ELECTRONICS AUSTRALIA

JANUARY 1983

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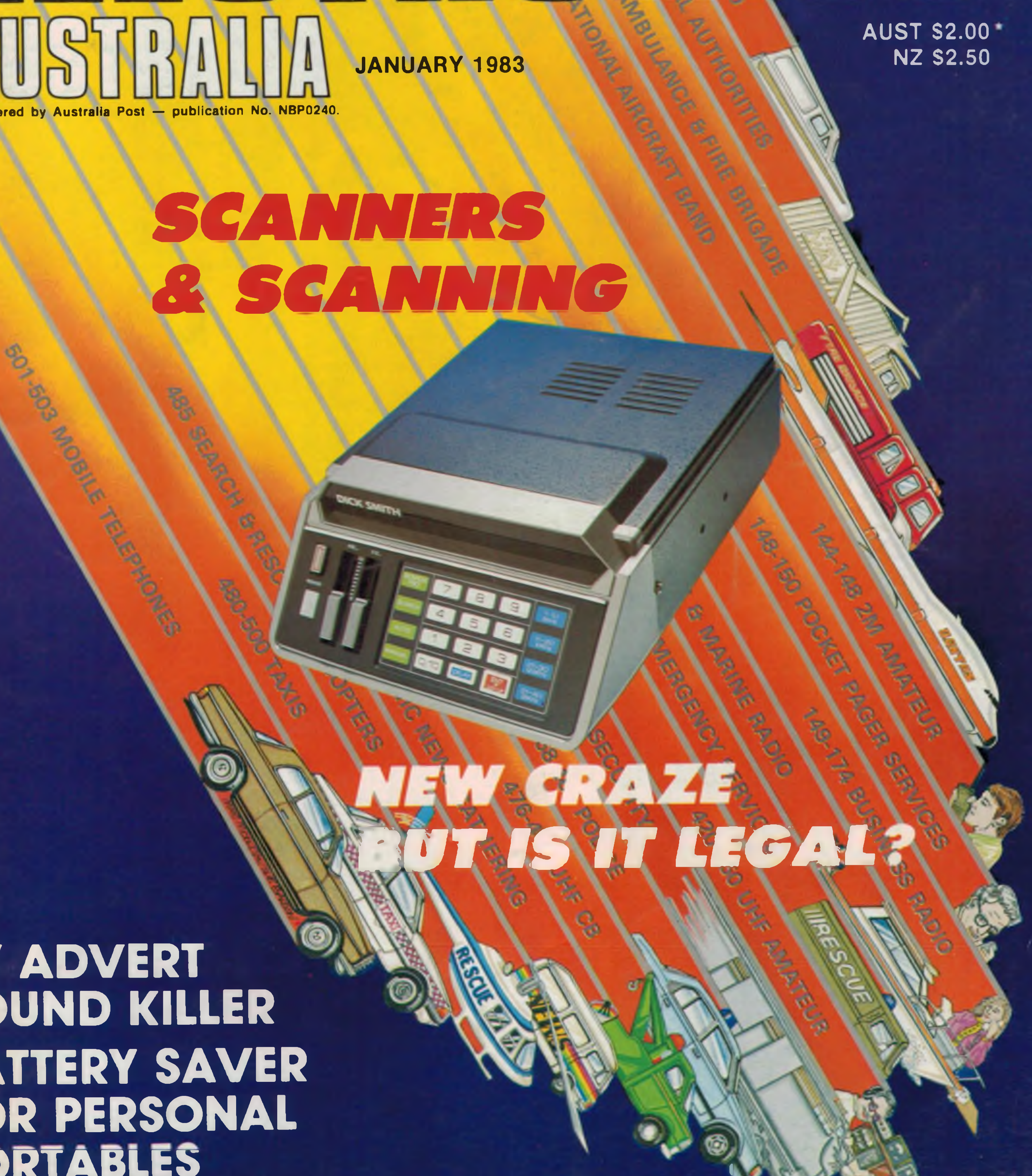

NEW CRAZE BUT IS IT LEGAL?

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BATTERY SAVER FOR PERSONAL PORTABLES

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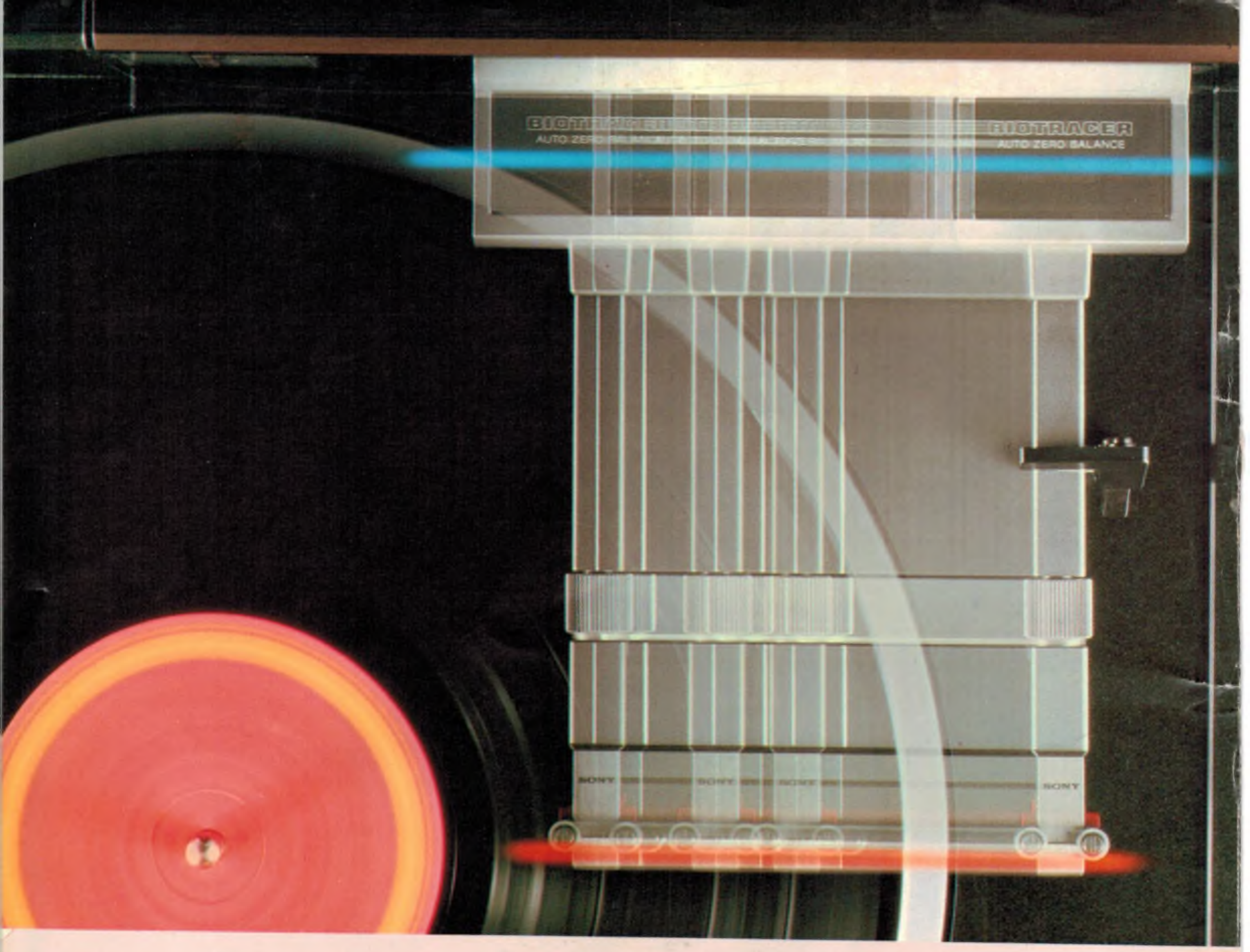

Off on a tangent with Sony.

We didn't jump into tangential tracking turntables right off the bat. And Sony hopes you didn't either. Because while most lateral tonearms don't exactly shift gears as they travel down their path, they do run into some rough spots. A hang-up called "cogging" that inhibits totally free flowing movement, and hampers left and right stereo separation.

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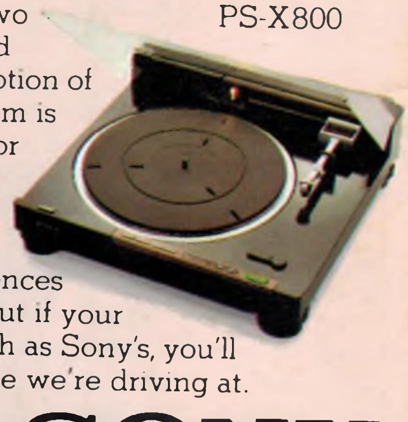

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ELECTRONICS AUSTRALIA

Volume 45, No. 1
January, 1983

AUSTRALIA'S LARGEST SELLING ELECTRONICS MAGAZINE

Remote control for TV sound

Kill those pesky TV commercials with this infrared TV sound control. It features eight steps of control, including full off, and can be built for around $40. Details p40.

This new plugpack regulator lets you power personal audio equipment from the mains. We tell you how to build it on p52.

On the cover

Eavesdropping on the bands using scanners may be the latest craze, but are scanners legal? Our feature article on page 16 has all the details. (Cover artwork produced by Mike Middleton and Sue Balson, and supplied by Dick Smith Electronics).

FEATURES

HIFI, VIDEO AND REVIEWS

PROJECTS AND CIRCUITS

PERSONAL COMPUTERS

COLUMNS

DEPARTMENTS

Editorial Viewpoint

Spend defence funds in Australia

As many readers will be aware, Australia has had two destroyers fitted with the American Phalanx anti-missile weapon. This is essentially a radar and computer-controlled Gatling gun which fires "penetrators" at the rate of 3000 per minute. The hope is that the hail of "bullets" will destroy the missile before it destroys its target.

While some people may regard Phalanx as the ultimate expression of the futility of war, in the wake of the Falklands, it does seem as though a weapon like Phalanx is a necessity if maritime forces are to be effective. So Australia has decided to buy Phalanx and, as part of the deal, Australia will make the ammunition.

The question I would like readers to consider is this: If Australia's defence department considers that we should make the ammunition, why can't we make the whole weapons system? Superficially, at least, there is little in the Phalanx system which could not be duplicated or at least adapted to local manufacturing capability. For example, instead of using depleted uranium in the penetrators (for maximum mass) Australia will use a special jacketed penetrator.

Certainly, some components for an Australian version of the Phalanx would probably have to be imported but that should not be a barrier. And having asked the question about an anti-missile system, why cannot Australia make other high-technology items?

If the government had a policy that a major part of defence needs must be satisfied by local sources, a number of very worthwhile benefits would be produced. First, research and development into many areas of technology would greatly increase. One has only to look at the R&D in America and Europe to realise that much of it is defence based or related. Secondly, the number of skilled engineers and technicians would also increase.

As our manufacturing skills increased there would be a consequent improvement in employment. In other words, instead of regarding the defence budget as mostly money down the drain, even though it is absolutely necessary, we could obtain much greater benefits from this large amount of spending by spending more of it locally rather than overseas.

There would also be a strategic benefit in that we would be less reliant on overseas suppliers. And in the international sphere, Australia would become less dependent on America as an ally in times of threat. We could "stand on our own two feet". And who knows, we might even start to sell defence equipment to other countries.

Leo Simpson

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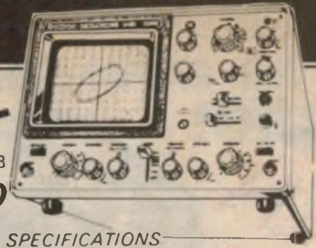

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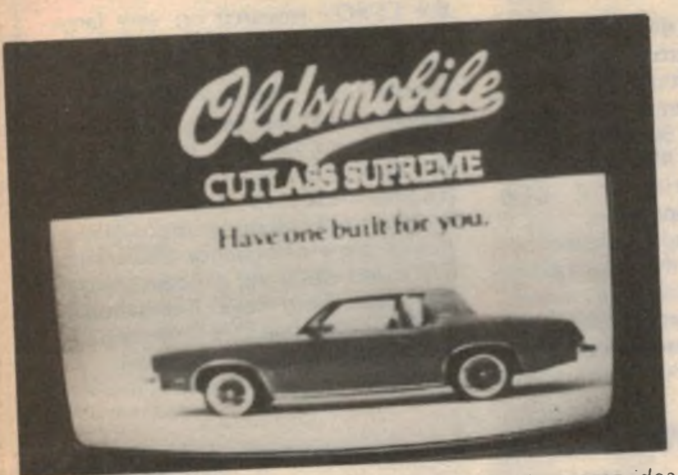
Australian experimenter plugs into CBS



Taken from colour prints, these photographs give some idea of the excellent picture quality.

On the 20th November, 1982 a transponder on board Intelsat satellite 413, orbitting the earth at 179°E, was switched on for the first time, enabling Sydney's channel 9 television network to have full-time access to the United States' CBS network – and experimenter Victor Barker to receive the same transmissions using a private earth station.

Victor's interest in receiving satellite television transmissions dates back to the mid-seventies, when international use of satellites increased to the extent that pictures could be received on a daily basis. Some of his previous experiments were covered in an article in the November, 1981 issue of "Electronics Australia".

His system has been upgraded in the last year to take advantage of Intelsat relays of domestic ABC transmissions from Perth and Brisbane as well as the CBS transmissions and two international program interchange transponders on the original Intelsat satellite at 174°E. Plans for the next year include the construction of a five metre dish antenna and a low noise amplifier to further improve received signals.

Victor warns against purchasing domestic satellite receivers from overseas unless the user has extensive experience of FM video and microwave techniques. Domestic satellites as used in the United States, Europe and the USSR operate on different bands, use linear polarisation and radiate about ten times the power of Intelsat international satellites. Equipment from overseas will also be of little use for receiving transmissions from the domestic AUSSAT satellite when it comes into service in 1985, as the specifications are different again.

First step towards artificial muscle

The first step to an artificial muscle which would revolutionise robotics may have been taken by researchers at the Massachusetts Institute of Technology.

Researcher Toyoichi Tanaka and his colleagues have reported that when an electric field is applied across a gel the gel may collapse to a volume several hundred times smaller than the original state. Such gels, controlled by low-voltage signals from microcomputers, may eventually be used as artificial muscles.

A gel – a jellylike material halfway between a solid and a liquid – consists of long-chain polymer molecules forming a tangled network and immersed in a solvent. The liquid prevents the network from collapsing, while the network stops the liquid flowing away.

In previous research Tanaka showed that large changes in the volume of a suspended gel can be brought about by small changes in temperature, solvent composition, acidity or low voltages. All these stimuli cause the gel to change from one network arrangement to another.

Using cylindrical fibres 3cm long and 4mm in diameter, Tanaka has shown substantial changes in volume with signals of from 1 to 2V. When the electric field is removed the gel returns to its original shape in about 10 minutes.

According to Tanaka the collapse time is approximately proportional to the square of the diameter. Micron-sized gel fibres should collapse in a matter of milliseconds. "It's very interesting that when nature made the muscle, nature made a bundle of very thin fibrils, of micron size, which make the muscle respond within 10 milliseconds," he says.

Natural muscle itself is a kind of gel in which the passage of calcium ions determines the volume. "We have a new phenomenon in which we can use electric fields to control this," says Tanaka. "We should be able to make artificial muscles in the future in which we can control the contraction and expansion by electric fields."

Next step is to extend the research to other gels. Tanaka says that "this question is very important because we showed theoretically that this is a very general phenomenon". There is already some evidence that sharp transitions can occur in other gels.

Trade mission for scientific instruments

A trade mission aiming to show what Australia has to offer in advanced technology recently completed a two month visit to Europe. Organised by ASIA, (the Australia Scientific Industry Association) with backing from the Department of Trade and Resources and the Victorian Economic Development Corporation, the mission took samples of Australian-made scientific instruments to Germany and France during November and December last year.

The mission was led by Dr Clive Coogan, author of the article "High Technology and Australia" which appeared in "Electronics Australia" in December 1981. Dr Coogan is a CSIRO officer and Chairman of ASIA.

The trade mission was the first from Australia to specialise in scientific instruments, although many Australian manufacturers have achieved considerable export success in the past years.

Dr Coogan quotes the levels of export for Varian Techtron, which ships 85% of its production of optical spectrophotometers overseas. Another company, Scientific Glass Engineering, exports 95% of its production of liquid and gas chromatography components.

Among the instruments shown by the mission were the Australian-designed opto-electronic components of the "Spacelab" telescope and a display of projects derived from

Dr Clive Coogan.

the CSIRO's research on very large scale integrated circuits.

Also on display were meteorological instruments, including tipping-bucket rain gauges and solar radiation instruments, from Medos and Rimco; atomic absorption spectrophotometers from Varian Techtron; nephelometers from IEI and Analite; power-frequency CROs from BWD; and electronic process control equipment from Royel International, the latter including CSIRO-devised oxygen probes for use in furnaces.

Electric vehicles give top Games performance

ELECTRIC VEHICLES were used for the first time in an Australian marathon event during the 1982 Commonwealth Games in Brisbane and, according to the South East Queensland Electricity Board, their performance showed that they are a viable means of transport. Lucas Industries, the Australian Electric Vehicle Association, and the Australian Lead Development Association provided two electric Bedford one tonne vans for two events: the 30km road walk at Manly on 7th October, and the 42km marathon run in Brisbane on 8th October. One was used as the lead vehicle for both events and carried officials and press photographers, while the other served as a field vehicle for the marathon, picking up exhausted or injured competitors.

A time and distance electronic display board, designed and built by staff from the SEQEB, was positioned on top of the lead vehicle and provided spectators with an instant update on the distance travelled and the time of the leading runner. The SEQEB's own electric vehicle, a Daihatsu Charade, also played a prominent part in both events. It transported the chief judge for the 30km road walk and the referee for the 42km marathon.

FIBRE-OPTIC NEPHELOMETER

For those readers unfamiliar with the term, a nephelometer is a device used to measure the scattering of light. The device, pictured above, is made by Analite, a subsidiary of Selbys Scientific, and was recently shown in France and Germany during a recent trade mission to Europe (see story above).

Invented by Dr Clive Coogan of the CSIRO, this particular device uses a LED light source together with fibre optics to introduce the light into a liquid and to collect the back-scattered light. The result is a low-cost, continuous-reading nephelometer with a thin probe that can be poked into the liquid being measured, and which can handle turbidities 200 times beyond the range of standard nephelometers.

Although originally developed for laboratory titration measurements, the device has also found application in other areas. These include: measuring protein and fat in milk; monitoring the "setting" of cheese during cheese making; monitoring the settlement of sludge in sewage ponds; determining the density of sperm in bull semen; monitoring metal particles in automotive engine oil; checking soil in run-off water; monitoring the efficiency of the flotation process and the settlement of fines in mining; and the ability to measure the refractive index of a liquid.

The search for space monsters

Sixty-eight prominent scientists from around the world have joined in a call for an international effort to detect radio signals from extra-terrestrial civilisations using existing radio telescopes. It is the first time that such a search has been endorsed by distinguished scientists – including seven Nobel prize-winners – across a wide range of fields.

Carl Sagan of Cornell University initiated the petition, with other signatories including Francis Crick, co-discover of the double helix of DNA, Marvin Minsky, a pioneer of artificial intelligence and Roald Sagdeev, director of the Russian unmanned space program.

Last year funding for Sagan's SETI (Search for Extra-terrestrial Intelligence) project was cut from the NASA budget, although a $1.5 million grant was made for prototype hardware to analyse signals from outer space. Under consideration is a design for a receiver which can analyse eight million wavelengths simultaneously.

John Billingham, head scientist of the SETI program, believes that there is a good chance of finding extra-terrestrial life because "the laws of Darwinian evolution push life in the direction of gradually increasing complexity."

Other scientists, including some radio astronomers, are not so optimistic. Tony Hewish, acting director of the Cambridge radioastronomy observatory said of Sagan's scheme: "I am rather neutral about this. It is better to attack the problems you are interested in – there are always plenty of exciting things to do in astronomy".

Electronics courses at Newcastle Technical College

Newcastle Technical College will offer a range of trade, post-trade and special courses in electronics in 1983. A part-time Electronics Trades Course is offered, over three years, with attendance either one full day per week or two nights per week.

Block release courses are also available for country students, requiring three days attendance every three weeks. In addition, post trade courses are available in television principles, industrial electronics and semiconductor electronics.

Special courses available include microprocessor circuits and applications, film and television production for education, principles of two-way radio and a two-way radio users' course.

For further information contact the Senior Head Teacher, School of Electronics, Newcastle Technical College, Maitland Road, Tighes Hill, NSW 2297. Telephone 61 0461, ext 367. Enrolments will be accepted on the 3rd, 4th, 7th and 8th February from 10am.

F/A-18 contract to British Aerospace

British Aerospace Australia has won the first design and development contract in Australia associated with the RAAF purchase of the F/A-18 Hornet tactical fighter aircraft. The contract from the McDonnell Aircraft Company is worth some $10 million and covers the design and development of portable electronic test equipment for the Hornet.

Called the "Avionics Fault Tree Analyser" , the equipment will be produced in British Aerospace's factory in Salisbury, South Australia. In addition to use with the 75 F-18s ordered by the RAAF the device may also be used by other customers of McDonnell, raising the possibility of significant export potential.

The Fault Tree Analyser is a portable, microcomputer based instrument which can be connected to the data bus of the F-18 allowing the aircraft's built-in avionics test system to be monitored and programmed from an external source.

"Bionic ear" developed in Australia

A "bionic ear" may soon be a reality for millions of nerve-deaf people throughout the world.

A prototype implantable hearing aid based on electronic processing of sound in a similar manner to that which occurs naturally in nerve fibres has been developed by the University of Melbourne in conjunction with Sydney-based firm Telectronics Pty Ltd. Recently the Department of Science and Technology agreed to fund further research and development, and it is expected that the device will be available by the mid-1980s.

The device works by picking up sounds and transmitting them to a miniature receiver implanted behind the ear. The receiver converts the signals to electrical impulses which are conducted to the inner ear where the nerve fibres are stimulated electrically to enable the deaf person to recognise speech and other sounds.

Next phase of the project is a full commercial development of the bionic ear, being undertaken by Telectronics and associated companies.

MOREE, NOV 3 – Moree 2, the second of two satellite earth station antennas at Moree in northern NSW, is now in operation following its official opening by the Minister for Communications, Mr Neil Brown. The new dish is 35.2 metres high, weighs 240 tonnes, and is 32 metres in diameter. Moree 2 and Moree 1 (at left) operate to separate Intelsat satellites over the Pacific Ocean, and transmit and receive all types of telecommunications.

The work of the ship's radio officer

Fancy a life on the ocean wave? A ship's radio electronic officer's life combines seafaring and an opportunity to use the latest electronic equipment. It is field that has developed rapidly over the past 40 years, with the promise of a lot more to come.

by CURT COLSTON

In 1934, when I joined the US Navy, a career in radio was most promising for many reasons. A well trained radioman could look forward to rapid promotion in the Navy and a variety of different assignments – in different classes of ships, submarines, shore stations and Navy aviation. In those days there were few opportunities in civilian life, even in the latter half of the depression.

Before 1937, a civilian ship's radio officer (RO) made less than $60 a month plus his room and board, but it was a job, and an opportunity to travel all over the world. Pan Am had started a flying boat service with their famous Clippers which carried an FRO (Flight Radio Operator); usually recruited from ship ROs and specially trained. Large aeroplanes in the old days had radio equipment that was very little more elaborate than a ship's radio equipment.

This situation changed so rapidly that, by the beginning of World War II, we had ILS (Instrument Landing System), GCA (Ground Controlled Approach), AM VHF, and ADF (Automatic Direction Finders) (also known as the "bird dog" because the needle pointed to the radio beacon to which it was tuned).

Flight radiomen continued to be used in aircraft flying over the oceans and desolate areas for over ten years after the end of the war. These were the good years for radiomen, with trips to Paris, Amsterdam, Geneva, Frankfurt, Luxembourg, etc. After each trip the FRO had a minimum of three days leave and sometimes as much as 15 days.

The author's ship, the Jersey. Electronics plays an increasing role in modern marine operations, from communication and navigation to the discharge of cargo.

A flight radio officer was required to have a complete knowledge of his equipment, as well as a knowledge of navigation and meteorology in order to anticipate demands by the captain. In addition to maintaining communications, making hourly position and weather reports, copying weather reports from the destination and alternates, and being ready to repair his equipment in flight, he was required to be able to man the direction finder in an emergency and to assist the pilot in "QDM" approaches.

In the QDM landing approach, as at Sandweiler Airport in Luxembourg where the only radio navigational facility was a radio beacon, the radioman would give the distance off and the magnetic course to steer for that leg of the approach. In actual practice the co-pilot would keep track on the ADF and this approach was not used where ceiling and visibility were good. This skill was acquired by long hours of drill on the direction finder trainer at the company operated FRO school. Figuring the distance to the station was done by knowing the true airspeed and the time for the bearing to change 10 degrees when the aircraft was abeam of the station.

In the early days, two radiomen were carried on flights from New York to Europe. These flights with fuel stops in Gander, Newfoundland; Shannon, Ireland; or Goose Bay, Labrador; Keflavik, Iceland; and Prestwick, Scotland took about 24 hours in the DC-4.

Back to sea

When the airlines converted to long-range radiotelephony, it was the end of a wonderful era for the FROs, many of whom went back to sea. Some FROs saw the writing on the wall long before the end came, and became pilots, navigators or flight engineers.

In the meantime electronic equipment on the ships was slowly changing and becoming more elaborate. With the addition of radar, echo sounders, automatic direction finders, VHF and UHF, satellite navigation, radio facsimile, walkie talkies, and entertainment equipment such as TV, HiFi, shortwave broadcast receivers, video tape players, etc, the Radio Officer became the Radio Electronic Officer with a corresponding increase in pay. The average pay of an American REO is $US5500 per month (before taxes). The pay on tankers and the larger bulk carriers is much higher.

Gone are the days when the RO could secure the radio shack upon entering some exotic port, go ashore, and return to the ship a couple of hours before sailing time. There is so much equipment to care for now that there is always something that needs attention. If it is not the radar or the echo sounder that is kaput, some sailor is complaining about one of the TV sets.

Compared to the modern REO, the radioman had a relatively simple job in the old days. He had in his care only two transmitters, two receivers, a manual direction finder, an automatic alarm, lifeboat radio, emergency batteries, and the ship's antenna system. All communications were by Morse on CW (continuous wave), or MCW (modulated continuous wave). The transmitters were therefore very simple. Some were MOPA (master oscillator, power amplifier) of only two stages. Some included buffer stages and driver stages, and some used crystal controlled oscillators.

Then, as now, the RO stood watch on 500kHz (600 metres or 500 kilocycles in those days), the international distress and calling frequency, for eight hours a day between 8am and 8pm. When going off watch the RO turned on the automatic alarm, which stood his distress watch for him. The auto alarm is activated by series of four second dashes separated by a space of one second. When a ship within about 1000km to 2000km transmits the auto alarm signal a relay in the auto alarm closes, energising the alarm bells on the bridge, in the radio room and in the RO living quarters.

In the old days the auto alarm was a very clumsy and cantankerous device. Timing was effected by motor driven wheels, cams, and relays. It was the greatest source of maintenance headaches.

Cluster of antennas on the MV Zim Kaohsiung is typical of modern vessels.

Transceiver, automatic alarm and emergency equipment in the care of the author.

The RDF (radio direction finder) was a simple device consisting of a rotatable directional loop and a receiver. The lifeboat radio was a ponderous box shaped instrument which was powered by a hand-cranked generator. It was kept on the bridge and carried to one of the lifeboats at the beginning of lifeboat drill.

In those days there was no radar. Radar came much later and it was years after the end of World War II that all merchant ships were equipped with radar and even longer before they started carrying two radars.

Most ships now have two radars. One of the most advanced ships' radar (exclusive of naval radar) is the Decca radar, not to be confused with the DECCA Navigation System. The Decca radar is all solid state, except the CRT, with the klystron local oscillator replaced by a Gunn diode. Two Decca radars may be installed so that if a modulator unit, display unit, or scanner of one is faulty, and some other unit is faulty in another, the good units may be switched to operate together, so that you have one radar that is operational.

Navigation equipment

The most advanced and elaborate piece of ship's electronic equipment is the "Satnav" (satellite navigator). Satellite navigation operates on the principle that, if a satellite's orbit, and its position in that orbit, is precisely known at any time, then the ship's position can be determined by measuring the Doppler shift on signals from the satellite.

The equipment on the ship consists of a quarter wave ground-plane antenna to receive 400MHz signals, a receiver, and a microcomputer. The US Navy operates six "Transit" satellites in orbit and the life of a Transit satellite is over five years. The accuracy of Satnav is around 300 metres, and a major factor contributing to this accuracy is a crystal in a constant temperature oven giving an oscillator accuracy of 1 part in 10^{11}.

In addition to the signal by which the Doppler shift is determined, the transmitted satellite data includes fixed and variable parameters. Fixed parameters are those of the satellite's orbit. Variable parameters are the small changes in the orbit over time and are determined by the US Navy tracking stations and up-dated every 12 hours. The up-dated information is transmitted to the satellites by the monitoring stations.

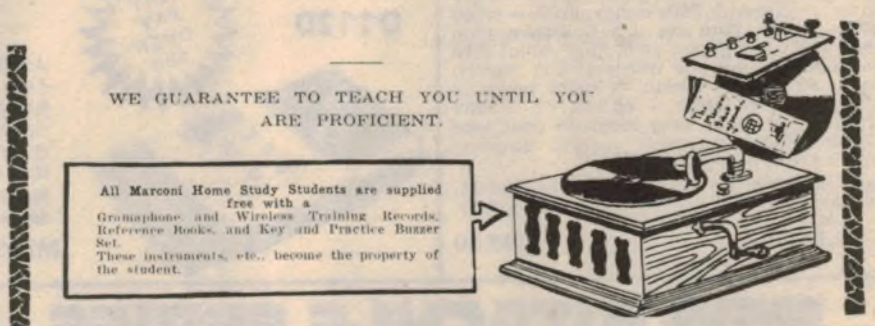
The input to the microcomputer consists of the above data plus the Doppler shift as measured by the receiver.

The read-out is on seven segment LEDs or on a VDU. By feeding course, speed, and current or drift into the input of the computer, the VDU will display the position at any time between fixes. Alternatively, the computer will give course and speed using the information obtained on the last pass of the satellite. Each measurement of Doppler shift gives an LOP (line of position). Several LOPs are obtained on each pass of the satellite. There are four polar orbiting satellites, their orbital planes separated by 45 degrees. The position of the ship is fixed by the intersection of two or more LOPs.

Other navigation systems are Loran, Decca, Consol, and Consolan. Loran and Decca are known as the hyperbolic systems because their LOPs are hyperbolas.

Marine electronics — then and now

The advertisement shown here is reproduced from the March 1, 1922 issue of "Sea, Land and Air" magazine. The Marconi School of Wireless then offered a home study course in radio, complete with a free gramophone and practice records. The advert concluded "With the limitless possibilities of Wireless, intending students should not delay".



Marine electronics

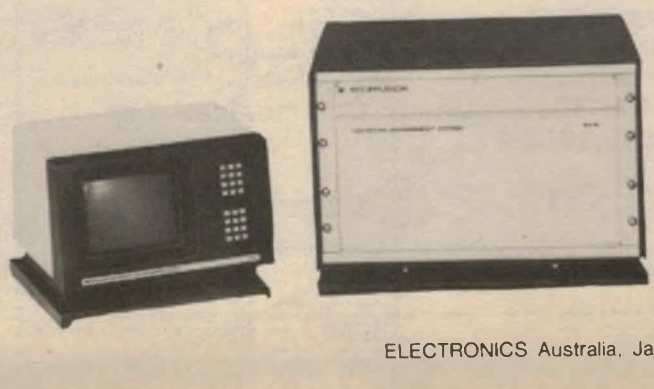
Electronics on board ships has increased enormously in complexity so that the REO has had to study and learn continuously to keep abreast of his equipment. The shipping companies plan to eliminate the radioman on ships by 1990. They probably will be able to eliminate him as a key pounder, but ships will always need a man to care for the electronic equipment and make repairs when underway.

Some American REOs have university degrees in electrical or electronic engineering. Almost all of the young ones have had at least three years at technical college. Australian radio officers are being given study leave in addition to their regular leave and are constantly working to up-grade their knowledge and ability to maintain modern electronic equipment.

An example of radio officers of other nations around the world is Hein Schmidt of Bremen who is RO on the container ship MV Columbus Victoria/DGVX, which calls at Sydney. Two modern communications receivers, a 1kW transmitter with CW, MCW, and SSB, a reserve transmitter, solid state auto alarm, and an ultra modern operating console are part of the equipment in his radio room.

The antennas in the photograph are on the MV Zim Kaohsiung of Brake, Israel. In the lower middle of the photo, the hemispherical shapes resembling flying saucers are the Vorta TV antennas. The double rings at the top comprise the Bellini-Tossi direction finder antenna. Unlike the loop antennas which rotate, the Bellini-Tossi is stationary and has a "search coil" in the receiver. This search coil rotates in the same manner as the loop in the loop antenna type. Just below the direction finder is one of the slotted waveguide type radar antennas. This is known as a "cheese" type antenna. The fork-like vertical antennas are for the transmitters.

There is still a future in marine electronics and young men who are interested in a career in marine electronics are trained at the Australian Maritime College in Launceston. Inquiries should be directed to the Admissions Officer, Australian Maritime College, PO Box 986, Launceston Tas, 7250.



Latest NV10 navigation system by Rediffusion uses both Omega beacons and Satnav satellite data. (Photo courtesy of Vicom International Pty Ltd).

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Jack O'Donnell

See EA November, 1982

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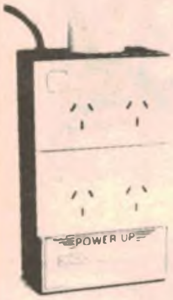

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Sensitivity	5mV div to 5V div 5% 10 calibrated steps 1mV div to 1V div 6% (When using x5 amplifier) Uncalibrated continuous control between steps 1 : 2.5 (provided with click positioning function)
Bandwidth	DC to 15MHz -3dB (at 4div) DC to 7MHz -3dB (at 4div) (When using x5 amplifier)
Rise time	24ns (for x5: 70ns typ)
Signal delay line	
Max. input voltage	600Vp-p or 300V (DC + AC peak at 1kHz)
Input Coupling	AC GND DC
Input impedance	Direct 1M ohm approx. 30pF
Operating modes	CH1 CH2 DUAL ADD DIFF
X-Y operation	CH1: X axis CH2: Y axis
Sensitivity	5mV div to 5V div (when using x5 amplifier 1mV div)
Phase difference	DC to 10kHz within 3°
X bandwidth	DC to 500kHz -3dB
Dynamic range	4 div or more
CH1 output	
Output voltage	20mV div or more (terminated into 50Ω)
Band width	50Hz to 5MHz -3dB
Output impedance	Approx. 50Ω

• Horizontal deflection			
Trigger modes	AUTO, NORM, TV (+), TV (-)		
Trigger source	CH1, CH2, LINE, EXT		
Trigger coupling	AC		
TV sync	TV sync-separation circuit		
Internal	1div or more (V sync signal)		
External	1Vp-p or more (V sync signal)		
Trigger sensitivity	Frequency	Internal	External
	20Hz to 2MHz	0.5div	200mV
	2 to 15MHz	1.5div	800mV
AUTO low bandwidth	30Hz		
Trigger slope	[illegible]		
External trigger input	Input impedance approx. 1M ohm, 30pF or less Max. input voltage 100V (DC + AC peak at 1kHz)		
Sweep time	0.2us div to 0.2s div ±5% 19 calibrated steps Uncalibrated continuous control between steps 1 : 2.5 (provided with click positioning function)		
Sweep time magnifier	10 times (± 7%)		
Max. sweep time	100ns div (20ns div and 50ns div, not calibrated)		
• Amplitude calibrator			
Waveform	Approx. 1kHz ±10% (typ), square wave		
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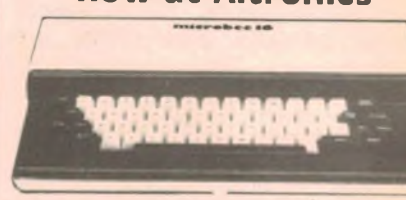

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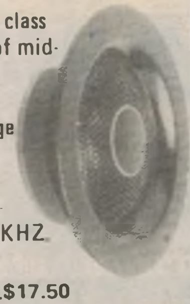

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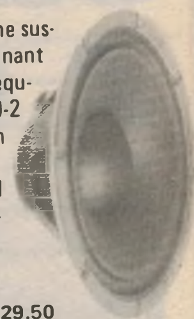

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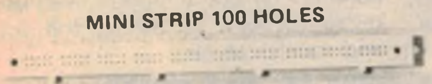

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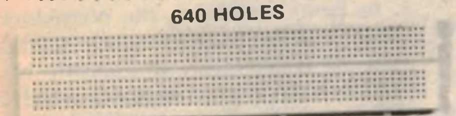

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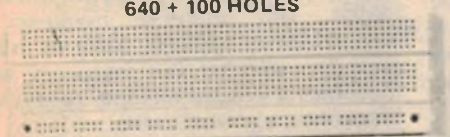

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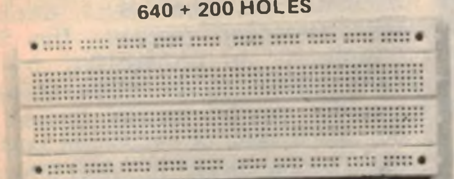

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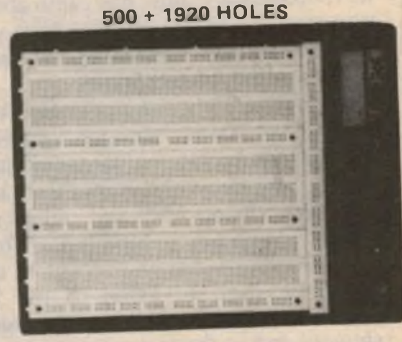

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SCANNERS & SCANNING

In recent months there has been a great deal of interest in the subject of scanners. What are scanners and what are people using them for? This article gives some of the history and technical background to this latest product technology.

When you have a close look at a scanner you may be surprised to realise that it is really little more than a glorified radio receiver. It is a radio receiver which is able to "scan" across a number of designated frequency bands or specific "spot" frequencies. Hence the name, "scanner".

So why is there any interest, then? Basically, people are interested in what a scanner can receive and how it receives it. To understand how this came about, it is necessary to go back a few years. More than ten years ago, in fact, it started in the United States.

Before the CB boom got under way in the United States, "stringers" (freelance cameramen and journalists selling stories to the new networks) found they could buy secondhand VHF taxi radios quite cheaply. With a little modification (often no more than a change of crystals), these could be used to listen to the local police, fire brigade and other emergency services and so the journalist could often obtain a good story ahead of colleagues not similarly equipped. (This story seems to have a close parallel with tow truck drivers in Australia. . Ed.) It wasn't long before US manufacturers caught on to the trend and in US magazines such as "Popular Electronics" one can find advertisements for scanners as long ago as 1969.

These early scanners were relatively unsophisticated and generally covered four or eight frequencies over a limited range and these were controlled by separate crystals. Perhaps the most advertised scanner in US magazines of the period was one made by Regency. Just who the product was intended for was not stated.

Later on, as the CB boom got under way in the US, some CB transceivers were offered which had a "scan" facility but this was confined to the 27MHz CB band. For the most part though, it would appear that there was little general interest in scanners until the CB boom died a few years ago. Then, having lost interest in CB (or childrens' band as some people derisively called it) hobbyists began to cast about for a new electronic pastime.

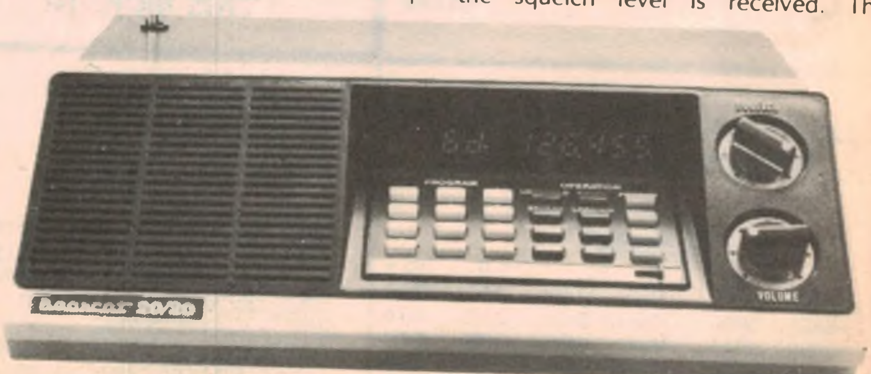
Lo and behold, the scanner beckoned. Now, scanners are a great deal more complicated and cover a very wide range of frequencies. They are microprocessor-controlled and can be programmed with lots of individual frequencies without the need for anything as prosaic as ordinary crystals. Today's models use phase-locked loop circuitry to synthesize all frequencies from a single crystal-controlled reference.

Scanners now cover both the VHF and UHF bands and have features such as "priority" channels, channel lockout and band search. Some models even use the microprocessor to control the volume and squelch levels.

How do they work?

As hinted at above, the phase-locked loop is at the heart of typical scanners. The PLL is essentially an oscillator which can operate at any frequency which is a multiple of the crystal reference oscillator which is typically at 2MHz or 4MHz. This reference frequency is divided down to 1kHz, 5kHz or 10kHz and the selected PLL frequency then becomes a precise multiple of this low frequency, eg, 66.152MHz.

In effect, the PLL is the first local oscillator in what is a double superheterodyne receiver. The PLL frequency is controlled by a counter/divider (in the microprocessor) and this can be stepped through a designated band of frequencies until a signal strong enough to break through the squelch level is received. The



The Bearcat 20/20 is one of the deluxe mains-operated scanners on the market.

receiver then locks onto this signal until it ceases.

Some scanners have an option whereby they will only stop and lock onto a signal for a few seconds. If you are interested in what is being said, you press a button to stop the scanning function.

If the scanner has the so-called "priority" channel function, it will automatically switch back to the priority channel if a signal is received on this frequency.

Since the functions are controlled by a microprocessor there is a random access memory (RAM) to store all the desired frequency settings. These are maintained in the RAM even when the unit is turned off, usually by a small 9V battery.

Since most scanners cover a very wide frequency range, they need to have a number of "front ends" and two detectors, one for amplitude modulation and one for frequency modulation. These are automatically switched in depending on the frequency being selected for reception by the microprocessor.

So basically a typical scanner is a microprocessor controlled double superheterodyne receiver which can be automatically set to scan almost any radio frequency band apart from those used for normal entertainment such as the AM and FM broadcast bands.

What can you listen to?

This will depend on a number of factors such as:

(a) the frequency coverage of the particular scanner;

(b) your location; whether you are at home or in your car;

(c) your antenna; and

(d) the channels actually in use at the time you are listening.

Perhaps the most important factor of those above is the antenna. All scanners are supplied with an extendable whip antenna which plugs directly into the back of the unit. For best results though, an outside antenna mounted on the roof of the dwelling is required. Then there is a choice to be made between broadband omni-directional antennas such as the groundplane or discone, or higher gain directional antennas. A selection of antennas is usually available from scanner retailers.

Depending on the final installation and the length and quality of coaxial cable required to bring signal from antenna to scanner, the additional cost to be added to a scanner purchase may be as much as $100 or more.

Some scanners can operate from 240V mains or from 12V DC. Thus they can be used at home or in the car. Others operate from 12V DC only so they need an external power supply if they are to be used at home.

Again, if the scanner is to be used in the car, an antenna installation will be required although this may be a relatively simple "gutter-grip" type.

The coverage of most scanners commences around 66MHz – the bottom end of the VHF "low band", a very popular business radio band. This extends right up to 88MHz, the bottom end of the FM radio band, which is normally not covered.

Some scanners cover the 108 – 136MHz international aircraft band. However, there is a problem here in that the aircraft band uses AM mode exclusively. So in order to do this the scanner has to switch in an AM detector. In models that offer this band, this is sometimes done by the microprocessor, but usually requries manual switching.

Above the aircraft band are TV channels, which are usually covered by a scanner more because its easier to cover them than not to! Above this again, is the 2m amateur band which is predominantly FM mode. Then comes the international VHF marine band around 156MHz which is again FM.

Higher still is another business radio band, the VHF "high band". Also in this band are the many emergency services and municipal and county councils. Most scanners then end their VHF coverage at around 174MHz because above this is mostly occupied by television channels. As most would realise, these do not make very interesting listening anyway!

As far as the UHF bands are concerned, most scanners begin at around 420MHz. It would seem that much of what interests scanner listeners occurs on these bands. For example, most metropolitan police forces now use the UHF bands, as do security services, taxis, tow truck operators and news services. And right at the top of most scanner's coverage is the frequency allocation for mobile telphones.

Controversy

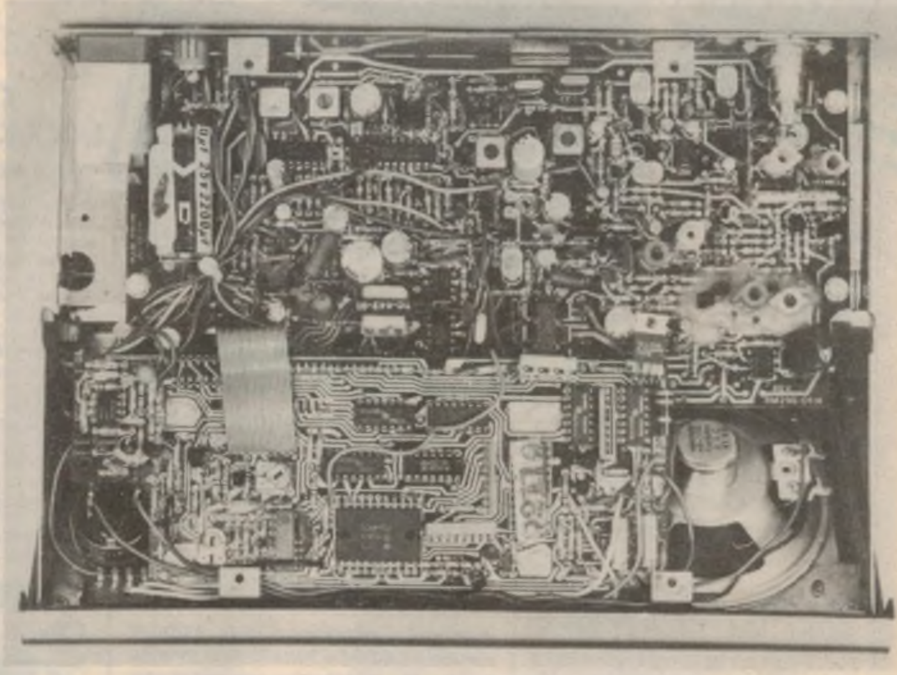
Understanadbly, some of the legitimate users of these services do not like the idea that what was once ostensibly private communication can now be listened to by all and sundry. In the United States the situation is apparently similar and some states enacted laws restricting scanner use. Whether these laws have been enforceable is another matter though, because of the US constitution.

Some US metropolitan police forces are now becoming favourably disposed towards the idea of their activities being actively monitored by the public. The reason for this is that the public gain some idea of the great amount of law enforcement activity.

In Australia, though, most legitimate users of these bands are not so favourably disposed. Police forces in particular are hostile and some moves have been made to ban scanners or to have scramblers used on the police radio network.

Legality of Scanners

Many readers will want to be assured of the legality of scanner use before they consider purchase of a unit. This is a question which may not be resolved until the new Communications Bill is enacted into law and this may take some time. For the present, the current Wireless Telegraphy Act of 1905 (when technology was somewhat less



This is the interior of the Bearcat 20/20 scanner. Note the microprocessor which is a quad in-line package.

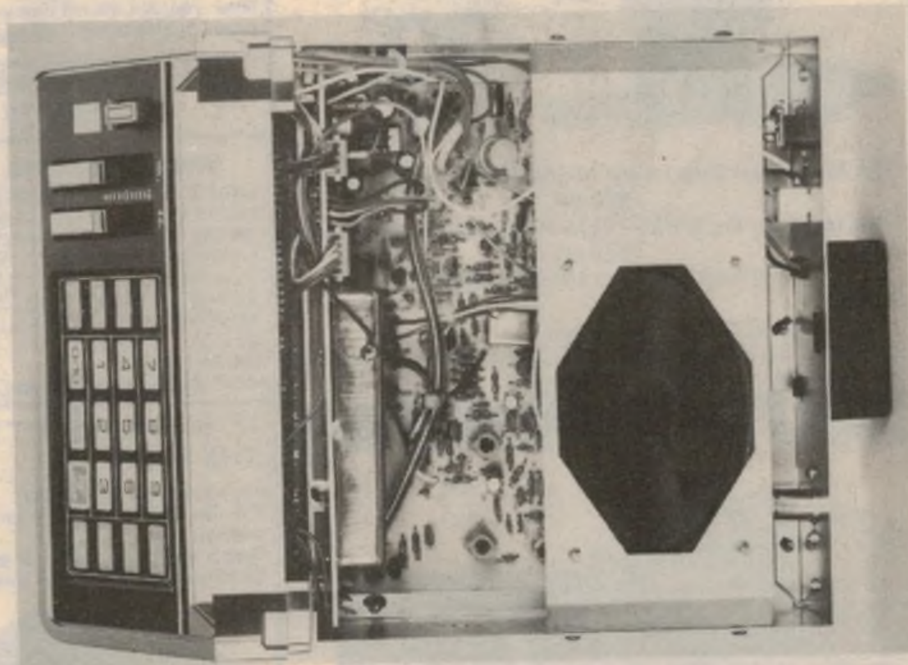
advanced) clearly outlaws unlicensed receivers:

"No person shall erect, maintain or use equipment for the transmission or reception of messages by Wireless Telegraphy" (revisions to the Act include Telephony in the definition of Telegraphy). By the above clause, the use of scanners is well and truly caught.

Two previous court decisions may have some bearing on any future legal proceedings involving scanners. The first, some years ago, became known as the "Nova-tech case" and involved a receiver which was widely advertised as being capable of receiving police frequencies. The importer/retailer concerned was charged under the Wireless Telegraphy Act clause quoted above.

This is the Dick Smith Pro 40, one of the lower priced scanners available.

This book has been recently released to provide a guide to the scanning scene.



This is the interior of the Dick Smith Pro 40. The battery for the memory backup supply is on the back of the case.

The case was eventually dismissed on the grounds that the Nova-tech receiver, as with most receivers available at the time, also had the AM broadcast band available. (Editor's note: Scanners do not include AM or FM broadcast bands although they do include some of the television channels).

A more recent and indeed, much more relevant case, occurred in Melbourne in 1979. The Victorian police discovered that a journalist was using a scanner to monitor their activities to gather new stories. The journalist was again charged under the Wireless Telegraphy Act.

Justice McInerney of the Supreme Court ruled that the journalist had no case to answer. An appeal by the Commonwealth was mooted at the time but to this date, it has not been moved. This may or may not have created a precedent. Essentially then, the strict legality of scanner use remains doubtful and this may still be the case when the newly drafted Communications Bill is enacted into law at some time in the future.

Perhaps predictably, many purchasers have not worried about these questions because a large number of scanners have been sold in Australia in the last few months. Some estimates have put the figure as high as 15,000 so far.

Reflecting the high level of sales, there has even been a book produced on the scanning scene. It is "Dick Smith's Australian Radio Frequency Handbook". As the accompanying photograph of the book's cover shows, the reader is invited to "get into the exciting world of 'secret' radio with a scanner". It remains to be seen whether scanner purchasers decide that the generally prosaic conversations on the VHF and UHF bands are, in fact, exciting. In the meantime though, there appear to be parallels between the present burgeoning sales of scanners and the exploding sales of 23-channel Citizens' Band transceivers before these units became legitimate.

Eventually, the CB boom led to many people becoming more seriously interested in electronics and many have become Amateur Radio operators. Do scanners have the same potential to interest people in the wider fields of electronics? That remains to be seen.

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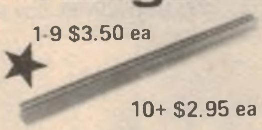

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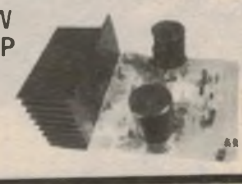

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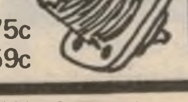

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Expedition to the Antarctic — Pt 2

Last month we told the first part of the story of the "Dick Smith Explorer" expedition to the Antarctic in commemoration of the Mawson expedition of 1912. Part two continues the tale with an account of scientific work in the area and the voyage home.

by DON RICHARDS VK2VXM/VK0DL

"The Dick Smith Explorer" spent almost three weeks moored to land-ice and rocks in Boat Harbour. During this time shore parties carried out scientific work within a day's march of the ship and a "bird" party was put ashore, from inflatable boats, on the Mackellar group of islands, where they stayed for several days amongst the penguins.

Within a few hundred yards of the boat, on land there were signs of previous human inhabitants. Foremost was Mawson's hut, at the head of the bay; two large joined huts, at the foot of a slope, strongly built in Baltic Pine during the short summer of 1912. It was from here that Mawson left with his two companions, Ninnis and Mertz, to explore the continent to the east during a three month sledge trip, a trek from which Mawson alone returned, his companions and dogs dead in the ice and snow.

Mawson's party erected several smaller huts for scientific observations and these were still standing. And above the harbour stands a wooden cross, erected to the memory of Ninnis and Mertz who gave their lives in the cause of science.

On the slope opposite stands a modern hut erected by ANARE (Australian National Antarctic Research Expeditions) that housed a group of four people in 1978 for several weeks whilst they examined and reported on the work necessary to restore Mawson's hut. We had been given permission to use this hut during our stay.

A view of Mawson's hut, looking south. Entrance is by a tunnel in the ice. All photographs in this article were taken by the author.

On the rocky ice-covered slopes and on the ice-flats above high water were colonies and rookeries of thousands of Adelie Penguins and their chicks; they croaked and squarked and flapped their wings and turned their backs to the freezing gales and blizzards that sweep down from the interior of the ice-covered continent.

Our communications changed whilst moored, in accordance with our changed activities. Walkie-talkies were taken each time a party went ashore for more than a few hours and by parties staying in the ANARE hut. The party taken by boats to the Mackellar Islands maintained contact by walkie-talkie and were alerted to bad weather or warned to prepare to be taken off. This type of communication is essential to reduce the risk caused by a change in the weather — which can happen in seconds. The general coverage of the FT-ONE was particularly useful for such contacts.

