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FEBRUARY 1981
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STEREO HEADPHONES
MDR

AP3528

ELECTRONICS AUSTRALIA

Volume 43, No. 2
February, 1981

AUSTRALIA'S HIGHEST SELLING ELECTRONICS MAGAZINE

This easy-to-build Oscilloscope Switch will increase the versatility of your single-trace oscilloscope by providing dual-trace operation. Find out how to build it on p40.

Having trouble with flat batteries? Our new battery charger is capable of charging 6 or 12V batteries at currents up to 6A and features full overload protection. Details p48.

COMING NEXT MONTH – Find out what's coming by turning to p29.

On the cover

Entertainer Peter Allen cools off as he displays some of the latest National Panasonic video gear. Don't miss our special feature articles on the coming revolution in home video electronics starting on p8. [Photograph courtesy National Panasonic (Aust) Pty Ltd and George Patteson Pty Ltd].

FEATURES

HIFI TOPICS AND REVIEWS

PROJECTS AND CIRCUITS

MICROCOMPUTERS

AMATEUR RADIO, CB SCENE, DX

COLUMNS

DEPARTMENTS

LOW COST PORTABLE OSCILLOSCOPES THAT DON'T COMPROMISE ON PERFORMANCE!

TTM303
15MHz
Mains and Battery Operation

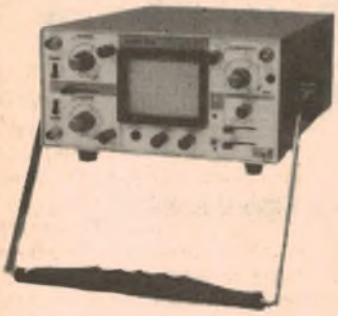
TTM303

The TTM Dual Trace Portable Scope Model 303 offers a high sensitivity of 5mV/DIV with DC to 15MHz bandwidth. The 3-inch CRT with 1.5kV regulated accelerating voltage gives a clear bright display.

This Portable Scope operates from standard line voltage (90 to 260V) or from the internal rechargeable Ni-Cad battery, that provides 2 hrs operation before recharging is required. It also operates from any external DC voltages of 11 to 30V, e.g. car batteries, standard 'C' size cells, etc.

SPECIFICATIONS:

SENSITIVITY:- 5mV to 10V/DIV 1-2-5 step with fine control. BANDWIDTH:- DC: DC to 15MHz (-3dB). RISETIME:- 24nS. OPERATING MODES:- CH-A, CH-B and Dual Trace TIME BASE:- 1μsec to 500 mS/DIV with fine control. EXPANSION:- x5 at all ranges. X-Y OPERATION:- X-Y mode is selected by SWEEP TIME/DIV switch. CH-A: Y axiz. CH-B: X axis. POWER REQUIREMENTS:- AC: 115/240V DC: 11-30V, 7.2VA. Battery: Ni-Cad Battery (up to 2 hour operation). SIZE: 113 (H) x 223 (W) x 298 (D) mm approx. WEIGHT:- 4.5kgs.



BS310S
Mains and Battery Operation
2mV Sensitivity
Add/Subtract Feature

APPLICATION BS310S

The dual trace Model BS-310 employs a high brightness 95mm CRT and offers a high sensitivity of 2mV/DIV from DC to 15MHz.

The ADD/SUB feature makes this model ideal for measurement and maintenance of computers and peripherals. This scope is recommended for FLOATING Measurements and FREQUENCY/PHASE Measurement (X-Y mode). Rechargeable battery operation makes it ideal for repairing TVs and other consumer and industrial equipment.

Now with 95mm rectangular tube

SPECIFICATIONS:

SENSITIVITY:- 2mV to 10V/DIV on 12 ranges in 1-2-5 step with fine control. BANDWIDTH:- DC: DC to 15MHz (-3dB). RISETIME:- 24nS. OPERATING MODES:- CH-A, CH-B, DUAL, ADD and CHOP. TIME BASE:- 0.5μsec to 0.5sec/DIV in 19 ranges and X-Y in 1-2-5 step with fine control. MAGNIFIER:- x5 at all ranges. X-Y OPERATION:- X-Y mode is selected by SWEEP TIME/DIV switch CH-A: Y axis. CH-B: X axis. POWER REQUIREMENTS:- AC: 115/240V DC: 11-30V, 7.2VA. Battery: Ni-Cad Battery (up to 2 hour operation). SIZE:- 113 (H) x 223 (W) x 298 (D)mm. WEIGHT:- 4.5kgs (5.5kgs including battery).

BS610
140mm
No Parallax Display

APPLICATION BS610

The BS-610 employs a high brightness 140mm Rectangular CRT with internal graticule assuring easy and accurate observation of waveforms without any parallax.

External DC-Powered operation expands the versatility of this oscilloscope to FLOATING Measurements as well as field operation.

Other features including TV SYNC and HF REJ, make this scope ideal for research and development, production lines or in-the-field service applications from computers to electrical appliances.

SPECIFICATIONS:

SENSITIVITY:- 5mV to 10V/DIV on 11 ranges in 1-2-5 step with fine control. BANDWIDTH:- DC: DC to 15MHz (-3dB). RISETIME:- 24nS. OPERATING MODES: CH-A CH-B DUAL, ADD and CHOP. TIME BASE:- 0.5μsec to 0.5sec/DIV in 19 ranges and X-Y in 1-2-5 step with fine control. MAGNIFIER:- x5 at all ranges. X-Y OPERATION:- X-Y mode is selected by SWEEP TIME/DIV switch. CH-A: Y axis. CH-B: X axis. POWER REQUIREMENTS:- AC: 115/240V DC: 11-30V, 7.2VA. SIZE:—145 (H) x 280 (W) x 369 (D)mm. WEIGHT:- 6.7kgs.

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Editorial Viewpoint

A problem at the grass roots level

Up until the late '60s, at least, component and radio factories were to be found, dotted around Australia. For school leavers, they provided a well trodden path into the radio industry.

Having been bitten by the "bug", many lads found their first job as an assembler or a wirer in a nearby radio factory. For some it led nowhere but, for many others, it provided support and background for continued hobby activity, and for study at a private or formal level.

Out of the ranks of assemblers and wirers came generations of well informed enthusiasts, amateur radio operators dedicated to home construction, servicemen, technicians, and quite a few qualified engineers. Those same men formed the backbone of the signals units during World War II.

From that same pool, through the years, has come most of the staff of "Electronics Australia" – men who knew the thrill of winning sound from that first crystal set, and the satisfaction of progressively filling the gaps in their understanding of basic theory. They shared that experience with readers.

But, over the last decade, factory after factory has closed down, to be replaced by bulk stores, crammed with imported goods. As the factories have disappeared, so have the grass roots jobs in electronics – or the bottom rungs of the ladder.

In that 10 years, we have become a nation of electronic consumers. We have more radio sets, more tape decks, more hifi systems, more electronic gadgets of all kinds than ever before. We listen to them, watch them, play with them, communicate through them, use them to work out problems – all with increasing facility but with a lessening perception of how the circuitry inside really functions.

These thoughts were prompted in part by a letter from a reader in Montefiores, NSW, who deplores the current dependence on kits, the attention paid to computers, the premature obsolescence of yesterday's projects, the readiness to discard rather than to fix. "Remember", he says, "that we were kids once, and there are so many more nowadays who need to learn how to use a soldering iron, and what to do from there on!"

Maybe there are, but try to tell the kids that! One of the anomalies we have come up against, in trying to fill recent staff vacancies, is that so many applicants are very familiar with built-up equipment but manifestly ignorant of basic components and circuits.

In short, a new kind of self-taught enthusiast is emerging, who doesn't have much regard for grass roots theory. If the industry is to have an assured supply of technicians, with a basic grounding in theory and practice, it will have to rely increasingly on apprentices and students trained in an organised and formal way.

Neville Williams

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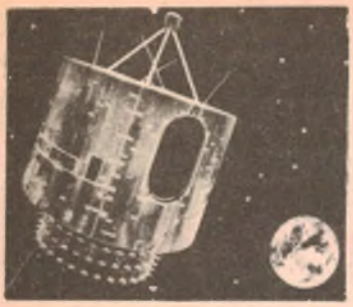


News Highlights

Radioactivity & coal-fired power stations

It is not generally realised that coal fired power stations create a signficant amount of radioactive pollution. According to David Fishlock, Science Editor of the London Financial Times, (27/11/80) the level is sufficient to justify monitoring in the interest of public health.

(In Australia, tests by the Australian Atomic Energy Commission, at Lucus Heights, NSW, confirm that significant amounts of radioactive waste are released from coal fired power stations. – Ed.)

According to David Fishlock, a study has been made by the National Radiation Protection Board, "watch – dogs" of the public interest in radiation. It is the first to be made in Britain in such depth.

The results show that public exposure from radioactive discharges to the atmosphere from Britain's coal-fired stations is about the same as the discharges to atmosphere from the whole of the nuclear fuel cycle as practised in Britain. The biggest contributor to the nuclear industry's releases, however, is not the nuclear power stations themselves but the reprocessing plant for spent nuclear fuel at Windscale.

Most minerals contain traces of the two nuclear fuels, uranium, and thorium, both radioactive, and traces of the products of their natural radioactive decay. In the combustion of coal in power stations the gaseous radioactive substances, mainly radon, are discharged into the atmosphere. Also discharged is a small proportion of the solid radioactive material, as dust. Claims and counter-claims have been made by those debating the politics of nuclear energy about whether a nuclear or a coal-fired power station "leaks" more radiation into the atmosphere.

The NRPB study, by Dr William Camplin, makes no attempt to compare directly the leakiness of the two technologies. Neither does it, consider the whole of the coal fuel cycle, from the coal mine to final disposal of the great bulk (99.5%) of the slightly radioactive ash as building material or landfill. Dr Camplin considers only the 0.5% of ash which evades the filters and is emitted from the chimney stack, together with radioactive gases.

Dr Camplin looked into five pathways by which people might pick up radioactivity from a coal-fired power station.

The most complex of these is through the foodchains, which involve movement of the activity into the soil, then into the plant, and then into an animal or directly to man. The contribution from this source dominates the estimate of the individual radioactive dose.

He estimates that the annual committed effective dose equivalent received by a member of a hypothetical critical group would be 23 millirems (230 micro-sieverts). This is less than 5% of the dose equivalent limit, and although conceivably some people in Britain could receive this much, he believes it likely that individual doses would be much lower.

Dr Camplin believes that enough radioactivity is normally emitted by large coal-fired power stations to warrant a program of environmental monitoring in the vicinity of a large power station to measure the true levels of radio-nuclides in animal food products.

Electronics: problems for auto industry

A "Car of the Future" conference, sponsored by the Australian Automobile Chamber of Commerce, was held in Canberra on November 27 and 28, 1980.

Technical addresses from General Motors Holden, Ford Motor Company of Australia, Robert Bosch Australia Pty Ltd and the Motorola Semi-conductor Group outlined the extent of new technology that will be introduced to vehicles on Australian roads within two-four years.

Particular emphasis was placed on new methods of manufacturing which, in turn, would force entirely new approaches towards servicing and repair of these vehicles.

Earlier the Conference was told that microprocessors and computer control would become commonplace for many vehicle functions in cars manufactured within the next two or three years.

According to the 1979 White Paper on Technological Change in the Retail Motor Industry, Australia's automotive retail and service repair industries seriously lack the expertise and the trained personnel to deal with technological advances currently being introduced into the world's automobiles.

Of major concern to the Conference participants was the rate of technological change and technical development, which has increased to such a point that current educational institutions and training organisations are unable to cope.

One delegate to the Conference claimed that some colleges were using 30 year old equipment trying to prepare young apprentices to work on new technology, highly complex 1980s motor vehicles.

Emphasis was placed on the need to re-equip technical and further education centres throughout Australia with more staff, better facilities, and more up-to-date teaching equipment.

AWA, Hughes in joint satellite venture

● **Amalgamated Wireless (Australasia) Limited** and **Hughes Aircraft, USA** are completing negotiations to form a team which will submit proposals to the Australian Government for the supply of satellite ground terminals. A team of AWA engineers had just returned from the Hughes plant in Los Angeles and has now set up a satellite project office at AWA's North Ryde Division in Sydney. The spokesman said Hughes and AWA must be one of the strongest contenders for the Australian satellite ground terminal system.

Changes at DSE

● Mr Ike Bain has been appointed Managing Director of the Dick Smith Electronics Group, while Dick Smith remains Executive Chairman. Mr Bain had been General Manager since 1975.

Predicasts: $200 billion US market in home electronics by 1995

Courtesy Predicasts, Inc., Ohio.

There's a revolution coming in home electronics according to a recent report released by Predicasts, Inc, the Cleveland-based business information and market research firm.

By 1995, says Predicasts, you'll be able to plan the annual household budget and the week's meals on the computer; get the latest stock reports from the cable TV; play checkers on a hand-held electronic game (and be soundly booed for a bad move; order a coat from a TV catalog; and talk to Ralph on the videophone.

Communications services will be the largest and fastest-growing home electronics category, according to Predicasts. Predicasts expects CATV to reach 90% of US households by 1995, with some 70% of households on 2-way interactive cable.

Solid growth is also expected for the audio-visual sector. Videodisc players in particular will shoot up a predicted 53% annually, reaching over 7 million units valued at nearly $1.5 billion.

Personal communications devices will also be an area of rapid technological innovation, while speech synthesis will greatly aid in personalising the home computer. Predicasts holds that a 2-way conversation facility, combined with continued cost reductions, will dramatically further the acceptance of the computer as a "member of the family".

$300 fine for breaching copyright

A video engineer was fined a total of $300 recently for possessing master video cassette copies of major feature films from which other infringing copies could be made.

John Ian Randall, 44, of Macquarie Street, Cromer, pleaded guilty in St James Court of Petty Sessions to five charges involving Stormboy, Rocks, F.I.S.T., and The Taking of Pelham 123.

He also pleaded guilty to a summons charge in similar terms involving The Hunting Party.

The offences, under the Copyright Act, were said to have occurred on February 13, 1980.

Randall was the proprietor of Electronic Instruments, a business carried on at his home.

On February 13 police seized from Randall's home 1300 video cassettes of cinema films and other title material, together with a quantity of documents and video recording equipment.

"The majority of these tapes are feature motion pictures and are subject to copyright with the exception of 56 video cassette tapes – all are of professional quality," Sgt Montford said.

He applied for an order for the forfeiture of 1216 video cassettes of motion pictures and other work which he said were illegal copies of cinema and TV films.

Mr G. Smyth, SM, refused a request that the seized tapes be erased and returned to Randall.

Mr D. Lasky, for Randall, said the tapes could be erased under police supervision.

He said the recording was a hobby and his client had no way benefited commercially.

"He had suffered large economic loss because of the seizure," Mr Lasky added.

AM stereo: the wrangle continues

The projected AM stereo service for the United States, using the Magnavox system, is still bogged down in legal and technical arguments. As reported in our August 1980 issue, the FCC originally gave the official go-ahead to Magnavox, but this was almost immediately challenged by other trade interests who claimed that the system had technical limitations. This was reported in our October issue.

The latest report comes from the US magazine "Radio-Electronics" for November 1980. It says:

Don't look for AM stereocasting to start any time soon. The best guess now is early 1982 at the soonest, as a result of the bitter controversy that erupted over the FCC's choice of the Magnavox system over four others. After the Commission chose Magnavox, critics were quick to point out that it generated "pops" at 95% negative modulation. Magnavox retorted that the pops are completely eliminated by special circuitry in the IC designed for the system.

Nevertheless, the Commission took note of the brouhaha over its choice by letting its engineering staff go back and refine and improve the decision-making that led to the choice of Magnavox. The decision will be released and the public will be given the opportunity to comment. That could result in the choice of another system, or in reaffirmation of the system originally chosen – but it means more delay. Although FCC staff sources say the delay could be as short as six months, past experience indicates it's more likely to be a year or more before there is AM stereocasting.

Laser rangefinder accurate to 5 metres

Shown in the photograph is the LP7 Laser Rangefinder, a British development that is in daily use in Britain's North Sea oilfields for the accurate positioning of oil platforms and drilling barges and with NATO forces for fire control, reconnaissance, and position siting for weapons.

The Rangefinder has a maximum range of 9km with an accuracy of ±5 metres regardless of distance. It weighs 2kg and has a built-in rechargeable battery that provides up to 600 measurements before charging. The equipment is housed in a rugged waterproof case and is of modular design to simplify repair and maintenance.

To make a measurement the rangefinder is aimed at the target and the firing button depressed. The range is immediately presented in the left hand eyepiece as a four digit LED display. The intensity of the display can be adjusted and in order to save power the display is automatically switched off three seconds after each ranging.

Further details from: Lasergage Ltd, Lennig House, Masons Avenue, Croydon, CRO 9XS, England.

NEWS HIGHLIGHTS

Artist draws on television

An artist can "paint" a colour picture or design colour graphics directly onto a television screen using this new microprocessor based device developed in Britain.

Called "Paintbox," it consists of an electronic drawing board called a tablet, a TV monitor and a floppy disc memory. The artist draws directly onto the tablet with a special stylus. Nothing appears on the tablet, but the moving stylus is followed by an electronic marker within the tablet. As its position is digitised and stored the drawing appears simultaneously on the TV screen.

Paintbox offers several advantages over conventional methods. The user can select a colour by switching a colour chart onto the screen, and touching the corresponding position on the tablet with his stylus. He can call up varying combinations of tone and brightness or alter the width of his stylus line. Paintbox even has an airbrush simulator, which "sprays" coloured dots onto the screen and the user can fill a defined area with colour at the touch of a button.

Originally developed by the Engineering Research Department of the BBC, Paintbox is one of several research projects being offered to British companies for manufacture and sale under licence.

Britain falling behind in micro industry says report

All is not well with the British chip (microprocessor) industry, according to a report in the London Financial Times (21/11/80). High development costs, lack of technical expertise, supply problems and depressed markets are some of the factors which prevent British companies applying the microprocessor.

These are some of the conclusions of a report on microprocessors in manufactured products published by the Policy Studies Institute.

It says that the Government's present support schemes such as the Microprocessor Applications Project should be continued and extended. The institute believes that Britain's industries face serious risks of falling further behind its major competitors in its application of new technology.

Already the report notes that some of the 90 companies it studied showed signs of falling behind their chief overseas competitors many of which had the advantage of substantial backing from their own governments.

The report also notes "the problem is not one of keeping in step with other countries but the much more difficult one of catching up from a position of weakness."

The institute also blames manufacturers' decreasing competitiveness on the fact that their products have bad or inappropriate design and specification, poor market research and inadequate after-sales service.

However not all Britain's industries are lagging behind foreign companies. The report says that at one extreme in the toy industry some companies are not only keeping up with world technology but actually setting the pace, but at the other extreme, in electronic games, Britain is well down in the ratings.

The institute says that the Government must be made aware of the fact that "British companies, if left to stand on their own two feet, may not have much chance against heavily supported foreign competitors."

The report claims that many British companies involved in microprocessors believe strongly that they are placed at a significant disadvantage relative to US and Japanese manufacturers because "they get second class treatment from their American suppliers in terms of prices, delivery times, access to the latest technology and help with development."

For this reason the institute felt that the Government's decision to continue to support Inmos, the silicon chip manufacturer set up by the National Enterprise Board, is a "partial but welcome recognition that some action is needed".

Satellite to rendezvous with Halley's Comet

The go-ahead has been given for a new satellite that will rendezvous in outer space with Halley's Comet, last seen in 1910, and, due to be visible again in 1985/86. The aim is for the satellite to intercept the comet so that instruments on board can obtain new information about the chemical composition of the region surrounding the nucleus and of the comet's famous "tail". It is also hoped to measure the comet's magnetic field.

British Aerospace, under contract to the European Space Agency (ESA), earlier completed a three-month study of the project and reported that a GEOS-type spacecraft could do the job.

ESA's industrial policy committee has now chosen the space centre of British Aerospace at Bristol to develop a satellite based on the design of Europe's first pair of GEOS geostationary scientific satellites.

BAe and ESA will negotiate a contract expected to be worth some $54 million. This will be shared between a number of European aerospace companies.

The satellite will be named GIOTTO after Italian painter Giotto di Bondone who observed the comet in 1301. His painting "Adoration of the Magi", completed around 1304, contains one of the first visual impressions of Halley's Comet.

GIOTTO will be launched during a 10-15 day period in mid-July 1985 and intercept the comet in March 1986. Because the time available for observation is only a few hours, the satellite must be highly reliable, as must the prediction of the orbits of both satellite and comet.

The satellite will have an on-board rocket motor that will fire the craft into orbit, while its advanced telecommunications system will transmit instrument readings a distance of nearly 160 million kilometres back to earth.

Illustrating the accuracy required for the rendezvous, British Aerospace says the satellite will have to pass less than 1000 metres from the nucleus — no mean feat when it is realised that the nucleus may be only a few kilometres across.

Special: the coming era in home video — 1

New-generation

Video cassette recorders have largely faltered since their introduction in the late 70s, but 1981 looks like being the year in which sales really take off. The reason — a range of new generation VCRs, smaller and lighter, and packed with features to make them attractive to the consumer.

by JOHN FREE

New table-model VCRs on dealer's shelves are notably slimmer, with distinctive, ultramodern styling. And what's inside these new-generation video cassette recorders – microcomputers for programming and switching logic, all-electronic tuners, soft-touch controls, new TV microcircuits – not only trims VCR size and weight to make the new look possible, it also means more reliability and operating flexibility. Competition is bringing last year's high-end features, such as high-speed picture search and slow-speed and frame-by-frame advance, to under- $1000 models.

These technology advances and features appear in portables, too. Manufacturers have whittled about 2kg off some earlier battery models. Now, with a 5kg portable and lightweight camera, you can tape on the go without straining under heavy gear. One new portable has a home-VCR first: stereo capability that adds an exciting new audio dimension.

The new lightweight portables, in the popular VHS tape format, helped squelch or postpone the expected introductions of two incompatible decks – so-called longitudinal recorders with fixed instead of spinning tape heads. Instead, only one new tape format has appeared, used in a remarkably compact 3kg portable.

Speed wars

VCR makers are now trying to capture sales by supplying more features at a better price. But until recently, the marketing emphasis was on recording time: *"Our models put more programming on a single tape than theirs."* Sony's first Betamax, which I tried five years ago, recorded just one hour.

Since then, with intense competition between the VHS and Beta tape formats, manufacturers have steadily boosted recording/playback time by slowing down tape speed. Machines for both formats can now record the longest movie or football game, so it's a standoff. But judging from the new models I've been trying and others I saw at demonstrations, there's a new kind of speed race – for the fast picture search.

The first speed-play model I tried was JVC's HR-3600. It doubles tape playback speed so you can bypass commercials, visually find a section faster, or actually watch programs in half the time. (A digital circuit prevents Donald-Duck-like pitch changes from doubled audio speed.)

Some of the newer decks have pulled out all the stops on playback speed for picture search. Sony's SL-5800 with BetaScan, for example, can boost tape speed from five to 20 times normal – in forward or reverse – to pinpoint a sequence or zip through commercials. Toshiba's SuperScan in its V-8000 Beta-format deck periodically displays pictures as tape whips by at 40 times normal speed. Audio, of course, is muted at

Catering to the overseas traveller, Sony's new SL-T7 "Color 3 System" video cassette recorder can play back NTSC and SECAM tapes as well as PAL-recorded programs. An 8-function remote control unit controls picture search and freeze facilities, in addition to the usual functions. (Note: the SL-T7 must be used with a modified receiver to take advantage of all three playback modes).

VCRs

Recently released *in Australia, National Panasonic's NV-7000 VHS video cassette recorder features 4-hour playback time, Dolby noise reduction, an electronic tuner, a 14-day 8-program timer, variable playback speeds, freeze frame, and a 12-function remote control unit. RRP is $1500.*

these high speeds.

The VHS decks, which load and scan tape differently than Beta-format models do, were initially left behind in the high-speed picture-search race. While catching up, VHS deck makers have stressed the slow-motion, freeze-frame, and frame-by-frame advance features of their machines. RCA's lead 1981 VHS model, the VET250, now has a forward or reverse picture-search feature at nine times normal speed.

Smart decks

Since microcomputers have crept into your new car, the food processor in your kitchen, and practically everything else, you'd expect to see them in VCR decks, too. In the 1981 models, the computer-on-a-chip handles everything from switching logic (pushing the wrong button won't harm anything) to the complex programming tasks of turning decks on and off automatically, to changing channels over a two-week period while you're away.

While microcomputers can increase the flexibility of complex equipment such as VCRs, they can also make deck operation more difficult. On its VC-6800, Sharp has a calculator-like keyboard for computer programming and an LCD panel that shows channels, dates, times, or even serves as a four-digit electronic tape counter.

For each channel you want to program in advance, you have to push some 18-odd buttons in an exact sequence. The panel and keys are also used in a complex procedure to fine-tune channels and assign them numbers. While the 6800's computer aids these tasks, its use demands patience and a knack for nimble, careful keyboard programming.

Sharp's 6800 can be programmed to change channels seven times up to one week ahead. This number-of-programs-days-ahead sequence varies widely among the costlier programmables. What makes this advance programming possible is the all-electronic (non-mechanical) tuners in virtually all new VCRs. Another nice feature is the soft-touch front-panel controls, which operate solenoids to quietly start or stop mechanical sequences.

What about recorded picture quality? Comparing brands, it's very difficult to detect any significant differences. Even in the six-hour VHS mode, where special noise-reduction and enhancement circuits are used, pictures are surprisingly good. Using test patterns, I noted that resolution was slightly worse with Quasar's lightweight VH5300 portable compared with more massive table-top models.

Versatile portables

"Consumers in the '80s will find a world of use for video and won't want to be limited by a stationary system to just taping and viewing TV programs at home,"

Hollywood hurries to put movies on video tape

MCA . . . Columbia . . . Paramount . . . Warner . . . Metro-Goldwyn-Mayer . . . 20th Century-Fox.

At times, from the names on exhibit booths, I felt it was a Hollywood convention instead of the annual summer Consumer Electronics Show in Chicago.

The new Hollywood names at the show confirmed that virtually all major motion-picture companies hope to benefit from the sales boom in VCR hardware and software (prerecorded tape). Until this year, distributor booths for adult or X-rated video cassettes dominated the video-tape scene at the show. (Studies indicate that while the sales volume of video pornography remains high, its percentage of total cassette sales is falling steadily.)

Why the new interest in prerecorded-cassette marketing? Hollywood companies and others have noted that VCR-deck sales are climbing steadily to the point where two million will be whirring in homes. If even a small percentage of this home-entertainment market buys its Hollywood favourites on prerecorded cassettes at $50 to $100 each, that spells big pofits.

Paralleling the explosion of new titles is the steady growth of new distributors and retailers. Stores specialising in video cassettes are popping up in larger cities. Mail-order video-tape clubs are multiplying, too. Some tape stores and nationwide chains such as Fotomat rent video cassettes. Pamphlets I collected at the show indicate there are distributors that specialise in everything from special-interest software, such as *The Two Best World Series Ever*, to such Saturday-afternoon TV staples as *Fort Apache* or classics such as *Citizen Kane*. One way to locate new sources of video software is to pick up some of the new video magazines.

Perhaps first prize for innovation in VCR-software distribution should go to a Santa Rosa, Calif, cable-TV firm. It plans to send prerecorded software to customers overnight on blank channels. A computerised controller to switch a subscriber's VCR on and off automatically is planned.

One development that may trim prerecorded cassette prices is the high-speed duplicator. Next year, Japan's Matsushita plans to offer a machine that can spew out 12, two, or four-hour VHS cassettes in four minutes. Conventional duplication techniques work on a "real-time" basis, with a master recorder and numerous slave duplication machines.

Flip cards *fit over buttons to aid programming the microcomputer in Sharp's VC-6800. LEDs on the deck's tape-remaining selector (left) light up so you can tell if there's enough to finish recording a program.*

says Charles Phillips, executive vice-president for Akai America. That's the logic behind Akai's entry into the VHS portable market last year and its improved model this year. Portables ae capturing a larger portion of VCR sales.

With a portable, of course, you aren't limited just to battery operation outside. All of the portables can be used with an optional tuner. A portable/tuner system works just like an AC-only, table-top model. The combination of deck and tuner costs about $1500, which may prove less expensive than buying an AC-only model and deciding later than you need a portable, too.

Akai's initial VHS portable could capture only two hours of material on a cassette. Its upgraded model, the VP-7350, includes a switch for six-hour recording. The 7kg portable also can record audio in stereo.

The Dolby noise-reduction circuits in the 7350 provide a 51dB signal-to-noise ratio. Akai's 7350 has another unusual feature: a key lock to prevent unauthorised use at a business, or at home by children.

Another new entry in the portable field is the two/four/six-hour VHS 7500 model from Hitachi. It weighs in at 7kg with its battery (compared with another VHS lightweight, Quasar's 5300, and the identical Panasonic PV-3000, which weigh 6kg with batteries). To help shrink the 7500s size, Hitachi used specially designed large-scale-integration (LSI) microcircuits.

The prize for compactness, however, goes to Technicolor's 3kg portable, which uses a new (nonstandard) ¼-inch tape – half as wide as VHS and Beta tape. "It is the first step toward a more comprehensive and versatile group of video products than would have been possible with former technology," said Jack Minor, president of the firm's audio-visual division.

The new portable deck was jointly developed by Funai Electric Trading Company in Japan and Technicolor. "Funai will manufacture the VCR, forerunner of the other related products in the video field," Minor said. "These will include a Technicolor camera and other innovative items to complement the VCR." The additional hardware may be available by the time you read this.

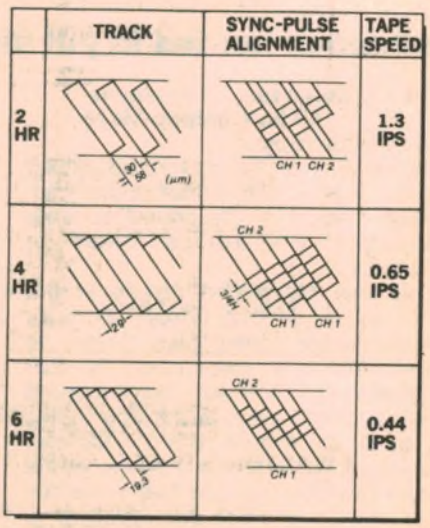
How to put six hours on a two-hour cassette

Many new VCR's now have a switch that reduces the tape-recording speed enough to put six hours of material on a VHS cassette originally designed for two-hour recordings. (Beta-type decks also have an extra-slow speed for up to five hours of recording.)

Several changes have been made in components and circuits to achieve the extra-long play. The chart (right) shows how some parameters change at various speeds in RCA's Matsushita-built VHS machines. The horizontal segments represent half-inch tape with diagonal recorded tracks. Adjacent tracks (CH1, CH2) represent a single 1/30-second (NTSC) TV picture frame, and are recorded or played back by heads on opposite sides of a spinning drum. (Some new special-effect VHS decks have a second pair of heads offset 90° from the other pair, and some JVC decks use four heads.)

Matsushita's six-hour decks without special effects have narrower heads (30 microns, or μm) compared with older two/four-hour VHS machines, which have heads 38 microns wide. As playing time is extended by reducing tape speed, the space between recorded tracks is reduced and even overlaps and erases parts of previously recorded tracks. Signals for adjacent tracks are altered before they're recorded to minimise interference between adjacent signals.

The sync pulses separating the 262-odd TV-picture lines (US NTSC system) on each track, for example, are aligned on adjacent tracks in the two/six-hour modes, minimising the effect of slight mistracking since adjacent tracks have similar picture content. In the four-hour mode, sync pulses can't be aligned, so they're offset slightly



(¾H). This precise offset causes adjacent interfering signals to cancel each other optically on the screen.

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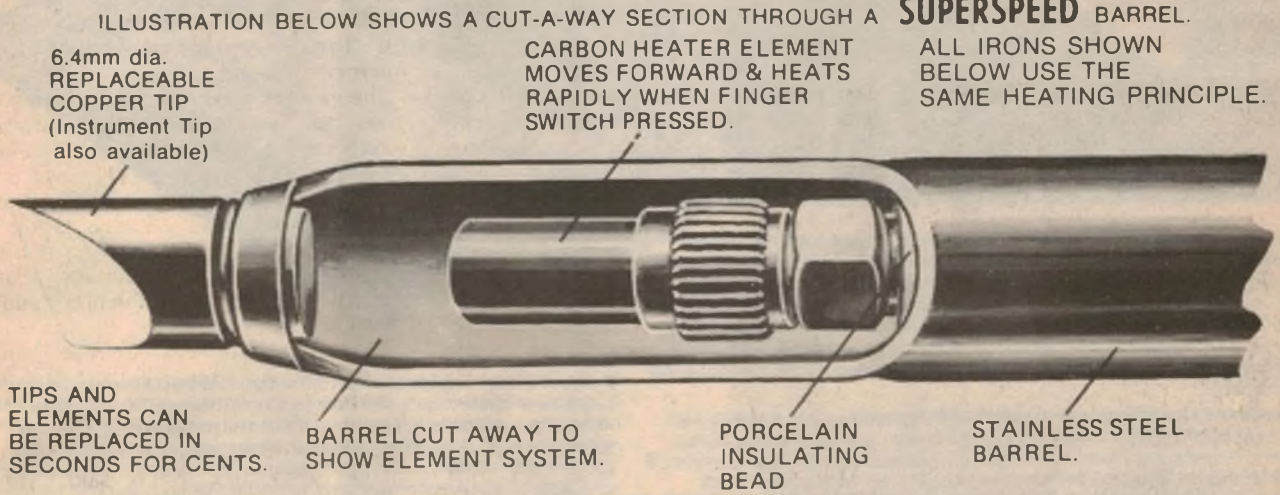

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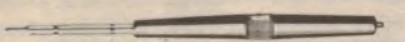

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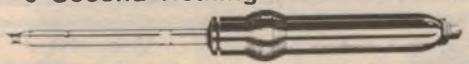

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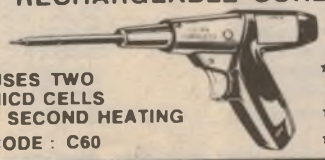

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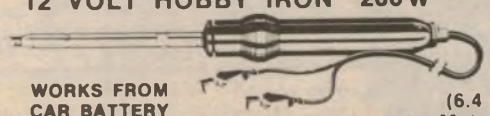

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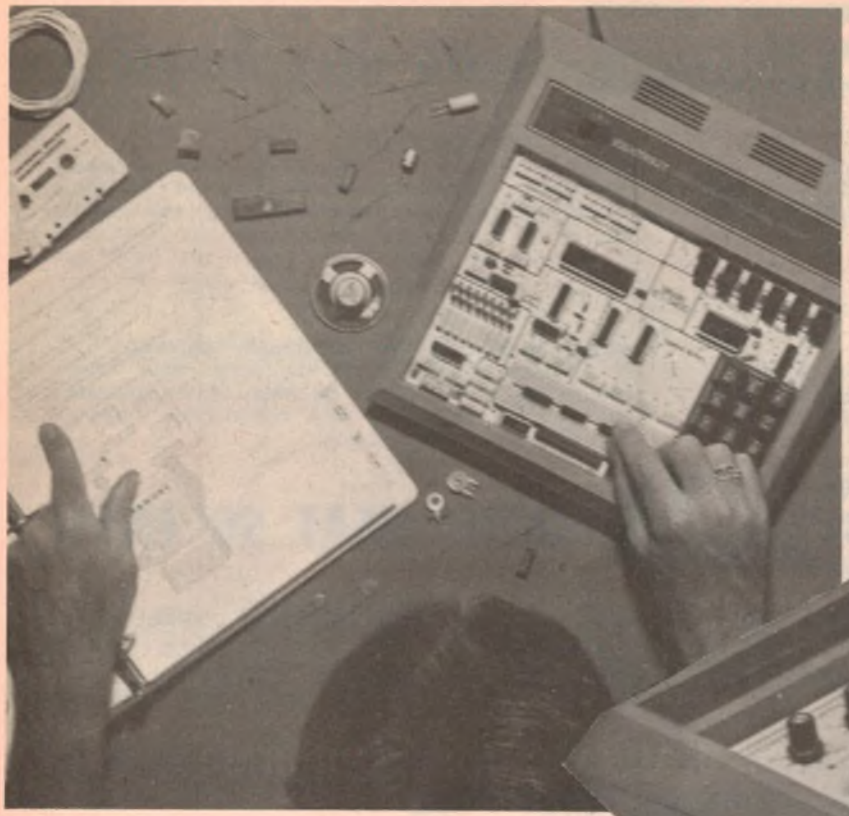

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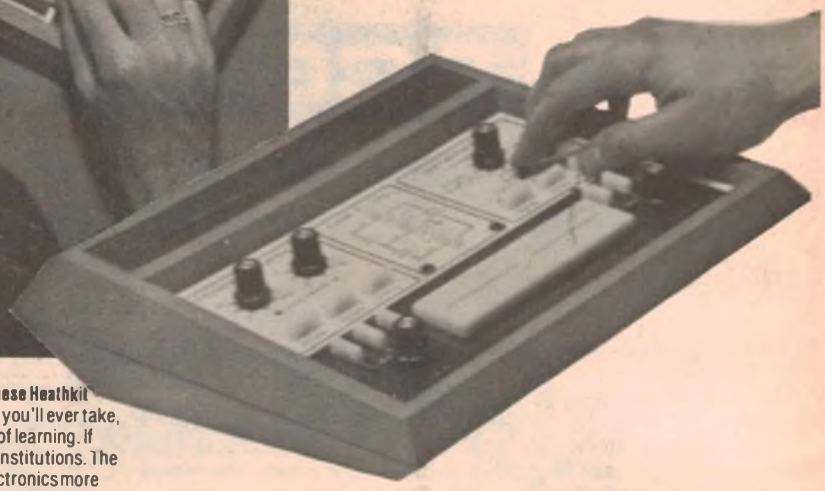

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New-generation video cassette recorders

Compact portable VCR *introduced by Technicolor uses a quarter-inch-wide tape in small (non-standard) cassettes. The 3kg deck records 30 minutes on a cassette. AC adapter (right) contains RF modulator that feeds signals to TV.*

Remote controls *for newer decks handle more and more functions. Slider control for JVC's HR-6700U varies playback speed while another button freezes TV picture. RCA's VET250 control has a button to change channels.*

Although the deck can be used with some portable cameras already on the market, special patch cables are needed for each camera.

The portable's battery supplies enough energy for 40 minutes of taping with a camera, and recharges in one hour. The recorder has a freeze-frame capability, slow and fast viewing speeds. Technicolor plans to market its new lightweight through video, camera, and other retail stores.

LVR's and more

Technicolor's marketing plans for its portable, and the latest 5kg VHS portables from Japan, were bad news for BASF. BASF had started a new factory in California to manufacture its longitudinal video recorder (LVR), which it has been demonstrating at European shows for several years. But the factory has now been closed down, and a new LVR model from BASF expected at the summer Consumer Electronics Show never appeared.

LVR machines use a fixed head, like audio tape recorders, with the tape pulled at high speed over the head. So-called helical-scan decks now on the market spin the video heads at high speed, but move the tape very slowly. While a 5kg LVR model sounded impressive a few years ago, helicalscan technology has caught up with it. Toshiba also demonstrated a slightly different LVR model last year. While it is planning to market an industrial version of its LVR, the consumer model expected was delayed this year, too. The LVR tape format is temporarily postponed, but its simple-construction and lower-cost advantages will no doubt surface again, probably in the form of advanced super-compact VCR decks.

Although the VHS and Beta formats seem firmly established, at least one other new tape format is on the way. Next year, N. V. Philips may introduce its eight-hour VCR in the US through its Magnavox subsidiary. This high-technology VCR uses a non-standard cassette that records four hours on one tape side; it is then turned over like an audio cassette for four additional hours.

Sony leads the recording-time battle with a cassette-changer mechanism for its decks that provides a 20-hour capability. But Philips reportedly has a changer for its deck that permits 48 hours of recording and playback. The recording-time war may start again in 1981.

Special: the coming revolution in home video — 2

Colour Video

Lightweight colour video cameras, available at a price the consumer can afford, will revolutionise home movie making and lend impetus to VCR sales throughout the 80s. Choosing the right camera depends on your budget and the features you want.

by WILLIAM J. HAWKINS

My oldest daughter was to be in a school play. Perfect, I thought, for a video taping.

With the J. C. Penney system I was using, I could tape the entire hour long show on one $13 video cassette. Not bad, considering that an hour's worth of film and processing for my super 8 movie outfit would have cost me about $150.

It's now all possible because of a new group of lower-priced home video cameras. Sure, colour video cameras have been around for years, but at prices ranging up to $50,000, they were a little out of reach for amateurs. New home cameras may be a step down in size and video quality, but they are affordable — from $750 to aout $1500. And even those prices are dramatically offset when you consider the cost of film versus tape. That doesn't include the cost of the videotape recorder you'll need, but it's not like a projector that sits in the closet for months at a time. You can use it to tape TV shows.

Video cameras take an image and convert it to a colour video signal that can be recorded on any videotape recorder. Since there's no film involved, there's no processing. You get an instant playback right on your TV set. Made a mistake? No problem. Just rewind the tape — as you would on an audio recorder — and try again. Record the same scene over again as many times as you like using the same tape. There's no waste and recording time is limited only by your recorder — up to six hours per cassette on some machines.

Choosing a video camera, however, is not as easy as using one. Price is one consideration, of course, but nearly all makers offer cameras at competitive prices. Picking the right one depends largely on how you'll use it, the features you'd like, and what equipment — if any — you already own. Here's how you sort through the variety of models available.

Just a camera

Despite their sophistication, video cameras rely heavily on conventional camera optics. Instead of focusing an image on a strip of film, however, the lenses on these cameras focus light on the face of an internal vidicon tube that converts the image to electronic signals.

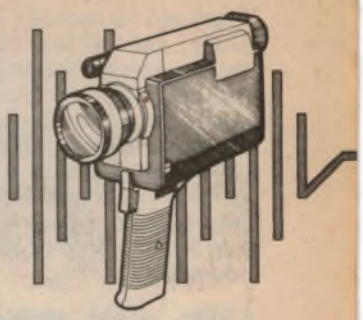
The lens used will have an effect on the type of recording to can make. Low cost models, for instance, usually have a single focal length, 25mm, f/2 lens. It's a standard lens with good quality, but it is limited — it has no wide-angle or telephoto capabilities.

The "f" number is a measurement of the "speed" of the lens — how much light it can gather. The lower the number, the larger its maximum aperture and the more light on the vidicon tube. An f/1.4 lens, for example, will provide twice the amount of light of an f/2. This means little if you do most of your shooting out-

Sony's video camera of the future

It's five years away, Sony representatives claim, but the "video movie" is not just a dream — the working prototype shown here is a complete video camera and recorder in one. Each miniature cassette (about the size of a microcassette, but twice as thick) holds up to 20 minutes of tape. Besides its smaller mechanics and electronics, one reason for its compact size is the use of a CCD chip (upper photo, far right) instead of a vidicon to sense a video image. Currently, the camera is placed in a home video editor (lower photo, far right) for playback on a TV screen or home recorder. Future versions may have playback electronics included. The total weight of the unit, including the rechargeable battery pack, is about 2kg.

Cameras



ABOVE & RIGHT: Sony's HVC-2000 Trinicon colour camera and SL-3000 portable VCR are ideal for both indoor and outdoor home movies. The camera features electronic zoom and fade, while SL-3000 VCR lets you record up to three hours of programming.

doors in sunlight. But as the light level goes down – say, if you move indoors – an f/2 camera will require additional floodlighting sooner than the 1.4.

Although more expensive cameras do have larger apertures (f/1.8 seems to be about average), the most significant change is in the type of lens you get; it zooms. One twist and you capture the whole family in a wide-angle picture. Another twist and you zoom in for a long telephoto shot. The typical zoom ratio (wide angle to telephoto) is 6:1. Many of these cameras give you macro capabilities: push a button and you can focus on something a few centimetres in front of the lens – a postage stamp will fill the TV screen on playback.

If you're on a limited budget, or not into exotic stamp shots, the standard lens will do fine. And many cameras, such as JVC's economy model, use a standard C-mount for the lens – unscrew the lens and replace it with an upgraded one later if you wish. But if you're a photo fanatic, save a little longer for the better lens – the additional capabilities it offers are worth the wait.

What you see is what it's got?

In photography, the human head can be decapitated without loss of blood – just a rise in blood pressure for the movie viewers. Properly framing a shot is just as important in video taping. To do it, these new video cameras use one of three methods: optical sighting, through-the-lens, or electronic viewfinding.

The Zenith KC1000, for example, uses the sighting technique. You aim the camera by looking through a pop up viewfinder and lining it up with a front mounted sight atop the camera body. The angle between sets the angle of the camera, properly framing the scene at an average distance. This works fine once you become accustomed to it (and you get plenty of tries since you can erase the video tape and use it again).

The through-the-lens systems (TTL) are a step up. Of these – Panasonic's PK-530 is an example – the viewfinder is optically coupled to the front lens, giving you two advantages.

For one, you see precisely what the lens sees – framing becomes simple and error-free. And second, you can manually focus the image as your subjects move. With a telephoto lens, for example, this is a must.

For a film camera, a through-the-lens system is the ultimate. But for video, it's only "next best". Top end cameras use an electronic viewfinder – a tiny 3.8cm black and white picture tube – to show you what's being recorded on tape. You look through a viewfinder equipped with a magnifying lens to see the CRT screen. Framing is simple, focus is precise, and even lighting is taken into account: If you can't see the scene on the CRT, it's not going on tape.

On some cameras, the CRT is mounted inside the rear of the camera body. Others, such as Sharp's QC-35, use an outboard CRT on one side of the camera. This allows you to move the camera closer to your shoulder for easier handling and better weight distribution. RCA's CC007 uses the same idea, but the CRT will pivot – from left to right side – for minority groups. Being a "lefty", and favouring my left eye for viewing, I found this a definite plus.

The CRT can be used for other things, too. Throw a switch on the Sony HVC-2000, for instance, and you see a display of the video waveform to help you set light levels. And one big advantage of a CRT viewfinder has nothing to do with recording – you can use it to play back a tape, as well. While some scenes just can't be re-enacted – like the night my three year old daughter fell asleep in her bowl of spaghetti – most can. Rewind the tape you just made and play it back through the camera. You see the scene – good or bad – in the viewfinder. If there's a problem, record it again. Great, but there is one catch.

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Without a special connector cable (which may or may not be available), most cameras cannot play back a tape unless it's attached to a compatible VCR (usually the same brand). There are exceptions, however, such as Sears' 53811, which has a video IN connection as well as the conventional video OUT for recording. If you're buying a camera only, be sure it is totally compatible with the VCR you're using.

LEDs, dials, things to try

All video cameras have circuitry that can compensate for a vast range of lighting conditions. But, in extreme changes, additional controls let you help it along.

When our eyes look at the colour white, for instance, we see white, whether it's in bright sunlight or a dimly lit room. To a vidicon tube, however, colour depends upon the colour temperature of the source. A white colour can turn reddish or bluish to the camera, depending upon whether you're shooting outdoors in sunlight or indoors under standard lighting. To compensate for it, all cameras have some sort of tint control (like the colour tint control found on NTSC colour TV receivers). Knowing where to set it is the trick, however.

For many cameras, you simply make a guess at the right setting, based on past experience. (If you're wrong, you can often correct the colour with the tint control on your TV during playback.) But some cameras take guesswork out of it. Push the WHITE BALANCE control on Sanyo's VCC545P camera, for instance, and you can adjust the tint while looking through the electronic viewfinder. Inside, LEDs show you when the colour is correct. The Sears camera gives you a temperature display on a small side meter – aim the camera at a white surface and simply adjust a control until the meter centres.

LEDs play an important role indicating other functions, as well. An underexposure LED, for example, tells you when to add light on a subject or when to readjust the iris to let more light into the lens (some cameras have automatic iris compensation, too). Another LED indicates whether the tape recorder is running or has paused when you press the camera tape-start trigger. Still another LED will show when the portable batteries are low (you've got about five minutes left). All these displays are in the viewfinder – you see the scene you're shooting plus a couplete status check in one glimpse.

RCA's swivel *CRT viewfinder allows the camera to be used from either shoulder.*

Sanyo's new VCC 545P *colour video camera features a built-in electret microphone, an electronic viewfinder, and a horizontal resolution of 250 lines. An AC power adapter (pictured) is included in the RRP of $1150 (approx).*

Depending upon the camera, there are a variety of other special-feature buttons, as well. They're designed to give your tapes a more professional touch. A FADE button, for example, fades into or out of a scene. And a ZOOM button controls a motorised zoom lens for jitter-free movement.

These are fine, but test every feature first, in the store, before you buy. Use a motorised zoom on a camera with a built-in mike, for example, and you may hear the whir of the motor on the sound track during playback. A quick check at the store will tell you.

Naturally, there are other things to check while in the store, too. Weight is one criterion, and the balance of the camera when you're shooting is another. If the camera feels clumsy or heavy, your taping sessions will become a real chore.

Specs? Sure, there are some you can check. Signal-to-noise ratio is one. Noise on a video signal means snow to a picture. The higher the signal-to-noise ratio (expressed in dB), the less snow you should see. Another spec is the horizontal resolution – the larger the number of lines, the better the picture detail. (And it will give you an indication of the vidicon quality – there are many types.)

Some specs become important depending upon how you use the camera. For outdoor portable operation, the lower the power requirement (wattage), the longer your batteries will last. For indoor use, the lower the minimum lighting spec, the less likely you'll need additional lights on your subject. Audio should also be an important consideration. If you take lots of telephoto shots (or try to tape school plays regularly), an external microphone will help. To use one, however, be sure the camera has an external mike input jack.

In use

What fascinates me most after using these cameras is how much they've changed me – the instant playback and erase and try again features of video tape make it all fun. I found myself shooting flowers, animals, people I didn't know – all the things I would never consider with three minute super 8.

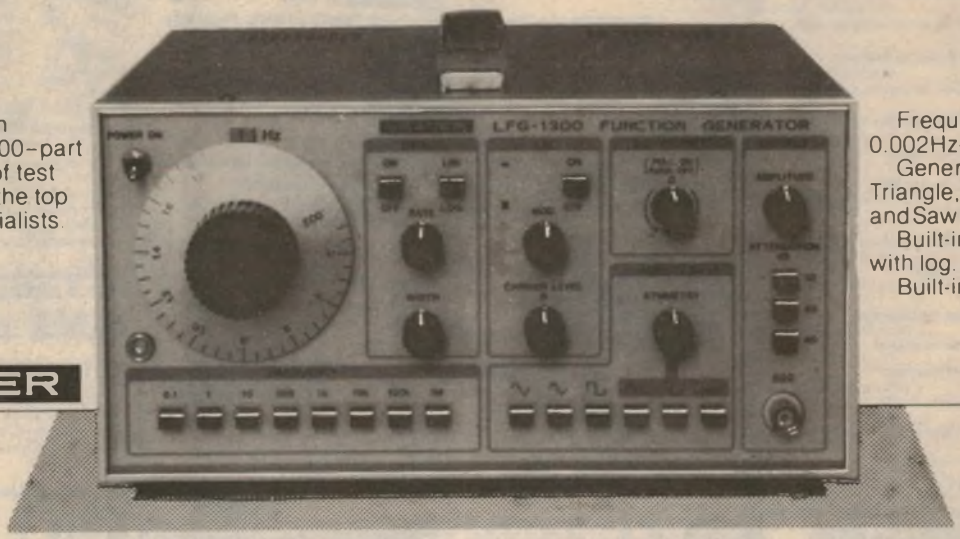
To be fair, however, super 8 is still more portable than video. Besides the camera, you'll need a portable VCR, fresh batteries, extra tapes, and maybe lights with an extension cord or two. Portable VCR systems do have fantastic advantages for home "movie" takers, but, for now, taking one along on a vacation is like taking your microwave oven along on a cookout.

Despite the portability problem, the results I've gotten from using a video camera have been excellent. And watching home "movies" is no longer a chore. There's no screen or projector to set up – just pop in the tape and turn on the TV. Picture quality is excellent.

Look to the 'LEADER'

The Function Generator with more flexibility, high performance and low cost!

Leader Function Generator LFG-1300–part of the new breed of test instruments from the top international specialists.



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PARTS FOR NEW KITS

If a kit you want to build is not listed, the parts may be available anyway. Check the Dick Smith Catalogue; or call in to your nearest Dick Smith store.

CRO SWITCH (See EA February)
Complete kit ..... Cat. K-3517 $69.50
PCB Only ..... Cat. H-8392 $3.75

SYSTEM 80 RS 232 INTERFACE (see EA February)
PCB only ..... Cat. H-8391 $2.25
All other components in this kit are normal stock lines

GUITAR FUZZ BOX (See EA February)
PCB only ..... Cat. H-8390 $2.15
All other components in this kit are normal stock lines

MINI SPOT 455kHz GENERATOR (See EA February)
PCB only ..... Cat. H-8389 $1.75
Other components in this kit are normal stock lines

AUTODIM (See EA Jan)
PCB (avail mid Jan) ..... Cat H-8388 $3.50
All other parts are normal stock lines

ETI MOSFET AMPLIFIER MODULE (See ETI January)
PCB (available mid January) ..... Cat H-8633 $9.95
Power Mosfets (low cost medium power types, as above) ..... Cat Z-1815 $15.00 pr

SELECTALOT (See EA December)
PCB ..... Cat H-8384 $2.95
All other components are normal stock lines

AC MILLIVOLTMETER
PCB ..... Cat H-8385 $2.25
All other components are normal stock lines

SYSTEM 80/TRS80 INTERFACE (See EA Nov)
PCB ..... Cat H-8383 $1.90
All other components are normal stock lines

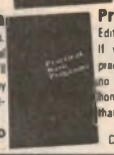
PLEASE NOTE: ABOVE PROJECTS AND PRICES ARE SUPPLIED FROM MAGAZINE'S ESTIMATES ONLY.

GET BOOKED! You'll save $$$!

Solid State Basics
Doug Demaw & Jay Rushgrave. 159 pages.
Contains a complete beginners course in solid state theory. This is backed by simple & useful projects that you can build. Illustrated & easy to follow.
Cat. B-2224 ..... $6.75

ARRL Electronics Data Book. 128 pages
Edited by Doug DeMaw.
This book covers math equations, data charts, explanations of technical terms & MUCH MORE! A must for any radio amateur/experimenter.
Cat. B-2203 ..... $6.75

Solid State Design
Wes Hayward & Doug DeMaw. 256 pages.
Radio amateurs: extend your theoretical understanding of solid state devices. You'll be surprised at what you can do by designing circuits; test equipment, transmitters etc etc!
Cat. B-2211 ..... $12.00



Practical Basic Programs
Edited by Lon Poole. 175 pages.
If you are having difficulty in finding a practical application for your computer – look no further. Applications include finance, home budgeting, statistics and many others that could help you save $$$!
Cat. B-2344 ..... $16.50

A DREAM COME TRUE!
FT902D With the new WARC bands!

Cat. D-2853
$1175.00

Most amateurs dream about a rig like this: now the dream is within your reach! All mode, digital readout, new WARC bands factory fitted this superb transceiver represents the absolute state-of-the-art in amateur communications!
Don't forget: we offer terms (to approved personal customers) and Bankcard.

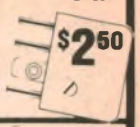
The Dick Smith SUPER CRO AT A SUPER PRICE!

We've sold 100's of these quality 6.5 Meg CRO's
Ideal for technicians, hobbyists, teachers etc.
- 10mV/DIV SENSITIVITY
- 10Hz-100kHz SWEEP FREQUENCY
- INCREDIBLY LOW PRICE!

Cat. Q-1280 ..... **$199.00**

HOBBYISTS/EXPERIMENTERS
Try this handy PHONE PLUG!

This handy plug is ideal for many experimental applications. Use it for intercom connections, amateur radio projects etc. Hobbyists, buy one for the junk box, you may never know when you need it!
NOTE: Not approved by Telecom for replacement of standard phone plug.



Cat. P-5700 ..... **$2.50**

Your First Computer
Rodney Zaks. 280 pages
Whether you are about to buy a computer or own one already, this book would be a valuable aid. You'll learn the many facets of a computer system - written in everyday language.
Cat. B-2386 ..... **$8.95**

You just bought a Personal WHAT? Thomas Dwyer & Margot Critchfield. 340 pages
Let your imagination go ... think of all the programs you can do with your new computer! This book educates the beginner & gives a structured approach to creative programming. There's even a section on business finance plus a chapter on expanding your computer system!
Cat. B-2331 ..... **$15.95**

The Kambrook TIME MACHINE

It may be no TARDAS, but Dr Who probably uses one to switch on & off K9 (His robot dog), security lights, electric jugs & frypans, the pool filter etc etc. It can switch on and off any appliance within a 24 hour period – you just set the time!
Cat. X-1120 ..... **$19.95**

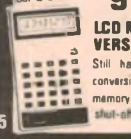
VVRROOOOMM!!
NEW LED TACHO KIT

Get the best from your car's engine. As with a conventional tacho, it displays the engine speed in an analogue form – but with an illuminated row of LEDS! It indicates at a glance what your engine is doing, without having to mentally interpret a numerical display as with a conventional tacho. YOU DON'T TAKE YOUR EYES OFF THE ROAD! Use with 12V positive or negative earthed systems. Only 3 connections are required and it is easy to build. Complete with instructions.
Cat. K-3240
ADD VALUE TO YOUR CAR **$24.50**

WATCH THIS SPACE
AND FIND OUT WHAT YOU MISSED
Each month all of our stores feature an outstanding special which is actually BELOW COST! N.B. Specials are strictly while store stocks last.
Don't miss out!

LAST MONTH:
AM/FM PORTABLE RADIO
Normally $22.50: reduced to $11.95

ECONOMY CALCULATOR
WITH LCD READOUT!
WITH MEMORY!
Cat. Q-3025 ..... **$9.95**
A bargain for pocket or purse. Batteries last for ages, auto switch off.
Cat. Q-3015



LCD METRIC CONVERSION CALC.
Still having metric troubles? Work out conversions with this beauty. It also has memory function with auto shut-off too!
$19.95

DON'T GET LOST!!!
(This side of the 'Rabbit Proof Fence')!

Next time you go holiday in a remote area take one of these with you just in case you get lost! Can tune into a radio station and be able to pin point its direction. Makes it ideal for bushwalkers, campers, fishermen etc etc.
Has 5 bands: AM/FM/VHF/SW/MARINE. At this price you can't go wrong!
Cat. D-2820 ..... **$125.00**

SAVING $10.55!

TALKING COMPUTERS!
Acoustic Coupler kit
Cat. K-3605

This Acoustic Coupler acts like a modem without any physical connection to the phone lines. It uses your standard telephone handset, placed over a small microphone & speaker in the coupler case, & transfers the information from your computer by sound. Now you can have your computer talk to another across the street, town or country! A must for all serious computer users.
$75.00

DUSTY DISKS?
Do you have valuable diskettes just lying around collecting dust? This library case will protect them from dust, dirt, heat etc. Holds 10 diskettes! Store away or folds into convenient position.
Cat. X-3515 ..... **$5.95**

SAVE $10.00 ON THIS GREAT PHONE DIALLER!
This is the ideal dialler for the experimenter, hobbyist etc. Features push button dialling plus a last number re-call! **WAS$49.50**
NOTE: Although this connects easily to the standard Telecom phone (no soldering required), present regulations do not permit so.
Cat. X-1175 ..... **$39.50**

YOU AIN'T HEARD NOTHING YET!
If you think your hi-fi sounds good, these units will make them sound GREAT!

Cat. K-3500

EQUALISER
Easy to build, easy to fit, easy to use! The Graphic Equaliser can adjust individual bands of frequencies in both channels to make up for system deficiencies, room effects and so on. Build now and save!

Cat. K-3510

ANALYSER
To get the most from an equaliser, you need to know where your system deficiencies are. The analyser tells you! So you end up with clear, pure sound! And this superb kit also doubles as a LED level meter, looks good, works really well! Complete with instructions.

EITHER UNIT NORMALLY SELLS FOR $99.50 NOW $89.50!!!
TIMBER SLEEVE SHOWN IS OPTIONAL AT EXTRA COST.
FOR THAT PROFESSIONAL LOOK: ONLY $8.50 (Cat H-3113)

THE RATINGS ARE COMING...
So why not get the best reception & SAVE!
Don't put up with John Wayne's Ghost appearing or a frosty Raquel Welch on your screen this season! Our antennas will get the bug out of bad reception.

Boost that signal...
With this mast head amplifier. Use with 75 or 300ohm sets. Gives 18db gain!
Cat. L-4200
The big gun for more difficult areas. 75 ohm. Use co-ax or twinlead. Cat L-4030
$39.50

Our biggest seller for good 0-2-7-9-10 reception in metro & near fringe areas.
Cat L-4022 ..... **$34.50**

READY FOR UHF?
Specially made for Dick to suit Australian standards. Adjustable directivity in 2 directions, very important for good UHF reception. Uses standard 300 ohm ribbon, too. Cat L-4028
$19.95

$54.50

CAN'T PUT IT UP?
CHECK OUR HUGE RANGE OF TV ACCESSORIES
Here are just a few...

28cm WALLMOUNT **$4.25**
Cat. L-4152
Wall or bargeboard mounting of vertical masts up to 5cm diameter.

69cm WALLMOUNT **$4.95**
Use for wall mounting or vertical masts. Both mounts are rugged & come with saddle clamp assembly.
Cat. L-4153

CHIMNEY MOUNT
Double arm, single strap. Complete mast assembly. Easy to mount.
Cat. L-4154 ..... **$9.75**

BARGEBOARD MOUNT
Mount any TV antenna from a vertical surface, bargeboard, wall, chimney etc. 139.7cm long.
Cat. L-4150 ..... **$6.50**

CABLE•PLUGS•SOCKETS•BALUNS• You name it– we got it!

MAJOR DICK SMITH RE-SELLERS:

Listed below are re-sellers who stock a large proportion of our range. However, we cannot guarantee that they will have any or all of the items, or at the same prices, as those advertised on these pages.

ATHERTON, QLD: Tableland Radio Service
2 Jack Street. Phone 912 017

BENDIGO, Vic: Sumner Electronics
95 Mitchell Street. Phone 431 977

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

BROKEN HILL, NSW: Crystal TV Rentals
66 Crystal Street. Phone 6857

CAIRNS, QLD: Thompson Instrument Services
79–81 McLeod Street. Phone 512 404

COFFS HARBOUR, NSW: Coffs Harbour Electronics
3 Coffs Harbour Plaza, Park Ave. Phone 525 884

DARWIN, NT: Kent Electronics
42 Stuart Highway. Phone 814 749

DUBBO, NSW: Selekta Sound.
31 Talbragar Street. 826 879

EAST MAITLAND, NSW: East Maitland Electronics.
Cnr Lewis & High Streets. 337 327

FAIRY MEADOW, NSW: Trilogy Wholesale Elect.
40 Princes Hwy. Phone 831 218

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

GOSFORD, NSW: Tomorrow's Electronics & HI FI
68 William Street. Phone 247 248

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

KINGSTON, TAS: Kingston Electronics & Records
Channel Court. Phone 298 802

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

LISMORE, NSW: Oecro Electric
Magellan St & Bruxner Hwy. Phone 214 137

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

MARYBOROUGH, QLD: Keller Electronics
218 Adelaide Street. Phone 214 569

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

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

MUSWELLBROOK, NSW: Silicon Chip Electronics
Suite 3, 98 Bridge Street. Phone 43 1098

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

NEWCASTLE, NSW: Elektron 2000
181 Wharf Road. Phone 262 844

ORANGE, NSW: M&W Electronics
48 McNamara Street. Phone 626 491

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

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

TAMWORTH, NSW: Sound Components
78 Brisbane Street. Phone 661 383

TOOWOOMBA, QLD: Hunts Electronics
18 Neil Street. Phone 328 944

TOWNSVILLE, Qld: Tropical TV
49 Fulham Rd, Vincent Village. Phone 791 421

TRARALGON, VIC: Power'N'Sound
147 Argyle Street. Phone 743 838

WAGGA, NSW: Wagga Wholesale Electronics
82 Forsyth Street.

WINDSOR, NSW: Hawkesbury Electronic Centre
111 George Street. Phone 773 411

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

WHYALLA NORRIE, SA: Miller Enterprises
Shop 2, Forsythe Street. Phone 454 764

WOULD YOU LIKE TO BE A DICK SMITH RE-SELLER?

