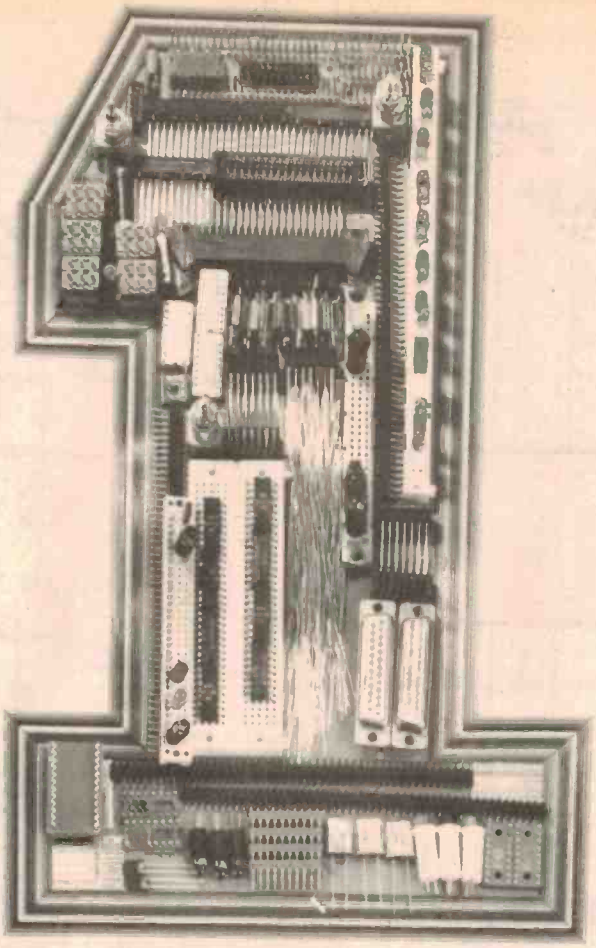
If you like, you can regard the counter, decoder and display circuitry as a "black box" controlled solely by the timebase pulse, the latch enable pulses and the clock pulses on pins 13, 10 and 12 of IC4 respectively.

Clock pulses for IC4 are derived from IC1b which is connected as a multivibrator and runs continuously. Its frequency is controlled by the .018µF capacitor in company with VR2, VR3 and the 27kΩ and 12kΩ feedback resistors. Switch S1 shorts out VR3 and the 27kΩ resistor, thus changing the oscillator fre-

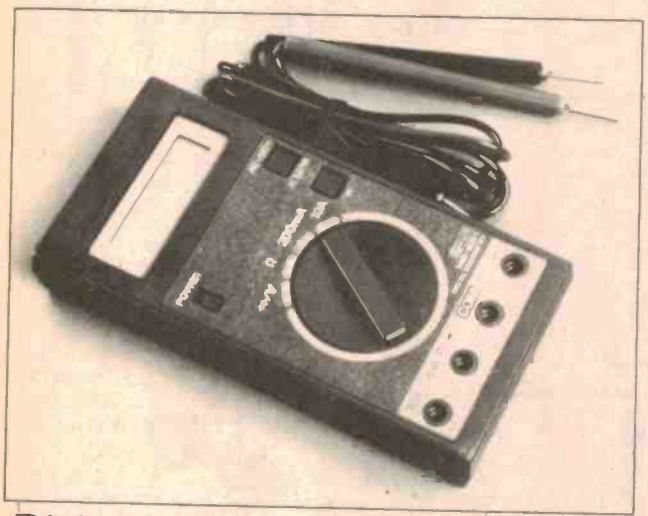


Close-up view of the completed PCB assembly. Note that the seven 680 resistors adjacent to the display board are mounted end on.


DEPTH SOUNDER
* SEE TEXT
1/MS/-
3 x MAN3640
7 x 680Ω
IC5 MC14511
IC4 MC14553
IC3 LM1812
IC1a
IC1b
IC1c
IC1d
IC2a
IC2b
IC2c
MC3401
BC327 Q1
BC327 Q2
BC327 Q3
BC338 Q4
8Ω SPEAKER
220Ω
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
VIEWED FROM BELOW
METRES
FEET
* S1
* SET S2
SENSITIVITY VR1 5k
VR2 5k
VR3 10k
* SET DEPTH VR4 100k
L1
L2
* L3
* ON/OFF
TRANSDUCER
+12V
+V



No.1 for any bits.



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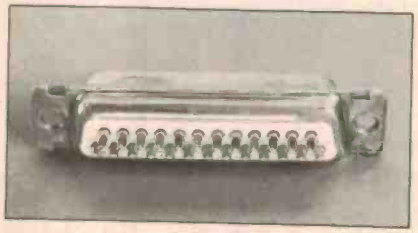

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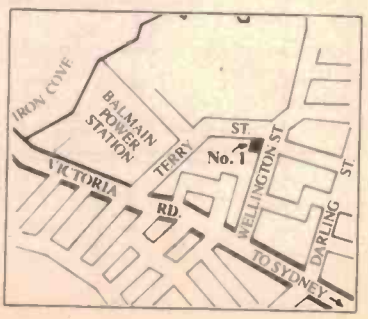
3" fan – 240V EP 75-38 – $13.20



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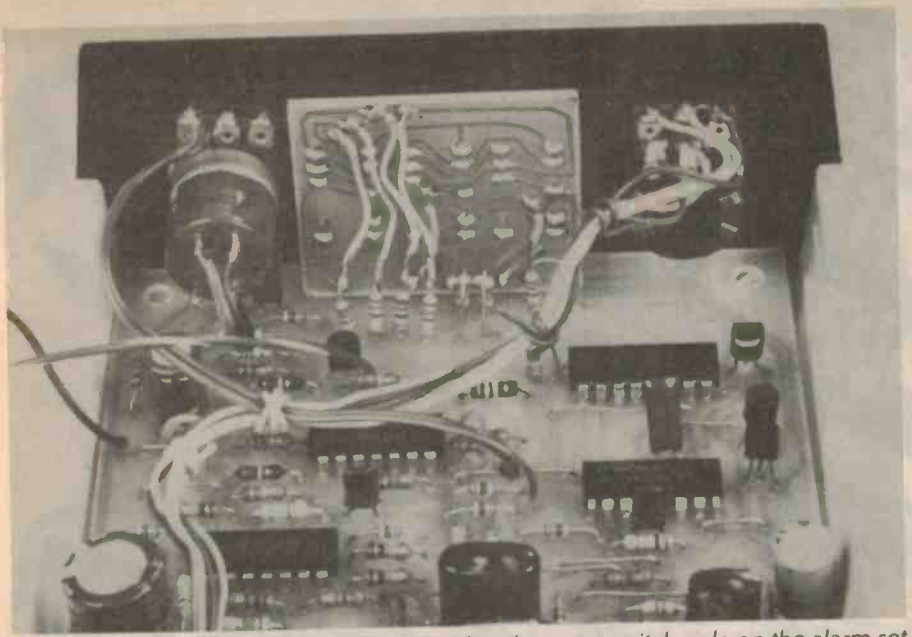
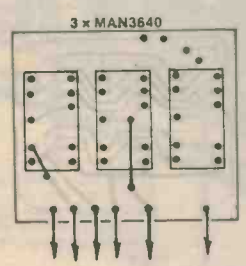


Front panel and display PCB details. Note that the spare switch pole on the alarm set control can be used to automatically disable the echo pulse (see text).



Parts overlay diagram for the display PCB. Insert the two wire links first.

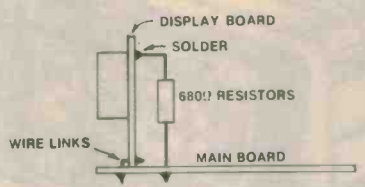


Fig. 3

This diagram shows how four of the 680Ω resistors are mounted.

quency so that the display can read directly in either feet or metres.

The clock frequencies for IC1b are derived as follows: the speed of sound in water is approximately 1500m/s and is fairly constant over quite a wide range of temperature and salinity. It will therefore take 1s to receive an echo in 750m of water, since the sound pulse has to go down and up. Thus, if the clock is set to 750 pulses per second, the counter will count up to 750 and the water depth will be displayed directly in metres.

If we want the display to read in feet, then the oscillator frequency can be found simply by multiplying 750 by 3.28 (the conversion factor from metres to feet) which gives 2460Hz. Thus the clock must run at 2460Hz for feet and 750Hz for metres. A fathoms display could be achieved with a clock of 2460/6 = 410Hz.

Finally, we come to the alarm function. The depth at which the alarm sounds is set using front panel "alarm set" control VR4. First, the "alarm set" control is pulled out to display the alarm setting. The control is then rotated until the display reads the required alarm depth and then pushed in again. The display immediately reverts to the water depth and, if this is less than the alarm setting, an audible warning is produced.

All alarm functions are controlled by IC2, an MC3401 quad op amp. IC2a functions as a monostable multivibrator, the period of which is determined by VR4 and the 1μF timing capacitor. The monostable is triggered by the timebase pulse which is coupled in via a 100pF capacitor and causes pin 9 to go high, thus reverse biasing diode D7.

If an echo is received while the monostable output is high, then both D6 and D7 will be reverse biased for the duration of the echo pulse (ie for as long as pin 9 of IC1c remains high). This causes pin 3 of IC2b to go high and the pin 4 output to go low. Since it is now forward biased, the anode of diode D9 also goes low, enabling oscillator IC2c to start up.

IC2c is a voltage controlled oscillator whose frequency depends on the voltage at the anode of D9; ie the charge on the 1μF capacitor. Initially, the 1μF capacitor is discharged and the oscillator starts at a high frequency. When the echo pulse ends, D9 is reverse biased again and the 1μF capacitor charges towards the positive supply rail via a 1MΩ resistor. As the voltage across this capacitor rises, the discharge current from the .001μF capacitor slows and the output frequency drops lower and lower until eventually the oscillator stops.

NPN transistor Q4 simply functions as a

PARTS LIST

1 printed circuit board, 111 × 100mm
1 printed circuit board, 41 × 35mm
1 SPST toggle switch
1 5-pin DIN socket and plug
1 plastic case, 125 × 140 × 58mm
1 front panel to suit
1 8Ω loudspeaker
2 knobs
1 U-shaped mounting bracket
2 mounting knobs for bracket
1 ultrasonic transducer kit
2 slug-tuned coils, L1 & L2 (available from Monitor Instruments)

SEMICONDUCTORS
2 LM3900, MC3401 quad op amps
1 LM1812 ultrasonic transceiver
1 MC14553 3-digit BCD counter
1 MC14511 BCD to 7-segment decoder
3 BC327 PNP transistors
1 BC338 NPN transistor
11 1N4001 silicon diodes
3 MAN3640 7-segment LED displays

CAPACITORS
1 1000μF/16VW PC electrolytic
1 220μF/16VW PC electrolytic
2 47μF/16VW PC electrolytic
3 1μF/16VW tantalum
1 0.33μF metallised polyester (greencap)
1 0.22μF greencap
2 0.1μF greencap
1 .018μF greencap
1 .01μF/250V disc ceramic
3 .0047μF greencap
1 .0033μF/250V disc ceramic
1 .0022μF greencap
4 .001μF greencap
2 100pF disc ceramic

POTENTIOMETERS
1 100kΩ linear potentiometer with DPST pull-on switch
1 10kΩ mini-trimpot, horizontal mounting
1 5kΩ mini-trimpot, horizontal mounting
1 5kΩ linear potentiometer with SPST rotary switch

RESISTORS (¼W, 5% unless specified)
2 × 10MΩ, 2 × 2.2MΩ, 1 × 1.2MΩ, 6 × 1MΩ, 3 × 680kΩ, 1 × 470KΩ, 2 × 390kΩ, 1 × 330kΩ, 2 × 150kΩ, 4 × 100kΩ, 1 × 68kΩ, 1 × 47kΩ, 1 × 27kΩ, 2 × 12kΩ, 5 × 10kΩ, 2 × 3.3kΩ, 7 × 680Ω, 1 × 22Ω, 3 × 10Ω

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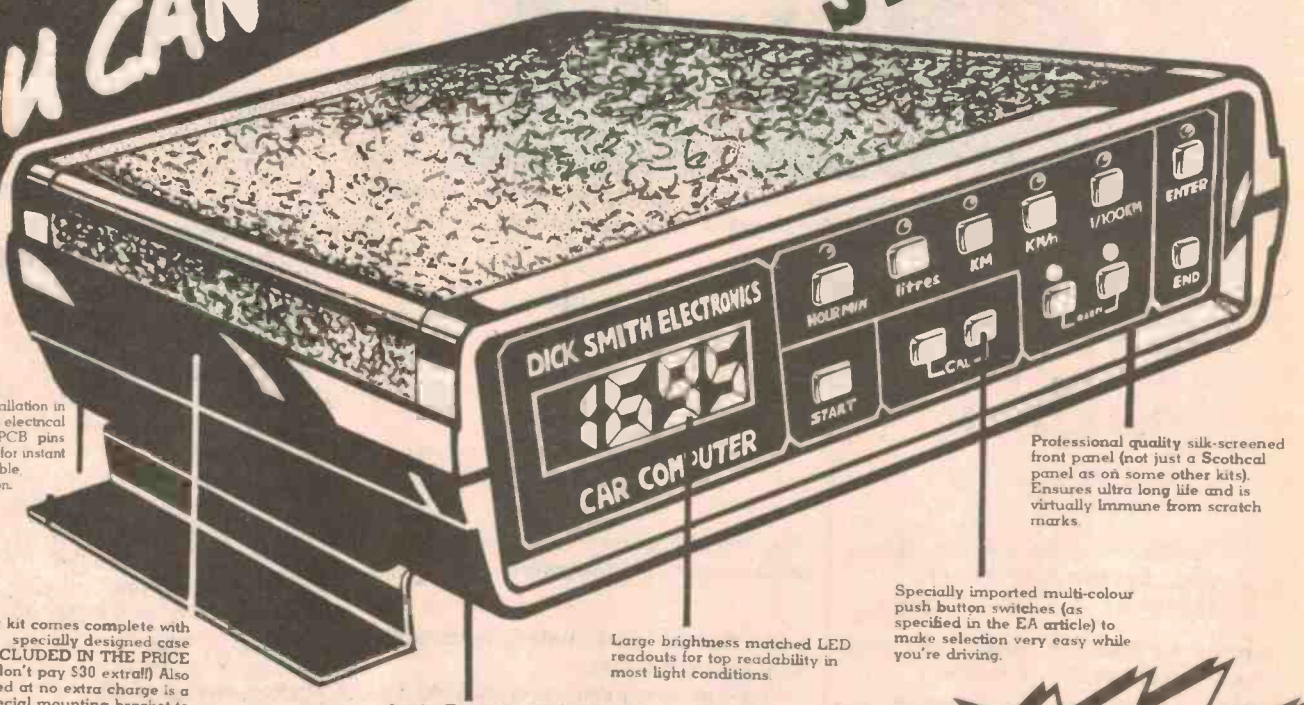

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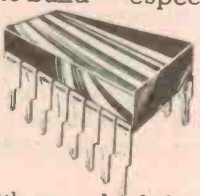

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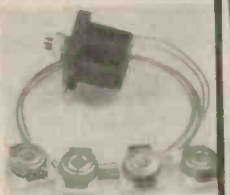

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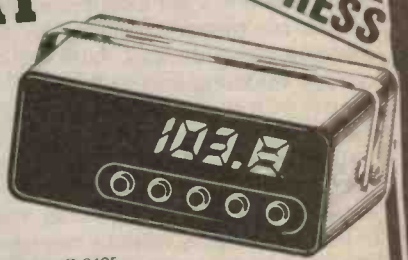

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SEE PAGE 98 FOR ADDRESS DETAILS

buffer and drives a small loudspeaker in its emitter circuit via a 22Ω resistor. The result is a siren-like note pulsed at the timebase frequency.

The alarm can sound only if an echo pulse is received while the output of monostable IC2a is high. Thus, it is the monostable pulse width that determines the alarm depth and this is displayed by using the trailing edge of the pulse to trigger the latch enable (pin 10) of counter IC4.

First, however, the echo pulse must be disabled and this is done by setting the sensitivity control (VR1) to minimum. The output of monostable IC2a is differentiated by the .0047μF capacitor, and the negative going pulse produced at the trailing edge coupled via switch S2 (on the back of VR4) and diode D8 to the latch enable of IC4. Since the timebase simultaneously resets IC4 and enables IC2a, the display will now show the alarm depth in the appropriate units.

Power for the circuit is derived from a 12V battery (normally fitted to the boat). Diode D1 provides protection against reversed supply polarity, while 0.1μF and 1000μF capacitors provide supply decoupling and filtering. Choke L3 is not supplied as part of the kit, and is not fitted unless problems are encountered with ignition interference (see contruction).

Construction

Construction can begin with the assembly of the main PCB according to the overlay diagram. Insert the wire links first, followed by the resistors, capacitors, coils, diodes and transistors. Take care to ensure that all polarised components are mounted the right way round.

The ICs should be inserted last. Note that IC4 and IC5 are CMOS devices and should be treated accordingly. When soldering these devices, earth the barrel of your soldering iron to the earth track on the PCB (use a small clip lead) and solder the supply pins (8 and 16) last.

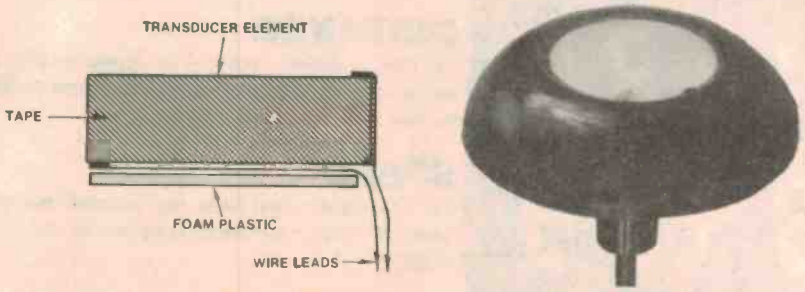
The display PCB should be assembled next. Watch the orientation of the displays and note that the links must go in first. The display board is mounted on the main board using six tinned copper wire links along the bottom edge. In addition, four of the 680Ω current limiting resistors are mounted between the main PCB and the display PCB and, if these are bent as shown in Fig. 3, will provide additional support.

The front panel controls can now be mounted in position and the red perspex window cemented in place using epoxy adhesive. This done, wire the controls to the main PCB, and fit the DIN socket and feet/metres switch to the rear panel. Complete the wiring according to the main wiring diagram and Fig. 3.

TRANSDUCER ASSEMBLY

Begin the transducer assembly by glueing together the two plastic pieces forming the element housing. These are moulded in ABS so use a suitable styrene adhesive. Apply adhesive sparingly to the top edges of the "fried-egg" shaped piece and then press the two parts together, ensuring that the mounting holes are correctly aligned. Allow sufficient time for the adhesive to dry.

The barium titanate element must be prepared next. Carefully tin a small spot close to the edge of the element on each side and solder a short length of hook-up wire to each spot. Be very careful with this operation, as too much heat will burn the silver off the surface of the element. Wrap the circumference of the element in plastic tape, using the tape to hold one of the wires against the edge.



The surface where the two wires emerge is now the rear face of the transducer. Now lay the wire from the rear surface against the transducer and place the plastic foam disc in position. Use more tape to secure it in place. The two wires should now emerge from one side as shown in the accompanying diagram, and should be reasonably well supported by the tape. Leave about 25mm of wire free and strip and tin 3mm at the end of each wire.

Force one end of the coaxial cable through the hole in the stem of the housing and strip and tin the ends of the braid and the centre conductor. Carefully solder the coax to the wires coming out of the transducer assembly and insulate the joints with more plastic tape.

The transducer assembly must now be pushed into the housing, carefully pulling the coax down to avoid building up a loop of cable behind the transducer.

Push the transducer down in the housing so that its front surface is about 3mm below the lip of the housing cavity. Check the cable, at the other end, for shorts and if all is well put your meter on a low AC voltage range and tap the transducer with a screwdriver handle. You should see the meter give a kick, indicating that the trandsducer is functioning correctly, If not, check your connections carefully.

Support the transducer assembly face up, where it can be left overnight, and you are ready for the epoxy resin encapsulation. Do not use 5-minute epoxy. You must obtain some epoxy resin with a 6-12 hour setting time and carefully mix up sufficient to fill the transducer housing. After mixing, allow it to stand for about 20 minutes to allow the air bubbles to escape, then pour it into the transducer housing.

Fill the housing right to the top so that the transducer element is completely immersed and keep an eye on it for an hour or so, topping it as it runs down behind the element. Use a pin to prick any air bubbles that emerge. Take care here, as any air bubbles can drastically degrade transducer performance.

On no account should you use polyester resin — you must use epoxy. Epiglass 40 resin is quite satisfactory.

Finally, fit the DIN plug to the end of the cable, and fit the red and black supply leads.

Although not part of the original design, the circuit can be easily modified so that the echo signal is automatically disabled whenever S2 is closed. As supplied, there is a spare switch pole on the back of VR4, and this may be used to disable the echo signal by connecting it between pin 2 of IC3 and ground. With this simple modification, you won't have to fiddle with the sensitivity control each time you wish to display the alarm depth.

The loudspeaker is fitted to the top half of the case (over the slots) by glueing it

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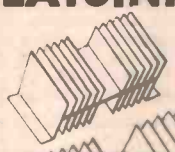

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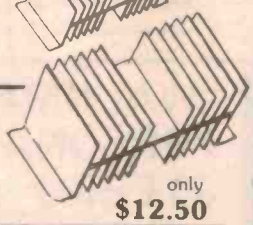

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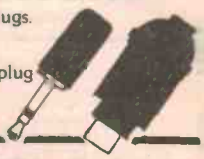

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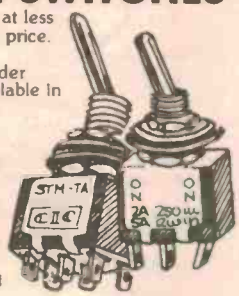

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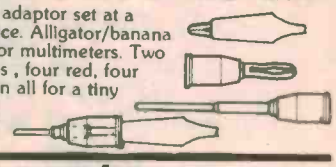

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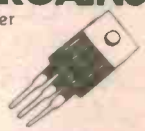

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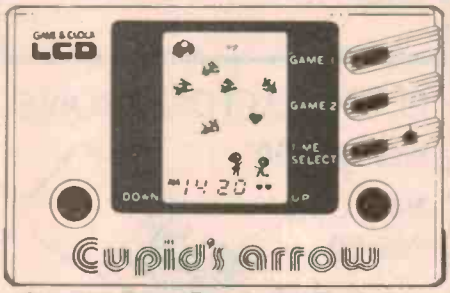

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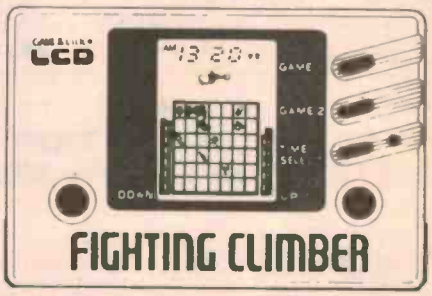

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in place with contact adhesive. A piece of cloth is provided to cover the slots. Connect up the speaker, fit the transducer DIN plug with a couple of flying leads for the power connections, and you are ready for the smoke test!

Apply power (12V) and switch on. All being well you should be greeted by a chirp from the speaker and the display should read 000 or 001. Make sure that the alarm set control is pushed in and fully anticlockwise (ie alarm off).

Now set the sensitivity control to minimum (to disable the echo pulse) and pull out the alarm set control. Slowly rotate the alarm set control clockwise and check that the display shows progressively higher numbers. If this check is OK, operate the feet/metres switch and check that the display changes by a 3:1 ratio. With the alarm set control fully clockwise, the display should read a maximum of approximately 30 metres (VR2 and VR3 roughly midrange).

Now turn the alarm off and the display should go back to zero. Turn the sensitivity control fully clockwise and lightly tap the face of the transducer with a screwdriver handle. The display should flicker and momentarily read some random numbers. If the alarm is now set to maximum depth it may be possible to trigger it by tapping the transducer face as above. (It will only trigger if you "hit" upon an echo reading of less than the alarm setting.)

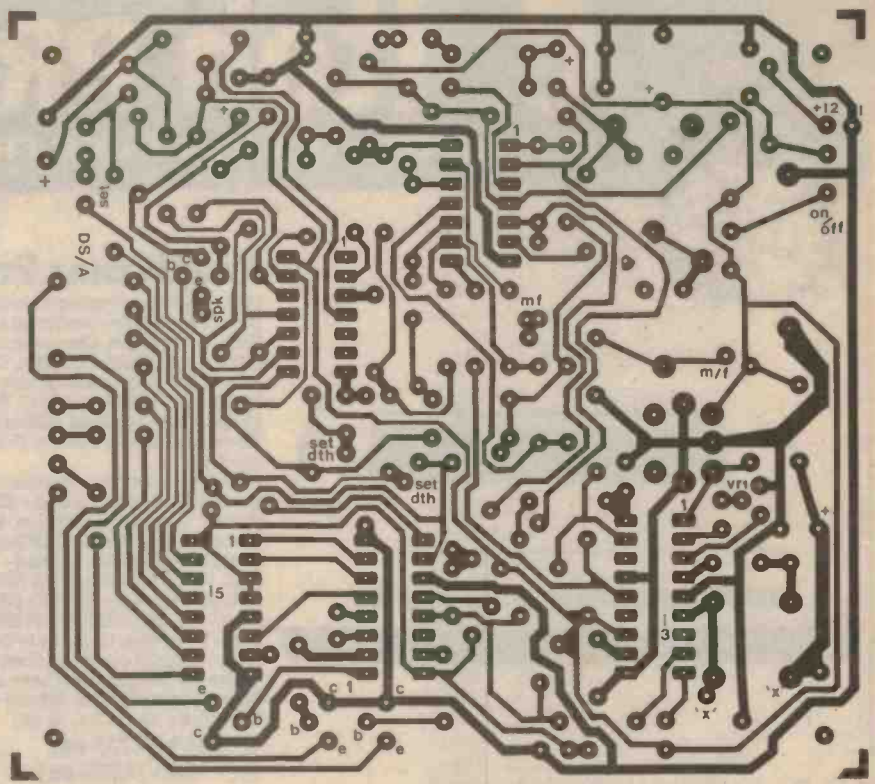
Calibration

If all the above tests work, your depth sounder is functioning and will give readings if taken out in a boat. However, it has to be tuned and calibrated if we are to obtain maximum sensitivity and if the readings are to be accurate. If you have access to the appropriate test gear this can be easily done on the bench; if you don't have test gear, the only way is to take the instrument out on the water.

Assuming that you don't have test gear, the procedure is as follows:

● Tuning: advance the sensitivity control until an echo is obtained then back it off until the echo is just lost. Now tune L1 carefully until the echo reappears (display reading). Reduce the sensitivity again and continue the process until the optimum setting is found for L1. L2 can be tuned in the same way, but as this has a low Q, its setting is not so critical. Most units will tune with the slug of L2 about flush with the top of the former.

● Calibration: once the tuning is done, the calibration can be set if you have a chart. The problem is to find a known depth of water and set VR2 and VR3 to the known depth. Do not forget to allow for the fact that the transducer may not be at the surface if it is mounted on the bottom of the boat; ie the instrument reads depth beneath the transducer.



This actual size PCB artwork is reproduced for readers who like to make their own boards. Finished boards are available from Monitor Instruments.

It may even be possible to resort to the good old lead line to get an accurate depth measurement.

First, set switch S1 to the "feet" position and adjust trimpot VR2 until the display shows the correct depth. This done, set S1 to "metres" and adjust trimpot VR3. Note that VR2 must be set first as it affects the setting of VR3.

If you have access to an oscilloscope, a signal generator and a frequency meter, the procedure is somewhat different:

● Tuning: connect the oscilloscope probe to pin 1 of IC3 and couple in a 200kHz signal to L2 via the .01μF capacitor. Now adjust L1 and L2 for maximum signal strength.

If no signal generator is available, then it is possible to get a signal echo in air. Clamp the transducer to the underside of the workbench and check that the unit is over a hard floor (carpet will not reflect ultrasound). Once an echo is being received, simply tune L1 and L2 for maximum signal strength. (Note: because of the much lower velocity of sound in air than in water, the display will read about four and a half times the actual distance.)

● Calibration: a frequency meter con-

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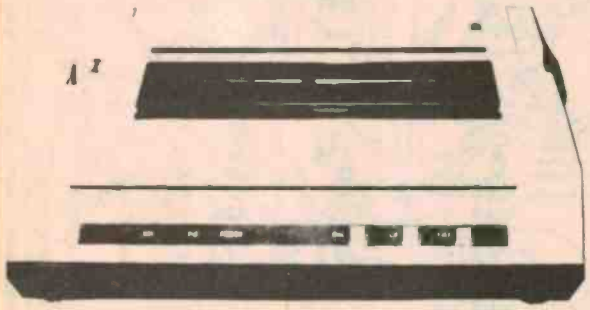

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Error Detection: (1) Parity (VRC)—Odd, Even, No-parity. Switch selectable. (2) Framing Error—Stop bit check. (3) Overrun Error—Error is detected when data are received before the previous data have been processed.
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Weight: 8.5 kg (18 lbs., 12 oz.)

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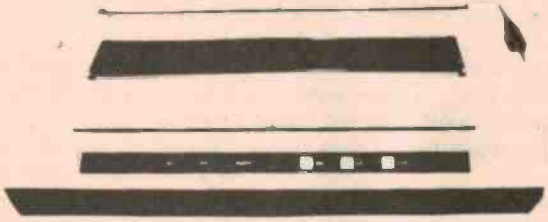

Model 1550

The Model 1550 is a compact desk-top dot matrix serial impact printer used for data communication terminals, hardcopy of CRT displays, peripheral terminals for minicomputers and microcomputers, and small-sized business systems.
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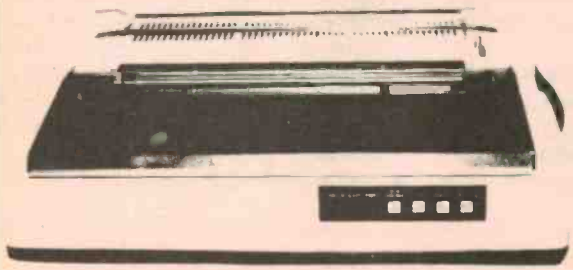
P* $1225 ($1050 ex)
S $1275 ($1195 ex)**



F-10 Printmaster Daisy Wheel Printer

Print Speed: 40 CPS. **Print Method:** Static Print Impact. **Number of Printable Columns:** 136, 163, Variable. **Character Spacing:** 1/120 Inch (minimum). **Line Spacing:** 1/48. **Return Time:** 900 msec. **Line Feed Time** 40 msec. **Paper Width:** 406 mm (maximum). **Print Characters:** 96. **Printwheel:** Industry Standard 96 Character Wheel. **Interface:** Industry Standard 8-bit Parallel, RS232-C Compatible, X-ON, X-OFF, 12-bit Qume and Diablo Compatible. **Dimensions:** 574 mm W x 405 mm d x 153.5 mm H (22.5" W x 15.9" D x 6" H). **Weight:** 14 kg (30.8 lbs.) with cover and power supply. **Noise:** Less than 65 Db (1M from Platen, A Scale).

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nected to pin 5 of IC1b will allow precise setting of VR2 and VR3 to 2460Hz and 750Hz respectively. Alternatively, you can use a CRO or a frequency meter to set the periods to 406μs and 1.333ms respectively.

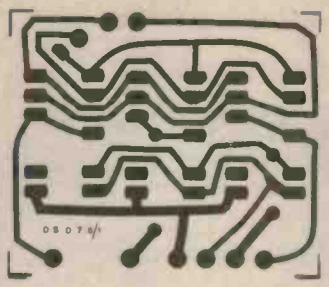
Once the unit is tuned and calibrated it may be mounted in the case. To do this, lay the top half of the case (the half with the speaker in it) upside down on the bench and sit the circuit board on the four mounting pillars. Fit the front and back panels into the slots provided and fit the large brass nuts into the cavities in the sides. Ensure that the board holes line up with the mounting pillar holes and fit the bottom half of the case.

The two halves will fit together closely and the four 12mm × No 4 self tapping screws may be fitted through the bottom holes and screwed into the mounting pillars. The U-shaped mounting bracket may now be attached with the large plastic knob-headed screws. Fit the front panel control knobs and your instrument is ready for use.

Operation

The transducer is the key to satisfactory operation of any depth sounder and a few tips on mounting may not go astray. Many people have mounted transducers inside the hull in a "waterbox" and it is possible to get satisfactory results with this method. However some sound attenuation will occur and this will reduce the range of the instrument. In the worst case it may not work at all.

The best mounting method is on the outside of the hull, roughly in the middle third of the boat and as close to the centre line as possible. It must be clear of any fittings and in an area of clear water flow. Turbulence and bubbles under the transducer will reduce its performance. In yachts, hull heeling under sail will cause the transducer to fire its sound beam out at an angle and this will reduce sensitivity – if the boat heels far enough the echo may be lost altogether. Mind you when this happens the crew is usually too busy to be looking at echo sounders!



Above is the actual size artwork for the display PCB.

Installation of the unit should be straightforward, but keep the transducer and all leads as far away from the engine as possible to avoid ignition interference. If ignition interference does prove a problem (ie the display reading fluctuates randomly), choke L3 will have to be fitted in place of the appropriate link on the PCB. This should be a power supply choke of around 10mH in value.

Because this choke is not available from Monitor Instruments, it will have to be purchased separately if required.

The maximum depth range attainable with this instrument will vary considerably and depends on a number of factors including: tuning accuracy, transducer mounting, water turbulence and bottom reflectivity. Bottom reflectivity will be high with a flat sandy bottom and may be nil with heavy weed growing over soft mud.

A typical unit should give a depth range of from 80-120 metres without any difficulty and possibly more with careful tuning and installation.

Note that apparently strange readings can occur with this type of instrument because the display is triggered by the first echo received. For example, echoes may be received from cold layers in the water, undersea currents, propeller wash from other boats and even fish. The usual effect of this is a steady bottom reading of 30 metres say, with occasional readings of much less; eg a fish at 20 metres or a salinity or cold water layer at 15 metres etc.

Where to buy the kit

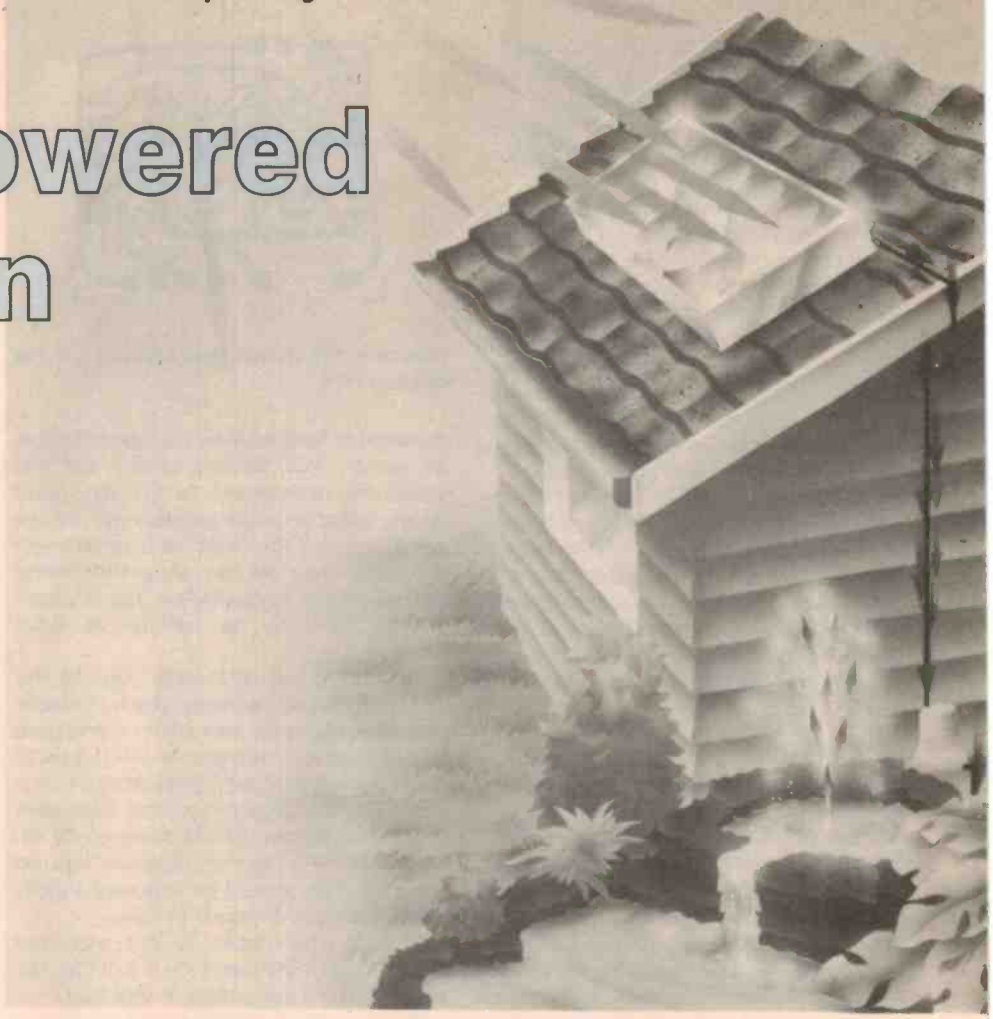
A complete kit of parts for this depth sounder is available from Monitor Instruments, PO Box 116, Rosebery 2018. Cost is $143 for the kit or, if you prefer, $203 for a fully-assembled and tested unit. These prices include postage and packing.

If you are unable to get the kit working, Monitor Instruments offer a repair service for a standard $25 fee (includes postage and packing), but reserves the right to return any kit which is badly wired so as to make repair uneconomic. The repair charge will be $60 in the event that the fault lies in the transducer.

