JULY 1981 $1.75* NZ $2

eti

ELECTRONICS TODAY INTERNATIONAL

BONE FONE STEREO RADIO
– SPECIAL READER OFFER

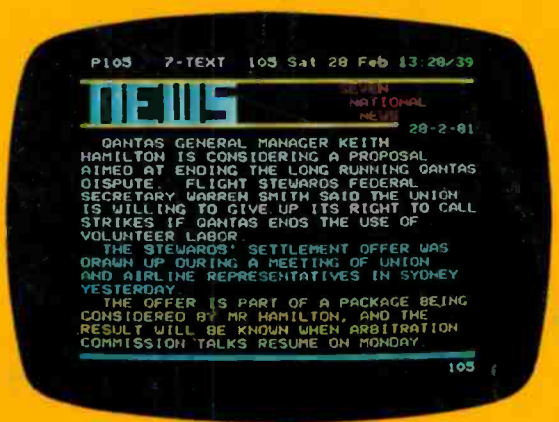
UNIQUE SPEAKERS

Technics SB10s examined in detail

BUILD A CAR ALARM

With exit/entry delay

System 80 reviewed



WIN A RADOFIN TELETEXT DECODER

The easiest way to get a better sound system.

Put in a Maxell Cassette.

You'll soon discover why most critics recognise Maxell as the finest recording tape money can buy.

For example, every batch of the magnetic oxide particles we use to coat our tape is run through an electron microscope.

If it isn't perfect, we don't use it.

On some brands of tape the magnetic oxide particles fall off as the tape gets older, taking some of your music with them.

So we developed a special binding process to make sure they stay on, even after years of use.

Why do we go to so much trouble?

It stands to reason that if you use better tape, your sound system will sound better.

maxell®

For further information on Maxell Tapes write to Maxell Advisory Service, Private Bag P.O. Kingsgrove 2208 or Phone: (02) 7503777.

MX0035/FMMH

ELECTRONICS TODAY INTERNATIONAL

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ISSN No. 0013-5216

ADDITIONS TO 'THE FAMILY'

THESE PAST FEW WEEKS have seen the culmination of some nine months or more of planning and production effort here with the launch of not one, but two new magazines from the ETI group. First off the rank was COMDEC Business Computer Magazine. This publication will be of special interest to many ETI readers as well as people you undoubtedly know who need or want to know about computers but are unfamiliar with the jargon and the technicalities. COMDEC is written in English – probably a first for a magazine of this type! This first issue is the 1981/82 Yearbook and contains a range of feature articles covering many aspects of choosing and using computer systems, from 'personal' micros through to the larger minicomputer systems. Many ETI readers will be particularly interested in the directory sections at the rear, which list who sells what and specialist companies. Our announcement on page 81 will tell you a little more about it.

Our second new publication we feel fulfils a long-felt need. Hobby Electronics is its name ('son of ETI' to the irreverent) and this magazine is intended for the newcomer or 'non-expert'. Projects are a big feature of Hobby Electronics and Editor William Fisher plans to present four every month along with 'learning' features about components and construction techniques. In addition, the magazine will include articles on broader topics such as AM radio, hobby computing and CB radio, etc. More information is given in our News Digest feature on page 8.

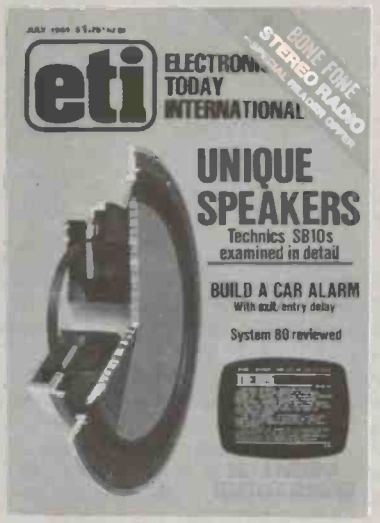
We've long felt there was a need for a 'simpler' electronics publication in Australia and have felt frustrated that we could not properly cater for newcomers to the hobby within the pages of ETI. We have to appeal to a very wide spectrum of readers and because of this, many newcomers and others not so advanced in their hobby were, we felt, 'put off' because much of the material was above their heads. Economics dictates that there's only a limited amount of space available within the magazine each month that can be devoted to these readers, so we hope Hobby Electronics solves that problem. Almost every electronics hobbyist knows another who is a beginner or a dabbler. We recommend you draw their attention to Hobby Electronics.

Roger Harrison
Editor

QUICK INDEX

advertisers

eti ELECTRONICS TODAY INTERNATIONAL



COVER

Technics new range of loudspeakers clearly benefits from new design approaches — as Louis Challis' review in this issue testifies. Cover photograph courtesy National Panasonic. It's a cutaway view of the 320 mm woofer Technics developed for their new speaker range.

*Recommended retail price only.

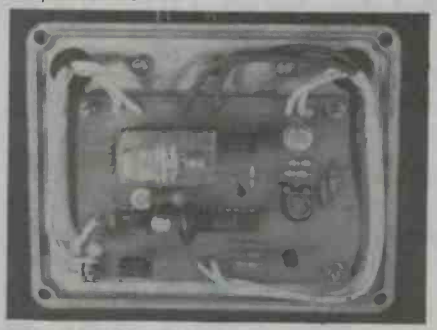
NOTICE: The ETI-660 Learners' Microcomputer has been held over owing to a number of difficulties beyond our control. We apologise for any disappointment and trust you understand.

news

features

computing

projects



sight & sound

general

next month

ELECTRONIC DISTANCE MEASUREMENT
Until recently, electronic distance measuring instruments have mainly benefited land surveyors. Hewlett Packard have developed an instrument that measures distance to both stationary and moving targets using an optoelectronic technique employing an infrared light beam. This article explains the technique.

COMPUTER SPECIAL
Data '81 is the name of this year's Computer Exhibition — the largest annual exhibition of its kind in Australia. Our feature gives a rundown on what's new and who's who this year in the world of computers and computing.

ALPHASORT PROGRAM
Sorting information alphabetically is one of the most common requirements of file handling and data sorting. You can arrange your printout with this program and never lose track of that special lady's phone number again!

AUDIO-TECHNICA ATH-8 HEADPHONES
What with all the trumpeting about loudspeakers recently, one would have thought headphones were a dying breed. Not so! This recently released model from Audio Technica is a top-line, top price set of 'phones that Louis Challis considers ". . . offer a standard of fidelity, total frequency response and other acoustical attributes for which many audiophiles have long aspired but could not otherwise afford."

REMOTE CONTROL SYSTEMS
Multi-channel remote control systems have many applications outside the radio control of models. Ray Marston describes and discusses a variety of circuits that you may find useful — all using commonly available components.

Although these articles are in an advanced state of preparation, circumstances may affect the final content. However, we will make every attempt to include all features mentioned here.

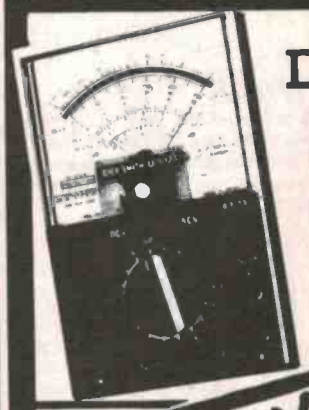
DICK SMITH NEW ZEALAND RETAIL STORE NOW OPEN!

Compare these prices with what you've been paying until now! All prices are in New Zealand Dollars, and are available from the Dick Smith retail store or any of our re-sellers throughout New Zealand.

AUCKLAND STORE OPENED 1st JULY

Due to huge demand by would-be NZ customers, we are pleased to announce the opening of our first NZ store in AUCKLAND.

DICK SMITH ELECTRONICS
98 Carlton Gore Rd.
Newmarket, Auckland
New Zealand.
Prices shown are recommended retail price only



DICK SMITH Q-1024 MULTIMETER

If you're into electronics, or a hobbyist, and you want an economical, reliable multimeter, this is the one for you! Offers the normal measurements plus high sensitivity. Why pay more!

$NZ35

Cat. Q-1024

DICK SMITH CRO

Every professional knows how valuable an oscilloscope is: and now Dick Smith puts a CRO within the reach of every hobbyist. 6.5MHz bandwidth - 75mm screen - 10mV/division. Try beating this for value!

$NZ235

Cat. Q-1280

YES! ONLY $235

NEW LOW PRICE!

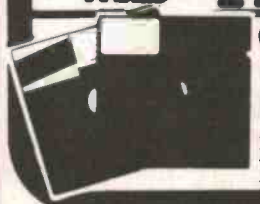
THE FANTASTIC SYSTEM 80 PERSONAL COMPUTER

Thinking of a personal computer? Check out the System 80, you'll be pleasantly suprised. It's Australia's fastest selling computer and soon to be New Zealands. Call in for more details.

WAS $1125.00

NOW ONLY $NZ1050

Cat. X-4005



CHEAPEST DISKETTES IN TOWN!

Soft or hard sectored mini floppy diskettes. Look at the price!

$NZ7.95

Cat. X-3510 Cat. X-3505

Hobby Electronics blasts off!

Forget the space shuttle, the launch of the year was definitely that of ETI's protege, Hobby Electronics!

The new magazine took off precisely on schedule, and according to mission control it's 'right on target'.

Hobby Electronics is aimed at everyone who's interested in electronics, but isn't yet expert enough to feel comfortable with any of the existing electronics magazines.

Some readers will already know a bit of electronics, others will be complete beginners.

Editor William Fisher makes it clear that, "This won't just be a gee-whiz sightseeing tour.

"Sure, our readers are going to be excited and enthralled a lot of the time, but they're also going to learn a lot, both practically and theoretically, from our projects and features."

Fisher, a lean 33-year-old refugee from the British Isles, is quietly confident of success. Hobby Electronics is his first independent command, but he has a solid background in magazine publishing. A physics graduate, he trained as a technical writer in the UK with the huge Marshall Cavendish publishing house and came to Australia in 1979. He joined ETI's staff in May 1980.

He takes his job seriously, but he has a sense of humour, too. Asked to substantiate his claim to have the 'world's fastest-growing magazine', he pointed out that sales of the first issue of Hobby Electronics represented an infinite percentage increase on the previous month's zero figure!

Four projects are presented every month in Hobby Electronics.

The opening issue featured a Radio Microphone, AM Tuner, Transistor Tester and Bench Amplifier.

The August issue follows up with a Guitar Phaser, Power Supply, Electronic Die and Extra Flash Trigger.

The aim with all projects is to keep them as easy and cheap to build as possible, with one proviso — the design must be utterly reliable.

Feature articles cover a wide range. For beginners there's a series explaining the functions of fundamental components. The July issue discussed capacitors; diodes are on the menu for August.

For more advanced readers there are articles about how common electronic functions are performed. Op-amps were the subject in the first issue and August introduces oscillators.

Then for general interest there are features on broader subjects, like AM radio and metal detectors in the first issue.

From time to time in Hobby Electronics there will also be articles about activities which have grown out of electronics but are not exactly part of it. The July issue kicked off with an introduction to hobby computing, August introduces CB radio, and the joys of shortwave DX will be explained in the near future.

Hobby Electronics has introduced a new service to the leisure electronics industry. Kit and component suppliers get information on an issue's projects two months in advance so that pc boards, parts and kits will be in the shops when the issue goes on sale. Article reprints are also available from suppliers.

Hobby Electronics is aimed at the beginner in electronics — be he 5 or 50 — and is written throughout in language the beginner can understand. It costs just 95 cents, available through all newsagents plus selected electronics stores.

Look for the first issue of Hobby Electronics in your newsagent now!

Red for danger?

The Natron Multi-colour Digital Panel Meter (CDPM) is designed to give clear and quick indication of readouts below or in excess of critical limits by changing the colour of its digits.

The input levels at which the colours need to change can be set by adjusting trimmer potentiometers, accessible by removal of the snap-off bezel.

Standard colours are green, yellow and red, but other colours can be substituted on request (for volume requirements) and the sequence of colour changes can be arranged as specified.

The CDPM could be of use to indicate critical parameters in medical electronics, remote control of oil, gas, water and electricity supply systems, and for industrial processes.

For further information contact Technico Electronics, P.O. Box 50, Lane Cove NSW 2066, or P.O. Box 520, Clayton Vic. 3168.

Videotex in 1982?

1982 has been tentatively scheduled by Telecom for the introduction of Videotex, a public information network which will give Australians armchair access to massive databanks through the domestic TV set and telephone.

Modified TVs with a $200-$300 adaptor and a calculator-like keypad will give access to information ranging from simple news and weather reports to travel timetables and fares, restaurant profiles including menus and prices, entertainment and sports directories, city guides, the latest gold and share market dealings, etc, etc.

The consumer will be able to reply to the information on the screen by keying into a response frame on the page to make an airline booking, hotel or theatre reservation, etc, from the comfort of the living room.

The databases will be provided by companies or individuals, who will pay Telecom for the privilege, and although searching the indexes will cost the consumer nothing, once the information file is reached costs start to accrue based on a charge per page of information and an hourly computer connection fee. The final cost of this will reach you on your telephone account.

Services should open first in Sydney and Melbourne, with one central computer complex hosting four minicomputers and multiplexing to provide interstate services, all at local telephone charges.

Probe gives multimeter a temperature output

Digitron Instrumentation of the UK recently introduced a pushbutton-operated probe to convert virtually any analogue or digital multimeter into an accurate temperature indicator.

Known as the 600 Series, the probes are offered in versions for millivolt or microamp output in the −25°C to +350°C temperature range. Two standard probes are available: Type 2 for liquids, semi-solids, air, gas, granular materials and plastics; Type 4 for surface measurements.

For further information contact the Australian agent, Pacific Communications Pty Ltd, 4 Euston St, Rydalmere NSW 2116.

Immediate-response DMM

The Avometer Auto DA117 digital multimeter is claimed to have response times of less than 1 s for dc (voltage or current) and resistance ranges, and less than 3 s for ac ranges.

The multimeter can be operated by four 1.5 V dry cells for dc and ac voltage ranges of 200 mV, 2 V, 20 V, 200 V, or 1000 V; dc and ac current ranges of 200 ua, 2 mA, 20 mA, 2 A, or 10 A; and resistance ranges of 200 ohms, 2 k, 20 k, 200 k, 2 M or 20 M.

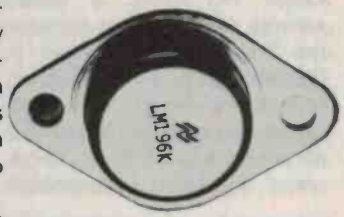
Readout is on LCDs, and changeover from auto-ranging to manual is at the touch of a button. The instrument is portable, and measures approximately 185 mm x 145 mm x 85 mm. It is supplied complete with leads, prods and insulated clips, a 20 mm high-top cover to house the leads, a fuse-removing key and two spare fuses.

Contact the Australian agent, Electrical Equipment Ltd, Industrial Division, P.O. Box 210, Arncliffe NSW 2205, for more information.

New Natsemi regulator offers highest output power

The LM196 is a 10 A monolithic adjustable voltage regulator manufactured with National Semiconductor's revolutionary MOOSE process, which is said to offer the highest output power available.

This process combines standard linear bipolar technology with high-power discrete transistor techniques, resulting in a 2:1 reduction in die size, plus significant improvements in efficiency, according to National.



The LM196 is said to have performance features equal to or better than existing lower power IC regulators, specifically: internal reference is trimmed on-chip to better than 1% accuracy, which simultaneously reduces temperature drift to a typical value of 0.003%/°C; TC is guaranteed to 0.01%; maximum junction temperature is 200°C in the power transistor; 45 W power dissipation at a case temperature of 125°C.

For further information contact Ed Schoell (03) 729-6333 or Chris Mason (02)439-6455.

NOTE ON THE CORE-BALANCE RELAY ETI-567

A reader has drawn to our attention a problem he experienced when using the core-balance relay with a long lead plugged into its output where a number of fluorescent lights were operating nearby. The core-balance relay would not trip on test with loads over about 25 watts. On investigation, he found severe RF noise generated by the fluorescent lights was preventing the unit's trip circuit from functioning. Looking at each end of L3 (secondary of T2, the sense transformer) using an oscilloscope, he found high amplitude noise on each, but of markedly differing amplitudes. The cure is simple — a 4n7 capacitor connected directly across L3. The unit still functions as designed, even with highly inductive loads plugged into the output. Our thanks to Bill Waters for passing that on.

NEWS digest

Electric vehicles — for governments and people!

The first electric vehicle to be tested for use by the NSW State Government, a van manufactured by Silent Power Pty Ltd, was recently delivered to the NSW Energy Authority.

The NSW Government will eventually receive nine electric vehicles as part of its Electric Vehicle Programme, designed to rationalise and conserve energy within government departments. Electric vehicles are being considered particularly for application in short-distance delivery situations.

The Silent Power van can be equipped to seat four people or two people and a small cargo. It has a range of 40-45 km or more in a single battery charge, and is powered by the mains electricity supply of 240 V. It is recharged by connecting the power source to a socket at the rear of the vehicle.

Meanwhile, up on the Gold Coast Vic Jones, a retired salvage operator, has become the first private individual in Queensland to own an electric vehicle. He bought the Silent Power van because he felt that someone had to be a 'trend-setter' and bring an alternative energy source into the realm of private life.

The South East Queensland Electricity Board has been in close liaison with Mr Jones, and has agreed to provide technical advice and assistance regarding the van; it will also install a separate metered power point so that exactly how much electricity the van uses can be measured.

Vic Jones is so far extremely pleased with the performance of his electric van, in particular with the on-board battery charge, which allows him to charge up at any power point. He said of the vehicle, "It is smooth, silent and has plenty of power in traffic. It is beautifully finished, the driver's vision is good, and it has all the comforts and luxuries of a petrol car."

The vehicle will eventually be equipped with longer range batteries, which will make it eminently suitable for Gold Coast/Brisbane travel, according to the SEQEB.

According to Vic Jones, nothing can beat this 'plug-in' transportation.

Hitachi probes deeper

Hitachi Denshi Ltd have recently released a new probe, AT 100 AG 1.5, as an accessory for their range of oscilloscopes.

The AT 100 AG 1.5 is a 100 to 1 and 10 to 1 switchable device usable up to 35 MHz. The input impedance is 100 Mohm on 100 to 1 and 10 Mohm on 10 to 1 setting. It is rated at 1000 Vdc, and is fitted with a 1.5 m cable and BNC connector.

Hitachi reckon that this new probe will be particularly useful to field technicians, laboratory engineers and TV servicemen.

The probe is available from Standard Components Pty Ltd, 10 Hill St, Leichhardt NSW 2040, for $76 plus tax.

Books for the student, or your reference library

Two recent releases from the McGraw-Hill Book Company Australia Pty Ltd should be of interest to students embarking on an electrical trades or electronics/communications trades course.

Both books would also be valuable reference works for the keen hobbyist, experimenter or radio amateur.

Electrical Principles for the Electrical Trades by J.R. Jennison, a lecturer at the Regency Park Community College, South Australia, is the theory text recommended Australia-wide by the National Core Syllabus Committee in Electrical Trades. The book consists of seventeen chapters, covering units and physical quantities, fundamentals of electricity, primary and secondary cells, dc circuit analysis, magnetism, electromagnetic effects, generation of emf, dc machines, fundamentals of alternating current, ac circuit analysis, multi-phase generation and distribution, three-phase synchronous machines, three-phase induction motors, single-phase motors, transformers, rectifiers and filter circuits and electrical measuring instruments. Also included are exercises, problems and mathematical tables.

The text is well written and clearly set out. The subject treatment is traditional (starting at the electric charge and the structure of matter, etc). The text is copiously and clearly illustrated using both photographs and line drawings. The book is 378 pages long and bound with a stiff card cover. It measures 210 x 280 mm. Price is $9.95.

Electrical and Electronic Drawing by James F. Lowe, head teacher of Electrical Trades at the Newcastle Technical College, is a somewhat smaller tome running to 198 pages in a 182 x 240 mm format with a heavy card cover. It is the third book in a series of three on drawing and drawing techniques for electrical and electronics students.

The text of Lowe's book is also very thorough and clearly written. He has made copious and effective use of photographic illustrations along with line drawings and second colour. Practical examples are used to illustrate various techniques of drawing and design. Some knowledge of electrical and electronic principles is assumed, but background to the processes of which the drawings are part and parcel is explained in detail. An informative text, it covers units 23 to 33 inclusive of the relevant course. It introduces students to ink drawings and techniques and covers four broad areas of electrical drawing design: motor starter and controller diagrams, switchboard layout and wiring diagrams, electronic circuit drawing and design, and printed circuit artwork production.

Energetic water?

The world's cleanest fuel, hydrogen, could be produced from one of the planet's most abundant resources — water — if scientists can find a cheap and reliable method of extracting it using the energy of the sunlight.

The CSIRO's Division of Applied Organic Chemistry in Melbourne is engaged in a study of recently discovered combinations of chemical compounds which cause hydrogen bubbles to form in water under the action of light.

The key compounds act as catalysts; they trigger the production of hydrogen from water using light energy, but are not involved in the chemical reaction themselves, and in theory should therefore last almost indefinitely. The CSIRO team specialises in finding out why the reality does not match up to the theory — why the formation of hydrogen eventually stops.

The only other energy source with similar potential is fusion power, which aims to duplicate the nuclear reaction which powers the sun. Like fusion power, hydrogen energy is not expected to provide a short-term solution to the world's energy problems, but one advantage of hydrogen energy is that it can replace fuels such as petroleum and natural gas in engines and power stations without the radical changes in existing technology required for nuclear fusion.

Another advantage of hydrogen is that when it is burned it turns back into water, thus virtually eliminating the pollution problems associated with most other fuels.

Christie Rand to distribute Sabtronics International products

Following the appointment of Christie Rand Pty Ltd of Sydney as sole distributor for Sabtronics International, Christie Rand have the following products for sale in either assembled or kit form (they say kits can be easily built within one evening):

● 0.1% Digital Multimeter 2010 — this measures dc and ac voltage in five ranges from 100 μV to 1000 V, with 0.1% accuracy on dc and 0.55% accuracy on ac. On dc and ac current there is similar accuracy, with measurement in six ranges from 100 nA to 10 A. The 2010 has several other useful features, and costs $138 including tax in kit form and $161 including tax assembled.

● 600 MHz Frequency Counter 8610 guarantees 10 Hz to 600 MHz, with a claimed typical performance of 5 Hz to 750 MHz. Its price is $202.40 with tax for the kit, $225.40 assembled.

Christie Rand also expects to be marketing the following items in the near future:

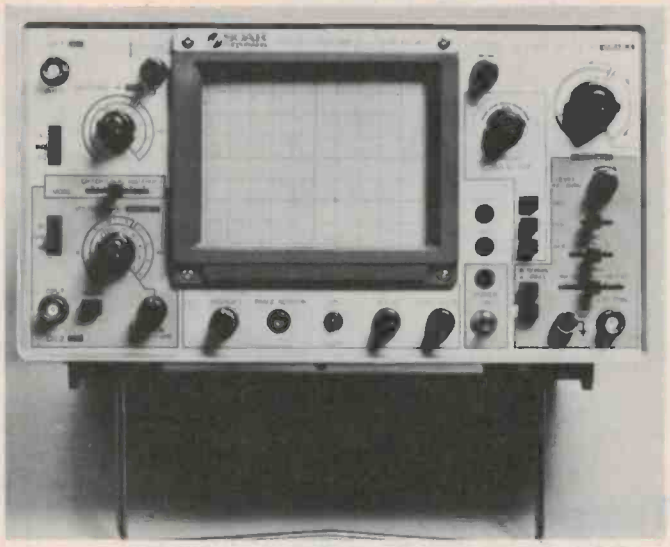
● 1 GHz Frequency Counter 8000 — the 15 mV - 30 mV sensitivity will resolve 10 Hz at 1 GHz, with an aging rate of ±5 ppm/year. Price for the kit will be $534.75 including tax, assembled $563.50 including tax.

● Function Generator 5020: the specifications are for 1 Hz to 200 kHz in five ranges, sine, square and triangle wave. It costs $230 in kit form including tax, $253 assembled.

For information on any of these products contact Christie Rand Pty Ltd, P.O. Box 48, Epping NSW 2121. (02) 477-5494.

ERRATA

A rather obvious, but potentially dangerous error occurred in the circuit on the top left of page 60 ('Power Monitor') in the March issue. It shows the mains active input connected to the earth at the output. The mains active input should instead go to the fuse. Correct your copy now. Correction slips were inserted in the majority of copies distributed.



New range of Japanese oscilloscopes soon available

GFS Electronics of Victoria have announced the imminent release of a range of five oscilloscopes, including a portable, from the Japanese SOAR Corporation.

All models use rectangular CRO tubes with a built-in graticule, which gives high resolution and brightness with a minimum of parallax error; all are dual trace and supplied with dual x1 and x10 probes. A front-panel-mounted trace rotation control is fitted to allow easy compensation for variation in terrestrial magnetism.

The models in the range are the MS-3015 (a portable), MS-6020, MS-6021, MS-6040 and MS-6045.

For further information contact GFS Electronic Imports, 15 McKeon Rd, Mitcham Vic. 3132. (03)873-3939.

Solar cell sun tracker

A novel tracking device that locates the sun and controls drive motors to keep a solar collector facing it has been invented by Burrel E. Hammons of Sandia National Laboratories, Albuquerque, New Mexico.

The device's shape partially shades four of eight small solar cells mounted on the sides and the base of a small, square pedestal when the solar collector is properly oriented to the sun. Until this spot is reached, unequal voltages from the cells cause the drive motors to move the solar collector until the voltages are equalised.

A ninth cell, mounted atop the pedestal, deactivates the tracking mechanism when the sun is obscured.

The simple and inexpensive device boasts unmatched tracking accuracy on a clear day — to better than ±0.1° — and the ability to find the sun even when the collector is facing away from it.

NEWS digest

Temperature-controlled soldering station from Weller

Claimed to be technologically the most advanced soldering station on the market, the Weller EC2000D has been released by the Cooper Tool Group.

Tip temperature range from 175°C to 450°C may be selected and locked at any desired temperature by the operator. Actual tip operating temperature is displayed on a three-digit LED digital display to within 1°C.

Innovative technology ensures that the tip temperature is maintained at the desired setting.

The EC2000D is ideal for delicate and precision soldering applications and where continuous use is necessary. Soldering pencils are interchangeable without recalibration of the temperature setting, allowing complete versatility in use.

Safety features of the EC2000D include a circuit breaker to prevent overloading, non-burning rubber silicone iron cord, ceramic-filled iron elements for long life and durability, and an unbreakable, high-impact flame retardent plastic housing.

For further information contact a Weller distributor or the Albury sales office of the Cooper Tool Group at P.O. Box 366, Albury NSW 2640. (060) 21-6866.

Intelsat to purchase more satellites

With the first of its Intelsat V satellites only launched on December 6 1980, the Intelsat organisation has decided to purchase three advanced Intelsat V-A satellites. These will be in addition to the nine satellites planned in the Intelsat V series.

According to Intelsat, the new satellites will be required to enable the organisation to cope with the world demand for satellite communications, which is doubling every three or four years.

The Intelsat V-As will be basically similar to the Vs, but will incorporate modifications and improvements to increase reliability and boost their communications carrying capacity by 25% — from 12 000 to about 15 000 simultaneous telephone calls plus two television programmes.

The cost of the three satellites, to be manufactured by Ford Aerospace and Communications Corporation and an international team of contractors, will be approximately US$100 million.

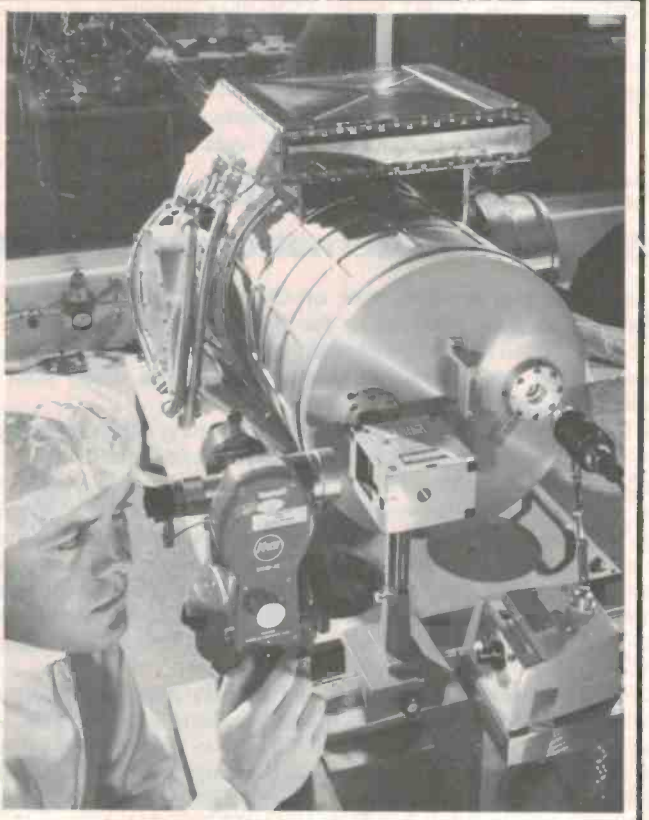
Sky spy!

As Europe's first authority to do so, West Germany's post office, the Bundespost, has started a radio-monitoring service that keeps tabs on satellite-based transmitters from a ground terminal in Leeheim, near Frankfurt.

A Siemens-built antenna system spots, tracks and identifies communications satellites and determines their orbits and their transmitters' frequency, polarisation, and radiated power.

With the increasing number of communications satellites aloft — around 200 at present — this monitoring task is becoming more and more important to ensure that satellite operators keep the transmitters adjusted to the assigned specifications and thus to prevent interference with other radio communications.

In its present configuration, the Leeheim antenna system monitors three frequency ranges: from 130 MHz to 1.3 GHz, from 1.5 to 2.3 GHz, and from 10.95 to 11.8 GHz. Later, the system will cover the entire 130 MHz to 13 GHz range.



INFRARED SENSOR TO DETECT MISSILES IN SPACE

An optical engineer carries out final checks on a new type of infrared sensing spacecraft, soon to be sent to an altitude of about 100 nautical miles, from where it will scan a wide area of space. Its main purpose will be to detect and track ballistic missiles by the infrared radiation they emit and so to provide as early a warning as possible of any such missile launch.

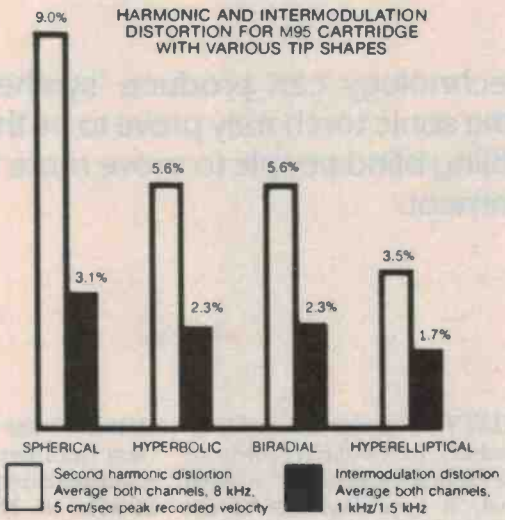
When the sensor has carried out its work it will fall into the sea after a slow parachute descent, from where it will be recovered to be used again.

The sensor has been developed by Hughes Aircraft Company, California, under contract to Boeing Aerospace, and will form part of a US Army programme.

fact: dramatic freedom from distortion comes to a mid-priced cartridge: the new Shure M95HE...

an affordable, audible improvement

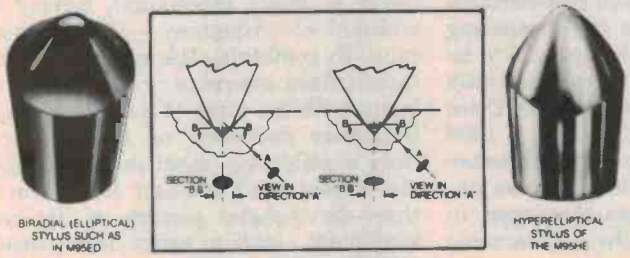
One of the critically acclaimed advances introduced in Shure's incomparable V15 Type IV pickup is its revolutionary and unique distortion-reducing Hyperelliptical stylus. Now, you can enjoy this standard of sound purity in a new, ultra-flat frequency response, light tracking, high trackability cartridge that will not tax your budget: the new Shure Model M95HE.



a measurable drop in distortion

As a result of the optimized contact area of the Hyperelliptical tip, both harmonic distortion (white bars in graph above) and intermodulation distortion (black bars) are dramatically reduced.

the Hyperelliptical stylus tip



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Radar for the blind

James W. Park

Until technology can produce 'synthetic vision' for the blind, the sonic torch may prove to be the practical answer to enabling blind people to move more freely around their environment.

THE ABILITY to sense the environment accurately, particularly within an immediate neighbourhood of around five metres, is a prerequisite of the mobility and lifestyle of the higher animals, including man. In man and many of the primates the sense of sight is the most important of the senses providing information about the environment; hence the incapacitation and relative helplessness of the blind.

Other species of mammals, however, rely chiefly on different senses, and in considering the problems of the blind the bat becomes particularly relevant.

Most species of bats are totally blind in the visual sense, but achieve an awareness of their surroundings in great detail by emitting high frequency sounds (many of them above the frequency range of human audibility) and listening to the echoes received from nearby objects. In the ocean dolphins and whales also use sophisticated high frequency echo-location, although aided by actual vision.

In this electronic age it is not too difficult to see the possibilities for the blind in an adaptation of this 'sounding' system for recognising the environment. As a principle, using radio waves, radar has been developed over the past forty years, mainly for locating the position of aircraft and ships, so echo-location for the blind is not drawing on totally innovatory ideas.

In adapting the principles of radar as an aid for the blind it became apparent that over the short distances involved (less than ten metres), sound waves of ultrasonic frequency, say in the range of 20 kHz to 100 kHz, were more convenient than radio waves. This is mainly because of the much lower speed of propagation of sound waves — 340 metres per second as compared with 300 million m/sec for radio waves. The method of echo-location using ultrasound is therefore similar to that used by the bat except that the echoes have to be translated into frequencies audible to the human ear.

The most practical and cost-effective way of converting the bat's sounding system to human use has proved to be the 'sonic torch'. The first commercially produced device was developed by Ultra Electronics in the UK, and about 1000 of these units were manufactured before it went out of production. Now an improved 'torch' has been developed in Melbourne, called the Radarsonic Lantern.

Weighing less than 350 g, the Lantern is hand-held like a normal torch. A beam of ultrasonic energy radiates from the front of the unit, much like the beam from a flashlight, and the small fraction of this energy reflected from objects in the path of the beam is detected and converted into audible sound in a listening device worn either in the ear or on the lapel.

The sound heard takes the form of a series of 'beeps', each lasting a quarter of a second and separated by a silent period of about 20 milliseconds (.02 sec). If the Lantern is pointed directly towards a hard, flat surface like a door or a plate-glass window a few feet away, the beeps are heard as strong, pure tones. The pitch or frequency of the tones is a direct measure of the distance separating the Lantern from the reflecting object.

A blind person can therefore determine the lateral separation of objects in his vicinity by sweeping the 'direction of gaze' of the instrument either vertically or horizontally. The beam is fairly directional, having a width of +/− 8 degrees — 16 degrees in total. By combining the information obtained from sweeping or scanning the beam with the pitch of the beeps (beep frequency decreases as the distance from a reflecting object decreases and vice-versa), the blind user can obtain a three-dimensional picture of his environment, with a range from about 10 mm to 6 m.

Further differentiation of the surroundings is provided by the variation of the beeps. They are not always heard simply as pure audio tones, but for different reflecting surfaces take the form of chirps, tweets, warbles, swishes, etc. With experience the blind person can learn to distinguish between many different features of his environment.

A blind American, Fred Gissoni, experienced in the use of a sonic torch, clearly describes the effectiveness of this aid to the blind:

"Once, while demonstrating the use of the aid in a room which was totally unfamiliar to me, I was asked to walk about the room describing objects that I found. I was able to walk about finding clear aisles, chairs and doorways. Suddenly near the centre of the room I found an object which gave a most curious set of signals. Against my better judgment I described the object as giving the impression of being a table but at the same time having a fence in the middle of it. This description was greeted with a combination of laughter and applause. The object I was examining was a ping-pong table.

"Another time, again in an area which I was visiting for the first time, I was asked to point the aid at an object and describe what I observed. After a few seconds I said that the impression I received was of a rock fence with foliage sticking through it. Upon examining the object by touch I found it to be just that: a rock fence with foliage sticking through it."

Gissoni also describes how he developed a memory bank of sounds, not necessarily restricted to the sound of an individual beep. For example, when standing at the foot of a flight of steps and scanning the beam upwards, the frequency of the signal increases in steps (rather like a musical scale), and this kind of effect is soon memorised.

When walking at a normal pace and carrying the aid in a natural position so that it points forwards, all stationary objects in the path of the beam will cause the pitch of the beeps to fall with closer approach. The presence of a constant frequency signal in this situation could indicate another pedestrian walking ahead at the same pace, and of course the absolute pitch of this signal would indicate how far away he or she was.

Better than such written examples of the use of the Lantern are tape-recorded demonstrations or, best of all, actually listening to the signal while handling the Lantern. The blind are therefore best trained to use the device by an interested sighted person, using a set of printed instructions supplied with each unit. There are 16 illustrated lessons, each an hour long, and the sighted instructor simply directs the blind pupil through a series of exercises of increasing difficulty.

After the first quarter of an hour the blind person can already use the aid as a simple obstacle detector, and after ten hours of training can easily perform such tasks as locating and picking up small objects like a ball of string or even an envelope lying on a table. The instrument can sense and discriminate very small objects, for example being able to detect and render identifiable a pencil at a distance of 2 m, making the Lantern a true and extremely efficient environmental sensor.

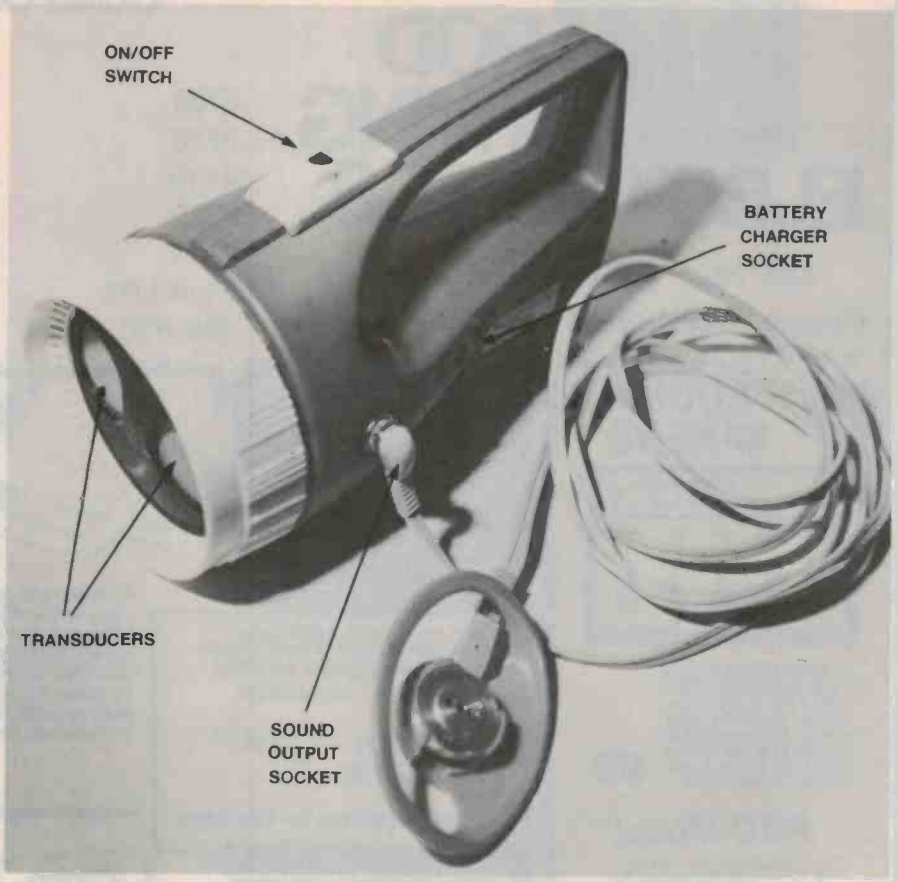

Figure 1. The Radarsonic Lantern.

In summary, there are four features of the sonic torch which the blind user combines to form a mental picture of his environment:

1. The lateral discrimination inherent in scanning a narrow beam;
2. The range or distance information provided by the pitch or frequency of the beeping tone;
3. The quality or timbre of the signal showing characteristics of the reflected surface;
4. The intensity or loudness of the signal — this gives some information on the extent of the reflected surface, and will also vary when the angle of the instrument's 'direction of gaze' is altered with respect to a reflecting surface, the loudest signal being received when the Lantern is pointed in a direction perpendicular to the surface.

Technical details

Although the blind user has no need to be aware of the technical details of the Lantern's operation in order to use it effectively, they are easily explained and illustrated.

The Lantern has an overall length of 165 mm, weighs 330g, and is housed in a moulded high-impact plastic case with carrying handle. Power is supplied by a self-contained 9 V rechargable nickel-cadmium battery of 150 mAh capacity. Current drain during operation is nominally 24 mA, so that a fully charged battery provides six hours of operation. A small battery charger is supplied with the Lantern, which will fully charge the battery in 15 hours.

Two ultrasonic transducers (one transmitting and one receiving) are housed in the front of the unit (see Figure 1); these are electrostatic types, identical for transmit and receive. They require a dc bias voltage of 150 V, which is supplied by a six-stage diode/capacitor voltage multiplier driven from the ultrasonic transmit amplifier (see Figure 2).

The electronic components include 11 bipolar transistors, one FET and two integrated circuits. These and associated resistors, capacitors, etc. are mounted on two printed circuit boards contained within the rectangular portion of the case (see Figure 1). The battery is housed to the rear of the pc boards.

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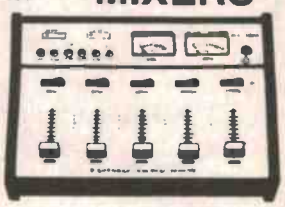

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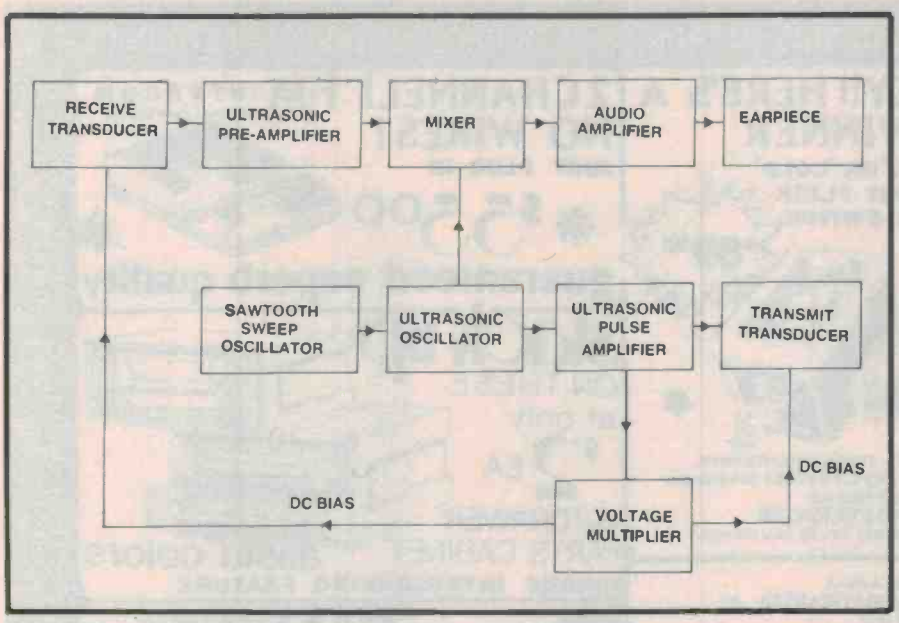

Figure 2. Block diagram of how the Radarsonic Lantern works.

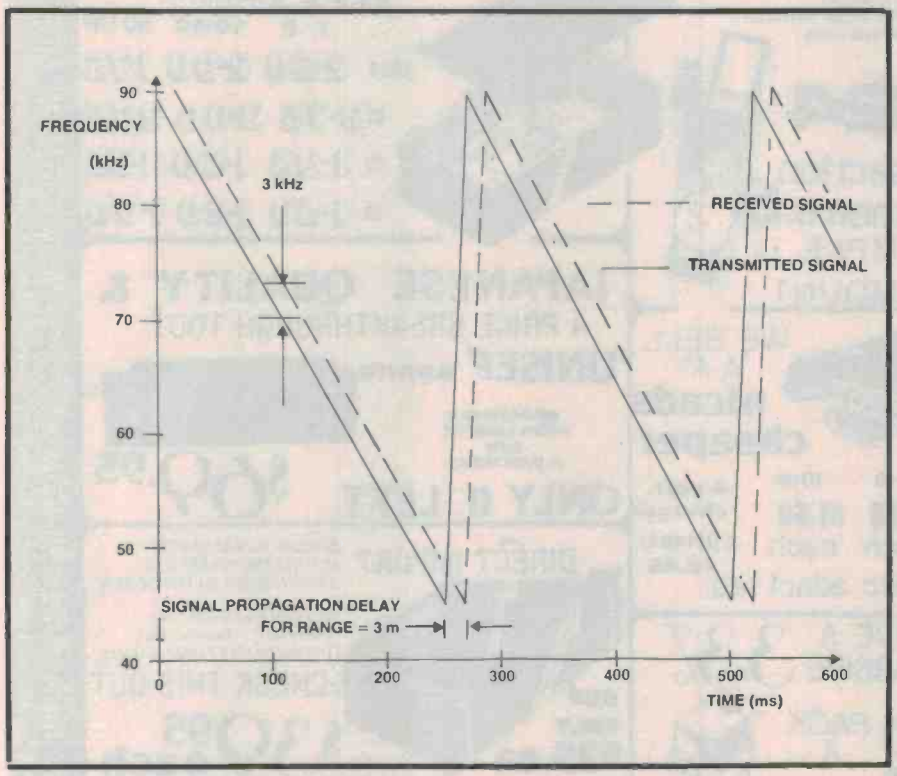

Figure 3. Transmitted and received signals.

ON/OFF switch on top of the unit and a sound volume control on the right hand side. On the left hand side of the case are the two sockets for the earpiece and the battery charger.

The unit is basically a frequency-modulated radar set, and the principle of operation may be explained easily with reference to the block diagram of Figure 2 and the graph of Figure 3.

The sweep oscillator (see Figure 2) produces a sawtooth sweep voltage having a rise-time of 250 ms and a flyback time of 20 ms. This voltage frequency-modulates the ultrasonic oscillator, causing its frequency to sweep downwards from 90 kHz to 45 kHz and then to return, as shown by the unbroken line in Figure 3. The ultrasonic oscillator is simply a two-stage multivibrator with constant current stages supplying timing currents. These constant current stages are controlled by the output of the sweep generator.

The broken line in Figure 3 shows the frequency of the echo signal reflected from a flat, vertical object 3 m from the Lantern. It will be seen that during the 250 ms duration of the sweep there is a frequency difference between transmitted and reflected signals of 3 kHz. The echo signal is detected by the receive transducer, amplified and fed to the mixer (which uses an MPF104 FET). Since the transmitted signal is also fed to the mixer (see Figure 2) there appears at the mixer output the difference frequency of 3 kHz. This signal, being in the audio range, is amplified by the audio amplifier and fed to the earpiece, thus producing the beeping sound characteristic of the device.

A variation in the distance of the reflecting object from the Lantern alters the time-lapse between transmission and reception, with a subsequent proportional variation in the difference (audio) frequency.

Obviously, two reflecting surfaces at different distances but both within the lateral width of the beam will produce two quite clear audio frequencies. In the buzzing confusion of the real world, surrounded by objects both stationary and moving, of various shapes and surface textures, very complex intermodulation of the audio signals results, and the signal heard is far removed from the pure tone situation illustrated in Figure 3. However, although it would be difficult to differentiate all these signals analytically, after some experience with the Lantern the blind person learns to memorise and discriminate between the various sounds heard, and to know from the quality or timbre of the beep exactly what he is confronting.

As presently supplied the Lantern contains commercial quality components of temperature rating 0 to 70 degrees C, and the battery is expected to operate over the range 0 to 50 degrees C. The instrument might therefore fail in sub-zero temperatures. It is suitable for operation in the rain, but cannot withstand immersion. These conditions, however, are fairly common for commercial electronic products, and permit consistently reliable operation in Australian conditions as well as in the majority of conditions in most other countries. The cost of the Radarsonic Lantern in Australia, including battery charger and training lessons, is $300.

The ultimate technological solution to the plight of the blind may be the provision of 'synthetic vision' by coupling some kind of minute television camera to electrodes implanted in the brain. Research in this area is still in a very primitive stage, however, and until such a solution is feasible, the sonic torch may well be the most practical aid yet developed to help the blind. ●

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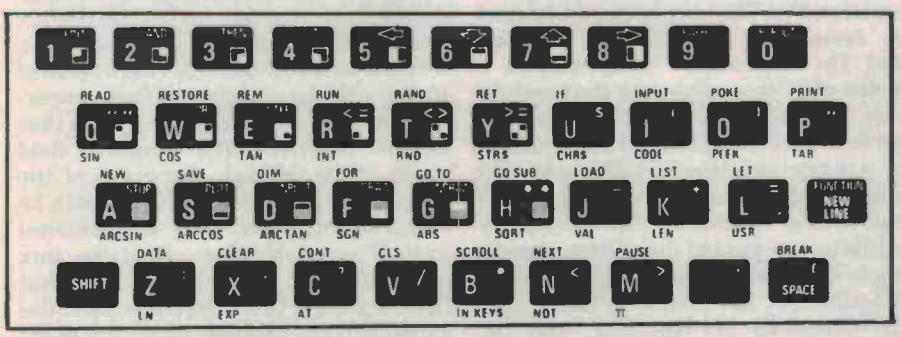

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EA5

Superconducting magnetic sensors

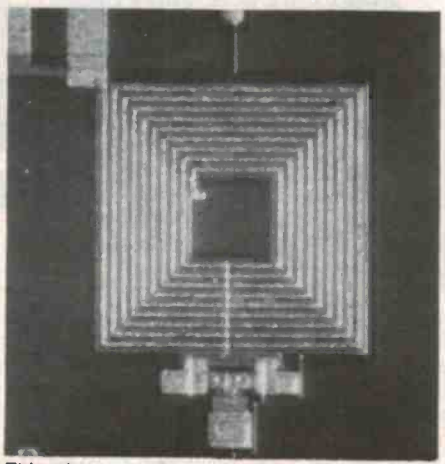
Scientists at the IBM Thomas J. Watson Research Centre have constructed experimental superconducting magnetic sensing devices whose operating characteristics approach limits imposed by fundamental laws of physics.

THE PROMISE of an increase of two orders of magnitude in sensitivity is spurring on research into new magnetic sensing devices containing Josephson junctions. The devices belong to a family called SQUIDs, Superconducting QUantum Interference Devices, which employ superconducting metals that lose all electrical resistance at temperatures close to absolute zero (273 degrees Celsius below zero).

When incorporated in complete measurement systems, the devices could permit measurement of changes in magnetic fields as small as one millionth of a millionth of the field of the earth when those changes occur at frequencies above 10 kilohertz. Such measurement capability would represent a 100-fold increase in sensitivity over existing commercial measurement systems that use similar magnetic sensing devices, for a range of application areas that includes geophysics, biomedicine, and pure science.

SQUIDs have been used in measuring variations in the magnetic field at the earth's surface, which is important in searches for geothermal energy sources and minerals and possibly in earthquake prediction. They have been used in detecting heart and brain waves (magnetocardiography and magnetoencephalography). SQUIDs have also been used to make voltage comparisons to one part in 100 million and current comparisons to one part in 10^9. In addition, SQUIDs have played roles in attempts to detect gravity waves and in searches for quarks — fractionally charged particles believed to be the building blocks of elementary particles such as neutrons and protons. They have also been used in studies of magnetic materials. Significant improvements in SQUID performance thus have, potentially, both practical and scientific importance.

The advances discussed here were reported to the worldwide scientific community by several IBM research groups beginning early 1979 and have stimulated further work at IBM as well as elsewhere. The work relates to SQUID devices made using several different technologies.



This shows a 10-turn square spiral input coil coupled to a SQUID (Superconducting Quantum Interference Device). The structure just below the coil in the photo contains the Josephson tunnel junctions that are the basis for the SQUID operation. The coil is approximately 175 micrometres (0.007 inches) wide.

Fabrication of the "Josephson tunnel-junction" SQUIDs relies heavily on technology developed in the long-term IBM research effort to build a laboratory prototype superconducting computer that uses related SQUID devices in experimental memory and logic circuits. Those lead-alloy tunnel-junction SQUIDs, designed and studied by researchers Dr. Mark B. Ketchen and Dr. Richard F. Voss, showed a factor-of-30 less noise than the previous best example of such a device. This performance has recently been equalled by a tunnel-junction SQUID made with a different technology based on superconducting niobium that moreover exhibits exceptional durability, according to IBM researchers Voss, Dr. Robert B. Laibowitz, Dr. Stanley I. Raider and Dr. Christina M. Knoedler, and Dr. John Clarke of the University of California, Berkeley.

Yet another SQUID technology involves IBM's recently achieved ability to construct the world's narrowest metallic stripes (as little as eight nanometers wide) with high-resolution, electron-beam lithography. The resulting ultra-small "nanobridge" SQUIDs, also fabricated out of the superconducting metal niobium, display a factor-of-two improvement over the above tunnel-junction SQUIDs when measured at a temperature of 4.2 degrees above absolute zero. This was the work of Voss, Laibowitz, and Dr. Alec N. Broers.

Technical background

The SQUIDs discussed here consist of two Josephson elements connected together in a thin-film ring of superconducting metal. Each Josephson element has two superconducting electrodes that are separated by a "weak link", either a very thin layer of insulator that is placed sandwich-like between the electrodes (to form a tunnel junction), or an ultra-small superconducting stripe connected between coplanar electrodes (to form a nanobridge). These weak links give rise to so-called Josephson coupling effects by allowing supercurrents of electron pairs to "tunnel" or pass from one electrode to the other, up to some maximum supercurrent.

SQUID operation is based on such Josephson tunnelling and magnetic-flux quantisation. In the latter phenomenon, when a superconducting ring is placed in an external magnetic field, supercurrents are set up in the ring such that the net magnetic flux (magnetic field times area) through the plane of the ring takes on values that can only be integral multiples of a fundamental unit of magnetic flux called the flux quantum. The essential point is that fields external to the SQUIDs affect the supercurrents through them: the fields change the maximum amount of supercurrent that can exist in the SQUIDs.

Currents greater than this critical supercurrent cause SQUIDs to enter the nonsuperconducting or voltage state.

In a complete measurement system, an input coil is used to extend the versatility of the SQUID for measurement of quantities such as voltage and current as well as to optimise magnetic-field measurements. Overall system performance, or sensitivity, thus depends on the input circuit as well as the SQUID. Achievement of near-ultimate low noise levels in SQUIDs consequently increases the importance of optimising the input circuit for the purpose of improving overall system measurement sensitivity.

IBM researcher Ketchen, together with Mr. Jeffrey M. Jaycox, an MIT graduate student working at IBM, most recently reported such an optimised input coupling scheme. They devised and tested a method for lithographically constructing a lead-alloy thin-film multiple-turn coil directly above a SQUID loop. The input coil is in the shape of a square planar spiral. A lead-alloy SQUID and a tightly coupled 100-turn input coil occupy an area of approximately two square millimetres.

Noise is the ultimate limit to the sensitivity of a SQUID sensing device. It can result, for example, from random motion of electrical charge produced by the thermal agitation at elevated temperatures. But even at absolute zero, noise still exists as so-called zero-point fluctuations, a manifestation of the uncertainty principle of quantum mechanics. Indeed, the IBM researchers showed that the noise in the niobium nanobridge SQUID is only somewhat greater than the limit set by fundamental physical theory.