How would you like to join the hundreds of successful Dick Smith re-sellers, spread right across Australia?
If you're interested, why not give our wholesale division a call – Sydney (02) 888 3200, 9AM – 5.30PM weekdays.
It could be the start of something big.

LOOKING FOR A LIGHT SHOW?

EA CHASER

Add life to your next party with this incredible Light Chaser. Features include reverse/forward chasing, variable flash rate control plus an invert/normal switch. This switch can make 2 lights appear to move instead of 1 at a time. The versatility is increased with 'auto reverse & inverse' functions. This automatically inverses or reverses the display at any set rate. All this makes it a worthwhile project that will save you $$$ and give hours of entertainment.

Cat. K-3145 **$69.50**

EA MUSI-COLOR

Turn your music into a coloured light show. This unit will accept an audio input from almost any amplifier and uses the information to control 3 channels of colour. Both the Musicolor and the Light Chaser are easy to build and come with detailed instructions. Makes it ideal for parties, discos, rock bands/concerts etc etc.

Cat. K-3140 **$59.50**

BARGAIN COMPUTER TAPES!

We've made a HUGE SCOOP PURCHASE of world renowned Memorex computer cassettes for computer recording. Is also ideal for recording notes etc (no drop outs)! These are professional quality (we've used them in our $25,000 computerised photo-typesetter and they're perfect!) These tapes are selling for less than HALF our normal computer cassette price – and they're much longer! Hurry – this is definitely a once-only offer. Buy now & save a fortune!

SIMILAR TAPES SELL FOR $12.00 EACH!

Cat. X-3501 **OUR PRICE: 95¢!!!**

TEST IT!

TRANSISTOR TESTER KIT

This one tests bipolar transistors, diodes, FET's and even SCR's & PUT's. It's a low cost and practical instrument sample enough for a beginner to build. Ideal also for the serviceman. A valuable piece of test equipment you can't afford to miss!

Cat. K-3052

$15.00 WAS $19.95!

BEAUT MINI ORGAN

Have hours of fun with this easy to build mini organ kit. Microprocessor technology provide versatility including tremolo & variable depth plus 2 switcheable voices. Comes complete with speaker & instructions (batteries & case not supplied). Cat. K-3430

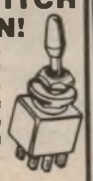
WAS $29.50! **$19.50**

IT'S HERE!

THE ALL NEW PLAYMASTER MOSFET AMP

SEE PAGE 57 FOR FULL DETAILS!

TOGGLE SWITCH BARGAIN!



A DPDT mini toggle switch for only $1.25! Contacts are rated at 125V 10A (but great for 240V at lower current). As used in just about everyEA & ETI project! Normally $2.50 each, but our bulk buying power enables us to slash the price. YOU REAP THE BENEFIT!!!

Cat. S-1168

WAS $2.50! **$1.25**

LEDS AND LADDERS GAME

One of our most popular kits of the past was the intriguing 'LEDS & LADDERS' game described in EA 1975. Now EA have come up with another version which is easier to build and play! Can you climb out of the well without being plummeted down again?

AND NOW FOR THE BEST NEWS: This kit is actually $1.00 cheaper than it was in 1976 – despite 4 years of inflation!

WAS $16.75 In '76 NOW ONLY

Cat. K-3390 **$15.75**

NEW NEW NEW NEW NEW

MINI SOLDERING IRON

This is the perfect iron for working on computer boards or any other detailed area. Comes with spare copper tip and heats up in seconds! The voltage is low so it is safer to work in those 'delicate areas'. Connect up to a car cigarette lighter plug (Cat. P-1875 @ 70¢) and you can repair things in the car!

$6.95

Cat. T-1920

TRANSFORMER TO SUIT: Cat. M-2155 multitap **$4.00**

SPARE TIPS:

Conical. Cat. T-1921 **$1.50**

Wedge. Cat. T-1922 **$1.50**

COMING SOON!

MEASURE IT WITH A DICK SMITH

PANEL METER

The MU range are of high quality with a full scale accuracy better than 2%! MU45. Dimensions – 58mm(W)x 52mm(H).

0-1mA – 120ohms	Q-2010	$8.50
0-50uA – 1.4000ohms	Q-2020	$8.50
0-5A DC – 3ohm (shunt)	Q-2030	$8.50
020V DC – 100ohm	Q-2040	$8.50

Dimensions: 100mm(w)x82mm(h).

MILLIAMPERES 1ma-120ohms. Q-2060 $12.50

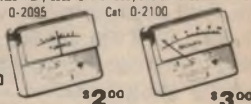
MICROAMPERES 100uA-1400ohms Q-2070 $12.50

SAVE EVEN MORE ON BULK PURCHASES!

TUNER PANEL METERS

As used in the famous Playmaster Tuner kit, these meters provide many uses for the hobbyist etc. Attractive finish.

Cat. Q-2095 Cat. Q-2100



$2.00 **$3.00** WERE $4.95 EACH!

RESISTANCE SUBSTITUTION WHEEL

Convenient size with large easy to read value selection that enables you to select values from 5 ohms to 1M ohm in 36 steps! Complete with leads and insulated crocodile clips. Fantastic for the experimenter, designer, hobbyist & serviceman. Buy a few & save hours of soldering!

Cat. Q-1410

$5.95

CAR COSTS BEATING YOU?

CDI COULD HELP

Thousands of happy motorists are saving money with CDI. You could join them! A Capacitor Discharge Ignition System could do any – or all – of these in your car.

- Increase spark energy giving better fuel combustion
- Help dirty or fouled plugs to fire – increasing time between plug changes
- Increase points life by lowering current through them – so car stays in tune longer.
- Give better cold and hot starts by maintaining firing voltage during cranking
- Help in wet weather driving

COMPLETE KIT:

SAVE! WAS $32.50 (Cat K-3280)

NOW: **$25.00!**

FUN WAY INTO ELECTRONICS

FUNWAY 1

It has to be the best way to learn electronics! The unique breadboard wiring system is simple, safe & a lot of fun. There are 20 exciting projects to build including the famous Beer Powered Radio!

B-2600 72 pages **$4.95**

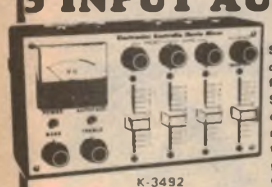
FUNWAY 2

Once you've enjoyed Funway Volume 1 why not step up to volume 2! Features 20 practical projects. There is full information on how to solder PLUS a guide to using your multimeter. Learn how to make PCB's. PLUS MUCH MUCH MORE! You'll have fun learning & building these projects & using them for a worthwhile purpose.

B-2605 128 pages **$6.95**

TEACHERS: Funway into Electronics has enormous educational benefits. Why not ask about our incredible discounts for bulk orders (10 copies or more). YOU'LL SAVE A BUNDLE!

3 INPUT AUDIO MIXER KIT



K-3492

Specially designed for the home recording enthusiast, this unit has more features than others selling for over $100! Features autofade from one channel to another for voice over music dubbing plus full bass and treble control. Also has 3 inputs with gain controls plus a master control! Complete with instructions.

$35.00 WAS $49.50!

SPEAK UP!

TELEPHONE AMP

Now you can let everyone hear that telephone message. This telephone amplifier has a sucker that attaches to the telephone. When someone calls, just switch on the unit to hear the caller loud and clear!

COMING SOON!

Cat. X-1174 **$12.50**

Build these simple kits & save $$$!

CONTINUITY TESTER

Checks the continuity of electrical circuits & components. Also gives an indication of continuity over a resistance range from zero to many thousands of ohms! Simple to build, it provides a valuable tool for the hobbyist when fault finding in projects.

Cat. K-2041 (Not illustrated) **$4.00**

2 OCTAVE ORGAN

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VISA

Glass bottles with lights in them

Readers of "The Serviceman" column in "Electronics Australia" over the years will have noticed valves disappearing from his case histories as solid state devices have displaced them. To one retired radio serviceman, however, those "funny glass bottles with lights in them" still remain an absorbing interest.

by BEN FURBY

Keith McIlraith, now 70 years old and in retirement in the city of Christchurch in New Zealand's South Island, still has the Browning Drake kitset receiver he bought as a boy and assembled – and over 100 other valve radio receivers as well. He remembers using the Browning Drake to listen to the radio coverage of the first attempt to fly the Tasman on January 10, 1928, by fliers Moncrieff and Hood in a Ryan monoplane. Wellington's leading station stayed on the air until 2am that night, but the fate of the fliers is unknown to this date.

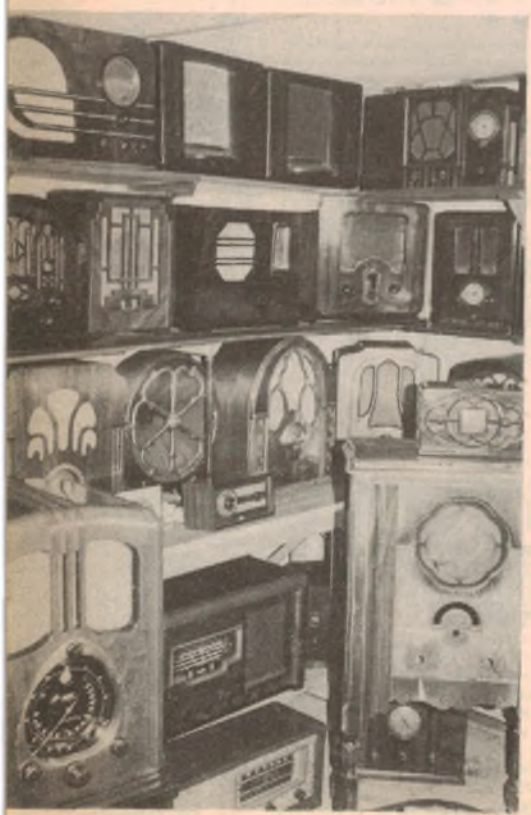
Possibly they overflew New Zealand in the darkness, or crashed in dense bush in some remote spot. In New Zealand the latter idea is still considered, and there is still interest in the possible discovery of the Ryan's wreckage, after 52 years.

In New Zealand, radio servicemen are licensed by the Electricity Registration Board, and after working for a while in a shop, Keith McIlraith turned his hobby into a career and qualified as a radio serviceman. In the town of Ashburton, 80km south of Christchurch, he operated his own business with considerable success until retirement – and collected radios as a matter of personal interest.

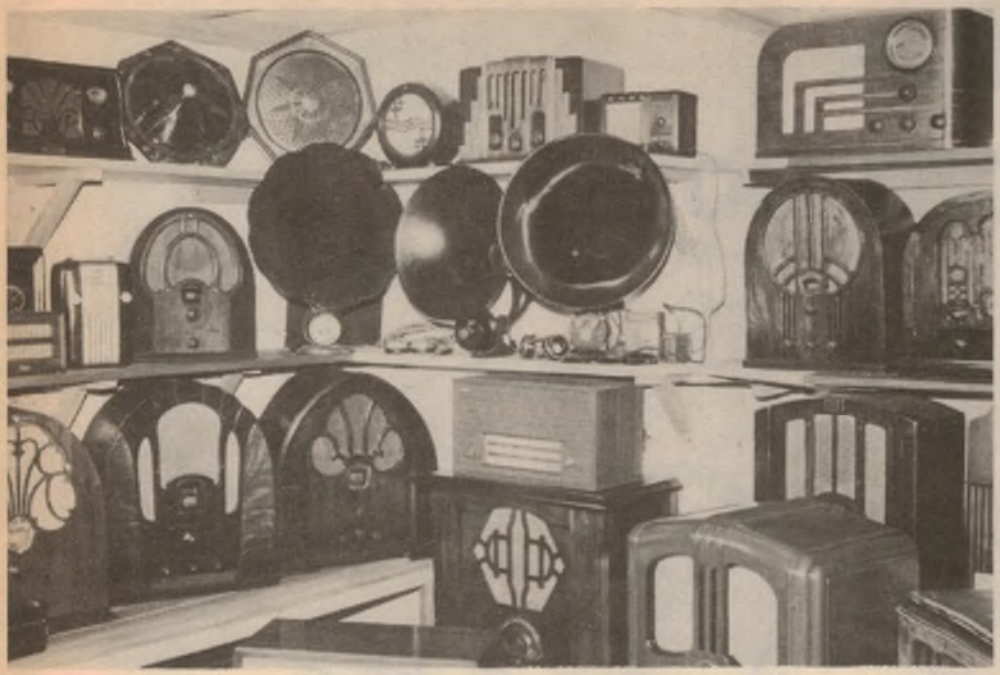
In retirement, the collection has become a major interest for him. Besides restoring the electronic componentry to operating order, cabinets often need major refurbishing: replacement of sections or veneers, and varnishing and repolishing to restore the former glory of these pre-television receivers. In many of the sets repaired, the restoration of major parts of the cabinets has been done so well that the work is barely noticeable.

Few Australian receivers were sold in New Zealand prior to World War II, and as local manufacture grew, the engineering tended to follow mostly USA radio practice. The post World War II shortage of US dollars created an opportunity for other manufacturers which Philips, always an active marketer and manufacturer in New Zealand, was quick to exploit. Philips' aggressive post-war marketing saw American valve types replaced by Philips equivalents and the widespread use of the European valve type code. AWA, also active in New Zealand, but more as a component supplier and a source of equipment, such as broadcasting transmitters, has always been prominent in New Zealand electronics.

Visiting Keith McIlraith's collection of



ABOVE: Keith McIlraith holds a radio receiver he made about 1925. It used two 01A valves and a crystal detector, and gave good reception on headphones. Other receivers in this photo and the photo at left include: 1923-24 Crossley (USA) 5-valve; 1931 Philco (USA); 1929 Philips 4-valve; Astor (Aust.) 5-valve; 1935 Cromwell (NZ) 5-valve; 1934 Stewart Warner (USA) 5-valve; 1932 Decca (UK) 4-valve; 1936 Stromberg Carlson (Aust.) 5-valve; and a 1938 Columbus (NZ) 7-valve.



Some of our older readers will recognise at least some of the brands in Keith McIlraith's collection. Famous makes include Zenith (USA), Philips, HMV, Air King (USA), Gulbransen (NZ), Burndept (UK), Amplion (UK), Philco (USA), Atwater-Kent (USA), Stewart Warner (USA), Rolls (NZ), Radiola (Aust) and Astor (Aust).

radios is a true walk down Memory Lane: names of manufacturers, once famous in radio and "wireless", are recalled by those with many years' association with the industry. The lineup of receivers also reminds us that Australia and New Zealand once had many competent radio manufacturers who built an efficient local industry that contributed considerably to those nation's efforts during World War II.

Twenty-five years from now

By W. M. WEBSTER

Technological change in home entertainment electronics, energy generation, and transportation will proceed more slowly over the next 25 years. But more importantly, sociological and economic pressures will play an increasing role in the selective development of technologies in these areas.

My assignment is to speculate about the world of 2005 – the end of the second 25 years of the *RCA Engineer*. To prepare myself for this assignment, I dug out a speech made by General Sarnoff in 1956 predicting some things about the world of 1976. This speech was one of the things that made me swear off making predictions.

In fairness, however, General Sarnoff was quite accurate in areas that he knew a lot about, such as television. I will learn from this and limit my comments to two areas: electronics with emphasis on the consumer, and energy including transportation. The main problem is in deciding what is likely to happen out of the many things that are or may become technically possible. In any event, it is unlikely that I'll worry much in 2005 about my accuracy – so here goes.

Electronics

Network and broadcast TV will still be with us. But television executives will emphasise news, interview and talk shows, and other formats that depend on immediacy. Also, alternative methods of delivering entertainment, such as pay TV and video disc, will partly displace broadcasting.

Low-cost digital technology will displace analog methods for most video signal processing but not for most transmission to the home. Digital transmission, however, will distribute signals via ground networks and satellites to broadcasters and cable operators.

The digital audio disc based on video disc technology will have a medium-sized market. But the audio disc will be less popular than the video disc, since most people will prefer good sound plus the picture.

Nearly every home in urban and suburban America will be connected to cable. And the cable will be two-way, with the upstream direction used for signalling and for low-speed data transmission. Access to channels carrying pay TV will be allowed or denied on a per-program, per-subscriber basis. Cable also will provide the main access to the services and databanks being market-tested today in Europe, Japan and the US. I think that the broadcast version of these services (similar in concept to RCAs "Homefax") will be introduced in the 1980s.

The systems which give telephone access to many different sources, but at a lower data rate, will be available in the 1980s, too. By 2005, these systems will be largely replaced by a switched system using the TV cable to achieve both the variety and the high data rate. This could be a connection supplied by the telephone companies. However, I think that the economics favour the development via cable. Distribution of these data services together with broadcast TV and pay TV, particularly of live shows such as sports, will share about equally the cable capacity.

With such widespread use of cable and the existing diversity of the broadcast system, I don't see a need in the US for direct broadcast from satellite to home. Although the technology will certainly be available, not enough homes will be without cable or be able to pay for the direct broadcast system. Direct transmission from satellite to home will be a reality in many other countries, however. Where the government owns the broadcasting system and particularly where no other system has yet been built (as in some Third World countries), the economics are quite different and will favour direct transmission from satellites.

A video disc with double the resolution in both the horizontal and vertical directions will be introduced in the mid-1990s. This high-resolution video disc will use an encoding technique that will permit compatibility with older players. Cable TV and probably broadcast TV will follow this lead. And, of course, the pictures will be displayed on a large, flat panel.

I have not put a computer in every home in 2005. Terminals with some intelligence will access the services and data I mentioned earlier. Some people will have fairly sophisticated terminals but I doubt it will be a mass market.

A great deal of intelligence, however, will be built into other things in our homes and autos. Appliances will be under microprocessor control. Discriminating switches will turn on lights, for example, only after sensing the simultaneous presence of darkness and a person. Room thermostats will operate similarly.

Energy and Transportation

By the year 2005, we will have had a war over energy or we will have learned to live with reality. In the first case, it would likely escalate to World War III and all predictions are off.

I believe that US energy needs will be somewhat reduced in 2005 – perhaps by as much as 15 percent of today's usage. More efficient climate control and more efficient transportation, both developed because of rising costs, will be mainly responsible for the reduction.

Use of passive solar heating, better insulation and efficient energy management will be economic realities by 1995. Photovoltaic solar cells will supply about 10 percent of our electrical needs in 2005. Nuclear power plants will supply 30 percent and the rest will be generated mostly by coal. None of these sources will be cheap.

There will be new oil and gas found, and liquid fuels will be developed from coal and alcohol. The energy packing-density of liquid fuels will increasingly reserve them for transportation. Gas, both natural and synthetic, will increasingly be used for residential heating because of the in-place delivery system.

The American public will not give up the automobile and the independence it provides. Mass transportation will continue to be used by commuters and for long-distance travel between large cities. Although the railroad system will have to be improved and rebuilt to deliver coal, the consequences will be some shift from roads to rails for goods but not for people. Instead, the autos of 2005 will be two- and four-passenger vehicles (for smaller families) of very lightweight but high-strength construction. The structural concepts used in aircraft construction will be adapted and plastics will replace steel. A comfortable two-passenger car with an empty weight of 550kg will get 30km/l. The difference between city and highway mileage will decrease because microprocessor-controlled stoplights connected in networks will phase themselves to the traffic needs.

I expect that the rate of technological change in the next 25 years will be slower in these areas than it was in the past 25 years. But one cannot anticipate major inventions such as the transistor which completely revolutionised our world and made today's computer technology possible. While other such revolutionary inventions are probable in the next 25 years, we engineers will have plenty to do to develop the technologies we already know about and to put them into profitable use.

Bill Webster, Vice President, RCA Laboratories, is responsible for directing RCAs central research organisation, located at the David Sarnoff Research Center, Princeton, New Jersey. He is also responsible for direction of technical programs at Laboratories RCA Ltd in Zurich, Switzerland; RCA Research Laboratories Inc in Tokyo, Japan; and RCAs Solid State Technology Center in Somerville, New Jersey.

A leader in the field of solid-state physics, Dr Webster joined RCA Laboratories in 1946 and made numerous contributions to tube and transistor developments. From 1954 to 1959, he was Manager of Advanced Development for the RCA Semiconductor and Materials Division. He returned to RCA Laboratories as Director of the Electronic Research Laboratory in 1959. He was appointed Staff Vice President, Materials and Device Research, in 1966 and has been in charge of RCA Laboratories since 1968. He was elected to his present position of Corporate Vice President in 1969.

Conclusion

In order to keep all predictors humble, let me remind you of the technical innovations of the past 25 years. In addition to the integrated circuit, solid-state memories and the microprocessor mentioned earlier, there were the Salk vaccine, manned space flight, lasers, microsurgery, the heart transplant, the "Pill", and permanent-pressed clothes. Some of these were perhaps predicted in 1955. But, I don't remember.

Australia's first under $300 COMPUTER...

$295
INCL. ZX80 BASIC MANUAL

Remember — *all prices shown include sales tax, postage and packing.*
N.B. Your Sinclair ZX80 may qualify as a business expense.

sinclair ZX80 -British made.

Until now, building your own computer could cost you around $600 — and still leave you with only a bare board for your trouble. The Sinclair ZX80 changes all that. For just $295 you get **everything** you need including leads for direct connection to your own cassette recorder and television. The ZX80 really is a complete, powerful full-facility computer matching or surpassing other personal computers costing much more. The ZX80 is programmed in BASIC and you could use it for anything from chess to running a power station.

Two unique and valuable components of the Sinclair ZX80: the Sinclair BASIC interpreter and the Sinclair teach-yourself BASIC manual. **The unique Sinclair BASIC interpreter:** offers remarkable programming advantages — unique 'one touch' key word entry. The ZX80 eliminates a great deal of tiresome typing, Key words (RUN, PRINT, LIST etc) have their own single key entry. Unique syntax check. Only lines with correct syntax are accepted into programs. A cursor identifies errors immediately, preventing entry of long and complicated programs with faults only to discover them when you run.

Excellent string handling capability — takes up to 26 string variables of any length. All strings can undergo all rational tests (e.g. comparison). The ZX80 also has string input to request a line of text; strings do **not** need to be dimensioned. Up to 26 single dimension arrays. FOR/NEXT loops nested up to 26. **Variable names** of any length. BASIC language also handles full Boolean arithmatic, conditional expressions, etc.

Exceptionally powerful edit facilities, allows modification of existing program lines. **Randomise function,** useful for games and secret codes. **Timer under program control.** PEEK and POKE enable entry of machine code instructions, USR causes jump to a user's machine language sub-routine. **High resolution graphics** with 22 standard graphic symbols. **The Sinclair teach-yourself-BASIC manual** 96 page book **free** with every kit.

Fewer chips, compact design, volume production means MORE POWER FOR YOUR DOLLAR! The ZX80 owes its low price to its remarkable design; the whole system is packed onto fewer, newer more powerful and advanced LSI chips. A single SUPER ROM, for instance, contains the BASIC interpreter, the character set, operating system and monitor. And the ZX80's 1K byte RAM is roughly equivalent to 4K bytes in a conventional computer because the ZX80's brilliant design packs the RAM so much more tightly. (Key words occupy just a single byte). You can add to the memory via the expansion port, giving a maximum potential of 16K.

ORDER FORM: SINCLAIR EQUIPMENT (AUSTRALASIA) PTY. LTD.
308 High St., Kew 3101, Vic. Tel. 861 6224

Quantity	Item	Item Price	Total
	Ready-assembled Sinclair ZX80 Personal Computer(s). Price incl. ZX80 BASIC manual, excl. mains adaptor.	$295.00	
	Mains Adaptor(s) (600Ma at 9V DC nominal unregulated).	$16.00	
	Memory Expansion Board(s) takes up to 3K bytes.	$ 28.50	
	RAM Memory chips — standard ½K bytes capacity.	$ 10.00	
	Sinclair ZX80 Manual(s) free with every ZX80 computer.	$ 15.00	
	I enclose cheque/Bankcard/ Diners Club/Amex	TOTAL	

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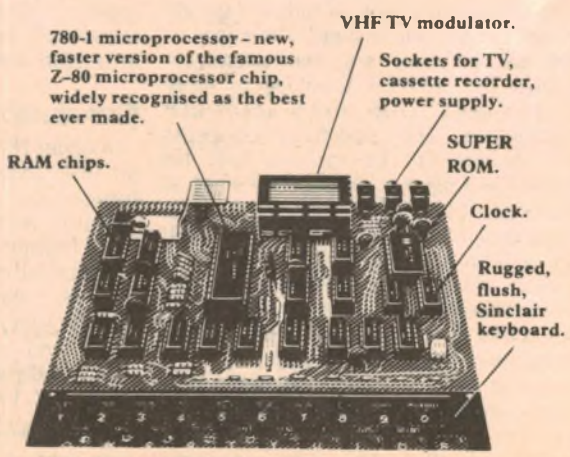
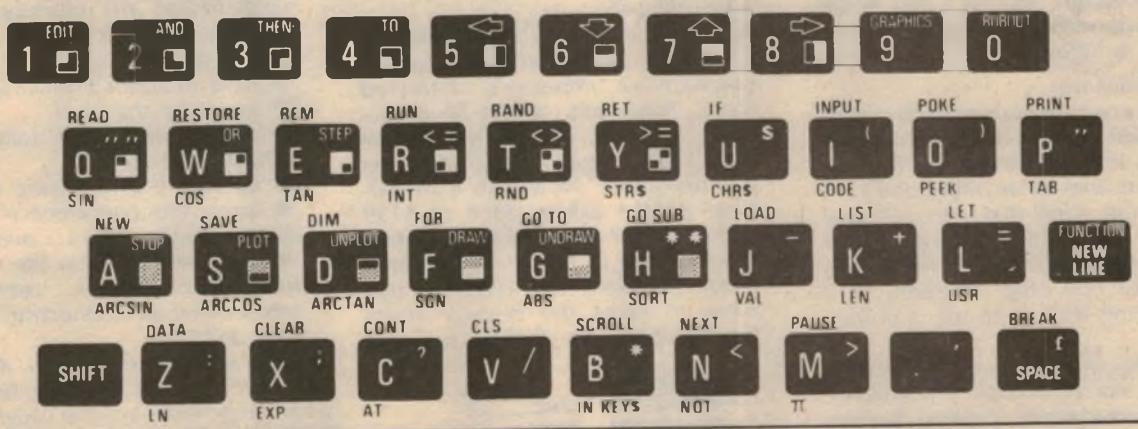


ZX80

COMING SOON

8K BASIC ROM

Fantastic new options for sinclair ZX80



THE CHIP a drop-in replacement for the existing 4K BASIC ROM, comes with a new keyboard template and a supplementary operating manual. Designed for high-level, full facility computing.

KEY FEATURES INCLUDE —

- Full floating-point arithmetic to 9-digit accuracy.
- Logs, trig, and their inverse functions, graph plotting facility.
- Animated displays using PAUSE n.
- Full set of string-handling facilities.
- n dimensional arrays, cassette LOAD and save with named programmes.

AND ZX80 16K-BYTE RAM PACK

Complete module designed to provide massive add-on memory capacity.

The 16K-BYTE RAM pack can be used for program storage or as a database. Yet it costs up to half the price of competitive additional memory.

Measuring 3 in × 3 in × 1.25 in approx., the RAM pack plugs into the existing expansion port on the rear of the Sinclair ZX80 via an edge connector. No additional power supply is needed.

SINCLAIR EQUIPMENT (AUSTRALASIA) PTY. LTD.

308-312 High Street, Kew, Vic., 3101. Tel. 861 6224.

SE3

FORUM

Conducted by Neville Williams

Non-approved transceivers and telephones — Moral problem or administrative mess?

A reader from Berowra, NSW is genuinely worried because he feels that "Electronics Australia" has been guilty of supporting double standards. Perhaps other readers have felt the same way and it may be helpful to publish his letter in full and examine the problems which he sets out.

First off, we don't resent the letter and we are not about to try to shoot the writer down in flames. The points he raises are quite legitimate and warrant a reasoned answer — even if it isn't in the terms that he might have expected. His letter runs as follows:

Dear Mr Williams,

I read several publications each month (including EA), and am normally not one to write to any of their editors. There is always a first time for anything, and I am writing in the hope that you will deal with my comments through your "Forum" column, as it is my belief that EA (and at least one other magazine, ETI) are condoning what is, to me, a double standard.

Whilst you probably are quite within your rights not to accept responsibility for advertising content, I believe that you do have the power to influence some of your major advertisers on the content of their advertisements. I list below four examples of what I call "double standard" advertising.

(1) At least two separate suppliers are advertising a push-button telephone dialling system and have been for some time. They carefully state that they are not approved for use by Telecom, however, they fit perfectly (no soldering required). One supplier obviously has sold all his original stock because he is now boasting a new bulk buy to reduce the price.

(2) The next example is the "Cutie Phone", which "although it easily replaces the standard Telecom phone, present regulations forbid them to be used for this purpose". I wonder what other purpose the average purchaser would have in mind! I understand that it even comes with a wall plug, which means that "Blind Freddie" could substitute it for his current phone, albeit illegally.

(3) The third example is a 40 channel CB radio, advertised as a "scoop purchase of importer's distressed stock. These sets cannot be licenced in Australia, but are brand new and ideal for parts or amateur experimentation." Now who is he kidding! At the asking price of $139 and the offer of a 100% guarantee, who is going to buy them for parts? I can only view this as encouragement to enter the field of illegal broadcasting. To further make a mockery of the situation, I seem to recall that this advertiser was one of the most vocal exponents of legalising CB in Australia! Now he seems to have changed his direction!

(Cartoon adapted from "Interface" newsletter, Sigma Data Corporation).

(4) Back onto the telephone again – a cordless phone and I really find it hard to believe my eyes on this one! "21st century technology is all around us and yet you still rent a telephone that has hardly changed since the days of Alexander Graham Bell. It is now possible with the Dick Smith X1178 cordless phone to:

- *have freedom from trailing wires*
- *use it by the pool*
- *receive and send calls from a remote location*
- *operate it as a paging system*
- *enjoy the convenience of push-button dialling, etc . . . even though this unit will work on the Australian telephone system . . . users will be prosecuted for connection or use of this unit."*

I suppose that covers you, Mr Advertiser, but it would be interesting to see what happened if anyone caught using it decided to join the supplier as co-defendant!

With apologies for the length of this letter, I now come to the role of yours and other magazines in this charade.

Whilst realising that you need advertisers, I personally believe that you have the right and ability to discourage this kind of advertising. This may be a hot potato for you, however, I strongly recommend that you, who I believe to have very high moral values, should tackle it head on.

I would be interested to hear, or read, your views on this subject. Other than that, I believe you have an excellent magazine, even though it sometimes goes over my head in some respects.

C.R. (Berowra, NSW).

C.R. mentions hot potatoes. This figure of speech is one that I find it difficult to exploit. If he would agree to swap the potato for a stone, I could proceed to

the remark that, in turning over the particular stone, he has uncovered a whole nest of worms – very mature worms at that!

In fact, the dilemma of which he speaks is not peculiar to the present; past events are very relevant to current attitudes, both in the business world and within our own administration.

One gets rather tired of making futile gestures; or, in the Australian idiom "of being the mug!"

I cast my mind back to the pre-war era when the Postmaster-General's Department maintained a very tight control over transmitting activities in Australia. They were able to do this, because their supervisory staff could cope with the limited number of would-be "pirates" in the community. Significantly, if you wanted a transmitter in those days, you built it yourself!

Their task was complicated, after the war, by the number of people who emerged from the services with an interest in radio and first-hand experience in the everyday use of transceivers.

However, the Radio Branch carried on much as before, sagely vetting applications for new services, inspecting equipment, conducting examinations and issuing new licences. For would-be "pirates" they had one message, based on the Wireless Telegraphy Act of 1905: the mere possession of equipment capable of transmitting radio signals could render one liable to prosecution.

Unhappily for the Department, another arm of the Federal Government was busily engaged in a quite different activity: getting rid of the military equipment that it no longer needed. And, of course, it included truckloads of surplus transmitters and transceivers. They were knocked down at auction to dealers from all over Australia, in the certain knowledge that they would be re-sold to the public.

And they certainly were – stacked to the ceiling in every second disposals store in the land.

ADVERTISING DILEMMA

I can't remember all the details now but the question arose as to whether we should or should not accept advertisements for ex-disposals transmitters. As a group of licensed amateurs, we were inclined to say no but the sheer futility of the situation was overwhelming.

On the one side, the Radio Branch was preaching "Thou shalt not . . .". On the other, the Defence Department of the same Federal Government was selling off thousands of transmitters and transceivers, most of them in working order, many of them new.

To pretend it wasn't happening would have made King Canute look like a sage. It would have earned us only ridicule from dealers anxious to advertise and from readers keen to know what the Government was unloading next, on to a market starved for bits and pieces by several years of war.

When disposals transmitter advertisements did begin to appear in our magazine, it was without hassle and without challenge – a complete anticlimax to our own internal hang-ups:

- Brand new AT5 transmitter . . . 140kc to 20 megs . . . with crystal and aerial coupling unit, circuit and instruction book . . . £27.10.0.
- New command transmitter . . . 5.3 to 7 megs . . . with valves and crystal . . . £9.10.0.
- Collins autotune ART 13 transmitters . . . with valves . . . £85.

So it went on for years, with successive governments, ministers and administrators aware of the anomaly but either unwilling or unable to do anything about it.

Ultimately, the equipment, the advertisers and the problem faded into history, with just a little of it still lingering in clearance houses like Deitch Brothers.

AND SO TO CB . . .

It was against that background that we watched the situation develop in relation to CB equipment. During 1976, 27MHz transceivers began to pour into Australia in far greater numbers than were needed to meet the demands of licensed amateurs and industrial users.

Not relishing the idea of 27MHz CB spawning in this country, the Radio Branch of the PMG Department made some attempt to control the situation by demanding that retailers keep records of purchasers. But, with no restraint whatever at the point of entry, it was like trying to stem a flood with a bucket! The Radio Branch itself couldn't keep up and the record system lapsed.

In the editorial for January 1977 our then editor Jamieson Rowe said "due to lack of co-ordination between Government departments, we already have a de facto CB service, albeit an illegal one."

And, once again, we found ourselves in the middle. Importers were being issued with licences to bring in any number of American standard transceivers, which were then being advertised, displayed and sold to the public, without restraint and presumably legally.

It just happened to be illegal to use them! How utterly ridiculous. And how completely reminiscent of post 1950.

In due course, the Citizens Radio Service was formalised and, overnight, "pirates" and illegal (to use) equipment had the chance to become legit. But, because of internal industrial action, the Radio Branch found itself unable to process all the applications and, for weeks on end, operators and stockists alike found themselves suspended halfway between piracy and long-sought respectability.

Ultimately, it was sorted out but still nothing was done about blocking the activities of those who trade in unacceptable

MR BUSINESSMAN!

here at last from DICK SMITH is a

STOCK CONTROL & PRICING SYSTEM

especially designed for Australian conditions

No, not just another software package imported from overseas, but one that has been written (at great expense)

by Australians for Australian businesses

In fact it has been modelled closely on the Stock Control and Pricing System used so successfully by Dick Smith Electronics.

The original system runs on an IBM computer costing more than $50,000 — but you can have the same benefits for less than one tenth of this cost (yes, for both the computer hardware and the software!)

While you're in one of our stores why not check out the many features of the System 80 and its peripherals?

You, and your business can benefit from this amazing system for less than you think!

HERE ARE JUST SOME OF ITS OUTSTANDING FEATURES

Cat X-3750

- Capacity for up to 1200 stock lines!
- Machine-language sorting for FAST operation!
- Ability to print out price lists as well as stock status reports and other listings (all dated!)
- Fast stock and financial status reports on the screen!
- Simple "menu-driven" operation — no special training required!
- Prints out stock count sheets for stocktaking, then gives you a printed analysis of all discrepencies!
- Special Australian Sales Tax feature (optional)!
- Easily expandable — so you're not forced to change to another system as your business expands!

$275!

(Program & Data Disks with comprehensive User Manual)

The full Dick Smith business computer system includes computer, monitor, disk-drives, expansion interface, large memory, cables, etc. — costs just $3,480.00. So with SCAP you can have a superb operating system for well under $4,000!!!

DICK SMITH Electronics

SEE OUR OTHER ADS FOR FULL ADDRESS DETAILS

table (to the P&T Dept) transceivers, antennas, "after-burners". This, despite the fact that there could no longer be an excuse that they were meant for use by licensed amateur station operators.

Which brings us to the present.

I rang Dick Smith personally and put to him C.R.'s question: How could you, as a one-time champion of legalised CB, now be offering 40-channel transceivers which do not meet the specs laid down by the Department of Communications?

He waxed eloquent in the manner of someone who has generated strong convictions. I summarise:

SAYS DICK SMITH:

- *Yes, I support legalised CB and I've tried to do the right thing.*
- *I've made endless representations to Melbourne and Canberra seeking practical support for legitimate traders who want to adhere to the Australian standards.*
- *I've received endless undertakings but they have all come to nothing. I simply don't believe them any more!*
- *With 40-channel (and more) equipment available from job lots, sales of legitimate 18-channel CB have fallen to a dribble. It's cost us something like $300,000 to back an administration which won't back itself.*
- *That kind of money affects jobs and staffing levels.*
- *It wouldn't be so bad if we got any credit for our stand, but we don't. Customers abuse our staff for not matching what they can buy somewhere else.*
- *Yes, we reversed our policy, and those are the reasons why.*

AND TELEPHONES?

The position in regard to non-departmental telephones and cordless telephones is a further extension of the same theme.

I came up against it personally when the subject was taken up by ABC television. They had been alerted to the anomaly of specialist shops in Sydney legally importing and selling telephones which the public were not supposed to connect to Telecom lines.

Seeking background on the subject, one of their reporters rang me (He's an editor; he's not involved; he ought to know what's going on!)

I filled in the broad background and made an on-camera statement. They also went off and talked to the retailers concerned, to a local manufacturer of "legitimate" equipment and to a representative of the P&T Department.

The report received nationwide exposure and comment. That was, maybe, a year ago and the subject was duly reinterred. The retailers went on importing and selling their verboten phones and Dick Smith went on being conservative. And here I add one more neo-quote in the style of the others:

- *The same with extension telephones. We were continually asked for them and abused for not stocking them. I got sick of being the mug!*

Nor is Dick Smith the only doubter.

During last year, our CB correspondent Jan Christensen included a "hot tip" in her notes, straight from the lips of the then Minister for Posts and Telegraphs, Mr Tony Staley. His department was preparing to come down "boots and all" on those who were selling unacceptable equipment – 40-channel (and more) CB, high power finals, cordless telephones, etc.

I crossed it out, partly because there was too much copy for the space available, and partly because I didn't believe it would happen anyway!

And, of course, it didn't. There was a general election, Tony Staley did not renominate and we're back at square one.

Perhaps the new Minister, Mr Ian Sinclair, may elect to "have a go" but then he has a few other morsels on his plate, like the status of the Australian Broadcasting Tribunal, multicultural radio and television, satellites, and so on.

THE "MORAL" ASPECT

C.R. rounds off his letter with a reference to morals, particularly as pertaining to this magazine and its Editor-in-Chief.

If morals are meant to relate, in this case, to an overall respect for, and observance of the law, I do confess to some difficulty in generating an unambiguous response to an administrative mess that has existed for at least 30 years.

As far as the Dick Smith advertisements were concerned, as quoted, the purchaser "victims" would obviously have been informed – and willing!

C.R. invites us to tackle the problem head on, presumably in the fond belief that we could pull advertisers into line with a particular point of view. Or, even if we did, that it would have the slightest effect on the vendors or the purchasers who never as much as see the magazine!

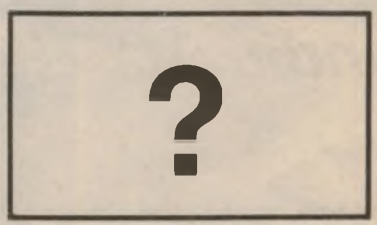
If anyone has to tackle the job head on, it must be the Government itself. Then and then only is it likely to become C.R.'s "hot potato". It's too big a job for "Electronics Australia", or any other single enterprise.

One final word: I am not being political in making the foregoing statements. During the 30 odd years to which I have referred, Governments and ministers of many persuasions have been in office.

But the "Too Hard" basket has remained blissfully undisturbed!

Coming Next Month*

Graphic Analyser with Colour Bar-Graph Display



We're so excited about this project that we did not even have time to have it photographed. Which is probably just as well really, because a small black and white photograph hardly does it justice. This analyser gives a dramatic multi-colour bar-graph display of your room or hifi system response, via your colour TV set. You can also use it to give a dynamic ten-band display of program signals. It is low in cost and easy to build.

Playmaster Guitar Amplifier

An easy-to-build guitar amplifier for practice or performances at small venues. Power output is 35 watts into a 4 ohm loudspeaker system and it all goes together in just a few hours.

***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.**

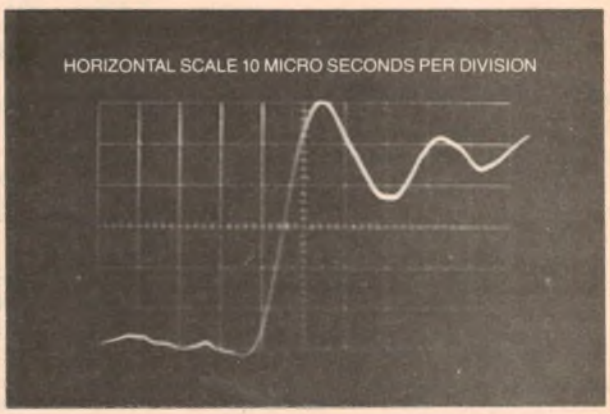
The moving coil replacement from Stanton Magnetics... the revolutionary 980LZS!

Now from the company to whom the professionals look for setting standards in audio equipment comes a spectacular new cartridge concept. A low impedance pickup that offers all the advantages of a moving magnet cartridge without the disadvantages of the moving coil pickup. At the same time it offers exceedingly fast rise time—less than 10 micro seconds—resulting in dramatic new crispness in sound reproduction—a new "openness" surpassing that of even the best of moving coil designs. The 980LZS incorporates very low dynamic tip mass (0.2 mg.) with extremely high compliance for superb tracking. It tracks the most demanding of the new so called "test" digitally mastered and direct cut recordings with ease and smoothness at 1 gram $^{+\frac{1}{2}}_{-\frac{1}{4}}$.

The 980LZS features the famous Stereohedron™ stylus and a lightweight samarium cobalt super magnet. The output can be connected either into the moving coil input of a modern receiver's preamps or can be used with a prepreamp, whose output is fed into the conventional phono input.

For "moving coil" audiophiles the 980LZS offers a *new standard* of consistency and reliability while maintaining all the sound characteristics even the most critical moving coil advocates demand. For moving magnet advocates the 980LZS provides one more level of sound experience while maintaining all the great sound characteristics of cleanliness and frequency response long associated with fine moving magnet assemblies.

From Stanton...The Choice of The Professionals.



Actual unretouched oscilloscope photograph showing rise time of 980LZS using CBS STR112 record.

STANTON

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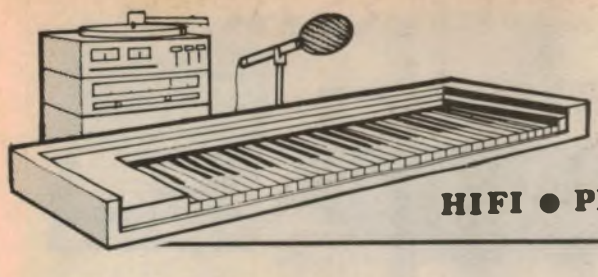


VIDEO DISC: Pioneer wants to be number one!

While most other companies seem content to let the video disc follow somewhere back in the wake of the new season's video cassette decks, Pioneer have taken a different approach. They are talking disc here and now and have already reached agreement with GMH whereby their video disc equipment will provide the essential audio/visual link between GMH and their Australia-wide network of dealerships and service centres.

The Pioneer/GMH announcement comes hard on the heels of another from the National Library of Australia in Canberra, indicating that they had installed what they believed was Australia's first video disc service which "allows film workers, researchers and others to view American films by plugging a video disc machine into a specially adapted television set".

Mr Ray Edmonson, Director of the Library's film section, said that the equipment installed was an MCA Discovision player using the laser principle – the only one currently on sale in the United States. The players are not normally available in Australia but Pioneer Electronics, the local distributors for MCA Discovision, had co-operated in obtaining a player for the Library.

GMH's new Pioneer/Rank Arena Video Centre uses 30cm laser discs which play for 30 minutes per side. One disc can carry as much material as twelve 4 to 5-minute film cartridges, as used in the now obsolete GMH "Mini Theatre".

According to Mr Edmondson "the Library's machine is a sophisticated industrial model, which has a built-in microcomputer enabling it to do such things as freeze frames and fast search film for particular frames."

Amongst the initial batch of features in the Library's disc collection is Fellini's "Cassanova", "To Kill A Mockingbird", "The Great Waldo Pepper" and the original "Frankenstein".

While the Library player was more or less a one-off installation, the arrangement between pioneer and GMH is on a much larger scale. According to Robin Macdonald, Publicity/Promotions Officer for Pioneer, "it makes Australia the first country outside North America to install laser video disc equipment in any numbers – a major breakthrough . . ."

Replacing the now obsolete GMH "mini theatre", the purpose of the new system is to communicate the latest training, sales and service skills, and product information, without having to take

VIDEO DISCS FIFTY YEARS AGO . . .

While practical commercial video discs belong undoubtedly to the 80s, the concept of recording television signals on disc is by no means new. Ten years ago, Decca and Telefunken developed a video disc with about a 10-minute playing time, which went on sale in Germany for a brief period.

But even Decca and Telefunken had been anticipated by John Logie Baird in England by about 40 years.

Baird had demonstrated his primitive mechanical-scan television to engineers in 1924, and exhibited it to the public in 1925 in Selfridges store in Oxford St, London. The signals were broadcast in 1926 and Selfridges opened a TV sales section in 1928. It was during the period 1926/8 that Baird first concentrated on video disc recording.

Since his low definition television signals required a bandwidth of only 13kHz, Baird realised that, with care, they might be accommodated on a standard 78rpm record. He patented the method in October 1926.

How to record picture and sound on the one disc posed a problem but Baird suggested that the most practical scheme would be to use side-by-side concentric grooves, played by a dual pickup. In fact, he seems to have concentrated on single groove recordings carrying picture information only.

Perhaps sound wasn't really all that important for the disc that went on public sale in Selfridges in 1935. Presumed to be a copy of one of Baird's 1928 test cuts, it carried 10 drawings on glass depicting the faces of Marconi, Harry Lauder, Stanley Baldwin and a number of other people who can no longer be identified.

Those 10, flickering, silent images are a long way from today's full colour television but they represent a notable piece of electronics history.

Pioneer's industrial Laser Disc Player with remote control (left) and two typical MCA Discovision feature movie albums.

staff out of their normal dealerships to attend regional and Head Office seminars.

The GMH Video Centre, as the new system is called, consists of a Discovision 7820 laser disc player, produced by Universal Pioneer Corporation, a TV monitor and an optional Pioneer sound system. It is housed in a special cabinet constructed by Rokor, Pioneer's manufacturing subsidiary.

The 7820 video disc player features fast visual scanning in forward and reverse modes, single frame display and what Pioneer describe as "chapter search", an invaluable aid for educational and office use in the future. The player can reproduce a normal movie or access any of 54,000 distinct frames on one side of a 30cm disc. To find and display a nominated frame takes a maximum of five seconds.

Because General Motors in the United States and Canada has taken up the Video Centre concept on a huge scale – to a total of 11,500 units – GMH in Australia should have access to a vast amount of general software.

However, they have also arranged to produce software in Australia, through AAV, to the master video tape stage. It will be shipped to Discovision Associates in America, where video and audio will be transferred to the laser disc.

The entire system operates to NTSC standards. However, it is to be displayed here on an Australian sourced Rank Arena receiver/monitor, which has been adapted to operate from either NTSC or normal broadcast PAL video.

The Video Centre is to be supplied, installed and serviced by Pioneer Electronics. The package price to GMH dealers stands at "under $4000", and installation is planned for May, this year.

While projects like this serve to focus early attention on Philips/MCA Discovision, they also tend to draw attention to editorial opinion expressed some months ago in the Japanese English-language journal JEI. They expressed the view that the laser system is well suited for industrial applications but less so to the consumer market. Here, the capacitance systems of RCA and JVC would appear to have the advantage, on the basis of simplicity and economy.

Les Black, Managing Director of Pioneer Electronics Australia rejects this view outright. He maintains that the multi features of the Discovision system and the complete freedom from disc and "stylus" wear will more than offset the price advantage of the two competing systems.

Discovision retails at present, at a little over $700 but developments in the pipeline will bring this figure down markedly, without sacrificing performance.

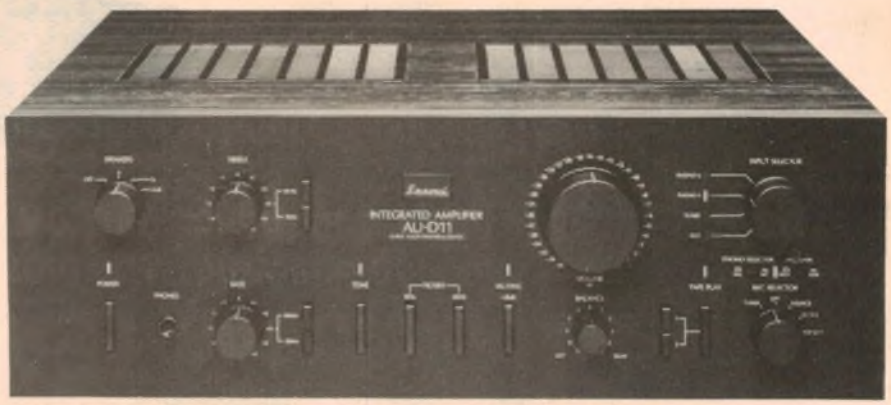
As far as Pioneer Australia is concerned, they were saying in October last that they expected to be the first company in Australia to market the video disc system. They were also tipping a delay of about 12 months for PAL system equipment to become available.

The more recent press release announcing the GMH Video Centre still maintains: "domestic release is tentatively set for 1981".

Pioneer are obviously still hopeful of being number one in the marketplace.

To some degree, this will depend heavily on the availability and supply of video disc players and software designed

FROM SANSUI: Feedback plus "feedforward"



Sansui's latest contribution to the struggle for ultimate performance in hifi amplifiers is found in their new models AU-D9 and AU-D11. In addition to the normal negative feedback provisions, Sansui engineers have applied what they describe as "Super feedforward" to the power stage. Although patented in 1928, the method has rarely been used in commercial amplifiers. Basically, it involves sensing the distortion content being produced by the output stage, processing it through a separate small supplementary stage and applying it independantly to the load. The aim is not just to reduce distortion (as by negative feedback) but to cancel it altogether. Sansui claim that it can cope with all forms of distortion, including switching distortion; this being the case, it removes the point from current debate about class of operation: class-B, class-A, etc.

The AU-D11, as pictured above, offers 120W min. per channel into 8 ohms, both channels, 10-20kHz, with a THD of 0.005% max. Actual response (-3dB) is DC to 300kHz. Dimensions are 445 × 163 × 443 (mm, W, H, D) and weight 14.5kg. The AU-D9 offers 95W min per channel, being slightly less deep and about 1kg lighter. Both have the same panel layout and offer a full range of user facilities. (Our information came direct from Japan. In Australia: Vanfi Aust Pty Ltd, 162 Albert Rd, South Melbourne, 3205. Phone (03) 690 6200.

Sony's inseparable separates.

Sony's new ST-J55 tuner and TA-F55 amplifier come in elegant matching designs. Separately, they're outstanding. Together, they're out on their own, both in appearance and performance.

The J-55's tuner is frequency synthesized and quartz locked. A neat line of feather-touch switches gives a choice of Memory, Auto, or manual tuning.

The J55's incredible electronic MNOS memory tuning lets you preset your 8 favourite AM/FM stations – including reception adjustments like muting or mode pre-set.

The other half of the team, the 65W F55 Amplifier, features an electronic motor driven volume control, straight signal processing circuit construction, revolutionary Heat Pipe, and Pulse Power Supply, providing extremely clean and noise-free sound quality.

The F55 operates with almost any type of MC and MM cartridge; has gold-plated phono jacks, oxygen-free copper wiring, metallized film resistors and polypropylene capacitors.

You won't find better engineering than these. Not even from Sony.

SONY®

AP 3526

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MARANTZ ST500
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Sleek, slimline and microprocessor controlled — tune and recall stations with amazing speed and precision. The Computuner features state-of-the-art, quartz-locked, drift free frequency synthesised tuning with 7AM and 7FM memory presets. The LED signal strength display doubles as a multipath indicator and the Wide and Narrow IF Selector enables the switching of a tuning bandwidth best suited to reception area conditions.

MARANTZ ST600
AM/FM STEREO TUNER

This model incorporates a built-in oscilloscope that affords the most precise means possible to determine optimum reception, even from weak or distant stations. The functions of the oscilloscope extend well beyond those of conventional tuner meters.

MARANTZ ST400
AM/FM STEREO TUNER

A large, fuss-free Vacuum Fluorescent readout clearly displays the selected frequency and Electronic Gyro-Touch with Servo-Lock guarantees drift-free, razor-sharp tuning every time. Uncompromising quality through and through.

MARANTZ ST300
AM/FM STEREO TUNER

Consistent with all quality Marantz tuners, the ST300 features MOSFET FM front end and Phase Lock Loop demodulator for superlative performance — low distortion, extremely linear operation and wide dynamic range. Illuminated dial cursor, LED function indicators and Gyro-Touch tuning make the ST300 an exceptionally sophisticated buy at a modest price.

Your Marantz stockist will be pleased to demonstrate the complete range of Marantz tuners. If you see your hi-fi as an investment and, if you demand critical performance standards as well as the best value for money, listen to the future.

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to work with PAL receivers.

The first round for system supremacy will be fought in the US and Japanese arenas, where NTSC reigns supreme. The mass markets in Europe, Australia and elsewhere will attract attention from the various manufacturers only when they can afford to divert some of their manufacturing potential to the production of PAL standard equipment.

This could conceivably give Philips and possibly other European manufacturers a head start in the PAL markets.

However, reports from Japan have drawn attention to another factor which could vitally influence public preference in longer term — success or failure in producing good quality recordings, substantially free from noise and dropouts.

Pioneer President Yozo Ishizuko claims that his company has had considerable success in this area and may, in fact, be leading the World.

Their discs are made from PMMA (Poly Methyl Meta Acrylate resin) sometimes referred to as resin-glass, by reason of its high transparency.

At a video disc test plant at Pioneer's Kofu factory at Yamanashi Prefecture, discs are produced by injection moulding at a temperature of 200°C. One of the prime aims is to so control the entire process that the discs which emerge will be free from inherent stress and warp.

PHILIPS, SONY DISCS

In the Netherlands, according to the same report, Philips also use acrylate resin but subjected to photo polymerisation by ultra-violet radiation. This modifies the molecular structure and produces a very hard disc. The method is technically difficult, however, and Philips are reportedly studying the Pioneer approach.

Sony also produce optical video discs, but they appear to be relying more on conventional pressing techniques,using vinyl chloride.

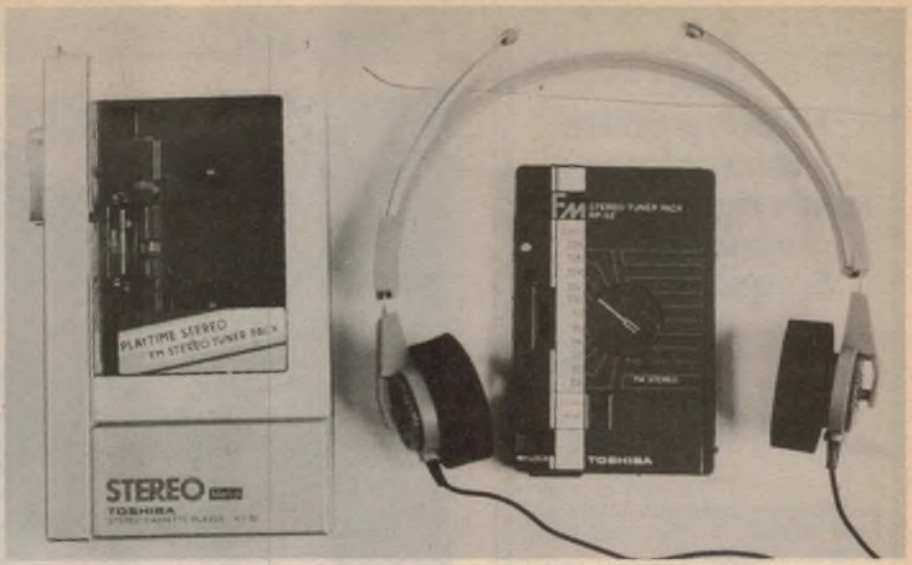
For double-sided optical discs, the biscuits have to be metallised, then cemented together. According to Pioneer, the techniques for moulding and metallising discs, and for cementing them together all exist and need only to be refined; new equipment for mass production is under development. "The opinion that optical video disc is difficult to produce is groundless".

On the other hand, production of the capacitance type disc is much closer to established audio techniques. They use vinyl chloride, rendered conductive by the inclusion of carbon black; RCA reputedly treats the surface also with a silicone oil, to ensure smoothness and low friction.

The art of producing a top quality capacitance disc (CED or VHD) rests heavily on the use of the smallest possible carbon particles and, for these, prime patents are held by Azko in the Netherlands. In a joint venture, Azko and Lion have been producing the carbon for about 12 months at the Yokkaichi factory of Japan EC.

The product merges well with vinyl chloride and makes very little difference to its moulding qualities.

President Toshihiko Yamashita, of the Matsushita Industrial Co Ltd, a major competitor for the optical system, says



Left, the KT-S2 player, with lightweight headphones and, between them, the FM-stereo tuner.

Personal stereo cassette/radio

During the month, we were able to have a closer look at the Toshiba KT-S2 stereo cassette/radio player pictured in our January issue. Measuring 88.5(W) x 155(H) x 31.5(D)mm, and weighing 455g with batteries, it is intended primarily for personal portable wear, using stereo headphones. No provision is made for a loudspeaker, either internal or external.

The KT-S2 is a player only, with no recording facilities, its prime role being to reproduce prerecorded cassettes. This it does very well indeed, with ample loudness and excellent tonal balance.

Provision is made to compensate for normal ferric or other tape, and there is a hi/lo tone switch. There is provision for cue (fast forward) or review (fast rewind) and auto-stop which will cut off the supply at the end of a normal play over-run.

A novel feature of the KT-S2 is the provision and use of an in-built microphone, which might otherwise serve for recording. In the KT-S2, pressing the appropriate button mutes the normal music signal somewhat and turns on the microphone. The user can thereby be involved in a conversation, without having to remove the headphones.

The headphones, by the way, are very light and comfortable and offer a good sound, as judged by their use in this unit. However, they are fitted with a miniature plug rather than the more usual 6mm type.

But the really novel feature about the KT-S2 is that it comes complete with an FM stereo tuner, styled to insert in place of a cassette. Connections are established automatically, but there is no provision for an external antenna. A tiny (too tiny?) thumbwheel allows the user to tune right across the normal FM band and there is even a built-in light to indicate a stereo transmission.

In use, the lack of an antenna renders the tuner somewhat sensitive to attitude and location and hiss can be a problem on some stations in some locations. Fortunately, the tuner carries a tiny mono-stereo switch and this is likely to get a fair amount of use.

Operation is from four internal "AA" cells, but there is provision for operation from an external 6V DC supply. Battery life is quoted as three hours (approx) for tape replay or 11 hours for radio. This assumes a modest listening level, however, not the 40mW+40mW of which the unit is capable.

The KT-S2 comes in a package with headphones, FM-stereo tuner, carrybags for player and tuner, carrying strap, instruction booklet and warranty card.

We understand that an AM tuner has been designed which can be used instead of the FM tuner which comes with the unit.

For further information: Toshiba Aust Pty Ltd, 16 Mars Rd, Lane Cove NSW 2066. Phone (02) 328 2055.

With so much hifi equipment coming, nowadays, from Japanese sources, it is appropriate to be reminded that a beleaguered but esteemed group of manufacturers in Britain are carrying on the traditions of earlier days. This picture, from the British Information Service, shows a Linn Sondeck LP12 single-speed turntable being tested at the factory of Linn Products Ltd, 235 Drakemire Drive, Castlemilk, Glasgow G45 9SZ, Scotland.

that the major groups are all trying desperately to optimise techniques for the mass production of video discs.

He states, as a conviction, that the group which gains the advantage in producing quality pressings will be the one which enjoys ultimate success in the battle of the video discs.

SANYO AUSTRALIA PTY LTD are offering a 5-year warranty on their ambitious "Plus 35" hifi system. It includes a Q40 fully automatic direct-drive turntable with quartz-locked PLL servo motor. The tuner is the "Plus" T35 unit, as pictured below. For the amplifier, Sanyo have chosen the class-A DC model A-35, featuring hi and lo filters, loudness, two tape dubbing switches, and 12-point LED bar graph with range switching. Rated power output is 50W per channel. The cassette deck is Sanyo's model D62, with metal tape compatibility, two-colour fluorescent peak-hold output indicators and the AMSS track search system. Recommended retail price of the system is $1776, with loudspeakers and mounting rack extra. [Sanyo Aust Pty Ltd, 225 Miller St, North Sydney 2060.]

The T35, pictured above, belongs to Sanyo's new "Plus Series" of tuners. It offers both digital and analog frequency display, operating in conjunction with a sampling quartz locked tuning system. Also provided is a bar-graph signal strength indicator, plus another for centre tuning. As an aid to recording, the tuner provides a reference tone matched to 50% modulation from an FM transmitter. Other features include wide/narrow IF band selection and two-level FM muting. Recommended retail price is $399. Details from G. Boucher, Sanyo Aust Pty Ltd, 225 Miller St, North Sydney 2060. Phone (02) 436 1122.

"Concertmate" — a new rhythm unit from Tandy

Unlike most other rhythm units, Tandy's new "Concertmate" has its own battery supply and its own in-built amplifier and loudspeaker. It can therefore be used as is, or connected to an external loudspeaker or amplifier. In its simplest role, the Concertmate can be used as a metronome with controllable sound level and tempo, and LED visual timing indicator. But it also offers eight distinctive rhythms, including latin, bossa, rock, foxtrot and waltz. It offers also, the sound of five musical instruments: bass drum, clave, cymbal, snare drum and high hat. Measuring 28 x 7 x 20cm, the Concertmate operates from 6 C-type cells, or from an external DC supply. As catalog item 42-2103, it is available from Tandy stores and outlets for $89.95.

CONCEPT AUDIO PTY LTD have a cassette head demagnetiser which is marketed under the name "Whistle Stop". Manufactured by Robins Industries in the USA, it looks like a standard cassette but, inside, it contains a special oscillator circuit and batteries to operate it. The idea is to plug the Whistle Stop into a casette deck, switch the deck on and set it in the "Play" mode. This automatically activates the oscillator, which initially produces a signal at about 60Hz. During the next six seconds approximately, the oscillator frequency slides up the range to beyond audibility. In so doing, the sound can be monitored through the loudspeaker, indicating that the Whistle Stop is doing its job. At low frequencies the magnetising current through the head is quite high but it diminishes to a negligible value as the frequency drifts higher. The Whistle Stop retails for $19.95. [Concept Audio Pty Ltd, 22 Wattle Rd, Brookvale NSW 2100. Phone (02) 938 3700].

R. H. CUNNINGHAM PTY LTD are producing a small news sheet intended to keep audio professionals and dedicated sound enthusiasts up to date in lines being handled by the Company. To be put on the mailing list, apply through PO Box 4533, Melbourne 3001. Announced in the issue to hand is a new pair of headphones from Sennheiser, type HD222. They are lightweight, with soft cushions and gentle headband pressure. Rated response is 20Hz to 20kHz, impedance 600 ohms and nominal sound pressure level 94dB. Also announced is the Soundex Stereo PPM 400, a twin peak program meter, with in-built ppm amplifiers, illuminated meter movements and mains power supply.

Compact for what it is, the Ferris JMPA 3020 is nevertheless big on facilities and performance. It offers AM/FM-stereo radio with muting and local/DX switch, and stereo cassette with auto stop and lock-in fast forward and reverse. It has volume and balance controls and a 5-level graphic equaliser with a range of ±12dB. Frequency response is quoted as from 50Hz to 12kHz. The price is $250 approx. For details: J. Manneken, Ferris Audio Products, 353 Victoria St, Brunswick, Vic 3055. Phone (03) 387 3844.