Now that the sails were down and the booms lashed I had space for a wire antenna, so I cut a dipole for 14.105MHz and rigged it from the mizzen to the inner end of the main boom. This gave it an angle of about 30° to the vertical. I also brought out the TS820S and set it up on the chart table which was no longer in use. Connections to the Tono RTTY were checked and leads repaired.

Our daily schedules contained some interesting traffic. Not only was there more to talk about but we also received a stream of congratulatory messages from many quarters. The Minister for Science and Technology exchanged messages with Dr David Lewis, as did Lord Shackleton and Dr Harry Edwards, MP.

Teletype communication was set up with VK2APQ, this mode suiting our circumstances very well. Not only was it "easy on the ears" but as Barbara could touch-type, the many personal and family messages could be passed quickly and accurately. Malcolm and Barbara often took on the job of second operator, which was most welcome if I wanted a spell or was preparing for a commercial schedule.

The Mawson expedition

The expedition organized and led by Douglas Mawson in 1911-1913 is rated by Antarctic historians as the best equipped and scientifically successful of the pre-World War I era. Mawson, a geologist and engineer, was the first to make effective use of radio communication for control and expedition news. He also realised the problems of Antarctic communication and set up a relay station on Macquarie Island. He carried electric generators, a well equipped workshop and an aircraft. The expedition members included Frank Hurly, a professional photographer of great skill and fortitude.

The expedition story is told in Mawson's book "The Home of the Blizzard" (Rigby) and later, by Lennard Bickel in "This Accursed Land" (Macmillan of Australia).

Permission had been given for us to enter Mawson's hut but we were not to move any of the things inside it. From the outside every passage way, doorway or opening seemed blocked with ice but an entry was dug through a narrow tunnel, just wide and high enough to push yourself along on elbows and knees – very cold, dark and wet! Inside, it was more than half full of ice. Ice hung from the ceiling and the roof beams were splintering under its weight. The workshop and observatory were almost impenetrable but a small section of the main hut was clear, as was Mawson's cubicle.

Around the walls were the bunks, two high, of the party members with their names carved or burnt into the wood. Shelves crammed with jars of food and medicines (mostly based on opium) – Mawson's bunk and chair – old magazines, telling of the sinking of the Titanic, and Sherlock Holmes novels, apparently preferred Antarctic reading. It all looked as though it had been left in a hurry when the relief ship appeared and the ship's boats could get to the shore to take off the seven men after that long second winter.

I brought the Honda generator across from the ANARE hut and took a 240V lead in through the roof so Malcolm could get light for his documentary shots. Eventually, we closed up some of the splits in the roof and replaced shingles. Then we closed the hut and left it until the Australian government can decide what to do with this national monument.

The next leg of the voyage was to the Mertz Glacier about 60 nautical miles to the east. The expedition geologist, Dr Harry Keys, was to conduct iceberg studies, plot the tongue of the glacier and, if possible, locate the tip of the tongue.

Inside the Mawson expedition's hut thick ice hangs from the roof beams.

The author inspects the cubicle in which Mawson worked.

Gales at the glacier

Here gales held our vessel against the glacier tongue for two days, ice floes and icebergs threatening to trap the "Explorer" and crush her against the ice cliffs. It was here also that the stern helical antenna was ripped off by a passing ice floe, as if to give warning of the true danger of the situation.

At the first break in the weather a lookout went to the crows nest and we set about finding a way out. About 12 hours later the vessel was in fairly open water and making for the French base at Dumont D'Urville. French champagne and steaming hot showers were the conversation topic en route but, in the event, it was water rationing and Australian Riesling. However, the hospitality and help given us by the French, and the secure mooring provided, compensated for both the shortage of water and the lack of bubbles!

The opportunity to go ashore into comfortable surroundings, enjoy the company of a group of young, friendly people, eat in a dining room, and sleep in a stable bed for a few nights was a wonderful change and a welcome

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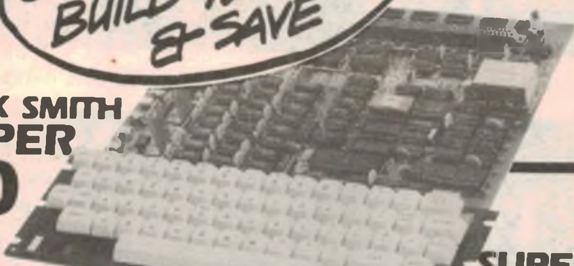

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Expedition to the Antarctic

preparation for the long voyage home. The scientists on board were able to carry out ice studies and biological studies at the one time so we made up for the days lost at the Mertz glacier.

Daily schedules went on as usual, one of particular interest being with an English expedition en route to the North Pole. This was arranged by Harry Caldecott, VK2DA, and through his efforts we made contact with Ric, VE8RCS at Alert, a weather station on Ellesmere Island, north of the Canadian Continent. Alert is the most northerly settlement in the world, at a latitude of 84°. Sir Ran Finnes, a British explorer, was leaving on an ice traverse to the North Pole and Jeni and Paul talked with Lady Virginia Finnes who was known to them from previous expeditions.

The voyage home

The weather was getting colder, the blizzards were more frequent and the sea water around the boat was starting to freeze. On Saturday, February 22, a break in the weather occurred so we took up the mooring lines and motored slowly through the narrow pass that led to open water — which by now was anything but "open". Icebergs, brash ice, and ice floes were all around and it was an anxious two or three days before we were clear.

I had changed the dipole from the main to the mizzen mast as the mizzen sail would probably not be used on the way home. I had also decided to mount the TS82OS for the return voyage and use the Sony 2001 receiver for cross-band reception from the Australian bases. This meant the FT-ONE had to be taken out of action, which I did with reluctance because its general coverage receiver had given excellent results.

I should mention that the Australian bases are issued with their own frequencies for inter-base communication. To work them, which I did almost every day for weather and ice reports and to give our position, it is necessary to receive on their transmit frequency using a general coverage receiver. They, in turn, receive our crystal controlled signal by similar means. The little Sony did this job well, keeping us in daily touch with the bases until I could work Hobart Radio using full crystal-locked transmit and receive.

During the return trip I had the opportunity to contact stations that had not been on the daily net, two interesting QSO's being with Frank VK9NYG on Cocos Keeling and Bob VK9NND on Norfolk. At other times I moved to 40 metres to keep in touch with Tasmanian amateurs and soon we were able to work Sydney on 40 metres which we did all the way up the NSW coast, both morning and evening.

"The Dick Smith Explorer" entered Sydney Heads on March 16 and anchored in Watsons Bay for customs and immigration. Pierce brought a 2-metre pack on board and talked us up the harbour as he drove by car to our berth at Circular Quay.

The path of the Explorer

During the course of the Oceanic Foundation Antarctic Research Expedition the "Dick Smith Explorer" covered 3600 nautical miles. First land-fall was Boat Harbour, in Commonwealth Bay, the site from which Mawson's historic expedition set out 50 years ago. The expedition also made a study of the Mertz Glacier and visited the French station at Dumont d'Urville before returning to Sydney. The journey occupied a total of almost three months.

Lessons learned

During the expedition of almost 100 days we were able to contact Australian or New Zealand amateurs on all but three occasions: twice due to solar flares and resultant ionospheric disturbance, and once due to low battery power. Contact was most usually on phone, but RTTY proved very reliable and convenient. I used CW twice when neither phone nor RTTY could get through, but it was amazing how well a weak RTTY signal would print.

Contacts were made with 110 amateur stations, covering Canada, Ireland, the USA, Pacific Islands, the Indian Ocean and Antarctica. Two amateur "firsts" are claimed — contact between an Arctic and an Antarctic expedition, and RTTY contact between a yacht at sea in Antarctica and an Australian station.

Our experience confirmed previous findings that a wire dipole on a yacht is a very effective antenna for long distance communication, the broad-band helical giving good results on 40 and 80 metres over shorter distances. Amateur operation has many advantages over commercial — for example, ease of changing frequency, range of frequencies available, useful receiver and transmitter features such as speech processing, RIT, IF shift, etc.

Commercial yacht equipment is required to be simple and rugged and capable of being operated by a relatively unskilled person. However, for the conditions we experienced, the amateur gear should be easy to operate. Gloved fingers do not cope readily with small co-axial knobs on a crowded panel, for example.

The 20 metre band provided good communication most hours of the 24, but was affected by solar blackouts as badly as all other bands. Frequencies above 20 metres were not useful and I could not get consistent results on 10 or 15 metres day or night using tuned wire or helical. Operating at times was difficult due to the low temperature and the motion of the boat. Also, standing up to operate for several hours at a time is hard on the feet!

So perhaps, out of that, come some suggestions for future maritime amateurs in the Antarctic!

Altogether, the expedition was a most interesting and enjoyable experience. I am amazed by the number of people who, since my return, have commented on how much they enjoyed being "with us" and I was always pleased to hear a new station come up in the net and say that he listened regularly to our messages and couldn't resist a contact. The interest and good fellowship generated by a well-run net relieved the frustrations that sometimes occurred when passing detailed messages under difficult conditions.

The benefits arising from the crew being able to talk with friends and family cannot be over-estimated, particularly when life is difficult or dangerous. All crew members drew strength from such contacts. The safety of the expedition was enhanced by the fact that the vessel's latitude and longitude were always known "at home" and this was reflected in crew morale.

I spoke with operators at the Australian bases almost every day. They were professional, friendly, helpful, patient — and always busy! The same comments apply to the operators at the ship-to-shore bases in Hobart, Adelaide, Melbourne and Sydney.

My thanks to all who participated and gave encouragement and assistance to us!

FORUM

Conducted by Neville Williams

Where there's smoke, there's a TV set — perhaps!

Self-destructing television receivers seem to have the same sort of fascination as rattlesnakes and piranha fish. They don't bite you, they don't consume you; they simply explode and set fire to your home at the slightest provocation. Or so it would seem!

Back in September, last, we ran an instalment of "Forum" with the heading: "TV receivers still catch fire — occasionally!". I mentioned in the introduction that, for a topic that by then should have been dead, "it exhibits a remarkable disinclination to lie down."

The remark still applies. The issue had been on sale only a few days when a reader posted to me a copy of the "Manly Daily" (Sydney) for September 11, 1982. The lead headline on page 1 proclaimed in bold type "Woman dies after TV fire wrecks home".

The story beneath the heading told how neighbours had noticed a fire in the elderly woman's home and had smashed their way in to find her unconscious. The lounge was on fire and one neighbour is quoted as suggesting that the lady, who died before reaching hospital, could have gone to sleep while watching television.

CAUSE OF FIRE?

Of the fire itself, the report said:

"Two large holes were found in the lounge room where fire had burned through flooring.

"One was thought to have been started by a cigarette and the other when a television set caught fire."

The reader who sent in the cutting asked simply and rather pointedly: "Based on the story, as published, wouldn't it have been just as pertinent to headline it another way?

"Woman dies after cigarette fire wrecks home".

It might even have caused a few people to question the safety of cigarettes, rather than of TV receivers!

Another letter came to hand from about as far away, in Australia, as one could get from Manly, NSW — from Berrimah, Northern Territory. It refers to a self-destructing TV receiver, which is probably a rather special case:

The set had been worked on unsuccessfully in Singapore before being brought into Australia and to the service company that I work for.

After cleaning up a badly mangled soldering job that had been done on the power supply board, and checking a few components, I tried it but nothing fired up. Further checking showed a faulty regulator transistor, which was replaced.

At the next switch-on, the power supply fired up but, about a second later, there was an almighty explosion as a 160V electro on the 130V line destroyed itself. Pieces of the capacitor lodged firmly in the wiring harness — a half-inch round bundle of plastic coated wires and burned quite intensely in about three different areas, with flames about two to three inches long.

I managed to blow the flames out. If the set hadn't been on the workbench, with the back off and someone on the spot, it would soon have been engulfed, with wooden case, plastic panels and wiring, and the picture tube exploding as well.

There wasn't enough left of the capacitor to determine if it had been put in the right way round but I guess that exploding electros could explain some of the situations talked about in your column.

We never did fix the set; scrapped it instead!

K. C. (Berrimah, N.T.)

Yes, K.C., I agree that there is evidence to suggest that exploding capacitors could be responsible for some of the traumas but there are at least two reasons why the case you refer to could have been non-typical.

One you have already mentioned: the possibility that the electro may have been wired in back-to-front — causing the demise of the regulator transistor. The next time around, the transistor won!

The other is that the receiver could have been designed for, or set for, a 220V mains supply. If connected to Australian mains, particularly during a period of over-voltage, the components could be subjected to considerable voltage stress.

MAINS VOLTAGE

This is one of the practical hazards of bringing in electronic equipment, bought over the counter in foreign cities. Whereas imports through normal channels are designed to cope with supply voltages of 240-plus, many near-equivalent models overseas are fitted with a switchable 110/220V mains transformer — seemingly near enough but not good enough for Australian conditions!

As a matter of interest, I have on my desk at the moment a table of standards and voltages from the British "Television" magazine. Of the many countries using the PAL system of colour television, most of them are shown as having 220V supply mains.

So there's ample reason for jetset bargain hunters to be careful!

The problem of high voltages is most commonly identified with Western Australia, where 260V is regarded as normal, by reason of the generation/reticulation equipment. However, according to a South Australian reader there are also problem areas in that state. I quote:

Some years ago, we were connected to the SWER — Single Wire Earth Return, with 19000V delivered to a transformer at the door. Voltages of 270 were not uncommon at the time. They were hard on light globes but using 250V rather than 240V globes eased things somewhat.

Talking to an ETSA technician one day, he said that their aim was to maintain 250V but voltage drop on some lines *made higher voltages at the source end necessary, with higher voltages to the consumer if the line drop was less, at a given time, than anticipated.*

Later installation of automatic switching transformers, suitably sited on heavily loaded lines, levelled this out.

Another electrician made an interesting point. He said that a long power line system can show an excessive voltage rise as it nears a resonant length, similar to an RF transmitting aerial. In fact, he said, measures are taken to keep the rise down.

With all of agricultural South Australia and much of the inner pastoral area now covered by SWER, there are some very long lines around!

R. B. (Quorn, S.A.).

The same reader comments on the tendency for Fire Brigade personnel to favour turning off appliances at the wall switch and even removing the plug from the socket when an appliance is not in use.

He says that, in older houses, there is no standard in regard to the wiring of power points and mains plugs, with the result that "there is a 50% chance that the appliance switch is in the neutral line, leaving the works live and looking for a stray path to earth."

By way of example he quotes the case of some friends who returned from a holiday to find that there had been an electrical breakdown in the washing machine. A fire had occurred but, fortunately, it had not spread. The washing machine was turned off but the wall switch was still on.

These days, most appliance switches should be of the double-pole type, interrupting power to the internal "works" of the appliance, irrespective of the supply wiring. However, there are probably a fair number of older appliances and gadgets around which still rely on a single-pole switch and there is always the possibility that the switch itself may fail, as per the September '82 "Forum".

SUPER PESSIMIST?

Another advocate for unplugging electronic equipment, when not in use, is an electrical engineer from Cairns in Queensland – emphasising the widespread nature of the discussion:

If you live in an area serviced by overhead electricity mains, there is a risk of damage by voltage surges during thunderstorms. Admittedly the risk is small but why increase it by leaving equipment plugged in when it is not necessary?

There is also a chance (again small but unfortunately on the increase) that a car will collide with a pole carrying both high voltage and low voltage cables, with the result that they touch. The time taken for the high voltage breakers to trip, back at the substation, is much too long to save solid state devices.

H. H. (Cairns, Qld).

FRENCH TELEVISION: Key dates

Turning back the clock, or rather the calendar, L.McD of Yeppoon, Qld, came across some information on French television in a copy of "Practical Television" magazine dated October, 1952. He recalled having seen another reader's question on the subject in an old issue of EA (November, 1980, page 25).

"Practical Television" pinpoints the following dates, which may be of interest:

1937: The first regular French TV transmissions commence using a temporary transmitter installed in the 985ft Eiffel Tower. Transmission standard 455 lines.

1938: Permanent equipment installed in the tower, fed by cable from three studios in Cognacq-Jay, Paris and an associated mobile unit. (Transmission was discontinued during the war).

1944: Transmission resumes on October 1, after wartime shut-down.

1948: French Authorities decide to adopt a higher definition system using 819 lines, but to maintain the low definition system for 10 years to service existing receivers.

1949: Low definition system readjusted to 441 lines. (It was later abandoned when fire destroyed the installation in the Eiffel Tower).

1950: A high definition service opens in Lille in September.

1951: High definition transmissions commence from the Eiffel Tower in May. Picture carrier 185.25MHz (3kW), sound carrier 171.1MHz (700W), both horizontally polarised.

THE PRESENT: The principal service is 625-line SECAM colour, with 819 lines regarded as an obsolescent monochrome system.

Back to the Sydney area, another electrical engineer (E. R. of Earlwood) debates the findings of the serviceman who was quoted in the September '82 "Forum". He had concluded that the fault in the particular TV receiver had occurred in the most damaged part of the set, the double-pole on-off switch. In so doing, he may have dismissed too lightly, the possible role of the fuses.

E. R. maintains that fuses operate with the least trauma when they are subjected to a moderate overload. When they are faced with a high current short across a high voltage, well regulated supply, they can rupture and track in a way that can set up an arc between the fuse connections. Thus, damage may concentrate around the fuse area, even though the fault may be a short in a remote part of the wiring.

I have seen this sort of thing happen with DC power mains, as in pre-war downtown Sydney, but never with AC mains. In any case, I doubt that it could have happened in the TV fire discussed in the September '82 issue, because the fuses were presumably isolated from the mains by the double-pole switch.

E. R. also expresses apprehension about TV receivers with "instant picture" circuitry, but that would be the least of our problems, if problem it is. As I pointed out in the September issue, the average modern home is thick with gadgets that are normally left plugged into live power points and are turned on and off by their own switches.

And, with the proliferation of devices with in-built clocks and timers, some of the circuitry is never turned off!

Included in that last category is a round half-million VCRs which spend their idle hours in the "Standby" position, maintaining the clock and timer and the TV antenna splitter/amplifier.

Perhaps we should be talking about the relative safety of modern electronic equipment, at least as normally marketed in Australia!

MICROPHONE MADNESS?

Visitors to stall 206, hall 2 of the "Fera" Fair in Zurich, Switzerland, could have been excused for believing that an attendant at the AKG display had suddenly flipped.

He had picked up one of the demonstration microphones, which was coupled to an active amplifier and had hurled it at a pile of rocks that just happened to be in the middle of the display area.

The amplifier protested loudly and the onlookers cringed, but the AKG attendant casually picked up the mic and repeated the Swiss equivalent of "Testing, testing, one, two, three . . ."

The thing still worked, so he hurled it at the rock pile again, and again . . . Finally, he handed the microphone to the spectators and invited them to have a go.

Mind, you, the microphone concerned was no ordinary model. It was AKG's D 330 BT stage model, advertised by the makers as being "the world's toughest stage microphone.

Being manhandled and dropped by Abba, Frank Zappa, Police, Manhattan Transfer was one thing, however. Being hurled against a pile of (non) rolling stones was something else!

Next day, a couple of soccer players show up and repeatedly boot the mic viciously against the rocks. More earsplitting protest comes from the amplifier but still the 330 BT survives: "Testing, testing . . . one, two, three . . ."

Three days after the show opened, after coutless drops, throws and kicks, the mic finally succumbs: the connector has broken and the shaft is too bent to allow another one to be fitted. But the transducer inside is still functional.

The above story came to us via AWA but they didn't invite us to come out and play missiles with an AKG mic in Parramatta Rd, Ashfield!

A line-up of historic television receivers at the Matsushita company museum in Osaka, Japan. In the model on the right, the picture is viewed via a 45-degree mirror beneath the lift-up lid.

And now, thirty years later . . .

In the same 1952 issue of "Practical Television", which gave details of the French system, there is an announcement of the establishment of television broadcasting in Japan.

It says that, after months of inquiry and consideration, the Radio Regulatory Commission granted a provisional licence to a private company, the Japan Television Broadcasting Company described as "a £2,000,000 amalgamation of three leading newspapers and three film companies.

The report goes on to say that "many newspapers express approval that private enterprise was entrusted with the initial start of television in Japan, rather than allowing it to become a state monopoly of the Japan Broadcasting Corporation."

Target date for the commencement of the service is the spring of 1953, with the Japanese Ministry of International Trade and Industry readying to help manufacturers get started in receiver production . . . "with 10,000 receivers off the line by March next".

Major producers of TV receivers would be Japan Electric, Tokyo Shibaura Electric, Matsushita Electric, and Mitsubishi Electric. Estimates put the cost of receivers at £150 for a 12in screen and £130 for a 7in screen . . . "prices which will certainly not lead to widespread use, as they are prohibitive for the bulk of the population".

But R. F. Tiltman, who wrote the article was less pessimistic: "If the present ambitious plans mature . . . there is every possibility of Japan entering the electronic field and making a determined bid for world markets in this modern industry."

Now, a mere 30 years later . . .

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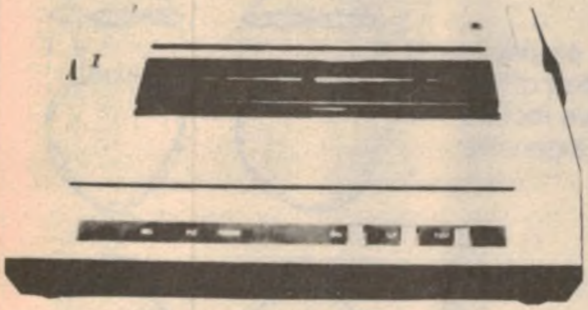
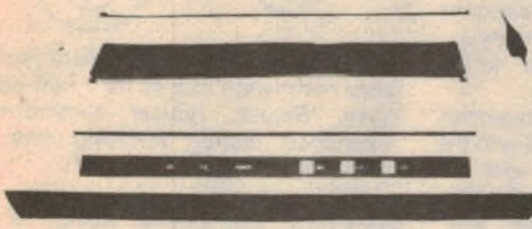


Pro/Writer Printer 8510

Print Features: Number of columns—136 col. max. Print Speed—120 CPS. Print Direction—Single-directional and Bidirectional, Switch Selectable. Throughput Speed—From 44 to 152 lpm. Character spacing (max. number of columns per line)—Pica 10 CPI (80), Double Width 5 CPI (40), Compressed Font 17 CPI (136), Double Width 8.5 CPI (68), Elite 12 CPI (96), Double Width 6 CPI (48), Proportional Double Width Proportional. Line Spacing—Variable to 1/144". Print Width—203 mm (8") max.
Forms Type: Fan Fold Roll or Cut Sheet: Width—113 mm to 254 mm (4.5" to 10.0"). Total Thickness—0.05 to 0.28 mm (0.002" to 0.011"). Number of Copies—Original + 3 copies nominal.
Form Feed: Method—Tractor or Friction. Form Loading—Either rear or top.
Interface—Serial: Method—EIA RS232-C and 20mA (40 & 60mA switchable option) Current Loop Serial Interface. Baud Rate (BPS)—110, 300, 600, 1200, 2400, 4800, 9600. Transmitting Method—Half Duplex. Synchronization—Asynchronous.
Interface—Parallel: Method—TTL compatible, 7-bit, parallel interface. Control Signals—ACK, BUSY, SELECT, DATA STB, INPUT PRIME FAULT, INPUT BUSY, PAPER EMPTY. Instruction Codes—(ASCII): CR, LF, VT, FF, CAN, SO, SI, DEL, DC1, DC2, DC3, DC4, GS, RS, US, FS, EM; GRAPHIC SYMBOLS: BIT GRAPHICS.
Error Detection: (1) Parity (VRC)—Odd, Even, No-parity. Switch selectable. (2) Framing Error—Stop bit check. (3) Overrun Error—Error is detected when data are received before the previous data have been processed.
Physical dimensions: 398 mm W x 120 mm H x 285 mm D (15.7" W x 4.7" H x 11.2" D).
Weight: 8.5 kg (18 lbs., 12 oz.)

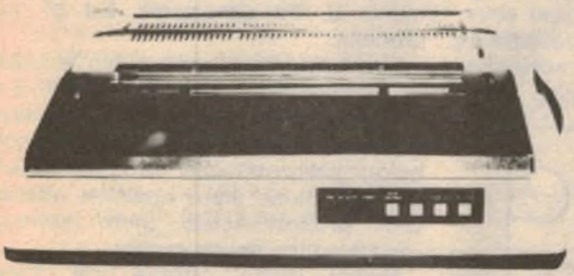
P* $795 ($725 ex)
S $845 ($775 ex)**



Model 1550

The Model 1550 is a compact desk-top dot matrix serial impact printer used for data communication terminals, hardcopy of CRT displays, peripheral terminals for minicomputers and microcomputers, and small-sized business systems.
The character format is a dot matrix of 7(H) x 9(V). or 8(H) x 8(V).
Print speed is 120 characters/second. Up to 136 characters can be printed per line at 10 CPI.
Its main features are: ● Compact desk-top dot matrix printer ● 136-column print ● Light-weight ● Low power-consumption ● High-quality print ● Bit image graphics ● Graphic Symbols ● Prints in six different languages ● High reliability ● Low cost.

P* $1225 ($1050 ex)
S $1275 ($1195 ex)**



Extra Special Microline 80
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F-10 Printmaster Daisy Wheel Printer

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

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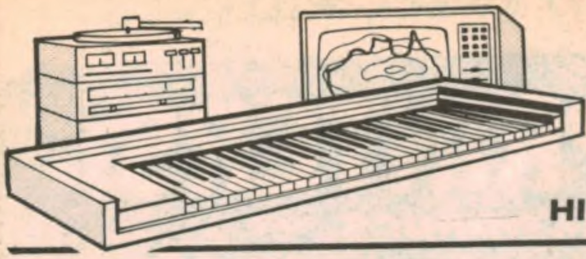

Audio-video Electronics

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LOUDSPEAKERS: Laser test equipment does away with the guesswork.

Time was when the design of a loudspeaker was based on price, precedent, theory, gut-feeling and listening tests — rounded off by a limited amount of measurement. Nowadays, the subjective factors are greatly diminished in importance, in the face of more extensive and more precise measurement of actual performance.

by GEORGE TILLETT

It has been known for years that loudspeaker diaphragms vibrate in nodes and anti-nodes, depending on their structure, their dimensions and the frequency at which they are excited.

Back in 1787, long before loudspeaker cones existed as such, Chladni published his "The Theori des Klanges", which described how the notes from an organ could vibrate flat diaphragms and form intriguing patterns in sand sprinkled over them. In later years, until quite recently in fact, lycopodium powder was used to make these "Chladni Patterns" in experiments performed in school labs for the edification of students.

Designers of loudspeakers have to contend with these nodes and anti-nodes, these "Chladni Patterns", these cone "break-up" patterns, which cause peaks and dips in the perceived frequency response, as sections of the diaphragm move independently in or out of phase. They constitute one reason why loudspeaker response curves can look so jagged to the eye — and sometimes sound "jagged" to the ear, as well!

Cone behaviour at low frequencies can be studied reasonably well with the help of an ordinary strobe light but behaviour at high frequencies was very difficult to analyse until the laser appeared on the scene.

Up till that time, diaphragm design was really a matter of trial and error, involving instinctive and painstaking work, and culminating in subjective evaluation by way of listening tests.

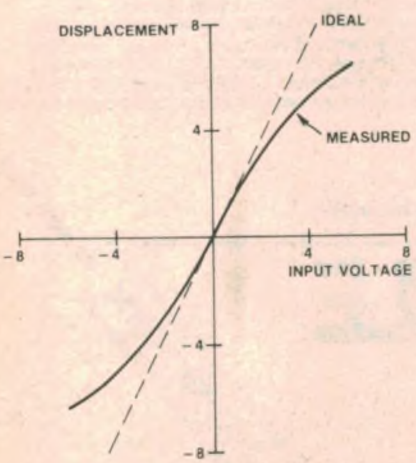


Fig. 2: As measured on the B&W Interferometer: a non-linear static transfer characteristic between the voice coil input and actual cone displacement.

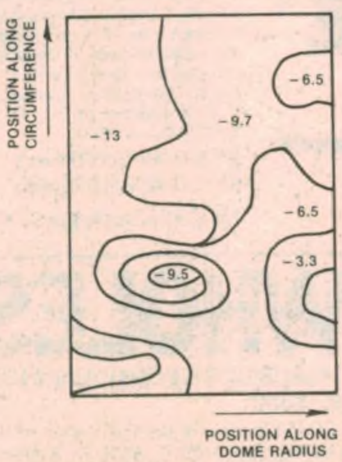


Fig. 3: A freehand tracing of a contour map showing the amplitude of a 2.5kHz signal over the surface of a 26mm dome tweeter. Harmonics can also be plotted.

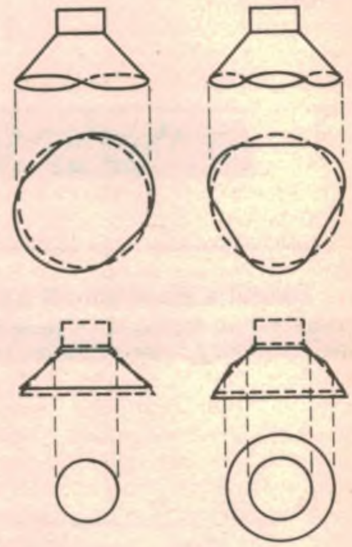


Fig. 1: Illustrated at the top are typical radial resonance modes for a free-edge cone. Below: typical symmetrical resonance modes involving one or more nodal circles.

Even now, loudspeaker design is as much an art as a science but tools like the computer and the laser are taking much of the guesswork out of the process.

Fig. 1 illustrates some potential radial and symmetrical resonance modes of a free-edge vibrating cone. Of necessity, the modes illustrated are simple ones but excitation at higher frequencies can produce much more complex effects with proportionately more serious impact on the sound quality.

Radial mode effects are most commonly caused by irregularities in the suspension or by cone flexing. Symmetrical modes commonly result from energy reflected back from the free edge towards the centre; they interact with the source energy to form concentric "standing wave" patterns, and are more serious in their effect on sound quality than radial mode aberrations.

Early methods of using the laser as a research and design tool involved illuminating the whole cone with laser light. This was reflected on to a photographic plate, which was also illuminated by a reference beam from the laser, the two beams creating an interference pattern.

After the plate had been developed, the resulting "hologram" could be viewed by laser light. Parts of the cone at rest (nodes) might typically appear light while those in motion (antinodes) would appear dark.

Because the wavelength of laser light is extremely small (only about 0.6μm for a helium-neon type) the technique enables displacements down to about 1μm to be seen but each procedure took appreciable time and the holograms were frequently difficult to interpret, anyway.

In 1978, the well known British Company B&W Loudspeakers Ltd decided to invest in a "Vibration Interferometer", as developed by the Atomic Energy Establishment, based at Harwell England. This, too, uses a laser but the principle of operation is much more advanced.

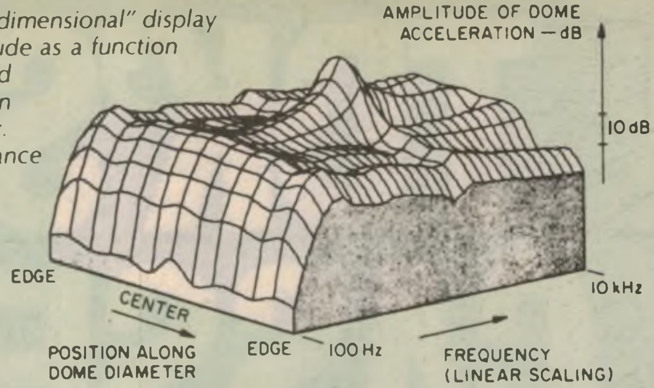
The beam from the laser is directed towards the surface to be examined — in this context a loudspeaker cone — but passing, en route, through a Kerr cell and a polarised beam splitter (more about these later).

Reflected light from the cone is passed back along the optical path and then diverted through one of a pair of photomultipliers to electronic processing circuitry: a differential amplifier and frequency discriminator, as well as to a counter/processor and thence to both analog and digital instrumentation, including a PDP 11/40 computer.

Reverting to the Kerr cell, mentioned earlier, this modifies a small proportion of the laser beam energy, causing a 90-degree polarity shift and a constant frequency shift of about 5MHz.

Because of the polarity shift, it is diverted by the polarising beam splitter (also mentioned earlier) clear of the loudspeaker cone and back along another optical path to the second photomultiplier and the second input to the differential amplifier and output

Fig. 4: A "three-dimensional" display showing amplitude as a function of frequency and cone diameter in a dome tweeter. Note the resonance peak centred at about 6kHz.



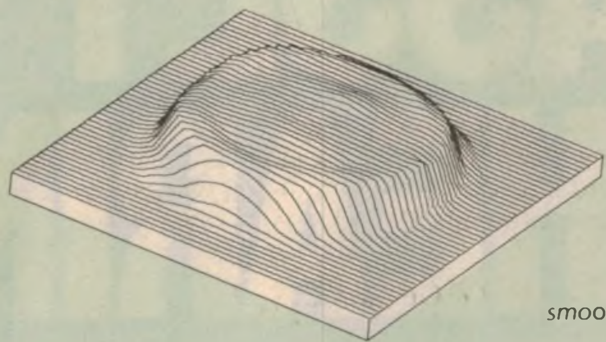
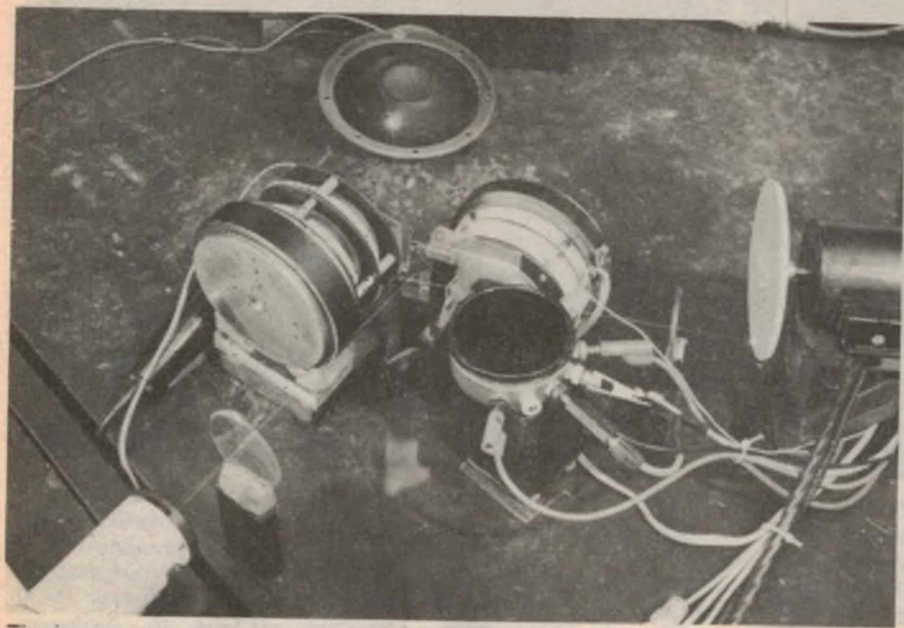


Fig. 5: Another "three-dimensional" plot, this time of B&W's new TM20 LM 12mm tweeter, at 12kHz. The contour is notably smooth and free of peaks.

The B&W Interferometer set-up on the left and electronic instrumentation and computer terminal (right).



The basic elements of Wharfedale's SCALP (Scanned Laser Probe) system, set up on a benchtop for display purposes. Like B&W's Interferometer, it provides Wharfedale engineers with vital information about loudspeaker behaviour.

instrumentation. In short, it serves as a reference beam, constant in frequency but displaced from the original beam by about 5MHz.

The two frequencies are sensed and compared by the instrumentation when the cone surface is not moving.

When the cone is in motion, the reflected beam is modulated and a voltage is generated by the FM discriminator. The order of frequency modulation is, of course, proportional to the velocity of the illuminated portion of the cone surface.

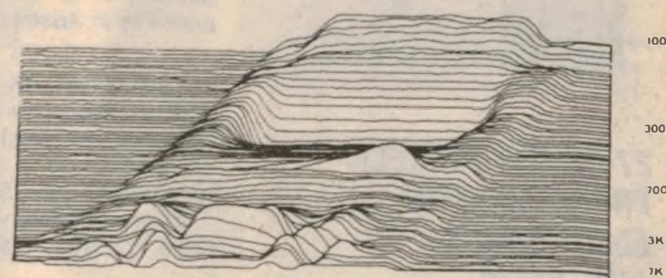
Because of the initial frequency displacement of the reference beam, the system can sense not only the direction in which the cone is moving, but also the instantaneous displacement. Amplitude and phase responses can be displayed and stored on a magnetic disk by the PDP 11/40 computer.

(It is evident that the computer is a most useful "tool" and, on a recent visit to B&W I noted several access terminals in the factory.)

The position of the beam on the cone surface can be controlled manually but, for some applications, it can be controlled by a system of stepping motors, with a suitable data feed from the motor shafts to the computer. Complex measurement programs can therefore be initiated and the data stored for subsequent examination.

Fig. 2 illustrates how the laser interferometer can measure a non-linear transfer function — a distortion caused by a too-tight suspension system.

Fig. 7: A frequency response plot of a slice across the centre of a mid-range cone from 100Hz to 7kHz. Odd behaviour is apparent.



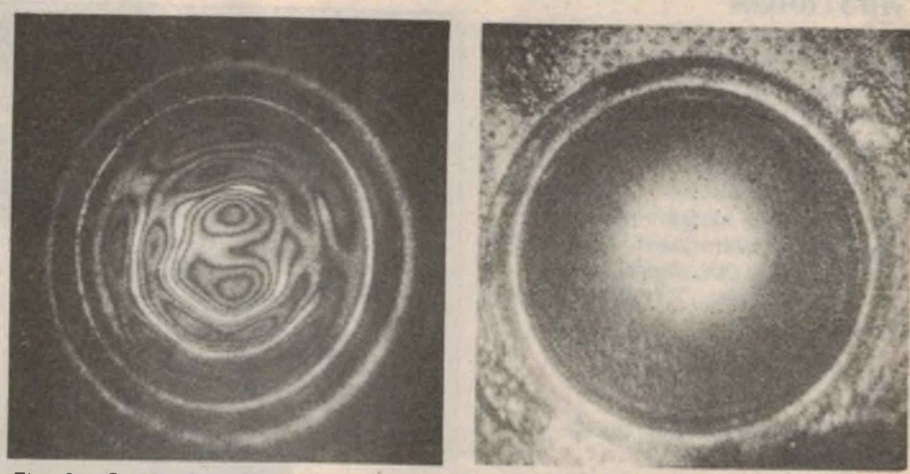


Fig. 6a: Seen through the eyes of Wharfedale's SCALP, the cone on the left has severe break-up problems while the cone on the right (Fig. 6b) is free of the effect.

Fig. 3 represents a planar computer plot of the amplitude of a 2.5kHz fundamental drive signal over the surface of a 26mm dome tweeter. Similar contour maps can be drawn for the second, third, or any other harmonic.

"Three-dimensional" displays are also very useful as they can show the actual position of defects that cause trouble and a typical example can be seen in Fig. 4. The resonance is centered on 6KHz with a peak of some 30dB.

The response of B&W's new TW20 LM tweeter (Fig. 5) is notable for a smooth, symmetrical contour pattern and it demonstrates what can be achieved with this remarkable new laser technique.

The graphical representation of the dome behaviour was derived from the velocity impulse responses measured at 180 points distributed over the dome surface. The frequency of the applied signal was 10KHz.

WHARFEDALE ALSO

I also visited the Wharfedale factory on this trip and again, I was impressed with the advances in laser technology. Wharfedale were pioneers in the use of holography and Dr. Fryer is justly proud of his Scanned Laser Probe system which rejoices in the name SCALP.

It is quite similar to the B&W system: Light from the laser is divided into two parts or beams; one is directed to the loudspeaker being tested and the other to a rapidly rotating disk which changes its frequency by exactly 10.7MHz. Both are returned to the beam splitter which then sends a composite beam to a photocell.

The two components beat together to produce a signal which is amplified, passed to an FM discriminator and an X-Y plotter. When the speaker cone is stationary, a steady DC signal is

Shortly after World War II, a small enterprise was set up in a farmhouse in Wennebostel, Sweden, under the name "Labor W". It began by manufacturing vacuum tube voltmeters but, in 1947, diversified into dynamic microphones. In 1958, the company was renamed Sennheiser Electronic and, under the guidance of its founder, Professor Dr F. Sennheiser, grew into a concern with over 1000 employees and world-wide representation. Recently, at age 70, Professor Sennheiser (left) handed over control of the company to his 37-year-old son, Dr J. Sennheiser (right). In the centre of the picture is Mr Jim Cunningham, Managing Director of R. H. Cunningham Pty Ltd, authorised distributors for Sennheiser products in Australia.

generated but, as soon as the cone moves forward, the light beam is shifted upwards in frequency. Conversely, when the cone moves back, the reflected frequency will be lower.

The beam falling on the loud speaker cone passes through two mirrors connected to magnetically energised coils: one drives the beam across the cone while the other scans vertically, enabling the plotter to build up a three-dimensional picture of the cone's vibration.

"Contour Maps" can also be

Unabashed by the challenge of new technology discs, TDK have upgraded the performance of their range of audio cassettes and re-packaged them for immediate recognition. The Laboratory standard mechanism, once reserved for the SA-X, MA and OD (now AD-X) series is now used for the AD and SA series. Silver striping distinguishes the good-results-modest-price cassettes, while a gold stripe indicates hifi specialist quality. Performance specifications have been revised upwards. [For details, contact Miss Colleen Maloney, at TDK (Australia) Pty Ltd, PO Box 100, Pyrmont NSW 2009. Phone (02) 660 4955].

TWO NEW TAPE RECORDERS FROM TEAC

Pictured on the right is the newly developed TASCAM model 58 0.5in eight-track recorder and reproducer, successor to the well proven professional model 80-8.

For those who need a deck of similar quality but with fewer channels, the TASCAM model 52 is available, a 0.25in two-track master recorder and reproducer, which replaces the 35-2D. Both have facilities and performance commensurate with a professional recording environment and warrant close consideration by anyone planning to equip or update. For detailed information, contact Travers Falkiner, Tascam National Product Managar, TEAC Australia Pty Ltd, 115 Whiteman St, South Melbourne 3205. Phone (03) 699 6000.

produced and Fig. 6a and 6b show a cone with break-up problems compared with a high quality one as used with Wharfedale drive units.

SCALP gives "three-dimensional" plots of a cone's behaviour in a fequency range and a variation is called FRESP which is translated as Frequency Slice Plot (Fig. 7). With this method, the vertical scanning beam is turned off and each curve plotted is of the same horizontal slice but at a different frequency. With both kinds of plots, it is possible to change the phase of the display so "holes" become peaks.

Yet another possibility with FRESP is to make curves at any phase angle in relation to the loudspeaker input and the way a slice across the cone behaves throughout a complete vibration cycle can be studied.

As a matter of interest, both Wharfedale and B&W use computers for crossover design and it was fascinating to see complex equations solved in seconds. However, engineers still have to carry out the programming . . .

In brief

TELDEC of West Germany, well known for their expertise in phono record vinyl technology, have come up with a technique which may well supersede vinyl in at least one important role — that of the master recording.

Traditionally, master cuts are made in vinyl, which is then given a thin coating of silver or gold to form the base for an electroplating operation.

While the technology has been highly refined, it does have its drawbacks. For example, the stylus needs to be heated and also specially shaped to produce a clean groove, with edges free of burrs and tears. The silver or gold metal deposition can also introduce problems, with dust particles being a particular hazard at this stage.

The new Teldec development replaces the vinyl master with a stainless steel disc, heavily plated with copper. They say that the inscribed groove is inherently clean (no burrs or tears) and is a more accurate record of the signal shape, because of the absence of plastic deformation.

Also, because the master is already in metal, the whole operation of depositing silver or gold and plating is eliminated. The master can be used more directly for the manufacture of dies and stampers.

AKG ACOUSTICS have gone one better than other manufacturers, with their latest hifi headphones. Not only are they miniature, not only do they fold flat, but the band folds like a pantograph so that they can fit into a pouch. (Talk to AWA at 554 Parramatta Rd, Ashfield, NSW 2131.)

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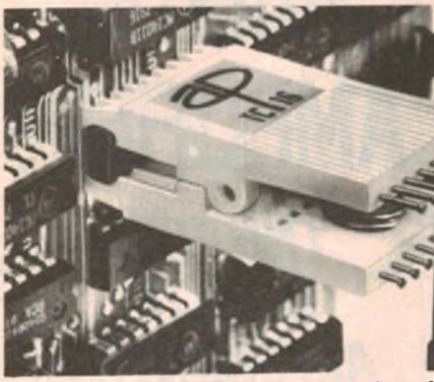
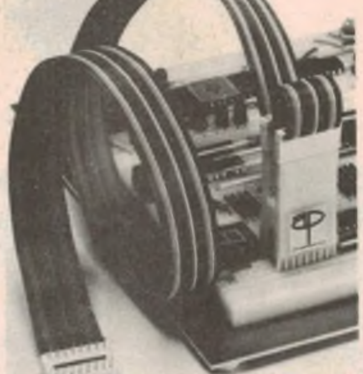


IC TEST CLIPS — We've improved on the original

The Super-Grip II IC Test Clip has a narrow nose for fitting on DIP's on high-density boards. "Open-nose" design also permits probe tip access at DIP leads. New "duck-bill" contacts are flat, won't roll off narrow DIP leads. Contact comb fits between DIP leads, eliminates shorts. New "nail-head" contact pins keep probe hooks from sliding off. Offset pin rows allows probes to hang free on longer top row pins and not interfere with shorter lower row. Sizes to fit all DIP's (TC-14 fits 14-pin DIP etc.). Gold-plated or unplated alloy-770 pin contacts. Simplifies testing, trouble-shooting and QC inspection. Also available with long, headless lead pins for attaching cable connectors.

IC Test Clips — AP No.				IC Test Clips
Alloy 770		Gold-Plated		
Std.	Headless	Standard	Headless	
923695	923690-08	923743-08	923739-08	TC-08
923698	923690-14	923739-14	923739-14	TC-14
923700	923690-16	923743-16	923739-16	TC-16
923702	923690-16LSI	923743-16LSI	923739-16LSI	TC-16LSI
923703	923690-18	923743-18	923739-18	TC-18
923704	923690-20	923743-20	923739-20	TC-20
923705	923690-22	923743-22	923739-22	TC-22
923714	923690-24	923743-24	923739-24	TC-24
923718	923690-28	923743-28	923739-28	TC-28
923720	923690-36	923743-36	923739-36	TC-36
923722	923690-40	923743-40	923739-40	TC-40
923724	923690-48	923743-48	923739-48	TC-48
923726	923690-64	923743-64	923739-64	TC-64



LOGICAL CONNECTIONS

A P Logical Connections are a Test Clip/Jumper Assembly combined. They are ideal for microprocessor-to-logic analyzer connections. The Test Clip end is a pair of single-row socket connectors attached to the pins of a Super-Grip II Test Clip. The remote end is a DIP connector. Connectors are molded onto the 18" color-coded flat ribbon cable. Probe access holes in backs of all connectors. Factory tested.

LOGICAL CONNECTION (Test Clip and Jumper)		JUMPER ONLY (No Test Clip)
End	AP No.	AP No.
With DIP Plug	923884-16	922594-16
	923884-24	922594-24
	923884-40	922594-40
No DIP Plug	923880-16	922590-16
	923880-24	922590-24
	923880-40	922590-40

Suffix denotes No. of pins.

CONNECTOR PINS AND SOCKETS

Two sizes cover from .019" to .035" pin dia. Solder cup accepts up to 22 AWG wire. Has exceptionally secure grip. Units cannot be over-stressed, are practically indestructable. Pins are hard brass. Sockets are beryllium copper with brass sleeve, permit no contact damage. Gold-over-nickel plated.(100/pkg.)

MINIATURE 8-PIN CONNECTORS

Shown above; incorporates above pins and sockets. No. 923625 fits A P test clips with long, headless contact pins and fits on .025" sq. posts. No. 923626 fits all A P plug-in circuit boards. Cover provides excellent strain relief. Glass-filled nylon body.

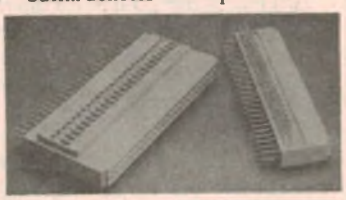
AP No.	Pins and Sockets
923610	Connector sockets .019"/.028"
923612	Connector sockets .028"/.035"
923614	Connector pins .019"
923616	Connector pins .030"
AP No.	**8-pin Connectors**
923625	8-pin connector .028"/.035" (F)*
923626	8-pin connector .030" (M)
923627	8-pin connector .019"/.028" (F)
923628	8-pin connector .019" (M)

*Attaches to test clip.

AP No.	Description
922576-20	20-pin connector
922576-26	26-pin connector
922576-34	34-pin connector
922576-40	40-pin connector
922576-50	50-pin connector
922578-20	20-pin switch
922578-26	26-pin switch
922578-34	34-pin switch
922578-40	40-pin switch
922578-50	50-pin switch

INTRA-CONNECTOR and INTRA-SWITCH

Connector mates in-line with standard .1" x .1" dual-row socket connectors & headers. Right-angle pins permit probing or daisy-chaining. Intra-Switch permits in-line, on-off switching to test individual circuits. Switches actuated with pencil or probe tip.



DIP JUMPERS

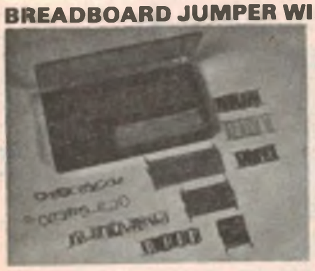
DIP jumpers fit standard DIP sockets. Ideal for jumpering within PC boards; between boards, backplanes, and motherboards; I/O signals, etc. Connectors molded onto cable for optimum strain relief; factory tested; probe access holes on backs. Conductors: 28 AWG. Color-coded cable uses 10-color sequence.

Dip Jumper — Connector on one end	
AP No.	No. Pins
924102-36	14
924112-36	16
924122-36	24
924132-36	40

Dip Jumper — Connector on both ends	
AP No.	No. Pins
924106-06	14
924106-12	14
924106-18	14
924106-24	14
924106-36	14
924116-06	16
924116-12	16
924116-18	16
924116-24	16
924116-36	16
924126-06	24
924126-12	24
924126-18	24
924126-24	24
924126-36	24
924136-06	40
924136-12	40
924136-18	40
924136-24	40
924136-36	40

Suffix in AP No. is length (-06 = 6 in.)

BREADBOARD JUMPER WIRE KIT



Each kit contains 350 wires cut to 14 different lengths from 0.1" to 5.0". Each wire is stripped and the leads are bent 90° for easy insertion. Wire length is classified by color coding. All wire is solid tinned 22-gauge with PVC insulation. Packaged in a convenient plastic box.

JK1 Wire Kit . . . 923351

MALE AND FEMALE HEADERS

Molded-in, straight and right angle male headers have 36 posts per row. They are stackable to make up matrices of .025" sq. posts on PC boards or to use as patchboards for discrete connections. All mate with female connectors on .100" spacing. Posts extend .235" and .100" beyond .100" sq. header for wire wrapping and soldering. "Break to row length" feature. Posts are alloy 770, unplated. Female headers also are stackable and mate with matrices of .025" sq. or round posts on .100" centers. 36 "tuning fork" contacts per row are molded into header strip with .100" solder tails for PC board mounting or cable attachment. "Cut to row length" feature. Contacts are alloy 770, unplated. Dual-row headers are ultra-sonically welded at factory.

AP No.	Headers	No. Rows
929974	Female header	1
929975	Female header	2
929834-01	Male header, straight	1
929836-01	Male header, straight	2
929835-01	Male header, rt. angle	1
929838-01	Male header, rt. angle	2

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Baeumlesweg 21 • D-7031 Weil 1 • W. Germany

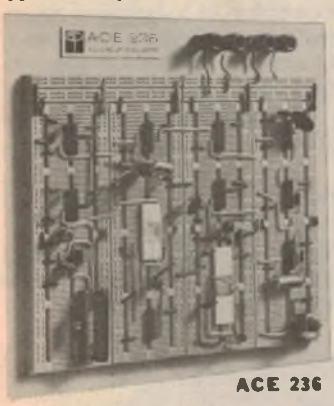
ACE ALL-CIRCUIT EVALUATORS

Two kits and five assembled breadboards for quick build-up and check-out of experimental circuits. All models have integral voltage distribution system with solderless, plug-in tie points on universal .100" x .100" matrix for excellent circuit design flexibility. These ACE's accept all DIP's, TO-5's, discrete components and solid wire patch cords to .032". Use buses for voltage, ground, reset and clock lines, shift command, etc. Five-way binding posts. Aluminum base serves as ground and has gold-anodized protective surface. Multi-tie-point terminals are non-corrosive nickel silver. Four rubber feet included.

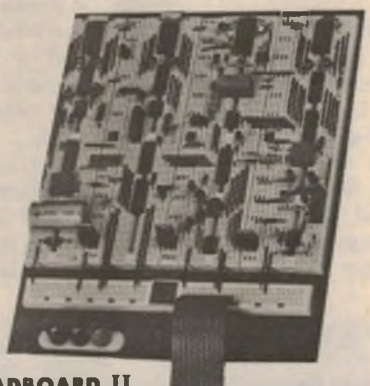
Powerace 101
923101 . . . 120 VAC
923221 . . . 220 VAC

Powerace 102
923102 . . . 120 VAC
923222 . . . 220 VAC

Powerace 103
923103 . . . 120 VAC
923223 . . . 220 VAC



ACE 236



BREADBOARD II

Fully assembled. Unique system of 3 distribution strips, two levels of printed circuits and 3 binding posts. 18 buses are color coded and internally connected to 3 corresponding color binding posts. High distributed capacitance and low inductance design minimizes unwanted voltage spikes, provides superior low impedance system. Same solderless, plug-in matrix features as ACE's. Laminated NEMA G-10 glass epoxy; circuits and gnd. plane are 2-oz. copper; terminals are copper alloy 770.