In agreement with circuit theory, SQUID-noise reduction was a result of decreased size of the Josephson elements as well as optimisation of circuit parameters. The cross-sectional area of the weak links in the nanobridge SQUID (that is, the cross-sectional area of the metallic stripes) was 0.001 square micrometres. For the lead-alloy tunnel junctions, the weak-link or insulator area was 10 square micrometres. Finally, for the niobium tunnel junctions, the weak-link area was 1.0 square micrometres.

The reported low-noise behaviour has been demonstrated only when magnetic-field changes occur at relatively high frequencies (10 kHz to 100 kHz). At sufficiently low frequencies, performance of all devices is degraded by the presence of so-called 1/f noise. Such noise (read "one over f noise") becomes more and more pronounced as the frequencies of the magnetic-field changes decrease.

Measurements of the 1/f noise have been made for the lead-alloy SQUID by Ketchen and Dr. Chang C. Tsuei. This noise was found to be comparable to that in commercially available SQUIDs, indicating that the strength of the IBM SQUIDs is in their higher frequency performance. The origins of 1/f noise are not well understood. Continuing research on these SQUIDs could improve our understanding of the origin of that noise. ●

Supercooled AD converter produces 6 bits at 2 GHz rate

Researchers at the National Bureau of Standards in Boulder, Colorado, have succeeded in building an experimental Josephson analog-to-digital converter capable of two billion 6-bit samples per second — the highest conversion rate ever achieved.

The converter, built of Squids (Supercooled Quantum Interference Devices), works like a flash converter but uses only six elements (rather than 36) and fits on a 1 sq. mil. silicon die.

A study has shown that an 8-bit part operating at somewhat lower rates is also feasible. The lab setup — consisting of a 2 GHz. sine-wave generator, sampling scope, transmission lines and refrigerator — cost about US$60-000.

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Series 5000 stereo control preamplifier

Part 1.

Designed as the 'perfect partner' to our Series 5000 MOSFET stereo amplifier, this preamp offers many unique features.

David Tilbrook

IN DESIGNING the Series 5000 Stereo Control Preamplifier we have had to look closely at the facilities and options available on existing preamplifiers. The concept that evolved was to design a preamplifier with the accent on versatility and control. We judged that most Series 5000 components will be built by those interested in high quality sound, who will therefore spend a considerable time taping, either from source material or dubbing from one deck to another. The preamp should therefore offer good facilities for taping and tape dubbing.

Tape facilities

Two tape inputs have been provided, either of which can be selected as a source input or used through a conventional tape monitor circuit. Dubbing from one deck to another is simply a matter of selecting the playback deck as an input and selecting the record deck with the tape monitor facility. Now if a tape deck were put into record mode and then selected as a source, its output would be connected via the preamplifier back to its own record input. This forms a feedback loop that would lead to oscillation, probably within the audio spectrum and at full power. To prevent this, this preamplifier automatically mutes the record output to any tape deck that is selected as a source input. If any other source is selected the muting is removed. Thus, both decks can be used simultaneously to record source material.

Metering

Another facility that is *essential* for high quality taping is a really good set of level meters. Unfortunately, those supplied on most cassette and reel to reel decks are of the −20 to +3 VU type and as such are poor indicators of the true audio level. To overcome this problem the Series 5000 Preamp has been provided with two wide dynamic range LED level meters, each with 3 dB resolution and covering the range −48 to +9 dB, so a dynamic range of 57 dB can be displayed. The LED level meter displays *both the peak and the average* of the audio signal at any instant, with the peak indicator having a rapid-attack/slow-decay characteristic that ensures any transient can be easily seen on the display. The prototype has been tested with single pulses and even with pulses as short as 50 μs the transient was accurately recorded and easily spotted.

A 400 Hz sinewave oscillator is also provided and is selected by one of the positions of the tape input selector. This enables calibration of 0 dB on the LED level meters to match the 0 dB reading on the tape deck meters.

This LED level meter will also be valuable in many other projects where accurate monitoring of an audio signal is required. For this reason we have given it a separate project number (ETI-458). Full details were given in the June issue, so many constructors may already have built the LED level meter.

The preamplifier is provided with both *master* and *monitor* volume controls. The master control varies the output to the LED level meters and to the line and tape outputs. In this way the record level can be adjusted. The monitor volume control varies the signal level on the monitor output. Normally the power amplifier would be connected to this output so that the volume can be adjusted without affecting the record level. If the monitor level control is turned fully up, however, and the master control used as the main volume control, the LED level meters indicate the output level below 1.2 V, which corresponds to full power from the power amp. So, in this configuration, the LED level meters function as output level indicators, with full power before clipping occurring at 0 dB.

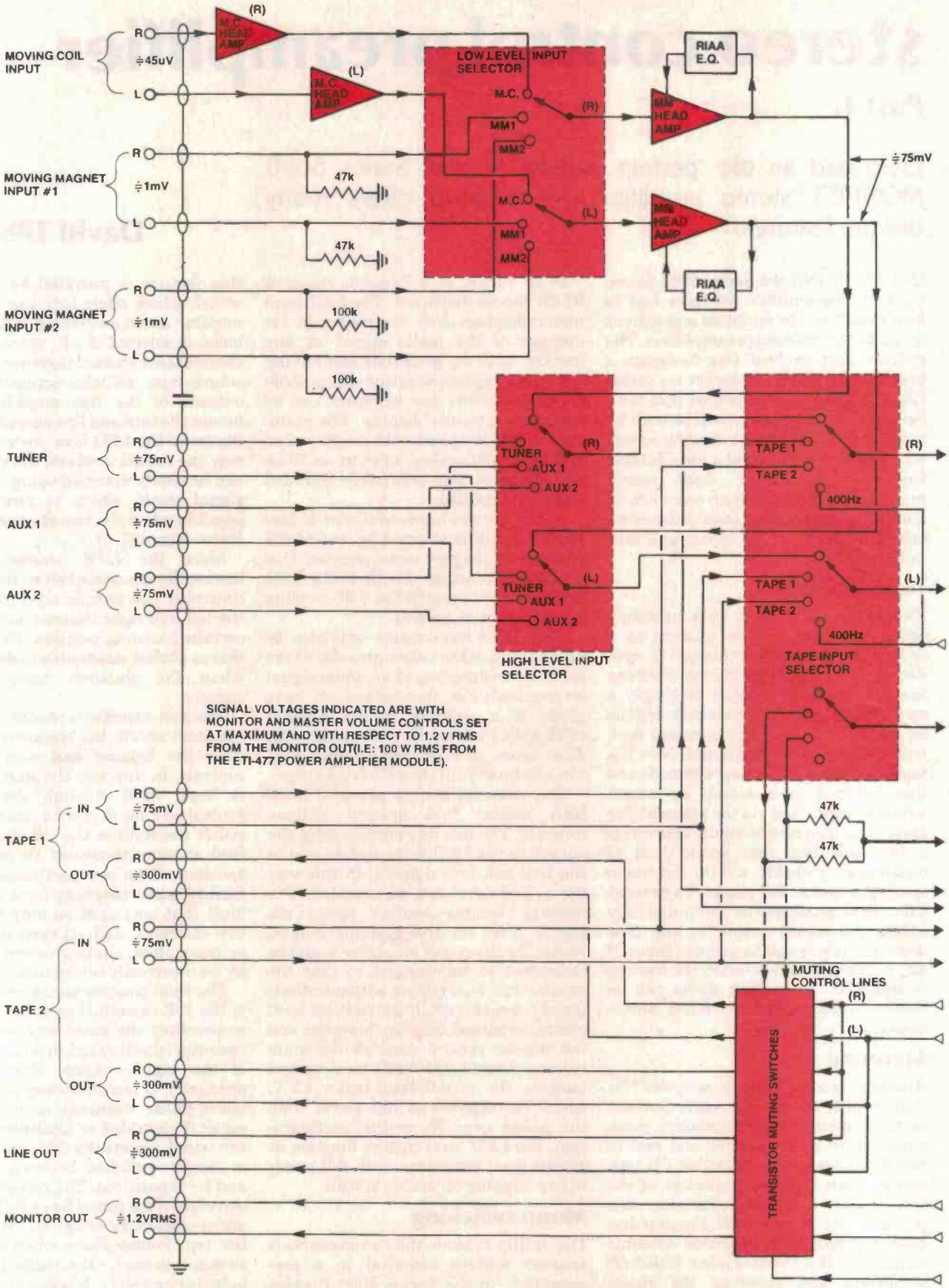
Mono switching

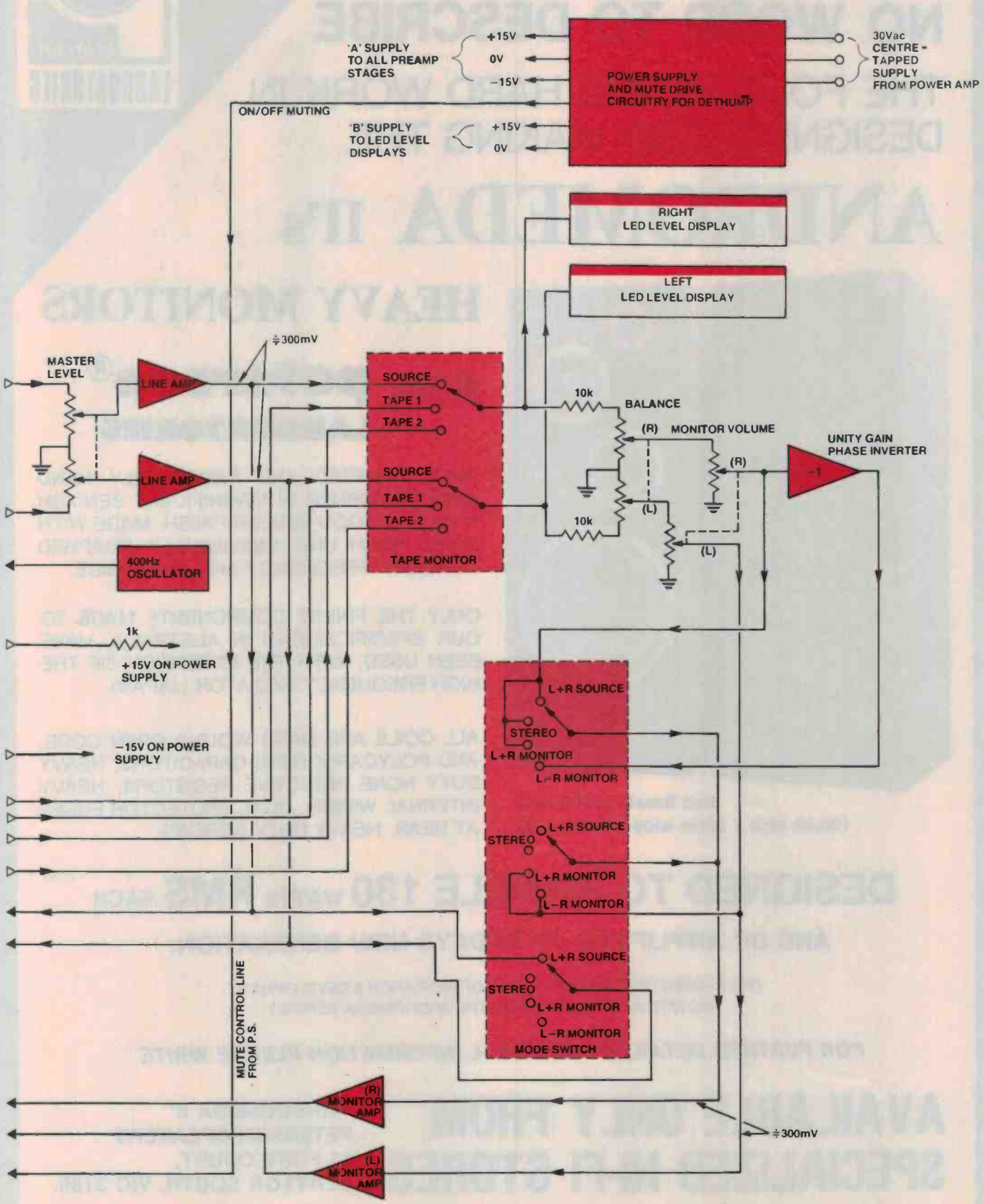
The ability to mono the two channels is another feature essential in a preamplifier. In the Series 5000 Preamp this feature is provided by the *mode* switch which offers both pre- and post-monitor mono switching. If the source mono is selected (L+R, source) the two channels are shorted together before the source-tape switch, actually at the outputs of the line amplifiers. This monos the tape and line outputs, and the inputs to the LED level meters. In this way the record levels on the tape decks can be easily matched using the source signal itself, which is virtually impossible when the two channels have a stereo signal.

Since the L+R (source) position monos the channels before the balance control it can also be used to optimise the left and right channel balance for a certain listening position. Once again, this is almost impossible to do properly when the channels have different signals.

The post-monitor mono facility (L+R, monitor) shorts the channels together *after* the balance and monitor level controls. In this way the stereo content is kept valid through the balance control so that it can be used to select either the right or the left channel and feed it simultaneously to both loudspeakers. This is a particularly useful facility when listening for a suspected fault that may exist on only one of the two channels, such as cartridge faults, or more often, skating errors produced by an incorrectly set-up tone arm.

The final position on the mode switch is the L-R (monitor) position. This acts in precisely the same way as the L+R (monitor) position but inverts the phase of the right channel first. This is primarily to facilitate easy detection of out-of-phase channels such as would occur if cartridge or loudspeaker leads are wired incorrectly. The mode switch is simply switched between the L+R and L−R positions. The system is set up correctly if the sound has a full bass end and a stationary image in the centre of the two loudspeakers when the mode switch is in the L+R position. If the bass is better on the L−R position, however,▶


MOVING COIL INPUT
R
≒45uV
L
M.C. HEAD AMP
(R)
(L)
LOW LEVEL INPUT SELECTOR
M.C.
MM1
MM2
RIAA E.Q.
MM HEAD AMP
≒75mV
MOVING MAGNET INPUT #1
≒1mV
47k
MOVING MAGNET INPUT #2
100k
TUNER
AUX 1
AUX 2
HIGH LEVEL INPUT SELECTOR
TAPE 1
TAPE 2
400Hz
TAPE INPUT SELECTOR
SIGNAL VOLTAGES INDICATED ARE WITH MONITOR AND MASTER VOLUME CONTROLS SET AT MAXIMUM AND WITH RESPECT TO 1.2 V RMS FROM THE MONITOR OUT(I.E: 100 W RMS FROM THE ETI-477 POWER AMPLIFIER MODULE).
IN
OUT
≒300mV
LINE OUT
MONITOR OUT
≒1.2VRMS
MUTING CONTROL LINES
TRANSISTOR MUTING SWITCHES


'A' SUPPLY TO ALL PREAMP STAGES
+15V
0V
−15V
POWER SUPPLY AND MUTE DRIVE CIRCUITRY FOR DETHUMP
30Vac CENTRE-TAPPED SUPPLY FROM POWER AMP
ON/OFF MUTING
'B' SUPPLY TO LED LEVEL DISPLAYS
+15V
0V
RIGHT LED LEVEL DISPLAY
LEFT LED LEVEL DISPLAY
MASTER LEVEL
LINE AMP
LINE AMP
÷300mV
SOURCE
TAPE 1
TAPE 2
SOURCE
TAPE 1
TAPE 2
TAPE MONITOR
10k
BALANCE
(R) MONITOR VOLUME
(L)
10k
(L)
(R)
UNITY GAIN PHASE INVERTER
−1
400Hz OSCILLATOR
1k
+15V ON POWER SUPPLY
−15V ON POWER SUPPLY
L+R SOURCE
STEREO
L+R MONITOR
L−R MONITOR
L+R SOURCE
STEREO
L+R MONITOR
L−R MONITOR
L+R SOURCE
STEREO
L+R MONITOR
L−R MONITOR
MODE SWITCH
MUTE CONTROL LINE FROM P.S.
(R) MONITOR AMP
(L) MONITOR AMP
÷300mV

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then the system has an out-of-phase channel. The surest way to perform this test is to position the loudspeakers directly facing one another and approximately 50 mm apart. The bass should drop *dramatically* when the L−R position is selected.

Block diagram

The overall configuration of the Series 5000 Stereo Control Preamp is best seen by looking at the block diagram. The preamp has both moving coil and moving magnet cartridge inputs. The moving coil phono input is fed directly to a moving coil input preamplifier which amplifies the output of the cartridge up to typical moving magnet signal voltages. The *low level input* selector switch determines which of the three cartridge inputs is sent to the RIAA-equalised phono preamp stage. The output of this stage is around 75 mV for a 1 mV input signal to one of the moving magnet inputs. The *high level input* selector switch selects between the output of the phono preamp and one of three other line level inputs (the tape input and two auxiliary inputs).

The output of the high level input selector is fed to the *tape input* selector together with the two tape inputs and the output of the inbuilt 400 Hz oscillator. A third set of contacts on the switch is used to drive the *muting* transistors whenever a tape input is selected as a source.

The output from the tape input selector switch is fed through the master level control and line amplifiers to the tape and line outputs, and to the LED level meters and tape-source switch, through the balance and monitor volume controls and via the monitor amplifiers to the main monitor output.

The signal voltages shown on the circuit are with respect to a 1.2 V signal from the monitor output and with the master and monitor level controls fully up. In this condition the average signal voltages at the input to the LED level meters will be around 300 mV. Since the preamplifier is never run with the level meters off scale it is impossible for the preamplifier to overload any stage after the line amplifiers; this is another distinct advantage offered by the LED level meters. As stated earlier, typical signal voltages at the input to the master level control are around 75 mV for a 1 mV input signal to one of the MM inputs. Most moving magnet cartridges produce maximum output signal voltages of the order of 60 to 80 mV. Some higher output cartridges may produce signals as high as 120 to 140 mV but these are generally the exception. Allowing for a signal input voltage of, say, 140 mV, the output voltages from the main phono amplifier will be approximately 10 V RMS. So this stage must be provided with adequate supply voltage and slew rate capabilities so that overload cannot occur. Fortunately this is not particularly difficult, necessitating a supply voltage of around 15 V and a slew rate of approximately 1 V/μs.

A more detailed discussion of the slew rate requirements of phono stages will be included in part two of this series of articles on the Series 5000 Preamp.

Using op-amps?!

The basis of the Series 5000 Preamplifier is a new audio op-amp by Signetics, the NE5534N and its low noise complement, the NE5534AN. These devices are capable of truly *superb* performance. There is a popular misconception among audiophiles that op-amp stages cannot 'sound' as good as discrete designs. This undoubtedly has come about due to the introduction of some earlier amplifiers that used 741s, or similar devices, which are simply not suitable for audio applications. The noise performance of these earlier op-amps was mediocre and their slew rate figures were typically less than 1 V/μs. If we consider the output stage of a preamplifier, for example, the maximum output signal voltage from the stage is required to be around 1 V and this dictates a slew rate substantially higher than is possible from a 741 op-amp. The result is slew limiting distortion or TIM (transient intermodulation distortion).

The slew rate figures for the 5534, however, are *in excess* of 10 V/μs, giving the device a large-signal bandwidth of around 10 MHz and maintaining the open-loop gain at 10 kHz at greater than 6000. This is important since it ensures that the negative feedback loop of the stage will not be degraded at higher frequencies. The noise performance of the 5534 is equally good, being equal to or better than the best discrete input stages for input impedances above 1000 ohms.

In order to test the 5534, a high quality moving magnet input stage and a line amplifier stage were built with discrete transistors. Actually these stages were originally designed for the Series 5000 Preamplifier before the 5534s were available. These stages were compared with similar stages designed around the 5534s and both objective and subjective testing was carried out. Both the discrete and IC stages gave measured distortion figures less than 0.001% at all operating frequencies up to 20 kHz. The noise figures were similar and none of the stages gave any indication of slew rate limiting. The subjective testing was carried out by comparing the two phono amps and then the two line amps. The input signal was sent via a selector switch to the inputs of the two stages and the levels matched by potentiometers at the outputs. The wipers of the pots were then connected to a second set of contacts on the selector switch. This configuration allows both the input and the output of the unused stage to be disconnected from the circuit so that no possibility of interaction exists.

After many hours of experimenting with this circuit we were *still unable to determine which stage was operating at any one time*. The op-amp circuit, however, contains approximately half the number of components of the discrete design.

A complete data sheet for the NE5534N will be included with part two of this series.

Tone controls?

As stated earlier, the Series 5000 Preamplifier is intended as a high quality linear preamp, and as such, the conventional tone control circuits have been omitted. This is becoming the accepted practice on high quality preamplifers, since the usual tone control facilities are very seldom used in good sound systems. More importantly, their presence can impair the sound quality unless provision is available to completely remove them from the circuit. If control over the frequency response of the system is required it is usually to overcome problems associated with room acoustics, and conventional tone controls are practically useless. A 1/3-octave graphic equaliser is much more effective and can be incorporated into the system easily. The equaliser is placed in the monitor output circuit, between the output and the power amplifier input, leaving the line output of the preamp free as a general purpose non-equalised output.

In following articles we will describe the specifications and construction of the Series 5000 Preamp as well as the problems that must be overcome to ensure the best possible performance.●

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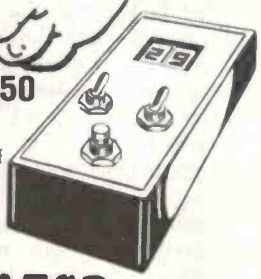

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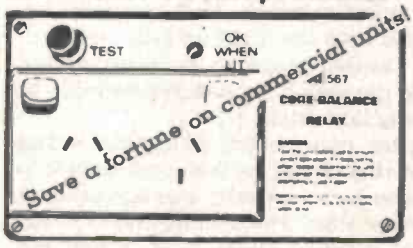

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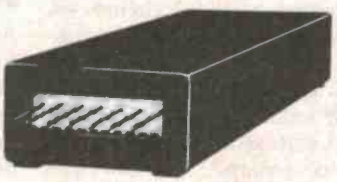

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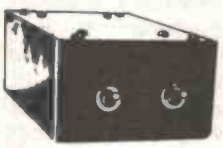

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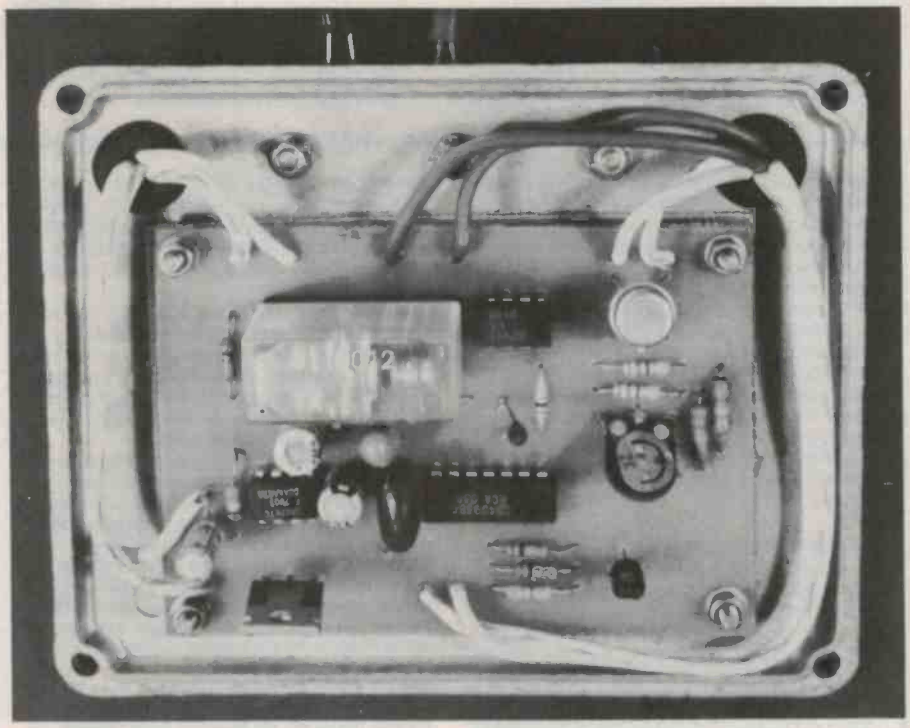
Phil Wait

A SIGNIFICANT proportion of cars are stolen at least once in their lifetime. The thieves are generally 'joyriders' who use them for a few hours and then abandon them after vandalising such items as wheels, seats, stereo/radios etc. If you fit a good, reliable alarm you're bound to deter all but the most determined of criminals — who are usually professionals out to 'redo' the car or strip it completely for parts. There's almost nothing that will stop the latter type of thief — alarms, steering locks or any other deterrents notwithstanding.

Early car alarms were electro-mechanical by nature. They generally had a balanced cantilever or a pendulum with a switch contact attached. Any movement of the vehicle would close the contact and latch on a relay sounding the horn. Simple and effective — but prone to false triggering. They've all but disappeared. Others operated from a series of hood and door switches, but installation often proved a major undertaking.

Later alarms became more sophisticated — one type sensed the slight voltage-drop pulse that appears across the vehicle battery's terminals when a load is connected — such as a 'courtesy' light being operated when a door is opened. Reliability often proved a problem with these alarms as they depended on the internal resistance of the battery, which causes the voltage-drop pulse following the connection of a load (the battery terminal voltage drops momentarily and then rises again). Any variation in the terminal clamp resistance produces the same effect — giving rise to false triggering problems.

A cunning variation on this is to detect a voltage drop anywhere in the vehicle's electrical system. We published the design for such an alarm some time back in our book 'Project Electronics' (ETI-084). Whilst a popular project, many constructors reported problems with false triggering. In addition, the alarm did not include entry and exit delay times, which many constructors have requested over the years.

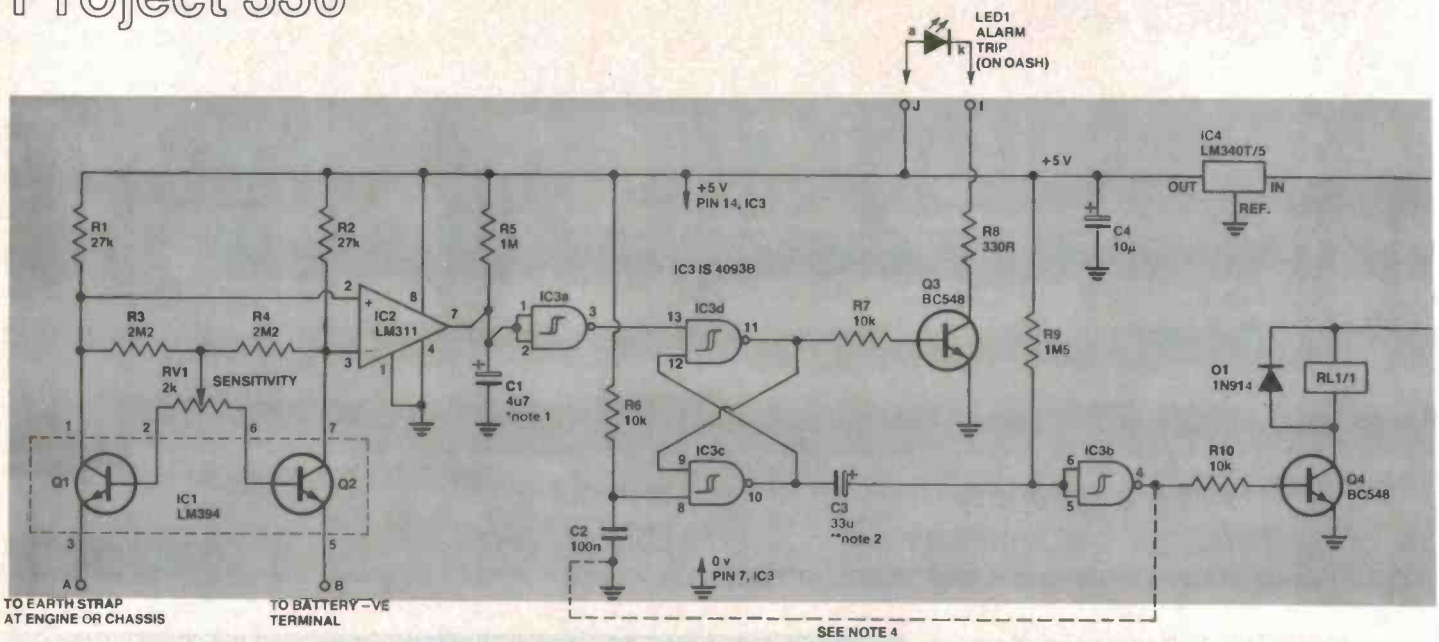


The completed unit was mounted on the lid of a diecast box with a scrap of blank pc substrate underneath as an insulating spacer. The external leads are passed through two grommeted holes.

This project employs a similar principle to the ETI-084, but rather a different technique. The battery 'earth' strap has a small, but finite, resistance. Any load on the battery will cause a current to flow through the earth strap (since the vehicle's chassis is used as the return circuit). The current causes a small voltage drop across the earth strap resistance. This is detected and used to trip the alarm. As the 'sensing' input is essentially a very low impedance input, false triggering from magnetic induction or other sources is avoided. Other voltage drop sensing schemes essentially have a medium to high input impedance, hence their susceptibility to false triggering.

Additional measures are incorporated in this project to further reduce the possibilities for false triggering. ▶

Project 330



*NOTE 1: Value of C1 sets entry and exit delay times.

**NOTE 2: Value of C3 sets alarm-on time.

***NOTE 3: Value of C5 sets flash and horn pulse rate.

NOTE 4: If you wish the alarm to reset itself after 45 seconds following tripping, lift the 'earthy' end of C2 and connect it to pin 4 of IC3b as shown by the dotted line.

NOTE 5: Capacitors C1, C3 and C5 may be either tantalum types or so-called 'low leakage' electrolytics such as the Elna RBLL, or similar.

HOW IT WORKS — ETI 330

Any load on the electrical circuit of a vehicle will produce a voltage drop across the small, but finite, resistance of the vehicle battery's 'earth' strap. This unit detects that voltage drop and trips an alarm circuit that operates the vehicle's horn. A thief entering the vehicle will inevitably operate a 'courtesy' light or something that draws current, thus tripping the alarm.

The circuit can be divided into five sections: the sense circuit, entry and exit delay circuit, latch circuit, alarm timing circuit and horn pulsing circuit. In addition, a three-terminal regulator provides a 5 V supply to most of the electronics, avoiding problems with false alarms.

THE SENSE CIRCUIT

The current in the earth strap is sensed by a pair of transistors connected in a common base configuration. These two transistors, Q1 and Q2, are encapsulated in an integrated circuit package and are on a single chip of silicon, ensuring that they have very closely matched characteristics. The device is known as an LM394. This device was used in much the same way in our Expanded Scale Vehicle Ammeter, ETI-329, published in the February '81 issue. The base-emitter voltages of each transistor will track within 50 microvolts of each other, a characteristic which is exploited here.

When no current is being drawn from the battery there will be no potential drop across the resistance of the battery earth strap (ignoring the miniscule current drawn by this alarm). Thus, the emitters of each transistor in IC1 will be at the same potential. As the base-emitter voltage of each is virtually identical the collector currents will be identical. Thus initially, the collector-emitter voltage of each will be the same.

When current is drawn from the battery (when a courtesy lamp is operated, for example), a small voltage drop will appear across the battery earth strap. Thus, point A (emitter of Q1) will be raised to a *higher* potential than point B (emitter of Q2). That is, point A will be more positive than point B. The voltage on the collector of Q1 will thus rise (a common base amplifier is a *non-inverting* amplifier).

The voltage difference between the collectors of Q1 and Q2 is monitored by a differential input comparator, IC2 — an LM311. When the voltage on its non-inverting input exceeds the voltage on its inverting input the comparator's output switches high. What happens next we'll get to shortly.

The voltage on the collector of each transistor in IC1 (Q1 and Q2) is initially set by a trimpot, which varies the current fed to each base. This compensates for any slight mismatch between Q1 and Q2 (the dc gain of this circuit is very high) and also acts as a 'sensitivity threshold' control by introducing a preset offset which must be overcome by a certain level of current through the battery earth strap before the alarm will trigger.

ENTRY AND EXIT DELAY

The comparator IC2 has an open collector output requiring an external load resistor — this is R5. When the output of IC2 is low the timing capacitor, C1, is held discharged by IC2's output circuitry. When the alarm is tripped and the output of IC2 goes high C1 starts to charge through R5. After a time determined by the time constant of R5 and C1 the Schmitt gate IC3a toggles over and its output, pin 3, goes low.

LATCH

The Schmitt gates IC3c and IC3d form a latch circuit. On power up, the latch is automatically reset by the time constant of R6 and C2, placing a momentary low on pin 8. The output of IC3c is high and the output of IC3d is low, Q3 is turned off and LED1 is not lit.

When the output of IC3a goes low the latch (IC3d and c) toggles over. The output of IC3d goes high, turning on Q3 and lighting LED1. The output of IC3c goes low at the same time. The latch remains in this state until it is reset when the power is turned off and then on again.

ALARM TIME PERIOD

Before the alarm is triggered the output of IC3c is high and the input of IC3b is held high by R9. As IC3b is wired as an inverter its output is low and Q4 is turned off. When the alarm is triggered the output of IC3c goes low, and since C3 is discharged, the input of IC3b is pulled low, its output goes high and Q4 is switched on, allowing the relay to operate.

The timing capacitor, C3, slowly charges through R9 and, after a period determined by the time constant of C3/R9, IC3b switches over, turning Q4 off again and stopping the horn.

HORN PULSING CIRCUIT

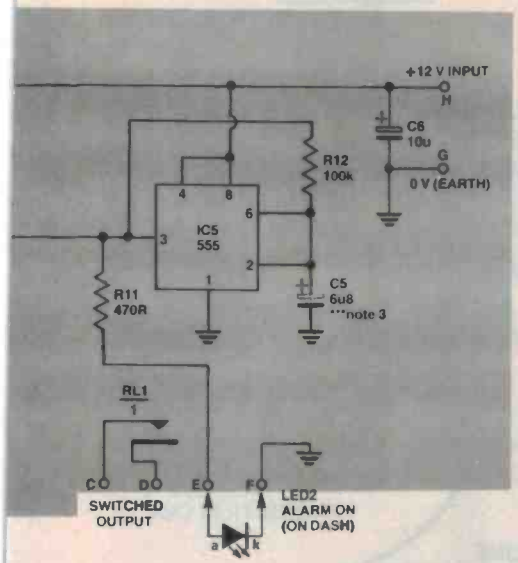
The relay RL1, and therefore the horn, is pulsed on and off about once per second during the horn timing period. IC5 is a 555 timer wired as a free-running oscillator. The frequency of oscillation is determined by the time constant of R12 and C5. As the 555 is capable of driving quite high currents it is connected directly to the relay, which is then switched by Q4. In other words, the 555 pulses the supply to the relay.

The output from the 555 is also used to pulse LED2 (mounted on the dash) as a warning to would-be car thieves and as an indication that the alarm is on.

REGULATOR

A three-terminal regulator, IC4, drops the battery voltage down to 5 V to supply the sense and timing circuits. This protects against false triggering from battery voltage variations and also helps to remove noise from the supply.

Using a Schmitt-triggered input quad NAND gate for IC3 provides further noise immunity and reliable timing due to the precise switching action of its inputs.



Design

A block diagram of the alarm is shown in Figure 1. The Sense and Trigger circuit detects when the voltage drop across the battery earth strap rises above a predetermined amount. When triggered, this then arms the entry/exit delay. If the alarm does not remain triggered after the delay period nothing further will happen. If it does remain triggered, the delay circuit will trip the Latch and start the Alarm Period Timer. The Alarm Trip Indicator will also light. When the Alarm Period Timer is activated the Relay Driver is also activated. The Relay Pulser will then turn the relay on and off at one-second intervals, pulsing the horn on and off too.

The Relay Pulser circuit operates continuously and flashes a dash-mounted light to indicate that the alarm unit is 'armed'.

After the Alarm Period Timer completes its period, the Relay Driver is turned off and the horn will cease pulsing on and off at one-second intervals. Car alarms are required by law to turn off within ten minutes of being triggered, but can automatically re-arm.

If someone attempts to steal your car, trips the alarm and then abandons the attempt, the Alarm Trip Indicator will remain on, telling you that the alarm was tripped during your absence.

Construction

Our prototype was constructed on a printed circuit board, the artwork for which is reproduced elsewhere in this article. While this is not absolutely necessary — the project could be constructed on matrix board — a pc board does reduce the possibility of wiring errors, which have to be sorted out when you first power up the project.

There is no particular order for assembling the components to the pc board but it is usually easier to solder the resistors and capacitors in place first. Take care with the orientation of the tantalum and electrolytic capacitors. Follow with the semiconductors. Again, watch orientation of these components. The relay should be mounted last of all.

The completed pc board can be mounted in any convenient case — we housed ours in a diecast box measuring 120 x 40 x 95 mm. A diecast box was chosen because it can be effectively sealed against the ingress of dirt, moisture and other undesirable substances.

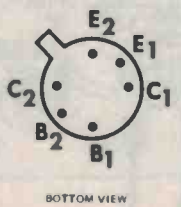
We mounted the pc board on the underside of the diecast box's lid and fitted a 10-way terminal block on the outside of the lid for all the external connections. Leads from the pc board to the 10-way terminal block are passed through grommetted holes. These were later sealed with Silastic.

THE LM394 FAMILY AND ALTERNATIVES

There are a number of devices in this monolithic npn dual transistor 'family', each characterised by different tolerance specifications. The LM194 is the mil-spec version which has the tightest specifications and top price. It's also hard to get and its use is not really necessary in this application. The LM394 is available in 'H' and 'C' versions. The LM394H has tighter tolerance specifications than the LM394C and is more expensive. The cheaper LM394C is recommended for use in this project as it is the least expensive member of the family and generally obtainable in good quantities.

Philips manufacture an npn dual transistor family, designated BCY87, BCY88, BCY89, and any of these could be pressed into service in this project, although their V_{be} tolerance specifications are somewhat wider than for the LM394 family. There should be sufficient adjustment available with RV1 to compensate for the wider tolerance in V_{be} offset. The BCY89 is the least expensive, widest tolerance device. Note that the package pinout for the Philips devices is different — see the diagram following.

A further alternative would be to use two transistors from a transistor array IC. The CA3045/46, manufactured by RCA, is a general purpose transistor array IC containing three isolated transistors and one differentially-connected transistor pair. Any two of the isolated transistors may be used. However, this device is encapsulated in a 14-pin DIL package which would have to be glued to the pc board in a suitable place, upside down, and connecting wires run from the appropriate holes in the pc board to the device pins. RV1 should be able to compensate for the wider tolerance in V_{be} offset here too.



BCY87/88/89
FAMILY PINOUT

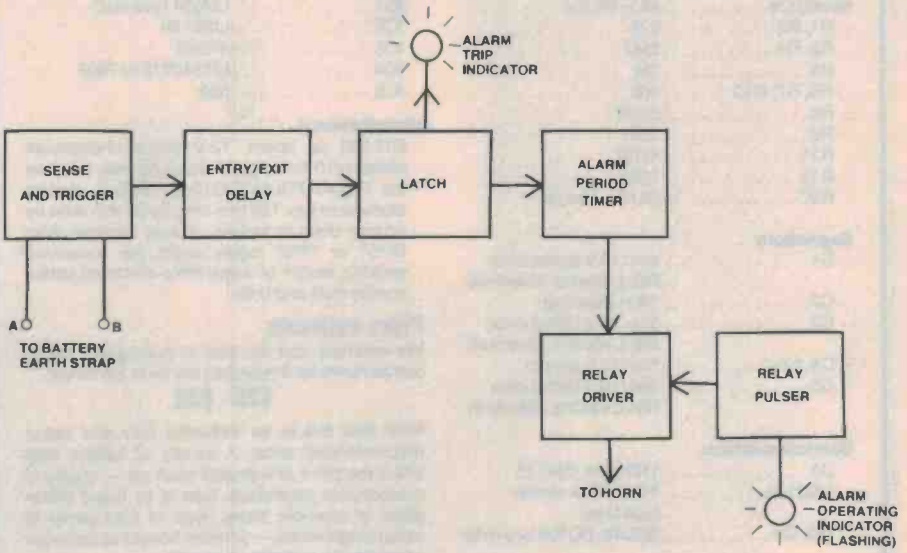
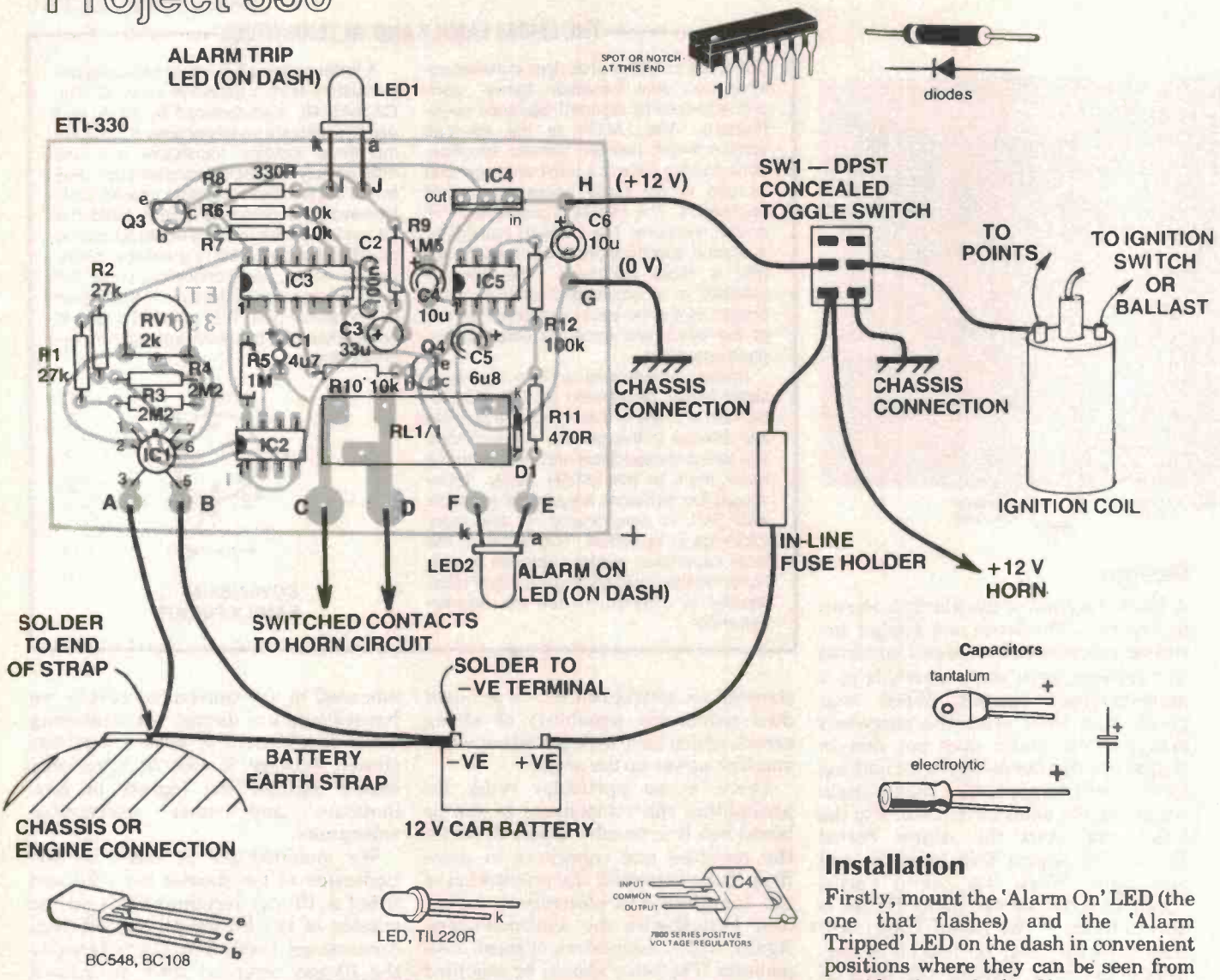


Figure 1. Block diagram of the ETI-330 car alarm showing the basic functional blocks of the circuit.

Project 330



BC548, BC108

LED, TIL220R

PARTS LIST — ETI 330

Resistors ..... all ½ W, 5%
- R1, R2 ..... 27k
- R3, R4 ..... 2M2
- R5 ..... 1M
- R6, R7, R10 ..... 10k
- R8 ..... 330R
- R9 ..... 1M5
- R11 ..... 470R
- R12 ..... 100k
- RV1 ..... 2k min. trimpot

Capacitors
- C1 ..... 4u7/16 V tantalum or RBLL electro. (See text)
- C2 ..... 100n greencap
- C3 ..... 33u/16 V tantalum or RBLL electro. (See text)
- C4, C6 ..... 10u/16 V electro.
- C5 ..... 6u8/16 V tantalum or RBLL electro. (See text)

Semiconductors
- D1 ..... 1N914 or 1N4148
- LED1, 2 ..... TIL220R or similar (see text).
- Q3, Q4 ..... BC548, BC108 or similar
- IC1 ..... LM394 (see text)
- IC2 ..... LM311N
- IC3 ..... 4093B
- IC4 ..... LM340T/5 or 7805
- IC5 555

Miscellaneous

ETI-330 pc board; 12 V single changeover contact (10 A rating) pc mounting relay (such as the Fujitsu FRL611DO12 or similar); diecast aluminium box 120 mm long by 95 mm wide by 40 mm deep or similar; 10-way terminal strip; DPST or TPST toggle switch (for concealed switch); length of automotive electrical cable; sundry nuts and bolts.

Price estimate

We estimate that the cost of purchasing all the components for this project will be in the range:

$25 - $32

Note that this is an estimate only and not a recommended price. A variety of factors may affect the price of a project such as — quality of components purchased, type of pc board (fibreglass or phenolic base), type of front panel (if used) supplied etc — whether bought as separate components or made up as a kit.

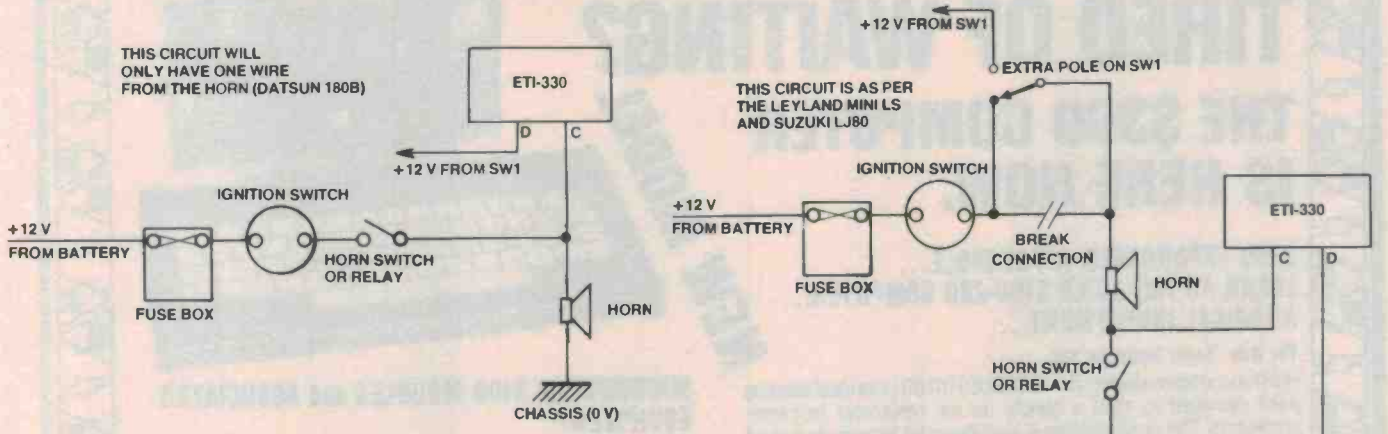
Installation

Firstly, mount the 'Alarm On' LED (the one that flashes) and the 'Alarm Tripped' LED on the dash in convenient positions where they can be seen from outside the vehicle. You can obtain LEDs mounted in metal and plastic mounting which is secured by a nut or clip, and these are ideal for this application.

The alarm is switched on by a concealed switch which may be located under the dash or under the driver's seat. Alternatively, an externally mounted keyswitch may be used. If you install the latter, entry and exit delay may be reduced to about half a second by changing the value of C1 to 1u.

We used a two-pole switch, one pole to switch the supply to the alarm, the other to short out the points when the alarm is switched on. Thus, if somebody does gain entry to the car and ignores the alarm or disconnects the horn, they will not be able to start the car even if they jumper the ignition!

Connection to the earth strap is quite straightforward. Take a wire from terminal A and solder it to the end of the earth strap. Terminal B is taken and



COMMON HORN CIRCUITS

soldered to the battery terminal connection. It's a good idea to keep these leads fairly short to reduce noise pick-up. Ours were about one metre long.

The positive supply, via the alarm switch, should be taken through an in-line fuse holder, directly from the battery positive terminal. The normal fuse holder in a car is usually under the dash and could easily be pulled out by a thief when the alarm goes off.

The output from the alarm is a pair of switched contacts, which operate the horn by bypassing the horn switch or, on some cars, the horn relay. We have shown two common horn circuits. The the first circuit the horn switch is bypassed by the relay contacts. The second circuit is a little more complex and requires an extra pole on the alarm switch. If you want to short out the points as well you will need a three-pole double-throw switch. Make sure you break the connection from the ignition switch to the horn as shown, or when you switch the alarm on you will also switch on the ignition!

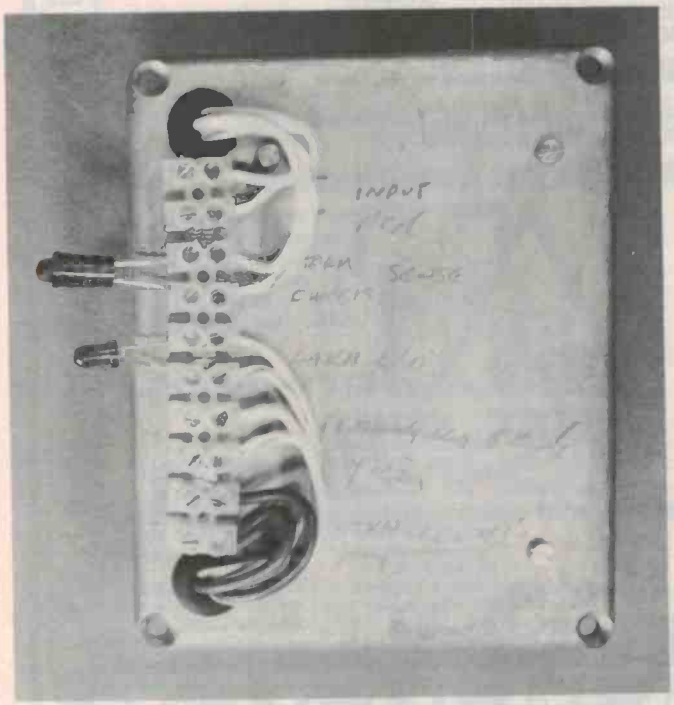
Try to make all wiring as neat as possible and try to blend it in with the car's wiring so it is not obvious to a thief what wire he has to pull out to stop the alarm.

Setting up

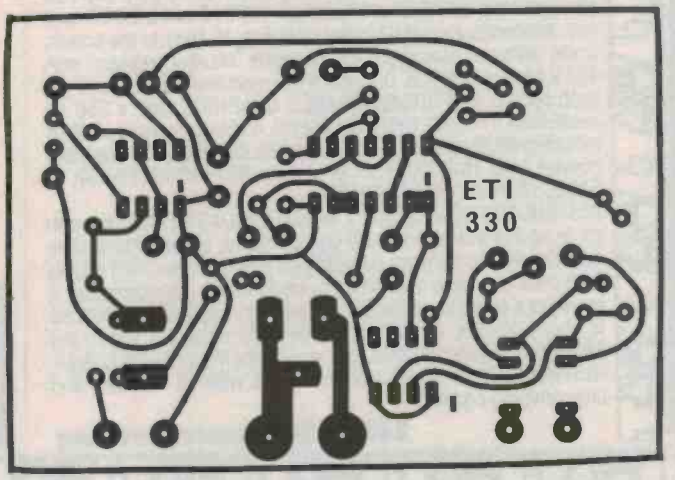
When all the wiring is complete, all that remains is to set the sensitivity trimpot. Disable the entry and exit delay by removing C1, or alternatively connect a high impedance voltmeter across C1. With no current being drawn from the battery, adjust RV1 until the alarm just fails to trip or C1 fails to start to charge. Note the position on the trimpot. Turn on the interior light and the alarm should trip. If it does not, check your first adjustment; if it is correct, you probably have the leads to the earth strap and the battery negative terminal swapped.

Turn the trimpot until the alarm just won't trip or C1 doesn't charge when the interior light is turned on. Note this position. The correct position for RV1 is midway between these limits, for reliable operation.

Next check that the alarm doesn't trip on the car radio or the electric clock. Some mechanical clocks are rewound by a motor every few hours, or even days, and these are often a cause of false triggering. If false triggering occurs from the radio or the clock, reduce the sensitivity. In some extreme cases it may be necessary to use a higher wattage interior light, though I found operation to be extremely reliable with a five watt light, and there was sensitivity to spare! ●



Everything is mounted on the lid of the diecast box and terminations made via a 10-way terminal block mounted on the outside of the lid. Mark each lead, especially where polarity necessary.



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- Newsflash capability

RULES

This contest is open to all persons normally resident in Australia with the exception of members of the staff of Radofin Electronics (Aust.), Modern Magazines (Holdings) Ltd, K.G. Murray Ltd, Australian Consolidated Press, Offset Alpine Pty Ltd and/or associated companies.

Entries should be addressed to ETI/RADOFIN Teletext Adaptor Contest, Electronics Today International, 15 Boundary St, Rushcutters Bay NSW 2011.

Closing date for the contest is 31 August 1981. Entries received within seven days of that date will be accepted if postmarked prior to and including 31 August 1981.

The contest will be judged by the Editor and Managing Editor of ETI whose decision will be final. No correspondence can be entered into regarding their decision.

In the event of one or more tied results occurring in the multi-choice questions amongst entrants, the finalists' entries will be judged on the written answer to the last question.

The winner will be advised by telegram the same day the result is declared. The name of the winner, together with the winning answers, will be published in the next possible issue of ETI.

Contestants must enter their names and addresses where indicated on each entry form. Photostats or clearly written copies will be accepted, but if sending copies you must cut out and include with each entry the month and page number from the bottom of the right hand page of the contest. In other words you can send in multiple entries but you will need extra copies of the magazine so that you send an original page number with each entry.

This contest is invalid in States where local laws prohibit entries.

Entrants must sign the declaration accompanying this contest that they have read the above rules and agree to abide by their conditions.

NOTE: Please read contest rules carefully, especially if sending in multiple entries.

• You may enter as many times as you wish but you must use a separate entry form for each entry and include the month and page number cut from the bottom right hand page of the contest. You must put your name and address where indicated on each entry form.

ENTRY FORM

Here are five questions, each having multiple-choice answers, to sort out the 'goers' from the 'noers', followed by a question requiring a short essay answer. All questions must be answered. Put a cross (x) in the appropriate box for questions 1 to 5.

If you can't find out the right answers to the first five questions then just have a guess — you may well be right!

1. Are Teletext signals synchronised with the TV line frequency?
   - **yes** ☐
   - **no** ☐

2. Can the Teletext display be superimposed over the normal TV picture when using the Radofin adaptor?
   - **yes** ☐
   - **no** ☐

3. The release of the Radofin Adam 180 Teletext Adaptor was announced in which issue of ETI this year?
   - **March** ☐
   - **April** ☐
   - **May** ☐
   - **June** ☐

4. When did Teletext officially go into service in Australia?
   - **11 November 1979** ☐
   - **18 January 1980** ☐
   - **4 February 1980** ☐
   - **27 July 1980** ☐

5. About when did TV stations first start test transmissions of Teletext signals?
   - **November 1975** ☐
   - **March 1977** ☐
   - **June 1979** ☐
   - **February 1980** ☐

Tell us in 50 words or less which feature of Teletext most appeals to you and why.