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Sony PS-X75 automatic turntable

Sony's top-of-the-line record player is the PS-X75, an automatic unit whose turntable is driven by a crystal controlled direct-drive motor. A unique feature is the Biotracer tonearm in which the horizontal and vertical movements of the tonearm are servo-controlled — under microprocessor command — by "linear motors" which are fed information from sensors incorporated in the arm.

At least two of what Sony call "linear motors" appear to be solenoids in which the drive current is varied in an analog manner to give smooth control of the tonearm's movements. The application of solenoids for this purpose appears to be an excellent idea as no friction is incurred, the only slight penalty being a minor increase in mass.

As a matter of interest a similar system has been in use for many years on most of the disc recording lathes located around the world. In this case the application is for control of the vertical movement of the cutterhead such that the depth of cut – and hence groove width – is subject to automated dynamic control according to program level and frequency, as well as providing for remote manual control.

Three motors are incorporated in the Biotracer arm; one for horizontal motion, one for vertical and the other for lifting the tonearm from its (lowered) playing position to its upper (safe) setting. Inverse feedback for the servo amplifiers is derived from moving-magnet sensors which provide electronic damping of solenoid deflections.

Complete electronic control of the horizontal and vertical movements of the Biotracer tonearm allow Sony to provide full remote facilities for the following functions:

- Tonearm raise and lower
- Lateral positioning of the tonearm
- Stylus tracking force
- Anti-skating bias. In practice a separate control is not provided, the bias being obtained as a function of the variable (stylus) tracking force control.

In common with several other state-of-the-art record players, the controls are mounted in a straight line along the front edge of the deck such that even with the clear perspex lid closed, operation is unhindered.

At the extreme left of the control strip is the mains OFF-ON pushbutton. All other controls are grouped together, reading from left to right:

- Motor OFF-ON pushbutton
- Tonearm traverse "left" pushbutton
- Tonearm traverse "right" pushbutton
- Tonearm raise/lower pushbutton
- Display window
- Turntable speed selector pushbutton
- Repeat play pushbutton
- STOP pushbutton
- START pushbutton
- Stylus tracking force adjustment knob

The Sony PS-X75 has all controls mounted outside the lid. Our review sample had a transparent overlay which gave a see-through view of the Biotracer arm.

From its rest, traversing to the outer edge of the record (where the lead-in groove is) and gently lowering the cartridge onto the surface of the record.

When the tonearm has reached the lead-out groove, the arm lift solenoid raises the arm, after which the horizontal motor returns the arm to its rest, with the turntable being brought to rest within approximately one-third of a revolution, through the microprocessor controlling an electromagnetic brake.

After coming to rest the brake is released so that the turntable may be easily rotated by hand for cueing purposes.

Should one wish to cease play before the end of a record, press the STOP pushbutton and the tonearm is lifted from the record and returned to its rest, with the turntable being halted as previously.

If it is desired to repeat-play a side, press the REPEAT pushbutton. Repeat-play continues until such time as either the REPEAT pushbutton is pressed a second time or the STOP button is actuated.

Playing a record is simplicity itself. Place the record on the turntable, select turntable speed, press the START pushbutton and the motor will start in addition to the Biotracer arm lifting away

SONY PS-X75 TURNTABLE

Manual play is equally easy. In this case, after selecting turntable speed bring the tonearm to the desired position over the record by pressing the traverse "left" pushbutton. Should overshoot occur, one presses the traverse "right" pushbutton to return the arm to the desired position. Thence press MOTOR (ON) and tonearm "lower". The PS-X75 unit will respond to the commands irrespective of which of these two pushbuttons is pressed first.

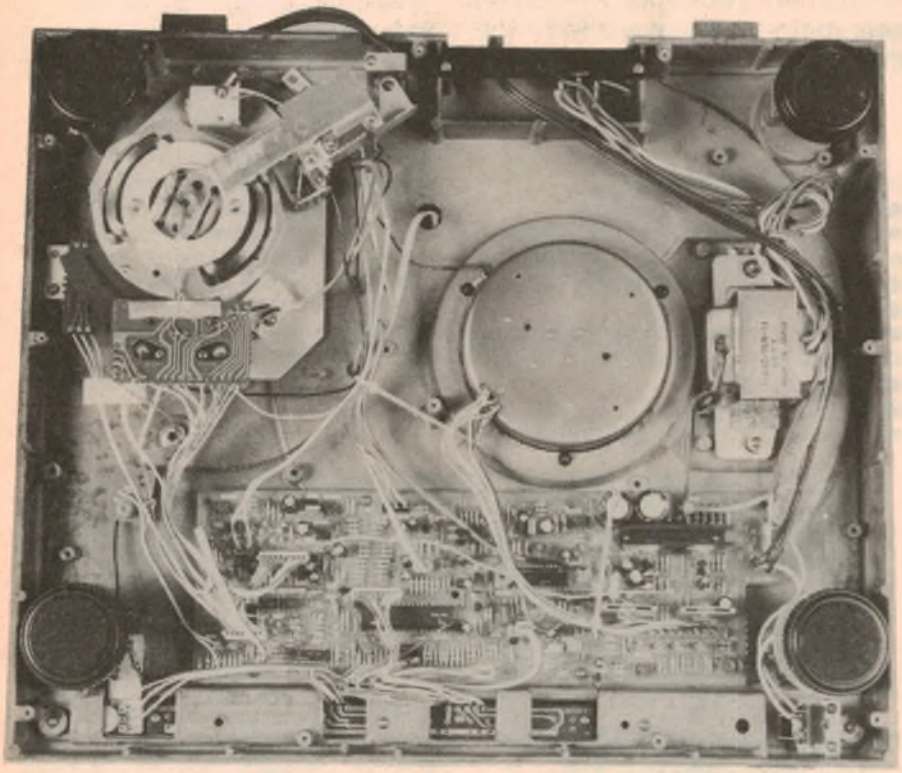
This is a nice feature since it enables the operator to give priority to mode according to his requirements viz, if searching for an item of music he would probably press MOTOR followed by tonearm "lower", but if he were cueing a track for, say, recording to cassette he could first lower the arm, cue the start of the track by moving the turntable backwards and forwards, and then simultaneously start (turntable) motor and cassette recorder.

The latter operation is assisted by the fact that the turntable only requires one-half revolution to accelerate to normal speed at 33⅓rpm, and just over three-quarters of a revolution at 45rpm.

Relatively quick as the turntable startup may be, at times one feels just a little frustrated by the time taken for the motors to both swivel and raise/lower the tonearm. It takes about five seconds for the tonearm to traverse from its armrest to a point halfway across a record, and a further two seconds for the arm to lower.

To speed up the operation the arm may be moved by hand, which is no handicap when time is at a premium. However, unless the tonearm has previously been lowered electronically in the normal way, it is not possible to lower it by hand.

At the right rear of the turntable is a pillar light which is beamed through plastic prisms on the turntable mat to phototransistors mounted underneath the turntable. This photo sensor system detects the size of record on the turntable for automatic positioning of the tonearm at start of play. If no record is on the turntable, the tonearm will not descend, but will return to its armrest with the turntable being stopped.



Inside the chassis of the Sony PS-X75. Note the microprocessor on the PC board.

Sony describe the turntable drive system as direct-drive, crystal lock, magnedisc servo control system with the motor being brushless and slotless (probably an ac induction motor). Speed accuracy appears to be excellent, certainly better than the ±0.02% to which we normally measure. Sony claim a speed accuracy of ±0.003%. Wow and flutter measured just under 0.1%. Whilst just perceptible on constant tones, wow and flutter was not noticeable on normal music recordings.

Width of the PS-X75 is 480mm, depth is 420mm and height is 165mm. Although by no means the smallest in its class, it certainly cannot be considered oversized. In fact it feels just about "right". The mains cable is two-core as the unit is double-insulated, being identified as such by the international "double-square" symbol. The RCA phono plugs are gold plated – a quality touch.

The stylus tracking force is adjustable from the control panel by means of a knob with a scale calibrated in 0.1g increments from zero to 3.0 grams. After initial setting – of which more anon – the accuracy of this remote control appears to be within ±0.1g.

We found great difficulty in accurately setting the initial tonearm balance according to the supplied instructions. The suggested method is to balance the arm by means of the counterweight at zero tracking force. Unfortunately our subjective judgment of "balance" was such that we rarely achieved results closer than ±0.25g, and on occasion incurred an error as high as 0.5g.

But with the aid of a stylus pressure gauge we arrived at a method whereby we would preset the stylus force to, say, 1.0g, and then adjust the counterweight so that the actual stylus force was indeed 1.0g. Having done this we found that the calibration accuracy of the remote stylus force control was within ±0.1g over its range – an excellent performance. To any intending purchasers of the PS-X75 we would therefore suggest the acquisition of a stylus pressure gauge so as to accurately set the stylus force.

The counterweight control knob requires approximately 360° rotation to change the effective stylus force by one gram. This provides good vernier control for adjustment but unfortunately it is all too easy to inadvertently upset this setting as no locking mechanism is incorporated, nor is this control "detented" which would be another way of overcoming the problem.

In normal usage it may be that one's fingers do not stray to this area of the tonearm, but in inspecting and testing we found that we knocked this control out of adjustment on several occasions.

As supplied, the PS-X75 is fitted with a Sony XL-25A cartridge which has a 0.3 × 0.8 mil elliptical diamond stylus. We measured the inductance of each winding and found it to be 530mH, which is about average for today's moving magnet cartridges.

Whilst the suggested tracking force lies within the range from 1.0 to 2.5g, Sony recommends operation at 1.5g for optimum performance. At this pressure the XL-25A handled the +12dB drum test track on the W & G 25/2434 test disc but the tracking force had to be increased to 2.5g in order to track the +16dB test track.

Frequency response of the cartridge was flat within ±2.5dB from 20Hz to 20KHz. Channel separation was 30dB at 1KHz, falling to 20dB at 10KHz and remained essentially the same right up to 20KHz. *(Continued on page 142)*

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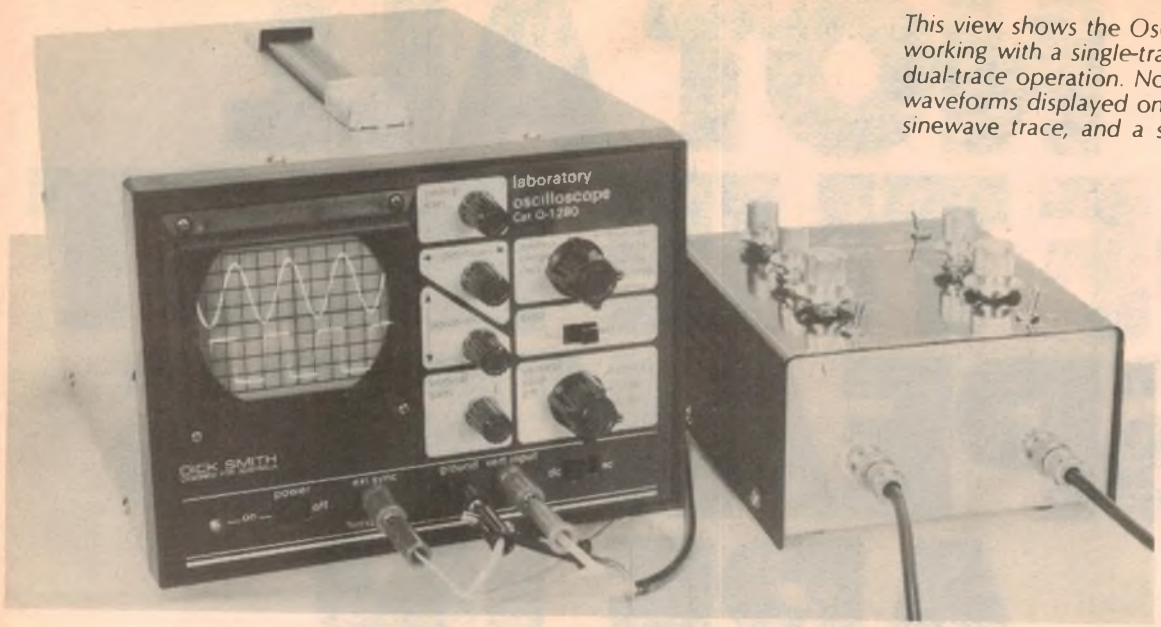


This view shows the Oscilloscope Switch working with a single-trace CRO to provide dual-trace operation. Note the two waveforms displayed on the CRT: an upper sinewave trace, and a squarewave.

Add dual-trace facilties to your CRO with this

Oscilloscope Switch

Dubbed the Oscilloscope Switch, this easy-to-build instrument will increase the versatility of your single-trace oscilloscope by providing dual-trace operation. It features switched attenuators, sync selection, AC or DC coupling and selectable chop rates.

by IAN POGSON

The oscilloscope is without doubt the most useful and versatile instrument we have for observing, measuring and analysing electrical signals. However, if an oscilloscope has only single trace capability, this limits its usefulness to a considerable degree.

Where two signals must be monitored simultaneously the single trace instrument can still be used in some cases but the operator needs more skill in interpreting the resultant display. For example, phase and frequency differences between two signals may be measured using the technique known as Lissajous figures. This involves feeding the two signals to the horizontal and vertical amplifiers of the oscilliscope, and is described in many textbooks.

There are other methods whereby a single trace oscilliscope can be used to compare different signals but they too require extra skill on the part of the operator.

By far the easiest way to monitor two signals simultaneously is to observe them on a dual trace oscilloscope.

Note the term "dual trace" rather than "dual beam". There are very few true double beam oscilloscopes these days, and even the more expensive ones usually use the dual trace system. In the dual trace oscilliscope, a single gun CRT is employed and the beam is switched rapidly between the two signals to give two traces which sweep across the tube face at the same speed.

Essentially, what our Oscilloscope Switch does is convert a normal single trace oscilloscope to dual trace operation, thereby greatly extending its versatility.

As an example, when testing an amplifier one can compare input and output signals and note any phase shifts or distortion. When testing a stereo amplifier, comparisons can be made of signals in both channels and crosstalk may also be observed directly.

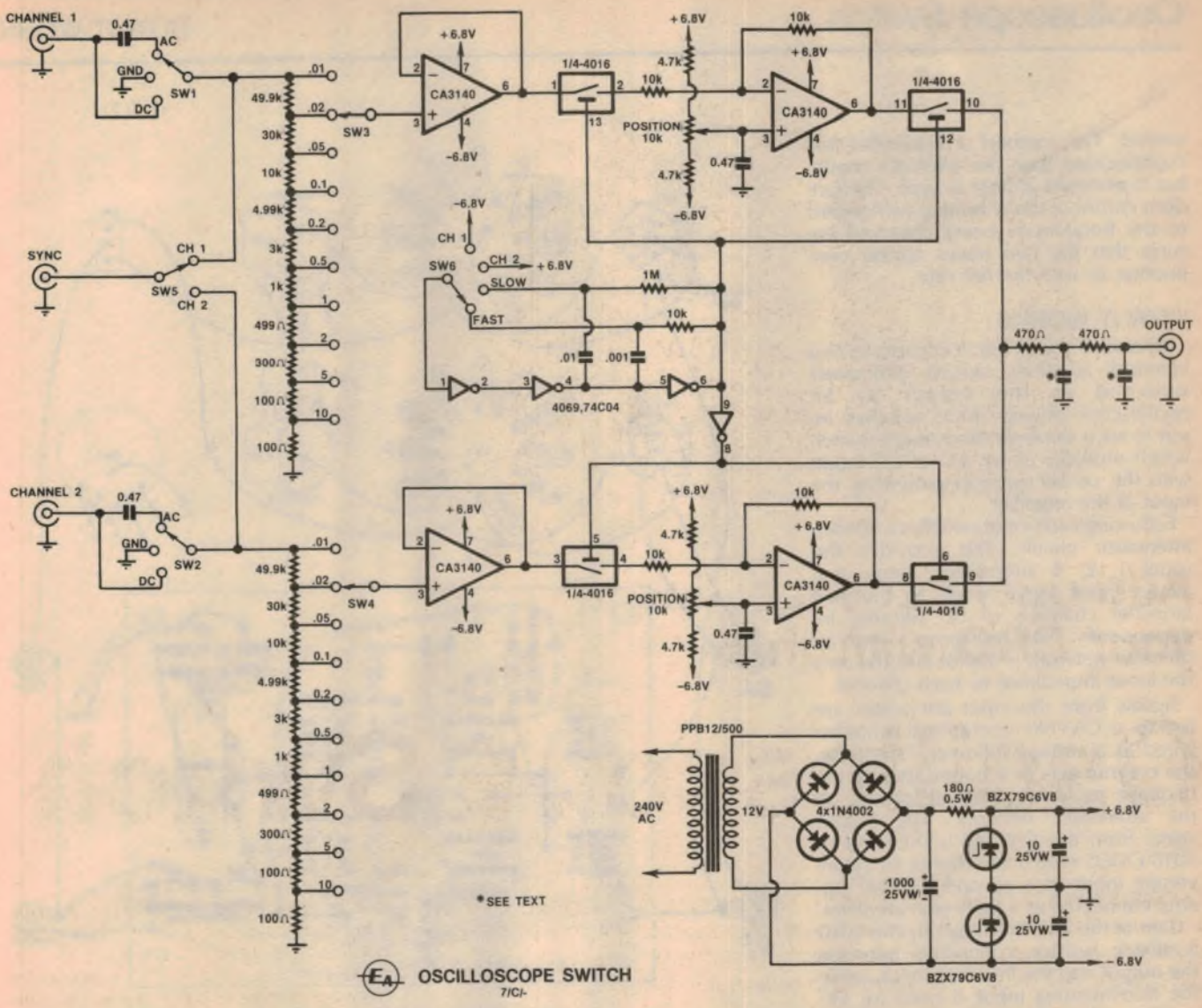
One might also use a dual trace oscilloscope for checking a transmitter – comparing the modulation envelope with the modulating signal. At the other end of the line, one can observe detection or demodulation in a radio receiver.

In digital circuitry, the dual trace oscilloscope really becomes indispensable for observing timing relationships between different pulse trains and seeing logic at work!

There are actually two modes of operation by which a dual trace display can be produced on a single trace oscilloscope. One is the "chopped" mode, the other is the "alternate" mode. In the chopped mode, the electron beam is switched rapidly between the two signals at a rate considerably higher than the frequency of the signals being observed.

In effect, what happens is that a square wave is applied to the vertical amplifier of the oscilloscope. At the same time, the signals to be displayed are superimposed on the square wave – one signal on the upper part of the waveform and the other signal on the lower part of the waveform. The vertical sections of the waveform become invisible, provided the rise and fall times of the square wave are fast enough.

The "chopped up" nature of the two apparent traces seems to disappear for two reasons. One is that each waveform develops visual continuity due to its "row of little dashes" nature. The other is that the switching frequency of the square wave is deliberately arranged not to be harmonically related to the signals being displayed. For this reason, the



The circuit consists of two identical amplifier channels alternately switched to the output by an oscillator.

dashes effectively "move" along the traces rather than remain stationary.

This, combined with the visual persistence of the tube phosphor and the human eye, makes the two traces appear continuous.

In situations where high frequencies are to be measured however, the chopped trace mode cannot be used. The main reason is that the chopping rate is limited by the bandwidth of the oscilloscope, so that the "chopped" nature of the traces tends to become more apparent when viewing high frequency signals. In these situations, the "alternate" mode of dual trace operation is used.

In this mode, a square wave of lower frequency than those being displayed is applied to the oscilloscope vertical amplifier. The square wave is locked to half the timebase frequency and again has the signals to be displayed superimposed on the upper and lower sections of the waveform. However, in this case the beam traces the upper half of the square wave (and one signal) in one complete sweep and the lower half of the square wave (with the other signal) on the successive sweep. Hence the "alternate" operation.

Thus, in the alternate mode, the two traces are produced successively and persistence effects in the tube phosphor and the human eyes make it seem as though there are two separate and simultaneous traces.

Most dual trace oscilloscopes have both chopped and alternate trace operation, with the mode automatically selected by the timebase switch (chopped for low speeds and alternate for high). On the more flexible instruments the user has the option of selecting the mode of operation himself.

Our new Oscilloscope Switch has a fast chop rate of 65kHz, but to provide the alternate mode would involve gaining access to the timebase circuitry of the oscilloscope to be used with the switch. As an alternative (no pun intended!) we have provided a slow chop rate (74Hz)

SPECIFICATION

Bandwidth (−3dB):
DC coupled — DC to 1MHz
AC coupled — Approx 10Hz to 1MHz

Input impedance:
100kΩ shunted by ≤30pF

Trigger source:
Channel 1 triggered by Channel 1 signal; Channel 2 triggered by Channel 2 signal

Maximum input voltages (attenuator set to .01):
DC — ±4V; AC — 3V RMS

DC blocking on AC input:
±250V (DC + peak AC)

Output DC level shift: ±2V

Chop frequencies:
Slow — 74Hz; Fast — 65kHz

instead. This method is somewhat less sophisticated than the alternate mode, but it performs almost as well. The random nature of the chopping with regard to the frequencies being observed ensures that the two traces appear continuous, as with the fast rate.

HOW IT WORKS

Refer now the circuit. It consists of two identical amplifier circuits alternately switched to the output by an oscilloscope driving CMOS switches. Input is via a three-position toggle switch which provides either AC or DC input, with the centre position grounding the input of the amplifier.

Following each input switch is a 10-step attenuator circuit. This provides the usual 1, 2, 5 attenuation steps, and allows input signal levels to the two amplifier channels to be adjusted independently. Total resistance of each attenuator network is 100kΩ and this sets the input impedance to each channel.

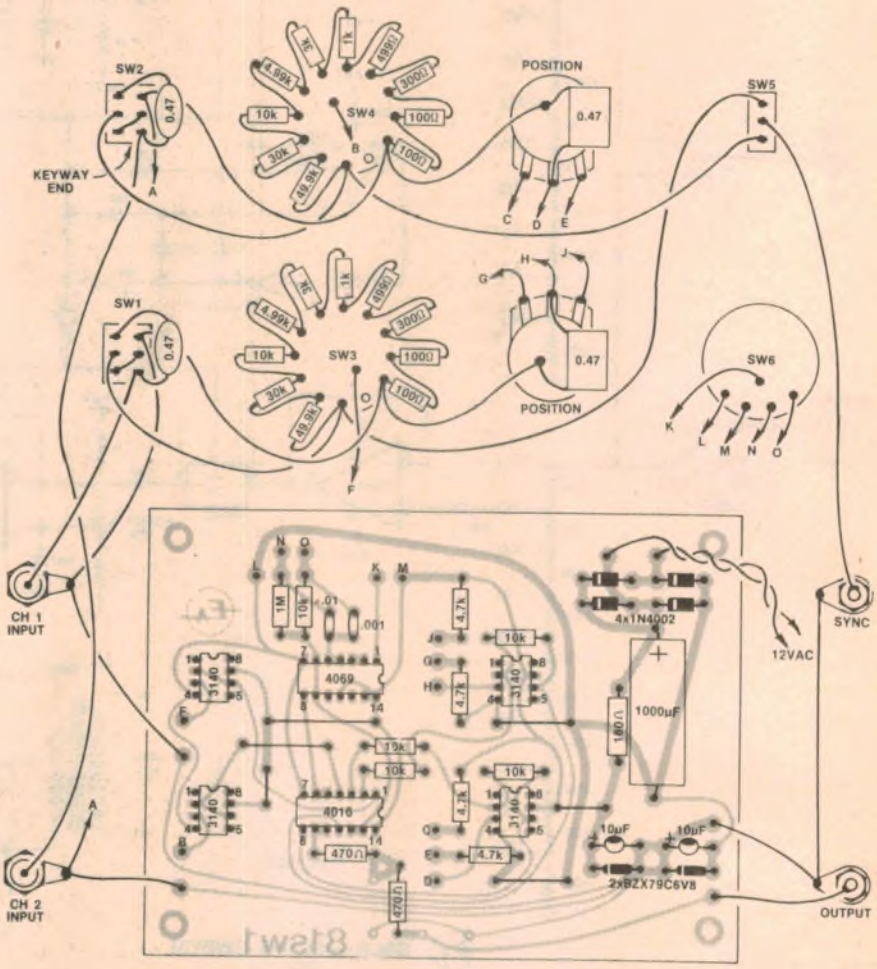
Signals from the input attenuator are fed to a CA3140 operational amplifier wired as a voltage follower. Essentially, the op-amp acts as a buffer, its high impedance providing minimal loading on the attenuator network. The output signal from the CA3140 is then fed to 4016 CMOS switch and thence to the inverting input of a second CA3140 op-amp connected as a unity gain amplifier.

Gain of the amplifier is set by the 10kΩ feedback resistor connected between the output and the inverting input, while the non-inverting input is used for DC position adjustment. A voltage divider consisting of a 10kΩ potentiometer and two 4.7kΩ resistors is connected across the positive supply rails. By adjusting the pot, the user can set the reference voltage on the non-inverting input (pin 3) according to requirements.

Output signals from the unity gain amplifier are fed to a second CMOS switch whose control electrode is wired in parallel with the first. (Some readers may be wondering why we have included CMOS switches on the inputs to the unity gain amplifiers. Why switch the inputs as well as the outputs? We tried the circuitry both with and without the first set of CMOS switches and found that the circuit depicted worked best and minimised output transients.)

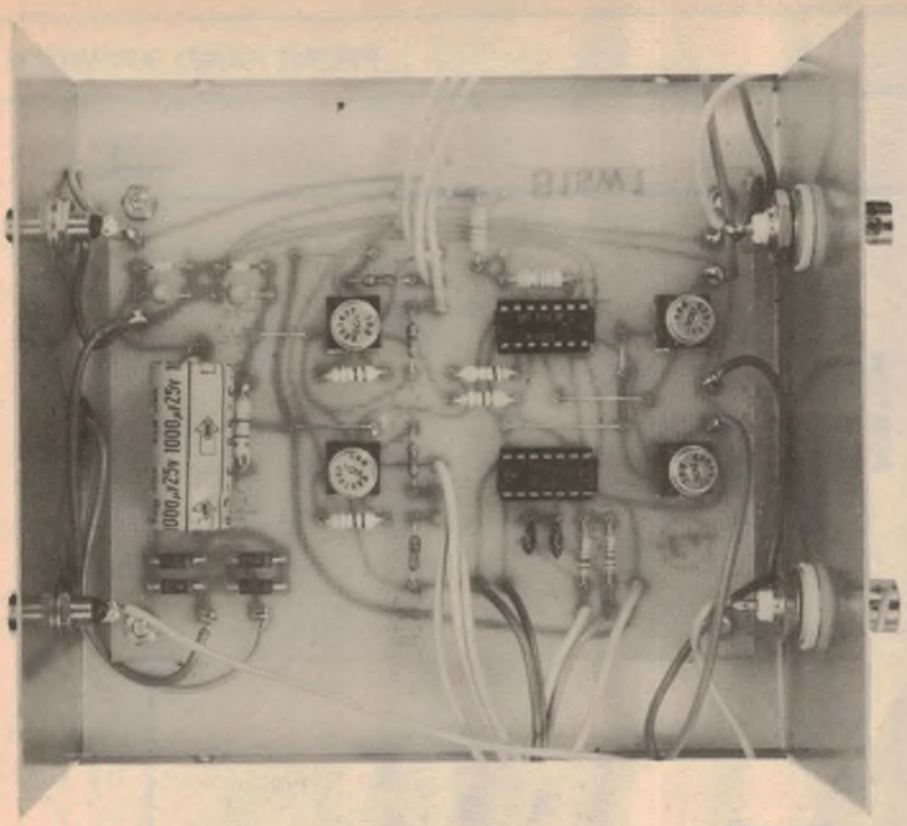
Switching transients are further reduced by a two section RC filter wired between the output switches and the output socket. This circuit is something of a compromise between bandwidth and transient suppression, and is open to experimentation by individual constructors. More about this later on.

The switching oscillator consists of three sections of a 4069 (74C04) hex in-



ABOVE: the wiring diagram for the Oscilloscope Switch. Note that the resistors on the attenuator switches must be 2% types.

RIGHT: the completed prototype. As well as providing dual-trace operation, it also provides a calibrated attenuator for a CRO which doesn't already have this feature.



View inside the prototype showing the assembled PCB. Observe the precautions listed in the text regarding the CMOS ICs, and don't forget the wire links.

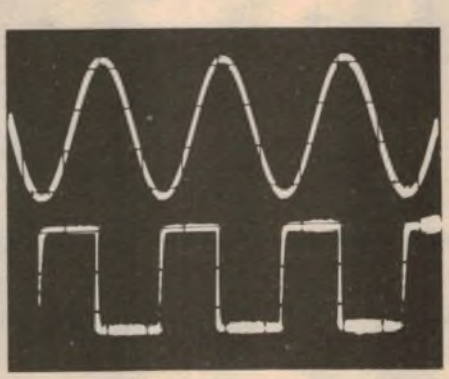
verter arranged in standard three-gate configuration. It has two switched output frequencies selected by switch SW6 to provide the fast and slow chop rates (65kHz and 74Hz). A fourth section of the hex inverter is used to give a second output (at pin 8) which is 180° out of phase with pin 6.

With this arrangement, the oscillator output at pin 6 controls the CMOS switches in Channel 1 while the inverted output from pin 8 controls the switches in Channel 2.

The remaining two switch positions on SW6 switch the oscillator off so that the user can select either channel for display. For example, in the CH 1 position, pin 1 of the 4069 is pulled low, thus forcing pin 6 high and activating the CMOS switches in Channel 1. In the CH 2 position, pins 1 and 8 of the 4069 go high and the Channel 2 trace is displayed.

When viewing the signal traces, the oscilloscope timebase frequency must be synchronised directly from one of the two input signals – the one desired to be kept stationary. In our circuit, sync signals are derived directly from the wipers of the input switches (SW1 and SW2) and are selected by switch SW5.

In practice, this means that the oscilloscope should be set for external synchronisation of the timebase (Ext Sync) and the external sync terminal connected to the sync terminal on the Oscilloscope Switch. SW5 then allows the user to synchronise to either Channel 1 or Channel 2.



A typical display produced by the Oscilloscope Switch. The small breaks in the traces are the graticule lines.

The power supply is derived from a nominal 12V AC which may be obtained from a plugpack or any other suitable transformer. The 12V AC is fed to a bridge rectifier using four 1N4002 (or similar) power diodes, and the rectified output filtered by a 1000μF 25VW electrolytic capacitor. The filtered DC output is then split and regulated by two BZX79/C6V8 zener diodes to give the plus and minus 6.8V supply rails.

CONSTRUCTION

We built our Oscilloscope Switch into a standard metal case measuring 150 x 76 x 134mm. Construction is straightforward, with most components mounted on a small printed circuit board (PCB) measuring 124 x 93mm and coded 81sw1. A Scotchcal label provides an attractive finish to the completed instrument.

Both the PCB and the Scotchcal label should be available through the usual retail outlets by the time this article appears in print. A list of potential suppliers is published on the last page of the magazine.

Commence construction by assembling the PC board. Follow the accompanying wiring diagram carefully and make

PARTS LIST

1 metal case, 150 x 76 x 134mm
1 Scotchcal front panel, 134 x 150mm
1 printed circuit board, 81sw1, 124 x 93mm
1 single-pole 4-position rotary switch (see text)
2 single-pole 12-position rotary switches (see text)
2 2-pole 3-position miniature toggle switches
1 SPDT miniature toggle switch
2 10kΩ linear potentiometers
5 knobs to suit front panel
1 12VAC plugpack transformer
4 8-pin DIL sockets (optional)
2 14-pin DIL sockets (optional)
2 single hole mounting RCA sockets
1 rubber grommet
2 insulated BNC sockets (see text)

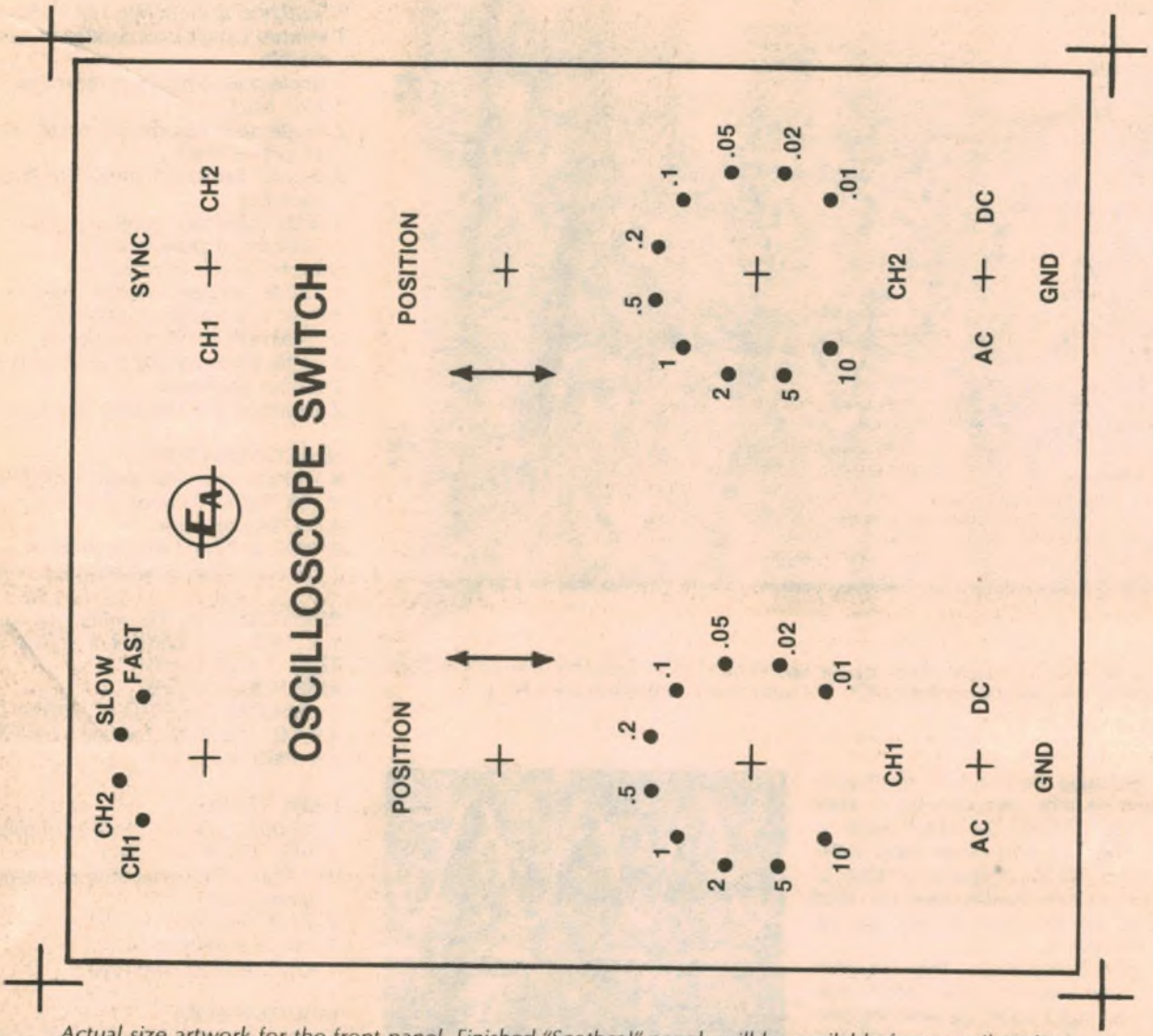
SEMICONDUCTORS
4 1N4002 or similar power diodes
2 BZX796C6V8 zener diodes
4 CA3140 op-amps
1 4069 or 74C04 hex inverter
1 4016 or 4066 quad bilateral switch

RESISTORS (½W, 5% unless stated)
1 x 1MΩ, 5 x 10kΩ, 4 x 4.7kΩ, 2 x 470Ω, 1 x 180Ω ½W
RESISTORS(¼W, 2%)
2 x 49.9kΩ, 2 x 30kΩ, 2 x 10kΩ, 2 x 4.99kΩ, 2 x 3kΩ, 2 x 1kΩ, 2 x 499Ω, 2 x 300Ω, 4 x 100Ω

CAPACITORS
1 1000μF 25W axial lead electrolytic
2 10μF 25VW tantalum
4 0.47μF 250V metallised polyester (greencap)
1 .01μF greencap
1 .001μF greencap
1 47pF ceramic (see text)

MISCELLANEOUS
Screws, nuts, hookup wire, PC stakes, solder etc.

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



Actual size artwork for the front panel. Finished "Scothcal" panels will be available from retail outlets.

sure that all polarised components are correctly oriented. Don't forget to install the six wire links, and leave the CMOS ICs (4016, 4069) till last. We used IC sockets in the prototype and readers may care to do the same.

If you do elect to solder the ICs into circuit, then the following precautions should be observed for the CMOS devices: avoid handling the pins; earth the barrel of your soldering iron to the earth track on the PC board using a clip lead; and solder the supply pins (pins 7 and 14) first.

The use of PC stakes is recommended to facilitate external connections to the PCB.

Once the PCB assembly is complete, the case can be drilled to accept the two RCA sockets, the BNC input sockets, and the rubber grommet through which the power supply leads pass. This done, the PCB can be mounted in the case using machine nuts and screws and the wiring to the sockets completed.

The next step is to fix the Scotchcal label to the case lid and drill the holes for the various front panel controls. However, if you are using a case similar to that used for the prototype, you may find that the Scotchcal panel will not adhere properly due to the rough nature of the painted finish. The solution is to augment the adhesive on the panel with rubber cement such as Bostik or similar material.

Now mount the front panel controls and complete the wiring according to the diagram. Note that the two potentiometers should be oriented so that their lugs face each other, and that the resistors fitted to the attenuator switches must be 2% close tolerance types (or better).

Some readers may think that some of the resistor values specified for the attenuator network are a little strange, eg 49.9kΩ, 4.99kΩ and 499Ω. The explanation is quite simple – these are the close tolerance preferred values and are so close to the required values of 50kΩ, 5kΩ and 500Ω that it really doesn't matter! If you have difficulty in obtaining some values, then the 49.9kΩ resistor can be replaced by two parallel 100kΩ resistors, the 30kΩ resistor can be replaced by two series 15kΩ resistors, and so on.

A few other comments on components may also prove helpful. First, although a single-pole 4-position switch

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

$60.00

This includes sales tax but does not include a plugpack.

PLAYMASTER MOSFET STEREO AMPLIFIER

Performance of prototype:

POWER OUPUT	One channel	Both channels
4 ohms	64W (72W)	45W (60W)
8 ohms	50W (56W)	42W (50W)
16 ohms	37W (38W)	31W (31W)

FREQUENCY RESPONSE
Phono inputs RIAA equalisation within 1dB from 30Hz to 20kHz
High level inputs 25Hz to 20kHz ±1dB

CHANNEL SEPARATION
(with respect to 50W) 10kHz −40dB
1kHz −47dB
100kHz −50dB

INPUT SENSITIVITY

Phono at 1kHz	2mV	56k
Overload at 1kHz	120mV	
High level inputs	190mV	36k (minimum)

HUM & NOISE
Phono (with respect 10mV) 73dB (75dB) unweighted with typical cartridge
Other inputs 80dB (82dB) unweighted with inputs open circuit

TOTAL HARMONIC DISTORTION
At full power with both channels operating from 25 to 20kHz: less than 0.2%
Typically less than 0.05% at normal listening levels

TONE CONTROLS

Bass	+12, −13dB at 50Hz
Treble	±10dB at 10kHz

DAMPING FACTOR

at 1kHz	>50
at 30Hz	>50

STABILITY Unconditional
(Figures in brackets refer to the performance with the Ferguson PF 4361/1 transformer.)

PCB $9.90
Output transistors
Front panel $11.00

- Complete kit of parts ..... $159.00 ea
- Front panel ..... $11.00 ea
- PCB 80Sa 10 to suit ..... $9.90 ea
- Mosfets to suit 2Sk133 ..... $8.95 ea
- Mosfets to suit 2SJ48 ..... $8.95 ea

KITS KITS KITS KITS KITS KITS KITS

Kit for Exidy Sorcerer EPROM Programmer to be released in August EA Kit price including Scotchcal Front Panel $75.00

TV PATTERN GENERATOR
Kit of parts as featured in EA JUNE 1980. Dot, Greyscale, Crosshatch, Raster, Check
COMPLETE KIT (including Scotchcal front panel) $48.49
KIT WITHOUT BOX $36.90

EPROM PROGRAMMER KIT
Kit of parts as featured in EA JULY 1980 Programs 2708, 2716 & 2532 Usw with TRS 80, Sorcerer & Compucolour Kit does not include connector from the programmer to computer
COMPLETE KIT (inc Scotchcal Front Panel) $72.49
KIT WITHOUT CASE $59.99

DIGITAL PANEL CAPACITANCE METER
Kit of parts as featured in EA MARCH 1980
Four Digits Extremely popular
COMPLETE KIT (inc. Scotchcal Front Panel) $52.49
KIT WITHOUT CASE $39.99

TV CRO ADAPTOR KIT (EA MAY 1980)
COMPLETE KIT (Inc. Scotchcal Front Panel) $29.00
(without power adaptor)
POWER ADAPTORS TO SUIT
1 240V to 6/7.5/9V ..... $ 9.50
2 240V to 9V ..... $ 5.95

KITS

ETI SERIES 4000 60W STEREO AMP KIT
Complete Kit Rack Mounting Case $199.00
Woodgrain Sided Case $189.00

PARTS AVAILABLE SEPARATELY

Front Panel	$10.90
Rack Mounting Case	$55.00
Wooden Sided Case	$49.00
ETI 471 PREAMP KIT of parts	$45.00
ETI 472 PS KIT of parts (without transformer)	$47.00 $24.00
ETI 470 60W Kit pf parts (without heatsink)	$26.50 $23.00
ETI 480 50W KIT of parts	$17.50
ETI 480 100W KIT of parts	$22.50
ETI 084 Car Alarm KIT	$11.50
EA TV CRO ADAPTER KIT	$29.00
EA 300W POWER AMP MODULE	$63.50
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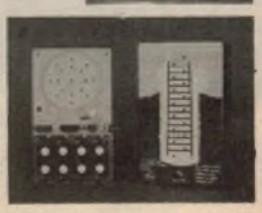

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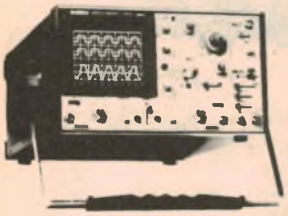

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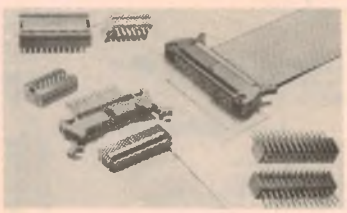

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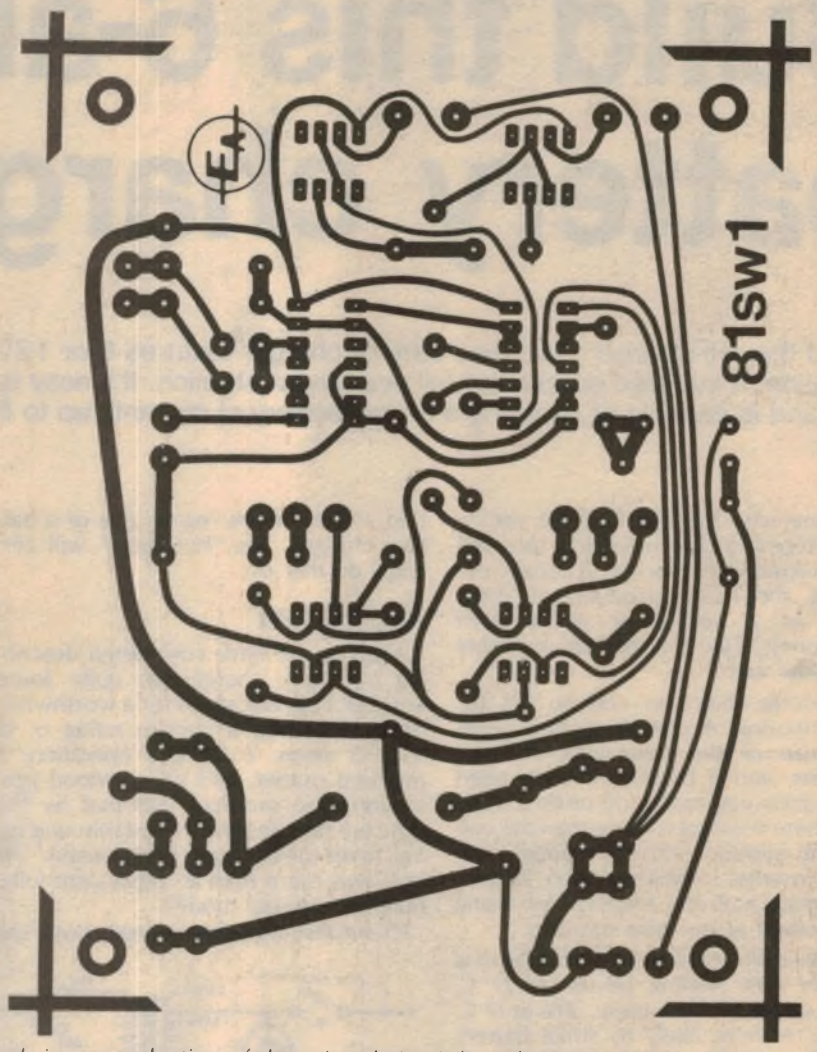

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With the construction of the Oscilloscope Switch now complete we are in a position to test and set it up for use. We suggest that you go through the following procedure:

- Set SW1 and SW2 to "AC", SW3 and SW4 to ".01", and SW6 to "FAST";
- Set both "POSITION" potentiometers to mid-position;
- Connect the output cable to the input socket of the oscilloscope and the sync lead to the external sync input of the oscilloscope;
- Switch on the oscilloscope, set it to DC input, and adjust the trace to the centre of the screen.

Now switch on the Oscilloscope Switch. Two traces should now appear on the screen, and these should move vertically with adjustment of the two position controls. If the movement of the traces is restricted, the gain control of the oscilloscope is set too low. Advance the gain control until the trace can be moved over the full range of the screen.

From here on, it is simply a matter of getting used to the operation of the Oscilloscope Switch. In general, you will find that fast chop will be best for viewing low frequency signals, while slow chop will be best for high frequencies.

The way in which the input switches are used will soon become obvious. Selection of "AC" or "DC" depends on whether the DC component of the signal is to be taken into consideration, while the "GND" position grounds the input circuit without grounding the input signal. The latter facility is useful for setting the trace so that DC signal levels can be measured.

We settled for an input impedance of 100kΩ rather than 1MΩ. A 1MΩ attenuator would require some elaborate frequency compensation, whereas 100kΩ could be used without any compensation and with only a relatively small effect on the losses of high frequency components. However, there are some losses and to keep these to a minimum we suggest that wherever possible the attenuator should be set to ".01" when viewing frequencies above about 500kHz.

Finally, the Oscilloscope Switch provides the bonus of a calibrated attenuator for a CRO which doesn't already have this feature. Assuming that you have a CRO with a sensitivity of 10mV/div or better, the procedure is to set the attenuator switch on the Oscilloscope Switch to "1" and feed in a suitable AC reference voltage say 5V p-p. (An unabashed plug: the EA Voltage Reference, described in June 1976 and January 1977, is ideal for this purpose.)

Now all you have to do is adjust the sensitivity of your CRO to give a reading of 1V/div. The result – a calibrated attenuator capable of switching from 10mV/div sensitivity down to 10V/div sensitivity!

New design features full overload protection

Build this 6-amp battery charger

Called the "Hi-Charge", this new battery charger features 6 or 12V operation, a metered output and full overload protection. It's easy to build and is capable of charging a typical battery at currents up to 6 amps.

by GREG SWAIN

Anyone who has been caught with a flat battery in a car knows only too well how frustrating this can be. It usually occurs at the most inconvenient time, often as a result of one's own carelessness. Ever left the parking lights on in your car?

Of course, batteries can go flat for other reasons. A combination of short runs, use of the headlights and accessories, and a battery that has seen better days may easily add up to a situation where the load is more than the battery can supply. And quite apart from these external conditions, the battery itself aggravates the situation by being less efficient at low temperatures.

For example, a half-charged battery has typically 60% starting power at 27°C, which could fall to a mere 30% at 0°C. So you're more likely to strike battery trouble in winter, when the battery is least efficient and when much greater use is made of lights and other accessories. Also, to some extent, the starter motor will draw more current in cold weather because the engine is harder to crank.

For all these reasons, well-prepared motorists like to keep a battery charger in the garage, either to get their car back on the road when the worst happens or, better still, to prevent trouble occurring when the likelihood can be foreseen. Unfortunately, most of us get caught "with our pants down" – a flat battery, no battery charger and a 2½ hour wait for a service van. The battery charger design presented here is your chance to correct this situation.

Boating enthusiasts and caravanners are even more likely to be interested in our new battery charger. Boats and caravans tend to be used at irregular intervals and batteries left idle in a partially charged state or "flat" tend to deteriorate. Ideally, these batteries should be kept in a fully charged condition, which means regular use of a battery charger. The "Hi-Charge" will certainly do this job.

THE DESIGN

Actually, we have considered describing a battery charger for quite some time. Our specifications for a worthwhile design included a current rating of at least 5 amps, 6 or 12V operation, a metered output, and full overload protection. The problem was that by the time we had designed a suitable unit using over-the-counter components, its cost was more than an equivalent fully-built commercial model!

It's surprising just how quickly costs can escalate by the time one mounts a suitable transformer inside a case and then proceeds to add a high power bridge rectifier, a meter, switches, output cables, and other sundry items of hardware!

Our approach was to put the problem to A&R Electronics Pty Ltd who, among other things, manufacture a range of commercial battery chargers. Could they design a kit using off-the-shelf components that the hobbyist could assemble at favourable cost? In return, we would feature the article in "Electronics Australia", complete with circuit and wiring diagrams and full constructional details.

The result of our joint efforts is this fully-protected 6-amp battery charger which we have christened the "Hi-Charge". (A&R refer to it simply as the PS518 Charger Kit.) At around $58 it is substantially cheaper than the Arlec Charger 8 which has similar specifications, but is sold fully assembled.

The Hi-Charge conforms with all the specifications listed above and in addition, features a current rating of around 6 amps. This is where the Hi-Charge scores over the $25-30 battery chargers that you may have seen in discount stores and motor accessory shops. The latter only have a continuous current rating of 1-2A, hardly sufficient to get you moving quickly when you do get a flat battery.

By comparison, the Hi-Charge should be able to "pump" enough charge into the battery to get you going within a period of 15 or 20 minutes (as opposed to a wait of some hours). So the extra money for the heavier duty unit is well worthwhile.

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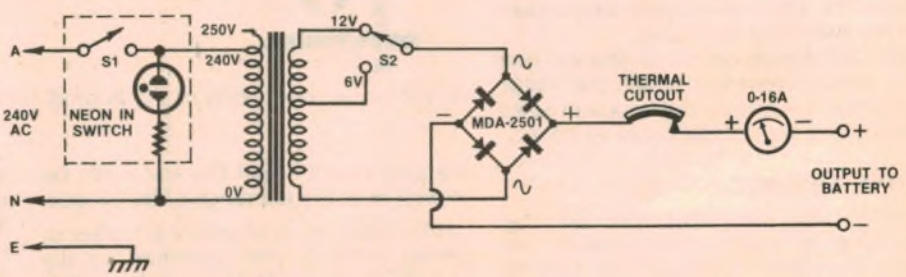
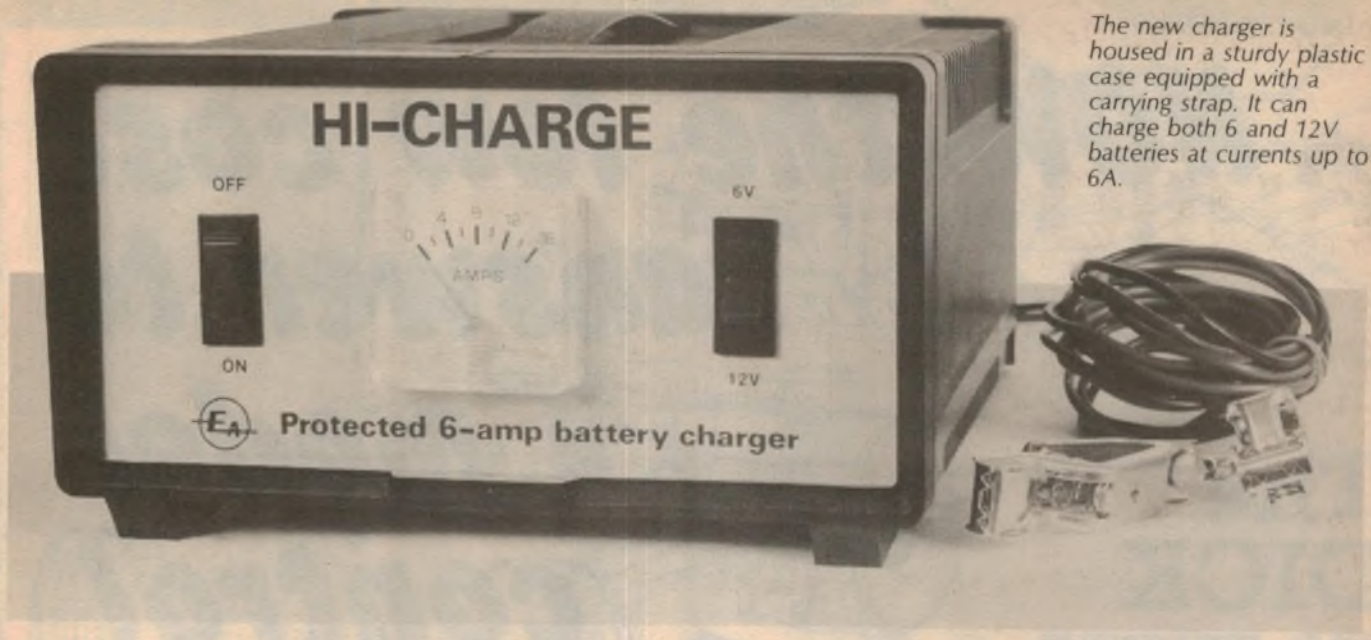


HI-CHARGE — PROTECTED 6A BATTERY CHARGER 2/BC/-

The circuit consists of a transformer driving a bridge rectifier. A bi-metal thermal cutout provides protection in the event of overload.



The new charger is housed in a sturdy plastic case equipped with a carrying strap. It can charge both 6 and 12V batteries at currents up to 6A.

has a nominal output voltage of 14.3V with a tap at 8.4V, and these are selected by switch S2 to provide for 12V and 6V operation respectively.

S1 switches the mains active and features a built-in neon indicator to give visual indication of mains on or off. Note than a 250V tap is provided on the primary side of the transformer in addition to the usual 240V AC connection. This 250V AC connection should be used in areas where the mains voltage is consistently above 240V, eg in Western Australia.

Overload protection is provided by a bi-metal thermal cutout wired in series with the positive output. While at first sight this method may seem rather crude it is actually very effective and has several advantages over electronic systems, including low cost, simplicity and reliability. It provides protection in the event of overload due to reverse battery connection, output short circuits and incorrect selection of charging voltage.

Essentially, the thermal cutout monitors the output current, although not in the same way as an electronic protection circuit. It works as follows: as current flows through the cutout, it heats the bi-metal strip, the degree of heating depending upon the current level. If the output current exceeds a certain level, the temperature of the bi-metal strip will rise, the strip will bend, and the load will be disconnected.

The thermal cutout will then cycle on and off every few seconds until the fault condition is removed.

Selection of the thermal overload point is critical, since the cutout must be able to hold the rated current in high ambient temperatures but still react quickly enough to fault currents to protect the transformer and the bridge rectifier. In the Hi-Charge, the thermal cutout operates at about 7 amps.

The two presspahn barriers fitted to the transformer serve to separate the primary and secondary wiring areas inside the charger. They are an important safety feature – in fact, if construction is carried out according to this article, the resulting charger will substantially comply with the requirements of Australian Standard C126.

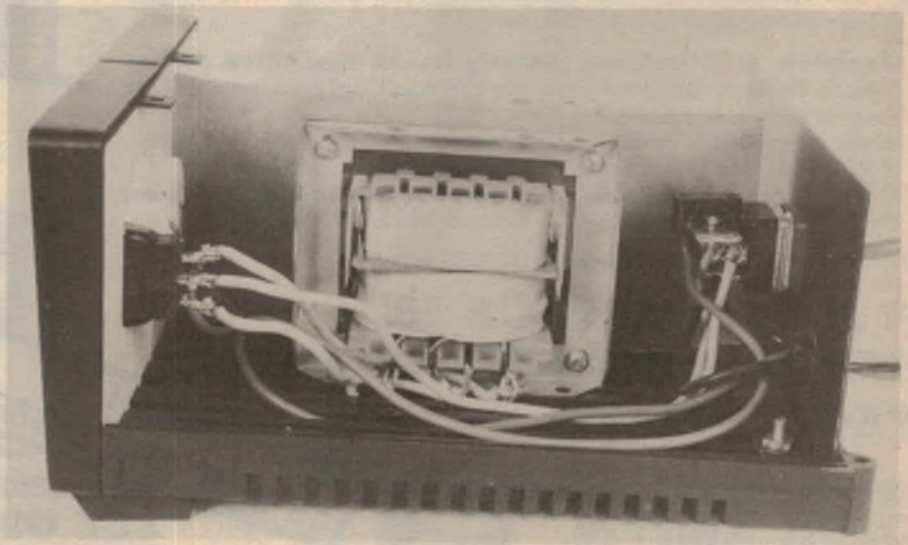
A 0-16A meter movement, also connected in series with the positive output rail, is used to monitor the charging current. A&R are the first to admit that the meter supplied is not a high quality unit, but one that has been selected on the basis of ruggedness and low cost. In this application it is perfectly adequate, although readings should be taken as an approximate guide only.

As it stands, the circuit is capable of charging a typical battery at 6A, depending on the state of discharge of the battery, its age and condition, and the mains voltage. Charging current is determined by the resistance of the circuit, which is the sum of the internal resistances of the charger and the battery, and by the difference between peak value of the rectified secondary voltage and the battery voltage. Hence a 10% change in mains supply voltage will produce a much greater than 10% change in charging current.

When the charger is connected to a flat battery, the charging current will initially be quite high due to the marked voltage difference between the two. The charging current automatically tapers off as the battery voltage approaches the charger voltage.

CONSTRUCTION

A&R's kit for the Hi-Charge is supplied complete to the last nut and bolt. All the constructor needs is a soldering iron, solder and a few simple tools to assem-



View inside the unit showing the wiring on the secondary side of the transformer. The bridge rectifier is mounted in the centre of the rear panel (right).

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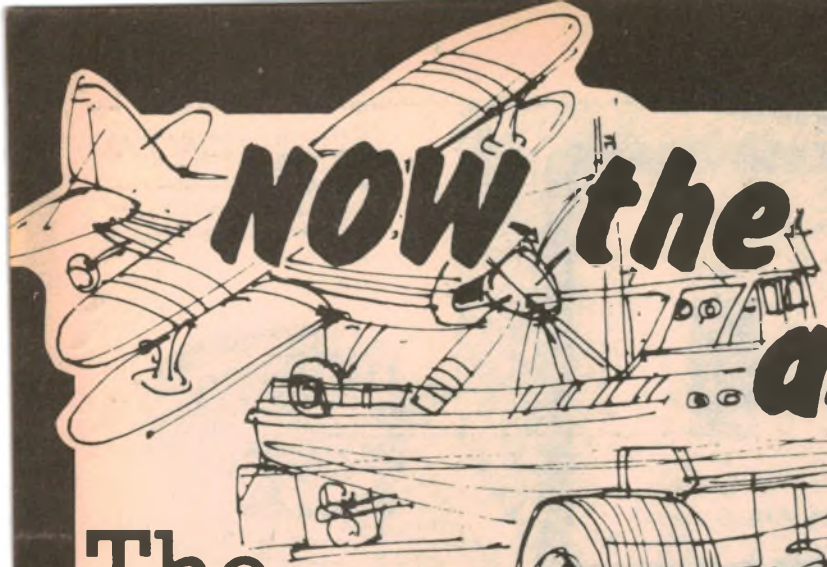

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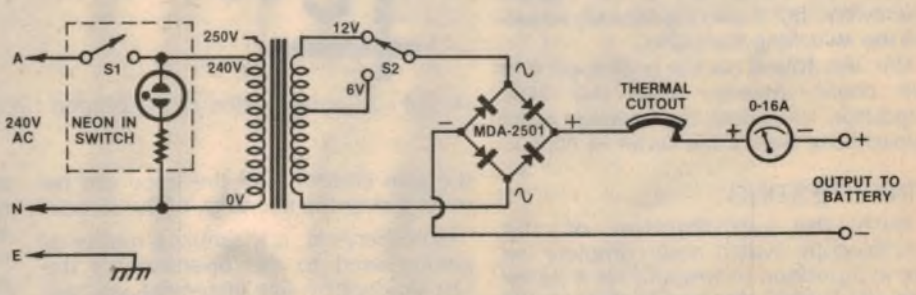

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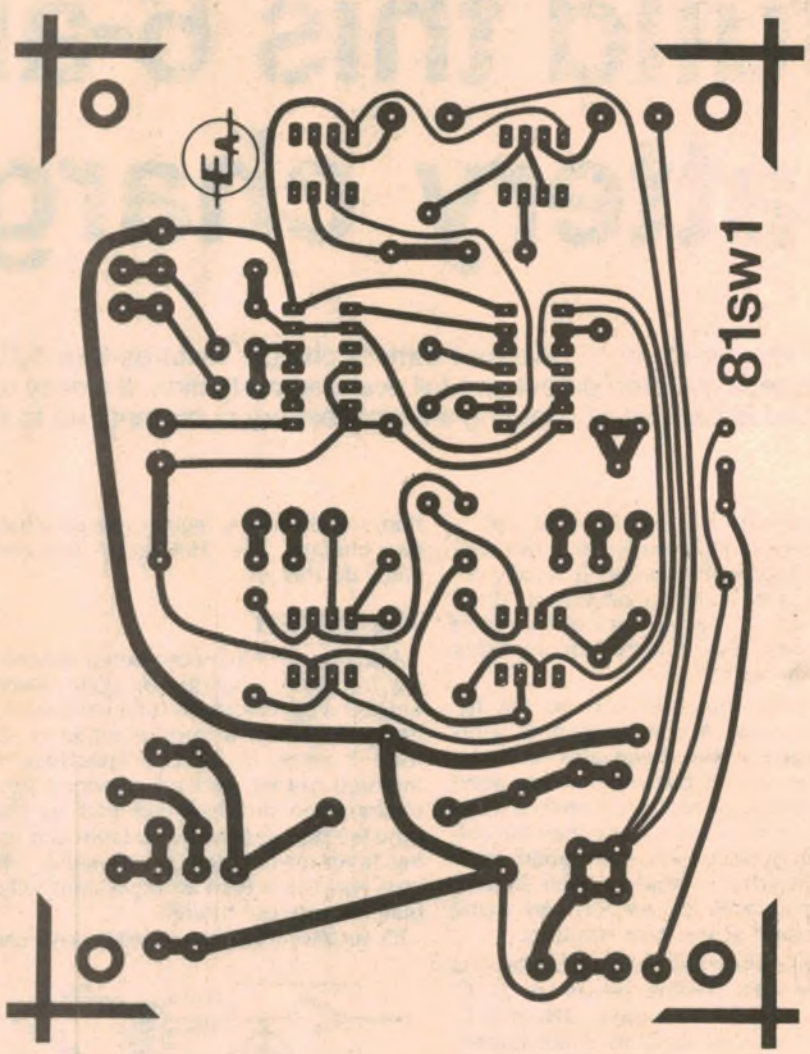

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- Switch on the oscilloscope, set it to DC input, and adjust the trace to the centre of the screen.

Now switch on the Oscilloscope Switch. Two traces should now appear on the screen, and these should move vertically with adjustment of the two position controls. If the movement of the traces is restricted, the gain control of the oscilloscope is set too low. Advance the gain control until the trace can be moved over the full range of the screen.