Note that because the PCB is a proprietary design, it will not be available from other kit suppliers. Similarly, the transducer is not sold as a separate item, although it may be possible to purchase an equivalent unit from a ship's chandler. All other components, including the PCB, are available on a one-off basis from Monitor Instruments.

Harness the sun for tranquillity with a

Solar-powered Fountain



Over the last few years small ornamental fountains and garden pools have become very popular with Australian householders. And with good reason. Bright sunshine and trickling water go together to add sparkle and charm to any garden. But there is a way to add more charm and interest and that is to run the fountain from solar power.

by LEO SIMPSON

When the sun shines the fountain runs. That is the concept used here in applying silicon solar cells to run a fountain pump.

In a way, the concept of using solar power to run a fountain is a return to the original method used by the early Greeks and Romans. They used water from mountain streams and springs and brought it long distances in aqueducts to supply their needs for fresh water and incidentally, to provide the cooling and soothing effects of fountains. That was an early use of stored solar energy.

Up till now, if you had a yen for a cascading garden pool or fountain, it had to be mains-powered. This meant the need for a full mains installation or a power supply for a low voltage installation. As well as that, you would have to remember to turn the pump on and off or use a mains timer. For many people this probably amounts to too much trouble and after a while the fountain is likely to fall into disuse.

When the sun shines your fountain runs, the process is completely automatic. You don't have to remember to turn on anything and there is no cost, (apart from the initial investment). And there is a further benefit. The amount of water going through the fountain is proportional to the amount of sunlight actually present from moment to moment. If a cloud partially obscures the sun, the flow will drop to a trickle and then stop altogether if the sun is totally covered. Then it will burst into life as the sun comes out again.

In designing this project, "Electronics Australia" has arranged with Amtex Electronics for the supply of a suitable pump and the principal parts for a solar array consisting of 14 75mm diameter solar cells and Lexan or similar polycarbonate glazing sheets.

The pump which is to be supplied for this project is designed as a bilge pump. Called the "Bilge Mate", it is a submersible impeller pump with a sealed permanent-magnet motor. It is rated at 1400 litres/per hour for an input of 12 volts DC at 3.2 amps. A particular advantage of this pump is that the motor itself is not cooled by the water being pumped and is thus less likely to be clogged by vegetable matter in the water.

When used at 12 volts the Bilge Mate pumps far more water than is likely to be desired for a small garden fountain or pool. Operating the pump at a lower voltage reduces the volume of flow as can be expected but it also reduces the current drain appreciably. At below six volts the current drain is less than one amp which is within the capacity of the supplied solar cells.

While solar cells normally have a nominal open circuit voltage (when fully illuminated) of 0.6 volts, this normally drops to around 0.4 volts under load. With fourteen cells, the total supply voltage varies between 5.5 and 6.4 volts, depending on the available sunlight. This is sufficient to give an adequate flow of water for most small fountains and recirculating garden pools. We estimate the volume to be around 300-500 litres per hour.

This assumes that the pump is working against a head of about 30cm or so. If working against zero head the pump is less efficient. Maximum head is about 1.2 metres. At around 6 volts, the pump is considerably derated so it should have a long life.

Construction of the Array

A number of problems must be taken care of in making an array of the 14 solar cells. First, they must be held securely and protected from any flexing which would crack them. No strain must be placed on the grid (negative) connections otherwise they may be damaged.

The principles of solar cells

Silicon solar cells are photovoltaic. They generate a voltage in response to light falling upon them. The cell is a pn junction as shown in Fig. 1. Light falling on the cell generates hole-electron pairs which are swept away to the two electrodes to produce a voltage between them.

The amount of energy needed to release electrons is called the band gap of the material and this is expressed in electron-volts. Silicon has a band gap of 1.12eV and this gives a cell with a maximum open circuit voltage of 0.6V.

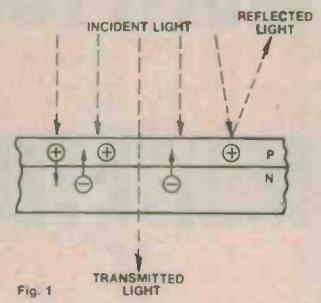


Fig. 1

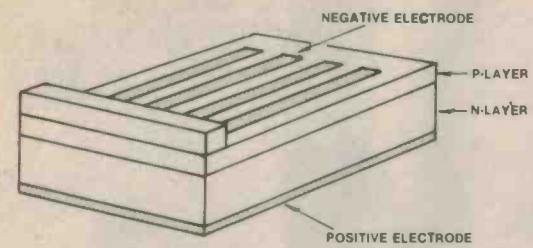


Fig. 2

The characteristics of a silicon solar cell are shown in Fig. 3. When not illuminated, the cell behaves like an ordinary diode with heavy currents flowing for forward voltages in excess of 0.6 volts. For reverse voltages relatively small currents flow. This is shown on the dark characteristic curve.

When light falls upon the cell it generates an open-circuit voltage V_o, or delivers a short-circuit current I_s which is also the reverse current without any voltage applied. The maximum power output is at V_m and I_m, as shown on the light characteristic curve. For the cells in question this corresponds to an output voltage of 0.46V and a current of 1.1 amps.

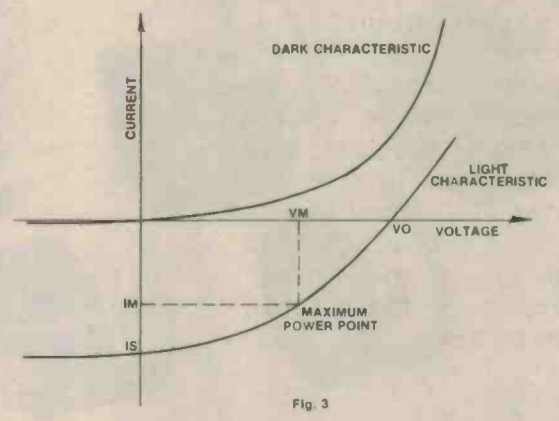


Fig. 3

The construction of typical solar cells is shown in Fig. 2. This shows a relatively thick base of n type silicon laid over the positive electrode. The top p-layer is an oxide of tin or indium or cadmium sulphide or gallium phosphide. This has a grid pattern for the negative electrode connection.

The cells must also be protected from the weather while being exposed to as much solar radiation as possible. This latter factor means that they cannot be housed under ordinary glass as its iron content will unduly attenuate ultraviolet radiation. The preferred glazing material for this application is Lexan (made by General Electric) or an equivalent transparent polycarbonate material.

Two sheets of this polycarbonate material will be supplied with the cells and the pump. Both sheets will measure 600×180mm, one 3mm thick and one 2mm thick. The thin sheet is the top cover while the thick sheet becomes the base.

A series of holes is drilled in the base sheet so that the connecting leads to the cells can be passed through it and interconnected. In practice this means that an 8mm (5/16-inch) hole should be drilled under each cell to make the positive connection while a small hole (about 2mm) adjacent to each cell allows the negative lead connection to pass through. Two holes are also drilled at one end of the array to take a pair of binding post terminals (one red, one black)

The "Bilge-Mate" pump must be fully immersed in the pool and should work against a head of at least 30cm for best results.

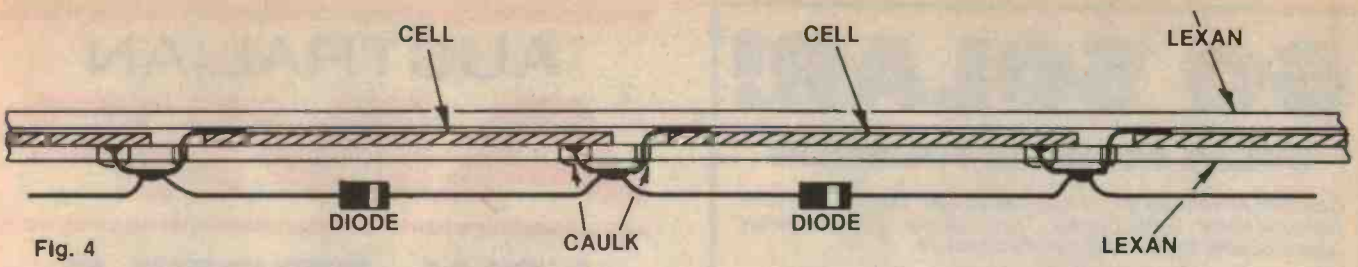


Fig. 4

This diagram shows the sandwich construction of the array with the cells held between two sheets of Lexan.

for the output connections to the pump.

The method of construction is as follows. The Lexan sheets are supplied with protective paper covering on both sides. This allows you to mark the positions of holes to be drilled with a soft pencil. Keep all holes in two straight lines so that the resulting wiring is neat and tidy. Do not remove the paper backing until all holes have been drilled and deburred. Do not use too high a drilling speed for this job otherwise the material will tend to melt.

Having drilled all the holes, remove the paper backing and place a dab of Dow-Corning silicone caulking compound in the centre of each cell mounting position on the sheet. Then place all cells in their respective positions and line them up so that their grids are oriented in the same direction. Be very gentle in handling the cells as they are very fragile. Squeeze the cells down on the sheet (very gently) so that they are held reasonably firmly by the suface tension of the caulking compound. (In time, the compound will cure.)

It is important that the top surface of the cells does not become contaminated by any foreign substance. Do not handle the top surface, and take care to ensure that the cells are not splashed with water or other liquids. Also, when soldering, avoid depositing flux sediment on the cell top surface.

Now solder a short length of stripped and tinned multi-strand insulated wire to the grid connection of each cell. Do not use single-strand insulated wire as it is too rigid and inclined to break or stress the cell connections. (We used a ribbon of tin foil for connections on our prototype but this is not available).

It is essential that you use a low-powered soldering iron with a small tip. Preferably, it should be a temperature controlled iron. Be very careful when making the solder connections to apply the very minimum of heat to the cell tab connections as they can easily lift from the cell surface.

Having made a connection to the top tab of each cell, pass each connecting wire through the Lexan sheet. Place the top Lexan sheet over the cells and then turn the entire sandwich assembly upside down so that the solder connections can be made to the underside of each cell, via the 8mm access holes.

Proceed until all the cells are connected in series. Then temporarily mount the binding post terminals and connect them. The red (positive) terminal should connect to the underside of the last cell in the series string while the black terminal should connect to the grid connection of the cell at the other end.

Now you are ready to test the array before it is sealed.

Take the array outdoors, and expose it to sunlight and measure the voltage across the output terminals. It should be close to 8.4 volts in bright sunlight. If not, check that you have 0.6 volts across each cell and that the series connections have been correctly made so that individual cell voltages all add.

Now immerse the pump and connect it to the solar array. With bright sunlight the pump should start immediately and pump at a reasonably high rate. With no outlet pipe attached to the pump it will place maximum loading on the array which should deliver 5.5 volts or more in bright sunlight. Under these conditions each cell should deliver about 0.4 volts.

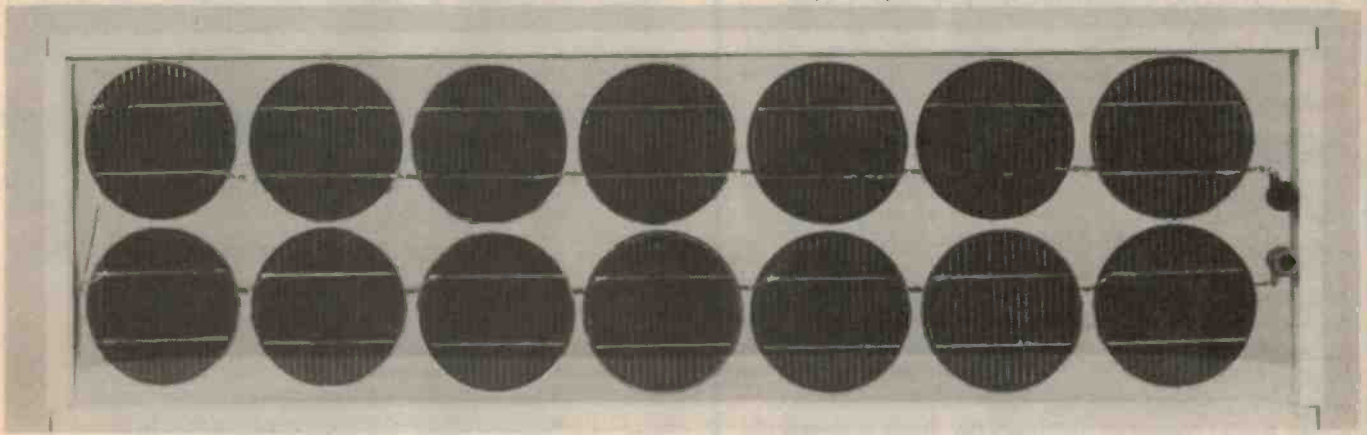
If the pump does not run it is probably because you have a bad connection to one of the cells or one of them has become partially open circuit. The voltage checks above should reveal any defect of this sort.

If one of the cells is defective, try bridging it out with a jumper lead. The pump should now run. However, if you have been reasonably careful in assembling the array you should not have any problems.

With these checks complete, we suggest the addition of a diode across each cell, connected so that it is normally reverse-biased. We recommend a diode type with a rating in excess of one amp. In practice, this means that most people will use the 1N5404 (14 required) which has a three-amp rating and is readily available.

The diodes are a protective measure. First, if one cell does become defective over the life of the array, the parallel diode will automatically shunt it out of circuit and only a small loss of performance will result, rather than complete failure. Secondly, if a leaf or other object lodges over one of the cells it will not be reverse-biased and possibly burn out.

Deep shadows falling over part of the array will also be protected against. This is important if the array cannot be posi-



The prototype solar array with extruded aluminium frame. Note the two binding posts. The cells to be supplied will have a different grid pattern.

GO SOLAR!

SOLAR POWERED FOUNTAIN

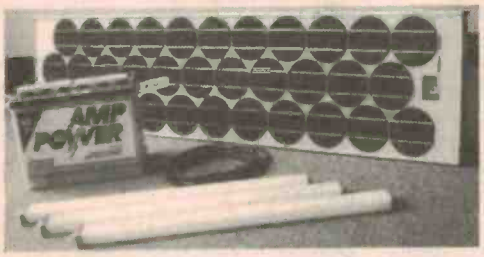
Complete kit consists of: 14 x 75mm dia solar cells, submersible, high-efficiency water pump, two sheets of solar-grade polycarbonate. Price $150. Certified post $5.

SOLAR LIGHTING KIT

If you are not connected to mains electricity, think how convenient it is to just push a button to get light! In most locations, this kit will provide four hours of light from three 13 Watt fluorescent lamps. Alternatively, the power could be used to run other 12V DC appliances like a TV set, ham rig, water pumping, remote data logging — just to name a few.

On average this kit will supply 75 AHrs/week at 12V DC. The actual performance depends on the season, exact location and weather condition at the time.

SEE ARTICLE ON PAGE 58



Kit consists of: One ARCO 35Watt solar module, one 90 AHr deep-cycle battery (supplied dry), three 13W high efficiency fluorescent lamps, 10M cable, diode, battery clamps. Price $700. Rail freight to nearest station $15. Road transport can be arranged, freight collect.

OTHER SOLAR PRODUCTS

ARCO ASI-16-2000 solar module 15.5V 2.26A 35W Tempered solar glass cover with extruded aluminium frame all around. 1220 x 300 x 38mm. Lightweight 4.9kg. Price $600. Rail freight to nearest station $7.

PHOTOWATT MU3410 solar module 14.1V 1.2A 17W Tempered solar glass on an extruded aluminium heatsink. Hexagonal cells allow compact size of 725 x 300 x 25mm. Weight 6kg. Price $370. Certified post $6.

SOLAR POWERED CEILING FAN

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Complete with its own solar module $250
Fan only (runs off 6 to 24V DC) $150
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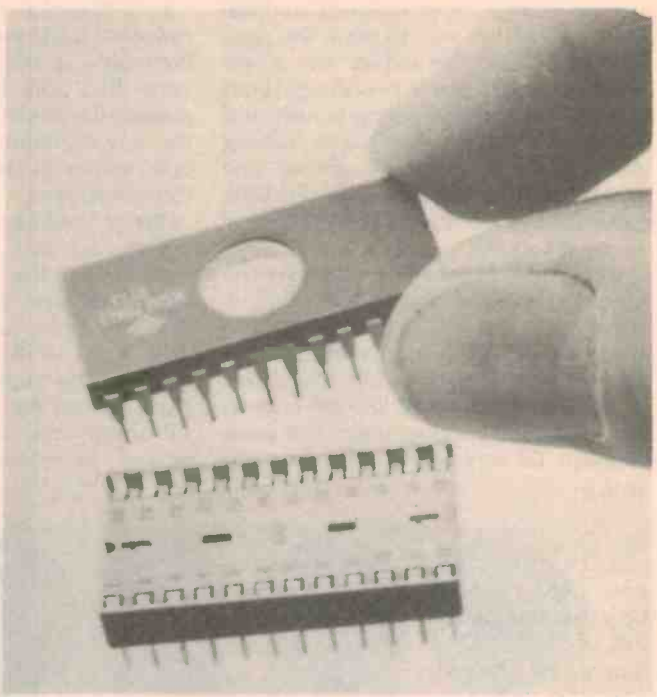
LOW-PROFILE DIP SOCKETS



DIPLOMATE

Features

- Low Profile
- Dual wiping contacts
- Large target area, with tapered lead-in ramps
- Designed for automatic machine insertion—
- Tin or gold plated phosphor bronze or beryllium copper contacts
- Closed bottom
- Visual polarization
- Designed to meet EIA RS-415
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Technical information available on request.

Soanar

Soanar Electronics Pty Ltd

30-32 Lexton Road, Box Hill, Vic., 3128, Australia.

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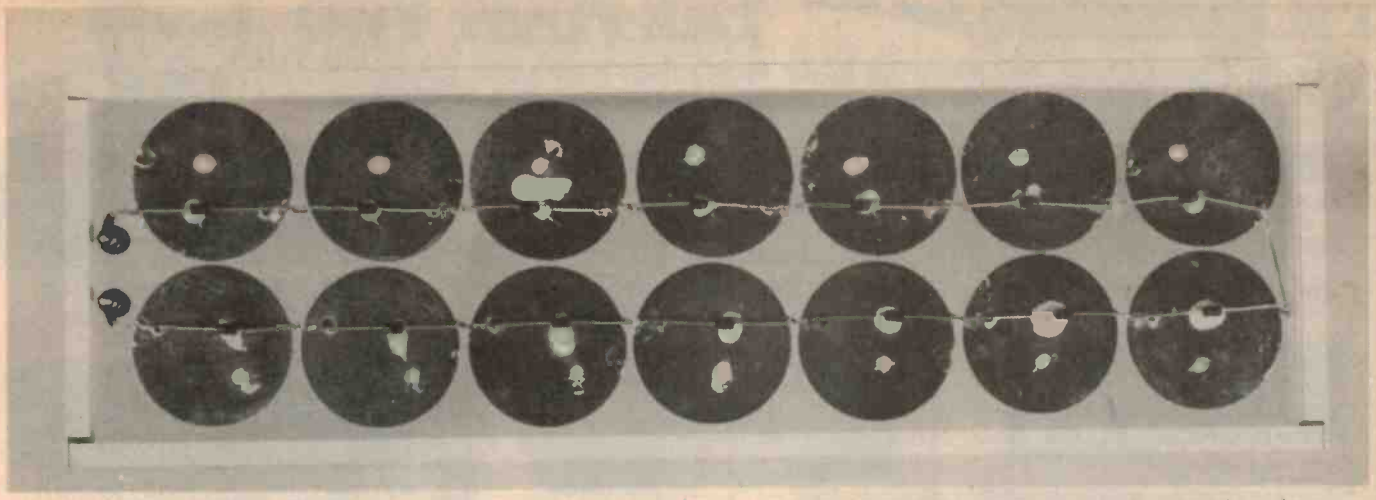


The rear of the cell array showing the dabs of caulking compound on each cell and the protective diodes wired in place.

Optimum inclination for solar arrays

Darwin	17°
Cairns, Broome	22°
Rockhampton, Alice Springs	28°
Brisbane, Geraldton, Broken Hill, Perth	37°
Sydney	39°
Canberra, Adelaide	40°
Melbourne	43°
Hobart	48°

This posed picture shows the solar array with a set of three small cascading pools at Ferguson's Garden Centre, Narrabeen, NSW.

tioned high enough to avoid shadows falling over it at some time of the day. We wired the diodes directly across the back of each cell, as shown in the accompanying photographs.

With the wiring complete, there still remains the task of making a suitable frame for the Lexan sheeting so that the array is a rigid assembly. We made our prototype from white-enamelled aluminium extrusion which is normally intended for making flyscreens. This extrusion is made by Alcan and has two channels, one of which will hold the two sheets tightly together. A similar rolled and folded aluminium strip, also intended for flyscreen use, is available from most hardware stores and can be used for this purpose.

Individual constructors can make their own decision as to whether the aluminium frame should be mitred, lapped or butted. We used lap joints. Before slipping the frame work over the Lexan sheets, run a bead of silicone caulking compound into the channels to provide a good weather seal,

Wipe off any excess caulking compound after the frame has been assembled. Now set up the array in the sun and leave it to run the pump for several hours. This will make it quite hot and any moisture lodged between the sheets should be exhausted via the wiring holes in the bottom sheet of Lexan. Finally, seal each of these holes with a dab of caulking compound. The assembly should be completely sealed against any ingress of moisture

Constructors may also wish to provide a protective panel over the rear of the array, to avoid any possibility of damage to the wiring of the diodes. We did not do this.

When finally installing the array, it should be firmly mounted and positioned as high as possible so that it will be unaffected by trees, shadows, mischievous children and other hazards. Ideally, it should face due north and be inclined as shown in the accompanying table, to obtain maximum solar input, all year round. In this application, this is probably not really important.

Wiring from the solar array to the pump can be ordinary figure-8 mains cable but the overall resistance should be less than 0.3 ohms to avoid undue voltage losses. The wiring can be buried so that it is out of sight.

Where to buy the bits

Amtex Electronics, of PO Box 285 Chatswood, NSW 2067 will supply the pump, 14 cells and two sheets of Lexan or equivalent polycarbonate glazing cut to size. The price for the package is $150. See details in the advertisement elsewhere in these pages. Aluminium flyscreen framing can be obtained from hardware stores or Alcan aluminium centres. Selley Dow-Corning silicone caulking compound is available from hardware stores in tubes or cartridges. The cartridges cost about $6.60. 1N5404 diodes can be obtained from almost any electronic parts retailer, as can figure-8 cable. Fountains and recirculating pools can be obtained from landscapers, nurseries or home handyman centres. Have a nice day! Good gardening!

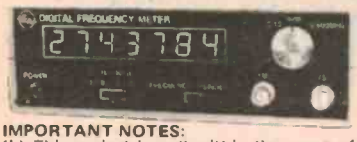
I'M BUILDING have built THE FIRST TWO

– what am I raving about? Well, having one of the World's finest home stereo systems (the brilliant ETI 5000 series amp and preamp together with my beloved B & W DM II loudspeakers of course!), I couldn't resist building ETI's 5000 series 1/3 octave Graphic Equalizers. I have been pestering ETI for well over a year – and **at last the many 1000's of 5000 series owners have the opportunity** *to complete their system with another* **classic, no compromise DAVID TILBROOK DESIGN.** *Details are on the other page of this ad. Cheers* Jack O'Donnell

DIGITAL FREQUENCY METER

See Electronics Aust. Mag. Dec. 81-Feb. '82

500 MHZ, 7 DIGIT RESOLUTION PLUS PERIOD MEASUREMENT FEATURE



IMPORTANT NOTES:
(1) This project is well within the scope of the "not so experienced" as virtually all components are contained on a single PCB.
(2) ALTRONICS USE ONLY THE SPECIFIED INTERSCIL LSI – BEWARE OF INFERIOR KITS THAT DO NOT CONFORM TO THE ORIGINAL DESIGN.

* Screened front panel * Bright high efficiency 7 segment display * Frequency ranges 0-10MHz, 0-50MHz, 10-50MHz (with optional pre-scaler) * 4 gating times – 01, .1, 1, 10 seconds. * 4 period measuring ranges 1, 10, 100 and 1000 input cycles give 0.1uS resolution. * High input sensitivity – 10mV to 30MHz, 100mV at 50MHz @ 1M input impedance, 200mV at 500MHz @ 75 ohms input impedance. * High accuracy – typically better than .005%/ count uncalibrated.

Costs a fraction of commercial counters.

EXCLUSIVE ALTRONICS KIT FEATURES:
- IC sockets provided throughout.
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Combination Colour Organ and Light Chaser. Four channel colour organ. Internal microphone or connect to speakers for colour organ operation. (The lights connected to each channel pulse in beat to the music proportional to portion of frequency spectrum concerned.) Four chaser modes forward and reverse. Output lamp load capacity a massive 2400 watts – that's 100 party globes. Full instructions and every last nut and bolt included. Great for parties, shop signs, display windows etc.

K 1004 . . . . . $79.50

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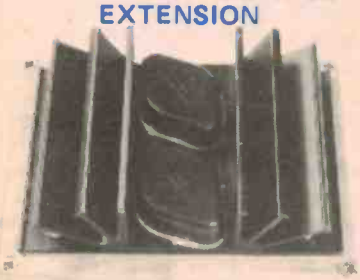

Petrol $2.00 a gallon – Good Grief!

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EA's new Function Generator covers the frequency range from 15Hz to 170kHz in three ranges with coarse and fine frequency controls. An economical 4-digit display has been incorporated to eliminate dial calibration. Sine wave distortion can be trimmed to around 0.5%.

See EA April, 1982

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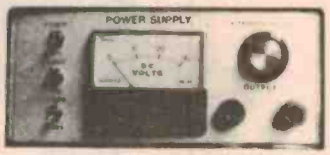
ALTRONICS POWER SUPPLY

BASED ON EA LM 317K PROJECT
Every workshop, school and hobbyist should get one now!



- Overload and short circuit protected.
- Full voltage and current metering.
- 3-32 volt output at 1 AMP.
- Uses LM 317K variable regulator.
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VALUE PLUS!

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Electronics Australia Project. Measures 1PF – 99.99 UF. 240V Mains Powered. Bright LED Display. Easy to build. Complete kit of parts and full instructions.

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Each kit now includes precision measured capacitors for accurate calibration of each range.

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DUAL TRACKING POWER SUPPLY

± 1.3 to ± 22V @ 2 AMPS + 5V @ 0.9 AMPS

Unit is fully protected against short circuits, overloads and thermal runaway. Pos and Neg supplies track within 1MV, voltage adjustable to within 10MV.

- Uses .25% linearity 10 turn pot.
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Essential for every school, workshop and lab. Easy to build!

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It looks terrific!! And for this month only, it's the same price as the original version.

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- Gold plating on both PCB edge and edge connector.
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Build this for your hifi system

Power Up: ends the multiswitch fiddle

How would you like to turn your entire hi-fi system on or off using just the one switch on the amplifier — and get rid of that ugly mess of piggy-backed power plugs at the same time? It's easy with our Power Up device, which should also prove useful in many other similar situations.

by JEFF SKEEN

The Power Up is basically a current operated switch which senses whether a controlling appliance, eg an amplifier, is drawing current, and turns on all the other components in the system if it is.

This should have applications for any combination of appliances, such as a computer or audio system, where mains power has to be applied to many devices at once. Rather than turn on and off maybe three or four switches, the Power Up allows you to control the system with just one switch.

A further benefit is that no warranty voiding modifications have to be made to any system component. The Power Up is a completely self contained unit, designed to be placed out of sight behind the system. It plugs into the wall socket and provides four outlets into which the devices to be controlled can be plugged. A fifth socket, mounted on the end face of the unit, powers the controlling appliance.

Another application for the Power Up is in providing an auto turn-off facility at the end of a record. This presupposes that you have an automatic or semi-automatic turntable.

In this case, power supplied to the turntable is used to control power to the rest of the system. When the start switch of the turntable is pressed, the system is automatically turned on. After the record is finished, the turntable automatically turns itself off, thus turning off the rest of the system.

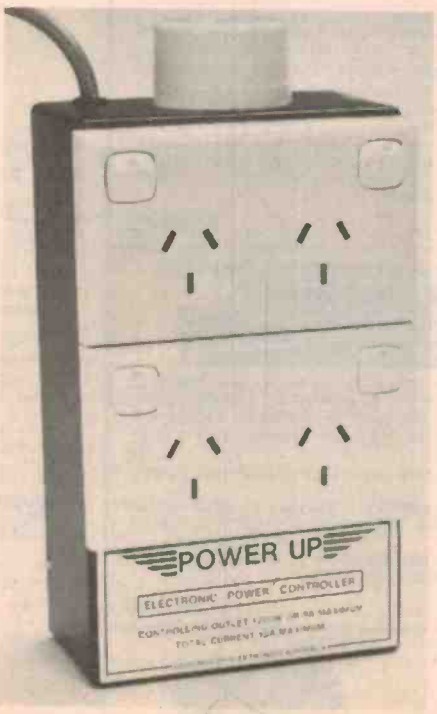
This can be a useful feature if you listen to records in bed at night, or if, like the author, you forget to turn off the rest of the system after the record has finished. In this case the amplifier usually sits for several hours doing nothing but wasting power.

A cassette player with automatic shut-off may also be used in the same manner as the turntable.

As the Power Up is permanently connected to the mains, it should consume as little power as possible. With this in mind we have designed the circuit so that standby consumption is under 0.75 watt. This increases to around 3.75 watts when the relay is activated, mainly due to dissipation in the 10 watt resistor and the relay coil.

How it works

To best understand the circuit it is necessary to split the operation into several parts. To begin with, assume that the unit has just been plugged into a wall socket and there are no appliances connected to any sockets.



Power Up automatically controls up to four separate mains appliances.

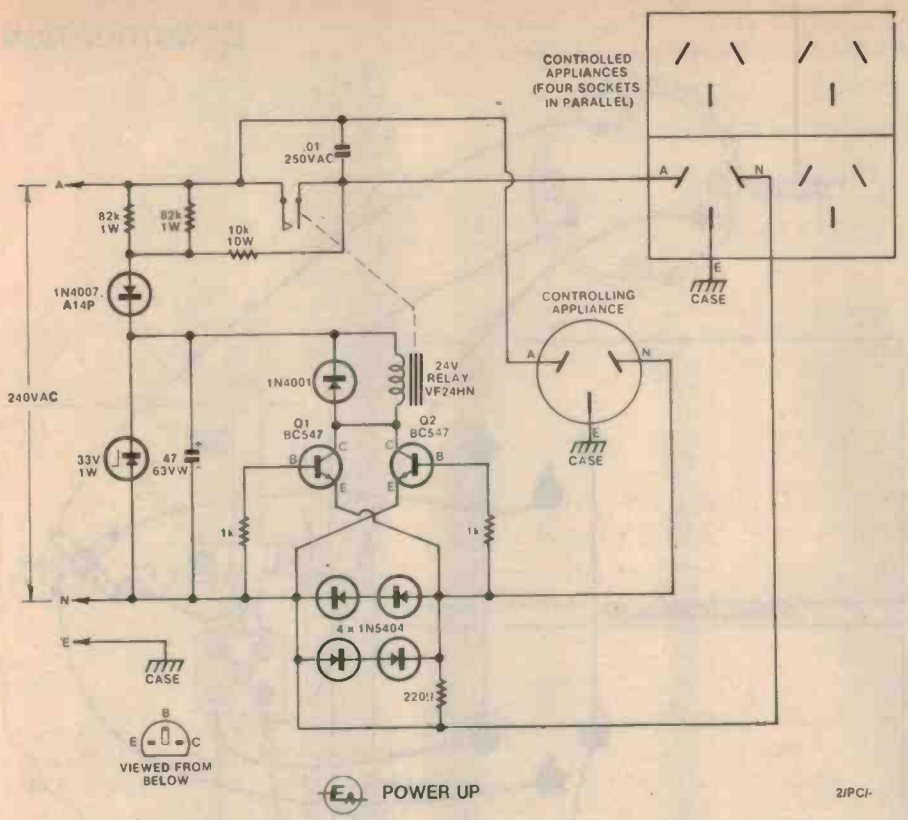
When the voltage on the active lead goes positive, current flows through the two 82kΩ resistors in parallel, through the 1N4007 diode, and charges the 47μF capacitor to the zener value, approximately 33V. When the active lead goes below the capacitor voltage the 1N4007 diode is reverse biased and prevents the capacitor discharging. The capacitor takes several seconds to charge.

If an appliance is now plugged into the controlling socket, and the appliance turned on, a voltage will appear across the 1N5404 diodes. This voltage is used to turn on the relay in the following manner. When the voltage on the active lead goes positive, current through the controlling device and through the diodes, makes the base of transistor Q2 about 1.2V positive with respect to its emitter.

This turns Q2 on, which discharges the 47μF capacitor through the relay coil. The current supplied by the capacitor pulls in the relay, closing its contact. This switches in the 10kΩ resistor, placing it in parallel with the two 82kΩ resistors already connected to the active lead.

The effective value of these resistors is 8kΩ, low enough to supply the current required to hold the relay on. When the voltage on the active lead drops to zero Q2 is cut off and no current flows through the relay. This condition is very brief, and the relay, which has a release time of 3ms, will not have time to let go.

As the active lead goes negative, current flows through the 1N5404 diodes but in the opposite direction. This biases on Q1, which completes the circuit from the 47μF capacitor through the relay, thus holding the relay on. The capacitor



Transistors Q1 and Q2 form the heart of the circuit and activate the relay whenever current flows in the controlling appliance.

discharges to its lowest point during this period (about 4.2V).

In the next half cycle Q2 turns on as before, and the relay is held on by current via the two 82kΩ and the 10kΩ resistors in parallel. At the same time the 47μF capacitor is partially recharged (to around 7.2V) via the above resistors.

This cycle of events continues while ever the controlling appliance is turned on. If an appliance is plugged into one of the switched outlets and the controlling appliance is turned on, power will be supplied to the switched appliance when the relay contact closes.

As the energy to pull in the relay comes from the 47μF capacitor, it is essential that this capacitor be given time to charge before the relay is asked to operate. As already mentioned, this charging cycle takes several seconds, and at least three seconds should be allowed between switching on the power point and switching on the appliance. This same time should be allowed between off-on cycles of the controlling appliance.

No damage will result if the above period is not maintained; the relay simply will not operate and the switched outlets will remain off. To correct this situation, switch the controlling appliance off, wait three seconds, then switch on again. The switched outlets should now be energised.

The function of the 220Ω resistor in parallel with the 1N5404 diodes is to prevent current under 2.5mA from turning on Q1 and Q2. This is necessary as the suppression capacitors placed across the mains switches of most electronic equipment will pass enough current to partially turn on Q1 and Q2.

If this happens, Q1 and Q2 will prevent the 47μF capacitor from fully charging and there is a good chance there will not be enough voltage to pull in the relay. This problem only occurs when a suppression capacitor is fitted to the controlling appliance. The 1N5404 diodes do not pass current from the switched appliances and so capacitor currents from these appliances will not trouble the circuit.

The final components to discuss are the diode across the relay coil, and the capacitor across the relay contacts. Both these components act as suppressors by limiting voltage spikes.

When Q1 and Q2 turn off, the current in the relay coil drops to zero in a very short time. This induces a large voltage spike across the relay coil which could damage Q1 and Q2. The diode prevents the build up of such a voltage by appearing as a short circuit across the relay whenever the spike exceeds 0.6V.

The .01μF capacitor suppresses the arc that would appear between the relay contacts when they open while carrying current. The capacitor appears as a short circuit at the instant the contacts open and the current flows through the capacitor. By the time the capacitor is charged the contacts are too far apart for an arc to form. This is a precaution against thumps in any speakers in the system.

This suppression capacitor must be rated for 250VAC operation. This means that it must either be a metallised paper or dual dielectric (paper plus polyethylene terephthalate) type rated at 250VAC, a metallised polypropylene type with a rating of 250VAC or 1kV or 1600VDC or a ceramic disc capacitor rated at 2kV or higher.

Do not use polyester or polypropylene capacitors rated at 630VDC or 220VAC. They could be a potential fire hazard.

PARTS LIST

1 PCB coded 82pc10, 106 × 56.5mm
1 Zippy Box, 196 × 112 × 60mm
1 Scotchcal front panel, 106 × 48mm
1 240V surface mounting socket
2 240V double wall sockets
1 mains cord and plug
1 2-way insulated mains terminal block
4 earth lugs
1 grommet to suit mains cord
1 cable clamp to suit mains cord
1 metre brown 240V AC rated mains wire (active)
1 metre blue 240V AC rated mains wire (neutral)
½ metre green/yellow 240V AC rated wire (earth)
1 24V relay, code VF24HN (see text)
4 adhesive rubber feet

SEMICONDUCTORS
1 1N4007 or A14P diode
4 1N5404 diodes
1 1N4001 diode
1 33V 1 watt zener diode
2 BC547 transistors

RESISTORS (10% tolerance)
2 × 82kΩ 1W, 1 × 10kΩ 10W, 2 × 1kΩ ¼W, 1 × 220Ω ¼W

CAPACITORS
1 47μF/63VW PC electrolytic
1 .01μF/250V AC rated mains suppression capacitor (see text)

MISCELLANEOUS
Nuts, bolts, washers and lockwashers for mounting hardware.

Construction

Our prototype was assembled into a commonly available Zippy Box measuring 196 x 112 x 60mm. These boxes have multiple internal slots for mounting printed circuit boards (PCBs) or other hardware. The PCB for this project is designed to fit into these slots.

The PCB is coded 82pc10 and measures 106 × 56.5mm. Before mounting components on it, trim it so that it fits exactly into the last set of slots in one end of the box. The metal lid should be able to fit flush with the box without the PCB fouling it.

Mount the components on the board, beginning with the smallest, such as the resistors, diodes and transistors. Take particular care with the orientation of the diodes as mistakes could be spectacular. Now mount the larger components, the 47μF capacitor, the 10 watt resistor and the relay. Solder the suppression capacitor directly across the relay contact terminals.

The VF24HN relay used was supplied by Associated Controls Pty Ltd. It has a 24V coil and contacts designed to switch up to 25A and 240V. The relay may be purchased directly from Associated Controls, 55 Fairford Rd, Padstow, NSW 2211 for $3.85 plus sales tax.