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****

NAME: .....

ADDRESS: .....

.....

..... **POSTCODE** .....

I have read the Contest Rules and agree to abide by their conditions.

SIGNED: .....

DATE: .....

Contest closes: 31 August 1981. Any entries reaching us after that date must be postmarked no later than 31 August 1981.
Send your entries to: ETI/RADOFIN Teletext Adaptor Contest, 15 Boundary St, Rushcutters Bay NSW 2011.

The Tools. from Cooper The Toolmaker.

Weller industrial SPI non-temperature controlled line voltage soldering irons, with iron plated copper tips, stainless steel barrels. Impact and heat resistant handles are lightweight.

Available as SPI25D 25 watt or SPI40D 40 watt irons.

The Weller WTCPN soldering station is temperature controlled and combines high volume capability with precision performance. The low voltage TC201 soldering pencil employs the exclusive "closed" loop method to control maximum temperature and protect sensitive components.

Lufkin

Official Supplier of Measuring Tapes to the XII Commonwealth Games in Australia 1982.

The Cooper Group

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WELLER·WISS·XCELITE

The Cooper Tool Group Limited
P.O. Box 366, Nurigong Street
Albury NSW 2640, Australia
Tel: 215511 Telex: 56695

Take it easy

If you like electronics but you sometimes find you're a bit out of your depth in ETI, we've got good news for you. There's a new electronics magazine called **Hobby Electronics** that makes things a lot easier.

Hobby Electronics is specially designed for easy reading. That doesn't mean we use extra big print and treat you like an imbecile — it just means that we explain everything you might not already know.

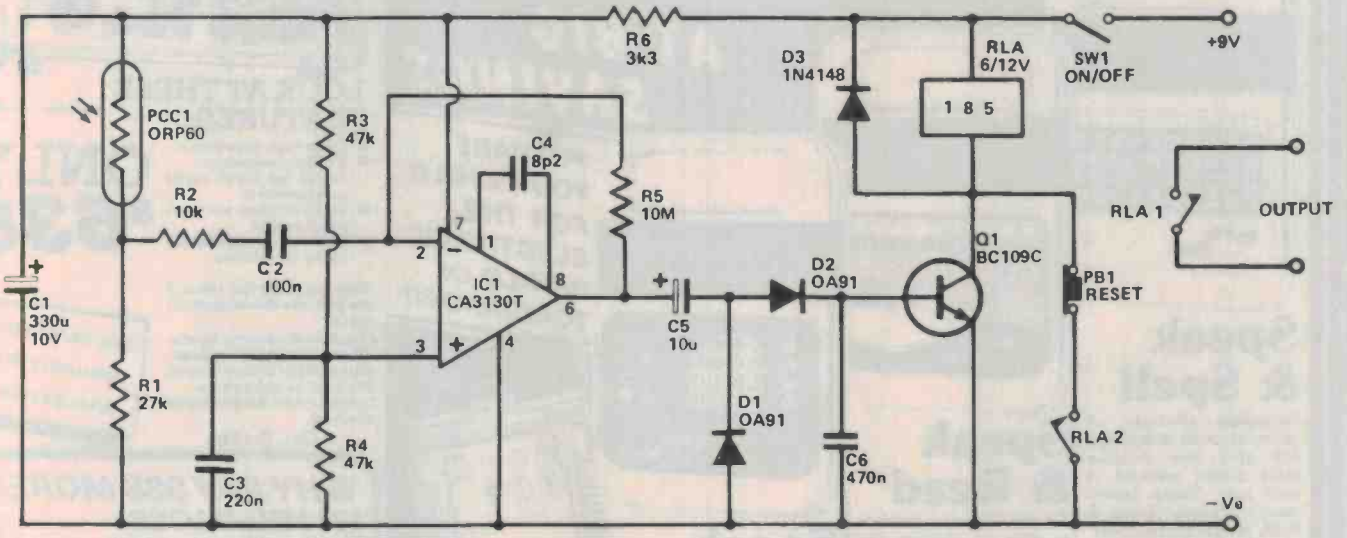
Every month **Hobby Electronics** has complete, detailed instructions for building several projects, as well as fascinating features on all aspects of electronics. And because it's published by the same people as ETI, you can be sure that everything has been done properly — all the projects have been tried and tested, all the features double and triple-checked for accuracy and authenticity.

On sale now at all newsagents only 95¢

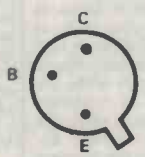
Hobby Electronics

AN ETI PUBLICATION

'Photocell' switch is activated by change in light level



CA3130T
TOP VIEW



BC109C
BASE VIEW

THIS SIMPLE light-activated switch can be employed in intruder alarm systems, or in certain other applications where a proximity detector is required. It is not a light-operated switch of the type which responds to some particular ambient light level, but instead it responds to rapid changes in light level. It will, for example, trigger if a torch is shone on or near the photocell, or if someone passing in front of the unit casts a shadow onto the photocell. The unit is unaffected by natural, slow changes in light level.

The photocell used in the unit is a cadmium sulphide photo-resistor (PCC1) and together with R1 this forms a potential divider connected between the supply lines. The voltage at the junction of R1 and PCC1 depends upon the resistance of PCC1, which in turn depends on the light level to which this component is subjected.

IC1 is an operational amplifier which is used here in the inverting mode. R2 and R5 form a negative feedback network which sets the voltage gain of the circuit; a high degree of gain is required in order to give the unit good sensitivity. The gain of the amplifier is approximately equal to R5 divided by R2, or about 1000 times (60 dB).

The output from PCC1 and R1 is coupled to the input of the amplifier, but C2 provides blocking here so that the output from these components is of no consequence. However, rapid changes in the output voltage from the photocell circuit will be passed to the input of the amplifier, and will appear greatly boosted at the output.

The output from IC1 is coupled by C5 to a voltage-doubler rectifier circuit consisting of D1, D2, and C6. When the unit is activated, the positive bias produced across C6 is sufficient to bias Q1 into conduction, so that it energises the relay coil which forms its collector load. RLA2 then closes and maintains the supply to the relay coil, so that once triggered, the circuit latches in the on state. The alarm or other controlled equipment is operated by RLA1.

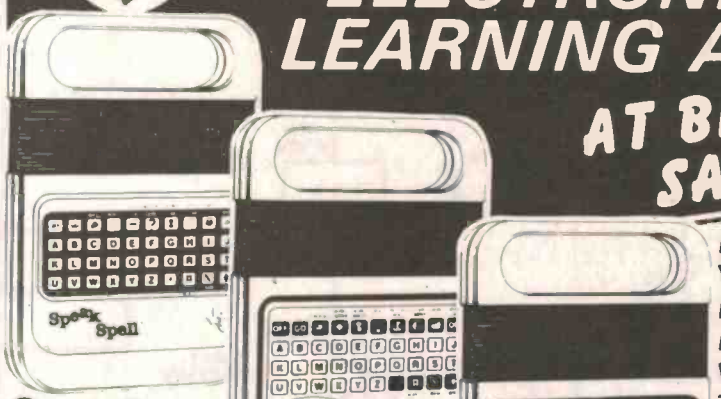
SW2 can be used to break the supply to the relay, and thus reset the circuit. SW1 is merely the on/off switch. C4 is the compensation capacitor for IC1 and D3 is the normal protective diode. Maximum supply current is about 50 mA with the relay operated.

When constructing the unit, make sure that the input components of IC1 (PCC1, R1, R2 and C2) are kept physically separate from the output components (C5, D1, D2 etc) to avoid instability problems. If the unit is too sensitive for your application, reduce the value of R5 to decrease the sensitivity. ●

HUGE SCOOP PURCHASE!

FAMOUS
Texas Instruments
ELECTRONIC LEARNING AIDS
AT BIG SAVINGS

PREPARE YOUR CHILD FOR THE ELECTRONIC WORLD OF TOMORROW!



Speak & Spell

Incredible advances in microcomputer technology can give your children skills almost unheard of until now. Texas Instrument's amazing 'Speak & Spell' makes spelling lessons FUN: children will actually want to learn to spell words other kids at school can hardly even say! No tapes; no records: Speak & Spell actually forms the words within its computer 'brain': to praise when the answers are correct, encourage when the answers are wrong, and to encourage another try. Cat. Y-1300

SAVE $13.50 Rec. Retail $83.00
Dick's Price $69.50

Speak & Read

Do you want your children to grow up illiterate like many of today's school leavers? Of course not! This unique learning aid helps beginner readers build basic skills - so often missing in today's fast moving education system. Includes a colourful 64 page book 'You Can Read'!

Cat. Y-1313

SAVE $9.50 Rec. Retail $99.00
Dick's Price $89.50

Speak & Math

Imagine over 100,000 maths problems that the kids will want to just keep on attempting. That same warm, friendly voice - encouraging them to attain higher and higher levels. And because the child sets his own pace, learning is so much faster! Your children will really need maths skills in the years to come: why not start them off on the right track now?

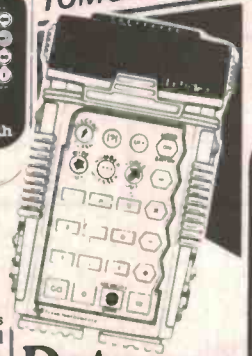
Cat. Y-1310

SAVE $9.50 Rec. Retail $89.00
Dick's Price $79.50

Plug-in Modules

Expand the capabilities of your Speak & Spell. Plug-in modules give more words, higher skill levels.

Cat. Nos. Y-1301, Y-1302, Y-1305
$21.95 each



Dataman

One of the most popular electronic maths trainers. A huge variety of games which makes learning maths real fun - from ages 7 & up. Battery operated, with battery saver feature: it turns itself off if the kids leave it turned on! Includes special 24 page illustrated manual.

Cat. Y-1320

SAVE $5.50 Rec. Retail $28.00
Dick's Price $22.50

LOOK AT THIS PRICE FOR HITACHI DUAL TRACE CRO

LOOK AT THESE FEATURES:

- Extra high sensitivity.
- TV Sync-separator circuit for rapid video measurement.
- Trace rotation via front panelcontrol.
- Built-in delay line for fast rising waveforms.

ONLY $638

These are only just some of the features-there are much more.
Great for the service bench, the laboratory, the college, university or school-or even the serious hobbyist or amateur who simply wants the best.

Cat. Q-1242

TAX FREE PRICE AVAILABLE ON APPLICATION.

WHY PAY $$$ MORE!

100 MHz PROBE

This Versatile probe set will suit virtually any CRO and give you all the features of a more expensive unit.

INCREDIBLE VALUE $34.50

Check these specs.

600V Pk (or 600V DC) ● 6 piece inc various tips and plastic wallet ● 1M or 10M input impedance (switchable) ● Switchable x1 & x10 settings ● suits virtually any CRO ● Ideal for Dick Smith budget laboratory CRO tool

Cat. Q-1245

NOW IN STOCK!

SIMILAR UNITS OVER $1000!!!

$245

The best computer chess set you're ever likely to find! Does everything – play against it, or set up various games. Includes unique chess board & men which tell you what to do. It will even play against itself if you want it to! A must for all serious chess players.
Includes power supply. Cat Y-1256

BE QUICK! LIMITED STOCK!

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WITH THE FAMOUS
TI 59 Calculator

The TI Programmable 59 calculator has up to 960 program steps or up to 100 memories. Magnetic card read/write capability lets you record your own custom programs.

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4116 RAM ICs

What a bargain price for fast 4116 dynamic RAMs! You won't bleat at our price – compare it with you-know-who!

ONLY $3.95

Cat. Z-9310

TWO NEW GREAT VALUE CBs

SUPER JAGUAR 18 Ch SSB

If you want the performance of a large SSB unit, but lack the space, the Super Jaguar is the one for you. Gives you full power and all the punch to get those distant stations.

ONLY $219

Cat. D-1710

SUPER LYNX 18 Ch AM

This superb little rig gives you the same performance as the Super Jaguar, but without SSB. If your mode of operation is AM, why pay $$$ more for SSB.

ONLY $149.50

Cat. D-1705

NOW YOU CAN AFFORD YOUR OWN DIGITAL MULTI-METER

This superb 20 range digital multimeter offers exceptional performance, together with a highly legible liquid crystal display. Has also overload protection so you won't 'cook' it if you make a few errors!

Cat. Q-1450

ONLY $75.00

WATCH THIS SPOT

To see what you missed out on!

Did you miss out on our BELOW COST SPECIAL?

LAST MONTH:

KAMBROOK TIMER

for only $12.28 norm $19.95

SAVING YOU $7.67

NEXT MONTH:

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SAVE HEAPS ON 400mW ZENERS! ~~16~~ 12c

We're clearing our stocks of 400mW Zener diodes: some stores are already getting low, so get in for your chop now! Buy some for the junk box and SAVE!

SPECIAL SEMI'S

FET input op-amps.		
TLO 71 Single	Z-6071	$0.95
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Special Hi-quad, low noise op-amp.		
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Transconductance op-amp.		
CA 3080	Z-6075	$2.45
Function generator.		
XR 2206	Z-6820	$5.95

Rectangular LEDS.

RED (Z-4040), GREEN (Z-4042), YELLOW (Z-4044), ALL 40¢ EACH.

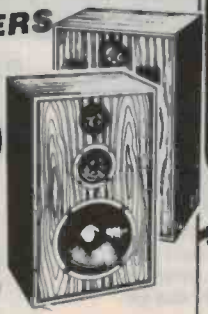
VALUE PACKED PACK!

You know how maddening it is! You can never find a pot nut or washer when you want one! Dick's solved your problems with this new pot nut/washer pack. Buy one for the junk box and be ready!

ONLY 95¢

Cat. H-1360

SAVE UP TO $40! ON THESE SPEAKERS



10 inch ONLY $299

Cat. A-2362

12 inch ONLY $345

Cat. A-2364

Amazing value for such incredibly popular speakers. Your choice of 250 or 300mm sizes (that's 10 & 12 inch for the old school!) completely built-up and ready to go. Simply superb!

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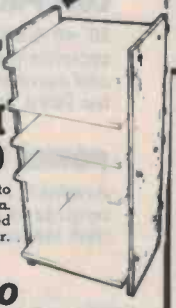
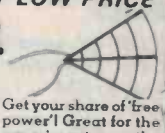


What better way to show off your system. Finished in simulated walnut vinyl veneer.

ONLY $69.50

Cat. A-0105

INCREDIBLY LOW PRICE SOLAR CELLS



SAVE 50¢ $2.00

Cat. Z-4830

Get your share of 'free power'! Great for the experimenters or the hobbyist. These cells have a high output for their size.

Bargains: 'AA' size Cat. S-3300 $1.90 ea., 'C' size Cat. S-3302 $7.50 pack 2!, 'D' size Cat. S-3304 $7.95 pack 2!

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

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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 8857

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 525 684

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

DUBBO, NSW: Selekta Sound.
31 Talbragar Street. 826 979

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

FAIRY MEADOW, NSW: Trilogy Wholesale Elect.
40 Princes Hwy. Phone 831 219

GERALDTON, WA: KB Electronics & Marine
361 Main Terrace. Phone 212 176

GOSFORD, NSW: Tomorrow's Electronics & Hi Fi
68 William Street. Phone 947 246

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

KINGSTON, TAS: Kingston Electronics & Records
Channel Court. Phone 296 802

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

LISMORE, NSW: Oocro Electric
Magellan St & Brunner Hwy. Phone 214 137

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

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

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

MT GAMBIER, SA: Hutchesson's Communications
5 Elizabeth Street. Phone 256 404

MUSWELLBROOK, NSW: Silicon Chip Electronics
Suite 3, 98 Bridge Street. Phone 43 1095

NAMBOUR, QLD: Nambour Electronic Shop
Shop 4, Lowan House, Ann St. Phone 411 664

NEWCASTLE, NSW: Elektron 2000
181 Wharf Road. Phone 262 644

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 322 644

TAMWORTH, NSW: Sound Components
78 Brisbane Street. Phone 661 363

TOOWOOMBA, QLD: Hunts Electronics
10 Neil Street. Phone 326 944

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

TRARALGON, VIC: Powar'N'Sound
147 Argyle Street. Phone 743 638

WAGGA, NSW: Wagga Wholesale Electronics
82 Forsyth Street.

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

WODONGA, VIC: A & M Electronics
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Dear Customers,

Quite often, the products we advertise are so popular they run out within a few days. Or unforseen circumstances might hold up goods so that advertised lines are not in the stores by the time the advert appears. Please don't blame the store manager of staff: they cannot solve a dock strike on the other side of the world, or even locate a shipment that has gone astray.

What we are trying to say is that, if you are about to drive across town to pick up a particular line at a Dick Smith store, why not give the store a ring first (addresses and phone numbers opposite)...just in case! Thanks.

Dick Smith and Staff

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- BROADWAY: 818 George Street. 211 3777.
- BROOKVALE: 531 Pittwater Rd. 93 0441.
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- GORE HILL: 162 Pacific Hwy. 439 5311.
- PARRAMATTA: 30 Grose Street. 683 1133.
- SYDNEY: 125 York Street. 290 3377.
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- BURANDA: 166 Logan Rd. 391 6233.
- CHERMSIDE: 842 Gympie Rd. 59 6255.

SA
- ADELAIDE: 60 Wright Street. 212 1962.

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- MELBOURNE: 399 Lonsdale Street. 67 9834.
- RICHMOND: 656 Bridge Rd. 428 1614.
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- PERTH: 414 William Street. 328 6944.
- CANNINGTON: Wharf St & Albany Hwy. 451 8666

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SERVICE CENTRE: LANE COVE & WATERLOO RDS. NORTH RYDE NSW 2113. PHONE (02) 888 3200. 9AM TO 5PM. MONDAY TO FRIDAY ONLY.

SHOP HOURS: 9AM – 5.30PM Mon – Fri, 9AM – NOON Sat. (Brisbane ½hr earlier). Some stores open for late night shopping, please phone store before making special trip in!

BUYING BY MAIL?

ORDER VALUE:	P&P
$5 (min) to $9.99	$1.00
$10.00 to $24.99	$2.00
$25.00 to $49.99	$3.00
$50.00 to $99.99	$4.00
$100 or more	$5.50

NOTE: These charges apply to goods sent by post in Australia only. Large and bulky items cannot be sent by post.

If you prefer, we will despatch your order by Comet Road freight to anywhere in Australia for only $7.00 – that's below what it costs us! Large and bulky items are normally sent by Comet unless you specify differently (eg. by rail or air – you pay freight on delivery).

AMAZING BOO-BOO

A manufacturer's mistake means we can sacrifice these incredible CRAIG language translators at a staggering

OVER 70% OFF!

WAY BELOW COST

90 DAY WARRANTY

THE CRAIG M100

This unit sold in Australia for $250 and over 200,000 were sold world wide at similar prices. The manufacturer made too many and we have scooped a limited quantity at WAY BELOW the manufacturer's cost!

WAY BELOW COST

SAVE $180
Normally over $250!
NOW $69.50
Cat. Y-1340
Includes English Cartridge

NEW PHONETIC CARTRIDGE
SPELLS THE WORDS AS THEY ARE PRONOUNCED
Cat. Y-1347
$12.00

How would YOU like to be able to convey your thoughts, needs and questions in another language? Well now you can! The CRAIG M100 enables you to type in a message and at the touch of a button translate that message into another language. It even has whole phrases that can be called up at the touch of a button and partial phrases to which you can add your own ending. A truly remarkable unit that can calculate (e.g. currency conversions) and it has inbuilt metric conversions, a great boon! The Craig M100, a true hand-held language computer with RAM, ROM and CPU! Ideal for businessmen on over-seas trips, students studying languages etc.

YOU REAP THE BENEFIT

It is recommended that you use 4 Duracells (Cat. S-3280) at $2.78 or 4 NiCads (Cat. S-3300) at $2.05 each. If using the NiCads they can be re-charged in the Craig M100 by using the M-9525 battery eliminator which also serves to power the unit from the AC. The M-9525 is great value at $6.90.

LANGUAGE CARTRIDGES

French (Y-1341):
Japanese (Y-1342):
German (Y-1343):
Italian (Y-1344):
Bar & Wine Guide (Y-1345) and Calorie Counter (Y-1346).

SAVE 60%
Normally $35 ea.
ALL AT $12 ea.

7 DAY SATISFACTION GUARANTEE
TRY ONE AND SEE!
If you are not totally satisfied return the unit in the same condition as received and your money will be refunded.

DICK SMITH ELECTRONICS

See our other advertisements in this publication for a full list of store addresses, phone numbers and post details.

DSE4394

KITS FOR EVERY AGE

KIT 1	One Transistor Radio	$ 5.95
KIT 2	Two Transistor Radio	$14.50
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KIT 10	3 Watt Audio Amplifier	$ 7.50
KIT 15	Magnetic Preamplifier	$ 7.95
KIT 17	4.5 Watt Stereo	$14.75
KIT 25	Continuity Tester Amplifier	$ 5.50
KIT 28	Electric Train Horn	$ 7.50
KIT 33	Snooze Alarm Clock	$20.00
KIT 41	Calculator	$10.50
KIT 43	Burglar Alarm	$13.50
KIT 47	Power Supply for Kits 48, 49, 51-52	$11.95
KIT 48	30 Watt Power Module	$27.95
KIT 49	50 Watt Power Module	$38.95
KIT 51	10 Watt Power Module	$16.50
KIT 52	20 Watt Power Module	$23.45
KIT 60	Cassette Deck Mechanism	$36.95
KIT 66	LCD Credit Card Calculator	$14.25
KIT 68	Gents 5 Function LCD Clock	$16.50
KIT 69	Ladies 5 Function LCD Clock	$16.50
KIT 81	Electronic Decision Maker	$ 8.25
KIT 82	Electronic Siren	$ 6.25
KIT 83	Electronic Organ	$ 9.50
KIT 85	Electronic Police Car Siren	$ 7.50
KIT 89	Electronic Light Flasher	$ 7.50
KIT 90	Electronic Dampness & Water Level DEtector	$ 6.95
KIT 92	Solar Power Kit	$16.95
KIT 105	Crystal Set	$ 5.95
KIT 106	Temperature Alarm	$ 8.95

SOUND SUPREME STEREO POWER BOARDS

ELECTROKIT A50***

Output 47W + 47W RMS, 8 ohm.

Frequency response: Flat within 1dB 20Hz-20kHz.

Input for rated output 450mV.

Supply voltage dual ± 48V DC.

Our price only $38.50

ELECTROKIT A70***

Output 68W + 68W RMS, MOSFET, 8 ohm.

Frequency response: Flat within 1dB 20Hz-20kHz.

Input for rated output 700mV.

Supply voltage dual ± 50V DC.

Our price only $84.00

PLUGS/ SOCKETS

P38	2.5mm DC Adaptor Plug	.40
S38	2.5mm DC Adaptor Socket	.40
S38B	2.5mm DC Adaptor Socket Flush Mount	.35
P44	Standard Metal Phone Plug — Mono	$1.38
P45	Standard Insulated Phone Plug — Mono	.55
P46	Standard Metal Phone Plug — Angled	.68
S47	Standard Rean Phone Socket — Mono	.66
S48	Standard Metal Phone Socket — Mono	.70
S50	Standard Insulated Phone Cord Socket — Mono	.50
S50A	Standard Metal Phone Cord Socket — Mono	$1.07
P51	Standard Metal Phone Plug — Stereo	$1.52
P52	Standard Insulated Phone Plug — Stereo	.90
S53A	Standard Metal Phone Socket — Stereo	.90
S53B	Standard Metal Phone Socket — Stereo (Enclosed)	$1.09
S54	Standard Insulated Phone Cord Socket — Stereo	.89
S54A	Standard Metal Phone Cord Socket — Stereo	$1.88
S55	Standard Rean Phone Socket	$1.25
P57	3.5mm Plug to 6.3mm Stereo Socket	$1.12
P58	6.3mm Plug to 3.5mm Socket	$1.12
P59	6.3mm Stereo Plug to 3.5mm Socket	$1.20
P59A	3.5mm Plug to 6.3mm Mono Socket	$1.20
P59B	RCA Plug to 6.3mm Mono Socket	$1.20
P59C	6.3mm Plug to RCA Socket	$1.20
P60	Mini Phone Plug 3.5mm	.35
S60	Mini Phone Socket 3.5mm	.30
S60A	Mini Phone Cord Socket 3.5mm	.40
S60B	Mini Phone Socket 3.5mm (Enclosed)	.35
P61	Submin. Phone Plug 2.5mm	.35
S61	Submin. Phone Socket 2.5mm	.30
P62	Quality Mini Phone Plug 3.5mm	.40
P66	Metal Auto Aerial Plug	.35
S66	Metal Auto Aerial Socket	.35
P68	Quality Metal Auto Aerial Plug	.55
P71	2 Pin Din Speaker Plug	.50
S71	2 Pin Din Speaker Socket	.50
S71B	2 Pin Din Speaker Socket Cord	.59
P72	6v Battery Plug	.30
P73	9v Battery Plug	.30
P75	Metal Coax Plug	.80
P75A	Plastic Coax Plug	.50
P75L	Angled Coax Plug	$1.00
S75	Metal Coax Socket Chassis	.40
S75B	Plastic Coax Socket Cord	.95
S75C	Flush Plate Coax Socket	$2.50
P82	Pin Plugs Red, Black	.35
S82	Pin Sockets Red, Black	.35
P85	Car Cigarette Lighter Plug	.70
P1	4mm Banana Plugs Red, Black	.30
S1	4mm Banana Sockets Red, Black	.40
P1A	4mm Banana Plugs Red, Black, Green, Yellow — German	.30
S1A	4mm Banana Sockets Red, Black, Green, Yellow — German	.40
P1B	4mm Banana Stackable Plugs Red, Black	.35
P2	2 Pin Polarised Plug	.25
S2	2 Pin Polarised Socket	.25
P4	4 Pin Cinch Plug	.25
S4	4 Pin Cinch Socket	.25
P7	3 Pin Moulded Plug	.40
S7	3 Pin Moulded Socket	.40
P8	4 Pin Moulded Plug	.40
S8	4 Pin Moulded Socket	.40
P12	2 Pin Flat Cord Plug	.40
S12	2 Pin Flat Cord Socket	.40
P13	2 Pin Chassis Plug Polarised	.40
S13	2 Pin Chassis Socket Polarised	.40
P14	3 Pin Din Plug	.50
S14	3 Pin Din Socket	.45
P15	5 Pin Din Plug 180°	.65
S15	5 Pin Din Socket 180°	.45
S16	5 Pin Din Socket 180° Cord	.85
P19A	5 Pin Din Plug 270°	.70
S19	5 Pin Din Socket 270°	.55
P21	7 Pin Din Socket 270°	.80
S21	7 Pin Din Socket 270°	.55
P22	Small Metal Phono Plug — RCA	.20
S22	Wafer Phono Socket — RCA	.35
S22A	Metal Phono Socket — RCA	.35
S24	Water Twin Phone Socket — RCA	.60
S24A	Wafer Four Phone Socket — RCA	$1.12
P25	Quality Metal Phone Plug — RCA	.50
P25A	Quality Gold Contact Phono Plug — RCA	$1.32
S25A	Quality Gold Contact Phono Socket — RCA	$1.51
P27	Plastic Covered Phono Socket Red, Black, Blue, Yellow — RCA	.40
S27	Plastic Covered Phone Plug Red, Black, Blue, Yellow — RCA	.40
P30	2 Pin TV Outlet	$1.20
P31	2 Pin TV Outlet Plug	.60
P37	2.1mm DC Adaptor Plug	.40
S37	2.1mm DC Adaptor Socket	.40
S37A	2.1mm DC Adaptor Socket Flush Mount	.50
S37B	2.1mm DC Inline Socket	.35

BC107	.42
BC108B	.28
BC108C	.34
BC109B	.34
BC109C	.34
BC142	.50
BC143	.50
BC177B	.45
BC178B	.45
BC179B	.45
BC182B	.30
BC182L	.30
BC182LB	.30
BC183	.30
BC183L	.35
BC183LA	.35
BC184	.30
BC184C	.30
BC184L	.35
BC184LC	.35
BC212B	.30
BC212L	.30
BC213B	.30
BC213L	.30
BC214L	.25
BC327	.25
BC337	.25
BC338	.28
BC547	.14
BC547B	.25
BC547C	.25
BC548	.14
BC548B	.25
BC548C	.25
BC549	.18
BC549B	.25
BC549C	.25

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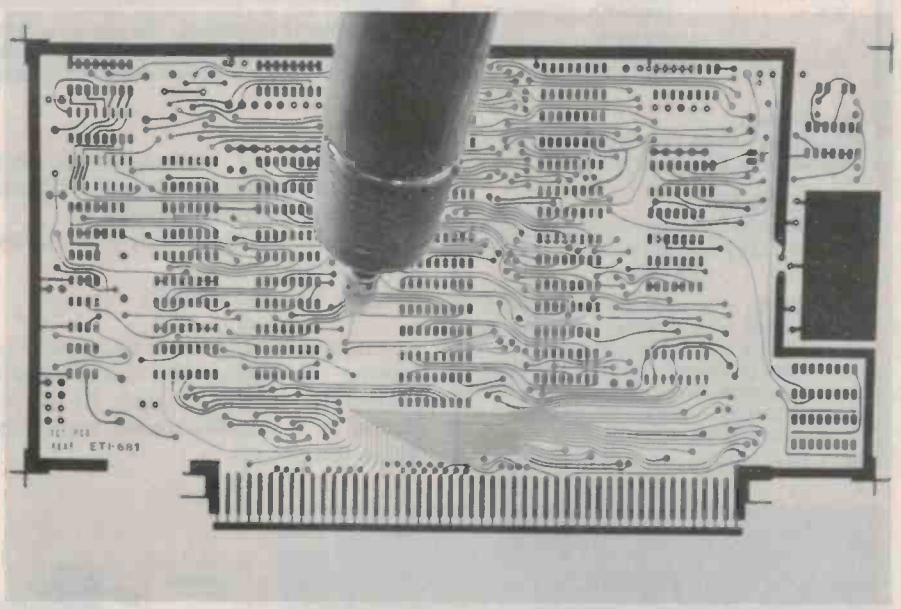
A simple speed regulator for miniature dc electric drills

Graeme Teesdale

Mini-drills are inexpensive, handy and widely used amongst electronic hobbyists, servicemen and technicians. Their one drawback is poor speed regulation under load. This simple circuit fixes that!

'MINI-DRILLS' are widely used by a whole range of hobby and craft enthusiasts — electronics hobbyists, technicians, etc, finding them very useful for drilling holes in pc boards, deburring holes in panels and similar applications. Many mini-drills locally available incorporate a 12 Vdc motor and have a chuck speed of around 6000 to 10 000 rpm. Unfortunately, this tends to drop dramatically when you're trying to drill a pc board — particularly if it's a fibreglass pc board. Many are meant to be operated from batteries, often at a reduced voltage (and lower chuck speed, but fast enough for many applications). Operation is best with fresh batteries but the motor stall current can be as much as one amp. Operating current may be 200 mA or more under a reasonable load. The output voltage of most dry batteries 'sags' rather a lot under such loading owing to their internal resistance and the drill speed drops accordingly. The drill bit's efficiency therefore drops alarmingly and all of a sudden you have difficulty drilling the hole.

This project consists of a dc supply which senses the load on the drill motor by sampling the current drawn, then boosting the supply output to maintain the motor speed under load.



Perhaps the most common use for a mini-drill is drilling the holes for components in pc boards. It's a time-consuming job unless your drill has a suitably high chuck speed (over 6000 rpm) and good speed regulation.

The problem, the solution

What causes the speed of the motor to drop when it is loaded? Normally, a fairly constant voltage is applied to the motor from either a battery or a fixed voltage power supply. When the motor is run without any load the speed increases until the power consumption is exactly sufficient to cover losses in the motor. When a load is placed on the motor, the speed drops, back-emf reduces and the difference between the back-emf and the supply voltage increases. This causes the motor current to increase. A new reduced speed is reached when the losses of the motor and the power delivered to the load equal the increased power consumption. Since the motors in these mini-drills generally have a fixed flux magnetic field (i.e: permanent magnet stator), to increase the speed to the unloaded speed (or to increase the speed at all) the supply voltage to the motor must be increased. ▶

Project 258

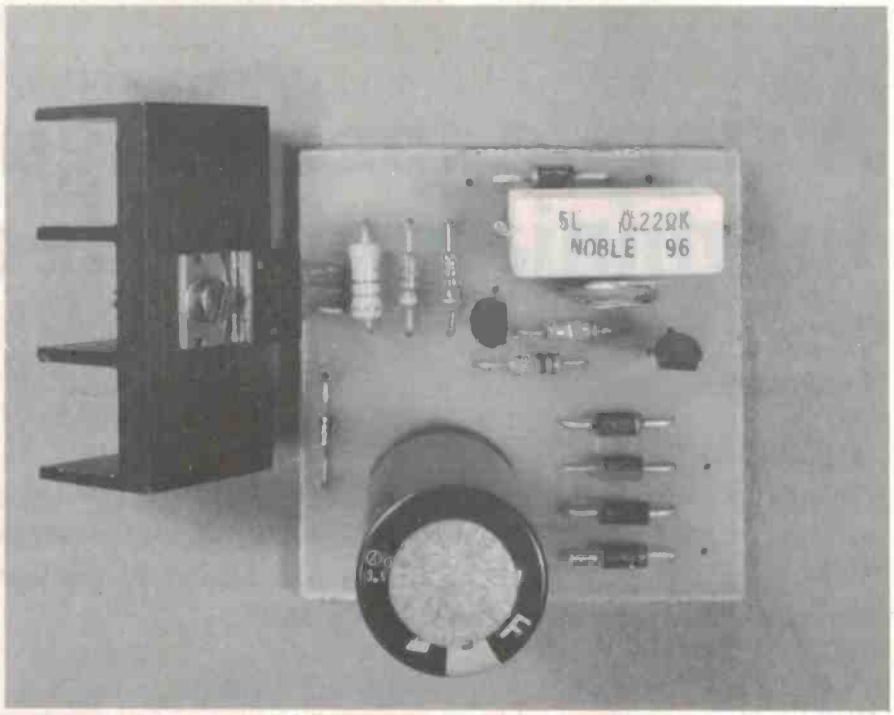
The circuit used in this project employs a standard three-terminal positive voltage regulator IC and a transistor differential pair in a feedback circuit to increase the output of the regulator under load. An LM340T5 (National Semiconductors) regulator was used here. A 7805 could equally well be used.

How's it used? Well, the output voltage of a 5 V three-terminal positive voltage regulator can be increased by returning the 'reference' (REF.) pin to the junction of a resistive divider connected between the output terminal and 0 V, as shown in the circuit.

The output voltage is determined by the formula:

$$V_{out} = 5\ V + \left(\frac{5}{R_2} + I_Q\right) R1$$

The output voltage can be varied by making the resistor R1 in the circuit adjustable. In this project, R1 is replaced by a suitably biased transistor (Q1 in the circuit).



Construction is very simple — as you can see! The pc board is not absolutely essential, but convenient. The trimpot, RV1, visible just adjacent to the 0.22 ohm 5W resistor (R3), is adjusted to provide a nominal 12 Vdc at the output terminals under no load. Adjustment is relatively non-critical.

PARTS LIST — ETI 258

Resistors — all ½W, 5% unless noted
- R1, R2 ..... 470R
- R3 ..... 0R22, 5 W
- R4, R5 ..... 100k
- R6 ..... 220R
- RV1 ..... 10k

Capacitors
- C1 ..... 2200u/25 V electro.

Semiconductors
- D1-D5 ..... 1N4004 or similar
- Q1, Q2 ..... BC547
- IC1 ..... LM340T/5 3-terminal regulator
- ZD1 ..... 12 V, 400 mW or 1 W zener

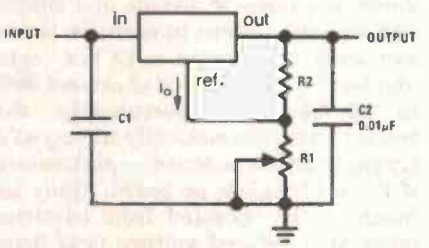
Miscellaneous
ETI-258 pc board; 12-14 Vac supply (i.e: plugpack); wire; zippy box to suit, etc.

Price estimate

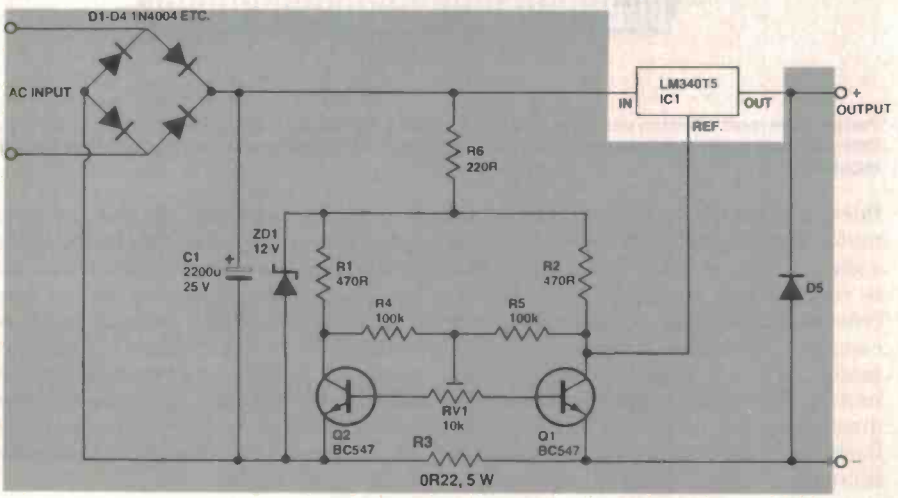
We estimate that the cost of purchasing all the components for this project will be in the range:

$6 - $8

Note that this is an **estimate** only and not a recommended price. A variety of factors may affect the price of a project such as — quality of components purchased, type of pc board (fibreglass or phenolic base), type of front panel (if used) supplied etc — whether bought as separate components or made up as a kit.



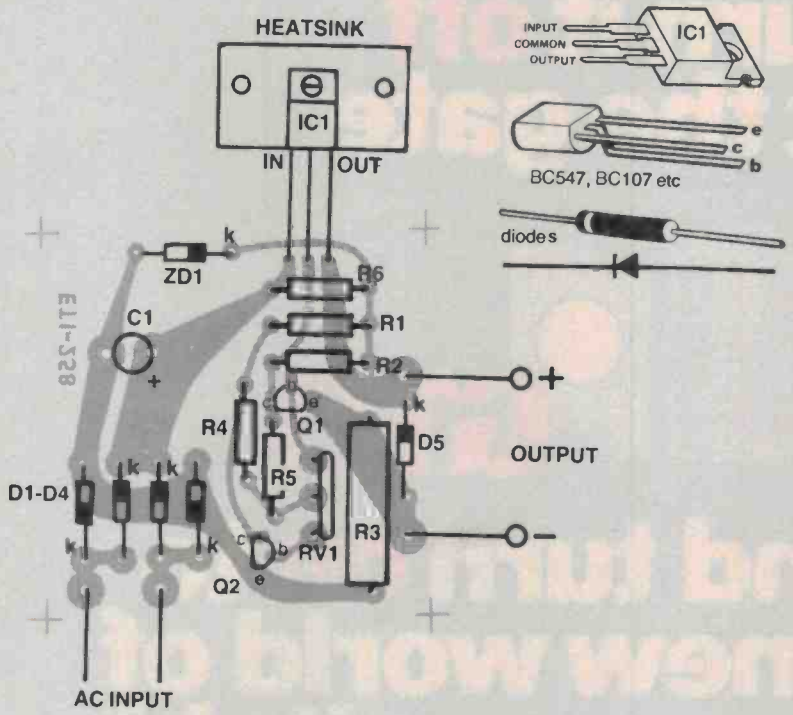
Showing how a three-terminal regulator can be arranged to have an adjustable output. The variable resistor, R1, here is replaced by a transistor in our regulator circuit below left.



Construction

Construction is quite straightforward, no tricks here. Using our pc board will ensure you have a compact unit that can be conveniently tucked somewhere out of harm's way. The pc board is not essential, however. Layout is not really critical, but keep all leads to and from IC1 short to prevent high frequency oscillation. If you have trouble with the latter, a 10n ceramic or greencap capacitor soldered directly between the output and reference pins of IC1 will cure the problem, although we didn't find it necessary. But that's getting ahead of ourselves!

mini-drill controller



Construction is best tackled by mounting all the resistors, diodes and transistors on the pc board first — leaving R3 till last as it's a bulky item. Watch the orientation of the diodes and transistors as usual. Mount C1 next. Mount IC1 last of all and then attach a small heatsink to it.

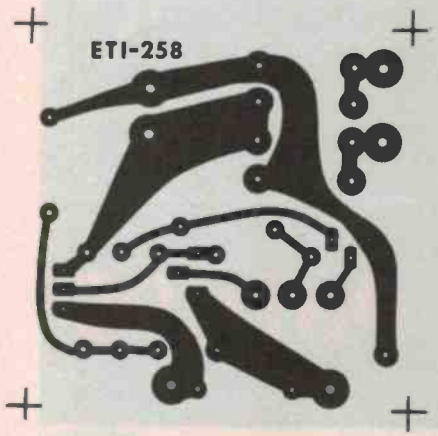
The completed unit can be housed in any convenient box or case, to suit yourself.

Supply input

The project may be supplied from any transformer, or a plugpack, that will deliver between 9 Vac and 12 Vac at 200 to 500 mA, or up to 1 A. A transformer such as the ubiquitous model 2155 (e.g: Arlec AR-2155 or Dick Smith M-2155, etc.) will do the job nicely using the 9.5 V tap.

A dc plugpack may be used if you leave out D1-D4 and connect the plugpack's output directly across C1 (watch the polarity!). A 12 Vdc plugpack rated at 200 mA or more would be suitable.

Although the mini-drill we used originally ran off two 1.5 V batteries (i.e: 3 V) it ran quite happily from our speed regulator. If you have to use the drill for prolonged periods, rest it at intervals so that the motor temperature does not rise too high. ●



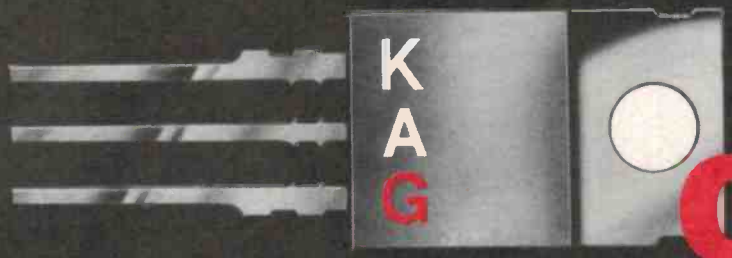
HOW IT WORKS — ETI 258

A conventional bridge rectifier (D1 to D4) and capacitor-input filter (C1) provides dc input to the regulator circuit consisting of IC1 and Q1, Q2 plus associated components. Output with no load is set by adjusting RV1 for a nominal 12 Vdc at the output terminals. With the drill connected and operating the voltage drop across R3 causes Q2 to conduct more. As Q1 and Q2 are connected as a differential pair, the collector current through Q1 will decrease. This results in an increasing collector voltage on Q1. The reference pin of IC1 will be raised to a higher voltage with respect to the −ve line and the output voltage will increase.

Diode D5 is fitted to protect IC1 against back-emf spikes from the motor. There is no need to worry about the IC suffering damage from this source as it is internally protected. If you stall the motor, the maximum current delivered will be limited by IC1, which is internally protected to limit at a maximum current of 1 A.

Different voltage motors can be accommodated by changing the reference zener, ZD1.

Turn it off at the gate



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

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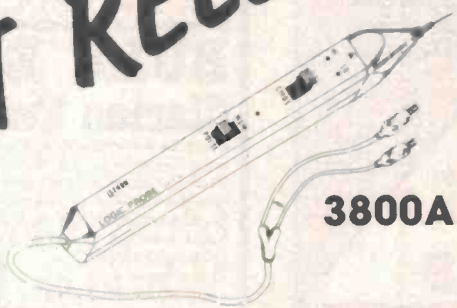

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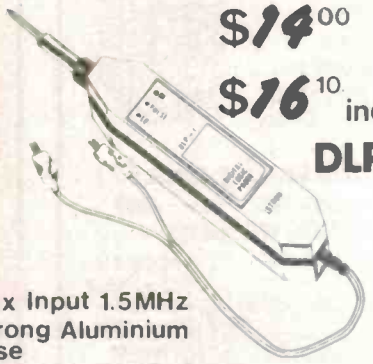

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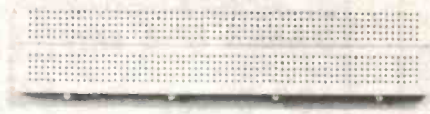

WB-TN 640 Holes
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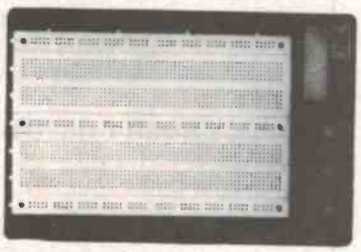

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CJ

Five-mode logic pulser probe

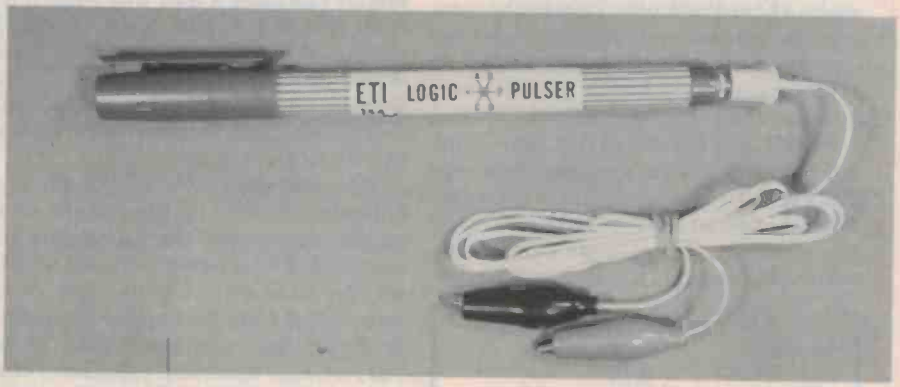
Undoubtedly, one of the most useful and convenient test instruments for designing and trouble-shooting digital circuitry is the logic probe. However, regardless of its sophistication it can only observe the circuit under test. The solution to this problem is a logic pulser used in conjunction with the logic probe.

Philip J. Jones

A LOGIC PULSER is an instrument which injects pulses into a digital circuit. These pulses are of opposite state to the point being injected and are of very short duration to avoid damage to the logic element whose output is being forced to the opposite state. Ideally, both single pulses and pulse trains of various frequencies should be available.

The logic pulser has many uses. Say, for example, a four-stage binary counter is suspected of being faulty. A pulse to the reset pin will reset it; single pulses are then fed to the clock and the four outputs are observed with the logic probe. Any counting fault will become evident as the various counts are cycled through. If a seven-stage counter is under test, the pulses are most conveniently injected in the form of a pulse train of the required frequency. Further examples will suggest themselves during use.

The pulser described here operates from a wide range of supply voltages and is compatible with both CMOS and TTL ICs. It has five modes: a single pulse mode and four pulse trains of frequencies 1, 10, 100 and 1000 Hz. The frequencies are largely dependent on the supply voltage, but in practice a precise value is not required. Single pulse injection and mode selection are achieved through the use of a touch switch. Briefly touching the switch injects a single pulse, whilst touching the switch for more than one second advances the pulser to the next mode. The current mode is shown on an LED display.

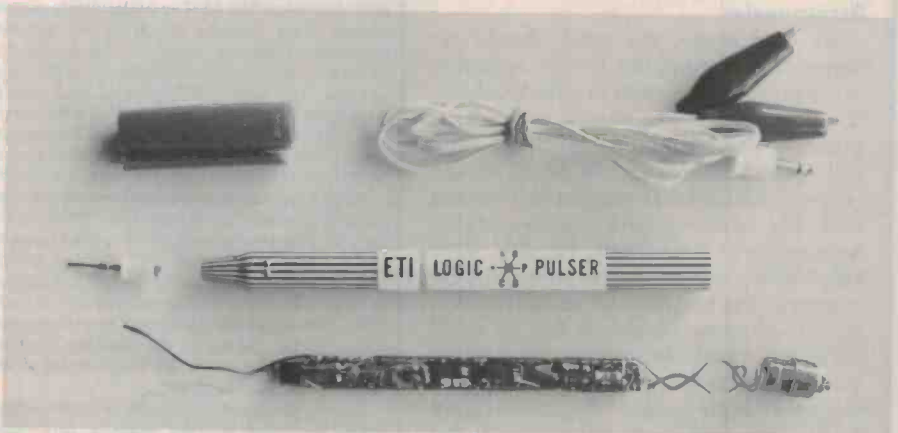


The completed probe — smart and business-like!

Pulse width is 4 μs, which represents a compromise between the much shorter width acceptable for normal IC inputs and the longer width required for, say, an interrupt to a microprocessor. The pulser obtains its power from the power supply of the circuit under test, which is assumed to be sufficiently regulated and filtered.

Construction

Construction of the pulser is largely left to the reader due to the varying nature ▶



The completed probe — but disassembled! No pc board is used, the components are wired directly together.

SPECIFICATIONS ETI-154

- CMOS or TTL compatible
- Supply voltage: 5 to 15 volts (18 V max.)
- Output impedance: approx. 10M
- Pulse width: 4 μs
- Five modes:
  - — single pulses
  - — four pulse trains of approx. frequencies 1, 10, 100 and 1000 Hz
- Current mode displayed on seven-segment LED display
- Pulse injection and mode selection by single touch switch

of pulser housings, etc, although a detailed description of the prototype construction is given for those who wish to make a normal pen-sized pulser. Many of the details given will be applicable to most forms of construction.

The pulser housing used was a Pilot "Ball Liner" pen obtainable from stationery stores, which has a length of 120 mm and an internal diameter of 8.5 mm. Whatever housing is chosen it is essential that it be made of plastic or a similar non-conducting material.

Direct point-to-point wiring has been employed in favour of a printed circuit board due to the prohibitive amount of space a board requires. To give the components the necessary support, a unique construction technique has been used. It involves the use of the ICs themselves to form the base for construction!

Firstly, the narrow part of the IC pins are cut off and the remaining stems are pushed up tight against the IC package. Then the corners of the top face of the IC are rounded. This is most easily done with an electric sander or grinder.

PARTS LIST — ETI-154

Resistors
- R1 ..... 390k
- R2 ..... 2k2
- R3 ..... 1M
- R4, R7 ..... 10M
- R5 ..... 6M8
- R6 ..... 680R
- R8 ..... 1M2
- R9 ..... 100k
- R10 ..... 10k

Semiconductors
- IC1 4081
- IC2 40106
- IC3 4017
- IC4 4016
- Q1, Q3 ..... BC548
- Q2 ..... BC558
- D1 ..... 1N914 or similar
- LED.D ..... Small, common-cathode 7-segment display

Capacitors
- C1, C2 ..... 150n/16V tantalum
- C3 ..... 220n/16V tantalum
- C4 ..... 10p ceramic
- C5, C6 ..... 2n2 ceramic

Miscellaneous

Twin lead with black and red alligator clips or E-Z hooks; 2.5 mm plug and socket (optional); pulser casing, tip, and two pins.

Price estimate

We estimate that the cost of purchasing all the components for this project will be in the range:

$9 - $11

Note that this is an estimate only and not a recommended price. A variety of factors may affect the price of a project such as — quality of components purchased, type of pc board (fibreglass or phenolic base), type of front panel (if used) supplied etc — whether bought as separate components or made up as a kit.

To fit inside the small pen barrel, each IC has the top ground down to a round shape and the pins cut back, as shown.

Finally, the IC packages are glued end-to-end with epoxy resin or other suitable glue. This procedure is really quite straightforward and is illustrated in the diagrams on page 56.

Now, a note on the vulnerability of the CMOS ICs involved. CMOS technology has come a long way since it was first introduced and as a result the chance of an IC being damaged by the above procedure is very small. Nevertheless, as a safeguard against later disappointment, it is advisable to check the ICs at this stage.

The next step is to mount the components and wire up the circuit. As far as the components themselves are concerned, they are best purchased over the counter so that the smallest of each can be selected from the supplier's stocks. It is surprising how much the size can vary of, say, tantalum capacitors of the same value from the same manufacturer. The hookup wire should be the single strand, plastic-coated type and have a total thickness of about 0.5 mm.

The component leads should be bent and cut before soldering with a minimum of solder. It is important to hold, rather than press, the components in position while soldering, as joints soldered under stress may come apart. With care, all the components including the LED display can be mounted on top of the IC base except for the output transistors and the zener diode, which are best mounted at either end. The transistors may be filed down to make fitting easier.

At this stage, the unit should be tested. Upon applying power, segment 'd' should light up, and briefly touching the two touch wires should result in a pulse at the output. Advancing to the pulse train modes should result in the corresponding LED segments lighting and the corresponding pulse trains appearing at the output. Finally, after the 1 kHz pulse mode, the pulser should return to the single pulse mode. If some, or all, of these functions fail to work correctly, read the circuit description and track the fault down with a multimeter or logic probe. The most likely faults are incorrect wiring and dry joints.

With the pulser now functioning correctly, construction of the housing can proceed. This involves providing a window for the LED display and fitting the contacts for the touch switch. The display window can be provided as follows: drill an oversized hole with diameter, say, 4-5 mm. Insert a soft, transparent plastic disc (the plastic used in Kodak slide boxes is ideal) of sufficient diameter to ensure a tight fit. Due to the curvature of the housing, the disc will have protruding edges which can be trimmed with a razor blade. Finally, a paper label with the correct sized window cut in it can be fixed over the disc with Contact or a similar transparent, adhesive plastic covering. The circuit should be fitted in place before the plastic disc is positioned. The purpose of the oversized hole masked by the correct-sized paper window is to reduce the precision required when positioning the circuit and LED display.

The contacts for the touch switch are made from two pins. Cut each pin about 3 mm below the head. Then solder fine

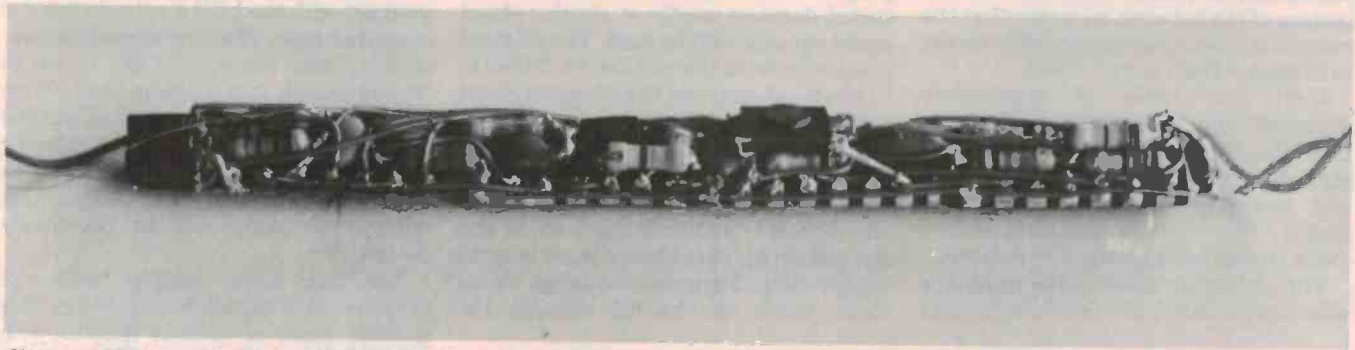
HOW IT WORKS — ETI-154

In the single pulse mode, touching the touch switch contacts makes the output of IC2a go low, with R1 and C1 eliminating switch bounce. The output of IC1b then goes low, producing a short, positive pulse at the output of IC2b. The pulse width is determined by R2 and C5 and is approximately 4 μS. This pulse is then fed to the two AND gates, IC1c and IC1d, one of which is enabled and thus switches on the appropriate output transistor. The AND gate enabled is determined by the state of the point being injected. If it is high, the output of IC1a is high, which enables gate IC1d through R3. Thus, TR3 turns on and injects the required negative pulse. The complementary situation occurs if the point being injected is low. The RC combination, R3 and C4, prevents the pulser from responding to its own pulses. Base resistors are not required for the output transistors due to the very short pulse width.