AP No.	ACE's and Breadboard II	Tie-Pts.	DIP Cap.	No. Buses	No. Posts	Size (inches)
923333	ACE 200-K (kit)	728	8(16's)	2	2	4 9/16 x 5 9/16
923332	ACE 208 (assem.)	872	8(16's)	8	2	4 9/16 x 5 9/16
923334	ACE 201-K (kit)	1032	12(14's)	2	2	4 9/16 x 7
923331	ACE 212 (assem.)	1224	12(14's)	8	2	4 9/16 x 7
923326	ACE 218 (assem.)	1760	18(14's)	10	2	6 1/2 x 7 1/8
923325	ACE 227 (assem.)	2712	27(14's)	28	4	8 x 9 1/4
923324	ACE 236 (assem.)	3648	36(14's)	36	4	10 1/4 x 9 1/4
923605	BB II (assem.)	2696	36(14's)	18	3	7 x 9

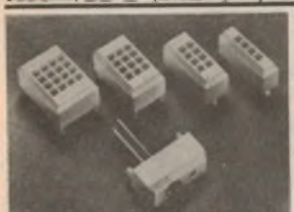
POWERACE POWERED BREADBOARDS

Fully assembled. All three Powerace models offer a new dimension in convenience for fast, solderless, circuit building and testing. Each incorporates two A P Super-Strips with 1680 plug-in tie points to hold up to 18 14-pin DIP's. Breadboards accept all DIP sizes including RTL, DTL, TTL and CMOS devices, TO-5's and discretes with leads up to .032" dia. Built-in groundplane — ideal for high-frequency and high-speed/low-noise circuits. Interconnect with any solid 20 or 30 AWG wire via plug-in tie-point blocks on panels. Operate on 200 to 240 VAC at 50 Hz or on 110 to 130 VAC at 60 Hz (with fused power supplies). Ripple/noise is ≤ 10 mV at full load. Dimensions of all three Poweraces are: 7.5" wide, 11.5" deep, 4.0" high at the rear, but only 0.75" high at the front for working-level convenience. Weights are approx. 2.5 lb. Complete operating instructions included.

POWERACE 101 — General purpose for all types of circuits. Power supply is regulated, adjustable from +5 to +15 VDC at 600 mA. Line and load regulation is ≤ 3%. O-15 VDC meter for monitoring power supply or circuits.

POWERACE 102 — For prototyping digital circuits. Power supply is regulated +5 VDC at 1 amp. Line load regulation is ≤ 1%. Built-in pulse detection with memory — combined with three buffered logic indicators, provide free built-in logic probe. Also contains two logic switches, four data switches, a clock generator and a one-shot pulse generator.

POWERACE 103 — Triple-output power supply for linear and digital circuits has outputs of +5 VDC at 750 mA; +15 VDC at 250 mA; and -15 VDC at 250 mA (±15-volt outputs track). Line and load regulation is ≤ 1%. Meter is built-in 15-O-15 VDC. Also contains two buffered logic indicators, two logic switches and two data switches.



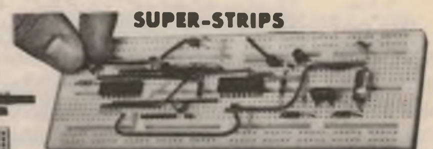
TIE-POINT BLOCKS

Four models available with .1" matrix of solderless, plug-in, 4-tie-point terminals for custom layouts, attaching relays, displays, in/out patching. LED block accepts 3/16" dia. bulb (not included). All models have solder tails and mount by press-fitting into holes. All styles packaged 20 per pack

AP No.	Tie-Point Blocks	Tie-Points
923297	TB1 (single)	4
923299	TB2 (double)	8
923301	TB3 (triple)	12
923303	TB4 (quad)	16
923305	LB1 (LED)	1
923306	Assortment: 4 each of above 5 styles	

TERMINAL AND DISTRIBUTION STRIPS

For building custom breadboards. Solderless, plug-in matrices on .1" x .1" centers that accept all DIP's, TO-5's, discretes and solid wire jumpers to .032". Terminal strips available in 4- and 5-tie-pt. single and dual rows. Distribution strips available with 2 or 6 buses. Includes integral, non-shorting mounting backing.



SUPER-STRIPS

Universal, breadboarding elements have 840 solderless, plug-in tie points, integral, low-impedance distribution system, accepts all DIP's, TO-5's, discretes and solid jumpers to .032". Hold up to nine 14-pin DIP's. Choice of contact finishes. Includes integral, non-shorting, instant-mounting backing.

AP No.	Terminal Strips, Distribution Strips and Super-Strips	Buses, Terminals and Tie Points	DIP Capacity	Size# (in.) L. x W.
923273	217L Terminal strip	34 five-tie-point term.	2 (16's)	1.8 x 1.36
923269	234L Terminal strip	68 five-tie-point term.	4 (16's)	3.5 x 1.36
923265	248L Terminal strip	96 five-tie-point term.	6 (14's)	4.9 x 1.36
923261	264L Terminal strip	128 five-tie-point term.	9 (14's)	6.5 x 1.36
923291	154R Terminal strip	54 four-tie-point term.	*	6.5 x .63
923289	264R Terminal strip	128 four-tie-point term.	9 (14's)	6.5 x 1.1
923285	206R Distrib. strip	2 buses of 24 tie points	....	3.5 x .35
923281	209R Distrib. strip	2 buses of 36 tie points	....	4.9 x .35
923277	212R Distrib. strip	2 buses of 48 tie points	....	6.5 x .35
923293	606R Distrib. strip	6 buses of 24 tie points	....	6.5 x .43
923252	SS-2 Super-Strip	128 five-tie-point term. &	9 (14's)	6.5 x 2.25
923748	SS-1 Super-Strip†	8 buses of 25 tie points	9 (14's)	6.5 x 2.25

*Model 154R is a single strip of terminals: all others are dual row for DIP's.
†Gold-plated copper alloy terminals. #Height of all strips is .32 inches.

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Hifi Review

Teac T-707 synthesised AM/FM tuner

The T-707 tuner is an attractively styled unit with features such as quartz locked circuitry, fluorescent display and a 12-station memory. An inbuilt 400Hz oscillator provides a constant level reference tone for use with tape recorders.

The T-707 digital synthesiser AM/FM stereo tuner is one of the latest offerings from Teac. With an overall height of only 72mm, there should be no problem finding enough space in the average hifi system for this tuner.

Other dimensions of the tuner include a width of 432mm and a depth of 289mm. The weight is listed as 3.7kg and the power consumption is 10W.

Tuning knobs are a thing of the past with this synthesised tuner from Teac.

The front panel has a two-tone colour scheme of silver and grey, the silver being a scratch finish aluminium panel into which is set a grey plastic section housing most of the pushbutton controls and the fluorescent display.

The fluorescent display contains illuminating segments to show such information as frequency selected in MHz or kHz, received signal strength, stereo mode operation, band selected (AM or FM) and whether the memory is in store mode.

The pushbutton controls include AM or FM selection, a memory activation button, six memory enter and recall buttons, mode and muting buttons and a "rocker style" tuning button. In addition there is an inbuilt 400Hz oscillator to allow calibration of a tape recorder (either cassette or open reel) so that signals from the tuner can be recorded on a tape at the optimum level.

The tuner contains memory to store the frequencies of six AM and six FM stations. To place a station in memory it is necessary to tune to the desired station and then press the button labelled "memory". A portion of the fluorescent display will then light up with the word memory, and upon touching one of the buttons labelled 1-6, the station frequency will be stored at that location.

If no station is stored within a short time of pressing the "memory" button, then the tuner will "time out" and return to normal operation. Stations may be stored in any order and are recalled by simply pressing the buttons labelled 1-6 without first pressing the "memory" button.

If the desired station is on the other frequency band, ie AM instead of FM, then it is also necessary to push the button selecting that frequency band before recalling the station from memory.

Manual tuning is achieved by pressing either side of the large tuning button according to the desired direction of change. Touching the right hand side of the button causes the tuner to move up in frequency while touching the left hand side moves it down. Short touches on the button step the tuner in increments of 9kHz on AM and 50kHz on FM.

Sustained pressure on the button will cause the tuner to scan up or down the band with the output muted. There is no provision for an automatic stop when the tuner reaches a station so a close watch needs to be kept on the bar graph display to see when a station is reached.

When first turned on, the tuner will come up on the last station to which it was tuned in the frequency band selected. The tuner memory is protected against power loss (eg blackouts) for up to a week by a 3.6V nicad battery which is presumably float charged during normal operation.

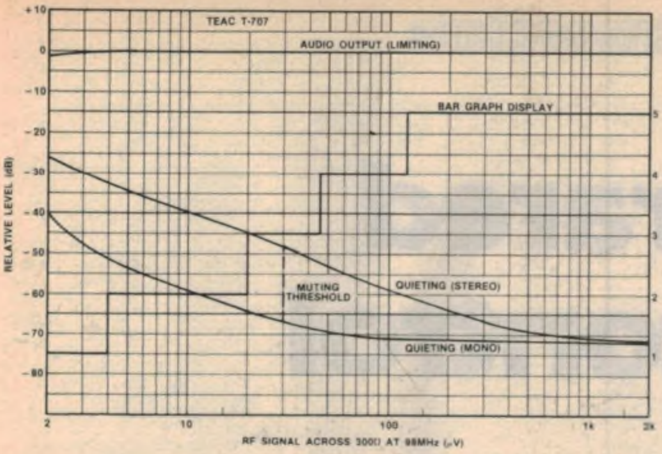
The back panel of the tuner has provision for connection of a variety of antennas. Screw-down terminals are provided for an AM antenna, a 75Ω FM antenna and a 300Ω FM antenna. In addition there is a 75Ω Belling Lee panel plug for the termination of a coaxial antenna cable.

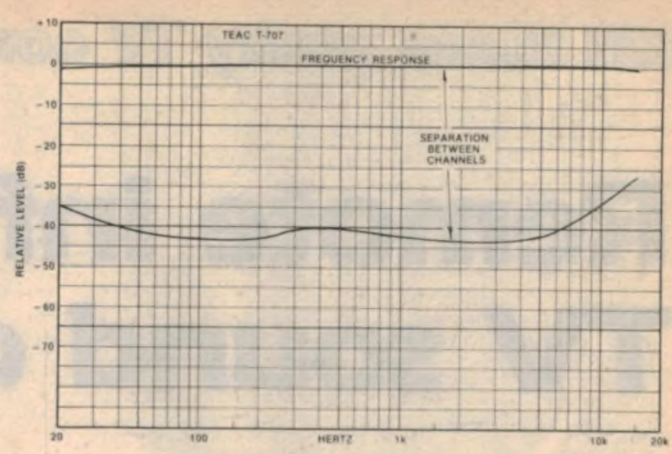
Two minor criticisms of the connection arrangements are: one, the screw terminals are too close together, making the actual attachment of the antenna wires unnecessarily difficult; and two, a Belling Lee panel socket, rather than a panel plug, should have been used for the 75Ω FM antenna connection since most people will have antenna fly leads with plugs on each end rather than sockets.

A 300Ω dipole antenna is provided with the tuner for FM reception. However in many parts of Sydney (and around most other cities) it will not be directional enough to screen out multipath interference.

Also on the back panel is a symbol indicating that the tuner is "double insulated" although examination of the internal mains terminations tends to suggest that it would not comply with the Australian standards on "double insulation".

The internal examination also revealed another interesting fact. The Teac T-707 has a front-end input module that appears to be similar with the module used in the Technics ST-Z45 tuner reviewed in the September, 1982 issue. The modules are apparently made by an outside company called Mitsumi and are probably purchased already aligned to reduce





The quieting or s/n characteristic of the T-707 for various RF input levels. Frequency response across the audio band was very flat.

production costs.

Most of our test results have been summarised into the two graphs allowing a quick and easy comparison with other tuners we have tested.

Looking at the graph of the quieting characteristic it can be seen that 50dB of quieting was achieved in mono mode with an input of 3.5μV. The automatic switch to stereo mode occurs around 2μV meaning that for all practical received signals the tuner will be stereo unless deliberately placed in mono mode.

The muting threshold is 30μV corresponding to a stereo quieting of about 50dB. There is a small amount of hysteresis associated with this threshold to prevent the tuner going into mute with signal strength variations in a borderline signal.

The five-step bar-graph display works well except that the threshold level of the first segment has been set too low and interstation noise keeps it on all the time. By resetting the threshold of the first segment and respacing the other thresholds to cover a greater range, the usefulness of the bar-graph could be further increased.

One point against bar-graph displays as signal strength indicators is that they cannot indicate the presence of multipath distortion. A conventional moving coil meter shows multipath signals as a wavering or flickering of the needle. Since bar-graph segments turn on abruptly, and employ hysteresis on the thresholds to prevent flicker, they cannot indicate the tell-tale small variations in signal strength caused by multipath.

Ultimate quieting was 72dB in mono and 71.5dB in stereo, a good result. The 19kHz stereo sub-carrier had a measured residual only 3.5dB above the noise and the 38kHz switching frequency could not be measured at all, its amplitude being below the noise. These are excellent figures.

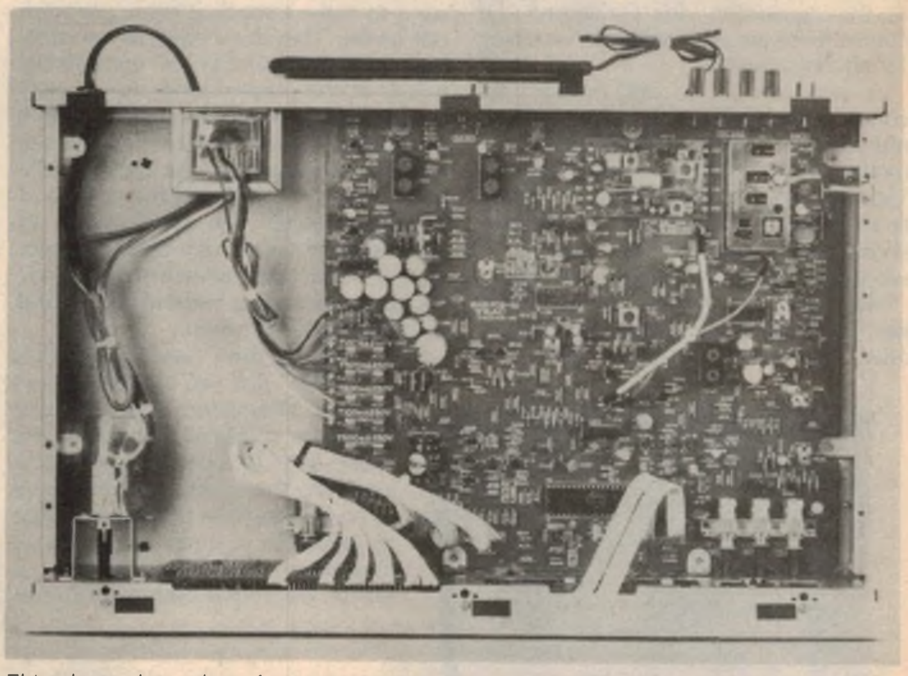
Total harmonic distortion with a 100% modulated (75kHz deviation) input signal was: in mono mode, 0.18% at 6kHz, 0.06% at 1kHz, and 0.07% at 100Hz. In stereo mode the figures were: 0.5% at 6kHz, 0.6% at 1kHz, and 0.5% at 100Hz. The manufacturer's claimed specification for stereo is 0.1%.

Limiting audio output was achieved with an RF input of only 3μV. The frequency response was extremely flat being only 1.5dB down at 20Hz and 0.2dB down at 15kHz with respect to 1kHz. Response above 15kHz is not shown since this is affected by the 19kHz filter.

Channel separation equalled or exceeded 40dB over most of the audio band. There was a deterioration in the separation at 15kHz to only 27dB but this is to be expected and is quite adequate.

Listening tests confirm that the Teac is well up to par as far as FM reception is concerned and the digital tuning certainly works well and without any hitch. However the AM reception is poorer than found on most AM/FM tuners and could be said to be "equivalent to a $6 portable" in the words of one of our staff members. In particular, the AM bandwidth is unnecessarily restricted leading to muffled reproduction.

The performance of the AM section of the tuner was not actually measured in the review, however we have no reason to doubt the manufacturers specifications. The specifications read as follows: Usable sensitivity – 450μV/m (loop antenna), selectivity (±9kHz) – 30dB, harmonic distortion – 0.5%, signal to noise ration – 50 dB. There was no specification for AM bandwidth.



This photo shows how few components are needed to produce a tuner these days. The battery back-up for the memory is on the bottom left hand corner of the PCB.

A loop antenna for AM reception is supplied with the T-707 and is held in place by a small clip on the back panel of the tuner. A hole is provided in the plastic moulding of the loop antenna to enable it to be hung on a wall or other convenient location away from signal suppressing metal surfaces.

The T-707 is available through all Teac dealers and carries a recommended retail price of $299. (JS)

Kill those pesky TV commercials

Remote infrared TV sound control

Designed to relieve the long-suffering TV viewer from painful, brain-killing advertisements, our TV Sound Control provides remote control of volume. It gives eight steps of control, including full off, when total silence is called for. Give yourself a break and relieve advertising tedium today.

by JOHN CLARKE

To many commercial enterprises, television advertising has become an accepted means to persuade consumers to use or purchase their products. This acceptance is not necessarily mutual as far as the consumers are concerned. Of course there are alternatives to watching TV advertisements:

Viewers can opt to only watch non-commercial stations such as the ABC or multicultural television so that total protection can be had from advertisements. The only problem that can occur is what to do when a suitable program is being shown on a commercial station? Is it worth the torture of advertisements?

One alternative is to initiate conversation with fellow viewers during the advertisements, however, there is a drawback. The conversation may prove far more interesting than the television program itself, rendering the TV redundant.

Another means to escape the advertising is to make a snack at every commercial break. This does have its rewards, but with the number of commercial breaks at the present time, the practice can lead to obesity. No, if your set does not already have remote control, the only practical alternative is to build our TV Sound Control. In this way the volume of the commercial can be turned off remotely and fast; a vital and important feature. In fact, the advertisements may be more interesting without sound and certainly more humorous.

Of course the TV sound control is not only just an advertisement volume attenuator. Eight volume steps are available to adjust the sound level to a comfortable listening level. The actual level may need to be altered from time to time due to variations in ambient noise in a household situation and this is where the sound control becomes very useful. Just a touch of the button and the volume is adjusted.

The transmitter is housed in a compact plastic utility case that fits easily in the hand. Just press the down button to kill those commercials!

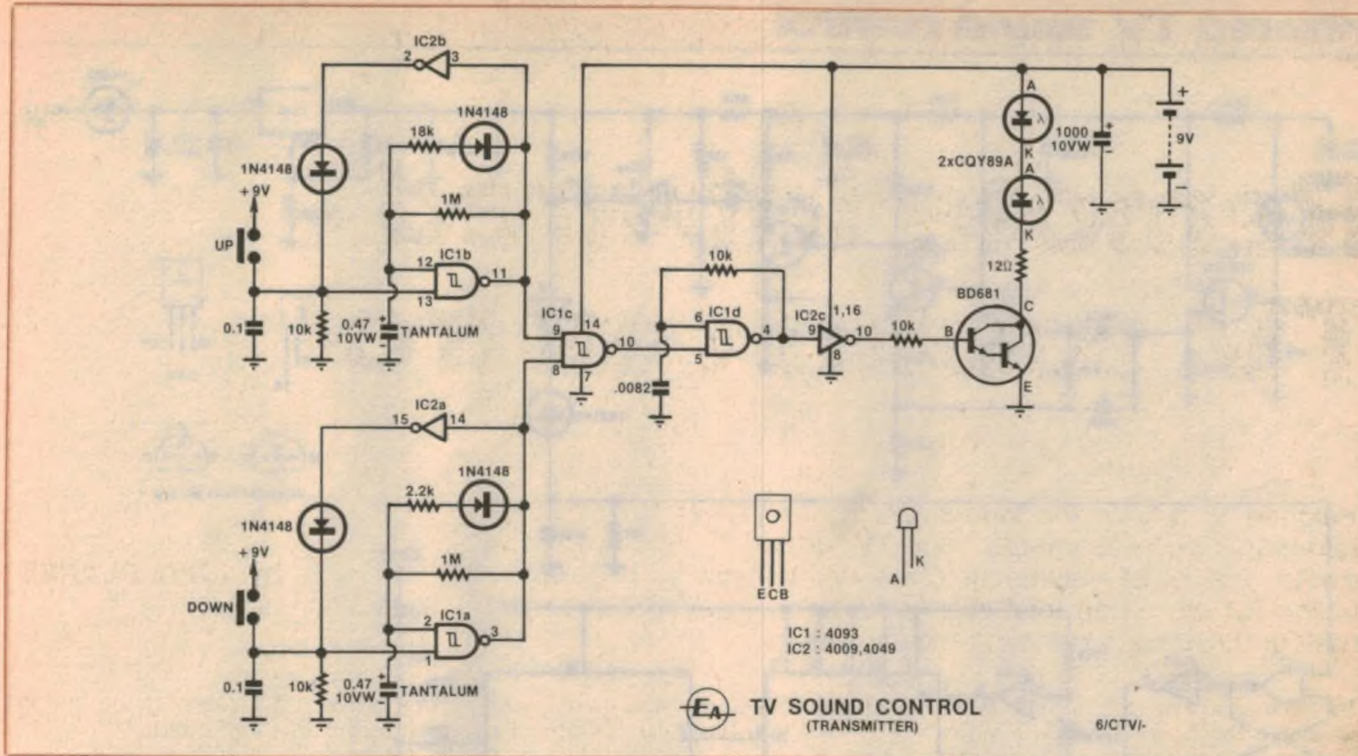
Features

The TV sound control comprises two separate circuits; the transmitter and receiver. The transmitter is housed in a small plastic utility box and contains two control buttons, one for increasing the volume, UP, and the other for decreasing the volume, DOWN. It is completely self contained, powered with a small battery and transmitting with infrared light to the receiver. The receiver is housed within the TV cabinet and is powered from the low voltage supply of the TV set. The infrared receiver diode is mounted at the rear of the TV chassis so there is no need to drill a hole in the front of the TV and mar the finish.

Two relatively simple connections need to be made to the TV set. One is to break into the volume control of the audio amplifier circuit. This is easily found by locating the volume control and finding the wiper wire. The second connection is to pick up the low voltage supply to the TV circuitry and can be found by referring to the circuit diagram supplied with the TV set.

In use, the transmitter is located on the arm of the chair within easy reach of the viewer. When an advertisement intrudes the DOWN button can be pressed and almost immediately the sound is completely attenuated. When the adverts have finished, the UP button is pressed and the volume increases until the required volume is reached whereupon the button is released.

The eight volume steps can be chosen by either: a momentary press of the Up or Down button, whereby the volume will alter by one step only; or by holding the button, the volume will glide from one step to another at a 0.5 second rate.



The transmitter circuit uses three gated oscillators and a Darlington transistor driving a pair of infrared LEDs.

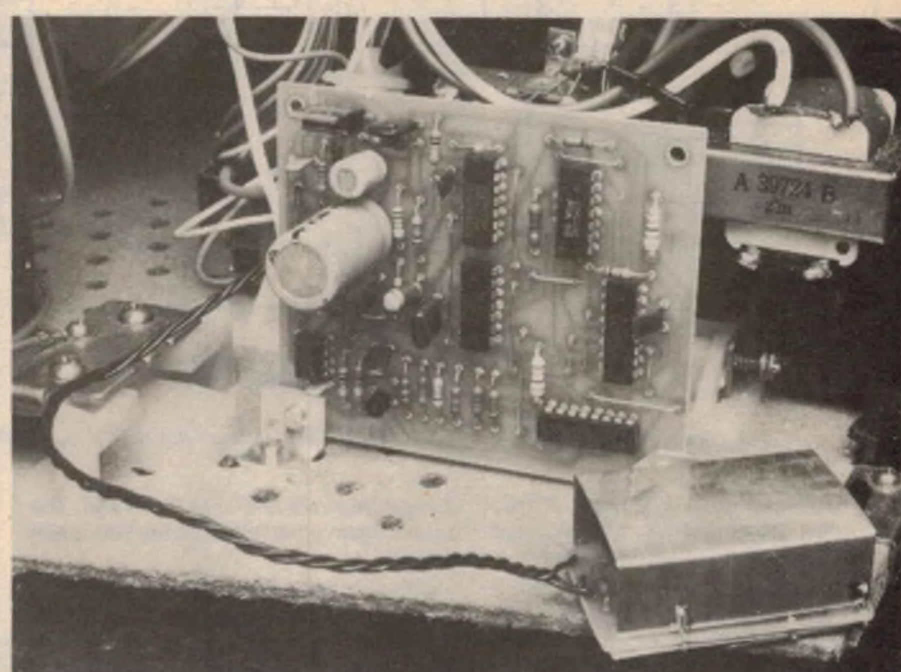
When the volume reaches the extremes, either maximum or minimum volume, the volume will stay at that level until a change in volume direction is selected.

At first switch on of the TV set, the sound control will automatically reset to half volume. It is envisaged that the normal listening level will be first adjusted on the TV set volume control, and any further volume adjustments made solely with the remote control.

Attenuation at the highest volume level can be regarded as 0dB. From there down the attenuation increases in approximate steps of −3, 4, 5, 6, 7, 8dB and complete attenuation on the last step. The reason for this apparently strange series of attenuation steps rather than having, say, 3dB per step is that greater control is desirable at higher volume levels.

Infrared signals

The transmitter provides two types of signals: a 10kHz signal of 5ms duration for an UP code and a 10kHz signal of 1ms duration for a DOWN code. So that the TV volume will glide up or down through each attenuation level, the 10kHz signals need to be repeated at regular intervals whenever the UP or DOWN buttons are pressed. In addition it is necessary that a complete five or 1ms pulse is generated regardless whether the UP or DOWN button is pressed or released during this transmitting interval. Without this feature, an UP signal may be truncated to the length of a DOWN signal and be interpreted incorrectly as a DOWN code by the receiver circuitry.



This photo shows the amplifier and demodulator boards mounted in a TV chassis. Metal shielding is fitted to the amplifier module to protect the circuit from line flyback pulses generated by the TV receiver.

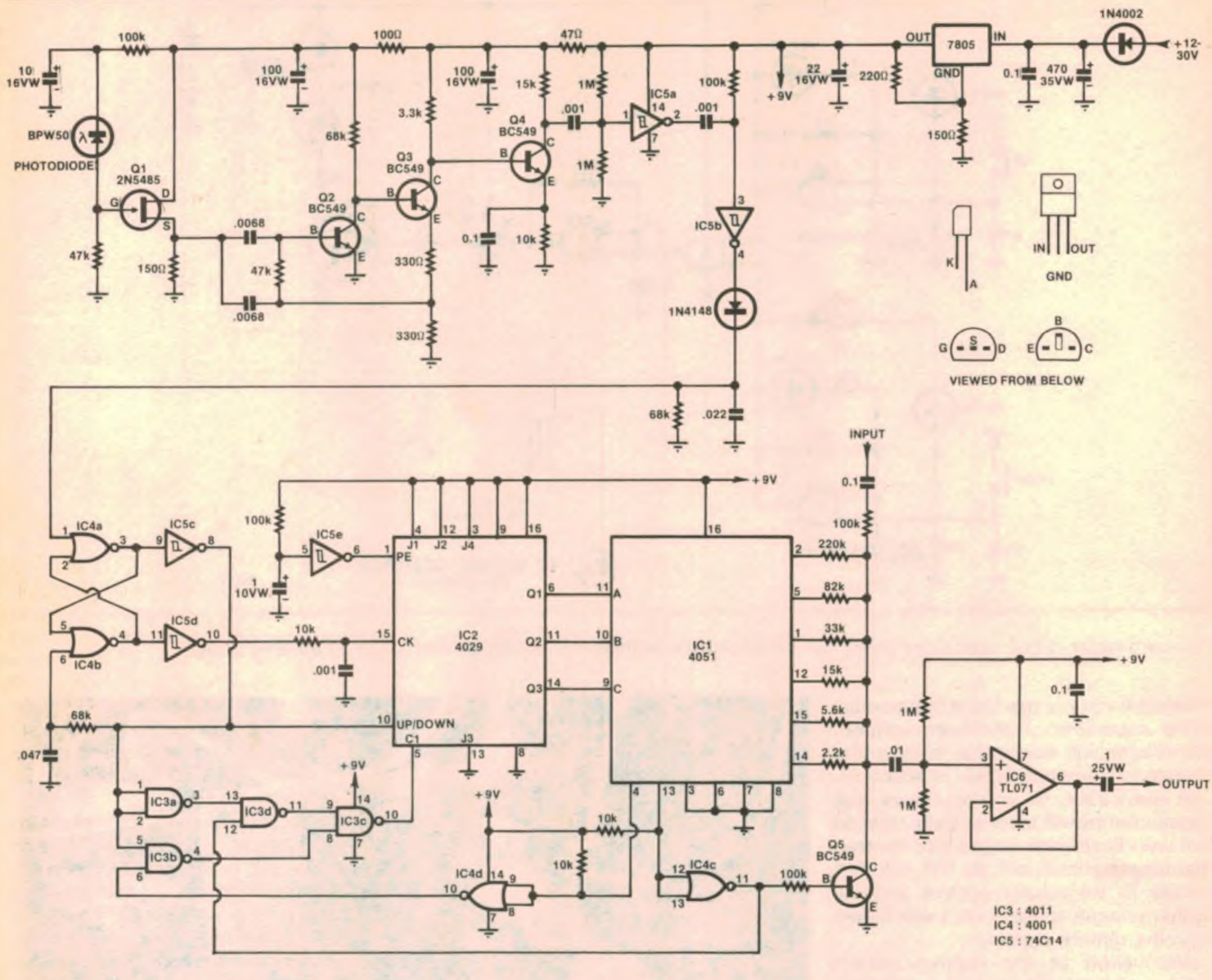
The receiver needs to reliably decode the transmitted signals and switch attenuating resistors to provide the requisite volume.

The circuit

The total circuitry for this TV sound control is relatively simple and low in cost. The hand held transmitter uses a mere handful of components comprising two CMOS ICs, a Darlington transistor and a couple of infrared LEDS plus a few resistors, capacitors and diodes. The receiver includes six low cost ICs, a photodiode, voltage regulator and a few resistors, capacitors and diodes.

Let's look at the transmitter circuit first: There are three gated oscillators in this

Infrared TV sound control



TV SOUND CONTROL
(RECEIVER)

The receiver consists of an amplifier (Q1-Q4), demodulator (IC2-IC5), and audio attenuator (IC1, IC6).

circuit, each comprising Schmitt NAND gates. IC1d provides the 10kHz signal and is enabled, ie, it runs, when pin 5 is high. This only occurs when either pin 8 or pin 9 of IC1c is low. IC1b provides the low 5ms pulse, suitable for an UP signal. Similarly, IC1a provides a low 1ms pulse suitable for a DOWN signal.

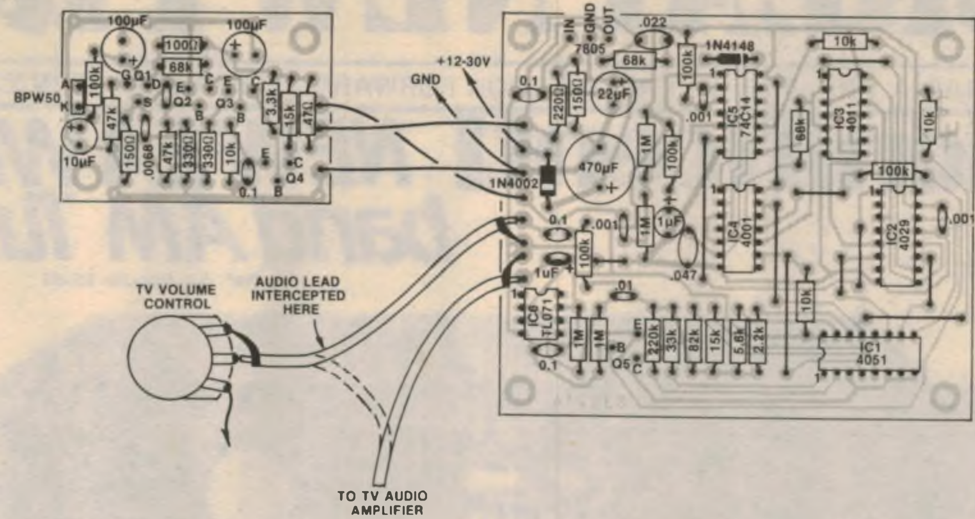
To see how these Schmitt NAND gate oscillators function, we shall take IC1d as an example. Assuming pin 5 is high and the .0082μF capacitor is initially discharged, the NAND gate now functions as an inverter with pin 6 low and the output high. The capacitor now begins to charge via the 10kΩ resistor. When the capacitor voltage reaches the high threshold of the Schmitt, the output changes to a low state and the capacitor now begins to discharge through the 10kΩ resistor. When the capacitor voltage reaches the low threshold, the output again goes high and the sequence repeats.

With the capacitor and resistor values specified, the oscillator runs at 10kHz. Whenever pin 5 goes low, the output of IC1d is forced to go high and remain in that state. This provides a simple method of gating the oscillator on and off.

IC1b oscillates in a similar manner to IC1d, except that two separate charging and discharging paths for the 0.47μF capacitor are provided. When the output, pin 11, is high, the capacitor takes about 0.5 seconds to charge via the 1MΩ resistor. This is the period in which the 10kHz oscillator is gated off. When the output of IC1b is low, the capacitor can discharge through the 1MΩ resistor and the 18kΩ resistor and forward-biased diode. This allows the capacitor to discharge quickly providing the 5ms low signal to gate on the 10kHz oscillator.

To enable this oscillator, the second input of IC1b, pin 13, must be brought high and this can be done in two ways. Firstly, to begin the oscillator sequence, the Up button must be pressed, which pulls the input high. The switch contact debounce circuit consists of the 0.1μF capacitor and 10kΩ resistor. (The resistor keeps pin 13 low when the Up switch is open circuit.) The oscillator starts and after about 0.5 seconds the output goes low. IC2b inverts this to a high which keeps pin 13 high via the forward-biased diode. This second means of enabling the oscillator ensures a complete 5ms low output regardless of when the Up switch is released.

The Down oscillator, IC1a, operates in



Above: parts overlay and wiring diagram for the receiver circuitry.

a similar manner to the Up oscillator with the exception that the discharge time is reduced to 1ms by using a 2.2kΩ resistor.

The output from IC1d, the 10kHz oscillator, is inverted with IC2c which provides a normally low signal when IC1d is gated off. This inverter drives a BD681 Darlington transistor via the 10kΩ resistor. The Darlington provides the necessary gain and high current capability to drive the LEDs while the 12Ω series resistor limits the current to prevent damage to the LEDs.

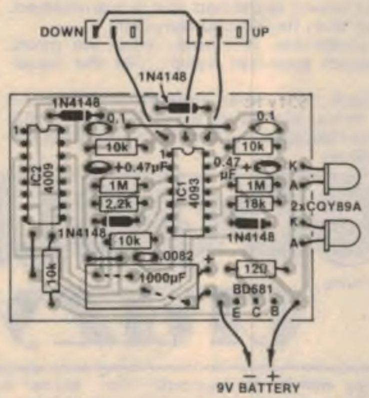
Even so, the peak current is about 300mA which is more than the battery could supply on its own. Most of this peak current is supplied by the 1000μF capacitor across the battery. When the buttons are not being pressed, the current drawn from the battery is very low, typically around 10μA. Consequently, an on/off switch is unnecessary and even with frequent usage, the battery should last for more than a year.

The infrared LEDs used are either Philips CQY89A or Siemens LD271. These are similar in appearance to the more usual red LEDs, except that they are encased in a dark blue epoxy encapsulation which is translucent to infrared radiation.

Let us now turn to the receiver circuit which consists of three sections: the amplifier, demodulator and the audio attenuator.

Infrared light generated by the transmitter LEDs is received by an infrared photodiode. This is a Philips BPW50 and is specifically designed to match the CQY89A LED. The diode also has an integral infrared filter which almost completely rejects visible light.

The photodiode has its cathode connected to the 9V rail via an RC decoupling network, while the anode is connected via a 47kΩ resistor to ground. In operation, the photodiode acts as a current source such that it generates a current proportional to the incident light. The current signal is converted to a voltage by the 47kΩ resistor.



Switch connections for the transmitter are made to the common and normally open terminals, as marked on the switch body.

The signal from the photodiode is fed to the input of Q1, an N-channel FET, connected as a source follower. The gain of this stage is about 0.5.

Output impedance of the FET stage is about 100Ω and this drives a bandpass filter consisting of transistors Q2 and Q3. The centre frequency of the filter is about 10kHz and it has a Q of 10; ie the bandwidth is 1kHz. This bandwidth is wide enough to pass the 10kHz signal from the transmitter, even allowing for some mistuning, yet effectively eliminates interference from other sources (eg fluorescent lights).

Disregarding the two .0068μF capacitors for the moment, Q2 and Q3 form a two-stage inverting amplifier. Both transistors operate as common emitter amplifiers, with the second stage providing two separate outputs: one from the junction of the two 330Ω resistors and the second from Q3's collector. The first output has a low impedance and is used to drive the filter and to provide DC feedback via the 47kΩ resistor to bias Q2.

The filter components are the two .0068μF capacitors and the 47kΩ bias resistor (for Q2) which, together with the low output impedance of the previous FET stage, determine the centre frequency and Q of the filter.

The collector output of Q3 provides an amplified version of the filter output. This output is DC-coupled to the next stage which consists of transistor Q4 in another common emitter amplifier circuit. Gain of this stage is at least 150. A 0.1μF emitter bypass capacitor is included to provide further attenuation of unwanted low frequency signals.

Following Q4, the signal is AC-coupled to IC5a which is a CMOS Schmitt trigger. When the signal peaks from Q4 exceed the upper and lower thresholds of the Schmitt trigger, the device will square up the signal and provide a constant level 10kHz square wave output. If the input signal drops below the trigger thresholds, the 10kHz signals from the output will cease and the Schmitt will remain in its last state, either high or low. IC5b is capacitively driven from IC5a and has a normally low output due to the 100kΩ resistor connected to +9V at its input.

To convert the presence or absence of a 10kHz signal into a simple high or a low signal, the output of IC5b is filtered with the .022μF capacitor connected via

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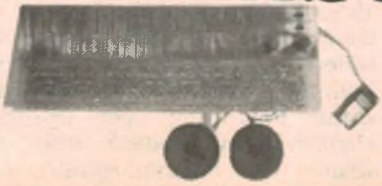

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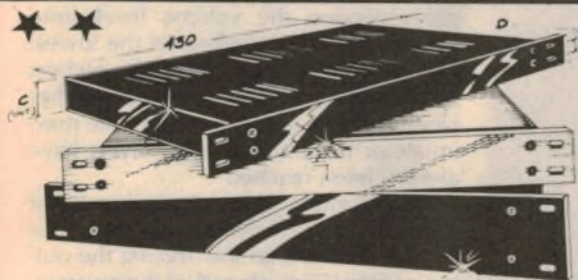

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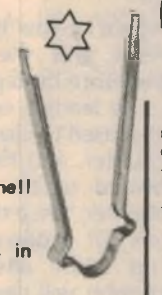

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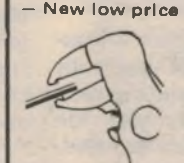

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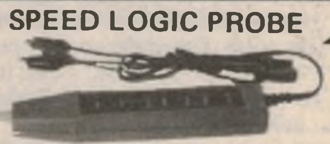

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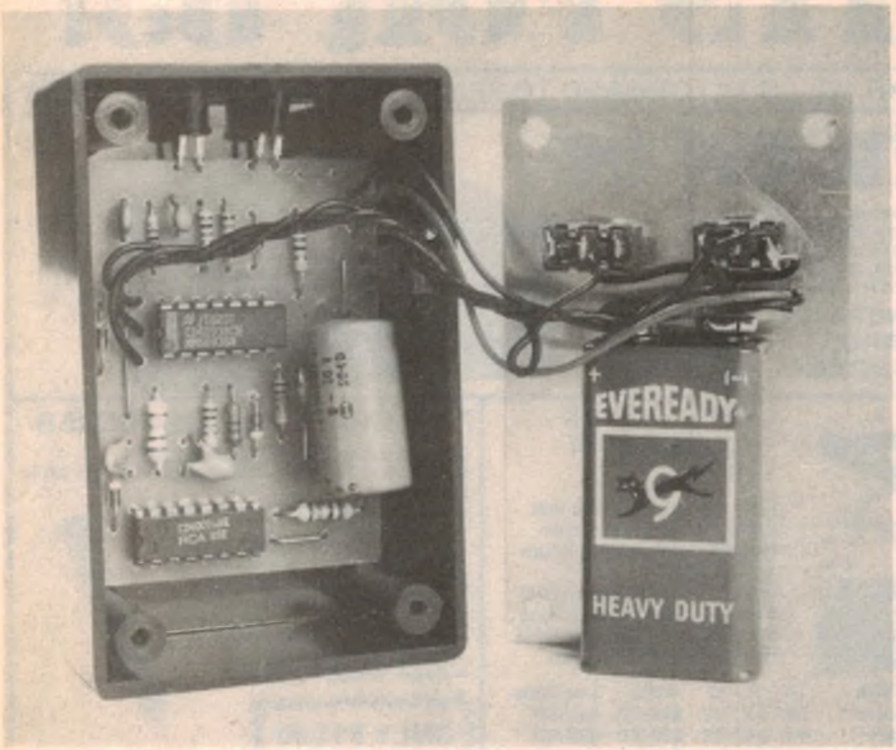


View inside the transmitter case.

the 1N4148 diode. This allows the capacitor to charge when the output of IC5b is high and the 68kΩ resistor dischages the capacitor when IC5b is low. Providing there is a 10kHz signal the capacitor voltage will be high. When there is no signal, the capacitor is discharged.

The output of the rectifier filter will appear as a pulse on pin 1 of IC4a and with the filter time constant used the duration of the pulse will be approximately the same as the signal originally transmitted. As noted above the "down" pulse is about 1ms long while the "up" pulse is about 5ms long. This difference in pulse length is decoded by NOR gates IC4a and IC4b (connected as an RS flipflop), and the inverter IC5c.

Normally both inputs to the flipflop, pin 1 of IC4a and pin 6 of IC4b, are low, but when a pulse from the filter arrives the flipflop is set, with the output of gate IC4a low and the output of gate IC4b high. The flipflop would remain in this state if it were not for the resistor at the output of IC5c charging the 0.047μF capacitor at the input of IC4b, pin 6, to form a time delay reset.

The reset for the flipflop occurs about 2.5ms after the leading edge of pin 1 goes high which is after a down pulse would finish and before an up pulse would finish. So if an up pulse was received the output of IC4a would be low since pin 1 will still be high immediately after the flipflop is reset. If a down pulse is received however, pin 1 would be low by the time the flipflop is reset and the output of IC4a will therefore be high.

The leading edge of the reset pulse is also used to clock IC2; a binary up/down counter, and the output of IC5c is connected to the up/down input of the counter. Since the output of IC5c will be low for a down pulse and high for an "up" pulse after the reset signal, the counter will count up for an "up" pulse and down for a "down" pulse.

The 10kΩ resistor and .001μF capacitor at the clock input of the counter delays the reset pulse slightly so that the up/down signal will have been present for an appropriate time before the counter is clocked.

Naturally, the most important part of the remote control is the audio attenuation circuit which consists of an eight channel analog multiplexer, IC1, and an op amp, IC6. The attenuation is passive, performed by a voltage divider consisting of a 100kΩ resistor in series with the input signal and one of six shunt resistors or a transistor (for full attenuation), which are individually selected by the multiplexer.

> We estimate that the current cost of components for this project is approximately
>
> **$40**
>
> This includes sales tax.

Whenever pin 13 of IC1 is selected, driving the input of IC4c low and consequently the output high, the transistor is switched on to shunt the audio signal to ground. At the highest volume level, pin 4 is low and no resistor is switched in to attenuate the signal. This output when low drives the output of IC4d high.

IC4d and IC4c are used to detect the maximum volume level and minimum volume level respectively and these are connected to a gating arrangement formed by the NAND gates IC3. These gates prevent the volume level from changing from the highest to the lowest level or from the lowest to the highest level. IC3 therefore prevents further clocking in the same direction if the maximum or minimum volume levels have already been reached.

If the counter is being clocked up and it is already at the highest level, the output of gate IC3b will go low forcing the output of gate IC3c high and inhibiting counting. Similarly if the counter is being clocked down when it is already at its lowest level, gate IC3d will go low and inhibit counting.

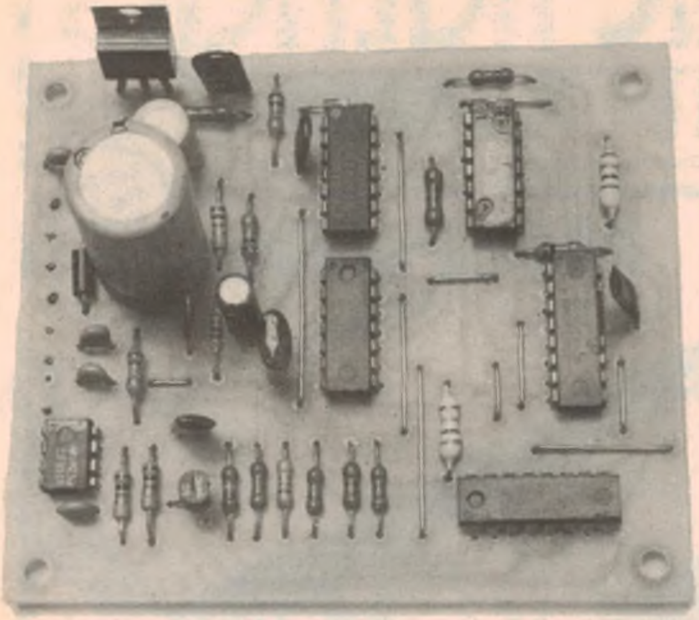
The attenuating signal from IC1 is buffered by a TL071 op amp connected as a voltage follower to provide unity gain. DC biasing of the op amp is provided by two 1MΩ resistors, one from ground and the other from the positive rail. So that this DC level will not upset the attenuator, capacitive signal coupling is used. The output of the op amp is also capacitively coupled to remove the DC bias.

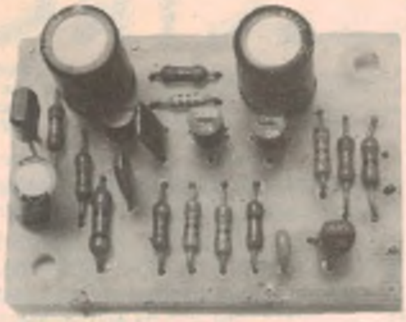
As mentioned previously, power for the receiver is derived from the main DC (12-30V) supply of the TV set. This is filtered with a 470μF capacitor and regulated with a three terminal regulator. Although a 5V regulator is used, the output voltage is around 9V and this voltage increase is achieved as follows: Since the regulator supplies 5V between the GND pin and output, there will be 23mA flowing through the 220Ω resistor. This current plus the quiescent current from the GND terminal (about 4mA) produce about 4V across the 150Ω resistor. Consequently when the 5V of the regulator is added to this, the output voltage is about 9V.

The 0.1μF capacitor at the input of the regulator ensures stability, while the 22μF capacitor at the output provides improved transient response of the regulator.

Construction

Construction of the circuit involves three printed cicruit boards. One PCB coded 83tv1c is used for the transmitter





The demodulator (left) and amplifier PCBs are shown here approximately actual size.

and is housed in a plastic utility box measuring 28 × 54 × 83mm. Of the two other PCBs, one coded 83tv1b and measuring 37 × 53mm is the amplifier while that coded 83tv1a and measuring 79 × 93mm is the decoder.

Start construction on each PCB by placing all the links, resistors and diodes into position. Make sure that the diodes are pointing in the correct direction. When soldering the ICs make sure that they are oriented correctly and that the power supply pins are soldered first, with the barrel of the soldering iron connected to the ground track of the PCB. Again when placing the transistors and capacitors in position ensure they are oriented correctly. The 1000µF capacitor in the transmitter is bent over and lies across the PCB, so ensure that there is enough lead length to facilitate this.

The 0.47µF tantalum capacitors in the transmitter are bent over sideways so that the 9V battery can be placed on top of the PCB and clear the lid. In fact this is the way in which the PCB is held within the case. The battery provides very little clearance between the lid and so holds the PCB in place. Holes for the two IR LEDs should be drilled as well as those for the switches, after the Scotchcal label has been placed onto the front panel.

Wiring to the transmitter switches can now be completed and the switches secured to the lid. Note that these are oriented sideways to allow clearance for the battery. Place the PCB into the case, insert the battery with some foam insulation, and screw the lid down. The transmitter is now complete.

When the receiver PCBs have been completed, the TV sound control is ready to be tested. It is not recommended that you test the unit within the TV set initially since many TV sets have a live chassis, rendering any testing in this situation dangerous. Consequently it is advisable to ensure the circuit is operating as expected before installation into the TV set.

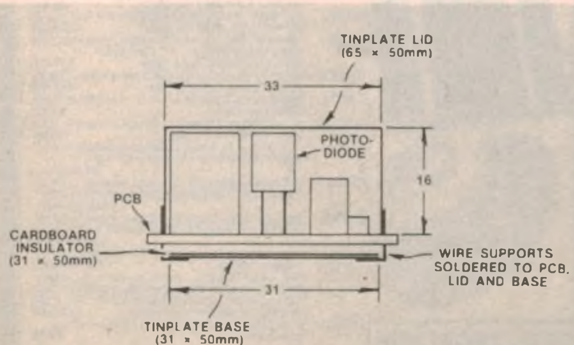
Wire the interconnecting leads between the two PCBs and connect a voltage between 12 and 30V DC from a suitable power supply to the decoder PCB. Check that the voltage regulator is supplying around 9V and that all the ICs are receiving power.

To check that the receiver is operating correctly and attenuating the signal, it will be necessary to connect in a sound source and monitor it after attenuation. A suitable source would be from the eaphone socket of a radio, or a tone from a function generator connected to the audio input of the decoder PCB. Monitoring can be done by listening with an earphone at the audio output of the decoder or by amplifying the signal and listening with loudspeakers. Alternatively, the tape monitoring facilities provided on most amplifiers can be used by switching to tape monitor and connecting the audio output to the Tape input and the audio input to the Tape output.

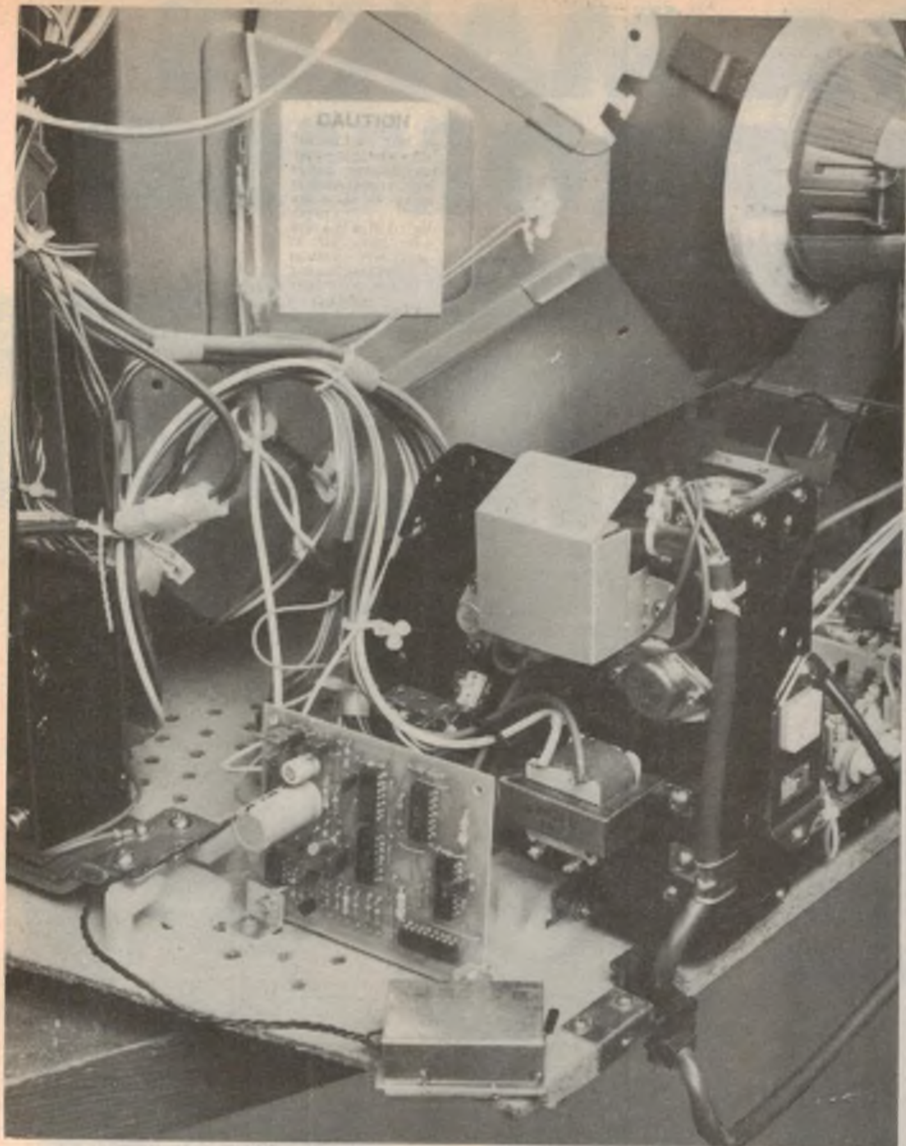
When the Down button is pressed, the receiver should attenuate the signal at a rate of one step every 0.5 seconds. Pressing the Up button should increase the volume until maximum volume is reached. At first switch-on of the receiver the volume should be at mid volume setting with pin 12 of IC1 selected. Pin 9 of IC1 should be low and pins 10 and 11 high. At maximum volume, pins 9, 10 and 11 are all high and pin 4 is selected, while at minimum volume the pins are low and pin 13 is selected.

If the unit does not appear to operate correctly, check all the PCBs for broken or shorted tracks, incorrectly oriented components, bad solder joints and power supply connections to the ICs. If the sensitivity appears low, the gain can be increased by increasing the value of the 47kΩ resistor at the anode of the photodiode. Values of up to 470kΩ can be used. Do not increase the value to such an extent as to cause the circuit to trigger on ambient light.

The amplifier PCB requires a shield to protect the sensitive circuitry from the high level of line flyback pulses generated by the TV circuitry which would otherwise render the circuit in-



This diagram shows how the amplifier module is shielded using tinplate sheeting. Note that shielding is used on both sides of the PCB.



Power for the receiver circuitry is derived from a suitable 12-30V supply within the TV set. The photodiode should face through a hole in the rear of the cabinet, so that it receives energy reflected from the wall.

operative. We used tinplate sheeting salvaged from a tin can to make the shield. Use the diagram to aid you in construction of the shield. Wire links are used to mechanically support the shield above and below the PCB and these pass through the pads provided. There are three pad positions on each side of the board and all are connected to the ground rail rendering the shield earthed when soldered to these points.