We would not suggest substituting any other type of relay unless it has specifications equal to or better than the above relay.

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

$33

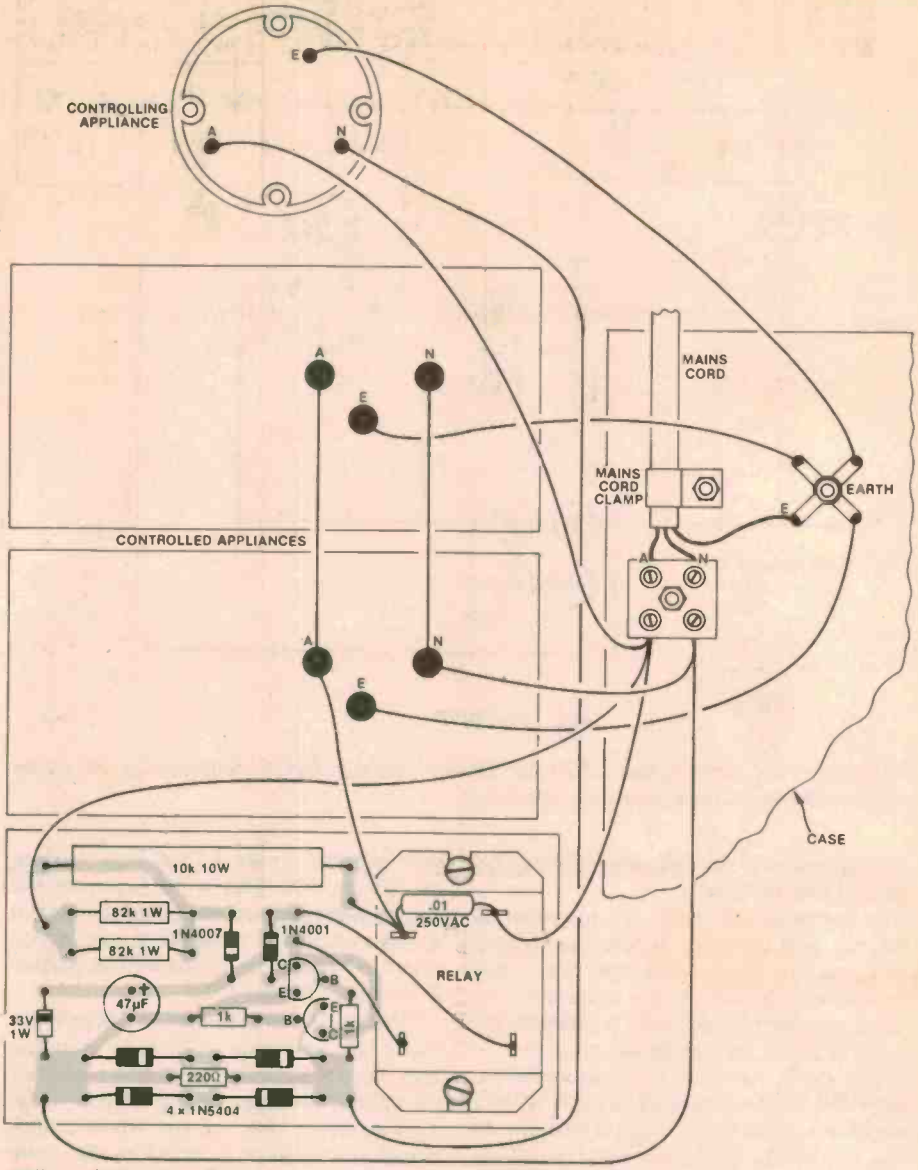
This includes sales tax.

Next, mount the 240V outlets on the box. The positions we use for the prototype can be seen from the photo. Holes for the double sockets can be made quite easily in the soft plastic with the aid of a drill and small saw. The single surface socket mounts on the end of the case opposite the PCB. Use the socket itself as a template for locating the mounting holes and cable holes.

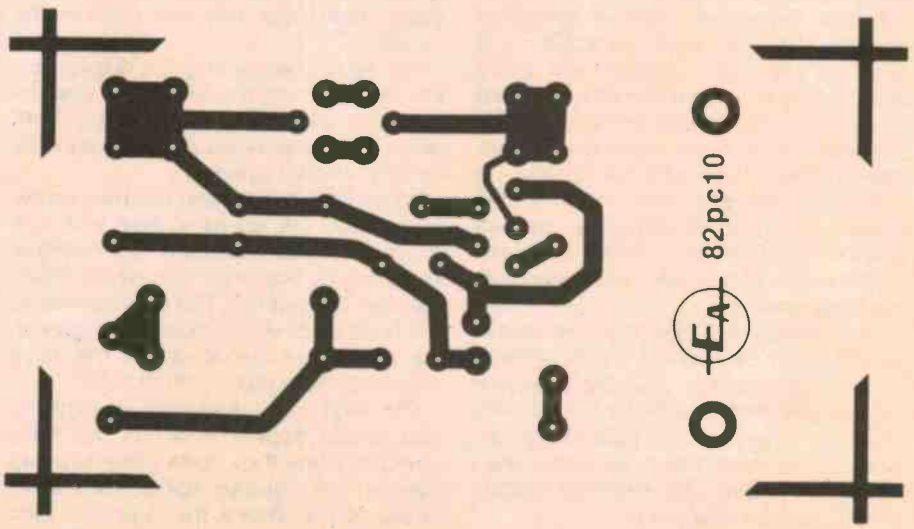
In the same end of the case, drill a hole large enough to take the mains cord grommet. Locate this hole in one corner near the lid (as in the prototype), to allow the mains cord to be terminated easily. Use a 2-way piece of insulated terminal block for the termination, and secure the mains cord to the lid with a cable clamp.

The earth lug from the mains cable is attached to a central earth point on the lid with a separate nut and bolt.

All wiring within the Power Up should be done with 240V-rated mains cable. Follow the wiring diagram carefully, crossing off wires on the diagram as they are run on the project. For maximum protection, run separate earth wires to each socket. Do not simply link the



Follow this wiring diagram carefully when building the Power Up and make sure that you keep all mains wiring neat and tidy.



Above is an actual size reproduction of the printed circuit board.

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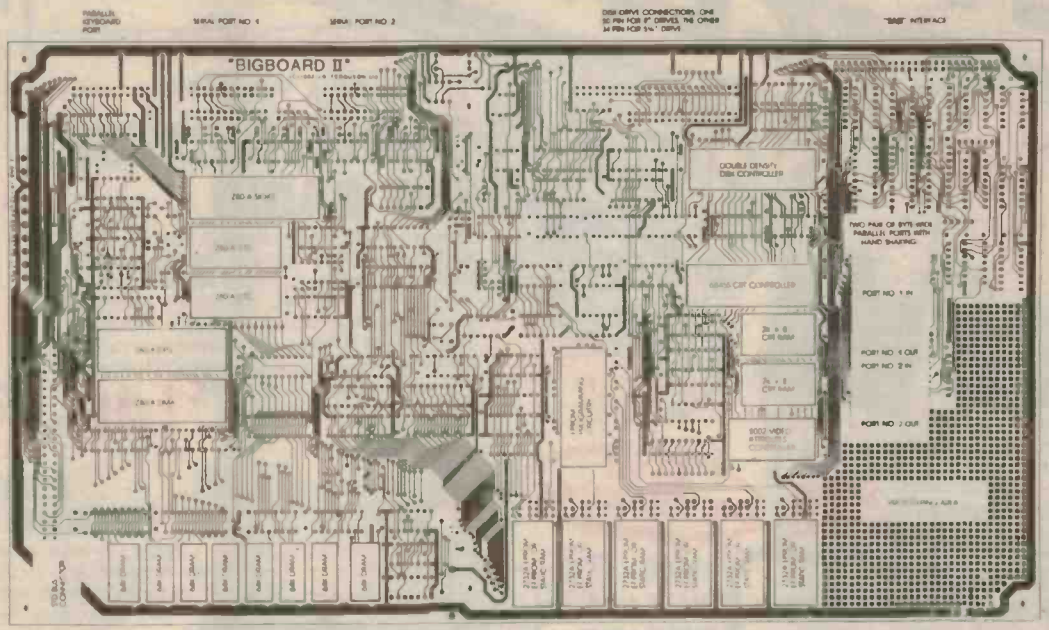
"BIG BOARD II"



Jim Ferguson, the designer of the "Big Board" distributed by Digital Research: Computers, has produced a stunning new computer that we will begin shipping in November called "Big Board II", it has the following features:

4 MHz Z80 — CPU AND PERIPHERAL CHIPS

The Ferguson computer runs at 4 MHz. Its monitor code is lean, uses Mode 2 interrupts, and makes good use of the Z80-A DMA chip.

64K DYNAMIC RAM + 4K STATIC CRT RAM + 24K E(E)PROM OR STATIC RAM

"Big Board II" has the three memory banks. The first memory bank has eight 4164 RAMs that provide 60K of user space and 4K of monitor space. The second memory bank has two 2Kx8 SRAMs for the memory-mapped CRT display and space for six 2732 As, 2Kx8 staticRAMS, or pin-compatible E(E)PROMs. The third memory bank is for RAM or ROM added to the board via the STD bus. Whether bought as a bare board, a full kit, or assembled and tested, it comes with a 200 nS2732A EPROM containing the monitor.

MULIPLE-DENSITY CONTROLLER FOR SS/DS FLOPPY DISKS

The new Ferguson single-board computer has a multiple-density disk controller. It can use 1793, 1797, or 8877 controller chips since it generated the signal with TTL parts. The board has two connectors for disk signal with 34 pins for 5.25" drivers, the other with 50 pins 8" drives.

VASTLY IMPROVED CRT DISPLAY

The new Ferguson SBC uses a 6845s CRT controller and 8002 Video Attributed controller to produce a display that will rival the display of quality terminals. Characters are formed by a 5x7 dot matrix on 15.75 KHz monitors and 7x9 dot matrix on 18.60 KHz monitors. The display is user programmable with the default display 24 lines of 80 characters.

STD BUS CONNECTOR

The Ferguson computer brings its bus signals to a convenient place on the PC board where users can solder an DSTD, bus cards can be plugged directly into it, and it can as well be connected by bus cable to industry-standard card cages.

DMA

The new Ferguson computer has a Z80-A DMA chip that will allow byte-wise data transfers at 500K bytes per second and bit serial transfers via the Z80-A S10 at 880K bytes per second with serial processor overhead, though the monitor for the new computer uses the DMA chip mainly for transferring data to and from disk, the chip can readily be used for other things since its "wait/ready" pin can be connected under software control to some half a dozen signal lines. When a hard-disk subsystem is connected to the "Big Board II" via its "SASI" interface, the DMA chip makes breathtaking disk performance possible.

"SASI" INTERFACE FOR WINCHESTER DISKS

The "Big Board II" implements the Host portion of the "Shugart Associates Systems Interface". Adding a Winchester disk drive is no harder than attaching a floppy-disk drive. A user simply 1: Runs a 50-conductor ribbon cable from a header on the board to any of several inexpensive controller cards for Winchester drives that implement the controller portion of the SASI interface. 2: Cables the controller to an appropriate drive, and 3: Provides power for the controller-card and drive. Since our CBIOS contains code for communication with hard-disk, that's all a user has to do to add a Winchester to a system!

A Z80-A S10/0 = TWO ASYNCHRONOUS/SYNCHRONOUS SERIAL PORTS
A PARALLEL KEYBOARD PORT = FOUR OTHER PARALLEL PORTS USER 1/0

The new Ferguson single-board computer has one parallel port for an ASCII keyboard and four others for user-defined 1/0. When the computer is powered-up or reset, the monitor looks for a carriage-return at the keyuboard and serial ports. If the first carriage-return the monitor gets comes from the parallel keyboard, the monitor uses the board's video display circuitry to communicate with the user via a CRT. If the first carriage-return is typed at an ASCII terminal attached to a serial port, the monitor autabauds and makes the terminal the system console.

TWO Z80-A CTCs = EIGHT PROGRAMMABLE COUNTERS/TIMERS

The new Ferguson computer has two Z80-A CTCs. One is used to clock data into and out of the Z80-A S10/0, while the other is for systems and application use.

PROM PROGRAMMING CIRCUITRY AND SOFTWARE

The new Ferguson SBC has circuitry and drivers for programming 2716s, 2732(A)s, or pin-compatible (E)EPROMs.

CP/M

CP/M with Russell Smith's CBIOS for the new Ferguson computer is available for $190. The CB1OS is available separately for $39.50.
Actual board size: 39.6cm x 22.2cm.

Pricing and Availability:

Availability: We should start shipping the second week in November.
In single quantities, full kits cost $750.00 + tax, and A&T'd computers cost $895. There are attractive discounts that range to 35% for OEM's and dealers. For details about them please call Rod Irving on (03) 489 7099. ie: 3 Ferguson II "Big Board" are less 20% off the one-off price, hard disks disk controllers, boxes and power supply to suit both 8" & 5¼" systems will be available.

DICK SMITH NEW ZEALAND

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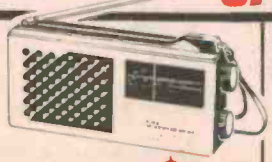

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earths together as the loss of just one link may remove the entire earth protection.

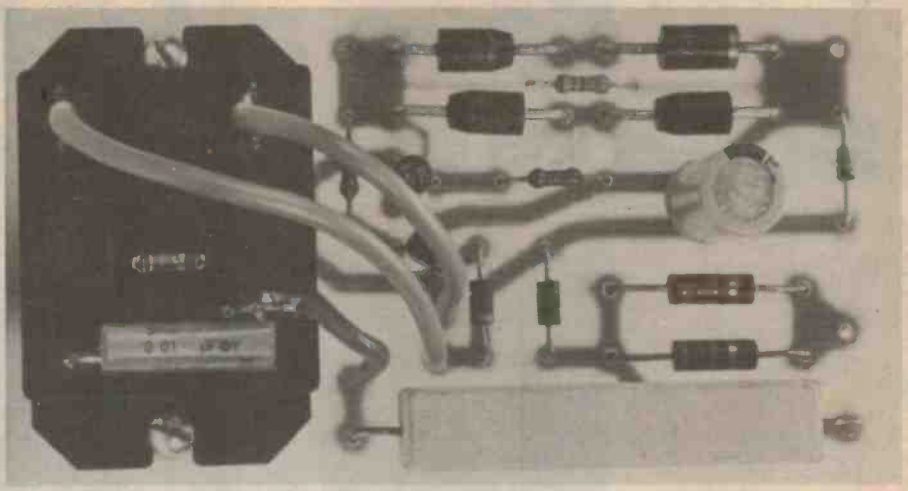
To give the finished unit a professional appearance we have prepared a label to fit on the front panel below the two power outlet blocks. The artwork is reproduced herewith, and copies of it have been distributed to various component suppliers, who normally provide Scotchcal versions. They should be available by the time this article appears.

If necessary, trim the Scotchcal label using scissors or a sharp knife. Stick it into place on the top of the box then screw the lid of the box into position. If you are using adhesive rubber feet, peel off the backing tape and stick the feet to the metal lid. Construction is now complete and after a final error check power can be applied.

If everything is OK, switch off and plug an appliance into the controlling outlet, and another into one of the switched outlets. Turn on the switched outlet, and the appliance plugged into it. Switch on the power point, wait three seconds, and switch on the controlling appliance. There should be a click from the relay and the other appliance should come on.

If, for any reason, the Power Up fails to perform as expected, turn it off immediately and double check the circuit for errors. Do not reapply power until the fault has been found and corrected.

During operation the front panel of the Power Up will get warm. This is quite normal, and is due to the 10 watt resistor mounted underneath the front panel.



Above is a view of the assembled PCB. We recommend that you use the VF24HN relay from Associated Controls Pty Ltd (see text).

Here is an actual size artwork for the front panel.

Save a fortune - build this speaker system!

Special self-adhesive 'Playmaster' logo to complete your system stylish, elegant - and professional!

Fully imported contour grilles that simply press into place on the special grille clips provided. You won't have to worry about grille rattle or movement.

Inside, a fully assembled wiring loom with colour coded push-on connectors. No soldering required: everything is pre-made, ready for you to simply connect together.

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Dick Smith brings you these superbly styled speaker systems to suit your room, your decor ... and your pocket!

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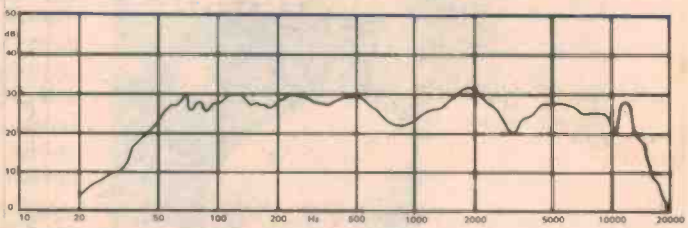
You'll **save a fortune** over comparable commercial speakers because you build them yourself. And all it takes is a couple of hours construction time, a tube of glue and a screwdriver.

They look so good, and sound so great, your friends will never believe you built them!



Measured response of Playmaster 300mm speaker system. Compare this performance with speaker systems you'd pay 3 or 4 times as much for.

Measurements performed by Dick Smith Electronics Technical staff

look how easy

The boxes simply fold together - no woodworking knowledge needed. All panels are pre-cut, pre-rebated and pre-drilled. We've even heard of schoolchildren building their own Playmasters: they're that simple!

no special tools needed

What the experts say:

"... the end result represents outstanding value for money. Whether you buy it in kit form or fully assembled, we are sure you will be pleased with sound quality."

"... the new Playmaster 3-70L has generous power handling capacity so that it can give a good account of itself on virtually any type of music."

Neville Williams & Leo Simpson (EA, March 1982)

All you need is a tube of glue and a screwdriver - everything else is supplied for you. The wiring loom for the speakers is pre-assembled — the connectors just push on. And the speakers drop into position in the holes provided. If you can read simple instructions, you can build your own commercial quality speakers.

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★All new design in simulated woodgrain finish to complement decor ★Separate level control for high and mid ranges* - tailor the sound to suit your listening environment ★Special speaker sealant material supplied to ensure absolute air tightness ★New design ribbed woofer with massive 30cm cone for accurate bass reproduction ★Built-in plinth to raise speaker off floor level for minimum audio colouration ★Manufactured to the exacting standards of the original design published in Electronics Australia magazine ★Acoustically transparent silk-like grille cloth heat welded to support frame.

*300mm system only

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Note: All prices are per pair	
TOTAL SYSTEM ONLY **$384 per pair**	**TOTAL SYSTEM ONLY** **$339 per pair**

and look at the superb finish

DICK SMITH Electronics

SEE PAGE 98 FOR ADDRESS DETAILS

DSE/A285M/JW

The Serviceman

Handyman repairs can prove expensive!

Where should the handyman leave off and the professional take over? Unfortunately, there can be no precise answer: How handy is the handyman? How urgent the need? How far away is professional help? And what are the risks if he fails? Will he simply be back to square one, or can he do more damage in the process? My first story highlights the risks in this latter regard.

In fact, the story is somewhat unusual on a couple of counts. One is that there is nothing particularly significant about it from a technical point of view, the interest being almost entirely in the reason why the set had to be serviced. And the other point is that the set came from well outside my normal area; from some 300 odd kilometres up the coast to be more exact.

I became involved with the set through one of my regular local customers, who was a friend of the owner. The location was a small coastal village, with no resident serviceman. And, while he doubtless could have found a competent service organisation a lot closer than the city, it was fairly natural for him to ask the advice of my customer when he encountered trouble. Added to that, he was in the happy position to organise transport at minimal cost.

FAULTY LOUDSPEAKER

The set in question was a HMV C211 colour set; a 63cm chassis in a large double ended cabinet featuring twin speakers, one on each side of the picture tube. And it was these speakers, or rather one of them, that caused all the bother.

I'm not absolutely certain about all the details, or the sequence of events but, as nearly as I have been able to piece the story together, it went something like this. One of the speakers began to misbehave, the voice coil apparently having gone out of alignment.

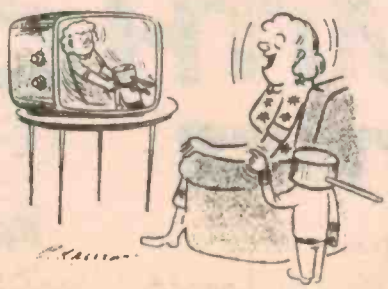
The resultant distortion was more than the owner could stand and, being relatively isolated as he was, he decided to have a go at fixing it himself. His approach, if not completely new, was at least unusual; he wedged pieces of plastic foam between the speaker frame and the cone, and these were still in place when I received the set.

I'm not sure whether his aim was to force the voice coil back into alignment – assuming he knew enough about loudspeaker mechanics to reason thus – or whether it was more of a brute force approach aimed simply at silencing the speaker, or at least those of its sounds which were objectionable. I suspect the latter.

Anyway, the cure was apparently successful for a while, but the trouble gradually became worse, necessitating several more plastic foam "treatments". And each time he did this it was necessary to move the chassis out of the way. The chassis on the C211 hinges near the top of the cabinet and can be swung out and up, and locked in position either horizontally or vertically 180° from its normal position.

The next thing that happened was that the speaker failed altogether, due to an open voice coil. I imagine that this may have happened because, in spite of the foam plastic, the voice coil was still rubbing and eventually wore its way through the wire.

At this stage the owner would have been well advised to call it quits, at least until he could get professional help. After all, the speaker's complete failure meant that there was no longer a distortion problem and he should have been able to rough it on one speaker for a few weeks.



But no; apparently something of a perfectionist, he insisted on having one more go at the problem. And this was when tragedy struck. He swung the chassis out and up as before, locking it in place, and turned his attention to the speaker.

The trouble was, he hadn't locked the chassis properly, or perhaps the lock was faulty. Anyway, it came crashing down and, in the process, clipped the neck of the picture tube. And that was that; one picture tube down the drain.

NEW PICTURE TUBE

So my job was basically to supply and fit a new picture tube and a new speaker. I ordered a new speaker from the makers, and a rebuilt picture tube from an independent organisation. This resulted in a worthwhile saving, though not as much as it normally would. The old picture tube was no longer under vacuum and therefore of no value as "glass allowance", a fact which added about $80 to the price.

The new items eventually arrived and were duly fitted. The set worked immediately and, after a de-gauss, purity adjustment, convergence, and grey scale adjustment, turned in a first class performance. And, in theory at least, that was all that I needed to do.

In practice, experience has taught me that there are a number of potentially troublesome components in this set, mainly in the power supply, which can be changed with advantage on a routine basis. This approach was particularly appropriate in this case, in view of the owner's isolation and the high cost which was involved anyway.

The suspect components are several electrolytic capacitors; a 10μF, C101; and two 47μF, C102 and C104. These were replaced as a matter of course and I also checked C112, the 330μF main

smoothing capacitor, and C105, a 1μF electrolytic.

The 330μF is not the most reliable, and needs to be changed if there is any suspicion of hum trouble. There were no such symptoms in this case, so I left it in place. The 1μF, C105, should be a tantalum electrolytic but, in some production chassis, an aluminium electrolytic was fitted, and this can give trouble in that the switch mode power supply will not start. This one was, in fact, the right type and did not need to be changed.

This left only one more suspect; another 10μF electrolytic in the frame circuit, C318. Failure here can cause the picture to creep down from the top of the frame or, in some cases, to jitter at the top. This was replaced as a matter of course.

And that was more or less that. I let the set play in the workshop for the next couple of days while the owner arranged transport, and it never missed a beat. That was several weeks ago and a message just to hand via my local customer advised that the set had travelled well and performed perfectly at switch-on and ever since.

So there it is; a relatively simple fault which should not have cost more than a few dollars turned out to be a very expensive one due, in part, to the owner's inexperience and in part to bad luck. The truth is, I'm not quite sure why the chassis clipped the picture tube when it collapsed; it should have followed the same path down as it did up. I can only assume that its bearings were sloppy.

NO REMOTE CONTROL

My next story concerns one of the early model Kriesler TV sets with remote control; a model 59-3 to be exact. This uses a quite comprehensive remote control system, featuring channel selection, volume, brightness, colour saturation, tone control, sound mute, etc. And it was this section of the set which had failed, there being no remote control function at all.

In any remote control failure the first thing to establish is whether it is the transmitter in the remote unit which has failed, or whether it is the receiver section within the set. To this end I always like to take a spare remote unit with me when answering such calls. There is little point in lugging the whole TV set back to the workshop, and depriving the owner of its use, if it is only the remote transmitter which is faulty.

Unfortunately, on this occasion, I had no such spare available, and so I just had to play it by ear. Fortunately, the lady of the house was able to give me the history of the failure – "I had an accident with the thing and sent it flying along the floor" – which seemed to leave little doubt that it would be the transmitter at fault.

In fact, from the lady's description of the accident, I fully expected a broken printed circuit board, or some equally drastic damage, when I opened the unit. I even went so far as to warn the customer that the repair could be expensive or, if the damage was too great, that it would be cheaper to buy a new one. This didn't seem to deter the lady, who simply insisted that whatever was necessary should be done.

Back at the workshop I opened the unit, fully expecting the worst, only to find that there appeared to be no physical damage at all; certainly none of the dreadful things I had envisaged. But why wouldn't it work?

A more subtle form of damage to the board? A hairline fracture? I pulled the board out and examined it in detail under the bench magnifier, but could find nothing wrong with it. The battery? Could one of the cells have been on its last legs anyway, and failed coincidentally with the accident? Once again I drew a blank; the cells were obviously new and in perfect condition.

So, with these preliminaries over, I had to really get down to some serious testing. This remote control system uses an ultrasonic link to the set proper, so the first thing I had to do was establish that an ultrasonic signal was being generated and applied to the transducer and then, if this was so, confirm that the transducer itself had not been damaged.

The first step was relatively simple: I hooked the CRO across the transducer terminals, set the timebase to an appropriate speed, and pressed one of the buttons on the unit. Sure enough, up came a near sine wave pattern at around 40kHz, suggesting that most of the circuit was functioning correctly.

Checking the transducer was a little more complicated. I fished out a small microphone insert which had been used for something quite different originally, and connected it to a general purpose amplifier which I keep on the bench for audio signal tracing. I connected the output of the amplifier to the CRO and set the microphone hard up against the transducer.

I was aware of several serious limitations in this set-up. The weakest link was the microphone, which was certainly never designed to respond to these frequencies, and to a lesser extent the amplifier. While it is not unusual to find that modern amplifiers work well beyond the audible spectrum, this is often as much a matter of good luck as of design. And I had no idea how good this amplifier was in that region.

All of which added up to a test which might well prove inconclusive; if no signal could be detected it could be due to either failure of the transducer, or simply because the test set-up wasn't

good enough. Only a positive reaction would be of any benefit.

Strangely enough, it did work; much to my surprise. Granted, it only just worked. Only when the microphone was hard against the transducer could I get any response; move it four or five centimetres away and there was nothing. That still left a niggling doubt; was this result due solely to the limitations of the test set-up, or was the transducer sick? I decided to assume that it was my set-up that was weak, at least for the present.

But now, having apparently cleared the transducer, I was rapidly running out of simple ideas to explain the unit's failure. In fact, I could think of only one other explanation; that the frequencies being generated were out of tolerance, though how the accident could have caused this I couldn't imagine. Still, it had to be checked out.

This meant delving into the instruction manual and re-acquainting myself with the finer points of the unit's behaviour. It actually generates three frequencies; 37kHz, 39kHz, and 41kHz, all of which have been chosen because they fall between the second and third harmonics of the line frequency and thus prevent false triggering by the line output stage.

As a further precaution against false triggering, a command always involves two frequencies, either 37 or 39kHz in a suitable code, followed by 41kHz to confirm that the command be executed. (Some early ultrasonic systems would change channels, etc. when a viewer sneezed or rattled a bunch of keys!)

As an example of the system, the manual reads as follows: "When any one of the eight channel selection buttons on the transmitter is pressed, a signal is transmitted consisting of a pulse of given duration at 37kHz, followed directly by a continuous signal at 41kHz. The duration of the 37kHz pulse determines which of the eight channels is to be selected, and then the 41kHz signal indicates that the command may be executed. The 41kHz signal remains for as long as the button is depressed."

This makes it relatively easy to generate a 41kHz signal for test and measurement purposes; simply hold the button down for as long as is necessary. But measuring the frequency with the accuracy required is another matter. It might be possible to do this with the CRO, assuming a suitable timebase reference frequency was available, but it is likely to be a rather messy approach.

The job really calls for a frequency counter and, fortunately, I had treated myself to one of these instruments not so long ago. In fact, this was the first serious service application I had found for it. The procedure, as set down in the manual, starts with adjustment of the 41kHz signal. This is produced by holding down the channel selector button as already described, then adjusting transformer T1 to give exactly 41kHz.

In fact, this frequency turned out to be noticeably off; it was closer to 43kHz than 41kHz. I put this back on frequency, then tackled the other two adjustments. This involved shorting out first one transistor (TR5) and then another (TR7) while adjusting first one variable capacitor (C5) to produce a 37kHz signal and then another (C9) to produce 39kHz. Finally, a second transformer (T2), in the output stage, is adjusted for maximum output.

(Incidentally, my copy of the circuit has a minor error in it; there are two C5s and no C9. Fortunately, the correct designations are fairly obvious.)

In fact, both the other frequencies were a little off, though not by as much as the first one. However, it appears that transformer T1 is common to all three oscillator circuits, so that these two frequencies could have been badly off also, before I adjusted the core.

After that there was little more that I could do until I took the unit back and tested it on the set. When I did, it was with some relief that I found it was working perfectly. Naturally the lady was delighted, particularly when she realised that the repair had not cost as much as I had feared it might.

That was a couple of months ago, and I have seen both the lady and her husband several times since and they report that the unit hasn't missed a beat.

But why had it gone off frequency in the first place or, more specifically, how could the accident have caused such a fault? Frankly, I haven't a clue. The adjustable core, while not locked tight, was firm enough, and I find it hard to believe that the accident could have caused it to move as far as I had to turn it to put it back on frequency.

Another possibility I considered was that the fall had damaged the core, causing a small piece to break away and thus increase the frequency. The only snag is that I could find no evidence to support this theory.

The only theory I can advance is that the system was well off frequency to start with, and only just managing to work. When it was bashed, the core did move marginally and this was enough to move the frequency outside the working tolerance. I know it's a tenuous theory, but it is the best that I can offer.

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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.

Signal controller for model train layouts

Using a single light beam, this circuit will switch three miniature 12V lamps, as used in model trackside signals.

The signals are placed about 40cm or more past the light beam. As the train passes between the LDR and lamp, the signals change from red to green. After a delay of several seconds, the signals turn amber, then back to red again. In the prototype, the green lamp remained on for about eight seconds and the amber lamp for approximately four seconds. While this may not seem realistic (the train never has to stop for a red light), it is better than a static display.

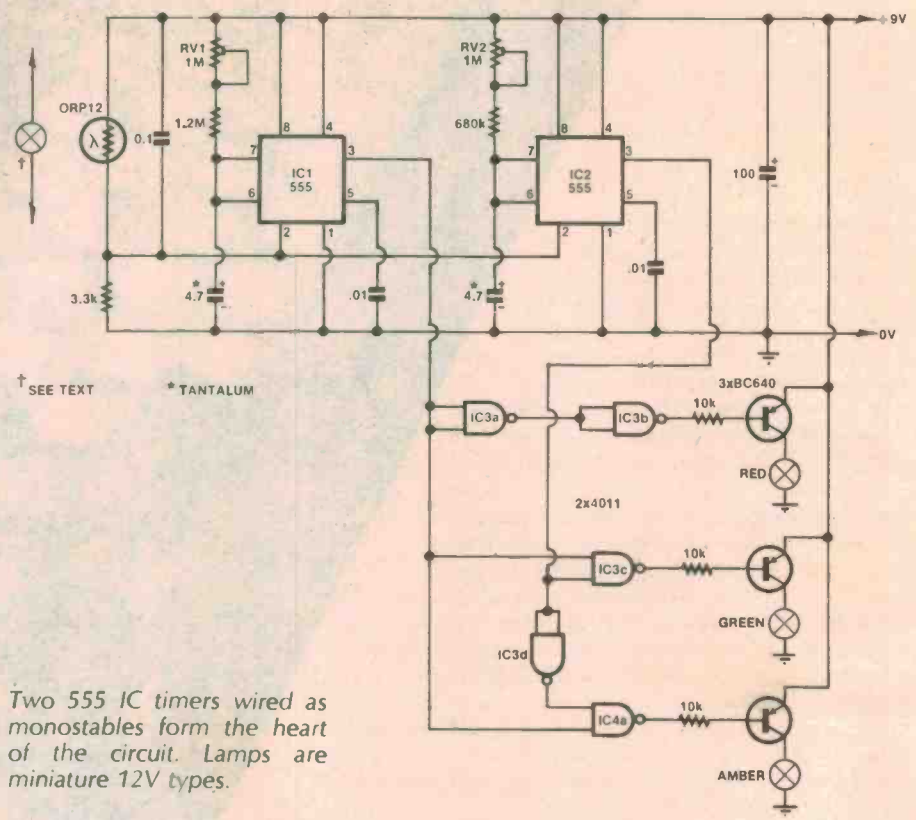
The circuit is based on a pair of 555 timers, wired as monostable multivibrators. When light falling on the LDR is interrupted, the voltage on pin 2 drops below one-third of the supply potential. The timing capacitor then charges up towards 9V at a rate determined by the charging resistors (1MΩ trimpots and associated resistors). The time taken for the capacitor to charge to two-thirds of the supply voltage regulates the length of the output pulse.

IC1 generates a pulse which governs the length of time in which a train can "legally" pass through the signals. IC2 provides a shorter pulse, used to divide this time between the green and amber lamps.

The lamp for the light beam could be an ordinary torch bulb; the type with the built in lens would be ideal. In my version, the bulb was a small 14V type with an aluminium foil reflector wrapped around it, and run off the main train transformer.

When setting up the controller, RV2 should be set for minimum resistance, then RV1 adjusted to give the required length of the entire timing cycle (green AND amber times). After this, RV2 can be set to obtain the desired green:amber timing ratio.

D. Houlder,
Charnwood, ACT.



Two 555 IC timers wired as monostables form the heart of the circuit. Lamps are miniature 12V types.

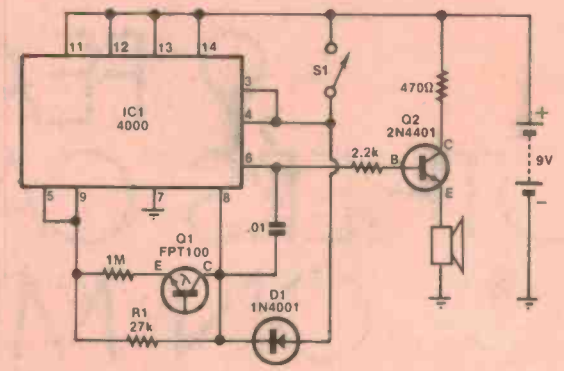
Cudlipp's sister a ladybug

Those who were intrigued with Cudlipp (EA, February 1982) and Cudlipp's Brother (EA, June 1982, p84) will want to know about Cudlipp's sister. Now Cudlipp's sister does not like light, she loathes it. While ever you leave the light on to read she complains. You could have fun by building the whole Cudlipp family and hiding them in some poor soul's room.

When the light is on, Cudlipp's sister complains. When the light is off, Cudlipp's brother starts up and if the victim starts swearing, Cudlipp himself chimes in. Pity the poor victim – he can't read, can't sleep and can't swear.

The circuit is basically a NOR-gate oscillator which has its pitch controlled by the photo-transistor Q1. Changing R1 to a higher value will give a lower-pitched wail and vice versa.

K. Mueller,
Greensborough, Vic.



Cudlipp's sister consists of a NOR-gate oscillator driving a loudspeaker via transistor Q2.

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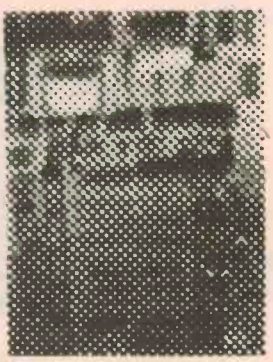

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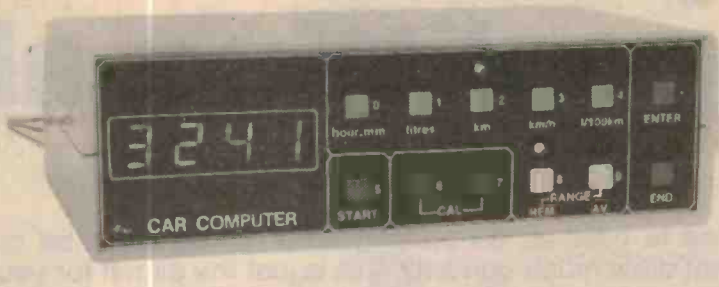

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Novel circuit uses a piezoelectric tweeter

Super Siren: an ear-splitting alarm

Ever wanted to build an ear-splitting alarm which would be compact and not draw much current? This is just the circuit for you. It uses a piezoelectric tweeter in a pulsed mode to form an arresting and very efficient alarm.

design by COLIN DAWSON

Piezoelectric tweeters have been around for a long time but they have never really caught as a medium for high fidelity sound reproduction, probably because they are difficult to manufacture to the requisite smoothness of frequency response.

Be that as it may, piezo tweeters have a number of characteristics which make them highly suitable for use in alarms. In this respect, they are identical in principle to the small, highly efficient alarms used in many computers and digital watches.

The equivalent circuit of a typical piezo tweeter is a capacitor of about 0.1μF. Because of this, a piezo tweeter connected across an AC signal source draws very little current. This is important for our application because we wanted to operate the alarm from a small 9V battery. At this voltage the circuit draws less than 10mA when it is sounding.