In the single pulse mode of operation, the zero output of the 4017 is high, which closes switch IC4d, thereby disabling the Schmitt oscillator. However, touching the switch for more than one second charges C2 sufficiently to cause the output of IC2e to go high, which advances the 4017 counter. Switch IC4d opens and IC2f begins to oscillate at 1 Hz. The square wave at the output is fed to the remaining input of IC1b and hence a 1 Hz pulse train is injected.

Further advancing the counter increases the pulse frequency by switching in resistors R8 to R10. The counter outputs are also used to drive a seven-segment LED display, which indicates the current mode. The '5' output (pin 1) from the counter is connected to the reset input, hence returning the pulser to the single pulse mode. Capacitor C6 ensures that the pulser will come on in the single pulse mode when the power is applied.

Zener diode, D1, provides overvoltage protection and reverse polarity protection should the power be incorrectly applied.



Close-up of the completed unit. Connections to the probe tip and the touch contact pins are to the left, power supply connections to the right. All the components are wired directly in place and small gauge insulated hookup wire used for interconnections. The ICs are glued end-to-end to form a solid 'base'. This form of construction is only necessary if you wish to construct the unit and house it in a pen barrel as the author has done. Otherwise, matrix board could well be used to support the components.

enamelled or silk-covered wire to the bottom of the cut pins, ensuring that the resultant joint is not appreciably larger in diameter than the pin itself.

Drill two holes of appropriate diameter and spacing in the housing near the tip. Feed the wires from the pins through the holes and out the tip end and push the pins in position. Lightly touching the pinheads with a clean iron tip will set them in position.

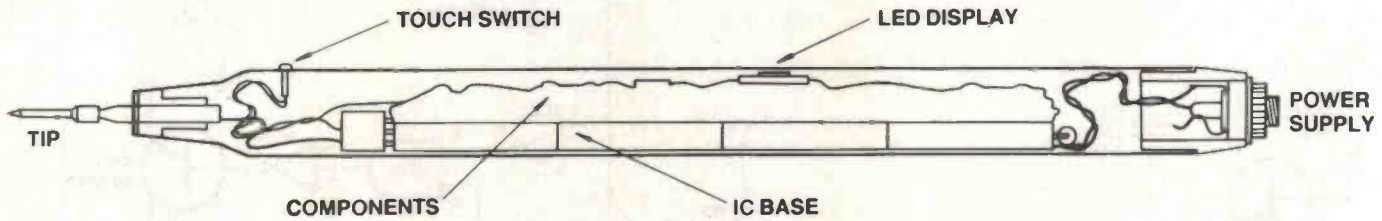
The pulser tip used in the prototype was a gold-plated pin from a computer plug. It certainly looks the part, but a metal darning needle or similar object could equally well be used. The original plastic tip from the pen can be drilled to fit the tip chosen and the whole lot glued at the appropriate stage.

The circuit can now be positioned. The two wires from the touch switch circuitry should be of the type used for the pinheads and both these wires and the pulser tip wire should have lengths longer than the pulser housing. These three wires can be fed through the housing and the circuit then pushed into position with the LED display below the oversized hole. The five wires now protruding from the tip end can be cut to 20 mm length and the four touch wires paired, soldered, insulated, and pushed back into the housing. The remaining wire is soldered to the pulser tip, which is then glued in place. The LED display window is completed as previously described.

The two power supply leads are terminated with a 2.5 mm socket.This enables leads of various lengths with various clips to be substituted; however, the use of the plug and socket is optional.

The logic pulser is now complete, and will find many uses, in both designing and trouble-shooting digital circuitry. ●

Positioning of the ICs, bottom view. The dot indicates pin 1 on each.



Location of the components inside the pen barrel.

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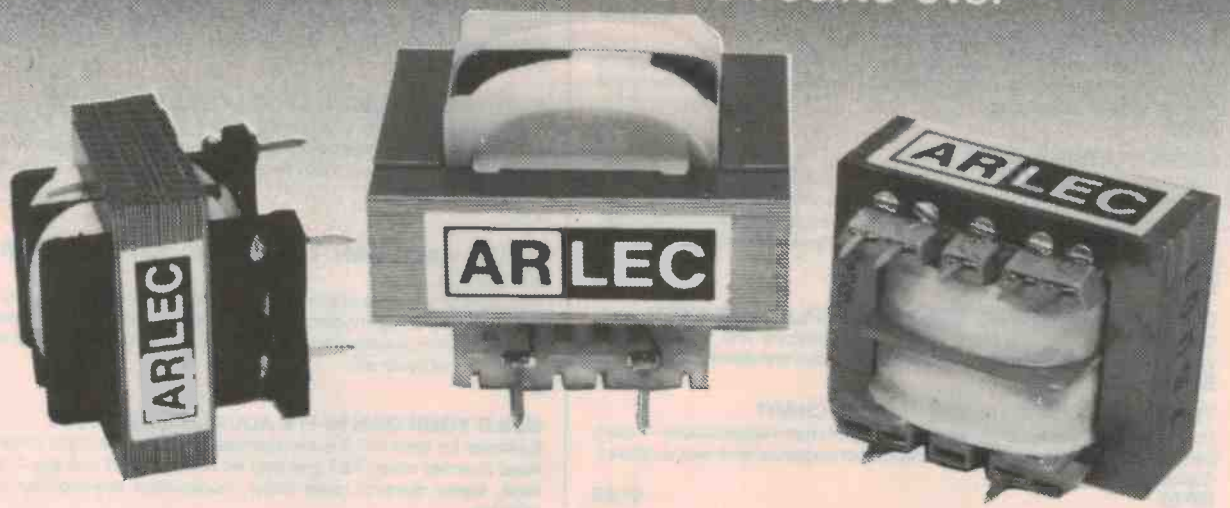

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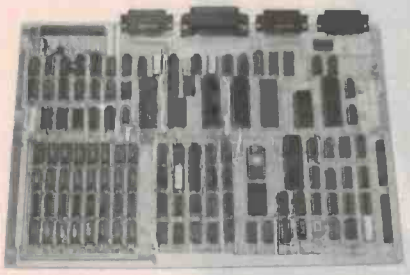

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Lab Notes

Attenuator ups and downs

One of the most important types of artillery in the design engineer's armoury of 'vital weapons' is the apparently simple passive circuit known as the 'attenuator'. Naturally, these apparently simple weapons are full of nasty little surprises and have a tendency to explode in the face of the unwary designer, says Ray Marston.

Ray Marston

ATTENUATORS are used to reduce an awkward value input or output signal to a lower and more convenient level. The simplest example of a practical attenuator is the 'pot' circuit of Figure 1, which may be used as a volume control in an audio system or as an output level control in a simple audio generator, etc.

The input signal to the pot attenuator is connected across the total resistance chain and the output is taken from the pot slider. Note that the pot effectively comprises an upper (R1) and a lower (R2) resistive arm, thus forming a basic 'L'-type attenuator, and that the degree of attenuation is determined by the ratio of lower arm resistance divided by the total resistance.

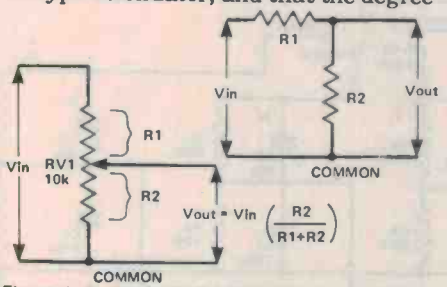

Figure 1. A simple 'pot' attenuator, as used for a volume control or an uncalibrated output level control (left) is a common version of the 'L' attenuator (right).

The precise amount of attenuation provided by a pot is generally of little importance and the control is usually left uncalibrated. If a precise amount of attenuation is required, a simple switched potential divider network of the type shown in Figure 2 may be used. It is important to note, however, that this circuit is designed to feed into an *infinite* impedance, or at least one that is very large compared to the total resistance of the divider chain.

Design tips

The first step in designing an attenuator of the Figure 2 type is to decide what its input impedance or total resistance is to be. Next, the values of the individual resistors are determined. Here the design is carried out in a simple sequence of logical steps, there being as many steps as there are attenuator switched positions. In each of these steps, the circuit is considered to consist of an upper and a lower half only. An example will help clarify matters.

Assume (as in our example) that the total resistance is to be 10k and that two attenuation positions (excluding unity) are required and are ÷ 10 and ÷ 100. The values for the greatest amount of attenuation are always determined first, so for ÷ 100 the lowest arm must contain 1/100th of the total resistance, or 100R. This gives the value for R3 and leaves the remaining 9900R in the 'upper' (R1 + R2) arm.

The values for the ÷ 10 position are next calculated and it is found that 1k is needed for the 'lower' arm. In this case, however, the 'lower' arm consists of R2 + R3, but as R3 is already known to be 100R, R2 must be 1k − 100R = 900R. The upper arm, R1, must obviously contain the remaining 9k of the 10k chain.

This simple design procedure may be expanded up to give as many attenuator steps as are required for a particular application.

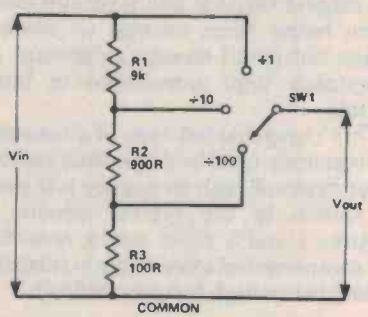

Figure 2. The method of designing this simple switched attenuator is explained in the text.

It should be noted that the simple attenuator circuit of Figure 2 is only accurate at low frequencies or when▶

Lab Notes

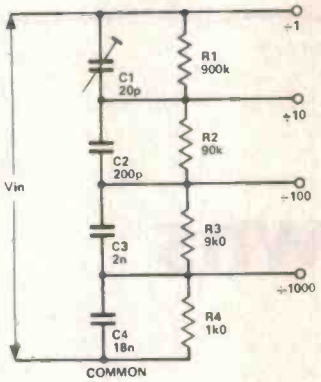

Figure 3. A method of providing frequency compensation (to give a wide frequency response) to a simple attenuator network.

moderately low values of resistance are used. At high frequencies, stray capacitance will shunt the values of all resistors and may significantly reduce their values and thus the accuracy of the attenuator. This effect is particularly acute when high value resistors are used: a mere 2 pF of stray capacitance represents a reactance of about 800k at 100 kHz and will have a very significant shunting effect on any resistor with a value greater than a few tens of kilohms.

Compensation

This problem can readily be overcome by shunting all resistors with correctly chosen values of capacitance, as shown in Figure 3.

Here, each resistor of the chain is shunted with a fixed capacitor, the reactance values of capacitance being in the same ratios as the resistive arms of the attenuator. The highest reactance (smallest capacitance) is connected to the largest resistor and typically has a value being large enough to 'swamp' strays but small enough to present an acceptably high impedance to input signals.

This 'compensated' type of attenuator is invariably used in 'scopes and various other types of high frequency test gear, as shown in the typical circuits of Figures 4 and 5. Once again, note that the compensated attenuator is intended to feed into a high impedance load.

Pot pitfalls

At this point in our discussion it may have dawned on you that, because of the effects of stray capacitance, there can be certain pitfalls in using pots in some types of circuit. Suppose, for example, that you have designed an audio amplifier with a beautifully flat frequency response but have, in a moment of madness, fitted it with a 500k volume control. You will (hopefully) not be unduly surprised to subsequently find that, at low volume settings, stray capacitance of a few picofarads across the upper arm of the pot causes the amplifier's treble response to be boosted by several dB at 12 kHz or so!

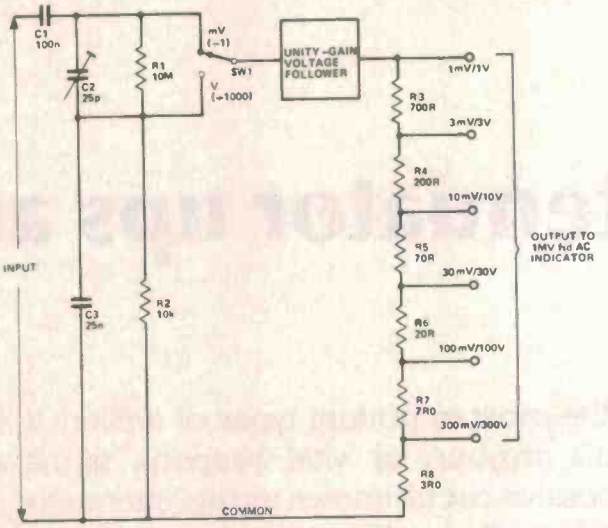

Figure 5. Typical attenuator sections of an ac millivoltmeter.

Again, suppose that you have designed a superb LF sine/square generator which produces square waves with rise and fall times of a mere 50 nS or so, but have fitted the beast with a simple 10k pot as an output level control. Naturally, you will not be surprised to find that the few picofarads of strays across the upper arm of the pot act as a reactance of only a couple of thousand ohms to your fast rise and fall time signals and consequently cause

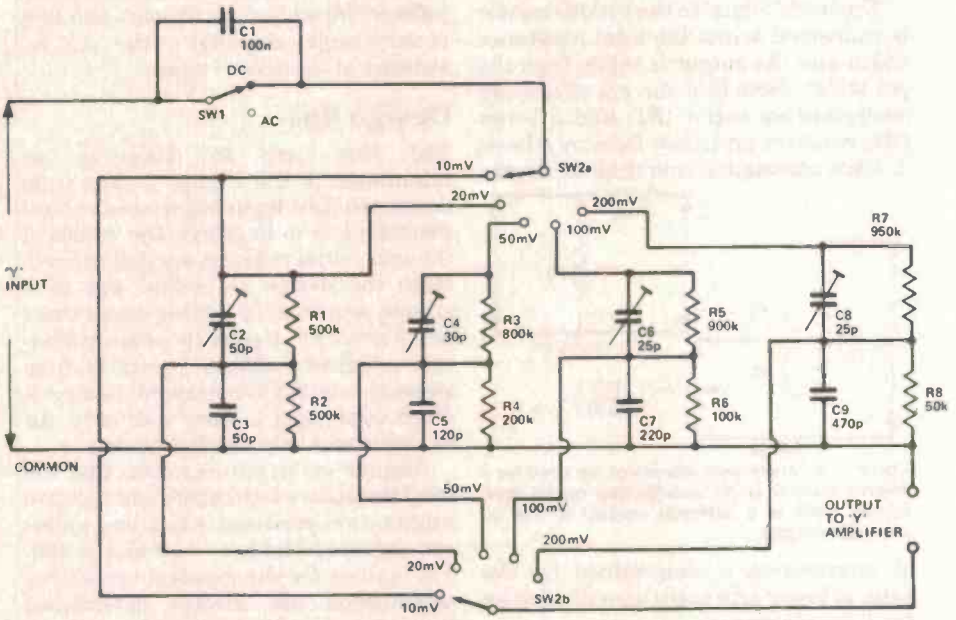

Figure 4. Section of a typical scope 'Y' amplifier attenuator.

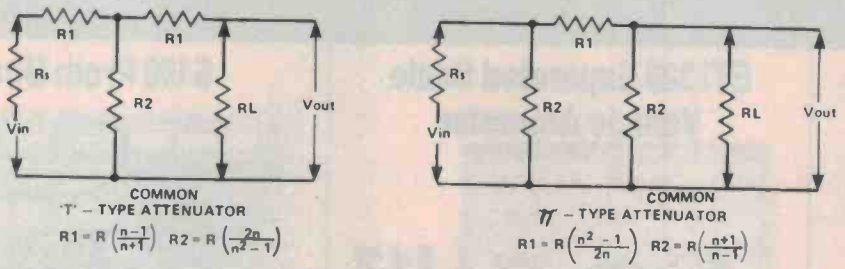

Figure 6. Two popular types of matched-resistance attenuator.

your square waves to appear incredibly 'spiky' at low amplitude settings.

Both of the above problems can be solved or minimised by using pots with sensible low resistance values, bearing in mind the effects of strays at the operating frequencies in question.

Matched-resistance attenuators

Often, an attenuator is needed to feed into and/or from a fixed load of some kind, in which case the simple potential divider types of circuit discussed above are of little use. Instead, one of the many versions of the so-called matched-resistance attenuator must be used. Two of the most popular attenuators of this type are shown in Figure 6, together with their basic design formulae. Note that these formulae are valid only when the attenuators are correctly terminated at each end.

The 'T'-type attenuator is a perfectly simple design and several sections can readily be cascaded to form variable attenuator networks, as shown in the practical circuit Figure 7. Here, the attenuation can be varied from 0 dB to 60 dB in 20 dB steps by switching individual sections into or out of the circuit.

The π attenuator sections cannot be directly cascaded, as is made clear in Figure 8. Nevertheless, sections can be cascaded in modified form to produce a laddered attenuator network, the most popular of all attenuator types.

Looking at Figure 8, you can see that if three individual π sections are wired in cascade (Figure 8a) their adjacent R2 sections connect in parallel to give an impedance of P/2 (Figure 8b), while the two R2 end sections have impedances of P. If an external load, RL, is simply switched to the different outputs of the cascaded π attenuator sections (Figure 8c) the load will clearly see impedances of roughly half of the correct value and so be severely mismatched. To put things right, the formula for the component values of the ladder network of Figure 8c are re-jigged as shown.

The ladder attenuator of Figure 8c is very widely used in AF and RF signal generators. Figure 9 shows the practical circuit of a fully variable 600 ohm attenuator that can be used in sine/square generators, etc. The odd resistor values (correct within 2%) can be made up by wiring pairs of resistors in series or parallel. ●

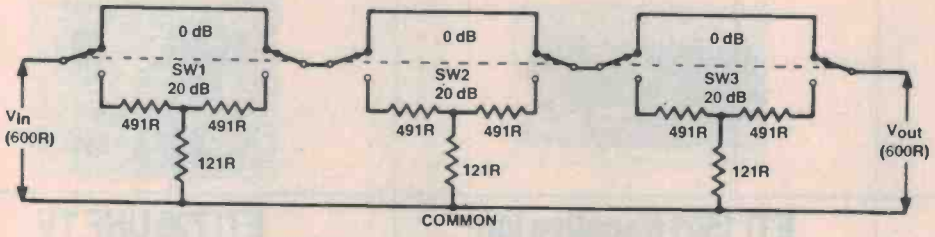

Figure 7. Three identical 20 dB 600R 'T' attenuators cascaded to make a 0-60 dB switched attenuator unit.

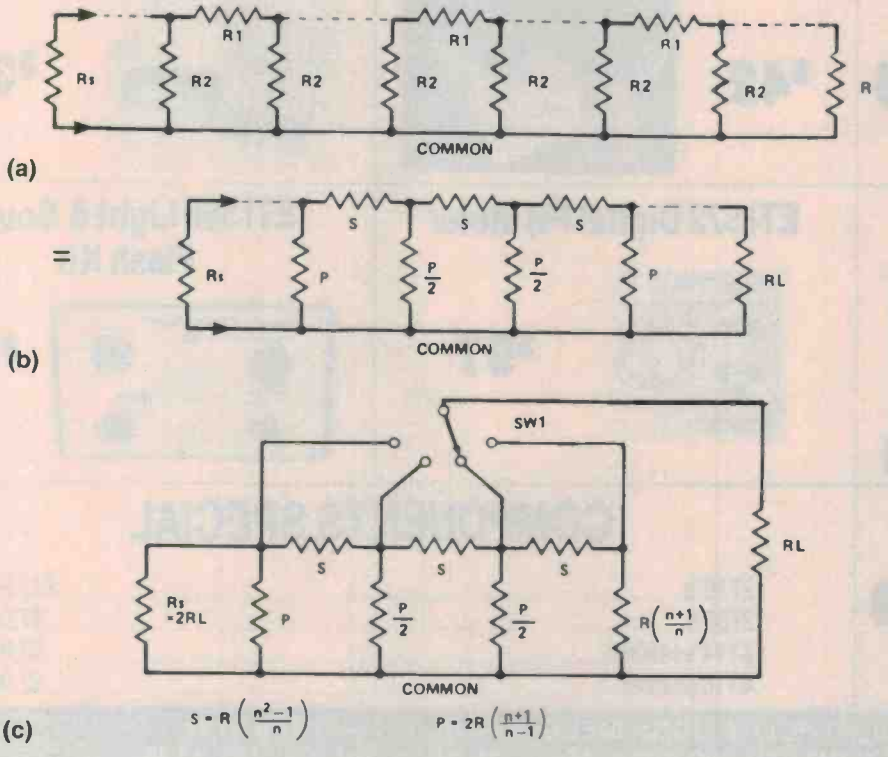

Figure 8. The ladder attenuator (c) is a development of the basic π attenuator (a and b).

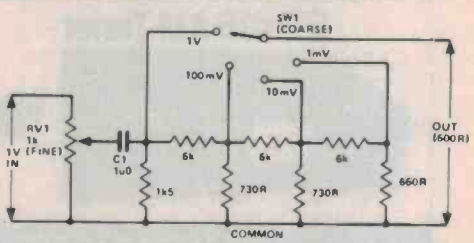

Figure 9. Practical 600R output attenuator network for a modern sine/square generator. RV1 gives fine control. SW2 gives coarse control.

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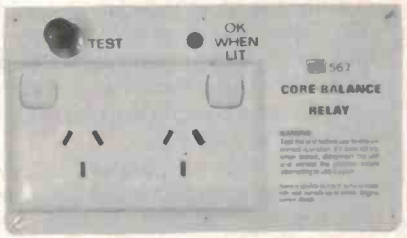

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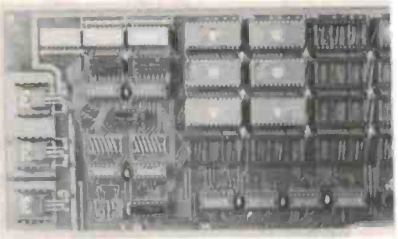

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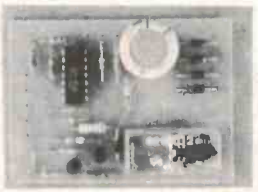

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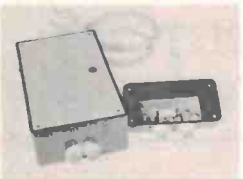

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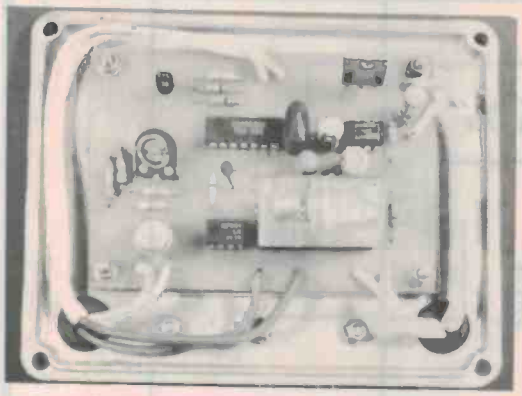

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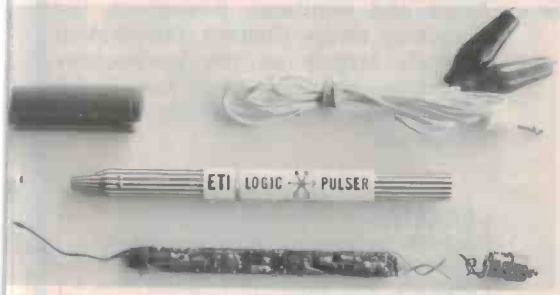

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Ideas for Experimenters

These pages are intended primarily as a source of ideas. As far as reasonably possible all material has been checked for feasibility, component availability etc, but the circuits have not necessarily been built and tested in our laboratory. Because of the nature of the information in this section we cannot enter into any correspondence about any of the circuits, nor can we produce constructional details.

VLF ramp generator

It is always satisfying to exploit the otherwise unwanted property of a device — the reverse bias current of a leaky germanium diode, in this circuit from **G. Malloy of Whitby, UK.**

The reverse saturation current is typically a few microamps for the OA90 and is relatively constant over 2-10 V. This constant current is used to linearly charge the capacitor in the relaxation oscillator built around the 741.

When the diode becomes forward biased the capacitor is rapidly discharged by the limited output current of the op-amp. Frequencies below 0.01 Hz are possible, though measures may have to be taken to improve the linearity of the ramp.

PR1 allows some degree of dc offset of the ramp, and the source follower (Q1) reduces the loading on the capacitor, which tends to degrade the ramp's linearity. For the same reason tantalum or RBLL electros (i.e: low leakage) types should be used for large values of C1. Linearity can be further improved by the use of a FET input op-amp such as the 3140.

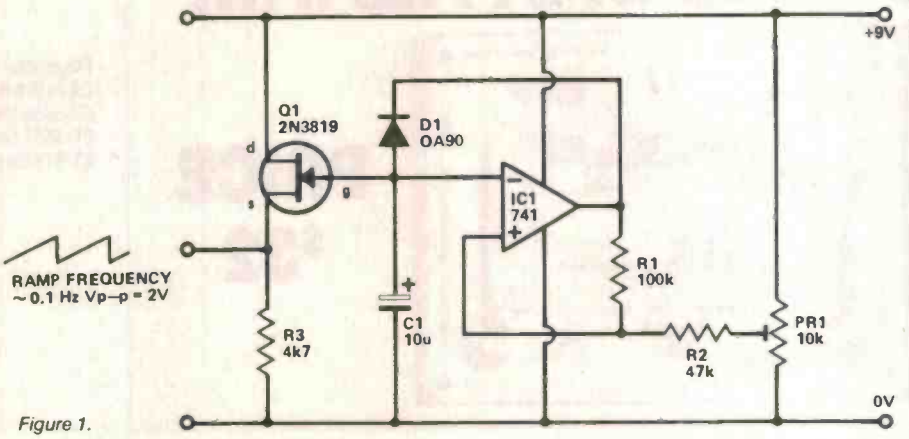


Figure 1.

The frequency can be made variable by using the FET constant current generator shown in Figure 2, which should replace the diode, D1. With RV1 at 100k the current will be about 30 μA and roughly inversely proportional to RV1. This constant current generator needs a voltage of about 3 V to function well. This may require an increased power supply. However, the resulting linearity is excellent, especially with the suggested FET input op-amp.

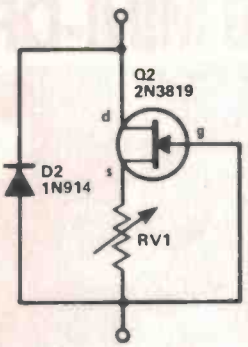


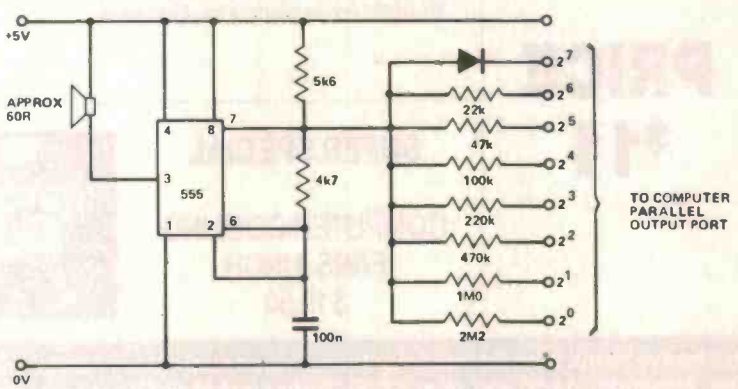
Figure 2.

Cheap micro music box

This circuit may be connected to the output port of any micro to generate musical notes over a range of about 1½ octaves. On/off control is provided by the most significant bit and the resistors provide seven-bit resolution. Alternative on/off control methods can be used to give eight-bit resolution, e.g: by using the handshake lines, if available.

If the diode is replaced by a resistor, say 10k, it will be found that below a certain output value the voltage at pin 7 is insufficient to charge the capacitor. Thus the sound can be switched off.

The resolution is sufficient to enable values to be found corresponding to tones and semitones throughout the frequency range. Current consumption depends largely on the loudspeaker impedance and is generally low enough for power to be taken directly from the computer.



ERRATA

A rather obvious, but potentially dangerous error occurred in the circuit on the top left of page 60 ('Power Monitor') in the March issue. It shows the mains active input connected to the earth at the output. The mains active input should instead go to the fuse. Correct your copy now. Correction slips were inserted in the majority of copies distributed.

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8,200uF	25V		$4.00
12,000uF	25V		$4.50
19,000uF	25V		$6.00
22,000uF	25V		$6.50
50,000uF	25V		$8.00
71,000uF	25V		$9.00
2,000uF	30V		$1.50
16,000uF	30V		$5.00
26,000uF	30V		$6.50
37,000uF	30V		$7.50
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8,300uF	40V		$4.00
5,500uF	45V		$4.00
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1	560uF + 47uF 160VW can electro	$2
1	3300uF 63VW insulated can electro	$2
1	LM309K 5V 1.5A Motorola reg. TO3	$2
1	400V 25A stud SCR C37D	$2
1	4" Magnavox 15ohm speaker	$2
1	6" x 4" Plessey 15ohm speaker	$2
1	pair multimeter test leads	$2
2	250V chromed red bezel, miniature	$2
30	assorted chokes, RF, video, etc	$2
1	CB/car stereo noise filter	$2
1	permeability tuner, 3 coils	$2
1	transistor radio repair kit	$2
1	de-soldering wick in dispenser 1 metre	$2
1	car speaker fader, dual 25ohm pot	$2
1	8" ceiling spkr grille for background music	$2
6	PCB offcuts, assorted, handy sizes	$2
20	IBM computer boards, assorted	$2
1	12V car cassette head demagnetizer	$2

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7404	0.22	74LS00	0.34
7405	0.42	74LS04	0.34
7406	0.42	74LS10	0.34
7408	0.30	74LS42	0.64
7410	0.22	74LS73	0.47
7413	0.42	74LS75	0.38
7420	0.30	74LS86	0.42
7427	0.30	74LS92	0.76
7430	0.30	74LS93	0.68
7432	0.30	74LS151	0.64
7441	0.90	74LS174	0.76
7446	0.55	74LS244	1.30
7473	0.40		
7474	0.40	74S00	0.68
7475	0.50	74S373	1.30
7485	0.68		
7486	0.51	4001	0.34
7490	0.45	4002	0.34
74116	1.60	4022	0.75
74132	0.60	4049	0.51
74150	0.90		
74154	0.95	BT97N	1.15
74160	1.20	9102	0.90
74188	1.95	9305	1.00
REGULATORS		2102PC	1.00
78L12	0.34	2102A	1.70
79L05	0.51	2708L	6.50
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LM309K	1.50	SCMPII	9.50

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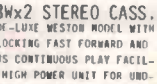

BEST QUALITY RADIO WITH -VE OR -VE GND, USUALLY $79

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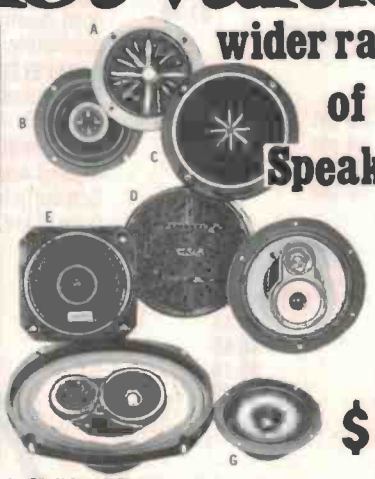

$11 PAIR

A 5" SLIM-LINE TWIN-CONE SPEAKERS, 4 ohms, max. 12W, only 1" depth behind grille, were $24.95, now $21.50

B 5" SLIM-LINE 2 WAY CO-AXIAL SPEAKERS, 4 ohms, max. 25W, 1" depth behind grille, were $45,....now $39.90

C 5¼" 2 WAY CO-AXIAL 4 ohms, max 15W, huge 20oz magnet, highly efficient, were $39.95,....now $29.50

D 5¼" BLACK PADDED GRILLE, 4 ohms, 6 watts, now $11.00 also avail. as dual 4/8 ohms,.....now $13.00

E 4" FULL-RANGE TWIN-CONE SPEAKERS, 4 ohms, max. 25W, acoustic suspension cone, were $35.90, ...now $32.00

F 5¼" BIG SOUND 3 WAY CO-AXIAL, 4 ohms, big 25W max. power, hi-fi performance, were $59.95,....now $55.00

G 4" ECONOMY TWIN-CONE SPEAKERS, 4 ohms, max 12W, acoustic suspension cone, were $24.90,....now $19.90

H 7" x 5" DE-LUXE 3 WAY CO-AXIAL SPEAKERS, 4 ohms, max 30W, acoustic suspension cone,.....now $49.00

also 9" x 6" SUPERB 3 WAY CO-AXIAL SPEAKERS, our best sounding speakers, huge 50W, acoustic suspension cone for deep bass, were $79.00,.....now $69.00

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24V 4c/o as above, permanent latching	ea$2.50
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Light dimmer kits, 700W, RF supp. etc	ea$4.95
Stereo ceramic replacement cartridge	ea$2.50
5" x 4" NSP 15 ohm speaker	ea$1.50
400V 25A stud SCR C37D	ea$1.95
2SD350 1500V 5A 22W TO3 power	ea$3.90
BU126 300V 3A 30W TO3 power	ea$2.20
5 pin din to 5 pin din lead 1.3metres	ea$2.25
C-90 LN low noise cassette tape	ea$1.10
Record cleaner arm, Goldring	ea$2.95
2½" (57mm) Philips tweeter, 8 ohm 20W	ea$3.00
5" twin-cone mid-range/tweeter	ea$3.00
4" Novik mid-range, 8 ohm 20W	ea$5.00
6" Magnavox twin-cone speaker, 8 ohm 7W	ea$6.00
5K log or 500 ohm lin. 45mm slide pots, 4 for	$1.00
Philips triplers for colour TV, this month only	ea$10.00
Octal sockets for relays, valves, etc.	4 for $1.00

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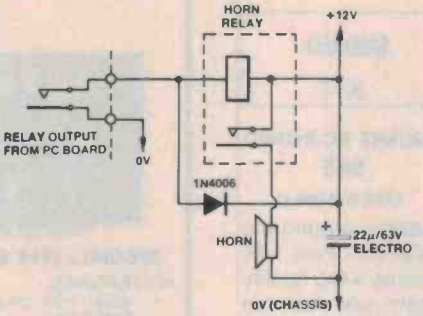
Ideas for Experimenters

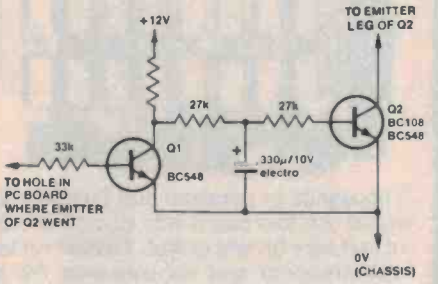
ETI-084 car alarm mods

A number of readers, including the **Service Manager at Dick Smith Electronics, Gary Crapp,** have sent along suggested modifications for this alarm, which was published in our 'Project Electronics' book and has been quite a popular kit.

The principal problem observed was that the alarm would reset itself after tripping and operating the vehicle's horn. There are several suggested methods of curing this. Gary Crapp suggests linking pin 4 and pin 8 on each 555 (IC1 and IC2), adding a 100n capacitor between pin 5 of IC1 and the +12 V rail and adding a 1000 uF capacitor across C1. **Geoff Sinclair of Williamtown, NSW,** cured it by adding a 25 uF capacitor from pin 5 of IC2 to the 0 V rail and adding a 4u7 capacitor from pin 2 of IC1 to the 0 V rail. He also increased the value of C3 to 25 uF.



Rodney Hunt of Oyster Bay, NSW, cured the resetting problem by adding a horn relay (which helps the project's on-board relay to survive longer) and a 22 uF capacitor in the circuit shown here. He also replaced C3 with a 100 uF capacitor (giving an exit delay of seven seconds). By increasing C4 to 22 uF, Rodney also increased the reset time to almost two minutes.



Entry delay can be provided in several ways, but that suggested by Rodney Hunt is the simplest we've seen. The second circuit here shows how it's done. The emitter leg of Q2 on the pc board is lifted and this circuit inserted between that leg and the hole it went into (to pin 3 of IC1). This provides an entry delay of around seven seconds. Rodney constructed the circuit addition on a piece of tagboard.

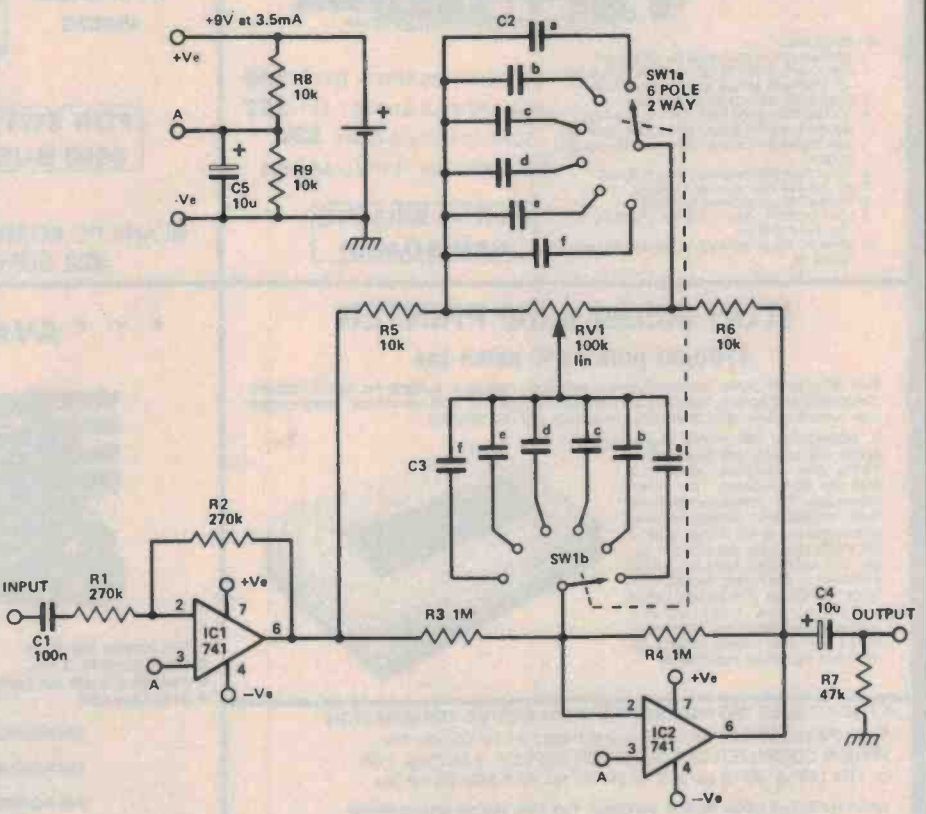
Parametric equaliser

This parametric equaliser offers six bands of tone control separated by an octave in frequency, each frequency band being selected by the six-position rotary switch.

Potentiometer RV1 permits the selected frequency band to be boosted or cut by 12 dB. The filter is particularly ideal for use with a guitar to modify and enhance the tonal qualities of the instrument. For example, the 500 Hz setting with cut gives a hollow funky sound, whilst the 500 Hz setting with boost gives an overdriven valve amplifier the raunchy sound favoured by many rock guitarists, but without the unpleasant, muddy, harsh sound resulting from boosting the entire audio frequency spectrum.

Capacitor values for the filter frequencies are given in the accompanying table.

A neat idea from **C.E. Read of Norwich, UK.**



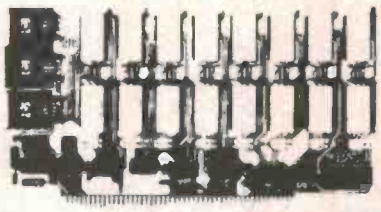
	FREQ (Hz)	C2 (pF)	C3 (pF)
a	125	47000	4700
b	250	22000	2200
c	500	12000	1200
d	1k	5600	560
e	2k	2700	270
f	4k	1500	150

ROD IRVING ELECTRONICS

425 HIGH STREET, NORTHCOTE 3070, MELBOURNE, VICTORIA.

S100 COMPUTER PRODUCTS

16K EPROM CARD-S 100 BUSS



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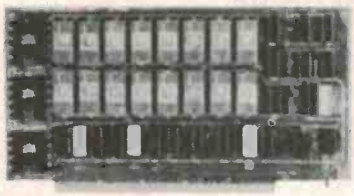

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SPECIAL: 2716 EPROM's (450 NS) Are $8 EA. With Above Kit.

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's.
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9. Gold plated contact fingers.
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12. Easy and quick to assemble.

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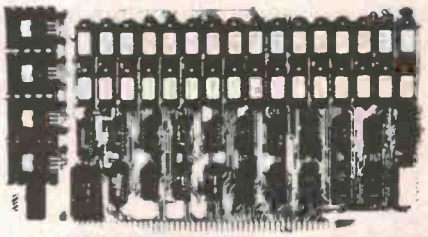
KIT $189
A&T $219



KIT FEATURES

1. Addressable as four separate 4K Blocks
2. ON BOARD BANK SELECT circuitry (Cromemco Standard) Allows up to 512K on line
3. Uses 2114 (450NS) 4K Static Rams
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6. All address and data lines fully buffered
7. Kit includes ALL parts and sockets
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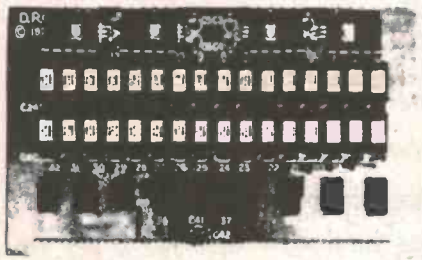

FOR SWTPC 6800 BUSS!

KIT FEATURES

1. Addressable on 16K Boundaries
2. Uses 2114 Static Ram
3. Runs at Full Speed
4. Double sided PC Board Solder mask and silk screened layout Gold fingers
5. All Parts and Sockets included
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BLANK PC BOARD —$45 COMPLETE SOCKET SET — $22 SUPPORT IC'S AND CAPS — $45

ITOH Model 8300 PRINTER

$790.00 plus 15% sales tax

This 80-column printer provided quiet operation, making it suitable for use in offices, classrooms and homes. Specifications include 125cps, 60 lines per minute, paper loading from bottom or rear and Centronics-compatible, parallel interface.

A bidirectional, dot matrix impact printer with a print head designed for 100% duty operation, assuring a print life that exceeds 100 million characters. The precision sprocket-feed mechanism permits printing forms from 4½ to 9½ inches wide. A 96 ASCII character set prints in upper and lowercase with the added capability of producing double-width fonts in boldface. The vertical format unit provides preprogrammed/programmable tab positions, top of form and bottom of form for complete formatting capabilities.

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- Assembled, tested and guaranteed
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16K Dynamic RAM Board assembled and tested: Special $269 plus tax (2mHz), $299 plus tax (4mHz) This must be the best offer available on quality tested dynamic RAM boards.

32K Assembled and tested	$309 plus tax (2mHz) $339 plus tax (4mHz)
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Kit of Parts $89.00. Assembled and tested $115.00, inc tax.
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LETTERS

Dear Sir,

I am in the process of constructing the ETI-475 AM tuner. I would like to be able to switch the whistle filter in and out of circuit. Could you suggest (with a circuit) how to do this please? Also, I have heard of "stereo" adaptors being used on AM tuners and TV sound. Have you any information on these, and could you run a project on one of these, please, for the "poor" country listeners?

Thanks for the article on the Negative Ion Generator. I am building several of these at the moment although mine are straight from the mains (similar to the Aironic — courtesy DSE!) at a cost of about $20 each. I had held off buying the parts, until your article appeared. Don't worry — I was an electrician earlier on in the piece and still intend to buy ETI for a long time yet!

Many thanks also for the article on the Portable Core-Balance Relay — I have waited a long time for this project and wish I had had one on several occasions in the past. At well under half the price of a commercial unit it has to be a winner!

Now for the most useless idea of the year for a computer (not fit even for DREGS)! The bane of many commercial TV station watchers (this includes some ETI readers) are the commercial breaks. The affluent have their remote handheld control and can immediately and easily censor at least the sound.

My suggestion:

As ads are repetitious (subtle brainwashing), it should be possible to develop software to cover every ad on TV. With a home computer thus suitably armed, within a short time of each ad commencing it will take the appropriate action (e.g: turn over to AM or FM music etc) and then revert back to TV sound at the end of the ads. We have the technology, all that is needed now is someone with the knowledge, and time to waste on developing software to do this. This problem has bugged me for many years and perhaps the end is in sight!

On a more serious note, as there are now various colour LEDs available (red, yellow, orange, green), I would like to see a project on a Power Point Safety Tester. The commercial type uses NE-2s. It should be possible to build one into a side entry three pin plugtop (HPM 106 or Clipsal 418) and plug the entry hole. The "hinged" flap could be drilled easily and the LEDs glued into place. A suitable chart could be arranged showing the various possibilities and faults.

Anyway, congratulations on a bumper tenth birthday issue of ETI and I hope there will be some more competitions this year. You will have to make them a little harder — too many people are getting all the answers correct, particularly those city people with the big libraries!

Brian Connors
Gunnedah NSW.

Thanks for the complimentary remarks about our April issue, Brian, we hope you find many following issues just as stimulating and useful.

With regard to the whistle filter in the ETI-475 Quality AM Tuner (Sept. '80 issue), a simple switch connected in parallel with L3 should suffice. The switch could be mounted on the front panel of the unit and connected to L3 via either a short length of shielded cable or tightly-twisted pair made from hookup wire. Any slight effect on the tuning can be compensated for with the adjuster in L3.

We don't recommend operating the Negative Ion Generator high voltage board direct from the mains. It is dangerous and the output voltage is too low for effective operation of the emitting head.

Now, as for the 'ad-killing computer' — firstly, there are those that would not share your opinions about advertisements (nuff said!) and secondly, what you're asking is a tall order indeed involving lots of fast memory. Would you be prepared to pay the enormous cost of such a device for the (to you) peace of mind? There is a simpler way, but the ad-killing is done by you. The ETI-599 Infrared Remote Control Unit can be arranged such that its output relay turns off the TV set's audio, rather than switching the mains to the unit's output socket.

Your suggestion concerning a power point safety tester is a good one — keep your eyes peeled. As for contests, it seems the harder they are, the more readers like them! We've a great contest this issue with a Radofin 'Adam 180' Teletext adaptor as a prize. Sharpen your wits!

Roger Harrison
Editor

Dear Roger,

Just a brief note of praise from an overseas traveller. As a subscriber to ETI back in Canada, I was quite pleased to see my favourite electronics magazine (I reckon the best!) in various Australian newsagencies. In your April '81 edition, I was quite surprised to discover, though, that the Australian ETI edition was the 'parent' of several international versions, including the Canadian one. So much for North American snobbery! I must say that ETI's ten years in Australia have produced a high quality, comprehensive and thoughtful magazine for electronics enthusiasts. Indeed, in comparison, Canada's ETI, and it would seem its retail electronics industry in general, are growing infants. There is so much more readily available to the enthusiast in Australia.

Keep up the fine work! I just might break down, ignore the exchange rate (ouch!), and subscribe to both editions!! All the best.

David Finley
Willowdale, Ont., Canada

Dear Sir,

I have read ETI from its very first issue, not missing one. I also have read your competition for almost two decades. In case it has escaped your attention, they are now featuring a surprising number of projects which are repeats of projects previously published by them, albeit with the occasional update in the face of new technology. The high standard of originality and independence of your magazine is thus illuminated even more clearly. I congratulate you.

'Loyal Reader'

Well, thank you, L.R. — but we're not entirely faultless, either. In the two years between April 1979 and April 1981 we published a total of 95 projects (not counting items such as 'Short Circuits'). A total of six were repeats, generally of projects four years old or more. We'll try and do better in the next two years.

Roger Harrison
Editor

THE AFFORDABLE HOME COMPUTER

When the System 80 was first introduced to Australia, the response was overwhelming! The Computer World was ASTONISHED at the QUALITY, as well as the PRICE. In fact, the System 80 has more features than the TRS-80, but with a price tag that is substantially less!

Microsoft's Level II BASIC and 16K Memory.

Another reason for all the commotion is that the System 80 uses the same, easy to learn, LEVEL II BASIC language that the TRS-80 uses! What does this mean? It means that the System 80 can run most of the 1000's of programs that have been written for the TRS-80 Level II, 16K computer! This means that you have scores of games, educational programs, business programs, simulations etc, that can be used with the System 80.

The System 80 is Expandable!

Your System 80 is ready to grow with your needs. The S-100 Expansion Interface enables lots of other "goodies" to be interfaced to the System 80. For example, you can control up to 4 disk drives, there is a full Centronics-type parallel printer port, RS-232C serial communications port plus two vacant S-100 card sockets. All of this for $499 (X-4010) plus if you want further RAM memory you can get a 16K card for only $199 (X-4016) which has provision for a further 16K to be added for only $59.95 (X-1186).

IS NOW ON SALE

Comparison Chart

Parameter	Syst. 80	TRS-80
CPU Type	Z-80	Z-80
Speed	1.7MHz	1.7MHz
S-100 Compatible (with expansion unit).	Yes	No
RAM (basic computer)	16K	16K
Built-In Cassette Recorder	Yes	No
Built-In Video RF Modulator	Yes	No
Capacity of BASIC ROM	12K	12K
Cassette Recorder Ports (basic machine).	2	1
Motor Control for Cassette Recorders.	Yes(2)	Yes(1)
Cost of basic unit with 16K RAM, video monitor & cassette recorder *	**$899.50***	**$1169**

* The Basic System 80 costs only $750. As this computer can connect direct to your TV set a video monitor, as a separate entity, is not required: making the saving on TRS-80 prices even greater!

WHY SPEND MORE AND GET LESS! SYSTEM 80 – THE AFFORDABLE COMPUTER. . . .

Also available for the System 80: Disk Drives (X-3230 for $379); Printers from $495 (X-3252) to $1995 (X-3265); Light pen (X-3645 at $9.95); Add sound to your computer with "Sound Off", X-3648 at $14.50 plus a host of cassette based software from system utilities to games – a full support of peripherals for your System 80.

Save Money! Use your own Television!

The System 80 has a built in RF modulator so you can use your black and white or color TV for a VIDEO MONITOR! A simple hook-up to your television's antenna socket.

Here's what you get:

The System 80 microcomputer with 16,000 characters of "In Computer Memory", Microsoft's Level II BASIC (built into the computer), a cassette player for storing or retrieving programs or data (cassette player is built into the computer!), an RF modulator for connecting the System 80 to your TV set (can also be connected directly to a video monitor, see our X-1196 @ $149.50), complete instruction manual, learning manual and owners manual so you can begin to write programs straight away, plus a demonstration cassette with 5 programs (Cost Analysis, Graphics, Statistics, Biorhythm, and Star War).

ORDER TODAY!

4K RAM Cat. X-4003

$695

16K RAM Cat. X-4005

$750

DICK SMITH ELECTRONICS

See our other advertisements in this publication for address details, phone numbers, post and packing etc.

DSE-966 A

Shoparound

THIS PAGE is to assist readers in the continual search for components, kits and printed circuit boards for ETI projects. If you are looking for a particular component or project — check with our advertisers if it is not mentioned here.

ETI-330 car alarm

We understand that this project will be widely stocked as a kit. In Melbourne, try the following suppliers: All Electronic Components and Rod Irving Electronics. In Sydney: Electronic Agencies and Jaycar. Dick Smith Electronics will also be stocking this project, to replace our older unit, the ETI-084.

In addition, quite a few suppliers have indicated they will be stocking the pc board and will have the other components available off the shelf. In Melbourne, try Ellistronics, Magraths and Tasman Electronics. In Sydney, try Radio Despatch Service and Dave Ryall Electronics. West Australian readers should try Altronics in Perth.

If you're looking for automotive cable to wire the alarm into your vehicle, most motor accessory shops carry it so you shouldn't find it difficult to obtain.

The LM394H (IC1) was in short supply at the end of May, as we went to press, but the local National Semiconductor distributor, Semtech, advised us they were expecting stocks of the LM394C to arrive before the end of June, so constructors should be able to obtain this device by the time this issue goes on sale.

ETI-258 mini-drill controller

This project uses mostly off-the-shelf components and constructors should have little difficulty obtaining them. The electrolytic capacitor, C1, may be either 2200μ or 2500μ, so long as it's a pc-mounting type. The three-terminal regulator, IC1, may be either a 7805 or LM340T/5. The heatsink we attached to this IC was a type 342-1PP from the American AHAMtor range, sold here by Stewart Electronics, 44 Stafford St, Huntingdale 3166 Vic. It costs about $1. Any similar heatsink that can dissipate a few watts should suffice — even a piece of aluminium sheet.

You *haven't got* a mini-drill but you've seen the project and think it's a good idea to get one? Well, mini-drills may be purchased from Dick Smith stores, David Reid Electronics (Sydney), Radio Parts (Melbourne), Magraths (Melbourne), Altronics (Perth) and many hobby and craft suppliers.

Plugpacks suitable for powering this project are widely obtainable. The ac output types are generally rated at 12 Vac, 200 mA or 500 mA output (e.g: Dick Smith model M-9555). Ferguson Transformers market an ac output plugpack-style bell transformer (for doorbells, alarms, etc) rated at 8 Vac, 1 A, and this too would be suitable. If you discard the input rectifier (diodes D1 to D4) then the project can be powered from a 12 Vdc output plugpack rated to deliver 200 mA or more.

ETI-154 logic probe

This project uses parts which should be widely available, with the exception, perhaps, of the tiny seven-segment display the author used in his prototype. To fit inside the Ball Liner pen barrel as described, you'll need a display such as those used in pocket calculators. These are often available as 'surplus' items — try Pre-Pak Electronics or Sheridan Electronics. If you don't wish to cram the project into a pen barrel, then a probe housing such as the Jabel PH3 would probably suit you. These can be obtained with a clear plastic barrel so that the LED mode indicator display can be viewed through it. There is considerably more room inside these probe housings than in a pen barrel and a conventional seven-segment LED display may be easily fitted. Jabel probe housings are marketed by Watkin Wynne, 32 Falcon St, Crows Nest NSW 2065. (02)43-2107. Radio Despatch Service in Sydney stock them.

NEW! NEW! NEW!

Next month Sheridan Electronics returns to 'the fold' (pardon the pun) with an 8-page catalogue of goodies which you should find inserted in your issue of ETI. Sheridan specialise in components you'll usually find hard to get elsewhere, apart from stocking a range of the more common components. Check next month's issue for your catalogue to see what they have to offer.

Melbourne readers who live east of the metropolis will no doubt be pleased to learn that a new electronics store has opened in Dandenong. Robtronics is the name and you'll find it at 295 Thomas St, Dandenong. The proprietor, Robert Kloestor, had always felt there was a need for an electronics store in the Dandenong area, so a few months ago he purchased a stock of surplus electronic components and also became a Dick Smith 'reseller'. Keen enthusiasts will find items such as surplus valves and radio equipment in the store, along with a range of Dick Smith kits and components. If you want to check if Robtronics stock a particular item you can phone Robert Kloester on 791-2900.

On this page back in our February issue, we announced the availability of the British ILP series of audio modules, which are sold here by Electromark of 40 Barry Ave, Mortdale NSW 2223. Electromark advise that the latest module in the series, a summing amplifier, is now available. Designated model HY7, this module is designed for audio mixing applications. Eight inputs are provided, each of which has unity voltage gain. Frequency response is quoted as 15 Hz to 50 kHz (+0, −3 dB) at 500 mV output and signal to noise ratio greater than 80 dB. Distortion is given as 0.005%, maximum output as 7 V RMS into a 2k load and current consumption as 5 mA from each supply rail (±15 V). The module measures 45 x 50 x 20 mm (including the connector) and weighs 65 grams. Contact Electromark for further information.●

NEW!