The decoder PCB can now be installed into the TV cabinet. Before removing the rear cover of the TV set ensure that the power plug is removed from the wall socket to prevent electric shock. Note that many modern TV sets have a live chassis. Do not work on these sets when they are switched on under any circumstances. The PCB should be secured to the chassis with suitable angle brackets in a position that is close to the screened leads from the volume control potentiometer. We mounted our decoder board vertically on two angle brackets and intercepted the audio lead from the wiper of the volume control at a point close to the decoder PCB.

Depending upon the positioning of the TV set, whether it is free standing with wall space behind it or wall mounted, the shielded receiver will need to be mounted at the front of the TV set or preferably at the rear (provided that light from the transmitter can be reflected from the wall behind a free standing TV). The receiver should be supported using suitable brackets and screws onto a convenient structurally solid point within the TV. With a front mounted receiver, it should be located so that a 4mm hole can be drilled in front of the TV opposite the IR photodiode and preferably in an inconspicuous position. Similarly for a rear mounted receiver, a 4mm hole should be drilled for the photodiode. The photodiode should not protrude from this hole.

PARTS LIST

1 PCB coded 83tv1a, 79 × 93mm
1 PCB coded 83tv1b, 37 × 53mm
1 PCB coded 83tv1c, 61 × 45mm
1 plastic utility box 28 × 54 × 83mm
1 216 9V battery and battery clip lead
1 tinplated steel sheet, 53 × 120mm
2 C&K momentary contact switches (C&K preferred)

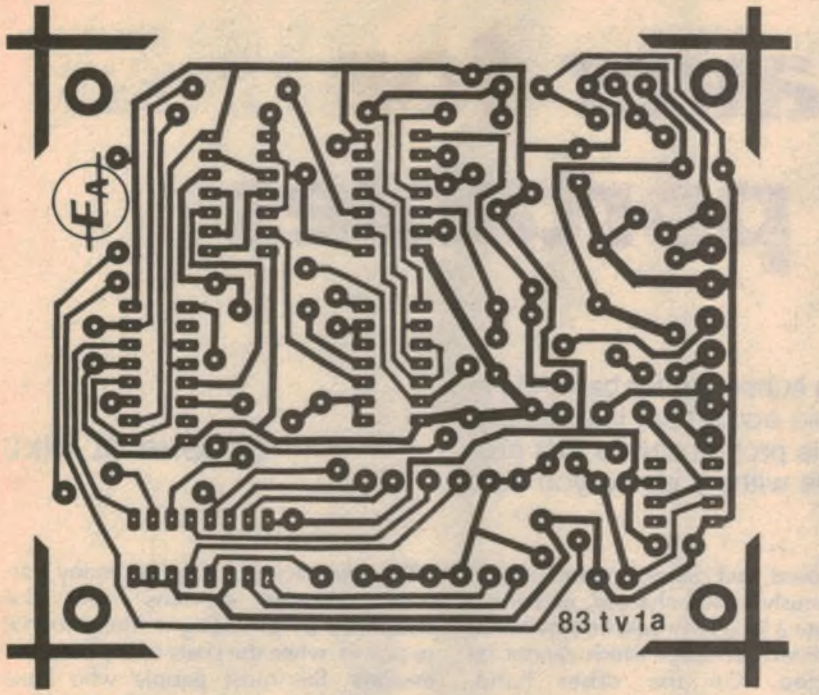
SEMICONDUCTORS
1 4051 single eight-channel analog multiplexer/demultiplexer
1 4029 binary decade up/down presettable counter
1 74C14 hex Schmitt trigger
1 4011 quad two input NAND gate
1 4001 quad two input NOR gate
1 4093 quad two input NAND Schmitt trigger
1 4009, 4094 hex inverting buffer
1 7805 positive 5V three terminal regulator
1 TL071, LF351, CA3140 op amp
1 2N5485 N-channel FET
4 BC549 NPN transistors
1 BD681, BD263 NPN Darlington transistor
2 CQY89A IR LEDS
1 BPW50 photodiode
5 1N4148, 1N914 small signal diodes
1 1N4002 1A rectifier diode

CAPACITORS
1 1000μF /10VW pigtail electrolytic
1 470μF/35VW PC electrolytic
2 100μF/16VW PC electrolytic
1 22μF/16VW PC electrolytic
1 10μF/16VW PC electrolytic
1 1μF/25VW PC electrolytic
1 1μF/10VW PC electrolytic
2 0.47μF/10VW tantalum
6 0.1μF monolithic ceramic
1 .047μF metallised polyester
1 .022μF metallised polyester
1 .01μF metallised polyester
1 .0082μF metallised polyester
2 .0068μF metallised polyester
3 .001μF metallised polyester

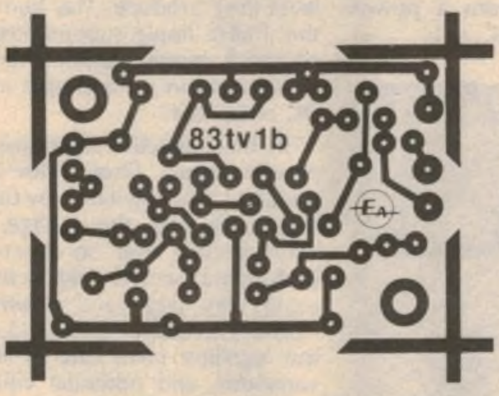
RESISTORS (1/4W, 5%)
6 × 1MΩ, 1 × 220kΩ, 5 × 100kΩ, 1 × 82kΩ, 3 × 68kΩ, 2 × 47kΩ, 1 × 33kΩ, 1 × 18kΩ, 2 × 15kΩ, 8 × 10kΩ, 1 × 5.6kΩ, 1 × 3.3kΩ, 2 × 2.2kΩ, 2 × 330Ω, 1 × 220Ω, 2 × 150Ω, 1 × 100Ω, 1 × 47Ω, 1 × 12Ω.

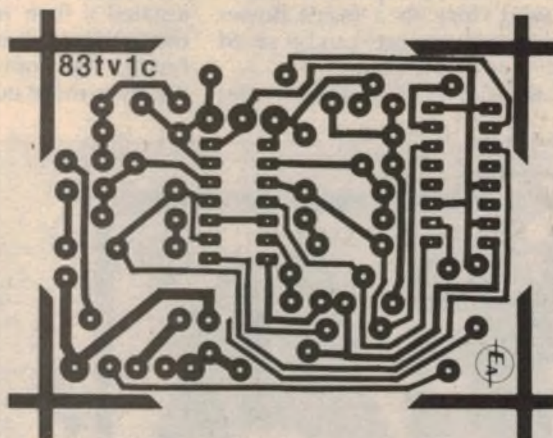
MISCELLANEOUS
Hook up wire, solder, mounting screws, brackets, etc.

NOTE: Components specified are those used in the prototype. Generally higher ratings can be used provided they are physically compatible.



Here are actual size reproductions of the three PC artworks and the transmitter front panel.





In either case, if the TV has a live chassis, in other words there is no power transformer, no screws should be exposed on the cabinet exterior since these may be live.

Wiring to the PCBs can now be completed. The audio lead from the TV volume potentiometer is intercepted and the attenuator on the decoder PCB connected in series with the line. The wiper from the potentiometer connects to the input of the attenuator while the output of the attenuator continues the audio signal back into the lead to complete the circuit.

The power supply connection to the TV set can be found by referring to the circuit diagram supplied with the TV set. Any DC voltage from 12 to 30V will be suitable and should be obtained from the main DC power supply of the TV circuity.

When all wiring is complete and the PCBs secured to the TV chassis, the cabinet back should be replaced and the unit tested. If not functioning satisfactorily, the power supply from the TV circuit could be derived from the wrong point or line flyback pulses could be entering the receiver. Ensure that there is a heavy earth lead running from the shield connection to an earth point in the TV.

In the case of a rear-mounted photodiode, the receiver obtains the light from the transmitter by reflection from the wall behind the TV set so the transmitter needs to be pointed towards the TV. Do not expect the transmitter to produce sufficient energy so as to allow light to reflect from one wall to another then to the photodiode.

We trust that you will enjoy having absolute control over the sound level of your most disliked TV adverts. Don't they look funny when soundlessly banging their gums together?

Stop Press

As this article went to press it was discovered that some recent model TV sets have a two-wire volume control which varies a DC voltage to a control pin on the sound IF detector IC. This means that the circuit published here needs to be tapped into the TV circuit at the input to the sound output stage. This will probably require the removal of a signal-coupling capacitor so that the input and output leads of the Sound Control can be connected.

An alternative and easier method is to reconfigure the Sound Control so that it directly varies the volume control DC level. The transmitter buttons then need to be swapped over to account for the fact that reducing the control voltage increases the sound level. Details of the modified circuit will be published next month.

Compact piggyback design:

Battery saver for personal portables

While typical DC plugpack adapters can substitute for batteries in calculators, their use with portable audio equipment is often unsatisfactory due to high hum levels. This project solves that problem and saves on the cost of batteries without giving you hum between the ears.

by JOHN CLARKE

Although battery operated equipment has the advantage of being operable anywhere its greatest disadvantage is the need to replace the batteries periodically, whether the item is used or not. In many cases, battery operated equipment is used close to a mains power point and so battery costs can be saved by powering from the mains.

Nickel cadmium rechargeable batteries can be used, and charged periodically or continuously trickle charged, and these constitute a long term cost improvement over primary batteries which cannot be recharged. On the other hand, rechargeable batteries can only be justified if their portability is utilised. If the equipment is used mostly in the house, then operation from a power supply is more economical.

Our plugpack regulator eliminates the need for batteries and does away with the hum problems that can occur when audio equipment is used with a standard plugpack.

The plugpack has rescued many battery operated devices from the scrapheap by providing a cheap source of power, while the costs of dry batteries escalate. But most people who have tried a DC plugpack to power portable radios and cassette recorders have been very disappointed by the excessive hum level they produce. This hum is due to the 100Hz ripple superimposed on the plugpack supply output and is a common failing in most simple inexpensive DC plugpacks.

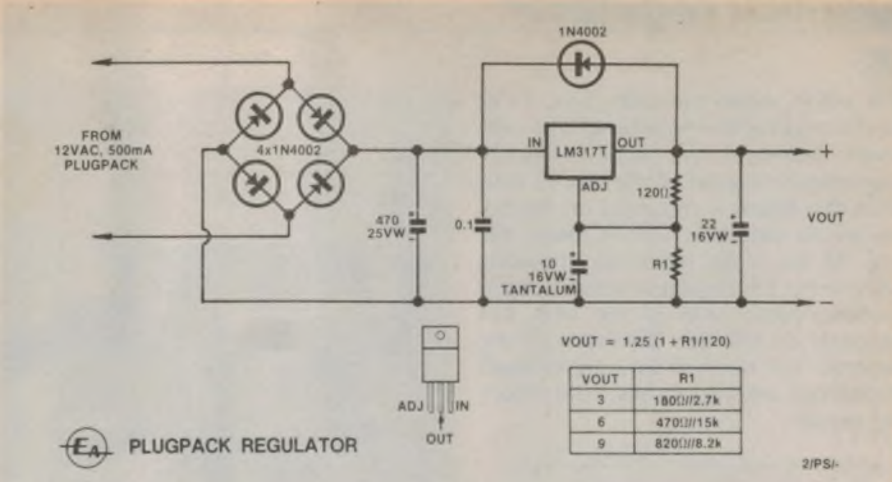
The most effective solution is to build a power supply fitted with a voltage regulator. The regulator, by the very fact that it regulates the voltage, acts as a very effective filter; so effective that its performance could only be matched by using very large and expensive electrolytic capacitors. Over and above this the regulator takes care of line voltage variations, and potential voltage variations due to changes in load, or output current.

Our plugpack regulator is housed in a small plastic utility box, glued onto the rear of an AC plugpack. The leads from the plugpack enter the regulator box and emerge fully regulated and without the ripple which causes hum. The voltage from the regulator is necessarily several volts less than the voltage available from the plugpack and so a 12V AC plugpack is a suitable choice.

Voltages available from the regulator can be selected from between 1.5 and 9V. This range is sufficient for virtually any piece of portable radio or audio equipment. At 9V the maximum current available before the regulation ceases is 350mA; at 6V, 430mA; and at 3V, 660mA. The regulator can be adjusted to any voltage required, by turning a small trimpot, or fixed resistors can be installed to provide a single preset voltage.

The plugpack regulator circuit is relatively simple and comprises an adjustable three terminal regulator, five diodes, and associated resistors and capacitors. A full wave bridge rectifier converts the AC voltage from the plugpack to pulsating DC and this is filtered to moderately smooth DC with the 470μF capacitor across the supply. For transient suppression, the 0.1μF capacitor is also included across the supply.

The remainder, and vital, part of the filtering is performed by the LM317T three terminal regulator which, as already hinted, also pegs the output voltage within very close limits over a wide range of input (line) voltage variations and output load (current) variations.



The plugpack regulator is based on the LM317T adjustable voltage regulator.

How it works

To provide a better understanding of how the regulator works we have prepared a much simplified diagram of it (Fig. 1). As we show it the LM317T consists of a power transistor in an emitter follower configuration, with the base being fed from the output of an operational amplifier. The input to the operational amplifier is taken from the output of the emitter follower – thus making it a feedback system – but, more specifically, it is the voltage developed across R2. The op amp monitors the voltage across R2 and adjusts the drive to the power transistor to keep the output voltage within tight limits.

The whole system is so adjusted that it strives to maintain a constant value of about 1.25V across R2 which means that, in turn, it also maintains a constant current through R2 and thus, by definition, the same constant current through R1. By selecting the value of R1 we can nominate the voltage which will appear between the "OUT" terminal and the negative rail, which will be 1.25V higher than the voltage across R1.

Let us now consider what happens if the output voltage (between "OUT" and negative rail) tends to vary, due to either variations in the input voltage or variations in the load current. Let's say the voltage tends to rise. This would have the effect of trying to force more current through the R2, R1 network and increasing the voltage across R2. But the feedback network will have none of this; it will immediately pull down the forward bias on the transistor, thus lowering the output voltage until the requisite 1.25V is restored across R2.

Similarly, if the voltage should tend to fall, the reverse corrective action would occur. This is a greatly simplified explanation of both the regulator circuitry and the manner in which it functions in the circuit, but it should give the reader at least a basic grasp of what is involved. It also explains how the LM317T can precisely control the voltage between its output and "Adj" pins, while negligible current actually flows into or out of the "Adj" connection.

In practical terms, and reverting to our main circuit, R1 should be 744Ω for a 9V output, 456Ω for 6V and 168Ω for 3V. The table on the circuit diagram shows the parallel combination of standard 10% resistor values to obtain these specific resistances. Alternatively a single multiturn 1kΩ trimpot can be used and adjusted for the correct voltage.

(The values of R1 have been calculated on the basis of the quoted centre voltage of 1.25 for the LM317T. The actual spread is from 1.2V to 1.3V and this, together with normal resistor tolerances, could produce slightly higher or lower voltages. However, even under worst case conditions – assuming 5% tolerance resistors – the highest voltage would be about 13% high. Most appliances could cope with this without trouble but, in any case, typical variations would be much less than this.)

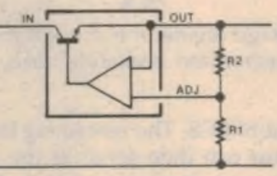
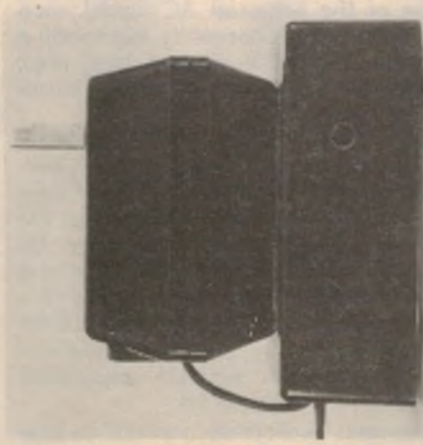


Fig 1



The regulator is glued to the plugpack.

The 10μF tantalum capacitor bypasses the voltage at the adjust terminal to ensure a stable output of the regulator without transients. Similarly the 22μF capacitor at the output provides decoupling and transient suppression.

An RF bypass capacitor in parallel with the 22μF capacitor may be desirable in some cases, but this is unlikely. Most circuits designed for battery operation would already have such a capacitor across the supply input terminals, to cope with ageing batteries. If it is felt that such a bypass is needed, it could be conveniently wired across the input socket for this supply, which will be discussed in detail later.

Diode D1, is used to protect the regulator against supply voltages entering the output of the regulator. In normal circumstances this diode is unused as it is reverse biased. If a voltage higher than the regulator voltage is applied to the output when, say, a charged capacitor is connected, the diode conducts and shunts the current from the regulator.

That more or less completes the circuit description. There is not much to it, but it offers high regulation performance. The circuit is completely safe since the plugpack is double insulated and does not require earthing.

Construction

Construction is on a printed circuit board (PCB) coded 83ps1, and measuring 62 x 46mm. The PCB is housed in a plastic utility box measuring 28 x 54 x 83mm. This box is glued to the rear of the plugpack to make a small neat unit.

Start construction by checking that the

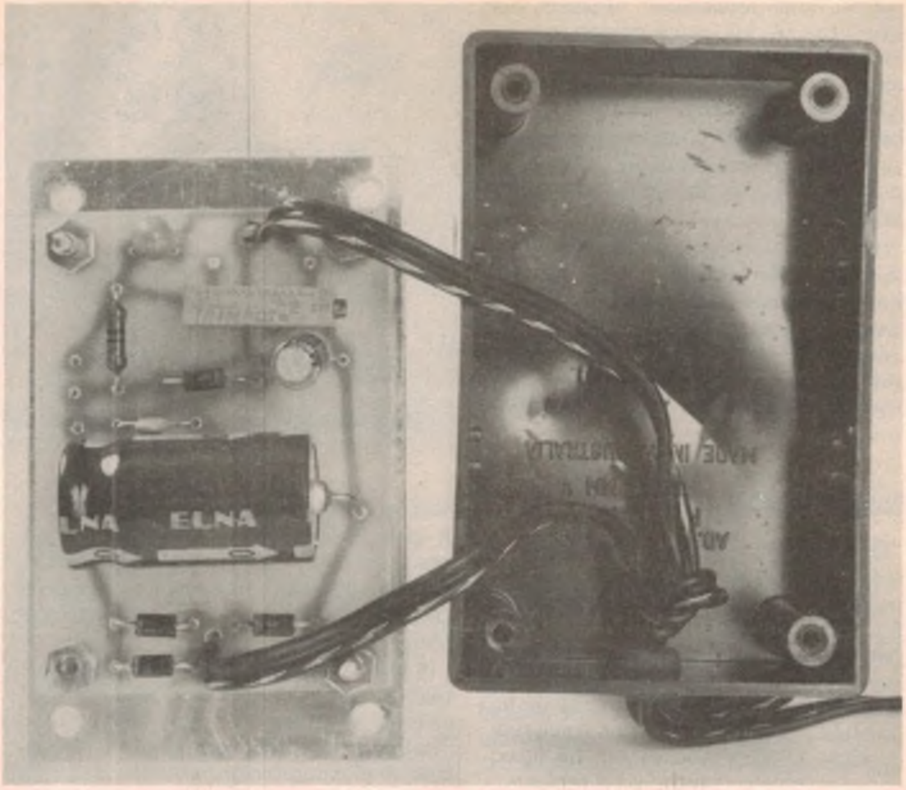
PCB will fit within the utility box. If not file the edges of the board until it has sufficient clearance. Now mark the mounting holes on the lid of the box so that, when the board is mounted on the lid, the whole assembly will fit inside the box. At this stage mark the mounting position for the regulator which is fitted on the copper side of the PCB, but mounted on the lid. The leads of the regulator will need to be bent through 90 degrees, and Fig. 2 shows the mounting details.

PARTS LIST

1 PCB coded 83ps1, 62 x 46mm
1 plastic utility box, 28 x 54 x 83mm
1 AC plugpack 12V 500mA, Ferguson PPB12/500
1 DC plug and socket (see text)
4 6mm spacers
1 TO220 mica washer and bush
1 LM317T three terminal adjustable regulator
5 1N4002 1A silicon diodes
1 470µF/25VW axial electrolytic
1 22µF/16VW PC electrolytic
1 10µF/16VW tantalum
1 0.1µF ceramic
1 120Ω ¼W resistor
1 1kΩ multi-turn trimpot (see text)

MISCELLANEOUS
Nuts and screws, solder, grommet, polarised figure-8 flex if needed (see text).

NOTE: Components with ratings higher than specified may be used, provided they are physically compatible.



The PCB is mounted on the metal lid of the case using 6mm spacers.

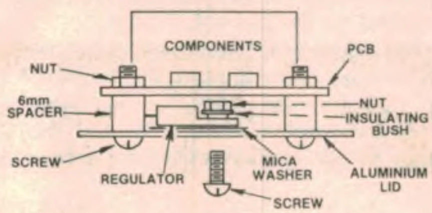
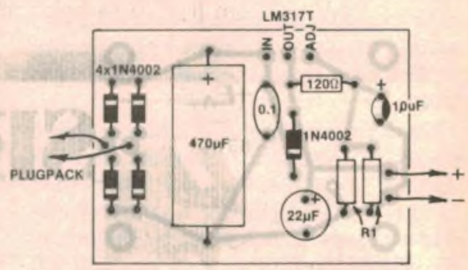


Fig. 2

The voltage regulator is mounted using a mica washer and insulating bush.



Follow this component overlay diagram.

Drill holes for these mounting positions, and also a hole at the end of the plastic box suitable for a small grommet. Deburr all the holes, particularly around the regulator mounting hole. This is to prevent swarf punching through the mica insulating washer.

Insert and solder all the components into the PCB, making sure that they are oriented correctly. Solder the regulator to the underside of the PCB and bend the leads so that it can be secured to the case lid. Place a smear ..' heatsink compound on both sides of the mica washer and then bolt the regulator to the case lid, as shown in Fig. 2.

While most DC plugpacks are fitted with an output lead and connector, some, such as the Ferguson AC plugpack PPB12/500, are fitted with screw terminals. If your plugpack has a fitted lead this should be cut short and wired to the AC input of PCB. The remaining lead and connector can then serve as the output lead for the regulator circuit. If your plugpack has no fitted lead, as in the case of the Ferguson AC model cited above, it will be necessary to provide a suitable length of figure-8 twin lead, preferably with a colour streak to indicate polarity.

Before mounting the PCB on the standoffs, check that the regulator is electrically isolated from the lid by measuring with a multimeter, switched to the "ohms" range. Now the lid can be secured onto the plastic box base and the regulator is ready for testing. If a trimpot is used, a hole in the side of the plastic box directly opposite the screw of the trimpot will facilitate adjustment without removing the lid.

We used "Airfix plastic cement" to glue the back of the plugpack to the base of the box. Before glueing, roughen the mating surfaces with a file so that the glue will have sufficient "key" to the plastic. While the glue is curing clamp the two pieces together.

Connect a multimeter on the DC volts range and plug the plugpack into the mains and switch on. The voltage should be as set by R1. If a trimpot is used adjust it for the required voltage. Now the regulator is ready to be put into service.

The low voltage plug to be used at the end of the regulator lead will depend on the matching socket already fitted to the appliance to be powered or, if one is not fitted, the type which is most easily fitted. There are four popular types. There is the audio jack type normally used for earphone connections, which comes in two sizes; 2.5mm and 3.5mm. If one of these is contemplated, make sure that it cannot be confused with any existing socket on the appliance.

The other type is power plug with a hole down the centre which mates with a pin electrode on the socket. These come in two sizes also; 2.1mm and 2.5mm. Both types of socket have the facility to break one connection when the plug is inserted. This is commonly used to isolate the battery when the external power supply is plugged in.

Some appliances have an external power inlet socket built into the unit so a suitable plug with the correct voltage and polarity can be inserted into the socket. To make sure that the correct polarity is applied, check with the manual or open up the case and check polarity by following the wires to the battery terminals. Generally the red wire is positive and the black negative, although this is not necessarily the case.

Neither type of socket, as fitted to various appliances, is necessarily always wired in the same way. In the case of the power plug and socket, for example, the outer conductor is frequently positive, but some manufacturers adopt the opposite convention.

For those appliances without an external power socket one will have to be installed. Open the case and find a suitable free area where a socket can be fitted without fouling when the lid is replaced. Drill a hole for the socket, and mounting holes if needed, and mount the socket. Use the circuit diagram (Fig. 3) to help you in wiring the socket from the battery connections. When complete the lid can be replaced and the plug connected to the regulator leads.

Although we have recommended a 12V AC plugpack, this is by no means the only power source that can be used. If voltages below 6V only are required then a 9V 200mA DC plugpack can be used and this constitutes a considerable saving over the 12V AC plugpack. Alternatively, the plugpack regulator can be used in cars by tapping the 12V via the lighter socket. In either case, the rectifier diodes are unnecessary and the voltage is applied to each side of the 470μF capacitor.

Over all, the circuit has proved to be both reliable and effective, with no audible hum from the audio equipment. In fact a similar unit has been powering a portable radio for patients in the intensive care ward of Concord Repatriation Hospital for several months.

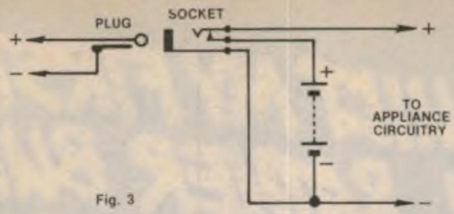
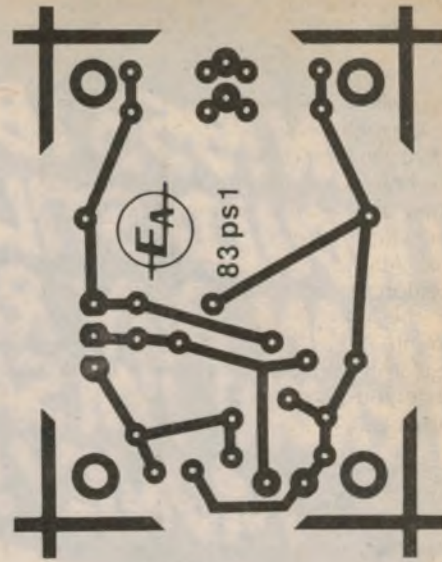


Fig. 3: This circuit disconnects the internal battery when external power is used.

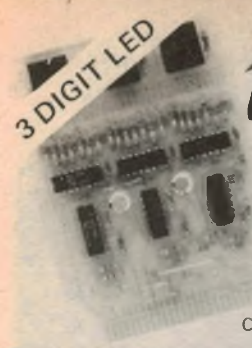
We estimate that the current cost of parts for this project is

$14

This includes sales tax but does not include the price of the plugpack.



The full size printed circuit board pattern is shown above.



DICK SMITH DELUXE COUNTER

The experimenter's delight! Every hobbyist at some time needs a counter. Here's one that won't break the bank. A deluxe fibreglass PCB with all counter components are supplied — and you can use this as a base for a huge number of projects. Operates from 5 to 15V supply. Exclusive to Dick Smith Electronics, with our own specially prepared instruction manual showing not only how to build it, but a number of experiments too!

Cat. K-3451 **$29.50** **WOW!**

SUPER SIREN

This siren has got an ear-splitting sound, yet it is compact and draws very little current. It uses a piezo-electric tweeter, which can be soldered directly to the PC board. Has many uses: as an equipment malfunction alarm, intruder alarm, car alarm (separately powered and not dependant on the car battery).

Cat. K-3505 SEE EA NOV '82 **$19.95**

Transistor Assisted Ignition

Cat. K-3300

This kit incorporates circuitry with dwell extension which results in a hotter spark at high engine speeds and is compatible with modern electronic tachometers. Comes complete with a custom made aluminium box and all components are supplied. SEE EA NOV '79

NEW METALWORK! **$29**

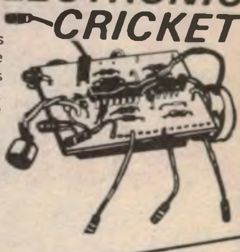
YOUR OWN DISCO LIGHTING! DISCO STROBE

Now's your chance to put one of these great Disco Strobes together yourself! This kit is quite simple to build, but it does use high voltages, so experience is most definitely required. The flash rate of the unit is variable from 1 flash/sec to 20 falshes/sec. Comes complete with metalwork, reflector and perspex cover. SEE ETI SEPT. '79

$35.50

Cat. K-3152

ELECTRONIC CRICKET

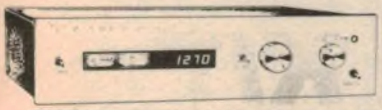


His name is Cudlipp and he imitates insects perfectly. He's bound to be a conversation piece — once he's been unearthed! Easily constructed, he speaks when others do and flashes his eyes impressively. But just try to find him! When all is quiet, he doesn't make a sound. SEE EA FEB '82 Cat. K-3397

$12.50

PLAYMASTER AM/FM TUNER WITH CLOCK **$139.00**

Why buy one without FM?



Professional quality pre-built tuner module means all the hard part of this kit is done for you. Dick solved the problem of FM alignment by importing a pre-built and pre-aligned tuner module ready to be built into a project. EA came up with a design incorporating digital frequency readout that doubles as a clock. Easy to build, comes with instruction manual. Superb tuner sound at this low price will be hard to find anywhere else! Cat. K-3494 SEE EA NOV '78

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This has to be one of our most popular novelty kits. Can you climb out of the well without getting dumped back in? Easy to construct, comes complete with full instructions. A kit for all the family! Cat. K-3390

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SYSTEM 80 OWNERS!

JOYSTICK INTERFACE

Ever wish you could hook up a joystick to your System 80 so you could play games faster and with greater realism? Well, your wish has been answered. This little adapter won't strain your piggy bank and can be assembled easily. It plugs in, and away you go! Cat. K 3455
NOTE: Compatible with most US games software designed to work with the 'Alpha' joystick.

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BUILD YOUR OWN

You've heard all about Negative Ion Generators and their benefits, now buy the kit and find out what it's all about. Our kit runs on 12V DC, you can put one in your car! Includes exclusive Dick Smith emitter head, power pack and tough moulded plastic case. Cat. K-3335 SEE ETI APRIL '81

$38.50

electronic circuit breaker

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now only $45.00

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was $52.00!

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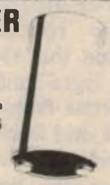

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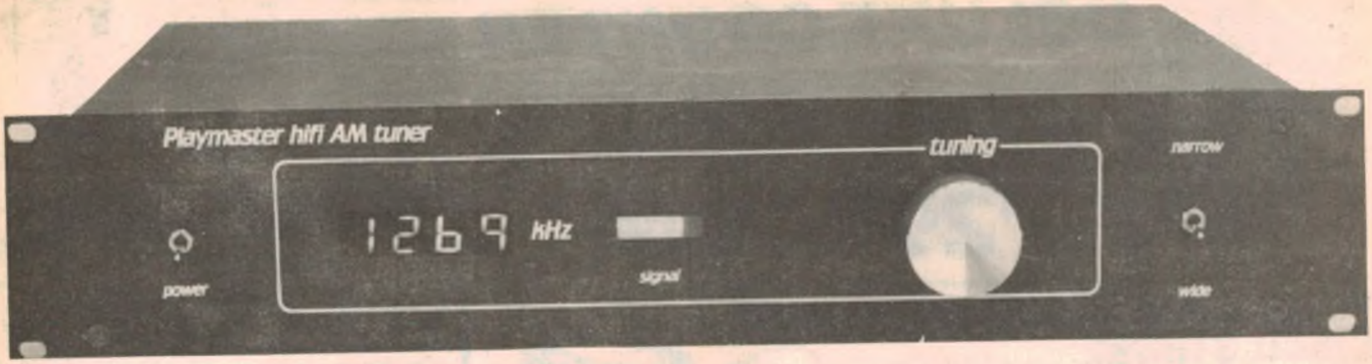
SEE PAGE 5 FOR ADDRESS DETAILS

104/CR

Second article has the construction details



A high performance AM tuner: Pt. 2

Despite the circuit complexity, construction of our new Playmaster AM tuner is fairly straightforward. Most of the circuitry is contained on three printed circuit boards: the main tuner PCB, the main readout PCB and the LED readout PCB.

by JOHN CLARKE & GREG SWAIN

By now, you've probably got the parts for our new AM tuner together, ready to commence assembly. Before diving in with soldering iron "a-smoking", however, readers should note that some of the components used in this project can be damaged by careless or unnecessary handling.

In particular, the RF, IF and local oscillator coils should be handled carefully. Do not idly twiddle the slugs of these coils, as they are quite fragile and easily broken. The slugs are adjusted only during the alignment procedure (to be described next month), and then only using a plastic alignment tool.

Similarly, take care not to damage the toroids (they are quite brittle) and leave the CMOS ICs in their static-protection foam until you are ready to mount them in position. Because this is a fairly complex project, we suggest that you take your time and proceed carefully. Double-check each step for mistakes as you go, and pay particular attention to component orientation.

That's enough sermonising! Let's turn our attention to the construction details.

As already mentioned, virtually all the circuitry is accommodated on three PCBs. The main tuner PCB carries the RF circuitry plus power supply components, while the remaining two boards carry the digital readout and signal strength indication circuitry. The latter two boards are soldered together at right angles, thus keeping internal wiring to a minimum.

We'll describe the assembly of each board in turn, beginning with the main tuner PCB.

Main Tuner PCB

This board is coded 82qr12a and measures 161mm × 178mm. Before actually mounting components, inspect the copper side of the board and repair any track faults at this stage. You should also check that all the holes have been drilled, and that the holes beneath the two 9817 coil positions are large enough to accept the alignment tool (ie, about 4mm). Holes are not required under the other coils, since these have only one slug and are tuned from the top.

The tuner PCB can now be assembled according to the parts overlay diagram. Mount the low profile components first before moving on to the larger components. We used PC stakes for all external connections to the PCB and to terminate all those components which are only connected during the alignment procedure. These include resistors R1, R2, R3 and R4; capacitors C4, C5 and C6; and links LK1 and LK2.

Note that IC6 is a CMOS device, so observe the usual precautions. When soldering it into circuit, connect the barrel of your soldering iron to the earth track on the PCB (use a small clip lead) and solder the supply pins (7 and 14) first. Note also that IC1 is in a metal can package, so its leads will need to be splayed to suit the dual-in-line holes in the PCB.

Pay particular attention when mounting the 3-terminal regulators and the FETs, since they are easy to install the wrong way round. Pin connection diagrams for the FETs, regulators and transistors were published last month with the circuit diagrams.

The RF, IF and local oscillator coils are all polarised, and can only be mounted one way on the board since the two centre pins are slightly offset from centre. The main thing to watch here is that you use the correct coil type in each position. You'll find the type number on the side of the metal can.

The 8010 whistle filter coil is not polarised and can be mounted either way.

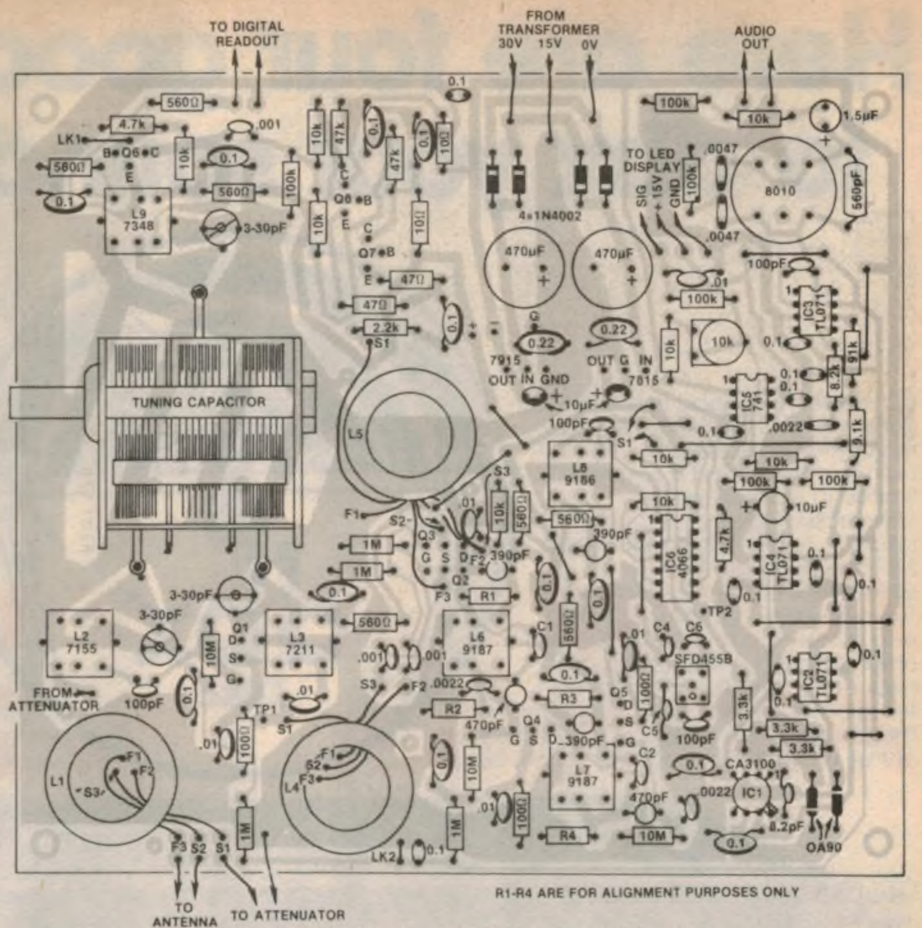
The toroid transformers are all wound identically. First, take three two-metre lengths of 0.4mm (26 B&S) enamelled copper wire and twist them together using a hand drill until the twist approaches one crossover every 4mm. The triple-twisted (trifilar) wire is then wound on the toroid to give about 65 tight, closely-spaced turns. Terminate the start and finish off the winding by lightly twisting the ends together for a few turns.

The ends can now be trimmed to a length of 35mm and the insulation removed from the tip of each wire using a sharp knife. One end of the trifilar winding can now be terminated in each of the three start positions: S1, S2 and S3. The corresponding finish wires – F1, F2 and F3 – must now be identified using a multimeter and then terminated in the F1, F2 and F3 positions on the PCB.

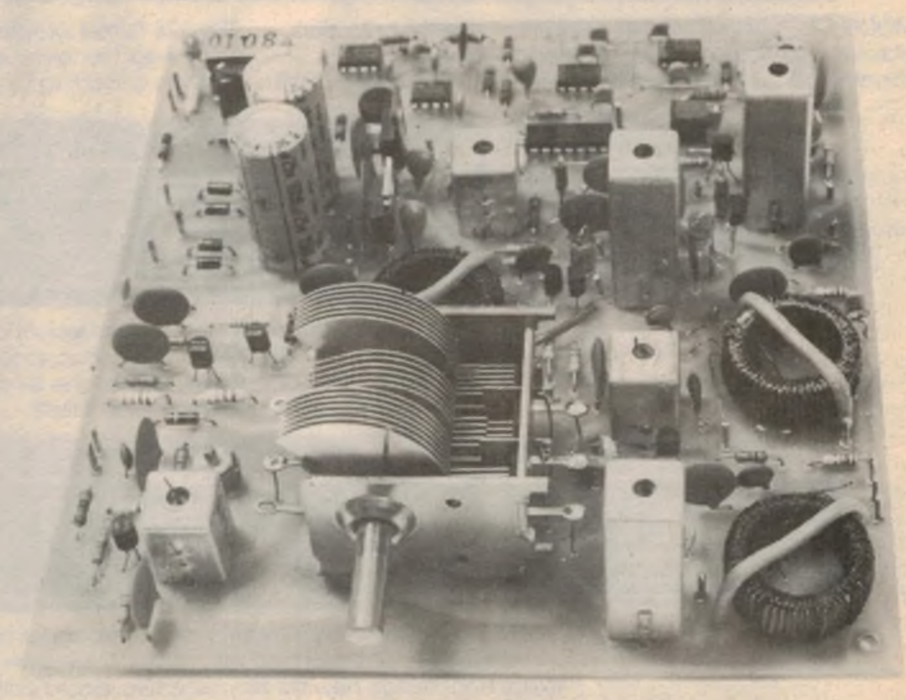
It does not matter which end of the trifilar winding you actually choose as the start. What is important is that you identify which start and finish is actually S1 and F1 and so on. Note that S3 and F2 of coil L5 are connected together in a common hole on the PCB.

The toroid coils are secured using U-shaped wire links to clamp the coils in position. First, solder one end of the link in the hole provided and sleeve the wire with 35mm of spaghetti insulation. Now terminate the other end of the link in the opposite hole, pull it down tight over the coil with a pair of pliers, and solder it to the PCB.

The ganged capacitor can now be mounted on the PCB using three ⅛-inch Whitworth screws (³⁄₁₆-inch long). Do not use longer screws, otherwise they may short the capacitor plates. Solder wire links between the capacitor lugs and the PCB as shown on the overlay diagram. There are five connections in all – three to the fixed capacitor plates, and two to the separator plates.



Above is the parts overlay for the main tuner PCB while below is a photograph of the fully assembled board. See text for coil winding details.



Main Readout PCB

This board is identical to the main board used in the Digital Tuner Readout described in the October issue. It is coded 82fc8a and measures 160mm × 125mm.

Note that IC2 is not used here, since it is only necessary for the counter to cover the broadcast band (520-1630kHz). Instead, link LK3 bypasses IC2 while link LK2 ensures that IC3 divides by 10. At the same time, the decimal points used in the original version are omitted so that the tuner displays the frequency in kHz rather than in MHz.

Because switch S1 is no longer used, all preload encoding links are now wired permanently into circuit. These include the three links adjacent to IC6 and IC7 that were previously shown dotted. As shown, the links encode the required 455kHz offset.

Start construction by assembling the components on to the PCB according to the overlay diagram. All the ICs face in the same direction except for CMOS ICs 9, 10, 11 and 12. When soldering the CMOS ICs, solder the power supply pins (8 and 16) first to enable the internal static protection diodes. As before, the barrel of the soldering iron should be connected to the earth track on the PCB with a small clip lead before soldering.

The CMOS ICs are recognised by their 4029 and 4511 type numbers.

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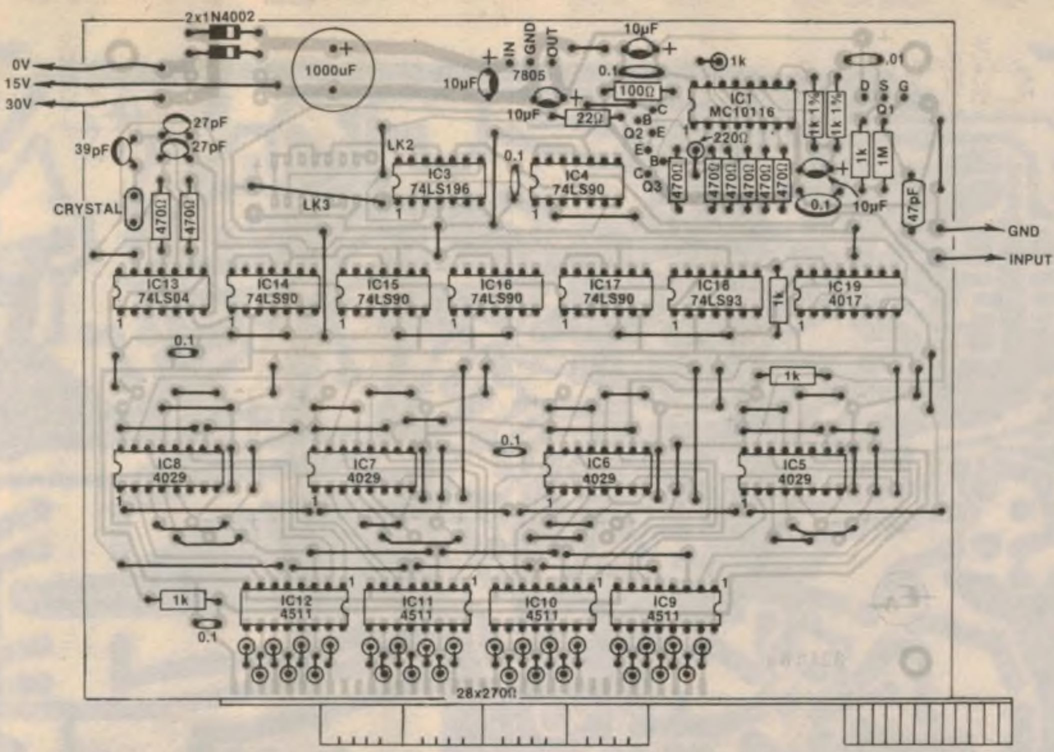
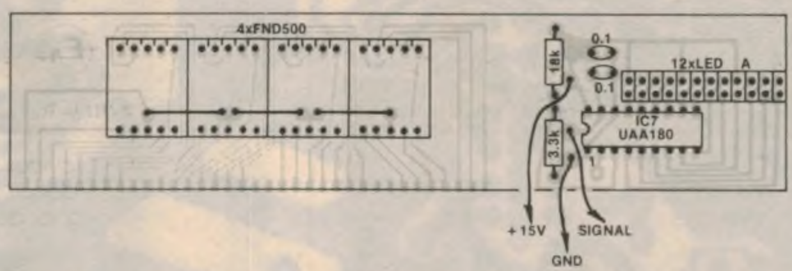




Parts layout diagrams for the main readout PCB (above) and the LED readout PCB (right). Make sure that all links are correctly inserted, and that the LED displays are oriented so that the ribbed edge of each display is at the top.

Note that many of the resistors are mounted end on, including two adjacent to IC1 and 28 adjacent to ICs 9, 10, 11 and 12. The remaining resistors are mounted in the conventional manner.

We recommend the use of PC stakes to facilitate external wiring connections to the power transformer and tuner PCB.

LED Readout PCB

With assembly of the main readout PCB complete, attention can now be turned to the LED readout board. This board is coded 82qr12b, measures 146mm × 33mm and accommodates the FND500 LED displays, the UAA180 bar graph display driver IC, and the 12 signal strength indicator LEDs. Eight red LEDs are used at the low signal (left-hand) end of the signal strength indicator, while four green LEDs are used at the high end.

It is necessary to install the three wire links first, since these are situated beneath the LED displays. This done, the remaining components can be installed but do not solder the leads to the indicator LEDs at this stage. The four FND500 displays are mounted flush against the PCB and must be oriented so that the ribbed edge of each display is at the top.

The 12 indicator LEDs are mounted slightly proud of the PCB so that they line up with the front surface of the LED displays. This is best achieved by temporarily mating the LED readout PCB with the front panel. Carefully push the FND500 displays through the front panel cutout until they sit flush with the surface of the panel, then adjust and solder each of the indicator LEDs in turn.

Exercise care when soldering the indicator LEDs – the leads are very close together so it is all too easy for the solder to bridge across to an adjacent pad.

Chassis wiring

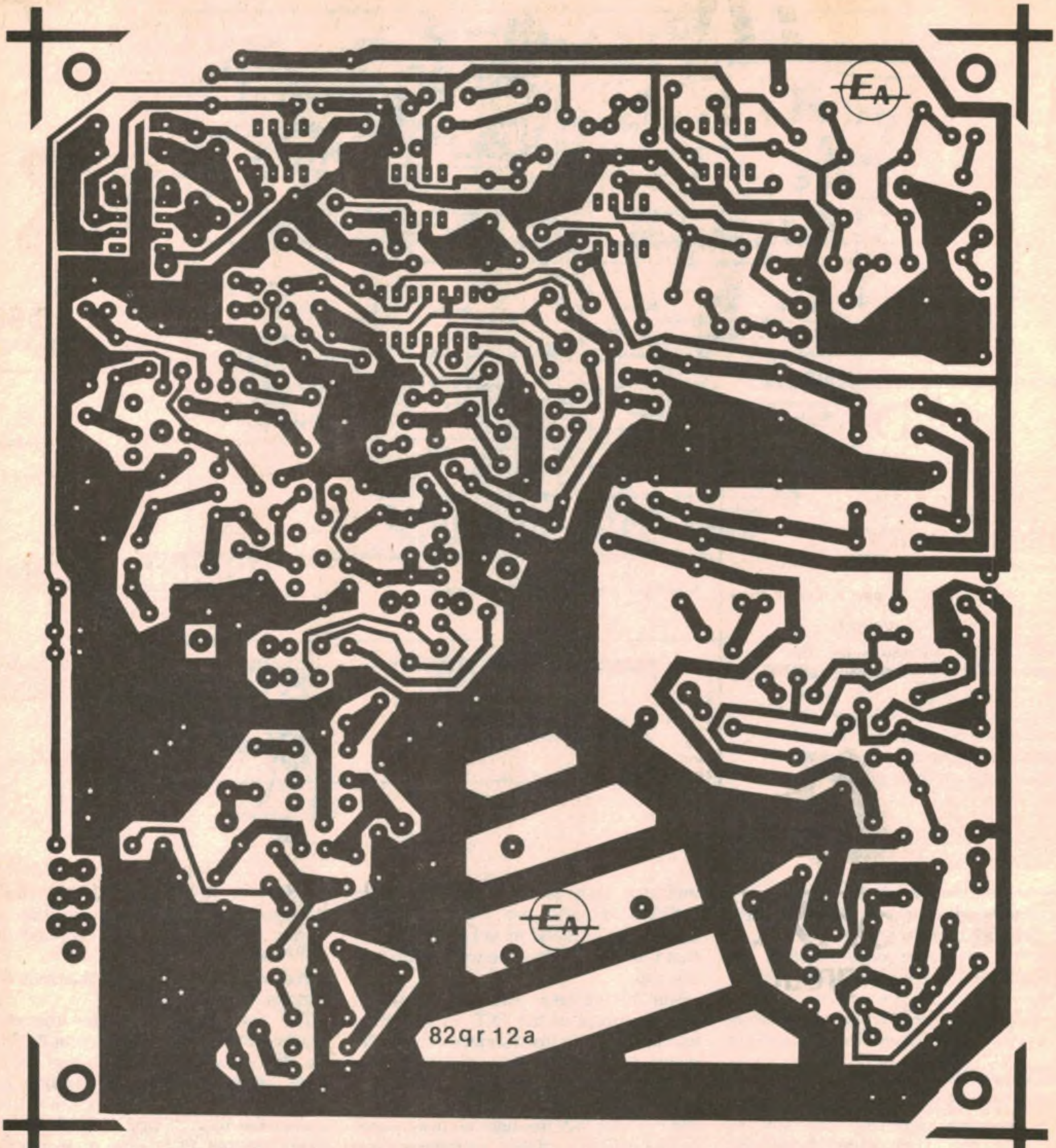
A standard rack mounting cabinet measuring 430mm × 255mm × 88mm is used to house the new Playmaster AM tuner. This is fitted with a matching black anodised front panel with white silk-screened lettering for a really professional finish. To make the job easier, the front panel is supplied pre-punched.

We will assume that the chassis is also supplied pre-punched.

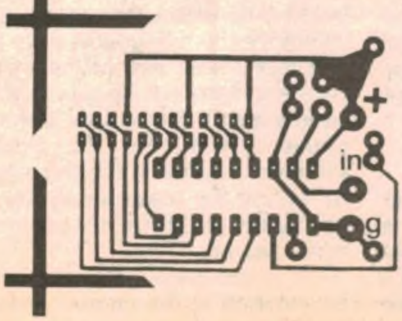
The first job is to solder the main readout PCB to the LED readout PCB. To do this, attach the front panel to the case, insert the FND500 displays and indicator LEDs into the cutouts, and screw the four 25mm standoffs to the main readout PCB. The main readout PCB can now be positioned in the case and a pencil used to mark where the two boards intersect.

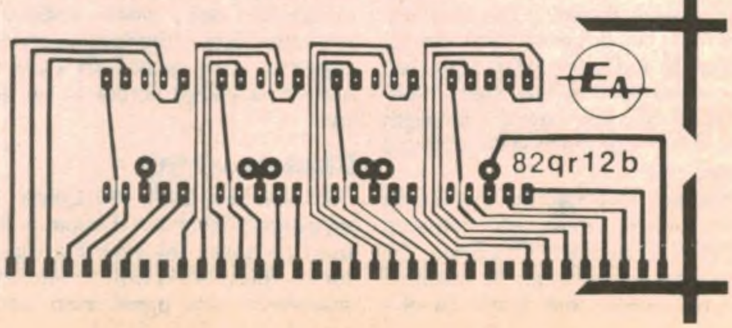
Remove the two boards from the case and tack solder two of the mating bus pads together, making sure that the two boards are at right angles. Before going further, check that the boards are soldered together in the correct position by testing the assembly in the chassis. Readjust as necessary, then solder all the pads together.