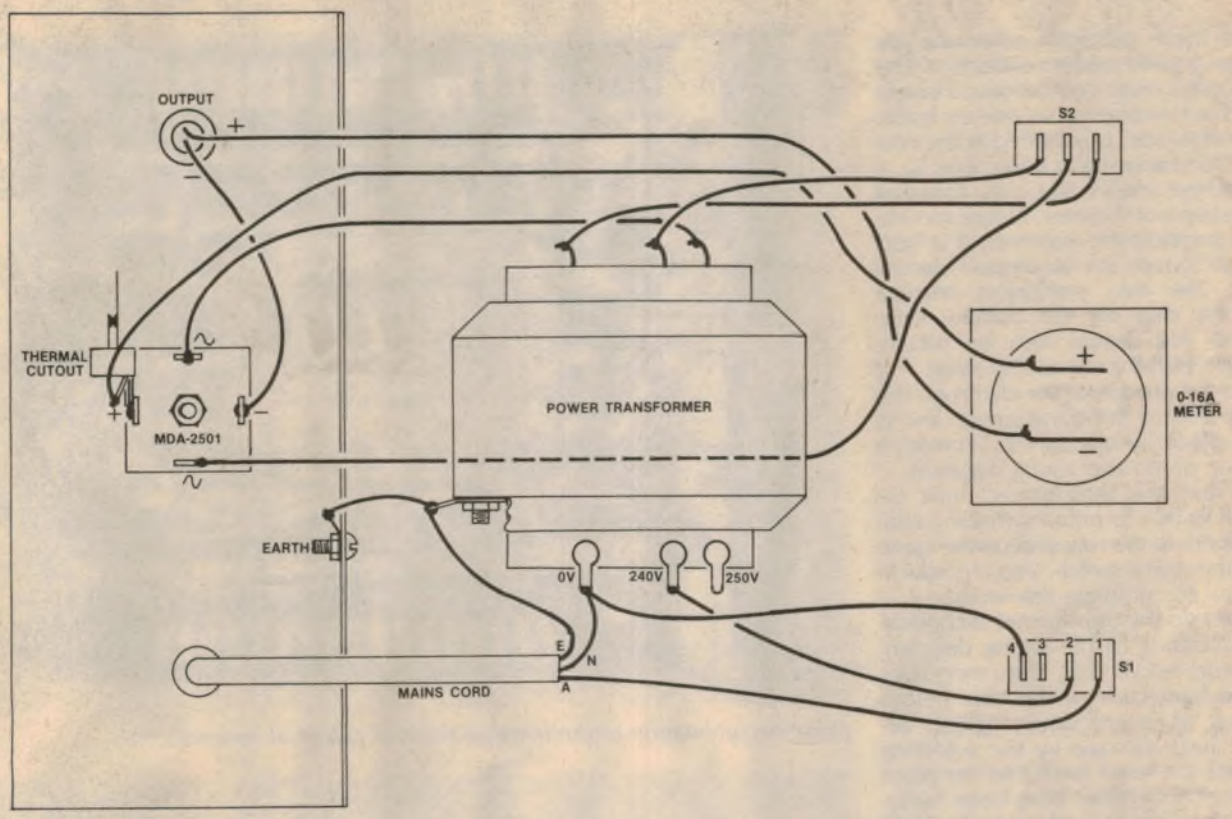
From here on, it is simply a matter of getting used to the operation of the Oscilloscope Switch. In general, you will find that fast chop will be best for viewing low frequency signals, while slow chop will be best for high frequencies.

The way in which the input switches are used will soon become obvious. Selection of "AC" or "DC" depends on whether the DC component of the signal is to be taken into consideration, while the "GND" position grounds the input circuit without grounding the input signal. The latter facility is useful for setting the trace so that DC signal levels can be measured.

We settled for an input impedance of 100kΩ rather than 1MΩ. A 1MΩ attenuator would require some elaborate frequency compensation, whereas 100kΩ could be used without any compensation and with only a relatively small effect on the losses of high frequency components. However, there are some losses and to keep these to a minimum we suggest that wherever possible the attenuator should be set to ".01" when viewing frequencies above about 500kHz.

Finally, the Oscilloscope Switch provides the bonus of a calibrated attenuator for a CRO which doesn't already have this feature. Assuming that you have a CRO with a sensitivity of 10mV/div or better, the procedure is to set the attenuator switch on the Oscilloscope Switch to "1" and feed in a suitable AC reference voltage say 5V p-p. (An unabashed plug: the EA Voltage Reference, described in June 1976 and January 1977, is ideal for this purpose.)

Now all you have to do is adjust the sensitivity of your CRO to give a reading of 1V/div. The result – a calibrated attenuator capable of switching from 10mV/div sensitivity down to 10V/div sensitivity!



Follow this diagram carefully when wiring up the battery charger. Note that the transformer is NOT centre-tapped and don't forget to fit the presspahn barriers.

ble the unit. A handsome silk-screened front panel with dark blue printing on a light blue background provides a really professional finish.

Commence construction by fitting the two switches and the meter to the front panel. You will need to do some work on the back of the panel with a small file in order to get the switches and the meter to fit properly, as they were originally designed to suit a somewhat thinner panel. Make sure that you mount the mains switch – the one with the neon indicator – so that the number one terminal is at the top.

The front panel is supplied with holes of the correct size to suit the meter and switches. Similarly, the rear panel is supplied with holes to accept the "Gripit" grommets for the power and output cords, but not with the rectifier and earth screw mounting holes. You will have to drill these yourself.

The next step is to drill a $\frac{5}{32}$in hole exactly in the centre of the rear panel for the bridge rectifier, together with a ⅛in hole in the foot of the panel for the earth screw. The latter should be carefully positioned so that, with the rear panel bolted in position, the head of the screw fits naturally into one of the channels running along the length of the base. A solder lug and a shakeproof washer complete the earth screw assembly.

Smear a thin layer of heatsink compound on the underside of the bridge rectifier and bolt it to the rear panel using a $\frac{5}{32} \times \frac{3}{4}$in machine screw and nut. (Note: A&R specifies screw sizes in Imperial units.) Use a serrated shakeproof washer under the nut on the bridge rectifier side. The rectifier should be oriented so that its positive terminal is at the top.

This done, the rear panel can be bolted into position ready to commence wiring. All leads are supplied precut to the correct length, stripped and tinned, so it is important to use the right lead in the right place. Do not shorten any of the leads supplied while wiring the kit.

Begin by connecting the 250mm long yellow wire between the centre terminal of the voltage selector switch and one of the AC input terminals on the bridge rectifier, as shown in the wiring diagram. Arrange the wire so that it runs naturally down one of the channels in the case. The other yellow wires are soldered to the two remaining lugs on the voltage selector switch (2×130mm) and to the remaining AC input terminal on the bridge rectifier (170mm), ready for connection to the power transformer secondaries.

Next, pass the two output leads through the appropriate hole in the rear panel and solder the red lead to one of the meter terminals (see wiring diagram) and the black lead to the negative terminal of the bridge rectifier. Both output leads are then clamped using the smaller of the two Gripit grommets.

Use a pair of bull-nosed pliers to install the grommet, and leave plenty of slack in the leads inside the case so that they are not subject to strain.

The thermal cutout is soldered to the positive terminal of the bridge rectifier with its contacts facing upwards. Orient the device as shown in the photograph and avoid handling the bi-metal strip, as this can alter the thermal cutout point significantly. The cutout point can be "tweaked" later on, if need be, by varying the exact point of connection to the rectifier terminal.

(For example, to increase the cutout point, solder the thermal cutout closer to the end of the rectifier terminal; to lower the cutout point, move the device closer to the rectifier body. The more heat the thermal cutout receives from the rectifier, the lower the cutout point will be.)

With the thermal cutout mounted in position, connect the 300mm red wire between its remaining terminal and the remaining terminal on the meter. Don't forget to scrape the enamel off the ends of the heavy gauge copper leads that

form the meter terminals, otherwise you won't get a good solder connection. The same applies when you get round to wiring up the transformer secondary leads.

The transformer is mounted in the centre of the chassis base using four 5/32 × ½in machine screws and nuts, together with shakeproof washers. Before mounting the transformer, however, it is necessary to loosen the lamination clamps and fit the two presspahn barriers under the clap on the primary side. An earth lug should also be attached to the transformer at this stage – it goes on the outside of the clamp on the primary side of the transformer, and is held in place by one of the lamination bolts (see photo and wiring diagram).

Note that the transformer must be oriented so that its primary winding connections are at the top, and on the same side of the mains switch. You are now in a position to complete the wiring.

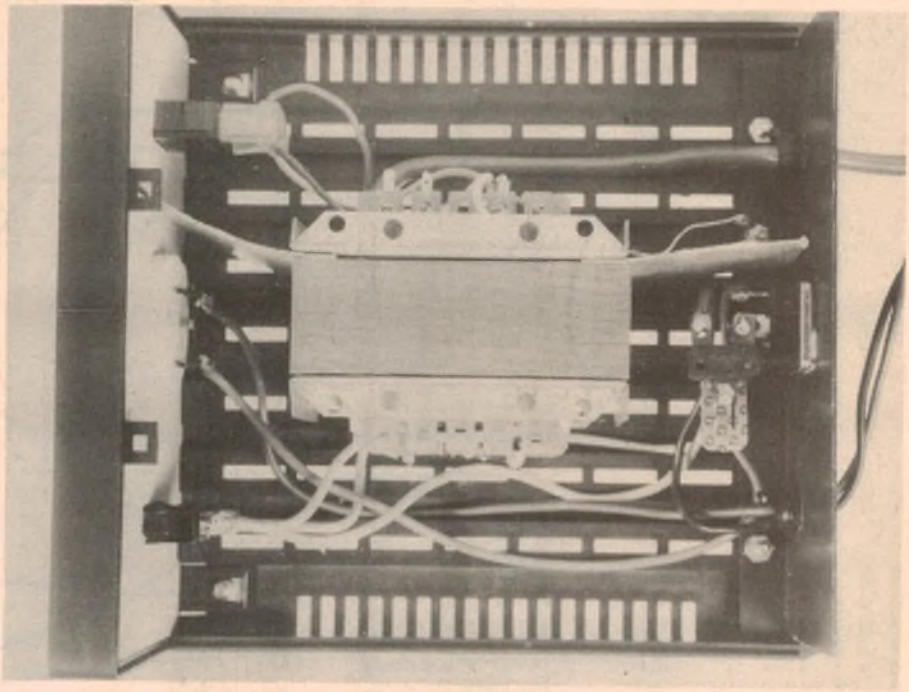
Connect up the transformer secondary leads according to the wiring diagram. We recommend that the secondary leads be bent clear of the case before soldering, as a precaution against accidental heat damage by the soldering iron. Tuck the leads back into the place when the connections have been made.

Important: the transformer is NOT centre-tapped. Instead, the tap is off-centre to allow for the effect of the two diode drops in the rectifier bridge. Make sure that you wire your unit up exactly according to our wiring diagram, otherwise the charging voltage on the 6V range will be too low.

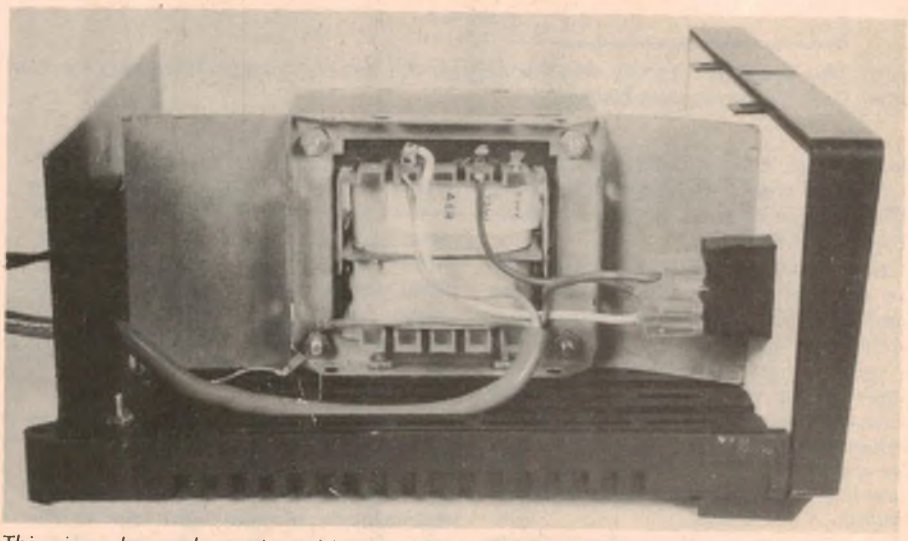
Utilux connectors are used to make all connections to the mains switch, and these are supplied already fitted to their appropriate leads. A&R really have made the job easy! The sequence of wiring is as follows: connect the white lead between the transformer neutral (0V) connection and the No. 4 terminal on switch S1; connect the red lead between the transformer 240V connection (250V in WA) and the No. 2 terminal on switch S1; connect the short length of tinned copper wire supplied between the rear panel and transformer earth lugs.

The mains cord is the last item to be wired into circuit. Pass the leads through the hole in the rear panel, and connect the active lead (brown, with the Utilux connector) to the No. 1 terminal on the mains switch. The neutral (blue) and earth (green and yellow) leads are then terminated according to the wiring diagram, ie, to the neutral connection on the transformer and to the transformer earth lug respectively.

Use the large grommet to securely clamp the mains cord to the rear panel. Again, use a pair of bull-nosed pliers to install the grommet and leave plenty of slack in the leads.



Note the orientation of the bi-metal thermal cutout at centre-right.



This view shows the mains wiring to switch S1 and the transformer primary.

Before going further, carefully check your wiring against the wiring diagram. Assuming that all is well, fasten down the lid of the case using the two self tapping screws provided, slip the front panel bezel into position, and tighten the two securing screws located under the unit behind the front panel.

Finally, a few words of warning. Never cause a spark or use a naked flame near a lead-acid battery – you could cause an explosion if you do. Lead-acid batteries generate hydrogen gas as a by-product and, as readers will know, hydrogen is highly inflammable.

When using the charger, always make the connections to the battery first, before plugging the charger into the mains and operating the mains switch. We also recommend that the vent caps on the battery be left in place, and that the battery be disconnected from the car electrics. Take care to ensure that you connect the battery the right way round – the red (positive) lead from the charger goes to the positive terminal on the battery, the black lead to the negative terminal.

Stocks of the A&R Hi-Charge battery charger kit should be available from most components suppliers by the time you read this article.

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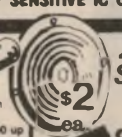

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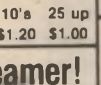

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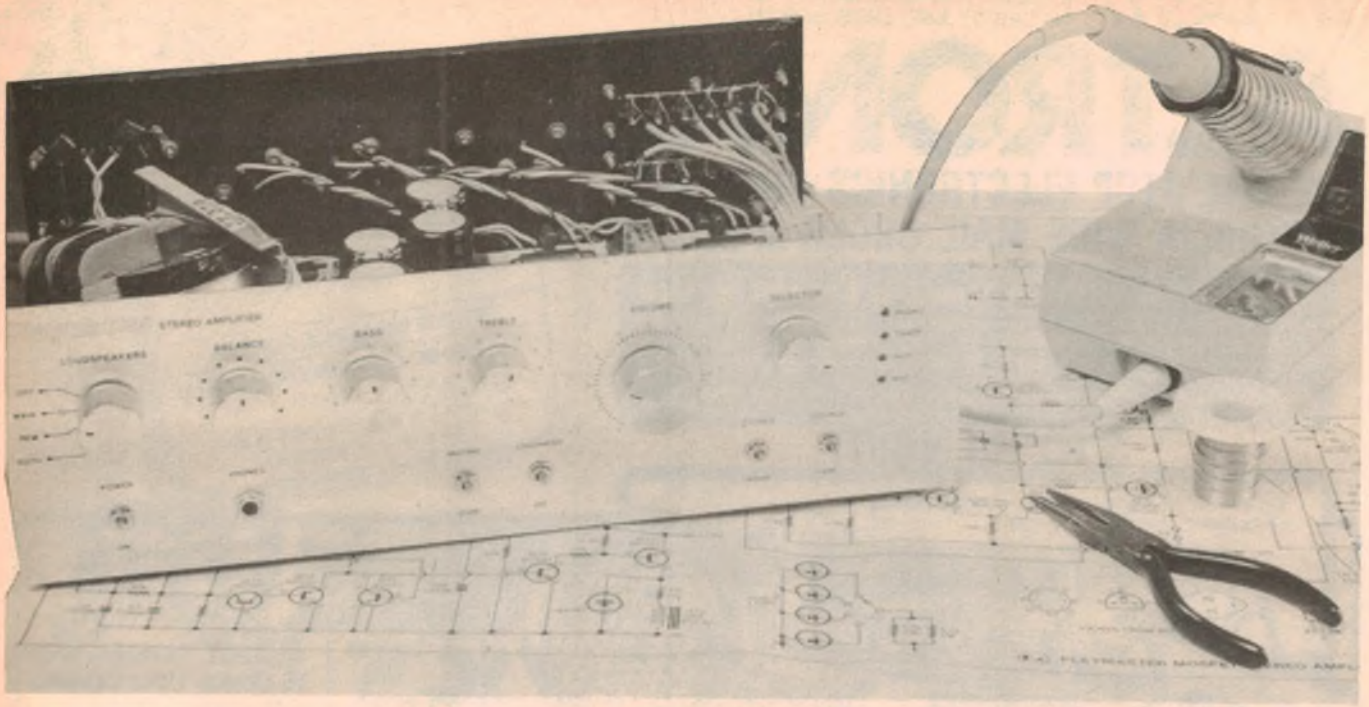


Playmaster Mosfet Stereo Amplifier

In this third and final article on the Playmaster Mosfet Stereo amplifier, we complete the details of construction, detail a number of options and give a trouble-shooting procedure.

By LEO SIMPSON

Several points concerning the PC board remain to be discussed before we can proceed to the chassis assembly.

Some holes on the PC board layout provided last month appear to be unused. However, only two of these, behind the relay are actually unused. We can account for all the others. Those adjacent to terminal 41 on the PCB should be used for loudspeaker (earth) returns. And those underneath the reservoir capacitors are provided for the additional securing lead on each 2500μF capacitor.

Similarly, alternative mounting holes are provided under the trimpots for standard upright types. We used Bourns tenturn trimpots because they are less critical to adjust and less likely to be knocked out of adjustment by clumsy handling of the PC board. Regardless of which type of trimpot is used, you will have to use a small screwdriver with an insulated shaft to make the adjustments.

Two tasks remain in the assembly of the PC board. First, install a length of figure-8 shielded cable between the balance control connections and the power amplifier input connections, pins 1, 2, 3 and 34, 35, 36 and 37, respectively. This cable is shown on the chassis wiring diagram and should be routed as shown in the chassis photographs.

Finally, solder a 100Ω/5W resistor across each pair of fuseholders on the PC board (the fuses should not be installed). These resistors perform two functions during setting up of the amplifier. First, they provide a convenient means of monitoring the quiescent current of the amplifier output stages. Second, they provide safe current limiting in the event of a circuit fault in the amplifier.

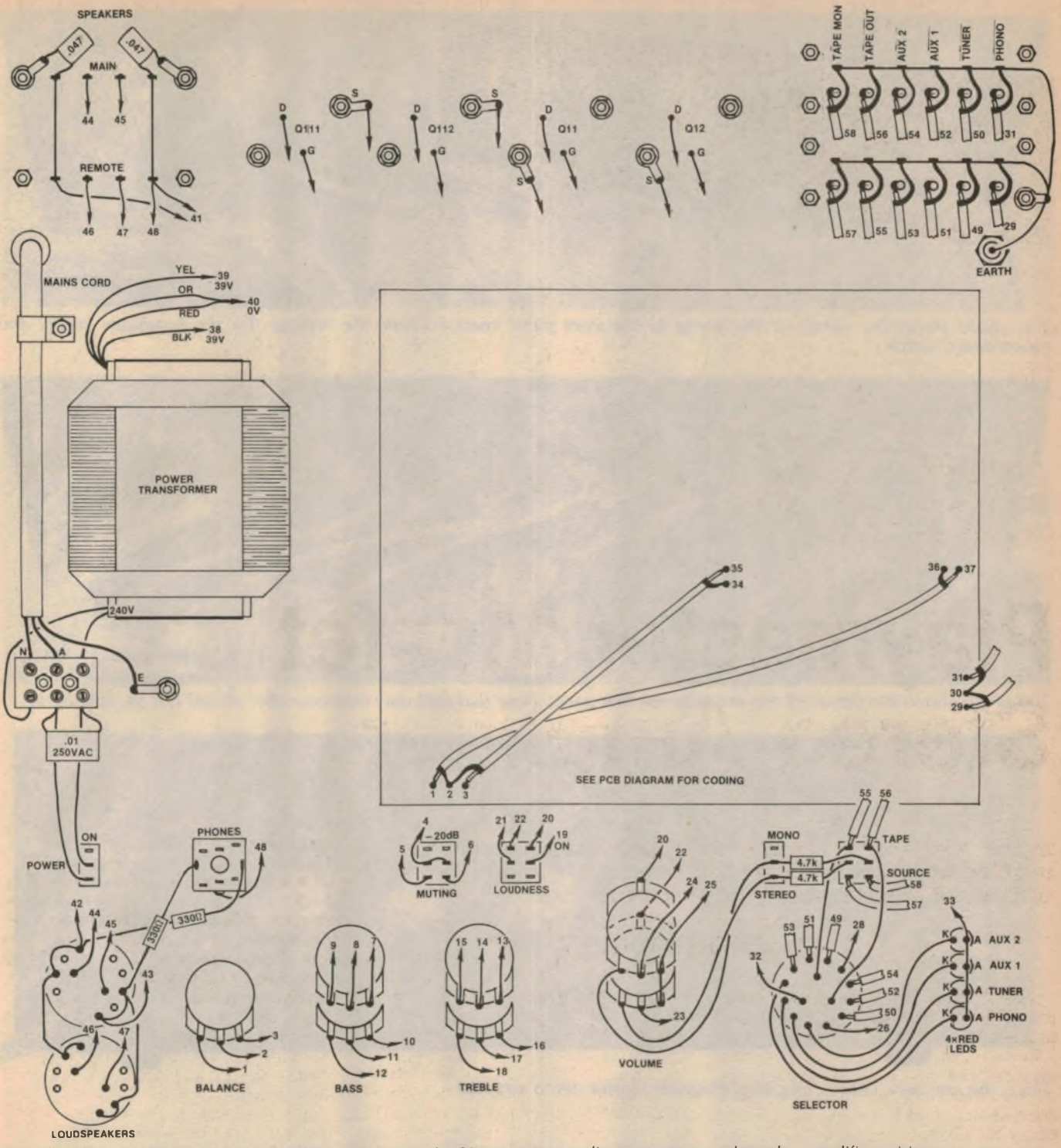
With the circuit board complete, go over it very carefully to check that all components are correctly installed as far as their values and polarity are concerned. Do the same on the copper side of the board, checking that each and every solder joint is good. That done, put the board aside and start work on the chassis.

A first step in the chassis assembly is to check, as far as possible, that all holes are correctly placed and of correct size. For example, you can check that all controls and switches actually fit in their respective holes and that the transformer mounting holes are correct. Check too, that the dress front panel holes line up with those on the chassis. The idea behind these checks at this point is to drill and debur any required holes now rather than later when metal swarf may find its way into potentiometers or other components.

Start by mounting the smaller hardware first, such as the RCA phono input panels and the spring-loaded loudspeaker terminals. Note that a number of solder lugs are attached at the same time as these panels. The chassis wiring diagram shows where these are located.

Swap one pair of red and black terminal covers on each spring loaded terminal panel so that the red terminals are in the centre of each panel. The idea behind this is to minimise the possibility of damaging shorts between the output leads.

A binding post terminal should be installed just below the phono inputs to



Use this diagram, in conjunction with the circuit and PCB component diagram, to complete the amplifier wiring.

provide an earthing point for those turntables which have a separate earth lead for the tone arm.

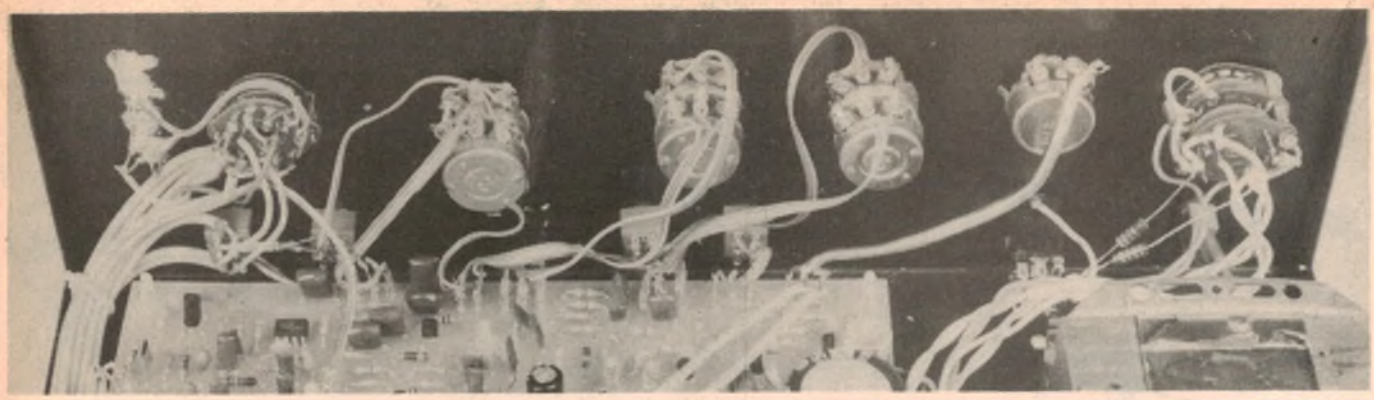
Do not mount the dress front panel until the amplifier has been completely checked out and is working satisfactorily. By leaving the dress panel until all other work has been completed you avoid the possibility of scratches on the panel.

Cut the shafts of the potentiometers and rotary switches to a length about 11 or 12mm, before they are installed in the chassis. Note that each of these controls should be spaced away from the inside of the chassis by the thickness of one nut so that, when the dress panel is finally installed, the potentiometer and switch bushes do not protrude unduly.

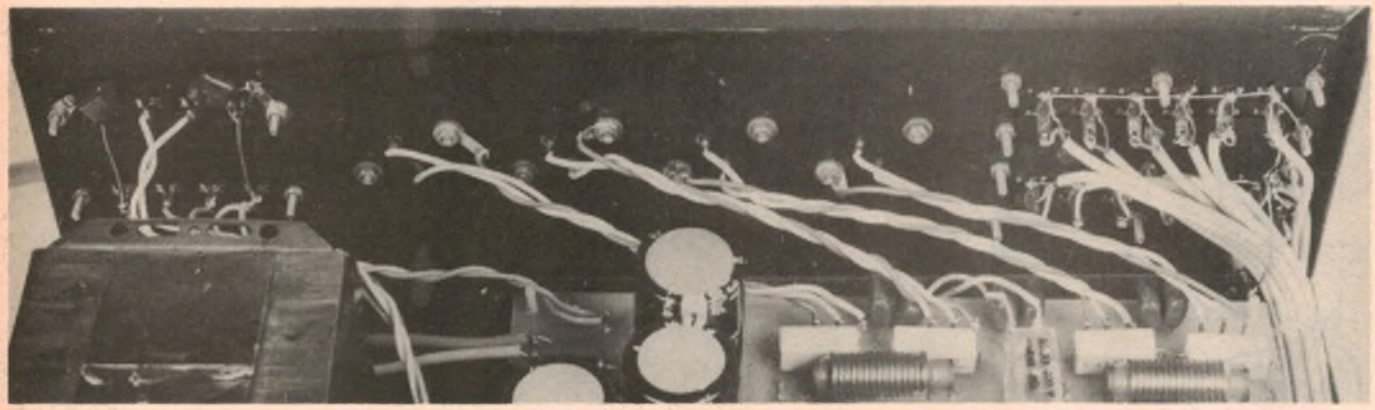
The loudspeaker switch is a 4-pole, 4-position type. At present, two types are available: One is a Lorlin type RA, distributed by C&K Electronics (Aust) Pty Ltd and available from most parts suppliers; the other is from Dick Smith Electronics. The switches may employ make-before-break or break-before-make contacts – it is not critical. Neither switch is intended to switch heavy currents although they can both carry the relatively high currents involved.

The headphone socket can be a non-switching type instead of the switching type which we used (because we had it on hand). The 330Ω resistors to the headphone socket are wired directly between the relevant terminals on the speaker switch and the socket itself. These resistors should be ½W or 1W types, to avoid the possibility of overheating when listening at high levels to the headphones.

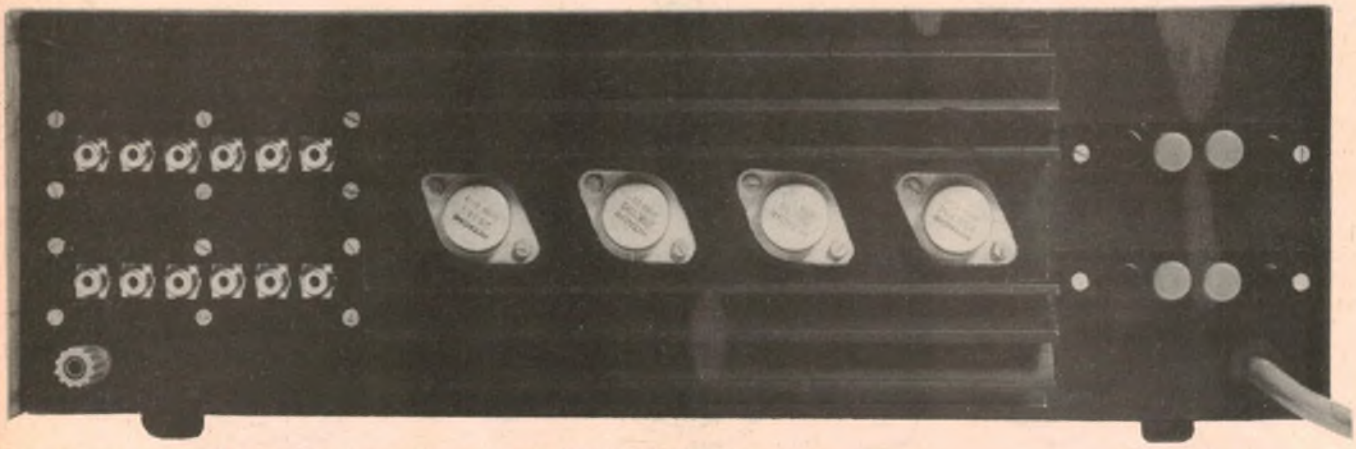
The headphone socket should be in-



This photo shows the details of the wiring to the front panel controls. Note the resistors for the headpone socket and mono/stereo switch.



This photo shows the details of the wiring to the rear panel. Note that light-duty rainbow cable should not be used here.



This is the rear view of the completed Playaster Mosfet stereo amplifier.

sulated from chassis and a separate earth return run back to the loudspeaker terminal panel (shown as connection 48 on the chassis wiring diagram). Insulate the headphone socket using two fibre washers and insulating tape. Alternatively, you can make your own washers out of suitable plastic sheet. The insulation tape is wound around the bush of the socket where it passes through the chassis and, ultimately, through the front panel.

When the headphone socket is mounted and connected, check that it is, in fact, isolated from chassis by using a multimeter switched to one of the high resistance ranges.

Similarly, the 4.7KΩ resistors between the Tape Monitor and Stereo-Mono switches are wired directly between the switches themselves. In this case, the resistors should be sleeved with spaghetti or Nylex tubing to prevent the likelihood of shorts.

The output transistor heatsink is secured to the chassis via the various mounting screws of the TO-3 output transistor packages. Once again, you should carefully examine the heatsink to ensure that all holes line up exactly with the corresponding holes in the chassis. Also make sure that the transistor mounting surfaces are flush and free of any metal swarf or burrs.

The Mosfet output transistors are mounted in the same way as conventional bipolar transistors having TO-3 cases. Use mica washers and insulating bushes to isolate the transistors from heatsink and chassis, as depicted in the diagram on page 61.

Note that the Mosfet output transistors do not have the connections you might expect if you are familiar with bipolar power transistors. The Source is in fact connected to the transistor case rather than the Drain, as you might expect. Take great care not to transpose the Gate and Drain connections otherwise you are sure to end up with damaged transistors.

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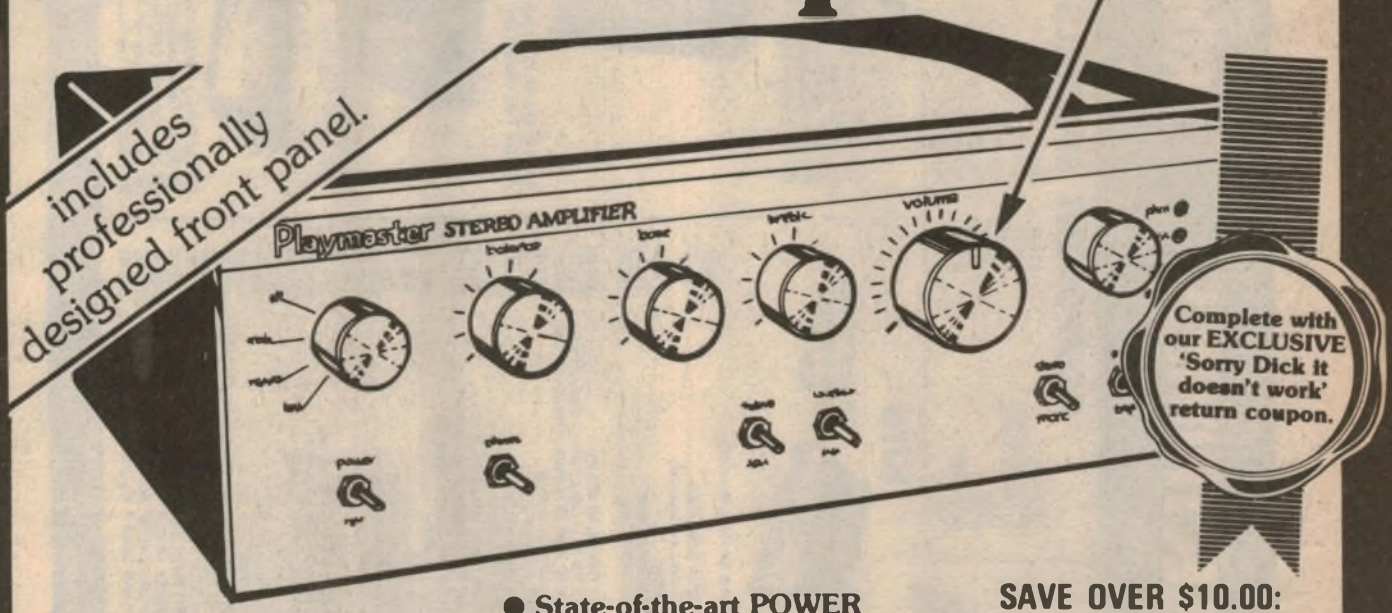

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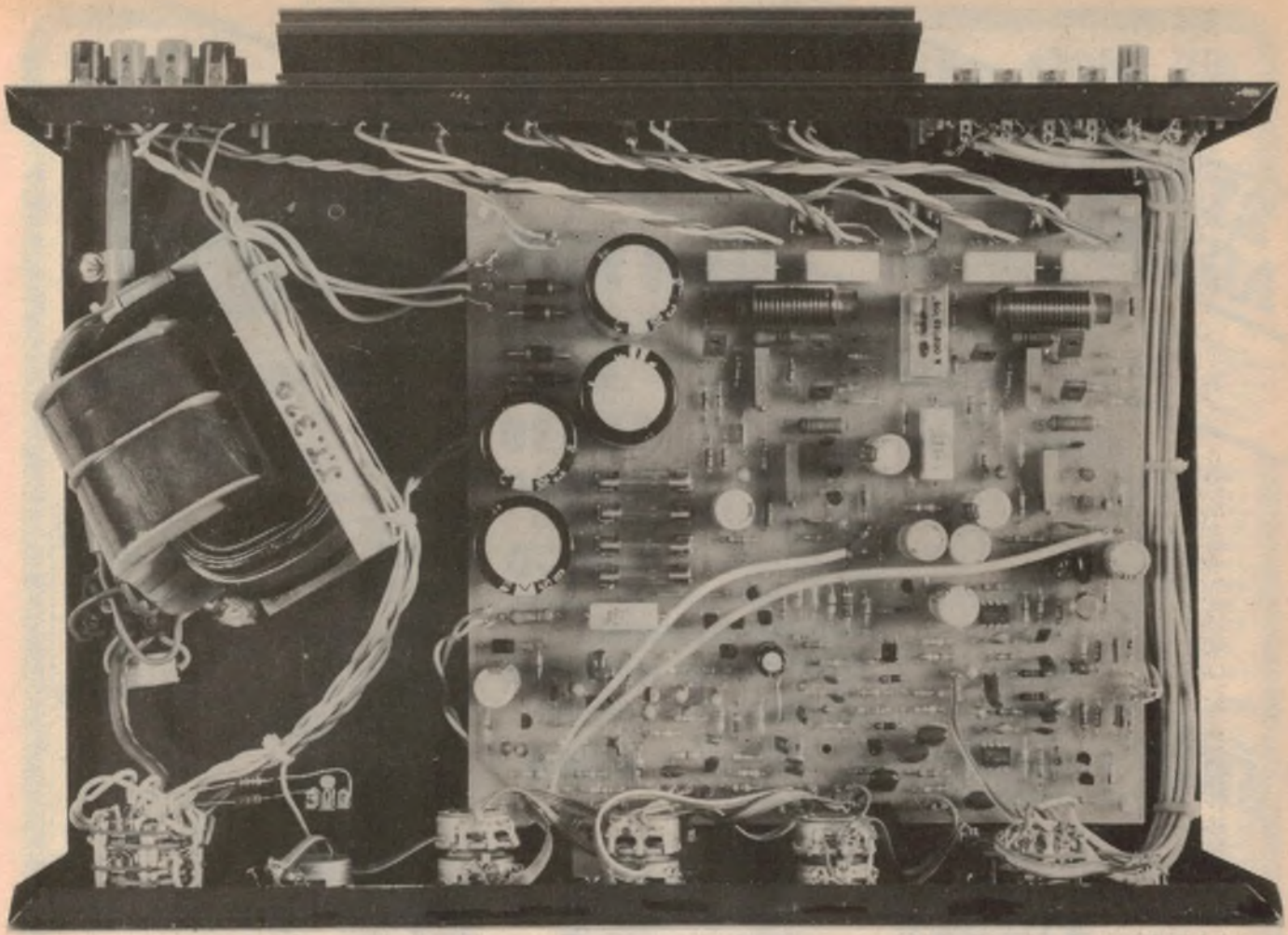

This photo shows how the wiring from the Speaker Selector to the Speaker terminals is attached to the C-core transformer.

The mains cord should be passed through a grommetted hole in the rear of the chassis and anchored with a cord clamp. Terminate the mains active (brown or red) and neutral (blue or black) wires to the insulated terminal block and solder the earth (green or green with yellow stripe) wire to a solder lug near the transformer.

The mains switch has a 0.01μF interference suppression capacitor wired across it, at the insulated terminal block. Keep the leads to this capacitor reasonably short and sleeve them if necessary with Nylex and spaghetti to prevent them from contacting the chassis (or the user). This interference 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.

Mount the transformer as shown in the photographs and chassis wiring diagram. Note that the Jones C-core transformer has an odd orientation, to minimise hum. Whichever transformer is used, the primary connections should be near the on/off switch while the secondary connections are to the rear.

Wiring from the input sockets to the Selector and associated switches can now be installed, with the shields all terminated to the common earth "bus" around the input sockets. This bus is soldered to a solder lug retained by the input panel mounting screw close to the binding post terminal. The cable shields are not terminated at the Selector switch. The cable shields for the phono input are terminated at the PC board, when it is installed. Note that the phono input cable must be run first, before that for the tuner and auxiliary inputs.

Cut and dress the input cables so that they lie together neatly, as in the photographs. Use three cable ties to hold the cables in position.

Flat ribbon cable can now be run from each potentiometer section, and from the associated toggle switches. Each cable should be of an appropriate length and stripped and tinned at the free end, ready for termination to the PC board.

By way of explanation, flat ribbon cable usually comes in 10 strand form – just peel off as many strands as needed and cut to length.

On the loudspeaker terminal panels, connect the two outside earth connections together with 16-gauge tinned copper wire and then install two .047μF capacitors from the "earths" to solder lugs on the chassis. These capacitors must not be omitted as they help maintain amplifier stability and suppress mains-radiated interference.

Now you can mount the PC board into the chassis. Terminate the transformer secondary wires directly to the PC board (do not use PC pins for these three connections) and then mount the PC board using six Richco plastic supports. Both the board and chassis should be drilled for these supports.

Make all connections exactly as shown in the chassis wiring diagram. Do not use ribbon cable to make the connections to the Mosfet output transistors or the loudspeakers – it does not have sufficient current rating. Instead, use conventional hook-up wire such as 10 × 0.2mm or heavier.

Connecting leads to the output transistors should be kept as short as possible and twisted together for neatness. Keep these leads away from the input socket panels, or instability could result.

If you are using the Jones C-core

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transformer do not dress and bind the loudspeaker wiring permanently at this stage. You will have to find the optimum wiring dress in a procedure we will outline later.

With all the wiring complete, double-check all your work to ensure that no mistakes have been made. You are now almost at the stage where power can be applied. Set the trimpots associated with the power amplifier inputs to midpoint and the trimpots for quiescent current adjustment (between the collectors of Q9 and Q10) to minimum resistance. Do not connect loudspeakers or dummy loads at this stage. Disconnect the power amplifier inputs at pins 35 and 37 on the PC board.

Now apply power and measure the supply voltages which are shown on the circuit diagram. Note that these are approximate only. Now check that the amplifier output voltages, at the junction of the 0.56Ω/5W resistors in each channel, are close to 0V. That being the case, you can set the quiescent current. This is done by measuring the voltage across one of the 100Ω 5W resistors installed across the fuseholder clips.

Adjust the appropriate trimpot to obtain 7.0 volts across the resistor, coinciding with a quiescent current of 70 milliamps. Later checks of this voltage will probably show that the current drifts but provided it stays within about ±10mA or so there is no cause for worry.

Note that it is immaterial whether you measure the voltage across the 100Ω resistor in the positive or negative supply rails to each power amplifier – the reading will be the same. Just make sure that you measure the voltage across one of the appropriate resistors, dependent on which channel you are adjusting. Looking at the PC board from the front, the two fuseholders for the righthand power amplifier are closest to the front, with that closest being in the negative supply rail.

The quiescent output voltage at the output of the power amplifiers should preferably be adjusted with the aid of an accurate digital multimeter which has polarity indication, so that the voltage can be adjusted to within a few millivolts of 0V. Failing that, a conventional multimeter switched to the lowest available DC voltage range will do the job, although the final setting will probably not be as good. (Note that, in theory, greater sensitivity could be obtained from a conventional multimeter when switched to the lowest available current range, eg, 50μA, but the strong possibility of inadvertently damaging the meter movement makes it inadvisable!)

This adjustment is fairly touchy in nature but it should be possible to set the quiescent output voltage to within ±5mV of 0V. The trimpots in question are the ones associated with Q6 and Q7 in each channel.

Now connect loudspeakers and the connections on the PC board at pins 35 and 37. With the volume control set fully anti-clockwise, listen closely to the loudspeakers for any extraneous hum and noise. With typical loudspeakers and in a quiet room, the noise level should be very low. Turning up the volume control should not increase the noise level markedly, except in the case of the phono input which should have a magnetic cartridge connected (or be short-circuited) for minimum noise output.

As noted previously, it is possible to optimise the loudspeaker wiring "dress" for minimum hum output, if the C-core transformer has been used. Reference to the relevant chassis photo will show that the loudspeaker wiring is bound into a cable form with ties and attached to the topmost edge of the transformer clamp (with a suitable adhesive). The best position for this cable form can be found by monitoring the residual hum output from both channels by using a pair of stereo headphones (the more sensitive, the better).

Those who have access to an audio oscillator will be able to orient the tone control potentiometers accurately so that when set to zero they are flat. For the treble control the "flat" position is very close to the mechanical centre of the resistance element but for the bass control, the flat setting is closer to "2".

If these checks are okay, turn off the power and wait until the reservoir capacitors discharge, as indicated by one of the LEDs. Now install the 2A fuses and you are in business. Select program source and listen to your heart's content. Providing that all these checks are to your satisfaction, you may then install the front panel.

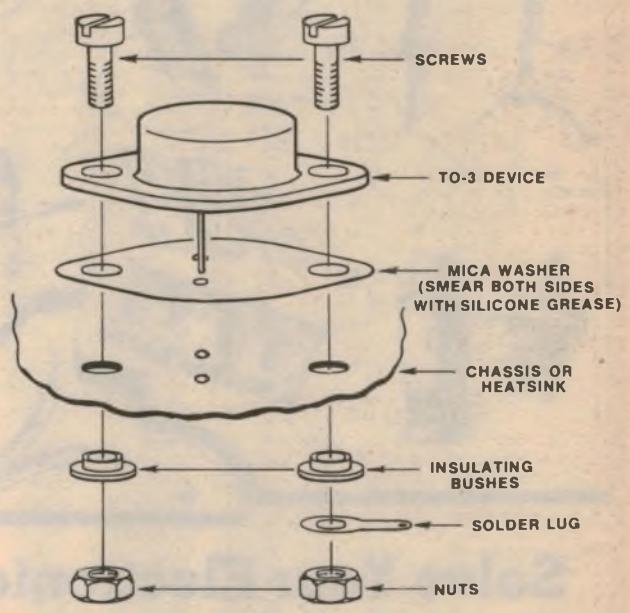
For those who have been unlucky enough to be unable to obtain correct operation, we sympathise with you and now provide some notes on trouble-shooting.

Trouble-shooting in the power amplifiers should be performed with the 100Ω 5W resistors wired across the fuseholders in place of the 2-amp fuses. If a fault is present which causes heavy current drain, the resistors will get very hot but they will generally prevent damage to the ourput stage. This means that you can work on the amplifier without worrying about burning up expensive output devices.

Even so, you should take care while trouble-shooting. The total DC voltage in the power amplifiers is 100 volts or so, which can give you a nasty belt! By the same token, avoid touching the output transistor cases when the amplifier is delivering high power.

Tabulated below are the voltages at all the key points in the circuit. These were taken with the amplifier under no-signal conditions, with volume control at minimum setting, tone controls and balance control centred and with 240VAC input. Note that small changes in the mains voltage will cause equivalent changes in the power amplifier voltages while in the preamplifier, normal component tolerances will cause voltage changes of up to ±10%.

First, we will assume that the positive and negative supply rails are operational. If the negative or positive 15V rails are less than 1V, the likely cause is a short-circuit or reverse-connected zener diode. On the other hand, if these supplies are substantially higher than 15V, then it is likely that the associated zener diode is open circuit. Note that the 15V rails are actually slightly less, at about +13.9 and −14.4V.



This diagram shows the method of mounting the power transistors.

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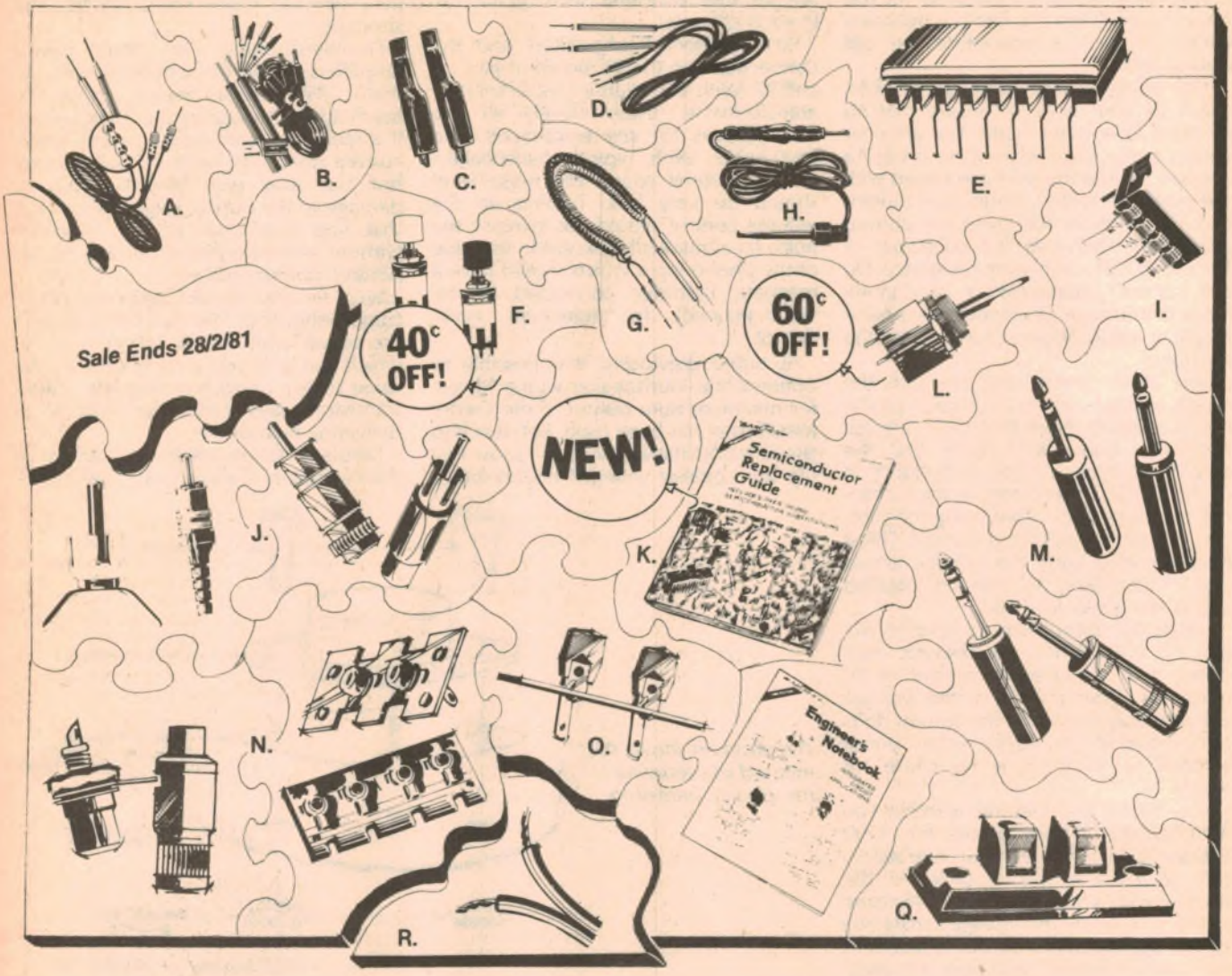

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Low Loss Clear	18 Stranded	18	278-008	7.19
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	emitter	base	collector
Q 1	−0.57	−0.015	1.2
Q 2	−0.57	−0.015	1.2
Q 3	6.6	7.2	13.9
Q 4	0.68	1.3	7.5
Q 5	6.8	7.5	13.9
Q 6	0.75	0.15	−47.9
Q 7	0.75	0.15	−47.9
Q 8	−48.6	−47.9	−20.1
Q 9	−48.6	−47.9	−0.5
Q10	48.9	48.3	0.6
Q13	0.0	0.0	0.2
Q14	0.68	0.2	0.0
Q15	0.0	0.0	0.68
Q16	0.0	0.68	0.26
Q17	51.0	50.4	50.9

These are the key voltage readings in the circuit of the new amplifier.

These voltage readings were taken with a digital multimeter having an input impedance of 10 megohms. Readers should note that loading effects of conventional multimeters with a sensitivity of 20,000 ohms per volt will prevent accurate voltage measurements from being taken around Q1 and Q2, and at the bases of Q3 and Q4. The voltages given at the bases and emitters of Q6 and Q7 are notional only and will depend on the matching between the transistors and the setting of the balance trimpots.

A difficulty in using voltage measurements to diagnose faults in amplifier circuits is that negative feedback can often cause the fault conditions to be "reflected" throughout all stages. Worse still, negative feedback may enable an amplifier with a faulty transistor to produce very-close-to-correct operating conditions in all stages. Still, careful analysis of the operating voltages can often give a clue to where the fault lies.

A useful point to remember is that all conducting transistors will have a base-emitter voltage drop of 0.6 to 0.75V. It is also useful to remember that if one channel is fully operational, it can serve as a basis for comparison with the faulty channel.

Trouble-shooting in the power amplifiers should be done with the amplifier inputs at pin 35 and 37 on the PC board disconnected.

If the amplifier output voltages cannot be set to zero, check the base-emitter voltages of Q6 and Q7 (0.6V) and their collector voltages – approximately −48V and equal. If no fault is evident here, continue voltage checks through the stages of the amplifier. If the voltages around Q8, 9 and 10 are wildly askew, check that you have not inadvertently swapped Q10 with Q8 or Q9.

If the amplifier offset voltage is close to zero and the 100Ω protective resistors are dissipating excessive voltage it is likely that the amplifier is oscillating supersonically or drawing excessive quiescent current. Check that the gate connections to Q11 and Q12 are okay. If no variation of the quiescent current can be obtained by varying the appropriate trimpot, try shorting the gates of Q11 and Q12 together. This should drop the quiescent current to zero. If not, one of the Mosfets is probably faulty. If so, the relevant trimpot wiper is probably open-circuit.

Instability in the power amplifiers in the form of supersonic oscillation could be due to the following causes: faulty RLC network in the output stage; faulty 100μF bypass capacitors; open-circuit 100pF capacitor associated with Q8; poor lead dress associated with Q11 and Q12 or with the loudspeaker wiring.

Faulty or open-circuit capacitors can generally be checked by bridging with a capacitor of equivalent value.

Trouble-shooting in the preamplifiers follows similar procedures to those used in the power amplifiers. Remember to leave the 100Ω protective resistors in circuit just in case you drop a meter prod on the PC board or a similar untoward event occurs.

Note that while the output voltage at pin 6 of the TL071 op amps is nominally zero, it can be as high as ±200mV, dependent upon the matching of Q1 and Q2 and the match of the input stage transistors in the TL071. If the output offset is higher than this figure, it is likely that Q1, Q2 or the TL071 op amp is faulty. Do not fall for the trap of forgetting that the op amps are orientated in different directions. You were warned previously!

If any transistors are removed from the circuit as suspect, it is handy to be able to check them with the aid of a multimeter. The range which is usually appropriate is "R × 100 ohms". First check the transistor from collector to emitter in both directions. Each measurement should produce a high resistance reading. Similarly, check the base-emitter and base-collector junctions. These should give high readings in one direction and low readings in the other.

Excessive hum in the amplifier may be a problem caused by some of the abnormal operating conditions already described, or by incorrect layout. But the latter should not occur if the wiring diagrams have been followed explicitly.

ERRATA:

A number of errors have come to light in the parts list for this project, published last month on page 47. In the list of capacitors, delete the 2 x 33uF/50VW electrolytics, and one 47uF non-polarised electrolytic. In the list of resistors, add one 15kΩ/¼W and change the 4 x 0.47Ω/5W to 0.56Ω.

Add interest to your music with this

Simple fuzz box for electric guitars

Feel like some fuzz on your guitar? What is fuzz anyhow? Does it have anything to do with policemen? These and other hairy questions are answered in this article which shows you how to make a fuzz box for your electric guitar.

by PHILIP WATSON

We first described a fuzz box back in August 1967 (File No. 1/GA/10) and it proved extremely popular. So much so, that we were recently inspired to take a fresh look at the original design, with the aim of simplifying construction. As a result it now uses a PC board and employs CMOS switching to circumvent a shortage of suitable mechanical switches as used in the original.

For those who may be a little hazy as to just what a fuzz box is, or how it works, let us recapitulate from the original article.

A fuzz box is a piece of circuitry introduced into the guitar amplifier chain to deliberately distort the waveform. It produces a sound which is "buzzy" by nature, not unlike that from a heavily overloaded amplifier or from a loudspeaker whose voice coil is fouling in the magnet gap. In fact, the similarity of fuzz to overload is no accident, because a fuzz box deliberately simulates or introduces an overload condition.

By nature, the waveform from an electric guitar ranges from the reasonably sinoidal to one carrying mainly consonant harmonics – depending on playing technique and the position of the pickup coils in use. A fuzz box squares up, or otherwise distorts the waveform envelope, adding multiple harmonics as it does so, and also adding further dissonant frequencies by intermodulation of those actually being fed in from the pickup coil. The naturally "round" tone of a guitar therefore takes on a strident quality.

Just how a fuzz box treats the wave envelope passing through it depends largely on the circuitry involved. Straight clipping circuits, for example, square off the tops of the waveform, so that predominantly sinoidal waves begin to look quite square on a CRO. As might be expected, the sharper the corners, the wider the spectrum of the harmonics so generated.

In actual fact, most guitarists tend to regard squared waves as too conservative in terms of fuzz, particularly when generated from substantially pure waveforms; a squared sine wave has a rather pleasant "woodwind" quality and is anything but strident. Again, while a broad spectrum of harmonics may be generated in the first instance by simple clipping, those above about 4kHz don't count for much in the average guitar situation.

The kind of guitar fuzz which is likely to have greater impact is that in which there is a concentration of spurious harmonics within the normal musical range of a guitar system – that is, up to about 3kHz. Aurally, the requirement seems to be met best by circuitry which tends not just to clip waveforms, but to generate waves with generous overshoot at either or both ends of the plateau.

In short, fuzz is a gimmick intended primarily to add stridency to single tones or, at most, simple chords. It should not be used with complex chords and needs to be switched out before such chords are attempted.

The method we have used to produce fuzz is to pass the guitar signal through a small transistor amplifier whose operating conditions can be modified to operate in overload mode from direct guitar signals.

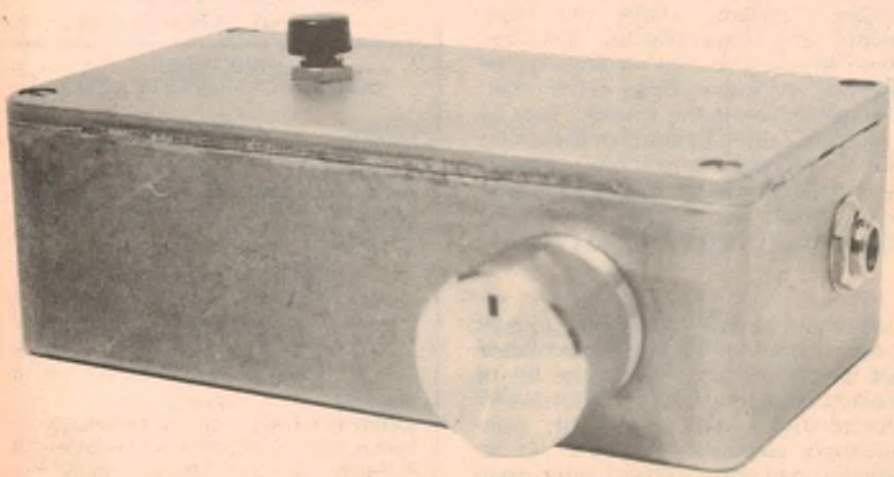
The characteristics of our fuzz box may be summed up as follows:

(1) Completely self-contained, connecting between an individual guitar and its normal input jack to the main amplifier. It should operate with almost any typical guitar system.

(2) Output on "normal" and "fuzz" is at substantially the same level and, in both modes, the unit contributes a small amount of gain.

(3) In addition to the normal fuzz footswitch, a control allows the degree of fuzz to be varied as required.

As can be seen from the circuit diagram, the device consists of, basically, two DC coupled transistors operating as

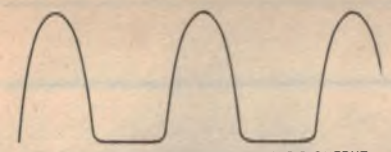


Why make it beautiful if you're only going to tread on it?

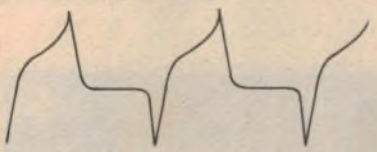
We estimate that the current cost of parts for this project is approximately

$19

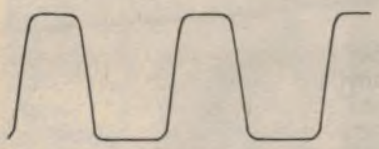
including sales tax.



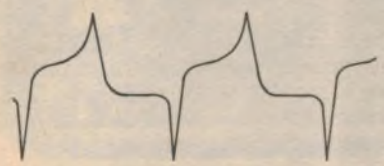
MIN. FUZZ 30mV RMS INPUT, 120mV P-P OUTPUT



MAX. FUZZ 30mV RMS INPUT, 360mV P-P OUTPUT

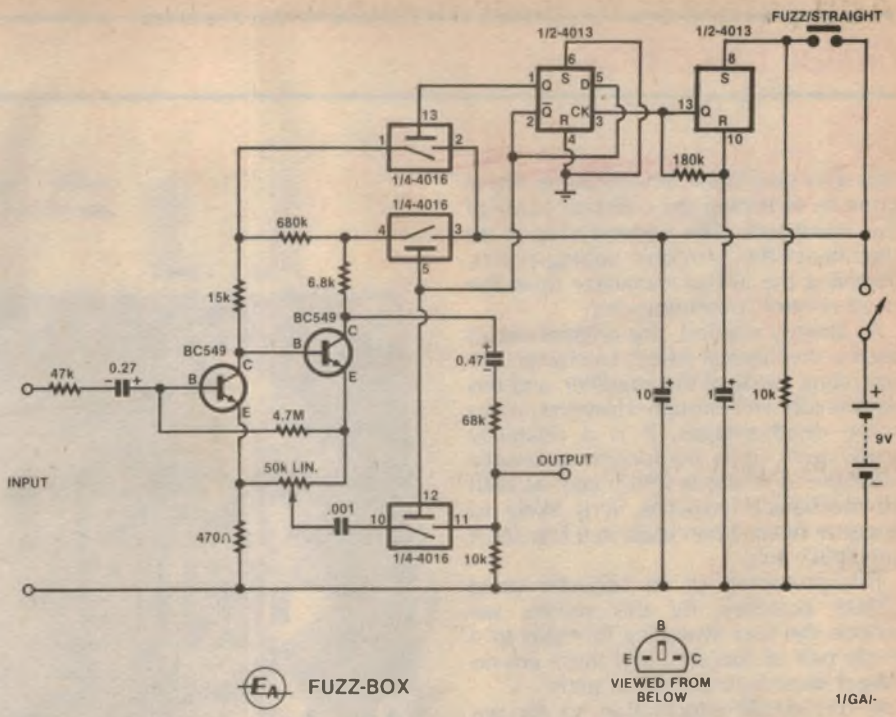


MIN. FUZZ 60mV RMS INPUT, 120mV P-P OUTPUT



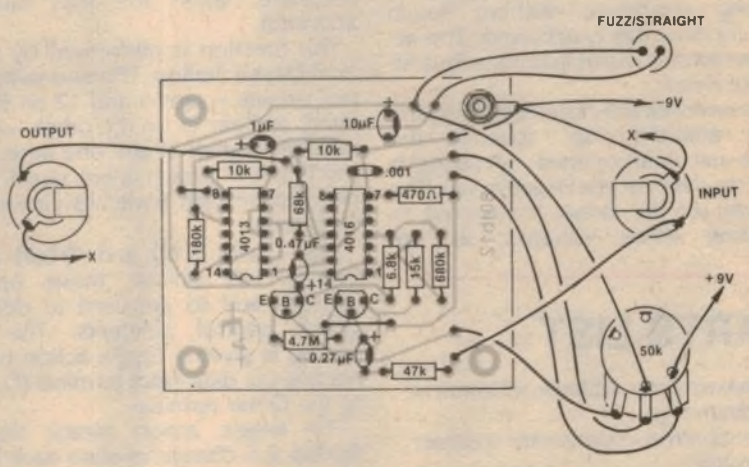
MAX. FUZZ 60mV RMS INPUT, 520mV P-P OUTPUT

Shown above are typical waveforms from the unit. As can be seen, the "fuzz" at minimum is amplitude dependent but at higher levels of distortion the waveform is determined mainly by the "fuzz-control" setting.



FUZZ-BOX

The circuit consists of two DC coupled transistors operating as an amplifier in the guitar line. It is designed to deliberately introduce distortion.



This wiring diagram shows the PC board as viewed from the component side. Observe the usual precautions when soldering in the CMOS ICs (see text).

an amplifier in the guitar line. By means of three CMOS switches (4016) the operating conditions can be changed from a simple distortion-free mode, to a high distortion mode, but with the degree of distortion variable over a useful range.