"THE BIG BOARD"

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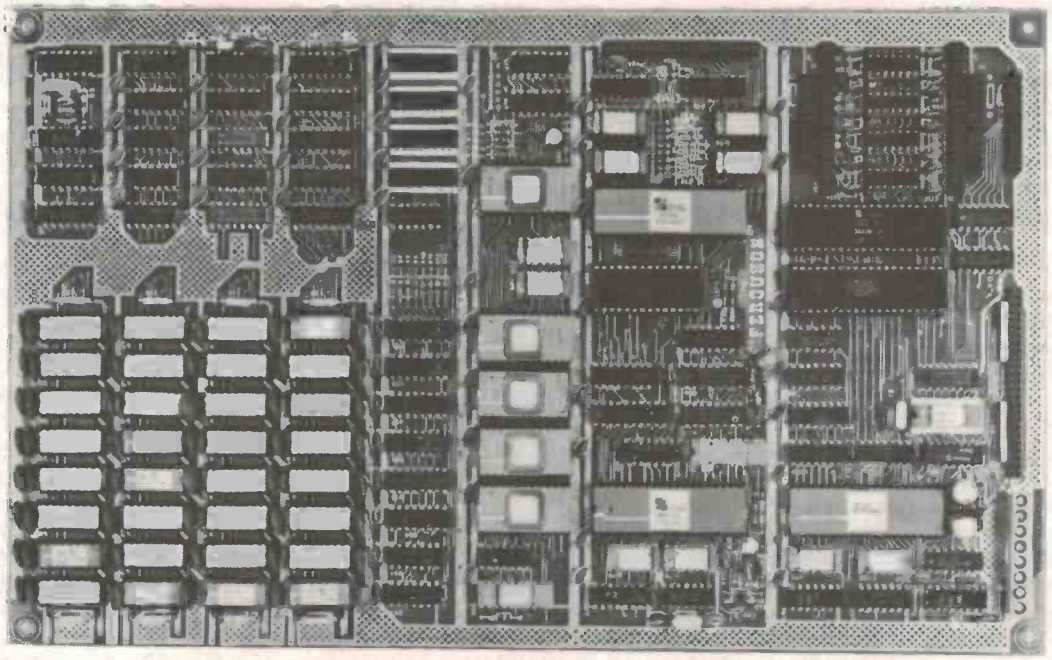
SINGLE BOARD COMPUTER KIT!

Z-80 CPU! 64K RAM!

NEW!



THE FERGUSON PROJECT: Three years in the works, and maybe too good to be true. A tribute to hard headed, no compromise, high performance, American engineering! The Big Board gives you all the most needed computing features on one board at a very reasonable cost. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed! Take a Big Board, add a couple of 8 inch disc drives, power supply, and an enclosure; and you have a total Business System for about 1/3 the cost you might expect to pay.

$695.00 (64K KIT BASIC I/O)

SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+12V @ .5 AMPS.

FEATURES: (Remember, all this on one board!)

64K RAM

Uses industry standard 4116 RAM'S. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: $95

BASIC I/O

Consists of a separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true.

FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

FOUR PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. User selectable hand shake polarity. Set of all parts and connectors for parallel I/O: $45

REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: $25

PFM 3.0 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.0 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search. PFM occupies one of the four 2716 EPROM locations provided. It does not occupy any of the 64K of system RAM!

CP/M* 2.2 FOR BIG BOARD

The popular CP/M* D.O.S. modified by MICRONIX SYSTEMS to run on Big Board is available for $150.00.

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ALL PRICES PLUS TAX IF APP

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Copy of manual and assembly instructions $15. Refundable on purchase of board. Photocopy exchanged for original. Delivery ex stock.

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ETI 7/81

How many of these kids are equipped for the electronic world of tomorrow?

This century has seen remarkable advances in electronics. Advances which are now a part of every day living. As this continues into the next century, there will be the need for more education in electronics. A good basic knowledge of electronics is essential for those children who are to become our future technicians, programmers and so on. Without this knowledge, your child could be left in the dark, perhaps without a future career.
You can give your kids a head start in electronics; knowledge which is essential to the future of your children.

DICK SMITH'S FUN WAY INTO ELECTRONICS

can provide that essential knowledge- & what's more it's FUN!

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DICK SMITH Electronics

SEE OUR OTHER ADS FOR FULL ADDRESS DETAILS

ARRL books: mail order from ETI

A selection of popular and useful publications put out by the American Radio Relay League are now available mail order direct from ETI.

The selection includes: A Course In Radio Fundamentals, Solid State Basics, The ARRL Antenna Anthology, The ARRL Antenna Book, The ARRL Electronics Data Book, The Basic Book of Ham Radio and the ARRL Amateur Radio Map of the World.

A Course In Radio Fundamentals, by George Grammer, is recommended reading for anyone studying for their amateur licence, be it Novice, Limited or Full. In fact, it's a very good reference text for any enthusiastic hobbyist. The book has 26 chapters covering everything from the Electronic Field to RF Amplification. A variety of experiments are included along with problems and answers. The book has 180 pages and costs $7.00.

Solid State Basics takes you from simple solid state theory right through to circuit design, including practical examples you can build. The book is an anthology of the very popular series published in QST, edited by Doug DeMaw and Jay Rusgrove; 160 pages, $6.75.

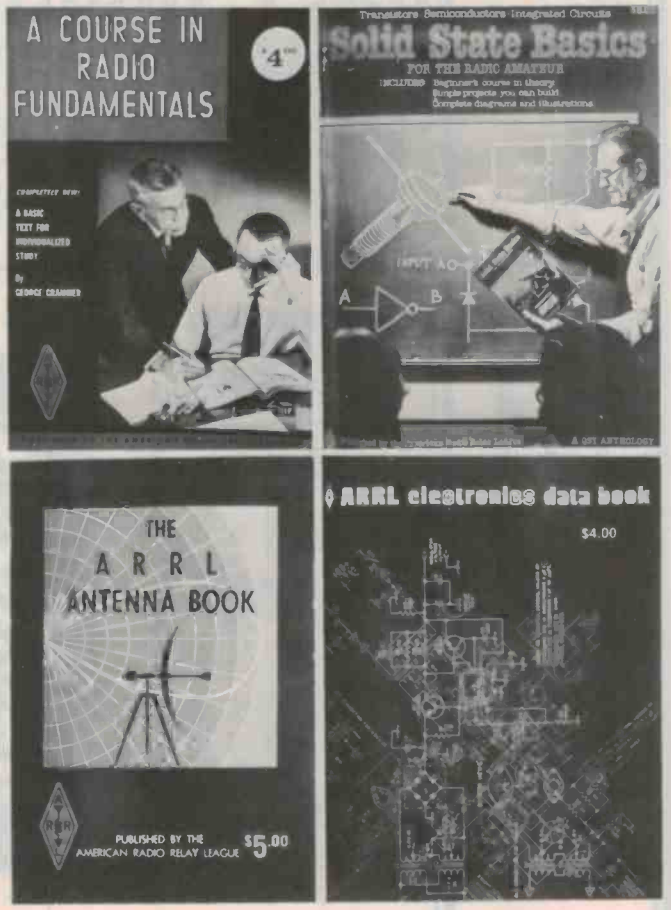
The ARRL Antenna Anthology and the ARRL Antenna Book must be the two best-known practical 'reference' works on the subject of antennas. The Antenna Anthology is a compilation of the best of recent HF antenna articles and theory presentations from QST magazine. It runs to 152 pages and costs just $7.00. The Antenna Book is a solid text covering everything from wave propagation to antenna construction and RF measurements. This updated edition of a famous text runs to 336 pages and costs $8.75.

The ARRL Electronics Data Book is a must for every experimenter's shelf, workshop library or enthusiast's bench. Its 10 chapters cover maths aids and tables, time and frequency, transformers, LCR networks, filter designs, antennas, etc, and a useful potpourri of data. It's 128 pages long and only $6.75.

The Basic Book of Ham Radio is just what it says. If you want to know what the hobby's all about, or want to let a budding enthuslast know, this book is just the thing. Only $7.75.

The ARRL World Map is a modified equidistant azimuthal projection showing countries, call areas, time zones, ITU divisions, etc. This huge map would be a valuable addition to any shack. $6.75.

Postage is $1.35 for one to four items, $2.70 for five items or more. You may order them from ETI Book Sales, 4th Floor, 15 Boundary St, Rushcutters Bay NSW 2011. You should allow up to four weeks for delivery.



Sky Ace receiver available again

GFS Electronic Imports of Melbourne recently announced that they now have stocks again of the airband receiver, Sky Ace Model R-517.

The Sky Ace is small and sturdily constructed, giving coverage of the airband from 108-136 MHz using both a main or fine tuning control, and has up to three crystal-locked channels.

This receiver is designed for use by both amateur and professional pilots, but could be just as useful to anyone interested in monitoring aircraft communications.

Price of the Sky Ace is $109 plus $4 postage; standard frequency crystals are $8 each, with special frequency crystals at $20 each.

Further information may be obtained from GFS Electronic Imports, 15 McKeon Rd, Mitcham Vic. 3132. (03)873-3939.

Digital storage RF spectrum analyser

Bringing digital storage capabilities to the most widely used frequency ranges in the RF spectrum, Tektronix recently introduced the 7L14 Spectrum Analyser.

The 7L14 will be of special importance to operators using the HF, VHF and UHF bands, and has been designed to meet the needs of user groups such as broadcast stations (AM, FM and TV), military communications, CATV companies, and utility companies (specifically firms and agencies that use two-way radio).

The 7L14 is claimed to have a longer lifetime and lower operating costs, resulting from the use of a standard P31 Phosphor CRT in place of the storage CRT.

The 7L14 provides frequency coverage from 10 kHz to 1800 MHz. Other features include a built-in limiter to protect the first mixer; 70 dB on-screen dynamic range, spurious free; minus 130 dBm sensitivity, with 30 Hz resolution; CRT readout of control settings; four-to-one shape factor resolution filters; tracking generator and counter options; and a display mainframe compatible with more than 25 different 7000 Series plug-ins.

More information can be obtained from Tektronix Australia Pty Ltd, 80 Waterloo Rd, North Ryde NSW 2113. (02) 888-7066.

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A regular update of this catalogue will be despatched to members which will include special offers in blank cassettes, new film releases and special equipment purchase offers in such items as large screen televisions and portable video tape recorder cameras — all at very special prices.

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A Video Tape Network newsletter will be sent to members free on a regular basis to keep you informed of new product releases, technical tips for your video tape recorder, special product offers, government decisions which may affect you, information on such issues as satellite TV and the use of home computers with your video tape recorder and other Video Tape Network services as they become available.

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As a limited offer for new members who pay $10 now, the Video Tape Network will offer you:

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☐ I am not interested in joining VTN now but please add my name to your mailing list for future information.

COMPUTING TODAY

New computer magazine for non-experts

June saw the launch of a new computer magazine boasting that it's written in "... an amazing new language. English"!

Published by the Scientific Publishing Division of Modern Magazines (publishers of ETI), it is called 'COMDEC Business Computer Magazine'. The June issue is the 1981/82 Yearbook, which will be followed by regular issues throughout the year.

The magazine is written for people who have to make decisions about computers but who don't understand the difference between a floppy disk and a mini-floppy, ROM and RAM, byte and kilobyte.

The first issue contains a dozen articles on everything from 'Purchasing Your First Small Business Computer' through 'Approaching Word Processing: A Beginners' Guide', 'Computer Crime ...', 'Negotiating A Computer Contract' to 'Office Applications For Graphics'.

In addition, Comdec contains a directory section listing major vendors of microcomputers, minicomputers, terminals, word processors, micrographics and specialists. Articles have been written by such industry luminaries as Roger Davis of Liveware, Trevor Housley of Housley Computer Communications, Tim King of 3M's Micrographics Division and Kevin Fitzgerald, the Executive Director of the Computer Abuse Research Bureau at the Caulfield Institute of Technology.

The 1981/82 Yearbook runs to 180 pages and costs $4.95, available at all newsagents.

Understanding and using computer graphics

This is the title of an extremely successful seminar, already held for several years in Europe and the US, which will be held in Sydney this year from July 15-17.

The seminar is designed to make the full usage and benefits of computer graphics known to both potential and current users. It covers an explanation of graphics, their use, justification, and systems; explains CRT, input devices, commercially available user stations, hard copy, software, applications and evaluation techniques.

The seminar will also be held in Hong Kong from July 8-10 this year.

For further information or to register, contact Frost & Sullivan Ltd, 104-112 Marylebone Lane, London W1M 5FU, England. (01)486-8377; telex 261671 (FANDS G).

Dicker Data supply Navy

Dicker Data Projects have successfully applied for a tender to supply the Navy with 17 Vector Graphics systems for use at the Naval College, Jervis Bay.

Fourteen of the Vector VIP systems will be used to train young naval officers in programming. The other three will be used for administrative purposes, including a library catalogue system.

A 3030 system is being purchased for mass storage, incorporating a Winchester hard disk drive with a capacity of 32 megabytes.

The VIP systems have 64K of memory using the Z80A CPU. Two floppy disk drives will be used, giving a storage capacity of 630K.

The CP/M operating system is to be supplied with the machines, along with the RAID debugger and SCOPE, a full-screen editor with word processing-like facilities, including global search and replace, block move and horizontal scrolling.

The tendered order was for $110 000 and was scheduled for delivery in late April/early May this year.

Dicker Data Projects Pty Ltd, of 31 Cawarra Rd, Caringbah NSW, (02)525-4707, have 150 systems installed to date in such varied applications as the Western Australian Education Department, the CSIRO, universities and many different small businesses.

Vector products are available through a dealer network throughout Australia.

MENSA COMPUTERS

454 St. Kilda Road, Melbourne, 3004. Telephone: (03) 26-5683, 26-4526.

FINDEX,. . . FINDEX professional portable computer.

This is a professional, portable computer with display and printout functions up to a huge 2 million byte Bubble Memory and RAM, ROM, Diskette Drive AND can operate for 1 hour on a re-chargeable battery without mains power!

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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.

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Facilities management consulting.
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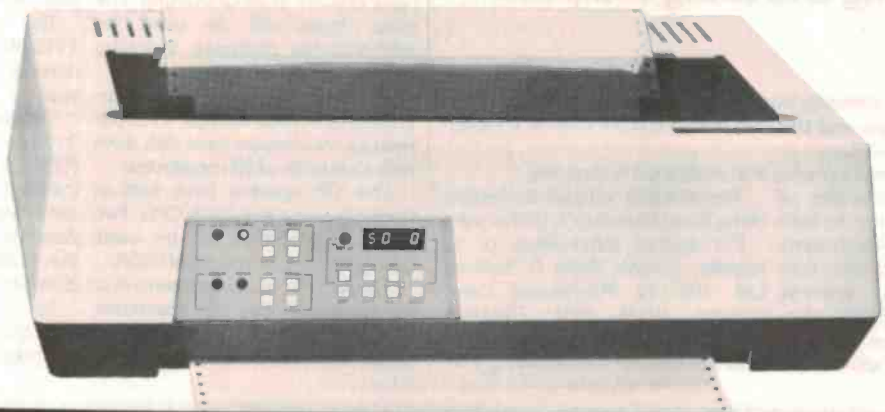
DATASOUTH DS180

HIGH SPEED MATRIX PRINTER

The Datasouth DS180 is a dot-matrix serial impact printer designed for high performance at an economical price. Application flexibility and a long list of standard features make the DS180 an ideal device for small business systems, distributed communications networds and intelligent terminals.



Printout

Advanced single board computer is locally made

Two years of research and development have culminated in the release of an advanced single board micro featuring a 4 MHz Z80 CPU, 64K of RAM, four peripheral interface ports and a floppy disk controller, designed to serve as a stand-alone business or scientific computer.

Designed, developed and marketed by Advanced Digital Systems of Sydney, the SBC is designated the ADS8000 and has the capability of running all the popular high-level languages (BASIC, FORTRAN, COBOL, PASCAL, CBASIC and FORTH).

The ADS8000 is based on the Zilog Z80A microprocessor and operates at a clock rate of 4 MHz. Minimum instruction execution time is claimed to be 1 μs. A monitor stored in a 2K EPROM performs the power-up system diagnostic tests and loads the disk operating system. 64K of 200 ns dynamic memory is built on board with a bank switching scheme. During normal operations, the monitor EPROM is switched out, thus leaving the full 64K of memory for program usage.

The floppy disk controller handles up to four single- or double-sided drives. It can be connected directly to any 8" (203 mm) drives produced by Shugart, Y-E Data, Remex or Siemens.

The controller supports the industrial standard IBM 3740 (FM) recording format. CP/M 2.2 Disk Operating System by Digital Research of America has been adapted to run on the ADS8000, and as well as the various languages, word processing and accounting packages are available.

Communications facilities in the ADS8000 consist of two RS232 serial ports and two parallel ports. The two RS232 ports can be used to connect various video terminals, modems, printers, graph plotters, paper tape readers or punches. Data transmission speed is programmable from 110 to 9600 baud.

Of the two parallel ports, the first is programmed to accept Centronic type printers, and the second, which has eight bidirectional data lines and two control lines, is available for general purpose interfacing.

The ADS8000 is specially designed for computer manufacturers and original equipment manufacturers (OEMs). It provides the low-cost alternative to doing in-house circuit board design and manufacturing.

Advanced Digital Systems will provide full technical support to OEMs who wish to incorporate the ADS8000 in their products.

For further information contact the manufacturer, Advanced Digital Systems, 34-40 Central Ave, Manly NSW 2095. (02)977-6955.

Z80 peripheral processor board

Memory Electronics recently announced details of the M80 Peripheral Processor Board, which executes Tiny BASIC (resident in ROM) and Z80 machine code.

The M80 sits on the serial or parallel port of any computer such as TRS80, Sorcerer, Apple, System 80, etc. Programs are downloaded into RAM from the host machine, or the M80 can stand alone with program in ROM.

The M80 is said to open up applications such as robots, message processors, alarm message generators, smart peripherals and controllers.

The M80 is configured with up to 2K RAM, a possible 4K ROM, a wire wrap area for addition of, for example, a UART, A/D converter, floppy disk controller, speech processor, etc. 16 versatile, buffered I/O lines are available on the connector.

The M80 is small and fully documented. Software for editing, debugging and loading Tiny BASIC is also available, and Z80 code can of course be generated on your machine with a DDT or Assembler, or with the M80 monitor.

The M80 is priced at around $100 plus monitor ($32) or BASIC in ROMs ($46).

Further information may be obtained from Memory Electronics, P.O. Box 322, Moorabbin Vic. (03)557-5394.

THE Z80 — NAKED AT LAST?

Following the article on 'Uncovering the Z80' in our April issue we published a note from Stephen Dennis in June issue's Printout (page 97) about further undocumented instructions. However, one reader, Mr Peter A. Schmektschek, uncovered what may be either an omission or two in the original article and/or differences between his System 80 and the original author's TRS80. Here's what Mr Schmektschek found:

"In the article 'Uncovering the Z80' on page 88 (of the April issue) I feel the source listing of program 1, line 340 should read LD A,XL and not LD A,XH.

"Also, on page 89, the source listing of program 2, line 4050 appears to have two bytes missing: line 4050 should read:
DATA 221,33,52,18,253,120,86,221,69,253,76,253,85,221,92, 221,125,201

"The instruction in bold (line 330 in program 1) was missing and so test segment 1 failed though the others were successful (on my System 80 Mk 1).

"Incidentally, in line 4040, program 2, the data 19, . . . will now be correct."

Another reader, Tony Garland of Terrey Hills, NSW, found he had to make the following changes for the program to work on his TRS80:

ADD NEW LINE
5 CLEAR 500
(to overcome ?OS error In 3090).
Alter line 4040 to read
4040 DATA 17,52,13398,30738,4660,22136,LD1
(otherwise, in the READ statement line 80, J4 will try to read LD2 in DATA line 4070, which it cannot do).

Tony found segment LD1 in his system failed.

Print-out

Pupils' PETs!

Commodore has prepared an advisory programme to show teachers how to use computers to help run their schools as well as to further their pupils' education.

Nigel Shepherd, head of Sydney's Commodore Information Centre, sees a major responsibility in preparing young people for computers in society.

The campaign offers a free $1000 PET (Personal Electronic Translator) to every school that installs a bigger Commodore 3000 Series model. The big machine is for the school to use, for example in day-to-day business administration, charting students' academic history, balancing availability of classes against the number of pupils, etc. The PET would be for the students' use.

Commodore has a huge bank of specially written school programs on physics, maths, English, languages, numeracy skills and even on computers themselves, but the PETs are not just for teaching but for the children to experiment with, write their own programs on, analyse sports results, etc.

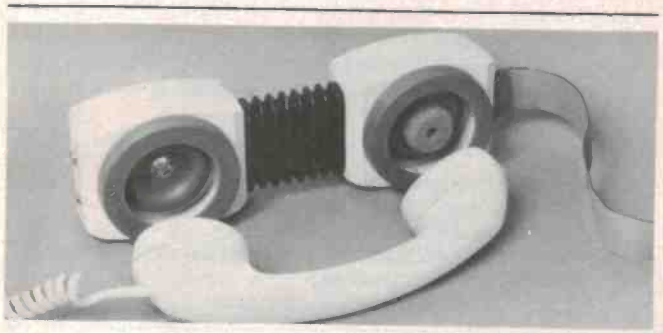
According to Nigel Shepherd, "When we first introduce a Commodore 3000 to a teacher, a common response is: 'What am I going to do with it?' Even maths and science teachers are often shy of it because they don't know enough about computers to justify having one."

Mr. Shepherd also mentions a "psychological barrier" against computers in school, but stresses that personal teaching skills are still necessary to operate computer teaching successfully.

Commodore established a back-up service and maintenance facilities before starting operations in Australia in September 1980. This has paid dividends in acquiring business; as Nigel Shepherd says: "It's no good having a computer that has to be sent half-way round the world if any bugs get into it."

Commodore recently announced a profit in its first three months of operation, after writing off all setting-up costs in Australia, and expect a turnover in excess of $200 million for this fiscal year. Its dealer network is now 60-strong, and figures for December and January showed sales of 300 PETs alone, regarded by Nigel Shepherd as an "unbeatable sales figure". In addition Commodore sold full business systems.

For further information telephone Di Palmer on (02)33-4225, or Nigel Shepherd on (02)437-6296.



Space-saving VDU from ADE

Anderson Digital Equipment recently announced a new VDU design, manufactured by the Teleray factory, which is believed to be the smallest and lightest 12-inch terminal in the industry.

The new 'L'-style display unit occupies just 12 x 13 inches of desk space, and weighs 18½ lb. With an optional wall-mount bracket, it may be tilted and swivelled to achieve optimum viewing angle, and, except for its detached keyboard, it occupies no desk space at all.

The L-style is initially available on the two fastest-moving Teleray models — the 10 and the 100. Model 10L is a single-page editor with user-programmable function memory; the 100L is a 132-column, VT100-compatible unit, with 'advanced video', bi-directional peripheral port and user-programmable function memory. Both are completely modular, for quick and easy servicing by anyone, without tools.

The Model 10L is priced at $1505 and the 100L at $2095, and both will shortly be available through the A.D.E. network of branches and distributors in Australia, New Zealand and Papua New Guinea.

For further information, contact Anderson Digital Equipment Pty Ltd, 1 Expo Court, Mount Waverley Vic. 3149. (03)543-2077.

Buss allows MicroCon to work as slave

MicroPro Design recently released a new interface, the IEEE488 (HP-GP18) buss, for use with their MicroCon microprocessor system.

This buss allows the microprocessor in MicroCon to act as a slave to computer systems, so that it can control/monitor systems using the other interfaces available.

Computers such as the Commodore CBM and PET or Hewlett-Packard 9845 or 85 systems can be inexpensively interfaced to sensors, etc. The microprocessor in MicroCon can have its program loaded from the host computer, allowing it to perform the control or data acquisition function independently of the operation being performed in the host. This can be particularly important in fast real-time applications.

For further information contact MicroPro Design Pty Ltd, P.O. Box 153, North Sydney NSW 2060. (02)438-1220.

Modem lets computers talk to each other

Dick Smith Electronics has just announced a new low-cost acoustic modem which allows digital data to be transmitted and received over the normal telephone network.

Transmitting at rates up to 300 baud, this new device makes it possible for computers and data terminals to communicate using standard telephones, and for computer/terminal owners to access remote data bases.

The new modem is said to be compatible with most telephone handsets worldwide. and is simply operated by dialling the required number and fitting the transmitter and receiver of the handset into the coupler's rubber-lined receptacle.

The coupler is designed for full duplex operation, so that data may be transmitted and received simultaneously. It is also switchable between the 'answer' and 'originate' modes, so that communication between two units is just as easy as between one unit and a fixed 'answer' modem.

Power for the unit is normally provided by a standard 9 Vdc plug-pack, but provision is made for supply from the computer/terminal.

Designated by the catalogue number X-3270, the unit is priced at $399, and was expected to be available from Dick Smith branches and resellers by April this year.

Digital cassette recording system

Memodyne Corporation of the USA have announced a new portable and compact RS232C compatible recording system.

The 2343CV is a self-contained instrument that accepts data at 110 and/or 300 baud, formats the data and records it on certified digital cassettes. The unit will also play back at 110 and 300 baud in addition to reading complete files continuously at 1200 baud. Teletype data from a 20 mil. current loop may also be recorded and read out.

The 2343CV features eight controls which may be operated by front panel switches or activated by negative action TTL or CMOS signals through a rear connector. These controls include Record, Hold, Playback, Off Load Forward, Rewind, Backspace and Step.

The 2343CV has a storage capacity of 72 000 characters. It is 10½" wide x 12" deep x 7" high and weighs only 12 lb.

For further information please contact: Mr. Andrew Reid, Marketing Director, The Dindima Group Pty Ltd, P.O. Box 106, Vermont Vic. 3133.

Floppy disk system for Sorcerer IIs

Dick Smith Electronics now have available a self-contained add-on floppy disk subsystem (FDS) for the Sorcerer Mark II computer.

All disk controller and interface logic is included within the drive box, together with a power supply, so that the FDS plugs directly into the expansion socket on the rear of the Sorcerer and does not require the Sorcerer's S100 expansion unit.

The FDS's mini-floppy drive and controller take standard soft-sector diskettes and give 77 tracks of double density storage capacity. This gives a formatted data capacity of 308K bytes per disk. The controller within the FDS can also handle up to two add-on drives.

The FDS is claimed to provide double the usual data transfer rate: 250 000 bits per second instead of the more usual 125 000, which means that programs and data are loaded and saved in approximately half the usual time.

The FDS comes complete with a version of CP/M that has been specifically designed by Exidy to suit the Sorcerer and FDS combination. Along with the CP/M comes a variety of utility software programs, including a Z80 assembler, a linking loader, a debug and an editor. Also provided is a comprehensive folder of user documentation covering hardware, installation, software functions and operating instructions.

Price of the Sorcerer Floppy Disk Subsystem is $1190, and it will have the Dick Smith catalogue number of X-3220. It should be available from Dick Smith branches and resellers in all states from mid-May.

New 5 V only 64K RAM from Intel

Intel Corporation recently introduced the 2164, its first 64K dynamic RAM.

Designed with Intel's patented HMOS (high-performance MOS) process technology, the 5-volt-only 2164 is said to provide users with upward compatibility with Intel's future 256K RAMs.

The 2164 also allows users of Intel's current 2118 +5 V 16K dynamic RAM to upgrade to a compatible product.

The 2164 is configured in a 64K x 1 bit organisation and is packaged in the industry standard ceramic 16-pin DIP pinout.

Intel has also announced the introduction of a new board-level memory module for general purpose computer applications, which makes the 2164 available to designers at the system level.

For further details contact AJF Systems and Components, 310 Queen St, Melbourne Vic. 3000. (03)67-9306.

For Sorcerer Apprentices

It's only going to be a short one this month, unfortunately, but the following should be very useful for many enthusiasts.

Dear Editor,

The enclosed object code listing is a subroutine which can enlarge the characters displayed on the video screen by 16 times. This is particularly useful in a program where headlines or instructions are to be displayed in bigger than normal characters. Go into Monitor by typing BYE in BASIC, then enter the codes starting from FD08 hex. After entering the codes, save on cassette by typing:

'SA LARGE FD08 C8' ‹CR›

Now try the instruction 'SE O=0' ‹CR›

Wow! everything displayed is blown up sixteen times. To get back to normal size, type:

'SE O=V' ‹CR›

To call the subroutine in BASIC, use the following routine before and after each print statement where large display is required.

Subroutine to call LARGE character subroutine:

```
1000 Z=256 * PEEK (-4095) + PEEK (-4096) - 47
1010 IF Z > 32767 THEN Z = Z - 65536
1020 POKE Z,0 : POKE Z+1,0 : RETURN
```

Subroutine to get back to NORMAL size video:

```
2000 POKE Z,27 : POKE Z+1,224 : RETURN
```

For example, to print "SORCERER" in large prints:

```
100 GOSUB 1000
110 PRINT "SORCERER"
120 GOSUB 2000
130 END
```

Daniel Wong.

ENLARGER ROUTINE BY DANIEL WONG

```
ADDR 0  1  2  3   4  5  6  7   8  9  A  B   C  D  E  F
FFD0: 00 00 00 00  00 00 00 00  0F 0F 0F 0F  FF FF FF FF
FFE0: F0 F0 F0 F0  FF FF FF FF  FF FF FF FF  0F 0F 0F 0F
FFF0: FF FF FF FF  F0 F0 F0 F0  FF FF FF FF  FF FF FF FF
0000: F5 FE 0C 28  26 FE 0D 28  22 FE 0A 28  28 FE 17 28
0010: 1F FE 1A 28  20 FE 01 28  17 FE 13 28  13 FE 08 28
0020: 0A FE 11 28  06 FE 20 30  11 F1 C9 CD  1B E0 F1 C9
0030: CD B1 00 F1  C9 CD AF 00  F1 C9 FD E5  C5 D5 E5 6F
0040: 26 00 11 00  F8 29 29 29  19 CD A2 E1  FD 7E 6A 4F
0050: FE 3D 38 08  3E 0D CD 1B  E0 CD AF 00  06 04 C5 56
0060: 23 5E 06 04  E5 C5 C5 01  00 00 7A 07  CB 11 07 CB
0070: 11 57 7B 07  CB 11 07 CB  11 5F 21 B9  00 09 7E CD
0080: 1B E0 C1 10  E1 3E 0A CD  1B E0 C1 79  06 04 FE 3C
0090: 20 02 06 03  3E 01 CD B3  00 E1 23 C1  10 C0 3E 13
00A0: CD B1 00 3E  17 CD B1 00  E1 D1 C1 FD  E1 F1 C9 3E
00B0: 0A 06 04 CD  1B E0 10 FB  C9 20 95 96  AA A0 A8 A6
00C0: FB A1 A5 A7  FC A9 FD FE  FF
```

Thanks Daniel, I can think of hundreds of uses for this routine. Several of my friends saw this routine working towards the end of last year and were most frustrated when I told them they'd have to wait for its publication in ETI. Little did I know that they would hassle me for such a long time about it.

Thanks for your contribution to this column and, keep up the good work.

A.P.F. Fry

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In the world of personal computers there is just one that is known as the best: the PET

NOW 16K RAM AT 8K PRICE $999

The Commodore PET has become the standard for the Personal Computer Industry.

The Pet is completely integrated, with the processor, memory, keyboard and visual display unit contained within a robust housing, allowing easy transportation with no interconnecting cables necessary. In order to retrieve and save your data and programs, a storage device is used which operates like a cassette recorder, with your information recorded reliably on standard cassettes. The PET has 16k bytes of RAM. Optional equipment permits expansion to 32k. Also, it has 14k bytes of ROM.

The Pet communicates in BASIC— the easiest computer language. Easy to learn and easy to use, BASIC has now become the standard for personal computers, with literally thousands of programmes available. The PET is also programmable in machine language, allowing more efficient use of the system.

The full-size keyboard is capable of producing letters, numbers and graphic symbols. Upper and lower case is standard. Characters appear on the screen in a pleasant green colour designed to reduce eye fatigue and may be displayed in normal or reverse print.

PET's IEEE-488 Bus- just like H.P.'s mini and full size computers — permits direct connection to over 200 pieces of compatible equipment such as counters, timers, spectrum analysers, digital voltmeters and printer plotters from H.P., Philips, Fluke, Textronix and others.

The full range of Commodore Disk Drives and Printers are plug-compatible with the PET and a comprehensive range of cassette and disk based programmes are available through the extensive network of Commodore Dealers.

APPLICATIONS

The Commodore PET is a creature of many faces. Its applications are limited only by the user's imagination.

The future of the PET is virtually unlimited; its present capabilities are already many and impressive. As a personal computer, the PET can teach languages and mathematics; play games; create graphic designs; store meal recipes and change number of portions; maintain budgets, personal records and checkbooks; operate appliances and temperature controls.

As a management tool, it delivers the information the executive needs, in the form he can use, and available to him alone. Trend analyses charts and graphs can be almost instantly available.

The professional may use the PET for maintaining appointment schedules, recording income and expenditures and filing all the specialized information and forms he may need to make his work more efficient — from medical records for a doctor to income tax computations for an accountant.

The engineer, mathematician, physicist, has a tool far superior to the very best programmable calculators yet developed... at a cost that is comparable...and with almost infinitely greater versatility.

And the businessman has a computer that can maintain inventories, keep payroll records, operate accounts payable and receivables, issue cheques and handle correspondence.

Commodore PET 4016 Computer Technical Specifications.

Computer/Memory
Read/Write Memory (RAM) 16K bytes available to the user.
Read Only Memory (ROM) 14K bytes in total, divided into:
8K BASIC interpreter available immediately you turn on your PET.
5K Operating System
1K Test Routine
The 6502 micro-processor chip makes the PET one of the fastest and most flexible BASIC systems. Significant features of Commodore BASIC are:

- 960 simple variables
- 960 integers
- 960 string variables
- 960 multi-dimensional array fields for the above 3 types of variables
- Up to 80 characters per program line with several statements per line
- Upper/Lower case characters and graphics capability
- Built in clock
- 9-digit floating point binary arithmetic
- True random number generator
- Supports multiple languages; machine language accessibility

Keyboard
74-Key professional keyboard.
Separate calculator/numeric pad.
Upper-case alphabetical characters with shift key to give 64 graphics characters.
Can be set for lower case and shifted upper case characters.

Screen
40 characters wide by 25 lines (1000 characters in 8 × 8 dot matrix).
23 cm screen phosphor screen.
Brightness control.
64 ASCII plus 64 graphics characters.
Blinking cursor with full cursor control, including programmable control.

Screen editing capabilities
Full cursor control (up, down, left, right).
Character insert and delete.
Reverse character field.
Overstriking.
Return key sends the entire line to the CPU regardless of cursor position.

Input/Output
8 bit parallel input/output port.
IEEE-488 Bus (HP-IB and IEC Bus) allows up to 12 other peripherals to be connected.
Two cassette ports.
Video signals for additional displays.
Serial output port.

Technical Data
Dimensions: Height 355 mm (14"), Width 419 mm (16.5"), Depth 185 mm (18.5"). Shipping Weight 20.9 kg (46 lbs).
Power requirements 240V ± 10%, Frequency 50 Hz, Power 100 Watts.

Commodore BASIC

APPEND	GOSUB..RETURN	STOP	SPC
BACKUP	IF..THEN	SYS	LEFT$
CLOSE	INPUT	VERIFY	RIGHT$
CLR	INPUT •	WAIT	MID$
CMD	LET		CHR$
COLLECT	LIST	SGN	ASC
CONCAT	LOAD	INT	LEN
CONT	NEW	ABS	VAL
COPY	ON..GOSUB	SQR	STR$
DATA	OPEN	SIN	TI
	POKE	COS	TI$
DEF/FN	PRWT	TAN	ST
DIM	READ	ATN	DS
DIRECTORY	RECORD	LOG	DS$
DLOAD	REM	EXP	+
DOPEN	RENAME	AND	−
DSAVE	RESTORE	OR	•
END	RUN	NOT	/
FOR/NEXT	SAVE	TAB	↑
GET	SCRATCH	POS	π

Commodore microcomputers

For details of your local dealer send to: Commodore Information Centre, Box 336, Artarmon, NSW 2064. Australia. Phone (02) 437 6296
MIvl 469

And you thought your System 80 was just for playing games...

THESE PROGRAMS WILL ALSO RUN ON A 16K TRS-80 MODEL II

Most people think the same way. Personal computers – ho hum. Great for playing 'Space Invaders' . . . but what else can you do with them?

How would you like to do your 1981 Income Tax return by computer?

AUSTRALIAN INCOME TAX, 1981

YES! You can now use your personal computer to accurately and properly complete your personal income tax return! 'Austax 81' goes through each vital step of the tax form, making sure you don't miss anything! Calculations are done for you – automatically – and you can add, delete or change any entry at any time: the program automatically adjusts all the figures to suit! As far as we know, this is the ONLY program available for the 1981 income tax form, written specifically for a personal computer!

Program suitable for form 'S' available June; program for 'A' form available July. **'AUSTAX 81'** Cat X-3762 **$29.95**

TYPING TUTOR

With our new 'Typing Tutor' program, you can learn to touch type in less than 8 hours! The computer is your teacher: it will tell you if you are making errors; even concentrate on the keys that are giving you problems! And it's so much cheaper than doing a typing course! **'TYPING TUTOR'** Cat X-3682 **$19.95**

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SPEED READING COURSE

Time is always pretty short these days: why waste it by taking longer than necessary to read? Read everything faster, and with greater comprehension, with this unique program. **'SPEED READING'** Cat X-3692 **$19.95**

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You've always regretted stopping those piano lessons! Now here's your opportunity to learn to read music – even though you can't play a note! It will teach you all the basics – from note recognition through to tempo.

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AND FOR THE KIDS . . .

A set of three programs designed to help them learn. They learn faster because learning becomes FUN! Take your choice of maths oriented, spelling or word usage programs. They've all been written exclusively for Dick Smith

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THE DICK SMITH SYSTEM 80

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Features like a built-in cassette deck & power supply. 2 cassette controls instead of 1. S-100 bus compatability. Built-in video modulator (use with any standard TV set!)
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16K RAM WAS $750
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DICK SMITH ELECTRONICS

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965 RT

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Get MORE with MMS FORTH

MMSFORTH is a powerful implementation of the popular FORTH programming language, designed for both professional and hobbyist use on System 80 & TRS-80 computers. Users can expand FORTH into virtually their own custom programming language. It comes on diskette complete with its own disk operating system, itself written in FORTH.

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  FORTH is an incredibly versatile new language that operates 10 to 20 times faster than level II BASIC!
- ★ **Get more room . . .**
  Forth has a compiled code plus VIRTUAL MEMORY which makes your RAM act longer!
- ★ **Get more instructions . . .**
  Add YOUR commands to its large instruction set! Far more complete than most other Forths: single and double precision, arrays, string handling and more!
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  Forth operating system interpreter AND compiler, internal Z80 disassembler; VIRTUAL I/O for video & printer, disk & tape.

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And your programs become VERY difficult to pirate!

Simutek's ZBASIC is what you need.

ZBASIC is an interactive compiler. This means it is resident while you write BASIC programs. You may compile your program and run or save it, in machine language form, without destroying your original BASIC version. In fact, jumping back and forth between your compiled code and the BASIC original is one of its best features.

The ZBASIC compiler allows saving your compiled programs to disk. Programs may then be loaded as a /CMD file from DOS. This makes it extremely hard for others to 'pirate' your programs.

And Simutek, the manufacturer, makes no royalty charge on programs that are compiled with ZBASIC – unlike some other companies which charge you up to $200 a year!

Some of the BASIC commands supported by ZBASIC:

FOR	NEXT	STEP	IF	THEN	ELSE	PEEK	ON GOTO
SET	RESET	POINT	CHR$	RANDOM	RND( )	POKE	ON GOSUB
DATA	READ	RESTORE	END	GOTO	GOSUB	CLS	
PRINT	LPRINT	PRINT@	USR	SGN	INT	ABS	
SQR	LEN	ASC	VAL				

INT MATH: — – * / AND OR SQR

Why use a complicated 'Assembler' to write machine language programs when you can write them in ZBASIC?

$140.00

Cat X-3570

Learn to fly . . . by computer! FLIGHT SIMULATOR

Thanks to fast animation and accurate representation of flight, the non-pilot can now learn basic flight control, including take-off & landing!

And experienced pilots will quickly recognise how thoroughly they can explore the aircraft's characteristics: without risk!

Computer and aviation experts call this program a marvel of modern technology: you'll call it fantastic! Once you've acquired flight proficiency, you can engage in the exciting British Ace 3-D Aerial Battle Game included in the package.

Features:
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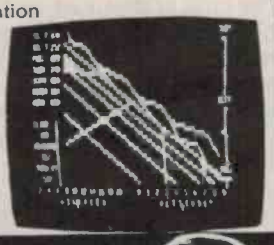

$34.90

Cat X-3684

ASK AT YOUR NEAREST DICK SMITH STORE FOR A FULL PROGRAM LIST!

Touch typing tutor

The ability to touch type is one which few amateur programmers possess, but one which can be very useful, especially when typing in a long program from a printed listing.

Malcolm Banthorpe

THE PROGRAM presented here was developed for an Ohio Superboard as a means of using the computer itself (via its VDU display) to train the user to associate a specific finger position with a specific alphanumeric character. It can be successfully adapted for use on a UK 101.

Program description

The bulk of the program (lines 105-275) is used to generate a graphic representation of a keyboard. All alpha and numeric keys are shown but control, shift and punctuation keys are not included. The next section of the program (lines 280-315) is used to randomly select a single character and blank its corresponding key as depicted on the screen. This remains blank until the user hits the same key on the keyboard. If an incorrect key is struck then the character on the correct key is momentarily flashed on the screen.

Throughout the exercise the user should keep his/her eyes on the screen and not look at the keyboard. In this way the brain should gradually come to associate a given finger movement with a particular character. For preliminary information concerning which finger should be used for which key and the correct position of the hands, the user should consult one of the many available books on typing.

Enhancements

The program as presented is very basic and there is considerable scope for expanding its teaching aspect. For instance, instead of choosing a random sequence of characters it would be a simple matter to offer instead sequences which would spell out coherent sentences, either of the quick brown dog variety or preferably an interesting anecdote or joke previously unknown to the learner. This would make learning more enjoyable and provide a positive reinforcement to hitting the right keys. Another possibility would be, after some initial practice, to bias the selection of characters towards those which have been most frequently miskeyed. These and other modifications are left to the ingenuity of the reader.

As mentioned above, it is possible to convert the program to run on a UK 101, which has a similar set of graphic characters to the Superboard but which has a different screen format. Details of the changes required are not given here as most of the POKE addresses need to be changed. However, any interested UK 101 user who is familiar with its graphics system will find that by running the program as presented, the resultant display will suggest the changes required.

Program listing

```
100  REM TOUCH TYPING
105  FOR X=0 TO 29:PRINT:NEXT
110  P=53478:POKE 11,34:POKE 12,2
115  FOR X=546 TO 552:READ C:POKE X,C:NEXT
120  POKE P,221:Q=P+1
125  FOR X=1 TO 9:GOSUB 340 :NEXT
130  POKE Q,148:POKE Q+1,222
135  P=P+32
140  POKE P,149:Q=P+1
145  FOR X=1 TO 9:POKE Q,X+48:POKE Q+1,149:
     Q=Q+2:NEXT
150  POKE Q,48:POKE Q+1,149
155  P+P=32
160  POKE P,220:Q=P+1
165  FOR X=1 TO 9:GOSUB 345 :NEXT
170  POKE Q,217:POKE Q+1,215:POKE Q+2,222
175  P=P+33
180  POKE P,149:Q=P+1
185  FOR X=1 TO 10:GOSUB 350 :NEXT
190  P=P+32
195  POKE P,220:Q=P+1
200  FOR X=1 TO 9:GOSUB 345 :NEXT
205  POKE Q,217:POKE Q+1,223
210  P=P+33
215  POKE P,149:Q=P+1
220  FOR X=1 TO 9:GOSUB 350 :NEXT
225  P=P+32
230  POKE P,220:Q=P+1
235  FOR X=1 TO 8:GOSUB 345:NEXT
240  POKE Q,148:POKE Q+1,223
245  P=P+33
250  POKE P,149:Q=P+1
255  FOR X=1 TO 7:GOSUB 350 :NEXT
260  P=P+32
265  POKE P,220:Q=P+1
270  FOR X=1 TO 6:POKE Q,148:POKE Q+1,215:
     Q=Q+2:NEXT
275  POKE Q,148:POKE Q+1,223
280  C=INT(RND(1)*43+48)
285  IF C>57 AND C<65 THEN 280
290  P=53510
295  Q=P
300  IF PEEK(Q)=C THEN 315
305  Q=Q+1:IF Q-P<21 THEN 300
310  P=P+65:GOTO 295
315  POKE Q,32
320  X=USR(X)
325  IF PEEK(640)=C THEN POKE Q,161:GOSUB 355 :
     :POKE Q,C:POKE 280,0:GOTO 280
330  GOSUB 355 :POKE Q,C:GOSUB 355 :GOTO 315
335  END
340  POKE Q,148:POKE Q+1,217:Q=Q+2:RETURN
345  POKE Q,217:POKE Q+1,215:Q=Q+2:RETURN
350  READ A$:POKE Q,ASC(A$):POKE Q+1,149:
     Q=Q+2:RETURN
355  FOR X=0 TO 100:NEXT:RETURN
360  DATA32,0,253,141,128,2,96
365  DATAQ,W,E,R,T,U,I,O,P,A,S,D,F,G,H,I,J,K,
     L,Z,X,C,V,B,N,M
```

CAN YOU AFFORD NOT TO SUBSCRIBE TO MICRO-80?

MICRO-80 is a monthly magazine dedicated to users of SYSTEM 80 and TRS-80 microcomputers. Owned and produced entirely in Australia, each issue of MICRO-80 contains at least six programs, articles, useful hints and answers to readers' problems; all designed to help YOU get the most out of your SYSTEM 80 or TRS-80. Since MICRO-80's first issue in December 1979, we have published over 80 major pieces of software and 10 hardware projects. Most of the programs and articles are written by our readers to whom we pay publication fees thus enabling them to make their hobby pay. MICRO-80 readers can save money by buying Tandy products at 10% discount from an authorised dealer — for details see any issue of MICRO-80. Our sister business, MICRO-80 PRODUCTS, sells Australian designed and produced software and high quality, imported goods at low, sensible prices. We repeat, if you own a SYSTEM 80 or TRS-80,

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If you do not have enough time at the keyboard to type in the program listings which are published in MICRO-80 each month, then you need a cassette subscription. As well as MICRO-80 magazine, you receive a cassette each month containing all the programs listed in the magazine.

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TRS 80 and SYSTEM 80 OWNERS

TRS 80 and SYSTEM 80 OWNERS

Dick Smith's alternative — the System 80 (designed for Australia)

The System 80 from Dick Smith Electronics has recently been released in a Mark II version, and seems to be settling down to a position amongst the top sellers in the 'middle range' home computer market. We thought it about time that we took a closer look. Phil Cohen investigates.

Phil Cohen

THE SYSTEM 80, as most readers well know by now, is Dick Smith Electronics' answer to the Tandy TRS-80. Early advertising for the DSE machine carried price breakdowns for equivalent systems from both Tandy and DSE, and the System 80 is claimed to be software-compatible with the TRS-80.

Tandy is a very large organisation indeed. Having started in the US as, I believe, a leatherwork and homecraft shopping chain, they have grown to become one of the major forces in hobby electronics worldwide.

As with many of his 'exclusive' products, the DICK SMITH label carries a tag saying 'Designed for Australia'. It's interesting that this self-same computer is marketed overseas as the 'Video Genie'. So much for the tag line.

First impressions

The System 80 comes in a sturdy plastic case with 'wooden' end cheeks (plastic, actually). The keyboard has a nice 'solid' feel to it — not quite the best I've come across on a computer, but far from being the worst.

A cassette mechanism is built in — an unusual feature. Most hobby computers these days seem to be going for an external unit — which cuts down on the cost, as the user may well have one already when he buys the computer.

The only other machine I can think of that has a built-in cassette is the 'old' PET from Commodore — I say 'old', because the latest version of the machine has dropped the cassette mechanism in favour of a larger keyboard.

The bottom of the System 80 holds an interesting label — it says "BASIC INTERPRETER COPYRIGHT BY MICROSOFT, 1980 ...". This indicates that the machine runs the now-standard Microsoft Z-80 BASIC interpreter — well tried and tested, and with plenty of software available for it. No cost-cutting there.

The back of the case was a bit of a surprise. I had expected the enormous gold-plated edge connection usually found on this sort of machine. There is a ▶

connector — but smaller than most, and hidden behind a removable cover.

I found something extra, however — a couple of DIN audio sockets, more usually found on cassette recorders.

One *is*, in fact, for a second cassette recorder — the other is for the connection of a video monitor. It is unusual to use an audio connector of this type to carry video-frequency signals. Presumably, the amount of high-frequency interference radiated is within acceptable limits. This could be the start of a move towards the use of this kind of connector (which is, pin for pin, probably cheaper than the alternatives) for this application.

The power supply of the System 80 seems to be an integral unit — the mains switch, fuse and cable entry are all in one panel at the back of the machine, and this is part of an enclosed box within the main case of the computer.

Controls and indicators

Starting at the front of the machine, the keyboard has all the usual typewriter keys, plus computer-oriented ones. A loose sheet which comes with the manuals points out that the 'NEW LINE' key on the System 80 is identical in function to the 'ENTER' key of the TRS-80. There are a couple of other minor variations between the two keyboards, and this is due presumably to DSE using an off-the-shelf keyboard unit, and consequently not being able to match the other machine totally.

A LED at the top left of the keyboard indicates that the machine is switched on.

Two buttons above the main part of the keyboard provide functions connected with the cassette operation and the video output. Leaving the video one for the moment, the 'F1' button provides a function which has been much called-for by TRS-80 users: the cassette recorder motor in both machines is software-controlled. It turns on when the computer encounters an instruction to read from or write to cassette, and turns off when the reading or writing is finished.

Unfortunately, the user quite often wants to use the fast-forward or fast-rewind facilities of the cassette independently of the computer — perhaps even while the computer is doing something else. To accomplish this, early TRS-80 users (I believe that add-on devices now on the market obviate the problem) had to unplug the remote control jack from their cassette recorders, thus returning the motor of the recorder to manual control.

The 'F1' button of the System 80 overrides the software control of the cassette, turning the motor on no matter what the state of the software.

The cassette mechanism has the usual controls, along with a counter (very useful for finding programs on a long tape — especially since the usual method of recording a spoken message before each program is not possible in this configuration).

A level indicator sited above the cassette mechanism, and a level control beside it, allow the user to set the level of the cassette output to suit the computer. This is necessary because in transferring programs (or data) from one machine to another, variations in recorded level can cause problems. Presumably the first System 80s had this sort of trouble — the meter and control appear only on the Mark II version.

A LED beside the cassette mechanism shows when the cassette motor is on — this is useful for spotting the end of a program which is currently loading.

The back of the computer holds the two DIN sockets I mentioned earlier — one for a second cassette and the other for a video monitor.

Two cables exit the machine at the back. One is for mains, the other for a TV set. The System 80 is unique as far as I know, in that it has outputs for both a video monitor *and* a normal domestic TV set. Cable bollards keep the TV connection neatly coiled if it is not used.

Two buttons stick out of the back of the machine — one is a RESET button, in case the user gets into trouble that even the BREAK key on the keyboard won't resolve.

The other button is called 'VIDEO CUT'. What it does is to change the screen width from 64 characters to 32 characters. This means that the right-hand side of the output becomes invisible (i.e: it disappears off the edge of the screen). The PAGE button just above the main keyboard allows the user to see the right-hand half — successive operations of the PAGE button switch the screen between left and right hand halves of the output.

The advantage of having 32 characters per line is, of course, clarity. I suspect that the idea was to allow the user to select the 32-character option while he was entering programs (program lines are usually fairly short, and don't fall off the edge of a 32-character wide screen).

Personally, I disliked using the 32-character format, as I was never 100% sure what I was missing off the edge of the screen — but that *is* just a personal view, and in any case you don't *have* to use it.

And that's it — the System 80 is the bare minimum when it comes to fiddly connectors and option switches.

Internals

The memory map for the System 80 is shown in Figure 1. There's nothing unusual about it, except perhaps that the user RAM starts at 4000.

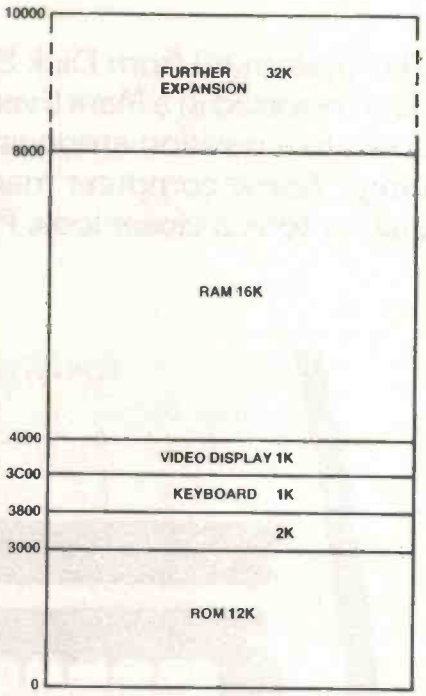

Figure 1. Memory map of the System 80.

In some machines, the operating system is arranged so that the user RAM begins at address 0 for simplicity of software writing. But this is a minor problem.

The total addressing space (with maximum expansion) is 64K — that's the limit set by the Z-80 microprocessor in its basic configuration, of which 48K is available as RAM. The standard configuration (i.e: without add-ons) has 16K of RAM.

There's really not a great deal more that I can say about the inside of the System 80 from the hardware point of view, as the documentation that came with it did not include any sort of circuit diagram — not even a block diagram. While on the one hand this is not necessary for the average user, who would tend to regard the machine as a 'black box', it's useful for the small percentage who might want to expand the system from the inside at a later date (after the warranty has run out).

The manual does give the pin assignments for the expansion connector on the back of the System 80. These are, basically, those Z-80 signals which are necessary for the correct operation of an S-100 buss system.

Dick Smith Electronics is already marketing an S-100 expansion box for the System 80, and they obviously had it in mind when they designated the pins of the System 80 expansion connector.

As far as the software goes, there's not much I can say on that score either — the BASIC system offered in the System 80 is a standard Microsoft BASIC interpreter with perhaps a few augmentations not found on some other machines. I was unable to check out the 'software compatible with Tandy TRS-80' claim.

For those who have not come across this type of BASIC system before, I have included a quick list of its more interesting capabilities below.

ACTIVE COMMANDS: i.e: those which are available to the user as soon as the machine is turned on, and which are not usually used within a program:

AUTO: causes the computer to generate line numbers automatically during program entry, so that a program can be entered more quickly.

CLOAD: loads a program from cassette into the machine's memory.

CLOAD? re-reads a recently-recorded program from cassette and checks it against the memory contents to make sure that the recording is error-free.

CSAVE: records a program onto cassette.

EDIT: allows the user to change parts of a line of program without the need to re-enter the entire line. A number of special editing commands are in force while this is done.

SYSTEM: causes the machine to go into 'monitor' mode, in which the user can load or save machine code programs on tape, run or modify those programs, etc.

TRON, TROFF: turn on and off the 'trace' facility, which lists on the screen the line numbers that a program is going through *while it is running* — so if it is stuck in an 'endless' loop, the user can spot what is happening.

PROGRAM STATEMENT COMMANDS: i.e: those used in the body of a program:

PRINT@: causes the computer, rather than just PRINTing something on the next available line of the screen, to start it at a particular point. This is very useful for graphs, etc.

PRINT USING: allows the user to specify the format of the numeric data to be printed. For example, a number can be output with two digits after the point, and with commas inserted in the appropriate places before the point.

PRINT #: puts data onto cassette, rather than onto the screen. I suspect that, with the addition of an S-100 expansion and a disk drive, the same command will be used to send data to the disk.

DEFINT, DEFSNG, DEFDBL, DEFSTR: cause a list of variable names to be treated as string, integer, etc. (i.e: without the need for $, % or # symbols). For example, DEFINT A-D will cause all variables starting with A, B, C, or D to be treated as integers.