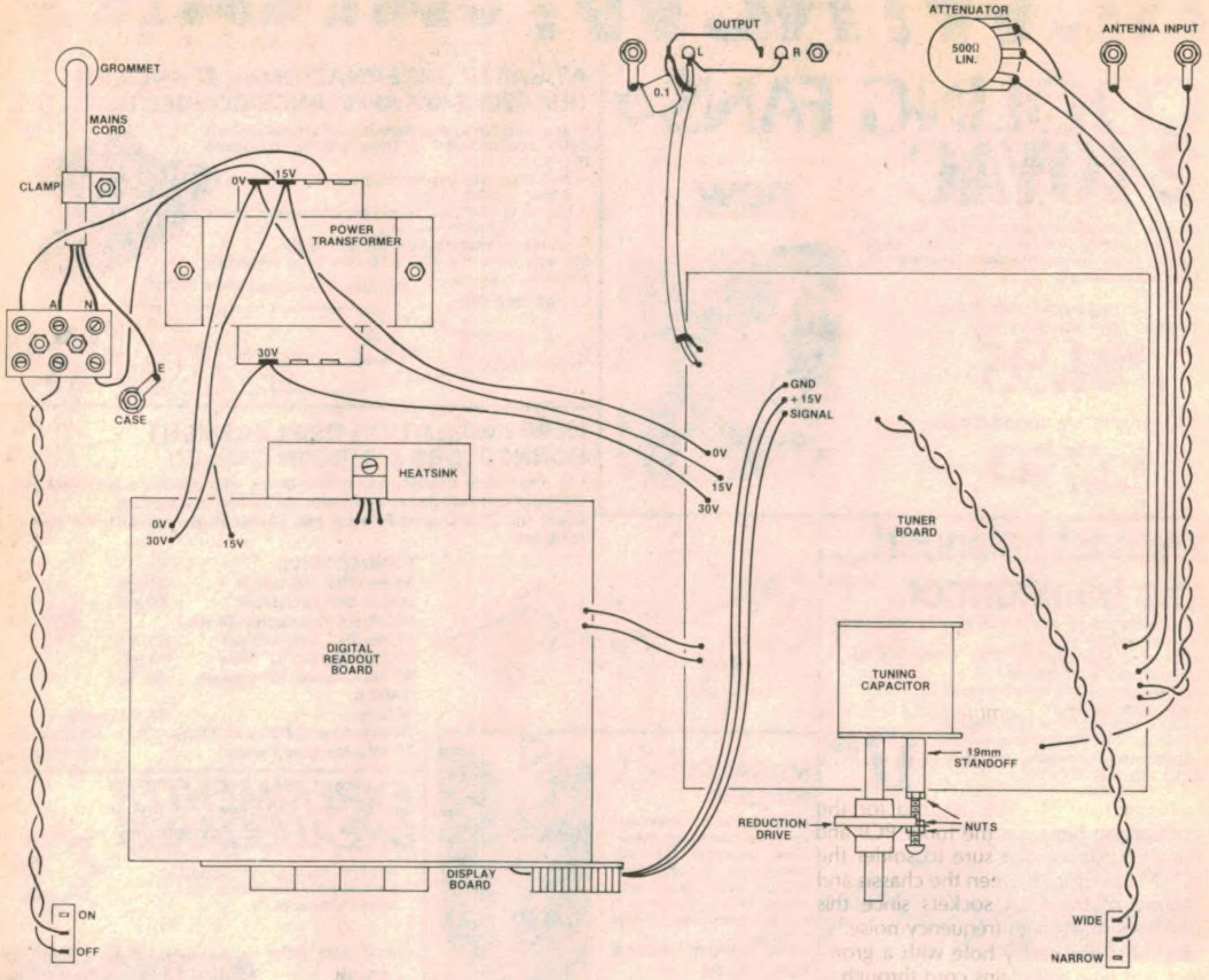
The various items of hardware can now be installed in the chassis according to



Here are actual size artworks for the main tuner PCB (above) and the LED readout PCB (below). A full-size artwork of the main readout PCB was published on page 58 of the October 1982 issue.







Use this diagram in conjunction with the circuit and parts overlay diagrams to complete the tuner wiring.

the wiring diagram. Before mounting the tuner PCB, it is necessary to fit the reduction assembly to the tuning capacitor shaft. The wiring diagram shows how the reduction drive is secured to the gang using a 30mm-long ⅛-inch Whitworth screw, three nuts and a 19mm brass standoff.

The tuner PCB is installed in the chassis using four 19mm brass standoffs. In most cases, it will be necessary to file down the standoffs slightly so that the reduction drive shaft is centred in the front panel hole. On no account should the reduction shaft short against the front panel, since this will upset the tuner operation.

A substantial heatsink is required for the 7805 3-terminal regulator on the main readout PCB. This is fashioned from a 70mm × 65mm sheet of light gauge aluminium, as shown in Fig. 1, and bolted to the chassis using machine

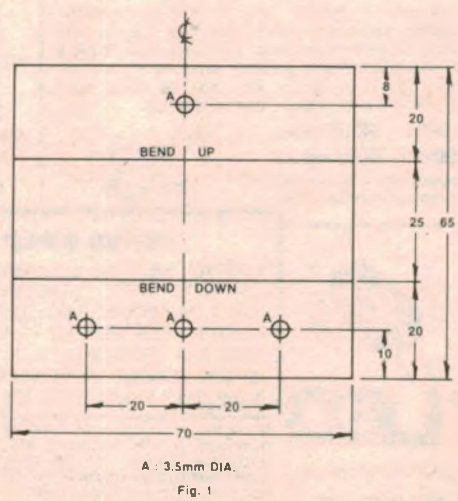
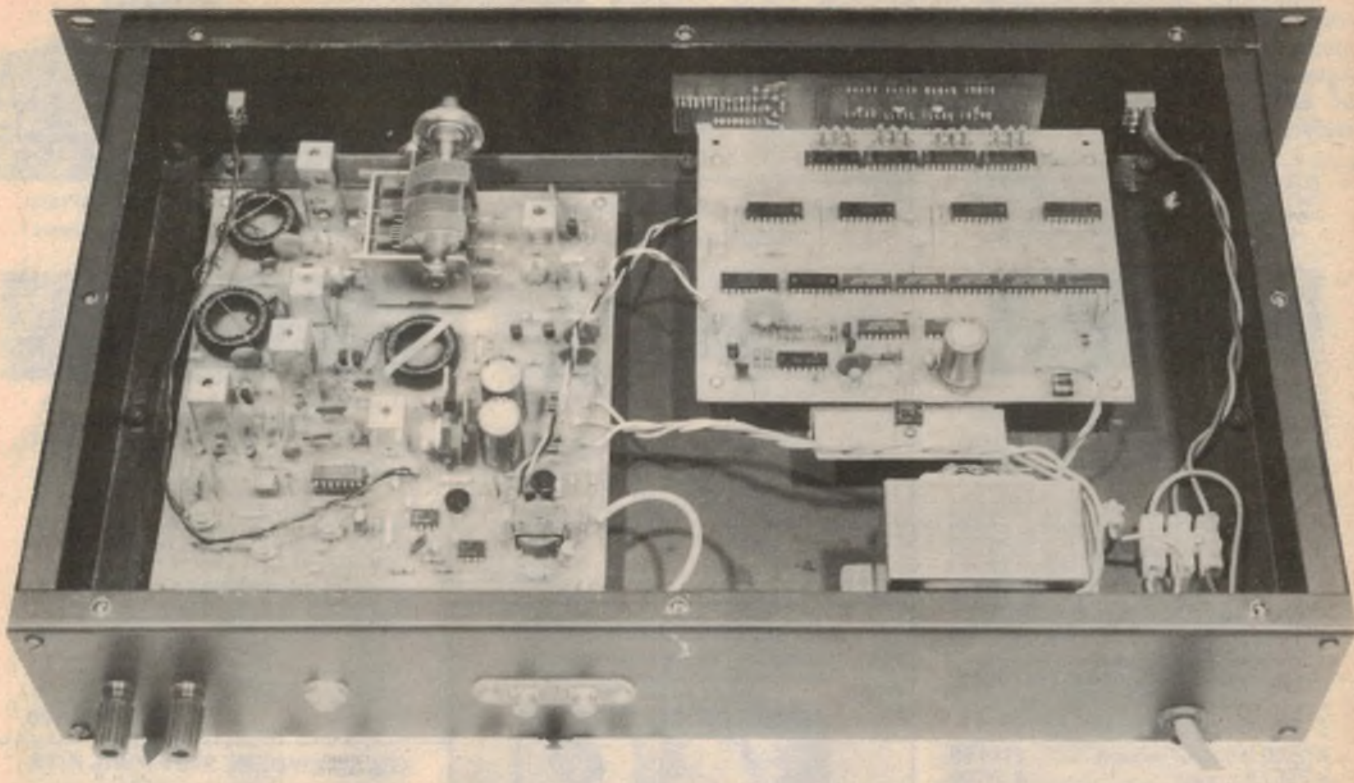


Fig. 1: use this diagram to fashion a suitable heatsink for the 7805 3-terminal regulator (main readout PCB).

screws and nuts. The readout PCB assembly can now be permanently installed in the chassis but note that you may have to drill new mounting holes at the front of the board so that they line up with the chassis holes. (We found it necessary to move the mounting holes back about 10mm to clear a small lip at the front of the chassis.)

A mica washer and an insulating bush must be used to electrically isolate the 7805 regulator from the chassis. Smear heatsink compound on the mica washer and regulator, then bolt the regulator to the heatsink as shown in Fig. 2. Finally, use a multimeter to check that the metal tab of the regulator is indeed isolated from the chassis.

Use medium duty, 10mm × 0.2mm hookup wire for the low voltage power supply wiring and light duty, 10mm × 0.12mm insulated wire for the connections to the antenna sockets and



View inside the assembled AM tuner. Note the heatsinking arrangement for the 7805 3-terminal regulator.

attenuator as well as the wide/narrow switch.

Shielded audio cable is used for the connection between the tuner PCB and the RCA sockets. Be sure to solder the 0.1μF capacitor between the chassis and ground of the RCA sockets since this bypasses much high frequency noise.

Fit the mains entry hole with a grommet and pass the mains cord through it. Anchor the cord securely with a cord clamp and connect the earth lead (green/yellow) to a solder lug bolted to the chassis. Make sure that paint is removed from the area of the chassis around the earth connection to ensure a good contact. The active (brown) and neutral (blue) leads are connected to an insulated terminal block.

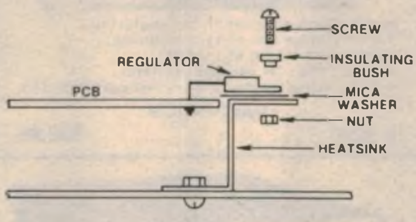


Fig. 2

Fig. 2: mounting method for the 7805 3-terminal regulator.

Complete the mains wiring to the power switch and transformer primary using 250VAC rated insulation hookup wire. Fit the three terminals of the mains switch with push-on sleeving to avoid the danger of accidental contact with the mains supply.

Next month we shall describe the alignment procedure and a simple CMOS RF oscillator to facilitate this task. Note that the only essential measuring instrument required is a multimeter.

NOTE: The following parts should be added to the parts list published last month: 3 × 3-30pF trimmer capacitors (Philips 808); 1 × 4066 CMOS switch.

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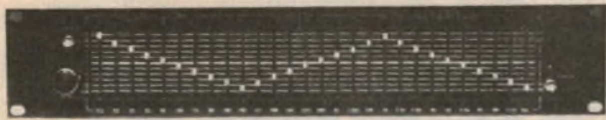

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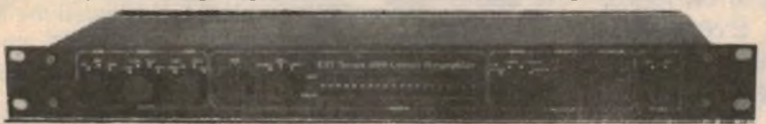

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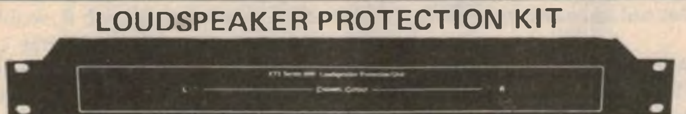

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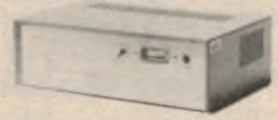

Having built the modems for our own computer use ALTRONICS strongly recommend (as do ETI) the inclusion of Audio and Visual Monitoring (signal strength). Our K 9645 includes all the components listed on Page 23 October ETI, custom ALTRONICS PCB, speaker, panel meter, front panel and case to house these options plus the full modem.

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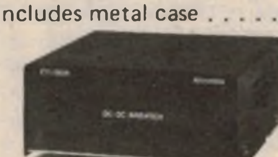

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The Serviceman

A tale of two Sanyos: same symptoms, different fault

When two sets of the same make and model exhibit the same symptoms it is odds on that they are both suffering from the same fault. Odds on, yes; but a sure thing, no. Every once in a while Murphy plays a dirty trick, as he did on me on this occasion and, incidently, handed me one of the potentially most embarrassing jobs I have had for a long time.

It all started with a perfectly routine call — from a new customer, incidently — which simply described a failed colour TV set. By asking the usual routine questions I learned that it was a 63cm Sanyo set, about three years old, which had neither picture nor sound. It had shut down while the family was watching it, and started making a little clicking sound inside the cabinet.

When I eventually came face-to-face with the monster — and I use that word with some feeling — it turned out to be the Sanyo model CTP8604; one that I had not had a great deal to do with at this time, though I was familiar with the earlier model, the CTP7601, and described a strange fault in one in my September 1982 notes.

The clicking sound the customer had mentioned was, as I had assumed and which the reader has probably also identified, the power supply in a hiccup condition. Somewhere, something had failed and was loading the power supply excessively. All I had to do was find out what.

THE LINE OUTPUT STAGE?

Along with the power supply itself, the most vulnerable part of most colour TV sets is the line output stage. With the relatively high voltages involved this is the place where most breakdowns occur. Even so, finding the exact culprit is not always easy. It is seldom that the fault can be measured directly with a multimeter; the usual approach is to disconnect suspect components or sections until the power supply holds in, then narrow it down from there.

In this case my first step was to measure the main HT rail, which should have been 120V, and try to get some idea of the severity of the fault from the voltage actually being produced. In fact it turned out to be swinging up to about 60V each time the supply cut in, suggesting that the fault, while severe enough to upset the power supply, was something less than a dead short.

I had made this measurement at the juction of C485, a 100µF filter capacitor, and R483, a 10 ohm safety resistor (though it is not shown as such on the circuit). Significantly, this hadn't tripped, but it was an easy place to break the circuit to the line output system, by lifting one side of R483. I was thinking in terms of a faulty line output transistor, or a faulty tripler, either of which can produce this kind of loading.

And it seemed I was on the right track. When I switched the set on again the power supply held up, the HT line came in at a little over 120V, and we had sound. The next easiest thing to do was to unplug the tripler, re-connect R483, and try again. But this didn't work; the power supply cut out again even without the tripler.

This suggested that the line output transistor, Q481, was the next most likely culprit, but this wasn't quite so easy to check in situ, due to the low DC

"Tell me where you got it from and I'll fix it for nothing!"

resistance in the associated circuitry. Unsoldering the base and emitter leads solved this problem and allowed me to test it. Unfortunately, it tested OK, thus squashing my line of reasoning somewhat.

So where did I go from here? In fact, there isn't a great deal more to go wrong in this part of the set, and I was somewhat reluctantly beginning to suspect the line output transformer (T902). Whereas some sets generate a number of voltages from tappings and windings on the line output transformer, and failure in any one of these circuits can shut the power supply down, this circuit appears to have only one such circuit.

This involves diode D482 from pin 9 of the transformer, and which generates an 18V supply for the signal unit. I checked the diode and associated filter components, but could find nothing wrong. So was it the line output transformer? The trouble was I didn't have a spare, either with me or in the shop. Otherwise I would have tried a new one quick smart, for they are an easy unit to fit.

NEW TRANSFORMER

At this point I decided to bail out for the moment. The easiest thing to do was order a new transformer and fit it. If it worked — fine. If it didn't it would be time enough to start worrying about more subtle faults, while a spare transformer in stock wouldn't go amiss. So I advised the customer that I would have to order a spare part and that it might be a couple of days before I could get back to finish the job. He seemed to accept this philosophically.

And this is where one strange aspect of this story began. Back at the workshop, and before I had had time to send off the order for a replacement transformer, what should turn up, from one of my regular customers, but the same make and model of set with exactly the same symptoms; no sound, no picture, and a hicupping power supply.

I didn't regard this as too much of a coincidence until I started making some measurements, only to encounter exactly the same results; about 60V on the 120V rail, no change when the tripler was unplugged, a normal 120V rail when the R483 safety resistor was lifted, no fault in the line output transistor, and no fault around the D482 circuit.

I amended the order to read two line output transformers.

They didn't arrive for a couple of days and, by that time, the owner of set No.1 had phoned to say that the family would be out of town for a week or so, and they would let me know when they returned. Well, at least that would give me some breathing space in the event that the fault in set No.2 turned out to be something other than the transformer.

As I have already mentioned, fitting a new transformer is a simple job in these sets, for which the makers are to be commended. There is only one mounting bolt and the leads are wire wrapped on the terminals. A few minutes work with a pair of cutters and a soldering iron and the set was ready to go. I left the tripler unplugged, crossed by fingers, and switched on.

I heaved a sigh of relief as everything came up as I had hoped; normal 120V rail, sound, and EHT as far as the tripler terminals. I switched off, plugged in the tripler, and tried again. Whereupon the power supply promptly shut down again and it didn't take a genius to work out that the tripler was shot.

So now I had to order a replacement tripler and I didn't have to speculate for very long on the wisdom of ordering two. I could just imagine my embarrassment if I turned up to repair set No. 1 with a replacement transformer, only to find that I needed a new tripler as well. That would only cause further delays, which would be bad enough with a customer I knew, but unthinkable with a new one I was trying to impress.

The new triplers turned up in due course and I lost no time in fitting one to set No.2 in the workshop. And this time everything worked; all that was needed was a routine touch-up of picture geometry, convergence etc, and the set went back to the customer. All that remained now was to tackle set No.1, but I felt reasonably confident that I had covered all eventualities.

The chance to confirm this confidence came a few days later when the customer phoned to advise that he was back home and, naturally, would like the set fixed as soon as possible. So, armed with tripler and transformer, I duly knocked on his front door. Before commencing the job I warned him that, based on a recent experience, the job might turn out to be more expensive than I had originally indicated. He simply shrugged his shoulders and said, "go ahead".

As before, fitting the new transformer took only a few minutes and, once again I unplugged the tripler, crossed my fingers, and switched on. And, once again, everything worked; normal 120V rail, sound, and EHT up to the tripler. Then I plugged the tripler in and tried again. And – surprise, surprise – everything held and I sensed that we had normal EHT. So the tripler was OK after all. Oh well, I could always use a spare.

All that remained now was to give the picture a routine touch-up and I could be on my way. Except that when I moved around to the front of the set there wasn't any picture. What a let-down! Still, I had to put on a brave face and carry on as though this was quite normal at this stage of the job. But what was I looking for now?

I felt reasonably sure I had normal EHT but, to make sure, I fished out the EHT probe and checked it. Sure enough there was a good 23kV at the ultor, which should have been plenty. What about the G2 voltage? Yes, that checked out OK as well. That suggested the R,G,B, outputs as the next most likely cause of picture tube cut-off.

Sure enough, there was clearly something wrong here. According to the circuit, voltages at the collectors of these three transistors, Q281, Q282, and Q283, ranged between 120 and 140V, whereas they were sitting on 180V plus. Well, at least I was making some progress, but what was upsetting the three stages?

A COMMON SOURCE

The fact that all three stages were affected suggested that it was coming from a common source, and the most likely common source was the video chain supplying the luminance to all three stages. This signal starts at the first video amplifier, Q200, and goes via the second video amplifier, Q172, and the third video amplifier, Q173, and thence to the emitters of the R,G,B, output stages. The chrominance signals are fed to the bases of these three stages from the R-Y, G-Y, and B-Y amplifiers in the demodulator chip.

The video chain, as is fairly common these days, was direct-coupled from the first stage right through to the emitters of output stages, meaning that even a small voltage error at the beginning of the chain could have marked effect at the end of it. I made voltage measurements along the chain and up to the base/emitter circuits of the output stages.

This wasn't very conclusive. Some voltages were spot on, others were a little off, but seemed as though they should be close enough. But how close is close enough in a direct-coupled circuit that you've never seen before?

Then I had another idea. Could I brute force the video chain into working and thus, possibly, gain a clue as to what was working and what wasn't? One of my contributors pulled this stunt when he was faced with a cut-off problem in a Rank Arena. (January 1981.)

I armed myself with a 1kΩ resistor on a flying lead connected to chassis and, for a start, connected this to the emitter of the third video amplifier. This was enough to bring up a faint image and, thus encouraged, I went straight to the first video amplifier and found that, by connecting the 1kΩ to the base I could produce a perfect picture.

Well, at least that seemed to rule out any faulty transistors in the video chain, but did seem to confirm that there was a faulty DC condition somewhere. By now I was becoming suspicious of another stage in the video chain; Q174, an automatic beam limiter (ABL) stage. Once again, voltages seemed to be close enough, but were they?

I decided to remove the transistor and see what happened. This was a simple job and it worked; the set immediately came back to normal and produced a first class picture. I checked the transistor and it measured OK but, just to be on the safe side, I replaced it with a new one. But this did no good, the set still would not work with the transistor in circuit.

In hindsight, the next few steps should have been easy, but they weren't. The problem was one that had been bugging me right through the job, and involved the circuit diagram I was using. This was not a manufacturer's issue, but a commercially reprinted one published as a service manual. Nor is the problem the publisher's fault. He has done the best he can in a very awkward situation.

In common with most modern circuits the original was quite large; too large to allow it to be reduced to a one page size and still be usable without a magnifying glass. So the only thing left is to break it up into sections, with plenty of overlap at the breaks. In general this works, except for one thing. Modern circuits are so complex that the draughtsmen invariably resort to the trick of terminating various leads in arrows and indentifying codes, to be matched with another arrow and code on the other side of the circuit.

This isn't too bad when you have all the circuit in one piece, although, to me, the arrows never seem to point in the right direction. But when the circuit is broken up, the arrows become completely meaningless. In this case a lead from the base of the beam limiter stage leads off the signal unit board to an arrow and is coded as 1AB, with the arrow indicating that it goes to 6AB.

Fair enough I suppose, but do you think I could find 6AB? I don't know how much time I wasted looking for it. It seemed like hours (it wasn't, of course) but, with the customer in the same room, I was close to panic a couple of times. When I did find it it turned out to be on the neck board of the picture tube, rather than the deflection unit board where I had expected it to be.

As soon as I realised this I went straight to the neck board, pulled it off — and I knew the search was over. Staring me in the face was a slightly discolored electrolytic with, as they say, its inside outside. More precisely it was a 4.7μF electro, C603. It forms part of a voltage divider network on the negative end of the EHT winding and which supplies, among other things, the G2 voltage.

But it also supplies a much lower voltage to the base of the beam limiter transistor and, without having to delve too deeply into the finer points of circuit operation, it was obvious that the circuit couldn't work without it. In fact, it proved to be open circuit and I imagine that, without it, pulses were being fed to the beam limiter, at line frequency, which cut the system off without the cause being very obvious at DC levels.

Naturally, a new capacitor fixed the set and, after a routine touch-up, I said goodbye to a happy customer.

But there are still a few points to be considered. One concerns the problem I had with the sectionalised circuit. I was subsequently able to view the whole circuit in one piece and imagine how I felt when I discovered that the draughtsman had very thoughtfully labelled 1AB/6AB "To Picture Tube Socket Unit".

Why hadn't I seen it? For the simple reason that this was where the circuit had been cut, leaving the 6AB on one page and the instruction on another. Oh yes, it was on another page all right, together with an appropriate amount of overlap, but this portrayed the power supply circuit (apart from the extreme left hand edge) and I had no reason to give it a second glance.

OK, I'll know better next time.

The other point concerns the likely sequence of events in both sets. What happened first? Did the capacitor in set No.1 fail and take out the line transformer? Or did the transformer fail and produce a spike that wrecked the capacitor? My guess is that it was the latter sequence but, then, it might just have been coincidence.

And set No.2? A faulty tripler that took out the transformer? Or a transformer failure that wrecked the tripler? Again, my guess is for the latter sequence. But, if both guesses are correct, why the tripler in one case and the capacitor in the other?

Your guess is as good as mine.

The oddballs a serviceman meets

After that, I think something in lighter vein is called for. Fortunately, one of my consistent contributors, Mr J.L. of Tasmania, recently submitted a series of short anecdotes dealing with the strange behaviour of some customers. I can't cope with them all this time round, but here are some of the shorter ones.

A colleague once said, over a quiet glass of lunch, that servicing would be a wonderful job if it wasn't for the customers. He related some stories about his oddball clients and, after he had gone, I thought about some of the people I had met over the years.

The first is the "fresh air fiend". She had called me to look at improvements to her antenna system. I arrived at 9am on a cold foggy winter morning. (This is Tasmania, remember. Ed.) I could not see the antenna for the fog so I went to the door, expecting to be able to warm up while I inspected the interior layout.

But no. All the windows and doors were open and she was wearing light summer clothes! I shivered my way through the inspection and said I would come back when the fog cleared — like next summer.

Then there are the "dog lovers"; nice house, nice family, and quite charming customers — except that they have three large dogs which live inside all winter. Last time I called the atmosphere in the house was so overpowering that I felt I just had to open something. The trouble was that the window frames had been painted over years ago and the windows hadn't been opened since.

And one I dread hearing from is "the perfect host". As soon as I enter the house he opens a bottle and insists that I join him glass for glass until the job is done. I think he enjoys having a major breakdown in his TV set because it takes longer to fix and he gets more drinking time.

Then there was "Mr Plug". He had an ancient radiogram that stopped working. He decided that a valve had failed and that he could replace it himself. He saw a notice on the back of the cabinet which said, "Remove the power plug before making adjustments or changing valves." So he did; he took the power plug off the lead and couldn't get it back on again!

And it wasn't a valve.

Thank you J.L. I think all those are good for a chuckle, particularly the last one. There are others, but that's all we have room for this month. We'll hold the others over for the present.

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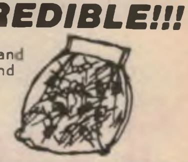

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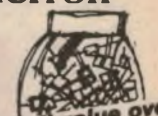

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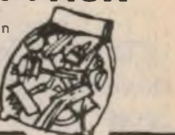

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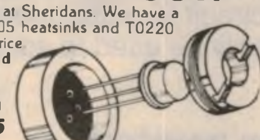

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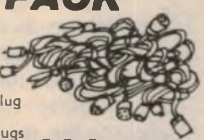

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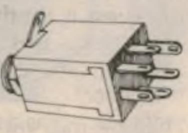

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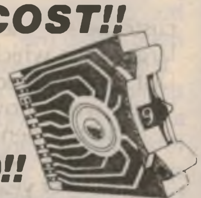

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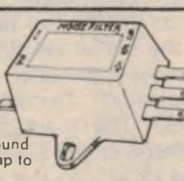

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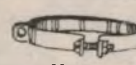

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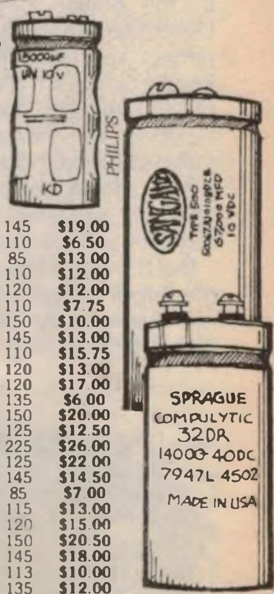

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39000	30	SPRAGUE	50	145	$13.00
44000	35	SNGAMO	75	110	$15.75
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47000	25	PHILIPS	65	120	$17.00
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65000	35	SNGAMO	75	150	$20.00
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Be the light of the party:

The dazzling new "LED Head" lightchaser

LED chasers have been used in some weird and wonderful devices over the years but few have been as outrageous as this project. In our uncompromising quest for state-of-the-art electronic gimmickry we have designed an electronic headband utilising the LED chaser. The circuit is quite compact and simple and could, of course, just as easily be used to adorn a sun visor or any other likely item.

by COLIN DAWSON

We are assuming, however, that most constructors will opt for the LED chaser headband, and in honour of these innovators, we have christened the project "LED Head". Why LED Head? Well, there aren't many names suitable for a project that sets light emitting diodes chasing around the pre-frontal lobe and anyway, it seemed like a Bright Idea!

This project is quite similar in concept to the Boggle Goggles, presented in December '82. In fact, it would make a perfect accessory for the well dressed Boggle Goggler! It should prove very simple to construct, and in most cases will be one of the cheapest projects you can build. The actual chaser circuit, including a box, should not cost much over $10. The only additional expenses are a battery and suitable headband.

The LED Head has a big advantage over the Boggle Goggles in that the wearer is not significantly incapacitated whilst demonstrating them. You can go about your business as normal. For this reason we anticipate that the LED Head may be used for rather long continuous periods. This, of course, makes a fairly heavy demand on the power supply which may not be met by the 216 9V battery. This battery will give a useful life of about one hour of continuous use, and is the only battery which will fit in the small plastic utility box. If its capacity is inadequate, the solution is to use an external battery pack. An alternative would be to use a bench power supply but this may present a problem if you wish to lead a conga at a party!

Giving the impression of movement to a string of lights, chasers produce an appealing effect. Besides the well known commercial applications, they are almost mandatory on the control panel of science fiction space ships. To the technically uninitiated, such displays are synonymous with computers, death rays and other devices of unfathomable complexity. In fact, this circuit is quite simple, but only "Electronics Australia" readers need know this.

While he may look like a lunatic being restrained, this brave fellow is regarded as a leading light among his colleagues.

The LED chaser circuit and type 216 battery fit into the smallest size plastic utility box. The switch is wired between PCB and positive terminal of the battery.

It is possible to impart the impression of movement to any number of lamps in a "string" by wiring them in groups of four. It is then only necessary to use a sequential four pole switch (or its electronic equivalent) to switch the lamps in sequence. At the first switch position, only the first lamp from each group is on and at the second position, only the second lamp should be on, and so on. By placing several groups of lamps end to end, movement appears continuous from one end of the array to the other.

The circuit employed in this project is almost identical to our Electronic Christmas Decoration of December 1981. The main difference is that the printed circuit board has been remodelled to fit into the smallest plastic utility box. Mounted on this printed circuit board are two ICs, four transistors and just a few other components. This part of the circuit can be considered as three parts: an oscillator (IC1); a divider (IC2), and a buffer/driver section (the four transistors).

IC1 is a 4011 quad two input CMOS NAND gate. This may sound rather daunting, but it simply means that the IC has four NAND (Not AND) gates, each gate having two inputs. In this circuit, only three of the gates are used, with the inputs to the fourth gate tied permanently low. By tying the inputs of a NAND gate together, the gate can be made to operate as an inverter ie, its input is in the opposite state to its output.

Referring to the circuit diagram, it can be seen that three such inverters, IC1a, 1b and 1c, are connected in series. A 1μF capacitor and a 27kΩ resistor are connected between the outputs of IC1b (pin 4) and IC1c (pin 10). Since these two outputs will always have opposite polarity (because IC1c is an inverter) the capacitor will be charged in one direction, or the other. The 27kΩ resistor provides a time of about 60 milliseconds for this charging. After this time has elapsed, the input of IC1a (pins 1 and 2) will be taken low (or high) and the gate output will change.

This will cause the other gates to change states and the 1μF capacitor now begins to charge in the opposite direction, again with the same charging time. The result of this continuing sequence is a square wave output at pin 10, which then provides clock pulses at a frequency of about 17Hz for the counter.

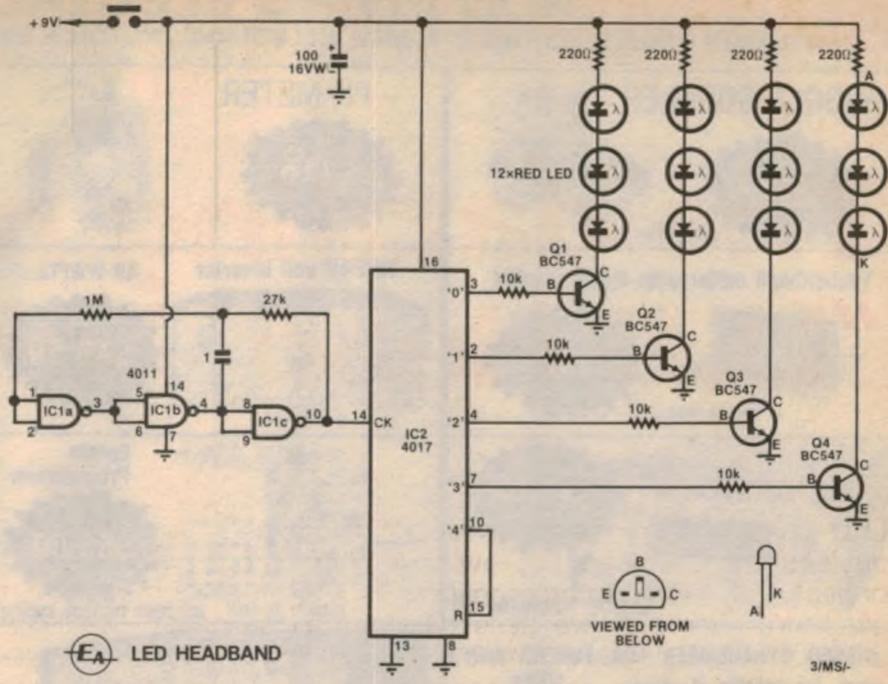
To give the desired sequential switching of the LED groups, a 4017 CMOS decade counter is used. This IC has 10 outputs, numbered 0-9, and normally each one goes high in turn for one clock cycle. Because we only require four different outputs, the fifth output is connected to the reset and the effective count is only four.

The 17Hz output of IC1c at pin 10 is connected to the clock input (pin 14) of IC2, the 4017 decade counter. On each positive transition of the square wave, the 4017 advances one count. The decoded "4" output (pin 5) is connected to the reset (pin 15). As soon as pin 5 goes high, the counter is reset with the decoded "0" (pin 3) going high. This last operation is independent of the clock input and, so far as this circuit is concerned, is instantaneous. Hence the 4017 is operating as a one-of-four counter.

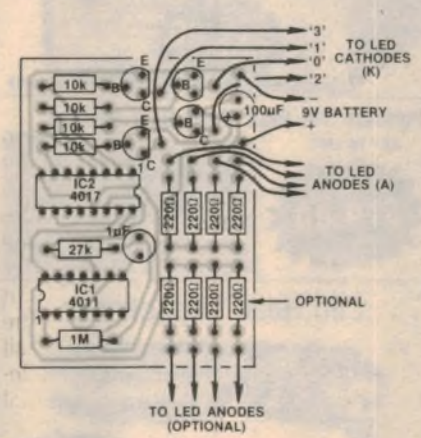
Four NPN transistors are used to buffer the outputs of the 4017. A 10kΩ resistor connects each output to the base of its respective transistor.

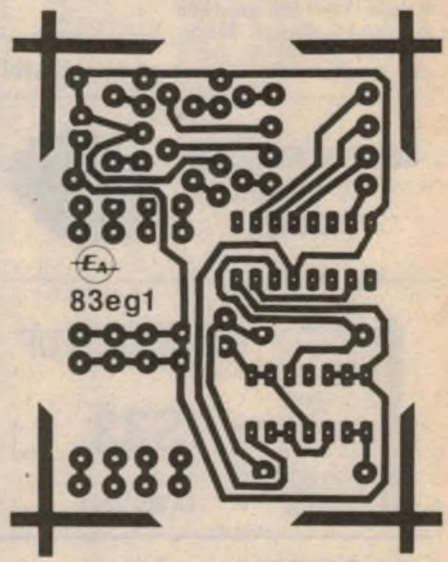
LED combinations

Assuming that there are to be 12 LEDs in the array, the LEDs driven by the decoded zero (pin 3) will be 1, 5 and 9. Similarly, the decoded 1 (pin 2) will drive LEDs 2, 6 and 10; decoded 2 (pin 4) LEDs 3, 7 and 11; and decoded 3 (pin 7) LEDs 4, 8 and 12. If an additional 12 LEDs are included, they must be wired in the same manner as the first 12. The two displays are then mounted end to end (in the mechanical sense).



The chaser circuit consists of an oscillator, counter and LED driving transistors.





Above is the component overlay diagram. Parts marked "optional" can be added to produce a 24 LED chaser. The full size PCB pattern is at right.

As we have presented it, the display has 12 LEDs arranged in four groups of three. One group is on at any given time, meaning that three LEDs at a time must be driven. In fact, the three LEDs are driven in series to minimise the current drain from the 216-type battery. The printed circuit board allows the option of adding another four groups of LEDs, the second group being driven in parallel with the first. Consequently, the current drain of the circuit is doubled. This virtually eliminates the 216 battery as a practical power source with a pack of four 1.5V "AA" cells becoming the smallest practical power supply.

A separate current limiting resistor is used for each group of LEDs so that the value of the resistor can be tailored to suit the LEDs used. Different value resistors are required to compensate for the differing operating characteristics of various LED types. For example, red LEDs will exhibit a forward voltage drop of typically 2V, whereas green LEDs will be nearer to 2.6V. Assuming that the chaser has homogeneous LED groups, the red LEDs will require a higher value limiting resistor than the green. In fact, the values suggested are 220Ω and 68Ω for red and green LEDs, respectively. Our prototype used red LEDs only, for minimum current drain.

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

$12.00

This includes sales tax, but not a battery or headband.

Actually, the values of 220Ω and 68Ω do not precisely equalise the operating currents. The green LEDs are purposely operated at a slightly higher current than the red to compensate for their lower efficiency. Amber and yellow LEDs are also available and their operating characteristics can generally be expected to fall between red and green LEDs.

Irrespective of the current limiting resistor used, the battery can be expected to have a shorter useful life if green LEDs are used. With three LEDs in series, the total forward voltage drop is 3 × 2.6V, or 7.8V. Once the battery voltage falls below this level, the LEDs will not illuminate at all. Hence the useful life of the battery is the time it takes to discharge from a nominal 9V to 7.8V, which, for a 216 battery, will be somewhat less than one hour. By comparison, the circuit will continue to function down to about 6V with red LEDs.

Construction

If you are housing the electronics for the project in a "zippy" box, make sure that the printed circuit board, coded 83eg1, fits into the box. The board has nominal dimensions of 46mm × 60mm, but it may need to be filed down slightly to fit into some boxes. Once this has been taken care of you can begin assembly of the PCB components. Mount the ICs last and earth the barrel of the soldering iron to the earth track of the PCB when doing so. Solder the earth pins (7 for the 4011 and 8 for the 4017) first, followed by the positive supply pin (14 and 16). This protects the ICs from static damage.

The box needs to have two holes drilled in it. One of these is for the switch and the other is for the wires connecting to the LEDs. For a momentary contact pushbutton switch, a hole of 7mm is needed. Make sure you mount the switch high enough to clear the PCB. You can see from the photograph that the battery sits to one side of the box, so the hole for the wiring will have to be drilled with this in mind. This hole will most likely need to be about 4mm, depending on the type of hook-up wire used.

To prepare the LEDs for mounting, bend the leads so that they are perpendicular to the encapsulation. This allows the LEDs to face forward (rather than upward) after mounting. Make sure that you bend the leads the same way on each LED – for example, the anode always to the left.

Assembly will be simplified if the cloth is of the looped Terry-towelling type. The leads of the LEDS are pushed through the loops on the outside of the headband. If the leads are splayed by about 6 or 7mm, the LEDs will be less prone to movement after assembly. Once the wiring was completed, we found that no other means of securing the LEDs was necessary with the qualification that a periodic re-alignment may be needed.

The method of connecting the series strings are as follows: LED 1 to LED 5 to LED 9; 2 to 6 to 10; 3 to 7 to 11; 4 to 8 to 12. Connect the LEDs anode to cathode, using links of hook-up wire which are long enough to accommodate the full stretch of the headband. The anodes of the first four LEDs are connected to the current limiting resistors and the cathodes of the last four LEDs are connected to the driving transistors. The cathode connections will have to be in the correct sequence or the chasing effect will be lost.

The wiring is the major part of the construction for this project so it is well worthwhile re-checking it before switch on. The LEDs may be damaged by having a reverse bias applied to them and this would undoubtedly be a cause for disappointment amongst potential LED Headers. If the circuit is operating correctly, you will be greeted with a chain of LEDs which appear to chase rapidly around the head. The speed at which they chase can easily be altered by changing the value of the 27kΩ resistor.

Why not dazzle your friends with your LED-lit brilliance?

PARTS LIST

1 4017 CMOS decade counter
1 4011 CMOS quad two-input NAND gate
4 BC547 NPN transistors
12 LEDs (red)
1 100µF/16VW electrolytic capacitor
1 1µF non-polarised electrolytic
1 SPST momentary contact pushbutton switch
1 Plastic utility box, 28mm × 54mm × 83mm
1 printed circuit board, 46mm × 60mm, code 83eg1
1 9V battery, Eveready 216 or equivalent (see text)
1 snap connector to suit battery

RESISTORS
1 × 1MΩ, 1 × 27kΩ, 4 × 10kΩ, 4 × 220Ω (see text)

MISCELLANEOUS
Rainbow cable, headband, solder.

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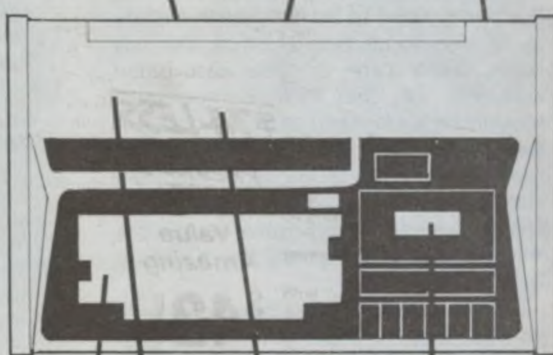

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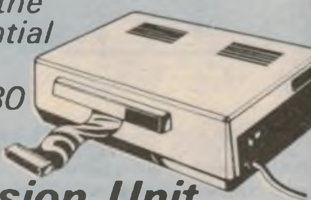

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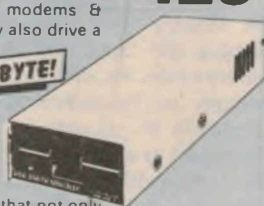

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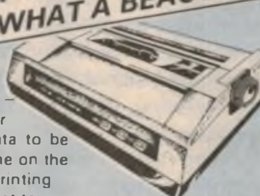

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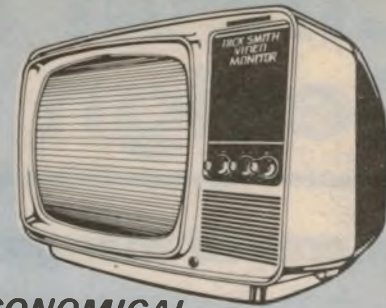

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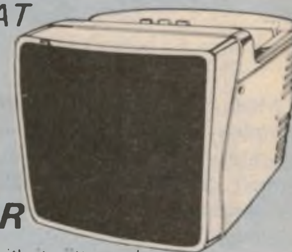

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Dick Smith Electronics

SEE PAGE 5-6 FOR ADDRESS DETAILS.

A589

Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.

Improved triangle-to-sine-wave converter

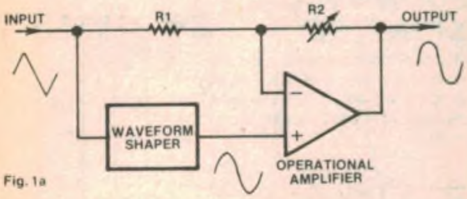


Fig. 1a

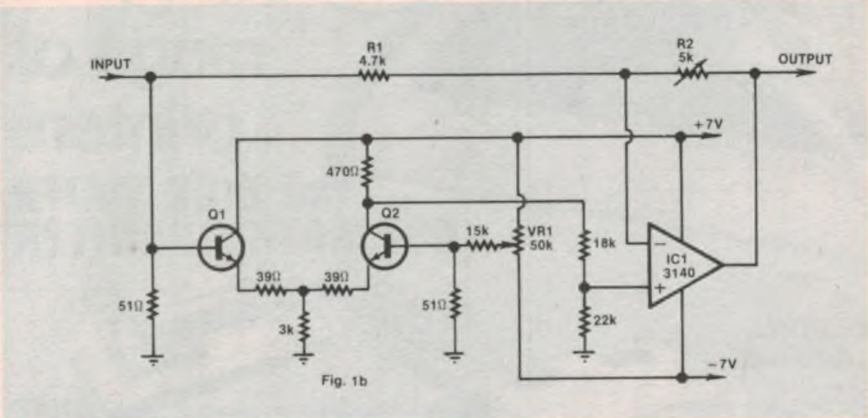


Fig. 1b

Most triangle-to-sine-wave converters employed in function generators are incapable of reducing the cusps (spikes or steps) on the triangle peaks, so that discontinuities occur in the sine-wave derivative. Typical function generators (such as the EA Function Generator for April, 1982) use diode or transistor shaping networks to round the peak of the triangle into a sine-wave, the networks being embodied into an IC, such as the XR2206.

This design (Fig.1a), taken from the US magazine "Electronics", follows the shaping network with an operational amplifier in which most of the remaining triangular component is cancelled. In addition, the design is not affected by small changes in the triangle wave amplitude.

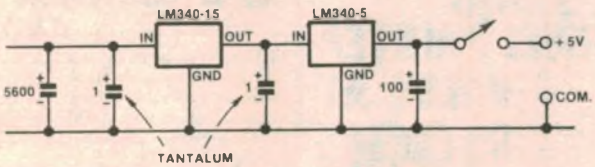
Fig. 1b shows the system in greater detail. The preliminary shaper is a differential amplifier consisting of Q1 and Q2. Any differences in transistor characteristics, which would generate even order harmonics in the output, can be taken care of by trimpot VR1. Finally, the shaped signal from Q2 is fed to the non-inverting input of the operational amplifier 3140.

At the same time a portion of the original triangular wave is fed to the inverting input, resistors R1 and R2 controlling the level. This level is adjusted until most of the remaining triangular component in the shaped wave has been cancelled.

The circuit is claimed to reduce odd harmonics by up to 52db to produce a resultant harmonic distortion of 0.4% for midband frequencies.

From "Electronics",
July 28, 1982.

Pre-regulator for EA power supply



In the EA dual tracking power supply described in March 1982, the current from the fixed 5V output is limited to about 0.9A by temperature rise of the regulator. If an attempt is made to draw more than this current, thermal shutdown will occur.

This is because the voltage drop across the LM340-5 is 20 volts, thus producing a power dissipation of over 20 watts. Extra heat sinking is not feasible in the existing cabinet, so a pre-regulator (LM340-15) interposed between the unregulated line and the input of the LM340-5, and mounted on the rear wall of the cabinet is the solution. The result is a drop of 10 volts across each regulator instead of 20 volts across just one.

While the same power (about 24 watts) still has to be dissipated by the same total heat sink area, it is now being generated at two different locations on the sink and this obviously helps. In any event the 5 vclt output can now supply well over 1A continuously without thermal shutdown.

D. Bolton,
Melbourne State College,
Vic.

Hex display for EPROM Programmer

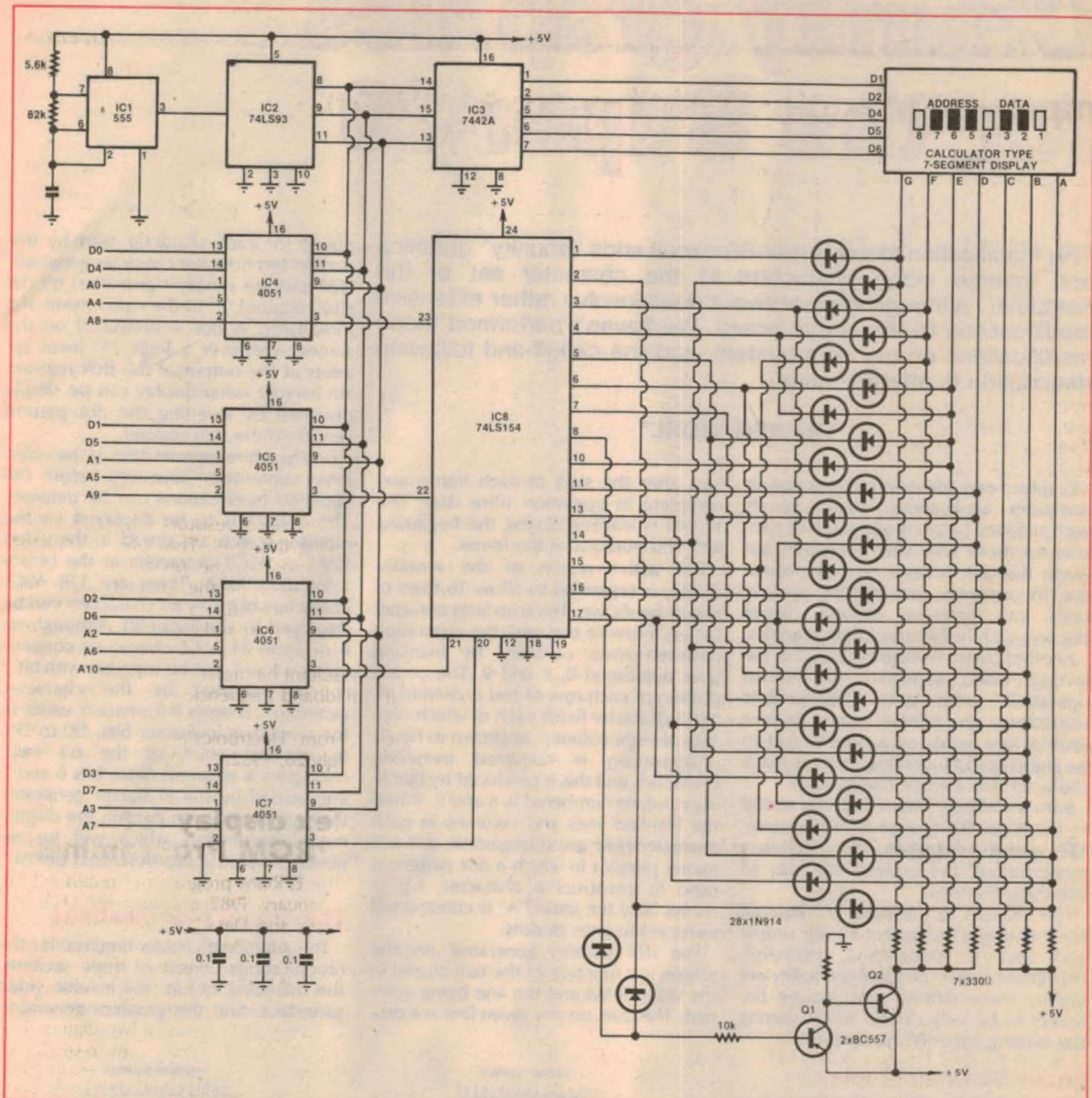
The EPROM programmer published in EA January 1982 uses discrete LEDs to display the Data and Address lines in binary code. As all EPROM programs are written in hexadecimal code, a hex display is an advantage. The Address is displayed as a three-digit hex code, while the Data is displayed in a two-digit code.

As is usual when seven-segment displays are used for alphanumeric hex characters, the display format is a mixture of upper and lower case, as follows: A, C, D, E and F.

The circuit operates as follows: A 555 oscillator clocks a 74LS93 binary counter which is connected to count to eight and drive a 7442 BCD-to-decimal decoder. This is connected to drive the common cathodes of the multiplexed display. The output of 74LS93 three-bit counter is also used to scan the 4051 one-of-eight line multiplexers, which multiplex the Address and Data codes.

continued on page 79

Hex display . . . ctd from page 78



The four-bit binary code from the multiplexer is used to drive a seven-segment display through the use of a 74LS154 four-line to 16-line demultiplexer and 28 diodes. The 74LS154 converts the 16 different binary codes to separate hex displays. Each output is connected to diodes which turn off selected segments to produce the required character.

For example, when the binary code for "3" is present at the input of the decoder, the "e" and "f" segments are turned off, to show the number three.

There are two reasons to turn the segments off rather than on. The first is that the outputs of the 74LS154 are active low and the second is that less diodes are required through the use of this method (on average, more segments are on than off). The numbers one and seven have more segments off than on and this would require the 74LS154 to sink more than its rated current. Hence, the two transistors disable the unwanted segments when these numbers are displayed.

Note that the increase in overall current consumption because of the addition of this circuit to the Eprom Programmer means that a heatsink should be fitted to the three-terminal regulator.

D. H. Dawes, Granville, NSW.

Circuit modification gives inverse and . . .

Chunky graphics for the Super-80

This modification to the Super-80 circuit adds "chunky" graphics and inverse video characters to the character set of the computer. Although inexpensive it does involve rather extensive modifications to the circuit board. We haven't performed these modifications on our own system, and the circuit and following description is offered "as is".

By REG WORL*

Graphics can add enormous scope to computer applications. Video games such as Space Invaders use graphics symbols for those little alien monsters, bar graph displays depend on high resolution for accuracy, and plotting applications can produce neater, clearer displays with higher resolution graphics.

Another useful feature on VDUs is the inverse video capability. In normal operation using only alphanumeric characters, an inverse video feature enables key words on a page of text to be highlighted by printing them as black characters on a white background.

Both the above features can be added to the Super-80 microprocessor system. This article describes the necessary modifications and explains the way to use these features.

The changes to the Super-80 required for the inverse video feature are simple and easy to understand. However, modifications for the graphics facility are slightly more difficult and require the reader to be very careful when altering the existing Super-80 hardware.

Super-80 video display

To assist the reader in understanding how these modifications will affect the Super-80 system, a brief description of the video display format is necessary.

The video circuitry of the Super-80 refreshes the screen once every 20ms. Throughout each frame interval the microprocessor is halted for 10ms to allow the contents of the video area of memory to be transferred to the video display circuitry. The video circuitry starts to write characters onto the screen 5ms after the start of each frame and complete its operation 10ms later. The screen is blanked during the beginning and end portions of the frame.

The active region of the monitor display is organised to allow 16 rows of text to be shown. Ten scan lines are used for each row of text with the separation obtained by blanking between rows numbered 0, 8 and 9. The centre portion of each row of text is divided into 32 character fields each of which consists of eight columns as shown in Fig. 1.

Separation is required between characters and this is produced by blanking columns numbered 0, 6 and 7. When the blanked lines and columns in each character field are disregarded, a 7 x 5 matrix remains in which a dot pattern is used to construct a character. Fig. 1 shows how the letter "A" is constructed using seven lines of dots.

The dot pattern generated on the screen is a function of the text stored in the video RAM and the line being scanned. The dots on any given line are produced for each character field by five parallel bits from the character generator U27 and are serially transmitted by the shift register U23 to the video mixer and modulator. A dot is produced on the screen whenever a logic "1" level appears at the output of the shift register. An inverse video display can be simply obtained by inverting the dot pattern sent from the shift register.

Finally, a brief examination of the video RAM contents is necessary before the Super-80 modifcations can be detailed. The characters to be displayed on the monitor screen are stored in the video RAM as ASCII characters in the binary form 0XXX XXXX. There are 128 ASCII characters but only 64 characters can be displayed by the Super-80. Although bit 6 of these 64 ASCII characters contains either a 0 or 1, this bit together with bit 7 is not required by the character generator. Enough information exists in the remaining low-order bits, D0 to D5, to decode which of the 64 valid characters is required. Since bits 6 and 7 are unused by the character generator they are available to contain the display mode information which will be required by the circuits described below.

The circuit modifications

The additional circuits required for the modifications consist of three sections; the decoding circuit, the inverse video generator, and the graphics generator.

Fig 1

Characters are built up in an 8×8 matrix.

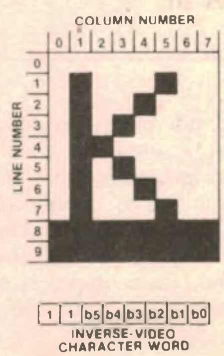


Fig 3

Inverse characters are black on white.