To understand how this is done, imagine that two of the switches – pins 3,4,5 and 10,11,12 – are closed and the third one – 1,2,13 – is open. Under these conditions the load for the first transistor is made up from the 15kΩ and 680kΩ resistors. This, with the forward bias applied, is sufficient to bring the stage near to current saturation. Because the second transistor base is DC coupled to the first collector, the second transistor will simultaneously be held to near cut-off.

When a sinoidal signal is applied to the first transistor base, the base will be driven alternately positive and negative. On the positive swing of the input signal the transistor will be driven into complete saturation, limiting the collector's voltage swing and resulting in a clipped signal peak at the collector.

On the other hand, the quiescent voltage across the load is sufficient to allow a full and unclipped collector voltage swing on the other half-cycle of the signal. The resulting waveform at the first collector is therefore a sinusoid with a clipped negative peak.

Now for the other transistor. The unaffected signal peak at the first collector will drive the second transistor into a complete cut-off, thereby delivering a signal at the output which has both peaks clipped.

The actual gain through the fuzz unit is largely a function of the output divider, the 10kΩ and 68kΩ resistors being chosen to give a small amount of gain in both modes, actually about 1.5 times.

However, as we have already pointed out, waves which are merely squared produce rather modest fuzz, and further elaboration of the distortion circuitry is called for, at least for the more extreme effects.

Looking again at the circuit, a distorted signal appears also at the emitter of the second transistor and, by adding the higher frequency components from this distorted and out-of-phase waveform to the output from the collector circuit, the end result is a large spike above the trailing edge of the initial squared, output waveform.

By using a potentiometer as the emitter load for the second transistor, it is possible to vary the basic fuzz shape to one with the superimposed spike, as already mentioned.

This explanation assumes that the output from the guitar will be sufficient to overdrive the transistors, but this will normally be the case **provided the guitar is operated with its own volume control fairly well advanced.**

When the CMOS switch positions are reversed, ie, the 1,2,13 section is closed, and 3,4,5 and 10,11,12 are open, two things happen. Firstly, the operating condition of the transistors is changed so

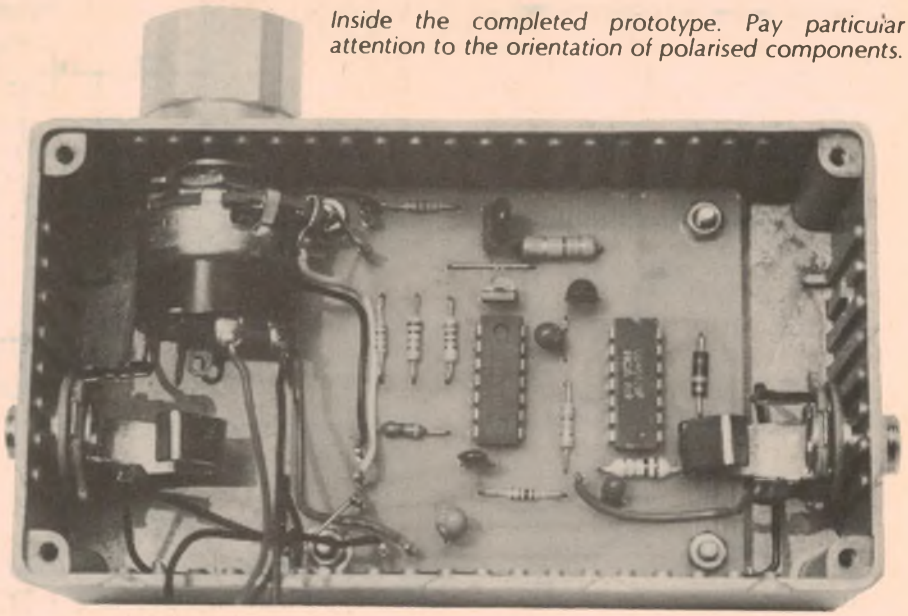
that they give linear amplification; this is done by switching the collector loads of the transistors. The second step is to disconnect the harmonic adding circuit, involving the .001μF capacitor from the "fuzz control" potentiometer.

As already implied, the original circuit used a mechanical switch to change the operating mode of the amplifier, and this did the job well enough. However, it has some disadvantages. It is a relatively costly item, it is no longer as readily available as it was in 1967, and, as with all mechanical switches, it is likely to become noisy when used in a low level circuit like this.

This prompted us to consider using CMOS switches. By this means we reduce the fuzz switching function to a single pair of contacts, and these are no longer directly in the signal path.

In our circuit explanation so far we have simply assumed that the three 4016 bilateral switches have been open or closed, as required for a particular operating condition, without much regard for how this is achieved. The actual operation is worth looking at in a little more detail.

These switches are closed by taking the control element "up" towards the positive rail, and opened by taking it "down" to deck, or the negative rail. The remainder of the circuit is devoted to generating these voltages, as appropriate, when the foot switch is activated.



Inside the completed prototype. Pay particular attention to the orientation of polarised components.

This function is performed by a 4013 dual-D type flipflop. The two switch control circuits – pins 5 and 12 on the one hand, and pin 13 on the other – require opposite signals at any one time. When pin 13 is low (switch open), pins 5 and 12 need to be high (switches closed), and vice versa.

Pins 1 and 2 (Q and Q-bar) of the flipflop will deliver these opposite voltages and so are used to drive the switch control elements. The same flipflop is given a toggle action by connecting the data input terminal (D, pin 5) to the Q-bar terminal.

The toggle action means that the flipflop will change its state each time a positive pulse is fed to the clock terminal (pin 3) and, in theory, such a positive pulse could come directly from the positive rail via the footswitch (with suitable current limiting).

In practice, bounce in the mechanical contacts would inevitably result in more than one pulse being generated, giving an unreliable end result. For this reason the second flipflop is used as a debounce circuit, the 180kΩ resistor and the 1μF capacitor providing the necessary time constant.

Thus, although the footswitch is only a simple momentary-make switch, it is made to function, as far as the user is concerned, in the same manner as the original mechanical switch, ie, in a "push on-push off" mode. Each time the switch

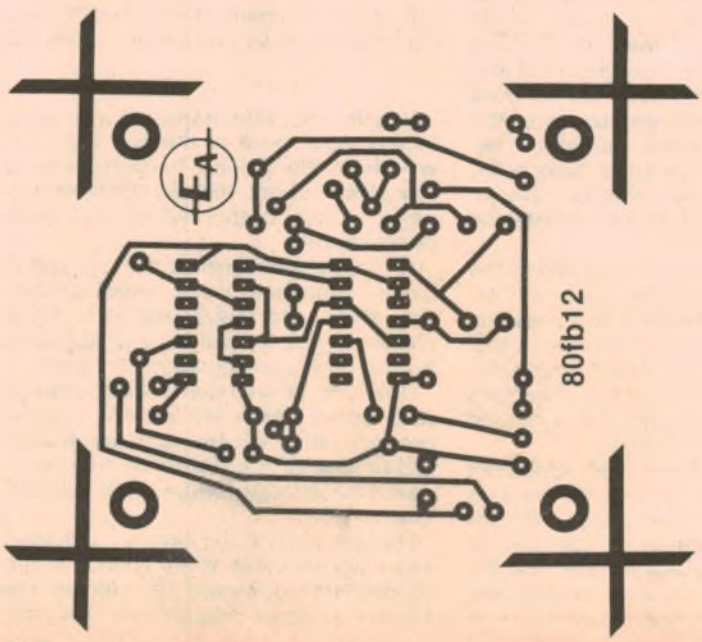
PARTS LIST

1 Diecast box, 122mm x 66mm x 40mm
1 Pressbutton momentary contact switch
2 6.5 panel sockets
1 9V battery (Type 216 or similar)
1 Connector to suit battery
1 Aluminium knob, 25mm dia
1 50kΩ linear potentiometer with switch
2 BC549 NPN transistors
1 4013 dual-D type flipflop
1 4016 quad bilateral switch
1 PC board, code 80fb12

CAPACITORS
1 x 10μF tantalum, 1 x 1μF tantalum, 1 x 0.47μF tantalum, 1 x 0.27μF tantalum, 1 x .001μF greencap.

RESISTORS (¼ or ½W, 5% tolerance)
1 x 4.7MΩ, 1 x 680kΩ, 1 x 180kΩ, 1 x 68kΩ, 1 x 47kΩ, 1 x 15kΩ, 2 x 10kΩ, 1 x 6.8kΩ, 1 x 470Ω

MISCELLANEOUS
4 mounting screws, nuts, and spacers. Hookup wire, solder, etc.



At left is an actual size reproduction of the artwork for the PC board.

is pressed, even briefly, the operating conditions are changed.

CONSTRUCTION

So much for how it works. Construction is simplified by the use of a printed circuit board (80fb12). This should be readily available from the same source as the other components.

Points to watch during assembly of the board include the polarity of electrolytic capacitors, correct interpretation of transistor lead connections, and correct orientation of the ICs. In regard to the latter, some makers provide a groove at one end, as shown on the component diagram, and some identify pin No. 1 by means of a small dot moulded on the top of the package.

Another point about these ICs concerns soldering precautions. Being CMOS devices, they are more sensitive to stray voltages than some other types. A good precaution is to connect the barrel of the soldering iron to the negative rail of the board, and to solder the two supply pins – pins 7 and 14 in this case – before other pins are soldered.

The complete circuit is housed in a small diecast box measuring 122mm (L) x 66mm (W) x 40mm (D). Input and output sockets are mounted at opposite ends of the box, the footswitch on the lid, and the fuzz control/on-off switch on the side. The board is mounted in the bottom of the box, using four screws with suitable nuts and spacers to lift the board clear of the metal surface.

And that's about all there is to it. It is a relatively simple circuit, with little to go wrong. If built with reasonable care and with due regard to the simple precautions we have mentioned, it should go first time.

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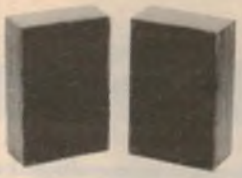

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The Serviceman

Bolts and washers can drive a serviceman nuts!

Intermittent faults in TV sets and other domestic appliances have a high nuisance value, and can often prove expensive, but have you ever considered the effect of similar faults in professional computers? And if you imagine that these elite devices are above that sort of thing, you have another think coming.

This is not a story from my own workbench, but comes from one of my regular readers – "from the early days of Radio and Hobbies" – who is now a Senior Technical Officer (electronics) in charge of computers in a large research establishment. He is Mr B. J. of Victoria, and this is how he tells it. I quote:

This story is written to show that multi-thousand dollar computer installations are just as prone to curly faults, originating from poor quality control, as are their cheaper domestic cousins such as the colour TV sets, etc.

As a senior technical officer in charge of a large research laboratory it is part of my function to maintain a large computer system which handles real-time data from several medically orientated research units. As the real-time data is the result of weeks of experimental preparation, and is quite often not repeatable, breakdowns of any kind are bad news. But intermittent faults, involving repeated crashing of the system, are a prescription for instant ulcers!

This particularly applies in our situation as, due to the high cost of contract servicing, we opted to do all our own maintenance. Looking back six years to those first couple of years when our theoretical knowledge was good (due to in-house courses run by the computer manufacturer) but our practical knowledge of the system was zero, I wonder how we survived – particularly when we encountered the type of fault I am about to describe.

There is one law of electronics that I have discovered after 25 years of fixing all forms of devices, from radios to computers, and it is not found in any text book. It is that electronic devices, if they break down in their warranty period, invariably develop intermittent faults. Moreover, the fault magically disappears when the service technician walks through the door, to reappear a year later when the warranty has expired!

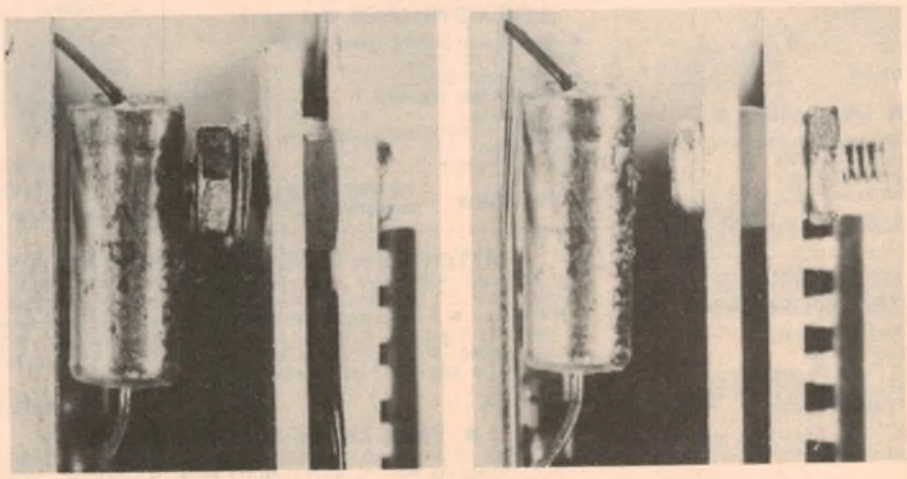
Our system followed this pattern religiously with several mysterious crashes during the warranty period. Upon restarting, the system would run perfectly. No fault would be found by the service representative, who would run all the appropriate diagnostics, drink our coffee, and disappear.

This sort of fault in a large system is a servicing nightmare; it can be anything from a glitch in a power supply – of which there are a dozen or so – to a memory or CPU fault. As the system works perfectly when restarted, and the fault that caused it might have lasted for only microseconds, finding and repairing it usually involved a series of inspired guesses and sheer hard work.

It was late one week when our programmer came to tell me that the system had crashed again. I gave a groan, thinking that it was going to be the usual tale of chasing a phantom, but the programmer almost cheerfully told me that as he was standing in front of the computer all the panel lights on one disk unit lit up to twice their normal brightness before expiring. At the same time a small cloud of smoke came out of the cabinet, and he made even time to the power switch to shut the system down.

I spent the next hour stripping all the metalwork off the disk unit and giving it a close visual inspection. Nothing was immediately obvious and all the fuses were still intact, so setting up a DVM to take some voltage readings, I asked the programmer to switch the system on and to be ready to switch it off quickly if needed. On these particular disk units all the power supply leads emerge from a common point, which makes voltage checking easy, and a quick run around the various pins confirmed what I already suspected; that the −15V supply which, among other things, supplied the voltage for the front panel lights, was non-existent.

As the lights were so bright before failing, I had the unhappy prospect that the supply had failed in a catastrophic manner and applied the full unregulated voltage to the −15V rail. This thought



An intermittent fault, before and after. On the left, an assembly bolt has bitten into the body of an electrolytic capacitor, with a loose washer to provide an intermittent path to the copper pattern. On the right, as the bolt should have been.

did not fill me with a lot of joy, as the −15V supply ran to dozens of amps and transistors scattered over several boards, and the possibility of damage to some of these was extremely high.

Putting an ohmmeter across the rail showed a dead short to earth. Fortunately, on this model disk store, all the logic and servo control boards can be unplugged, so I promptly yanked the whole lot. The short remained — which didn't surprise me, as the power supply was left in circuit.

The power supply is a fairly standard circuit consisting of a series transistor and associated voltage reference circuitry, with a full wave rectifier and meaty transformer supplying it. The one surprising feature for a supply in equipment of this price is the fact that it has no overvoltage protection — creating a potentially disastrous situation.

SUPPLY, A MESS!

Some quick checks confirmed that the supply was a real mess. The bridge rectifier and series regulator transistor were both shorted and several tracks on the printed circuit board were melted and charred, which explained the smoke. The next day was spent rebuilding the supply and then, with the −15V rail disconnected, checking to see if it gave the correct voltage when switched on.

Now came the hard part; finding the reason for the failure in the first place, which I suspected was a dead short on the −15V rail. This was not easy as the overvoltage could have shorted out a dozen components which would mask the original short.

There was nothing for it but to laboriously pull boards and isolate blocks of the circuit and that's what I did, finding in the process several shorted components. It was when I reached the last two boards that I found the reason for all my troubles and also the cause of the intermittent crashes.

The last two boards consisted of the head amp board and the main servo control board. As soon as I moved the servo board the ohmmeter, which I had permanently connected across the −15V rail, showed that the short had gone. Wiggling the board a bit more caused the short to reappear.

It did not take very long before all lay revealed. As intermittent faults go, it was the most unusual one I have struck and in nature was very much like a time bomb that had been built in at manufacture.

The photographs show how the two boards are mounted vertically, with the servo board on the left and the head amp board on the right. The head amp actually involves two boards; the head amp board proper and a ground-plane board bolted to it. The metal ground-plane faces the adjacent servo board.

During the manufacture one of the bolts had been inserted the wrong way, leaving the sharp end of the bolt protruding. If it had been any of the other three bolts it would not have mattered, but the end of this particular bolt happened to be opposite the body of an electrolytic capacitor decoupling the −15V supply to the servo board. This meant that when the head board was inserted the bolt end gouged into the body of the capacitor (see photo), raising the bolt to −15 volts.

The really interesting part of the fault is yet to come. As well as being inserted the wrong way, the nut on the bolt had obviously not been tightened and the washer underneath the nut was free to move along the bolt, although constrained to some extent by the roughness of the threads.

The bolt head was anchored against an etched section of the board, so there was no path to earth there. Similarly, the body of the bolt was smaller in diameter than the hole drilled through the earthed backplane, so no short occurred here.

It was the washer that was the time fuse. It must have been at the nut end during initial testing and for the first few months of service in our labs. Vibration from the disk unit eventually shook it the fraction of a millimetre required to form a bridge between the earthed groundplane and the bolt at −15 volts.

The intermittent crashes had obviously been caused by the washer touching the groundplane for a few milliseconds and the resulting glitch in the −15V supply crashing the disk. Eventually the washer must have touched solidly and welded onto the groundplane, causing the havoc previously described.

Reversing the bolt and plugging the boards back in was all that was needed to finish the repair. All told, this fault had caused a multi-thousand dollar computer installation to be down for several days with the result that a whole research unit had ground to a halt, all because somebody on an assembly line had reversed the installation of a 1-cent bolt.

IN RETROSPECT . . .

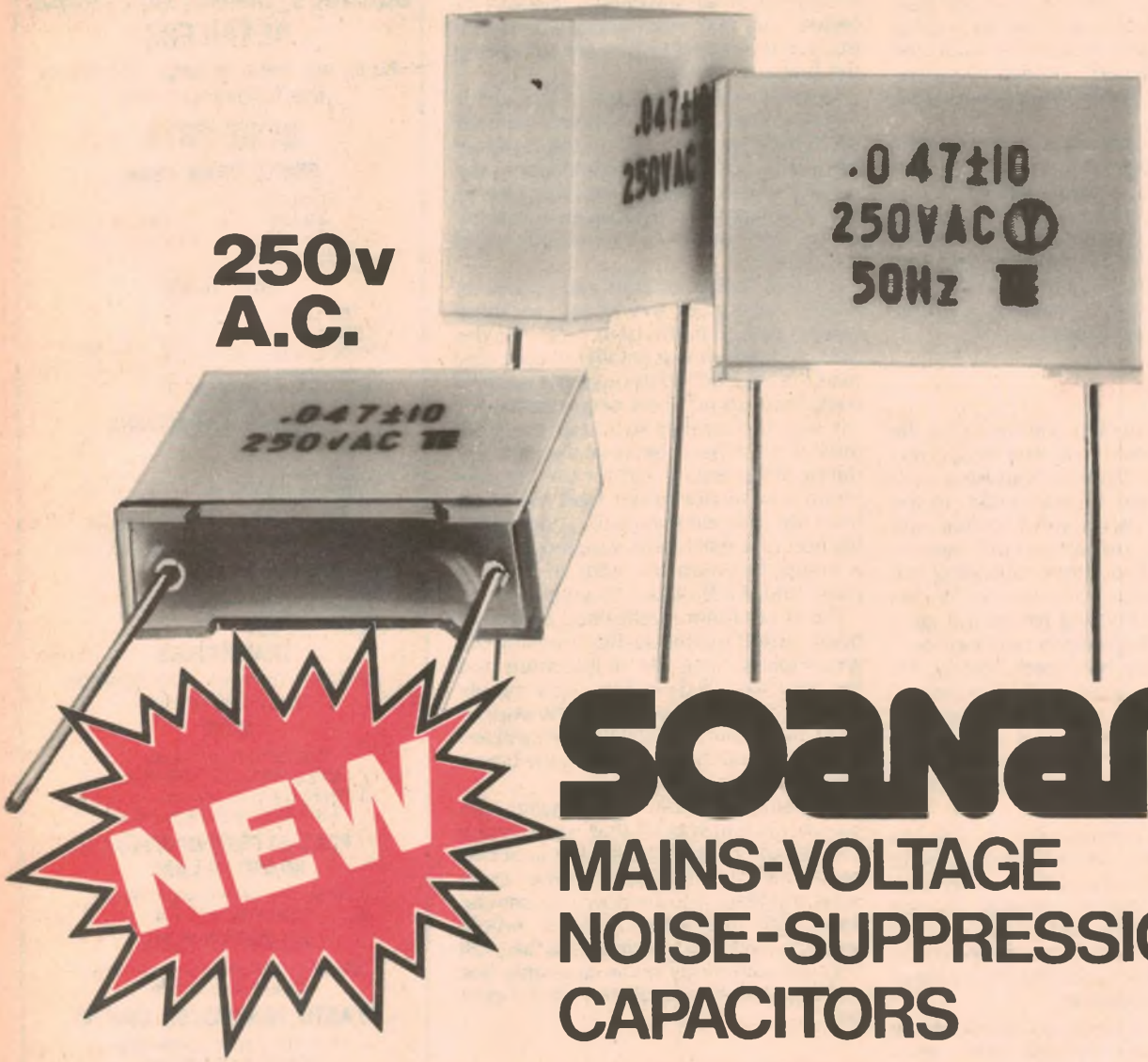
Well, that's Mr B.J.'s story and I must confess to being just as shocked as he obviously was to find such an example of quality control — or lack of it! — in a piece of equipment of this standing.

After all, we have been conditioned to believe that these devices are only one small step behind the ultimate in man's achievement; space hardware. Which reminds me of what one of the astronauts was reputed to have replied, when asked what he thought about while sitting on top of rocket waiting to be blasted into space.

"I think," he said, "about the hundreds of thousands of individual components on which a successful launch depends — all supplied by the lowest bidder!"

In a lighter vein, here is a rather unusual technical problem my amateur friend presented to me recently. It in-

MAINSCAP



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volved a typical low-cost 5W, 27MHz transceiver, which he had been modifying for 28MHz on behalf of his local WICEN group. (Refer March 1980 notes.)

He walked into my shop late one afternoon, dumped the aforementioned piece of equipment on the counter and, looking me straight in the eye announced, deadpan, "This has a microphonic valve in it." Now he is one of the old school, who is more at home with valves than with solid-state devices, but the expression on his face told me that this was no slip of the tongue; he was deliberately baiting me.

"What do you mean, a microphonic valve?"

"Well, that's the only way I can describe it. It's just like a microphonic valve, and I thought you might like to see it. You might even like to pass it on to that Serviceman bloke."

That was another dig, because he knows full well that I write these notes, but I decided to humour him. After all, there could be a story in it. So we took it into the workshop, hooked it up to a power supply and switched on. Nothing much happened, except the speaker gave forth the usual background hiss.

My friend leaned over and tapped the top of the case gently with his knuckle. "Boing" said the speaker.

"There," said my friend smugly, "what's that if it isn't a microphonic valve?" And I had to admit that that was exactly what it sounded like.

"Try the channel selector switch."

I did, clicking the switch through several positions. "Boing, boing, boinggggggg" went the speaker, with the last "boing" showing a marked reluctance to die away. In fact it didn't, but started to build up again. In a few seconds the whole thing had taken off, and was wailing like a PA system run amok.

Suddenly my friend wasn't looking so smug anymore. "Crikey, it's never been as bad as that before." Like me, he was obviously beginning to worry that the output transistors might be damaged by such a gross overload and he reached for the volume control/on-off switch. To our mutual surprise, turning the volume down did nothing to stop the racket; only the switch had any effect.

By now, of course, I was hooked; I just had to find out what was wrong. I removed the top cover and found myself looking at the component side of a printed board. Armed with the butt end of an alignment tool, I switched on again and tapped the board gently. Everything happened as before, except that it all seemed to be that much more sensitive.

I had hoped that, by decreasing the vigour of my tapping, I would eventually find which part of the board was most sensitive, thus pinpointing the general area, at least. But it was hopeless; every part of the board seemed equally sensitive and I eventually gave up.

As an alternative, I tried exerting gentle pressure on each component, pushing it this way and that, hoping that I might find a dry joint or something similar. I didn't seem to be getting anythere this way either, until I pushed the top end of a vertically mounted resistor. The speaker gave a pronounced click as I did so and, when I tapped the board again, the microphoney had vanished.

Taking a closer look at the board, I could see what had happened. The resistor was mounted hard alongside a vertically mounted trim pot and one, or both, had been bent slightly towards the other. As a result, the bare pigtail from the top of the resistor had been resting gently against the carbon track of the pot.

The set-up must have been very similar to the crude carbon microphones I used to make as a youngster; a carbon rod, from a discarded dry cell, was sharpened at both ends and supported between two more rods, vertically mounted, with recesses drilled to take the pointed ends.

Elaborate claims were made for such devices, including one that would enable you to hear an ant walking! All I can say is that the ants in my backyard must have worn rubber soled shoes because, even when I managed to coax one or two on to the sounding board of the device, I never detected any footsteps.

In fact, the devices were so touchy as to be almost useless in any role, including the reproduction of speech. Still we had a lot of fun building them.

But, come to think of it, my friend's "microphonic valve" might just have been sensitive enough to pick up Archie Ant's fairy footsteps.

CIRCUIT & DESIGN IDEAS

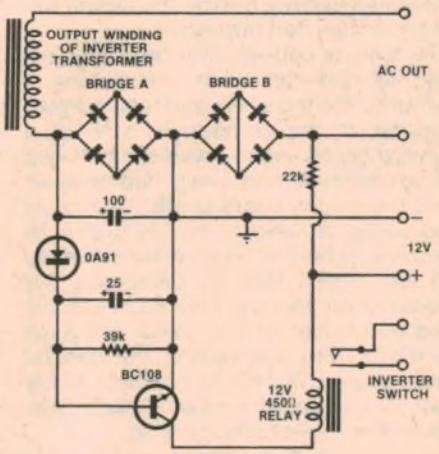
We invite readers to submit circuit ideas and solutions to design problems. Explain briefly but thoroughly the circuit's operating principle and purpose. Sources of material must be acknowledged and will be paid for if used. As these items have not necessarily been tested in our laboratory, responsibility cannot be accepted.

Auto-start for 12-230V AC inverter

Where the output of an inverter is to be used some distance from the battery and inverter, there is the problem of the "no load" current. This is a particular problem with intermittent use. The circuit shown is an addition I have made to the 12-230V Inverter as described in February, 1979. The circuit has been devised so that the inverter will only operate when a load is switched across the AC output. The idea could be useful in low energy solar powered installations where the inverter may make AC available at several locations.

The AC terminals of the bridge rectifiers are connected to the circuit, whereas the DC terminals are short-circuited, to form AC zeners. A bias is then developed across bridge "B" through a 22k resistor from the 12V supply. When a load is switched across the AC output, this bias is fed round via the transformer winding and diode, to the base of the BC108. This is sufficient to turn on the BC108 and pull in the relay.

The 100μF capacitor cancels the effective capacitance of long AC lines and



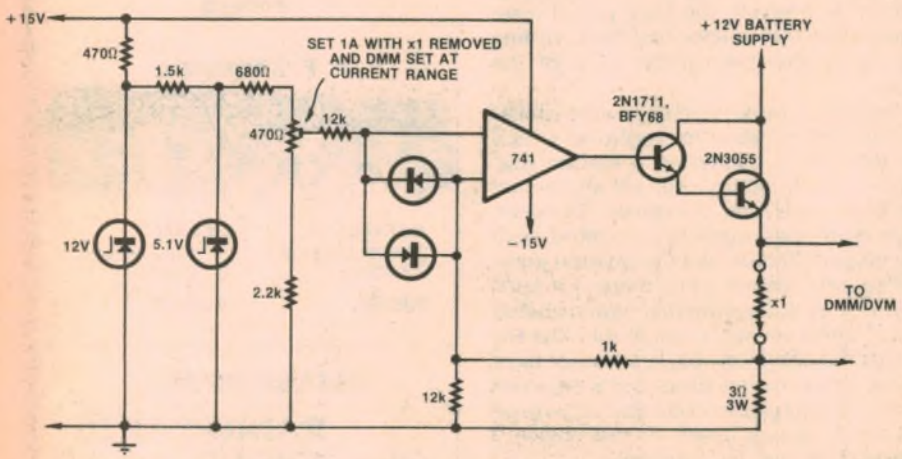
prevents "lock on". The 25μF capacitor prevents the relay from chattering and dropping out as the inverter starts. The diode is necessary as the AC component tends to take over the hold in once the inverter starts. The full load power loss through the two bridges is about 1%. There is a fraction of a second delay in the start and stop but this is no problem. The standing current is under 1mA.

The relay contacts must be heavy enough with a self-oscillating type of circuit to break the main 12V supply. Otherwise, the rest of the components are not critical and may be substituted for similar types. The diode should be germanium as this will pass on more of the available bias. The bridge rectifiers need to carry the maximum output current of the inverter but they can be low voltage types as they are not seeing any high voltage peaks. The neutral end of the output transformer is not directly earthed but it is connected to earth via bridge "A". There is only a little over one volt difference between the two points, so this should not be a problem.

I have built the 12-230V Inverter, as well as several self-oscillating ones and this circuit has been successfully used on both types.

(By Mr J. A. Sheard, VK5JA, 53 Crouch Street South, Mt Gambier, SA 5290.)

Add milliohms measurement to your digital multimeter



Most digital voltmeters and digital multimeters do not incorporate a milliohms range in their design. This circuit attachment extends the range of any DVM or DMM to measure low resistance, such as RF chokes of transmitters, motor and transformer windings etc, without any modifications to the instrument itself.

The circuit basically is a constant current generator of 1A. The voltage across the unknown resistance measured in millivolts can therefore be read as milliohms directly.

The circuit can be modified by altering the current generator to drive a current or 0.1A or 10A and introduce a multiplication factor of 10 or 0.1 respectively, to the measured millivolts.

[By Mr. T. J. John, B-15/6, Modipuram, Meerut. (UP) India.]

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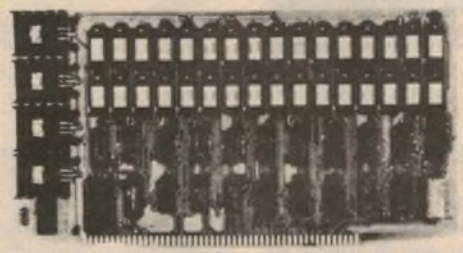

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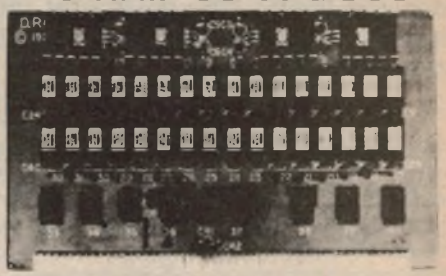

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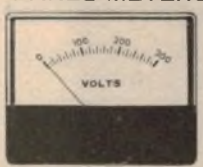

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Minispot 455kHz signal generator

Basic Electronics

Here is a handy little device for broadcast and shortwave receiver alignment. It is the Minispot. It generates a fixed 455kHz RF signal modulated at 500Hz.

by JOHN CLARKE

A problem which many enthusiasts encounter is that, having completed building a broadcast or shortwave receiver, they have no equipment to provide accurate IF alignment.

Very poor performance can result from lack of, or inaccurate alignment, but, on the other hand, the experimenter who makes only a few projects may hesitate to invest a lot of money, or time, in acquiring a full size service oscillator or signal generator.

Alignment of IF systems is aimed at satisfying two requirements: (a) ensuring that all tuned circuits in the IF systems are tuned to the same frequency and (b) that the frequency to which they are tuned is the correct one.

Failure to satisfy requirement (a) will result in degraded sensitivity and selectivity. Failure to satisfy (b) can result in spurious heterodynes or whistles in certain localities, as well as failure of the tuning system to track accurately with the dial calibrations, particularly in the centre of the dial.

The simplest approach to receiver alignment is "by ear." Using broadcast signals at appropriate positions on the band, the various tuned circuits are adjusted to produce maximum output from the loudspeaker.

While this approach has the advantage of simplicity and will undoubtedly result in some improvement, it leaves a lot to be desired.

It cannot ensure that the IF system's tuned circuits are tuned to a specific frequency, only that they are all tuned to approximately the same frequency. This is only approximate, because we are depending on the ear to tell us when the maximum signal level has been reached.

The ear is notoriously insensitive to small changes in signal level (less than 3dB) so that each adjustment could conceivably be in error by, say, 2dB. If there are six adjustments to make there is room for a possible total error of 12dB – a very significant amount. While the error will usually be less than this in practice, it may still be significant.

The more usual approach calls for the use of an oscillator (or signal generator) and an output meter. The generator should be capable of generating RF signals, suitably modulated, at the IF used by the receiver, at frequencies at each end of the broadcast band, and in similar positions on the short-wave band or bands, where these are featured.

In use, the generator is connected so as to feed signals into the appropriate part of the receiver, while the output meter is connected to the output circuit feeding the loudspeaker.

The generator is modulated with a steady tone – rather than music or speech as from a broadcast station – and this is registered as a fixed level on the output meter. As various adjustments are optimised (peaked), the meter will swing up the scale to maximum reading, giving a far more accurate indication than can the ear.

While most multimeters can serve as an output meter, it is the generator which most experimenters find hard to provide. Indeed, a generator to satisfy all the requirements we have just enumerated would be a relatively costly instrument.

However, if we accept the compromise that the IF system is the one most needing adjustment by this method, and that the other adjustments can be made "by ear" without serious error, then a very much simpler and cheaper device will serve our purpose.

More precisely, we can settle for a simple, low cost, single frequency oscillator, preset to the popular 455kHz IF, and intended to do no more than provide alignment facilities for the IF channel.

Rather than implementing the oscillator with an LC circuit, a very good alternative is to use a ceramic filter element. This provides a cheap and reliable alternative 455kHz oscillator when used in the feedback loop of a high frequency amplifier. The stability of this arrangement is close to that of a crystal based oscillator but without the additional associated cost.

Considering the comparative cost and the inherent stability, we feel sure that the alignment generator described here would be a worthwhile device to have. It will fill the need for an inexpensive but reliable source of modulated 455kHz signal suitable for IF alignment of broadcast and shortwave receivers.

The PC board should be housed in a metal case to prevent stray radiation.

We estimate that the current cost of components for this project including battery and suitable case is

$9.00

This includes sales tax.

The circuit is also quite easy to modulate. The modulating tone is generated by a free-running bistable multivibrator operating in the vicinity of 500Hz.

It modulates the RF oscillator by varying the supply voltage fed from the junction of the two resistors forming the collector load of one of the multivibrator transistors. The two resistors function as a voltage divider to control the depth of modulation.

As can be seen, the Minispot circuit is quite simple and consists of three low cost transistors, seven resistors, six capacitors and the ceramic filter. Two of these transistors are used in the multivibrator and the other in the 455kHz oscillator. The two capacitors in series with the ceramic filter set the frequency to close to 455kHz. AC coupling is provided for the RF output by way of a 27pF capacitor.

PARTS LIST

1 PC board coded 80if12, 67 × 39mm
1 metal case to suit
1 9V, 216 battery
1 clip connector to suit battery
1 RCA panel socket
1 RCA plug
1 Murata type SFB455A ceramic filter

SEMICONDUCTORS
3 BC548 NPN transistors

RESISTORS (¼W 10%)
1 × 100k, 2 × 47k, 1 × 3.3k, 1 × 1.5k, 1 × 1k, 1 × 470 ohms

CAPACITORS
1 0.22uF metallised polyester
2 .047uF metallised polyester
2 68pF NPO ceramic disc
1 27pF ceramic disc

NOTE: Ratings are those used on the prototype. Components with higher ratings may be used providing they are physically compatible.

Construction of the Minispot is relatively simple and could be finished within an hour or so. Start by mounting the components on the printed circuit board coded 80if12 and measuring 67 × 39mm. No particular order is necessary in placing the components.

No problems should be encountered in housing the device. A metal housing must be used, however, to prevent direct radiation from the multivibrator coupling into the audio stages of a receiver.

Any small metal box can be used, such as a general purpose aluminium box measuring 100 × 30 × 54mm (W × H × D) or larger or a box can be fashioned from some scrap aluminium or tin plate.

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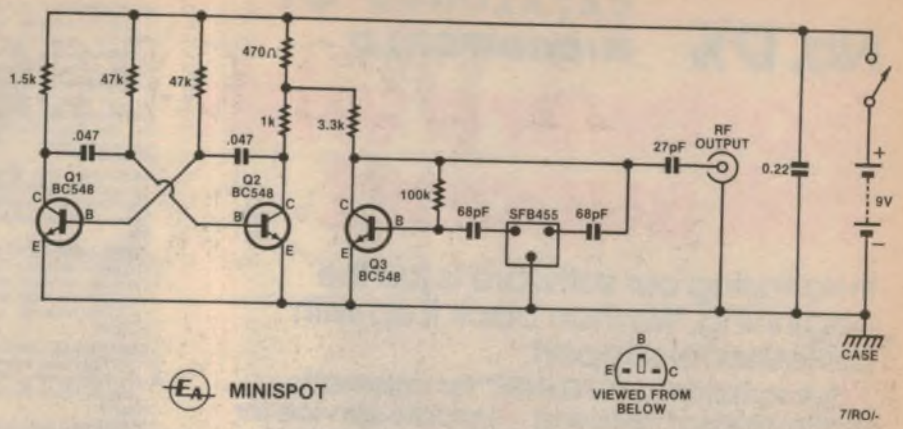
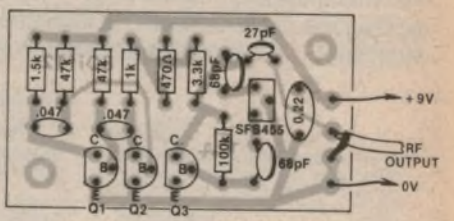
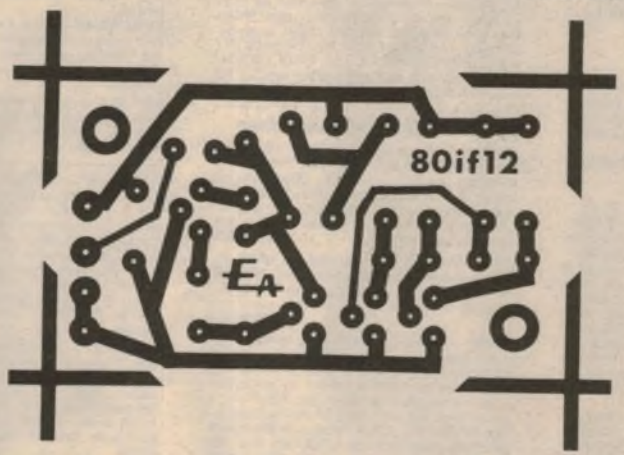


ABOVE: A multivibrator (Q1 and Q2), an RF amplifier (Q3) and a ceramic filter make up this simple circuit. It generates a 455kHz RF signal modulated at 500Hz.



RIGHT: This wiring diagram shows the PC board from the component side.



At left is an actual size reproduction of the PC board.

A small on/off switch should be installed within the box and connected in series with the battery lead. The PC board has provision for two mounting screws on opposite corners and it should be raised from the base with bushes to prevent shorting.

An RCA phono panel socket can provide for the RF output on the case and the output connecting lead made from two pieces of hookup wire soldered into an RCA plug. Connect the opposite ends to alligator clips or probe clips.

Finally the battery can be connected to the PC board with leads and a suitable clip and the circuit is ready to be used.

The Minispot can be used to align the IF amplifier section of receivers equipped with 455kHz IFs, with or without a ferrite antenna.

In the solid state receivers, the most common input point is the base of the mixer, or mixer-oscillator stage. The tuning capacitor should be set for minimum capacitance to avoid any undue loading on the generator signal.

At the mixer input, coupling can be made through a twisted pair of insulated wires, the amount of wire and twisting controlling the capacity (and hence the RF level) between them. The RF level can be reduced by simply unwinding the twisted pair.

In any alignment procedure, the presence of an AGC (Automatic Gain Control) system presents a minor problem.

Virtually all sets are fitted with AGC systems, the purpose being to maintain, as nearly as possible, a constant audio output regardless of whether the received signal is weak or strong. This they do very well (though not perfectly) but, fairly obviously, this action is undesirable during alignment, since it tends to mask the effectiveness of each adjustment as it is made.

Fortunately, most AGC systems are deliberately designed to have a threshold level below which they do not operate (delayed AGC). This is to ensure maximum sensitivity to weak signals.

We can take advantage of this during alignment, by deliberately keeping the input from the generator at the lowest possible level, at the same time keeping the gain of the receiver at the highest level. As various adjustments increase the sensitivity of the receiver, the input should be reduced by a like amount.

Almost any multimeter having the usual AC ranges can be used as an output meter. Connection can be readily made across the loudspeaker terminals.

With the Minispot connected to the receiver, adjust each IF transformer core for maximum indication on the output meter, reducing the RF input level as necessary for the reasons outlined previously.

The cores should be adjusted so that their physical positions are at the outside of each coil in the IF transformers, NOT towards the inner area through the coils.

All the foregoing methods of connection have assumed that the user has ready access to any part of the receiver; a situation which would normally apply where a receiver had just been constructed but not yet fitted to its case. However, if we wish to work on a complete receiver, it may not be convenient to remove it from its case.

As already discussed, the output meter can be connected to the loudspeaker terminals, which are generally accessible. However, the input to the mixer stage may not always be so easy to get at, particularly in very small receivers. In this case it is usually possible to feed the signal in through the antenna terminal where fitted, or by coupling to the ferrite rod antenna.

The "Minispot" can be coupled to a ferrite antenna either by laying its output lead across the coil on the rod, or forming an induction loop by connecting the two clips on the output leads together. The lead or loop should be spaced away from the rod so as to control the output as mentioned earlier.

After peaking the IF transformers, turn off the Minispot. Find a broadcast station at the low end of the dial and adjust the oscillator coil core to place the station at its correct dial position. Tune a station at the top end of the dial and adjust the oscillator trimmer to place it at its correct marking. Repeat the procedure until the two ends are correctly placed.

Find a weak station at the top end of the dial and adjust the aerial trimmer for maximum volume from the speaker. Return to the low end of the dial to a weak station and adjust the position of the coil on the ferrite rod, or the aerial coil's core for maximum audio level. Repeat the procedure until no further change is detected.

As a final note, although the frequency of the Minispot will run close to 455kHz, the operating frequency can be set to an "exact" 455kHz with the aid of a frequency meter. By adjusting the values of the 68pF capacitors in series with the ceramic filter frequency changes can be made. In general, though, without adjustment the Minispot will operate to within 1kHz of 455kHz.

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Computer system	Format Code
Altair 8800 Disk	See MITS 3200
Altos	A1*
Apple · SoftCard 13 Sector	RG
Apple · SoftCard 16 Sector	RR
AVL Eagle	RB
BASF System 7100	RD
Blackhawk Single Density	Q3
Blackhawk Micropolis Mod II	Q2
CDS Versatile 3B	Q1
CDS Versatile 4	Q2
COMPAL 80	Q2
Cromemco System 3	A1*
Cromemco Z2D	R6
CSSN BACKUP (tape)	T1 #
Delta	A1*
Digi-Log Microterm II	RD
Digital Microsystems	A1*
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Durango F-85	RL
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MSD 5¼	RC
North Star Single Density	P1
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Nyiac Single Density	Q3
Nyiac Micropolis Mod II	Q2
Ohio Scientific C3	A3
Onyx C8001	T2 #
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RAIR Double Density	RE
Research Machines 8	A1
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SD Systems 5¼	R3
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RS-232C printer interface for the System-80

We published a design for a simple serial interface in the November 1980 issue that was suitable for use with the TRS-80 computer. This month we present a modified form of the same interface which is suitable for use with the System-80 computer. The driver software for this unit differs in quite a number of respects to that published in the last article.

by GERALD COHN

The hardware difference lies in the power supply circuitry. Instead of having a convenient power source as is the case with the TRS-80, we had to incorporate a power supply into the design of the new interface unit. The power supply uses the Ferguson 12V AC plugpack, allowing the rest of the interface to fit into the same size case as the previous design.

The 12V AC from the plugpack is half-wave rectified to provide a positive and a negative supply, both of which are smoothed with 1000μF capacitors. Following the smoothing capacitors we have two zener diode regulators providing ±9 volt supplies.

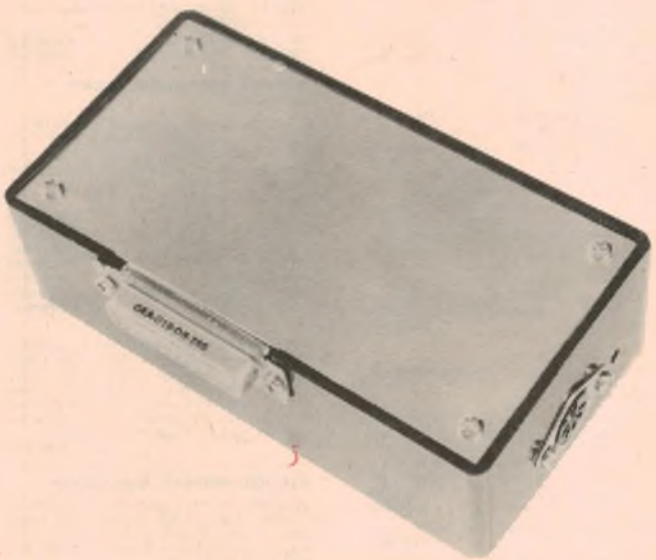
Apart from the power supply there was only one other minor change to be made to the circuit. The reference level for the inverting input of the 741 had to be changed to cope with the different levels at the output of the System-80 cassette interface. Instead of being centred around 400mV, the output waveform is in fact centred around a level of 200mV, with the peak-to-peak swing of the signal being a mere 300mV. The diode used in the previous design has now been replaced with a 150Ω resistor.

All the other changes involved the software driver for the interface. There are several differences between the two machines making it necessary to have different software drivers for each. The most noticeable difference is the inbuilt cassette recorder in the System-80. Because of this, it was necessary to use the second cassette port to output the serial data stream, but this was not without its problems.

One problem is the necessity to switch the relay for the second cassette unit. The data stream as well as the motor control is switched by the relay, instead of just the motor as is the case with the Tandy machine.

The control of the relay is performed with two output instructions. An in-depth description of how this is achieved can be found in the Column 80 article in the November 1980 issue.

To allow for the switching time of the relay, a timing loop has been included.



The completed serial interface is mounted in a utility box with a DIN socket for the cassette recorder and an RS-232C socket for the printer.

This allows the contacts to settle before the data stream is initiated. It should be noted at this point that the printer driver routine is called up for each character that is sent to the printer. Keeping this in mind, it can be seen that the timing loop is included in the transmission of each and every character.

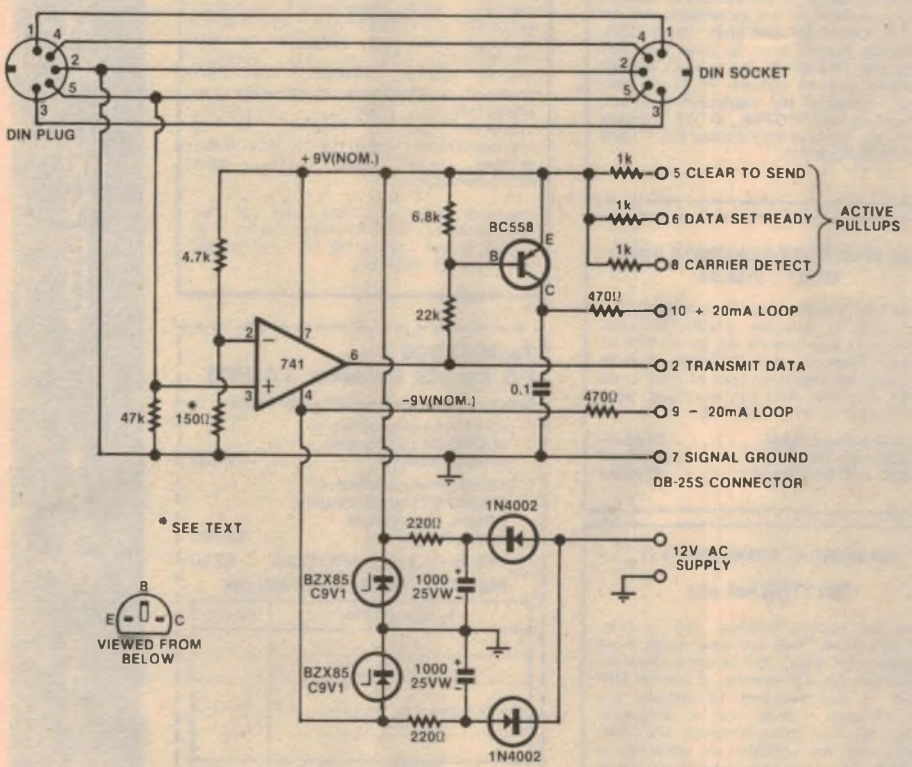
This has the effect of slowing the printing operation, but this only becomes significant at higher baud rates. (The bit rate is not affected by this timing loop since the baud rate is software generated in another part of the driver routine.)

The other software changes involved the values for the zero and one codes. In the TRS-80 version these were FC01 and FC00 respectively, but they have now been changed to FC05 and FC04. This sets bit 3 of port FE high, thus keeping the relay enabled for the data transmission.

That just about wraps up the changes to the software. The new machine language driver is just a little longer than the one for the TRS-80, and more RAM must be reserved as a result. The new initialisation values for the top of RAM are given in Table 1. These values are entered when the machine is first switched on, and the message READY? appears. Enter the value that corresponds to the amount of free RAM that is available in your particular system.

The rest of the initialisation with the BASIC program is exactly the same as that described in the November 1980 issue, and is reproduced below.

When either the LPRINT or LLIST commands are now used, the vector in the



SYSTEM 80 SERIAL INTERFACE 2/CC/-

This circuit is similar to the November 1980 version apart from the power supply.

PARTS LIST

1 printed circuit board 100 x 52mm (81SP1)
1 plastic utility case 130 x 69 x 42mm
1 5-pin DIN socket (180°)
1 5-pin DIN plug (180°)
1 12V AC plugpack Ferguson type PPB 12/500
1 DB25S connector
2 x 1000µF/25VW electrolytic capacitors
1 x 0.1µF metallised polyester capacitor

RESISTORS
1 x 47k, 1 x 22k, 1 x 6.8k, 1 x 4.7k, 3 x 1k, 2 x 470Ω, 2 x 220Ω, 1 x 150Ω
SEMICONDUCTORS
1 x 741 operational amplifier IC (8-pin)
1 x BC558 PNP transistor
2 x BZX85/C9V1 or similar 9V/1W zener diode
2 x 1N4002
MISCELLANEOUS
Screw, nuts, solder, hookup wire etc.

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MICRO-80 is a monthly magazine dedicated to users of SYSTEM 80 and TRS-80 microcomputers. Owned and produced entirely in Australia, each issue of MICRO-80 contains at least six programs, articles, useful hints and answers to readers' problems; all designed to help YOU get the most out of your SYSTEM 80 or TRS-80. Since MICRO-80's first issue in December 1979, we have published over 80 major pieces of software and 10 hardware projects. Most of the programs and articles are written by our readers to whom we pay publication fees thus enabling them to make their hobby pay. MICRO-80 readers can save money by buying Tandy products at 10% discount from an authorised dealer – for details see any issue of MICRO-80. Our sister business, MICRO-80 PRODUCTS, sells Australian designed and produced software and high quality, imported goods at low, sensible prices. We repeat, if you own a SYSTEM 80 or TRS-80,

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SYSPAND 80 is a self-contained module which connects to the expansion port on your SYSTEM 80 and gives you a CENTRONICS parallel port to drive a printer PLUS the TRS-80 40 line bus. SYSPAND 80 allows you to connect all Tandy peripheral, including the expansion interface, disk drives, MICROTEK MT-32 memory expansion unit and the fabulous EXATRON STRINGY FLOPPY.

TRS-80 MEMORY EXPANSION UNIT
MT-32 ... $149.00

The MT-32 is manufactured by MICROTEK Inc., USA. It provides a CENTRONICS printer port and sockets for up to 32K of dynamic RAM. It comes complete, ready to plug into the expansion port of your Level II 16K machine. (Will also work with your SYSTEM 80 via SYSPAND 80).

MT-32A without RAM $149.00
MT-32B with 16K RAM $208.00
MT-32C with 32K RAM $262.00

16K MEMORY EXPANSION KIT.
ONLY $59 incl. p&p

These are prime, branded, 200 ns (yes, 200 ns!) chips. You will pay much more elsewhere for slow, 350 ns chps. Ours are guaranteed for 12 months. A pair of DIP shunts is also required to upgrade the CPU memory – these cost an additional $4.00. All kits come complete with full, step-by-step instructions, no soldering is required. You don't have to be an electronic type to instal them.

DISK DRIVE HEAD CLEANING DISKETTES
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Disk drives are expensive and so are diskettes. As with any magnetic recording device, a disk drive works better and lasts longer if the head is cleaned regularly. In the past, the problem has been, how do you clean the head without pulling the mechanism apart and running the risk of damaging delicate parts. 3M's have come to our rescue with SCOTCH BRAND, non-abrasive, head cleaning diskettes which thoroughly clean the head in seconds. The cleaning action is less abrasive than an ordinary diskette and no residue is left behind.

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How good is it? - This part of our advertisement was typeset using an ET-121 driven by a TRS-80. Write and ask for full details.

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TRS 80 and SYSTEM 80 OWNERS

TRS 80 and SYSTEM 80 OWNERS

device control block will point to the new driver residing at the top of RAM.

TABLE 1

Memory Size	Last Location	Enter
4K	20479	20350
16K	32767	32640
32K	49151	49020
48K	65535	65410

After a short delay while the machine language program is loading, the computer will respond with:

BAUD RATE?

Answer this question with one of the values listed below. Check your printer manual for the correct baud rate to be used.

110	450	2400
150	600	4800
300	1200	9600

After the baud rate has been entered the computer will respond with:

ADD LF AFTER CR (Y/N)?

BASIC transmits carriage returns after each line of text, but does not transmit the line feed character. If your printer requires a line feed character to advance the paper, answer Y. If you are using a Centronics or a Selectric, answer N, since these printers automatically advance the paper when a carriage return is executed. If you are not sure, consult the printer's manual.

Having answered the last question the computer will respond with:

NUMBER OF NULLS (0-127)?

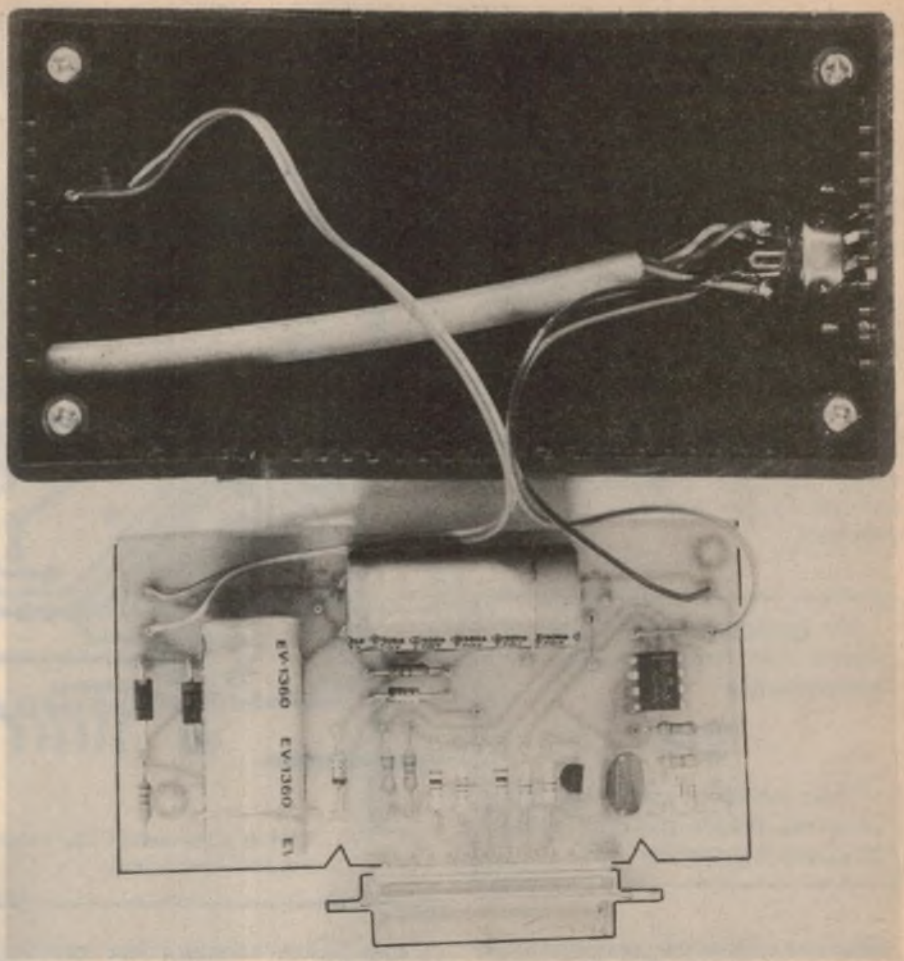
Some printers require null characters after each carriage return to allow time for carriage travel. If your printer requires these nulls, answer with the desired number, otherwise type 0.

After this question is answered, control returns back to BASIC and the READY message will appear. You are now ready to load and run any of your BASIC software.

The entire circuit with the exception of the plugpack transformer is accommodated on a printed circuit board (PCB) measuring 100 x 52mm and coded 81sp1.

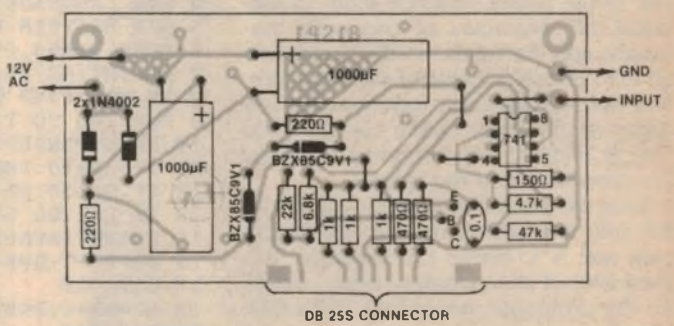
Construction is simple, requiring about an hour of your time. Start the assembly of the PCB by placing the four wire links onto the board and soldering these into place. Follow these up with the resistors and the diodes. Next solder the transistor and the IC into place, leaving the two filter capacitors until last.

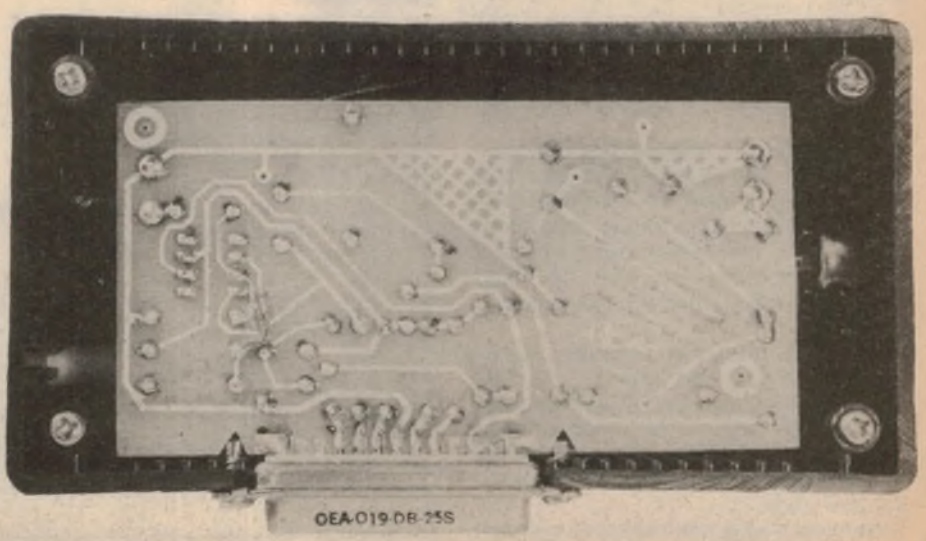
The value of the 150Ω resistor may have to be juggled a little depending on the signal levels at the output of the cassette interface in the computer. The value of 150Ω proved quite satisfactory with several System-80's on which the interface was tried, and should work on almost all others. If the signal level is



Notches are cut into one side of the PCB to allow clearance for the socket screws.

Assembly of the PCB is simple. The photo below shows the PCB mounted in the case, supported by the 25-pin socket.





lower than 300mV superimposed on a DC level of 200 to 300mV then you will need to decrease the value of this resistor. The converse is true for higher levels.

The photograph of the PCB shows that we have used PC mounting electrolytics, but provision has been made for pigtail types in case these happen to be more readily available. If you use PC mounting types, then you will need to place a retaining loop around the end of the capacitor, which is then soldered to the board. The last component to be soldered to the board is the DB-25 connector.

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

$15

This includes sales tax but does not include the cost of the plugback transformer.

Before you solder the connector to the board, make sure that the side containing 13 terminals is the one on the copper side of the board. The PCB slides in between the two rows of connector terminals, and the tracks on the board line up with the solder tails of the terminals. The two outside pads have been made larger so that more solder can be used. This provides a rigid support between the connector and the board.

Once the board is complete, place it to the side and start preparing the plastic case that is to house the interface. We used one of the popular "zippy" boxes for the prototype, measuring 130 x 69 x 42mm.

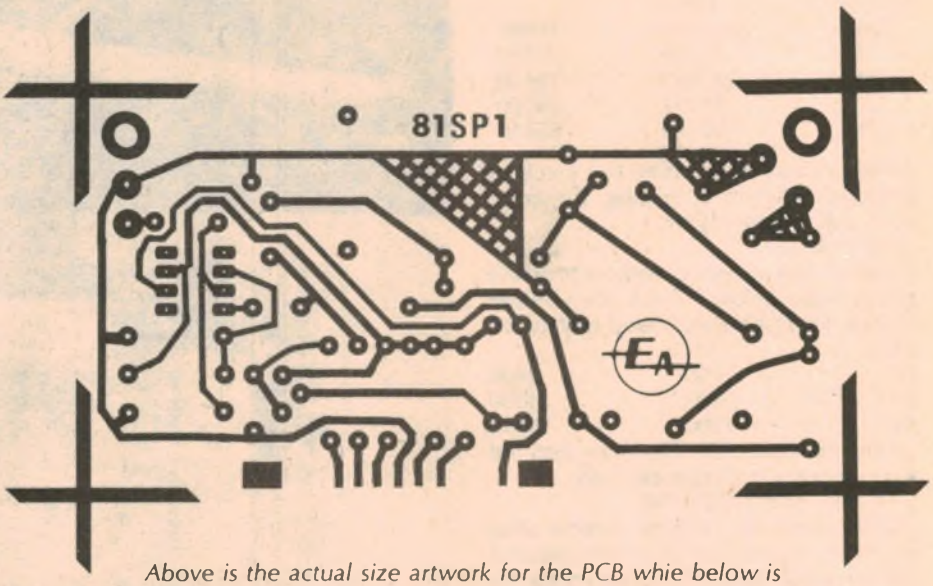
The first thing to be done is to make the cutout for the 25-pin connector. Note that the connector is not in the centre of the board, but slightly off to one side.

Three holes are required for the 5-pin DIN socket, the power connector and the cable entry from the computer. We have provided a pin-for-pin equivalent socket in the interface housing so that a cassette recorder can still be used without having to take the interface out of circuit.

The cable from the computer is terminated on one end with a 5-pin DIN plug while the other end is fed through a hole in the case of the interface and soldered to the DIN socket. Make sure that there is a pin-for-pin match between the two ends.

We used a plug and socket to connect the plug pack to the interfaced unit but this could be hardwired if desired. Now all that remains to be done is to make the connection between the interface board and the computer cable, mount the board in the box, after checking everything thoroughly, and trying it out. As mentioned before, the procedure for using this version of the printer interface is exactly the same as that described in the November 1980 issue.

There you have it, a simple low cost interface between your System-80 and a serial printer. Have fun.