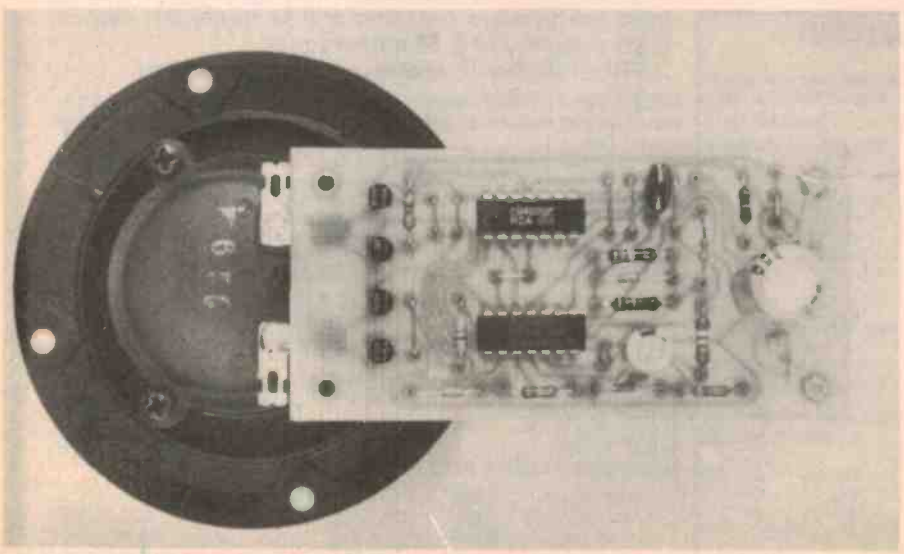
The sound output of this alarm is a series of four short pips in a one-second period, followed by a half-second break, then another burst of pips and so on. The resulting sound effectively conveys a sense of urgency and is more likely to be acted upon than one of the more common transistor powered alarm circuits which sound like a half-strangled cat!

We will leave it to the reader to think of applications for this alarm. We are sure that there will be many. It could be used as an equipment malfunction alarm, intruder alarm or car alarm (separately powered and not dependent on the car battery).

Fig. 1 gives a picture of what the sound output of the alarm looks like on an oscilloscope. Each pip is actually a burst of 5kHz signal lasting for about 60 milliseconds and there are four pips in each 400ms burst. The frequency of 5kHz was settled upon as being the most earsplitting. At frequencies below 5kHz, piezo tweeters do not have much output.

The waveform of Fig. 1 could easily have been produced by conventional logic circuitry using counters and gates plus an oscillator to drive it all. But we elected to take a different approach and ended up with a circuit that uses no counters at all. The circuit uses just two CMOS ICs plus four transistors to buffer the piezo tweeter.

The two ICs are a 74C14 hex Schmitt trigger and a 4011 quad 2-input NAND gate.



The Super Siren PCB is soldered directly to the terminals of the tweeter.

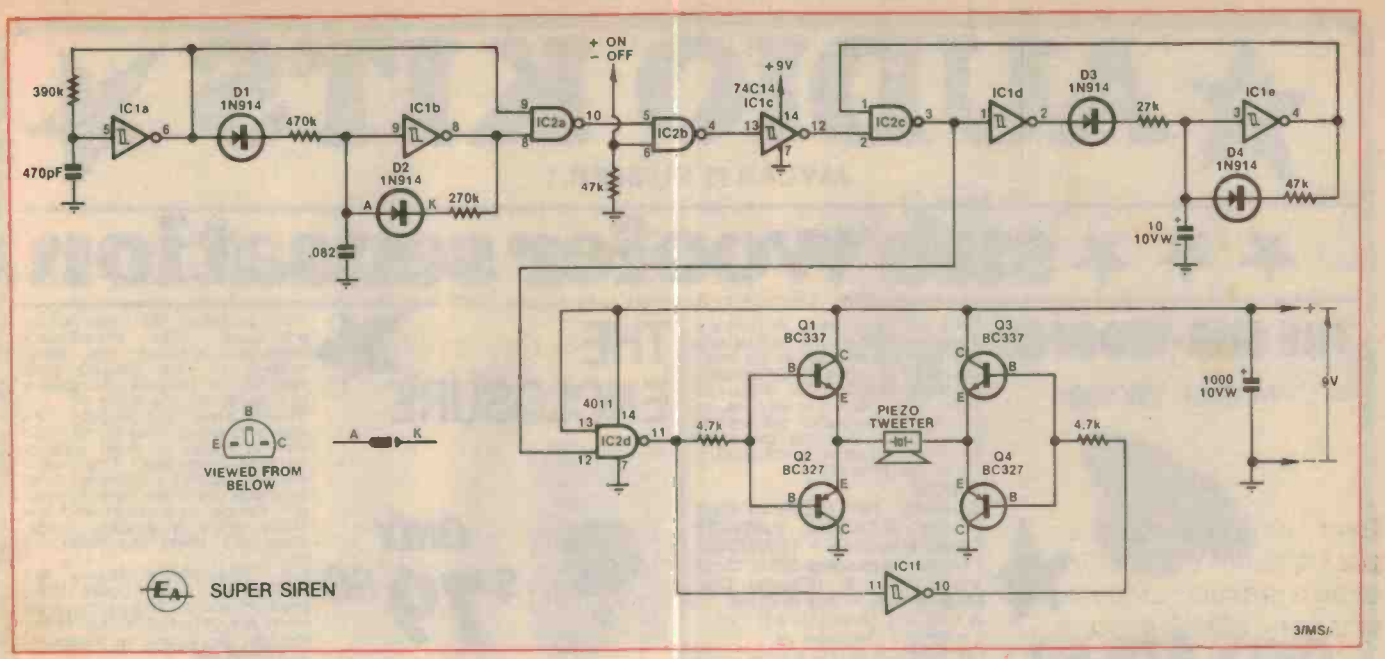
How it works

IC1a is the free-running oscillator in the circuit with its 5kHz frequency determined by the 390kΩ resistor and 470pF capacitor. This is one of the simplest oscillators possible and makes use of the hysteresis characteristic of a Schmitt trigger inverter. It works as follows:

Consider that power is applied and the 470pF capacitor is discharged. This means that pin 5 of IC1a is low and (because it is an inverter) pin 6 will be high. The capacitor is then charged from pin 6 via the 390kΩ resistor until the voltage across it rises to the upper threshold of the Schmitt trigger. At this point the voltage at pin 6 abruptly goes low and so the capacitor begins to discharge via the 390kΩ resistor.

It continues to discharge until it reaches the lower threshold of IC1a whereupon the voltage at pin 6 abruptly goes high again. This sequence continues while ever the power is applied. Thus the output waveform at pin 6 is a square wave of 50% duty cycle while the waveform at pin 5 is a sawtooth.

So IC1a provides the basic 5kHz tone which then needs to be frequency divided to derive the "pip" waveform. IC1b in conjunction with D1 and D2 form the first frequency divider. If you ignore the diodes for the moment the configuration of IC1b is similar to IC1a just described



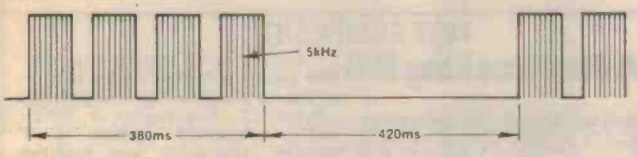
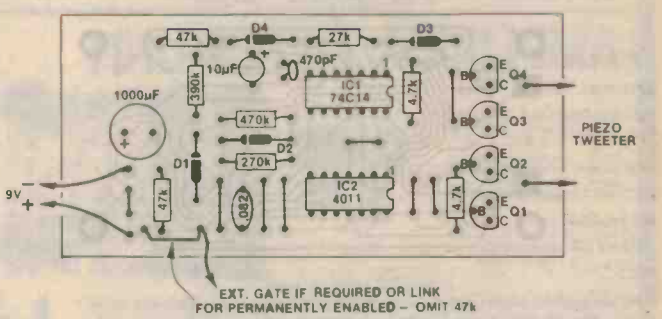


Fig. 1

This diagram shows the waveform across the tweeter.



At right is the parts overlay diagram. The 47kΩ resistor on pin 6 of IC2 can be omitted if the alarm is to be permanently enabled.

and that will give a clue to its operation.

Now consider that the .082μF capacitor associated with IC1b is discharged and, as a consequence, pin 8 is high. This reverse-biases D2 and effectively removes it and the 270kΩ series resistor from the circuit, for the moment. Each time pin 6 of IC1a goes high, D1 is forward biased and feeds a small amount of charge into the .082μF capacitor via the series 470kΩ resistor.

This continues until the voltage across the .082μF capacitor rises to the upper threshold of IC1b whereupon the voltage at pin 8 goes low. This then discharges the .082μF capacitor via D2 and the 270kΩ resistor until the voltage at pin 9 drops to the lower threshold of IC1b. The voltage at pin 8 then goes high again, reverse-biasing D2 and allowing the capacitor to charge via D1.

The result of this charge and discharge cycle is a square wave at the output of IC1b which is high for approximately 65 milliseconds and low for 30 milliseconds. This is then used to gate the 5kHz waveform on and off, using NAND gate IC2a.

IC2b is used to provide an enable control for the whole siren circuit. If pin 6 of IC2b is held high, the signal from IC2a will be gated through and the circuit will operate. If pin 6 is low, IC2b is disabled. The gated signal from IC2b is inverted by IC1c to provide the correct pulse polarity to enable the following frequency divider, comprised of IC2c, 1d and 1e, to work.

IC2b allows the circuit to be switched on in a "standby" mode without the siren actually sounding. When the external gate is taken high, the siren is instantly enabled. This avoids the inevitable distortion of the siren tone which occurs briefly while the supply bypass capacitor charges. Also, because the circuit uses such a small amount of power, the siren is audible for a number of cycles after power is switched off. If either of these characteristics is considered a disadvantage, then the external enable is the solution. Where not required, it is simply tied high by an optional link on the board.

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

$21

This includes sales tax, but not the cost of a battery.

IC1e plus diodes D3 and D4 function in exactly the same way as IC1b, with the 10μF capacitor charging via D3 and discharging via D4. The difference with this circuit is that while the capacitor is being discharged by D4 the signal to D3 via IC1d is disabled by means of NAND gate IC2c. IC2c, and thus IC2d, is gated on when the output of IC1e (pin 4) is high. IC2d functions merely as an inverting buffer for the output of IC2c.

By using IC2c and IC1d (to invert the signal), the duty cycle of the output waveform from IC1e can be controlled over a wide range by suitable selection of the associated 27kΩ and 47kΩ resistors.

To sum up the circuit description thus far: We have a free-running oscillator at 5kHz, IC1a; a frequency-divider with an output at about 10Hz (IC1b) which gates the 5kHz signal on and off via IC2a; and a further frequency divider, IC1e and associated components, with an output at about 1.25Hz which also gates on and off the pulse-modulated 5kHz signal from IC2a, using gate IC2c.

Two variables will affect the oscillator frequency and the timing of the pips. The first variable is the supply voltage and the second is the hysteresis of each Schmitt trigger in IC1, ie, the difference

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Ref: Electronics Australia June-August 1982

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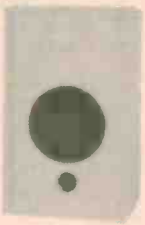

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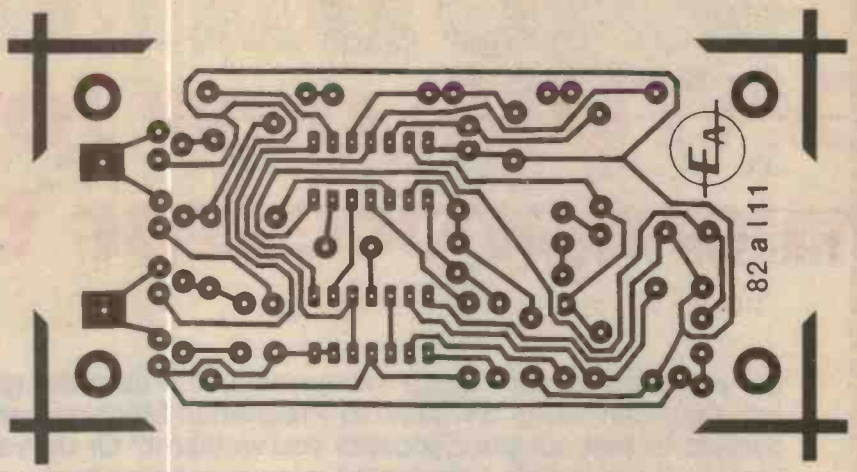
between the upper and lower voltage thresholds.

Because of the effect of these variables it may prove desirable, in some cases, to alter some resistor values to obtain a preferred sound from the circuit. The important point to note is that, if alterations are made to the first frequency divider, IC1b, the 270kΩ resistor cannot be increased appreciably, with respect to the 470kΩ resistor, otherwise the circuit will cease to divide.

The pulse-modulated signal from IC2d cannot be used to drive the piezo tweeter directly because of the relatively high output impedance of CMOS devices. One side of the tweeter is driven by Q1 and Q2 which function as complementary emitter-followers and thus as a buffer stage for IC2d.



Above is an actual size reproduction of the PC board.

PARTS LIST

1 Printed circuit board, code 82al11, 49 x 101mm
1 9V battery (Eveready 216 or equivalent)
1 Battery clip to suit
1 Piezo tweeter

SEMICONDUCTORS
4 1N914, 1N4148 diodes
2 BC337 NPN transistors
2 BC327 PNP transistors
1 4011 quad NAND gate
1 74C14 hex Schmitt trigger

CAPACITORS
1 1000µF/10VW electrolytic
1 10µF/10VW electrolytic
1 .082µF metallised polyester (greencap)
1 470pF ceramic

RESISTORS (¼W, 5%)
1 x 470kΩ, 1 x 390kΩ, 1 x 270kΩ, 2 x 47kΩ, 1 27kΩ, 2 x 4.7kΩ

If Q1 and Q2 were used alone to drive the tweeter, it would have a square wave of about 9 volts peak impressed across it. This is equivalent to a voltage of 4.5V RMS. By adding Q3 and Q4 to drive the other side of the tweeter with an antiphase signal from inverter IC1f, we double the drive voltage to 9V RMS and thus quadruple the power level.

The 1000µF electrolytic capacitor across the 9V battery allows the transistors to deliver the necessary high spike currents to the tweeter. These spike currents occur because we are essentially feeding a capacitor (the tweeter) with a square wave.

While the spike currents may be quite high, the average current when the alarm is sounding is low and typically of the order of only 10mA during actual sound pulses, or about 5mA overall. When the alarm is disabled, using pin 6 of IC2b, the standing current is about 0.4mA.

The circuit will work effectively, with some change in frequency and rate as mentioned before, over the range of supply voltages from 6 to 15 volts. For supply voltages above 10V, the rating on the two electrolytic capacitors in the circuit should be increased to 16VW.

Construction

Almost any piezoelectric tweeter may be used with the circuit. We used one made by Motorola and supplied by Jaycar. The printed circuit board, measuring 101 x 49mm and coded 82al11, was designed to mate with the solder lugs on the Motorola tweeter.

Mount the links first on the PC board and then the resistors and diodes. Take particular care to ensure that diode polarity is correct. The diodes we used had clear glass packages with a coating of grey paint over the cathode end.

Next, mount the capacitors, starting with the 470pF ceramic. The transistors can then be installed and, finally, the two CMOS ICs. With these you should solder the supply pins, 7 and 14, first and then solder the others but first connect the barrel of the soldering iron to the negative rail of the copper pattern using a jumper lead.

The piezo tweeter may be soldered directly to the PC board if its lugs are compatible with the spacing of the output pads. Alternatively, it may be wired into circuit.

When it comes to testing the siren, place the piezo tweeter face down on the bench and wear ear muffs. Do not direct the tweeter at yourself or anyone else as the sound level is painful at close quarters. It could do permanent damage, so do not play about!

If you are using the external enable option do not forget to tie it high for the test.

When finally installing the alarm, be aware that the piezo tweeter is fairly directional and should be aimed to cover the "target" area. Do not place it where someone may be blasted by it at close range.

DATUM: new low-cost microprocessor trainer

Do you want to learn about microprocessors from the ground up? Have you been following our series on "How to Program in Machine Language" but have no system to test out the concepts you've learnt? Or do you know a bit and are looking for a low-cost dedicated microprocessor system for experiments or for use in a control application? If your answer to any of these questions is "yes" then this is the project for you. Designed initially for teaching microprocessor concepts to students of Electronic Engineering, DATUM is a complete self-contained microprocessor system with everything needed to get you started.

This project got its start when staff at the School of Electronic Engineering at the South Australian Institute of Technology noticed that students with their own microprocessor system at home performed much better than those who had to rely on the limited number of evaluation kits used in the laboratories.

It was obvious that to give every student the same opportunity a low cost microprocessor trainer was required, so the staff set to work. The result was DATUM (Digital Aid for Teaching yoU Microprocessors), an inexpensive, easy to use microprocessor kit based on the Motorola MC6802 processor.

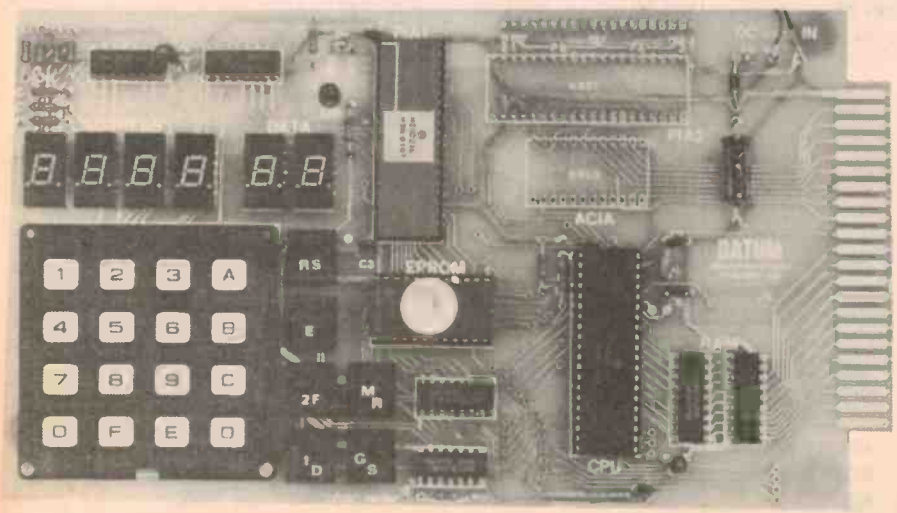
The design and development of DATUM was a co-operative effort, with many of the staff of the School of Electronic Engineering contributing, and a South Australian company, Gammatron, undertaking the production of the printed circuit board and kits for the project. Software for the Monitor program was written by Mr P. D. O'Neill of the Institute.

One of the most important design decisions for the DATUM project was that it had to be a completely self-contained system. A simple keypad on the board provides the means of inputting instructions and data, while output is displayed on seven segment LED displays.

Those readers who have followed our series on "Machine Language Programming for the 6800" will be in their element here, for the only way to program DATUM is by machine lanaguage and the "instruction set" of the 6802 is identical to that of the 6800. Both processors are relatively simple but very versatile, and quite powerful enough for many advanced applications.

There are only two differences between the 6800 and 6802 processors. The 6802 has an on-chip clock generator, needing only an external crystal. More importantly, the MC6802 has 128 bytes of Random Access Memory on the chip, 32 bytes of which can be placed in a low power "stand-by" mode to preserve important data when the rest of the system is off. This is one reason why we chose the 6802 for use in our Car Computer project.

In fact the Car Computer is a good illustration of what is possible with a small system such as this. Besides its use as a learning aid, DATUM can be put to use



DATUM is a low-cost trainer for learning about microprocessors.

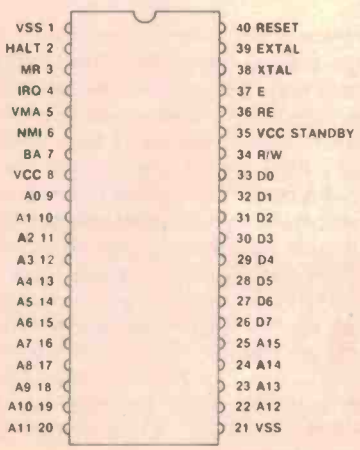


Fig. 1

Fig. 1: Pin-outs of the MC6802.

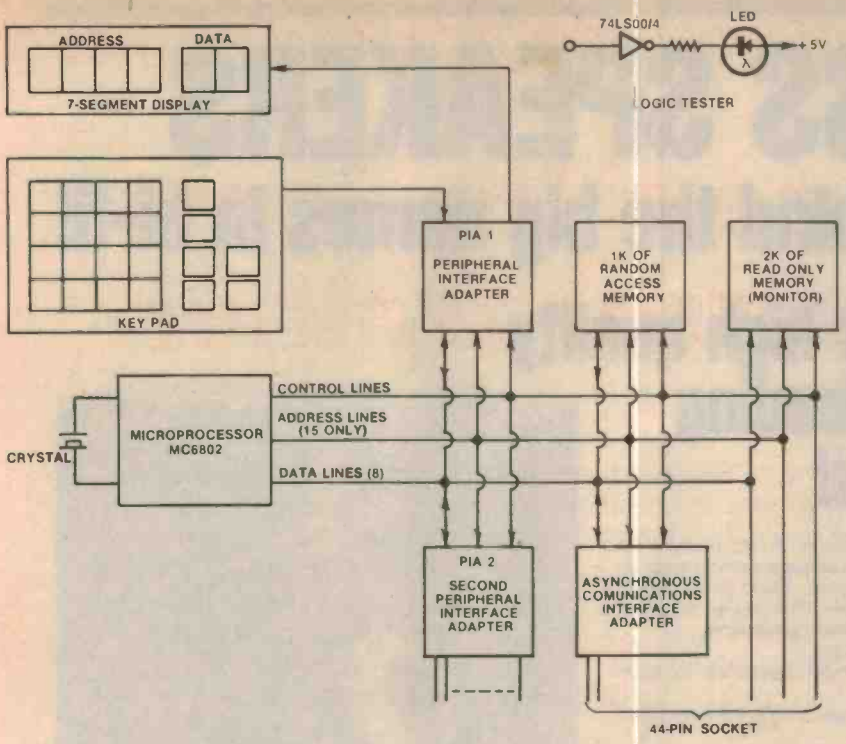


Fig. 2: Block diagram of the fully expanded DATUM system.

as a controller around the home (or the factory), or expanded into a larger computer system. Bus signals are brought out to a 44-way edge connector on one end of the board for this purpose and there is provision on the board for additional Input/Output, with a PIA for parallel I/O and an ACIA (Asynchronous Communications Interface Adapter) for serial communication.

The double-sided DATUM printed circuit board measures 228mm x 127mm and is silk-screened with component locations (although not component values). The manual we received had the component values hand-written after the parts list, although it is hoped that this will be corrected in final versions.

The design of a minimum microprocessor system

The heart (or is that the brain?) of any microprocessor system is of course the processor chip itself. Pin connections for the MC6802 are shown in Fig. 1. The processor has 16 address lines, and is thus capable of addressing 2^{16} or 65,536 separate memory locations.

64K of memory is far more than we need, so the first decision made in the design of DATUM was to decode blocks of memory, rather than individual locations. This simplifies the circuitry required and reduces costs, at a negligible penalty – maximum memory expansion. This is 12K bytes in 4K increments.

A minimal system will require both Read Only Memory for permanent storage of an operating program, and RAM (Random Access Memory) for user programs. Static RAM is used since it avoids the complications of refreshing dynamic RAM (see our articles on the Super-80 for details of a dynamic RAM system).

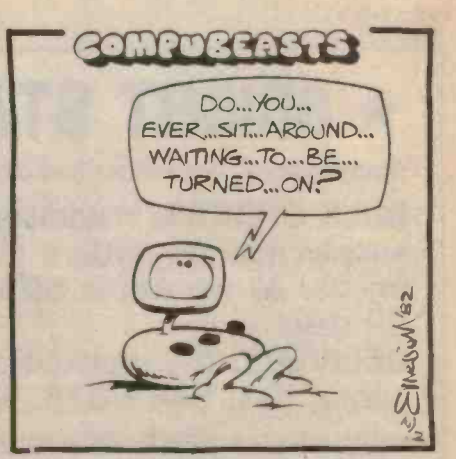
Because we will be entering programs by hand it is unlikely that they will exceed about a hundred instructions. Around 200 bytes of RAM would be sufficient, but the most readily available and cost effective memory for our purposes is the 2114 static RAM chip. This chip is organised as 1K locations, each of four bits, so just two packages will give us 1024 8-bit memory locations.

The ROM package of DATUM holds the Monitor program – a collection of routines which assist the user in communicating with the microprocessor system. Software is provided which scans the keypad, drives the LED displays and accepts input from the user. Depending on this input other routines are activated which allow the contents of memory to be inspected and changed, the internal registers of the 6802 to be displayed and the user's programs carried out.

The Monitor program of DATUM is 1K bytes long, and a complete listing of the source code is included in with the instruction manual supplied with the kit. Since the 2716 EPROM is a 2K device other programs which the user wishes to store permanently can be programmed into the unoccupied addresses. An EPROM programmer suitable for this purpose was described in our January 1982 issue.

Since DATUM is programmed in assembly language, hexadecimal output was decided on. Each 16-bit address location and 8-bit data byte are considered as combinations of four bits, with each combination represented by one of 16 hexadecimal characters, the numbers from 0 to 9 and letters from A to F. A complete description of the hexadecimal numbering system is given in Part One of "How to Program in Machine Language Language", EA March, 1982.

In hexadecimal, 16-bits are considered as four groups of four, and 8-bit data consists of two groups of four. Six displays are therefore required, four to display the address and two to display the data stored at that address.



A commercially available keypad provides hexadecimal inputs while six individual pushbuttons are used for control functions. Six switches provide the best balance between flexibility and cost. Key functions provided are:

HARDWARE SPECIFICATIONS

Processor: *Motorola MC6802.*
Clock: *1MHz.*
RAM: *1K x 8 on board, expandable to 12K externally, plus 128 bytes on chip.*
ROM: *2K (Monitor program occupies 1K).*
Display: *Seven segment LED readouts (6).*
Input: *Hexadecimal keypad and six function select buttons.*
Output: *Two PIA lines, optional extra PIA, ACIA*
Power requirements: *Regulated +5V or 6V battery at 400mA.*
Programming: *Hexadecimal machine code.*

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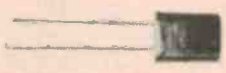

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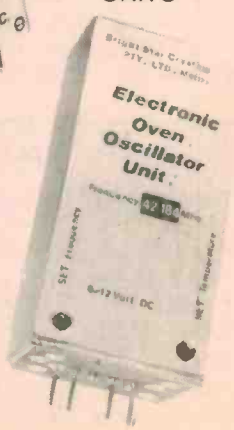
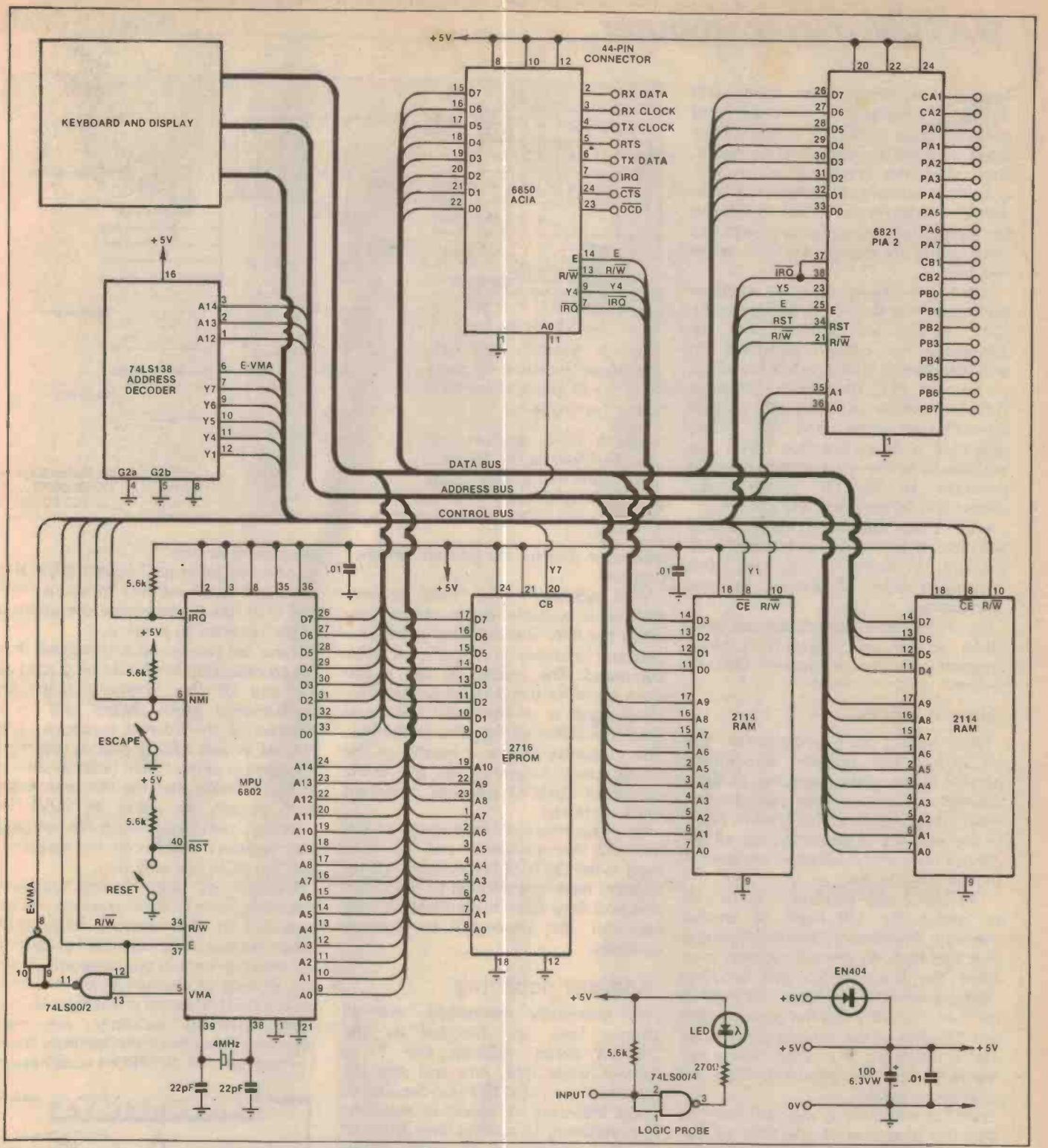




Circuit diagram of the full DATUM system, less the keyboard and display section shown in Fig. 6.

1. RESET (RS). Initialises all devices and causes the system to jump to the beginning of the Monitor control program.
2. ESCAPE (E). Lets us exit one control function ready for the next control sequence.
3. MEMORY (M). Allows memory contents to be displayed and modified.
4. GO (G). Provides a "start" instruction so programs can be run.
5. REGISTERS (S). Lets us display the contents of the internal registers of the 6802 microprocessor.
6. SINGLE STEP (R). Assists in "debugging" programs by allowing us to step through a program one instruction at a time.
7. INCREMENT/DECREMENT. Lets us inspect memory contents, stepping the address in either direction.

While all these functions were considered essential, some will be used less frequently than others. It is thus possible to share some switches, with functions which are used less often requiring two key presses, the first being the "second function" (2F) key. Other keys such as Reset and Escape must operate directly and cannot be shared. Fig. 3 shows how the seven functions can be accommodated on six switches.

So far we have described a minimum microprocessor system, with a

hexadecimal keypad for input, LED displays for output, a processor and memory. Two additional features have been included on the DATUM board. First, since the system is to be self-contained a simple logic probe has been included on the board so that signals can be monitored. Secondly, provision has been made to expand DATUM when required.

The 44-pin edge connector, visible in photographs of the board, brings out the data, address and control lines for connection to other equipment. In addition there is space on the board for a second PIA (Peripheral Interface Adapter) which provides 20 parallel Input/Output lines and an ACIA, providing a serial interface. With the addition of 12V level translators this chip provides an RS-232C channel for connection to terminals and printers.

With these additions DATUM can become more than a learning aid, finding a host of control and communications functions in real applications.

Fig. 2 summarises the design decisions taken so far and presents a block diagram of the minimum DATUM system.

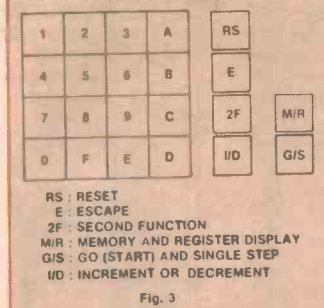


Fig. 3: Alternate key functions are activated by pressing the 2F key then the function key required.

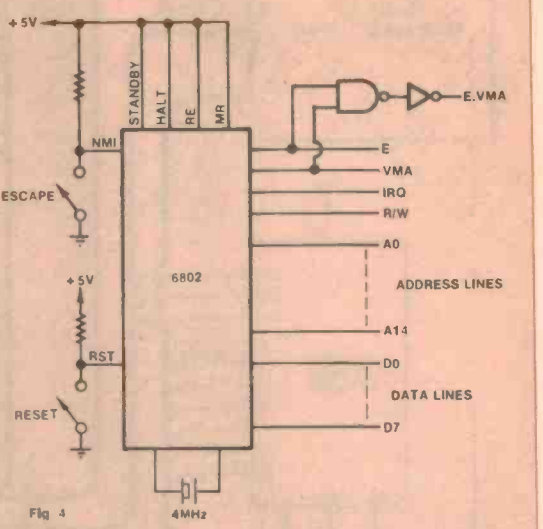


Fig. 4: Data, address and control lines of the MC6802 microprocessor used by the DATUM system.

How it works

Like most microprocessors the MC6802 is "bus" oriented. A common parallel signal path consisting of data, address and control lines connects the main components of the system. Again in the interests of simplicity, not all the control lines of the MC6802 are used in the DATUM design.

The RAM Enable (RE) line is tied to +5V to enable the 128 bytes of on-chip memory. The Memory Ready (MR) line is also tied high. Its normal function is to allow the processor to wait for slow memory devices which are not used in DATUM. "Standby" applies power to the first 32 bytes of the internal memory so that in the event of a power failure this memory can be powered from an emergency supply.

HALT is not used, as we don't want to stop the processor at any time so this line is also tied to +5V. Since HALT is not used, the Bus Available (BA) line which indicates that the processor has halted is not used and can be left open. The remaining control lines are used as follows:

RESET resets the MC6802. A pull-up resistor holds this line high until the Reset pushbutton is operated. NMI, the Non-Maskable Interrupt, is also pulled high and connected to a pushbutton, in this case the "Escape" function. IRQ is the interrupt request line, allowing processing to be suspended and the processor directed to perform another program.

VMA indicates that a "Valid memory address" is available on the address bus, while the R/W line indicates whether a memory operation is a read or a write command. The Enable (E) line is the clock signal for the DATUM system. This clock signal is ANDed with VMA and used to initialise all the units on the bus. The frequency of E is a quarter of the crystal clock frequency, so the 4MHz crystal of DATUM provides a system clock of 1MHz.

Fig. 4 summarises the outputs of the MC6802 microprocessor and the lines used in the DATUM bus system. Pull up resistors have been added to the RESET and NMI lines since these must be held high for the processor to operate correctly.

Address decoding

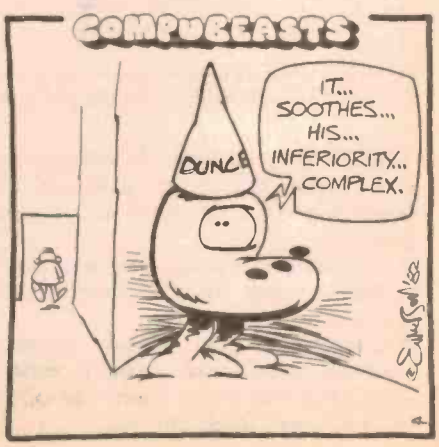
As previously mentioned, not all address lines are decoded by the DATUM circuit. Address line 15 is ignored while A14, A13 and A12 are decoded by a 74LS138 1-of-8 decoder to select individual 4K blocks of memory. The remaining 12 address lines (from A0 to A11) provide a 4K (4096 bytes) addressing capacity. Memory in DATUM is thus divided into eight blocks, each of 4K, for a total addressing capacity of 32K bytes.

The next question is how to allocate the available memory locations. Three constraints are set by the internal organisation of the MC6802 chip:

1. The internal 128 bytes of RAM must be the first 128 memory locations.
2. After a Reset the last processor reads the last two locations in memory (FFFE and FFFF hex) to find the address of the program to be run.
3. After an Interrupt Request (IRQ) the processor reads address locations FFF8 and FFF9 hex to determine the address of the program to jump to.

These last two constraints suggest that the Monitor EPROM should be placed at the top of the "memory map" to permanently store Reset and IRQ pointers at the correct locations. The PIA, ACIA and RAM locations are then allocated in a convenient order as shown in Fig. 5. Note that the PIA and ACIA each occupy an entire 4K block of memory, even though each PIA has only four registers which can be accessed, and the ACIA has only two.