*67 Conrad St, St Albans, Vic 3021.

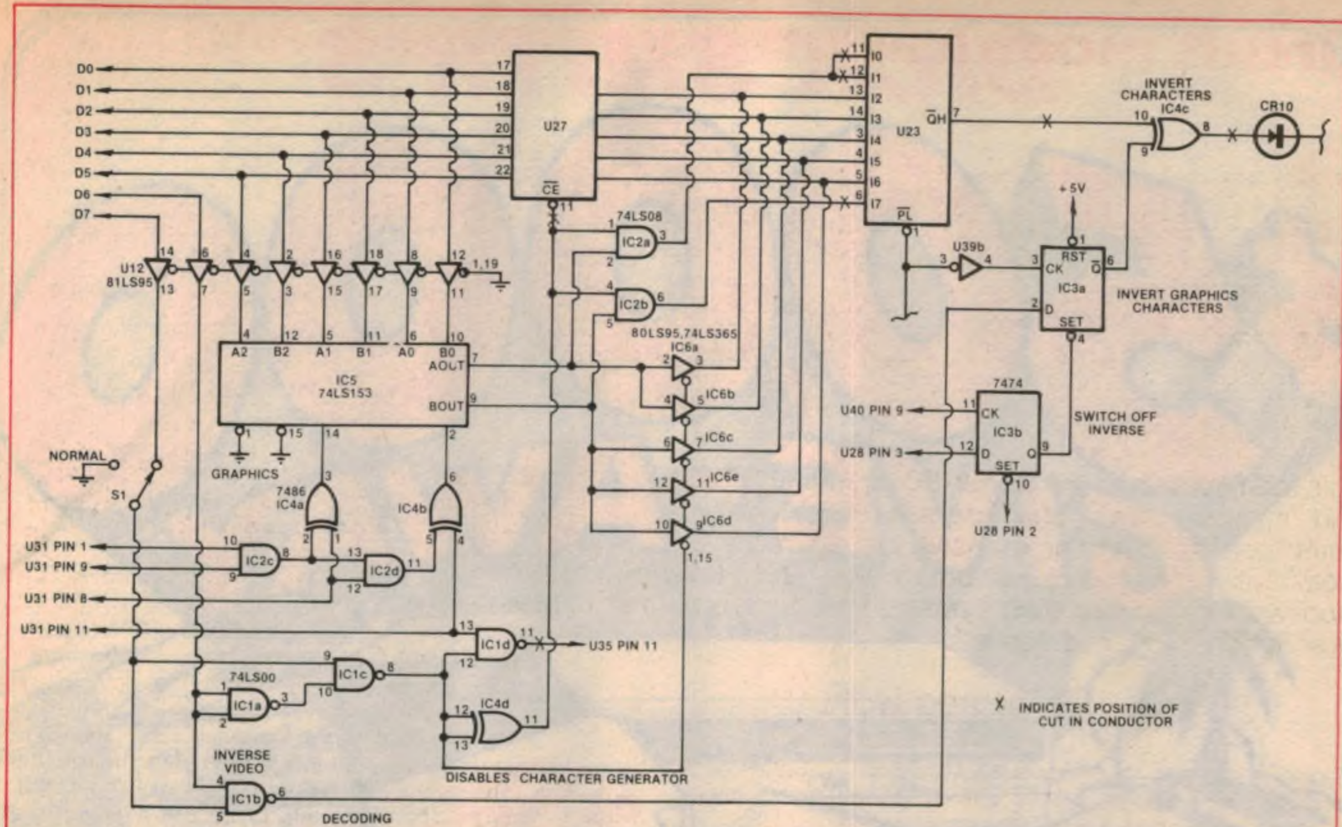


Fig. 2

"X" indicates a track to be cut on the existing board. "IC" prefix indicates a device to be added to Super-80 circuit.

The circuit diagram for the complete modifications is shown in Fig. 2.

The function of the decoding circuit is to determine from the encoded information in bits 6 and 7 of each video character word which of the three possible display modes (normal, inverse video, or graphics) is required to display that character. The selected display mode is then produced by enabling the respective circuits. The codes for the three display modes are given in Table 1 and have been so arranged that all characters written to the screen by the Monitor are displayed in their normal mode. This arrangement allows the user to retain the normal operation of the Super-80 without the need of any software changes.

The decoding circuit consists of four NAND gates and an exclusive OR gate IC4d. Gate IC1b activates the inverse-video circuit when required and gate IC1c controls the graphics circuitry. In the graphics mode the character generator is not required and is hence disabled by gate IC4d. Switch S1 is an option which may also be added although it would generally not be required. Operating this switch would completely disable the inverse video and graphics generator circuits allowing normal operation of the basic Super-80.

The inverse video generator is a simple circuit consisting of four components: the D flipflops IC3a and IC3b, an exclusive OR gate IC4c, and the inverter U39b. When this circuit is selected by the decoder circuit a logic 1 is applied to flipflop IC3a. The input signal is clocked through the flipflop at the beginning of each character field and controls the programmable inverter for the display duration of that character. Flipflop IC3b ensures that the inverse video is switched off after the last character on each row. The display produced by the inverse video generator is shown in Fig. 3.

FUNCTION	BIT 7	BIT 6
NORMAL OPERATION	0	0
NORMAL OPERATION	0	1
GRAPHICS	1	0
INVERSE VIDEO	1	1

TABLE 1

New features are accessed by setting data bits 6 or 7. Software is unchanged.

Note that the two separation lines at the bottom of the character field remain blanked.

To display a character in the inverse video mode, bits 6 and 7 of the character word must contain the code "11". Normal characters can be changed to this mode by "OR-ing" them with 1100 0000 binary or C0 hex before they are placed into the video RAM. Characters stored by the Monitor can be read and replaced by a user program to produce an inverse video display.

Graphics mode

Unlike the normal and inverse video display modes, the graphics mode uses the entire character field by eliminating the previously blanked lines and columns used for row and character separation. The line blanking is controlled by the output of gate U39b. In order to disable the line blanking during a graphics character, U39b is replaced by the NAND gate IC1d which is enabled as required by the decoding circuit. Note that U39b must have both its input and output disconnected from this circuit because it is re-used in the inverse video circuit. The grounded shift register inputs 10, 11 and 17 which cause the blank columns must also be disconnected and connected to the two AND gates IC2a and IC2b. The decoding circuit activates these gates to inhibit column blanking during the graphics mode.

Each graphics character consists of six pixels which together occupy the entire character field. The pixels are numbered as shown in Fig. 4 and are controlled by the respective bits in the character code. Since the dot patterns are now directly controlled by the character codes, the character generator U27 is no longer required and has its output replaced by the Tri-state buffers IC6a to IC6d. The 74LS153 decoder selects which of the character code pairs b0-b1, b2-b3, or b4-b5 is required for each of the 10 lines

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Super-80 graphics modification

in every row. The selected bit pair is then loaded into all eight inputs of the shift register for transmission to the screen. The gates IC2c, 2d, 4a and 4b determine which bit pair is to be selected. Note that these modifications cause the prompt placed at the left of each row by the monitor to be displayed as a graphics character.

With this modification each character cell is divided into two blocks horizontally and three blocks vertically. Since normally 16 lines of 32 characters each are displayed on the screen, the effective resolution in the graphics mode in 64 blocks horizontally by 48 vertically.

When writing programs which will require the graphics facilities, it is best to obtain the codes for the various graphics characters from a table. Table 2 has been provided for this purpose. To use this table construct the required character by selecting the necessary pixel combinations from both parts of the table. The codes given with the selected combinations are then combined to give the character code.

To ensure that these modifications do not interfere with the operation of the microprocessor due to loading or incorrect construction, the data bus is isolated from the additional circuits through the buffer U12. The additional components required for these modifications can all be installed on the existing Super-80 board. The six packages IC1 to IC6 occupy the spare pads at the rear of the microprocessor board whilst IC U12 is added to the S-100 expansion area.

Note, though, that if you elect to do this the S-100 expansion interface cannot be used, as U12 is normally used as a buffer for data to the S-100 expansion connector.

Care required

These modifications require fairly extensive "surgery" on the circuit board of the Super-80. There are nine tracks to be cut and 15 wire connections to the existing computer circuitry, apart from the inter-connection of the new ICs. This is not a project for the beginner.

The positions of the tracks to be cut or are shown by an "X" on the circuit diagram of Fig. 2.

If you are thinking of building a Super-80 but have not yet begun, finding and cutting the required tracks is relatively easy. If your Super-80 is already completed it will be necessary to remove ICs U27 and U23 to gain access to the tracks to be cut. For those who have used IC sockets a simple alternative to cutting tracks is to remove the ICs from their sockets, bend the pins to be disconnected upwards and re-install the ICs. The necessary wire connections can then be made directly to these pins.

It is suggested that 30AWG insulated wire (as used for wire-wrapping) be used for the modified connections. This wire is thin enough to allow several pieces to be twisted together and soldered to a single printed circuit pad. Care must be taken to avoid solder bridges and connections made to wrong locations.

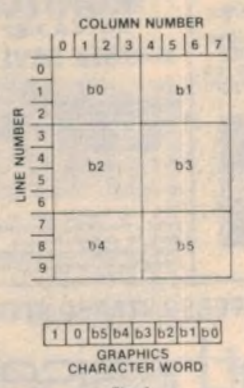

Fig. 4

Graphics are set by six lowest data bits.

Where a cut needs to be made through a conductor it is recommended that two parallel cuts 2mm apart be made across the conductor with a sharp blade. A clean, hot soldering iron is then used to heat the strip between the cuts until it lifts away from the board. This procedure ensures that a reliable cut is obtained. Ensure that enough track remains on each side of the cut to allow a link to be soldered in should the cut ever need to be repaired.

After these modifications have been completed, the Super-80 video display should appear as normal but with the Monitor prompt displayed as a graphics character. These modifications can be tested by using the Monitor "E" command to place various character codes into the video RAM buffer. For a 16k system the monitor selects the memory block from 3E00 hex to 3FFF hex as the video RAM area. Any character code placed in this area will be displayed on the screen in the display mode determined by bits 6 and 7 of the code.

For a 32K Super-80 the video RAM area is normally from 7E00 to 7FFF, while 48K machines place the video RAM at BE00 to BFFF.

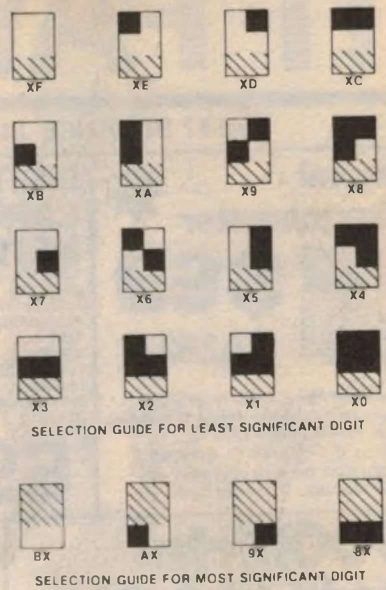

TABLE 2

Table shows each graphics shape produced.

Editorial note

Super-80 owners should be aware of two other graphics add-ons. Dick Smith Electronics offers a board containing an EPROM providing lower case and inverse video characters which is installed in place of the existing character generator, with some modifications to the circuit character clocking circuitry. This board was reviewed in EA, February 1982, p111.

EL Graphix offers a similar board with a choice of three different EPROMs, one providing quarter-character sized graphics blocks and other symbols and another providing one-sixth sized blocks. The third EPROM provides both the character sets. This board was featured in EA, August 1982.

Neither of these two boards require extensive modifications to the Super-80 circuit board. Since they use an EPROM for character storage, however, they are more expensive than the approach described here.

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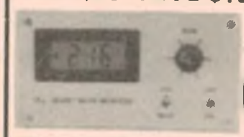

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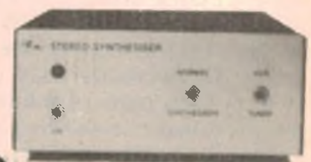

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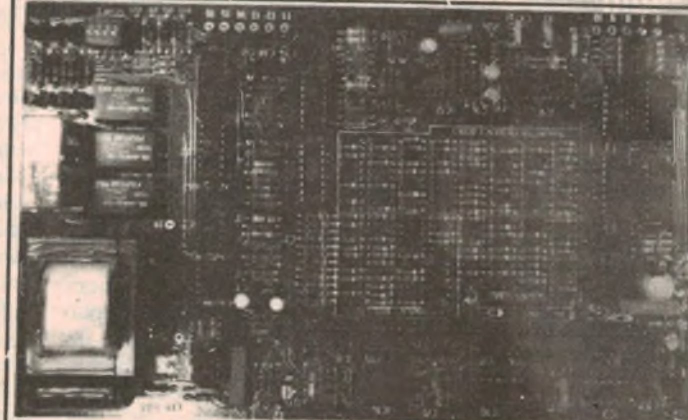

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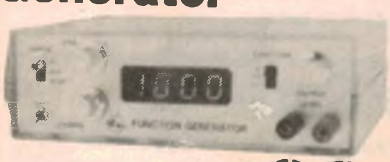

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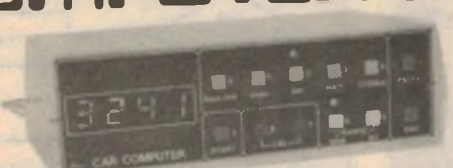

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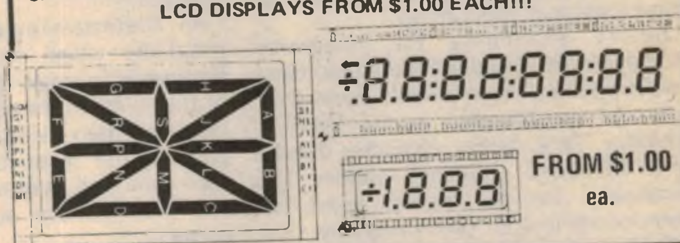

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DATUM: games and software design

DATUM, a "Digital Aid for Teaching you Microprocessors", is a single board microprocessor trainer based on the MC6802 processor. Construction and programming have been covered in previous articles. This final instalment provides more programming details, including three useful examples to show what can be done.

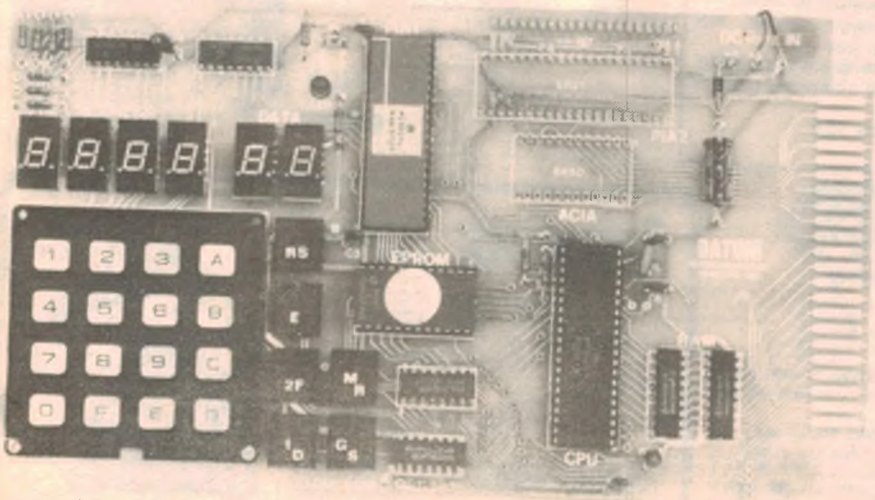
Although called a minimal microprocessor system, DATUM is actually quite powerful, with applications limited only by the user's imagination and programming abilities. Skill in programming comes with experience, but to get things started this article has a few examples. They have been written as games, but lend themselves readily to more practical applications.

Before examining the programs however, we should point out that many useful routines have already been written and incorporated in the DATUM monitor. Time delays, character display and keyboard scanning routines are available to be incorporated as subroutines in your own programs.

Table 1 provides the names and starting addresses of useful subroutines in the DATUM monitor and comments on their use. There is a penalty for using them, however – single stepping through ROM routines is not possible. A single-step jump to a monitor routine simply brings up a prompt and halts execution. In some cases this can be overcome by copying the monitor routine into RAM, with appropriate address changes.

An alternative method of debugging programs which incorporate monitor routines is to single step up to the point of the jump to the monitor subroutine, reset and then recommence single stepping at the instruction following the subroutine call. We can, after all, assume that the monitor subroutine itself is correct.

When writing programs it is good practice to finish with a software interrupt instruction (3F). Should there be an error in



Repeated from last issue, this photo shows the completed DATUM microprocessor board. Construction and Monitor software have been covered in previous articles.

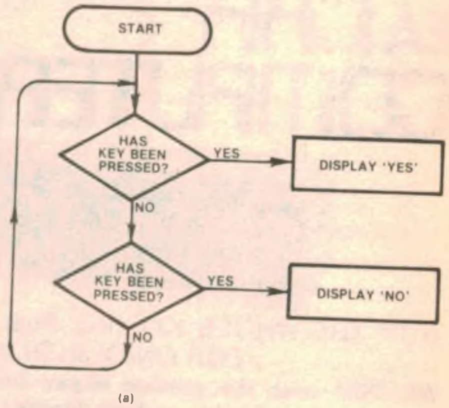


Fig. 1 (a) shows the flowchart for a simple decision-maker program loop.

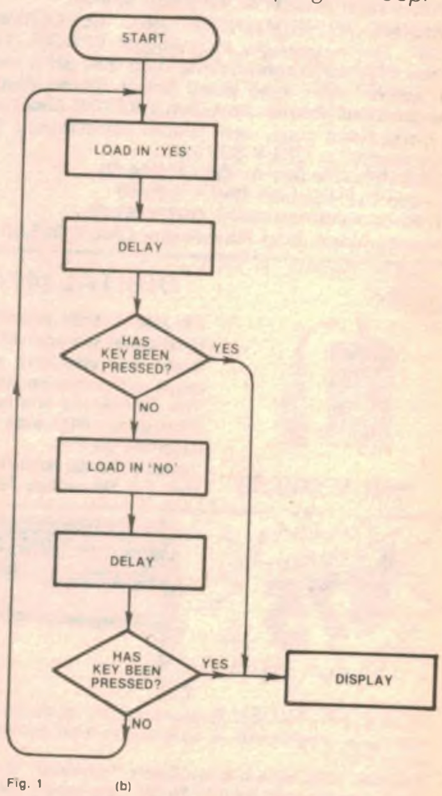


Fig. 1(b) shows a more complex approach to the same problem which is more flexible, allowing the use of common subroutines.

the program then this instruction may stop the program running into higher memory locations and overwriting your program. With these remarks out of the way we can discuss the example programs.

A decision maker

This simple decision maker program consists of a loop that is interrupted by depressing any of the hex keys. The flowchart of Fig. 1(a) shows that the program consists of two decisions, represented by the diamond boxes. Depending on the exact time a key is depressed, the answer is either "yes" or "no". Fig. 1(b) shows a more complex approach which has a number of advantages. By loading in the word to be displayed before a decision has to be made, a common display subroutine can be used. The program could be organised so that the delay and decision blocks can be shared, but since these are subroutines within the monitor that we will call upon there is little point in doing this.

By introducing delay blocks we can weight the "yes-no" decisions depending on the relative length of each delay. In this program we will make them equal to give a 50:50 chance for the answers to be "yes" or "no". Finally, both flow diagrams can readily be extended to become higher order decision makers, with other words like "stop", "danger" being displayed.

The next question is how the flow chart of Fig. 1(b) is converted into an actual program. Each box represents a small program, or "module" which must be written. We will consider each function in turn.

Firstly we have to load the display register with hex numbers that provide the appropriate characters for our message when they are decoded by the display drivers. From the monitor listing (supplied with DATUM kits) it can be seen that a range of characters is available in a "Display look-up table" at lines 77A0 to 77C1.

Also from the monitor listing we can see that memory locations 0010 to 0015 are the six display register locations. Whatever is loaded into memory location 0010 is displayed on the first seven segment display, with the contents of memory location 0011 displayed as the second digit and so on (all addresses are in hexadecimal).

Loading of the word "no" is performed in the same way except that only the first three digits have to be changed, since the last three are already blanked.

To display the word "yes" we must load location 0010 with 48, the hex code for "y", location 0011 with 06 ("E"), and location 0012 with 42 ("S"). Locations 0013 to 0015 are loaded with hex 7F, which is the code for a blank. The first part of the decision maker program in listing 1 uses the index register to address the display registers one by one.

A short time delay is required by the second module of the program, and this can be most easily achieved by using the timing subroutines in the monitor. A jump to TIMLP at address 71D2 will provide a 10ms delay. Larger delays can be generated by using additional loops to call TIMLP as many times as required. Alternatively by using another timing subroutine XTIMLP at memory location 71D7, we can provide a delay equal to 8 multiplied by the value in the X register, in microseconds.

Testing whether or not a key has been depressed can be done by using the monitor subroutine MPXK at address 7177. At the end of this subroutine a non-zero number is loaded into accumulator B if a key has been pressed while the value of the key is in accumulator A.

In this case we are not interested in the particular key, but simply whether or not a key has been depressed. Thus, if accumulator B has zero contents, no key has been depressed and we must continue on in the loop. However, if the contents of accumulator B are non-zero, a key has been depressed and the appropriate "decision" must be displayed. Listing 1 thus shows a jump to test if a key has been depressed (to location 101A) and the subsequent statements to test whether the contents of accumulator B are zero or not.

Program listing 1: Decision maker

```
0010                          DISBUF   EQU          $10       DISPLAY BUFFER MEMORY
71DD                          DISPLY   EQU          $71DD     DISPLAY REFRESH
7177                          MPXK     EQU          $7177     KEYBOARD SCAN
71D2                          TIMLP    EQU          $71D2     10MS TIME DELAY
                              *
1000                                   ORG          $1000

                              *
                              **       SET UP TO DISPLAY 'YES'
                              *
1000   CE    00    10         YESSET   LDX          #DISBUF   POINT TO DISBUF
1003   86    48                        LDA     A    #$48      LOAD ACC A WITH A 'Y'
1005   A7    00                        STA     A    0,X       PUT IT IN THE 1ST DIGIT
1007   86    06                        LDA     A    #6        LOAD ACC A WITH AN 'E'
1009   A7    01                        STA     A    1,X       PUT IT IN THE 2ND DIGIT
100B   86    42                        LDA     A    #$42      LOAD ACC A WITH AN 'S'
100D   A7    02                        STA     A    2,X       PUT IT IN THE 3RD DIGIT
100F   86    7F                        LDA     A    #$7F      LOAD ACC A WITH A
                                                              BLANK
1011   A7    03                        STA     A    3,X
1013   A7    04                        STA     A  - 4,X
1015   A7    05                        STA     A    5,X
1017   BD    71    D2                  JSR          TIMLP     WAIT FOR 10 MS

                              *
                              **       HAS A KEY BEEN PRESSED?
                              *
101A   BD    71    77                  JSR          MPXK      SCAN KEYBOARD
101D   26    19                        BNE          OUTPUT

                              *
                              **       SET UP DISPLAY FOR 'NO'
                              *
101F   CE    00    10                  LDX          #DISBUF   POINT TO DISBUF
1022   86    3A                        LDA     A    #$3A      LOAD ACC A WITH AN 'N'
1024   A7    00                        STA     A    0,X       PUT IT IN THE 1ST DIGIT
1026   86    01                        LDA     A    #1        LOAD ACC A WITH AN 'O'
1028   A7    01                        STA     A    1,X       PUT IT IN THE 2ND DIGIT
102A   86    7F                        LDA     A    #$7F      LOAD ACC A WITH A
                                                              BLANK
102C   A7    02                        STA     A    2,X
102E   BD    71    D2                  JSR          TIMLP     WAIT FOR 10 MS

                              *
                              **       HAS A KEY BEEN PRESSED?
                              *
1031   BD    71    77                  JSR          MPXK      SCAN KEYBOARD
1034   26    02                        BNE          OUTPUT
1036   20    C8                        BRA          YESSET    SET UP FOR 'YES' AGAIN

                              *
                              **       OUTPUT THE DECISION AND FREEZE THE DISPLAY
                              *
1038   86    80               OUTPUT   LDA     A    #$80      SET DISPLAY FREEZE TIME
103A   B7    10    48                  STA     A    TEMP      SAVE IT
103D   BD    71    DD         OUT1     JSR          DISPLY    REFRESH THE DISPLAY
1040   7A    10    48                  DEC          TEMP
1043   26    F8                        BNE          OUT1      IS IT FINISHED?
1045   20    B9                        BRA          YESSET    STAR AGAIN
1047   3F                              SWI

                              *
1048                          TEMP     RMB          1         FREEZE TIME
                              *
                                       END
```

The first five lines of this listing are information only. The program code starts at address 1000 and each line contains two or three bytes of code which are loaded into successive addresses. The program ends at address 1047, with location 1048 used as temporary storage.

DATUM: Flowchart for Program 2

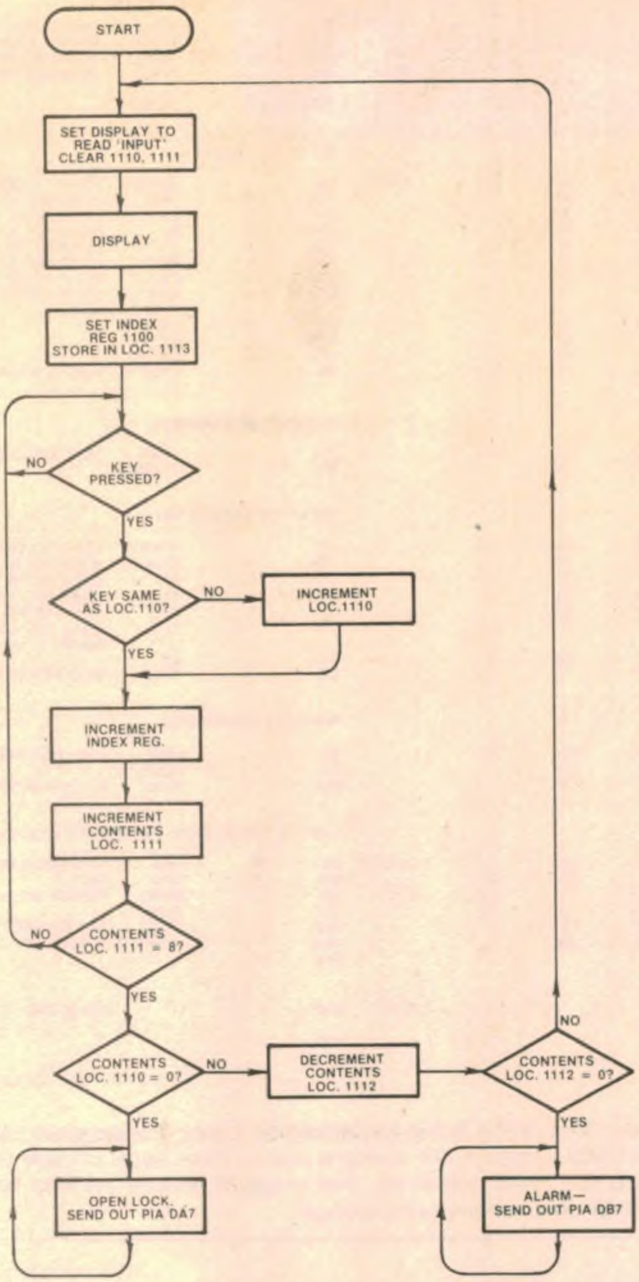


Fig. 2

The final box in the flow diagram is for displaying the characters already set up in the display buffers. Again a monitor subroutine can be employed, namely DISPLAY (71DD). This particular routine only displays a character for a few milliseconds so a small loop is introduced to hold the display for a longer period. Since DISPLAY makes use of both the A and B accumulators, the display counter is stored in memory location 1060. In the program given in listing 1 the value fed in is 80, providing a display for about 2½ seconds. Although not previously mentioned, a further advantage of flow diagram (1b) is that when the display is terminated the decision maker is immediately ready for another decision.

Combination lock

The second program may be considered as a guessing game but it also provides the basis for a combination lock system. An N-bit code are stored in the memory and when the user keys in the correct code the lock is energised and allowed to be open. In this example N is set equal to 8 but the value can readily be changed. If someone tries to break the code they are allowed three attempts before an alarm operates. Outputs to the lock and alarm are through the PIA data lines DA7 and DB7 respectively at the top of the board. Values on these lines can be confirmed using the logic probe. Fig. 2 shows the flow diagram for the program.

The majority of the programming routines have been discussed previously, with the exception of outputting a signal to the PIA. The eight digits of the correct combination are stored in memory locations 1100 to 1107 by the operator before the program is run. The number of errors in entering the combination is stored in location 1110, the number of times the keys are pressed per try in 1111 and the number of attempts to input the correct code is stored in location 1112.

Because the key input subroutine makes use of the index register, the contents of this register must be saved prior to calling the input subroutine. Memory locations 1113 and 1114 are used for this purpose. Listing 2 shows the complete program.

The PIA may be divided into two nearly identical halves, A and B. Each has three registers, the control register, the data direction register ("0" = input a signal; "1" = output a signal) and the actual data register. Only two address lines are used for each half of the PIA, the data direction and data registers sharing one address. The addresses used in DATUM for the display PIA are given in Table 2. To decide between the two registers that have a common address, bit 2 of the control register is employed. A zero in bit 2 allows the data direction register to be addressed while a 1 addresses the data register. Thus the sequence in setting up the A half of the PIA for outputting a signal is as follows:

- Set up the control register (address 6001) with a 0 in bit 2 position.
- Next set the data direction register (address 6000) to all 1's for output of data.
- Readdress the control register now putting a 1 in bit 2 position so that the data register will now be address at 6000.
- Finally, send the data out.

This sequence is used twice in the program, once to open the lock if the correct code is fed in and the second time to initiate the alarm signal. Notice that after sending information to the PIA the program jumps back to hold this instruction. If this is not done the monitor returns the display PIA to its normal role and the output immediately goes high again.

Should you wish to develop this program further for use as a safe lock or something similar, then the hex key pad

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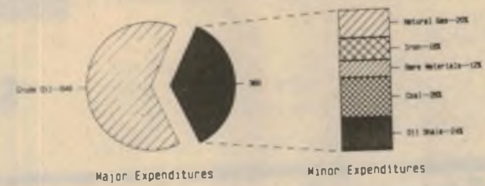

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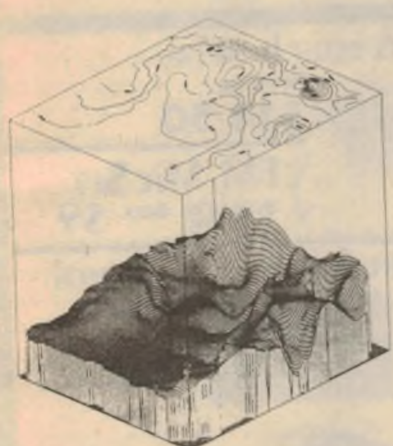

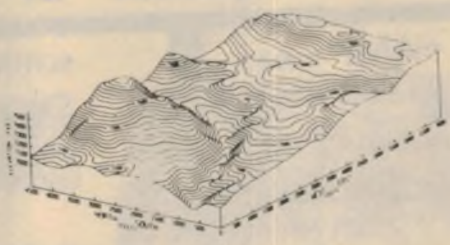

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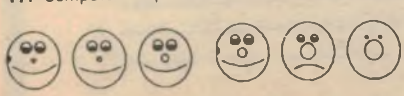

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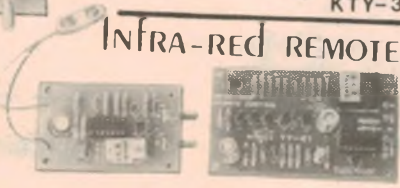

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can be removed from DATUM and mounted remotely. The system should be organised so that power must be applied to undo the lock while removing the power will sound the alarm. Thus the system is secure should power to DATUM fail.

Pick up sticks

The final program is a game you may have played when younger. There is a pile of match sticks and the two players are allowed to remove in turn a number of matches (for example any number between 1 and 10), each player trying to force the other to pick up the last match. This simple game can be expressed in mathematical form and so this program, among other things, is to illustrate how DATUM can be programmed to perform simple arithmetic.

The easiest way to understand the winning strategy is to start from the end of the game and work backwards. If the maximum number of sticks that can be picked up by either player is M, then we wish to force things so that on our last move we leave a single match. Thus on our next to last move we leave (M + 1) + 1 matches, and on our third to last move 2(M + 1) + 1.

Starting with N matches in the pile for our turn, we must therefore leave

$L = A(M + 1) + 1$

matches, where A is the largest positive integer and is given by

$A = \text{integer}\,[(N-1)/(M+1)]$

Thus for any move the player should remove

$R = N - A(M + 1) - 1$

A problem occurs if the operator knows this strategy and also applies it. When this happens R equals zero and a check for this must be made. In this case DATUM subtracts one match stick in the hope that it was by chance that this situation arose and on the next time around he will win.

To set up the game on DATUM the operator feeds in N, a two-digit number, being the number of matches in the pile and M, and a single digit number, the maximum number of matches a player can pick up per turn. The operator is given the privilege of having first go and so they feed in P, the number of matches they wish to remove. The program checks the value to see they are not cheating. In fact, "DATUM" takes a rather sadistic attitude in this program. If he wins he calls the operator a CLOT and if he loses he says the operator has cheated.

Fig. 3 presents one flow diagram for the game Pick Up Sticks and listing 3, shows the program. The only difficult programming steps in the flow diagram are the compute stages. Division is achieved by multiple subtraction and multiplication by successive additions. The program as written has a number of defects and it is suggested that as an exercise you may try and make some changes. Firstly, the arithmetic is all done in hexadecimal and while this will provide practice for working out branch offsets, it would be more convenient to do this with decimal figures.

In addition to testing the input to restrict values from 0 to 9, decimal arithmetic requires the use of the Decimal Adjust instruction to allow for overflow. This instruction only works in conjunction with the three addition instructions ABA, ADD and ADC, so for decimal subtraction the values must be converted to two's complement and then added.

The program as written does make use of FOUR additional monitor subroutines

Text continues on P95

Flowchart for Program 3

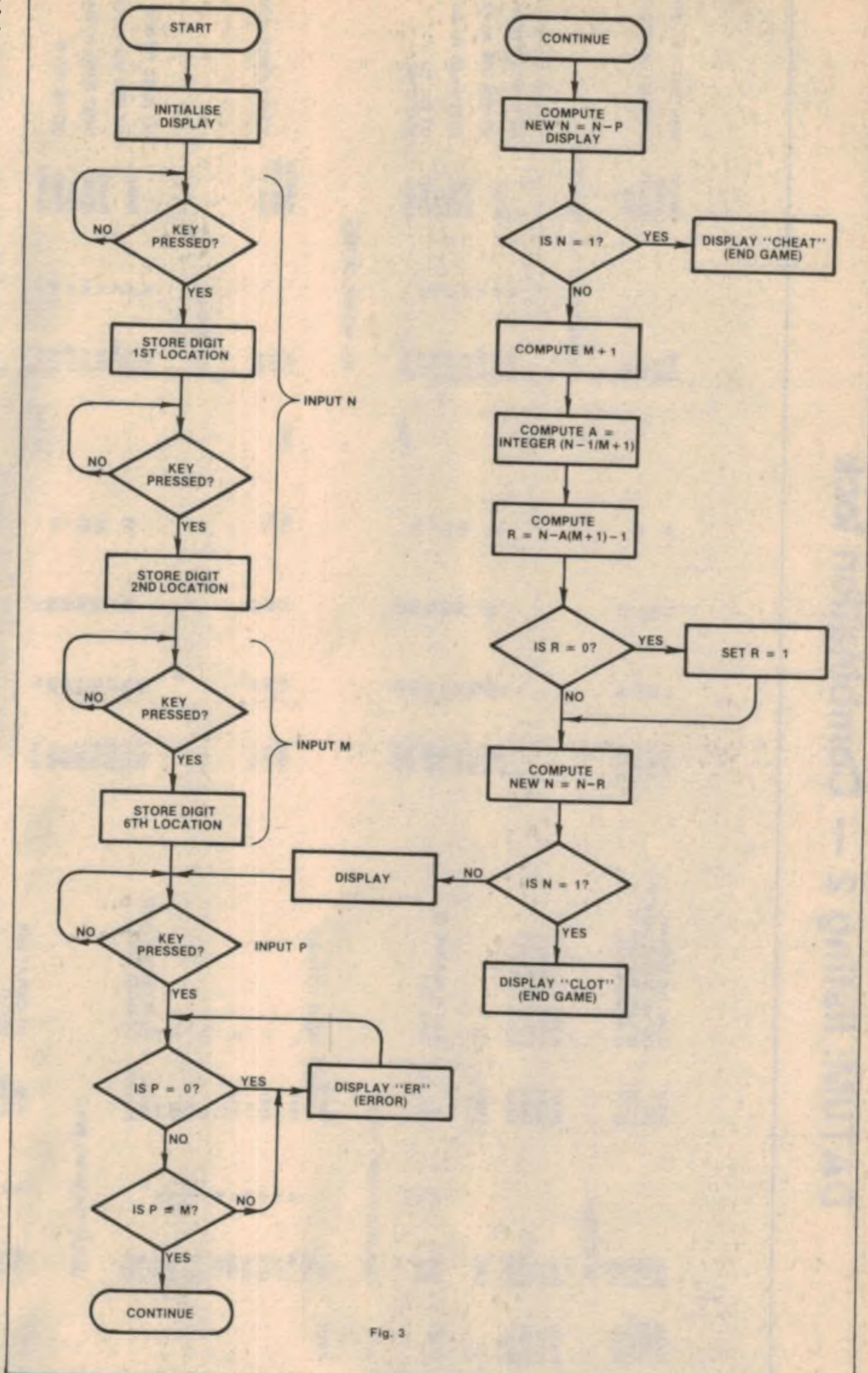

Fig. 3

DATUM: listing 2 — Combination lock

```
7107                    BLANK    EQU         $7107     CLEAR THE DISPLAY
0010                    DISBUF   EQU         $10       DISPLAY BUFFER MEMORY
71DD                    DISPLAY  EQU         $71DD     REFRESH THE DISPLAY
7177                    MPXK     EQU         $7177     KEYBOARD SCAN
                        *
                        **       PIA ADDRESSES
                        *
6000                    PIAAD    EQU         $6000     A SIDE DATA/DDR
6001                    PIAAC    EQU         $6001     A SIDE CONTROL
6002                    PIABD    EQU         $6002     B SIDE DATA/DDR
6003                    PIABC    EQU         $6003     B SIDE CONTROL
                        *
1000                             ORG         $1000
                        *
1000  86 03             START    LDA   A     3         SET THE NUMBER OF
1002  B7 11 0A                   STA   A     NUMTRY    TRIES TO 3
                        *
                        **       DISPLAY THE WORD INPUT
                        *
1005  BD 71 07          INPUT    JSR         BLANK
1008  CE 00 10                   LDX         #DISBUF   POINT TO DISBUF
100B  86 1F                      LDA   A     #$1F      'I'
100D  A7 00                      STA   A     0,X
100F  86 91                      LDA   A     #$91      'N'
1011  A7 01                      STA   A     1,X
1013  86 14                      LDA   A     #$14      'P'
1015  A7 02                      STA   A     2,X
1017  86 09                      LDA   A     #9        'U'
1019  A7 03                      STA   A     3,X
101B  86 0E                      LDA   A     #$E       'T'
101D  A7 04                      STA   A     4,X
101F  7F 11 08                   CLR         ERRCNT    CLEAR ERROR COUNT
1022  7F 11 09                   CLR         KEYCNT    CLEAR KEY COUNT
                        *
                        **       DISPLAY THE WORD 'INPUT'
                        *
1025  86 80                      LDA   A     #$80      SET DISPLAY TIME
1027  B7 11 0B                   STA   A     XTEMP     SAVE IT
102A  BD 71 DD          DISOUT   JSR         DISPLAY   REFRESH THE DISPLAY
102D  7A 11 0B                   DEC         XTEMP     DECREMENT DISPLAY TIME
1030  26 F8                      BNE         DISOUT    IS IT FINISHED?
                        *
                        **       GET THE COMBINATION
                        *
1032  CE 11 00                   LDX         #COMBIN   POINT TO COMBINATION
1035  FF 11 0B                   STX         XTEMPT    SAVE THE POINTER
1038  BD 71 77          GETKEY   JSR         MPXK      SCAN KEYBOARD
103B  27 FB                      BEQ         GETKEY    HAS A KEY BEEN PRESSED?
103D  FE 11 0B                   LDX         XTEMPT    POINT TO COMB. STORE
1040  A1 00                      CMP   A     0,X
1042  27 03                      BEQ         MISERR    WAS IT AN ERROR?
1044  7C 11 08                   INC         ERRCNT    YES
1047  08                MISERR   INX         NO, GO TO
                                             NEXT DIGIT
1048  FF 11 0B                   STX         XTEMP     SAVE POINTER
104B  7C 11 09                   INC         KEYCNT
                        *
                        **       CHECK KEY COUNT
                        *
104E  C6 08                      LDA   B     #8
1050  F1 11 09                   CMP   B     KEYCNT    WAS THAT THE LAST KEY?
1053  26 E3                      BNE         GETKEY
1055  7D 11 08                   TST         ERRCNT    IS ERROR COUNT ZERO (MAX)
1058  26 12                      BNE         TRIES
                        *
                        **       COMBINATION IS OK, OPEN LOCK
                        *
105A  4F                         CLR   A               SET PIAAD TO DDR
105B  B7 60 01                   STA   A     PIAAC     SET DDR FOR ALL OUTPUTS
105E  43                         COM   A
105F  B7 60 00                   STA   A     PIAAD
1062  B7 60 01                   STA   A     PIAAC     RESET PIAAD TO DATA
1065  86 47                      LDA   A     #$47
1067  B7 60 00                   STA   A     PIAAD     SET PA7 TO '0'
106A  20 FE             OPEN     BRA         OPEN      STAY OPEN
                        *
                        **       TEST NUMBER OF TRIES
                        *
106C  7A 11 0A          TRIES    DEC         NUMTRY
106F  7D 11 0A                   TST         NUMTRY
1072  26 91                      BNE         INPUT     IF NOT ZERO TRY AGAIN
                        *
                        **       SET ALARM
                        *
1074  4F                         CLR   A               SET PIABD TO DDR
1075  B7 60 03                   STA   A     PIABC     SET DDR FOR ALL OUTPUTS
1078  43                         COM   A
1079  B7 60 02                   STA   A     PIABD
107C  B7 60 03                   STA   A     PIABC     RESET PIABD TO DATA
107F  86 60                      LDA   A     #$60
1081  B7 60 02                   STA   A     PIABD     SET PB7 TO '0'
1084  20 FE             ALARM    BRA         ALARM
                        *
                        **       TEMPORARY STORAGE
                        *
1100                             ORG         $1100
                        *
1100                    COMBIN   RMB         8         THE COMBINATION SHOULD
                                                        BE STORED HERE
                        *
1008                    ERRCNT   RMB         1         ERROR COUNT
1109                    KEYCNT   RMB         1         KEY COUNT
110A                    NUMTRY   RMB         1         NUMBER OF TRIES
110B                    XTEMP    RMB         2         TEMP STORE
                        *
```

This program can be used as a guessing game or as the basis for a security lock system. An 8-bit code is stored in memory before the program is run. The user has three chances to enter the correct code before an alarm connected to PIA1 bit DB7 is activated. All programs shown are entered in memory beginning at location 1000 (hex). Code before this address are "equates" which define the location of routines and storage used by the program, and should not be entered.

DATUM: listing 3 — Pick up sticks

```
                          BINSEG   EQU   $727D    'BIN7SEG' ON DATUM
722D                      BLANK    EQU   $7107    CLEAR THE DISPLAY
7107                      BYTE     EQU   $724D    FORM A BYTE FROM 2 NIB-
724D                                              BLES
715E                      DISKEY   EQU   $715E    REFRESH DISPLAY AND
                          *                         SCAN THE KEYBOARD
0010                      DISBUF   EQU   $10      DISPLAY BUFFER
71DD                      DISPLAY  EQU   $71DD    REFRESH THE DISPLAY
726E                      TWODIG   EQU   $726E
                          *
                          **       SET UP THE DISPLAY
                          *
1000                               ORG   $1000
                          *
1000  BD 71 07            START    JSR   BLANK    CLEAR THE DISPLAY
1003  CE 00 10                     LDX   #DISBUF  POINT TO DISBUF
1006  86 7E                        LDA A #$7E     '-'
1008  A7 01                        STA A 1,X
100A  A7 05                        STA A 5,X
                          *
                          **       GET AN INPUT
                          *
100C  BD 71 5E                     JSR   DISKEY
100F  B7 12 00                     STA A TEMP1
1012  BD 72 7D                     JSR   BINSEG
1015  97 10                        STA A DISBUF
1017  BD 71 5E                     JSR   DISKEY
101A  B7 12 01                     STA A TEMP2
101D  BD 72 7D                     JSR   BINSEG
1020  97 11                        STA A DISBUF+1
1022  CE 12 00                     LDX   #TEMP1   POINT TO TEMP1
1025  BD 72 4D                     JSR   BYTE     FORM A BYTE
1028  B7 12 00                     STA A TEMP1
102B  BD 71 5E                     JSR   DISKEY
102E  B7 12 02                     STA A TEMP3
1031  BD 72 7D                     JSR   BINSEG
1034  97 15                        STA A DISBUF+5
1036  BD 71 5E            AGAIN    JSR   DISKEY
1039  B7 12 03                     STA A TEMP4
103C  27 08                        BEQ   PZERO
103E  7C 12 02                     INC   TEMP3    M=M+
1041  B1 12 02                     CMP A TEMP3    P=(M/
1044  2B 18                        BMI   NEWN
1046  CE 00 10            PZERO    LDX   #DISBUF
1049  86 06                        LDA A #6       'E'
104B  97 12                        STA A DISBUF+2
104D  86 15                        LDA A #$15     'R'
104F  97 13                        STA A DISBUF+3
1051  8D 61                        BSR   DISOUT
1053  CE 00 10                     LDX   #DISBUF  POINT OF DISBUF
1056  86 7F                        LDA A #$7F
1058  A7 02                        STA A 2,X
105A  A7 03                        STA A 3,X
105C  20 D8                        BRA   AGAIN
105E  B6 12 00            NEWN     LDA A TEMP1    N
1061  B0 12 03                     SUB A TEMP4    N-P
1064  B7 12 00                     STA A TEMP1    SAVE NEW N
1067  BD 72 6E                     JSR   TWODIG
106A  D7 10                        STA B DISBUF   MSN
106C  97 11                        STA A DISBUF+1 LSN
106E  BD 44                        BSR   DISOUT
1070  B6 12 00                     LDA A TEMP1    N
1073  4A                           DEC A
1074  27 3C                        BEQ   CHEAT
                          *
                          **       CALCULATE NEW VALUES
                          *
1076  7F 12 05                     CLR   TEMP6    A
1079  7C 12 02                     INC   TEMP3    M=M+1
107C  7C 12 05            INCA     INC   TEMP6    A=A+1
107F  B0 12 02                     SUB B TEMP3    (N-1)-(M+1)
1082  2E F8                        BGT   INCA
1084  7A 12 05                     DEC   TEMP6    A=A-1
1087  5F                           CLR B
1088  FB 12 02            ADDM1    ADD B TEMP3    +(M+1)
108B  7A 12 05                     DEC   TEMP6    A=A-1
108E  26 F8                        BNE   ADDM1
1090  B6 12 00                     LDA A TEMP1    N
1093  10                           SBA            N-A(M+1)
1094  16                           TAB
1095  5A                           DEC B          R=N-A(M+1)-1
1096  26 02                        BNE   MISSET   R=0?
1098  C6 01                        LDA B #1       SET R=1
109A  B6 12 00            MISSET   LDA A TEMP1    N
109D  10                           SBA            N=N-R
109E  B7 12 00                     STA A TEMP1    N
10A1  BD 72 6E                     JSR   TWODIG
10A4  D7 10                        STA B DISBUF
10A6  97 11                        STA A DISBUF+1
10A8  B6 12 00                     LDA A TEMP1
10AB  81 01                        CMP A #1       N=1?
10AD  27 04                        BEQ   CLOT
10AF  7E 10 36                     JMP   AGAIN
10B2  3F                  CHEAT    SW1
10B3  3F                  CLOT     SW1
                          *
                          **       DISOUT, DISPLAY ROUTINE WITH TIME-OUT
                          *
10B4  86 80               DISOUT   LDA A #$80     SET DISPLAY TIME
10B6  B7 12 04                     STA A TEMP5
10B9  BD 71 DD            DISOU1   JSR   DISPLY
10BC  7A 12 04                     DEC   TEMP5
10BF  26 F8                        BNE   DISOU1
10C1  39                           RTS
                          *
                          **       TEMP STORE
                          *
1200                      TEMP1    RMB   1
1201                      TEMP2    RMB   1
1202                      TEMP3    RMB   1
1203                      TEMP4    RMB   1
1204                      TEMP5    RMB   1
1205                      TEMP6    RMB   1
                          *
```

This program simulates the game of "Pick up sticks" or "Matches". The winner is the player (either DATUM or the operator) who forces the opponent take the last object.

Table 1: DATUM Monitor routines

NAME	START LOCATION	COMMENTS
SPROMPT	7107	Puts a "PROMPT" in the left-most digit and blanks the rest.
DISKEY	715E	Refreshes the display then scans the keyboard. If no key was pressed then the routine loops back to display refresh routine.
MPXK	7177	Tests whether a key has been depressed. Acc B = 0 if no key depressed else # 0. Acc A has value of key. Index Reg is used.
TIMLP	71D2	Gives a 10ms delay and does not change Acc A, Acc B or Index Reg.
XTIMLP	71D7	Time delay depends on the Index Reg. Delay = Index Reg contents x8μS.
DISPLAY	71DD	Displays for 10msec contents of display locations 0010—0015. Index Reg used.
BYTE	724D	Takes two nibbles in successive memory locations (indexed) and combines to form a byte. MSN in location 00 and LSN location 01. Index Register must be set before entering subroutine. Result in Acc.
TWODIG	726E	Takes byte in Acc A and splits into 2 nibbles MSN in Acc B, LSN in Acc A Index Register.
BIN7SEG	727D	Converts a hex value in Acc A, into a segment code. This result is in Acc A, the original hex value being lost. Index Reg is left unchanged.
ADBX	734C	Adds the contents of Acc B to the Index Reg and the result is in the Index Reg on exit from the routine.
SBBX	7364	Is similar to ADBX but subtracts Acc B from the Index Register.

Table 2: Addresses of PIA 1 (hex).

6000	Data register A and Data Direction register A
6001	Control register A
6002	Data register B and Data Direction register B
6003	Control register B

Table 1 shows Monitor routines which can be used with any program. Table 2 has the addresses of PIA 1 of DATUM.

namely DISKEY, BYTE, TWODIG and BINTSEG. The function of each of these is explained in Table 1. Please note that MSN stands for most significant nibble and LSN for least significant nibble.

Concluding remarks

The above three programs illustrate some of the many applications of DATUM, and we hope that you have enjoyed studying and using them. The applications and usefulness of DATUM can be extended by adding the other two integrated circuits (the ACIA and PIA2), but even more, by adding the matching extension board. This board can be expanded according to user needs, and provides for memory to be increased up to 12k bytes (RAM and/or EPROM), analog to digital and digital to analog conversion, cassette interface and use with a terminal.

DATUM was originated by Malcolm Haskard, Senior Lecturer at the School of Electronic Engineering of The South Australian Institute of Technology, who designed the circuit and wrote the documentation. John Duval, a technician with the School was responsible for the artwork, including the printed circuit patterns used by Gammatron to produce the boards. As mentioned in the first article, Peter O'Neill, a masters degree student, wrote the DATUM monitor program.

Complete kits and instructions for building the DATUM microprocessor board are available from Gammatron, Unit 1, Weens Rd, Pooraka, SA, 5095. Phone (08) 262 6555.

Correction

The connection diagram for the DATUM expansion interface, Fig. 8, published in November 1982, is partially incorrect. On the upper side of the board, starting from pin 11, the address lines are in the sequence A0, A1, A2, A3, A7, A4, A8, A5, A9, A6, A10, and A11 (on pin 22).

Letters to the editor

Companies — perhaps modesty is justified

In your November issue your editorial led with the words "There is no need to be modest". On the contrary, I feel that in some areas of the Australian electronics industry there is need for a lot more reticence. Far be it for me to speak of the purveyors or creators of high technology produce. What is needed is quality control and responsibility at the nitty-gritty level.

Two days ago the phantom statistician struck at my house and two light bulbs blew. I subsequently purchased three bulbs (60 and 75W, reputable maker) of which one failed to work at all and the other died at switch on. Things were looking dim!

I purchased two more bulbs (60W, different although equally reputable make). While inserting the first I noticed that it rattled a good deal more than is usual. On inspection, the centre of the base proved to contain sufficient loose solder to enable a short circuit. The second bulb proved to be in the same condition. Not wishing to blow fuses I inserted the last of the original three bulbs.

It has lasted long enough to write this letter, though I can't help feeling for those with less than acute hearing or electrical knowledge amongst us who must have many blown fuses and frayed tempers. All in all, one out of five is not a good score.

It is hard to see (!) such companies being viable, let alone visible, in the market place for very long.

O. Reynolds,
Balgowlah, NSW.

COMMENT: We agree that one out of five is a poor score. We hope you returned the defective bulbs for a refund. One reason why companies become slack is that their customers allow them.

Weather Bureau likes Towards 2000

In your editorial for October 1982, you label the television series, "Towards 2000" as being an example of an ABC show put together by people "who could not care less". Further, you describe "Towards 2000" as having "indifferent presentation".

You are perfectly entitled to your own viewpoint, but I should point out to you that what you say is entirely without substance.

Indeed, "Towards 2000" is produced by one of the most professional and enthusiastic teams with whom it has ever been my privilege to work. The dedication to the series of the reporters, directors, film crews, researchers, producer's assistants and indeed the whole team of "Towards 2000" is, without question, total and unflagging.

The audience response to the two series to date has been overwhelming. For instance, the most recent TV Audience Appreciation Survey conducted in Melbourne shows "Towards 2000" as having an appreciation factor of 85% (ie, 85% of its viewers either "enjoyed" or "liked" the program). With the exception of the ABC's Commonwealth Games coverage (93% appreciation), no other program on *any* station equalled "Towards 2000's" appreciation rating.

As I write, a letter from Victoria's Bureau of Meteorology has arrived on my desk. The opening paragraph reads —

"I would first of all like to congratulate you on the high standard of your show. The technical quality and fresh approach to new advances are needed for our society to adjust to the future."