ON ERROR GOTO: means that, rather than just giving an error message and stopping, the program can be made to jump to a particular line number when something goes wrong (e.g: division by zero, etc). This means that the program can give a listing of the current values of all of the variables as its 'dying gasp' — useful in debugging!

RESUME: in conjunction with ON ERROR GOTO means that the error can be ignored altogether. RESUME sends the program back to a particular line, forgetting that an error even occurred.

SET, RESET: allow the user to turn on or off a particular point on the screen (which is taken to be made up of 47 by 127 points for the purposes of these commands). This means that graphs can be put on the screen a point at a time.

POINT: allows the program to find out whether a particular 'point' (see previous command) is on or off.

Variable types

The types of variables supported by the System 80 are as follows:

INTEGER: within the range −32769 and +32769.

SINGLE PRECISION: a floating-point number with six significant digits and a power of ten from −38 to +38.

DOUBLE PRECISION: a floating-point number with sixteen significant digits and a power of ten from −38 to +38.

STRING: a sequence of characters up to 255 in length.

One of the 'cute' accessories available is this 'Sound Off' package, which provides music and sound effects for the System 80.

ARRAYS: of any of the above types of variables — with any number of dimensions.

And lastly ...

The System 80 is not a 'cost-is-no-object' machine — but then, it was never intended to be. Some of the corners that have been cut to bring a machine in at this price are annoying — the manuals could have been better, and there is no [key (you have to use the ESC key instead) — but none of these cut corners are fatal.

The value of the machine can only be measured against the use for which it is designed — for the home user who wants to learn about programming, and who perhaps has some minor software applications in or around the home, office or small business.

The System 80 would not stand up to a 'harsh' environment (e.g: being used as a word processor on a shift basis) — but then, that's not what it's for.

All things considered, I *would* recommend the System 80 to anyone who wanted to take up programming as a hobby. ●

SYSTEM 80 — GENERAL SPECIFICATIONS

RAM	4K or 16K
Keyboard	51-key ASCII
VDU format	64 character x 16 lines or 32 double-width characters per line.
Storage	cassette included plus provision to connect an extra cassette. Level meter and level control included.
Expansion	via 48-pin socket.
Video out	direct video out plus on-board video modulator (Ch.1. output)
CPU	Zilog Z80, 1.7 MHz clock.
Language	12K Microsoft BASIC
Features	compatible with Level II TRS-80; memory expandable to 48K with S-100 expansion unit; expansion units available — parallel printer interface, voice box, S-100 expansion unit, S-100 RAM card, extra cassette deck, TV set monitor.
Price	$695 with 4K memory $750 with 16K memory

Review unit supplied by Dick Smith Electronics, North Ryde NSW. Supplied with Users' Manual, BASIC Manual and Programming For Beginners books.

The Superboard
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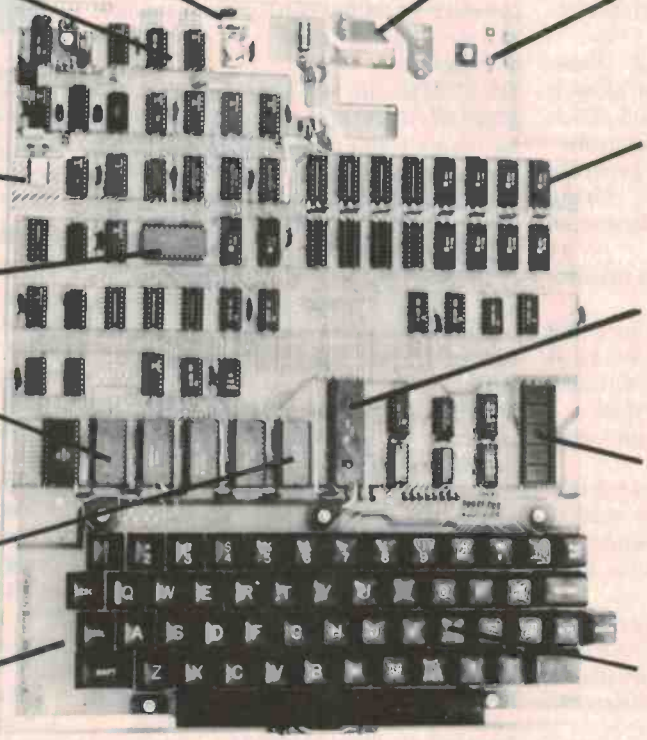

Cassette interface, 300 Baud Kansas City standard, so you can swap programs, ask your dealer how to double the speed!

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Character generators giving a full 256 characters from Alpha-numerics to planes, guns and spaceships.

6502 processor or chip as in four out of five of the top selling personal computers.

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8K BASIC available on power up with floating point, trig functions, multi-dimensioned array, and full string facilities.

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Our Superboard lets you suit yourself, offering a ready to go configuration that you can add to as needed. The Superboard is the first complete personal computer system contained entirely on a single board.

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We designed the Superboard specifically with versatility and economy in mind. It is suitable not only for the serious computer user, but also for first time users, the student or the hobbyist. The Superboard gets you off to the right start, and you can add to it later – saving money all along the line. If you're just starting, get the ready-to-go CI model, then all you'll need is your cassette and television set and you're into the world of computers in a really serious and flexible way.

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Spellguard — every proofreader's dream!

Spellguard is a software system for use with microcomputers that proofreads a text file typed into a word processor or text editor. Elaine Ray reviewed it for us, and not only did she find it an excellently organised and beautifully documented system, the copy she turned in having used it required the minimum of corrections!

Elaine M. Ray.

SPELLGUARD makes me realise how far the microcomputing world has come since the era when Altair was number one and if you wanted a computer you built your own system. In those days, if a program worked at all, you were happy. Now we have software that works as well as mainframe programs. Spellguard is an example of the new standard — fully professional microcomputer software.

Spellguard was reviewed using an IMS International Series 8000 using 96 M hard disk system and twin double-sided double density disks. This program will also run under MP/M.

What Spellguard does

Spellguard's purpose is to help users find spelling and typographical errors. It is meant to work in conjunction with a word processor or text editor, but it operates independently on the text file itself. It should therefore be generally compatible with almost any other program which operates under CP/M to create an ASCII text file. I know that there are no problems with the WordStar Word Processor or WordMaster Text Editor.

To describe the operation of this remarkable system, assume that you've created a CP/M text file using a word processor or text editor. Next you type "SP ‹filename›", and CP/M loads and executes Spellguard, which in turn starts proofreading the specified text file. Should you wish not to proofread first off, you need only type in "SP". The Master Menu will prompt you to type the name of the file you want proofread, and the program assumes that every series of letters between spaces, numbers or special characters in the file is a "word" and compares it to the dictionary file. For example, "customer6" in a file causes "customer" to be compared to the dictionary, but "customer#six" causes both "customer" and "six" to be compared.

Each word is then determined to be a match or mismatch with the currently selected dictionary entry. If it is a match, nothing happens; if, however, it is a mismatch, it is remembered by the program for review after the proofreading has been completed. You can then review the mismatches one word at a time or all at once and do one of three things with them. If the word is a typographical error such as "threethings" or if it is a spelling error such as "compatable" you can change the last character of the word to a predetermined special character in the original text file. (The default character on my copy was "[" but I decided that I preferred "≈".)

Once you've finished reviewing all the mismatched words, you can return to the word processor and use the FIND or SEARCH command to go directly to the words that need correcting. You simply have the word processor search for the special character that Spellguard implanted in the word.

The second thing you can do with a mismatched word is add it to your dictionary. Thus, as you use Spellguard you can tailor the 20 000 word dictionary that comes with the system. Don't think that 20 000 words is a small number, by the way, for as ISA remind us in the manual, an ideal dictionary would be large enough so that correctly spelled words only rarely caused mismatches, but it would still be as small as possible to save disk space, reduce running time and give as few incorrect matches as possible to words which are syntactically incorrect. Curious to see how big 20 000 words really was, I

proofread every text and program source file I had at hand. The result, after proofreading 16 Megabytes of files, was a dictionary of 20 661 words (I did discard program variable names but added anything that could pass as an English word).

The third thing you can do with a mismatched word is ignore it. In virtually every document you will find mismatched words, such as proper names, that are spelled correctly but should not be added to your dictionary because they will probably never be used again.

After you have completed the review and decided to mark, add to the dictionary or ignore each mismatched word, Spellguard marks the text file, adds to the dictionary and returns you to CP/M upon your command. It will optionally, depending upon the number of words you have added, decide to "reorganise" the dictionary. I took this to mean a sort of some kind, in which case the only comment I can offer is that it is incredibly fast.

The procedures just described comprise the usual operational sequence, but Spellguard will do several other helpful things. The most important ones involve operations with dictionaries. You can combine two dictionaries so that a third contains all the words that occur in either of the two source dictionaries. This feature allows you to build a specialised vocabulary (i.e: a special dictionary) and then add it to a general dictionary such as the one furnished with the system. You can also subtract one dictionary from another so that the third contains the words present in the first but not the second.

After using Spellguard on all my documents, I subtracted the original dictionary from the current one that contained my 661 additions. Since listing all or parts of dictionaries is another function of what the manual calls "dictionary management functions", I simply listed the remaining vocabulary. This allowed me to examine my added words, which in turn caused some reflection on some of the word pattern usage I saw. This is an aspect of using Spellguard that I had not expected but which I find quite valuable. The process of examining each word that was not in the original dictionary caused me to wonder whether some of them should be replaced by simpler, more common words. In fact I marked some words, not because they contained typographical errors or were misspelled, but simply because I wanted to replace them.

Another noticeable Spellguard characteristic is its remarkable speed. On the IMS International system with a 4 MHz Z-80 CPU and a hard disk, a 45-page, single-spaced legal document (20 066 words) was proofread in 41.2 seconds against a 20 661-word dictionary. Using a slower CPU or a slower disk system, the program would take more time.

Documentation

The manual is clear, complete and well organised, with a glossary of terms and a good index, and it goes into detail on setting up and operating Spellguard for the first-time user. I have never seen a microcomputer application instruction manual which assumes so little and explains so much, *clearly*. The program allows you to type 'HELP' any time it expects a command. The HELP responses are clear and appropriate.

I praise the authors of the manual particularly for providing an excellent discussion of the program's limitations. Too often users of other programs are left with the chore of discovering them on their own. Five problem areas are discussed: (1) Spellguard cannot detect errors that are also real words. In fact a classic unintended example occurs on page 27 of the manual, where the word 'to' appears instead of 'so'. (2) The dictionary may contain errors. The first thought in my mind was the American spelling differences in the dictionary. In my copy, there are quite a few, but the Australian Distributors, S.I. Microcomputer Products P/L, will be supplying the Spellguard with the correct English spellings in the dictionary. You must simply make sure that you don't add any misspelled words to your dictionaries. (3) Hyphens and apostrophes cause problems and are dealt with individually. (4) Words that have more than 42 characters are flagged and need special handling. (5) The program does not distinguish between upper and lower case. On reflection upon this last point, it occurs to me that distinguishing between upper and lower case would serve no useful purpose, other than to ensure that the first word of each sentence was a capital letter — which is not the purpose of a dictionary.

The manual sums up by saying, "None of the foregoing discussion can be interpreted to mean that Spellguard eliminates the need for proofreading. Proofreading is required to make sure the document makes sense, has proper grammatical structure, verb tense, etc."

Ease of Use

I don't think any program could be much easier to use than this one. Every operation is 'menu-driven', in that a list of possible commands is presented, and the user selects the desired command by typing a letter or a number. The letters are mnemonics of the function they initiate and their numeric equivalents seem to fall neatly under your fingertips, making mismatch scanning fast and easy. Numerous little touches like this throughout the system make things easy.

Another typical example is the menu prompt for changing between beginner and expert mode (expert mode is faster and has fewer messages to the user). The main menu prompt reads: "Change prompt level from 'beginner' to 'expert'" when the system is in the ▶

beginner mode, but reads " 'expert' to 'beginner' " when the system is in the expert mode.

The program uses a 'default-table' for remembering information that is likely to remain the same from one occasion to the next, such as the name of the dictionary, the special character used to mark errors and whether you have a CRT or hard copy terminal. That is not too unusual, but Spellguard allows you to have three separate tables, which *is* unusual. Thus you can reconfigure the system by using one command to change from one set of defaults to another, which would be helpful if more than one person were using the system.

The only inconvenience I found is that the procedure for removing words from the dictionary is rather involved. First you have to create a dictionary of words you want deleted, then use the subtract function to remove them from your main dictionary.

Error handling

I didn't experience any problems with Spellguard's error handling. The exception would be problems that are due to the way that CP/M handles BDOS errors, which can't be altered by programs like Spellguard because control is never returned to the application program. This could conceivably cause a dictionary to crash if it happened at the wrong time, but if there is one thing which the Spellguard gets across to the operator, it is that you should always back up your dictionaries. A very wise philosophy.

Support

Here ISA's self-appointed title of innovative is appropriate. Part of the support comes with the original purchase in the form of a maintenance program with two powerful features.

The VERIFY command is a self-checking feature designed to determine whether or not the Spellguard has been damaged or miscopied. According to the authors: "If there is a random error in a Spellguard program, there is less than one chance in one billion that VERIFY will fail to detect."

The other command, REVISE, allows the user to modify the original program using a special code. This means that non-technical users can type a code such as CNA AAB AAA KBA BOF KLC into REVISE to make a patch to Spellguard. Thus ISA can distribute updates on paper rather than on floppy disks.

Clearly ISA has thought out the requirements of customer support more completely than most vendors. The ISA approach is further indicated by its "money back acceptance test period", the warranty and the service policy — an entire chapter in the manual is devoted to these subjects. ISA even includes a preprinted form to use in claiming a refund!

Summary

I think anyone using a word processor in a business or professional setting would find that, even at $325, Spellguard will quickly pay for itself. When I first saw the price, I thought it was too high. But after using the program and reflecting on the value of reliable, professional-quality software as an addition to a microcomputer word processor system, I think it is well worth the price. ●

System Requirements
CP/M 1.4 or later
32K memory
Disk drive systems 400K or better
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• Liveware, 15 Boundary St, Rushcutters Bay 2011.
• S.I. Melbourne, 428 St. Kilda Rd, Melbourne. (03)26-5522.
• The Electronic Circuit, 20 Duncan St, Fortitude Valley. (07)52-8455.
Price: $325

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Advanced BASIC Part 2 — Chaining

Phil Cohen

Following the series on Back Door into BASIC, ETI has begun a series on Advanced BASIC for those who want to know where to go now. The first article of the series, 'Sorting', appeared in the June 1981 issue of ETI; this month Phil Cohen explains and illustrates 'chaining'. The language used is 8K Microsoft BASIC, and minor alterations will allow the included examples to run on almost any medium-sized personal computer system.

LET'S SAY you've got a list of items with a definite sequence — words in a word processor, or names in alphabetical order, for example. What's the best way to organise their storage in a program?

Easy, you say. Put them into an array.

Okay, but what if you want to add one item to the list, but *in the middle of the list*. What happens? One approach is to find out where the item goes and move all the items after it down one position (assuming, of course, there's room in the array). This becomes very slow if you have a lot of items in the list.

Another way of doing it is to have a separate list of 'amendments' to the existing list and to check it as the main list is read out. This is okay if the number of amendments is very small.

One solution to the problem is to use what is known as 'chaining'. Each item in the list 'points' to the next item.

Perhaps the easiest way to explain this is with an example. The list we want to represent is:

1.1, 2.2, 3.3, 4.4

This is stored in the array A(5,2). The 5 gives us room to add one more item to the list and the 2 allows the storage of 1) the data, and 2) the location of the next item:

A(1,1) = 1.1
A(2,1) = 2.2
A(3,1) = 3.3
A(4,1) = 4.4

The item after 1.1 is 2.2, and so

A(1,2) = 2

Similarly,

A(2,2) = 3
A(3,2) = 4

Now 4.4 is at the end of the list, so we'll mark this by a negative number:

A(4,2) = −1

This couldn't possibly be the next location, since the array subscripts start at 0, and so the program will be able to recognise the end of the list. We also need a 'pointer' to the start of the list:

S = 1

The following program will print the list defined above (see also Figure 1):

10 I = S

I is the current item. Point it to the start.

20 PRINT A(I,1)

prints the current item.

30 I = A(I,2)

sets I to the *next* element's location.

40 IF I › 0 THEN 20

repeats the process until all the items have been printed. When 4.4 has been printed, line 30 will set I = A(4,2), which is −1, and line 40 will 'trap' this as the end of the list.

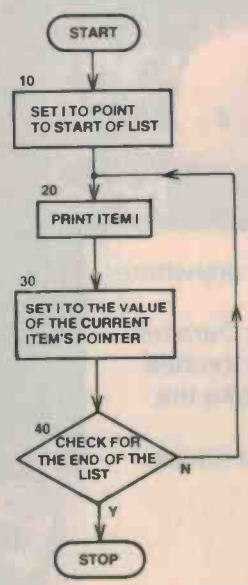

Figure 1. A program which allows the list to be printed in order.

Fine, we can read the list out — what about adding items?

This is where it gets a bit cleverer — we don't have to move any of the data. All we have to do is to find a place for the data, point one of the list's pointers at it (*which* pointer depends on where in the list the new item is to be added) and then point the new item's pointer back into the list where it was 'broken'.

First of all, though, we have to find out if there's room. Remember, we have no way of knowing (yet) which locations hold data and which are unused (without going through the list each time, that is). What if we set the 'next item' part of the unused locations to 0. Then we'll be able to tell the locations from data, or from the 'end of list' marker (which is −1). The unused location in the above example was location 5, so

A(5,2) = 0. ▶

Now see here

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What we have to do to add an item, then, is

a) Look for an empty location (and STOP if there are none!)

b) Change the pointer of the item which comes before the one we want to add to point to the new item.

c) Set the pointer of the new item to point to the item which will come after it.

Say we want to change the list to:

1.1, 2.2, 99, 3.3, 4.4

We set

A(2,2) = 5

A(5,1) = 99

A(5,2) = 3

The following program segment will add an item with value V after item L (see flowchart, Figure 2).

```
10 FOR I = 1 TO 5
20 IF A(I,2) = 0 THEN 50
30 NEXT I
40 PRINT "NO ROOM LEFT" : STOP
```

checks for empty locations (which have a pointer value of 0) and stops if there are none.

```
50 A(I,1) = V
```

I should be the number of the first empty location.

```
60 A(I,2) = A(L,2)
```

sets the pointer of the new item to where the pointer of the item was before it *was* pointing (whew!).

```
70 A(L,2) = I
```

completes the addition.

The following segment will remove item R. This is rather more tricky than the last program, as we have to find out which item is pointing *at* item R. It won't remove R if it's the first member of the list, by the way — this involves changing the value of S. It's easy enough to add a small section of program to check for this, though (see the full-sized example later in the article).

```
10 I = S
```

the start of the list;

```
20 IF A(I,2) = R THEN 60
```

if the item I *points at* R, jump.

```
30 IF A(I,2)<0 THEN PRINT
   "NOT FOUND" : STOP
```

If R hasn't been found by the end of the list then *something's* wrong!

```
40 I = A(I,2)
50 GOTO 20
```

try the next one:

```
60 A(I,2) = A(R,2)
```

This takes care of the pointers in the list. All we have to do now is to mark R as being empty:

```
70 A(R,2) = 0
```

Figure 3 shows the flowchart of the above program. ▶

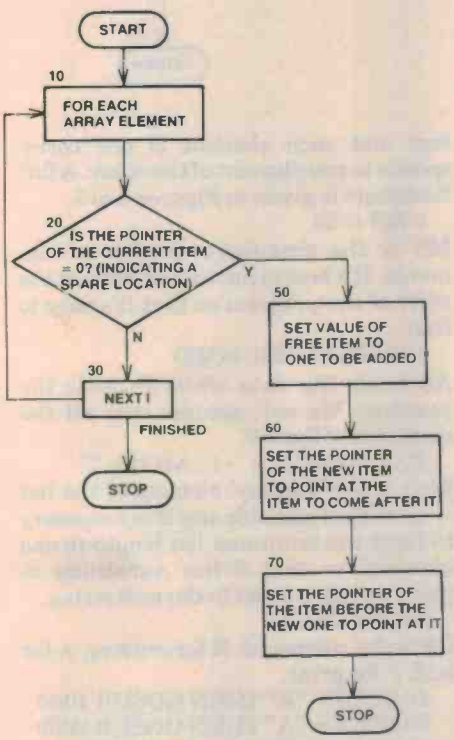


Figure 2. This segment adds one item to a specified position in the list.

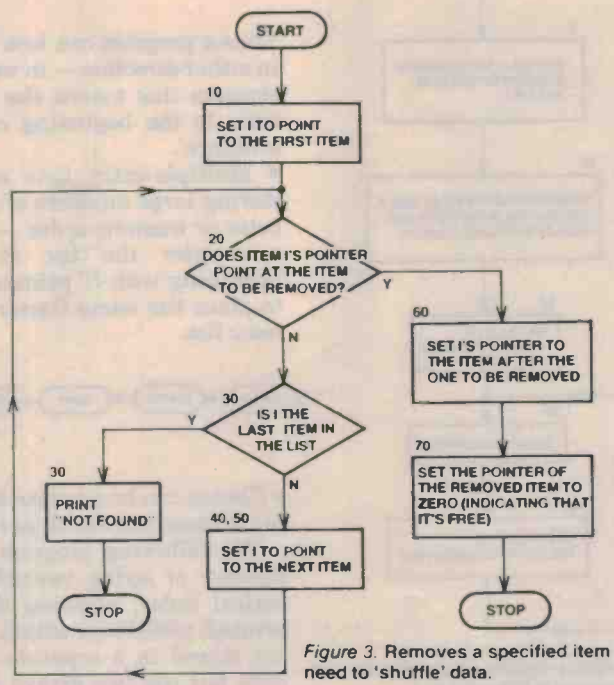
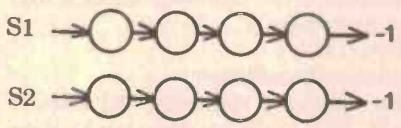


Figure 3. Removes a specified item — without the need to 'shuffle' data.

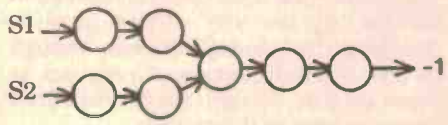
Other points to note about chaining are:

• There's no reason why there should only be one list per array. All that's required is to have several 'start of chain' pointers (like S in the above example). Remember — one array takes up less room than two of the same total size.

• Several lists can share the same 'tail'. If this is a representation of two lists:



then there's no reason why they shouldn't be arranged like this



This sort of thing is useful for mailing list systems where some addresses would appear on several lists — members of a club who are also committee members, for instance. Their addresses would only be recorded once.

• List pointers can go in both directions:

A(1,1) = 1.1, A(2,1) = 2.2, A(3,1) = 3.3
A(1,2) = 2, A(2,2) = 3, A(3,2) = −1
A(1,3) = −1, A(2,2) = 1, A(3,3) = 2

Using the A(I,2) pointers would cause the list to be read as

1.1, 2.2, 3.3

whereas using the A(1,3) pointers would cause it to be read as

3.3, 2.2, 1.1

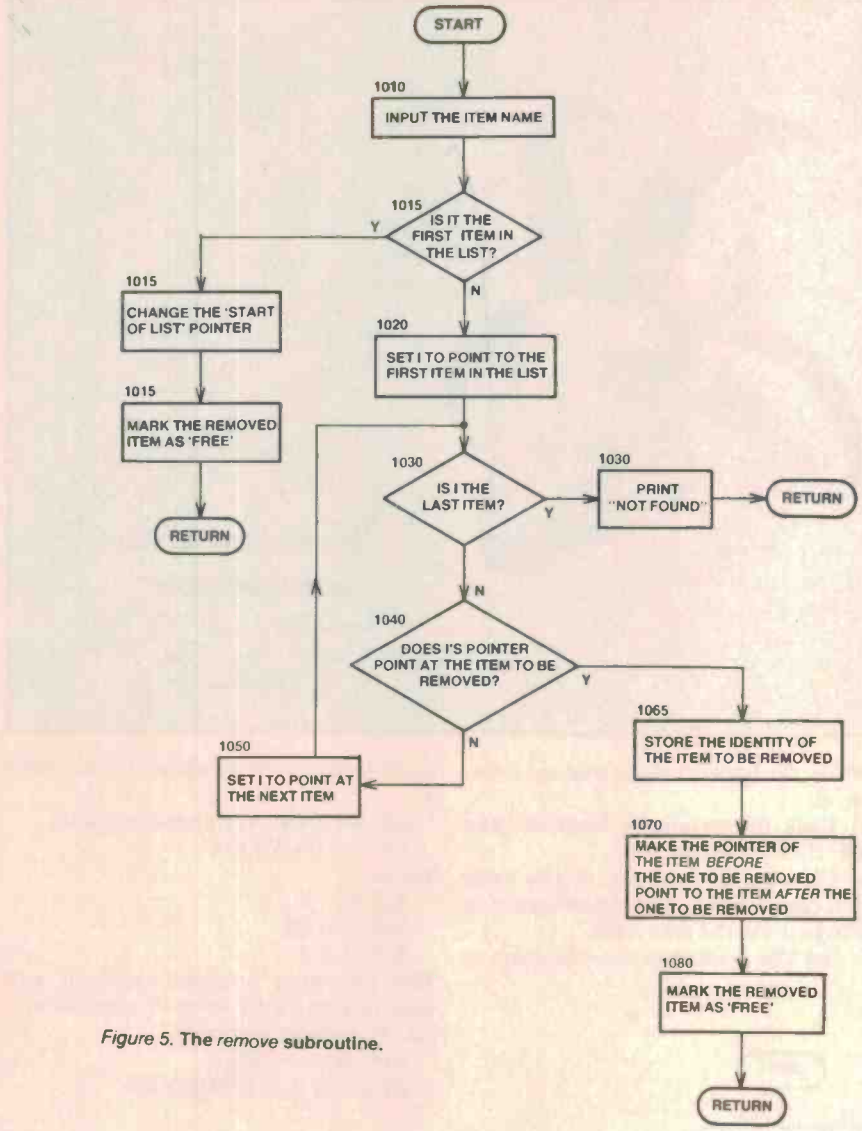


Figure 5. The *remove* subroutine.

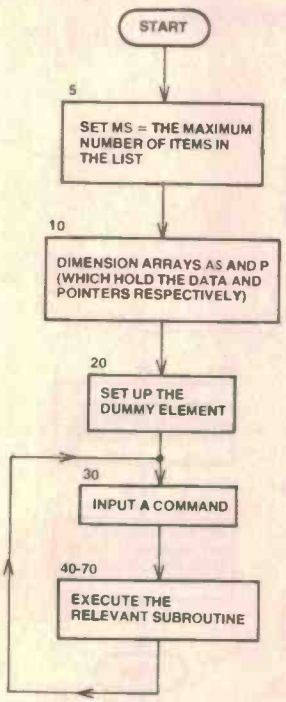


Figure 4. The main program. Flowcharts for the subroutines are given in Figures 5 to 7.

Thus a program can look through a list in either direction — in word processing systems this means the ability to 'go back to the beginning of the current sentence'.

• Multiple-entry lists are useful for storing large numbers of data in alphabetic or numeric order — the program can enter the list at the 'words beginning with C' pointer when trying to place the name Carter in an alphabetic list.

• Chains can be circular, for storing repeated sequences such as rotas.

The following program will store a number of string variables in alphabetical order, allowing the list to be printed, added to or edited. The pointers are stored in a separate array to the data but the two arrays are the same size and each element of one corresponds to one element of the other. A full flowchart is given in Figures 4 to 7.

```
5 MS = 50
```

MS is the maximum number of elements. It's best to have it set right at the start of the program so that it's easy to find.

```
10 DIM A$(MS), P(MS)
```

A$ holds the data while P holds the pointers. We will assume that all the elements of P are 0.

```
20 S = 1 : P(1) = −1 : A$(1) = ""
```

This is the 'dummy' element of the list — in lists of variable size it is necessary to limit the minimum list length to one element, so that S has something to point to. A$(1) is set to the null string.

```
30 INPUT C$
```

C$ is the command: R for remove, A for add, P for print.

```
40 IF C$ = "R" THEN GOSUB 1000
50 IF C$ = "A" THEN GOSUB 2000
60 IF C$ = "P" THEN GOSUB 3000
70 GOTO 30
```

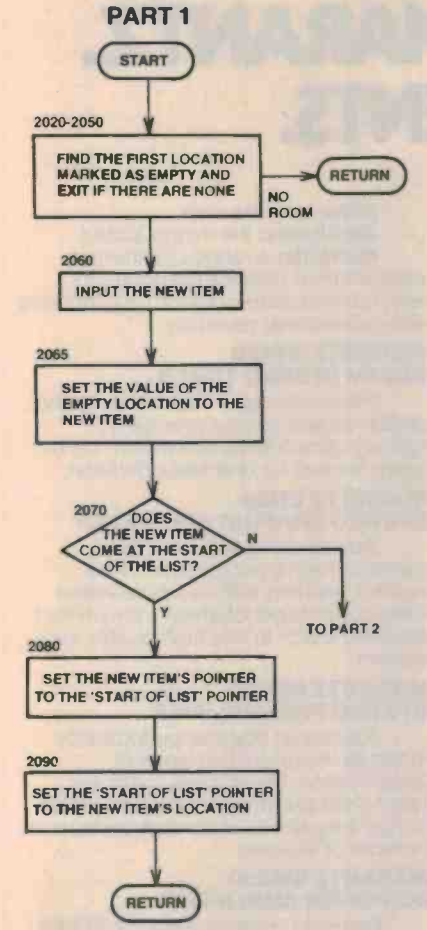
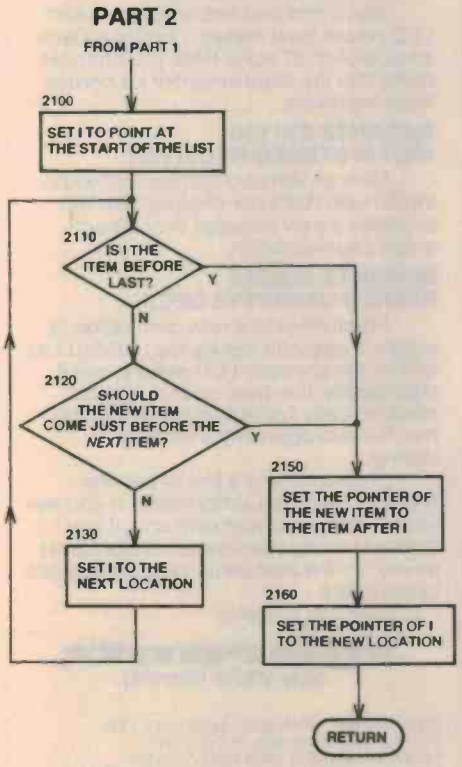


Figure 6. Add subroutine — this also checks to see if there's room.



executes the relevant subroutine and returns for the next command.

```
1000  REM REMOVAL
      SUBROUTINE
1010  INPUT "WHICH ITEM "; W$
```

finds out which item to remove.

```
1015  IF A$(S) = W$ THEN
      SS=S : S = P(S) : P(SS)=0
      RETURN
```

checks to see if the first member of the list is the one to be removed. As the algorithm used in the subroutine can't handle this directly, this line grabs it when it occurs. SS is a temporary store for S — see line 1080 later.

```
1020  I = S
1030  IF P(I) = -1 THEN PRINT
      "NOT FOUND" : RETURN
```

Since we're looking one item ahead — so that we can change the pointer which points *at* W$ — we look for the end of the list at the item *after* item I.

```
1040  IF A$(P(I)) = W$ THEN 1065
```

found W$ in the next item? — then jump out of the loop. If not,

```
1050  I = P(I)
1060  GOTO 1030
```

. . . try the next one. If W$ *has* been found, these next two lines take care of the pointers:

```
1065  P = P(I)
1070  P(I) = P(P(I))
```

Now mark item I as being empty:

```
1080  P(P) = 0
```

P was a temporary store for the value of P(I), as we need this value at line 1080 but it has been changed by line 1070. Location I is now empty. The dummy location (see line 20) will not be removed by this subroutine, as line 1010 will not accept a null string and the routine cannot, in any case, remove the last item in the list — line 1030 would prevent it.

```
1090  RETURN
2000  REM ADD AN ITEM
```

First, find out if there's room:

```
2020  FOR F = 1 TO MS
2030  IF P(F) = 0 THEN 2060
2040  NEXT F
2050  PRINT
      "NO ROOM" : RETURN
```

F is now the location of the first free element of the array — if there are any.

```
2060  INPUT "ITEM "; W$
2065  A$(F) = W$
```

This routine uses an alternative approach to the problem of dealing with the beginning and end of the list — the end causes problems for the REMOVE subroutine and this is why the dummy element was put in at the end. The beginning of the list will cause problems for this routine if we're not careful but we won't put a dummy element in the beginning as well — just to show the alternative approach. Instead:

```
2070  IF A$(S) ◇ "" THEN
      IF A$(S) ‹ W$ THEN 2100
```

If the dummy element isn't the only one in the list and W$ doesn't come first in the list, jump to 2100. The ‹ can be used to compare strings alphabetically in most comprehensive BASICs. If the version you're using doesn't have this feature you will have to write a short subroutine to do it. The IF . . . THEN IF . . . THEN construction causes the program to ignore the result of IF "" › W$. If W$ got past line 2080 then it must come just at the start of the list, so:

```
2080  P(F) = S : S = F
2090  RETURN
```

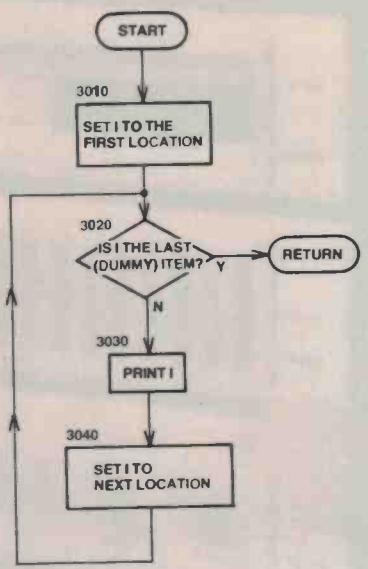


Figure 7. The *list* routine — the simplest of the three. Note how the addition of a dummy element makes this routine different from Figure 1.

However, if W$ comes further down the list,

```
2100  I = S
2110  IF P(P(I)) = -1 THEN 2150
```

If the search reaches the end of the list, W$ must come last in the list.

```
2120  IF A$(P(I)) › W$ THEN 2150
```

If the next item is further down the alphabet than W$, it must go in just after I (and before A$(P(I))). If not, try the next one:

```
2130  I = P(I)
2140  GOTO 2110
```

Now add location F in the right place:

```
2150  P(F) = P(I)
2160  P(I) = F
2170  RETURN
```

Now for the simplest of the three routines:

```
3000  REM PRINT
3010  I = S
3020  IF P(I) = -1 THEN RETURN
```

This prevents the dummy element from being printed, and ends the subroutine's execution.

```
3030  PRINT A$(I)
3040  I= P(I)
3050  GOTO 3020
```

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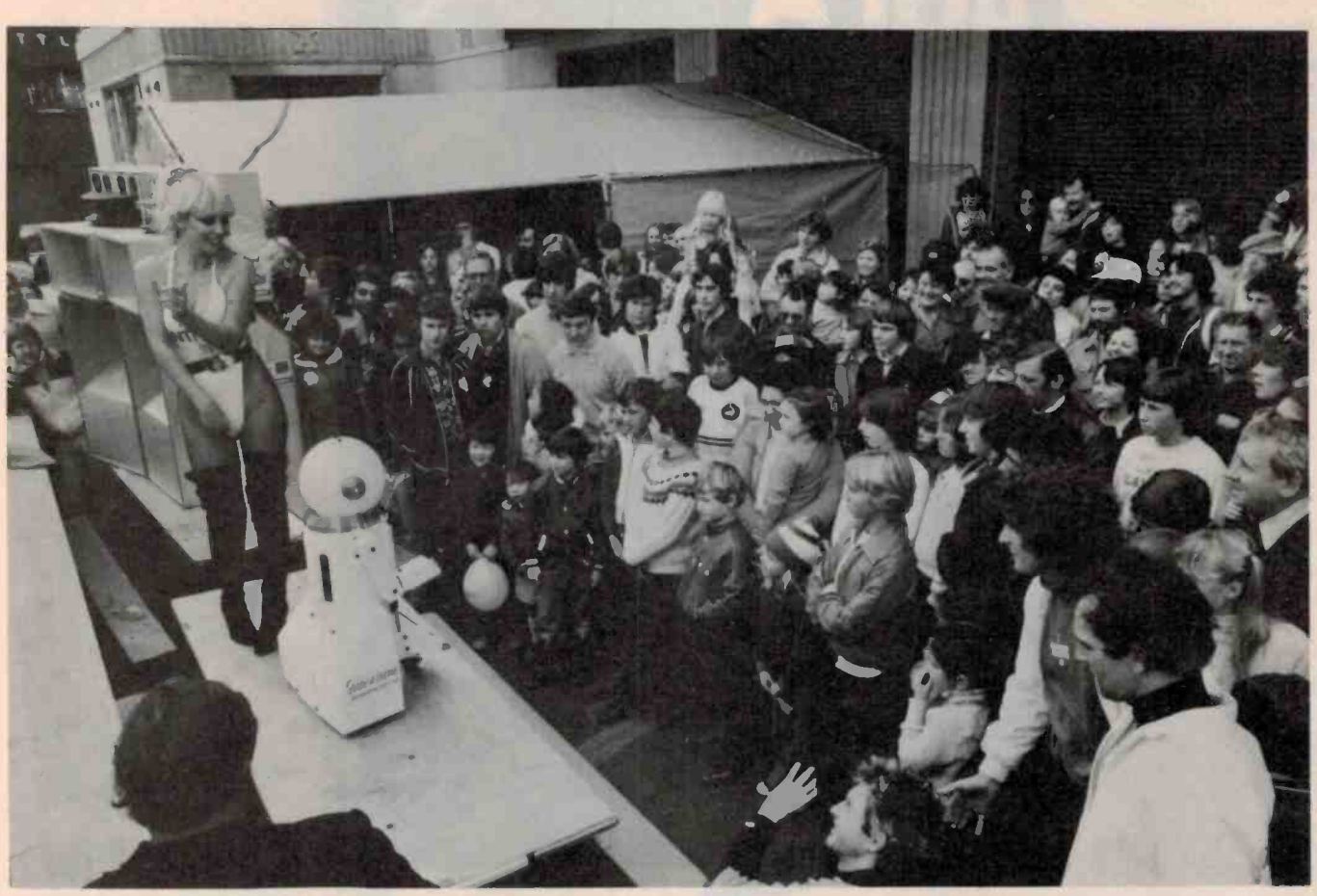

No more wild crowd scenes featuring disco dancers and robots, it seems.

Sixth C.E. Show cancelled!

In a surprise move in mid-May, Riddell Exhibitions cancelled this year's Consumer Electronics Show, scheduled to be held at the Yennora Woolsheds in Sydney over July 20 to 26.

The reason given was insufficient bookings — only 34 companies had committed themselves, compared to nearly 60 in the 1980 Show.

First held back in August 1976 in Sydney's Hilton Hotel, the show grew year by year until it occupied nearly four pavilions at Sydney's Showground in Moore Park. The Show started out as a hi-fi show for trade and public, along the lines of America's Chicago and Las Vegas electronics shows or the All Japan Audio Show.

For the first three shows our then sister publication Hi-Fi Review gave support and was closely associated with the event. In 1979 the scope was broadened and ETI's July issue that year carried a Show Guide in a 228-page bumper issue. Whilst the bulk of exhibitors at the 4th C.E. Show displayed hi-fi and associated gear, there was much 'consumer' electronic equipment in evidence.

The 1980 Show had more exhibitors than ever before, but some who had been prominent in previous years were conspicuous by their absence. That trend clearly turned into a mass 'include me out' this year.

Various reasons have been advanced, from lack of promotional budgets of the size required to mount a stand at the C.E. Show to lack of interest by company managements. Certainly there was some rivalry amongst the big show exhibitors as to who could mount the 'most brilliant' stand in years past, and if a company couldn't mount an exhibit to match the brilliance of the Opera House then they risked looking second best. It's easy to understand the attitude of '... rather not be there than be second best'.

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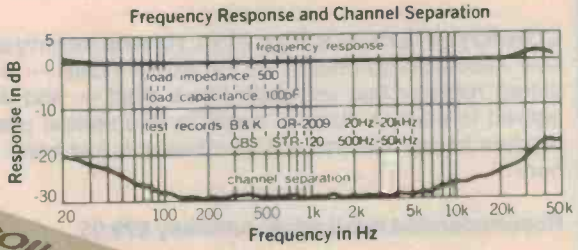


XL-55 Pro

Specifications

Type:	Moving-coil
Output voltage:	0.2mV NAB (1kHz, 5cm sec, 45°)
Frequency response:	10-50,000Hz
Channel separation:	More than 30dB (1kHz)
Channel balance:	Less than 1dB (1kHz)
DC resistance:	40Ω
Impedance:	40Ω (1kHz)
Load impedance:	More than 40Ω
Compliance:	15x10⁻⁶cm dyne
Tracking force:	1.5-2.5g (recommended value 2.0g)
Type of stylus:	Elliptical (0.3x0.8 mil) Nude diamond
Weight:	22g (including the shell)
Installation dimensions:	EIA

Design and specifications subject to change without notice.

SONY®

AP 3558

BONE FONE

SPECIAL OFFER — EXCLUSIVE TO READERS OF ETI

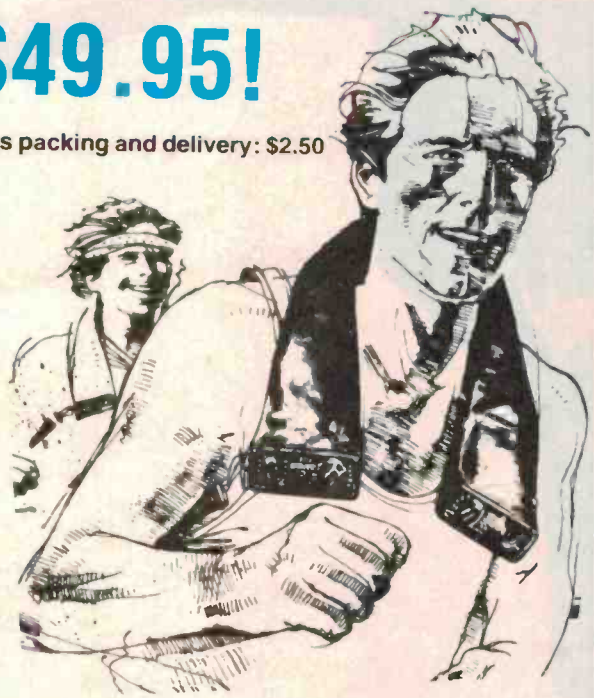
CONVOY INTERNATIONAL PTY LTD were recently appointed sole Australian distributors for the **BONE FONE** — an AM/FM stereo receiver that you wear like a scarf — and they have agreed to make a number available at a special price to ETI readers to promote the unit as it has only just been released here.

Recommended retail price: normally $79.95

SPECIAL OFFER PRICE:

$49.95!

plus packing and delivery: $2.50



The **BONE FONE** is an AM/FM stereo receiver constructed so that you can wear it like a scarf. The integral speakers provide stereo sound that the manufacturer claims is heard, or rather experienced, through your body by 'bone conduction'. The **BONE FONE**, unlike headphones or earpieces, does not block out external sounds. If you're active in any sport — jogging, ski-ing, cycling, horse riding, skating, etc — the unit can be secured by straps that permit free body movement. You can wear the **BONE FONE** whilst working, gardening or mowing the lawn — or just relaxing. The **BONE FONE** is powered by four penlight batteries. The sleeves may be changed (various colours available); a blue lycra spandex sleeve is supplied with these units.

The unit is warranted by Convoy International for 90 days after purchase and is supplied with a bone-shaped storage bag, straps, warranty card and instruction booklet.

OFFER CLOSES 30 SEPTEMBER

NOTE: This offer is made by Convoy International Pty Ltd and ETI is acting as a clearing house for orders only. Cheques or money orders should be made out to Bone Fone Offer and sent to:

ETI/Convoy Bone Fone offer
ETI Magazine
15 Boundary St
Rushcutters Bay NSW 2011

We will then process the order and pass it on to Convoy, who will send you the goods. Please allow up to four weeks for delivery. Offer expires 30 September.

Please supply ..... Bone Fone(s)
I enclose $ ..... plus $2.50 each post and handling.
TOTAL $ .....
Name .....
Address .....
..... Postcode .....
Cheque or Money Order No: .....
Signature .....
(Please allow up to four weeks for delivery).

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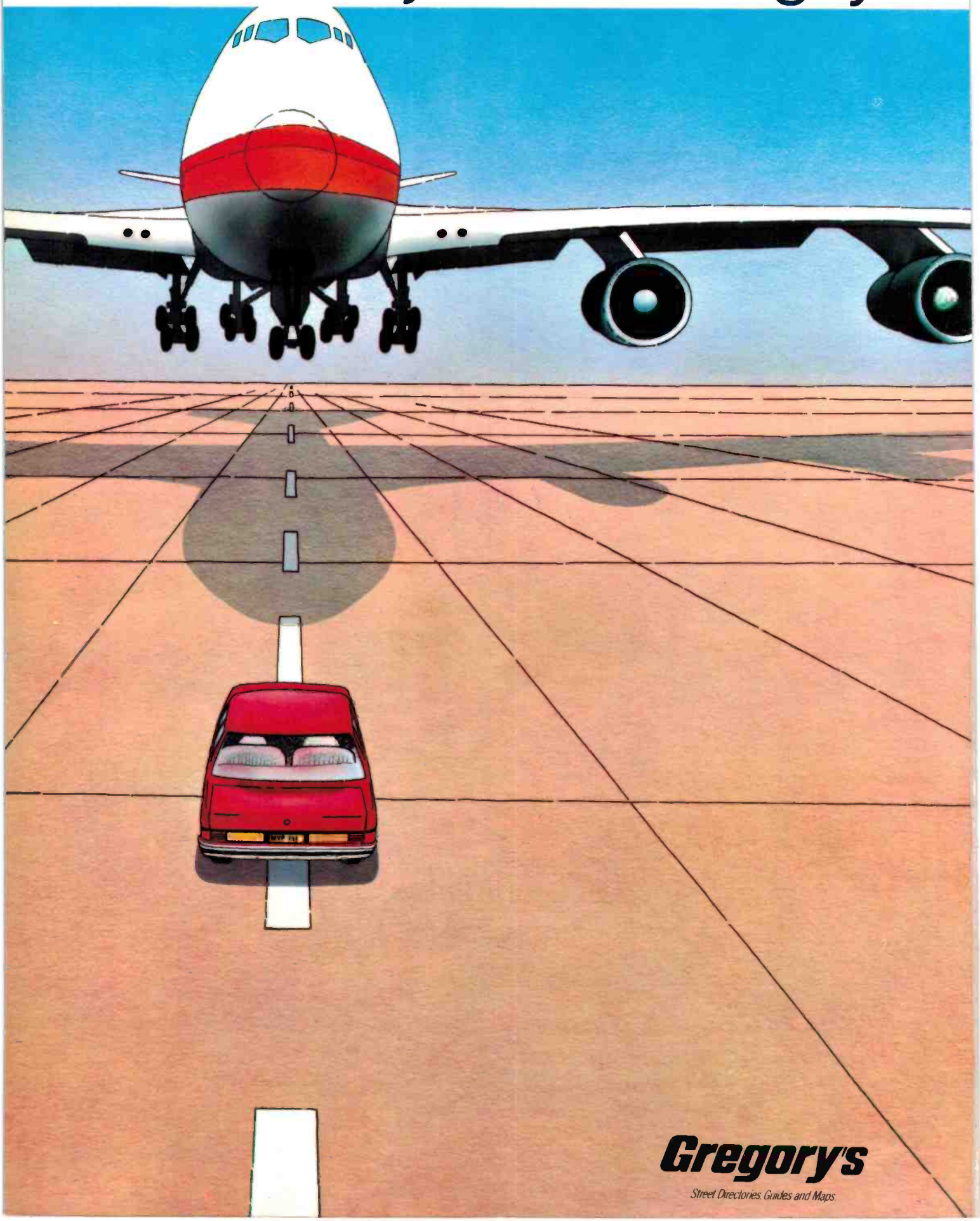


Gregory's

Street Directories, Guides and Maps.

SIGHT & SOUND news

Portable video system from Sanyo

Sanyo Australia has added a portable Beta format video recorder system to its range of video equipment.

The system consists of a VTC 3000P portable recorder, a VRF 300P tuner/timer unit, an ac adaptor, a VBT 300 rechargeable battery pack, and a VCC 350P colour video/sound camera.

The VTC 3000P recorder has audio dubbing facility and a timer standby function. The recommended camera is equipped with an optical viewfinder and a zoom lens with rangefinder, but the Sanyo VCC 545P colour video/sound camera is also available as an alternative with electronic viewfinder for monitor playback.

When used as a home video system, the tuner/timer unit offers automatic recording over a one-week period — five programmes on any channel. The VRF 300P tuner has UHF/VHF 12-channel selection with soft touch controls.

Recommended retail prices are: VTC 3000P portable recorder — $1599 including carry case; VRF 300P tuner/timer — $599; VAR 300 ac adaptor — $159; VCC 350P colour camera — $999; VBT 300 rechargeable battery pack — $59.

For further information contact Sanyo Australia Pty Ltd, 225 Miller St, North Sydney NSW 2060. (02) 436-1122.

Hitachi's Triple Cube

Hitachi have recently introduced what they claim to be the ultimate in hi-fi housing versatility, their 'Triple Cube' system.

This equipment consists of three cubical units which may be stacked in a variety of configurations as best suits your available space and taste.

The units may be stacked on top of each other, as in the photo; the record storage cabinet can be placed quite separately from the other two units; or the three units may be placed alongside each other and fastened to a wall at a convenient height for operation. The loudspeakers could then be placed on the floor at each end of this horizontal configuration. Each unit of the series is also available separately, plus matching loudspeakers.

The cabinet modules are finished in simulated black ash, and the main cabinet will house any amplifier, tuner or cassette deck from the Hitachi slimline range, including the new FT 10RM tuner and the HT 10RM turntable.

An RM 1000 remote control unit is also available, which enables the hand-held RB 1000 transmitter unit with its 28 push keys to control the turntable, amplifier, tuner and cassette deck — all from the comfort of your armchair!

Each cubical unit is approximately 475 mm wide, 375 mm high and 400 mm deep, while each of the loudspeakers is 254 mm wide, 470 mm high and 264 mm deep. There is considerable space for both disc and cassette storage.

Toshiba releases 'Mini-Component'

Toshiba's SK-02 L-Component, designated 'little brother' to their SK-01 unit, combines an amplifier, AM/FM tuner and cassette deck in one stylish package measuring only 350 x 308 x 160 mm.

The SK-02 can be mounted directly on to a wall, or placed on a shelf, in a cabinet, on another piece of furniture — the 'L' in the designation is said to represent 'layout freedom'.

The SK-02 has sleek modern lines, carefully spaced controls, and a brushed aluminium finish, and features metal tape compatibility, a 'Music Track Skipping Selector' (MTSS), and a Dolby noise reduction system.

Any Toshiba dealer can provide more information on the SK-02 L Mini-Component.

Telex your tape recorder?

Telex Communications Inc. are now marketing what they call a new 'tape transport' — that is, a motor unit for tapes that is compatible with the Telex RP85 record/play preamp.

The 3000 series transport is a three-motor unit which accepts reels up to 10½" (267 mm), and is available for 3.75 and 7.5 ips or 7.5 and 15 ips in 120 V/60 Hz or 240 V/50 Hz versions. One, two and four-channel systems are available.

Amongst many other features, the 3000 has a variety of interchangeable head configurations from half track/single channel to quarter track/four channel. These are easily mounted on a heavy-gauge assembly plate which will accommodate up to four heads.

Suggested user price for the 3000 series tape transport begins (!) at US$1950, and further information may be obtained from Ron Taylor, Telex Communications Inc, 9600 Aldrich Avenue South, Minneapolis MN 55420, USA.

sight & sound news

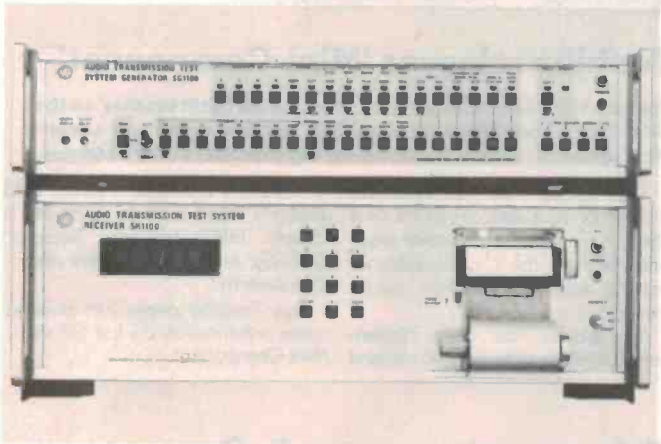
Test engineers to go automatic?

The North Ryde division of AWA, of which Mr. Barry J. Leather was recently appointed Instrumentation Department Manager, has designed and developed a new automatic audio transmission test system, claimed to set new standards for automatic monitoring and testing of mono or stereo sound transmission chains and associated equipment.

The S1100 is said to measure up to 43 significant transmission parameters and report in approximately 3.5 seconds on sound and television broadcasting chains, telecommunications systems, bearer links and tape recorders, and can also be used during equipment production. This kind of testing is at present carried out manually by an engineer, but this automatic equipment is claimed to take over many of the duties of such an engineer.

Parameters tested include receive absolute level, frequency response, total harmonic distortion, intermodulation distortion, RMS noise, stereo crosstalk and phase, peak level, wow and flutter, and quasi-peak noise weighted and unweighted.

For more information contact Brian M. Carey, Commercial Public Relations, 157 Walker St, North Sydney NSW 2060. (02)929-4911.



Two Sanyo 'bookshelf' hi-fi systems

Sanyo's new System 8 and System 10 hi-fi systems are both compact and slimline and incorporate an amplifier, tape deck, tuner and matching speakers.

The System 10 amp is 22 W RMS per channel with loudness contour control, volume, bass and treble controls. The AM/FM tuner has a five-LED signal strength meter, FM/Auto muting, fly-wheel tuning and a LED FM stereo indicator. The tape deck has bias and equalisation settings for all tape types, LED level meters, line/mic input selector and dual rotary input controls. The speaker system is a high-performance two-way type incorporating a 10 cm free-edge woofer and a cone tweeter. Rrp is $886.

The System 8 output is also 22 V RMS per channel, and the amp has a subsonic filter, loudness control and LED function indicators. The AM/FM tuner has a five-point LED signal strength indicator, LED tuning indicator and a large tuning scale. The tape deck is equipped with Dolby, metal tape facility and LED record level meters fitted with separate left/right level controls. The speakers are similar to those in the System 10. Rrp is $775.

For further information contact Mr. R. Hopwood, Sanyo Australia Pty Ltd, 225 Miller St, North Sydney NSW 2060. (02)436-1122.

The Mordaunt-Short Carnival Series 2 200 mm two-way system sells for a mere $398!

Mordaunt-Short speakers from Concept Audio

As a result of a recent agreement with Mordaunt-Short Ltd of the UK, Concept Audio will shortly be marketing Mordaunt-Short loudspeakers throughout Australia.

Sales of Mordaunt-Short speakers in the UK, their country of origin, are claimed to have reached unprecedented levels, and business in the USA has become so brisk that Mordaunt-Short have also established their own corporation there.

Concept claims that Mordaunt-Short speakers will be the most competitively priced fully imported speakers on the Australian market, citing the Carnival Series 2, an 8" two-way, finished in genuine walnut, as an example at $398. The Pageant and Festival Series 2s and the newly released Signifers will complete the Mordaunt-Short range and will also be competitively priced.