Because of the limited address decoding, each of these registers will be repeated in the memory map 1024 times, but this is not important as long as we are consistent in our programs. Since the amount of memory (RAM or ROM) on the DATUM board is less than 4K, the same memory locations are also repeated throughout the memory map. For example the 2K EPROM is addressed



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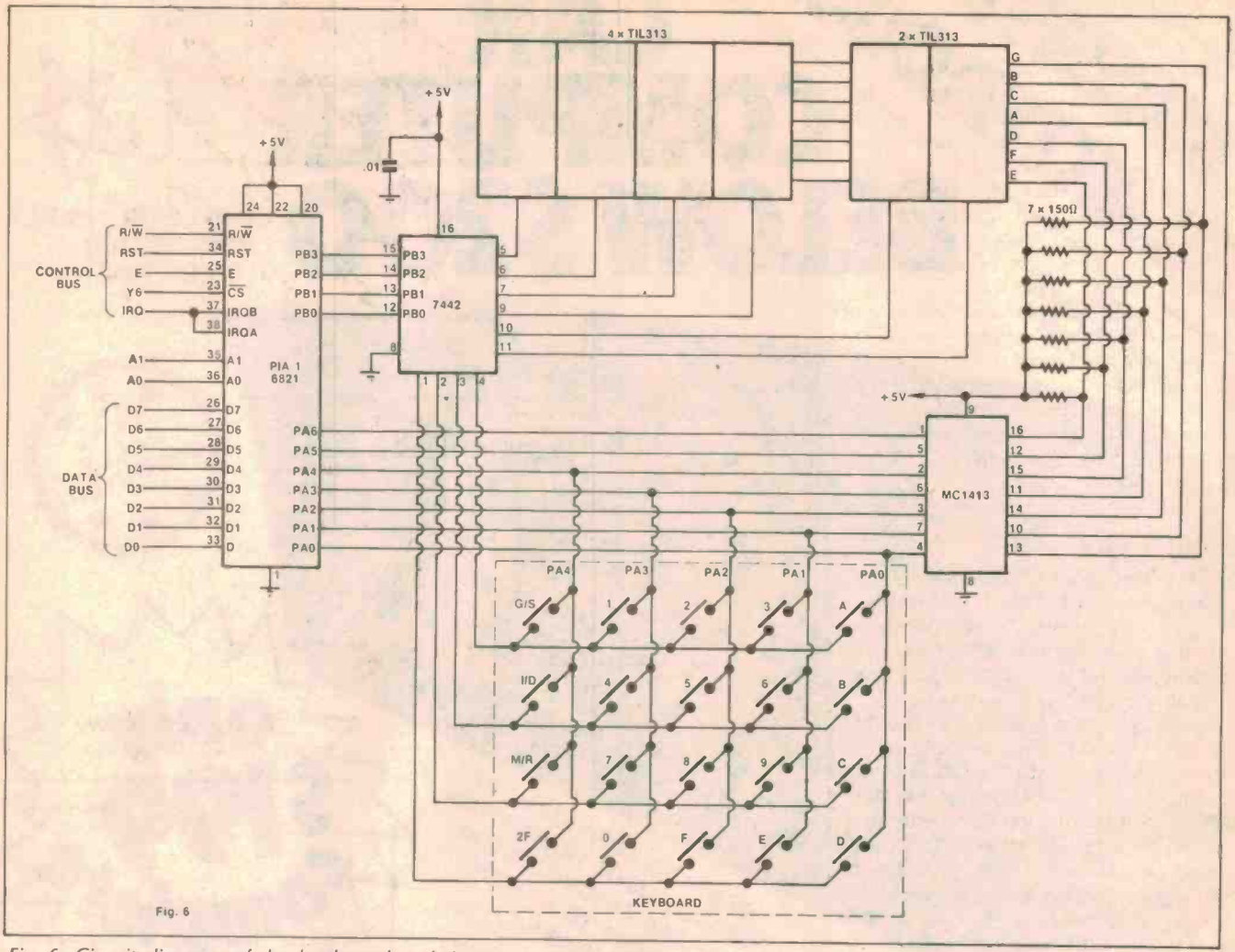


Fig. 6: Circuit diagram of the keyboard and display section of DATUM.

from 7000 (hex) to 77FF and is then duplicated from 7800 to 7FFF hex. Similarly the 1K of RAM is repeated four times, beginning at address location 1000 hex.

This repetition does not matter and any of the appropriate redundant addresses can be used, although a lot of trouble and confusion will be avoided by consistently using the same address locations.

Note that if we ignore the 16th bit of the address bus, 7FFF in hex is the same as FFFF, so the two constraints on EPROM addressing are satisfied even though DATUM has only a 32K addressing capability.

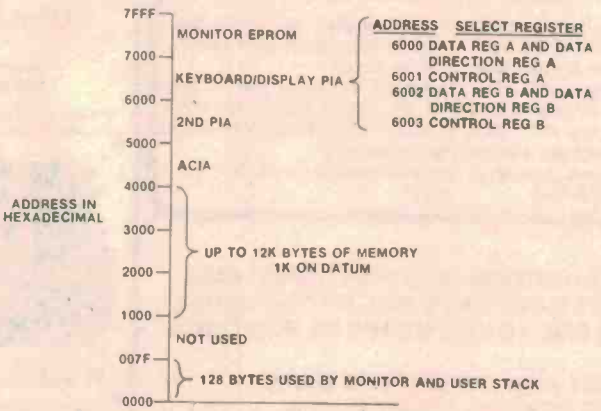


Fig. 5: DATUM memory map shows allocation of ROM, RAM and peripheral adapters.

Keyboard and display

Fig. 6 shows the method of interfacing the keypad and the six displays to the microprocessor. Port B of PIA1 is programmed for output, and four lines, DB0 to DB3, drive a 7442 1-of-10 decoder. Six of the outputs of the 7442 sequentially ground the cathode of each seven segment display while the remaining four lines are input to the rows of the keypad.

A closed key is detected by programming Port A of PIA1 for input and scanning the columns of the keypad through PA0 to PA4. With the four rows of the keypad each driven low in turn a closed key will cause one of the five column lines to go low. The particular key pressed will be at the interesection of the row which is currently low and the column line which is read as low.

For driving the display Port A of PIA1 is programmed for output and seven of the lines (PA0 to PA6) are fed to an inverting buffer to select one of the segments of each seven segment display. All the identical segments of the six displays are connected in parallel and the display illuminated is determined by which

cathode is selected by the outputs of the 7442. The segment driving lines of Port A go low to select a segment, causing the output of the MC1413 inverter to go high and allow the 150Ω resistor to +5V to supply current to the LED segment.

Fig. 7 shows the organisation of the keypad and display circuitry and the way in which each output line is decoded. With this information it is possible to program DATUM to illuminate any segments of the display for a quasi-alphanumeric messages or to monitor a particular key of the keypad.

Note that pins DA7 and DB7 of the PIA1 are not used for the keypad or display and are brought out to pins on the board for experimental purposes. More details of the Peripheral Interface Adapter chip can be found in "How to Program in Machine Language", in EA, August 1982.

Logic probe

One element of the 74LS00 NAND package on the DATUM board drives a LED which serves as a power-on indicator and a simple logic probe for checking wiring and the operation of programs using the PIA outputs.

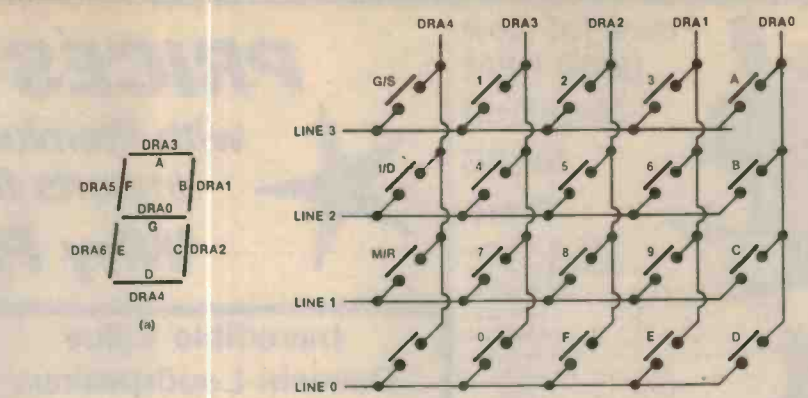
A pull-up resistor ensures that the LED will be on when there is no input to the probe, indicating that power is available to the circuit. This has the unfortunate side effect that if the logic probe input is applied to a pin which is in fact open circuit the LED will be lit, indicating a high state. Despite this drawback the probe is still useful. If for instance, the input of the probe is connected to pin 37 of the microprocessor (the clock output) the LED will be lit if the oscillator is functioning but its intensity will be less than when the probe input is connected to +5V.

The final system

Page 89 shows the circuit diagram for the complete DATUM system, excluding the keyboard and display sections shown in Fig. 6. Fig. 8 shows the connections for the 44-pin edge connector while the printed circuit board overlay is shown at right.

Power to DATUM can be provided either via the edge connector or via pins on the PCB (labelled DC volts in). Power can be supplied from a regulated 5V source or by a 6V lantern battery. Current consumption is around 400mA.

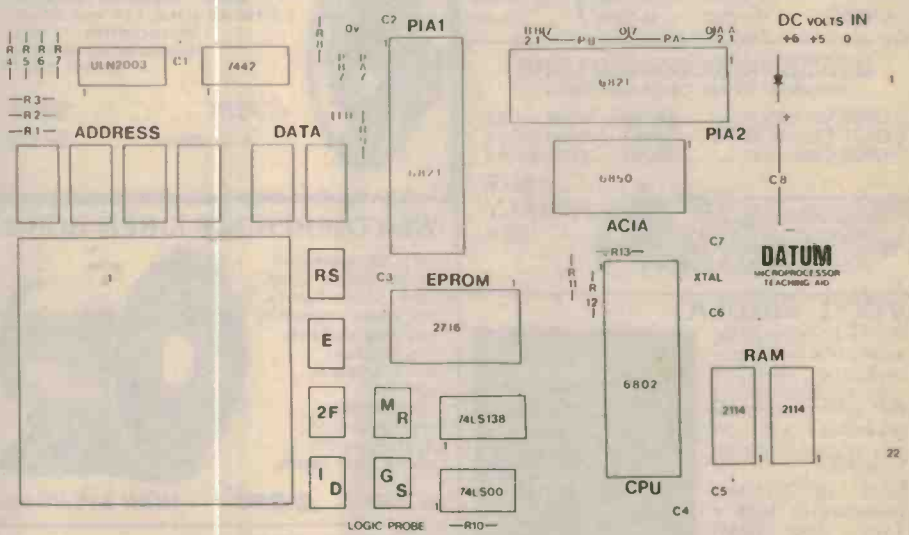
If a battery is used power can only be connected to the pins on the circuit board labelled 0 and +6V which is connected via a series diode. The diode prevents the power being applied with the reverse polarity and drops the 6V to approximately 5.4V. Under no circumstances should 6V and 5V supplies be used at the same time as the diode will be destroyed.



DRIVER LINES (VIA 7442)				HEX CODE	FUNCTION
DRB3	DRB2	DRB1	DRB0		
0	0	0	0	0	KEYPAD LINE 0
0	0	0	1	8	KEYPAD LINE 1
0	0	1	0	4	KEYPAD LINE 2
0	0	1	1	C	KEYPAD LINE 3
0	1	0	0	2	LHS 7-SEGMENT DISPLAY
0	1	0	1	A	DISPLAYS MOVING LEFT TO RIGHT
0	1	1	0	6	
0	1	1	1	E	
1	0	0	0	1	
1	0	0	1	9	RHS 7-SEGMENT DISPLAY

Fig. 7 (c)

Fig. 7: Organisation of display and keyboard. Display segments are driven by Port A of PIA 1, with cathodes selected by decoder outputs.



Component overlay of the DATUM board. PIA2 and ACIA are optional additions.

Assembling the DATUM kit

Start construction with the keypad. The kit provides a nut and bolt to fix the keypad to the board. When soldering the connecting pins of the keypad be wary of applying excessive heat, or else internal solder joints could melt and create an open circuit. Mount the six pushbutton switches then the resistors and capacitors.

Make sure that the electrolytic capacitors are correctly oriented as shown on the PCB overlay.

Mount the diode, LED and the seven-segment displays, again observing the polarity of each part. The 4MHz quartz crystal and the socket for the EPROM should be installed next. We also installed sockets for the microprocessor and the PIA1, although these are not provided in the kit.

Install the ICs, starting with the smaller packages, and making sure that pin 1 of each chip aligns with the 1 printed on the board. Before mounting the ICs, apply power to the circuit and check for the presence of 5V on the appropriate supply pins.

Install EPROM, PIA1 and microprocessor. Finally stick the rubber pads on the underside of the board to keep it clear of the bench.

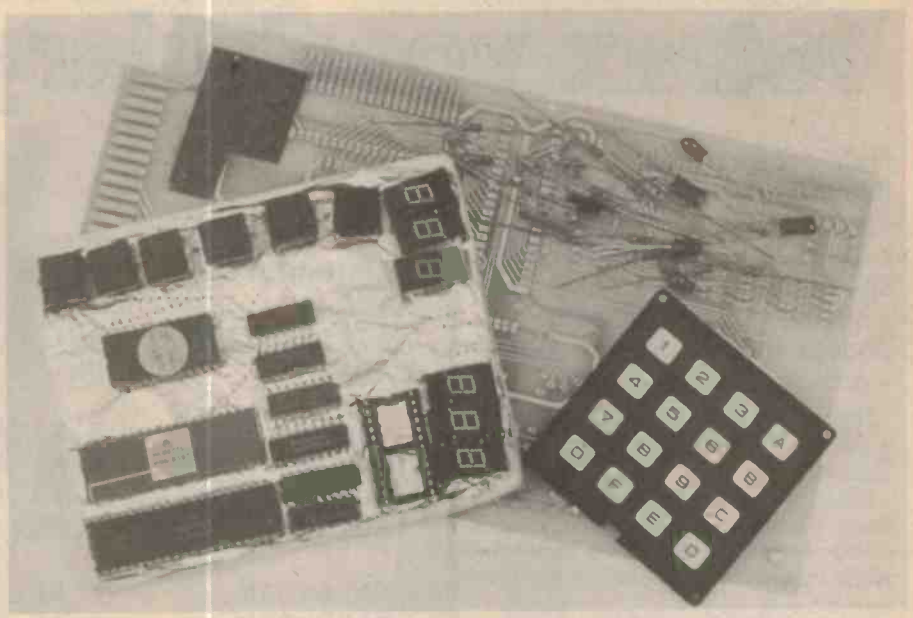
The manual that comes with the DATUM kit provides a fairly complete description of the circuitry from a technical point of view and step-by-step assembly instructions. A simple trouble-shooting guide is also provided which proved unnecessary in our case. The only problem we had was with the placement of capacitor C6, which is parallel to and directly opposite C7. An inviting pair of holes to the left are through-the-board connections, not for component installation.

We also found that it was necessary to cut the plastic supports off the bottom of the pushbutton switches supplied so that they would mount flush on the board. This makes it slightly difficult to mount the switches neatly and some care is required.

The PCB is not solder masked, and some of the tracks are closely spaced. A soldering iron with a small tip is essential here.

The manual provides an example of test procedures, including reading the contents of the EPROM and a simple program to test the RAM. If everything checks out OK you're on your way. Our next article will provide some software for the system and article number three will provide suggestions for applications.

Assembled or kit form DATUMs are available from Gammatron, Weens Road, Pooraka, 5095. Printed circuit boards, key pads and monitors are also available separately. Next month we shall look at software aspects, including the monitor routines.



DATUM kit provides PCB and all components for a minimal system. Full instructions are included.

UPPER (IC) SIDE OF PCB		PIN NUMBER COMMENCING FROM TOP	UNDER SIDE OF PCB
	+5V	1	0V AND COMMON
ACIA LINES (NOT USED)	RX DATA	2	
	RX CLOCK	3	
	TX CLOCK	4	
	$\overline{RTS}$	5	
	TX DATA	6	
	$\overline{DCD}$	7	
	$\overline{CTS}$	8	
	$\overline{IRQ}$	9	E
	$\overline{RESET}$	10	ADDRESS BLOCK 3000 (4K BYTES)
	A0	11	ADDRESS BLOCK 2000 (4K BYTES)
	A1	12	ADDRESS BLOCK 1000 (4K BYTES)
	A2	13	R/$\overline{W}$
	A3	14	VMA
	A4	15	D0
	A5	16	D1
	A6	17	D2
	A7	18	D3
	A8	19	D4
	A9	20	D5
	A10	21	D6
	A11	22	D7

Fib. 8: Connections for 44-pin expansion interface of DATUM. The third article in this series will cover applications.

A useful word list for the Compuvoice

Votrax vocabulary

Held over from last month, this vocabulary list is just a sample of some of the capabilities of our Compuvoice speech synthesiser. By combining the appropriate phoneme codes any required word can be produced.

The vocabulary is presented in the form of "phoneme codes" as used by Votrax.

Either the table or the program in listing 1 published last month, can be used to convert the phoneme codes into ASCII characters to be sent to the Compuvoice unit.

The short sample program given here illustrates how the resulting ASCII codes can be used to construct words and sentences.

Note that to produce the "CH" sound, as in "charge", the "CH" code must be preceded by a "T" code. To produce the "J" sound of "judge", the "J" code must be preceded by a "D" phoneme code. Normally both "CH" and "J" are silent, having no sound of their own but affecting the sound of following codes.

By following the examples given here and in last month's article an unlimited vocabulary can be created for your computer.

A talking program

```
00100 FOR W=1 TO 7
00110 READ A1$
00120 LPRINT A1$;
00130 LPRINT "?";
00140 NEXT W
00150 REM
00160 REM
01000 DATA"\V^UI!"
01010 DATA"CC"
01020 DATA "8KIR?"
01030 DATA "IIR?"
01040 DATA ")44+"
01050 DATA "Y3L%)67*:"
01060 DATA "R%<YET"
```

Due to an oversight, last month's article did not include interfacing details for the System-80 computer. To use the Compuvoice with the System-80 it is necessary to ground pins 23 and 25 of the Centronics edge connector. Otherwise the Centronics driver program will receive a "paper out" signal from pin 23 and suspend processing.

ACCOUNT	UH1 K AH1 O1 U1 N T
ADDRESS	UH1 D R EH1 S
AFFIRMATIVE	UH1 F ER M EH2 T I1 V
ALARM	UH1 L AH1 AH1 R M
BASE	B A1 AY S
BASIC	B A1 AY S I3 K
BUSY	B I3 I2 Z Y
BUTTON	B UH1 UH3 T EH3 N
CALENDAR	K AE1 UH3 L I3 N D ER
CASSETTE	K A2 AY S EH1 EH2 T
CENTIGRADE	S EH1 N T I3 G R A1 Y D
CHECK	T CH EH1 EH3 K
CONTINUE	K UH1 N T I1 I3 N Y1 IU U1
DAMAGE	D AE1 EH3 M I1 D J
DATA	D AE DT UH1
DECIMAL	D EH1 S M UH3 L
DESTROY	D Y S T R O1 UH3 I3 AY
DIVIDE	D I1 V AH1 EH3 Y D
EASY	E1 AY Z Y
END	EH1 EH3 N D
EQUAL	Y K W UH3 L
ERROR	EH3 EH3 EH3 R ER
FALSE	F AW L S
FARAD	F EH3 EH3 ER AE1 EH3 D
FINAL	F AH1 Y N UH3 L
FIRST	F ER R S T
FUEL	F Y1 IU U1 UH3 L
GAUGE	G A1 AY Y D J
GO	G OO1 O1 U1
GRAM	G R AE1 EH3 M
GUESS	G EH1 EH3 S
HAPPY	H AE1 EH3 P Y
HEAR	H AY I1 R
HELP	H EH1 EH3 L P
HERTZ	H R R T S
HEX	H EH1 EH3 K PAO S
IMMEDIATE	I1 I3 M E1 D Y EH3 T
IMPORTANT	I1 I3 M P O2 O2 R T EH3 N T
INCOME	I1 I3 N K UH1 UH3 M
INDEX	I1 I3 N D EH1 EH3 K PAO S
ITEM	AH2 UH3 Y D UH3 M

A Votrax vocabulary

JOB	D J AH1 UH3 B
JOIN	D J O1 UH3 I3 AY N
JOLT	D J O2 O2 L T
JUMP	D J IU U1 U1 N
KEEP	K E1 Y P
KEYBOARD	K AY Y B O1 O2 R D
KILL	K I1 I3 L
KILO	K E1 AY L UH3 O2 U1
LARGE	L AH1 R D J
LENGTH	L EH1 EH3 NG TH
LIST	L I1 I3 S T
LOAD	L UH3 O1 U1 D
LOW	L O1 U1
MAXIMUM	M AE1 EH3 K PAO S EH3 M UH2 M
MEASURE	M EH3 EH1 ZH ER
METRE	M E1 Y T ER
MILLI	M I1 I3 L UH3
MINUS	M AH1 Y N UH3 S
MULTIPLY	M UH1 L T I3 P L AH1 Y
NEAR	N AY I1 R
NEGATIVE	N EH1 G EH3 T I1 V
NEXT	N EH1 EH3 K PAO S T
NO	N QO1 O1 U1
NUMBER	N UH1 UH2 M B ER
OBJECT	AH1 UH3 B D J EH2 EH2 K T
ODD	AH1 UH3 D
OFF	AW F
OHM	O2 O2 U1 M
OPERATE	AH1 UH3 P ER A1 Y T
PAPER	P A1 Y P ER
PEEK	P E1 AY K
PERCENT	P ER S EH1 EH3 N T
PLEASE	P L E1 Y Z
PLUS	P L UH1 UH2 S
POSITIVE	P AH1 UH3 Z I1 T I1 V
QUANTITY	K W AH1 N T I3 T Y
QUARTER	K W O1 R T ER
QUIET	K W AH1 EH3 AY I2 T
QUOTE	K W O1 U1 T
RANGE	R A1 AY Y N D J
RATIO	R A1 Y SH Y O1 U1
READY	R EH1 EH3 D Y
RECORD	R E1 K O2 O2 R D
RETURN	R E1 T ER R N
SAVE	S A1 AY Y V
SAY	S A1 I3 Y

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	162 Pacific Hwy	GORE HILL	439 5311
	396 Lane Cove Rd	NORTH RYDE	888 3200
	30 Grose St	PARRAMATTA	683 1133
	6 Bridge St	SYDNEY	27 5051
	125 York St	SYDNEY	290 3377
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	263 Keira St	WOLLONGONG	28 3800
	Tamworth Acde & Kable Ave.	TAMWORTH	66 1961
ACT	96 Gladstone St	FYSHWICK	80 4944
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	260 Sydney Rd	COBURG	383 4455
	656 Bridge Rd	RICHMOND	428 1614
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	205 Melbourne Rd	GEELONG	78 6766
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	166 Logan Rd	BURANDA	391 6233
	842 Gympie Rd	CHERMSIDE	59 6255
SA	60 Wright St	ADELAIDE	212 1962
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DSE A327

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SYNTAX	S I1 N T AE1 EH3 K PAO S
TEMPERATURE	T EH1 EH3 M P ER UH1 T CH ER
TIME	T AH1 EH3 Y M
TOTAL	T O1 U1 T UH3 L
TURN	T ER R N
UNDER	UH2 UH2 N D ER
UP	UH1 UH2 P
URGENT	R R D J I3 N T
USE	Y1 IU U1 U1 Z
VALID	V AE1 UH3 L I1 D
VERIFY	V EH1 R I3 F AH1 EH3 Y
VOICE	V O1 UH3 I3 AY S
VOLT	V O2 O2 L T
WAIT	W AH1 UH3 N T
WEAPON	W EH2 EH2 P UH1 N
WHO	H IU U1 U1
WRONG	R AW NG
X-RAY	EH1 EH2 K PAØ S R A1 I3 Y
YEAR	Y1 AY I3 R
YES	Y1 EH3 EH1 S
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DSE/A193M/JW

Letters to the editor

More on that Gordon River editorial

For the first time in my life I am moved to support an editor of a magazine or newspaper. For a period well in excess of two years I have put up with "emotional garbage", as Mr Coulson so elegently puts it in your September issue.

Judging by the "incensed" response of Mr Coulson and many of the "unbiased non-greenies" to your editorial, but more importantly to the whole of the Franklin/Gordon power scheme and (dare I drag a ghost from the past) the Lake Pedder and current Pieman schemes, the issue can not be less than emotional.

My reasons for saying this are as follows. In selecting and implementing each of the aforementioned power developments the people of Tasmania have been repeatedly subjected to a barrage of facts, fantasy distortions and half truths. As recently as the Tasmanian State Election our now Premier (then opposition leader) stated quite clearly – "the Franklin/Gordon power scheme is a NON issue" when asked on the bearing this scheme would have on his (Liberal) party's chances in the election.

Just a few weeks ago Mr Gray then stated "my party has a clear mandate to get on with the job". I question how one sets a mandate about such a non-issue. How else can the average Australian evaluate the issue at hand except on an emotional level?

It is true that the HEC is one of the State's largest employers – on capital works. However their permanent post-construction employment numbers are incredibly small for the enormous amount of money invested. Fifty per cent of its budget goes towards interest payments (1979 figures).

Whilst 17% of eligible voters in the Tasmanian Referendum wrote "no dams", which was classified as informal, the total informal vote was a staggering 34%. One can only speculate, albeit at an emotionally biased level, what a true No Dams option vote would have meant for Tasmanians.

The Tasmanian State election was clouded by a politically and an economically unstable climate and to lay the election result at the bottom of yet another Hydro-Electric power scheme is clearly irresponsible if not letting one's "emotions" blind one from the other issues that are involved in looking after our State.

One final and very emotional point I would like to make about the "selfish minority". A dictionary would broadly define the act of being selfish as looking after one's own interest in preference to another's needs. I have been most fortunate to have rafted the Franklin River on two occasions. I may never do so again. If, by being selfish, I may preserve this – our heritage – for my children and YOURS then so be it.

D. Tasker.
Westbury, Tas.

In reply to comments by Dr Guidici in "Electronics Australia", August, 1982. I fail to see that approximately one billion dollars to finance 180MW of electricity (and this to be done by the taxpayers in the whole of Australia) is in any way, shape or form, a "bargain" and considering the generators still to come for the Strathgordon scheme and after that the Pieman scheme, flooding the Franklin or Gordon rivers further is completely unnecessary.

The HEC seems to be only interested in building dams to generate electricity. Has full research been carried out into the use of wind power, also a costless fuel, as an alternative? (Tasmania certainly has the ideal geographic location for this) and if not, why do we lag so far behind many other countries in the search for more "passive" forms of energy?

Creating a lake is one thing: flooding a whole river system, with its absolutely unique scenery and vegetation, archaeological sites etc is a different thing completely and is tantamount to ravaging the area.

Our environment is being destroyed at a rapid enough rate already and great problems have been generated by large scale damming and irrigation systems and destruction of forest so it would seem to be a logical step to find ways to save and not destroy our land.

The same 60,000 people have also looked at the rest of Tasmania and probably a lot of the mainland as well and I

(Continued on page 104)

Power factor error

I would like to comment on a recent article in "Electronics Australia", namely, the Power Monitor featured in the July 1982 issue.

While the idea of using a moving iron ammeter to indicate power consumption is fine for a resistive or near unity power factor load, for many applications it can be in error by a factor of two or more!

What I really want to take issue with is the statement that average household loads such as refrigerators and washing machines have a power factor near unity.

This is just not so. The average ¼ or ⅓ HP split-phase motor has a PF of about 0.6 on full load as does the average hermetic refrigerator unit. A few (very few) may have PSC motors (permanent split capacitor) but even then PF is about 0.8 maximum. Small shaded-pole motors such as used in fans etc can have PF's as low as 0.2 to 0.3.

A few figures will illustrate the point. Take an average ¼hp motor which on 240V draws about 2 amps; ¼hp is 746/4 which equals 186.5W; efficiency is about 65% so input is 186.5/.65 =287 watts; but 240V times 2 amps = 480VA so PF = 287/480 = 0.59.

For power consumption purposes the figure of 287W (in this case) is the one to use. If you take the 2 amp reading on your meter this equates to 500W which you'll agree is a long way out.

The only satisfactory way to measure power consumption in an AC circuit is to use a standard (preferably dynamometer) type wattmeter or one of the newer solid state transducers which can have a DC voltage or current output linear with the power consumed. Watts/kW can then be read on a standard moving coil instrument or digital meter. Agreed, these are costly ($500-600) for the average home experimenter to buy, however, what about a project to build a solid state version which may cost, say, $150-200? An article in the American magazine "EDN" for February 4, 1981, describes such a device.

I am currently using a commercial version very successfully, which cost $NZ465. Perhaps I should point out at this stage that I have been in the home appliance design and development field for over 30 years so have some experience in this area. Apart from this one brickbat I have nothing but bouquets for your magazine.

I. N. Ricketts,
Auckland, NZ.

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74LS10	.18	.17	.13B
74LS32	.18	.17	.13B
74LS74	.45	.41	.30B
74LS240	.80	.70	.60B
74LS241	.80	.70	.60B
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4002	.19	.18	.16B
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continued from page 102

would go as far as to suggest that a significant proportion of these tourists would also favour no further destruction of this beautiful area.

I also find it hard to reconcile the fact that men with such a high standard of education seem to have so little feeling or interest in preserving what surely is a God's gift.

B. Rixon.
Strathfieldsaye, Vic.

Belligerent letters criticised

I must say I am not surprised at the replies invoked by the editorial regarding the Gordon River dam (EA, June 1982). Editorials are meant to be provocative, and this one certainly provoked some discussion, both rational and irrational. What does surprise me is the lack of reader support for the editorial and the obvious bias of those who have written.

Mr Felmingham of Tarraleah (an HEC power station plus employee residences) says (EA, September 1982) "It appears to Tasmanians that the most vocal people against the flooding of the Franklin River are those on the mainland". Perhaps Mr Felmingham only monitors the mainland news-media because from my perspective the most vocal opponents of the scheme are members of the Tasmanian Wilderness Society. I hope your readers do not gain the impression from correspondence so far that all Tasmanians are so parochial. We are, after all, Australians, and the Franklin River is a part of Australia's heritage.

The HEC cannot build the scheme without a federal loan, so let all Australians who wish to, have a say.

Leo Simpson's query regarding continued employment for the construction crew might be extended to cover the highly paid bureaucracy and engineers who would have to seek employment elsewhere should the scheme be negated. I might add that Mr Holgate, during his short colourful term as Premier, outlined a further half a dozen schemes to follow the lower Gordon scheme. Mr Gray (current Premier and treasurer) announced in his budget the allocation for $11 million to the HEC to get on with the lower Gordon scheme. Is he trying to get well under way before the Federal proposal for World Heritage listing of the area is formalised?

Perhaps Messrs Coulson, Felmingham and Roberts have been under the realm of the HEC for so long they no longer question the validity of HEC motives and actions. Why do they prefer to believe all the misleading and false propaganda comes from opponents of the scheme? Why does the HEC need to spend thousands of dollars to advertise itself. After all, where else can we obtain power in Tasmania?

With the mining companies on Tasmania's West Coast closing down as they are what happens to power consumpion predictions? TEMCO (BHP) at Bell Bay recently had to shut down a furnace owing to lack of product demand and this single act released over 12 megawatts for other uses. A pointer for the future?

I am heartened to see that some engineers are concerned about the effects of technology on the environment. Through lack of this concern in the USA, overdamming of the Colorado River has ensured that it no longer reaches the sea and Mexico gains minimal benefit from the little that reaches its soil. In Tasmania the largest single cause for the disappearance of forest is the HEC and its dams.

I commend "Electronics Australia" for printing these often belligerent and insulting letters. This demonstrates their willingness to listen to other opinions, even though they may disagree.

Still on power consumption, but a separate issue, regarding the September editorial. As an adjunct to microprocessor power meters, a 24-hour clock based on a crystal oscillator could be used as an off-peak system controller. If a NiCad battery and charging circuitry were incorporated, power failures would become superfluous as would the need for resetting following blackouts.

D. R. Waters,
Scottsdale Tas.

I applauded your editorial regarding the Gordon River dam and in view of the comments you have received I would like to make a few points of my own.

Firstly, the referendum that is constantly referred to never was a chose between dams or no dams; it consisted of a choice of two **dam projects** and approximately **38%** of the people cast an informal vote, most by writing no dams on the ballot paper. There are still a number of schemes being completed and according to press reports when the Pieman is completed (about 1986) there will be 200 megawatts more power available than there is at the moment. The greatest worry is that with the closure of mines and a general down turn in business, the HEC projection of power requirements for the future is going to be grossly exaggerated. If that is so and the power is notr sold, who is going to pay off the colossal debt involved in building the Gordon scheme.

I do not knock the HEC as I feel they have done all that is required in the past, but I do think that when a vital decision, such as the Gordon River scheme is at stake, an unbiassed independent authority (completely divorced from the State and its politics) should be engaged to give the government the true facts. The present drought highlights the weakness of hydro power, and a decision for a thermal plant would not have only saved a worthwhile asset, but would give back up when water is scarce. Of course the whole question is do we need that quantity of power for the future? One must remember that if, for example, the aluminium works closed down there would be almost a third of the total power developed in the State not needed.

D. C. Logan.
Lenah Valley, Tas.

Car Computer comments

As importers of the Zemco range of trip computers and cruise controls, we have naturally followed your recent series on the car computer with interest. After three years of experience with these devices we thought that it may be

(Continued on page 107)

Sensational headline?

As one who has worked in the occupational health field for 27 years after several years in the electronics industry, I should like to protest at your use of a sensational headline for the well-balanced article on VDUs by Dr Colin Mackay. That there are some unsatisfactory areas in the use of this equipment is not doubted – I find myself suggesting methods for their correction almost weekly – but your headlines will give rise to unnecessary apprehension.

More appropriate headlines for the article would be along the following lines:

"VDUs can be used safely!
Whilst there are no intrinsic health hazards associated with video display units their inappropriate use may cause unacceptable disability to some people. This article will help to allay some unnecessary fears."

I should be pleased if you could find space in your journal to publish this letter.

G. Major,
Lecturer in Occupational Hygiene,
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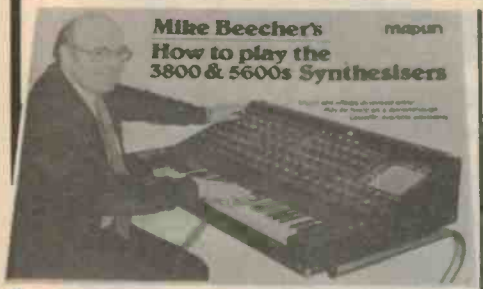

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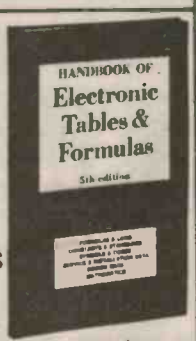

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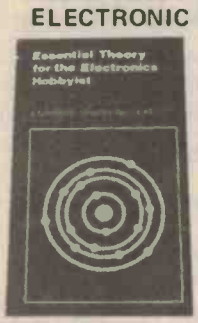

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As reviewed in Sept. EA page 107

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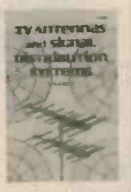

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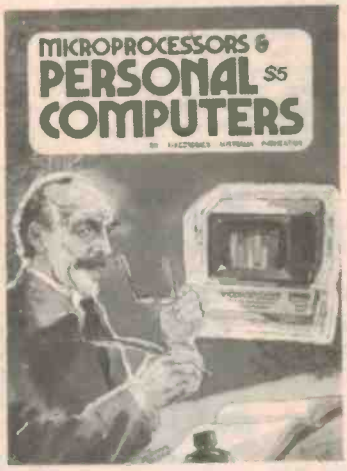

Microprocessors and personal computers, little more than a dream a few years ago, are now changing the face of electronics. This book introduces the basic concepts, describes a selection of microprocessor and personal computer systems, and details a build-it-yourself computer designed especially for beginners.

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Available from "Electronics Australia", 57 Regent St, Chippendale, NSW. **PRICE $5.00** OR by mail order from "Electronics Australia", PO Box 163, Chippendale, 2008. **PRICE $5.90.**

continued from page 104

beneficial to your readers if we were to make some observations based on this experience.

Firstly, after fitting the flow sensor to the fuel line, run the engine and inspect all connections for fuel leaks. Even if there are no leaks ensure that each clamp is tight. Should a fire result from a loose connection or faulty hose, the insurance company may refuse to cover the damages.

While it has been said that the flow sensor will not operate on fuel injected petrol engines and diesel engines, this could well be possible. Zemco have an adaptor available for electronic fuel injected vehicles which reads the electronic pulse to the injector solenoid, and this should marry in with the EA computer. If the system is mechanical, eg Volvo, there is an adaptor but this is suitable for the four cylinder only. With the increased fuel flow of the six cylinder there are problems with fuel vapourisation. The Saab has a similar system but as the fuel pump is within the fuel tank it creates difficulties.

On diesel engines it should be possible to place the flow sensor in the fuel line, but it must be fitted to the suction (low pressure) side of the pump (the same applies to petrol injection). Pressure on the delivery side is excessive and there is the possibility of hoses bursting. One problem to be overcome is the injector spill return. On some vehicles this spill is fed back to the pump or filter, and so it is a simple matter to carry out the installation. However, on many vehicles the spill is returned to the tank, which means re-routing the line back into the suction side of the pump with a T-piece, and locating the sensor between the T-piece and the fuel tank. This system will work providing there is no vapour in the spill. If there is this may cause vapourisation problems. It is our belief that there is little or no vapour in diesel systems, but this is not the case with petrol-injected engines.

In relation to the speed sensor magnets, the fore and aft movement of the drive shaft as the rear axle moves up and down is only slight, and it is not necessary to mount two magnets side by side. If at all possible we recommend that the sensor bracket be attached to a bolt on the back of the gearbox, and (if there is sufficient space) the magnets be secured to the gearbox output coupling (but not on the larger diameter universal joint flange). If the bracket is attached to the floor pan, there could be sufficient flexibility in the rear engine mountings to allow the drive shaft to move sideways when a large pot hole is encountered. If the magnets strike the sensor damage could occur.

As mentioned in the text, whenever possible connect the power supply to the fusebox. If other sources are tapped, eg the horn wire, the voltage drop occurring when the horn is used can be sufficient to lose the memories.

The motor vehicle is a rather unfriendly environment for anything electronic, and one problem sometimes encountered is interference from an electrical source within the vehicle. While this is rare, when it does happen it can take some time to track down. Possible sources of EMI are: primary and secondary ignition wiring (solid core spark plug leads in particular); ignition components (coil, distributor, spark plugs); electronic ignition; alternator; tachometer and digital clock wiring; radio, and two-way radio wiring; compressors for air horns or pneumatic shock absorbers. Similar problems can also be caused by EMI sources outside the vehicle, such as radio frequency interference (RFI) and high voltage power lines. There may be a possibility of memory loss if a booster battery is used to start the vehicle or if high voltage tune up equipment is attached to the vehicle.