Like I say, your editorial writer is perfectly entitled to his viewpoint. It's just a pity that view is so far removed from reality.

L. Capps,
Executive Producer,
"Towards 2000",
Australian Broadcasting Commission,
Sydney, NSW.

Metrics: advertisers should take more care

No doubt many of us had a good chuckle at Dick Smith's "Exclusive" — new for 82" autoranging digital multimeter which is advertised on page 54 of his 1982/83 Electronic Enthusiast's Catalogue (Cat Q-1446) — and which weighs 250kg (well that is what he said!).

However, Jaycar Pty Ltd were not content to let the matter rest at that. In the June 1982 issue of EA (page 17). Jaycar advertise their version of the same meter as one thousandth the weight of Dick's (cheaper too).

All good light-hearted stuff perhaps. But it shouldn't happen. Not in technical publications. Maybe John Citizen is still suffering withdrawal symptoms following the abandonment of the imperial system, but electronics buffs should be familiar with the metric system from way back, I learnt it in secondary school 25 years ago. Didn't you city slickers have a go at it too?

For further examples of shoddy use of

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As reviewed in Sept. EA page 107

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metric units, look no farther than the 1982/83 Altronics catalogue which featured as a supplement to EA back in March. At least they tell you (page 20) that UF is microfarad and PF is picofarad – but why didn't they use the correct abbreviations μF and pF? One page 18, however, they leave it to the reader to decipher the values associated with fuses and cradle relays, which makes the game more interesting!

Perhaps we can forgive the wheelies their "kph" and other confused terms; and the fishermen whose "3lb bream" become 1.36kg in magazines with spurious accuracy; but technical people should do better than that.

I. B. Staples,
Mareeba, Qld.

Problems with VCR signal distribution

I would be obliged if you would draw your readers' attention to a possible problem with reference to my article on TV Distribution in the November issue. In discussions with colleagues at the recent TETIA-TESA Convention in Melbourne, it was brought to my attention that the suggested system (of incorporating VCR signals) may not work with certain VCRs. In particular, those Beta machines without an antenna switch could cause intermodulation, patterning or colour subcarrier cancellation.

I have not had the opportunity to investigate this problem, nor to devise an answer where the problem does exist. I can only apologise to any reader inconvenienced by this omission, and would be pleased to hear from anyone who has met and overcome this particular problem.

J. Lawler,
Geilston Bay, Tas.

Farads are a reality

Upon seeing the cartoon on page 69 of your September issue, I thought you might appreciate the enclosed device (a capacitor of about 25mm in height and 12mm in diameter – about the size of a 16V/470μF electrolytic – Ed). It is possible you have already seen one as it is out of a JVC HR2200 portable VCR.

If you haven't, I can assure you it is not a joke. That is a real 3.3 Farad 1.6V capacitor! It serves as a power supply back up for the LCD tape counter (being much more successful than a Ni-Cad battery in this application). It is not an electrolytic and has no indication of polarity. It can be charged in either direction.

It has a fairly high internal resistance, but will still run a small motor. One particular motor out of a camera zoom unit ran for about four minutes! Even more surprising was that by spinning the

motor (by rapidly running the attached pulley across the table top a few times) the capacitor could be charged. The motor will then faithfully run in the same direction.

It ran a small 1.5V radio for about 90 seconds at a listenable volume, but the local oscillator stopped at about 1V. If not for this, it would no doubt have operated much longer. We have no information about the company who manufactures the device, the only identification being the title "Gold Cap" printed on the plastic sleeving.

I can recall reading in your magazine some years ago that capacitors of this size could be made with a new process, but the last I heard was that they were limited to a rating of about 0.5V working. Another of our VCR's has one of these capacitors with a rating of 5.6V.

K. Walters,
Auckland, NZ.

Comment: "Gold Caps" are apparently being increasingly used for standby power supply for memory devices in Japanese synthesiser AM/FM tuners and VCRs. Thank you for the sample. It is a fascinating component.

Misconceptions in article on Amplitude Modulation

I would like to comment on the article on "Amplitude Modulation: The Basic Concepts", submitted by Elmo V. Jansz in your October 1982 issue.

The author described AM theory the same way it was taught to myself and many other persons involved in electronics and communications. However, the way it has been theorised by the author and countless other people introduces misconceptions into the understanding of AM.

It has been said that the amplitude of the carrier varies in accordance with the amplitude of the audio signal. This is not so. Regardless of percentage modulation the carrier signal will always remain at a constant amplitude.

What does occur is that the amplitude of the sidebands vary with the amplitude of the modulating signal, also the frequency of the sidebands vary with the frequency of the modulating signal.

Therefore it can be stated that with a constant amplitude and frequency of an audio signal the amplitude and frequency of the sidebands will remain constant. In the resultant transmitted AM signal there are three components present:

1. The carrier frequency.
2. Lower sideband frquency.
3. Upper sideband frequency.

When an AM signal is viewed on an oscilloscope it appears as if the carrier signal is varying in amplitude. The reason this occurs is because the oscilloscope receives three different frequencies and algebraically adds them together.

This result can also be done graphically on paper by adding the amplitudes of the three AM components together.

Further insight and understanding of AM can be achieved by displaying an AM signal on a spectrum analyser. This may be difficult to achieve because spectrum analysers are expensive and therefore somewhat scarce.

Having described amplitude modulation, it must follow that amplitude demodulation or detection must be described.

It is often taught that the AM detector diode rectifies the AM signal and the capacitor in circuit after the diode fills in the gaps between the carrier peaks to reconstruct the audio.

This is also a misconception. It has been established that the AM signal arriving at the detector consists of three separate frequencies. By using the detection method previously mentioned the three RF components would be rectified then shunted to earth by the filter capacitor. There would be no audio output from the detector.

It is apparent that a suitable explanation of AM detection is necessary. To reconstruct audio from an AM signal the sidebands must be mixed with the carrier signal.

Regardless of the amount of frequency conversion that occurs in the receiver the difference frequency between sidebands and carrier will always remain the same as the transmitted signal.

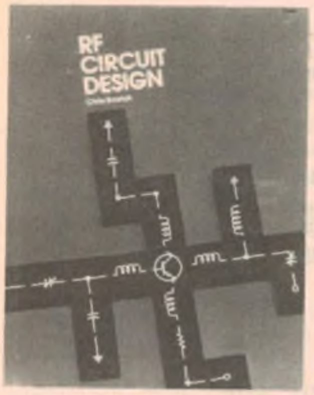
In AM detection, mixing occurs between the sidebands and the carrier signal. This mixing occurs in the nonlinear characteristic of the detector diode.

The capacitor shunts RF to earth leaving just the audio to be amplified. It should be noted that some mixing would occur between the sidebands producing a product of twice the modulating frequency. This would be likened to harmonic distortion.

D. Dutton,
Alpha Electronics,
Toowoomba, Qld.

Books & Literature

RF circuit design



RF CIRCUIT DESIGN by Chris Bowick. Published 1982 by Howard W. Sams, Indianapolis, USA. Soft covers, 215 x 279mm, 176 pages. Illustrated with many circuits and diagrams. ISBN 0 672 21868 2. Price $33.95.

Nowadays, when publishing in the electronics field seems to be dominated by books on computers and programming, it is a welcome change to come across a text on RF circuit design. Such books are all too rare. Having indicated that the book is welcome it is good to be able to state that it is also well written.

There are seven chapters in all, plus three appendices. Chapter one starts with components and discusses wire, resistors, capacitors, inductors, toroids and toroidal inductor design. Chapter two is about resonant circuits and covers the subjects of Q, insertion loss, impedance transformation and coupling. This leads naturally to chapter three which discusses filters.

Chapter three presents design procedures for multi-pole Butterworth, Chebyshev and Bessel filters including low pass, high pass, bandpass and bandstop designs. A really useful chapter in which there is surprisingly little mathematics considering the nature of the material.

Chapter four covers impedance matching of real and complex impedances. This is done numerically and with the aid of the Smith chart.

People who could never understand transistor RF parameters will find chapter five useful. Input and output impedance feedback capacitance and their variation with frequency are discussed and Y and S parameters are introduced. Chapter six then builds on the preceding chapter by discussing small signal RF amplifiers and chapter seven concludes on RF power amplifiers.

The three appendices cover vector algebra, noise calculations and the bibliography.

While the book covers the above subjects quite well it is fair to say that there are a number of surprising omissions. For a start, oscillators are not mentioned at all, let alone covered. While filters have been covered in some detail, they are all LC networks and quartz crystal and ceramic filters are not mentioned. Nor is there any discussion of attenuators.

Finally, there is no discussion of integrated circuits which are nowadays used extensively in RF circuitry and nothing on stripline techniques which are mandatory for the UHF region. In spite of that list of omissions, this text is well worthwhile as a practical guide to RF circuit designing. It is not cheap though, at $33.95 for 176 pages.

Our copy came from Technical Books & Magazine Company Pty Ltd, 289-299 Swanston Street, Melbourne, 3000. (L.D.S.)

Programming the VIC-20

VIC INNOVATIVE COMPUTING by Clifford Ramshaw. Soft covers, 151 pages, 140 x 210mm. Melbourne House Publishers, 1982 ISBN 0 86759 115 3.

Included in the 30 programs are several popular arcade games as well as strategy games such as Adventure and Chess. Dedicated alien zappers will most likely be pleased with this publication.

Any Commodore VIC 20 owner interested in video games would find this book worth a browse. Containing very little else besides the actual programs, it is not exactly the type of "good book" one might be tempted to curl up with! The only text is a brief description of each program and an even briefer description of the game.

The review copy was supplied by Compshop Australia, 4/75 Palmerston Crescent, South Melbourne, Vic, 3205.

Recently received

THE ILLUSTRATED DICTIONARY OF ELECTRONICS (SECOND EDITION). By Rufus P. Turner. Soft covers, 891 pages, 130 x 210mm. Published by TAB Books Inc 1982. ISBN 0 8306 1366 8. Price $23.50.

For people involved in the presentation of electronics information, it can be a full time task to keep abreast of current terminology. With over 25,000 definitions, this dictionary would no doubt prove a useful aid.

There are 600 new entries in the second edition, covering electronics, radio, audio, computers and other area. A data section contains some commonly encountered symbols and abbreviations, as well as mathematical constants and a metric conversion table. Some definitions in the data section use exclusively Imperial measurement values.

Our copy was supplied by Australian and New Zealand Book Company Pty Ltd, PO Box 459, Brookvale, NSW 2100.

☆ ☆ ☆

INDUSTRIAL APPLICATIONS OF LEARNING CURVES AND PROCESS FUNCTIONS. IERE Conference Proceedings No. 52. Soft covers, 159 pages, 210 x 295mm, illustrated. ISBN 0 903748 47 9. Price £20.

On December 4, 1981, a conference was held in London on the above subject. This book contains the proceedings of the conference, presenting nine papers. These include discussion on the application of learning curves to highly repetitive tasks and ask how complex a learning curve model need be.

This should provide useful discussion and data for anyone involved in the area of industrial efficiency. Contact: Publication Sales Controller, Institution of Electronics and Radio Engineers, 99 Gower Street, London, UK, WC1E 6AZ.

☆ ☆ ☆

THE INFLUENCE OF MICROELECTRONICS ON MEASUREMENTS, INSTRUMENTS AND TRANSDUCER DESIGN. IERE Conference Proceedings No. 55. Soft covers, 296 pages, 210 x 298mm, illustrated. ISBN 0 903748 50 9. Price £37.50.

Another of the IERE Conference series, this book contains papers presented at Manchester on June 30-July 1, 1982 on the above subject. Some of the topics dealt with at this conference include controlling a miniature insulin infuser, a microcomputer based stereo-scopic rangefinding and a video image processing system.

The papers provide interesting discussion on some areas of current medical and industrial electronics which should prove useful to people involved in there areas of research. Contact: Publication Sales Controller, Institution of Electronics and Radio Engineers, 99 Gower Street, London, UK, WC1E 6AZ.

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HOW TO MEASURE ANYTHING WITH ELECTRONIC INSTRUMENTS. By John A. Kueken. Soft covers, 336 pages, 130 x 208mm. Published by TAB Books Inc. ISBN 0 8306 1306 4. Price $14.95.

With 16 chapters, this book takes the reader from units of measurement through to constructing test gear. Most of the circuits utilise ICs, although discussion is provided on earlier types of electronic test gear.

Analog-to-digital and digital-to-analog techniques are described, along with chapters on temperatures, distance and force measurement. A reasonable amount of theory is provided, but little is offered in the way of applications for each of the circuits, excepting those of the final chapter which deals with automotive test equipment.

The review copy was supplied by the Australian & New Zealand Book Company Pty Ltd, PO Box 459, Brookvale, NSW, 2100.

☆ ☆ ☆

THE MASTER HANDBOOK OF IC CIRCUITS by Thomas R. Powers. Soft covers, 532 pages, 128 x 198mm. Published by TAB Books Inc 1982. ISBN 0 8306 1370 6. Price $21.50.

With chapters entitled Linear ICs, Voltage regulators, CMOS, TTL, Radio & TV ICs and Special Purpose Devices, this book has a collection of over 900 circuits. Particularly in the linear ICs section, there is a multitude of circuit designs which may prove of use to the hobbyist.

ICs used in the circuits (there are some 200 different types) are listed in the contents under their generic name. No manufacturer identifications are included which may prove a handicap where some of the less common ICs are concerned.

In spite of the large number of circuits the lack of any supporting data or any descriptive text at all will probably severely limit the usefulness of this book.

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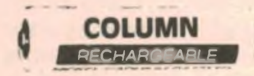

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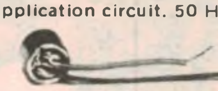

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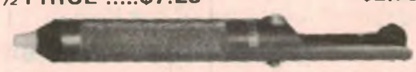
$2.75



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UNIVERSAL MULTIMETER

PORTABLE WITH BENCH STAND

23 ranges at less than $1 per range.

* 20,000 OHMS/Volt DC * 10,000 OHMS/ Volt AC * Mirror backed scale * Overload protected * Unique carry handle doubles as a bench stand * High-impact resistant case * Uses 1 AA Penlight batter (incl.) * Comes complete with battery, test leads and instructions. **RANGES: DC Voltage** 0-.25, 1, 2.5, 10, 25, 100, 250, 1000. **AC Voltage** 0-10, 25, 100, 250, 1000 **Decibles** 20 to +22db **DC Current** 0-50, 500 UA, 0-5, 50, 500MA **OHM Meter** 0-6 megohms in 4 ranges, 30 ohms centre scale. Size 135 x 91 x 39

Q 1002 . . **$22.50** 4 or more . . **$21.00**

A FREE Carry Case Cat. Q 1012 $3.50 value with every meter purchased from this advert — YES! that's right — yours for the asking.

CRYSTALS

CRYSTALS				
	Y 1000	1·000	12.3mm Pinout	11.50
	Y 1003	1·8432		9.50
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Parallel Resonant	Y 1012	4·000	5mm Pinout	5.00
	Y 1015	4·194		5.00
	Y 1017	5·000		5.00
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Frequencies Quoted in MHZ	Y 1019	8·000		5.00
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	Y 1025	12·000		5.00
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with minimum purchase value of $25.

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FAMOUS ELECTROLUBE PRODUCTS IN GENEROUS "TRADE SIZE" PACKS

ELECTRO MECHANICAL LUBRICANT PEN

T 3062 . . . **$3.50**

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T 3080 . . . **$5.50**

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T 3065 . . . **$6.50**

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T 3085 . . . **$6.95**

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PLUS $5 If Altronics Jetservice Delivery is not the Best in Australia

ORDER FROM ALTRONICS WITH COMPLETE CONFIDENCE. Compare this check list with any other Australian Electronics Supplier . . . ★ Delivery Time ★ Packing ★ Product Quality ★ Value for Money ★ Technical Queries Answered ★ Prompt Back Order Advice of not in stock items.
If after receipt of your Jetservice order you are not convinced Altronics service is superior to any other Australian Electronics Supplier you may return your purchase to us for a full refund plus $5 for your trouble. Regards

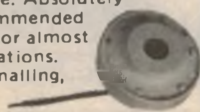
Jack O'Donnell

WEATHERPROOF SIREN HORN

12V DC operated — Deafening Siren Wail. Super handy for audio signalling, secruity systems etc. Current drain 500MA approx. Completely weatherproof. Attractive off-white PVC finish.

S 5058 . . ~~$19.50~~ NOW $15.00 ea.

PIEZO ALARM



Similar to "Sonalert" type. Absolutely ear piercing sound. Recommended voltage 5-15V DC. Ideal for almost all audio signalling applications. i.e. fire, water and gas signalling, computer alarms, etc.

S 5066 . . . ~~$4.95~~ NOW $4.50 each

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P 0900	Male 25 Pin . . .	~~$5.50~~	NOW $3.95
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Holds 12 magazines, each on a spring out wire rod. Just the shot for each year's set of Electronics Australia, ETI or any of your favourite magazine.
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B 9999 . . . ~~$5.50~~
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4 or more $4.50 each

Incredible Value Dainichi Loudspeakers

DAINICHI WIDE RANGE 25 Watt

200 mm (8 in.). This superbly smooth high power speaker comes from **Dainichi**, one of Japan's finest speaker manufacturers **(they produce OEM Speakers for Pioneer)**. Max. input power 25W 8 OHM Z. Resonant fo 60 HZ. Huge 10 OZ Magnet frequency response 40 HZ-18 KHZ.

C 2001 $19.50
4 or more $17.00

DUAL CONE WIDE RANGE

200 mm (8 in.). 10 Watts Max. power input. Public Address, Background Music. Ideal Hi Fi extension speaker. Includes transformer holes at 51 mm.

Over 30,000 sold in Australia!

Mounting holes 140 x 140 mm

C 2000 $8.50
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INTERLOCKING PARTS DRAWER

Unique side and top/bottom keying system allows you to use just a few or build a whole wall of drawers as your parts expansion dictates. Quality designed drawer slides will not "stick" or seize. Slide handle also takes ident. cards. Single or double drawers available.

H 0435 Single Way $2.20
H 0436 Double Drawers $2.20

New 10mm Digit LCD Clock Module

Uses the new NEC UPD833G LSI and quality EPSON LCD display.
Size 60 x 38 x 10mm, operates from 1.5V DC.
Display selectable to 12 or 24 hour format.
AM/PM Display.
Inbuilt control timer selectable to 15, 30, 60 and 120 minute intervals.
Stop watch facility to 24 mins duration.
Alarm timer, Snooze timer, Sleep timer.
An incredible diversity of applications.
i.e. clock radio, travellers watch, stop watch, digital alarm clock, sleep timer, snooze timer, appliance timer, sequential controller, dual time clock.

And the best news is the low price!

Y 1020 . . . . $16.50

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OEM QUALITY
250V 2 AMP
RATED

		PRICE	10 UP
S 1010	SPDT	$1.20	$1.00
S 1025	SPDT Centre off	1.40	1.20
S 1020	DPDT	1.40	1.20
S 1030	DPDT Centre off	1.95	1.75

DIL Switch Bargains

GOLD PLATE SELF WIPING CONTACTS

		ea.
S 3050	4 way	$1.25
S 3060	8 way	$1.75

KEY OPERATED SWITCH

19.5 mm mounting hole required. Supplied with two keys. Hundreds of applications for security type applications.

S 2500 . . . . ~~$6.95~~
NOW ONLY $5 EACH

TECHNICIAN PARTS CASE

See through acrylic parts tray and see through lid. Ident. label system. Movable compartment dividers. Two lift out compartment trays plus one extra deep tray. Great for screws, semis, passives etc.

H 0450 . . . .
. . . . $17.50

(Clear Lid not illustrated)

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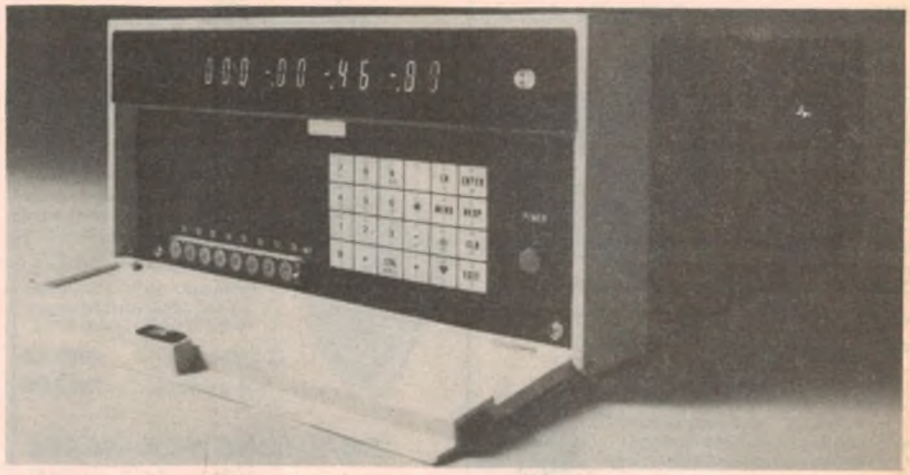
New Products...

Product reviews, releases & services

Intelligent data logger from Dindima

In a move to bridge the gap between data loggers and digital panel meters, Monitor Labs has developed the "Calc-U-Logger", the first of its forthcoming Series 2000 universal process indicators. This unit accepts 3 pulse and 12 analog inputs and provides 3 analog outputs.



Combining the capabilities of a stack-orientated scientific calculator (using reverse Polish notation) with those of a process monitor, the device can be programmed for specific applications through a keyboard. The underlying logic is programmed by the manufacturer in a Forth high-level language, known as FIG Forth, which supports the assembly-language routines of the unit's CPU, a 6502.

In many ways it resembles a state-of-the-art intelligent datalogger. It has analog, thermocouple and pulse inputs, alphanumeric data identification, alarms, analog output and RS232 or IEEE 488 ouput. The operator can specify data reporting rates, alarm levels and a multitude of other operating characteristics with the front panel alpha-numeric keyboard.

A 12-character alphanumeric LED display presents input and output parameters specified by the user. Other output options include RS-232 or IEEE-488 (GPIB) cards, with TTL levels for alarms. The basic device uses a single I/O card, which accepts four analog inputs and one pulse input and optionally produces one analog output and two additional I/O cards can be added.

The user programs separate sets of data inputs and the required calculations for each board. The user whose system contains, say, three I/O boards receives either automatically rotating display reports for each of the three calculation groups, or a concatenated single report, drawn from all three groups. A simple menu procedure establishes the characteristics of a particular calculation group.

Four alarms can be assigned to inputs or calculated results, either establishing high or low levels or setting a deadband. Alarms in the set condition are shown in the standard report format of the display. With the RS-232 option, annunciator ouputs are conditioned and reports are sent when a change in alarm state is detected.

Even calculations can be entered by the operator. The equation to be solved is entered using the RPN technique with a memory stack to handle calculation hierarchy. Standard functions include +, −, ×, ÷, , MOD, INT, RND. Optional functions include SIN, COS, TAN, SIN^{-1}, COS^{-1}, TAN^{-1}, LOG X, LN X, 10^x, e^x and X^y.

For further information contact The Dindima Group Pty Ltd, PO Box 106, Vermont, Victoria 3133.

New range of LED backlight displays

Sharp Corporation has introduced a range of LED backlight panel displays featuring high luminous intensity at low currents combined with uniform light emission.

Three colours are available, red, yellow-green and yellow, and dichromatic types can also be supplied. The devices are intended to be used with masks containing cut-outs of the word or symbol to be displayed. Several different sizes and shapes are included in the range, from 7 × 9mm to 7.9 × 19mm panels.

The indicators are distributed in Australia by Daneva Australia Pty Ltd, 66 Bay Rd, Sandringham, Vic. 3191. Phone (03) 598 5622

Tech-Sales appointed agent for Solartron

Tech-Sales Pty Ltd has been appointed Australian agents for Solartron/Schlumberger, and can now provide a range of digital multimeters and test instruments from that company.

The Solartron 7045 digital multimeter is a 4½-digit instrument, offering AC and DC voltage and current resistance and temperature measurements in a portable package. Accuracy is quoted as 0.01% on DC and 0.15% on AC measurements, and the unit may be powered from the mains or from built-in rechargeable batteries.

Also available from Tech-Sales is the Solartron 7150, a 6½-digit multimeter, providing DC and AC voltage and current measurements and a resistance range. Features of the instrument include automatic null and a selectable digital filter for ease of measurement. An IEEE-488 interface is standard for use in automatic test and measuring systems.

For further information contact Tech-Sales Pty Ltd, 83 Wellington Street, Windsor Vic 3181 (03) 51 1306.

Fibre optic components from Soanar electronics

Soanar Electronics Pty Ltd is now stocking fibre optic components and accessories at all branches throughout Australia.

Optical fibre cable is available in continuous lengths in multiples of one metre to maximum of one kilometre. The 125 micron fibre in 2.7mm diameter cable is designed for high flexibility and tensile strength and can be supplied plain or prefitted with connectors at the factory.

For those wishing to fit connectors themselves Soanar have cutting and stripping tools to remove the covering from the optical fibre and then cut the fibre squarely for a mirror-like surface.

Two types of connector are stocked by Soanar. One type enables fibre optic cables to be joined together and the other type couples the fibre to active components. Motorola and Australian AMP co-operated on the design of the active component connectors to ensure that their fibre optic products were entirely compatible.

Soanar also have a range of Motorola fibre optic active components available including emitters, detector/preamplifiers, transmitters and receivers.

Further information on these products is available from the Soanar Branch in your state or by contacting the head office. Soanar Electronics Pty Ltd, 30 Lexton Road, Box Hill, 3128. Telephone 840 1222

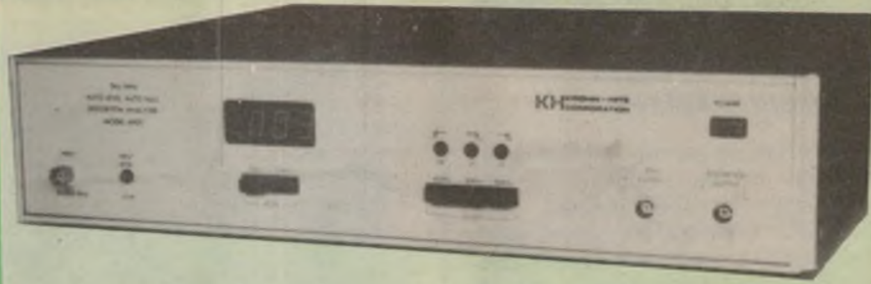
New Sanyo torch uses rechargeable batteries

Sanyo Australia has introduced a rechargeable torch, the model NL 2000, which avoids the inconvenience and expense of replacing batteries. The "Cadnica" torch can be recharged by simply slipping the batteries into a built-in recharger and plugging it into any power point.

The torch will provide up to 70 minutes of use on one charge.

For details contact Sanyo Australia Pty Ltd, 225 Miller Street, North Sydney, 2060. Phone (02) 436 1122.

Krohn-Hite automatic distortion analyser



Warburton Franki now has available the new Krohn-Hite Model 6900 distortion analyser, providing automatic frequency nulling and level setting for fast measurements of distortion or AC voltage over a frequency range of 5Hz to 1MHz.

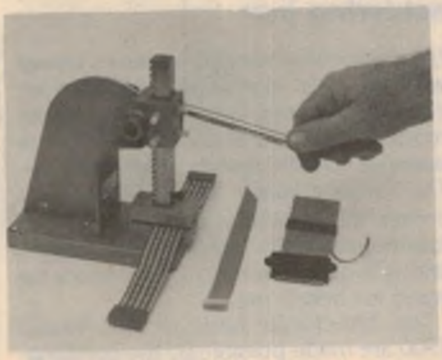
Total harmonic distortion is displayed on an auto-ranging digital read-out, with measurements ranging from 0.005% to 19.9% THD with a resolution of 0.001% and input levels from 100mV to 130V RMS. As an AC voltmeter the 6900 will measure from 10mV to 130V with an accuracy of 2%.

A distortion output is provided for oscilloscope inspection of the input signal after the fundamental frequency has been filtered out. An analog output is also available, providing a DC voltage which is proportional to the percentage measurement of the distortion displayed.

For further information contact Warburton Franki Pty Ltd, 372 Eastern Valley Way, Chatswood, NSW 2067.

Bench press assembles mass-terminated cables

Scope Laboratories has released a bench press for use with mass terminated cable connectors. Called the "Dilp", the press can handle any type of flat top plug, socket or D-type mass termination connector with 0.3 or 0.6 inch pitch up to a maximum of 50 pins.



The Scope Model Dilp sells for "under $200" complete with tooling for a variety of connectors. It is bench mounted and weighs less than 3kg.

For further information contact Scope Laboratories, 3 Walton St, Airport West, Vic, 3042. Telephone (03) 338 1566.

Rifa to distribute Texas Instruments' parts

Rifa Electronics has been appointed a distributor of Texas Instruments semiconductors and IC sockets. The announcement was made by Texas Instruments Australia's managing director Mr Peter Dixon and semiconductor marketing manager Mr Ian Hawkins.

According to Mr Dixon, "the appointment of Rifa is an important step in our continuing efforts to increase TI's penetration in the highly competitive semiconductor market in Australia. We are very, very glad to have them on our team".

For further information contact the head office at PO Box 95, Preston, Vic. 3072. Phone (03) 480 1211. In Sydney ring 570 8122.

Revised standard for mains-powered gear

The Standards Association of Australia has published a revision of its standard approval and test specification for mains operated electronic and related equipment for household and similar general use.

AS 3250 has been prepared at the request of approvals authorities to maintain safety standards and align with international (IEC) requirements. The standard establishes essential requirements and minimum safety for the design and construction of mains operated electronic and related equipment.

It is intended that AS 3250 will supersede AS 3159 two years after its publication on November 8, 1982. During this period, however, both specifications will run concurrently and it is expected that regulatory authorities will approve equipment to either of them.

Copies of AS 3250 can be purchased from any SAA office at a cost of $18.40 plus $2.50 postage and handling charge.

New Products

New Hewlett-Packard 7-segment displays

Hewlett-Packard are now producing an equivalent to the popular FND-500 seven segment LED display, the HDSP-5300/5500/5700/5800 series. Both numeric and ±1 overflow indicators provide a right hand decimal point and are available in common anode or common cathode formats.

The devices are categorised for luminous intensity, with all segments of the display matched for common luminous intensity, and multiple devices matched to ensure a display of uniform brightness.

Red, high-efficiency red, yellow and green displays are available. Segments have mitred corners but the displays do not include an integral polarising filter.

Luminous intensity of the HP displays is said to be up to 30% greater than competing types, enabling the users to either provide a brighter display for the same power consumption or reduce power consumption for the same brightness.

Hewlett-Packard components are distributed by STC-Cannon Components Pty Ltd with branches in Adelaide, Brisbane, Melbourne, Perth and Sydney.

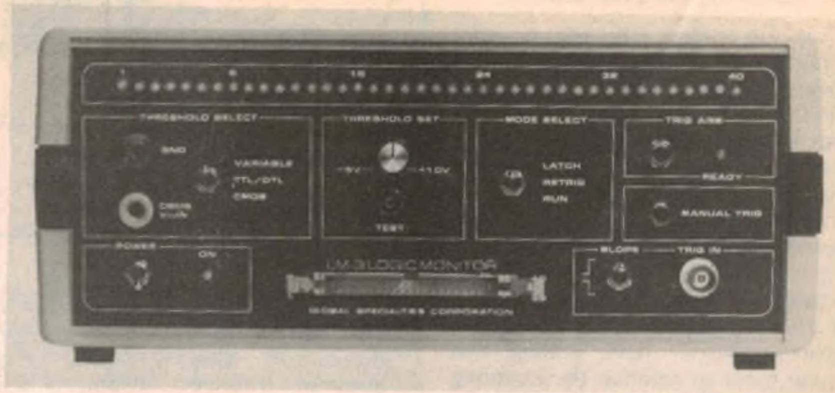
A range of accessories for the TV serviceman

Matthey Electronics currently has available a series of 75Ω miniaturised low pass video filters, the FLW series, with cut off frequencies from 2.5 to 10MHz. The series offers a flat pass band and sharp cut off, and a stop band attenuation of greater than 45dB at frequencies up to 100MHz.

Matthey Electronics also has available a small low pass filter which allows an oscilloscope to be used to make differential gain measurements in TV circuits. No specialised equipment is needed other than the filter, and details of the technique are available on request.

For further information contact Johnson Matthey Ltd, 160-170 Rocky Point Rd, Kogarah, NSW, 2217.

Logic monitor from Vicom International



The LM-3 logic monitor from Global Specialities Corporation combines 40 variable threshold logic state indicators with a triggered latching circuit to create a flexible logic test instrument. The variable threshold facility allows the LM-3 to monitor up to 40 points on any type of circuitry, while the triggering modes mean that the logic monitor can be used to follow logic states or freeze the display to examine a particular circuit condition.

The LM-3 is supplied with a 40-way ribbon cable terminated in clips which fit on to the circuit point being tested. Forty discrete LEDs on the front panel indicate the logic state of the inputs.

A selectable threshold control can be adjusted for use with any logic family and with positive or negative supply voltages. Input impedance is 0.5MΩ and the instrument works at clock speeds of up to 5MHz.

Applications include monitoring the operation of microprocessors and related circuitry, and process control, where the LM-3 can be used to monitor the status of 40 different digital signal or alarm lines simultaneously.

The unit is mains powered and measures 76 × 254 × 178mm. Global Specialities Corporation is represented in Australia by Vicom International Pty Ltd, 57 City Rd, South Melbourne, Vic 3205.

"Quick charge" cordless soldering iron

Freedom from the need for mains power was the first significant benefit from cordless soldering irons, however, many models require 12 hours to recharge the batteries to full capacity. The Wahl Iso-Tip "Quick Charge" Model 7700 overcomes this problem. It requires about four hours to fully recharge the batteries and is available with its own recharging stand for bench use.

The fast-charge rates of the Model 7700 are made possible by the combination of special nickel-cadmium cells within the iron and the charger stand which continually recharge while the iron is idling. The Model 7700 also features an improved header which holds tips firmly in place by friction.

A rotatable pushbutton switch activates the soldering tool, and may be indexed to either of two positions. In the Use position the button can be pushed far enough to allow the tip to be powered and when the iron is not in use, the Lock position ensures that it cannot be accidently turned on. When the power button is pressed, a special screw-in lamp located in the header illuminates the work area, and the tip reaches soldering temperature within about five seconds.

Full details are available from the Australian distributors Royston Electronics, 27 Normanby Road, Notting Hill, Vic 3168. Telephone (03) 543 5122.

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2716 5V	4.50	4.00	3.50B
2732 5V	5.50	5.00	4.50B
2114 300NS	2.10	1.90	1.80B
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8164 64x1K DYN. RAM	7.00	6.50	5.50B
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Z80ACPU 4MEG	7.00	6.00	4.20B
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Z80CTC	6.90	5.10	4.80B
Z80ACTC	8.40	6.00	5.70B
Z80S10/0	15.00	14.00	10.00B
Z80AS10/0	16.00	15.00	11.00B
8212	3.00	2.50	2.10B
8214	6.00	5.50	4.90B
8224	4.90	4.50	4.20B
8251	4.90	4.50	4.20B
8255	5.50	4.30	4.00B
6800	5.50	5.00	4.50B
6802	8.00	7.00	6.20B
6821	2.50	2.20	2.00B
6850	2.50	2.20	2.00B
FD1771	15.00	14.00	13.00
FD1791	24.00	23.00	21.00B
FD1795	27.00	25.00	23.00B
8080A	5.00	4.50	4.20B
8085	6.00	5.00	5.00B
7400	.18	.17	.16B
7410	.18	.17	.16B
7421	.18	.17	.16B
74LS00	.18	.17	.13B
74LS10	.18	.17	.13B
74LS32	.18	.17	.13B
74LS74	.45	.41	.30B
74LS240	.80	.70	.60B
74LS241	.80	.70	.60B
74LS242	.80	.70	.60B
74LS244	.80	.70	.60B
74LS245	1.00	.90	.90BN
81LS95	1.70	1.50	1.40B
81LS96	1.70	1.50	1.40B
81LS98	1.70	1.50	1.40B
8131	2.10	1.90	1.70B
BC547-8-9	.10	.09	.07A
BC557-8-9	.10	.08	.07A
RED LEDS 5mm	.10	.08	.07B
IN4001	.04	.035	.032B

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IN4002	.05	.04	.035B
IN4003	.05	.04	.035B
IN4004	.06	.04	.039B
IN4007	.11	.09	.07B
IN4148	.04	.03	.025B
IN5404	.20	.018	.017B
IN5408	.25	.023	.021B
BU126	1.70	1.50	1.30A
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TIP50	.99	.89	.81A
BD139	.40	.30	.22A
BD140	.40	.30	.22A
LINEARS			
LM308	.60	.45	.40A
LM555	.29	.26	.25B
LM741	.29	.26	.25A
LM317K	2.90	2.50	2.40B
LM350K	6.50	5.50	4.90B
LM380-14	1.10	1.00	.90A
LM324	.80	.65	.55A
CA3130T	1.50	1.40	1.30A
CA3140T	1.50	1.40	1.30A
RO-3-2513	11.00	10.90	9.50B
7805	.50	.40	.38B
7812	.50	.40	.38B
7815	.50	.40	.38B
7905	.60	.50	.45B
7912	.60	.50	.45B
7915	.60	.50	.45B
MDA3501	3.40	3.20	3.10B
MDA3502	3.50	3.30	3.20B
MDA3504	3.90	3.60	3.30B
FND357	1.00	.95	.78B
FND500	.95	.90	.78B
FND507	1.00	.95	.78B
78HO5	6.50	5.90	5.00B
78HGKC	6.90	6.50	5.90B
78PO5	9.90	9.50	8.90B
4001	.19	.18	.16B
4002	.19	.18	.16B
4007	.19	.18	.16B
4011	.19	.18	.16B
4077	.19	.18	.16B
4081	.19	.18	.16B
4093	.60	.55	.50B
4082	.19	.18	.16B
4017	.70	.60	.50B
2SK134	4.90	4.75	4.30A
2SK49	4.90	4.75	4.30A
MJ802	4.50	4.00	3.50A

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MPI 52.....$395.00 + 20% S.T.
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MPI 92.....$525.00 + 20% S.T.

	100+	1000+		100+	1000+
DB25C	1.00	.90	4116	1.30	1.10
DB25P	1.90	1.70	2716	3.50	2.95
DB25S	2.90	2.75	2764	9.00	8.50

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TO ORDER: Heavy items sent Skyroad Mail Order Phone 481 1436. Wholesale Customers Phone: 489 7099. Mail Orders to RITRONICS WHOLESALE, P.O. Box 235, Northcote 3070. Telex No. AA38897. Minimum P&P $2. Add extra for heavy items, registration and certified mail. Prices and specifications subject to change without notice.

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New Products

Tools and parts from Selectronic Components

Selectronic Components of Bayswater, Victoria, are the Australian distributors for "Channellock" pliers, a range of precision made, drop-forged tools for the electronics hobbyist and technician. Included are flat and round-nosed pliers and diagonal and transverse end cutters.

Also available from Selectronics is the TAI range of audio input transformers, designed and manufactured in Australia.

The TAI series 261, 262 and 263 transformers have an input impedance of 600Ω, 15kΩ and 30kΩ respectively. Frequency response is given as ±1dB from 20Hz to 20kHz, and total harmonic distortion as less than 0.4% at 30Hz, −10dBm.

For further information contact Selectronic Components Pty Ltd, 25 Holloway Drive, Bayswater, Vic. 3153. Phone (03) 762 4822.

Digital gain control IC on the way

National Semiconductor Corporation has introduced a monolithic IC package containing precision resistors, analog switches, latches and a data bus interface to be used for digital control of the gain of high input impedance operational amplifiers.

Designated the LF13006 and LF13007, the digital gain control packages allow the user to set voltage gains for standard op amps with a 3-bit control word from a microcomputer. On-board address latches and the ability to operate from supplies of up to ±18V make the devices easy to use in analog circuitry.

The LF13006 provides gains from one to 128 in eight binary weighted steps while the LF13007 provides a 1, 2, 5 . . . 100 gain sequence. Both devices have additional outputs to allow precise setting of the gain range and another pair of matched resistors, not connected internally, are available to modify the gain range.

Panel meter combines digital and bar display

C & K Electronics (Aust) Pty Ltd, distributors for Sifam Ltd of England, now has available a new combined digital/analog panel meter offering a precise digital read-out together with analog bar graph indication

Called 'Harmony', the LCD meter is a compact, rectangular display, resembling a conventional digital meter but incorporating a horizontal bar graph – the length of which fluctuates in proportion to the reading.

Essentially a millivoltmeter with a range of 0-50mV DC and optional current ranges of 100uA and 1mA, the digital readout provides a maximum display of 9999. The bar graph, made up of 31 segments, grows or falls alongside a printed scale located just beneath the digital display.

To the right of the main display there is an extension of the LCD strip which can be used to indicate the meter range in use (eg multipliers x 1, x 10 etc.) or the specific engineering units being measured (rpm, %, °C etc.). Up to five such indications are available – the one in use being signalled by a "flag" against a pre-printed scale. This facility is built-in as standard and the user can opt to use it or not as required simply by making appropriate external connections.

In addition to its dual display, the new meter also constitutes what is believed to be the first digital meter capable of being programmed to read in any engineering unit – including non-linear quantities. It can also be programmed to function as a meter relay, initiating alarm or control signals at fixed or variable set points.

For further information contact C & K Electronics (Aust.) Pty Ltd, PO Box 229, Parramatta. Telephone 635 0799.

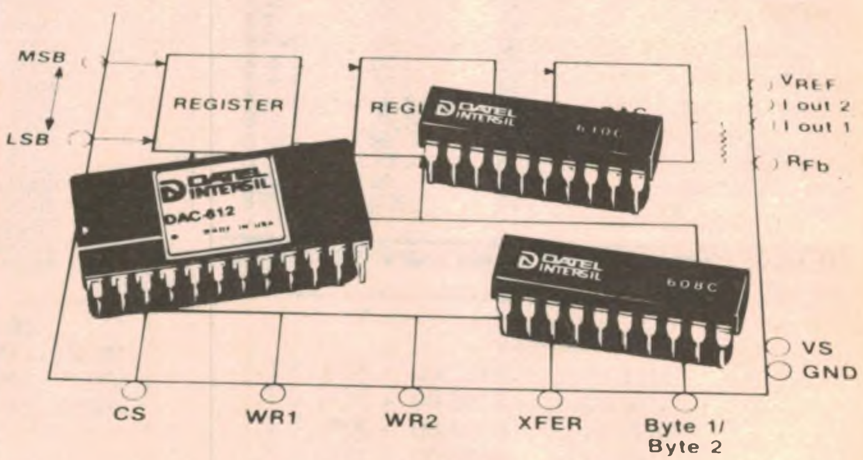
United States company offers buying services

Arnat Electronics of New York are offering buying and delivery services for Australian companies which use components made in the United States.

Large companies can afford to maintain their own overseas purchasing offices, but for smaller operations the services of an overseas agent can be a useful alternative to dealing directly with a United States supplier or with a local importer.

For further information contact Arnat Electronics, PO Box 235, South Station, Yonkers, NY, 10705, USA.

Simple interface for digital/analog converter



Datel-Intersil's DAC608, DAC-610 and DAC-612 are a series of 8-; 10- and 12-bit digital to analog converters designed to connect directly with the standard control bus of 8080 family microprocessors. The devices appear either as a memory location or an I/O port to the microprocessor and do not require additional interfacing logic.

All devices feature a double buffered output which allows the converters to output an analog voltage corresponding to one digital word while the next is latched off the microprocessor data bus. The required control inputs are available in most popular microprocessor systems, although all models will operate as normal (single-buffered) D/A converters when used without a processor.

Output settling time is quoted as 500ns for a full scale change, and maximum linearity error is said to be ±½ bit.

Datel-Intersil devices are distributed in Australia by Elmeasco Instruments Pty Ltd, PO Box 30, Concord, NSW, 2137. Phone (02) 736 2888.

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Non-Linear Circuits Handbook — 500 pages $13.00

A guide to the design of analogue, non-linear instrumentation systems. Subjects covered include: true RMS conversion, sine/cosine conversion, time and function fitting, linearising systems, logarithmic systems and discontinuous functions.

Microprocessor Systems Handbook — 194 pages $20.00

After providing a basic rundown on microprocessor architecture this book takes the designer into the world of A/D and D/A converters. It discusses all the various types and moves on to interfacing such devices with microprocessor systems.

Transducer Interfacing Handbook — 250 pages $18.00

An extremely useful guide for design engineers who require to interface any sort of transducer to electronic systems. It covers isolation, offsetting, filtering, linearising and noise elimination as well as many practical design considerations. This book is so highly regarded that it has been selected as a standard text by Universities.

Synchro and Resolver Conversion Handbook — 200 pages $15.00

A required reference for any engineer involved in numerically controlled machinery design or military electronics. This book discusses design criteria and techniques for angular position measurement.

The reader is taken through extensive information on the application of such devices as optical shaft encoders and synchro to digital converters.

These books are available from Parameters Pty. Ltd. directly or from your nearest Analog Devices Stockist.

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Shortwave Scene

by Arthur Cushen, MBE

Bonaire — tiny island with a big voice

The small island of Bonaire in the West Indies has an area of just 286 square kilometres yet is the base for two powerful transmitter sites, with a total power output of 1400kW.

The tiny island of Bonaire has the powerful transmitting plants of Radio Nederland and Trans World Radio, and must rank as one of the smallest islands with a powerful voice. Gospel station Trans World Radio has other transmitters in Monaco, Swaziland, Guam and Sri Lanka which make up a world-wide network and the Bonaire transmitter mainly covers Latin America, but programs are also broadcast to North America, Europe and the Far East. Both mediumwave and shortwave transmitters are used with a 500kW mediumwave transmitter on 800kHz often heard in the South Pacific and two shortwave transmitters, one of 250kW and the other of 50kW. Broadcasts are in Spanish, Portuguese and English and as well as programs being produced on Bonaire recording studios have been set up in several countries. Bonaire is governed by Holland and has a population of around 9000.

Both Trans World Radio and Radio Nederland generate their own power from diesel generating plants. The studios of both Trans World Radio and Radio Nederland are located close to each other though the transmitting plants are some distance away. Radio Nederland has automatic switching devices for their antennas and operates two transmitters at 300kW each. The main difference between the two stations is that Trans World Radio originates its programs from Bonaire, while Radio Nederland is only a relay station and receives its programs via a satellite from the studios in Hilversum, Holland.

Radio Nederland uses its Bonaire relay base for broadcasts to Australia in Dutch at 0630-0720UTC on 9630 and 9715kHz, and 0830-0920UTC on 9770kHz. Two transmissions in English are broadcast at 0730-0820UTC on 9715 and 9770kHz, and 0830-0920UTC on 9715kHz. A broadcast in Dutch at 0930-1030UTC is carried on 6020 and 9510kHz.

OUTSTANDING VERIFICATIONS

The award for the best verification for the year to a member of the New Zealand Radio DX League was made at the League's Annual Meeting in Oamaru recently. A verification from Tony Marr of Wellington of the Falkland Islands Broadcasting Service 2370kHZ 1kW was judged the best shortwave entry. This was a topical verification as the station was heard the night of the Argentine invasion and was the first reported reception of the Falkland Islands in Australia or New Zealand. The mediumwave award went to Michael Smith of Opunake NZ with a verification from KNOM Nome Alaska 780kHz using 5kW. The League inter-Branch competitions were all won by the Southland Branch.

CLEARING A FREQUENCY

For more than 30 years the BBC World Service has broadcast on 9410kHz using the call sign GRI, allocated by the British Post Office. In late September last year listeners in Australia and New Zealand found the frequency blocked by a new facsimile transmission, operated by the New Zealand Meteorological Service in Auckland NZ. The interference was widespread and recordings of the degree of interference were submitted at the request of the BBC to London.

It is interesting to note that the New Zealand Post Office which assigned the frequency stated that the channel was in the section for fixed services, but for many years the section between 9400 and 9500 has been used by international radio stations. After publicity within New Zealand, both on radio and television, and complaints to the Minister of Meteorological Services the Post Office reassigned the meteorological station which was transmitting weather maps to coastal shipping and allocated the frequency of 9458kHz for this service.

Following telephone advice from the Ministry in Wellington that the frequency had been cleared the BBC engineers in London were informed, and in their telegram of thanks they stated "Confident your initial vigilance helped speedily resolve problem".

NEW FREQUENCIES

AUSTRIA: Vienna is using some new frequencies in their transmission to Australia, including 0400-0600UTC on 17745kHz; 0700-0900UTC on 17740kHz; 1000-1200UTC on 17810 and 21490kHz. English is broadcast 0430-0500 and 0830-0900UTC.

FRANCE: Radio France International has a new daily transmission which opens at 2200UTC on 9790, 11955, 11970 and 11995kHz. The first hour is in French and at 2300UTC identification in Portuguese and Spanish is given followed by a program in Spanish.

ITALY: Rome Radio has made a frequency change for the Italian transmission at 2050-2130UTC. The new channel is 7235kHz which replaces 15330kHz while 9710 and 11800kHz also carry this broadcast. Rome also transmits to Australia 0830-0930UTC on 9585, 11810, 15330, 17780 and 21615kHz.

SPAIN: The Spanish National radio at Madrid is using the new frequency of 15375kHz for two transmissions in English 2010-2055 and 2110-2155UTC

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill NZ. All times are UTC (GMT). Add eight hours for WAST, 10 hours for EAST and 12 hours for NZT. In areas observing daylight time, add a further hour.

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REVIEWS OF RECENT

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BRAHMS' SERENADE: Haitink lends it "symphonic stature"

BRAHMS — Serenade No. 1 in D. Concertgebouw Orchestra of Amsterdam conducted by Bernard Haitink. Philips De Luxe analog Stereo 9500 322.

Despite Brahms' present-day popularity his Serenades are seldom heard in the concert hall. Yet they contain much attractive music. I think this is largely because Brahms couldn't make up his mind about the form he was seeking. Sometimes a movement sounds as if it came from a symphony. Others have Brahms trying hard to get back to the 18th century form of Serenade or Cassation, which was a work written for a chamber combinations.

Brahms, of course, until comparatively late in life, was eager to write a symphony yet feared to do so. This, by the way, with the great First Piano Concerto behind him. The Serenade shows his hesitations, especially under Haitink's percipient direction. It was 20 years after all this before Brahms finally embarked on the First Symphony.

It is in six movements, all unnamed except for such directions to the executant as allegro molto and so on. The first and third are movements already on the way to a symphony, the fourth tries to return to the 18th century. Haitink, however, seeks to unify the style by lending it symphonic stature, very satisfactorily in my opinion.

His tempos are measured, his phrasing broad, his treatment being particularly effective in the third (adagio) movement. The first movement opens with a rustic sounding tune that reminds one vaguely of Beethoven's Pastoral Symphony. The second has just a familiar feminine Brahmsian tune. There are many hints of later works in the first movement.

Throughout the whole work the scoring varies between Brahms at his most grumous and some quite delightful chamber music sound. All this is emphasised by the superb quality of Philips analog sound which has a dynamic range as wide as a well-judged digital recor-

ding. It also serves to show how Haitink preserves the Brahmsian style in the lightest, even skittish — yes skittish- passages.

The second scherzo starts a little seriously for a movement so described but is followed by a smooth melody which, despite macho manifestations elsewhere, still retains faint femininity.

The adagio is marked "non troppo", a fact that is carefully observed by Haitink, enabling him to preserve the work's not too evident tension. It makes a grand contrast to the sensitively played Second Scherzo.

The Concertgebouw is in fine form under Haitink. All play superbly but I must reserve special praise for the clarity and "waldhorn" quality of tone of the solo horn and to a solo flautist who in important passages adds an extra elegance to the whole exercise. (J.R.)

SHOSTAKOVITCH SYMPHONY: "Recommended"

SHOSTAKOVITCH — Symphony No. 10 in E Minor. Berlin Philharmonic Orchestra conducted by Herbert von Karajan. Digital disc 2532 030.

There is something good to be said about all the previous recordings of this symphony. As far back as 1955 Mitropoelos and the New York Philharmonic issued a splendidly vital version, still worth a play, even though its sound cannot compare with more recent versions. Then there was a really great Karajan version with the Berlin Philharmonic 14 years later. A great reading this, truly in the grand manner.

In October 1977 the always reliable Haitink and the London Philharmonic recorded the work. It lacked the thrust and spaciousness of the Karajan but had splendid recorded sound. There were others somewhat less impressive between these but I have chosen the above for their general excellence.

Now comes another Karajan, again with the Berlin Philharmonic, but even more overwhelming than his first.

Many musicians consider the 10th to be Shostakovitch's finest symphony, in which he reveals what might be described as the tragedy of the Russian soul — apparent in Russia's great literature as well as its music — a mixture of gloom, violence, rough play, graceful dancing revealed eloquently by such artists as Tolstoy and Moussorksky.

Karajan, of course, is not Russian but he might easily pass for one in his understanding of Russian characteristics. This new version differs only occasionally from the 1955 but has the advantage of digital recording. His reading sweeps over just as wide a spectrum and follows all the great virtues listed above.

The work is dominated by that important Russian characteristic — tragic at its gayest. No one listening to only the first three movements would disagree. The scherzo is brutal in every sense of the word. The third movement mediates but doesn't emerge any happier.

Not so the Finale where, for a change, the whole atmosphere is optimistic. It is here that you find those larrikin tunes that the composer seemed to have put down with glee. Yet it is not quite as optimistic as it would make out if you listen carefully to a few performances. And I suspect Karajan shares my opinion.

His reading shows complete awareness of the work's paradoxes and, under his

Reviews in this section are by Julian Russell (J.R.), Neville Williams (W.N.W.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), Greg Swain (G.S.), and Danny Hooper (D.H.)

A thorough check checkout for your hifi system

TELARC'S NEW "OMNIDISC"

With this new two-record set and instruction book from Telarc, you can pinpoint suspect areas in your hifi record playing system and hopefully achieve a higher standard of performance.

Over the years, quite a few phono disc manufacturers have issued evaluation or test recordings of one type or another — some intended for the home situation, some for laboratory use, and still others with a dual purpose in view. However, amongst those which have been aimed, in whole or in part, at the home hifi buff, it is doubtful whether any have been more ambitious in their presentation than this new "Omnidisc" from Telarc.