Full reprints of world-wide reviews of Mordaunt-Short speakers are available on request, plus a fully descriptive catalogue, from Concept Audio Pty Ltd, 22 Wattle Rd, Brookvale NSW 2100. (02) 938-3700.

New 'state of the art' Telex wireless microphone system

Telex Communications Inc. has introduced a VHF wireless microphone system utilizing new diversity reception circuitry.

The Telex FMR-1 operates as a conventional FM wireless microphone receiver when only one antenna is installed, and automatically operates as a dual diversity receiver when two antennas are used.

The combined signal of the two antennas is automatically phase shifted by the receiver for the best signal-to-noise ratio. The system is so effective against switching noise and the common problem of 'drop-out' or 'picket fencing' that Telex has applied for a patent on the unique diversity circuitry.

A belt-pack transmitter, WT-100, is battery powered; roughly the size of a package of cigarettes, this transmitter is easily concealed under clothing. A standard LEMO connector accepts the extremely small Telex WLM-100 electret lavalier microphone. A four foot (1.22 m) adaptor cable is provided with each belt-pack transmitter for instant adaptation of any low impedance microphone with a male XLR-type connector.

The Telex WHM-300 Handheld Transmitter/Microphone is lightweight and extremely slim, and there are no unsightly antenna protrusions or trailing wires. Both a ball screen and slotted head screen are supplied with each unit to instantly change the appearance when desired.

The Telex wireless microphone system operates in the 150-174 MHz range and is crystal-controlled single frequency. A full line of accessories is available, including a log periodic antenna with high, unidirectional gain useful in large stadiums and auditoriums.

For further information contact Ron Taylor, Telex Communications Inc, 9600 Aldrich Avenue South, Minneapolis MN 55420, USA.

20000Km RANGE!

Radio Australia or European stations: it's all the same to these brilliant receivers!

The ever popular FRG7
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The most widely used communications receiver IN THE WORLD! Yaesu's famous FRG-7 covers all MF & HF bands (from 500kHz through to 30MHz) with outstanding sensitivity and selectivity. It uses the famous 'Wadley Loop' principle for superb stability. And now you can really save with the FRG-7! Our huge bulk buying has enabled us to slash the price! But hurry: this special price can only last for the current shipment.

SAVE $76

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The brilliant new FRG 7700 SW

If you want the most up-to-date shortwave communications receiver in the world, you want the Yaesu FRG-7700SW. Complete short wave band coverage, with ease of operation the others only dream about.

- Digital frequency display (also shows the time!)
- One dial pre-selector
- Timer for recording, etc.
- Optional memory unit for instant popular frequency recall (up to 12 channels)
- Can be operated from 12 volts DC (240V AC normal)

If you're serious about short wave monitoring, you can't go past this superb piece of solid state craftsmanship.

YAESU

$495 Cat No D 2841

Optional memory unit: Store & instantly recall up to 12 channels.
Cat. D-2842 ..... $ 145.00

Optional Antenna Coupler/Attenuator: Get the most from your receiver.
Cat. D-2843 ..... $69.50

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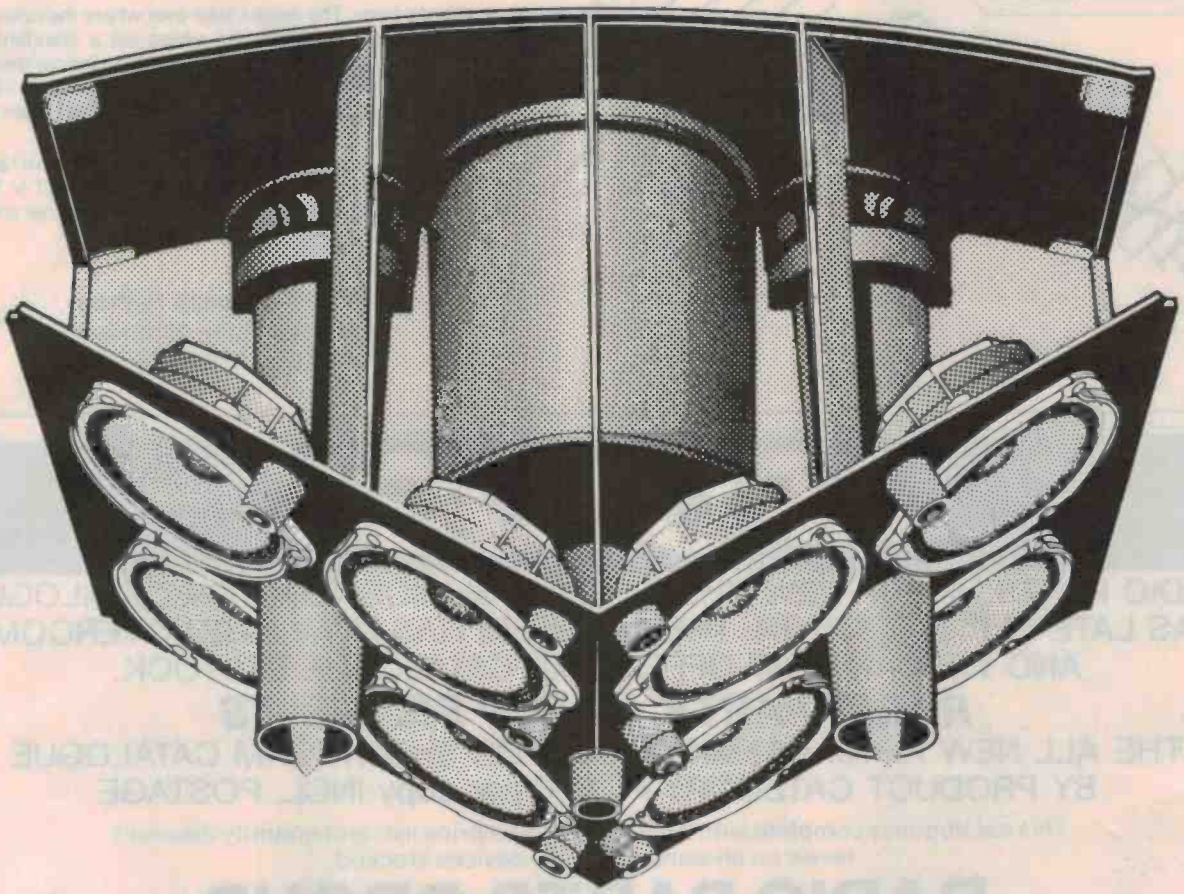
Introducing the Bose® 901® Series IV Direct/Reflecting® speaker.



No more power limit. Period.

The new Bose 901® Series IV loudspeaker has a new, all-aluminum helical-wound voice coil that virtually eliminates the heat build-up problems normally associated with driver failure. So Bose has removed all power limitations for home use. Yet you can still drive the speakers with as little as ten watts per channel.

Also, there are new equalizer controls that let you compensate for variations in room acoustics and speaker placements. The Bose 901® IV speakers give you life-like, spacious sound unmatched by any other speaker.

BOSE®

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111689-9/78-3

700ZXL

Peak Performance Redefined

A Triumph of Beauty and Technology

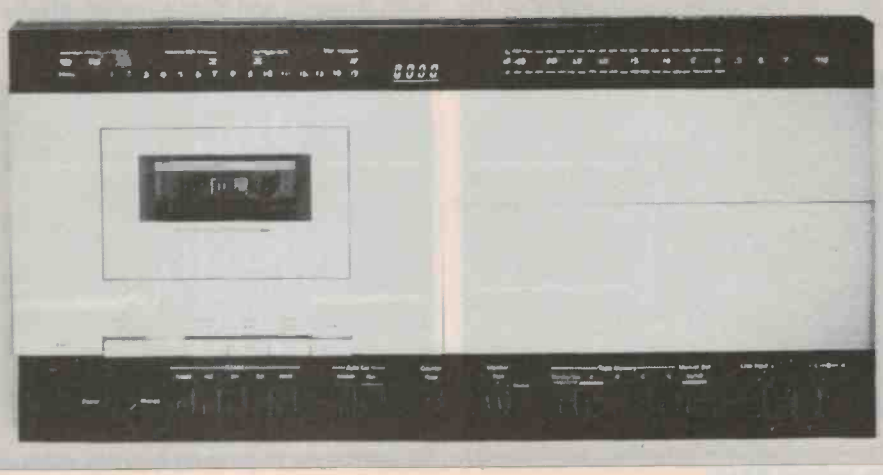
To carry the Nakamichi logo, a recorder must have special qualities. The 700 ZXL Computing Cassette deck is such a deck.

A marriage of classic beauty and technology is the essence of the 700 ZXL. Designed for the devotee of art as well as of music, the 700 ZXL will surprise you in its simplicity. All critical functions are carried out for you by computers.

For example, the time honoured art of user adjustment of a recorder to match each type of tape required test equipment and access to the right internal controls taking time and experience. But not with the 700 ZXL — its inbuilt A.B.L.E. auto calibration processor perfectly adjusts all four major recording parameters — azimuth, bias, level and equalisation for the tape you are using to achieve a 24 kHz response — and all with the touch of a button!

And with the 700 ZXL's new subsonic encoding technique, true error-free random access to any program on tape is now a reality.

And with Nakamichi's Diffused-Resonance transport, discrete 3 head technology, electronic tape counter, 50 dB range digital level meters and an optional remote control for all transport and RAMM functions, the 700 ZXL is truly a triumph of beauty and technology.



For complete information on Nakamichi's 700 ZXL Computing Cassette Deck, see your nearest dealer or write to Convoy International Pty Ltd, 4 Dowling Street, Woolloomooloo 2011.

Nakamichi

Technics SB-10 speakers

Louis Challis gives the SB-10s the accolade of being "the finest Japanese loudspeakers I have yet heard". What more needs to be said?

Louis A. Challis

EVERY MANUFACTURER of loudspeakers will tell you that they are the weakest link in the reproduction chain of a hi-fidelity system. Most manufacturers, when releasing their latest or greatest loudspeaker, will claim that *this* product finally overcomes the deficiencies plaguing previous models.

On this rare occasion the manufacturer does not speak with a forked tongue; there is definite substance both in the claims made for the Technics SB-10 speakers, and more particularly in the subjective and objective results achieved.

In January of this year we discussed in ETI the extent to which the Japanese speaker manufacturers have been carrying out research work along parallel lines to English loudspeaker manufacturers. Matsushita Electric have undoubtedly been at the forefront of the Japanese manufacturers in developing their laser/holography and finite element method of loudspeaker enclosure analysis to determine the modal characteristics, not only of the cabinets but more significantly of the all-important loudspeakers themselves.

The approach

Technics' approach to this problem has been a little different from that of either K.E.F. or B & W in the United Kingdom, or for that matter from other Japanese manufacturers, the majority of whom have tended to stay with the conventional concept of a loudspeaker.

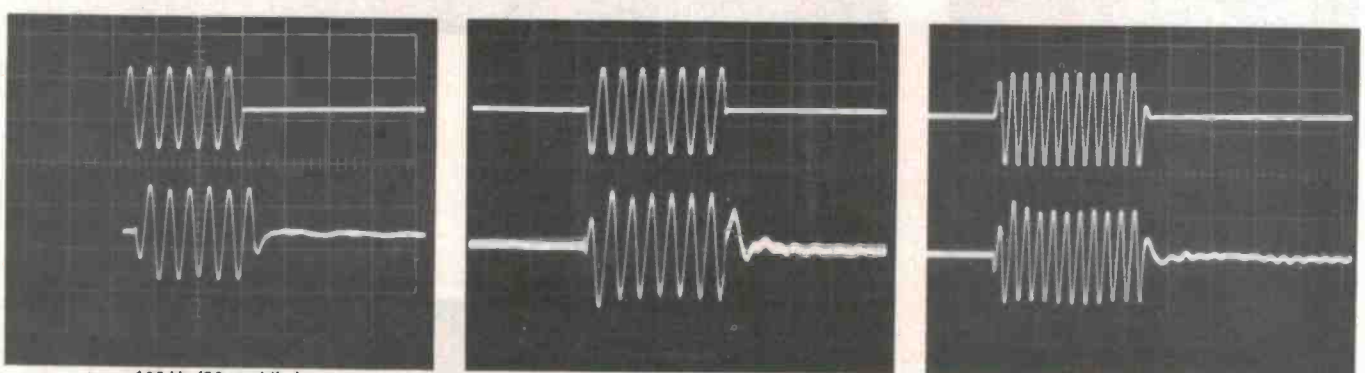
Technics' engineers decided that in order to achieve a true piston-like motion for a loudspeaker, the basic design philosophy used in the past of having a paper cone, a conventional voice coil and a conventional small magnet assembly would have to be discarded.

The conical shape of the conventional loudspeaker has never really been a virtue and had always resulted in speakers whose cones could be readily induced into resonance at one or more frequencies. These resonances cause poor linearity and destroy high-fidelity performance. Technics' aproach to this problem was to change from the basic concept of a cone to a flat diaphragm with strength and rigidity substantially better than in any loudspeaker previously constructed. They discarded such principles as aluminium or polypropylene stiffened fibre cones in preference to a material developed by the aircraft industry in the form of an aluminium honeycomb structure.

By using an axially symmetrical structure of honeycomb formed into a spirally wound disc with flat stiffening plates above and below, they were able to achieve a stiffness which is almost one hundred times that of comparable paper cone diaphragms. The primary fundamental resonance frequencies were then transposed up to the kilohertz region for the woofer.

The drivers

Obviously this approach could still create problems if the voice coil were considerably smaller than the diameter of the speaker diaphragm. To overcome this problem Technics developed a speaker voice coil with a diameter of 160 mm, which provided balanced drive to the face of the honeycomb speaker disc. A typical cross-section of the low frequency driver is shown on page 125 (for the 32 cm honeycomb disc woofer)



100 Hz (20 ms/div.) 1 kHz (2 ms/div.) 6.3 kHz (0.5 ms/div.)

Tone burst response of Technics SB-10, Serial No. BA0J20B008 (for 90 dB steady-state SPL at 2 m on axis). Upper trace is electrical input; lower trace is loudspeaker output.

and this shows how the resonance problems were minimised and the total voice coil power dissipation rating increased as a result. The 80 mm mid-range driver is built on the same principles but the voice coil here is a more conventional 50.5 mm in diameter. The mid-frequency driver covers the frequency range 450 Hz to 5 kHz, and the top end of the response is provided by a leaf tweeter whose frequency response extends to beyond 100 kHz.

The top end of the frequency response must have caused Technics' engineers a great deal of concern and possibly even anguish. They had to produce a 'state of the art' solution that was efficient, provided a flat frequency response, low distortion and good dispersion.

The leaf tweeter that resulted is unusual, for Technics have developed a tweeter which provides a remarkably flat on-axis response. The frequency response extends to beyond 20 kHz — the upper frequency with which we are normally concerned — and Technics claim that it works all the way to 120 kHz, which is way up above the range of human hearing. This tweeter makes use of a patterned polyimide film diaphragm with a heat-resistant aluminium voice coil to achieve a device with the characteristics of a ribbon tweeter but the impedance of a more conventional loudspeaker. As no transformer is required to match the tweeter to the rest of the system, phase and transient limitations are positively minimised.

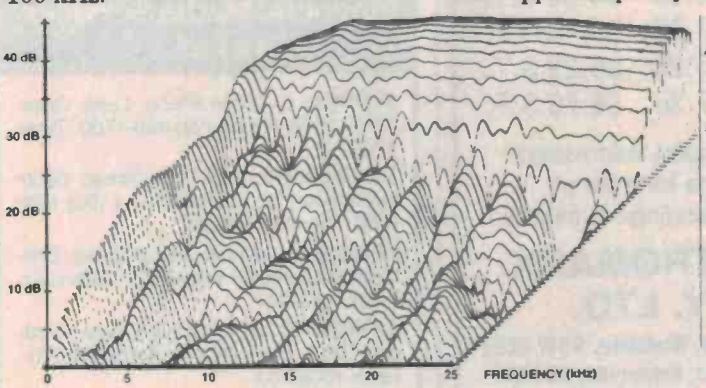
The loudspeakers

The SB-10 is an attractive loudspeaker system, featuring a black-lacquered, veneered cabinet with the same finish on all six faces. The front grille features an open-weave black cloth over a frame which latches into four sensible recessed catches on the front face. Behind this grille a tweeter and a separate mid-range frequency contour control are located, which provide up to a nominal 20 dB of mid-range and high frequency attenuation in reference to the flat response setting.

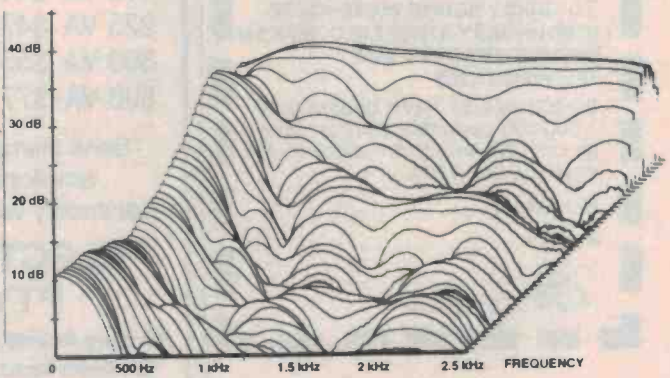
In addition to these two front-panel controls the designers have incorporated three separate self-powered protection circuits for the woofer, mid-range and tweeters, so that in the event of excessive voltage drive the speakers are protected from an untimely demise.

The back of the cabinet features a simple pair of screw terminals in a recessed plastic moulding, which regrettably do not accept the conventional banana plugs I believe most users would prefer.

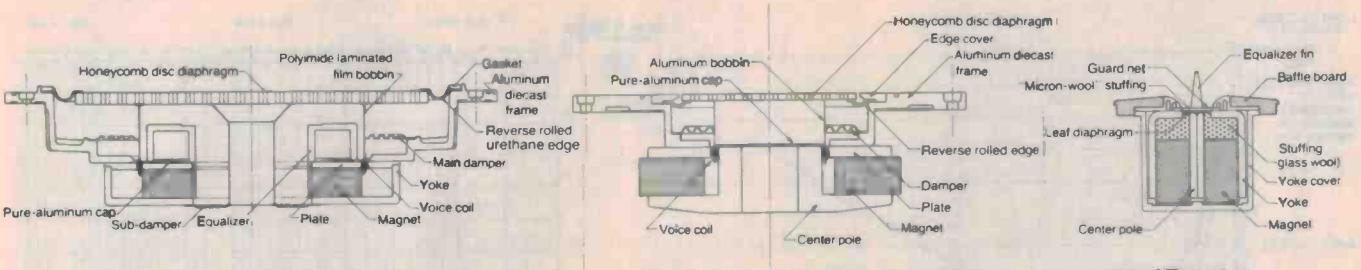
The speakers themselves have a particularly high standard of finish, incorporating not only the aluminium-faced honeycomb structure of the disc ▶



Spectral decay plot to 25 kHz.



Spectral decay plot to 2.5 kHz, covering the bass and mid-range regions.



32 cm Honeycomb Disc Woofer | **8 cm Honeycomb Disc Midrange** | **Leaf Tweeter**

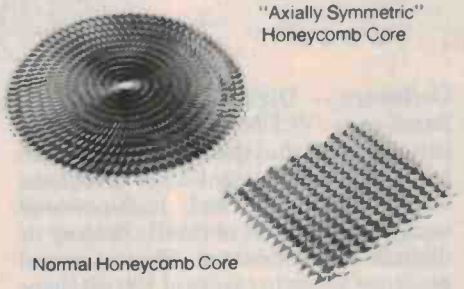
but also the frames round the speaker basket. This finish is so good that many users may wish to discard the grille in order to impress their friends with the speakers!

On test

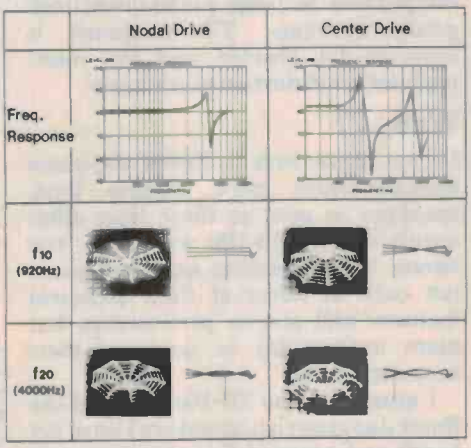
The objective testing proved exciting, as the SB-10s exhibit a remarkably flat frequency response which extends from below 35 Hz to beyond 20 kHz. The on-axis tweeter response in particular is remarkably smooth, whilst at 30° to the main axis it is still only 6 dB down at 20 kHz. The off-axis response does exhibit some interaction between the tweeter and mid-range unit, but the ripples that result come from the interaction of the two halves of the driver's phase responses as one moves to one side or the other.

The phase response of the SB-10 is remarkably smooth and shows how well the honeycomb disc speakers overcome the phase problems and the normal cavity effect created by the conventional cone loudspeaker.

The speaker's fundamental resonance occurs at 43 Hz, with a fairly significant rise in impedance, approaching 30 ohms. This value drops down to a stable 6-7 ohms in the 100 Hz region and then fluctuates between 16 ohms and 8 ohms across the rest of the range. Whilst the mid-range and tweeter contour controls do enable one to change the characteristics of the loudspeaker, it is questionable whether anybody would really want to make use of the controls because of the resulting non-linearity.



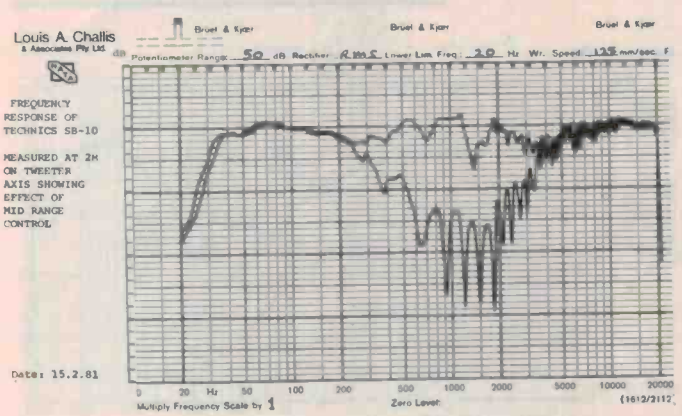
The 'axially symmetric' honeycomb core of the driver diaphragms compared to normal 'linear' honeycomb structure. The honeycomb core is sandwiched between thin aluminium sheets.

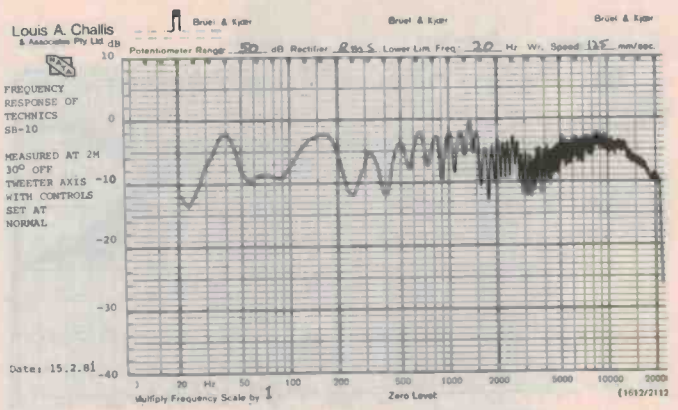


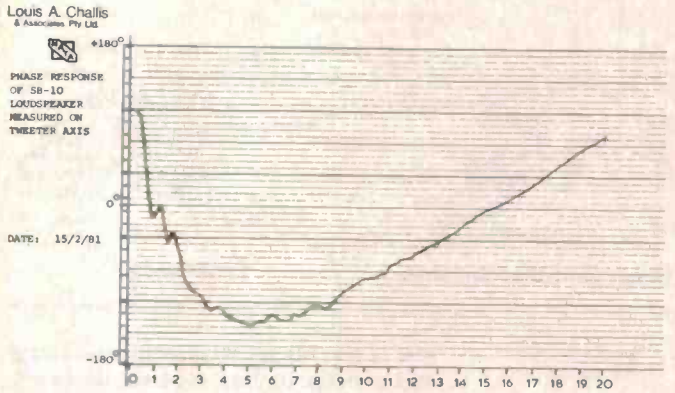
Illustrating how the range of 'pistonic motion', and thus frequency response, is increased by nodal drive.

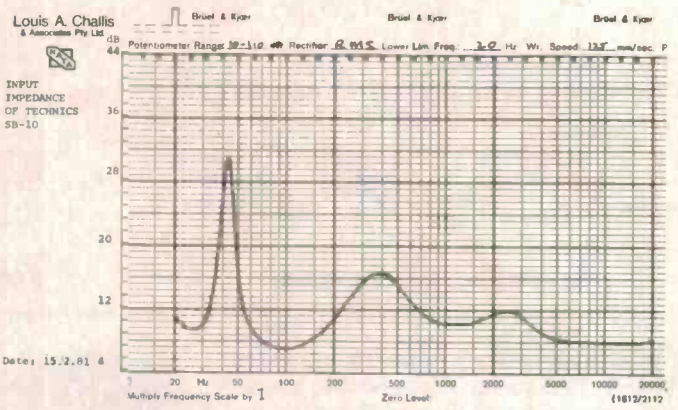
The decay response spectrum of the SB-10 is remarkably smooth and exemplary. Whilst there are some observable ripples 20 or more decibels down compared with the fundamental, these come from the speaker basket and the residual cabinet resonances. This speaker comes close to matching the performance of the B & W 801 that we reviewed in the January issue — and that performance was a particularly hard act to follow.

It is clear from the decay response spectrum that Technics have achieved just about everything they claim in terms of minimisation of speaker and cabinet resonances. The responses in the range 0-2.5 kHz and 0-25 kHz are as flat and as smooth as one could reasonably desire. Even the conventional tone-burst responses proved to be particularly good, and more importantly the total harmonic distortion measured over the range 100 Hz-10 kHz is amongst the lowest we have yet measured from any speaker at the 90 dB output at 2 m. ▶









The subjective testing of the loudspeakers has to be related to the objective testing, and I kept the SB-10s at home for a number of weeks carrying out many direct comparison tests on an A-B basis with the standard monitors, with speakers I have not used for many years, and with a series of other speakers including a pair of B & W 801s and a pair of Quad Electrostatics to provide reference standards for comparison.

The first, immediately obvious attribute is the magnificent stereo imaging the SB-10s provide. These speakers match the B & W 801s in this area and surprisingly come very close to matching the B & W 801s in most of the other prime areas, including frequency response, power handling capability, efficiency and overall linearity. Whilst there are subtle differences between the SB-10s and the B & W 801s they do, nonetheless, have many features in common, and it is a credit to both systems how well they perform.

In playing a wide range of high quality records, including two new ones — "Yehudi Menuhin and Stephan Grappelli — Strictly for the Birds" on Angel Records DS-37710 and "Morton Gould and the London Symphony Orchestra — Digital Space" on Verese Sarabande VCDM 1000.20 — it became evident that the SB-10s are able to handle without significant problems subtle transients and high-powered signals that would normally destroy or disturb other speakers. Thus at sound pressure levels in excess of 100 dB there is absolutely no trace of distortion, no audible colouration, and they are able to handle the signals in a manner that is comparable to large professional rock group speakers. The response is however far cleaner and the intermodulation distortion much lower.

Well ... ?

If you have ever believed Japanese manufacturers can't produce loudspeakers as good as those from other countries, the SB-10s will prove you wrong. These speakers are avant garde not only in terms of their technical features and proven performance but more importantly in terms of their acoustic fidelity.

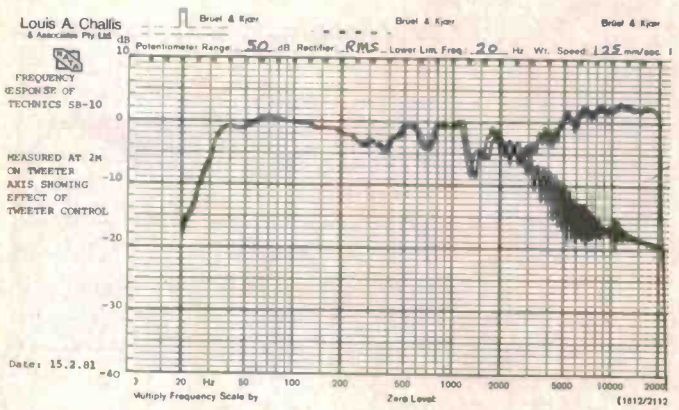
I must rate the SB-10s as being the finest Japanese loudspeakers I have yet heard and acknowledge that they provide a performance only surpassed by speakers selling at more than twice the price. ●

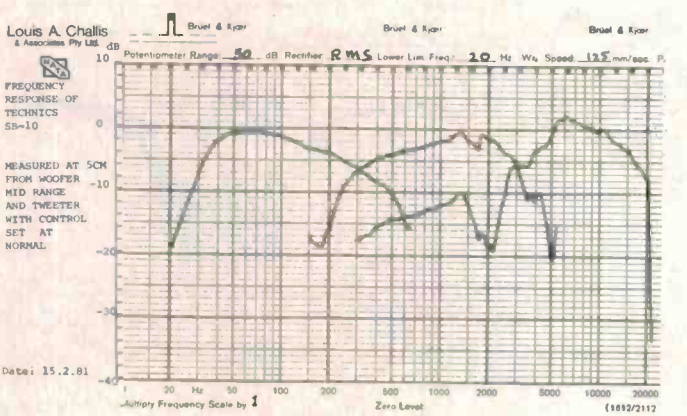
MEASURED PERFORMANCE OF TECHNICS SB-10
SERIAL NO. BAOJ208008

FREQUENCY RESPONSE:			32Hz - 20Khz
CROSSOVER FREQUENCIES:			300Hz - 3kHz
SENSITIVITY: (for 90dB average at 2m)			9VRMS = 10.1 Watts (nominal into 8Ω)
HARMONIC DISTORTION: (for 90dB) at 2m)	100Hz	1kHz	6.3kHz (@ 87dB)
2nd	-45.3	-53.1	-48.4
3rd	64.8	-49.9	-48.5
4th	-	-	-
5th	-	-65.2	-
T.H.D.	0.5%	0.39%	0.53%
INPUT IMPEDANCE:		100Hz	7.2Ω
		1kHz	10.4Ω
		6.3kHz	8.0Ω
Minimum at 100Hz			7.2Ω

TECHNICS SB-10 SPEAKERS

Dimensions:	*711 mm high x 402 mm wide x 318 mm deep*
Weight:	*32 kg*
Manufactured in:	*Japan by Matsushita Electric Limited*
Price:	*$1598 pair*
Distributed by:	*National Panasonic, P.O. Box 319, North Ryde NSW 2113.*





What's new in cassette decks at Sansui?

For starters, you won't find any belts, cams or gears in the capstan drive system of the new D-550M cassette deck. They've all been eliminated in the name of speed precision and transport reliability.

This simplified transport utilizes a newly-developed direct-drive motor for capstan drive. A built-in FG (Frequency Generator) Servo system regulates it with unerring electronic accuracy while a completely independent second motor drives the reels. It's no wonder the wow and flutter specification of the D-550M is one of the lowest in its price range —less than 0.035% (WRMS).

Another new feature is the Dyna-Scrape Filter (pat. pend.) that reduces undesirable modulation noise caused by tape vibration at the heads.

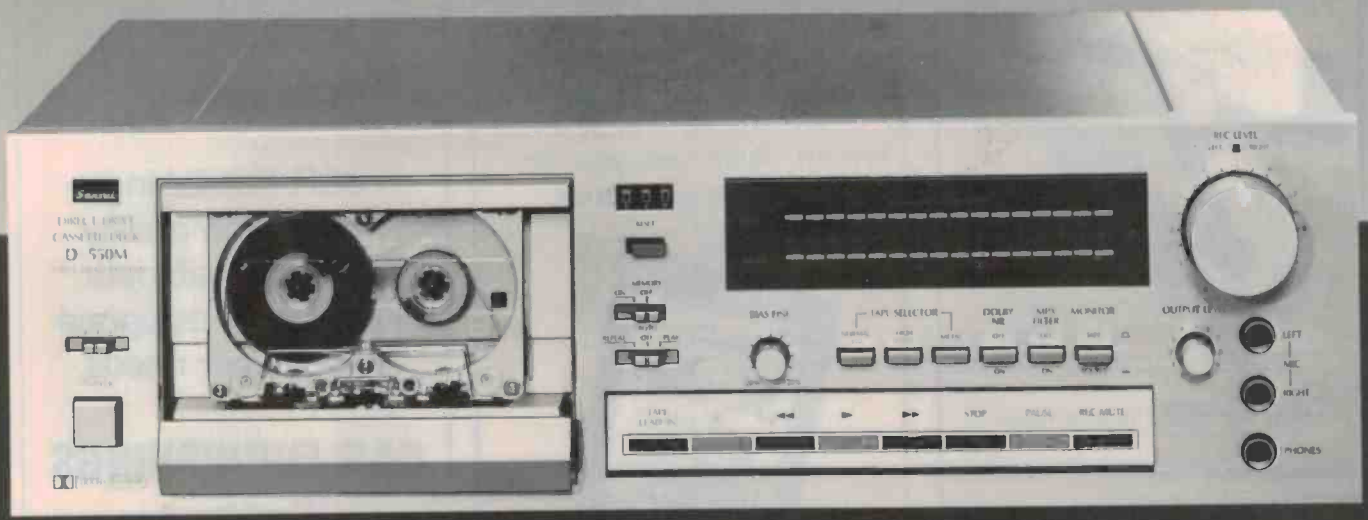
The three-head D-550M uses a combination Rec/Play head for no-compromise performance. Each head has its own amp (complete with a Dolby* noise reduction circuit) to enable you to monitor recordings as they are being made, Dolby-encoded if you wish.

Sansui gives you other features, some new, some great: backlit light-touch, logic-controlled transport buttons, selectable automatic modes, bias fine adjustment and LED peak level meters with peak hold, much more.

So whether you opt for the 3-head D-550M or the almost as capable 2-head D-350M, you're getting the newest and best in advanced Sansui technology, convenience and sound quality. And that's what counts.

(Black finished versions also available.)

*Dolby is a trademark of Dolby Laboratories.



D-550M

Sansui

SANSUI ELECTRIC CO., LTD. 14-1 Izumi 2-chome, Suginami-ku, Tokyo 168 Japan
VANFI (AUST.) PTY. LTD. 297 City Road, South Melbourne, Victoria 3205, Australia Tel: 690-6200
283 Alfred Street, North Sydney, N.S.W. 2060, Australia Tel: 929-0293

Boost the output of your portable radio-cassette

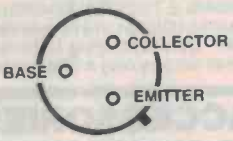
THIS AMPLIFIER was primarily designed for use as a booster to enable output powers of around 4 to 5 watts RMS to be obtained from a radio/cassette unit. Using a portable radio or cassette unit as a signal source will not provide hi-fi results, but using this set-up in conjunction with a speaker of reasonable quality and efficiency gives quite good results at low cost.

Of course, the amplifier is also suitable for other applications. It has an input sensitivity of approximately 350 mV rms into 10k for maximum output, and an output intended to feed an 8 ohm load.

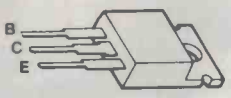
The circuit uses a well-known configuration which has common emitter input stage (Q1) direct coupled to a common emitter drive stage (Q2), which is in turn direct coupled to the complementary emitter follower output stage (Q3-Q4). R7 provides virtually 100% negative feedback at dc, giving the circuit approximately unity voltage gain at dc. R1, R2 and R4 form a potential divider which biases the input of the amplifier to about half the supply potential. The output is also biased to about this level due to the dc unity gain. This bias level gives the optimum unclipped output voltage swing. R1 and C2 filter out any hum or noise which might otherwise be coupled from the supply lines to the input via the bias circuit. R6 and C5 are used to decouple some of the feedback at audio frequencies, and thus give the unit a useful voltage gain at these frequencies.

D1 is used to give a small standing bias to the output transistors, and together with the fairly substantial amount of negative feedback used, reduces crossover distortion to an unnoticeable level. The emitter follower output stage gives the circuit a low output impedance so that the low impedance load can be efficiently driven with the high output currents involved here. Q3 drives the speaker during positive-going output excursions while Q4 drives the speaker during the negative output excursions. C6 provides dc blocking at the output, and C3 provides the same function at the input. R1 and C4 aid the stability of the circuit. RV1 is a volume control, and in the amplifier's intended application, results will probably be best if the volume control on the cassette radio is set for a fairly high output (but not so high as to cause clipping), and the volume is adjusted using RV1.

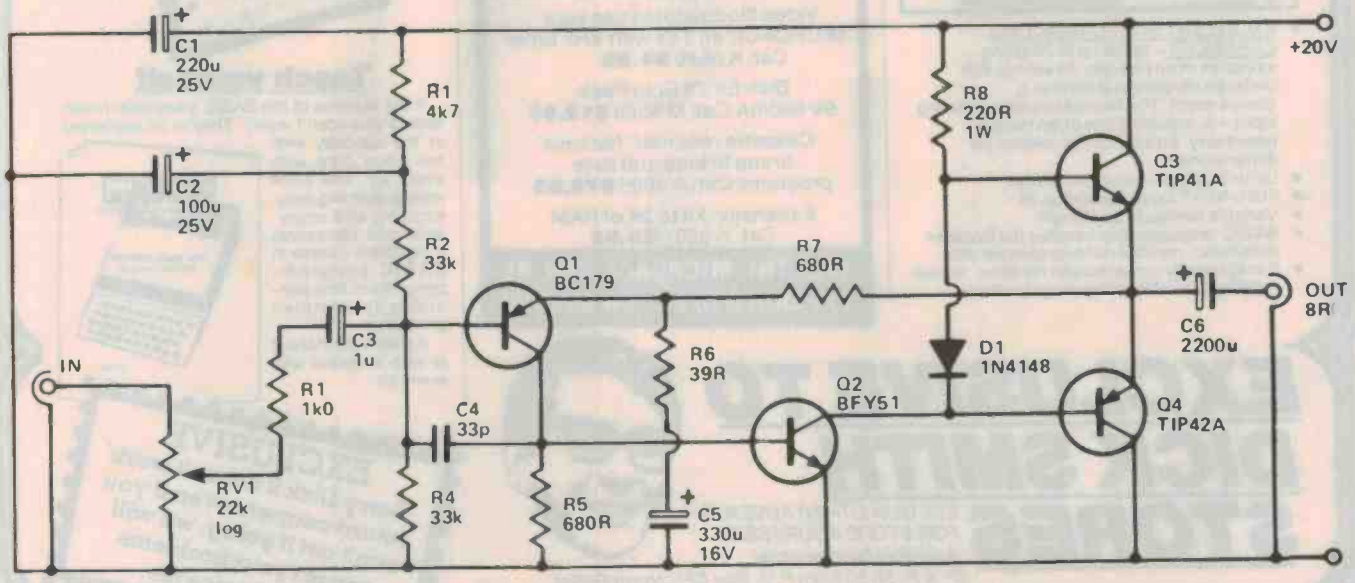
The circuit requires a stabilised supply of about 18 to 22 volts that is capable of providing up to 400 mA. Q2 should be fitted with a clip-on TO5-size heatsink. Q3 and Q4 are both fitted with commercially made, finned, bolt-on heatsinks. ●



BFY51, BC179



TIP41, TIP42



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***Software compatible with the very popular ZX80**
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Unique component parts

The MicroAce is not just another personal computer. Quite apart from its exceptionally low price, the MicroAce has two uniquely advanced components: the powerful BASIC interpreter, and the simple teach yourself BASIC manual.

The unique versatile BASIC interpreter offers remarkable programming advantages:

- UNIQUE 'ONE-TOUCH' KEY WORD ENTRY: the MicroAce 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. This prevents entry of long and complicated programs with faults only discovered when you try to run them.

- EXCELLENT STRING-HANDLING CAPABILITY—takes up to 26 string variables of any length. All strings can undergo all relational tests (e.g. comparison). The MicroAce also has string input—to request a line of text when necessary. Strings do not need to be dimensioned.
- Up to 26 single dimension arrays.
- FOR/NEXT loops nested up 26.
- Variable names of any length.
- BASIC language also handles full Boolean arithmetic, conditional expressions, etc.
- Exceptionally powerful edit facilities, allows modification of existing program lines.

Excellent value

For just $199.00 you get everything you need to build a personal computer at home . . . PCB, with IC sockets for all ICs; case; leads for direct connection to a cassette recorder and television (black and white or colour); everything!

Yet the MicroAce really is a complete, powerful, full-facility computer, matching or surpassing other personal computers at several times the price.

The MicroAce is programmed in BASIC, and you can use it to do quite literally anything, from playing chess to managing a business.

The MicroAce is pleasantly straightforward to assemble, using a fine-tipped soldering iron. It immediately proves what a good job you've done: connect it to your TV . . . plug in a mains adaptor . . . and you're ready to go.

Fewer chips, compact design

The MicroAce owes its remarkable low price to its remarkable design: the whole system is packed on to 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 MicroAce 1K byte RAM (EXPANDABLE TO 2K ON BOARD) is roughly equivalent to 4K bytes in a conventional computer—typically storing 100 lines of BASIC. (Key words occupy only a single byte.)

ACCESSORIES TO MAKE YOUR MICROACE EVEN MORE VERSATILE.

Video Modulator to use your MICROACE on TVs with VHF tuner
Cat: K 6040 **$4.95**

Dick Smith Plug Pack.
9V 600mA Cat: M 9560 **$12.95**

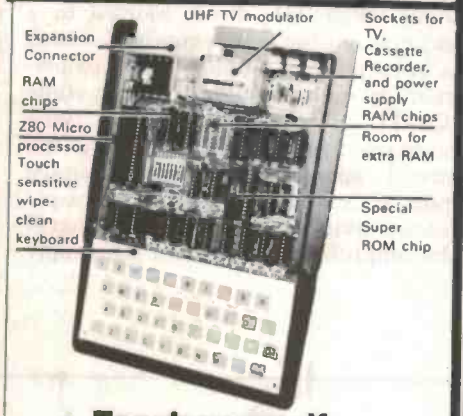
Cassette recorder 'National' brand to load and save programs Cat: A 4095 **$79.95**

Expansion kit to 2K of RAM
Cat: K 6501 **$9.95**

YES! THE MICROACE CAN BE EXPANDED TO 2K—ON BOARD!!

INCLUDES

- P.C. Board with IC Sockets for all ICs.
- All components supplied.
- New, wipe clean, touch sensitive keyboard.
- Stylish moulded case.
- Leads and Plugs. (For cassette and TV connection)
- Free BASIC programming book-course.
- Coaxial TV antenna connection switch.



Teach yourself

If the features of the BASIC interpreter mean little to you—don't worry. They're all explained in the specially written book *free* with every kit! The book makes learning easy, exciting and enjoyable, and represents a complete course in BASIC programming—from first principles to complex programs.

A hardware manual is also included with every kit.

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The Series 4000/1 4-way loudspeakers — a personal revamp

Our reader had constructed a pair of ETI-439 3-way loudspeakers (Dec. '75), adding concrete damping and extra bracing, and was very pleased with them. He couldn't resist applying his 'treatment' to David Tilbrook's Series 4000 4-ways — with surprising, and pleasing, results! He reveals here details of 'the treatment'.

Garth Pennington

11 Moldavia Wlk, Osbourne S.A. 5017

WHY SHOULD I go to the expense and effort of building another set of speakers when my old concrete-braced 439s gave me very clean and dynamic sound? The answer is simple — I am bitten by the most addictive and subjective bug in our society — hi-fi. When a new system is offered, one can't help but wonder if the technical changes reveal any obvious sonic improvement.

I am not one who enjoys working long hours in the shed. The only consolation was the promise of better speakers. It took much patience to go carefully through the steps I had planned for their construction, without any short cuts.

The objects

The objects of the variations detailed here were:

1) Increasing box strength by using —
   - 18 or 20 mm high-density chipboard.
   - liberal use of internal bracing.
   - coating internal surfaces with thinned Estapol.
   - adding a layer of concrete to the front baffle.

2) Reduction of standing/reflected waves on the front baffle by —
   - mounting the midrange and tweeter on sound-absorbing material.
   - raising all drivers off the front baffle to enable the grille frame to be recessed, thus removing the reflective front edge, even when the grille frame is in position.

I feel anyone attempting these boxes should have some handyman experience and much patience, as they take considerable time and effort to build. The following notes should be taken as hints to construction, supplementary to the original article (February 1980), and should enable you to construct your own boxes in the manner I have.

Note that, amongst the obvious mechanical alterations, I have made a slight modification to the exterior appearance by putting in a chamfer 100 mm up from the base, as can be seen in the drawings and pictures.

I have largely illustrated this article with pictures as they show more clearly the construction techniques I have employed. ▶

NOTE

This article should be read in conjunction with the constructional article on the Series 4000/1 4-way loudspeakers, published in the February 1980 issue of ETI, also reprinted in Top Projects Vol. 6. The details of the revamp given here are *additional* to the basic construction details given in the original feature. We present this article as one reader's ideas and experience with particular modifications of his own design. Whilst we have checked their feasibility, we have not been able to verify the results for ourselves. Readers wishing further information should contact the author.

Roger Harrison
Editor, ETI

INTRODUCING A REVOLUTIONARY DOT MATRIX PRINTER WITH JUST ONE HAMMER. AT AN INCREDIBLE PRICE— JUST $495.

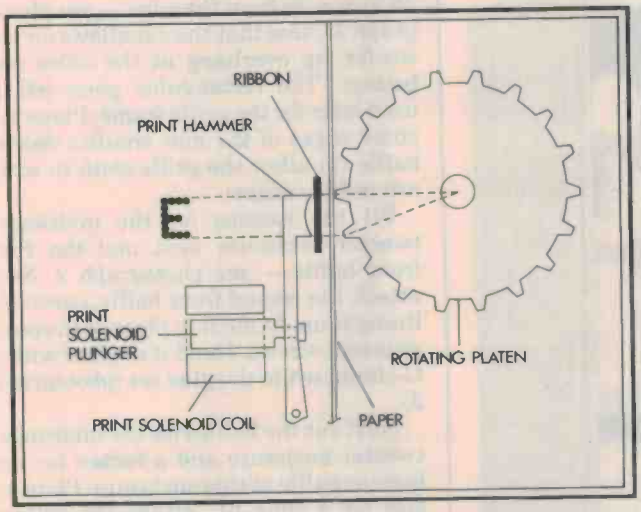
Cat. No. X-3252 P&P $5.50

The Uni-Hammer Replaces Seven . . . or More.

Revolutionary? We don't know what else to call it. An impact printer with a single rugged hammer, rather than the seven or more individual solenoids and print wires found in conventional dot matrix printers.

At an incredible unit price of $495!

Because of the unique Uni-Hammer design, the X-3252 is smaller and simpler than other dot matrix printers yet costs considerably less. Which makes it a natural for the personal or small business user who wants a quality, reliable impact printer at the lowest possible price.



A Product of the Seiko Group

It took a company such as the Seiko group, world's largest watch manufacturer, with vast experience in the design of small, intricate, precision products, to come up with a totally new concept in dot matrix printing.

How the Uni-Hammer Works

The X-3252, which prints both graphics and alphanumerics, uses a rotating platen with protruding splines positioned behind the paper (see diagram). The character or graphics image is created by multiple hammer strikes in rapid succession as the print head advances across the paper. The precision gear train assures exact positioning of the print hammer relative to the splines on the platen, to provide excellent print quality.

A Complete Printer

The X-3252 has features comparable to printers selling for thousands of dollars. These include upper/lower ASCII character sets, ribbon cartridge, 80 columns at 12 characters per inch, adjustable tractor feed, original and 2 copies, 30 characters per second, and full graphics with a resolution of better than 60 dots per inch in both horizontal and vertical axes.

Centronics Interface

The X-3252 DOT MATRIX PRINTER has a Centronics-type parallel data interface and is compatible with System 80, TRS-80, Sorcerer and Apple computers etc.

Fan Form Paper
2,000 sheets continuous fan form paper to suit printer
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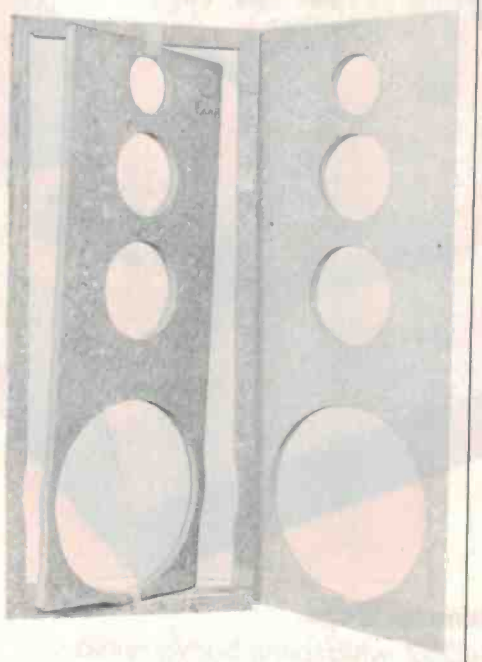
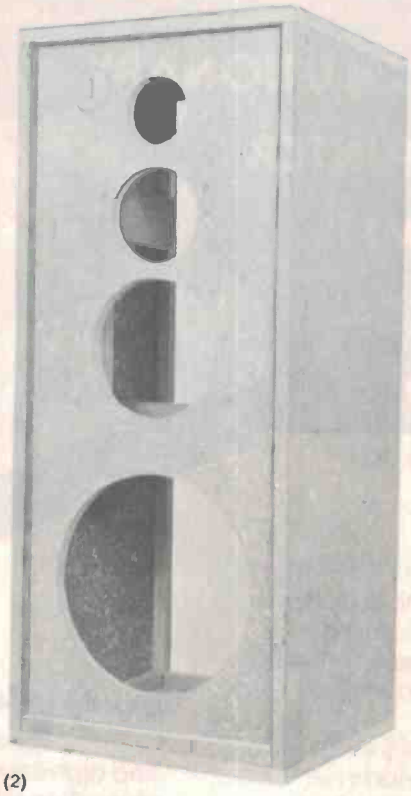
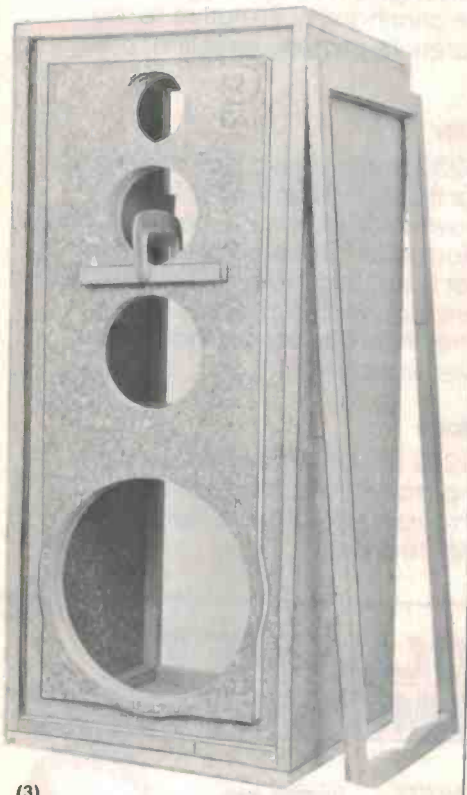


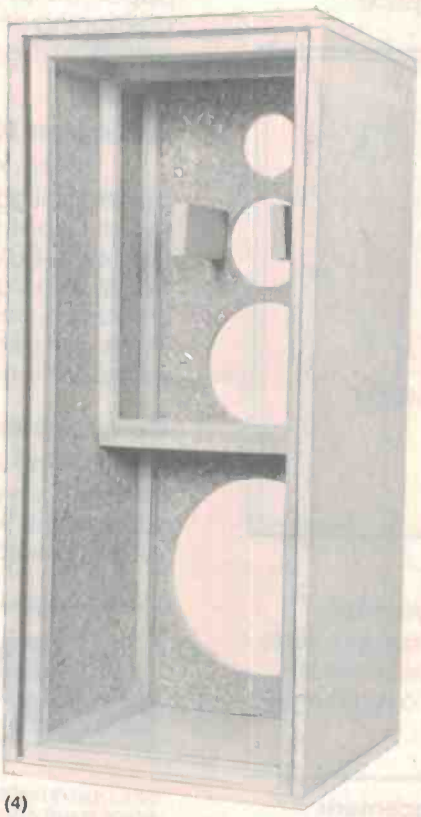
(1)
Two identical front panels are cut and then a cut is made around one about 25 mm in from the edge, allowing for the woofer lip.



(2)
The battens for the midrange-tweeter enclosure are fitted to the box next, followed by the first (larger) front panel.



(3)
The second (smaller) front baffle is attached next — screwed and glued in place.



(4)
Start on the midrange-tweeter enclosure components next.

Series 4000/1

Construction

The boxes were assembled from a high-density panel board called 'panel floor'. The internal volume of the boxes was increased slightly to make room for the volume taken up by the battens and bracing. All panels were cut with a jigsaw. The sides, top and bottom are assembled first by securing battens to the sides. With a little juggling they were glued and screwed and left to dry, being held square by a diagonal piece of wood tacked to the front. I used 1¼" (32 mm) by 6 gauge screws, drilled through the panel board into the battens. Drill a 7/64" (2.8 mm) root hole and a 9/64" (3.5 mm) clearance hole for each screw — this enables you to affix many screws without blistering your hands!

Next cut out two identical front panels. Plane each to fit the front of the box. Mark the driver holes in one with a compass and cut out the holes. Cut the driver holes in the second using the first as a template. Take the second front baffle and run a cut with the jigsaw right around the perimeter, about 25 mm or so from the edge — see photograph 1. Note that the cut allows for the woofer lip overhang at the sides and bottom. The rectangular piece left is used later for the grille frame. Plane the outer edges of the now smaller second baffle (to allow the grille cloth to wrap around the edges).

Fit the battens for the midrange-tweeter enclosure next and the first front baffle — see photograph 2. Now attach the second front baffle, carefully lining it up, fixing it in place with epoxy glue and screws. I held it in place with a G-clamp while the glue set (photograph 3).

Next cut the baffles for the midrange-tweeter enclosure and a batten for the bottom baffle of this enclosure. Plane to size for a snug fit. Attach the bottom baffle (photographs 4 and 5 refer). Don't attach the rear baffle of this enclosure yet. Note that I have added braces between the rear baffle of this enclosure and the front baffle of the box, placed either side of the third driver, as can be seen in photographs 4 and 5. Locate, mark and drill screw holes to secure these to the rear baffle of this enclosure.

The plinth on the base is attached next. Note that too much thickness on the piece going across the front of the cabinet will make the crossover

— a revamp

assembly protrude from the rear of the box.

I put the concrete mix on the rear of the front baffle next. Mix five parts of polystyrene beads (as used in 'bean' chairs) to four parts of sand and three parts of cement. Add a little PVA concrete additive and stir it all until you get a well-mixed, thick, sticky mixture. The internal face of the front baffle was first liberally coated with epoxy resin, which is also run up the sides for about 25 mm. Trowel on the cement mixture until it is around 22 mm thick, while the epoxy is still liquid. The result should turn out like photograph 6.