While problems may be caused by faulty connections do not overlook the possibility of a suspect sensor if there are no distance or fuel readings.

One last observation. When the computer is installed in the vehicle, do not devote too much time to pushing buttons or reading the display. Years ago the vacuum gauge was referred to as the "panel beater's friend" due to the fact that the driver paid too much attention to the gauge and too little to the road. The car computer can be a similar hazard during the first few days of operation, so take care!

Brian Willis,
Antelope Automotive Pty Ltd,
Neutal Bay, NSW.

Standards for computer shielding

I was interested to see an article in the August 1982 issue on the shielding of a System-80 personal computer to prevent interference to local TV reception.

The problem described is a very real one and one which the Association's committee on electromagnetic interference takes seriously enough to prepare an Australian standard which will be circulated for comment shortly. The approach taken by your reader and described in this article is alright as far as it goes but is not guaranteed to fix the problem in all cases.

He has certainly identified the simplest remedy for the simplest equipment but the approach is strictly limited, dealing only with one type of interference from the basic computer unit. The method he has used, the application of metallic shielding will be reasonably effective in limiting radiated interference even though the continuity of the shielding is suspect. The electrical safety of the procedure described is not something the experts like to think about either. Contact adhesive in a heated atmosphere is not noted for its ability to retain its bond-strength so the foil is likely to come adrift with possibly disastrous consequences to computer or operator even where the adhesive is compatible with the plastic enclosures.

The interference problem has been only partly dealt with. It has been found that the greatest source of radiated interference from a computer system is the cables used to connect the various devices which are interconnected. Shielding only the computer unit is therefore just a start. Of course, conducted interference is also a problem. Individual devices meeting the requirements of the various regulations already in force overseas have been found to radiate at high levels due to interference reaching them through the cables.

Shielding is something which can give some protection where radiated interference is the problem but it does nothing for conducted interference. To be sure of a good result the shielding must be continuous, well bonded to earth and isolated from the mains or other cables by suitable filters.

Apart from shielding the various devices and their connecting cables there are other simple options available such as only operating the computer at a distance from the TV receiver or shielding the room in which the computer is operated with aluminium insulation or fly-wire, in the direction between the computer and the TV receiver.

The problem can really only be contained, however, if attention is paid at the designs tage of the computer, to limiting the generation of RF radiation and spurious signal voltages at the terminals. Shielding, filtering and isolation can then be regarded as additidonal treatment which may be necessary for various combinations of equipment not envisaged by the designer or not available at the time of testing. It is problems such as these that make the application of a standard on the subject rather difficult. Regulations on the subject would seem to be essential.

R. K. Profitt,
Standards Association of Australia.

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EA March 81

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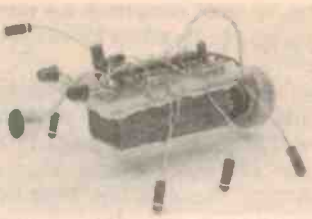

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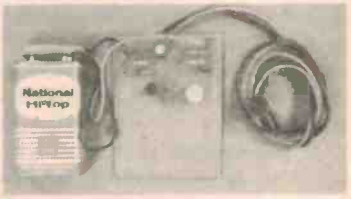

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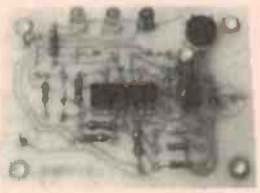

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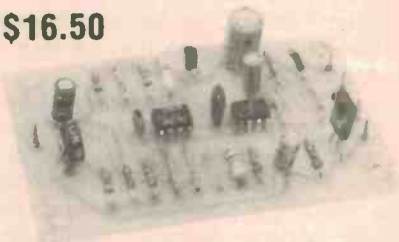

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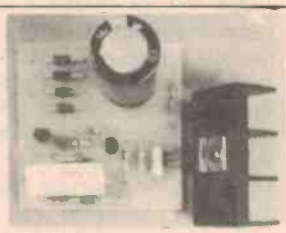

Here's an easy to assemble project for a simple speed regulator for miniature DC electric drills. ETI July 81

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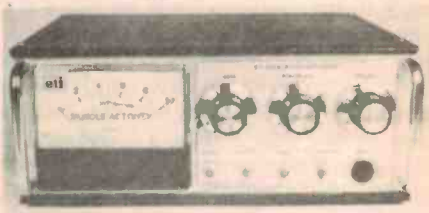

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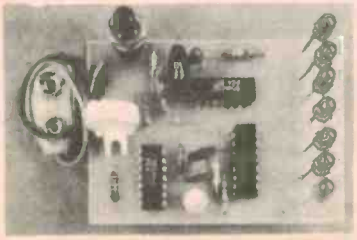

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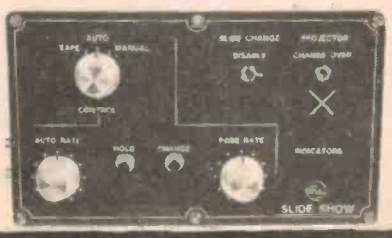


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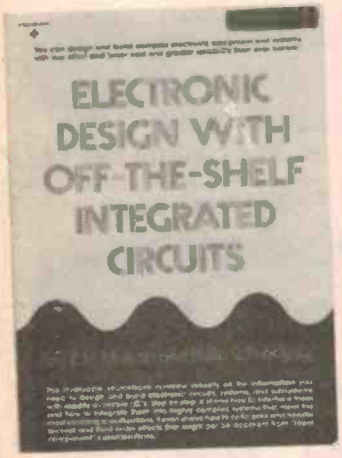
Electronic design with ICs



ELECTRONICS DESIGN WITH OFF-THE-SHELF INTEGRATED CIRCUITS by Z. H. Meiksin & P. C. Thackray. Published 1980 by Parker Publishing Company, New York. Soft covers, 383 pages, 246 x 175mm. Illustrated with many circuit diagrams. ISBN 0 13 250274 7. Price $10.75.

This is primarily a practical text which gives the broad principles of operation of a large number of circuit configurations without resorting to heavy mathematics or electronic circuit theory. It is ideal for the hobbyist, being very easy to read and well laid out. As such it will also be useful to many engineers who find their grasp of theory has become rusty.

Chapter one is devoted to op amps and covers all the major parameters such as common-mode rejection, gain-bandwidth product, slew rate, phase compensation and supply rejection ratio. Transconductance amplifiers are also covered as are the basic voltage amplifier configurations.

Chapter two covers passive components and features selection of resistors, capacitors, inductors and the various types of transformer for power supply, audio coupling, IF and RF and pulse applications. Chapter three discusses low noise design and talks in fair detail about the two main sources of noise, passive, ie, resistors and active, ie, op amp input devices.

Chapter four is devoted to oscillators: free-running multivibrators, sine wave oscillators (Wien bridge), triangle wave generators, quartz crystals and free-running oscillators using TTL, ECL and CMOS devices.

Chapter five has the broad heading of linear applications and covers integrators, differentiators, bridge amplifiers, voltage followers and four quadant multipliers. Chapter six covers precision rectifiers, peak detectors, sample-and-hold circuits and comparators.

Chapter seven covers filter design up to fourth order plus high-Q bandpass filters. Chapter eight is devoted to basic logic circuitry and discusses the various types of gates, latches and flipflops. It also distinguishes between the three broad logic technologies: TTL, ECL and CMOS.

Chapter nine is entitled Digital Building Blocks and discusses adders, comparators, parity generators and checkers, shift registers and counters. Chapter ten covers analog-to-digital conversion and discusses successive approximation and parallel conversion. Chapter 11 is headed Grounding and Shielding and covers the subject of ground loops, stray fields, unwanted signal coupling and so on. Finally, chapter 12 is headed System Design.

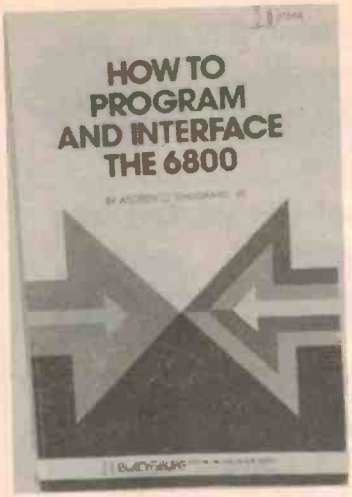
At the price of $10.75 it really is a bargain. Our review copy came from Technical Book and Magazine Co Pty Ltd, Melbourne. (L.D.S.)

Super-80 programs

DICK SMITH'S FIRST BOOK OF SUPER-80 PROGRAMS. Compiled by L. Ramsay. Published 1982 by Dick Smith Electronics, Sydney. Soft covers, 207 x 293mm, 34 pages. ISBN 0 949772 08 9. Price $4.95.

This book is a compilation of 16 Basic programs written or modified by owners of Super-80 computers. The listings are copies of printouts from various printers, from dot matrix to spinwriters, so the legibility is variable. The book represents a useful addition to the growing software base for the Super-80.

MC6800 applications



HOW TO PROGRAM AND INTERFACE THE 6800: Andrew C. Staugaard, Jr. Soft Covers, 414 pages, 137 x 216mm. Published by Howard W. Sams and Co Inc, ISBN 0 672 21684 1. $21.50

Many books have been written about the Motorola 6800 Microprocessor, however, this book is one of the few which encourages "hands on" experience with either the Heath ET3400 or Motorola MEK6800 D2 Evaluation Kits.

There are nine chapters in all and four appendices. The first chapters discuss the fundamental microprocessor concepts, the evaluation kits and then begins with programming. The author leads the reader through the various types of addressing modes and all the instruction types available with the 6800. In each chapter the objectives are listed, experiments carried out with the evaluation kits and questions.

Apart from the programming considerations, hardware interfacing using the 6821 Peripheral Interface Adapter is discussed. Not only is the operation of the PIA dealt with in great detail, but examples of using the PIA to control a switch matrix and LED display are shown. A complete chapter is devoted to memory system for the processor.

The entire instruction set of the 6800 is given in the Appendix. This is the complete version and not abbreviated. Revision on logic gates and number systems is provided in further appendices. The final appendix gives a complete copy of data for the 6800, 6821 and some memories. Data is also given for some D-A and A-D converters.

The book can be used as a complete teaching aid for the beginner, when learning microprocessor systems and will also be useful as a reference for the experienced user of 6800 microprocessors.

Our review copy came from McGills Authorised Newsagency, 187 Elizabeth Street, Melbourne, Vic 3000. (JC).

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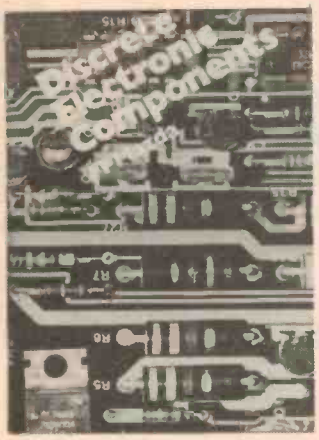
SEE PAGE 98 FOR ADDRESS DETAILS

DSE/A170M/JW

Discrete components — comprehensive text



DISCRETE ELECTRONIC COMPONENTS, BY F. F. Mazda. Cambridge University Press 1981. Hard covers, 262 x 182mm, 177 pages, illustrated with many diagrams. ISBN 0 521 23470 0. Price UK £18.

In these times of galloping progress in LSI technology, a book on discrete components is rare indeed and most useful. This text covers the whole gamut of discrete components from active semiconductor devices such as transistors and thrysistors, optoelectronic devices, passive linear components such as resistors and capacitors, magnetic components and even batteries.

In a slim text of only 177 pages one cannot expect detailed coverage of all the components featured but the author is to be commended in the succint coverage given. In each component type covered, the principles of operation and range of parameters is given but few details of manufacture are described.

Chapter headings are as follows: Discrete Semiconductors, Optoelectronic components, Resistors, Capacitors, Magnetic Components (includes relays and Hall effect devices), Peripheral components (switches and keyboard, fuses, heatsinks and connectors), Quartz, Ceramic, Glass & Selenium, Power Sources (includes fuel cells and solar cells).

In short, a good reference for any engineer's bookshelf. Our review copy came direct from the publisher. (L.D.S.)

New Zealand callsigns

NZART CALL BOOK '82. Published 1982 by the New Zealand Association of Radio Transmitters, Inc. Soft covers, 184 pages, 185 x 245mm.

As well as New Zealand amateur radio callsigns, this book includes information on marine radio services, radio and TV services and a 76-page catalog insert from Tricity House, Christchurch. Our copy came direict from the NZART.

Data manuals on Japanese semiconductors

Data Manuals with information on Japanese semiconductor devices have never been readily available. However, a range of manuals is now available from Imark Pty Ltd, 167 Roden Street, West Melbourne, 3003. Brief details of the various 1982 manuals are as follows:

"The Transistor Manual" lists all 2SA, 2SB, 2SC and 2SD devices including maximum characteristics, typical characteristics, typical uses, package configuration, and complementary device if applicable. (319 pages)

"The Transistor Substitution Manual" lists equivalent Japanese transistors by Makers for 2SA, 2SB, 2SC and 2SD transistors. Whether the transistor is discontinued, principally for renewal purposes only, available only by custom order, or if the manufacture is suspended is explained. (238 pages)

"The Diode Manual" provides specifications and package details for Japanese diodes. (439 pages)

"The FET Manual" details specifications and package details for Japanese FETs (2SK, 3SK and others). Performance charts and typical circuit configurations are often provided. (302 pages)

"The OP Amp Manual" (Parts 1 and 2) provides detailed specifications and package information for (Part 1) Analog Devices, Ancom, Burr Brown, Intech, Function Modules, Teledyne Philbrick, Zeltex, Hitachi, Matsushita, Mitsubishi, NEC, JRC, CR Box, Toshiba; (Part 2) Advanced Micro Devices, Analog Systems, Fairchild, Harris Semiconductor, Intersil, Motorola, National Semiconductor, Philips, Precision Monolithics, Raytheon, RCS, SGS Ates, Siemens, Signetics, Siliconix and Texas Instrument devices. (Part 1 – 303 pages, Part 2 – 399 pages)

"The Linear IC Manual" provides technical specifications, and package details of Japanese manufactured Linear Integrated Circuits. Typical or suggested circuit designs are usually included with the details for each particular IC (359 pages).

"The TTL IC Manual" provides technical specifications, package details, and lists world-wide manufacturers of the particular device. The manual includes details for 7400 series/74SL series/74S series. (332 pages).

"The C-Mos IC Manual" provides technical specifications, package details, world-wide manufacturers for 4000B series, 4500 series, TC5000BP series, TC5000P series, MSM500 series, and TC40H000P series devices. Truth and timing tables are often included. (367 pages)

"The Memory IC Manual" provides technical and package details, has tables of similar devices with their particular specifications and lists most major world-wide manufacturers devices including Japanese devices. Devices covered include Static RAMs, Clocked RAMs, Dynamic RAMs, UV-EPROMs, and EAROMS. (405 pages)

While each individual manual would provide a wealth of information for technicians, engineers, etc the complete set would provide an almost complete library of information on Japanese Semiconductor devices.

Each manual is priced at $9.95 (plus $1.50 post/pack) and the complete set of 10 manuals is $89.50 (plus $5.00 post/pack).

Teach yourself microcomputer programming

PASCAL PROGRAMMING FOR THE APPLE by T. G. Lewis. Published 1981 by Reston Publishing Co, Virginia, USA. Soft covers, 234 pages, 152 x 228mm. Illustrated with programming examples. ISBN 0 8359 5454 4. Price $13.50.

Our copy came from McGills Newsagency, Melbourne.

TRS-80 COLOR BASIC by Bob Albrecht. Published 1982 by John Wiley & Sons, Inc, New York. Soft covers, 378 pages, 172 x 253mm. Illustrated with program exercises. ISBN 0 471 09644 X. Price $13.95.

This book is written in the same lighthearted vein as the TRS-80 Color Computer manuals. It is easy to read and should be useful to TRS-80 owners. Our copy came from McGills Authorised Newsagency.

ASSEMBLY LANGUAGE PROGRAMMING FOR THE APPLE II by Robert Mottola. Published 1982 by Osborne/McGraw-Hill California, USA. Soft covers, 143 pages, 165 x 235mm. ISBN 0 931988 51 9 Price $18.15.

This book assumes that the reader has access to one of the assemblers sold for the Apple II, and a 48K Apple II with a disk drive and a printer, Applesoft in ROM or the Language Card.

Starting with a brief introduction to hexadecimal, the book covers the entry and editing of code, use of a assembler and elementary 6502 programming. Relocatable code and addressing modes are covered briefly, and there are separate chapters on debugging and use of the stack.

Our review copy came from McGills Authorised Newsagency, 187-193 Elizabeth St, Melbourne.

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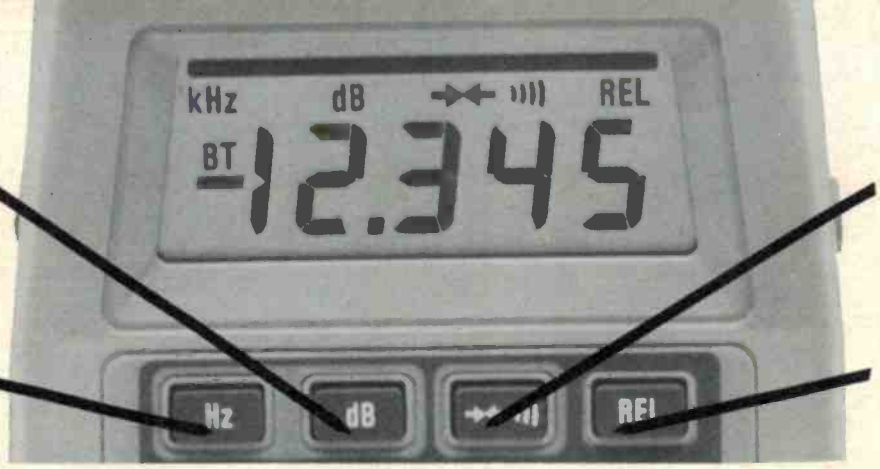

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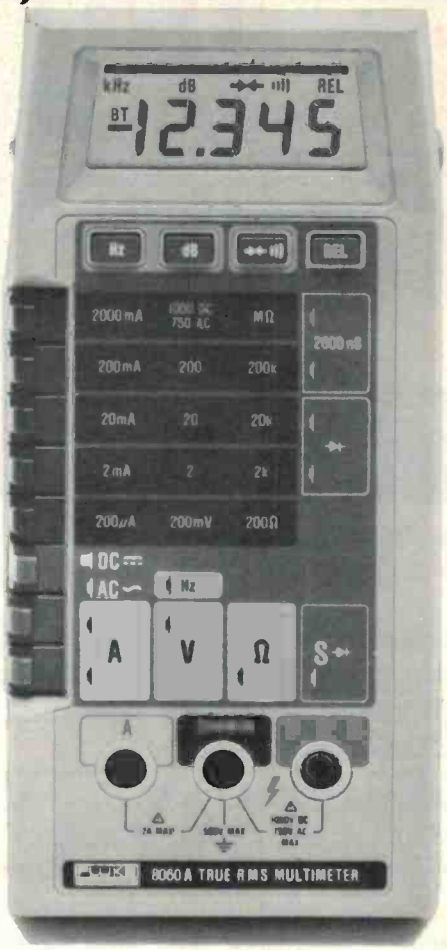

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8021B	•	•	•	•	•	•		•				0.25%	$185
8020B	•	•	•	•	•	•	•	•				0.1%	$234
8024B	•	•	•	•	•	•	•	•	•	•	•	0.1%	$296

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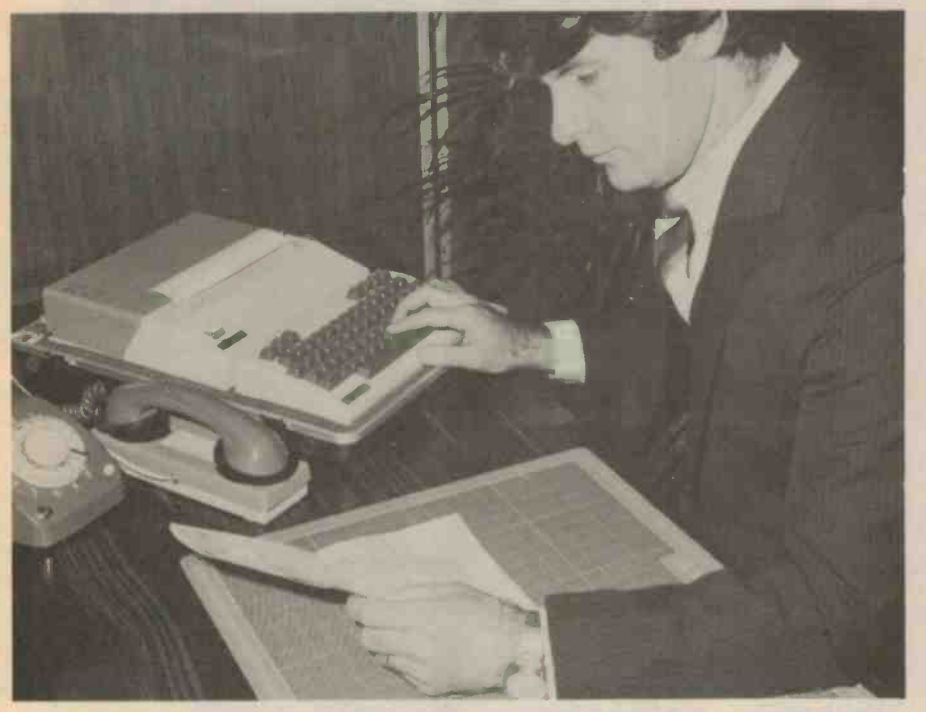
New Products...

Product reviews, releases & services

Quiet printer connects to telephone lines

Teleprinters are not widely used for communication, although the basic design has not changed for many years. They can be slow, noisy and difficult to use. 3M Australia, however, has recently introduced a new design which overcomes these problems.



3M Australia has introduced a desktop teleprinter which will "revolutionise office communications and encourage executives to use a keyboard and a computer", according to the company.

3M's "Whisperwriter" teleprinter has a 4000 character memory and can communicate at 300 baud with computers, word processors, and other teleprinter units over the public telephone lines. It uses a quiet thermal printer with a built-in modem, coupled to a keyboard unit which can store and forward send messages.

According to Mr David Judge, 3M National Sales and Marketing Manager for Business Communications, the "Whisperwriter will accelerate the trend to a paperless office, and overcome the reluctance of executives to use a computer.

"About 70% of middle/upper management are aged 40 years or more and have never used a typewriter and fear the computer. Because the 'Whisperwriter' has a full editing facility, a message can be prepared and corrected before sending. Executives themselves will become used to working with computers instead of leaving the task of obtaining information to the computer operators."

The Whisperwriter is available in a receive-only version, without keyboard, or as a transmit/receive unit. An external acoustic coupler is also available for use where direct connection to the telephone lines is not feasible.

For further information contact 3M Australia, PO Box 99, Pymble, NSW, 2073. Phone (02) 498 0033.

Dual concentric attenuators

Vicom International, Australian representatives of JFW Industries of the United States have announced the release of two models of dual concentric attenuators, the 50DR-003 and 75DR-003.

Available with either 50 or 75 ohm impedance, the attenuators cover a frequency range of DC-1000MHz and an attenuation range of 0-50dB in 1dB steps. Accuracy is said to be better than 0.5dB up to 500MHz and power rating is 1W average or up to 1000W peak. Units are available with BNC, TNC, N, SMA and F type connectors.

For detailed information contact Vicom Australia International Pty Ltd PO Box 366, South Melbourne, Vic 3205, or branches in NSW Phone (02) 436 2766 and New Zealand 697 625.

Measuring and control by Elmeasco

Elmeasco Instruments now has available a new 4½-digit panel meter display, the Datel Intersil DM4104, that accepts either parallel or multiplexed BCD data. The data are displayed on 7.6mm high LED seven segment displays.

The BCD (Binary Coded Decimal) data is latched on board the panel meter, and inputs can be taken directly from four, eight, 12 and 16 bit parallel data buses. A display blanking pin is also provided so that the display can be made to flash, to indicate an alarm condition, for example.

Also from Elmeasco is a new multi-function analog-to-digital and digital-to-analog convertor board for the Motorola Exorciser bus systems and Rockwell's System 65.

The SineTrac ST-6832 board interfaces both analog input and output signals to the computer system, and plugs into any slot in Exorciser bus systems. The board accepts up to 32 single-ended analog input channels or 16 differential inputs. Particular analog inputs are selected and digitised under program control. Two D/A channels can also be provided.

Analog input ranges can be selected by installing wire links on the board. Ranges available are 0 to +5V, 0 to +10V, ±5V and ±10V, and the board can also use 4-20mA current loop signals. A/D conversion time is eight microseconds.

A new Basic software package for the Fluke 1720A instrument controller is also available from Elmeasco Instruments. The new software updates existing controllers, providing features such as increased floppy disk storage capacity (up

from 175K to 200K bytes), a Help file, and lower case command inputs.

The Basic also provides easier setting up of RS-232C and IEEE-488 interface ports and enhanced interrupt handling. Several new software packages are in Fortran are also available. Users of the 1720A instrument controllers should contact their nearest Elmeasco office for details.

For further information on any of these products contact the Elmeasco Instruments office in your state, or the head office, PO Box 30 Concord, NSW 2137. Phone (02) 736 2888.

New range of Motorola optocouplers

Motorola has introduced a range of slotted optocoupler/interrupter devices that are drop-in replacements for the popular GEH21 and H22 series. These devices consist of a gallium arsenide infrared emitting diode facing a silicon NPN phototransistor, encapsulated in a moulded plastic housing. A slot in the housing between the emitter and the detector provides a means of interrupting the optically coupled signal by means of an externally introduced opaque material such as a card, tape, or disk.

The slotted optocouplers are widely used in video games, copy machines, keyboards, card readers, garage door openers, tape drives and floppy and hard disk drives. Other applications include position and motion indicators, digital pressure sensors, scales, industrial machine controls, limit switches, etc.

While the standard slotted optocoupler package being introduced is equivalent to the GE package, Motorola's custom moulding capability allows encapsulation of the various optocoupler components in a wide variety of customer configurations.

The newly-introduced slotted couplers are the first of a large projected family of standard units, and use the new MLED71 IRED and MRD701 phototransistor detector. The family will include devices using PIN diodes, Darlington and resistor-Darlington detectors, to be followed by more complex output functions.

The MLED71 infrared-emitting diode is manufactured with gallium arsenide. It provides a continuous power output of 2.5mW, at a forward current of 50mA. The pair of devices provides a transistor output of approximately 10mA for a diode current of 50mA, with a separation of 4.0mm.

Accessories for HP calculators

Hewlett-Packard has added three new peripheral products to its range of Hewlett-Packard Interface Loop (HP-IL) systems, used with HP calculators, computers and test instruments.

Included in the new release is the 82905B printer, an 80 character-per second dot matrix unit which can produce high quality text and dot graphics. The printer can be used with HP scientific calculators such as the HP-41 and the Series 80 personal computers equipped with interface loop capabilities.

Also available is the 82163B Video Interface which plugs into a television set or video monitor and adds video display capability to HP-IL systems. Display format is 16 lines of 32 characters each. The video display interface can be used with the HP-41 calculator, for class-room demonstrations and business presentations.

The HP 82165A general purpose input/output interface (GPIO) links devices with parallel ports to the HP-IL system. The GPIO is said to be particularly suited for connecting low-cost portable systems to mainframe computers that have parallel ports. A HP-41 can be used, for example, as a portable data entry terminal, linked to a large computer.

Further information on these and other new HP products is available from Hewlett-Packard Australia Ltd, 31-41 Joseph St, Blackburn, Vic 3130. Phone (03) 89 6351.

Antenna designs and equipment

A new series of active high frequency multicouplers (antenna combiners) has been released by Antenna Engineering Australia Pty Ltd. The RMC series can be supplied in a variety of configurations offering either one antenna input with up to 16 outputs or two antenna inputs each with up to eight outlets, allowing several receivers to use the same antenna.

An in-built broadband amplifier covers from 0.3MHz to 30MHz and an optional highpass filter is available to give 30dB attenuation below 1.6MHz of nearby medium frequency broadcasting stations.

Also from Antenna Engineering is the Model 4131 "Sloping Triangle" antenna, a broadband directional antenna designed for long range transmission or reception. The antenna is made up of two sloping wires 80 metres long in a "V" shape with the apex supported by a 15 metre mast and the wires resistively terminated at the centre of the base of the triangle, near ground level.

The antenna is fed via a balun transformer at the mast head.

Frequency range of the antenna is 5-30MHz without adjustment. The signal is horizontally polarised, and power gain varies from 0 at 4MHz to 10dBi (dB isotropic) at 22MHz.

For more information on the RMC antenna coupler or the new antenna design contact Antenna Engineering Australia Pty Ltd, PO Box 191, Croydon, Vic 3136.

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40Ch AM/SSB UNDER $250! That's the DICK SMITH HORNET II

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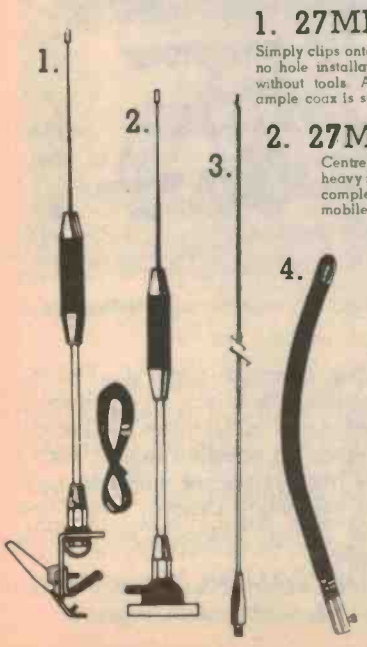

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Centre loaded stainless steel construction with heavy magnetic base. 16 feet of coax supplied, complete with PL259 plug. Ideal for 'instant' mobile use. Cat. D-4412 **$25.00**

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Your choice of stainless steel or fibreglass. Each is approx. 2.75m long, ideal for marine or CB use.
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4. 'Rubber Duck'

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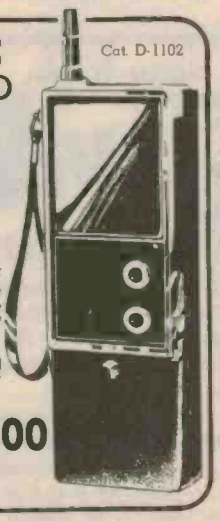
TOP VALUE HAND HELD

Cat. D-1102



For the weekend boatmen who don't want the more expensive full power transceivers, but who still need that reassurance of having a safety transceiver on board. Three channels available, one fitted with 27.620MHz, the others left blank for your own choices. Crystals are reasonably priced and easy to fit. This set takes 8 'AA' pencell batteries.

GREAT VALUE!

ONLY **$55.00**

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DICK SMITH Electronics

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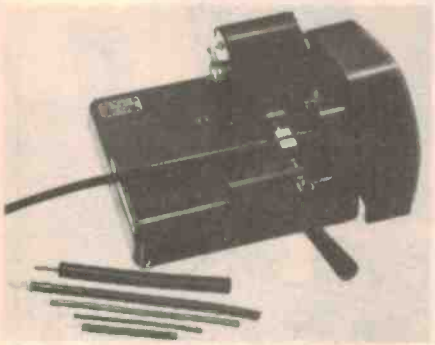
DSE/A234M/JW

New Products

Equipment for electronic assembly

The CM-1 "Cable Master", from The Eraser Company Inc, strips insulation from solid or stranded conductors with outside diameters from 10mm to 32mm. It uses a rotating blade driven by a chain from an electric motor, and can be adjusted according to thickness of the insulation.



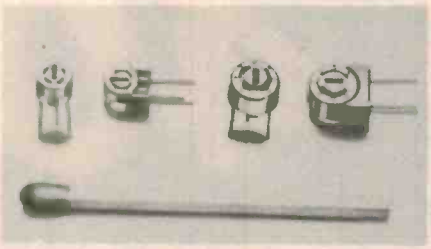
Wireguides are used to accommodate different cable sizes, and each unit is provided with one set of wireguide bushings, made to customer specifications.

The unit measures 56cm × 56cm × 23cm, and is available for use with 110VAC or 220VAC supplies.

The Eraser Company has also published a new 24-page catalogue covering their range of wire preparation and printed circuit board assembly equipment and tools. The catalogue includes details of tools and machines for cleaning component leads, pre-forming of components for automated assembly, IC insertion and PCB assembly.

For further information or a free copy of the catalogue contact The Eraser Company, PO Box 4961, Oliva Drive, Syracuse, New York, 13221.

New range of sealed trimpots



Copal Electronics Co Ltd has announced a new range of single turn sealed cermet trimpots, the RJ series. Features of the new range include small mounting space (60% of that of conventional trimmers), a wide resistance range from 10Ω to 2MΩ, setting stability of 1% against a shock of 100G, and half watt power rating.

Copal products are distributed in Australia by Mayer Krieg & Co, who also distribute a wide range of quality electrical and electronic components from manufacturers such as OKW, Preh and Hirschmann, to mention a few.

Head office is in Adelaide and the postal address is GPO Box 1803, Adelaide, SA, (08) 223 6766. In Melbourne ring (03) 579 5722 and in Sydney (02) 684 1900.

Computer program for amateur radio logs

Dick Smith Electronics has released a computer program designed for maintaining amateur radio log books. Written for the System-80 and TRS-80 Model I, Level II computers, the disk-based program provides for up to 500 individual log book entries.

Search facilities allow for entries to be retrieved by their stored sequence number or by the call sign entered. A series of reports can be produced on a printer attached to the system including detailed log listings by sequence numbers, call sign or call area.

The program diskette is supplied with a users manual, and is available from all Dick Smith stores and dealers, at $39.50.

From England; an automatic noise alarm

A British company, Cirrus Research Ltd, has announced an automatic noise alarm, the CRI 3.01. The self-contained noise alarm is a conventional illuminated sign with a built-in precision sound level meter, a comparator, and an electric switch.

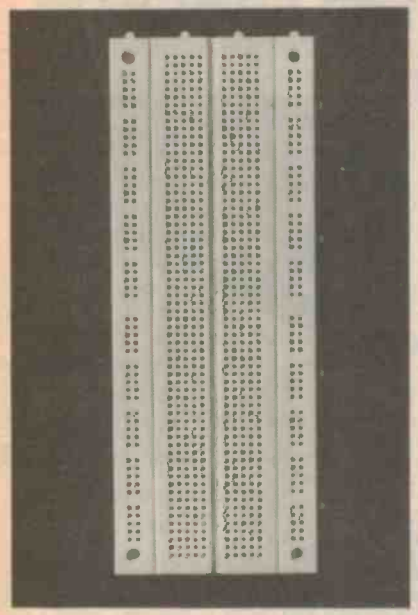
When the sound level exceeds a preset limit the comparator will trigger the switch and illuminate the high noise level warning legend.

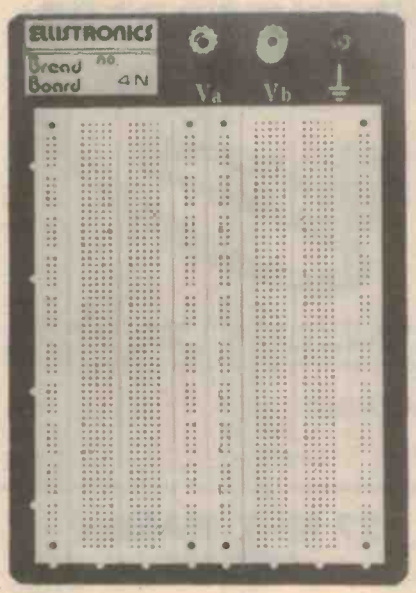
The Cirrus Research automatic noise alarm.

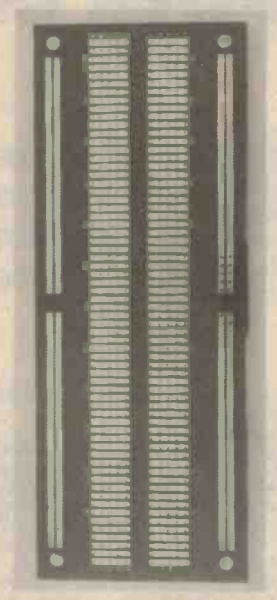
The most common application of the noise warning alarm is as an indicator of excessive noise in factories. A second use is in product noise testing, or, with a sensitive microphone or vibration pick-up, as a machinery monitor which can warn of failing bearings in rotating equipment.

For more information contact Cirrus Research ltd, Scarborough, England.

EXPERIMENTER KIT





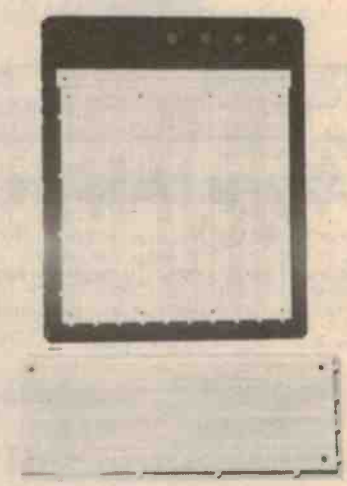


SPECIAL PRICE IN CONJUNCTION WITH ELECTRONICS AUSTRALIA COMPETITION — $11.75

ELLISTRONICS SOLDERLESS BREADBOARD

Designed around two interlocking modular units, the WBDN is a distribution strip for power etc. and contains 100 contacts grouped in clusters of five. The WBTN is the terminal strip containing 640 contacts in two separate rows of five interconnected contacts each separated by a .300" median. Contacts are made from non-corrosive nickel silver alloy and are reliable for more than 10,000 insertions. The boards accept all DIP size including RTL, TTL, DTL, CMOS and most passive devices and interconnect with 20 to 29 awg solid wire. All boards are interlocking and elements are mounted on ground plane. Ideal for H.F., High Speed, Low Noise application.