Above is the actual size artwork for the PCB whie below is the software listing.

```
1 REM BASIC PROGRAM FOR INITIALIZING SYSTEM 80 RS-232 PRINTER
2 REM INTERFACE. THIS PROGRAM REQUIRES THAT AT LEAST 125 BYTES
3 REM BE RESERVED AT THE TOP OF RAM SPACE FOR THE MACHINE
4 REM LANGUAGE DRIVER ROUTINE.
5 REM WRITTEN BY GERALD COHN - 11/11/1980
6 POKE 16553,255:CLS:INPUT"ENTER MEMORY SIZE";MS:MS=MS+1
7 HB=INT(MS/256):LB=MS-256*HB:POKE 16422,LB:POKE 16423,HB
8 IF MS>32767 THEN MS=MS-65536
9 FOR I=0 TO 123:READ D:POKE MS+I,D:NEXT I
10 PRINT:INPUT"BAUD RATE";B:BR=1
11 IF B=110 THEN 19
12 IF B=150 OR B=300 OR B=450 OR B=600 THEN 15
13 IF B=1200 OR B=2400 OR B=4800 OR B=9600 THEN 17
14 PRINT"INVALID SELECTION":PRINT:GOTO 10
15 BR=BR+1:B=B-150:IF B<>0 THEN 15
16 GOTO 19
17 BR=BR+1:B=B/2:IF B<>600 THEN 17
18 BR=BR+4
19 FOR I=1 TO BR:READ D:NEXT I
20 DH=INT(D/256):DL=D-256*DH
21 POKE MS+42,DL:POKE MS+43,DH
22 POKE MS+84,DL:POKE MS+85,DH
23 POKE MS+94,DL:POKE MS+95,DH
24 PRINT:INPUT"ADD LF AFTER CR (Y/N)";Q$
25 IF Q$="Y" THEN 28
26 IF Q$<>"N" THEN 24
27 FOR I=1 TO 4:POKE MS+67+I,0:NEXT I
28 PRINT:INPUT"NUMBER OF NULLS (0-127)";N
29 IF N<0 OR N>127 THEN 28
30 POKE MS+60,INT(N+1):CLS:END
31 DATA 243,62,255,211,254,229,33,255,1,43,62,4,211,255,124
32 DATA 181,32,247,225,121,254,13,40,3,254,32,216,245,229,197
33 DATA 6,9,55,245,245,33,5,252,205,33,2,33,222,0,43,124,181
34 DATA 32,251,241,31,245,48,19,33,4,252,24,19,14,2,175,13
35 DATA 40,2,24,219,62,10,24,215,24,47,198,0,33,5,252,205
36 DATA 33,2,0,0,33,222,0,43,124,181,32,251,16,212,17,222,0
37 DATA 203,74,40,11,33,4,252,205,33,2,27,122,179,32,251,241
38 DATA 241,254,13,40,198,183,40,197,193,225,241,201,615
39 DATA 450,222,146,108,51,23,8,1
```

Tandy TRS-80 pocket computer

Just released simultaneously in the USA and Australia, the Radio Shack/Tandy TRS80 Pocket Computer is aptly hailed as a breakthrough but it is almost concealed at the end of their catalogue. It certainly marks a great step forward in microcomputers — with the emphasis on the micro. At its price of $250 it invites comparison with Sinclair's ZX80 and the UK Compukit, neither of which can compete with the TRS80 in terms of portability. Indeed there is a real risk of losing the TRS80 under a sheet of paper when writing a program.

by R. V. Taylor

The basic unit is just 175 × 70 × 18mm and weighs 240g. The keyboard is of the "QWERTY" variety with a numeric pad at its right side; the 24-character liquid crystal display is placed above the keyboard along the unit's major axis. The 37 alpha keys are pitched at 11mm between centres in four rows, at 7.5mm between centres, while the 20 numeric keys are on the same centres laterally but in columns at 9mm between centres. All keys have a light but definite feel, except the "ON" key, which is set lower than the others and requires positive pressure to operate it. The keytops are clearly marked (SHIFT and CLEAR are also colour-coded) but the shifted symbols, such as colon and semi-colon, are engraved on the panel and are not so easily read. The shifted Y is a Yen sign (indicating the source of the device) though it is not marked on the panel.

The "ALL RESET" switch (operated by means of a stylus, through a hole in the back of the case) is the only off-keyboard control.

A nine-pin socket in the left hand end of the case, provided with a detachable cover, allows connection to the optional Cassette Interface, into which the basic unit may be fitted. This Cassette Interface then encloses the rear and two adjacent sides of the TRS80, making the overall dimensions 210 × 90 × 22mm and the cost $50 more. The Cassette Interface introduces no extra controls, but requires three AA size batteries, and has a built-in connector with a suitable lead and plug to fit a tape recorder.

The recommended mercury batteries (four in series) form the TRS80 power supply, and are fitted in a plastic holder reached by removing the rear cover of the unit's case. This is retained by four recessed screws, but with a battery life of 300 hours (100 hours if silver zinc cells are used) this is no handicap. Power consumption is .011W alone and .013W with the Cassette Interface connected.

The simplified block diagram shows the major components and the interface connections. The two CPU's share the bidirectional 4-bit data bus and are gated onto the 8-bit section of the address bus by their "busy" lines. The two remaining address lines of CPU1 access the RAM while those of CPU2 are used for I/O control. The CPU's Read/Write lines are gated onto the RAM/Write line. RAM is comprised of the three Display chips (128 bytes each) and the three RAM chips (512 bytes each).

CPU1 is mounted on the keyboard PCB and looks after the keyboard while CPU2 is mounted on the arithmetic PCB and deals with arithmetic routines. Other functions of the CPU's include the following:

CPU1
Interpreter
Manual operations
Power control
Clock control

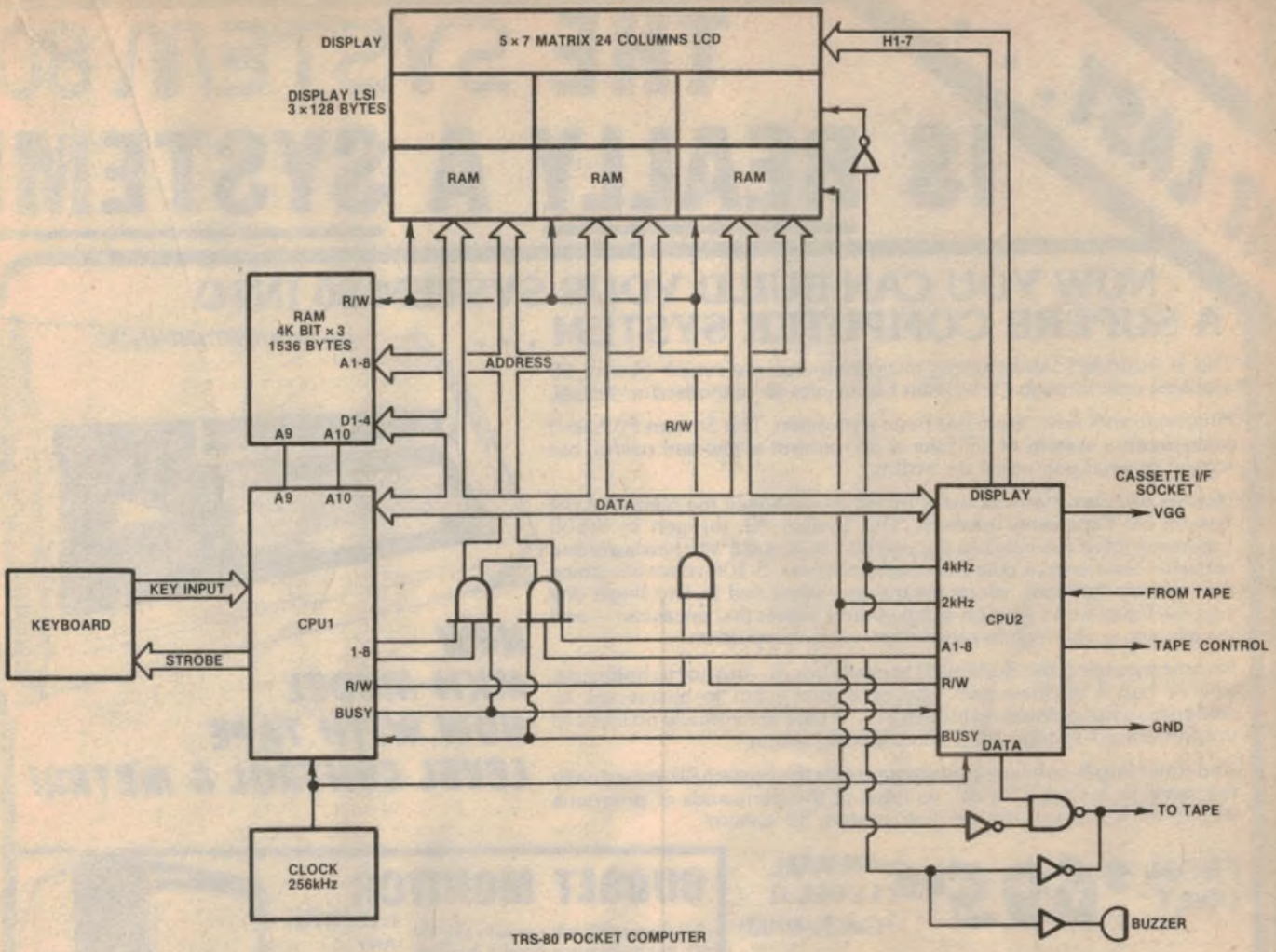
CPU2
Display processing
Input buffer
Character generation
Cassette routines
Buzzer control

Most functions require both CPU's to act together but the details are not relevant to this review.

One section of a 4011 CMOS chip provides the crystal oscillator giving a clock frequency of 256kHz which is rather slow but adequate for the unit's requirements.

Note that the CPU2 cassette routines include generation and decoding of the 2 and 4kHz tones. The Cassette Interface is more of a conditioning and control

Emphasising its small size, the TRS80 is dwarfed by its companion software manual.



unit, providing also tape motor control and muting, rather than acting as a modem. This makes for most reliable CSAVE and CLOAD operations and allows CLOAD Verification. The Cassette Interface batteries are used only for operation of the relay controlling the tape motor, the remaining power requirements of .002W being supplied from the TRS80.

Documentation is vital for a device of this complexity, so examination of the manual is mandatory. The 122 page Tandy manual weighs more than the microcomputer itself and is generally clear and well set out. The traditional quick reference card tucks into the soft pocket carrying case. Two overlays are provided against assignment of user definable (reservable) keys.

The manual provides an overview of the computer, followed by sections on manual and programmed calculations before going into programming the machine in BASIC. Some knowledge of BASIC is assumed but most of the text could be followed without prior experience – in fact, as the machine uses a shortened form it may be better to start from scratch. *(Continued on page 112)*

For program storage, the TRS80 and cassette interface mate to drive the recommended Minisette-9 (shown upside-down).

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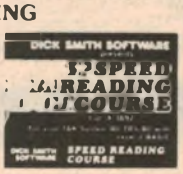

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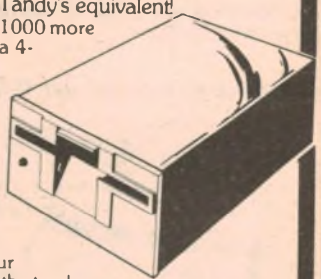

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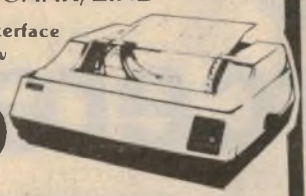

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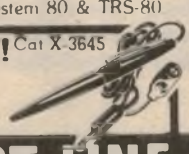

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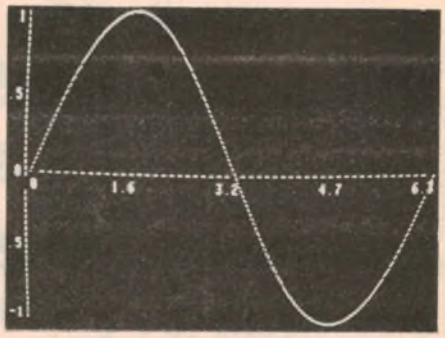
Basic program gives high resolution plus X and Y-axes

Curve-Plotting with your Sorcerer

This function plotting program for the Exidy Sorcerer takes advantage of the computer's user-definable graphics feature to produce a high resolution display of any single-variable function. The function and the domain over which it will be plotted can be defined by the user, and the final display is most impressive.

by DANIEL WONG



Above is a typical plot from the program listed on the opposite page.

The program will plot any single variable function with a high degree of resolution, and can be run on any Sorcerer computer. It produces a display which is almost continuous, without the "stair-case" effect seen in lower resolution plotting programs. The X and Y-axes and their corresponding minimum and maximum values are also depicted.

To run the program the user only has to define the function to be plotted in statement 10 and the domain of the X-axis in statement 20. XI is the minimum value that X can take, and XA is the maximum value. As listed here the program will plot the function X=SIN (X) between the limits X=0 and X=6.3 (in radians in this case).

Note line 1225, which confines the possible positions of the plotted points between the values of −3968 and −2049, which are the limits of the screen RAM of the Sorcerer (in decimal). Poking data into memory locations outside these limits can have strange results, and may cause the programs to crash. Adding this simple test to any program that manipulates the screen RAM can save many hours of de-bugging.

Any single variable function can be plotted. X=TAN(X) gives interesting results, as does X=EXP(X). Remember that when you define a new function to be plotted it will also be necessary to change the limits of the X-axis. The program will automatically scale the plot to make best use of the available screen area.

Users of the Sorcerer will be aware of the potential of the machine's user definable graphics and memory mapped display. Theoretically the combination of these two features results in a display with a resolution of 512 x 240 dots. The catch is that the programming for high resolution is quite complex. The subroutine from line 1020 to line 1245 in this program shows what must be done. Study of this routine will provide valuable hints to anyone interested in fully exploiting the Sorcerer's high resolution capabilities.

```
10 DEF FNY(X)=SIN(X)
20 XI=0:XA=0.3
90 DIM BK(24),X1(7),Y1(7)
100 GOSUB 900
101 PRINT CHR$(12)
102 IF YI=YA AND YI<0 THEN 128
104 IF YI=YA AND YI>0 THEN 126
110 IF YI=0 OR (YI>0 AND YA>0) THEN 140
111 IF YA=0 OR (YI<0 AND YA<0) THEN 131
120 XX=INT(ABS(YI)*25/(YA-YI))
124 GOTO 150
126 YI=0:YA=2*YA:GOTO 140
128 YA=0:YI=2*YI
131 XX=24:GOTO 150
140 XX=-1
150 FOR I=0 TO 50
160 H=I-64*XX-2227
170 POKE H,45
180 NEXT I
230 IF XI=0 OR (XI>0 AND XA>0) THEN 260
231 IF XA=0 OR (XI<0 AND XA<0) THEN 251
240 YX=INT(ABS(XI)*51/(XA-XI))
250 GOTO 270
251 YX=50:GOTO 270
260 YX=-1
270 FOR J=0 TO 24
280 H=YX-64*J-2227
290 POKE H,124
295 NEXT J
300 GOSUB 1020
301 AA=XI:BB=1:XX=XX-1:GOSUB 350
302 AA=INT(2.5*(XA-XI)+0.5)/10+XI:BB=13:GOSUB 350
303 AA=INT(5*(XA-XI)+0.5)/10+XI:BB=26:GOSUB 350
304 AA=INT(7.5*(XA-XI)+0.5)/10+XI:BB=39:GOSUB 350
305 AA=XA:BB=51:GOSUB 350
310 AA=YI:BB=YX:XX=0:GOSUB 350
321 AA=INT(2.5*(YA-YI)+0.5)/10+YI:XX=6:GOSUB 350
322 AA=INT(5*(YA-YI)+0.5)/10+YI:XX=12:GOSUB 350
323 AA=INT(7.5*(YA-YI)+0.5)/10+YI:XX=18:GOSUB 350
330 AA=YA:XX=24:GOSUB 350
335 END
350 CC$=STR$(AA)
360 XL=LEN(CC$)
370 FOR I=1 TO XL
380 DD=ASC(RIGHT$(CC$,I))
390 H=BB-I-64*XX-2227
400 POKE H,DD
410 NEXT I
420 RETURN
900 PRINT CHR$(12)
905 PRINT "Calculation in progress. Please wait'"
910 DIM Y2(50)
915 FOR J=0 TO 50
920 X=J*(XA-XI)/50
925 Y2(J)=FNY(X+XI)
930 IF J=0 THEN 985
935 K=J-1
940 FOR I=0 TO K
945 IF Y2(J)>=Y2(I) THEN 980
950 C=Y2(I):D=Y2(J)
955 FOR L=I TO K
960 A=Y2(L+1):Y2(L+1)=C:C=A
965 NEXT L
970 Y2(I)=D
975 GOTO 985
980 NEXT I
985 NEXT J
990 YI=INT(Y2(0))
995 YA=INT(Y2(50)+0.5)
996 RETURN
1020 P=1024:Q=128
1030 FOR K=-1024 TO -1:POKE K,0:NEXT K
1040 FOR I=0 TO 50
1050 A=I*8:B=I*8+7
1060 FOR J=A TO B
1070 C=J-A
1080 X=J*(XA-XI)/408
1090 YY=FNY(X+XI)-YI
1100 Y=INT(YY*200/(YA-YI)+0.5)
1110 BK(C)=INT(Y/8)
1120 IF C=0 THEN 1160
1130 D=C-1
1140 IF BK(C)=BK(D) THEN 1160
1150 P=P-8:Q=Q+1
1160 X1(C)=J-8*INT(J/8)
1170 Y1(C)=Y-8*INT(Y/8)
1180 E=2^(7-X1(C))
1190 F=7-P-Y1(C)
1191 IF F>=0 THEN 1245
1200 G=E+PEEK(F)
1210 POKE F,G
1220 H=I-64*BK(C)-2227
1225 IF H<-3968 OR H>-2049 THEN 1235
1230 POKE H,Q
1235 NEXT J
1240 P=P-8:Q=Q+1
1242 NEXT I
1245 RETURN
```

Letters to the editor

We'll let readers be the judge Pt. 2

Thank you for publishing my letter in your December issue. May I now clear up for you one or two statements in that letter.

Firstly, I fully agree with you that Dick Smith kits are not the responsibility of EA.

Secondly, I wasn't accusing EA or DSE of deliberate conspiracy. I was, however, taking your "Information Centre" to task for lack of technical thought in its reply to a reader's problem. Nothing was said about this in your reply.

My assumption that EA and DSE have a close association is based on the fact that "Column 80" is written by a DSE employee, and the original article for the "Playmaster AM/FM Stereo Tuner Clock" stated that the project was done in association with DSE. Lastly, the first errata that appeared for the project concerned itself with DSE kits, the change required for the AM/FM mono/stereo switch.

I also stated that I have been an EA reader for 20 years; that should imply that I hold your magazine in good standing. And as far as DSE is concerned, although I have had some problems with these kits due to missing parts etc, they ahve been very helpful and therefore, no complaints.

You must surely agree that as you design for a public which has varying degrees of technical expertise, your "Information Centre" must be accurate, and a bit of thought put into answers to the readers queries. I would venture to say that if one reader puts in a query, there could be a number of other people having the same problem, who would also use that information for their own projects. You would never find out about these people.

Take the case of JS, say 10 other readers had the same problem and saw that uninformative reply. They took the advice to try and fix their tuners, then they would have parted with $18 each. Tell me who is out of pocket when they find they still have the same probem?

In my case I knew of about a dozen people with that problem whilst I was in Sydney and a couple since I have lived down here. Two of these people had already bought new chips and, of course, still had the problem.

I've only talked about one case, but if that is representative of the replies given by the "Information Centre" it won't be an isolated case.

I don't intend to start a series of letters to aim criticism at your magazine, I'm far too busy in my own activities for that. But I think a bit of thought in your "Information Centre" pages would keep EA to the high standard that we are used to.

M. Rogerson,
Werribee, Vic.

COMMENT: As with the rest of the magazine, we take a great deal of care in preparing answers for the Information Centre. However, can you imagine the difficulty of trying to troubleshoot a problem which you have not personally experienced? We are often in this position – trying to diagnose and cure faults with sometimes very vague information supplied by readers, and without the benefit of having the faulty project in front of us to check our suggestions.

We do our best to help readers who have problems with our projects, but we do not claim to be infallible. Certainly, we did not expect that after 18 months on the market the AM/FM tuner kit would suddenly be sold with wrong instructions regarding the transistor leads.

Finally, we would like to inform you that it is strict editorial policy that we admit to all mistakes and publish corrections in the first available issue. How else could we maintain credibility with our readers?

Support for EA & AC wiring rules

Having read the letter from your disgruntled correspondent (M.R.) in the December 1980 issue of EA, I feel constrained to write a note in your support. Not, I guess that you need it, or you would long ago have fallen by the wayside.

In a long time in electronics (40 years approacheth) and having subscribed to about 0.7 cubic metres of EA, RT&H, & R & H (I have some 33 years of them), I cannot recall ever having seen your support given to a questionable practice of any kind. Further, it has only been on the rarest of occasions I can recall the odd technical boo boo, and no one could have been quicker than your journal in correcting such points in a subsequent issue, once the matter has been realised. Enough of that . . .

On the same page as the letter referred to above is one from Mr Stephen of the Energy Authority of NSW. It does bring up a point that leaves some measure of concern in my mind. The several articles that you print on projects involving work on the AC power system – the "Light Dimmer" being one such – can lead experimenters into a dubious zone. As with NSW, all states have fairly rigid "hands off the AC mains" rules.

I would be the first to compliment you on the safety comments you invariably add to such projects – rather more than other journals are apt to offer. However, apart from the very real points made by Mr Stephen, I suspect that there are one or two other matters also not generally realised – such as that unauthorised modifications to wiring may void the building fire insurance.

Equally real can be the effect on the RF Spectrum – you have reasonably well discussed this in "Forum", EA October issue. Again, the unwanted side effects from DC generated – vide the amendment to AS100 – by miscellaneous appliances are rather more relevant than the slightly abbreviated comment, with some added levity, that graced "Forum" in the June 1980 issue. Having had some little experience in this area, the "tip-of-the-iceberg" syndrome is again with us.

Brian Byrne,
Indooroopilly, Qld.

Robots & unemployment

Dear Professor Blatt,

May I venture to compliment you on your interesting and thoughtful article in Electronics Australia, December 1980, on the effects of technology on unemployment. I heartily agree with your views.

Although, to a minimal extent, people are already paid a living allowance, eg family allowances or the dole, I should like to see the introduction of a points system for living allowances. In such a points system, there would be points for getting born, for educational level reached, for looking after the young, old or helpless, for providing goods or services for others, for undertaking management duties, for providing professional services, for teaching, for work in science, engineering and art, and indeed in any activity which contributes to the quality of life.

The living allowance for minimum points should provide a full life within the capabilities of the particular individual, eg a baby or handicapped person. Those individuals who choose to advance and do work of the highest quality should receive the highest points and the highest living allowance.

All money, or tokens, paid for goods and services, including receipts from exports, would be paid into a regional, national or even world living allowance

fund from which would be disbursed the various allowances.

At the start of such a scheme, everyone would at least retain their present income and the scheme would evolve fully and slowly as generations of people grew up and died.

What a Utopian dream to set against the present omens of disaster! But surely, the massive human brain was not evolved for the purpose of its own destruction, but rather for the perfection of the species.

G. J. Winsbury,
Heathcote, NSW.

NSW was not first!

I would like to point out to Ron de Jong a small, but important, error in his "Selectalott" article (December 1980), where he states ". . . Lotto is played only in NSW, with a similar game called Tattslotto in Victoria . . ."

It should read: "Tattslotto is played in Victoria, with a similar game called Lotto in NSW".

Here, NSW must concede, they were **not** first!

M. J. Robinson,
Barkers Creek RSD, Vic.

Suppliers for the battery charger

Attached herewith is a list of suppliers who will be stocking the PS518 Battery Charger Kit described in the current issue of "Electronics Australia" (Editor's Note: see p48):

VICTORIA: Kalextronics Pty Ltd; Stewart Electronics Pty Ltd; Davred Wholesalers Pty Ltd; Ellistronics Pty Ltd; Truscott Electronics; Radio Parts Pty Ltd; Magrath's Pty Ltd.

NSW: Electronic Agencies; George Brown Pty Ltd; Browntronics Pty Ltd; Martin De Launay Pty Ltd; Davred Pty Ltd; Sheridan Electronics; Radio Despatch Service; D. J. Coulter Wholesale (Newcastle); Electronic Components (Canberra).

SA: Ktronics Pty Ltd; Gerard & Goodman Pty Ltd; Protronics Pty Ltd; M. S. McLeod Pty Ltd.

QLD: Audiotronics; Belsound Pty Ltd; GEC (Aust) Pty Ltd; Gayrad Pty Ltd; Lighting & Electrical; Repco Auto Parts; Traders A.G.S.

WA: Alltronics Pty Ltd; Atkins Carlyle Pty Ltd.

W. Bryer, Advertising Manager,
A&R Electronics Pty Ltd,
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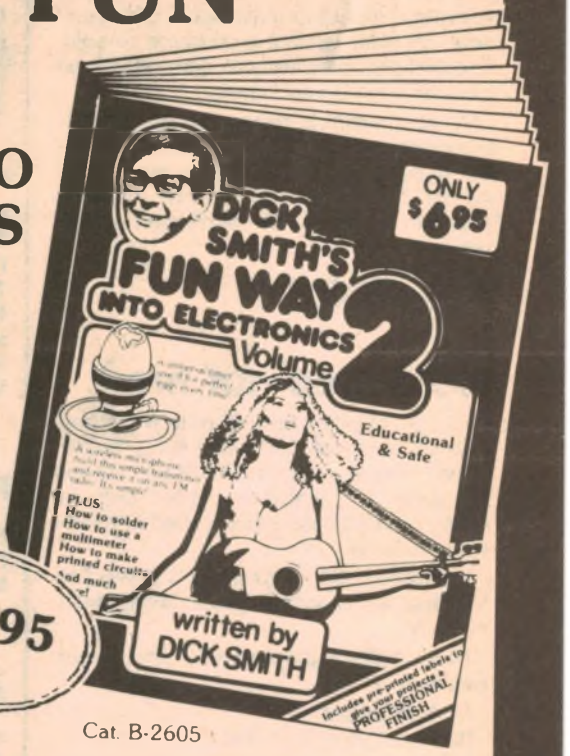

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AMATEUR RADIO

by Pierce Healy, VK2APQ

Amateur radio — and the need for a better public image

A good public image is a virtual necessity for almost any organisation, and particularly so for one which is under continual official and public scrutiny. Failure to project an accurate image may well contribute to the eventual demise of such an organisation.

This observation applies particularly to amateur radio, which owes its existence largely to its past history of contributions to the art and science of radio communication, and to its service to the community in times of emergency. But it is not sufficient that we provide these services, we must see to it that the public know what we have done, what we are doing, and what we can do.

Amateur radio is unique in many ways. One is that, in spite of its amateur status, it provided the foundations for today's commercial radio communications; local, international, entertainment etc. Yet it remains a hobby type activity to be enjoyed from home, from portable locations, from one's vehicle, and involving a wide range of techniques. Quite outstanding claims, but factual nevertheless.

That is an approach that can be used when introducing the general public to amateur radio. This opinion has been reinforced by my association with the amateur radio demonstration station, VK2BQK, at the Museum of Applied Arts and Sciences Museum Sydney, since its inception in December 1978. It was highlighted when, just prior to the 1980 festive season, I was asked questions by a visitor to the Museum.

This visitor, with a teenage family, had come upon the station during an unplanned visit caused by inclement weather on a weekend outing. He expressed amazement at the achievements, services given in emergencies, and the fact that the potential of amateur radio was not more fully publicised, adding that he also had a background of community activities. In fact, the only remarks about amateur radio that stirred in his memory were derogatory insinuations made about "ham" operators in the news media. But he now realised that these reports had been made by persons without any knowledge of amateur radio and with a mental fixation that all wrong doers on the air are amateur radio operators.

Another point that visitors are interested in is the international aspect of amateur radio and the national amateur radio societies rather than the parochial type radio clubs.

It is on these themes that the Wireless Institute of Australia should actively publicise amateur radio.

It has been suggested that, with the expansion of community radio, the opportunity exists for the WIA to publicise the Amateur Service; let the outstanding status of amateur radio be made public.

Within these notes are instances where amateurs are providing community services that receive little or no publicity through everyday news media.

A NEW BOOKLET

For those amateurs who wish to hold more fullfilling QSOs with the many Japanese amateurs on the bands, a booklet has been published by Westlakes Radio Club. Titled "QSO JA NOW", by Paul Rodenhuis, VK2AHB, it sets out a basic QSO in Japanese (Roman text) in an easily followed manner.

Commencing with the basics of equipment, signal reports, etc, it progresses through weather, counting, time, personal details, job, and other points of general conversation.

A companion cassette tape assists with the pronunciation of the Japanese words and phrases in the booklet. The aim is to promote more QSOs between Australian and Japanese amateurs, beyond the usual English stereotype.

The cost of the booklet is $2.95; including the cassette tape $4.95. Available from Westlakes Radio Club, PO Box 1, Teralba, NSW 2284.

The author, Paul Rodenhuis, VK2AHB, speaks Japanese fluently. He recently spent a month touring Japan as guest of a wide cross section of Japanese amateurs. As an amateur his keen interest is RTTY, and he is currently secretary of the Australian National Amateur Radio Teleprinter Society.

The booklet could also have an educational aid value to students.

RADIOTELETYPE NEWS

How many give a thought to the voluntary effort that goes into producing regular news bulletins? Particularly those broadcast on behalf of your own or other amateur radio societies. Well, here are some statistics about the Australian National Amateur Radio Teleprinter Society RTTY broadcasts in Sydney. These are made through VK2TTY each Sunday at 0030 UTC on 7045kHz and 14090kHz; 21095kHz at 0130 UTC and 3545kHz at 0930 UTC. Relays are made on 146.6MHz at 0030 UTC and 0930 UTC.

News bulletin number 166 was broadcast on December 21, 1980. In just over three years one and a half million words have been transmitted, involving 1142 metres of paper; 5425 metres of paper tape; 43 ribbons, and 525kWHs of power from the AC mains.

Time occupied in collecting, correlating, editing, and producing tapes, and transmitting these bulletins by the originating and relay stations cannot, with any degree of reasonable accuracy, be even estimated.

Nevertheless, these statistics are worthy of consideration and appreciation by those who enjoy this news service. The service also has a large overseas audience and co-operates with the American Radio Relay League and British Amateur Radio Telegraph Group teletype news services.

If interested in radioteletype contact the Secretary, ANARTS, PO Box 860, Crows Nest, NSW 2065.

AMATEUR RADIO

A visitor to Australia during December 1980 – January 1981, was Mal Westwood, 9M2MW from Penang, Malaysia. During his trip he visited amateurs in Western Australia, New South Wales, South Australia and Victoria, discussing radioteletype activities and equipment with amateurs, and visiting their stations. While in Sydney, stations visited included VK2SG, VK2ABH and VK2APQ.

Mal was the first amateur in Malaysia to be active on RTTY.

NAVY WEEK – TASMANIA

This story comes from Ted Beard, VK7EB, of Hobart. Ted is a member of the Royal Naval Amateur Radio Society (RNARS), and his story tells how amateur radio participated in Navy Week celebrations during November 1980. It is another example of community service amateur radio can provide.

"What has Navy Week to do with amateur radio? Generally speaking nothing. But for the training ship TS Derwent and the RANR Cadets in Hobart, Tasmania, quite a lot.

"For as long as I can remember (before WW II) units of the RAN have sailed up the Derwent River and entertained the locals during Navy Week.

"This year Lieut Cdr Max Webb, skipper of the TS Derwent, received a signal advising that, as units of the RAN had been deployed to other areas, no units of the fleet would be visiting Hobart for Navy Week. RANR Cadets were therefore requested to assist HMAS Huron, the Navy Depot, to entertain the public on Sunday, November 2, 1980.

"One bright news item was that Lieut Cdr Ron Coleman and crew of TS York, from Georgetown, northern Tasmania, were visiting TS Derwent for the weekend. Ron was to be commanding officer and, being an ex-wartime bunting tosser (visual signals – flags, semaphore, and light), this raised my hopes somewhat, as I was in charge of communications at TS Derwent.

"A program of activities for the cadets was evolved by Sub Lieut Ron Smith. Four watches were formed and classes held in navigation, firefighting, sailing, and rifle shooting. All activities were on a rotational basis.

"HMAS Huon's work boat was used to give rides to visitors. Naval Cadet Signalman D. Lacey maintained contact with his opposite number R. Scholes at TS Derwent with an aldis signalling lamp and an HF walkie talkie as alternative back up.

"Earlier I had installed an IC 701 amateur transceiver in the communications room to establish contact with VK6DV, VK6TO and ZL1AHK, all members of the RNARS. We also made contact with the American Naval Base at Guantanamo Bay in Cuba.

"At 6.30pm (0730 UTC) on a prearranged schedule, contact was made with G3ASM in Stockton-on-Tees in England. A lengthy contact ensured in which members of the ship's company participated. All concerned, including Hank, G3ASM, enjoyed the experienced.

"Other stations worked included VK2BVH, VK2BWQ and VK2APQ.

"In conclusion the skipper has asked me to extend an invitation to any RANR cadets to visit TS Derwent should they visit Hobart. Parades are held on Friday nights and sailing and other activities every Saturday."

NORTH QUEENSLAND CONVENTION

Preparations are already well in hand for the fourth biennial North Queensland Convention to be held by the Townsville Amateur Radio Club over the weekend September 26-27, 1981.

This will be a gathering of amateur radio operators and enthusiasts not only from Australia but also from overseas. As far as it is known, the convention will be the first planned to use the new international airport facility at present being constructed at Townsville.

The convention has already attracted the interest of several amateur radio operators from South America and it is also hoped that a number will arrive from Japan and USA.

Not only will there be activities and displays for amateurs and computer hobbyists, there will also be items of interest for other members of the family. Accommodation will be available at the venue over the weekend. For those wishing to stay longer, there are a number of high class hotels, motels, or caravan parks.

For further information contact – The Publicity Officer, Townsville Amateur Radio Club, PO Box 964, Townsville, Qld 4810.

WIA NEWS

Federal Executive of the Wireless Institute of Australia have agreed that the Worked All VK Call Areas (WAVKCA) award should be opened for Australian amateurs from January 1, 1981, for contacts made on or after that date.

The rules of this award will be suitably amended, and will require a total of 77 contacts to qualify.

The contacts are to be made up as follows: Ten on at least three bands for each call area VK2 to VK7 inclusive; five on two bands for VK1 and VK8 call areas; four in three territories in VK9 call areas; and three in two locations of the VK0 call area.

A separate award will not be available for any particular mode; proof of contact by production of QSL cards for contacts claimed.

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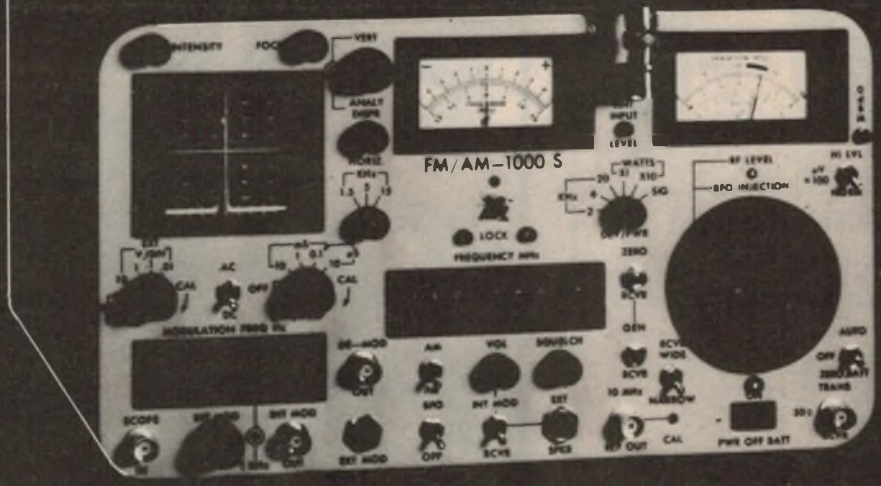

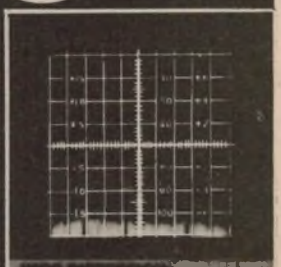

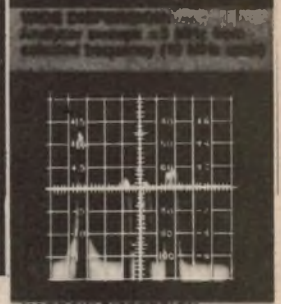

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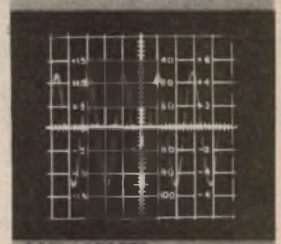

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AMATEUR RADIO

VICTORIAN CONVENTION

The Victorian Division WIA will hold a convention on February 28 and March 1, 1981, at the Latrobe University, Glen College, Bundoora, Victoria. Activities: Friday evening, social starting at 8pm. Saturday evening, convention dinner. Master of ceremonies: Harold Hepburn, VK3AFQ, plus guest speakers.

Saturday and Sunday: Trade, industry, and educational display, amateur TV demonstration, swap and trade table, book sales, and competitions, including equipment and field events.

For further information contact. The Secretary, Victorian Division, WIA, 412 Brunswick St, Fitzroy, Victoria, 3065. Phone: (03) 417 3535.

RADIO CLUB NEWS

WESTERN AUSTRALIAN VHF GROUP: During a holiday weekend in October 1980 an expedition was organised by members of the WA Repeater Group to Mount Toolbrunup. The purpose was to set up the group's channel 8 portable repeater, VK6REE. Mount Toolbrunup is in the Stirling Ranges, in the south west corner of WA, and is 1100 metres high. The climb took 2½ hours, carrying all the equipment, including two car batteries.

Setting up the station took about one hour. The repeater, cavity filters, batteries, and other bits and pieces were installed in a small cave from where the coaxial cable was fed inside a six metre high aluminium tube mast to the base of a Ringo antenna.

The moment the repeater was switched on signals were heard from all over the countryside. During the afternoon several of the party went mobile to test the coverage.

"The range of the repeater had to be heard to be believed. The experience of using a 2-watt handheld to talk to anyone within a circle of 160 kilometres was quite incredible."

The mobile coverage was also quite phenomenal; one contact was maintained over a distance of 300km. The repeater was heard in Perth and one brief contact was made. Stations in Bunbury were also worked.

Whether a permanent repeater can be installed on Mount Toolbrunup, which is located in a National Park, is being investigated by the WA repeater group.

(Extract from the WA VHF Group Bulletin Nov 1980).

CENTRAL COAST AMATEUR RADIO CLUB: Final preparations are being made by the committee for the Club's 24th annual field day to be held at the Gosford Showground on Sunday, February 22, 1981. Program details were given in last months issue of these notes. Make it a family weekend on the beautiful central coast of NSW.

A group of seven students attending the classes at the clubrooms, Kariong, will be sitting for the amateur licence examination held by the Department of Communications, in March 1981.

WAGGA AMATEUR RADIO CLUB: In answer to a request from the Wagga FM Community Radio Co-op, members of WARC helped in the painting and restoration of the Co-op's tower at the top of Williams Hill. Although it was estimated that it would take two weekends, the task was completed on the first. A community service that was greatly appreciated.

WESTLAKES RADIO CLUB: Novice licence, computer, and construction classes conducted by the WRC will commence during the first week in February, 1981. Details of the classes and other club activities may be obtained by writing to the Secretary, WRC, Box 1 PO, Teralba, 2284 or call at the club rooms in York Street, Teralba, NSW. Telephone (049) 58 1588. Club station VK2ATZ is net control on Thursday evenings at 8.30pm on 29475kHz or 3565kHz and Sunday 11.45am on 1912.5kHz.

TOWNSVILLE AMATEUR RADIO CLUB: At the annual general meeting the following officers were elected for 1981.

Roger Cordukes, VK4CD – president; Bill Sebbens, VK4XZ and Peter Renton, VK4PV – vice-presidents; Bob Mann, VK4ZFX – secretary; Ken Telford, VK4ZOC – treasurer.

The retiring president Bill Sebbens, VK4XZ complemented all those who assisted in club activities during his term of office. Included were the class instructors, led by Ross Wilken, VK4ZZW, for their efforts in helping more than 20 members to obtain either an amateur licence or upgraded to higher qualifications.

The report closed with the thought that there is a need to promote the image of amateur radio, possibly through the avenue of community service type exercises.

The TARC club station is VK4WIT and a repeater, VK4RAT, two-metre channel 6700. Postal address, PO Box 964, Townsville, Qld 4810.

ILLAWARRA AMATEUR RADIO SOCIETY: On the weekend March 28-29, 1981, members of IARS will be joining in the activities commemorating Laurence Hargrave's work as a pioneer in aviation, Displays of Hargrave's work, kite flying, etc, are expected to be well attended.

The club station VK2AMW will operate from the site of the celebrations during the whole weekend and at the same time inaugurate the Lawrence Hargrave Award.

Keep the dates clear and watch for further details of the award.

SOUTH WEST AMATEUR RADIO SOCIETY: This society, centred generally on the Riverina-Murrumbidgee irrigation areas in southern New South Wales, holds quarterly meetings and invites all amateurs in southern NSW and Northern Victoria to attend.

Regular weekly nets are held on Wednesdays at 2030 hours during daylight saving period and 2000 hours EST on 3610kHz. The call sign is VK2DEI.

For further information write to the Secretary SWARS, Sid Ward, VK2SW, C/o PO Box 71, Kooringal, NSW 3650.

Radio clubs and other organisations, as well as individual amateur operators, are invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits. All material should be sent to Pierce Healy at 69 Taylor Street, Bankstown.

The Australian CB SCENE

CB: each of us has a story to tell

CB isn't a single entity. You can't point to something or someone and say "There, that's what CB is all about." CB is made up of ordinary everyday people like you and I. We all have our own reasons for turning our rigs on, and for turning them off as well. Each of us came to CB in our own way and each of us has a story to tell.

I have been sitting here at the typewriter for the past hour or so wondering what on earth I can talk to you about this month. There has been nothing really exciting going on, and all seems quiet as far as "the Department" is concerned. It is hoped that by the time the next issue of EA arrives we will have heard more on the results of the CBRS inquiry, but at the moment there is a definite lull as far as news is concerned.

I've got an idea – let's try to organise a contest! The editor will probably scream blue murder, but I'll take my chances.

Here's what I'm thinking . . . CB isn't a single entity. You can't point to something or someone and say "There, that's what CB is all about." CB is made up of ordinary everyday people like you and me and we all have our own reasons for turning our rigs on, and for turning them off as well. Each of us came to CB in our own way and each of us has a story to tell. Some may be happy stories, some sad – but each story is different. I would like very much to hear your story, and I am sure other readers would too.

Let's try to find out what brings a person to buy a CB set? Even more importantly, what is a person looking for when he or she picks up the mike and starts talking to a complete stranger? Do they ever find what they are looking for?

This column is called "Australian CB Scene". CB is made up of people, isn't it? What better purpose could some of the space in the column be put to than using it as a forum for you to tell us why you became a CB operator? I would like very much to hear your story and I am sure other readers would too.

Realistically speaking, one always achieves better reader participation in something like this if there is a prize at the end of it. Perhaps a CB rig for the best story?

As I said, this is just an idea at the moment, and it depends on a few things if it is going to get off the ground: a name for the competition, a sponsor who is willing to put up a good prize, and the blessings of my editor (not necessarily in that order).

I tell you what. Leave it with me for a month or so and I'll see what I can organise. If I can get the support I need at my end (I know I can count on yours), then we could really have something here.

UHF CB: At the moment we have three brands competing for the UHF market: Philips, Sawtron and Apollo. I have only seldom used UHF, and therefore am in no position to talk about it to any great degree. However, I would like to, and intend approaching the companies concerned in an effort to obtain a set from each to be used over a trial period, giving my own personal view (from an operator's stance) each month.

My technical knowledge is limited, so I won't be going into all sorts of details. I will simply give my impressions of each one as an average CB operator. If the companies are prepared for that sort of testing, then you can look forward to reading about these sets in future issues.

SOME UNEXPECTED READERS

I have received mail from some strange and far distant places over the past year or so – the popularity of EA sees it going everywhere. However, I must admit that I was exceedingly touched to find out that the boys who are "guests of Her Majesty" have been reading my column. Some of them have not only taken the time and trouble to write to me, but have also sent me a Christmas card. The guys are using their time to learn more about electronics and have undertaken appropriate technical courses. I would like to send a special "Hi" to Noel, Jim, Shane and all their mates. Thanks for the letters and cards, and best of luck.

Speaking of the places in which my articles turn up . . . I was, to say the least, surprised when Ross Ramsay of the Department of Communications flashed a copy of one of them during the Convention. He commented that I say nice things about him. Well, that's not hard to do, because he really is a nice man. He has a good head start because he is a Queenslander!

Seriously though, I am confident that we can expect a really fair hearing from the Department with Ross in there as First Assistant Secretary. I know that the National Director of the NCRA is pleased with the swifter flow of communications from the Department these days.

NCRA national assembly meeting: Jan holding her NCRA-South Pacific Radio Special Recognition Award.

NCRA CONVENTION: I still can't get over my being presented with a special trophy at the NCRA Convention last November. I look at it and wonder "Why me?" Which reminds me – I must throw a huge bouquet of flowers to Terry Watkin, the National Director of the

NCRA who has worked (to the detriment of other aspects of his life) to improve the CBRS, in particular the 27MHz side. Thanks, Terry.

MAIL BAG

COMBINED CB MEETING: Our roving reporter, Ken Upton, has been at it again. I tell you, it's hard to keep a good man down!

Ken, as you all know by now, is the Omega One. There was a Combined CB Meeting (Ken tells us) at the Liverpool (NSW) Town Hall on November 28 and the Omega Club was represented by Ken, Gary, Steve, Eric and John. The guest speakers were: Mr John Kerin, MLA for Werriwa; Mr Bill Storer, Deputy State Superintendent (NSW) Department of Communications; and Mr Alfred Reipano from the Licencing Branch (DOC).

I gather from what Ken has written that many club representatives left the meeting feeling that more than a few of their questions had not been adequately answered. On the question of an easy-to-follow booklet of rules and regulations relating to CB, Bill Storer even suggested that the NCRA prepare a suitable draught copy and submit it to the Minister!

In spite of its apparently limited success, I would like to congratulate the people who organised the meeting and thank those who took the trouble to attend.

FOUNDATION FESTIVAL: The Parramatta Foundation Festival last November saw the Omega club put on its Radio Display for the second consecutive year. The members worked until around mid-night getting everything set up, and excessive SWR caused a few headaches until finally solved.

Members Dave and Steve are also full call amateurs, and attracted a lot of interest with their Kenwood transceivers. CB sets on display ranged from 100mW hand-helds up to the large base station setups. Sam Voron turned up with his shoulder pack, and apparently caused a bit of a stir with it.

Special thanks must go to Walter Roldoy (Omega 9) and Eric Gee (Omega 19) for all their efforts. All in all it seems to have been a worthwhile exercise in public relations by the Omega club. Well done!

Well that's about it for this month. If you have any news please write to me at PO Box 406, Fortitude Valley, Queensland 4006.

Jan Christensen

SHORTWAVE SCENE

by Arthur Cushen, MBE

Radio Vemarana heard during Santo Rebellion

During July 1980, a station called Radio Vemarana operated on Espiritu Santo in the New Hebrides. The station operated during the height of the so-called "bow and arrow" rebellion on Santo, and was widely heard throughout the South Pacific.

During July, 1980 broadcasts from Radio Vemarana were widely reported in Australia and New Zealand, and continuous listening gave a picture of a conflict between a Government in Vila and the rebellion on Espiritu Santo. Broadcasts were heard every morning on 3522kHz and during most of the transmissions there was severe jamming from the British forces who did their best to block the signal to listeners outside the area. During August the station moved to 3577kHz but later returned to its old frequency before it was finally put off the air.

The facts about the station are contained in a recent letter from the announcer of Radio Vemarana – now living in Australia. Radio Vemarana was thought to be a new name for the old Radio Tanafo which was operated by Jimmy Stevens for many years. Tanafo was the headquarters of Jimmy Stevens and was situated 25km from Luganville, the capital of Santo. This was never the location of Radio Vemarana, which transmitted from around Luganville. During July the operating power was 350W, but in August it was raised to 1000W.

BRAZIL ADDS FREQUENCIES

Radio Nacional Brazilia has added a second transmitter for its service to Europe and North America in English. The transmission to Europe at 1900UTC is now broadcast on 15125 and 17180kHz; the North American service at 0200UTC is carried on 15290 and 17830kHz; and the broadcast to Africa at 2100 continues on 15280kHz. The two new frequencies are both in the 16m band and are using the power of 250kW. The station is requesting reception reports and these should be sent to: Radio Bras, International Service, PO Box 04-0340 Brazilia Federal District, Brazil.

YUGOSLAVIA'S NEW VOICE

In the next two years, Radio Yugoslavia will provide a new service for Australian migrants who have been trying to hear broadcasts from Belgrade. Transmissions at the moment are being received on 9620kHz with English at 1830 and 2000UTC, but under difficult reception conditions.

The plans announced indicate that four new transmitters of 500kW will be used by Radio Yugoslavia, with broadcasts beamed to Asia, Africa, North and South America and Australia. The transmitters are to be constructed in Yugoslavia and most of the equipment will be supplied by local manufacturers, except for some antenna components which will be imported. A BBC Monitoring Service report states that the External Service of Radio Yugoslavia will then broadcast in nine languages.

MAJOR TIME CHANGES

The Soviet Union has announced that major changes in time zones across the country will be made later this year in order to bring some areas into the International Time Zone which was created in 1931, but rejected by some Soviet States. This year the Soviet Union will observe summer time from April 1 to October 1. Clocks will be put forward by one hour. On October 1 when most of the Soviet Union will return to standard time, the areas which did not observe the 1931 agreement will remain on daylight time thus bringing them into line with the correct time zone. The BBC Monitoring Service reports that this change will cover relatively small areas of the Soviet Union. During the period April 1-October 1, when Moscow will be observing daylight time, it will be four hours ahead of UTC.

VOICE OF GREECE

New frequencies are being used by the Voice of Greece in Athens for transmissions in Greek and English to Australia. The broadcast from 0900-0950UTC from Athens is carried on 9640 and 15405kHz and this transmission is in Greek and English. The broadcast 2100-2150 in Greek is on 9640, 11730 and 15405kHz, while a further transmission 2200-2250 is on 9640kHz only. A broadcast to Japan in English 1000-1050UTC is carried on 11845 and 15405kHz. The frequency of 9640kHz at 0900UTC is blocked by the BBC World Service up to 0915UTC while 15405kHz, though on a clear frequency, is received at low signal level. The schedule is valid up to March 1, 1981.

LESOTHO ON 11720kHz

The new 50kW Lesotho transmitters have previously been reported on 4800kHz and now 11720kHz has been observed opening at 0458UTC. The transmitters are used by the BBC World Service with news in English at 0500UTC, then a program in French to Africa at 0530UTC. At 0600UTC the BBC News Desk feature is presented and at 0630 a further broadcast in French has been observed. The new frequency provides fair reception in this area and is presumed to be the first used by the BBC of the new Lesotho relay station for high frequency broadcasting in Southern Africa from the new site. In the past, the Lesotho transmitter was heard on 4800kHz and around 1800UTC, but carrying local programming.

NIGERIA'S HIGHER POWER

A new high powered 300kW transmitter has been heard on 17800kHz broadcasting the External Service from Lagos on a test basis. John Mainland of Wellington, NZ first reported this transmission when test announcements were heard between 0700-0800UTC. Recently the frequency has been used to relay the Voice of Nigeria to North Africa but reference to the frequency of 15120kHz only made in the broadcast.

Observations show that there is a full world news bulletin at 0630UTC and on Friday, at 0700, mail from listeners is answered. At 0730UTC Nigerian local news is broadcast and the English

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 saving time, add a further hour.

SHORTWAVE SCENE

transmission ends at 0800 when the broadcast continues in French.

This transmitter has given good reception in southern New Zealand and parts of Australia at this time, with the only interference being from Paris, France also using 17800kHz, but with a much weaker signal level. The address for reports is Federal Radio Corporation of Nigeria, Broadcasting House, Ikoyi Lagos, Nigeria.

STRONGER IRAQI SIGNALS

The Iraqi Government recently signed a contract for the installation of high-powered medium and shortwave transmitters. Current plans call for 16 shortwave transmitters, each of 500kW, and two 1 megawatt medium-wave transmitters. The French company which has been awarded the contract plans to start installation shortly.

In the continuing conflict between Iran and Iraq it has become obvious that Radio Teheran in Iran is winning the propaganda war and so Iraq is attempting to improve its signals throughout the Middle East area and the world in general. The Iraqi could, however, be curtailed due to economic difficulties as a result of the recent fighting.

INTERESTING KOREAN SIGNAL

Broadcasts in English are being received from the Voice of Korean Unification, with English transmissions 1430-1500UTC. The transmission is carried on two shortwave frequencies, 4120 and 4557kHz, and on medium-wave on 1053kHz. A transmission at 2230-2300UTC is broadcast only on 1053 and 4557kHz. The broadcasts call for the unification of North and South Korea and though the station announces as Seoul it is obvious that the broadcast originates from Pyongyang in North Korea.

KTWR CHANGES

Frequency changes at KTWR Agana Guam have been numerous and at the present time the popular "DX Listeners' Log" is now carried on the new frequency of 9510kHz on Friday at 1445GMT. Some of the other changes include: 1430-1600UTC 11895kHz; 2159-0130 17800kHz; 0458-0700 15160kHz; and 1359-1429 15320. The transmission 2045-2129UTC in Russian is now on 11945kHz.

The English transmissions continue to be received 0000-0140UTC on 17770kHz and 0745-0930 on 11840kHz. DX Listeners' Log is heard on these transmissions on Thursdays at 0100 and Fridays at 0915UTC. Reports on reception are appreciated by KTWR, Box CC, Agana, Guam 96910.

KOREAN CHANGES

Radio Korea in Seoul has made some changes in times and frequencies for its English broadcast, though the transmission best received in New Zealand continues to be 9750kHz at 1000UTC. Other transmissions noted are at 0230UTC on 15570, and 11810kHz; 0800UTC on 9870, 11810 and 15570kHz; and 1230 on 7550 and 11830kHz. Another transmission well received is 2130-2230UTC on 15375kHz but there is some interference for the first 30 minutes from Cairo, Egypt broadcasting in English. Radio Korea now has a DX Program during their Friday transmissions.

NEW US STATIONS

A radio station owner in New Orleans, Joseph M. Costello III, who owns five radio stations in the area, has been granted a licence for a shortwave commercial broadcasting station. The licence for the new station was granted on the basis of a law passed in 1948 stating that the United States government does not have a monopoly on shortwave broadcasting. The FFC (Federal Communications Commission) therefore reluctantly granted the application and the station is expected to beam shortwave broadcasts to Canada and Europe. This will be the first international commercial station to operate in the United States since WNYW ceased transmission some years ago and was taken over by WYFR.

The FCC has also granted a licence to the Billy Graham Organisation to establish a shortwave broadcasting station on Hawaii.

ENGLISH FROM PATAGONIA

An English announcement has been heard from Radio Patagonia operating on 6080kHz from 0930UTC. The station has a series of descending chimes then there is a full identification in Spanish. This is followed by another set of chimes and a short announcement of station details in Spanish, followed by further chimes and then the English announcement. The English announcement indicates that listeners are tuned to Radio Patagonia in Coyhaique, Chile broadcasting on medium-wave on CD97 on 970kHz and on shortwave on 6080kHz. The station has already confirmed reception of reports to broadcasts heard in New Zealand.

A verification card and a fact sheet in Spanish about the area has been received. The card shows an ice scene at the San Rafael Lagoon. The principal city in the region is Coyhaique, which has a population of some 30,000.

LISTENING BRIEFS

EUROPE

ROMANIA: Radio Bucharest broadcasts to Africa in English 0530-0600UTC and is heard on 17790kHz. The transmission is also carried on 11840 and 15235kHz. The second broadcast 1730-1800UTC is on 11805, 15340 and 17720kHz, but only the first frequency is audible as 15340 is blocked by Kuwait and 17720kHz by WINB.

VATICAN: The Vatican Radio European language transmission opens at 0630UTC on 11715kHz, as Switzerland leaves the frequency. The opening announcements are in four languages and the same broadcast is noted on 6210kHz. At 0635UTC Mass is broadcast.

NORWAY: Oslo is using 11920kHz for the transmission to North America 0500-0630UTC. This frequency carries English on Monday 0600-0630UTC, but the last 30 minutes of the transmission suffers interference from Radio Moscow.

BELGIUM: Brussels is using a new frequency for English to North America – 11700kHz has replaced the old frequency of 15385kHz 0015-0100UTC. A further channel, 15175kHz, carries the same program. The broadcast from Brussels to Africa at 1000UTC is now heard on the new frequency of 21625kHz, replacing 21465. An additional frequency, 26050kHz, carries the same program.

ASIA

IRAN: The Home Service of Radio Iran in Teheran, after operating on 15315kHz, has moved to 11745kHz. Transmission opens at 0315UTC with an interval signal and broadcasts commence at 0330UTC. The new frequency of 11745kHz is not so well received, as it is also used by Radio Moscow for a transmission in Spanish to Latin America.

PAKISTAN: Radio Pakistan has been heard by Geoff Cosier, reporting in "DX Post", as carrying Home Service programs on 7091kHz at 1303UTC, while another frequency 7375 was heard at the same time with a program in English. Another frequency, 7120kHz, has been heard to closing at 1415UTC, but suffers severe interference from Radio Peking.

AMERICAS

COSTA RICA: Radio Noticias in Costa Rica opens with a guitar interval signal at 0855UTC and identification in Spanish at 0900. Signals on 9615kHz suffer light interference from a Russian transmission on the same channel, reports Simon Tuck of Adelaide in "DX Post".

PERU: Radio America in Lima now seems to be operating 24 hours a day on a Saturday, and is heard round 0700UTC on Sunday on 9510kHz. This signal causes severe interference to the BBC World Service from the Antigua relay base, although Radio America is heard clearly after 0915UTC when they use the slogan "American Radio" and feature popular American music.

NEW PRODUCTS

Hitachi V-352 35MHz Dual Trace Oscilloscope

Hitachi have recently introduced two more oscilloscopes to their range of medium priced CROs. The V202 and V352 are both dual-trace CROs with 20MHz and 35MHz bandwidths respectively and include such features as 1mV/div sensitivity and x10 sweep magnifier.

Dimensions of both CROs are 275 × 190 × 400mm (D × H × W) and weight is 8.5kg. A large carry handle is provided which also functions as a tilting bail. The CRT has a rectangular screen with a blue phosphor and measures 94 × 75mm.

An internal graticule is divided into 10 vertical and eight horizontal divisions, each 9.4mm. It is worth mentioning here that internal graticules, ie, graticules etched on the inside of the CRT tube, are relatively recent innovations in the medium priced CRO market. The major advantage of this feature is that "parallax" error is eliminated, so the signal on the screen can be accurately compared against the graticule from any viewing angle.

In appearance the new Hitachi CROs are almost exactly the same as other models in the series. All of the usual features expected in medium range CROs are provided. Input attenuators for both channels are calibrated from 5mV to 5V in 1-2-5 steps plus there is a separate variable adjustment of gain with an indented calibrate position.

Unlike many similar CROs, however, the Hitachi V-202 and V-352 also provide a x5 vertical gain feature which results in an input sensitivity of 1mV/div. This high sensitivity is very useful for observing low level audio or analog signals etc.

Time base calibration is in 19 steps in 1-2-5 sequence from .2us to .2s, and a separate variable sweep speed control has an indented calibrate position. Hitachi also provides a x10 sweep magnifier rather than the usual x5. The increased resolution is very useful for examining high frequency waveforms or complex waveforms such as video signals.

The Model 352 which we reviewed has a quoted bandwidth (ie, −3dB point) of 35MHz and we were able to verify that this was certainly correct. The ultimate frequency limit of a CRO however, is imposed by the triggering circuitry and the maximum writing speed of the CRO tube. In the case of the Hitachi 352 we found it still maintained triggering up to 100MHz and even gave a useable display using the x10 sweep magnifier.

Accuracy of both the time and voltage axis is quoted as ±3% and ±5% on the x5 vertical gain of x10 sweep magnifiers. Using a DFM to check the time scale we found it was accurate to within 0.5% for .1ms/div and above but the accuracy decreased to 2% at higher sweep speeds and with the x10 sweep magnifier. Measurements on the voltage axis with a DMM indicated a typical accuracy of better than 3% either with or without the x5 vertical gain.

We found that the Hitachi V-352 gave a useable display of signals up to as high as 100MHz.

Vertical amplifier input impedance was 1MΩ shunted with 30pF, though with the probes fitted, the input impedance at the probe was 1MΩ shunted by 150pF on the 1:1 position and 10MΩ shunted by 20pF on the 10:1 position.

Additional controls include the usual FOCUS, INTENSITY, SCALE ILLUMINATION, AC/GND/DC input switches, trigger level, trigger source and mode, and display mode. The trigger modes available are auto, normal and TV+ and TV−, with the latter modes particularly useful for syncing on the vertical sync pulse of a TV signal. Display modes are CH1, CH2 (X-Y), DUAL, ADD, DIFF plus an X-Y display can be obtained by switching to CH2 (X-Y) and switching the timebase to X-Y. This procedure is actually slightly more complex than other CROs which simply require the time base to be set to X-Y to give Lissajous displays.

The X-Y mode is useful for phase measurements of audio equipment and control systems, but of course the accuracy of the phase measurement depends on the relative phase shifts of the amplifiers. The Model V-352 exhibited virtually no phase error below 10kHz but we did note a slight error as the frequency was increased to 20kHz though well within the quoted accuracy of 3 degrees from DC to 50kHz.

Another feature not always found in medium priced CROs is electronic trace rotation. The trace rotation control is a recessed screw driver adjustment on the front panel which can be used to compensate for any inclination of the trace caused by external magnetic fields. Electronic trace rotation rather than actual rotation of the tube assembly is of course necessary because of the internal graticule, but this is still a very convenient feature for accurate observations on the time or voltage axis.

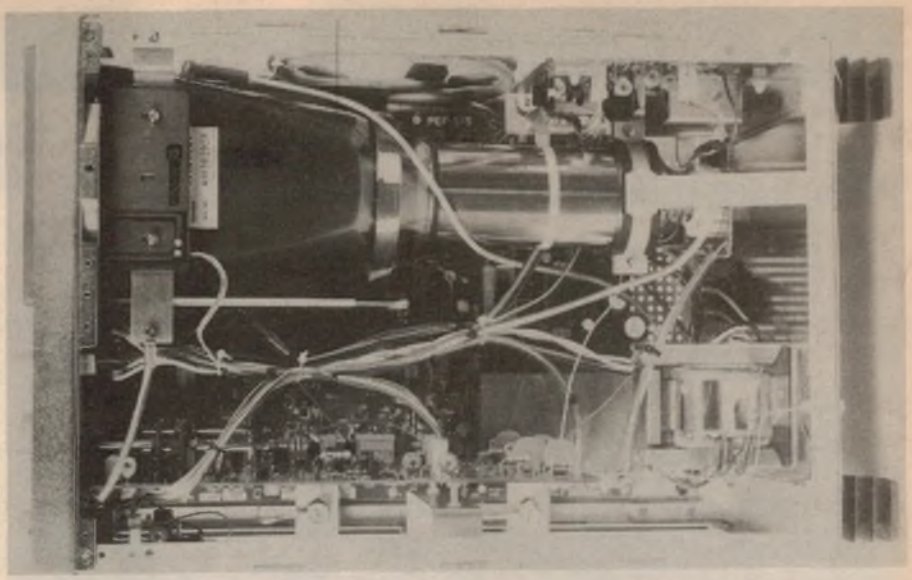
Interestingly, the actual trace rotation

is performed by a small coil on axis with the tube and the trace rotation control is a potentiometer which can be set anywhere between +12V and −12V effectively generating a magnetic bias field along the axis of the tube. When correctly adjusted the bias field just cancels out the component of the earth's magnetic field along the tube. Note that components of the external field in other directions merely shift the trace vertically or horizontally.

One feature which is not evident from the front panel is the inbuilt signal delay line which permits the leading edge of fast transient waveforms to be observed.