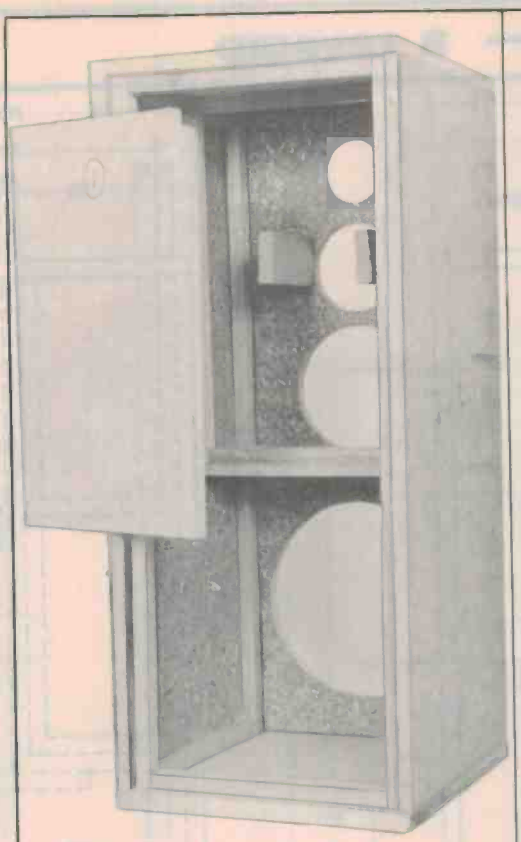
Horizontal braces are added to the internal baffle and the rear baffle before fixing them in place (see photograph 7). Glue and screw everything. Fill all the screw holes and sand the box down prior to veneering. I also added a brace from the bottom baffle of the internal enclosure to the rear baffle, running right from the front baffle.

Now you can tackle the grille frame. I brazed together a frame to the dimensions of the frame cut from front baffle No. 2, using mild steel strip 10 mm wide by 3 mm thick. This was elevated from the chipboard part of the frame by a sufficient margin to keep the grille cloth a few millimetres or so out from the tip of the dome midrange (driver No. 3). I set some ⅛" (3 mm) diameter bolts into the chipboard part of the frame so they protruded far enough, and then cut their heads off. I then drilled ⅛" (3 mm) holes in the metal in corresponding positions. I screwed nuts on to each bolt so that only about 3 mm of thread protruded, and placed the metal part of the frame in position, holding it in place with epoxy glue until I could stretch the grille cloth over the assembly.

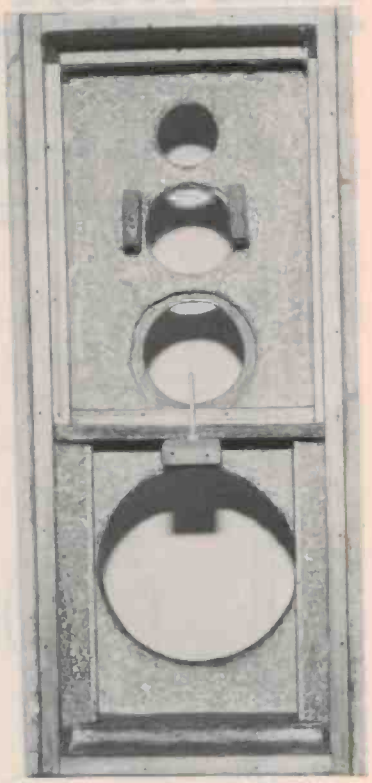
The grille cloth is tacked in place to the rear of the chipboard grille frame.

I added sound-absorbing material to the front baffle before mounting the drivers. It runs from just above the top of the woofer to the top of the baffle. I used upholstering velvet for this job. Before you assemble baffle No. 2 to the front baffle of the box, first lay it on a large sheet of cardboard or paper and trace its outline. This is then used as a template to cut out the velvet to be stuck on the front baffle.

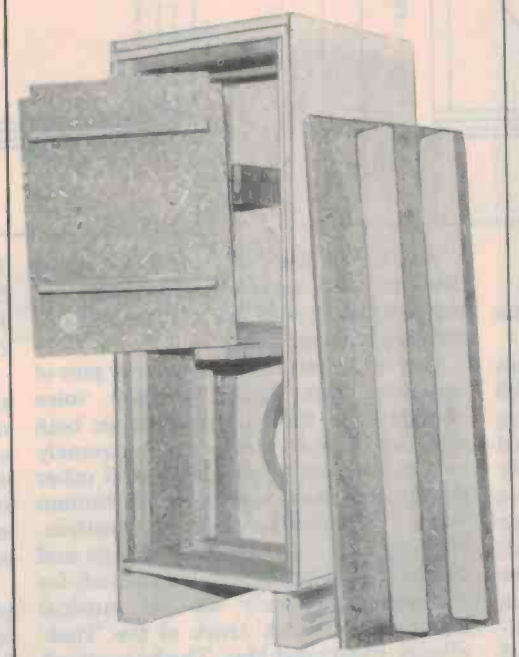
The final result can be seen in photograph 8 and the photograph used on the first page of this article. ▶



(5)
Cut the rear baffle for the midrange-tweeter enclosure to size, but don't fit it in place yet.



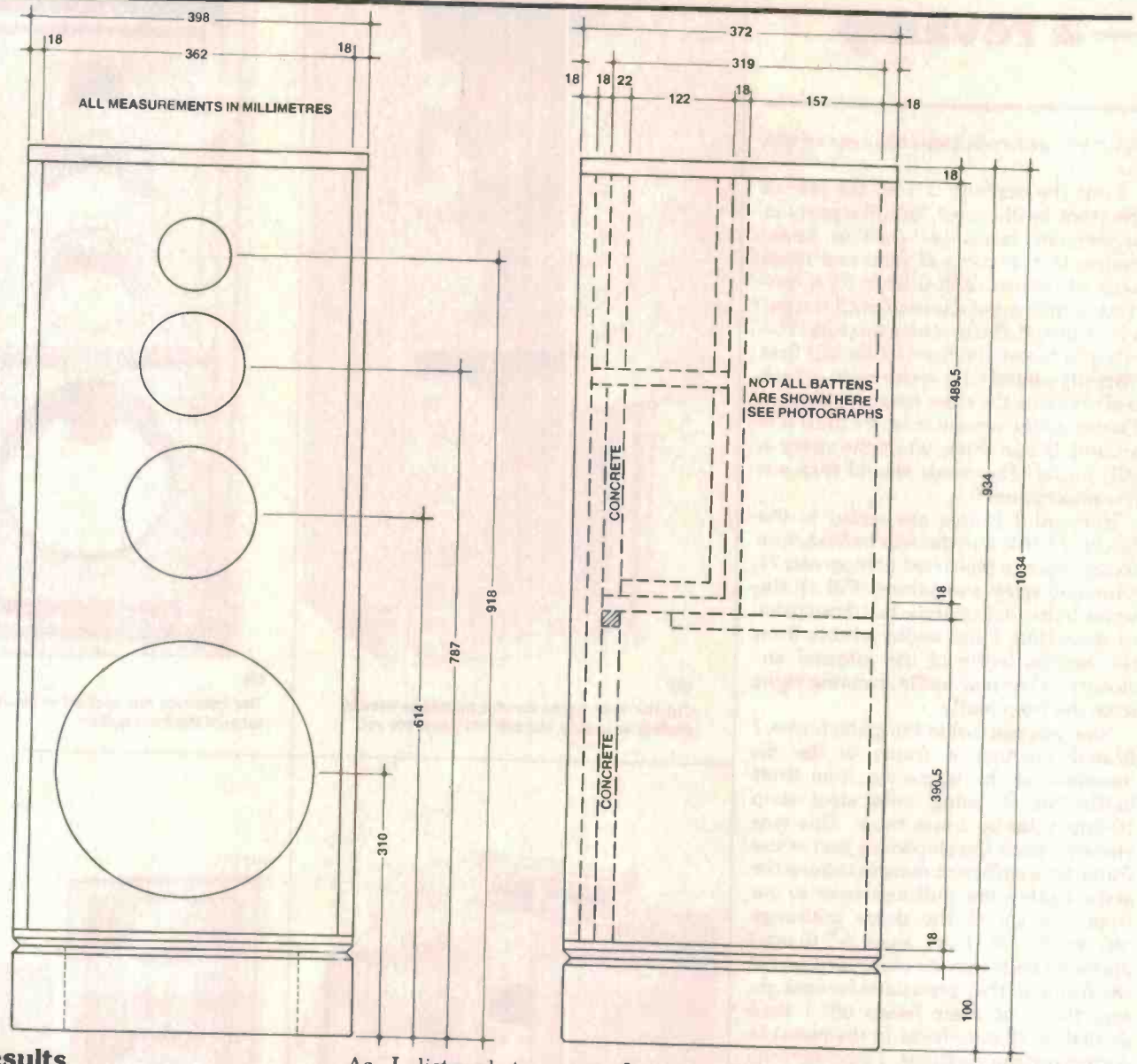
(6)
The concrete mix applied to the rear (internal face) of the front baffle.



(7)
Horizontal braces are added to the internal enclosure baffle and vertical braces to the rear baffle before assembly.

(8)
The final product! (See also page 131).

Series 4000/1 — a revamp



The results

After four weeks of solid work, the time came to connect them up.

When I talk about differences I am referring to my old favourite 439 speakers. The first reaction on listening to Sky II, as the volume was advanced from a low level to a comfortably realistic one, was that they were just another set of good hi-fi speakers, the bass level being more prominent. Further listening revealed that there were *definite* differences; the trouble is working out whether there is an improvement or just a difference. A-B testing was not possible, but listening to well-known and liked albums, one can notice differences by comparing previously remembered musical impact.

As I listened to many favourite albums, the superb performance of these units gradually became evident, strikingly so at times.

One of my main hopes in a new pair of speakers was more accurate voice sounds. The 4000-1 give this on both male and female vocals, with extremely real definition to sibillants and other throat and nasal aspects of the human voice. Transient attack is excellent, offering brilliant attack to drums and cymbals, also trumpets. I could not, for instance, previously see the musical merit of the 'Tusk' track of the 'Tusk' album, Fleetwood Mac. The bass attack and clarity of the 4000-1 made me realise the sonic experience the producers must have been trying to achieve. On fortissimo passages of the 'Planets', an RCA record with Andre Previn conducting the London Symphony Orchestra, I was able to follow the tuba passages in amongst other bass instruments.

The 'Windchase' track from the same-name Sebastian Hardy album is one of my favourites. I am able to drift into the space known as the stereo image more easily, noticing subtle ambient details in the recording studio, even during sustained loud passages. This, I believe, could be due to lower distortion.

It is strange how much imagination plays in my music perception. On some less listened to albums I had listened for, or tried to emphasise in my mind, instruments on particular tracks. With the 4000-1 speakers these mistakes are less easy to make. This fully justifies all the effort put into constructing them. ●

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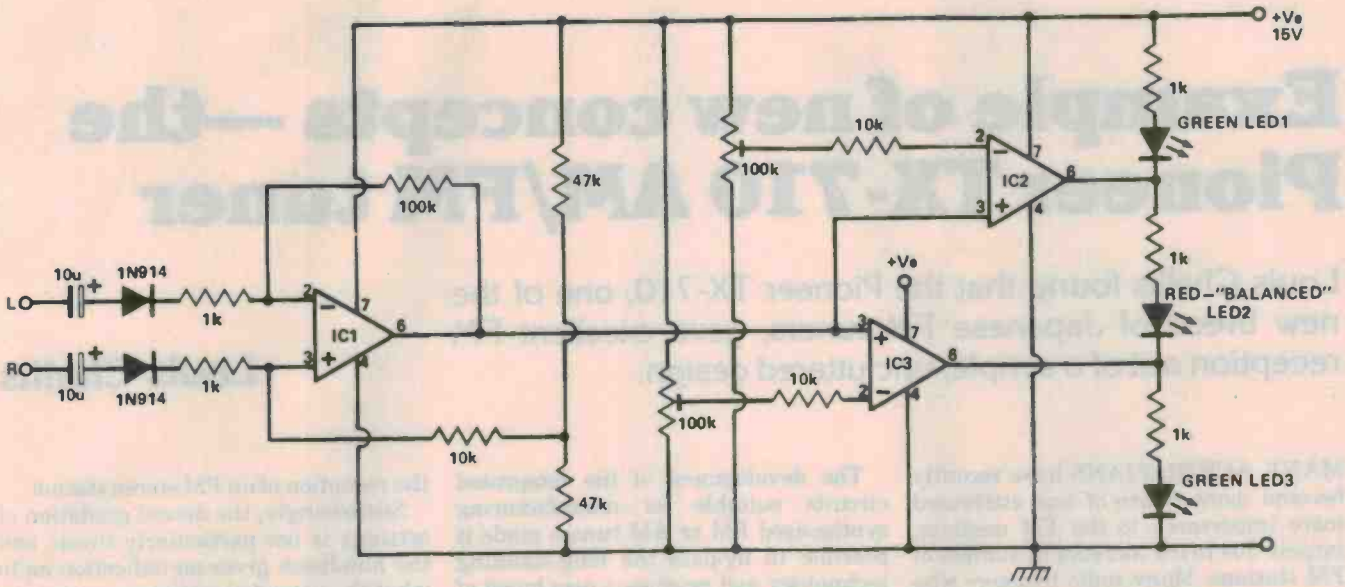
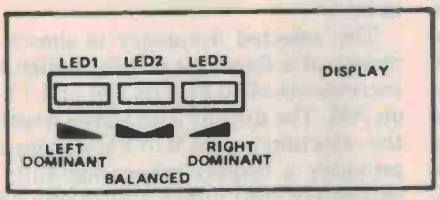


NOTE:
IC1,2 & 3 ARE 741
ALL LEDS ARE 0.2" OR SQUARE



Stereo balance meter

G. Durant

BALANCE on a stereo amplifier is usually set by ear, but this of course can be very difficult to judge. If an amplifier has a balance meter at all, it is usually of the centre-zero moving coil type — bulky, old-fashioned looking and expensive. This circuit is designed to overcome all of these problems.

The outputs from each channel are fed to the two inputs of IC1, this being connected as a differential amplifier. If the left and right channels are of equal levels, the output of IC1 will have its output about halfway between the supply rails. If the left channel gets above the level of the right channel, the output of IC1 will approach the 0 V rail. If the right channel is loudest, the output becomes positive.

IC2 and IC3 are also differential amplifiers, but in this case they are driven by the output of IC1. LEDs form a display at the outputs of the two ICs. Pin 2 of ICs 2 and 3 each go to a preset across the supply. In practice the preset in conjunction with IC2 is set to hold pin 2 slightly above 0 V and the preset connected to IC3 is set to hold pin 2 just below supply voltage. These settings, however, must be set by trial and error so that the circuit works accurately.

The output of IC1 is connected to the non-inverting inputs of IC2 and IC3. If the output of IC1 approaches the supply rail, the outputs of ICs 2 and 3 would be low, thus illuminating LED1. If the two channels were equal in amplitude, the outputs of ICs 2 and 3 would be high and low respectively, lighting up LED2.

The circuit can easily be added on to a ready-constructed unit without using up large amounts of panel space, or used as an add-on unit for a hi-fi system. The unit draws about 20 mA, so battery operation is practical.●

Example of new concepts —the Pioneer TX-710 AM/FM tuner

Louis Challis found that the Pioneer TX-710, one of the new breed of Japanese FM tuners, gave excellent FM reception out of a simple, uncluttered design.

Louis Challis

MANY AUSTRALIANS have recently become more aware of and attributed more importance to the FM medium, largely due to the increase in number of FM stations. Many radio listeners who formerly would not have considered buying an FM receiver now regard it as worthwhile, there being a wide choice of stations with programmes catering for most tastes — classical, pop, rock and background music.

Most audiophiles are aware of the type of conventional FM receivers that used to be manufactured, but I doubt if many really know or understand the implication of what has happened to the design of FM tuners (or receivers) over the last two years. In that time the Japanese manufacturers have developed a wide range of new integrated circuits whose power, potential and cost have upstaged design concepts nowhere more than in the area of FM receiver design.

The new breed

Conventional FM receivers were previously designed with discrete components in the radio frequency and local oscillator stages. These incorporated conventional butterfly-type capacitor tuning gangs, expensive slide rule frequency tuning dials, and a major part of their cost was dominated by the mechanical hardware required for their operation. The majority of these tuners offered good performance, but generally with a price to match.

From the typical Japanese manufacturer's standpoint they constituted a pain in the proverbial **** as in their fabrication they required considerable expensive manual labour — a positive no-no in Japan today.

The development of the integrated circuits suitable for manufacturing synthesised FM or AM tuners made it possible to by-pass the long-standing technology and produce a new breed of tuners with other important attributes. These tuners replaced the slide rule dial with a digital frequency display, and the large scale integrated circuits offered the alternative solution that most Japanese manufacturers had long sought. The real advantage of these tuners came as a result of the manufacturer's ability to simplify or discard the bulk of that mechanical hardware.

The new generation of receivers bears little resemblance to the old generation and to the untrained eye they even give the appearance of cheapness, as they appear to contain very little in the way of components. In reality what they contain is some of the most complex electronics available in consumer electronics, but this complexity is hidden in large scale integrated circuits with as many as 42 pin connections which are veritable mini computers in their own right.

Features

The appearance of the Pioneer TX-710 synthesised stereo tuner is deceptively simple. It comes in a small, light, neat package featuring a brushed satin aluminium fascia, the front panel incorporating an inset display on the upper right hand side of the unit, with the minimal number of controls laid out in a row below. The display contains five green rectangular LEDs to display the signal strength. These provide indication at signal strength of 20, 30, 35, 39 and 48 dBf respectively. Another red rectangular LED is provided to indicate the reception of an FM stereo station.

Surprisingly, the actual gradation of settings is not particularly linear and the handbook gives no indication as to what the intended settings were meant to be.

The selected frequency is shown by means of a five-digit display which has increments of 50 kHz on FM and 1 kHz on AM. The display also shows whether the selection is an AM or FM station and provides a display whose legibility is extremely good under almost any light condition.

The bottom row of controls consists of a rugged power on/off toggle switch on the left hand side of the unit, immediately below a red bezel light, and nine touch switches with their own green LEDs centrally located on the bottom of the fascia.

The first of these switches is for the FM local sensitivity threshold level, which comes into play in the auto tuning mode at an input signal strength of 50 dBf, compared with the normal capture capability of 25 dBf. The next switch is the memory activation switch, which, when depressed before selecting one of the switches 1-7, stores the frequency of the station which is displayed at that time.

Unlike some other tuners with internal memories, this unit does remember the stations selected, on both FM and AM, even when the unit has not been used for a week or more or when disconnected from the mains.

Two other toggle switches at the right hand end of the dial are for selection of FM and AM and the adjacent switch is the FM mode switch which, when in the auto position, will switch the reception to stereo if the pilot tone carrier is

detected and to mono if it is not. In the mono position this switches the incoming signal automatically to mono, a necessary feature with low strength signals. The two remaining controls at the extreme right hand end of the panel are downward and upward touch buttons which initiate an automatic frequency scan for a signal with sufficient strength to activate the automatic frequency control circuit. Obviously if the signal strength is too low, then the receiver will not lock on to the station and will continue its frequency scanning until it finds a station with suitable signal strength.

The rear of the receiver is particularly sparse and incorporates a 900 mm long, permanently wired output cable with two type RCA coaxial plugs on the end instead of the normal panel-mounted coaxial sockets. The aerial output requirements are met by a 75 ohm coaxial socket for connecting the FM aerial, together with screwed terminals for both 300 ohm feeder connection and external AM antenna inputs.

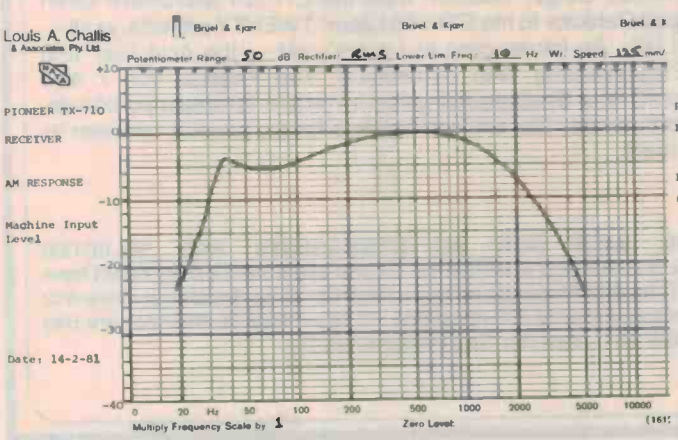
A conventional loopstick antenna is also provided, which incorporates a very effective universal joint to orientate the rod in a wide range of possible positions for optimum reception of local stations.

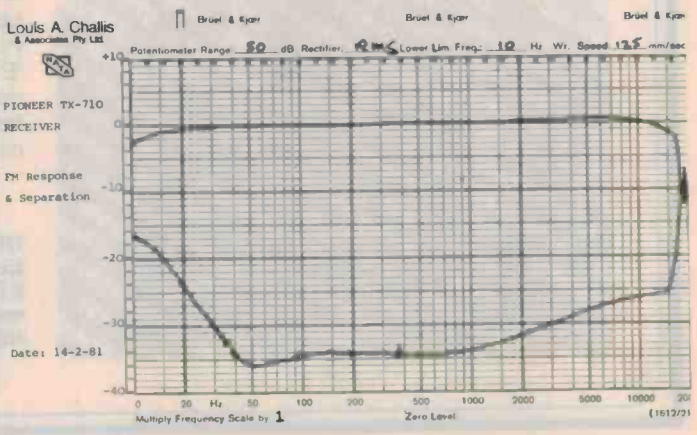
Inside the tuner

The inside of the tuner is remarkably simple compared with other tuners that we have recently seen. It makes use of one large mother board with nearly all the components mounted on it. The two exceptions to this are the power supply, which is mounted on its own separate board, and the frequency counter, the function indicator integrated circuits and the signal level indication drive ICs, which are mounted on a printed circuit board located behind the front panel.

The designers have gone to unusual lengths to provide all interconnections by means of flat ribbon cables, the majority of which are not colour coded. These ribbon cables are long and wide and even interconnect the power supply board to the mother board. Although one would expect them to provide a neater appearance, because of the way they are rolled over under the metal cover of the tuner, they detract a little from the otherwise neat appearance.

The FM tuning section is provided with a small separate electrostatic screen, but apart from this you could be excused for not knowing that you were looking at an AM/FM receiver. The chassis is of lightweight steel construction as is the cover, and is about as utilitarian as one could hope for. It provides simple but effective support and encapsulation for what is undoubtedly a very cleverly designed tuner. ▶





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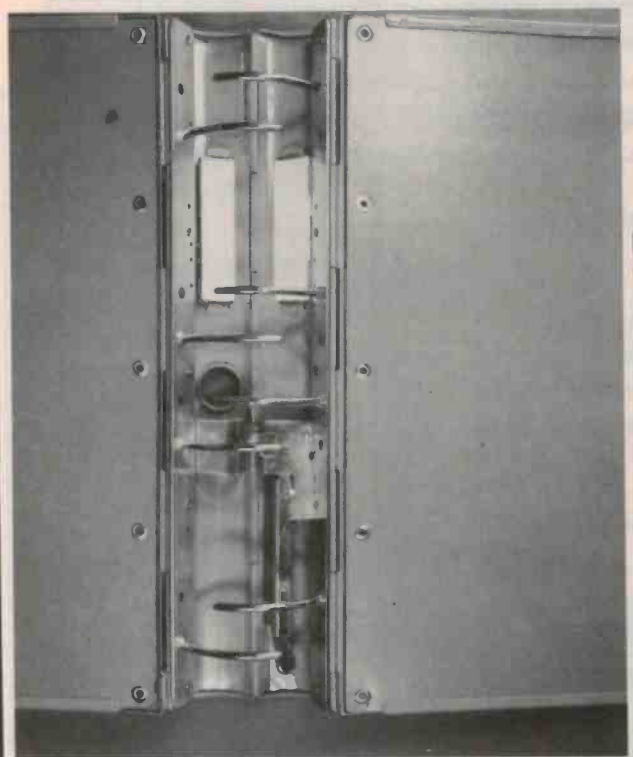

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6 - 24	$9.00 each	free
25 plus	$8.00 each	free

On test

The objective testing of the unit's performance reveals that the unit has lost little in the way of desirable characteristics as a result of the changes in design philosophy.

The most important parameter is undoubtedly the FM sensitivity, which is 16 dBf for 26 dB signal to noise ratio on mono and 31 dBf for 46 dB signal to noise ratio on stereo. The mono figure is not quite as good as the manufacturer claims, whilst the stereo figure is slightly better. The signal to noise figures are, however, exactly as claimed by the manufacturer and the frequency response is almost exactly the specification figures quoted.

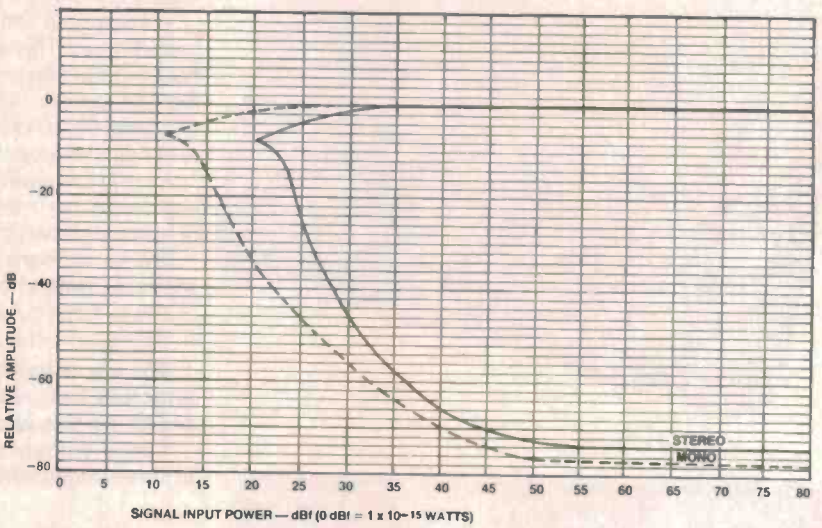
The channel separation is better than 36 dB at 1 kHz and is certainly better than 25 dB at all frequencies between 20 Hz and 16 kHz. Overall the FM tuner section provides very clean performance that is well up to the needs of most fastidious listeners. By contrast, the AM tuner section has a frequency response of 35 Hz to 1.6 kHz and is typical of the poorer AM tuners that we have recently seen. The sensitivity of the loop antenna is 300 microvolts per metre and this is only just good enough for local reception. In poor signal strength areas in the major Australian cities this would require the supplementary connection of a trailing wire antenna to provide sufficient signal strength for acceptable reception.

The subjective performance of the tuner on FM is remarkably good. I listened to a wide range of FM programmes at home for over a month and found that its performance was truly excellent (and that the FM stations in Sydney are improving with age). Whilst its overall sensitivity is not quite as good as some of the other expensive tuners we have recently reviewed, its ease of tuning and the quality of the signal it produces are every bit as good. With only a simple folded dipole in my home, which is not in a particularly good signal strength area, all seven of Sydney's FM stations were received with adequate signal to noise ratio and generally better than 50 dB, during both day and night.

By contrast the AM reception with just the loop antenna falls short of a fully adequate performance and is further marred by the narrow band width of the AM section's intermediate frequency stage. Whilst the AM section is good enough for listening to the news, it is, in my opinion, unsuitable for listening to music and is only little better than telephonic reception.

The TX-710 synthesised tuner has many attributes, the most important being the quality of its FM reception, its ease of usage, and the simplicity of its design. Given a reasonable aerial it provides excellent FM reception and would undoubtedly be an asset to anyone wishing to enter into the realm of FM reception or who is thinking of discarding an older and less effective FM tuner. ●

Dimensions:	*420 mm wide by 94 mm high by 270 mm deep*
Weight:	*3.3 kg*
Manufactured in:	*Japan by Pioneer Electronic Corporation*
Price:	*$329*
Distributed by:	*Pioneer Australia Pty. Ltd.*



MEASURED PERFORMANCE OF PIONEER TX-710 SERIAL NO. AK 5500 9505

FM TUNER SECTION

(measured at 98MHz unless otherwise stated)

FREQUENCY RANGE 85.8 - 109MHz

USABLE SENSITIVITY (40kHz deviation)
Mono for S/N 26dB 16dBf
Stereo for S/N 46dB 31dBf

SIGNAL TO NOISE RATIO (see curves)(40kHz deviation)
Mono 77dB
Stereo 74dB

FREQUENCY RESPONSE (see curves)
10Hz - 17kHz

SEPARATION (see curves) (includes generator)
> 34dB

CHANNEL BALANCE 0.2dB

OUTPUT VOLTAGE (at 1kHz, 40% modulation)
260mV

OUTPUT IMPEDANCE (at 1kHz)
1kohm

AM TUNER SECTION

FREQUENCY RANGE 492 - 1660 kHz

ANTENNA Ferrite Rod

FREQUENCY RESPONSE (see curves)
@ 6dB Point 37 - 1600 Hz

CHANNEL BALANCE 0.2dB

OUTPUT VOLTAGE
(@ 1kHz 40% modulation) 260 m V

OUTPUT IMPEDANCE
(@ 1kHz) 1kohm

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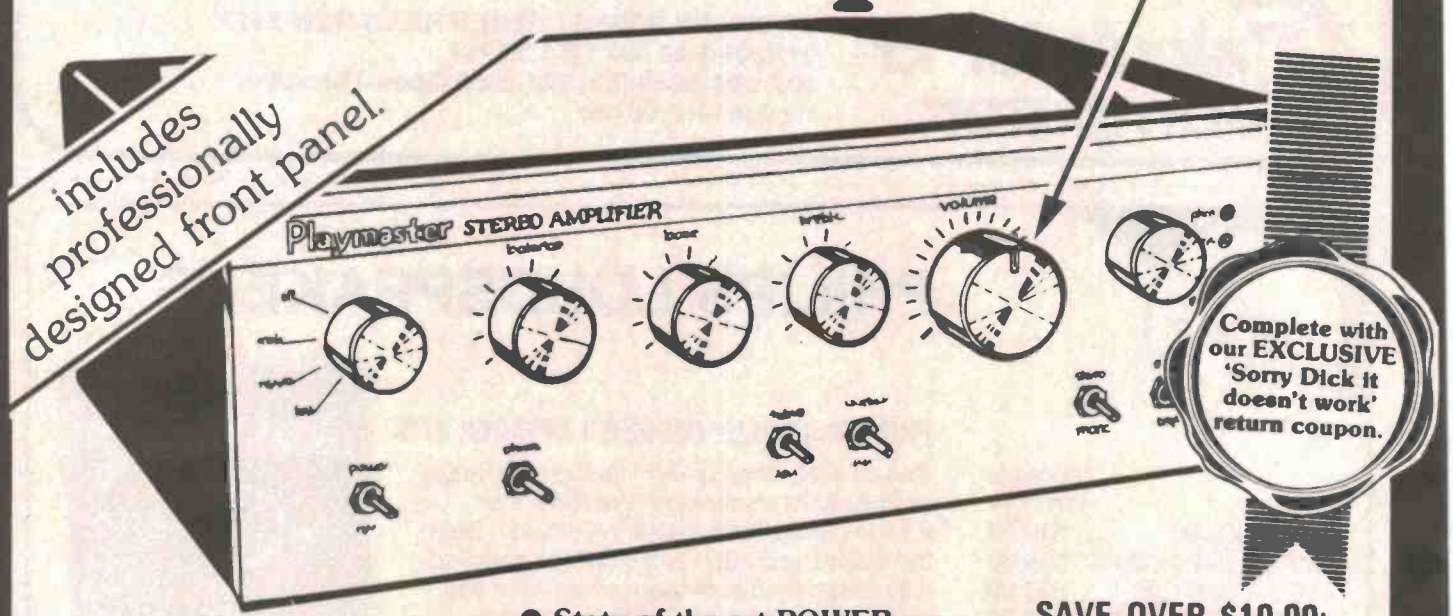

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- **Over 50 watts per channel!**
- **Speaker switching plus loudness & muting controls!**
- **And a brand new professional styling!**
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AIM65, $250; 6 S100 wirewrap cards, $20 each; OAE papertape reader OP 80 A, $40; ITT instructor microcomputer, incl course, $250. T. Hooft, (02)807-3961.

TRACTOR FEED: 11' x 14" fanfold paper, 5-ply, $8 a box; single ply $17 a box. Model 15 governed motors, new, $7.50. R. Long, 46 Gloucester St, Sydney. Phone (02)27-2982 a.h.

S100 RAM boards — A & T; 2 SME16K static, bank select, 4 MHz 2114s — $200 ea. 1 SSM8K static, 2112s — $125. R. Young (055)72-3082 a.h.

SINCLAIR ZX80 USERS: 3K RAM expansion — just plug in to use — plus over $40 software on cassette. $65 the lot. (03)729-5751 a.h.

CARD PUNCH IBM 24, recently overhauled, excellent condition, including circuit diagrams, $200 ono. Phone P. Taylor, Beecroft NSW (02) 84-5335.

FOR SALE: OSI Superboard II, 8K RAM, RS232 & TTL interfaces, homemade box and power supply, lots of software and documentation, $450. Ph. (076) 30-8122.

FOR SALE: JPC products TC-8 high speed cassette interface for TRS-80 with manuals and operating software, $110. Phone (03)29-4194.

TEXAS TI-58 programmable calculator with constant memory, $80. PC-100C printer/plotter, $150. Maths/utilities module for TI 58/59, $20. Phone (02) 570-6931 a.h. only.

SIGNETICS KT9500 (2650), assembled, never used, documentation included, as new condition, $80. Phone (b.h.) (02) 217-2140, (a.h.) (043) 28-2573.

S2650 MACHINE LANGUAGE DEBUG: Single-stepping, execution trace, multiple breakpoint facilities for debugging programs, documented listing, $10. C. Burrows, 45 Koninderie Pde, Narara NSW 2250. (043) 28-2671.

COMPUTERS: One ASR33 teletype with RS232 interface, together with full maintenance manuals, $600 or nearest offer. Phone A. Leo (02) 638-0166, ext 286.

MINISCAMP computer, 90% assembled, complete kit, never run, all in as new condition, $35. M. Gardiner, P.O. Box 132, Alstonville 2477. Phone (066) 38-3215.

2 MPI B52 Mini-floppies, power supply, case and manuals, never used, suits all micros. All for $1100 or offer. John Hall, Double Bay (02) 36-5170.

FOR SALE: One KTM-2 keyboard/VDU unit, $200 ono. R. Hall, c/- P.O., Southbrook 4352.

OSI USERS: Beginner, enthusiast, or "just looking". Our club can help. Meetings in Sydney, newsletter, information. Contact NOTICE, P.O. Box 250, Kingsford NSW 2032.

ETI-641 S100 PRINTER complete with printer working ok, $200 ono. Contact P. Harbort, P.O. Box 23, Eidsvold 4627. Phone Eidsvold 9.

FOR SALE: Exidy Sorcerer 47K, complete with word processor pak, cassette, green VDU, micro 80 printer, console. Bought September. $2100 ono. Phone (042)29-3867, Saturday mornings.

ASR-33 teletype, tape punch and reader, 240 V transformer in stand, 20 mA/RS232 interfaces, $600 ono. Matt (ah) (02) 773-3383, Padstow NSW.

MISCELLANEOUS

SELL: 60/40 solder packs, $1; radio module $4; 240V/16V plugpak $7; 240V/6V transformer $5; JP 274 walkie talkie $10. K. Howell, Box 405, Renmark 5341 S.A.

WANTED: VALVES 12AX7, 12AU7, 6CG7/6FQ7, 6SN7 GT, KT88, EL34, prefer new. Condition and prices to L. Anderson, 30 Lycett St, Weston ACT 2611. (062)88-8183.

PHOTOCOPIER: Apeco roll-fed photocopier, complete with one full roll of paper, three containers of replenisher, three ink refills. In need of T.L.C. Best offer accepted. Contact Jan Collins at ETI, (02)33-4282 during office hours.

COPY USA PATENT: The Echlin Stationary Amature Generator, designed to produce six times more output than input: $6.00. G. Egel, 18 Sturt St, Loxton 5333.

WANTED: Electronic hobbyist penfriend, age 15. Write Charlie Loeven, 44 The Corso, Surfers Paradise Qld 4217, Australia.

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 $^{+\frac{1}{2}}_{-\frac{1}{4}}$

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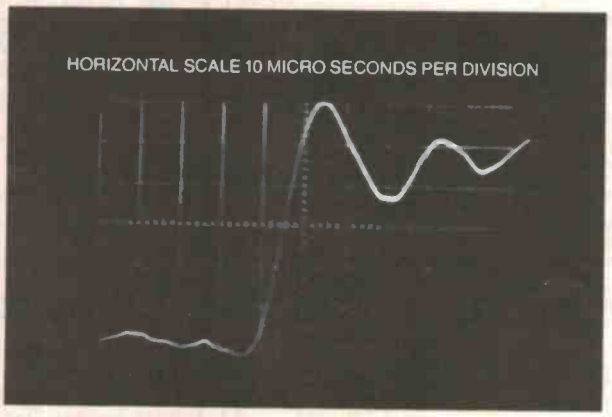

Actual unretouched oscilloscope photograph showing rise time of 980LZS using CBS STR112 record.

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TRANSISTORS

	$ c
2SA	
101	1.15
235	2.10
240	1.90
473	2.00
489	4.30
493	1.35
495	.75
495G, Y	1.10
496Y	1.60
505	1.65
509	1.40
539	1.20
561	1.80
562	.85
564A	1.40
608	1.50
628A	.65
634	1.95
636	4.50
639	1.15
640	1.15
641	1.15
642	1.30
661	1.35
670	2.45
671	2.55
673	.70
678	1.75
682 O	2.40
683	1.15
684	1.35
697	2.10
706	4.20
715	1.90
719Q	.90
720	1.15
726	1.55
733P, Q	.70
740	7.60
748	3.00
758	8.65
769	3.90
794	2.45
816	1.90
844C	.75
844D	.75
885	2.15
950	3.00
969	8.30
999	.65
1015Y	.85
2SB	
56	.80
77	.95
156	1.90
187	1.00
324	.95
337	4.50
364	1.50
405	1.35
407	4.20
415	1.10
434	3.65
440	2.10
449	4.80
463	3.60
471	4.80
474	3.15
492	2.40
504	16.60
506	21.60

TRANSISTORS

	$ c
2SB	
509	6.30
511	2.20
512	4.60
514	2.55
525C	1.45
529	1.70
534	2.20
536A	3.25
536B	3.85
541	9.60
544	1.10
549	3.35
554	16.80
555	15.00
557	12.95
562	1.80
596	3.65
617	6.00
618A	9.00
647A	2.00
688	6.00
764	1.20
2SC	
281	1.90
371	.75
372Y	.70
373	.60
374	.75
380	.65
381Y	.90
382	1.70
383	1.50
385A	1.45
387A	1.45
388A	1.15
398Y	2.30
399	2.15
403C	1.30
454L	.50
458B, C	.60
460	.55
461	.95
485	5.50
494	9.30
495Y	1.60
496	3.70
498	3.60
509Y	1.75
535A	.70
536D	.50
538A	1.50
562	1.95
563	1.95
605	2.35
620C, D	.65
641	1.30
643A	8.65
644	.70
681	7.90
685	3.00
693	.55
710C	.80
710D	.80
711A, E	.55
712C	.70
717	2.00
728	2.75
730	9.90
731	15.35
732	.65
733	.65

TRANSISTORS

	$ c
2SC	
734	.90
735Y, O	1.00
738	.75
756	7.30
761	1.90
762	1.90
763D	.80
776	9.40
780	1.95
781	6.50
782	11.20
783	6.75
784R	2.50
785	.85
789	3.85
790	2.95
791	7.00
792	6.75
793	6.30
799	6.25
815	.90
828A	.90
828O, P	.90
829B, C	.75
838H	.85
839F, H	.60
871E	.80
900E	.70
900F	.70
900U	.70
901A	7.80
926	1.35
929	.65
930	.65
933	1.40
935	8.45
940L	6.40
941	1.20
943	2.30
945A,O,R,S	.70
983	2.65
1000GR	1.10
1014C-2	1.65
1014D	1.65
1017	1.75
1018	3.80
1024	3.65
1047	.75
1060	1.70
1061A,B,C	1.60
1061D	1.60
1070	2.95
1096	1.40
1098	1.95
1106	9.40
1124	2.90
1162	1.15
1172B	18.60
1173	1.70
1175	.85
1210	.70
1213	.80
1214	1.90
1215	.70
1222	.70
1226A	1.25
1239	9.70
1260	6.40
1306	6.65
1307	7.85
1317	.75
1318R	.90

TRANSISTORS

	$ c
2SC	
1327T	.70
1328	1.20
1335	1.15
1344	.75
1346	1.50
1359	.90
1360	1.05
1362	1.70
1363	1.15
1364	.90
1368	1.75
1383R	1.30
1384Q,R	1.45
1393	1.60
1398	1.90
1419	2.45
1446	2.00
1447	3.95
1448	3.70
1449	2.75
1450	5.50
1475	1.90
1506K,L,M	1.55
1507K,L,M	1.55
1509	2.60
1550	1.95
1567	2.35
1568	2.35
1569	4.00
1571	.65
1583	2.10
1589	5.30
1591	39.70
1620	19.80
1647	.70
1674	.70
1675L	.70
1678	3.75
1683	3.10
1685	.75
1687	.95
1688	1.15
1740	2.90
1760	3.20
1775E	1.15
1810	5.85
1815GR	1.00
1815Y	1.00
1816	5.40
1827	3.90
1845	1.50
1846R	1.40
1848	1.95
1856	1.20
1906	1.75
1908	.95
1909	7.50
1923R	.85
1942	12.90
1945	14.00
1947	15.85
1957	1.35
1964	3.55
1967	26.60
1968A	39.65
1969C, H	6.90
1973	1.85
2053	3.15
2055	3.15
2073	2.85
2074	2.00
2075	4.95

TRANSISTORS

	$ c
2SC	
2076	.70
2086	1.05
2098	10.00
2099	26.90
2116	4.45
2131	9.20
2132	68.25
2146	4.55
2152	35.60
2166	3.65
2229	1.65
2233	4.35
2274	.85
2320	.65
2327	9.80
2724	.70
2SD	
30	1.30
91	8.10
93	8.40
111Y	10.50
113Y	26.10
180	5.95
187R	1.35
200	6.30
213	20.50
227	2.50
234	1.90
235Y	2.25
288	2.00
300	13.90
313E	1.80
315	3.40
318	4.00
325	1.60
330	1.75
350A	9.80
355C	1.05
359	1.80
380	9.70
388	6.30
389	3.60
400	.75
415	2.70
424	18.90
426	15.60
467	1.85
471	1.10
525	2.90
526	3.90
586	4.85
587SB	3.65
588A	8.25
667A	2.00
863	1.15
2SK	
19GR	1.45
19Y	1.45
30Y, A	1.30
33F	1.40
34E	1.25
40C	1.35
41D	1.05
41F	1.80
42	3.85
44	1.95
49H	1.85
54B	1.05
55D	1.05
55E	1.05

TRANSISTORS

	$ c
2SK	
68 L	1.00
107	1.60
120	1.45
125	3.75
128	1.60
150	3.70
3SK	
37	5.85
39Q,R	4.10
40M	5.50
41 L	4.95
45B	2.35
48	4.95
51-03	3.20
54B	3.05
59GR	2.90

INTEGRATED CIRCUITS

	$ c
AN	
214	5.25
217	4.10
240	14.70
272	8.10
315	7.95
360E	1.95
612	5.10
6552	2.95
7140	5.75
7151	6.95
BA	
501	9.25
511	9.25
521	9.25
CA	
3012	8.20
DS	
8654N	8.40
FX	
107	33.60
HA	
1156W	4.05
1199	4.55
1306W	5.40
1322	6.20
1329	4.75
1338	11.20
1339A	7.40
1342	5.45
1366W	7.50
1366WR	7.00
1367	11.40
1397	14.70
LA	
1201	2.90
4102	4.25
4420	4.10
4430	3.80
LM	
386N-1	1.30
M	
5115PR	12.90
5152L	5.15
51202L	3.10
51513L	14.40
58476	29.95

INTEGRATED CIRCUITS

	$ c
MB	
3705	4.80
3756	6.10
MC	
14001	1.85
14001BCP	1.60
14011	.65
14015	2.60
14016B	2.90
14028	1.90
14049	1.35
14066	1.65
14071	.85
14076	2.55
14511	3.10
14526B	6.95
14532	3.35
14543	4.30
14568B	12.55
1458	2.90
1496G	2.95
3340	5.65
4044	5.95
4069	1.35
MHW	
710-003	52.00
MM	
5369AA/N	5.95
5387AA/N	9.80
5799NBR	39.95
74C93	6.15
MSM	
100RS-8642	4.35
105R-7261	4.35
131R	6.60
153R	14.95
160R-7260	13.15
561	6.40
564	6.40
5107	11.75
5535	6.40
NDC	
40013	15.95
40044	24.80
NIS	
7261A	9.30
NJM	
4558D	2.85
PLL	
02 A	15.85
RC	
4558	2.30
SL	
1626	11.50
1640	8.80
SN	
74161	1.95
74184	9.95
76115	3.65
76600P	5.55
TA	
78	8.55
7045	5.75
7055P	5.85
7060P	2.20
7061P	2.75

INTEGRATED CIRCUITS

	$ c
TA	
7062P	4.70
7063P	2.10
7069P	4.45
7073P	10.25
7089M	7.30
7102P	11.55
7108P	3.85
7120P	1.80
7130P	4.60
7141AP	12.00
7146P	12.00
7203P	9.50
7204P	4.85
7205P	4.55
7215P	12.00
7222AP	6.25
7227P	24.30
7310/C3001AN	4.40
7310/C3001AT	3.35
7310P	2.95
7313P	3.65
TBA	
810 SH	5.00
TC	
4508	11.75
5032P	16.25
5080P	11.80
5081P	8.45
5082P	8.45
9100	13.95

INTEGRATED CIRCUITS

	$ c
TMS	
1943 NL	16.00
uA	
703	3.65
UHIC	
005	9.95
uPC	
78L05	1.75
78L06	1.75
78L062AWC	2.70
78L62WV	2.70
78L08AC	1.75
30C	5.45
41C	5.40
555H	1.60
562C	9.45
566H	1.25
575C2	4.95
576H	7.30
577H	1.60
587C2	6.95
592H2	1.55
1001H2	5.20
1020H	11.50
1025H	6.60
1156H	4.85
1181H	7.85
1182H	7.85
1350H	6.00
uPD	
858C	10.95

INTEGRATED CIRCUITS

	$ c
UP	
477-C12	69.00
Curtis	
8044	24.95

CRYSTALS

	$ c
1.0000 MHz.	11.95
3.579545	7.50
7.4015	6.80
7.8015	9.90
9.555	4.80
9.565	4.80
10.000	6.95
10.020	4.50
10.0525	6.35
10.240	6.95
10.245	11.50
10.692	6.95
10.895	6.95
12.800	11.50
16.965	6.20
17.065	6.20
17.115	6.20
17.165	6.20
17.215	6.20
21.145	11.50
32.520	11.50
33.020	11.50
33.520	11.50
35.395	11.50
35.500	11.50
35.552083	11.50

CRYSTALS

	$ c
35.895 MHz.	11.50
35.96875	11.50
36.380	11.50
36.395	11.50
37.36875	11.50
37.76875	11.50
39.16875	11.50
40.4875	11.50
40.9875	11.50
41.000	11.50
41.4875	11.95
41.500	11.50
41.9875	11.50
42.000	11.50
42.500	11.50
43.500	11.50
44.000	11.50
50.77666	8.30
50.79666	8.30
50.80666	8.30
50.81666	8.30
50.82666	8.30
50.84666	8.30
50.85666	8.30
50.86666	8.30
50.87666	8.30
52.486666	10.20
52.4966	10.20
52.506666	10.20
52.5166	10.20
52.526666	10.20
52.5366	10.20
52.546666	10.20
52.5566	10.20
52.5666	10.20

IMARK **167 Roden St, West Melbourne, Vic. 3003**
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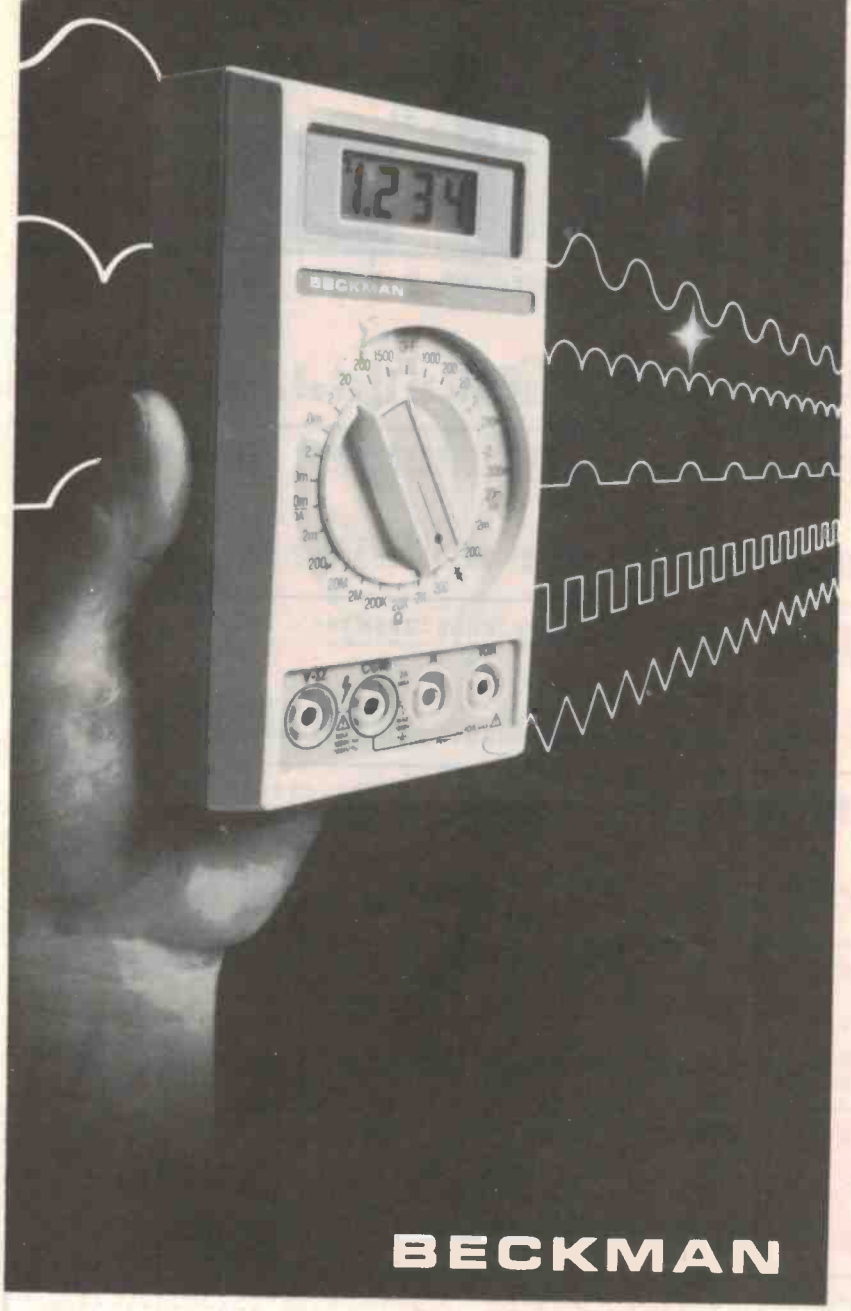
ETI 151

Beckman brings a new dimension to hand held digital multimeters...



BECKMAN

true RMS capability.

Now you can measure the exact power content of **any signal . . .** regardless of waveform. Beckman delivers the new TECH® 3030 multimeter with true Root Mean Square capability and many more fine performance features.

Unlike the common average responding multimeters calibrated to measure only sine waves, the TECH 3030 with true RMS capability gives you accurate readings of both sine and non-sine waveforms.

True RMS makes a significant difference in accuracy when measuring switching power supplies, flyback power circuits, SCR or TRIAC controlled power supplies or any other circuit generating a non-sine signal.

Measurement Comparison Chart

Waveforms (Peak = 1 Volt)	Average Responding Meter	Beckman TECH 3030	Correct Reading
Sine Wave	0.707V	0.707V	0.707V
Full Wave Rectified Sine Wave	0.298V	0.707V	0.707V
Half Wave Rectified Sine Wave	0.382V	0.500V	0.500V
Square Wave	1.110V	1.000V	1.000V
Triangular Sawtooth Wave	0.545V	0.577V	0.577V

The TECH 3030 also accurately measures the entire audio band up to 20 kHz. But that's not all you can expect from Beckman's finest multimeter.

You also get 0.1% basic dcV accuracy, instant continuity checks, 10 ampere current ranges, a separate diode test function, 22 megohm dcV input impedance, and an easy-to-use rotary switch.

Enclosed in a rugged water-resistant case, the TECH 3030 can take a 2-metre fall onto concrete and still perform up to specification. And to further ensure reliable, trouble-free operation, the TECH 3030 gives you 1500 Vdc overload protection, RF shielding, 2000-hour battery life, gold switch contacts, and fewer electronic components to worry about.

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WF 761/80

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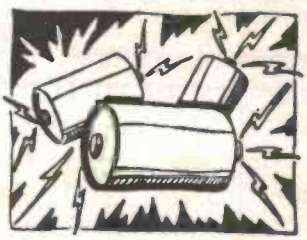
DREGS

"THE best laid plans of mice and men gang aft agley ...' said Robert Burns. That little gem is a literary refinement of Murphy's law, of course. It sprang to mind when Gary Johnston of Jaycar showed us an item from the Sydney Sunday paper, the Sun Herald, of April 26. Margaret Sydney runs a column of helpful household hints called 'You Say, We Pay'. Every week she has a number of Star Hints. The April 26 item is reproduced below — without further comment!



● If you intend to store batteries in the freezer (for longer life), make sure you wrap them well in foil to keep moisture out.

Penultimate pun-star?

Well, the computer punsters were out in force in an all-out effort to "have the last byte" at the Great Dregs Pun Competition, as Mike Scott of Palm Beach said, who sent two puns, but...

P.J. Crawford of Glenhuntly in Victoria sent several; here's a sample — 'Don't say watt, say pardon!' Wayne Brown from Dromana in Victoria sent, 'Is a pull-up resistor an electronic policeman?' and Greg Bond of Cranbourne South (another Victorian!) sent one too long to publish. Sorry, Greg.

Our lucky final winner sent the following story: Two design technicians in a large electronics firm had just finished prototyping their new dot-bar graph driver display. The board included only an IC and a handful of LEDs. All connections were accomplished cheaply using small wire bridges. Said one to the other, "It's nothing but the bare necessities. But what shall we call it?"

His mate replied, "How about ... bridge-it bardot!"

It certainly raised the most groans around the office! A copy of Test Gear Vol. 2 is on its way to Michael Carden of Belgrave South in ... you guessed it, Victoria!

That's it, no more — try our new competition.

(Incidentally — 'penultimate' means: the last but one. That's right, we're going to have the last pun-say. Watch for the story of Elmo and his Stratocaster in a forthcoming issue!).

New competition!

Even the very best of editors (i.e: past and present editors of ETI) have just occasionally been known to err. Our erudite managing editor has pointed out to Roger Harrison that his sub-heading on page 83 in May ('Play it again, RAM'), whilst amusing, was misquoted. Nowhere in the film 'Casablanca' does Bogart say "Play it again, Sam". Closest is Ingrid Bergman's "Play it once, Sam, for old time's sake". Later in the film Bogart says, "You played it for her, you can play it for me. Play it."

Before you all laugh **too** hard here are 15 well-known quotations. Every single one is incorrect. We're offering a couple of prizes to the first two readers to send us:

a) the corrected versions — if such exist.
b) the origins of the (correct) versions.

1. Elementary, my dear Watson.
2. We are the masters now.
3. Come up and see me sometime.
4. Money is the root of all evil.
5. I knew him well, Horatio.
6. Survival of the fittest.
7. I want to be alone.
8. The stuff that dreams are made of.
9. To gild the lily.
10. I must go down to the seas again.
11. First catch your hare.
12. Lead on, Macduff.
13. Pride goeth before a fall.
14. All that glitters is not gold.
15. Thou shalt not kill — but needst not strive officiously to stay alive.

On the basis that every right-minded reader already takes ETI regularly, we are offering two subscriptions to our competitive (competitive? — Ed) magazine, Electronics Australia.

First prize — one year's subscription to EA.
Second prize — two year's subscription to EA.*
(*No, we haven't got that wrong!)

Send your entries to Dregs' Quotes Competition, ETI magazine, 15 Boundary St, Rushcutters Bay NSW 2011.

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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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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