		RETAIL PRICE
WBDN	Distribution Strip	$1.80
WBTN	Terminal Strip	6.80
WB2N1	1 Distribution + 1 Terminal Strip	8.35
WB2N	2 Distribution + 1 Terminal Strip	10.30
WB2NB*	2 Distribution + 1 Terminal Strip	14.50
WB4N3*	1 Distribution + 2 Terminal Strips	17.00
WB4N1*	3 Distribution + 2 Terminal Strips	20.50
WB4N*	4 Distribution + 2 Terminal Strips	23.00
WB6N*	5 Distribution + 3 Terminal Strips	31.50
WB8N*	7 Distribution + 4 Terminal Strips	44.50
WB16N*	10 Distribution + 8 Terminal Strips	83.50
WB24N*	20 Distribution + 12 Terminal Strips	126.50
Experimenter Board	A drilled and etched circuit board to match WB2N	1.60



*WB2NB thru to WB24N are mounted on an aluminium base plate complete with non scratch rubber feet and appropriate binding posts.

Available from: **VICTORIA:** Rod Irving (03) 489 7099 Kalex (03) 458 2976 Truscott Electronics (03) 723 3860 Billco (Project Electronics) (03) 791 8655 Ballarat Electronic Services (053) 359 584 **SOUTH AUSTRALIA:** Electronic Equipment (08) 212 5999 **WESTERN AUSTRALIA:** Altronics (09) 328 1599 Atkins Carlye (09) 277 0511 **NEW SOUTH WALES:** Electronic Developments (02) 438 2500 Jaycar (02) 264 6688 Bill Edge (02) 745 3077

ALL PRICES PLUS 20% SALES TAX

New Products

Hands free pocket-size transceiver

Imark Pty Ltd has released a pocket-size FM transceiver for the 55MHz band. The transceiver is designed for "hands free" operation, with an integrated headset containing the microphone and antenna, and a voice operated transmit switch.

The transceiver switches to the transmit mode when the operator speaks into the microphone and automatically reverts to receive when the operator stops speaking.

Called the "Talkmate", the transceiver incorporates a switched volume control, an automatic squelch control, and an antenna filter. A vinyl carry case is provided while nicad batteries and a 240V adapter are optionally available.

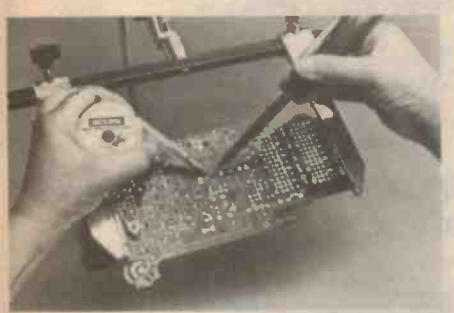
Further details are available from the importers, Imark Pty Ltd, 167 Roden St, West Melbourne, 3003. Phone (03) 329 5433.

Dispenser pack for desoldering braid

A new dispenser pack for desoldering braid which helps to avoid burnt fingertips and lets surplus braid be rewound easily has been released by Scope Labortories of Melbourne, under the name "Scope Solder Blotter". In addition to these advantages the new dispenser is said to hold 30% more braid than conventional packages.

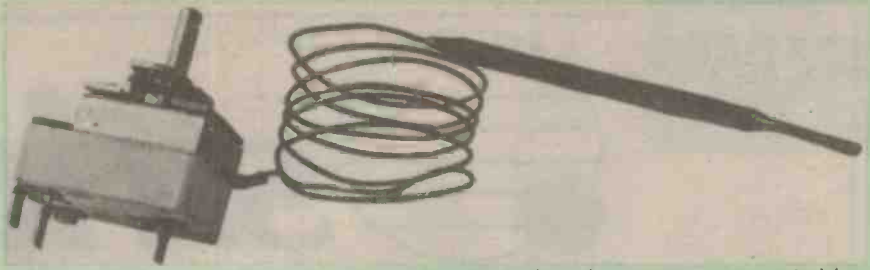
The metal tipped dispenser avoids the need to hold the flexible braid close to the working area and hot soldering iron. Both 3mm and 2mm widths of braid are available, in two metre lengths.

For further information contact Scope Laboratories, 3 Walton St, Airport West, Vic 3042.



Obviously, an idea whose time has come – not only does this pack hold more desoldering braid; it also dispenses it conveniently.

Low cost thermostat switches



Homelec Products Pty Ltd now has available a range of low-cost thermostats from Italian company CAEM. Four varieties are available, with adjustable set points in the ranges of 4-40°C, 30-110°C, 90-220°C and 50-300°C.

The units consist of a sealed sensor unit connected by copper tubing to the switch unit. Gas inside the sensor expands when heated, operating the thermostat switch at a pre-set level.

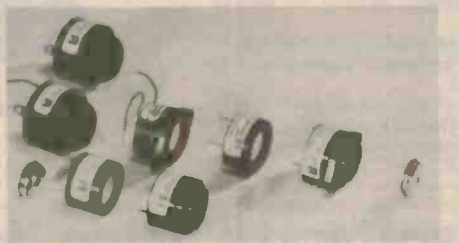
We tested a sample of the Homelec stock and found the thermostats to be quite accurate and positive in action.

Homelec thermostats are suitable for heating and air conditioning applications, cooking and laundry equipment, either installed in new appliances or as a replacement for existing controls.

Hobbyists will be interested to know that there is no minimum order quantity from Homelec. Recommended retail price is $8.66 including sales tax, with a knob and chrome bezel and extra $1.50.

For more information contact Homelec Products Pty Ltd, PO Box 1073 Victoria Rd, West Ryde, NSW 2114. Phone (02) 85 2922.

Solid-state audible alarms from C&K



C&K of Australia can supply a comprehensive range of audible alarms and indicators manufactured by Floyd Bell Associates of the United States. The devices are available in a number of mounting styles, with audio outputs ranging from continuous tones, beeps and warbles to the special-purpose high volume "Screemer".

Sound output is said to be typically 95dB (A), or 106dB (A) for the "Screemer". Operating voltages range from 5V to 35V with 110VAC and 250VAC types also available. Current consumption is from 6mA to 13mA depending on the model and operating voltage.

The audible alarms are entirely solid-state and are claimed to be completely unaffected by extremes of humidity and vibration or salt spray.

In addition to panel mounting types two varieties of piezoelectric sound transducers adapted for printed circuit board mounting are also available.

For further information contact C&K Electronics (Australia) Pty Ltd, PO Box 229, Parramatta, NSW 2150. Phone (02) 635 0799.

IRH Components has ceramic resonators

IRH Components now has available a selected range of Murata ceramic resonators, designed as a replacement of crystals in microprocessor circuits, television and radio receivers, tone diallers, and remote control circuits. Stability is between that of crystals and RC tank circuits.

Ceramic resonators can offer advantanges of size and cost saving over equivalent crystal circuits.

For information on the availability of Murata ceramic resonators contact IRH Components, PO Box 265, Kingsgrove, NSW 2208.

Arlec transformer for door chimes

Arlec Pty Ltd has introduced a multi-voltage transformer specifically designed to supply power to door bells and chimes from 240V mains.

The Arlec Bell and Chime transformer, type 60999 has a current rating of 1A and a choice of 5, 8, 12 or 16V outputs.

The transformer is totally enclosed in a flame retardant case with mains inputs protected from inadvertent contact. An in-built thermal cut-out switch protects the transformer from being damaged if a fault develops in the door chime wiring, etc.

For more information contact Arlec Pty Ltd, PO Box 170, Box Hill, Vic. 3128. Phone (03) 840 1222.

sirius 1

A third generation computer, from the designer of the 6502 Processor.

$4950 + TAX

TECHNICAL SPECIFICATIONS:

CPU:	8088, 5 MHz
Memory	128k (64k dynamic RAM chips) internally expandable to 512 kbytes; external module to expand to 1 Mbyte
Keyboard	95 keys inc. 7 prog. function keys, numeric pad, cursor control, editing, screen & loudspeaker control, all software re-definable.
Screen	80 char x 25 lines; hi-res graphics, 800 x 400 bit-mapped, user-definable character sets.
Disk drives	2 x 5¼in single-sided, high density, 600 kbytes per unit.
Ports	1 Centronics/IEEE-488 printer port, 1 RS232 printer port, 1 RS232 communications port.
System Software	CP/M-86 and MSDOS
Languages	Basic 86; Graphics & character set packages. Assembler, Fortran, Cobol, Pascal, PL-I, Extended business basic compiler, various applications software.

software price list

The Sirius comes complete with CP/MI-86, MS-DOS & M Basic

CBASIC (Digital Research)	$440	SELECT (Select)	$550
Report Manager (Image)	$330	SuperCalc (Sorcim)	$330
Time Manager (Image) (a)	$225	Pascal/M (Sorcim)	$550
Personnel Manager (Image) (a)	$225	Basic Interpreter (Microsoft)	$440
Project Manager (Image) (a)	$225	Basic Compiler Diskette	$550
Level II COBOL with Forms 2 (Microfocus)	$1125	COBOL (Microsoft)	$880
WordStar (MicroPro)	$550	Multiplan (Microsoft)	$330
WordStar with MailMerge (MicroPro)	$775	Pascal (Microsoft)	$660
WordStar with SpellStar (MicroPro)	$880	Fortran (Microsoft)	$550
WordStar with MailMerge and SpellStar (MicroPro)	$1125	Real Estate Package (Sample printout available)	$1500
SuperSort (MicroPro)	$280	Medical Package (Sample printout available)	$1500
WordMaster (MicroPro)	$175	Debtors & Creditors	$1500
		Stock Control Package	$2000

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425 HIGH STREET, NORTHCOTE 3070. MELBOURNE. (03) 489-8131.

TO ORDER: Heavy items sent Comet Freight on Mail Order Phone 481-1436. Wholesale Customers Phone: 489-7099. Mail Orders to RITRONICS WHOLESALE, P.O. Box 235, Northcote 3070. Minimum P&P $2. Add extra for heavy items, registration and certified mail. Prices and specifications subject to change without notice.

Turn to Page 56 for some great new Printers

Shortwave Scene

by Arthur Cushen, MBE

Voice of America to challenge Radio Moscow

A recent announcement by the United States Government indicates that President Reagan has plans to upgrade the Voice of America to meet Radio Moscow influence world wide, and will spend up to $US300 million on new sites and refurbishing present transmitters.

Approval is currently awaited for the establishment of a completely new relay base near Puttalam, Sri Lanka. Plans include the installation of four 500kW transmitters to increase coverage of the USSR and China and antenna systems to enable the area from East Africa to the Philippines to be covered. Work is continuing on the installation of two additional 250kW transmitters at the Tinang relay station in the Philippines, and four more 250kW transmitters were installed for the VOA by the BBC at its Woofferton station in Britain. Plans are under way for four shortwave transmitters in Botswana to increase the output from the present medium-wave transmitter.

The Voice of America is also requesting $11 million to build medium-wave relay stations on Grand Cayman, Grand Turk and a permanent station in Antigua, for coverage of the Caribbean. Further expansion includes 10 500kW and three 250kW transmitters for the relay base at Tangier, Morocco while the Munich relay base in West Germany would get a further eight 500kW transmitters. President Reagan has also recently authorised the Voice of America to operate on some out of band frequencies in order to overcome interference with the broadcasts.

The Voice of America operates 24 hours each day in English with the service to the South Pacific at 2200-2400UTC on 17740 and 26000kHz, and from 1100UTC onwards on 9565, 15160 and 15425kHz.

NEW FREQUENCIES

INDIA: A new transmitting station has been heard on 5050kHz with the opening of AIR Aizawal which operates from 1130-1630UTC, according to "Down Under DX Survey".

The new transmitter site is near the Burmese border and all broadcasts are in the dialects of that region.

INDONESIA: 5055kHz is a new frequency for RRI Nabire which uses 1kW, broadcasting from 0915-1400. The old 500W transmitter is now on 6126kHz and should be heard in their last transmission at 0700-0915UTC according to David Foster of Burwood, Victoria.

RRI Surakarta is now on 4900kHz at 1100-1700UTC and this frequency replaces 4932, but not on a regular basis. Our reception has been at 1300UTC when news is relayed from Jakarta.

NORWAY: Oslo has been observed on the new channel of 17710kHz at 1100-1230UTC but suffering considerable interference from Radio Moscow World Service. For this transmission Radio Norway is scheduled to use 6015, 21730, 25730 and 25615kHz and English is broadcast on Sunday 1200-1230UTC.

SWEDEN: Radio Sweden is using 21615kHz at 1100-1130UTC for the English Service to Australia. This frequency replaced 17825kHz which was used for the period July-September. Radio Sweden also has English at 0230-0300UTC on 9695 and 11705kHz.

USSR: Radio Moscow has re-introduced Russian language lessons into the World Service. The frequency of 9600kHz has been heard with the World Service at 0400UTC, but suffers severe interference from BBC World Service on the same channel.

BBC WAVEGUIDE

Since the BBC World Service ended World Radio Club some months ago, the 15 minute program has been replaced by a five minute feature called "Waveguide". This has covered reception of BBC broadcasts and has also given replies to questions about listening to London. This program has now been extended to 10 minutes and is broadcast on Monday 0915UTC, Tuesday 0100, Wednesday 0430 and 1735UTC. Listeners in Australia should find the Monday transmission at 0915 on 11750, 15070, 21550 and 25650kHz giving the best reception. As well as giving the latest frequency information concerning BBC broadcasts the program is able to look at various aspects of world-wide broadcasting.

Another BBC program which covers the subject of reception to some degree is "Letterbox", compered by Margaret Howard. Often questions from listeners to this session are of interest to the shortwave listener. The program is broadcast on Sundays at 0515 and 2015 for reception in this area.

BROADCASTS FROM ATHENS

Listeners to Greek Radio either in Greek or English will have noted some frequency changes in the three daily transmissions to this area. The broadcast 0900-0950UTC which includes English at 0940UTC has moved to 9865 and 15050kHz, while the transmissions for our morning reception 2100-2150UTC is on 9865, 11645 and 15050kHz, and 2200-2250UTC on 15050kHz. The power of all the transmitters is 100kW except for that on 11645kHz.

Relays of the Greek Home Program are also carried on shortwave over a 35kW transmitter at 0600-0830UTC on 9815 and 9855kHz on Sunday only, 1000-1730UTC on the same frequencies each day, and 1800-2215UTC on 15020 and 15035kHz. All these transmissions are in Greek. These times are for broadcasts from October to March, which during the remainder of the year are heard one hour earlier.

LATIN AMERICAN NEWS

COSTA RICA: Radio Reloj has returned to 6006kHz with the other shortwave outlet on 4832kHz. The stations operate around the clock and have frequent time announcements indicated by the slogan Radio Reloj. A verification card from the station lists the frequencies as well as 700kHz medium-wave, also heard here

DICK SMITH PRESENTS

THE NEW YAESU FT102

Cat. D-2880

FT102 HF TRANSCEIVER

The new super high performance HF Transceiver is now here! It's got all the amateur bands PLUS the new WARC bands. Special Hi voltage JFET RF Amplifier provides exceptional dynamic range – well beyond 100dB. New adjustable noise blanker even works on the woodpecker.

FC102 ANTENNA TUNER

This is the big one – All newly designed Antenna Tuner for the FT102. Band switched L-C PI – network will match a wide variety of antennas including a single wire. It features an inline watt meter with 3 ranges, a 'peak hold' system, SWR metering and best of all will handle 1.2KW, that means you can use it with the FL 2100Z.
Cat. D-2881

ONLY $319

CHECK NEAREST STORE FOR AVAILABILITY

SP102 Speaker/ Audio Filter

The SP102 features a large (120mm) HiFi speaker with selectable low & hi-cut audio filters allowing twelve possible response curves. Cat. D-2883

$72.50

SPECIFICATIONS: ● TRANSMITTER POWER INPUT: SSB & CW 240W DC AM* 80W DC FM* 160W DC ● CARRIER SUPPRESSION: better than – 40dB ● SIDE BAND SUPPRESSION: better than – 60dB ● SPURIOUS RADIATION: better than–40dB ● IF REJECTION: better than 70dB ● AF OUTPUT: 1.5W minimum (8 ohms) ● AF IMPEDANCE: 4–16 ohms ● SELECTIVITY: SSB, CW, AM 2.7kHz – 6dB, 4.8kHz–60dB ● WIDTH ADJUSTMENTS CONTINUOUSLY FROM 2.7kHz to 500Hz (-6dB) ● IF NOTCH DEPTH: better than 40dB ● SENSITIVITY: (RF Amp on) – SSB better than .25uV – CW better than .18uV ● AM better than 1uV – FM* better than .4uV – CW (APF ON) better than .05uV – SSB (Option Filter) better than .2uV – CW (option filter) better than .12uV

AM/FM PCB

Allows your 102 to operate AM and FM mode – great for 10 meter FM, Oscar or transverter to 6, 2 or 70cm. Cat. D-2882

$72.50

ALL THIS FOR ONLY $1225

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CHECK THESE ACCESSORIES FOR THE FT 290R

ALINCO ELH230 LINEAR AMP
High efficiency Linear Amplifier for 2 meters. 30 watts output – 13.8V supply make it perfect for mobile use. Cat. D-2546 **$89.50**

2 METRE ⅝ WHIP
Super strong Mobile Antenna. 1.3 m long fibreglass for mobile use. Cat. D-4205 **$15.50**

YAESU CSC1A CARRYING CASE
Protect your FT 290R with this smart black case. Cat. D-2910 **NEW $7.50**

YAESU MMB–11 MOBILE MOUNTING BRACKET
Mount your FT 290 in your car. Cat D-2911 **NEW $39.50**

YAESU YHA15 FLEXI ANTENNA
Replace your rigid FT 290 antenna with the Flexi Helical Antenna. Cat D-2912 **$9.50 NEW**

NO PRICE INCREASE!

FT 290R $349 Our most Popular 2 Metre

The brilliant Yaesu FT-290R. For the person who can't quite make up their minds whether they want a portable or a mobile set. This one is both! And whats more, it's fully microprocessor controlled, offering up to 10 memory channels, scanning, LCD display, high or low power operation, and all modes. All this in a transceiver which can be operated both portable (from internal batteries & whip antenna) or mobile (ext. antenna & power sockets fitted) Cat. D-2885

DICK SMITH ELECTRONICS
INC IN NSW

SEE PAGE 98 FOR ADDRESS DETAILS

DSE/A381/JW

in southern New Zealand. The transmissions on shortwave are received around 0800UTC and according to the verification card the address is PO Box 341, San Jose, Costa Rica 1000.

NO LIBERTY CONFIRMATION

During April and the Falkland Islands crisis Radio Liberty was widely reported by listeners in Australia and New Zealand with its broadcasts to the forces in the South Atlantic. This Argentine-based station used Miss Liberty to try and persuade the British forces to return home in a propaganda broadcast similar to Tokyo Rose of Japan during World War II.

In a handwritten letter from Radio Argentine Exterior a station official said that they were not Radio Liberty and had nothing to do with it. They advised details of the present schedule of RAE including a booklet on Argentina, a cassette of Argentine folk music and the latest schedule. Broadcasts in English are at 1100-1130, 1930-2000, 2230-2300, 0100-0130 and 0430-0500UTC. Frequencies are given as 6060, 6180, 9690 and 11710kHz.

The frequency of 15345kHz is also listed in operation from 1530-1800UTC. The station verifies with a card showing a map of the Malvinas Islands and has the address Radio Argentine Exterior, CC 555 Correo Central, 1000 Buenos Aires, REPUBLIC ARGENTINA.

FURTHER BRAZILIAN EXPANSION

A further expansion in the External programs of Radio Nacional Brazil has led to the inclusion of additional services in Portuguese. The station already broadcasts three transmissions in English with the broadcast at 0200-0300UTC heard on 15290 and 17830kHz.

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. In areas observing daylight time, add a further hour.

REVIEWS OF RECENT

Records & Tapes

CLASSICAL ● POPULAR ● SPECIAL INTEREST

MAHLER-ABBADO: " . . . phrased to perfection"

MAHLER — Symphony No. 4 in G Major. Vienna Philharmonic Orchestra conducted by Claudio Abbado with Frederica von Stade (soprano). DGG Analog Stereo 2530966.

Mahler's Fourth is his "lightest" symphony, mercifully free from the tiresome German metaphysics he so often associated with his others. The nearest he got to that outlook in the Fourth was to call it a Symphony of Heavenly Life.

For many years my favourite recording of this work has been Szell's with the Cleveland. It is a typical Szell "no nonsense" reading, kept simple without over-expression and almost always obedient to the composer's interpretative instructions. And, added to this, is the Cleveland's unique precision under its martinet conductor.

Abbado's reading of the symphony is almost directly opposite to Szell's. Abbado is often wilfully disobedient to many of Mahler's specific instructions, especially in the matter of tempos. Yet it must indubitably be accepted as a fine reading.

Let me explain this apparently paradoxical statement. First, in place of the Cleveland's unmatched precision, you have the Vienna Philharmonic at its sensuous best. They play for Abbado with elegance and a matchless bloom on their tone, always doing full justice to the composer's marvellous scoring. In this, they are aided by the analog disc's quite adequately wide dynamic range and meticulous clarity of detail.

Those who find the VPO's ability to sustain so successfully Abbado's extremely slow tempo in the long slow movement should bear in mind that this great orchestra is often called upon to deal with one of Bruckner's huge peristatic themes in the same way. Throughout the movement's 23-minute, mostly pianissimo progress, Abbado never once loses his concentration. Every bar is phrased to perfection.

Frederica von Stade, who sings the Wunderhorn song in the Finale has been

Gustav Mahler

criticised for introducing affectation into her reading. In my opinion, her interpretation adds childish charm to this innocent little piece. Moreover, her beautiful, light, fresh voice is quite capable of finding a true mezzo quality to the low B flats.

To me, after her very slightly breathless start, she is a joy to listen to. Also, for that matter, is the whole disc. (J.R.)

Italian vocal music

LUCIANO PAVAROTTI — First recording of rare Verdi arias. With the La Scala Orchestra conducted by Claudio Abbado. CBS Stereo Analog Disc SBR236060.

PLACIDO DOMINGO — Recital of arias from mostly popular Italian and French operas.

To readers interested in recitals of Italian vocal music I can recommend

these two discs. The Pavarotti has the added attraction of novelty in its introduction to the public of the first recording of rare Verdi arias never used by the composer for one reason or another. The accompaniments are by the La Scala Orchestra under Abbado.

The full title of the second is "A Portrait of Placido Domingo". It comprises popular arias from frequently performed Italian and French operas. Strangely, the name of the accompanying orchestra or orchestras is omitted, which tempts one to speculate that the program was derived from many sources. (J.R.)

Chilly and warm!

FAURE — Sonata for Violin and Piano in A Major. Berceuse.

DEBUSSY — Sonata for Violin and Piano in G Minor. Pinchas Zukerman (violin) and Marc Neikrug (piano). CBS Masterworks Analog Disc 76813.

There was a wide disparity in the ages of the composers when they wrote these works. In 1876 Faure was in his early 30s, of youthful spirits and still unknown. Forty odd years later, Debussy, who had long since won fame, was dying of a revolting form of cancer with the Germans working towards the gates of his beloved Paris. The Violin Sonata was his last work.

Faure could not find a publisher in France for his now popular sonata and ironically it was published eventually by a German company — Breitkopf — on savagely mean terms. It is a lovely work still gaining more and more popularity and one of the finest examples of French chamber music.

Faure's was a gentle art as this work — and don't forget his Requiem — shows. Yet it is a warm and intensely personal exercise, which calls for the most delicately responsive performance from both players.

Zukerman's reading, however, which could never be justly described as dead pan, has about it a seriousness which I feel was never intended by Faure. Its essential Frenchness is delivered with 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.).

slightest of foreign accents. It lacks what the French call "volupte". Neikrug's excellent piano part must perforce follow the mood of the violinist.

Curiously, on the other hand, Zukerman adds welcome warmth to the otherwise slightly chilly score of the Debussy. I described the circumstances of its composition above. There was every excuse for Debussy's occasional aridity but this is, to some extent, alleviated by the warmth of Zukerman's sympathy.

It is almost as if an Israeli of a younger generation were trying to console a member of an older on the grounds of having himself suffered similar patriotic agonies. A moving thought although perhaps not acceptable to some. Marc Neikrug adds a valuable contribution to both works.

The fill, Faure's Berceuse, is just a very pleasing little salon piece very nicely played. The analog sound is fine. (J.R.)

☆ ☆ ☆

STRAVINSKY — Petrouchka (complete). Scherzo a la Russe. Philharmonia Orchestra conducted by Michael Tilson Thomas. CBS Digital Disc D37271.

I found this first digital recording of Petrouchka to come my way a bit disappointing. This was chiefly because of a tendency to the lackadaisical in Thomas' reading.

In the first scene, there is very little sense of the hassle of a Russian carnival, although the digital process works well here on a score so full of important detail. (The version, by the way, is Stravinsky's own 1947 revision.)

Lack of vitality in the playing is the main offender although, at the end, the Puppet's Dance is nicely rhythmical.

In the second scene, in Petrouchka's black-walled room, I have never heard the music played so mournfully. This Petrouchka is a sad little fellow indeed. Later, where the piano has the solo part, it even seems to slow down until it reaches Petrouchka's attempt to battle his way out of the room.

Thomson, by the way, keeps the drum-roll going between scenes, something rarely done in concert performances but preserved when the work is presented in ballet form.

The third (Moor's) scene is more successful. Thomas' lackadaisical attitude matches well the Moor's idle playing with the big ball. And, of course, everything brightens up when the seductive little ballerina joins him. I have, however, heard her little trumpet tune sound much crisper.

The final scene gains in vitality, I think largely because the increased crowd and activity on the stage is responsible for more complex orchestral scoring, and that incident follows incident at great speed on the stage. Spirits get higher and higher until Petrouchka's macabre death — and resurrection.

The fill is a little Scherzo a la Russe, commissioned in the early 1940s by Paul Whiteman, who was apparently expecting something like Gershwin's vastly popular Rhapsody in Blue.

He finally rejected it but Stravinsky, as careful with themes as Scots are with bawbees, reorchestrated it into its present form, which can surely mean nothing but another fair scene. Stravinsky loved country fairs!

As mentioned above, the digital sound is good, but the Philharmonia Orchestra plays as if it weren't very interested. I think you might be advised to wait until an alternative performance is on offer. (J.R.)

☆ ☆ ☆

RAVEL — Piano Trio in A Minor.
SAINT-SAENS — Piano Trio in F Major. Played by the Tortellier family. World Record Club Stereo Analog Disc R09432.

Ravel's Piano Trio, unlike his String Quartet has never won the affection of a large public. This is a pity, because the Trio is an exemplary example and its per-

BOSTON PIPE ORGAN

. . . a matter of opinion!

ENCORES A LA FRANCAIS. Michael Murray playing the organ at the Symphony Hall, Boston. Digital stereo, Telarc DG-10069. [From P. C. Stereo, Pty Ltd, PO Box 272, Mt Gravatt, Qld 4122. Phone (07) 343 1612]

As depicted on the jacket, the Symphony Hall, Boston, is a large rectangular auditorium, with double galleries along both sides and a procenium occupying almost the entire front wall.

Beyond the procenium is a tapered sound stage area, backed by the pipes and chambers of the Aeolian-Skinner concert organ, installed in 1949-50. In effect, the organ speaks into the auditorium from the smaller end of a huge acoustic short horn — large and small pipes alike.

But apparently Bostonians like it that way because, according to the jacket notes, the organ has been carefully maintained in original condition and is one of the few substantially "romantic" organs in the USA which have not been re-voiced for a totally baroque sound.

Perhaps it's because of all this that the organ sounds as it does — at least as judged on this recording. The sound can be loud but scarcely spacious; soft but not really delicate.

The bass can be very loud, and I use the words deliberately with a degree of puzzlement. At a quite modest setting of the volume control, and with the power output LEDs on the amplifier hardly stirring, the loudspeakers were rumbling and the room reverberating in an impressive fashion. Perhaps the subjective loudness had to with the harmonic structure of the sound.

Buried somewhere in the bass were the smaller pipes and I found myself wishing that Telarc engineers hadn't been so professedly meticulous in mic placement and balance to capture the sound as heard in the auditorium.

I finished up playing the record minus a bit of bass and plus a bit of treble. Fortunately, the recording itself is basically very clean and it can be re-balanced thus, without significant penalty in respect to noise and distortion.

One other point should be mentioned: the organ has an enormous dynamic range which Michael Murray exploits in the Widor Toccata, perhaps to the delight of Telarc engineers. It's dramatic, abrupt but not very musical — and also frustrating unless your listening room is dead quiet!

Michael Murray is a very experienced musician who has been performing solo and with orchestras, throughout Europe, Canada and USA for more than 10 years. The items in this performance are a collection of the encores which he may offer at the end of formal recitals:

Chacone in G Minor (Louis Couperin); Carillon, Op 27 (Marcel Dupre); Scherzo (Eugene Gigout); Piece Heroique (Cesar Franck); Toccata, Symphony V (Charles-Marie Vidor); Sinfonia, Cantata 29 (J. S. Bach); Final, Symphony I (Louis Vierne); Musette, Op 51 (Marcel Dupre); Fanfare (Nicolas Jacques Lemmens).

As might be expected, Michael Murray plays them capably but, overall, "Encores a la Francais" didn't emerge as one of my favourite organ records.

I make that last remark with a frown on my gradually expanding forehead because, in the October issue of "Audio" magazine, reviewer John M. Eargle said of this same disc: "This stunning recording is a must for all lovers of organ music!" (W.N.W.)

formance by the Tortellier family (Maria de la Pau, piano; Yan Pascal Tortellier, violin; and Paul Tortellier, cello) is in every way admirable.

From the very first bar, there is no mistaking the Trio's origin in Ravel's own very personal harmony and melody. There is a delicious air of chastity about its perfect construction. Ravel has done more than most composers to reconcile the different timbres of a percussive piano, with bowed strings.

The Passacaglia treats this venerable form with great respect, while the players put refined passion into its tall dignity. The whole work is a supreme example of French elegance at its best. An important French tendency it carefully avoids is "La Gloire". Even the curiously accented Finale goes splendidly.

The Saint-Saens has its own style of elegance, simpler than Ravel's. And, as to the composer, it is hard to believe that that old curmudgeon was once a happy young man and during his life exercised a very strong influence on his younger contemporaries. I am referring here, of course, to his later years when he developed into a crusty old Chauvinist.

Yet at his worst during World War I, he retained in his music typical French clarity and taste. If it sometimes sounds slim alongside most of the German school of the period, it is nearly always brilliant and always immaculately turned out.

His influence, however, seldom reached beyond France although his Piano Concertos and his opera, Samson and Delilah had a good innings elsewhere, especially in England. The Concertos often get an airing today, played by pianists of all nationalities.

I have deliberately omitted the name of his great predecessor, Hector Berlioz, because I cannot think of his influencing anyone except, perhaps, Charles de Gaulle. The Saint-Saens Trio was composed during a stay in one of the least attractive parts of France — the Auvergne.

Yet the whole work is exhuberant in form and content, the Scherzo especially a delight to mind as well as ear. Needless to add that, in the hands of the Tortellier family, its performance is immaculate; their attention to detail faultless. The analog sound is excellent. (J.R.)

FROM THE MOVIES

GONE WITH THE WIND. Composed and authorised by Max Steiner. Played by the London Sinfonia, conducted by Muir Mathieson. Super stereo, Stanyan Records POW-4023. Distributed by RCA.

In his jacket notes, Richard Oliver points out that "Gone With The Wind" not only made its mark as an epic film and one that set box office records, it also contributed enormously to the acceptance of dedicated music scores and to the reputation of that most notable exponent of film music, Max Steiner.

Curiously, on the same weekend that I wrote this review, I also reviewed the very old film "Bill of Divorcement" and watched "Johnny Belinda", both with music direction credited to Max Steiner.

His score for "Gone With The Wind" has something of what Richard Oliver refers to as "symphonic proportions" and it forms the basis of this new performance by the London Sinfonia.

There are 16 theme titles on the two sides but there are no separate tracks; those who do not know the themes may have some difficulty in identifying them from the unbroken flow of music. But the jacket notes should help.

As an idea, here are the theme titles from Side 1: Tara's Theme — Invitation To The Dance — Melanie's Theme — Ashley — The Prayer — Bonnie Blue Flag — Scarlett O'Hara — Scarlett's Agony — War. There are seven more themes on side Two.

I am not sure what is meant by the endorsement "Super Stereo"; the sound certainly has a wide frequency range although, I felt, it to be a trifle "zizzy" in the string department. But, even if you prefer it with a bit of top-cut, it can be a pleasant reminder of a film that many readers may possibly have seen several times. (W.N.W.)

☆ ☆ ☆

MUSIC FROM GREAT AUSTRALIAN FILMS. The Neon Philharmonic Orchestra. ABC Records ABCL 8202. (Manufactured and distributed by CBS Records Australia Ltd.)

In recent times, the ABC has been doing the Australian viewing and listening public quite a service by releasing so many discs and cassettes inspired by the Australian entertainment scene.

This particular album, made in the ABC studios, uses the Neon Philarmonic Orchestra, conducted by William Motzig. The name Neon Philharmonic means nothing to this reviewer but it does feature such musicians as Bob Barnard, Errol Buddle, Tony Ansell and Mark Isaacs.

Featured on the discs are themes from 12 Australian movies. One dates back to 1937 ("Tall Timbers") but the remainder are of much more recent origin: Newsfront — Gallipoli — My Brilliant Career — Cathy's Child — Eliza Fraser — Breaker Morant — The Chant of Jimmy Blacksmith — The Picture Show Man — Picnic At Hanging Rock — The Mango Tree — Dimboola — Caddie.

The album comes in a handsome double-fold jacket, carrying a brief resume of each of the movies and the actors who featured in them. On the rear of the jacket is further interesting comment by the ABC's film critic, John Hinde.

The sound quality on the album is excellent but I felt that the orchestra could have been a little more adventurous in the matter of dynamic range. Even so, it should prove a popular release. (N.J.M.)

Devotional

DANA — Totally Yours. Stereo, Word WSB-8850. From Word Records Aus, 18-26 Canterbury Rd, Heathmont, Vic 3135. Phone (03) 729 3777.

Dana (pronounced Donna) is pictured on the jacket as a striking dark-haired beauty who, not so long ago won Europe's most coveted secular music award. Born and raised in Ulster, she has become a devout Christian and has recorded this album in London and Dublin for ultimate release through Word Records in Waco, Texas.

The basic theme of the album is probably caught best by "Sing For Me" on side 1 — an expression of her personal challenge — and "Totus Tuus" on side 2 or "Totally Yours", a hymn of personal dedication.

Other titles are: Praise The Lord — Mary's Song — Oh, So Wonderful — The Soft Rain — Home Where I Belong — Little Baby — He Careth For You — A Simple

Song Of Love.

Some of the words are by Dana herself but all of the songs have a personal, pensive quality, reflecting a deeply spiritual approach to everyday living. Diction is good and the lyrics are given in full on the inner sleeve, so it matters little if the titles are unfamiliar. And the melodies, too, are rhythmic and easy on the ear.

Technically, the quality is normal and, all told, it adds up to a pleasant album from a very pleasant lass. (W.N.W.)

Popular & rock

MURDERED BY THE MUSIC, Yuki Takahashi. Regular 2, REG L200. RCA Release.

According to the artist biography included in the sleeve, Takahashi is one of the leaders of the computerised, synthesised music rage in Japan at the moment. Apart from being the producer and arranger for this record, he is the electro-percussionist (how's that for a new career?) for the Yellow Magic Orchestra, runs a trendy boutique and produces stage clothing as well as records. I wonder what he does in his spare time?

The music is very bright and pop orientated, with all sorts of synthesised gimmicky sounds.

The titles are: School Of Thought – Murdered By The Music – Kid Nap The Dreamer – Radioactivist – The Core Of Eden – Bijin-Kyoshi At The Swimming Pool – Blue Colour Worker – Stop. In The Name Of Love – Mirrormaniac – Numbers From A Calculated Conversation. The sound quality is clear; try a track to see if you like the sound! (NJM)

☆ ☆ ☆

DEPECHE MODE, Speak & Spell. Mute records POW 6012 RCA Release.

Unless you are heavily into electro-pop, this record from one of the leading British bands using only synthesisers and voices, will not do much for you. Despite the synthesiser's ability to make almost any sound you wish, there is a limit to what the ordinary person will accept as musical; as a result, commercial electronic releases tend to become rather predictable.

The eleven tracks are: New Life – Puppets – Dreaming Of Me – Boys Say Go – Nodicso – What's Your Name – Photographic – Tora Tora Tora – Big Muff – Any Second Now – Just Can't Get Enough. In this last track, by the way, the title is the lyric!

Technically, the record is of a high quality. (NJM)

☆ ☆ ☆

INDIVIDUALS. Sunnyboys. Mushroom Records, L 37835, Festival release.

The Sunnyboys are a new Australian band and a lot of work has gone into the making of their album, which was recorded at Mandrill Studios, Auckland, New Zealand and mixed at Pasha Studios, Los Angeles, USA.

The band already has a following in Australia and the first single lifted from this album "You Need A Friend" has received considerable airplay.

The members of the band are: Jeremy Oxley, guitar and vocals; Richard Burgman, guitar; Peter Oxley, bass and vocals; Bill Bilson, drums; Steve Harris, keyboards.

The other tracks on the album are: This Is Real – Individuals – It's A Sunny Day – Leaf On A Tree – No Love Around – I'm Not Satisfied – Days Are Gone – You Don't Need Me and Colour Of Love.

Peter Oxley wrote "You Don't Need Me" while Jeremy Oxley wrote the other nine tracks.

This is a refreshing album from an exciting new Australian band. (D. H.)

"Electronic" singles

ONLY YOU. POW-0063 Powderworks Records.

Already an extremely successful single and receiving considerable airplay throughout Australia, this recording by the group Yazoo demonstrates the appeal of the "new romantic" sound that originated in the United Kingdom.

CALL THE UH-OH SQUAD. 104011 RCA Records.

An up-tempo record with a catchy tune and chorus. On Side B is a live version performed at the Paradise Theatre, Boston, USA by Robert Ellis Orrall.