As you can see from the photograph, the front panel layout is clean and uncluttered with the various controls grouped together according to function. Note that the variable gain and sweep adjustments are not concentric with the input attenuator and timebase switch as is the case on other CROs.

A comprehensive operation manual is supplied with the CRO and it provides useful information on making various measurements such as phase, risetimes, frequency etc plus there is a complete circuit diagram of the CRO.



The interior of the Hitachi V-352. The trace rotation coil on the tube can be clearly seen.

Our overall impression is that the V-352 is competitively priced and offers quite a few important features not found in similar CROs. The recommended retail price of the V-352 is $1059 plus sales tax of $119.13 and the retail price of the V-202 is $665 plus $74.81 sales tax. Probes are not included in this price but 1:1/10:1 probes can be purchased for $44.50 each, including sales tax. (RdJ)

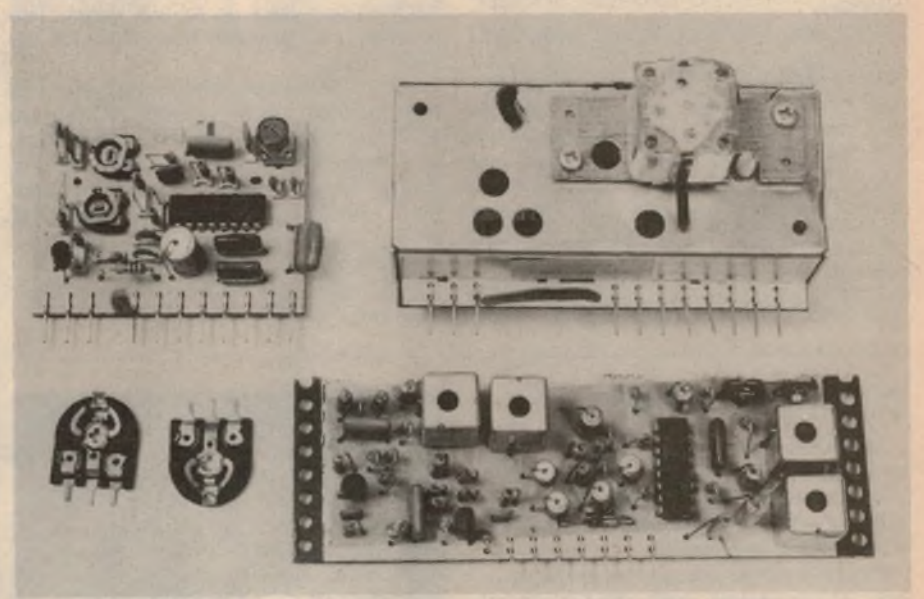
FM Tuner kit from L. E. Chapman

An FM stereo tuner kit for less than $20 must be one of the best electronics buys you can make in 1981. L. E. Chapman, of 122 Pitt Road, North Curl Curl, NSW has such a kit which is based on three printed circuit modules. All three modules are supplied fully assembled and aligned.

The RF module is fully shielded and uses a gear-driven solid-dielectric tuning gang to cover the whole FM band. It has provision for 300Ω balanced and 75Ω unbalanced antenna connections, together with AFC (automatic frequency control).

The IF and demodulator module employs the wellknown (and current) Philips TCA420A IF amplifier IC. As well as providing the required gain at 10.7MHz plus audio demodulation, this module also provides the AFC voltage for the RF module, the mono/stereo control voltage for the following multiplex decoder module and an output to drive a signal strength meter.

The stereo decoder module is also based on a Philips IC, the TCA290A. The module uses the standard Philips circuit for the TCA290A, which is claimed to yield separation between channels of better than 40dB at 1kHz with typical harmonic distortion of 0.2%. The module also drives a stereo LED indicator and has a pair of transistor preamplifiers to boost the left and right channels to the required level. 19kHz and 38kHz rejection (from the circuit used) is claimed by Philips to be typically 30dB and 40dB respectively.



The three modules will run from a 12 to 15V regulated circuit and we have heard of at least one system being successfully used in a car.

Also included in the kit are two trimpots and two photostat pages of circuit information which shows how to connect the modules together to obtain a working tuner. The complete circuit requires a handful of resistors and capacitors, two switches, a LED, a signal strength meter movement and the power supply already mentioned.

Price of the kit which comprises the three modules, two trimpots and the circuit information is $18 plus $1.00 for postage and packing where required. Mail orders should be addressed to L. E. Chapman, Box 156, PO Dee Why, NSW 2099.

NEW PRODUCTS CONTINUED ►

New Products

PROGRAMMABLE SCANNING RECEIVER

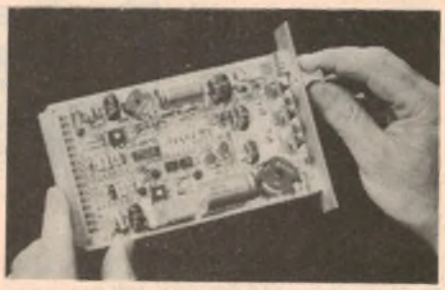
GFS Electronic Imports has announced the release of an updated version of the already extremely popular J.I.L. SX-200 HF/VHF/UHF programmable scanning receiver.

The new SX-200 features wide-band coverage (26-88, 108-180 and 380-514MHz), encompassing the 27MHz and UHF CB bands, the 10m, 6m, 2m and 70cm amateur bands, the Australian low and high VHF commercial two-way bands, VHF satellite and the UHF commercial two-way band, as well as the aircraft band. Both AM and FM frequencies are covered on all bands. Other features include a three mode squelch control that can be used to stop the set locking on spurious or carrier only signals; a digital clock and squelch output for use in triggering a tape recorder or some other auxillary equipment; and memory back-up that lasts up to two years. The receiver can operate from 12V DC or 240V AC.

Main differences when compared to the previous model include redesigned RF, IF and audio boards to give specification improvements in areas such as sensitivity, image rejection ratio and adjacent channel rejection. The expected selling price is $489 including sales tax.

Additional information from GFS Electronic Imports, 15 McKeon Rd, Mitcham, Victoria 3132.

DC-DC Converters



Scientific Electronics, designers and manufacturers of a wide range of high performance power supplies, has released a new series of Eurocard compatible 25W DC-DC converters.

The converters utilise a DIN 41612 connector and occupy only 300mm of rack width. Although they have been primarily designed for Eurocard rack systems, their small size (100 x 160 x 30mm) makes them ideal for a wide range of power supply applications.

The units are rated at 25W continuous operation at 60°C ambient temperature and input voltage range is 40-60V DC with efficiency greater than 75%. Two output voltages are available: 5V and 12V.

Input and output noise voltages are both below 50mV p-p DC to 20MHz and the input ripple current is less than 20mA p-p.

The units feature overvoltage and short circuit protection, 0.2% total line and load regulation, synchronisation facility, input voltage transient protection, input reverse polarity protection and 50kHz switching.

For further information contact Scientific Electronics, 6 Holloway Drive, Bayswater 3153.

DOT MATRIX DISPLAYS

Warburton Franki has released details of the SM-810-002, the second in a series of 5 by 7 dot matrix display systems from the Display Systems Division of Beckman Instruments, Arizona.

Like its predecessor, the 40-character SM-810-001, it is microcomputer controlled and can be used in process control or instrumentation applications, as well as for a variety of other OEM designs.

The SM-810-002 features a 130° viewing angle for its field of 20 12.5cm high characters. All of the operational features are the same as those of the 001; however, the larger characters of the 002 appear brighter and are easier to read.

Both display systems have the ability to blink a continuous field of characters that includes 96 standard ASCII symbols, as well as two non-standard symbols – the degree sign and the Greek letter, "Mu".

The new display system accommodates left-to-right data entry. Mounted on one PC board, smaller than a cigarette carton, it incorporates a custom-masked microcontroller with 1K of ROM. Refresh rate is 94Hz.

The microcomputer also keeps track of character position and intercepts the control codes for backspace, carriage return, initialise, scroll, blank, unblank, blink and position functions. This built-in intelligence simplifies the setup of special messages: an operator can completely blank, and then unblank the display to generate a message immediately. He can also scroll a message from right to left.

For further information contact your local Warburton Franki office.

MAINS INLET FILTERS

Rifa, distributors for the Bulgin range of products, has released a new series of 3-pole mains inlet connectors and combined interference filter units.

These new units are designed to protect digital and analog instruments from mains-borne voltage transients, and comply with the requirements of IEC 320, CEE22 and BS4491.

All filtering components are enclosed in a tin plated steel case which provides

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

NEW PRODUCTS

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

Part No.	Wire Color	Price
JW-1-B	Blue	$24.99
JW-1-W	White	24.99
JW-1-Y	Yellow	24.99
JW-1-R	Red	24.99

JUST WRAP Replacement Wire

Part No.	Color		Price
R-JW-B	Blue	50 ft. roll	$4.99
R-JW-W	White	50 ft. roll	4.99
R-JW-Y	Yellow	50 ft. roll	4.99
R-JW-R	Red	50 ft. roll	4.99

SCOTCHCAL FRONT PANELS FOR ETI & EA PROJECTS:

ETI 452 Guitar Practice Amp	$4.80
Series 4000 Any colour	$12.50
MOVING Coil Pre Amp	$2.00
577 Power Supply	$2.00
455 Loud speaker protector	$2.70
Variable power supply	$2.70
Linear ohmeter	$2.50
Muscle activity meter scale	$1.40
ETI 576 Electromyogram	$2.80
561 Metal Detector	$2.50
EA Capacitance meter	$3.50
EA Flash exposure meter	$4.25
EA Sound triggered flash	$3.50
EA Slave flash	$1.20
EA Playmaster graphic analyser	$8.50
EA Metal Detector 79md9	$3.90
EA Pulse generator	$4.80
EA Square wave oscillator	$2.50
EA RF Z Bridge	$3.25
EA Thyristor tester	$2.40
EA Quartz frequency ref	$2.70
EA Multi monitor	$1.90
EA Experimenters Supply	$2.80
EA Quiz master	$3.70
EA Variable wiper delay	$1.10
EA Playmate stereo Amp	$4.50

ALL FRONT PANELS AVAILABLE FROM DAY OF RELEASE OF MAGAZINES WHEN ORDERING FRONT PANELS, SPECIFY COLOUR OF LETTERING FIRST, THEN COLOUR OF BACKGROUND.

KITS

TV PATTERN GENERATOR

Kit of parts as featured in Electronics Australia June, 1980. Dot, Greyscale, Crosshatch, Raster Check

Complete Kit	$48.49
Kit without case	$36.90
Pack and post	$2.50

EPROM PROGRAMMER KIT

Kit of parts as featured in Electronics Australia July, 1980. Programs 2708, 2716 and 2532. Use with TRS80, Sorcerer, and Compucolor. Kit does not include connector from the programmer to computer.

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

DIG CAPACITANCE METER

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

Complete Kit	$52.49
Kit without case	$39.99
Pack and post	$2.50

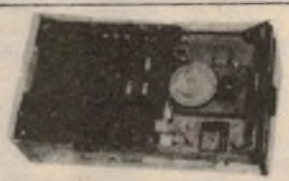
COMPONENTS

4116 RAMS	$5.00
2114 RAMS	3.30
2708 EPROM	6.90
741's 10 up	2.50
555's 10 up	2.90
BD139 10 up	5.50
BD140 10 up	5.50
SC141D 10 up	11.00
SC151D 10 up	21.10
RED LEDS 10 up	1.40
RED LEDS 100 up	11.00
YELLOW LEDS 10 up	2.30
8 PIN I/C SKTS 10 up	2.00
BC548	0.15 ea.
BC549	0.19 ea
MJ802	3.60
6,800/50V CAPS (LUG)	4.50
5,600/40V CAPS (PCB)	1.90

KITS & CIRCUIT BOARDS

ETI SERIES 4000 AMP

- Complete Kit $199.00
- Quality front panel to suit above 10.90
- ETI 470 kit of parts 22.50
- ETI 480 kit of parts 100w (incl. bracket) 19.75
- ETI 470 PS kit of parts (includes relay, not transformer) 19.50
- Transformer to suit 22.90
- ETI 471 pre-amp 45.50
- ETI 585R ultra sonic RX 15.95
- ETI 585T ultra sonic TX 8.95
- EA 79 SF9 sound flash trigger 15.00
- All parts available for DREAM computer project.
- P.C.B.'s (all quality fibreglass boards)
  - ETI 574 disco strobe 2.80
  - ETI 549A metal detector 2.75
  - DREAM circuit board 10.90



SCHUGART SA 400
5in Minifloppy Drive
$399.00 Tax Inc
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KIT $79.95 inc
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ETI636 MOTHERBOARD
7 Slot Motherboard $77.00
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INTERSIL LCD $34.50
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).

COMPUTER COMPONENTS

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

SPECIAL 4116 RAM OFFER
8 OFF PRIME SPEC 4116 I/Cs $39.00
16 4116s for $78.00

STATIC RAM KIT 16K S-100
2114 $3.30; 2716 $11.00; 2708 $6.90

DIP PLUGS

Ideal for use with flat ribbon cable or to mount components on
14 pin $0.80 24 pin $1.20
16 pin $0.90

POWER TRANSFORMERS
SPECIALLY DESIGNED FOR MICROCOMPUTERS

- Good regulation electrostatic shield
- RI 810 8V@10A 2 x 15V@1A $24.50
- RI 820 8V @ 20A 15V @ 1A 15V @ 3A $35.50

20 TURN CERMET TRIM POT

SPECTROL 43P ACTUAL SIZE

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

1—9	$1.40
10—99	$1.30
100	$1.20

Values may be mixed.

Hexadecimal Keypad
$24.50/each

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

Ideal for dream project

MULTIDIALS

Dials to suit 10 T Pots

Model 21 1.8" dia	$16.50
Model 16 9" dia	$12.50
Model 18 1" x 1.75" dia	$20.60

COMPUTER COOLING FANS

Muffin fan 4⅝" square

110V	$39.50
240V	$26.50

Range of larger fans available. Send for details.

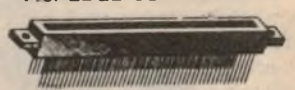
cermet single TURN TRIM POT
Spectrol model 63P ACTUAL SIZE

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

1—9	$1.00
10—99	0.90
100	0.80

Values may be mixed.

P.C. EDGE CONNECTORS



S100 gold plated wire wrap	$6.90
S100 solder tail	$6.50
D2 Motorola bus 43/86 solder tail	$6.34
43/86 gold plated wire wrap	$7.40

DREAM
ELECTRONIC AUSTRALIA MICROCOMPUTER PROJECT

Kit for main board (including programme 2708) $109.00
Also available re designed 6802 PCB $11.90

PCB (fibre glass) only	$10.90
2708 programmed	$15.50
Key Pad 19 keys	$24.50
Kit (less key pad)	$94.00
PCB for power supply	$3.50

10 TURN POTENTIOMETERS

Stock resistance values

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

Spectrol model 534 ¼" shaft.

Price 1—9	$8.50
10 + values may be mixed	$7.90

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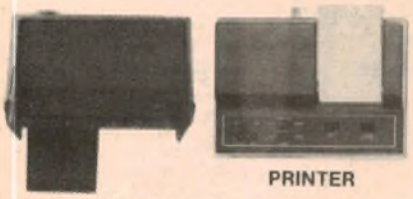
Free package and postage by registered mail anywhere in Australia.

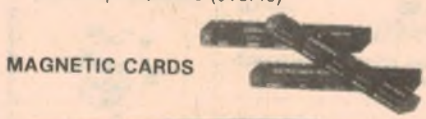
THE GREATEST CALCULATOR MONEY CAN BUY!
— THE HP41C SYSTEM —



- HP41C — over 400 steps, up to 64 data registers (continuous) $374 ($336)

The 41C has 4 interface ports for:
Extra RAM, Pre-Programmed ROMS's, Card Reader, Optical Wand and Printer/Plotter.

- Card Reader $273 ($245)
- Printer/Plotter $489 ($439)
- Extra memory modules each with capacity of basic 41C $56.40 ($49.10)
- Plus 16 application pacs (plug-in modules) $56.40 ($49.10) each.
- 24 solution books $15.70 ($13.60) each.
- Optical Wand $158.60 ($142.50)
- 40 Magnetic Cards $25.10 ($21.80)
- 120 Magnetic Cards $56.40 ($49.10)
- 6 rolls therm. paper $7.50 ($6.50)
- calc. rechargeable batteries $48.50 ($43.60)
- Calc. adaptor $18.20 ($16.40)



- HP31E Scientific $66.00 ($59.00)
- HP32E Advanced Scientific Statistical $91.50 ($82.00)
- HP33E Advanced Scientific Programmable. 49 steps $117 ($105)
- HP97 Card Programmable, printing 224 steps $953 ($857)

CONTINUOUS MEMORY

- HP34C Scientific Programmable, 210 steps $192.50 ($173)
- HP33C Scientific Programmable, 49 steps $155 ($139)

Plus business machines.

Price in brackets excluding sales tax.

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New Products

electromagnetic screening. The total earth leakage current is less than 0.35mA, as required by the general safety regulations in Europe and the UK.

There are four units in the series, the PS620 3 amp, PS620 6 amp, PS620 10 amp and the PS621 6 amp.

For further information contact Rifa Pty Ltd, 202 Bell Street, Preston, Victoria 3072.

MINIATURE RELAYS

One of the latest miniature relays to appear on the Australian market is the Fujitsu miniature high power relay, FBR600 series. Available in two basic types, FBR610 (SPDT) and FBR620 (DPDT) they can be supplied with coils to suit DC supply voltages of 5, 6, 9, 12, 18, 24, and 60V.

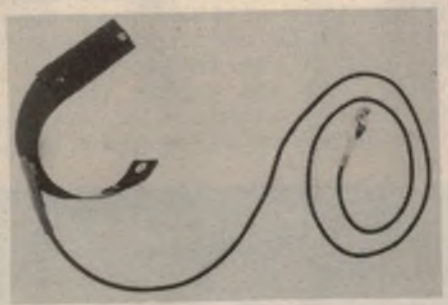
These relays are directly interchangeable with other miniature relays on the market, such as Pye, Varley, etc, and have been approved by the State Electricity Commission of Victoria and Telecom. They also carry international approvals, VDE, UL, and CSA.

The contacts are of silver alloy and for the FBR610 are rated at 10A carrying current and 10A making/breaking current at up to 30V DC and 240V AC. The FBR620 is rated at 5A for the same voltage ratings. Initial contact resistance is given as 100mΩ at 6V DC, 1A.

Coil dissipation is 0.5W for both models, while contact operate time is given as 8ms and release time as 2.5ms.

These relays will be available from a number of retail outlets, and further information can be obtained from IRH Components Pty Ltd, 53 Garema Circuit, PO Box 265, Kingsgrove, NSW 2208. Phone (02) 750 6444.

CONDUCTIVE WRIST STRAP



Royston Electronics has introduced a conductive wrist strap that meets military specifications for quick release and resistance to line voltages from accidental contact. Conductive wrist straps are used to prevent static electricity damage to microcircuits while radar, avionics, computer and other equipment is undergoing repair, maintenance or inspection in base stations or the field.

The CP401A grounding strap has a wrist attachment of "Velcro" hook-and-loop tape that separates with a slight pull and prevents a worker from breaking the grounding wire by inadvertently leaving the work area while still wearing the strap.

The wrist strap is made of conductive polyester ribbon for permanent conductivity, but with built-in resistance to protect the wearer against possible line voltages.

The wrist strap and ground wire are joined by a standard snap fastener. An extra snap fastener provides a convenient connection for grounding electric tools, bench covers or other items that must be grounded.

Further information from: Royston Electronics, 27 Normanby Rd, Notting Hill, Victoria 3149.

KIKUSUI OSCILLOSCOPES

Kikusui of Japan has recently released two new oscilloscopes: the models 5650 and 5531.

The Kikusui model 5650 is a 50MHz dual-channel oscilloscope with dual time base. The sensitivity of the vertical

amplifier is 5mV/div at full bandwidth with the capability of 1mV/div per division sensitivity at a restricted bandwidth of 10MHz. Waveform magnification with calibrated sweep delay is standard.

Other facilities include alternate timebase, alternate trigger, 500kHz chop frequency, auto level (lock) circuit, one touch trigger delay, variable hold off and one touch XY operation.

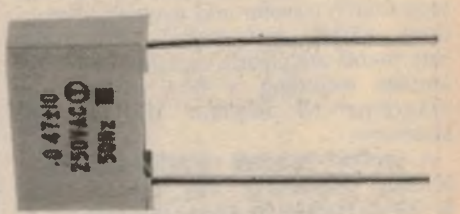
The Kikusui model 5531 is a dual-channel 35MHz oscilloscope offering 5mV/div sensitivity at 35MHz with a Y magnifier on both channels giving 1mV/div at 15MHz bandwidth.

The 5531 has two timebases, giving sweep modes of A, A intensified and B. The instrument also incorporates an uncalibrated trigger delay.

Among other features are alternate chop (200kHz), one touch trigger delay, variable hold off, one touch XY operation, internal graticule and a high brightness CRT.

For further information contact The Dindima Group Pty Ltd, PO Box 106, Vermont, Victoria 3133.

SUPPRESSION CAPS



Soanar Electronics Pty Ltd has announced the introduction of the "Mainscap" suppression capacitor. Specifically designed for 250V AC circuits, this capacitor has been approved by the Energy Authority of NSW to Australian Standard ASC100-1972 and AS3145-1979 (CS1630N) for Class Y applications.

Using metallised polyethylene terephalate film and fully encapsulated in epoxy resin, the Mainscap is fully sealed against moisture and humidity ingression and has self-healing characteristics for pulse operations.

The stock range is .01μF, .022μF, .033μF, .047μF, .1μF, .22μF and .47μF and the tolerance 10%. Other values, flying leads and delta configurations are available on an indent basis.

For full specifications and data contact Soanar Electronics Pty Ltd, 30 Lexton Road, Box Hill, Victoria 3128.

from p89

The Manual Calculations section covers direct execution of calculations using the device as a "scientific" calculator and is followed by a section on Programmed Calculations. Well illustrated with examples, this section is also the start of a BASIC primer (despite the suggestion that BASIC manuals be studied first). The section includes discussion on the organisation of the available memory and simple instructions on editing and debugging.

Under the heading of "Variables", the use of available memory is further discussed. The use of strings and indirect addressing is dealt with together with input and recall of contents. However, this section does not make clear one limitation – the fact that a character (alpha or numeric) can be sorted as a string ie, in a character variable, but if a digit, cannot be read from that string and processed as a numeric value. This makes handling of (for example) hex characters difficult (but by no means impossible).

The next sections, "Program Statements" and "Command Statements", really get down to BASIC, covering: LET, INPUT, PRINT, PAUSE (a 0.85 second PRINT), USING, GOTO, IF GOSUB, RETURN, FOR & NEXT, STOP, END, BEEP (self-explanatory and a handy device when used with the PAUSE statement as one could miss a brief display) CLEAR, AREAD (a limited READ instruction) and REM as program statements.

The Command Statements are RUN, DEBUG, CONT, LIST, NEW, MEM, CSAVE, CLOAD, CLOAD?, CHAIN (a tape-search transfer and execute instruction), PRINT and INPUT. All these statements are clearly explained with examples including a flow chart, and diagrams to explain the CHAIN statement.

A section headed "RESERVABLE key" follows explaining the use of the RESERVE MODE to allow the call-up of short programs or functions by means of a single key. Keyboard Overlays are provided to allow marking of the designated keys (the bottom two rows of the keyboard).

The last section in the manual lists the Error Codes and explains the methods of indicating and clearing errors.

Appendices cover specifications, battery replacement, Cassette Interface Connection and Operation (including a CLOAD 1 Statement not previously mentioned) and end with "Some Sample Users' Programs".

OPERATION

As a manual calculator, having 10 digits and exponent range −99 to +99, the TRS80 is a powerful device. With the reservable keys programmed and its built-in functions, few extra keystrokes are needed for quite complex calculations, even when comparing the TRS80 with larger dedicated calculators.

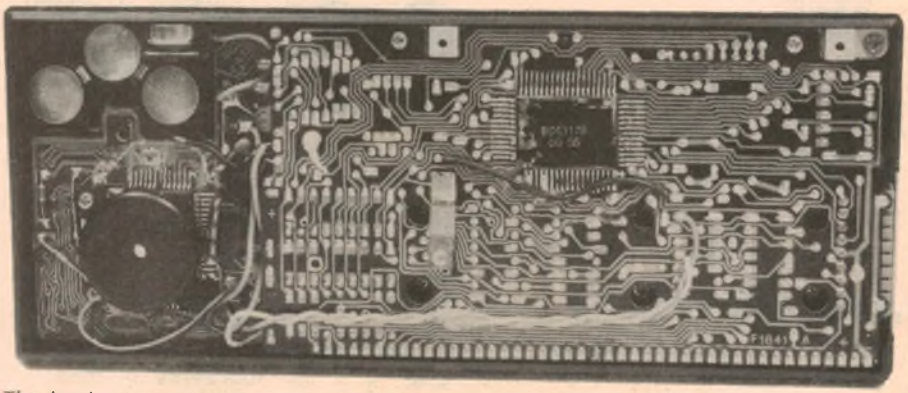
The recall facility and the moveable cursor with edit keys (DELETE and INSERT) make its use as a calculator more versatile than one would expect. Functions directly available are SIN, COS, TAN (and their inverse functions), natural and common logarithms, EXP (natural antilog, e^x), square root and powers; Gradians (100g=90°) – Degree/minute/second – Decimal degree – Radian angular modes or conversions may be specified; Integers, Absolute values and signs may be extracted. The basic four functions (+, −, ÷, ×) have keys in the numeric pad, but / and * replace the last two, as for any other computer.

Fixed (A-Z) and variable (27-204) memories are available in the Manual mode. Strings may also be used in this mode, but none of the usual BASIC string manipulations (LEN$, MID$, LEFT$ etc) are provided in any mode. The logical operators (≤, ≥, =, etc) and AND (*) and OR (+) can be used, returning "1" when expressions are true and "0" when false.

The 80-character buffer, the 15 levels of parenthesis and the 24-column display (columns 25-80 are not accessible in this mode except when recalling calculations) make the TRS80 a match for any advanced calculator. Add to the foregoing the advantages of programming in BASIC and there is no doubt that this device is a breakthrough.

Treating the TRS80 as a computer, the limited display is a handicap only to those users who require graphics. The line and cursor controls (up, down rolling, Left, Right at two speeds) with the LIST and RUN statements, allow quick access to any part of a program. The Reserve mode can be used to effectively expand the keyboard and add subroutines quickly. From the physical point of view, the keyboard is not so small that the average finger(s) cannot make entries accurately, and the 9.5mm high display characters are large enough to be easily read. The PAUSE statement allows automatic display of information a line at a time (24 columns only – not much of a limitation) and should be used with the BEEP tone to avoid being taken by surprise by the first item.

The available 1.9K of RAM allows quite long (say 100 step) programs to be written while "in the field" and retained in memory until they can be transferred to tape. With a portable tape recorder they can be recorded on the spot, as well. Using the CHAIN command, much longer programs, broken into stages, can be executed, though the lack of an immediate print out may limit the need for this mode of operation. Long tapes can be searched for data or programs without manual supervision, making up for the limited RAM. The shortage of string manipulations mentioned earlier may be felt, for example, by those who wish to use programs involving hexadecimal/decimal or other base conversions, though these can be done less elegantly and at the expense of brevity with the TRS80. The limit of seven characters to a string can also be circumvented with a little thought and at the same price.



The back of the TRS80 can be removed to reveal the circuitry and batteries.

Operations of the TRS80 with the Cassette Interface and almost any tape recorder is simple, and few problems with levels are likely, thanks to the effective signal processing and muting system. The built-in tone monitor is useful though 4kHz can be irritating to nearby uninvolved parties.

As for the TRS80 "Pocket BASIC", there is little cause for complaints apart from those already noted; it is simple and efficient, and with four levels of subroutines and four levels of FOR-NEXT statements allowed, it has plenty of potential for most users. Software in tape form will shortly be available.

Inevitably, with the present rate of progress in this field, the TRS80 will have competition before long, but that is no argument against this excellent genuine microcomputer. Supported by Tandy service and with the example of the large amount of both soft and hardware developed for the original TRS80, it is likely to generate a very large following.

Sound safe.

Agfa SUPERFERRO – the sound safe – will record and store your music safe in sound, ready for when you want it. And we mean all the music. The outstanding performance of Agfa SUPERFERRO is achieved through the use of a particular form of ferric oxide particle that is uniform in shape and size. The second factor is an Agfa technique that enables more particles to be deposited per sq. mm of tape, with each particle separated and in line to eliminate cross-over interference.

The advanced technology of the SUPERFERRO tape results in five big improvements:

1. Reduced background noise.
2. Better maximum output level.
3. Improved dynamic range.
4. Improved high frequency output level.
5. Reduced harmonic distortion.

In addition, Agfa SUPERFERRO cassettes feature a special mechanism for improved running properties.

Agfa SUPERFERRO – the sound safe you can bank on for outstanding performance.

Agfa*

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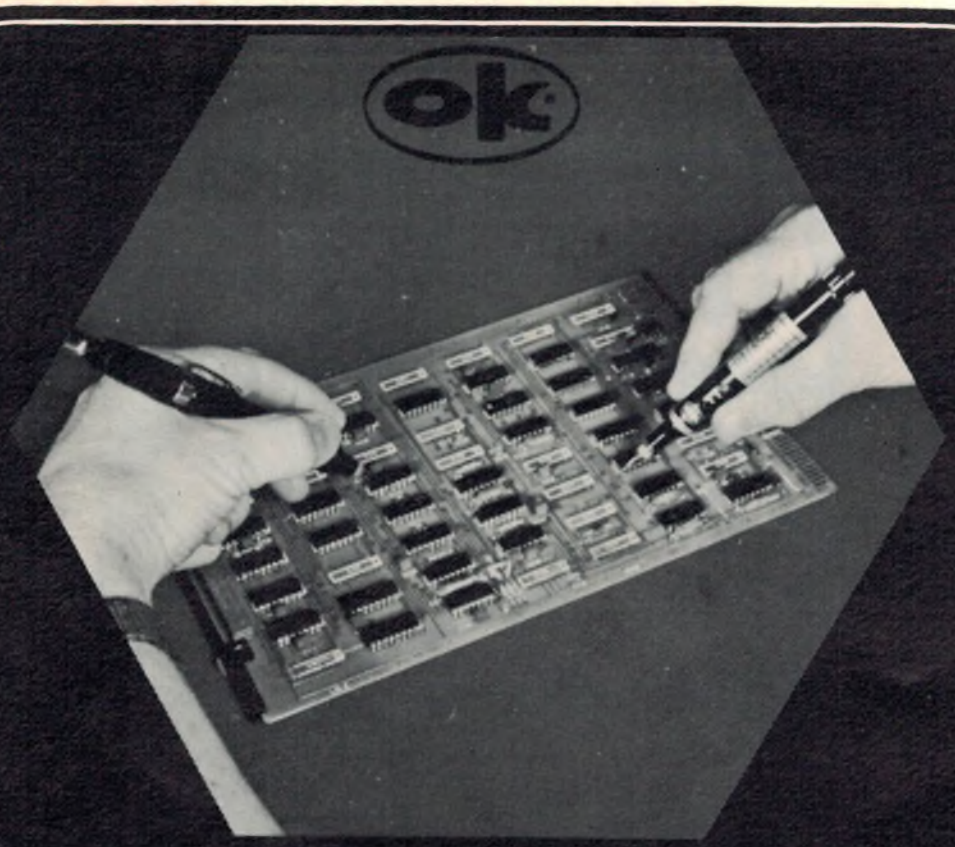

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REVIEWS OF RECENT

Records & Tapes

CLASSICAL ● POPULAR ● SPECIAL INTEREST

BERG, STRAVINSKY — "A must for all violinists"

BERG — Violin Concerto.
STRAVINSKY — Violin Concerto in D. Itzhak Perlman (violin) with the Boston Symphony Orchestra conducted by Seiji Ozawa. DGG Stereo Disc 2531 110.

Here is an excellent example of the divergent lines avant garde music took during the early years of this century. Berg, a Schonberg colleague mentioned in the last issue (Pierrot Lunaire) was blessed with such a strong lyrical gift that even the ultra rigid disciplines of the serial method most of the time retained something very like the ghost of a melody.

Indeed, he is the only one of the Second Vienna School to win — and retain — some popular acceptance. His violin Concerto appears regularly on scores of concert platforms and has been recorded many times. The same applies to his operas Wozzeck and Lulu. There are other works of his in the regular musicgoer's repertoire.

I think I can explain the popularity of the Violin Concerto because it emphasises rather more than usual the solo part — but without spotlighting it. This tends to make it sound like real music! It also has repetitive bars, forbidden in strict serialism.

You'll find the same wizardry in his operas of which Wozzeck, at least, has an absorbing dramatic libretto. When you get used to the concerto idiom I expect you will enjoy a deeply moving experience when listening to it. Indeed, I find that it tends to make the Stravinsky concerto on the reverse side sound almost facetious.

Stravinsky took a very different path. A pupil of Rimsky-Korsakoff he had a marvellous sense of orchestral scoring. He also brought with him a charming sense of romantic melody exhibited in his early works — the opera, The Nightingale, the ballets The Firebird and Petrouchka. This, plus a peerless sense of complicated rhythms, many of which might well be described as primitive, as in The Rite of Spring.

He then went on to a period of neoclassicism and also enjoyed putting his own stamp on music from the baroque and rococo periods. He did, well towards the end of his industrious life, turn briefly to serialism (Agon) but died before disclosing what this might have led to.

Both of these concerti were composed in the early 1930s and the Stravinsky is typical of his writing during this period.

The first movement, for instance, is jaunty with an overtone of mockery. The writing for both the solo part and orchestra is always wonderfully clean and incisive. Here and there during the work there is a hint of the garrulity of the baroque period; yet other parts of it are puzzlingly reminiscent of William Walton's post-Facade period. Bach also seems to keep a paternal eye on the way things are going.

The general impression of the whole work is that of a man struggling to get out of a well-worn romantic cloak.

All this refers to the solo part and perhaps Stravinsky's significance during this period was in his treatment of the orchestra. It goes along its own way, seemingly ignoring the soloist most of the time. The Finale is a kind of moto perpetuo movement — a la baroque — but with characteristic syncopation.

I can find nothing but the highest praise for Perlman's performances of both these immensely difficult works. He displays seemingly endless technical resources, and is completely in sympathy with the intentions of both composers. And the same must be said of the Boston Symphony's support under Ozawa.

The album is a must for all violinists and anyone else interested in this interesting period of musical development. (J.R.)

RESPIGHI: Pines, fountains and festivals

RESPIGHI — Pines of Rome. Fountains of Rome and Feste Romane. Boston Symphony Orchestra conducted by Seiji Ozawa. DGG issued in Australia to members of the World Record Club. Stereo 2530 890.

This Respighi disc is not a re-issue but a new recording of considerable merit. These picturesque but not great works were all the rage in the early '30s and their popularity has continued undiminished, with recordings being virtually uncountable.

Such a statement is strangely at variance with the welcome they received from the music critics in two Sydney daily papers, attributing to them blatant cacophony. This was in the '30s, when the ABC was beginning what might be called Sydney's musical education.

Today, of course, these three works sound quite mellifluous. They still make pleasing listening, especially when conductors capture their spirit as Ozawa does here.

After the jaunty Pines of the Willa Borghese comes the contrasting mystery of the Pines near a catacomb. This is truly ghostly music, despite its unexpected but well prepared climax.

The Janiculum Pines really aroused the venom of the critics of the time, because the composer had had the impudence to include in his score a 78 recording of a nightingale singing. The producers perforce used the equipment of the day, so that it was pretty well inaudible; but nowadays, with our improved techniques, it is perfectly balanced into the score.

The suite concludes with the Pines lin-

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.).

ing the Appian Way and, with a little imagination, the march used calls up visions of a Roman legion of some 2000 years ago.

The Fountains is my favourite among the three suites and they gush and glitter as picturesquely as ever. The fluid scoring of the Triton Fountain is something every student of orchestration should study.

I Like Roman Festvals least of the three pieces, even though the work is admirably played by a huge orchestra and recorded with outstanding depth and detail. Altogether, a pleasant reminder of times past. (J.R.)

☆ ☆ ☆

DVORAK – Cello Concerto in D Minor. Paul Tortellier (cello) and the London Symphony Orchestra conducted by Andre Previn. World Record Club Stereo R 06352.

Great cellist though he is, Tortellier faces stiff competition from others in his recording of perhaps the finest cello concerto ever written. There is, of course, the famous Rostropovitch record, and one I am particularly fond of but recently deleted by Gaudron, to name only two of many.

But quoting these is not to be taken as disparaging this excellent recording under review. Tortellier is undoubtedly one of the finest present-day performers of this glamorous work. But I am afraid that on the day he recorded it he was not at his best; nor, for that matter, was Previn and his orchestra. And I have heard the London Symphony better recorded too.

I must stress, however, that the disc's shortcomings are all very slight and that they'd probably pass unnoticed by those who do not love the concerto as much as I do.

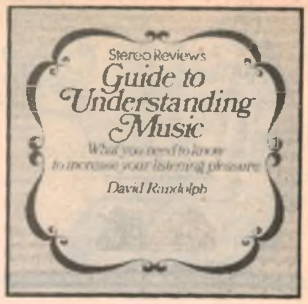
Perhaps some of these blemishes are due to the prominence of the cello part, beautifully played though it is. As a result, Dvorak's lovely orchestral scoring loses some of its exquisite detail. For instance, the clarinet is badly served in the enchanting slow movement. The only woodwind soloist to be given his deserts is the delightful flautist. In the Finale the clarinet is recorded much below average.

As an accompanist, Previn can usually be relied upon to be exceptionally sympathetic to his soloist but I'm not so sure about him this time, especially as an interpreter/collaborator. Here and there are passages where soloist and conductor do not seem of one mind. These, blemishes again, are slight, because Previn is much too fine a musician to pass any glaring faults. The same might be said of Tortellier.

Despite all that I have written, it is a great buy at the price it is offered to members. There is a fill, too – an enchanting bit of trivia, a Rondo in G Minor I have never heard before and which is deliciously played by soloist and orchestra. (J.R.)

MUSIC UNDER THE MICROSCOPE

"... potentially valuable"



GUIDE TO UNDERSTANDING MUSIC. Produced for Stereo Review magazine by David Randolph. Four record boxed set, stereo C4–10384. [From MR Acoustics, PO Box 165, Annerley, Qld 4103. Phone (07) 48 7598. $36.00]

I have been consciously dodging this review since receiving the last batch of records from MR Acoustics – this for one simple reason: it takes quite a while to listen to both sides of four LP records! But let me hasten to add that, for many, it will be a potentially rewarding experience.

David Randolph is a prominent choral conductor, broadcaster and lecturer on the New York scene, and author of the book "This is Music".

Carefully, painstakingly, he examines the nature and structure of music, illustrating every point with excerpts – most of them tantalisingly brief – drawn mainly from nominated classical recordings. Here is a brief rundown of the topics, referenced to the sides:

1 – Rhythm, melody, harmony; 2 – The Textures of Music; 3 – Sense and Sensation in Music; 4 – How Music is Unified; 5 – Form in Music; 6 – Words and Music; 7 – Can Music Tell A Story or Paint a Picture?; 8 – Interpretation of Music.

Accompanying the set is a brochure which introduces the author/narrator and provides background to the recordings. It also contains a full list of the recorded excerpts used to illustrate the text.

Who could benefit from this quite ambitious presentation? Certainly music teachers in classroom situations. By following through the various topics and allowing time for discussion and further examples, there is material here for quite a few periods.

In a less formal situation, the presentation is adequately clear and self-sufficient for home listening, even at a group level. It could introduce the structural aspects of music to the uninitiated who may not, as yet, have thought much about it.

And it could also help those who have developed a warm response to various works and composers, without quite understanding why.

The narration is good, as is the dubbing and panel work, and the recording itself well up to standard. A potentially valuable addition to any collection. (W.N.W.)

LISZT: Complete Hungarian Rhapsodies. Hungarian Rhapsodies Nos. 1-19; Polonaise from "Eugen Onegin of Tchaikovsky; Illustration No. 2 from "Le Prophete" of Meyerbeer; Waltz from "Faust" of Gounod; Reminiscences de "Norma" of Bellini. Michele Campanella, piano. Philips Box of four stereo discs 6999 084.

As far as I know, the only other pianists to record the whole of Liszt's 19 Rhapsodies in recent decades were Louis Kentner (a true Liszt specialist) and Philippe Entremont, a good all-rounder, whose principal work has concentrated on Ravel and Debussy. Others, with Alfred Brendel in the lead, have studied these works lovingly without, however, recording more than a discreet selection from the whole set.

Michele Campanella, now in his early thirties, has distinguished himself in many competitions, both in Italy and elsewhere and is getting fairly well known in Europe. He plays these works very well indeed and certainly has no technical problems; what leaves me less than enthusiastic is his musical approach: there is a tendency to exaggerate rhythms, to lapse into hoppity-hop at the least provocation. But what really bothers me is a patent lack of excitement and personal involvement; he can play the pieces, but it seems a chore rather than a labour of love.

As the heading makes clear, Philips have thrown in an extra disc of operatic paraphrases and these are certainly welcome as demonstrations of the artist's ability to become involved, and not just technically. If you want all the rhapsodies together and cannot find (or afford) the Kentner set, get this by all means; however, be prepared for odd disappointing moments musically and also for the fact that some of the lowest bass notes lack clarity – possibly due to the piano used in recording. (P.F.)

BRUCKNER — Symphony No. 7. Berlin Philharmonic Orchestra conducted by Herbert von Karajan.

WAGNER — Siegfried Idyll. Selected members of the same orchestra under Karajan. DGG Stereo recording issued in Australia to members of the World Record Club. R-06377-8. Two Discs.

If you have patience, you will hear some fine melodies in this mostly slow moving symphony. Myself, I'm temperamentally unsuited to so much nobility. You will also hear much peerless playing by the Berlin Philharmonic exploited to its limit by Karajan. The work itself is full of spacious landscaping.

You will also enjoy an Adagio movement, a tribute to Bruckner's adored Wagner that, for me, makes the whole of the rest of the work well worthwhile. The Scherzo, fails to give much sense of fun but is rescued from monotony by Karajan's enchanting pointing of the rhythm.

Though some might prefer it a little more pointed I thought it fitted perfectly into Karajan's overall plan of the work. And he also finds just the right difference in tempo in the Trio.

Another fact worthy of attention is Karajan's more forceful accenting of the Finale which goes far to explain his more delicate treatment of the Scherzo. Under his direction the symphony, already broad, takes on still broader proportions. Long, sometimes very long melodies unwind majestically till the final peremptory ending.

The fill is Wagner's Siegfried Idyll which Karajan handles as tenderly as he might his first born. Taking the splendour of the playing for granted there is, in the sleeve notes, an interesting explanation of Wagner's mysterious dedication of the work which reads: "Triebschen Idyll, with Fidi's bird-song and Orange Sunrise, presented as a Symphonic Birthday Greeting to his Cosima by her Richard, 1970". Well, Triebschen was the name of the Wagner house near Lake Lucerne. Fidi was the young Siegfried recently born by Cosima, and the Orange Sunrise was the colour of the wallpaper beside Cosima's bedroom. Again, it may refer to the Berlin Zoo, where the two swore eternal fidelity to one author back in 1863!

☆ ☆ ☆

HITS FROM BERLIN. 1927-1931. Jack Hylton and His Dance Band. Mono, World Record Club WRC R-06658.

This is a real turn-the-clock-back effort, recalling the period 1927-1931, when a conscious effort was being made in Europe to heal the wounds of World War I. In this generous collection of 16 recordings, Jack Hylton is playing numbers attributable to German composers. A few of the English titles are:

When Day Is Done — I Kiss Your Hand Madame — When The White Lilacs Bloom Again — O Maiden, My Maiden — Falling In Love Again — White Horse Inn (selection) — Today I Feel So Happy.

Along with the detailed jacket notes, each track is dated (Aug '27 to Sept '31), and the changing personnel of the band is noted. Archive material indeed.

The first track "When Day Is Done" opens to such a brisk tempo that one gets an instant recall of the frantic dance routines of the day. Notable, too, is what passed for appropriate vocals; I'll say no more!

The 4 Seasons . . .

VIVALDI — The Four Seasons. Gerard Schwarz and the Los Angeles Chamber Orchestra. Elmar Oliveira, violin. Digital-master stereo, DMS Delos DMS 3007. (From PC Stereo, PO Box 272, Mt Gravatt, Qld 4122. Phone 07 343 1612).

Here is yet another release on the Delos label, which attempts nothing spectacular, but which succeeds in capturing clean, intimate orchestral sound, sometimes quite vigorous, sometimes fading through whisper-quietness into silence.

Gerard Schwarz may be better known to some as the virtuoso trumpeter who featured on a couple of recent Telarc digital discs, but he also happens to be prominent in the rising generation of American conductors.

Elmar Oliveira is also a notable young musician, the first American to win the Gold Medal in the Tchaikovsky International violin competition in Moscow, and seen by many as a likely successor to the passing generation of violin greats.

The backing chamber orchestra was founded by Neville Marriner and is now under the directorship of Gerard Schwarz.

The sound is clean, intimate and virile; it should appeal to those who are familiar with the work and provide a pleasant listening experience to those who have yet to make its intimate acquaintance.

The handsome double-fold jacket carries full notes on the musicians, the recording process, and the work itself, including the sonnets which traditionally accompanied the score and which established the connection between the music and the thought patterns which prompted it. (W.N.W.)

Technically, the frequency response of the recordings is very limited but the sound is clean and substantially noise-free. An album for those interested in a slice of musical history. (W.N.W.)

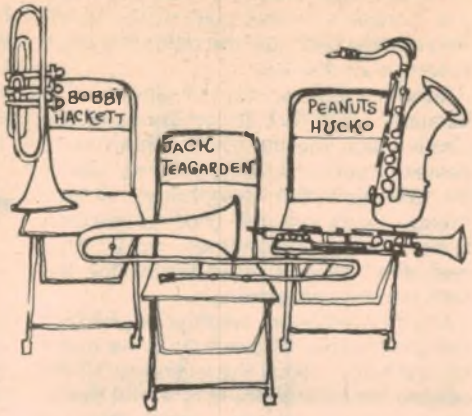
☆ ☆ ☆

JAZZ ULTIMATE. Bobby Hacket & Jack Teagarden. Stereo, World Record Club WRC-R 06766.

From an original Capitol recording, made in New York in September 1957, this club re-release still makes excellent listening.

It features Bobby Hacket on trumpet and Jack Teagarden on trombone – both jazz masters of their respective instruments. They are backed by a formidable team: Gene Schroeder, Peanuts Hucko, Billy Bauer, Ernie Carceres, Buzzy Drootin and Jack Lesberg.

There are 11 tracks in all: Indiana – Oh Baby – It's Wonderful – I Found A New Baby – Sunday – Baby, Won't You Please Come Home – Everybody Loves My Baby – Mama's Gone, Good Bye –



'Way Down Yonder In New Orleans – 55th And Broadway – 'S Wonderful.

"Just about anybody can enjoy the music on this album" say the jacket notes and that's probably not too far from the truth. It's a happy uncluttered sound, with Hacket and Teagarden working their way through freewheeling improvisation. (W.N.W.)

☆ ☆ ☆

BLACK RUSSIAN. Black Russian. Motown M7942. Astor Records.

Three immensely talented young Russian musicians (1 female and 2 males) known as Black Russian defected from Russia to the US in 1976. They are the first Soviet rock musicians ever to sign with an American recording company, and this is their debut album.

The sound is unique, reflecting the group's background in classical music, as well as the influence of rhythm and blues, rock and jazz.

The group wrote, arranged and produced all of the following eight tracks: More Together – Cause I Love You – Love's Enough – Leave Me Now – Mystified – New York City – Life Is Too Short – Emptiness.

An exciting debut album with clear vocals backed with fine musical arrangements. (D.H.)

☆ ☆ ☆

IRONS IN THE FIRE. Teena Marie. Motown G8997. Astor Records.

This is Teena Marie's third album for Motown Records and is virtually the imaginative creation of one person, with Teena writing the songs, handling their rhythm arrangements and overseeing the ultimate musical outcome.

The eight tracks on the album are: I Need Your Lovin' – Young Love – First Class Love – Irons In The Fire – Chains – You Make Love Like Springtime – Tune In Tomorrow – You Make Love Like Springtime (Reprise).

This is a refreshing album containing tracks of rhythm and blues and sentimental ballads.

The recording quality is also of a very high standard. (D.H.)

☆ ☆ ☆

JADE HURLEY. Festival Records. Stereo L37023.

Twelve tracks with a distinctive country flavour make up this excellent disc from Jade Hurley. Jade had a hand in writing

Recent devotional releases

THE BEST OF B. J. THOMAS. Myrrh MSB-6653. (From Word Records Aust, 18-26 Canterbury Rd, Heathmont, Vic 3135.)

Ten tracks with predominantly ballad style form a showcase for the vocal talents of B. J. Thomas on this enjoyable record from the "Word" stable. While the sleeve does not carry the lyrics, the singer's diction is so good that this is not too much of a problem.

The tracks are: Without A Doubt – Storybook Realities – Home Where I Belong – I Want To Be More Like Jesus – Happy Man – What A Difference You've Made – He's The Hand On My Shoulder – Jesus On My Mind – You Gave Me Love – Faith Of A Little Child.

All are songs of simple faith, well worth listening to. (N.J.M.)

☆ ☆ ☆

TAKE IT EASY. Chuck Girard. Stereo, Good News Records GNR 8108 (From Word Records Aust, 18-26 Canterbury Rd, Heathmont, Vic 3135).

Chuck Girard's latest release is a pleasant mixture of rock and ballad styles with an excellent backing group. There are ten titles:

Chuck Girard – rock and ballad

Take A Hand – Love Is Alive – Little People – Full Immersion Ocean Water Baptism By The Sea – Without Your Love – Our Lives Are In Your Hands – His Word Is Still His Promise – Song For A Christian Wedding – Wings Of Mercy – All I Want.

The "Song For A Christian Wedding" is worthy of attention, particularly when so many marriages seem to last only a short while. The record is a release from Myrrh records, a division of "Word" Records who seem to have most of the leading Gospel musicians under contract. (N.J.M.)

many of the songs himself, and he is backed by a competent group on guitar, banjo, percussion, bass and various keyboard instruments. As with other country music, two themes are prevalent on this album – love and going home.

The tracks are: For The Last Time – You Can Make Me Smile – Takin' The Country Road Home – Lady – Paradise – The Devil In Me (Is In Love With The Angel In You) – Hey Mr Lazy – Listen To The Singer Listen To His Song – I Want You To Spend Tonight With Me – I'm Goin' Back Where I Belong – I Write The Words And I Sing The Song – You Are The Reason.

Don't worry if the track titles are unfamiliar. The words are printed on the jacket if you fancy a sing-a-long. Recording quality is well up to standard. (G.S.)

☆ ☆ ☆

THE SECRET POLICEMAN'S BALL. Stereo, Island L-37253. Festival release.

This new album is a recording of a show put on, at no charge, by a bevy of Britain's "superstar comedians' in aid of Amnesty International. Included are such names as John Cleese, Peter Cook, Billy Connolly, Mike Balin, Terry Jones, Rowan Atkinson, John Fortune and Eleanor Bron.

The humour is Goon style, brilliantly written and performed.

But . . . on the cover is the warning: "This album contains language which may be considered offensive".

The more is the pity. Performers of this calibre don't need to rely on four letter words and double entendre to win laughs. What is does is merely alienate a segment of listeners who would otherwise want to share the show with their friends.

And that includes this reviewer. (W.N.W.)

Carlo Curley at the Alexandra Palace

AN ADVENTURE IN SOUND. Carlo Curley plays the Allen Digital Organ at Alexandra Palace, London. Stereo, Chalfont STG 77021. (From Allen Organs Aust, 32 Woodhouse Rd, Doncaster East, Vic 3109. Tel (03) 842 3465. $8.00 + $1.30 P&P Melbourne, $1.60 P&P elsewhere.)

If the sound at Holy Redeemer Church (reviewed last month) was big, here it is enormous. What else would you expect of an organ similar to Carlo Curley's own touring instrument: 5 tons in weight, 4 manuals, 164 stops and 380 loudspeakers?

All this set up in the Alexandra Palace, with its 7-second reverberation period. Not that this is any great hassle, as far as the recording is concerned. The venue had been the scene of two major seasons, more than a dozen full-scale recitals, and a hugely successful BBC television special.

In the jacket notes, Jerome E. Ruzicka refers to Carlo Curley's one-time flamboyant style but there is no doubting his sheer ability as he presents seven of his own favourite items and encores: Toccata and Fugue in D minor (J. S. Bach); Fantasia in F minor (W. A. Mozart); Toccata from Symphony No. 5 (Widor); Fugue a la Gigue (J. S. Bach); Trumpet Voluntary in D major (J. Clarke); Scherzando (G. Pierne); Finale from Symphony No. 5 (Widor). Considering the reverberation and (at times) the huge sound and bass content, the definition is very good indeed and the recording very clean. Full marks must go to those in charge of the technicalities.

Interestingly, however, there is reference in the jacket notes to a digital version of the same performance. It does not appear to be available at present in Australia but, if it does ever show up, it should be a "bottler" (translated: very impressive). (W.N.W.)

Books & Literature

CP/M disc-operating system explained

THE CP/M HANDBOOK with MP/M, by Rodnay Zaks. Published by Sybex, USA, 1980. Soft covers, 136mm × 214mm, 321 pages. Illustrated with photos, sample user input and computer outputs. Price $18.40.

Firstly we should explain for the uninitiated, that CP/M is a disk operating system designed by Digital Research Corporation, various versions of which have been written for such microcomputers as the Cromemco, PET, APPLE, TRS-80, NORTHSTAR, in fact most of the popular computers. Unlike the resident monitors of most computers though, it is not stored in ROM and hence must be bootstrap loaded from the disk each time the computer is turned on – just as is done on all large computers and minicomputers.

The term "bootstrap loaded" refers to a small program which is actually part of CP/M but which is always resident in the computer. When power is first applied the computer automatically executes this bootstrap program, which then loads the entire CP/M operating system – in effect, the CP/M cpu loads itself by its bootstraps.

The advantage of CP/M is that since it runs on most computer systems the user can work on any of these systems without having to learn a new "language" for each one. It is also a powerful operating system offering a vast range of software such as an assembler, editor, debugger and extensive file handling commands to rename, erase and save files, etc.

The CP/M handbook covers all these topics well and should provide an excellent supplement to the standard manuals. The subject is discussed in an evolutionary manner starting from turning the power switch on, all the way to editing and saving programs. Technical terms are clearly explained and there is a vast amount of computer dialogue to illustrate how the computer responds to various commands.

Contents of the book are as follows: Introduction to CP/M, CP/M and MP/M facilities, Handling files with PIP, Using the Editor, Inside CP/M, Reference guide to CP/M and MP/M commands and programs, Practical hints, the future. There are also extensive appendices tabulating ED and CP/M commands, PIP keywords, HEX conversion tables etc.

The thorough coverage of all levels of CP/M and MP/M and in particular the easy clear style in which the book is written could make it invaluable to the CP/M user.

We obtained our review copy from McGills Authorised Newsagency, 187-193 Elizabeth St, Melbourne. (R.deJ.)

Antenna Catalogue

HI-Q COMPLETE AERIAL CATALOGUE. Stiff paper cover, 44 pages, 242mm × 180mm illustrated.

In some ways a companion volume to their "TV and FM Aerial Installations", Hi-Q have now released a catalogue of antennas which they have available for purchase and installation by home handymen. Included in the catalogue was a "Hobbyist" price list and order form.

Most of the antennas illustrated are manufactured by Hi-Q but models by other manufacturers are also included.

Catalogue sections cover TV aerials, caravan systems, aerial spares and accessories, installation components, cable, plugs & sockets & switches, baluns & splitters, outlets & filters, amplifiers and rotators.

A covering letter says that a range of "Channel 0" antennas is available, although not mentioned in the catalogue. If required, information on Channel 0 antennas should be requested.

The catalogue is available from Hi-Q Aerials, 69 Maitland Rd, Islington, NSW 2296. Phone Newcastle 61 5317. (W.N.W.)

BASIC Programming

DICK SMITH'S EASY WAY TO PROGRAMMING IN BASIC; by John and Judy Deane. Stiff paper covers, 85 pages plus appendices, 297 × 212mm, illustrated. Published by Dick Smith Electronics Pty Ltd. Price $9.95.

The System 80 distributed in Australia by Dick Smith Electronics is a highly competitive alternative to the Tandy TRS-80. It is very largely software compatible with the TRS-80, and therefore supports a rather powerful BASIC interpreter. To help solve some of the mysteries of the BASIC language, and to assist those people who have not had any contact with computers, Dick Smith Electronics have released this book.

Written along the same lines as the Sorcerer manual (by the same authors), it provides an entertaining introduction to computer programming using the BASIC language.

The opening chapter starts by showing the user how to connect the system to the power and how to hook the monitor (or TV set) to the system. This is done in a step-by-step fashion, and the way in which it is written immediately tends to give the newcomer confidence.

In the chapters that follow, the reader is introduced to the basics of stored program writing and execution, dealing with two or three commands or statements at a time. The graphics capabilities are also discussed in detail. This comes in handy when writing your own games programs.

At the end of each of the chapters there is a summary of the points covered. Each chapter also contains one or two exercises involving the BASIC statements or commands covered. The answers to these exercises are to be found in Appendix C, at the back of the book.

Altogether the book is well written, and should fulfil its intended task in introducing the concepts of programming. It should also prove a valuable aid to those with more programming experience since it is a great refresher course as well.

Our review copy came from Dick Smith Electronics, and copies should be available from all Dick Smith outlets by the time this appears in print. (G.C.)

Your First Computer

YOUR FIRST COMPUTER, A guide to business and personal computing, by Rodnay Zaks. Soft covers, 258 pages, 140mm × 217mm. Published by Sybex Inc, USA, 2nd edition 1980. Price $13.20.

The author, Rodnay Zaks, has written quite a few books on microcomputers, and his considerable experience in this field is reflected in the contents of this book. If you are just starting in microcomputers or if you already have a "system" then this book should be invaluable.

It starts off with a futuristic discussion on the uses of microcomputers giving the reader a clear perspective of what can be done with a computer system. This is followed by chapters on using the system, basic definitions, how the system works, programming the computer, from Basic to Cobol, business computing, selecting a system, the peripherals and many more plus appendices on logic elements, the binary number system and disk file structures.

Virtually every aspect of microcom-

puters is covered, with many technical terms such as floppy disks, interpreter, breakpoints etc, clearly explained. The operation of micros and peripherals such as UARTs, CRTs, printers, ROMs, is also discussed on a basic level. If you are after a system then the chapter on "selecting a system" could be useful. It contains an extensive listing of the various micros available, with photographs and brief technical details.

Also of interest is the chapter on "programming your computer" which discusses the various languages used on micros, eg BASIC, APL, FORTRAN, PASCAL, COBOL. Program examples in each language are given along with a discussion of programming features and their advantages and disadvantages in various applications.

The extensive coverage of microcomputers and associated topics in an easy to understand manner makes this book ideal for the beginner and we have no hesitation in recommending it.

Our review copy came from McGills Authorised Newsagency Pty Ltd, 187 Elizabeth St, Melbourne, 3000. (R.deJ.)

Electrical Principles

ELECTRICAL & ELECTRONIC PRINCIPLES by S. A. Knight. Soft covers, 151 pages, 185mm x 246mm, illustrated with circuit diagrams, waveforms. Published by Newnes Butterworths, England, 1980. Price $11.50.

There are numbers of other books in the same series which are all written for the English electronic certificate course. The material in this book basically covers passive circuits, viz resistors, capacitors, inductors, transformers and electrical machines at a fairly elementry level and includes a large number of worked examples plus self test questions.

Chapter 1 starts with a discussion of Norton and Thevenin equivalent circuits and then goes on in chapter 2 with a discussion of DC transients, ie, simple R-C and L-R circuits and exponential charge/discharge waveforms. In the next two chapters the response of RC, LR and LCR circuits to AC is studied with a clear explanation of phase, impedance, power factor, reactive power, and resonance.

Transformer principles are the subject of chapter 5, though the discussion is limited, with nothing more "meaty" than turns ratio and a qualitative treatment of transformer losses. Following chapters are titled: three-phase circuits, electrical machines, the induction motor, methods of measurement and the final section provides answers to the self-test problems in the previous chapters.

All in all the author treats each subject in a clear, easy-to-follow manner making this book ideal for technical college couses or for the beginner who is interested in learning basic thoery.

Our review copy came from the publishers, Butterworths, 586 pacific Highway, Chatswood, NSW 2067. (RdJ)

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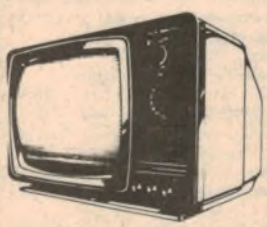

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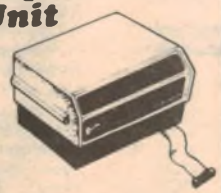

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Column 80

by JAMIESON ROWE
Technical Director, Dick Smith Electronics

Interpreters and Compilers Explained

Do you know the basic difference between an interpreter and a compiler, and the relative advantages of each? This month we take a look at these two important types of "systems software" program, and explain how they are used.

You can't go very far with computers of any size before you come across the terms "interpreter" and "compiler". Often newcomers find them quite puzzling, yet they tend to be used with gay abandon (often interchangeably and wrongly) to describe all sorts of software utility programs. So this month I'm going to try and clarify these terms for you.

As you may have already gathered, interpreters and compilers are basically **programs** designed to **translate** from one type of computer programming language into another. Generally, both terms are used to describe programs which are designed to translate from a "high level" or "problem-orientated" language like BASIC or FORTRAN, etc, into the computer's own "machine language" or binary code – the form which all programs must ultimately take before they can be "run".

It may seem a strange idea that we would write our programs for the computer in one "language", then use another program to get the computer itself to translate our new programs into the actual "language" which they must be in before it can "understand" and run them. Sounds a roundabout way of doing things, doesn't it? Yet it makes a lot of sense.

The main reason for doing it is that the computer's own machine language is basically just a string of binary numbers – each number a "code" signifying a particular type of elementary operation. This "language" may be fine for computers, but for we humans it is a very tedious and intricate form in which to try and write programs.

It is far easier and faster for us to write our programs in a more abstract and human-orientated form, and then get the computer itself to translate them into its own precise and fine-detail strings of binary codes. Unlike a human translator it doesn't have to "understand" what it is translating; it just follows rigid and clearly-defined rules of translation previously set down (by a human programmer). And being a computer, it can do the job of translation both faster and more accurately than could we humans – once a human has written the translation program to tell it how to do so, of course!

Well, so much for translation programs in general. Now for the differences between interpreters and compilers. Each type of translation program works in a rather different way.

Basically, a **compiler** is designed to be loaded into the computer and run by itself. Under its control the computer accepts your high-level program as "input data", works out the equivalent string of machine-language code, and delivers this as the "object code" version of your program. This may then be fed into the computer at any time, again by itself, to run like any other machine language program.

With a compiler, then, the actual translation of your program into object code is performed by the computer as a distinct operation, quite separate from its being executed. But with an interpreter, the two functions are "interleaved" and tend to be fused into a single complex task.

An **interpreter** is designed to be present in the computer's memory along with your high-level program, and to do its translation of the program "on the run". Instead of translating the program as a whole into machine code, it translates it a line at a time, and executes the equivalent machine code for each line before attempting to translate the next. So with an interpreter a full machine-code translation of your complete program never exists at any single time; its parts are produced and run in rapid succession.

What are the relative merits of the two? Well, because a compiler produces a full machine-code translation of your program, which subsequently runs by itself, your program can run at the full operating speed of the computer. The same high-level program can never run as fast with an interpreter, as the interpreter has to translate it afresh each time the program is "run". The computer obviously can't both translate and execute it in the same time as it would normally take to run it! So compilers have a speed advantage.

A compiler also allows you to run longer high-level programs, because your translated program ultimately runs in the computer by itself. In contrast, with an interpreter your program has to have the interpreter alongside it in memory, to translate it and "hold its hand" during execution. So for a given amount of computer memory, the space available for your program has to be "what's left" after that required by the interpreter.

Does a compiler have any disadvantage? Yes, and quite a serious one. Because a compiler translates your program quite separately from its execution, it doesn't allow you to work in "real time". You have to write the program first in the high-level language (generally using a text editor program), then use the compiler to translate it, and then load in the resulting object code version to see how – or even if – it runs.

If there are problems, either in the logic or the syntax (even a misspelt command word, or a comma in the wrong place), you have to go back to your original program, change it, translate it again using the compiler, then feed the new revised object code it again for another try. Even with a modest-sized program this can be a tedious and irritating business; with a big and complex program it can be a nightmare!

Here's where an interpreter pulls ahead, despite its relative limitations in terms of absolute speed and program size, because it allows you to work in "real time". As soon as you have written your program using its inbuilt text editor, you can tell the interpreter to "run" it. If there are any problems, these will become apparent in fairly short order. You can then "break" in, modify the program in memory, and "run" it again, solving the bugs as you go along.

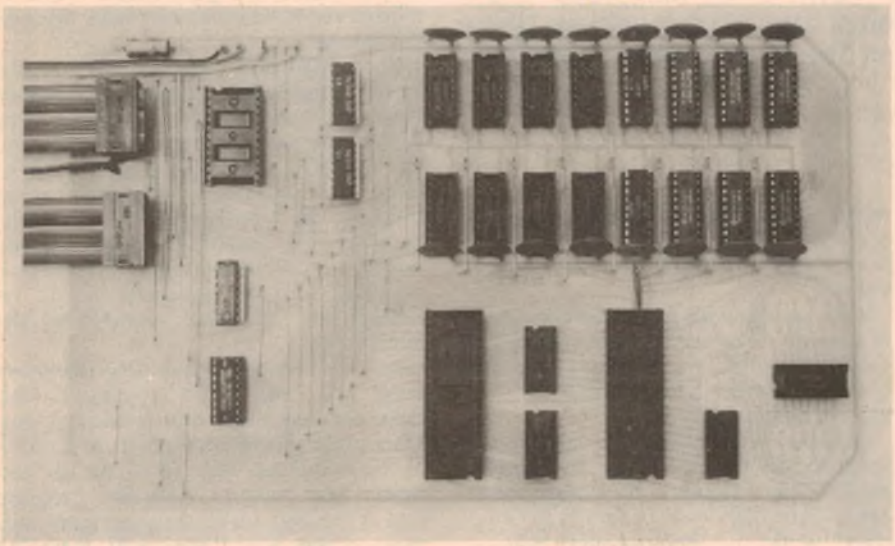
In practice, this proves a tremendous advantage in terms of programming convenience and speed. This is why just about all of the current generation of microcomputers are provided with a BASIC interpreter, which is generally resident in ROM so that it is "ready to go" as soon as you turn the machine on.

What about the compiler "hare" – does it always lose out against the friendly interpreter "tortoise"? No, not really;

(Continued on page 142)

Microcomputer News & Products

DREAM 6800 EXPANSION KITS FROM JR



Designed for the DREAM 6800 and 6802 a 4K Expansion Kit, consisting of a DREAM-sized fibreglass printed circuit board containing a 4k RAM (the 1K on the DREAM board is transferred to this board making 5K in total) with sockets, address buffers, select logic, connectors and instructions is now available for $99 (or $59 without RAM).

A more sophisticated kit has – in addition to the features of the 4K kit – provision for 8K RAM, two PIAs, one EPROM and drive transistors for off-card opto-couplers.

The PC board is intended to be mounted above or below the DREAM board. Connection is made via a short length of ribbon cable with plugs. If the unit is mounted in a box, ventilation must be provided. The amount of current drawn depends on which brand of RAM is used, and how many IC's are installed. Worst case current drain is just under 2 amps.

Enquiries should be directed to J. R. Components Pty Ltd, PO Box 128, Eastwood, NSW, 2122.

PROGRAMMED EPROM FOR DREAM 6800

Dreamsoft has introduced a software package on EPROM which is intended for use with the J. R. Components DREAM 6800 Expansion Kit. It provides 2K of programs which can generate text displays with variable delays, reverse video and scrolling. Waits for external key inputs may also be programmed. All these can be strung together to form repeating messages, advertising displays, titles or education aids.

Standard ASCII code is used to display the full 64 character subset on a 5 × 3 dot matrix. Inexpensive hard copy is available as a bonus for users with Baudot teletypes, whilst improved tape load, dump and verify routines are included which avoid the need to insert the start and finish addresses with the monitor program.

Details of user-callable subroutines are provided. The EPROM is supplied complete with commented listing and instructions for installation on the J. R. printed circuit board. Dreamsoft price this EPROM at $30, with further information being available from Dreamsoft, PO Box 139, Mitcham, VIC, 3132.

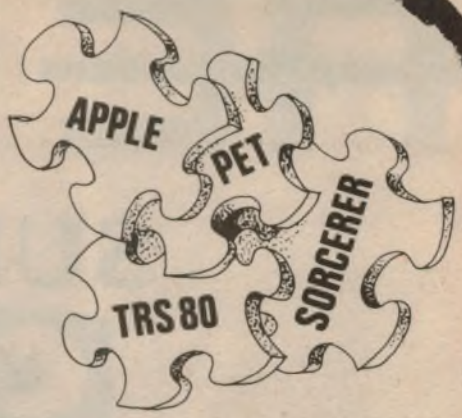
"WHISPERDISC" CHARACTER PRINTER

A medium speed serial printer that prints "letter quality" via a daisy wheel

Micronews continued p125

Puzzled? Which computer to buy?

The solution . . .



At Applied Technology we do things a little differently. Our market research has shown that a lot of people buy their first computer mainly to learn the basic concepts involved. Once they have mastered the basic principles only then can they effectively apply the computer to carry out their specific requirements.

We believe that a first computer must start small and be expandable and at the same time be supported with enough documentation and examples so that a user can master both hardware and software concepts at his own pace. Unless you can get "hands on" experience and actually make a computer actually do something like switch on a relay or play a musical tune you will find mastering the microcomputer a difficult, time consuming battle.

With this in mind we have designed a series of computer boards each with a specific function and yet fully compatible with each other. You can have fun and build each from kits (or buy them assembled and tested) and when a board is ready to go, plug it into the S100 BUSS (the hobby standard!) and you are ready to explore the fascinating world of the microcomputer. Some users of our Z80 system have already developed sufficient expertise to set up their own business writing software and designing industrial control systems. You could easily do the same!

$399 INSTRUCTOR 80

An ideal starting point and a powerful self-contained computer on two S100 cards. The kit includes DGZ80 CPU (with on-board ROM and RAM and adequate I/O for most applications), the DG640 VDU (64 character/line display with upper and lower case and graphics facility), a full feature RCA keyboard, 3 slot motherboard with edge connectors. The kit comes with complete manuals, a step by step programming course and sample programs to run. All you need to do is connect a simple power supply and a monitor/modified TV to complete the unit. Our exclusive warranty service and technical backup are readily available.

ADD ON S100 CARDS AND PERIPHERAL EQUIPMENT

The Instructor 80 can be readily expanded using cards from our wide range of S100 boards. You can, for example add 16K or more of reliable static memory using our AT16K RAM boards or add fine detail graphics/programmed screen characters and connect joy stick controls with the TCT PCG (see ETI July 1980). A full set of hardware is available to house your S100 computer system and if required we have just developed a professional quality 12" monitor with an easy-on-the-eye green phosphor and resolution to cater for up to 132 characters/line! A full range of peripheral equipment including printers and high capacity floppy discs is available as your needs arise.

SOFTWARE SUPPORT

The Z80 is probably the most popular 8 Bit microprocessor in the world and has an abundant software base including business packages, word processing and languages such as CP/M, PASCAL, FORTRAN, FORTH. We have developed cassette based programs including Microworld Basic, Microworld Editor/Assembler, Utility Package and many exciting and challenging games. Courses in microprocessor applications and programming are run regularly. Please enquire for more details.

PRICE LIST

DGZ80 S100 CPU Kit	$199.00
Assembled	$249.00.
DG640 S100 VDU Kit	$149.00.
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DGOS Operating System in 5Volt EPROM	$40.00
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AT.007

Microcomputer News & Products

has just been released by Olympia. Called the "WHISPERDISC", it will accept forms up to 381mm wide and prints at 20 characters per second.

Eight different typefaces are available, and it can make up to four copies.

In announcing the release, Mr Mike Connell, the Olympia national sales manager, states that the first contract for delivery of the new printer has been signed with Rudi Hoess of Electronic Concepts Pty Ltd, the Australian distributor for Apple computers.

The ES100 SP "Whisperdisc" can be used by most users of mini or microcomputers where they can access a standard RS232 interface. Priced at $2550 it is available from Olympia International, 59-61 Dickson Ave, Artarmon, NSW, 2064.

MENSA HAVE FINDEX

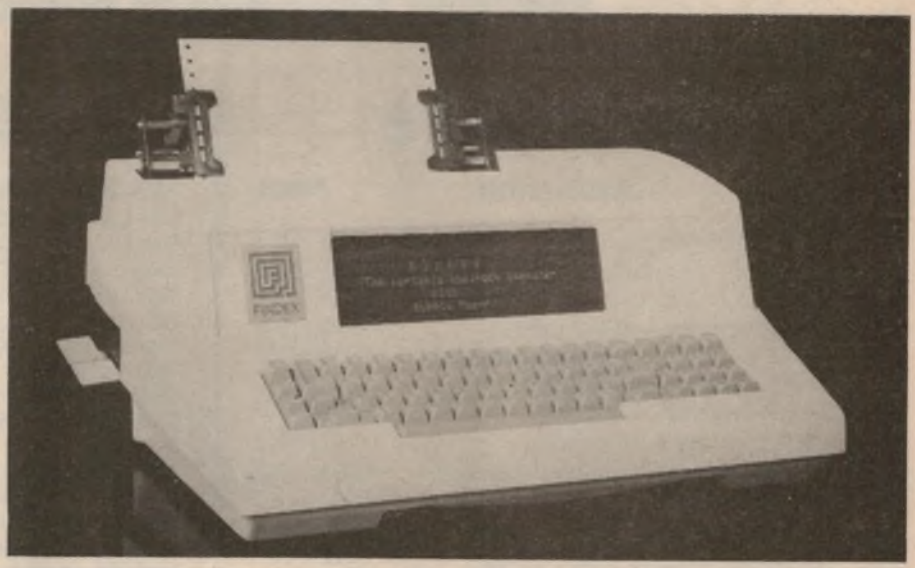
Mensa Computers Pty Ltd of 454 St Kilda Rd, Melbourne has just released the Findex portable business microcomputer, measuring 444 × 546 × 210mm with a mass of only 14kg.

Features of the Findex include an expanded keyboard with 72 keys, a lightweight gas plasma flat display panel, built-in mini-floppy diskette drive, 128k bytes of bubble memory (expandable to 2 megabytes) and built-in printer using forms 228mm wide.

The CPU utilises the Zilog Z-80 microprocessor functioning on a clock frequency of 2.5MHz, with the option of specifying a frequency of 4MHz. Serial, parallel and S-100 Buss interface is standard. Audio-cassette recorder jacks and built-in modem acoustic coupler are optional.

Peripherals include standard floppy and large hard disk drives, printers and other computers. Communication may be asynchronous, synchronous or bisynchronous.

Mensa Computers can also supply larger systems such as the Industrial Micro Systems Series 8000 and the Opal range of equipment.



More Micronews p127

NEW TELEPRINTER PRINTS RED AND BLACK

A new matrix print head for printing true lower case descenders and the capability of red and black printing are options now offered with the Tally T-1612 1200 Baud Printer terminal. Tally reports the new nine needle printhead design allows teleprinter users to have true APL capability. Underlining and lower case descenders are printed without sacrificing printer speed. The T-1612 prints bi-directionally at 160 characters per second and slews to the next print position at 48ips.

The black and red ribbon option allows the user to employ the same shift principle as a typewriter to achieve two colour printing. The option is useful in accounting applications for signalling debits or to highlight numbers, or for interactive communications whereby answers and requests can be colour differentiated. Also, the Tally T-1612 terminal has double wide character printing and with the added function of red printing, the user can highlight portions of text.

Tally reports that the addition of these two options to an already highly versatile machine makes the T-1612 the most flexible teleprinter available. The T-1612 offered with 42 standard programmable functions, lists among its many options a Short Form Quick Tear device for saving forms costs and an Auto Front Feed device for handling cut forms.

For further information contact the Warburton Franki office in the capital city of your State.

LOW-COST ROMLESS Z8 MICROCOMPUTER

A new member of Zilogs Z8 single-chip family that omits mask-programmed read-only program memory (ROM) and instead offers the user alternative combinations of input/output lines and bus compatibilities, has been announced by Zilog.

The ROMless Z8681, compatible with the Z8000 microprocessor's peripheral circuits offers an alternative to multi-chip solutions in such high-performance applications as smart terminals, printers and controller with specialized I/O requirements.

"Although these applications can be addressed by the mask-programmed Z8 with this internal ROM," said a Zilog spokesman, "the new ROMless version has a lower price, inherently greater flexibility, and no minimum quantity requirement. These benefits are expected to broaden the Z8's applicability to a wide

Micronews continued p128

range of designs in which it can be used to reduce chip count and power requirements."

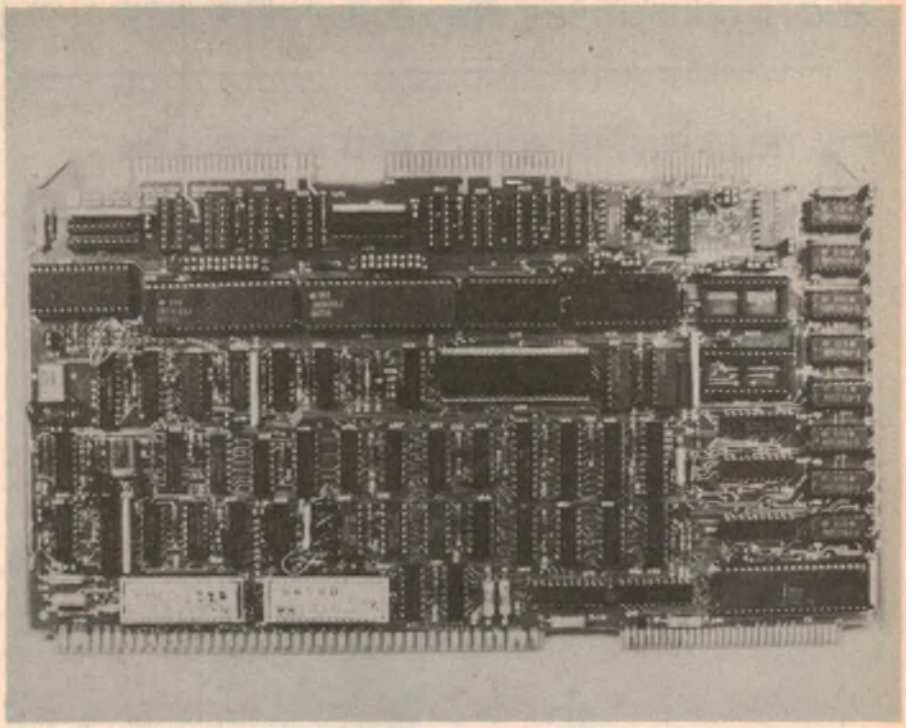
A complete microcomputer, the Z8681 contains 124 bytes of on-chip RAM, up to 24 I/O lines, two eight-bit counter/timers for real-time control applications, a UART for serial communications, six levels of interrupts, and an on-chip oscillator. An expandable bus interfaces up to 62K bytes each of external program memory and external data memory.

Under program control, the Z8681 can be tailored to the specific needs of the user. It can be configured as a traditional microprocessor that manages up to 124K bytes of external memory, or as a parallel-processing element in a system with other processors and peripheral controllers linked by Zilog's Z-Bus Component Interconnect. In all configurations, a large number of pins remain available for I/O purposes.

Housed in a 40-pin dual-in-line package, the Z8681 requires a typical current of 150 milliamps from a +5 volt power supply.

Enquiries should be directed to Zap Systems Pty Ltd, PO Box 22, St Leonards, NSW, 2065.

NATIONAL RELEASE SINGLE-BOARD COMPUTER



The BLC-80/316, a single board computer featuring dual-port RAM, is now available from National Semiconductor Corporation. Ideal for any system involving multiprocessing, dual-port RAM allows access of the onboard RAM by not only the on-board CPU, but by any board that can take control of the bus. In board-intensive systems, dual-port RAM potentially reduces system cost by eliminating the need for a RAM expansion board, as well as saving time by reducing the number of bus accesses.

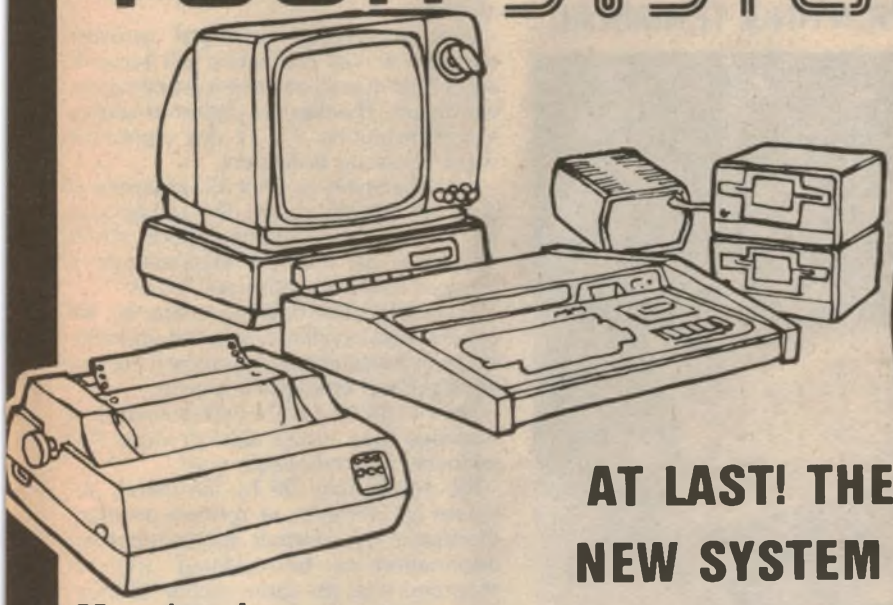
ROM/RAM "shadowing" capability under software control is also provided on the BLC-80/316, allowing ROM to "disappear" and be replaced by system RAM, creating the environment that CP/M was designed to run under. The BLC-80/316 uses a Z-80A CPU, which features an exceptionally fast, 3.69 MHz execution speed.

Supported by the BLC-8930 firmware monitor, the BLC-80/316 also features 9 levels of vectored interrupts, 48 programmable I/O lines, 3 programmable counter/timers, as well as full compatibility with the industry standard BLC/SBC Series/80 family of microcomputer products. Onboard arbitration logic is also included, providing transparent bus arbitration for multiple CPUs.

Enquiries to NS Electronics, PO Box 89, Bayswater, Vic 3153. Editor's Note: CP/M is a registered trademark of Digital Research.

MICRONEWS CONTINUED

E-X-P-A-N-D YOUR SYSTEM 80



AT LAST! THE NEW SYSTEM 80 S-100 EXPANSION INTERFACE

Here's what it can do for your System 80:

- Give you a standard Centronics parallel printer port. (Suits most printers including our Dot Matrix (X-3255) and Daisy Wheel (X-3265) printers.
- Give you an RS-232C port with full 'handshaking' logic for connection to modems, etc.
- Give you the option of fitting extra memory: fit a RAM CARD with another 16K or 32K (available separately) — plus you can still fit another S-100 add-on board.
- Give you a floppy disk controller (up to four drives) with external data separator for improved reliability
- Gives you the ability to use a cheap teleprinter instead of a parallel printer. Save a bundle!
- Gives you S-100 compatibility: so you can use many of the peripherals from hundreds of manufacturers: why be tied to one source of supply?

AND IT'S $$$$ CHEAPER THAN TANDY!

Apart from the massive savings on the computer itself, our expansion unit is over $119 less than Tandy's (theirs is $618.95 including RS-232C interface). And it offers you much more!

Sent anywhere in Australia for $6. Below cost!

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Terms available to approved applicants

16K RAM CARDS TO SUIT S-100 INTERFACE

Comes with 16K fitted; with room for another 16K. You can have a 48K computer!
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Card (including 16K RAM) (Tandy charge $220.00!)	X-4016 $199.00
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IF ALL YOU WANT IS A PRINTER INTERFACE . . .

We've got this economical parallel interface allowing you to run any Centronics-type printer direct from the System-80 — no expansion interface needed. And again, the price is a big saving over Tandy's!

Printer Interface:
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(suits Printer Inteface or S-100 Interface)
$39.50
Cat X-4014

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SEE OUR OTHER ADS FOR FULL ADDRESS DETAILS

HP INTRODUCES POWERFUL PRINTING TERMINAL

A portable terminal featuring high-speed thermal printing, national keyboards, and integrated mass storage has been introduced by Hewlett-Packard.

The new HP 2675A is the first terminal in its class to offer selectable columns per line and enhanced characters on a quiet thermal printer.

The new terminal also appears to be the first to offer eight user-definable softkeys. The softkeys, and a programmable RETURN key, make it possible to tailor the terminal to individual applications.

soft carrying case, the HP 2675A can be transported easily from one location to another.

The integrated thermal printer operates at 120 characters per second, and prints quietly to fit into an office environment. The thermal printer produces a high-resolution 7 x 11 dot matrix for sharp character definition.

With the ability to print 132 columns of data on 21.6cm paper, the printer can deliver full-size computer reports. At 40 characters per line, the expanded print mode is useful for titles and labels.

A standard line-drawing character set can be used to print forms. And underlined and framed characters make it easy to highlight and emphasize reports.

The HP 2675A comes with built-in dual cartridge tape drives able to store 320 kilobytes per removable tape.

File access may be by file name, absolute file number, or relative position. Updatable tape format allows recorded information to be updated and re-recorded over the same section of tape.

Search/rewind is done at 228cm per second, while read/write is 56cm per second.

For further information contact Hewlett-Packard Pty Ltd, 31-41 Joseph St, VIC, 3130.

STOCK CONTROL AND PRICING SYSTEM

Dick Smith has released a Stock Control and Pricing system program ("SCAP")

Micronews continued p133

MENSA COMPUTERS

Suite 3, 454 St. Kilda Road, Melbourne, 3004. Telephone: (03) 26-5683, 26-6150.

FINDEX, The Real Computer

THE WORLD'S FIRST PORTABLE MICROCOMPUTER
Battery or mains operated

RAM 48K to 2 megabytes, bubble memory to 2MB, gas plasma display, optional audio, printer, mass storage mini floppys to 800K bytes, hard disk to 195 megabytes, acoustic coupler, S-100 bus, battery optional, CPU with real time clock. For dynamic businessmen on the move. Ideal for real estate agents, insurance brokers and accountants.

SUPERBRAIN™
Intelligent Video Terminal Systems

Powerful, multi-purpose microcomputer systems.

BUSINESS SYSTEMS

Priced competitively from as low as $45.00 p.w. lease cost including sales tax and software.

TYPICAL APPLICATIONS

Debtors ledger and statements, creditors ledger and remittances, general ledger and trial balance, order entry/invoicing, sales analysis, payroll/wages, enquiry, word processing, mailing, record keeping, ledger card, doctors office, real estate, agency accounting, hotel/motel accounting, branch office accounting.
Facilities management consulting.
Software and computer sales.
Computer data preparation.

INTRODUCING

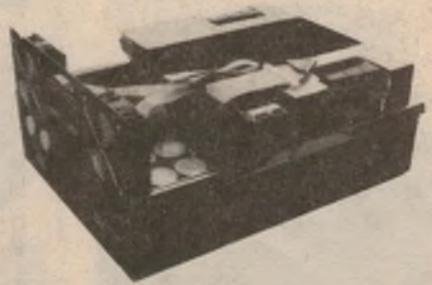
MENSA G.F. 1000

BASIC SPECIFICATIONS

CPU 8080 and Z80 operating at 4MHZ. 64K bytes Dynamic RAM expandable to 2MB with Bank select allowing multi user. Texas Instruments 810 Printer. Over 2MB total 4 drives on-line storage bytes of unformatted data on two double density drives. Optional external hard disk storage can be connected using the optional S-100 Bus. Floppy Disk.

WINCHESTER DISK

26MB of Winchester Disk complete with controller and easy backup. Disk has special capacity to only back up files accessed during the last period. Disk operating system CP/M.



OPTIONAL SOFTWARE

FORTRAN, COBOL, BASIC.
Application packages. Extensive software development tools are available from leading software vendors, including software for the following applications: payroll, accounts receivable, accounts payable, inventory control, general ledger and word processing. All modules mounted to base. CRT in a rigid aluminium frame. Disk Drive assemblies are mounted into special brackets for ease of servicing.
Mensa computers provide a service network throughout Australia at major service centre locations to minimise response time to service calls. To ensure that equipment will operate at peak performance, engineers and technicians are trained to ensure the highest possible standard of service.

Microcomputer News & Products

that has been written in Australia for Australian small businesses. It has been written to run on the Dick Smith System-80 computer (and it can be easily adapted to run on a Model 1 TRS-80, with Level II BASIC).

Developed from Dick Smith's own company stock control and pricing system, SCAP can control and manage up to 1200 stock lines. It is easy to drive, using "menus" on the video screen, and can be customised with the user's own company name. It also provides the option of taking Australian Sales Tax into account (or not) when working out gross profit margins, etc.

As well as providing on-screen information in seconds, SCAP can print out a variety of reports, including two different types of price list, five different types of stock status listing, fully itemised sales docket posting reports, and stock count sheets and stocktake analyses (for stocktaking). The last two of these are Dick Smith developments.

One of the other features of SCAP is a machine-language sorting routine which makes item sorting more than three times faster than with competing programs. It also features special item status "flag" codes.

SCAP comes on two mini-floppy disks (a Program disk and a Sample Data disk), together with a comprehensive User Manual. The complete software package sells for $275.00.

In order to run SCAP the following minimum hardware configuration is required: (a) a System-80 computer with video monitor and expansion unit, and a total of 32K of user RAM memory; (b) two 40-track floppy disk drives with power supply and daisy-chain cable; (c) a printer capable of printing 132 columns, with matching cable. Current price of this hardware package from Dick Smith Electronics is $3480.00, including sales tax.

This new software product is available from Dick Smith branches and resellers in each state.

THREE COMPUTING COURSES FROM RADIO UNIVERSITY

The University of NSW has announced that its educational radio station – VL2UV Radio University – will be con-

Micronews continued p134

ducting courses on Fortran IV Programming, Microprocessor Fundamentals and Pascal Programming; each commencing in March. Readers in other parts of Australasia will be interested to learn that the lectures will be available on audio cassettes, following conclusion of the broadcasts.

● The course on Fortran IV Programming will be in two parts, with the lecturer being Professor J. M. Blatt, Professor of Applied Mathematics at UNSW.

The language taught by Professor Blatt is USA Standard Basic Fortran IV, which is available on most, computers, and suffices for nearly all practical applications. "The course will enable students to write programs on many computers," he says, "not only the one on which they have been taught."

Professor Blatt's radio lectures will be broadcast at 9pm on Mondays, with repeats at 9pm on Fridays over Radio University's station VL2UV. Television sessions and seminars will take place on Tuesday evenings.

● The two-part course on Microprocessor Fundamentals was first offered in 1980 and proved so popular that Radio University decided to repeat it in 1981. Dr David Mee of the School of Electrical Engineering and Computer Science is the lecturer for the course.

This course requires no more than a basic understanding of electronic circuits and simple logic networks. Only general experience of computing is necessary. "By the end of part 1 students will have reached a level where they can understand simple programming and application of microprocessors," says Dr Mee. "In part 2, I go into further hardware and software problems encountered in microprocessor systems, and look at typical evaluation modules. I will then demonstrate how to design, develop and debug a simple microprocessor project."

Dr Mee will broadcast 10 lectures for each part of the course at 8pm on Wednesdays, with repeats at 9pm on Thursdays. There will also be one television segment to each part, and Dr Mee will conduct three evening tutorials at the University.

● The course on Pascal is also in two parts, with the lecturer being Ken Robinson of the Department of Computer Science.

Pascal is today's most sophisticated structured programming language. It provides extra capabilities that boost performance and cut development time for almost all computer projects.

Ken Robinson has structured the course so that it can be followed by beginners with no previous computing experience.

Part 1 of the course consists of six radio lectures, to be broadcast by Mr Robinson at 7pm on Mondays with repeats at 8pm on Fridays over Radio University's station VL2UV. In addition, Mr Robinson will use two television programs on Tuesday evenings for programming demonstrations, and conduct three attended seminars at the University of New South Wales.

Fees range from $42 to $56 dependent on Course selected. The audio cassettes are priced at $7 per cassette (ie, approx $150 per Course).

Radio University transmits on 1750kHz just off the regular broadcast band, and can be picked up in the Sydney area on a radio adjusted to receive this frequency. Instructions on how to modify a radio are sent out to enrolled students, or they can buy a transistor set already modified for $8 from Radio University. Television University transmits on 631MHz to four viewing centres in the Sydney Metropolitan area.

Further information on these and other radio, television and tape courses can be obtained from the Division of Postgraduate Extension Studies, University of New South Wales, telephone (02) 662 2691.

Microsoft Editor/Assembler reviewed

Microsoft Inc have recently released a new version of their EDTASM editor/assembler, suitable for use with both the System 80 and TRS-80 computers. Apart from the editor and assembler there is also a powerful debugging monitor called Z-BUG. All of this adds up to a very versatile software development package.

We will look at the package by examining each of the modules in turn, starting with the editor, then proceeding to the assembler and finally the Z-BUG monitor.

The editor is easy to use and is also very versatile due to its extremely good editing facilities. The input format is the same as most other text editors in that it starts with the statement number in the extreme left hand column, followed by the label field, the op-code field, the operand field and finally the comment field. Each of the fields are separated by a fixed number of tab stops which helps to keep text in a neat orderly fashion.

When the editor is first called up, the command to insert text (I) is given, followed by the starting statement number and then the increment between the statement numbers. The actual format is *I100, 10 where the * is the command mode prompt. The 100 specifies that the first statement number will be 100, while the increment between lines will be 10. This is very useful when it comes to adding additional lines of text between existing lines.

There is also a line renumber function that allows the user to renumber the statement lines. A situation that often occurs is that a few lines of text have to be inserted somewhere but the numbering of the lines won't allow this. This is where the renumber function comes into play.

Another handy function is a set of positioning commands that allow the user to locate a particular block of text in the edit buffer. The editor always maintains a pointer to the current line of the edit buffer. Two special symbols are used to position the pointer to the beginning or the end of the edit buffer. It is also possible to do a line-for-line search using the up and down cursor controls.

It is possible to print out either the entire contents of the edit buffer, or just a particular block which can be specified in the format of the print (P) command.

Another very useful feature is the ability to move specified blocks of text around to any location within the edit buffer. When a move is made, the text is placed into the new location while the text at the original location is automatically deleted. This is a very powerful and time-saving feature.

It is also possible to copy a block of text from one part of the buffer to another, but keeping the original source intact. This is great if you need a routine two or three times in the one program but don't want to go to the trouble of defining a macro (an often used subroutine).

That just about completes the summary of the major features of the editor and as can be seen, it is quite powerful.

Having prepared the source code with the aid of the editor, we are ready to move onto the assembler. This has the capability to assemble directly into memory and enables the use of macros. Other powerful features of the assembler include a function that allows the suppression of certain portions of the assembled code when printed out. It is possible, for example, to suppress the object code in a printout, symbol tables, printing of macros, or the entire program listing. This allows proprietry codes to be suppressed and therefore aids in the protection of software.

The assembler supports a good range of pseudo-ops, including the definition of single bytes, 16-bit words and also the definition of messages. The latter is extremely useful when text is to be incorporated into the program.

The assembler will also evaluate expressions such as DEFB $-TABLE where $ is the current value of the program counter and TABLE is a label in another part of the program. This expression is being used to find the size of a data table relative to the current value of the program counter. All four arithmetic operations are supported.

One thing that the assembler does not appear to support is the ability to specify GLOBAL symbols and there does not appear to be any facility to link programs together. I may be wrong about this but the documentation that accompanies the software makes no mention of these facilities.

The last major feature of the assembler is conditional assembly. The user can specify a certain set of conditions under which the assembly is to take place, and only when all conditions have been met will the assembler do its work. A very powerful and useful feature.

Now we come to the Z-BUG debugging tool. This allows the writing and editing of the source code, the assembling of the program, and then the debugging to be done without the need to load all these utilities separately. They are all loaded in together, and since they are all resident, the problems associated with debugging and modification are largely overcome.

Z-BUG will allow memory locations to be displayed and modified in hexadecimal, decimal or octal. This is a great help if you are working with 8080 code which is to run on the Z-80. Another useful feature is symbolic debugging. This relies on the editor buffer remaining intact since it references the label field in the source code. In this mode the user specifies a label and then proceeds to debug the program with the output showing the label and the corresponding offset into the program. This is a very powerful debugging mode that also allows modification of any memory location at any time.

With Z-BUG it is also possible to display and modify any of the registers and their contents. All registers and contents can be displayed simultaneously if desired.

Other features that Z-BUG supports are breakpointing, with a total of eight breakpoints being allowed, and a most important function, single-step execution. To use this function, the user enters the execution address and then presses @. The instruction at the execution address is then acted upon. Further use of the @ key will continue the execution of the program.

If the editor buffer is still intact, it is possible to specify a label as the execution address. This is a good way of testing subroutines etc.

A final note regarding Z-BUG. Although Z-BUG is loaded together with the editor/assembler, there is a stand alone version of Z-BUG on the reverse side of the cassette. This proves handy when the services of the editor/assembler are not required.

In summary, this is an excellent software development package which represents good value for money. It is highly recommended. The retail price is $39.95.

The review sample came from Dick Smith Electronics, Cnr Lane Cove and Waterloo Roads, North Ryde, 2113. Phone (02) 888 3200 (G.C.)

THE NDK S-4000 PRINTER

For all bulk word processing applications where reliability, speed and sustained print quality are of prime importance.

The NDK S-4000 is supplied with a heavy duty 16-wire head producing single pass high quality 17 × 16 matrix characters at 75 characters/second for word processing quality and 150-200 characters/second for drafts.

Four fonts (dot matrix, word processing, super/subscript and Katakana) are supplied as standard. Typical scientific, mathematical and currency symbols are included as standard. The fonts can be intermixed as bold faced, enlarged (5 CPI, 17 × 23 matrix), reduced (12 CPI) or normal (10 CPI). Other fonts can be specified by the user. Each dot on the 16 × 16 matrix can be programmed by the host computer to produce special graphic effects (such as letterheads and trade marks). Full page graphics is possible by controlling ten wires of the printer head and executing half-line feeds. The special graphic patterns can be printed at the rate of 900 dot columns/second at a resolution of 4.7 dots/mm (120 dots per inch) both horizontally and vertically. A horizontal dot resolution of 240 dots per inch can be produced using half dot timing.

Superscripts and subscripts are produced by the superposition method enabling complicated mathematical formulae to be produced quickly and easily. The subscripts and superscripts are half normal size and the printing pitch is half that of the PICA.

PRICE

The following come as **standard** and are **included** in the price shown:

A. Parallel or RS232c Serial (which includes ETX/ACK and X-ON/X-OFF protocols)
B. Front or rear paper feed
C. Adjustable tractors
D. 2 × Form Control Loops & 2 Ribbons
E. Variable pitch (10 CPI, 11.7 CPI and 5 CPI)
F. Soundproofed contoured casing
G. Ease of maintenance (only 3 major sub-assemblies)
H. 6 months' warranty

PRINTER (excluding sales tax) . . . $3,190.00

JOHN F. ROSE COMPUTER SERVICES PTY LTD IS THE SOLE AUSTRALIAN DISTRIBUTOR FOR THE NDK RANGE OF PRINTERS.

OPAL COMPUTER SYSTEMS

The OPAL 1000c is an 8-slot S-100 system conforming to the new IEEE standards. An NNC Electronics Z80a 4MHz CPU card with 2 RS232c serial and 3 + 8 bit bi-directional, fully buffered parallel ports is used in conjunction with the California Computer Services Disk Controller. One serial port has been initialised as a printer port. An additional I/O board with 2 serial and 3 parallel ports is provided for communications with peripherals and other systems.

Memory is provided by a 4MHz 64k dynamic RAM Board by Measurement Systems and Control. The memory board is fully bank selectable.

Disk drives are 2 × 8in Shugart SA801R running at double density (480k/drive).

The system is mounted in an attractive pressed aluminium housing with a cast front panel fitted with reset button and key operated on/off switch.

The operating system software is CP/M version 2.2. An extensive monitor is included.

Full test utilities for the CPU, disk drives, memory, terminal and printer are available.

PRICE . . . $4,775.00 (excludes sales tax)

BSTAM

BSTAM is a commercially orientated telecommunications facility for transmitting and receiving CP/M files over telephone lines. Files may be sent between two CP/M computers using a short wire.

BSTAM will transmit and receive **any CP/M** file. There is no limit on the size of the file. In addition to this, all data is transmitted exactly as it is stored on disk. For example, if a byte of data is X'FF', it is sent as 1 byte and not as 2 ASCII F's. By doing this, data is transmitted at maximum line speed.

BSTAM includes the following features:

1. ERROR CHECKING
   Framing Errors
   Overrun Errors Parity Errors
   BCC Errors (Block Control Check – CRC type)
   Auto Block Resend Lost Data Errors
   Mid Block Resend Exception Errors
   Length Errors Time Out Errors
   BCB errors (Block control Byte Counter)
2. GROUP FILE TRANSMISSION AND RECEPTION
   Transmit A: * * Receive A:
   Transmit B: *.BAS Receive B:
3. USER INTERFACE FOR UART/USART CHIP

New Features

BSTAM now has a new extended receive mode. In this mode BSTAM will wait to receive more files until a Control C is entered on the receiving console. In addition, BSTAM has further enhanced recovery features when data errors are detected.

Hardware and Software requirements

- 16k RAM
- 1CRT (running at least 4800 baud)
- 1 disk drive
- CPU 8080/Z80 or 8085
- Asynchronous modem that will support at least 300 baud:
  Full duplex option
  Originate or Answer option RS-232 option
- SIO interface (UART/USART chip)
  300 baud strapping Header strapped at terminal end
- CP/M or some derivative
- RECEIVE.COM (BSTAM)
- TRANSMIT.COM (BSTAM)

On short wire connections, the baud rate may be set at 9600 baud.

PRICE . . . $150.00

BSTMS

BSTMS was designed for the use of CP/M computers to connect the host computer (IBM, Honeywell, Univac, etc) for time sharing. **BSTMS is a high level TTY emulator.** The main difference between BSTMS and a real TTY is its ability to send and receive files. As you know, a human operator cannot enter data at 30 chrs/sec. This is what BSTMS does very nicely. Also BSTMS can echo all Host input to your list device.

BSTMS is divided into separate parts. First there is the terminal mode and second the file mode. The terminal mode is used to run your CP/M computer as if it was a TTY. While in the terminal mode, you may change between half and full duplex at any time just by keying a command to BSTMS. After doing whatever you have to do in CP/M, you may return to BSTMS and start off in the host computer. Also BSTMS has been connected to all types of CBBSs and ABBSs. BSTMS may also connect to another CP/M system as its host computer.

While BSTMS is in file mode, you may send or receive a file to the host computer. When sending a file, BSTMS will expand all Control Is into multiple spaces to align on columns of 8. BSTMS may also transmit binary files. There are two programs used to send and receive binary files. The first is DCOMPRES.COM. This program will convert any binary file into an ASCII file. The second program is COMPRES.COM. This program will convert any DCOMPRESsed file into a binary file.

The minimum requirements in the computer hardware and software are:

1. CP/M operating system or compatible
2. 24k user memory space when transmitting a file. All received files must fit into the available memory. (See BSTAM.)
3. 1 disk drive
4. 1 CRT running at least 4800 baud.
5. CPU: Z80, 8080, 8085
6. Asynchronous modem that will support at least 300 baud
   a. Full duplex option
   b. Originate option
   c. RS-232 option
7. SIO Interface – Any USART/UART chip
   a. 300 baud strapping
   b. Header strapped at terminal end
8. Installation of BSTMS may require knowledge of assembler language programming. Installed using the same technique as BSTAM.

PRICE ... $200.00

LIFELINES

Lifelines is a monthly software newsletter published by Lifeboat Associates.

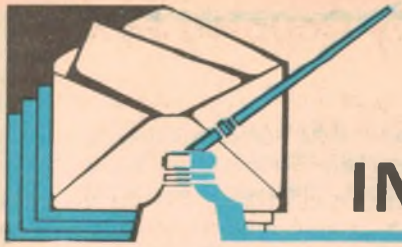
Although Lifelines contains features and columns dealing with new software products on the market, product comparisons, the CP/M Users Group and other items of general interest, the principal role of the periodical is to provide timely notice to owners about their software. Each month, new revisions are reported, together with information on the purpose for each such release, be it for the correction of "bugs" or the addition of features and facilities.

The software products distributed by Lifeboat Associates are frequently both complex and costly. We recommend that all serious users of software should take out subscriptions to Lifelines, ensuring that they are automatically informed about the current state of their software tools and thus get full value for their purchase.

Subscription Costs

- $36.00 for 12 issues. Price includes postage for anywhere in Australia.
- $5.00 each for back issues. Price includes postage for anywhere in Australia.

All orders must be prepaid.



INFORMATION CENTRE

BASS GUITAR: I am about to buy a bass guitar and I would like to make my own bass amplifier and speaker box. I have looked in your latest publications, but I could not find anything suitable for a bass amplifier. I was wondering if you could send me some plans of amplifiers suitable for a bass amplifier (over 100 watts) at a reasonable cost, less than $150. Also could you supply plans for a good speaker box and cross over for a large woofer speaker. (D. P., Melbourne.)

● Although we have not published a complete guitar amplifier in recent times which is suitable for your purposes, the Playmaster 300W amplifier as described in the June and July issues of 1980 would be suitable for the power amplifier and in conjunction with the guitar preamplifier as described in the October 1968 issue would constitute a powerful but inexpensive bass guitar amplifier.

An article entitled Loudspeaker Systems for Electric Guitars was published in September 1968, and although a little dated, will still apply when using modern loudspeakers. It would be advisable to observe the manufacturers power ratings though. These articles are available through our information service at $3 per article, which includes postage.

BURGLAR ALARMS: Ten or 12 years ago, after an article appeared in your magazine, we corresponded about burglar alarms for private homes. I contributed an article, which was published, in which the relay was activated by a transistor only if a burglary was attempted. This system had the advantage over normally activated relay circuits in that the current consumption of the circuit was considerably reduced.

I regret that since those days, due to pressure of other interests, I have been unable to indulge myself in the very interesting subject of electronics and hence am out of date on the subject.

I may say that at a later date an attempt was made to burglarise my home. The alarm was activated, and the would-be burglar fled, leaving open a window. A woman neighbour telephoned the local police station and reported the ringing of the alarm bells in my home. The reply she received was "The batteries will soon run down and then the bells will stop ringing". No police came to my home to check on the alarm.

I took up this dereliction of duty with Police Headquarters and an enquiry was instituted. I was informed that; "Appropriate action was taken". However, knowing the police department as I do, I imagine this statement meant that nothing was done!

As probably you are aware, the State Government has decreed that from January 1 next burglar alarms must be fitted with a device which automatically switches off the alarm after the alarm has been ringing for 10 minutes. I am of the opinion that this period is too short and should be extended to half an hour. However, the Government has spoken.

I do not possess the knowledge necessary to install in my alarm circuit the device needed to switch off the alarm after it has been sounding for 10 minutes. Therefore I wish to enquire whether you would provide me with the necessary information. Of course it may be that you have already published in your excellent magazine this information. (K.G., Castlecrag, NSW).

● Unfortunately, we have not published a circuit which would meet your requirements although it would be a fairly simple design. We will consider publication of an up-to-date burglar alarm while bearing in mind that quite a few commercial burglar alarms are available at reasonable prices.

PH METER: Would you please ask your readers if any of them have a circuit diagram for a PH meter, and also a circuit diagram for a b&w TV tube tester and rejuvenator. I will be happy to reimburse anyone who can help me for stationery and stamps etc. (L. R. Mansbridge, 41 Wharf St, Tuncurry, NSW 2428).

● Request granted L. M. We have published your full name and address so that readers may contact you directly.

REMOTE CONTROL: I have recently constructed the Stereo Infra-Red Remote Control Unit (October 1979).

The unit works well and has a high sensitivity. The one problem I have encountered is that every time the volume is changed, both up or down via the remote control, there is a great "thump" through the speakers.

The unit is connected between the preamp and power amp in my system. I wonder if this is a common fault, and if so what could be done to overcome it (P. S., Mount Isa, Qld).

● The problem you are having with "thumps" when the volume level is changed could be due to the metal shield around the audio stage, IC2, not functioning. Another possible fault is due

UTC — Co-ordinated Universal Time

UTC and GMT: Recently I heard Radio Canada International say that as from May 4, 1980 they would drop GMT (Greenwich Mean Time) and use UTC. In the August 1980 issue of Electronics Australia I read that the World Administrative Radio Conference had decided to do likewise. Is this a bit of one-upmanship on the part of UTC people, as the time is the same and the reference co-ordinate is the same? It appears that only the name is changed. I understand that UTC is more accurate than GMT but surely this accuracy is academic and is only useful to space travel and the like. It will be of insignificant use in radio broadcasting. Finally, how does Co-ordinated Universal Time come to be UTC, rather than CUT? (H. C., Nowra, NSW).

● The tendency in timekeeping worldwide is to standardise its terminology. GMT is for all practical purposes the same as UTC. However, the art of timekeeping has made enormous strides in the past few decades and as various errors and situations have been uncovered, different titles have been given to various time scales to cope with these errors. Incidentally, the errors generally arise from irregularities in the rotation of the earth. As recently as 1972, a time scale, was agreed internationally, based on atomic time and arranged so that it would stay as closely as possible to mean solar time. This scale is designated UTC, Co-ordinated Universal Time. Any accumulated errors are corrected periodically by adding or subtracting a "leap" second as required. The Bureau International de l'Heure, in Paris, acts as an international co-ordinating body for timekeeping services. We suspect that the discrepancy between UTC and "CUT" has occurred in its translation from the French. GMT is considered to be the same as mean solar time and so there would be some small discrepancies between GMT and UTC.

to the changing DC output voltage of IC2a and IC2b caused by the biasing currents drawn by the op amps, via the attenuator resistors. Perhaps the 4136 device you are using is marginal in which case you could try replacing it with another 4136 or with the BI-FET equivalent, the Texas Instruments TL075. This has an extremely low input bias current of 7nA hence it should not suffer from this problem.

DELTAHET MARK 2 RECEIVER: In Electronics Australia for February, March, April and May, 1971, you described the Deltahet Mark 2 Communications Receiver. I wish to know if you are going to rejuvenate it, incorporate a printed circuit board and a five digit frequency meter. If so, when? (G. W., East Burwood, Vic).

● We regret to advise you that we have no plans at present to update the Deltahet Mark 2 Receiver.

DIGITAL CAPACITANCE METER: Having constructed your digital capacitance meter (March, 1980) and found it to be a tremendous help to me on the work bench, I was wondering if it would be possible to add inductance ranges to it, as may be done with some analog meters. If this is impractical would it be possible to feature a project on this subject in a forthcoming issue, as I am sure many readers would be very interested in building one using the same digital format. (J. H., Windsor Gardens, SA.)

● Unfortunately the digital capacitance meter could not be adapted to measure inductance but we may consider a combined capacitance/inductance meter as a possible project.

TV ANTENNA: I was wondering if there are any back issues dealing with TV antennas suitable for country areas? As I have an engineering shop, the manufacture of an antenna presents no problem. I merely require a design. (D.A.B., Beverly Hills, NSW.)

● As most enthusiasts prefer not to get involved in complex mechanical construction, it is many years since we published a TV antenna project. However, we published three articles in 1965 which may be of interest to you. They were "Fringe Area TV Reception" (6/ATV/8) in September, 1965, "Log Periodic Dipole Antennas" Pt 1 (6/ATV/9) in December, 1965 and Pt 2 (6/ATV/10) in January, 1966. Whilst the two later articles deal in depth with the design of antennas, the first articles looks at fringe area TV reception and the methods of overcoming the problems involved, and serves as an excellent introduction. We can supply photocopies of each of these articles at our usual price of $3 each (ie $9 the set).

More on the Acoustically Coupled Modem

ACOUSTICALLY-COUPLED MODEM: I have read your magazine over many years and have always found it interesting and stimulating, particularly in this electronic age.

I was very interested in your article in September 1980 on the Acoustically Coupled Modem for joining up terminals or for home computers over telephone lines. However, now that you have whetted our appetites, there is one problem many of us will be faced with. No doubt most of us have had experience with BASIC and understand this part reasonably well.

When it comes to the sort of programming requirements to get these connections to work through the modems, however, many will be as lost as I am. What about a nice helpful article on the requirements for this and perhaps even a few program hints to get things working? (R. G., Glen Iris, Vic).

● We understand your problem although we would assume that most personal computers would have instructions in the manual on how to use the serial ports. If your computer is one that does not have a serial port, such as the Tandy TRS-80 or Dick Smith System-80, you will need a parallel-to-serial adapter or use the serial interface system and program described in our November 1980 issue (File No. 2/CC/56). In general, the PEEK and POKE instructions are used to send and receive data via the serial port and thus via the Modem.

ACOUSTICALLY COUPLED MODEM: Your project in the September issue entitled "An Acoustically Coupled Modem for Computers" appears to be very interesting. Whilst your Acoustic Coupler project is half-duplex in the form in which it was published, it would seem to me to be fairly easy to construct as an answer-only or originate-only device simply by certain substitutions of components on the receive side or transmit side as appropriate.

Such a device would be eminently useful to me and possibly other users. Would you seriously consider publishing the component values required to transmit and receive 980/1180Hz. (G. D., Sydney NSW.)

● To change the transmit and receive frequencies of the Modem from 1650/1850Hz to 980/1180Hz: On the transmitter the .01uF and .0068uF capacitors on IC4 and IC5 are changed to .0168 (.01 in parallel with .0068) and .01 respectively. On the receiver the 1.5kHz high-pass filter will need to be reduced to a 500Hz high-pass filter by using a .016uF capacitor for the .0068uF and .0082uF for the .0047uF capacitor. Also the .033uF on IC7 connecting pin 9 to pin 1 should be changed to .056uF for a centre frequency of 1080Hz.

EPROM PROGRAMMER: Your EPROM Programmer project (EA July 1980) was most timely and I am now procuring the necessary components to have this project built.

My problem is this! I'm currently developing a program that runs in excess of 8K and may possibly exceed 16K. How then can I utilise the EPROM programmer to burn and run programs in excess of 8K?

I guess that an EPROM card similar to the S-100 bus 16K EPROM card would be required, but I'm not sure of this.

I would greatly appreciate any assistance that you can provide. Perhaps other EA readers have a similar problem. (R. S., Wagga, NSW).

● The EPROM programmer which we described in July 1980 can only program or read the contents of one ROM at a time. Hence it is possible to burn as many ROMs as you like but not all at once. One other point to be noted is that the programmer is not memory mapped so it cannot run the program in a ROM. This can only be accomplished by plugging the programmed ROMs into ROM sockets provided on the computer or a plug in EPROM board as you have mentioned.

PLAYMASTER 760 ORGAN: I am interested in building the Playmaster 760 Organ as described in March, April, May, June and August, 1976. Would it be possible for me to build such an organ without any previous experience? Unfortunately, I do not have all of the series of articles, so could you send such plans to me if they exist in such a form I could understand? What is a "polyphonic" keyboard? I am also interested in the Auto Rhythm Unit by David Edwards. Could this be incorporated into the organ? Would such an organ be suitable for a rock band? (G. B., Yanco, NSW).

● We would hesitate to encourage you to embark on such an ambitious project without any previous experience. We can supply copies of the original articles for $3 each. A polyphonic keyboard is one where multiple notes may be played at the one time. The Auto Rhythm Unit could conceivably be added to the Playmaster 760 Organ but again we must emphasise that this would require at least some previous experience in the construction of electronics projects. Finally, we doubt that the organ in question would be suitable for rock band work, as it was designed more for use with classical music in mind.

L. E. CHAPMAN

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RESISTORS

150 ohm, 5W	20c
10 ohm, 5W	20c
47 ohm, 5W	20c
12 ohm, 3W	20c
2.5 ohm, 3W	20c
33 ohm, 3W	20c
8 ohm, 10W	25c
4000 ohm, 10W	25c
100 ohm, 5W	20c
330 ohm, 10W	25c
220 ohm, 5W	20c
5 ohm, 5W	20c
220 ohm, 10W	25c
950 ohm, 3W	20c
115 ohm, 5W	20c
10 ohm, 5W	20c
1k ohm, 5W	20c
5000 ohm, 5W	20c
6.8k ohm, 3W	20c
3300 ohm, 10W	25c
6800 ohm, 10W	25c
1500 ohm DUAL, 21W	50c
50 ohm, 5W	20c
330 ohm, 5W	20c
1k ohm, 5W	20c
820 ohm, 5W	20c
12 ohm, 10W	25c
470 ohm, 7W	20c
4700 ohm, 4.5W	20c
5000 ohm, 10W	25c
8.2 ohm	5W
3.3K	7W
1 ohm	5W
10K	7W
2.5 ohm	3W

CAPACITORS

0.0039uF, 1500V	20c ea
6N8, 1500V	20c ea
0.0068uF, 1500V	20c ea
1200PF, 400V	10 for $1
0.068uF, 400V	5 for $1
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0.47uF, 250V	10 for $1
0.10uF, 400V	5 for $1
0.082uF, 160V	10 for $1
26k, 250V	10 for $1
0.041uF, 400V	10 for $1
0.033uF, 250V	5 for $1
0.027uF, 100V	20 for $1
220uF, 10V	10 for $1
1uF, 350V	10 for $1
470uF, 40V	5 for $1
1000uF, 16V	10 for $1
2.2uF, 200V	10 for $1
0.047uF, 1500V	50c
47uF, 25V	4 for $1
680uF, 40V	50c
22K, 100V	20c
330uF, 25V	25c
2.2uF, 200V	30c
470uF, 40V	50c
680uF, 35V	50c
0.015uF, 250V	25c
2500uF, 35V	$1
1uF, 100V	25c
1000uF, 16V	50c
220uF, 16V	50c
2000uF, 63V	$1
0.47uF, 400V	50c
680K, 250V	25c
012, 250V	25c
15NF, 250	10c
120K, 250V	20
10uF, 315V	25c
0.056, 250V	10c

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5A, 250V AC	75c ea

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2 and 3 gang	$1 ea
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25uF, 63V	10 for $1
22uF, 160V	10 for $1
47uF, 16V	5 for $1
47uF, 200V	5 for $1
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68uF, 16V	10 for $1
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100K	30c
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50K Double Pole Switch	50c
7.500	30c
10K Switch	50c
250K	30c
50K	30c
20K	30c
10K Min Pots	25c
50/Ohm	50c
½ or 1 Meg Switch	50c
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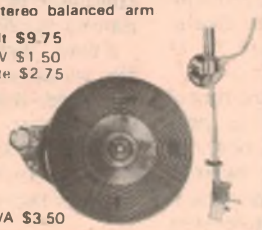

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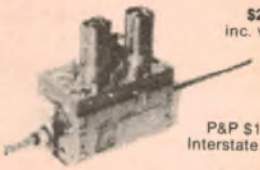

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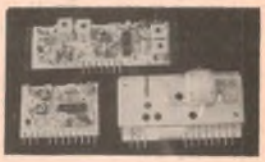

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TRANSISTOR-ASSISTED IGNITION: I have built the Transistor-assisted Ignition Kit and installed it in an HJ Holden van. I have only experienced one problem with it, that is, severe electrical interference with the car radio. Capacitors and suppression leads are fitted to the engine, and while running on the standard ignition there is minimal interference. I have checked the whole unit and it seems satisfactory to me. Your advice would be much appreciated. Secondly, I believe that a diagram of an In-circuit Transistor Tester once appeared in your magazine. Could you kindly tell me in which year/month it was published? (D.W.B., Gordonvale, Qld.)

● We assume that you are referring to the Transistor-assisted Ignition System described in our December, 1979 issue. Interference problems usually arise in one of these three areas:—

1. Radiation from the negative return to ground of the electronic unit. Keep this lead short and well away from the vehicle's own antenna. Sometimes it helps to return this lead direct to the engine block rather than the body/chassis of the vehicle.
2. Inadequately earthed case of the Transistor-assisted Unit. Generally, it is better to earth the case separately from the unit's own ground return, and to earth to one of its own mounting screws.
3. Radiation from the additional (length of) lead between (the CB terminal of) the coil and the electronic unit. Keep this lead as short as practicable, and well away from the vehicle's antenna.

Re your other query on the in-circuit transistor tester — this project was published in our April, 1977 issue (File No. 7/VT/13).

TV SET ENGINE SCOPE: Since reading the article on the TV CRO adapter in the May, 1980 issue of EA, I was wondering if it would be possible to use this project as an auto ignition analyser. I already have an ignition scope, but I find it difficult to interpret the waveforms on the small screen, in particular when there are six or eight traces being displayed. Also, have you considered featuring a negative ion generator project. It seems to me from what I have read on the subject that these devices are very similar to the television EHT circuits and should therefore not be beyond the capabilities of the home constructors. (W. W., St Marys, NSW.)

● While it may be possible to use the principle of the TV/CRO Adapter, considerable difficulties arise if many waveforms need to be displayed simultaneously. Another problem is that the TV/CRO Adapter has no sync facility whereby the display can be locked.

And while it is possibly true that television EHT circuits do produce negative ions, they also tend to produce ozone. In practice, while negative ion generators may use simpler circuits, it is very difficult to avoid production of ozone which is undesirable. We have no plans to publish a design for such a device.

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ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Beaconsfield, 2014.

TV-CRO ADAPTER: My son is experiencing considerable difficulty in getting a project to work. It is the TV-CRO adaptor on page 42 of the May 1980 edition of Electronics Australia. I have had it examined by a radio mechanic who reports as follows: "tracing the circuit through with a CRO, all is working correctly as though the project should work. A logic probe was used, all appears OK.

"A frequency meter revealed that the horizontal oscillator is running at 10 times its correct frequency, and the vertical oscillator runs at twice its correct frequency, there is no way the sync circuit can line up the trace with these conditions appearing."

If there was an error it would normally be corrected in a later issue but my son says a friend of his made the project which appears to work OK. As we are completely confounded I thought we'd write to you to seek your advice on how to get the ingenious device working. (E. N., ACT).

● The correct frequencies for the vertical and horizontal oscillators, IC7 and IC6, are 50Hz and 15625Hz respectively. These frequencies can be adjusted over quite a large range by adjusting the 100k trimpot connected to pin 7 of IC7 and the 100k potentiometer connected to pin 7 of IC6. If you are still unable to obtain the correct operating frequency the capacitors in each oscillator can be changed, although this should not be necessary.

The horizontal oscillator capacitor is a .001μF connected to pin 2 and 6 of IC6, while the vertical oscillator capacitor is 0.1μF and is connected to pin 2 and 6 of IC7. Increasing the values of either capacitor will decrease the horizontal or vertical frequency and decreasing them would increase the frequency.

Note however that even if these frequencies were not correct you should get some sort of signal display on the TV screen.

ELECTRODYNAMIC LOUDSPEAKER: I recently discovered an old speaker which seems to be in good condition. It is a Rola model F12 2500Ω with a transformer mounted on it. The transformer has 7000 printed on it but nothing else. What I wish to know is how can this speaker be used with an amplifier which requires 8Ω and if it is worthwhile to do so. Having no permanent magnet on it and four input wires I assume it is an electro-magnet sort of arrangement. Is this correct? (R. C., Seymour, Vic).

● You have found a component which is truly obsolete. It is an electrodynamic loudspeaker which has a separate magnet winding intended to be energised from the high tension rectifier of a typical valve radio of the mid-thirties to early forties. In fact, the magnet winding functioned as a filter choke for the high voltage supply.

To use it these days you would need a power supply capable of supplying around 150 volts DC at up to 60 or 70 milliamps. It would be cheaper to use the speaker for a non-electronic purpose such as a door-stop.

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COLUMN 80 from P121

compilers still have their place, particularly where it is most important that a program runs at the maximum possible speed.

In fact compilers shouldn't really be regarded as an alternative to interpreters. They can be used to complement one another. You can use an interpreter to develop your program and get it fully debugged, then turn to a compiler to produce the final "full speed" version.

Needless to say, to do this you have to have a compiler which matches the interpreter you are using. Unfortunately as yet there aren't too many compiler equivalents to the popular BASIC interpreters, but with luck these will appear soon.

SONY PS-X75 from P38

Waveform of sine and square waves was commensurate with those obtained from upper-middle price range cartridges.

Sound quality of the XL-25A was good, although a minority of buyers may wish to acquire another headshell and instal a more expensive cartridge.

In summary, we really could not fault the operation of this record player — it operates silently and treats records gently. It is a unit which can certainly take its place in the top echelon of automatic turntables.

Recommended retail price of the Sony PS-X75 is $649. Further information can be obtained from high fidelity retailers or from Sony (Australia) Pty Ltd, 453-463 Kent St, Sydney, NSW, 2000.

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Cuts sheet metal like a punch and die up to 18 G.A. Cuts Trims Notches $14.95 P + P $1.45

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Our Special only $27.50
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Concord, NSW 2137.

RCS Radio Pty Ltd,
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Radio Despatch Service,
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Fulham Gardens, 5024.

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Welshpool, WA 6106.

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ADVERTISING INDEX

UNTIL WE DEVELOPED THE STEREO GROOVE, HI-FI WAS PRETTY HO-HUM!

The world of hi-fi owes a lot to the original and continuing innovation of JVC. Few companies, if any, have done as much to help turn records and record-players into the virtual musical instruments they are today . . . or to lead the way in developing so many *firsts* in the more recent concepts of sound amplifiers, cassette decks and computer-designed speaker systems. Hi-fi, as we know it today, had its beginnings in 1956, with JVC's development of the 45°/45° groove for stereo records. The fact that this system still remains as the world standard is, in itself, outstanding testimony to the technology of JVC. The development revolutionised not only the record-*making* industry, in which we've been involved since 1930; it also paved the way for enormous advancement in the design and engineering of record-playing equipment. Now, hi-fi has expanded to

R-S77. Super-A FM/AM Stereo receiver

embrace a wealth of highly-sophisticated electronic equipment; and it's not surprising that JVC has continued to play a leading role in so much of its development.

HR-3660 EA. VHS Colour Video Cassette recorder

THAT WASN'T OUR ONLY FIRST, EITHER.

We also pioneered Japan's television industry, introducing their first TV receiver just over 40 years ago. A more recent innovation is VHS, the home video recording system now gaining world-wide acceptance as *the* system for such equipment. In the course of staying ahead, we've introduced a number of world *firsts* of radical importance: the Quartz Lock turntable is one of them.

THE QUARTZ LOCK TURNTABLE. MANY TIMES MORE ACCURATE.

It stands to reason that if your equipment is at the top end of the range, then your turntable must be capable of comparable performance. Only Quartz Lock ensures this, tying the speed of the turntable to the unvarying pulse of the atom, and providing a level of accuracy far in excess of conventional turntables.

MORE MILESTONES IN HI-FI.

To match the superb quality of Quartz Lock, we produced the S.E.A. graphic equalizer system. Then we refined it to such a degree it even compensates for the effect your furniture has on sound when it leaves the speakers! To expand the capabilities of tape, we designed ANRS and

SEA-80. Stereo Graphic Equalizer

Super ANRS — automatic noise reduction systems which not only reduce distortion and 'hiss' but actually extend the dynamic range of the tape. Similarly, with speakers: at JVC we employ computers in their design to help provide the ultimate in sound reproduction.

AND NOW, SUPER-A.

In its own way, as significant a hi-fi development as the stereo groove. Imagine an amplifier which combines the *best* features of the two recognised amplifier classes (A and B) . . . an amp which combines the *efficiency* of one with the *low distortion* of the other. Some engineers said it couldn't be done; but not those at JVC. Enter the Super-A amplifier . . . the *latest* JVC *first!*

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JVC
the right choice

THE FUTURE.

It's already with us. For instance, we were so far ahead in the new metal tape technology that our cassette decks were metal-compatible before the tapes were generally available. And now there's the JVC Electro-Dynamic Servo Tonearm, damping tonearm resonance by means of a purely electronic system and two 'thinking' linear motors. Who was it who dubbed JVC, 'the innovators'?

1861

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