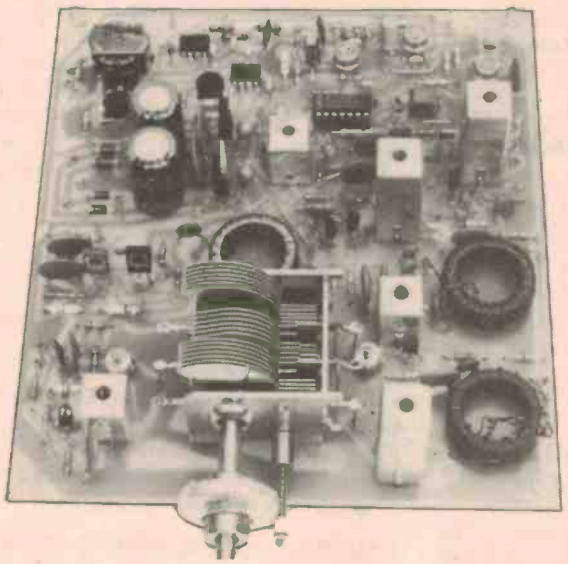
URUQUAY. POW-0089 Powderworks Records.

An English single performed by The RB's that incorporates a considerable number of brass instruments; it has a good beat and should emerge as a good dance record.

PAPA'S GOT A BRAND NEW PIGBAG. POW-0077 Powderworks Records.

The Australian group Pigbag perform (to me) a rather disjointed instrumental single, and was not appealing to this reviewer. (D.H.)

Coming Next Month***



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Want to build a really high-quality wideband AM tuner? This completely new design features wide audio frequency response, low harmonic distortion and excellent signal-to-noise ratio. In fact, apart from stereo reproduction, this new tuner compares very favourably with typical FM tuners. Other features include digital readout with 1kHz resolution, a 9kHz whistle filter and LED signal strength indication. (Picture at left shows the tuner PCB in early prototype form.)

Digital pH Meter

Based on the DPM-05 3½-digit LCD module, our new pH Meter can be used to check swimming pools, photographic solutions, fish tanks, or chemicals in the laboratory.

ON SALE:
Wednesday, December 1st

* 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.

50 & 25 YEARS AGO

"Electronics Australia" is one of the longest running technical publications in the world. We started as "Wireless Weekly" in August 1922 and became "Radio and Hobbies in Australia" in April 1939. The title was changed to "Radio, Television and Hobbies" in February 1955 and finally, to "Electronics Australia" in April 1965. Below we feature some items from past issues.

Wireless Weekly 3p

November 1932

The Radio Season: In the past it has been general practice to consider that radio is divided into seasons, that radio sets can only be sold and used in the winter time, and that a radio set is useless in summer time. What a ridiculous idea.

Today the local stations have such a powerful output that the great majority of listeners can have programs perfectly free from static except when there is a violent thunderstorm in the immediate neighbourhood. Radio has now definitely left the ranks of the novelties.

☆ ☆ ☆

Follow The Test: "OWZAT?" — Oldfield echoes Ironmonger's appeal for LBW . . . The batsman pauses. The umpire is looking at him intently . . . He shakes his head . . . Not out! . . . Listen to the crowd.

December 2, 1932, the first Test Match! In your easy chair with your Audiola Junior on the table, you can follow the match ball by ball — run by run. The announcer's voice is as clear as if you sat beside him. (From a Warburton Franki advert.)

☆ ☆ ☆

Radio for motorcycles: Some idea of the many applications of radio can be gauged from the fact that in America even the police motor cycles are fully equipped with radio sets, so that the patrolmen on their machines can pick up messages from headquarters whilst riding along.

A special form of loudspeaker has been developed for the job, and this is mounted between the handlebars with the mouth turning upwards. By slightly leaning forward the rider of the machine gets the full benefit of output from the speaker.

RADIO TELEVISION AND HOBBIES 1/6

November 1957

Next stop Mars: Experts are now planning space ships which can make the round trip to Mars in a few weeks.

Scientists visualise a stream of electrified vapour thrusting from the rear of the space ships like a violent electric wind.

They claim that ships up to 600 tons could be propelled through space once they are clear of earth's atmosphere.

British, US and Russian scientists are working on the "electric" space ships.

The new method of driving space ships is described as "fantastic".

Called the Ionic Drive, the new method amounts to the thrust of a huge machine through space by a beam of electrified particles instead of a jet of flame.

☆ ☆ ☆

Transistor radio advert: Now you can own a truly portable radio incorporating transistors, the tiny electronic marvels which obviate valves and cumbersome B batteries. These smartly styled "Sony" receivers give excellent reception with high sensitivity using only standard torch batteries costing, in all, only approximately four shillings. The "Sony" Model TR72 is equal in tonal quality to the best electric models and costs £45.

☆ ☆ ☆

Animals aloft: Reports from Moscow Radio say that scientists are sending animals more than 125 miles into space to study the effects of cosmic radiation on living organisms.

The broadcast quoted a scientist who spoke on research in the higher layers of the atmosphere.

In 1951 animals were taken up to a height of more than 60 miles, he said.

Tandy Electronics — new products and policies

Tandy Electronics recently added 12 new products to their line-up in Australia. Announcing the releases, Tandy also gave details of marketing strategies for the business and educational markets, and made some scathing criticisms on the lack of direction from Education departments on the controversial subject of computers in the classroom.

Tandy claims that their new Model 16 "puts minicomputer performance into a complete, compact desktop system". The Model 16 is Tandy's venture into the 16-bit market, combining the software base of the Z80A Model II and the power of the MC68000 16-bit microprocessor.

The Z80A handles input and output and other "housekeeping", and also allows the machine to run all TRS-80 Model II programs. The MC68000 running at 6MHz, provides advanced capabilities and allows the machine to use up to 512K bytes of programmable memory. (The Model 16 comes with 128K of RAM as standard, and can be expanded internally to 512K).

Features of the Model 16 include an 80 x 24 line green phosphor display, a detachable keyboard with numeric keypad, and one or two built-in 20cm disk drives, each providing 1.25MB of storage. Optionally, Tandy's hard disk controller unit can be added, providing 8.4MB of storage and the capacity to add three "secondary" hard disk drives, giving a total of 33MB.

One or two terminals can be attached to the Model 16, so the system be used by three users simultaneously, each running a different program. This "multi-user" capability allows users to add computing power as their requirements grow, without the need for additional software or hardware (apart from the terminals).

Software for the Model 16 consists of Tandy's own 16-bit operating system, which includes an editor, assembler, linking loader and debug program. Model 16 Cobol is also available for users who want to develop their own business programs. Software written in ANSI-74 standard Cobol can be transferred to the Model 16 "with little or no modification" according to Tandy.

Tandy also released the TRS-80 DT-1 data terminal, a stand-alone video terminal which can be used with the Model 16 or mainframe computers. The DT-1 can be configured under software control to emulate four standard terminal protocols; Televideo 910, Lear Siegler ADM-5, ADDS 25 or Hazeltine 1410. A back-up battery retains the terminal parameters when the machine is turned off.

Also announced is a new version of the Tandy Pocket Computer, the TRS-80 PC-2. This machine is slightly larger than the original PC-1 (195mm x 86mm x 25mm) and is said to be up to ten times faster. A 16K Basic in ROM offers features equivalent to the TRS-80 Model III, and 4K and 8K plug-in modules are available to expand the 1.8K of RAM provided internally.

The new PC-2 can be coupled with a four colour printer/plotter unit, which also contains two cassette interfaces. The tiny printer/plotter uses four pens, moved by solenoids in conjunction with forward and reverse movement of the printer platen to produce print-outs and plots in nine different character sizes in red, blue, green and black.

Tandy also announced details of a new range of printers, starting with the CGP-115 Color Graphics Printer, which uses the same printing mechanism as the PC-2 printer/plotter. Three new dot matrix printers have also been announced and a new lower priced daisywheel printer, intended for low volume professional printing applications.

It was Tandy's announcement of policies for the educational market which aroused the most interest.

Tandy has been active in computer education since 1978 and are one of the few microcomputer suppliers who maintain a specialist Education Division, offering workshops, seminars, in-service training and consultation.

There is at least one Tandy Computer training centre in each capital city (except Hobart). Each facility typically offers a number of computers for "hands-on" training and are used to conduct familiarisation sessions for teachers, school principals and educational ad-

continued on p133

SPHERE COMPUTERS

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MEMORY
A 64K Ram board is provided as standard. However the system may be provided with as little as 8k if desired and more added later.

POWER SUPPLY
Provides 8.5V, +12V, −12V unregulated supply to the buss. All components are P.C. board mounted and fuses readily accessible.

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The Cabinet is made of heavy gauge (approx 1/8") Aluminium Anodised in Delightful blue.

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Everybody loves video games and the VIC-20 has some of the best. But the Commodore VIC-20 can also help the kids with their homework and mum with her budgeting. Dad can even take the light, portable VIC-20 to the office for financial and business applications.

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The Commodore Information Centre,
3 Campbell St., Artarmon NSW 2064. Phone: 437 6296.

commodore COMPUTER

MLVLI 460a

ministrators. The computer centres are freely available to schools and individual teachers who wish to bring in classes.

In South Australia Tandy has donated equipment worth $35,000 to the South Australian Education Department. The donation is intended to demonstrate Tandy's concept of the "computer classroom" with off-the-shelf equipment and software.

The biggest sale to date has been the purchase of $933,000 worth of TRS-80 Model III computers by the Queensland Colleges of Technical and Further Education. The computers will be used in Queensland technical colleges to meet the demand for training in word processing, data processing and in "Computer Awareness in Society" and business courses.

According to Tandy, the adoption of computer technology in Australian schools has been anything but smooth. Mike Lehman, Tandy's Educational Marketing Manager, says the process has been "characterised by mystery, an aura of complexity, and pre-conceived ideas". Australian schools, with a few notable exceptions, have failed to take advantage of the equipment and consultation services available.

Most of the blame, says Tandy, rests with bureaucrats in both state and federal Education Departments. In many cases, decisions on the type of equipment to be used in schools has been left to a handful of people, "a band of amateur programmers-cum-teachers, or professional programmers with no knowledge of teaching, trying to re-invent the wheel", according to Tandy.

Most administrators, including Education Ministers, directors-general and heads of resources allocation committees, have admitted to a total incapacity to question the decisions made by this small group of people, to Tandy's evident frustration.

As an example of the "inappropriate" decisions being made, Tandy cites the ruling by the NSW Education Department that colour displays are an important feature of computers for use in the classroom. Tandy quotes figures to show that out of 272 computers with colour capability currently used in NSW schools only 31 are used with colour video monitors. Presumably many schools do not see the need for colour.

Tandy were particularly critical of the NSW Education Department. It seems that the officer appointed to co-ordinate the use of computers in State Schools has upset Tandy by not visiting their computer centres to see what is on offer. Worse still, says Tandy, the NSW Computer Education Office has not formally advised regional committees of the availability of the Tandy computer centres.

Mr Richard Wiktorowitz, of the NSW Computer Education Office, when contacted by this writer, replied that the in-service training courses are organised by regional committees, and says that Tandy were advised to approach each regional authority directly.

Some regions do take advantage of the availability of the computer centres. Schools in the western metropolitan region of Sydney, for example, have obtained permission and funding for in-service computer courses at Tandy's Rydalmere computer centre training rooms.

Tenders for the supply of computers to NSW schools are called each year, to ensure that the Education Department sees the latest in technology. At the time tenders were called for approval of computers for purchase in 1982 many of the products which Tandy cites as significant advances in education were not available. No doubt Tandy will have their chance to present current equipment when tenders are called for 1983.

Tandy expects that by 1985, educational applications will account for 20% of their computer sales. They already offer an extensive range of educational software (or "courseware", as they call it), and new titles and subjects are constantly being introduced. Scheduled for introduction next year is the Tandy authoring system and hardware to allow a Model II computer to control video tape and video disc players.

Tandy make no secret of the fact that their efforts to introduce TRS-80 computers into schools is self-serving. The company freely admits that it is hoping that school sales will flow on to the domestic and business markets as more and more people become familiar with computers.

"Psychotec" — program for the Microbee

Melbourne software supplier "Dreamcards" has turned its hand to programs for the Microbee, with the first offering, called "Psychotec", said to turn your computer into "a tame psychiatrist". The program allows a dialogue between operator and computer in the style of a psychiatric interview, and is based on the controversial "Doctor" programs developed some years ago in the United States.

The language processing logic which is the heart of any "conversational" program has been completely re-designed to adapt the program to the Microbee.

The program is supplied as a printed booklet containing a full program listing, a complete description of the program logic, and instructions for use. Instructions for conversion to other Basics are also provided. Users of the Super-80 should note that the program is particularly easy to convert because of the common string handling capabilities of both machines.

The program listing and instructions cost $20, with a cassette copy in Microbee format an extra $5. For further information send a stamped, self-addressed envelope to Dreamcards, 8 Highland Court, North Eltham, Vic 3095.

Microcomputer News

Programs by shortwave and a universal Basic

In 1981 Radio Netherlands began a unique experiment, broadcasting programs for popular microcomputers over its worldwide short-wave network using standard cassette data formats. The experiments were successful, with many listeners reporting that they were able to record the programs off-air and run them on their computer.

Programs were broadcast using the cassette data formats of the Apple II, TRS-80 and Commodore PET systems. To cope with the demands of owners of other systems to be included in the experiment, Radio Netherlands also began work on a "universal" version of Basic, and a universal cassette interface to suit many popular microcomputers.

A recent letter from Radio Netherlands advises us that this work is completed. The universal language, called "NOS BASICODE" allows programs to be written for the Acorn Atom, TRS-80 and System-80 computers, the Apple II, Exidy Scorcerer, OSI and SWTPC computers. In some cases minor hardware modifications are required to the cassette interface, and of course, machine language subroutines cannot be incorporated in programs.

Future tests on Radio Netherlands' short-wave program "Media Network" will use a 300 baud translation program, while 1200 baud version of the system is in weekly use on Dutch domestic radio. Computer users in West Germany report being able to record programs off medium-wave radio.

Radio Netherlands broadcasts to Australia via a relay station in Madagascar, and early results in this country were disappointing. The best chance of receiving a usable program requires a direct connection between the receiver and a cassette recorder (no microphone), levels of recording as high as possible without distortion, and maximum treble boost.

The protocol for NOS BASIC, details of hardware modifications, and a cassette input translation program for 10 different machines is available in a booklet from Radio Nederland, together with a cassette of sample programs. Computers covered are the Acorn Atom, Philips P200 (popular in Europe), the DAI, Sorcerer, Apple II, PET/CBM, TRS-80 and Videogenie (the European version of the System-80), the Cosmac VIP, the OSI IP and SWTPC 6800 systems.

Cost of the booklet and cassette is 35 Dutch Gilders, including airmail postage. At the time of writing the exchange rate is f2.61 to $A1.00, so the book and cassette will set you back $13.40. Payment must be made in Dutch Guilders however, via international money order payable to "Nos Algemeen Secretariat". The address is PO Box 222, 1200 JG Hilversum.

David Webster wins CHIPS award

Mr David Webster, Managing Director of D. D. Webster Electronics Pty Ltd was awarded the Australian Computer Industry's major 1982 CHIPS Award for services to the Australian Computer Industry. The Award was presented in conjunction with the Data '82 Computer Exhibition in Sydney in August.

D. D. Webster Electronics manufacture the Spectrum-11 range of minicomputers, based on the DEC LSI-11 processor with Webster's own slave processor and peripheral boards. Since 1977, 400 Spectrum-11 minicomputers have been installed, with exports to the United States and South-East Asia.

The judges remarked that Mr Webster "has demonstrated that given determination and innovative ability, an Australian company can start in the humblest possible way and grow to compete successfully in one of the world's most competitive computer markets".

Other CHIPS awards included "the most innovative computer application of the year", which went to Tom Zajovic, managing director of Tel Professional Consulting Services, for his work on automating coal loaders, and "the best computer advertising of the year", awarded to the Tandy Corporation for "Computerama", a highly successful series of computer exhibitions held in Sydney, Melbourne, Adelaide, Brisbane and Perth during early 1982, and seen by an estimated 90,000 people.

SME 48K memory board with battery back-up

SME Systems has introduced a 48K CMOS memory board with battery backup, intended to store operating system software and retain data even when the computer system is switched off. The CRC-48 board is designed for use in systems with clock rates of up to 8MHz, and is fully compatible with the S-100 bus.

A major feature of the CRC-48 board is its low power consumption. With a full complement of 6116 2K × 8 bit memory chips, the on-board 30mA/hr battery can ensure data storage for around 250 hours. The 6116 RAM chip is pin-compatible with single supply EPROM chips, which can be substituted in any combination for the RAM devices.

Bank protect logic and write protection are also provided.

For more information contact SME Systems, at 22 Queen St, Mitcham, Vic 3132. Phone (03) 874 3666.

New from the Clubs

- A computer interest group has been formed for the northern suburbs of Brisbane. Called "Computer Owners' Group" (COG), the club publishes a monthly newsletter called "COG 'n' Spiel" and encourages membership by owners of a variety of machines so that all members gain wider knowledge of computers. Emphasis is on computer use and programming rather than hardware.

  The club meets on the second Wednesday of each month. Contact the secretary, Mrs Betty Adcock, PO Box 115, Aspley, Qld, 4034. Phone (07) 263 4268.

- The Hasting Computer Group meets on the first Tuesday of each month at the Port Macquarie High School. Contact Secretary Neville Joyce, 8 Morton St, Wauchope, NSW 2446, for more information.

- The South Australian branch of the Commodore/VIC Computer Users Association meets each month. Further information is available from the Secretary, 13 Miranda Rd, Paralowie, SA 5108.

- The Northern and Western Suburbs Computer Users Group (Queensland) meets every second Thursday at the Maribyrnong Primary School, Warrs Road, Maribyrnong. For more information contact Mr David Coupe, 370 9590.

- The Blue Mountains Computer Club has changed its meeting schedule to the second and last Friday of each month, at the Springwood Civic Centre, 7.30pm. Contact Mr T. McIndoe, c/o Faulconbridge Post Office, NSW 2776.

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The AUSTRALIAN BEGINNING 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 BEGINNING 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 BEGINNING 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 COMMUNICATION

Members will be able, also, to communicate nationwide with other AUSTRALIAN BEGINNING members through our system.

THE AUSTRALIAN BEGINNING 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 BEGINNING. 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 BEGINNING by paying a one-time joining fee of $100, and a small hourly user charge of $10 an hour 8 a.m. – 6 p.m. and $4.50 an hour 6 p.m. – 8 a.m.

TELEX

Through the AUSTRALIAN BEGINNING'S unique telex feature — you can send messages to any telex users and receive messages back from anywhere in the world. All without having to pay an installation or rental fee for a telex machine.

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Yes, I think the idea of the AUSTRALIAN BEGINNING is great! I enclose $100 so please send me my user manual and password.

☐ *I have a computer, Brand.....*

Model.....

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NAME: .....

ADDRESS:.....

CITY:.....

STATE:..... *POSTCODE*.....

PHONE.....

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☐ *I am interested, but I need more information.*

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Try it for yourself . . . and see why Electronics Australia liked it so much! The new 'Blue Label' System 80 computer has even more features than before – and the best news of all, it actually costs less! Cat. X-4005

Features:

- ★ 16K Memory (expandable to 48K with X-4020 Expansion Unit)
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AND SO MANY MORE FEATURES!!!

"Overall we are very impressed with the Blue Label System 80. On a dollar per function basis it probably represents the best value around for a readybuilt computer. Other systems can be bought for less, but ultimately they are not as readily expandable as the System 80. There is also the matter of software, and here the System 80 really scores, with hundreds of compatible programs available for the TRS-80 as well as those specially written for the System 80."

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ELECTRONICS AUSTRALIA June 1982

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~~WAS $750~~

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★ Demo & Store Models.
– Some with imperceptible case marks.

★ ACT QUICKLY AND YOU'LL REAP THE BENEFIT!

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DATSUN STANZA DRAWN THIS MONTH!

Hurry! It could be your last chance to win a great Datsun Stanza. All you have to do is purchase a System 80, Sorcerer or VIC 20 and fill in the entry coupon supplied. It's that simple! Good luck!

Definitely Closes this Month!

COLOUR COMPUTER UNDER $400!

VIC-20

Colour Graphics, Sound and more for under $400! This remarkable breakthrough in computer technology represents outstanding value for money. And you don't have to know anything about electronics or computer programming to enjoy the advantages of the Vic 20 Colour Computer. Anyone can operate it with ease and confidence. It's ready to use as soon as you turn it on. Cat. X-2000

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Look at these Features

- Colour Graphics in up to 8 colours
- Memory expandable up to 32K with plug-in modules
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ONLY $399

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DICK SMITH Electronics

SEE PAGE 98 FOR ADDRESS DETAILS

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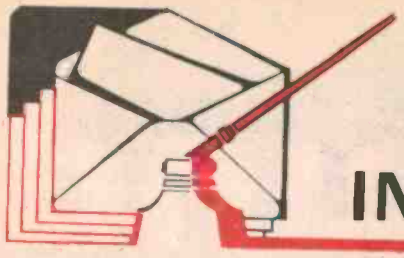

INFORMATION CENTRE

WIND DIRECTION INDICATOR: The January 1982 issue contained an article by John Clark called the Low Cost Wind Direction Indicator. The introduction referred the reader to the original project of an anemometer published in the August 1981 issue with further information regarding rewiring of the switch S1 in the October issue.

I have obtained both these issues and unless I am going blind in my old age I did not find any reference to the new or original project between the covers of both the entire magazines. What gives John? I wish to embark on said project but am not psychic! (L.P., Armadale, WA).

● The Wind Speed Indicator was published in the October 1981 issue, on pages 50 to 56. The person responsible for this error still bears the terrible scars of his punishment.

THE ALL-WAVE THREE: I am writing to you in the hope of obtaining some information concerning a certain project of yours that I have almost completed. The project in question is called the "All-Wave Three", dated April 1980. I have completed this project with the exception of the four Neosid toroid formers of type 4329R/2/FS. I know the frequency range of these toroids but unfortunately I do not know their initial permeability. and hence I cannot buy any equivalent types to substitute for the hard to get type mentioned above.

I would appreciate it if you could tell me either the initial permeability of this type (as once I know this I can buy the equivalent from Amidon Associates of America), or tell me from where the type used in this project was obtained. (D.B., Whitton, NSW).

● Neosid toroids are distributed in Australia by Watkin Wynne Pty Ltd, 32 Falcon St, Crows Nest, NSW. They are available in Sydney from Radio Despatch Service, 869 George Street, Sydney. Phone (02) 211 0190. Incidentally, the correct type number for these toroids is 4329R/2/F25.

SELECTALOTT: I seek your help in completing a project which has yielded a limited success in operation.

The project referred to is the Selectalott Pools/Lotto game. Upon completion I had no problems with operation of the circuit; all worked as per the written word. However the problem encountered is one of making the unit select numbers over the full capability of numbers. The lowest that I have been able to select is 10.

I believe that a modification has been given to alter this, however I have not been able to find this. Could you please advise the necessary steps to correct this minor problem. (G.F., Para Hills, SA).

● We have not published any Errata on this project and as far as we know, the article did not contain errors. It seems likely that you have a malfunction in the circuit. When you say you cannot select numbers below ten, are you saying that every selection gives a number above ten? Or do you draw blanks quite frequently? If the latter case is true then it is likely that you have an open circuit in the connections to pins 1 and 2 of IC1, as these outputs drive the first two rows of LEDs, the numbers one to 12.

DMM REPAIR: Although the following may not be an item of major importance, I feel that it is interesting enough to write to you about, and may save money. Recently, after working on a high voltage power supply (3kV), it was discovered that my digital multimeter was showing a constant offset of 70 on all ranges. This DMM is a 3½ digit LCD instrument and contains display driver circuitry, an AC converter, an Intersil ITS80062 chip, batteries and switchgear.

The ITS80062 was the item which had gone faulty, doubtless due to a high voltage transient. The cheap solution was to buy a new chip. A ring to the Intersil dealer brought forth "sorry no such number", moment of silence, "but it could be a special factory number". This could be expensive, I thought, if the instrument had to be sent to the dealer's service section for a new chip, but we persevered.

It was decided that the chip would probably be a standard Intersil line. Working from this I told the gentleman on the phone what type of DMM it was, ie 3½ digit LCD etc. Comparing the circuit diagram with his description we came up with the Intersil ICL7106CPL, which was exactly the same as the ITS80062 except that the pins were reversed, ie pin one was pin 40, pin two was pin 39, etc. It was then that I realised why I had been unable to find a pin one identification dimple on the IC. A screwdriver was grabbed, the chip removed and there was the dimple, on the underside of the IC.

So it was concluded that the DMM makers when buying ICL7106's for their instruments have Intersil, during manufacture, flip over the ICs bend the legs in the opposite direction and stamp a different identification number on the device. This means that you, the owner, would have to send the instrument to the dealer's servicing section.

The solution now is simple: purchase a standard Intersil ICL7106CPL (approximately $17) and working on an anti-static surface carefully bend the legs through 180° and insert the chip into the socket (checking the orientation), power up and the instrument is fully operational again. It would also be wise to write a brief note and staple it to the circuit diagram. (M.A., Clayton, Vic.)

● We agree that your solution may have been quick and simple but we wonder whether the DMM distributor may have had the correct item readily available and possibly cheaper. And were some parameters of the chip specially selected for the particular appliction? Before using a non-standard part (which may be perfectly acceptable) we would always be inclined to first approach the manufacturer or distributor to inquire about price and availability. That way, you know the device will work.

A typical case where this latter approach is usually the only practical way concerns FETs used in CRO circuits. While these usually have familiar type numbers they are often specially selected types for the particular application. Try as you might, an off-the-shelf FET from your friendly local parts grocer will usually be a dismal failure.

SPEED SENTRY: I have recently completed construction of your Speed Sentry circuit (May 1981) for the purpose of using it as an audible over-rev alarm as fitted to some exotic high performance cars. Unfortunately the circuit appears to work well at relatively low revs (up to 3000 rpm) but will not function reliably at higher engine speeds. Can you suggest any simple modifications which could overcome this problem? If the circuit cannot easily be adapted for high engine speeds (up to 7000 rpm) perhaps you would consider publishing a suitable

Self-excited wind generators not much chuff!

THOUGHTS ON WIND GENERATORS: Having read both John Andrew's article on the rewinding of a 12 volt car alternator (EA July 1978) and G. J. Bowden's letter in the July 1981 issue, I would like to offer a few belated comments.

The problem with any self-excited generator lies in the fact that below a certain critical speed it fails to build up its field, and only produces a very small voltage from the residual field. One can reduce the critical build-up speed by rewinding the field coils with a heavier gauge of wire, so producing a higher magnetomotive force for any given applied voltage. The MMF for any given voltage depends only upon the gauge of wire; naturally one puts on the maximum number of turns which can be got into the available winding space to keep the field current and therefore the energy loss as low as possible.

The other method, the one adopted by Mr Andrews, is to leave the field winding as it is and rewind the stator with more turns of a smaller gauge of wire. This produces the same effect.

The real point about any wind driven generator is that it must be capable of putting something into the battery at low speeds, ie, in light winds, which are the normal condition in most parts of the world for most of the time. The quoted output from the modified machine was 13 watts at 417rpm. Firstly, 417rpm isn't really low speed (it's nearly 7 revs per second). Secondly, 13 watts at 12 volts means about one amp of useful charging current, but to obtain this it was necessary to put two amps into the field. Disregarding other losses, the efficiency was only 33%. The wind rotor would therefore have been producing at least 40 watts, most of which wasn't available. Mr Bowden's test results clearly put the kiss of death on self-excited generators driven directly from the wind rotor.

I have held the opinion for many years that any viable small wind power system must have a permanent magnet generator. This ensures that the maximum field is present all the time, and eliminates the problem of critical build-up speed. It also eliminates the field winding loss which as we have just seen is a major factor under the wind conditions which prevail for most of the time.

If we wish to fulfil the condition of having a useful output at low wind speeds using a single generator we will have to accept the problem of a speed increaser, otherwise the machine will have to be wound with such a small gauge of wire to get the necessary number of turns that its maximum output will be unduly restricted. This doesn't however have to be a gearbox. Why not a toothed belt as used for the timing drive in many modern cars? They have a high mechanical efficiency, require only a weather shield, and the drive would relieve the generator of end thrust.

Permanent magnet machines are more or less self regulating through armature reaction, but in any case the output could be kept within the thermal limit by electronic regulation in the load circuit. Alternatively, the speed could be regulated by automatic (centrifugal) feathering of the rotor blades. This is desirable in any case, and would be within the capabilities of many hobbyists.

Direct driving combined with a significant output at very low speeds would seem to require two generators (both permanent magnet) in tandem on the same shaft. The first machine, for light wind conditions, would probably require a greater number of turns per phase than Mr Andrews' modification, and should be designed to reach 12 volts and start charging at about 150rpm. It would be electronically controlled to cut out when the wind speed brought it up to its thermal limit, at which point the second machine should be designed to cut in and take over.

I agree with Mr Bowden that the wind rotor end thrust should not be imposed on the generators. The rotor should be on a stub shaft with a pin type coupling which cannot transmit end thrust. Car alternators have 12 pole rotating field magnets with imbricated pole pieces and a single magnetising coil. It wouldn't be very difficult to reconstruct one with a cylindrical permanent magnet in place of the coil. Speaker magnets would probably be suitable. (A.B., Nundah, Qld.)

● Thank you for your thoughtful comments on windpower. We will have another article on this subject in a subsequent issue.

design in a future issue. (J.R., Alderley, Q).

● To adapt the circuit for higher engine speeds we suggest you reduce the value of the 47kΩ resistor connected to pin 3 of the 741 op amp.

CLOCK INTERFERENCE: Greetings from the Sovereign State of Queensland where the fishing is extra fine. Though our weather has been cold, rumour hath it that our beloved leader intends before next winter to build along the border a high wall to keep out the blast of cold air from the Nether Regions thereby making the Sovereign State more like Paradise.

In this epistle I have not been game to make any remarks about Daft Time, as twice in the last two months I have had an unexplained Happening. I own a Goldair AM/FM Electronic Clock Radio which normally keeps within ± 30 secs of correct time. However one Sunday night recently I found the clock over one hour fast. Rejecting the theory that some of Nifty's Heavies had been tampering with it while I'd been working downstairs, I reset things to correct. All went well for another three weeks when again on a Sunday night I found the clock about 12 minutes fast. Again I reset it and no further anomaolies have occurred.

Seriously, the only cause I can think of is mains interference. On the first Sunday we'd been working extensively with an electric drill for a large part of the day; on the second Sunday I'd used the old Sunbeam electric fry-pan to cook tea for the first time in ages. What think you? (H.S., Bulimba, Qld).

● Perhaps you are right. Why not try additional filtering across the low voltage supply rail to the clock circuitry. In addition, a 0.1μF metallised polyester capacitor connected directly across the transformer low voltage winding may be of assistance.

MUSICOLOUR Mk III: I purchased a Musicolour Mk III from Dick Smith electronics and assembled it. Since I assembled it, I have had to replace the components twice, at considerable expense and time. I found the fault to be a damaged flood light which was shorting and blowing the output Triacs.

My kit is now operational again, but I have had hesitations in using it for fear of another short circuit. I would be grateful if you could advise me on some sort of protection device (ie, fuses) that I could build into my Musicolour to prevent further damage to it through possible short circuits in my lighting system. Thank you. (R.S., Floreat Park, WA).

● In the article on the Musicolour III published in September 1976, we did warn against using lamps with a rating in excess of 150W. The problem with high power lamps is that if an arc occurs in the stem of the lamp the resulting cur-

rent may well blow the Triac before it blows the fuse in the stem. Additional fuses in the Musicolour will not help. In any case, these economy plastic-pack Triacs are not really expensive, at around $3, and any protective circuit is likely to cost more than this. For the best display, use lamps with ratings of no more than 100W.

FM RECEIVER: I found a diagram for an FM receiver in a book called "Understanding Electronics" by R. H. Warring. Unfortunately it gave no component values. As ! have only scratched the surface of electronic theory I can't work out the values. Please will you do this for me. The schematic diagram is enclosed. Please also can you tell me where I can purchase the transformers and the cost. Thanks for any help in answering this letter and a great magazine. (D.M., Esperance, WA).

● We do not think the author of your reference understood much about his subject. Otherwise he would not have shown a receiver for FM using only two transistors and two diodes. Some idea of the circuitry needed for an FM receiver can be gained by looking at the circuit for the tuner module used in our Playmaster AM/FM tuner. The circuit of the module was published in November 1978.

OPTO-ELECTRONIC IGNITION: I found one small mechanical problem when using the opto-electronic ignition unit (June 1981), which I feel I should pass on to other readers.

In many distributors, including mine (Australian Lucas), there is quite a lot of play in the centrifugal advance mechanism. Normally this is no problem because the drag of the points in the cam and rotor always "follow" the distributor drive shaft. However, with the points removed, the lack of drag means that the rotor, cam and chopper disc can sometimes "lead" the drive shaft, and sometimes "follow", producing a random variation in timing (of 4° in my case).

The solution is simple. Leave the points in, but not electrically connected, and mount the phototransistor and LED opposite them, with the rest of the electronics outside (my distributor was too small to fit the PCB anyway). Reliable timing results, as the points still cause sufficient drag on the cam.

With this modification, the unit seems excellent. Driving is noticeably smoother. Also, cutting the dwell angle on the chopper disc as shown in the article, produces a larger dwell angle in operation, because the chopper switches the circuitry on at a different point on the phototransistor to where it switches it off. In my case a cut gap of 36° produced a 42° measured dwell. This, of course, does not hurt. (S.R., Lane Cove, NSW).

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ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Chippendale, 2008.

● Thanks for the useful feedback, S.R. We wonder if the same problems occur with conversions using toothed magnet rings and Hall effect devices. Anybody know?

FOREIGN COMPONENTS: I wonder if you would be able to answer a couple of questions to which I have been unable to find answers. During WWII I was in radar so I know about magnetrons, but I trained as a biologist and have just gone back to electronics as a hobby. I have read all the texts, and built many of your circuits, mainly instrumentation. The whole field is fascinating; on a breadboard I can design and build circuits ten times more complex than circuits in the forties. But there are two snags.

How on earth can one get data on the European and US photodiodes, ICs and so on? For example, the TIL 100, it is not in my (expensive) T.I. photoelectronics data book. And what about the endless European semis? I look at a European circuit (I am mainly interested in optoelectronics) with diodes, ICs and so on, to which I can find NO reference whatsoever in the catalogues I can buy in Melbourne. Every new circuit I look at has a new photodiode! eg, the TIL 100, how do you find out it's dark current?

Secondly, where do you buy the things? I want an AD545L, nobody has heard of it. Do you write to the US?

These questions must be common, but I have not seen them discussed in "Radio & Hobbies" as I still think of your magazine. My reference book is Horowitz & Hill "The Art of Electronics". I suppose one can buy 5% of the op-amps described briefly and used in circuits in that book!

I have been designing and building high gain amps for modulated IR receivers. There are literally dozens of semis which would be useful, but none of the dealers have heard of them, eg, the SL 480.

There must be hundreds of people in my position, who want to design their own circuits but who do not have the library of a big engineering firm. Maybe there is an article here. (N. H., Canterbury, Vic).

● We commiserate with you. We suspect that the TIL 100 is now an obsolete device. The AD545L, a precision FFT-input op amp, made by Analog Devices, Inc is distributed in Australia by Parameters Pty Ltd, 41 Herbert St, Artarmon, NSW. The SL480 is made by Plessey but we have no knowledge of it. It is distributed in Australia by Plessey Components, 4 Christina Road, Villawood, NSW.

In fact, virtually every semiconductor manufacturer in the world is represented at some level in Australia. But, with relatively few exceptions, they are all asleep. None seem to be interested in promoting or advertising their wares, either in this magazine or in the small controlled circulation magazines. One wonders whether they are interested in doing more business. We often have great difficulty in obtaining data or samples of new devices.

We suppose that some semiconductor distributors may have all the business they can handle but there must be many who are doing little to exploit their potential market in Australia.

Notes & Errata

INFORMATION CENTRE (October 1982): The answer concerning headphone sensitivity on page 141 has two errors. For the example quoted, the output impedance is 330Ω and maximum loudness will occur when the headphone impedance matches the source impedance.

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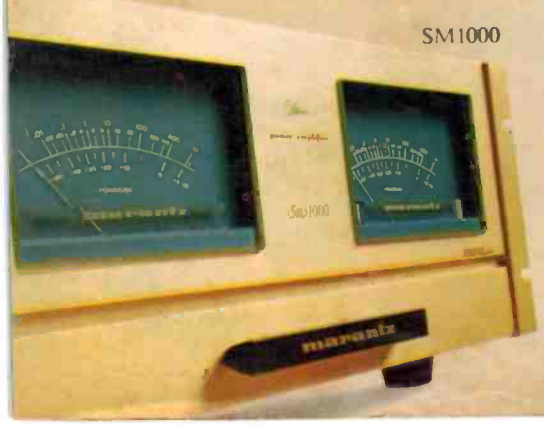

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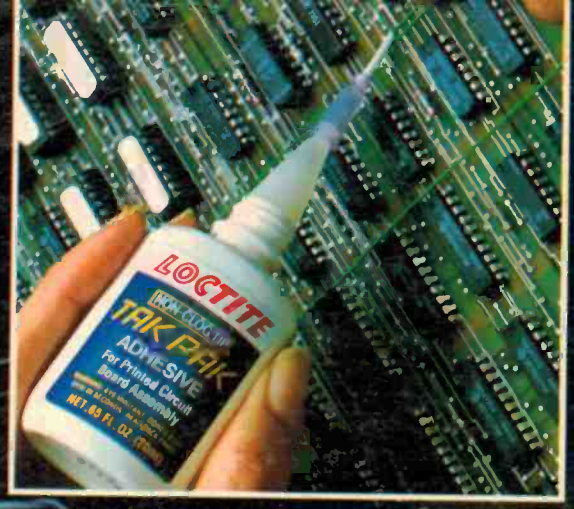

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