It comes as a boxed set containing two discs, marked as "Imported pressings" for the American home market, plus a 12-page album-size instruction manual. Well set out and illustrated, the manual explains the nature and purpose of each evaluation procedure, mixing it with commonsense advice. The adjective "commonsense" arises from the fact that, while the procedures envisage the ideal, they also accept the fact that, in practice, even hifi buffs may have to settle for something less.

Side 1 contains no ordinary tracks but presents a mirror-like surface into which is embossed a calibrated overhang scale centred on the spindle. There is also a calibrated radius line, flanked by a double row of right-angle reference lines. These allow the stylus overhang to be checked accurately, where the figure has been specified and also to determine, by inspection, the two "null" radii where zero tracking error occurrs. Alternatively, the user may choose to set up for the recommended null radii (66 and 121mm) and read off the overhang which results.

Also, at this stage, aided by the plain mirror surface of side 1, the user can judge the azimuth (frontal angle) of the stylus cantilever, whether the appropriate surfaces of cartridge and arm are parallel with the record surface and whether, in situ on the shelf or benchtop, the surface of the turntable and deck is exactly level.

Having checked out the geometry of the phono deck, whether conventional or straight line tracking, attention moves to side 2, which is tightly packed with tracks, mainly pink noise or 1/3-octave pink noise. Subjective tests include: channel verification and separation; tracking and anti-skating force; vertical tracking angle; turntable noise, acoustic isolation, cartridge microphonics; cartridge phasing; cartridge and tone-arm resonance effects; wow and flutter; 1000Hz reference recording level.

The remaining 30 tracks on side 2 are ⅓ octave pink noise segments covering from 20Hz to 20kHz, intended as instrumentation signals for system and room equalisation. While proper advantage of these demands access to appropriate instruments, some enlightening — and disturbing — conclusions can sometimes be drawn by simply listening from various positions in the room.

Assuming that the system has been checked systematically through the procedures outlined to this point, the next step is to see how it performs on selected musical passages, arranged for the purpose on side 3. Each passage is recorded first at normal level (ref. 5cm/sec) then repeated +2dB, +4dB and +6dB, the lastnamed at a relative reference of 10cm/sec. All are from the Telarc library: Beethoven — Symphony No 5; Orff — Carmina Burana; Tchaikovsky — 1812 Overture; Chopin — Tarantelle in A-flat Major; Stravinsky — The Rite of Spring.

At this stage, the user is subjected to a thorough revision and check-out: are all controls set at "flat"? Are all leads and connections in good shape? Re-check left and right channel identity, balance and phasing. Have another look at your loudspeaker placing . . . and so on.

This is in preparation for a serious listening test on side 4, with the emphasis both on sound quality and on stereo imaging. Hopefully, your final judgment will be that all the foregoing check and adjustment routines have paid off. The selections: Britten: Fugue From Young Person's Guide to the Orchestra. The Beach Boys: Good Vibrations.

SUMMARY: It adds up to a thorough and worthwhile checkout, particularly of phasing right through to absolute phasing, tracking weight and bias, and a tortuous two-tone test. And, if your system can cope with the 1812 cannon at +6dB, you can take it to the top of the class. The Telarc Omnidisc set is available through specialist hifi stores or direct from PC Stereo, PO Box 272, Mt Gravatt, Qld 4122. Phone (07) 343 1612. (W.N.W.)

direction, the Berlin Philharmonic has never played better. Indeed, it is hard to think of their equal in this type of music. Most enthusiastically recommended. (J.R.)

☆ ☆ ☆

RACHMANINOFF — The Complete Solo Piano Music played by Ruth Laredo. CBS Stereo Masterwork, Analog Discs, 79700. Seven Boxed Discs.

Despite my unswerving diligence in listening to 14 sides of Rachmaninoff's complete piano music my review, promised in the last issue, must alas be a cursory one. This is because any chance of mentioning separately the composer's torrential output in this field would be impossible in these days of newsprint economy.

I must confess that there seemed no end to the steady output of Preludes, Studies, Variations, Fantasy Pieces, Variations, Transcriptions and other small forms too plentiful to mention. And bear in mind that these seven excellently played discs do not include those pieces with orchestral accompaniment — the concertos, Paganini Variations and so on.

Yet this whole exercise reveals Rachmininoff as a superb technician as a pianist, even if the quality of some of the compositions doesn't quite measure up to the same high standard. This is not to suggest that those without much merit are numerous. On the contrary. The range of the composer's imagination was immense.

There is a 16 page guide to lead you through this forest of sound. Rachmaninoff must have been an extraordinarily industrious fellow because, in addition to his composing, he still found time to give piano recitals and performances of his orchestral pieces.

What is it possible to say about the pianist, Ruth Laredo, in these circumstances except that hers was a heroic effort well worth the work that went into it. No matter where you put the stylus on the 14 sides in this set, you will seldom be disappointed with what you hear.

In an effort of this dimension, forced into cramped space, this is to be taken as high praise.

Another tip from Shostakovitch junior when he was recently in Australia. The composer of these piano works pronounced his name Rakmaneenoff with the accent on the penultimate syllable. But how many times will you be contradicted if you use it? (J.R.)

☆ ☆ ☆

Remember the Boomerang mouth organ?

P. C. SPOUSE. Mouth Organ Champion of Australia. Re-issue of original recordings 1926-1936. Mono, RG-2. (From Bushlark Records, PO Box 465, Broadway, NSW 2007. $11.00 plus $3.00 P&P).

Here's a mix of nostalgia and history, if ever there was one — compiled by the same Ray Grieve who resurrected the old cylinder recordings discussed on page 112 of our March 1982 issue. This is a much more meaningful effort, however.

Back in the '20s and '30s, the word "Boomerang" had two main connotations: an Aboriginal throwing stick and a brand of mouth organ marketed by J. Albert & Son Pty Ltd of Sydney. Who in the country, didn't own one at one time or another? Or didn't struggle bravely through "Swanee River" in the fond hope of better things?

The reigning mouth organ champion of Australia, in those days, was Percival C. Spouse, a distinction earned as winner of Albert's Boomerang Mouth Organ Championship in the huge Coliseum Hall, Ballarat, October 12, 1925.

He won further championships during the following years but, more importantly, on October 21, 1926, he made his first recording in the then new Columbia Graphophone studios in Homebush, Sydney. This was one week after they opened, the third artist to be recorded and one of the first-ever electrical recordings to be made in Australia.

In the following 10 years he made 10 78rpm recordings on the Regal and Regal-Zonophone labels, most of them solos. The 20 tracks on this 12in album have been transcribed from those

records, partly in collaboration with the National Library in Canberra.

Listening to them, their shellac-based ancestry is unmistakable, but only as a background. The recordings probably sound a lot better today than ever they did with the mechanical phonographs or blunderbuss pickups of the era.

And how would P. C. Spouse compare with say . . . Larry Adler? How does chalk compare with cheese?

Larry Adler was a trained musician, who worked with trained musicians and the best chromatic harmonicas that money could buy.

P. C. Spouse was a part-time solo entertainer who, for the most part, stuck to the bushman's friend, the basic single-row, 20-note, single-key Boomerang. And, listening to some of the old evergreens, I doubt that anyone ever could, or ever did, get as much out of them as Percival C. Spouse.

Don't buy this album expecting a musical feast. It's essentially a carefully produced and well documented piece of Australian folk musical history, poised halfway between the city and the bush! (W.N.W.)

DAVE GRUSIN AND THE GRP ALL STARS, Live In Japan. Arista L 37682. Festival Release.

If you like your jazz solid with an Oriental touch, give this record an audition. Recorded before a concert audience, the record has the ambience one would expect, with plenty of applause, as well as very good sound quality.

Side one has three long tracks: Modaji — Trade Winds — Shamballa; side two has: Friends — Strangers — Don And Dave — Captain Caribe, together with an introduction for the band, which include Don Grusin, Buddy Williams and Marcus Miller and five other American musicians, with a large Japanese backing group, mainly on strings.

Dave Grusin, who has chalked up a long career in film music, features here on piano. (N.J.M.)

☆ ☆ ☆

MUSIC BY CANDLELIGHT: Gheorghe Zamfir. Philips 9120 309. Released by World Record Club.

Gheorghe Zamfir first came to widespread notice with the haunting theme for the Australian movie "Picnic At Hanging Rock", and his playing of the pan flute, an instrument whose origins are lost in antiquity. The Macquarie dictionary describes it as "a primitive wind instrument consisting of a series of pipes of graduated length, the notes being produced by blowing across the upper ends."

However you regard it, the instrument can produce some intriguing sounds, especially where it is backed by the lush, Mantovani style orchestra of Harry van Hoof in a dozen well known tunes, both old and new. These are:

She — Laryssa — Theme From Limelight — Elsha — Run to Me — Don't Cry For Me Argentina — Floral Dance Black Rose —

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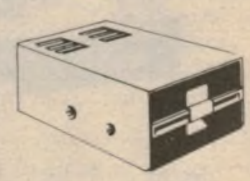

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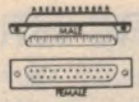

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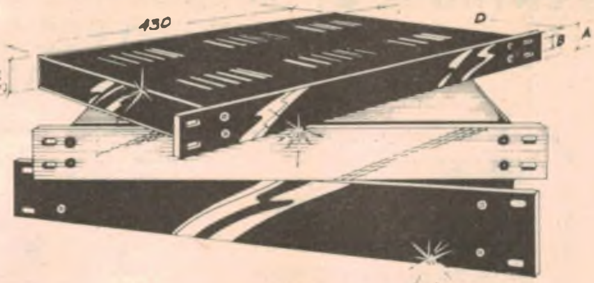

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SW1	1.6-3.8	MHz	VHF1	30-50	MHz	VHF5	144-176	MHz
SW2	3.8-9	MHz	VHF2	68-86	MHz	UHF	430-470	MHz

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Q 1040 Multimeter **$72.50**

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Remember the days when high grade precision laboratory multimeters were available only from UK and then they cost a King's Ransom?! — Well, that's history — The new Q 1040 is everything a high quality meter should be **PLUS** it checks transistor HFE and ICO and measures capacitors from 50 pf—50 UF.
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RANGES: DCV 250MV, 2.5V, 10V, 50V, 250V, 1000V. **ACV** 5V, 10V, 50V, 250V, 1000V (10K/V) **DCA** 10UA, 2.5MA, 25MA, 500MA, 10A **ACA** 10A **Resistance** x1, x10, x1K, x10K **Transistors** NPN/PNP **HFE** 0-1000 **ICO** 0-50UA **Capacitors** 50PF-3UF, .01UF-50UF.

Theme From Summer Of 42 — Meditation From Thais — Bilitis — Adagio.

The style of playing makes for a quiet, reflective listening mood; more than anything else, a record to enjoy on a quiet evening at home. (N.J.M.)

☆ ☆ ☆

VIRGINIA ASTLEY, A Bao a Qu. RCA Victor EP, 45rpm TEP-0374.

I must confess to some surprise when this disc came to hand from RCA. Although far from being a pop release, it is in the 12in EP format, with four tracks and a total playing time of just over 12 minutes. More than that, the jacket notes are very sparse and not at all easy to read.

However, RCA established for me that Virginia Ashley trained at the Guildhall School of Music, and now sings, composes, plays flute and piano and has a penchant for electronic music.

Early on, she earned a living by busking but, more recently, has been an arranger and supporting artist for Why-Fi Records.

The tracks on this new RCA record are "We Will Meet Again", with words taken from an English translation of Mahler's Kinderotenlieder; "Arctic Death" and "Angels Crying" are a complete change in style, with a strong overtone of electronic music; "Sanctus" is impressionistic vocal, in keeping with the title.

The recorded sound is clean enough and pleasant enough but, having in mind the effort needed to produce the record, it would have made so much more sense to prepare a few notes explaining what it's all about! (W.N.W.)

☆ ☆ ☆

VAL SINGS BING. Val Doonican, with orchestra and chorus. Stereo, RCA VAL1-0375.

I know it's a matter of taste, but what an utterly pleasant record this is. Ot, at least, it will be to the millions who bought Bing Crosby's records, and the countless others who have enjoyed watching and listening to Val Doonican.

I gather that the inspiration for the record was a session filmed in 1981 by BBC television, in which Val Doonican paid tribute to Bing Crosby. Of that session Vic Damone said "I couldn't believe anyone could do a 45-minute TV show live on air, without even referring to any kind of an idiot card" — but Val Doonican did it.

Because it is a tribute to Bing Crosby, the songs are Bing chestnuts, the mannerisms and the style are Bing's; but, even allowing for that, the vocal resemblance is uncanny. One might even go further and say that, for what differences there are, Doonican's voice control, pitch and phrasing is the better of the two. Here's the track list:

Pocketful of Dreams (medley) — True Love — Ac-cent-tchu-ate the Positive — Moonlight Becomes You — Irish Lullaby — Swinging on a Star — Mississippi Mud — That Sly Old Gentleman — May I — Beautiful Dreamer — Dear Hearts and Gentle People — Lazy Medley.

The sound on this local pressing is particularly clean and, if your loudspeakers have a good fundamental bass response, your room will throb to the leisurely tempo of the songs.

If you suffer from periods of tension, try listening to this one as a change from watching the goldfish in your aquarium! (W.N.W.)

Choral — devotional

SHEEP MAY SAFELY GRAZE. The Pendyrus Male Choir, conducted by Glynne Jones. Organist: Huw Tregelles Williams. Stereo, Word WST-9603. From Word Records Aust, 18-26 Canterbury Rd, Heathmont, Vic 3135. Phone (03) 729 3777.

You will certainly know some of the selections on this album but, even if others are unfamiliar, they will not diminish your enjoyment of the program, if you are fond of the sound of a Welsh male choir.

The Pendyrus Choir was founded just on 60 years ago, drawing its members mainly from miners in the Rhondda Valley in South Wales. Nowadays, its members come from all walks of life in South-east Wales.

Their repertoire is as wide as their membership, ranging from 16th century Italian School to contemporary composers, and taking in operatic choruses and traditional and folk music in many languages. They have toured nationally and internationally and featured, worldwide, on radio and television.

As depicted on the jacket, the choir represented here numbers about 90 members and, while I would hesitate to draw direct comparison, based on my memory of other recordings, I can say that they certainly don't come much better. The track titles are as follows:

The Lord's Prayer (Malotte); Sheep May Safely Graze (Bach); Steal Away (Traditional); O Father, Whose Almighty Power ("Judas Maccabaeus", Handel); Gwahoddiad (Hartsough); Sound An Alarm ("Judas Maccabaeus", Handel); Michael, Row The Boat Ashore (Georgia Sea Island Chant); Largo ("Xerxes, Handel); Deus Salutis (Jones); Kwmbayah (African Tune); Cym Rhondda (Hughes).

Made in the Rehearsal Hall of the Department of Music, in University College, Cardiff, the recording has magnificent support from the organ, played by Huw Tregelles Williams. The sound is smooth and clean, with wide dynamic range, the one point of criticism being a touch of surface "prickle" in the quietest passages. But don't let this put you off, unless you're super-sensitive to such matters. (W.N.W.)

☆ ☆ ☆

LIFT UP YOUR HEADS: Choir of The Temple Church, London. Organist and Choir master, Dr George Thalben Ball. World Record Club R 04999.

This record gives a sample of the evocative sound that a skilled church choir can produce under the direction of one of the world's most famous organists.

There are a dozen hymns, each followed by an organ voluntary based on the music: Jesu Lover Of My Soul — O Day Of God — Alleluia, Sing to Jesus — Help Us To Help Each Other — Loving Shepherd Of Thy Sheep — Thou Whose Almighty Word — Be Thou My Guardian — Lift Up Your Heads — What Sorrow Sore — Spirit Of Mercy — Blessed Jesus — Love Divine.

The record marks a fifty-year collaboration between HMV and the Temple Church and Dr Thalben Ball, dating back to 1927.

The jacket notes offer a brief history of each hymn and its author, together with a few notes on the history of hymn writing. The record captures the ambience of a big church very well, making it a useful addition to the collection of any lover of traditional church music. (N.J.M.)

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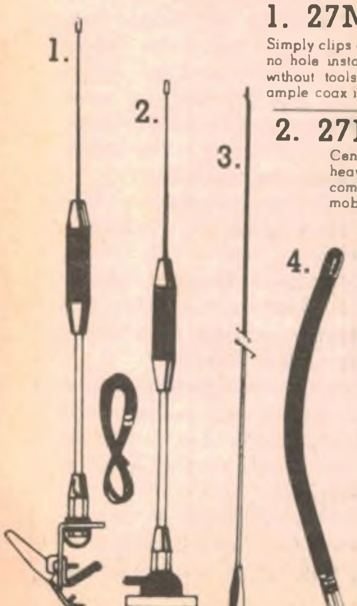

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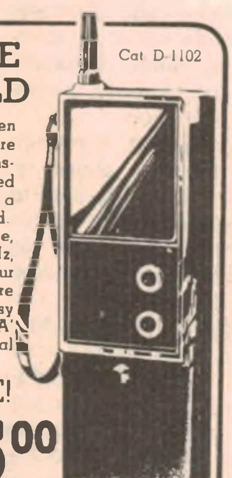

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"Electronics Australia" is one of the longest running technical publications in the world. We started as "Wireless Weekly" in August 1922 and became "Radio and Hobbies in Australia" in April 1939. The title was changed to "Radio, Television and Hobbies" in February 1955 and finally, to "Electronics Australia" in April 1965. Below we feature some items from past issues.

Wireless Weekly 3d

January 1983

Radio Pirates: At Newcastle early last month 55 people were fined for having possessed unlicensed radio receivers. The total fines amounted to £140.

The local newspapers featured the names of those prosecuted and next day between 900 and 1000 Newcastle citizens took out licences.

These interesting facts are put forward in proof of the efficacy of the campaign against pirate listeners, which has been conducted in New South Wales.

In England the radio pirate is treated more harshly. Not only does he pay a heavy fine but he also forfeits his set. Such drastic measures are not necessary in Australia. But take a tip: if you haven't a licence get one immediately and avoid a fine.

☆ ☆ ☆

Class-B amplifiers: There is every indication that B class amplifiers have appeared to make a very long stay in the modern radio set. To the man brought up on a diet of sets with a maximum output power of about 2.5 watts, the idea of hitching a loudspeaker to 20 to 25 watts of undistorted output sounds something like a nightmare. Visions are conjured up of splitting cones and bulging windows as the amplifier beefs out buckets of sound.

Do we want 20 watts of undistorted output? Of course we do. Not only do we get more power for our money with the new amplifier, but we make sure of enough reserve power to cater for the most severe audio peaks. One can not help but be impressed by a circuit which represents the most efficient audio amplifier of the moment, and will provide enough volume to make overloading at anything but the tremendous volume of which it is capable an impossibility.

RADIO TELEVISION AND HOBBIES 1/6

January 1958

Canine Cosmonaut: The dog Laika, travelling in the second Soviet satellite, was exposed to nearly all the hazards which could confront a man planning an excursion into space. Its presence there would not have been required if the Soviet scientists were interested only in geophysics; the experiment is clear proof that they are serious when they talk of manned rocket flights.

In America, too, space medicine is well-established as a new branch of physiology, and David Simons did not fly for 32 hours in a gondola this year merely to satisfy idle curiosity. He was studying the subjective impressions of high altitude and possibly (though rather improbably) the effects of cosmic rays on his body.

Before Laika's ascent recently the US Air Force and others made a number of experiments with animals in balloons to test their vulnerability to cosmic rays. Thus, monkeys were exposed for a total of 63 hours, 20 miles up to see if their irreplaceable nerve cells had been damaged – tests of their learning ability afterwards revealed nothing unusual. More positive were the observations on black mice, whose hair turned grey in patches owing to injury to the pigment cells. But the reaction of the dog to the more obvious features of space travel is equally important. It survived the accelerations of launching and there is good reason to believe that humans would, too.

☆ ☆ ☆

Short Wave Portable: Shades of things to come are illustrated by details of the new American Zenith receiver about to be released. Zenith have for some years made a world-range receiver using battery valves and with a wide-band coverage. Their latest model performs the same function, but is fitted throughout with transistors. It needs no aerials other than its own for good reception.

It is the size of an ordinary portable and is claimed to be the smallest and lightest band-spread short-wave set ever built. Weight, 13 pounds, including batteries, is half that of conventional short-wave portables.

Powered by standard flashlight batteries, available anywhere in the world, it will operate up to 30 hours on a set, and many hours listening can be had for the cost of one penny. Transistor operation eliminates needs for tubes, high-cost "B" batteries, or electric power line connection.

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20 TURN CERMET TRIM POT

SPECTROL 43P ACTUAL SIZE

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

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Dials to suit 10 T Pots

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Model 16 .9" dia	$12.50
Model 18 1" x 1.75" dia	$21.50

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Spectrol model 63P
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1 — 9	$1.20
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100	$0.90

Values may be mixed

DIP SWITCHES SPST

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

DIP SWITCHES SPST

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40 Pin Zip* Dip 11	17.50

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	1-9	10-25	25+
2708	4.90	4.00	3.90
2716	4.90	4.20	3.90
2732	8.00	7.50	7.00
4116 (200nS)	1.95	1.80	1.75
4164 64K Dynamic	11.00	10.00	9.50
M58725P (2K x 8) Static	10.00	9.00	8.50

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MPI 52 $385.00 + 17.5% ST
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AD0162-T15	$18.78
AD0162-T15	$13.03
AD0162-TB	$13.77
AD0210-SQ8	$42.00
AD02160-SQ8	$45.00
AD02161-SQ8	$33.46
AD10100-W8	$52.72
AD12100-HP8	$85.10
AD12100-M15	$79.11
AD12100-M8	$79.11
AD12100-W8	$53.99
AD12200-W8	$73.12
AD12250-W8	$83.00
AD12650-W8	$59.00
AD2273-T8	$5.03
AD4060-W8	$19.06
AD5060-SQ4	$22.05
AD5060-SQ8	$22.05
AD5060-W8	$17.59
AD5061-MB	$17.08
AD70601-W8	$22.00
AD70620-M8	$21.54
AD7063-M8	$20.78
AD70630-M8	$20.78
AD70650-W8	$26.96
AD7066-W8	$26.96
AD80601-W8	$20.24
AD8061-W8	$20.24
AD80652-W8	$26.20
AD8066-W4	$27.66
AD8081-M8	$9.81
AD9710-M8	$41.11
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ADF500-4500-8	$19.44

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IN4002	6c	5c
IN4004	7c	6c
IN4148	5c	4c
IN5404	30c	25c
IN5408	35c	30c
IN4007	12c	11c

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HS3 — 150mm	5.80	5.40	4.90	3.80	2.90	2.70
HS4 — 225mm	8.10	7.60	7.10	5.90	4.50	4.30
HS5 — 300mm	8.90	8.40	7.90	6.50	4.90	4.60
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HS11 — 38mm	1.40	1.20	1.00	0.90	0.80	0.70
HS12 — 75mm	2.50	2.20	1.90	1.60	1.25	1.20
HS13 — 150mm	4.90	4.50	4.00	3.20	2.45	2.40

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

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TDK ADC60	1 for $3.60	10 for $26.00
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TDK ODC60	1 for $3.50	10 for $31.00
TDK SAC60	1 for $3.50	10 for $31.00
TDK SAXC60	1 for $5.70	10 for $46.00
TDK DC90	1 for $2.40	10 for $21.00
TDK ADC 90	1 for $3.50	10 for $30.00
TDK SAC 90	1 for $4.20	10 for $39.00
TDK ODC90	1 for $4.70	10 for $45.00
TDK SAXC90	1 for $5.50	10 for $49.00
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Portable computer from Hewlett-Packard

A new portable computer from Hewlett-Packard – the first of its kind from HP – has the capabilities of larger, desk-top computers, including Basic language programming, interfacing and software. However the new HP-75C portable computer measures only 254mm by 127mm by 32mm, weighs 737 grams and runs on batteries.

Key features of the new portable computer include 169 instructions, including 147 Basic statements and functions. Other functions including time and appointment notification are provided in a 48K-byte ROM-based operating system, and a built-in Hewlett-Packard Interface Loop (HP-IL) allows communication with instruments, peripherals and other computers.

Software for specific applications such as engineering, math and statistics, and general use packages such as electronic spreadsheets and graphics presentations are also available.

The HP-75C's CPU is a CMOS version of the 8-bit custom processor in Hewlett-Packard's Series 80 personal computers. computers.

The HP-75C ("C" for continous memory) has 16K bytes of RAM (random-access memory) built in. The RAM can be increased with the addition of the 8K memory module (HP 82700) to 24K bytes. Three plug-in ports in the computer accept 8K- or 16K-byte ROM software or enhancement modules. The ROM-based modules let the computer be customised for specific applications, and also free all the RAM for data. With three 16K-byte plug-in modules, the 48K-byte built-in operating system and 24K bytes of RAM, the HP-75C's maximum memory is 120K bytes.

The computer's real-time clock and non-volatile memory give it some unusual features. For instance, the HP-75C can be left unattended, and it will "wake itself up" at a programmed time, take a reading from an instrument, store or communicate that reading, turn itself off, and carry out the same task every day. Appointments are another example. The user can key in future appointments and the HP-75C will beep and flash a reminder at the correct date and time.

Touch-typing is possible on the HP-75C, thanks to its typewriter-like "QWERTY" keyboard. Every key can be redefined by the user for specific applications and the redefined keys can be given new labels by snapping on keyboard overlays.

The 32-character, liquid-crystal display serves as a movable "window" on a 96-character line and features character descenders.

Rechargeable nickel-cadmium batteries power the HP-75C. Batteries will run the computer for 30 hours in maximum power-drain mode, or for three or four weeks of normal use.

One type of off-line mass storage is integrated into the HP-75C. A hand-operated magnetic card reader reads or writes up to 1.3K bytes per card. A portable digital cassette recorder is available but the card reader gives the HP-75C integrated mass-storage in the portable mode.

HP-IL, Hewlett-Packard's two-wire serial interface for battery-operable controllers, is built into the new HP-75C, and lets it communicate with a large number of devices including HP-IL and non-HP-IL instruments, peripherals and other computers. The HP-75C's Basic programming language and features are designed to make it an easy-to-use, portable controller.

On a desktop or lab bench, the HP-75C ties into full-sized printers and plotters, and can be easily detached from the system to become a portable, battery-powered computer. The HP-75C's desktop peripherals consist of the HP 82905B 80-column impact printer, HP 82912 and HP 82913 22.5cm and 30cm video monitors, and HP 7470 colour-graphics plotter.

Both video monitors, when used with the HP 82163 video/TV interface, provide 16 lines by 32 characters display from the HP-75C. The video/TV interface also allows the HP-75C to work with other monitors and home TV sets.

And the price? Just $1639 for the basic unit, with instruction manuals extra.

For further information contact Hewlett-Packard Australia Limited, 31-41 Joseph Street, Blackburn, Vic 3130. Telephone (03) 890 6351.

Microcomputer News

Tandy offers discounts in education market

In a bid to introduce and expand the use of Tandy computers in Australian schools, Tandy Electronics are offering large discounts to schools which purchase TRS-80s.

The offers are available to all schools from primary to university levels and are valid until February 28, 1983. There is no limit on the number of computers which may be purchased at the discount price.

Discounts offered range from $400 on the 1983 catalog price of a 16K Model III "student station" to more than $10,860 on a complete "TRS-80 Classroom".

The TRS-80 Classroom configuration includes a disk-based 48K Model III "teacher station", a network 2 controller to link the teacher station to up to 16 Model III "student stations", a Line Printer VI that can be shared through the network and a choice of either five, ten or 16 student stations. Two educational software packages are included in the price.

As part of the promotion, Tandy will match the number of student stations purchased with an equivalent number of TRS-80 Pocket Computers, to be used, perhaps, as part of fund-raising ventures by the school. In addition TRS-80 Service agreements will be offered at a reduced price to TRS-80 classroom purchasers.

According to Tandy's Managing Director, Mr Charles Wyse, many such promotions have been offered previously by other microcomputer companies. "However, I have yet to see a rival promotion that offers anywhere near the computer-value-for-dollar of ours . . . What schools require for that amount of expenditure is a complete computer classroom that is truly interactive and available to everyone in the school."

High tech export ban

In their attempts to prevent high-technology leaks to unpopular countries, the United States Customs Service recently seized and impounded "Belle", a chess computer which has won world championships.

Ken Thompson, the Bell Laboratories scientist who built the machine was taking it to Moscow for a chess exhibition at the time. The US Commerce Department said that Belle, winner of the World Computer-Chess Championship tournament in 1980, might be of military use to the Soviet Union.

A versatile EPROM programmer

Digital Automation has released a new EPROM programmer with an exceptional variety of features.

Designed for both the hobbyist and professional, the programmer can handle most popular EPROM types, including the 2716, 2516, 2732, 2532, 2764, 2564 and the latest 27128 128K bit device. The programmer is interfaced to a micro- or minicomputer by a built-in RS-232C port and appears to the host computer as a standard terminal.

EPROMS can be programmed, read or erasure verified simply by sending the appropriate sequence of characters – no additional "personality modules" are required. All contents and data are in printable ASCII codes and data to be programmed into the EPROM can be in either Intel or Motorola format or standard hex.

A manual gives interfacing details and includes software for use with Unix or Idris systems. CP/M software is available as an option.

For further information contact Digital Automation, 44 Winbourne Rd, Brookvale, NSW 2100. Phone (02) 939 1522.

First Computer Graphics conference

The first conference of the Australasian Computer Graphics Association will be held this year in association with the Institution of Engineers conference "Computers and Engineering". It will be co-sponsored by the NSW Institute of Technology, the Association for Computer Aided Design and the Institution of Engineers, Australia.

The conference aims to consider all aspects of the development and operation of computer graphics systems in all computer applications.

The organisers of the conference are calling for papers in areas including mapping, computer aided design, advertising, business graphics, medicine, personal computers, animation and video and computer assisted learning, among other topics.

Authors are invited to submit titles of proposed papers together with a 1000 word synopsis outlining content and conclusions by January 28, 1983.

For further information contact The Conference Manager, The Institution of Engineers, Australia, 11 National Circuit, Barton, ACT 2600. Phone (062) 73 3633.

Also on the subject of computer graphics, a special interest group known as SIGGRAPH-ACS has been formed. The group is modelled on similar overseas groups and is sponsored by the Australian Computer Society.

Aims of the group are the advance graphics technology, distribute information on techniques and identify policy issues relating to an Australian graphics industry. Full details are available from SIGGRAPH-ACS, PO Box N26, Grosvenor St, Sydney, 2000.

Rumours of a Mark II IBM personal computer

From the United States comes a rumour that IBM is preparing to introduce a successor to its personal computer. Based on the 8086 microprocessor, the new machine will have greater power, more memory capacity and larger disk drives. Introduction is said to be scheduled for late this year.

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6809 COMPUTER

8212 TERMINAL
(ASS. IN AUSTRALIA)

HARDWARE DESCRIPTION

S/09 6809 Computer w/128K Memory
/09 6809 Computer w/64K Memory
8212 12" Terminal w/monitor
DMF 2 Disk System w/2.5m Capacity
CDS-1 Winchester Hard Disk System
MP-09A 6809 Process/Board (assem)
D5-2 double side/double density 720KB
3809 128K Memory Expansion for S/09
MP-LA Parallel Interface
MP-L2 Dual Parallel Interface
MP-N Calculator Interface
MP-R Eprom Programmer
MP-S Serial Interface
MP-64 Memory board 64K
MP-S2 Dual Serial Interface
MP-SX Serial Interface Expansion
MP-T Interrupt Timer
S-32 Universal Static Memory Card

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General Purpose Flex 6809	$170.00
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Text Editor	$ 55.00
Assembler	$ 55.00
Debug Package	$ 82.00
Diagnostics	$ 82.50
Text Processor	$ 82.50

FRANK HOGG LABORATORY, INC

XForth	$165.00
Basic Programmer Tool Kit	$ 77.00
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Dynasoft Pascal Flex	$ 99.00
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Spell Test	$220.00
Super Sleuth	$110.00
Stylograph 2:0 Flex, OS-9	$325.00
Dynastar Full Screen Editor OS-9, Flex	$ 99.00
CRASMB Cross Assembler, Flex, 6809, 6800, Z80, 8080, 6502	$149.00
Dataman + DBM	$220.00
Plot	$ 49.00
Tabula Rasa	$110.00
Job Control Program	$ 99.00
TRS80C Colour Flex	$105.00

WASHINGTON COMPUTER SERVICES

6809RMS DBM for Flex	$220.00
6809 RMS DBM for UNIFlex	$330.00
6809 RMS DBM for OS-9	$275.00

UNIVERSAL DATA RESEARCH INC

DBM 2 Flex	$450.00
DBM 2 UNIFlex	$550.00
Payroll	$495.00
Accts Receivable	$495.00
Accts Payable	$495.00
General Ledger	$495.00
Inventory	$495.00

TALBOT MICROSYSTEMS

tForth	$ 99.00
tForth+	$275.00

COMPUTER SYSTEM CENTRE

DYNAMITE Dissassembler	$ 66.00
DYNACALC	$220.00

DUGGERS GROWING SYSTEMS

6809 C Compiler ver 2:0	$130.00

OMEGASOFT PRODUCTS

PCS2 Pascal Compiler Flex, OS-9, MDOS	$490.00
Rall1 Relocatable Assembler & Linking Loader	$150.00

SWTPC

EDIT Word Processing Editor Flex	$110.00
C Compiler for UNIFlex	$ POA

* Prices subject to alteration without notice, $5 handling and packaging plus postage.

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$50,000 IN PRIZES TO BE WON IN THE MIGHTY MATCH-UP COMPETITION.

Microcomputer News

Business opportunities in computer repair

The upsurge in the use of microcomputers in small businesses may be on the verge of creating a booming new industry – computer repairs.

For many small business users the computer has become central to the day-to-day running of their operation. Losing the computer for a week (the shortest possible repair time promised by many distributors) can mean losing the means to carry on business and thus losing money.

Perhaps a recent development in the United States points the way. There two major computer service companies have opened the first of a planned nationwide chain of computer repair shops. TRW plans 15 of the service centres, while MAI has opened three "Sorbus" repair stations so far and has plans for more.

"The retail computer service centre is the equivalent of the TV repair service shop," says Bill Whelan, manager of Sorbus, whose stores currently offer service on 11 types of personal computer, including IBM, but not Apples, which are covered by an extensive network of distributors.

"The need is there. As more and more people buy personal computers more of them will need repair."

National Semiconductor Digitalker programs

National Semiconductor Corporation has announced a software package to support its MM54104 Digitalker speech processor chip. The new Digitalker Vocabulary Selection System (DVSS) contains a 500-word vocabulary provided on two 20cm single-sided CP/M floppy disks.

The 500 individually-spoken male-voice words can be used in prototyping and in the production of products requiring voice output.

In a typical application a user can define a vocabulary with words available in the DVSS software package and download this vocabulary into RAM. Once in RAM, the words can be arranged into the phrases or sentences required. The resulting software can be sent to a ROM programmer.

National's DTSW-500 DVSS software package contains numbers, letters of the alphabet and a useful variety of words for industrial and consumer products. The package sells for $199 in the United States.

Support for local software industry

Senator John Siddons, Victorian Senator for the Australian Democrats, recently introduced a Bill in Federal Parliament to exempt all forms of Australian-produced computer software from sales tax for a five year period.

Speaking in support of the Bill, Senator Siddons made the point that the software industry in Australia is at a crossroads. It is expanding rapidly with hundreds of small businesses engaged in the industry, and shows promise of becoming a significant export earner.

The importance of a native software industry is demonstrated by the trade balance in the computer field. For every dollar of equipment and software exported, Australia currently imports $14 worth of computer hardware and software.

Present Government policy concerning the software industry is causing a great deal of confusion at the moment. In the past provision of software was regarded as a "service industry", whose products are not generally subject to sales tax.

However, earlier last year the Taxation Office apparently re-interpreted the sales tax schedules and assessed some software companies for up to three years unpaid sales tax. At least one company, DeForest Software, has successfully appealed against the retrospective imposition of sales tax.

Concluding his remarks in support of the Bill, Senator Siddons stated "I believe programs for computer software should be viewed as mechanisms for information transfer, and thus analogous to books. Like books, they should be free of tax."

Readers who wish to contribute to the debate on government support for the Australian software industry can write to Senator Siddons at the Commonwealth Parliament Offices, 400 Flinders St, Melbourne, Vic 3000.

Acme software for the VIC-20

A new software company, Acme Software has commenced operations in Melbourne, specialising in programs for the Commodore range of computers.

The first four offerings are for the VIC-20, with more to come. Currently available are the games "Locomotion", "VIC-Derby" and "Sentinels", and "VIC-Voice", a machine language program which shows how speech can be synthesised using the standard VIC sound generation circuitry. The user can record his or her own voice for use in programs.

All Acme software requires at least 8K of memory in addition to the standard memory of the VIC-20. Cost of cassette programs is $20, including an instruction manual.

Look for the new software at Commodore dealers or contact Acme Software, PO Box 1053, Richmond North, Victoria 3121.

Versatile communications board suits the Apple

The NetComm 2780 Communications board for the Apple II computer provides both synchronous and asynchronous data communiction capabilities. Using NetComm Apples can communicate with mainframe and mini-computers from IBM, DEC and Data General as well as with data bases such as The Source, Infonet and CSIRONET, or used together in local area networks.

The board slots into the Apple II computer and contains a Z80 microprocessor to handle synchronous communication at up to 9600 baud. The user can select the option of running the Apple as a teletype (asynchronous) terminal or as an IBM 2780 terminal.

A transmission program on disk, control code and a user guide are supplied with the board.

For more information contact NetComm Pty Ltd, 7th Floor, 275 Alfred St, North Sydney, NSW 2060. Phone (02) 92 4655.

Tektronix to hold micro design seminars

Tektronix Australia Pty Ltd has announced a new seminar in its series on microprocessor design. Following on from the microprocessor selection seminars, the Microprocessor Design Tools seminar focuses on the hardware and software tools needed to develop particular microprocessor applications.

The one-day seminar will cover the use of development systems with Pascal editors, compilers and debuggers. The Unix operating system and equipment such as high speed emulators and logic analysers will also be discussed.

Seminars will be held in Sydney on February 22 and Melbourne, February 8, and are intended for engineers and managers involved in microprocessor

Microcomputer News

applications. A fee of $30 per person will cover lunch and a set of course materials.

For further information contact Sonya Stokell in Sydney, 888 7066 or Jill Scott in Melbourne, 813 1455.

Apple Computer reports healthy sales increase

Apple Computer Inc has reported a 74% increase in net sales and a 56% increase in net income for the fiscal year ending September 25, 1982, compared to the previous year. Worldwide net sales increased from $US334.8 million a year to $US583.1 million and net income increased to $61.3 million.

Commenting on the results President A. C. Markkula said he was pleased with Apple II and Apple III sales increases which resulted from special promotions that are still underway.

"Investment in research and development during the quarter exceeded the amount spent a year ago by more than 50%," he said. "For the full year, R&D was $US38 million, 81% more than last year. Several major products resulting from this effort are scheduled for introduction in 1983."

Reports from the United States indicate that Apple will shortly announce the long-awaited successor to the Apple II, the Apple II-E. The II-E is said to have an 80-column video display and handle more than 64K of memory, features which are available for present Apples only through add-on boards. The new computer may sell at slightly less than the price of the present Apple II.

New range of video monitors from Rifa

Rifa Pty Ltd has available a range of peripherals for microcomputer users, including new printers and colour and monochrome video display terminals.

Rifa distributes the BMC range of video monitors, and currently has available several new 30cm green screen displays, including the BM-1A, with a bandwidth of 15MHz and the BM-12E, with a bandwidth of 18MHz. Both monitors accept a 1V p-p composite video signal with negative sync.

Rifa can also supply the BM-1401RGB and the BM-1402RGB colour video monitors. The 1401 has a slit-type shadow mask and provides a resolution of 400 dots (horizontally at the centre of the screen) while the 1402 uses a dot-type mask for a resolution of 640 dots.

Both monitors have a bandwidth of 18MHz and require separate red, green and blue inputs at TTL levels. The horizontal scan frequency is 15.75KHz.

Rifa can also supply the Qume Sprint 9 series of printing terminals, featuring a new carriage mechanism said to be less complex and more reliable than the steel cables and pulleys used by conventional daisywheel printers. The Microline 84 dot matrix printer is also stocked by Rifa.

For more information contact Rifa Pty Ltd, 202 Bell Street, Preston, Vic. 3072. Phone (03) 480 1211.

Software Australia to distribute YE-Data disks

Software Australia has been appointed an Australian agent for YE-Data floppy disk drives and can supply both 12.5cm and 20cm drives.

Managing Director of Software Australia, Dr Michael O'Shea, said that initially the company will concentrate marketing efforts on the YD 180 20cm slimline and YD 174 disk drives. Both drives have 3ms track-to-track stepping times and will support single and double-density and single and double-sided operation, using a steel band head positioner.

"Where possible we will supply orders ex stock. New shipments have been ordered to land in Australia each month, ensuring availability of stock at all times," Dr O'Shea said.

Companies interested in YE-Data drives should contact Software Australia, 2 Somerfield Street, Mt Gravatt, Brisbane 4122. Telephone (07) 349 9122.

News from the Clubs

- The Melbourne Atari Computer Enthusiasts (MACE) meet on the first Sunday of each month at 12 noon at the offices of 3M Australia, corner of Blackburn and Ferntree Gully Roads, Melbourne.

The group publishes a monthly newsletter, the "Australian Atari Gazette". The address is PO Box 246, Northcote, Victoria, 3070.

- BUG-80, listed in our September users' group guide is in fact no longer in operation.

The conjunction of Mitsui and Spectrum in the September listing is an error. The Spectrum 11 minicomputer is of course manufactured by D. D. Webster Electronics Pty Ltd.

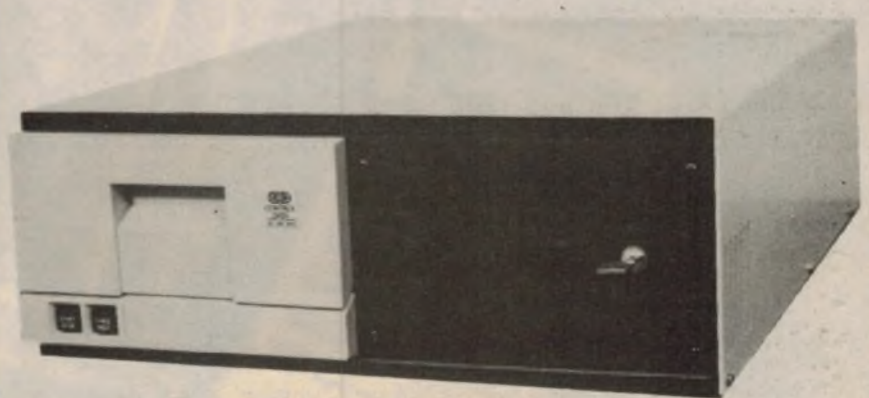
- The WA Compucolor/Intecolor User Group meets at the WAIT Computing Centre, Kent St, South Bentley. For information phone (09) 350 7384 during business hours.

- A Professional Apple Users' group has been formed in Melbourne. Through its magazine, PRO, the group will present reviews and articles on all aspects of the Apple II for the professional and business user.

Membership of the group costs $25, including a once-only joining fee of $15 and a $10 yearly subscription. For a free sample of the first issue of the PRO contact the Professional Apple User's Group, Box 969G, GPO Melbourne, Vic 3001.

- The new address of the Sorcerer Users Group of South Australia is c/o Brian Richards, PO Box 647, Salisbury, SA 5108.

Hard disk drive for S-100 computers



A new hard disk system that allows eight megabytes of data to be stored, and backed up in two minutes has been released by SME Systems of Mitcham, Victoria.

The "Lark" hard disk drive provides eight 8MB of storage on a removable carriage and 8MB on a hard disk. It can be used with any S-100 Z80-based computer system, but is specially designed to complement the SME Systems Unicorn MPU-100 microcomputer system.

Interface to the host computer is through a S-100 controller board which occupies two motherboard slots, and is implemented under the CP/M 2.2 operating system.

Further information is available from SME Systems, 22 Queen St, Mitcham, Vic 3132. Phone (03) 874 3666.

INFORMATION CENTRE

Feedback on the EA Car Computer

CAR COMPUTER: I have recently constructed the Car Computer described in the July, August and September 1982 editions. The computer now works successfully, however my experiences may be useful to other would-be constructors.

The problems I encountered were:

1. The light emitting diodes which were obtained for the display appeared to be unduly susceptible to heat during soldering. Of the original LEDs supplied, only one remained with reasonable brightness, one did not light at all, one was dim, and the remainder weren't much better. I replaced all the LEDs (with some obtained from a different source at less than half the price of the originals). It appears that these LEDs were of better quality, in that all but one LED was satisfactory, however 2 more LEDs had to be selected before a satisfactory LED was installed.

As I was using a 6 watt miniature soldering iron and have never experienced this problem with LEDs before, I can only conclude that present day LEDs are very susceptible to heat damage, as I estimate my soldering times per LED (both leads) at 1-2 seconds.

2. The fuel flow sensor I acquired was the Moray unit. However, the calculation for the calibration number gave 1224 (=25.6 × 47.8). In practice this gave unbelievable rates of fuel consumption (typically 30 litres/100km being indicated from a 2 litre engine). Subsequent experience indicated that the calibration number should be about 2240. When the calibration number of 1224 was used initially, the one second update time for the litres/100km was obtained as expected. However with the new calibration number of 2240, the update time of litres/100km changed to eight seconds, contrary to expectations. Is this consistent with the test made by the program to select the update time from the calibration number?

I will say however that in some respects the 8 second updates are more useful in that demand for fuel appears to be sometimes supplied solely from fuel stored in the carburettor, until such time as the float needle valve opens to allow fuel to flow into the carburettor, and hence be registered by the fuel flow sensor.

3. I also had a problem with excessive output level from the distance sensor. The symptoms were that the pulses on pin 40 (or CA1) of the MC6821 PIA merged at speeds above 50km/hour, with the result that no distance interrupts occurred over this speed until I attenuated the distance sensor output with a 100kΩ potentiometer. The separation between the magnets and pickup coil used is 10mm. This effect was simulated by feeding a sine wave of variable magnitude (from an audio oscillator) at 10-200Hz into the distance sensor input, thereby identifying the problem, and a solution.

4. Finally the case is not exactly reversible top to bottom unless, when the case is right-way-up, the two boards are not soldered directly together. This was because the bottom of the case was moulded with a multitude of "screw-holes" which conflicted with component tails projecting through the board. If the main board was raised to avoid this conflict, the two boards could no longer be securely soldered together and still line up the display board with the front panel.

For the record the computer is installed in a Toyota Hi-Ace van (long wheelbase) and results, although limited, are promising. The only definite information obtained to date is that at a "steady" 70km/hour, a figure of 7-8 litres/100km (40-35mpg) was obtained. Also the average for the trip of which the above was part, was 10.9 litres/100km (26mpg), the trip being stop/start city driving. Prior to the computer installation, the average consumption was about 13.3 litres/100km with primarily country driving. Figures during acceleration are of the order of 17 litres/100km.

Finally I think that your design has some features which make it attractive when compared to the imported unit described in Electronics Australia October 1982. These features are:

1. It is about $30 cheaper and is quick to construct, even if the other is pre-assembled.
2. Your computer used readily available components.
3. With a light coloured case, it would stay cooler on top of the dashboard of a car than would one with a black case.
4. The km remaining range I consider a useful output not available from the imported unit (as far as I can determine).
5. Constructing one's own gives one a useful insight into the practical workings of a microprocessor unit.

To be realistic, it's probably a case of "to each his own". However I had the choice of constructing your design, or buying the pre-assembled unit. I chose your design and would still do so. Actual installation of either unit would be much the same, although installing a car computer in a Hi-Ace van takes more than four hours as access to the engine is a little restricted. (D.H., Hazelmere, WA).

● We have not experienced the problem you have encountered with LEDs. The LED lead length when soldering into the car computer display PCB is very short and ideally a clip on heatsink should be used when soldering to avoid destroying the LED.

Regarding the fuel sensor, we have been informed that later versions are calibrated in a different manner to the original sensors and the new number that the sensor calibration number should be multiplied by is 32.97. This is explained in the answer to another letter elsewhere in these pages.

For a one second update time when using a calibration number greater than 1999, the EPROM location 070A can be altered to 20. You will need an EPROM programmer to do this. Alternatively, the software changes for a two second update time have been noted elsewhere in these information pages.

Many readers have found a similar problem with the speed not being displayed above 50km/h. We have provided two solutions as noted elsewhere in these information pages, however, your solution is also suitable.

The case you mention is a type just recently released by Dick Smith Electronics and, as such, our car computer was not initially designed to mount within this case.

Thank you for your comments regarding the attractive features our car computer has over the imported unit. The fact that the imported unit is fully assembled is, as you say, not much of a time saving, particularly when a plated through PCB is used. Another advantage that you have not mentioned is that the EA car computer is easier to repair.

CAR COMPUTER: In the "litre CAL" section of the car computer article (September 1982, page 63) you quote a

Coming Next Month*

REVISED TRANSISTOR IGNITION SYSTEM

Next month, we represent our Transistor-Assisted Ignition System which has dwell extension for a high-energy spark. The revised circuit contains a number of modifications to improve reliability and to reduce power dissipation. (Due to space constraints, this article has had to be held over from January.)

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

ON SALE: Monday, February 7th

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multiplying factor of 25.6 to arrive at the number of pulses per 0.1 litre. The literature provided with the Moray sensor I bought quotes a calibration number flow rate of 2.4 gallons per hour. Please correct me if I am wrong, but I calculate approximately 32.9 secs/0.1 litre for the correction factor.

Although I have positioned the fuel filter between the Moray sensor and the fuel pump, the much desired litres/100km facility is next to useless because of the cyclic fuel flow produced by the pump. Could this perhaps be remedied by increasing the one-second time period upon which the calculation is based. At present, on a level road, at a constant speed the reading typically cycles between 6 and 12 litres/100km. Any suggestions would be much appreciated. (P.G., Red Hill, Qld).

● From our experience, the litres/100km reading is quite effective particularly at a constant speed. Perhaps the needle valve in your carburettor is sticking, producing erratic flow in the fuel. If this is not the problem, the update time for the reading can be increased by altering the program listing in the EPROM. Note that for these changes the EPROM does not need to be erased, just reprogrammed in the appropriate locations. For a two-second update time, the addresses from 670A to 670F should be altered to read as follows; 20 00 84 01 81 01 No other changes are needed.

The multiplying factor of 25.6 for the Moray flow sensors is correct for the first version of the sensor. Moray have now released a newer flow sensor which apart from a slightly differing rotating vane, is calibrated in a different manner. What is done now is to allow a flow rate through the sensor of 2.4 gallons per hour or 10.92 litres/hour. The frequency from the flow sensor is then measured in Hz and this is given as the calibration number on the sensor. Multiplying by 32.97 will give the number of pulses per 0.1 litres.

If you wish to make the above change to your EPROM you will need access to an EPROM programmer such as our low cost design featured in January 1982 (File No. 2/CC/66).

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ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Chippendale, 2008.

CAR COMPUTER: I have recently completed construction and installation of the EA Car Computer and offer the following comments, which may be of interest to would-be constructors.

Regarding the distance sensor, if two magnets are mounted side by side and the coil placed 10mm away as you suggest, the signal strength is too great, causing transistor Q6 to saturate and turn hard on at a speed of approximately 50km/h. Two methods of overcoming this are: to remove the coil to about 40mm away from the magnets or to leave the coil where it is, remove one magnet from each side and place a 15kΩ resistor in series with the coil.

Regarding the Moray Fuel sensor, the unit I purchased had only one calibration number on it of 44.7. When multiplied by 25.6, this gives a calibration number of 1144 pulses per 0.1 litres. By pumping a measured 10 litres of fuel through the sensor several times, I was able to determine that the correct number was 1518.

Also several other problems are evident:

1. The MPU, IC1, runs quite hot to the touch. It would be rather uncomfortable to keep a finger on it continuously. My main worry is, what will happen when the weather really gets hot?

2. When the ignition is turned on, there is a momentary flash when all display segments and LEDs light up, except that LEDs 0 and 8 do not light. At night, just the faintest glimmer is barely discernible in these two.

3. When the AV switch is activated along with switches 1 and 2, both LEDs 8 and 9 are energised simultaneously. This does not occur when these switches are used as numerals. This could well be perfectly normal operation.

4. When calibrating "Litres Rem", the display can only be zeroed by adding to the displayed random number a suitable number to add up to 1000. However, the first addition after loss of memory is usually incorrect, but subsequent additions are usually correct.

5. Given the above five points, when ignition is turned on, one of the following occurs:

(a) All functions operate correctly (which is usually the case).

(b) Occasionally there will be the usual momentary flash of all display segments and most LED's, then there will be no display. None of the function switches operate. Switching off and then on again will restore normal operation, memory is unaffected.

(c) Occasionally, there will be the usual momentary flash and pause after ignition switch on, then it will display all segments ie, 8.8.8.8. and all LED's except 0 and 8. Sometimes the intensity of the light fluctuates. It may be necessary to switch off and on again more than once before it will revert to a normal display. All memories are lost, and revert to random numbers. None of the function switches operate.

Continued on page 134

Notes & Errata

COMPUVOICE (October 1982, File 2/CC/75): A change in the circuit around IC2, the 74121, will give more set-up time for the SC-01. Route the STB signal from the computer to pin 5 of IC2 rather than pins 3 and 4. These two pins should then be connected to ground.

The System-80 apparently accesses the printer port automatically after an LPRINT statement to check the status of the printer buffer. This can cause the Compuvoice to resume sounding after receipt of a STOP code. The solution is to execute an OUT 253,63 which sends a stop code directly, rather than via the printer driver routine. The equivalent for the TRS-80 Model 1 is POKE 14312,63.

In some cases it may be necessary to repeat the statement to ensure that it is latched, since this method does not read the READY signal from the SC-01.

FLUORESCENT LIGHT STARTER (October 1982, File No. 2/PC/33): Some have been sold with a 0.1μF/400VW capacitor. This must be a 250VAC unit as originally specified otherwise there is a fire risk. Also, if some tubes prove difficult to start, the .015μF. capacitor may be altered to 0.1μF. Finally, the rating for the 56Ω resistor should be ½W.

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(d) Occasionally after the usual momentary flash and pause, the unit will display rEdy. Once again all memories revert to random numbers, but all function switches will operate. Switching off and on again will bring up rEdy every time until one of the function switches is activated.

These problems were evident right from the first switch on. Initially I used sockets for all ICs, but have since removed all except ICs 1-3 and soldered them direct to the board.

Any suggestions you could offer as to where or what to look for would be most welcome. (D.W., Tamworth, NSW.)

● We will consider each point in turn. So that the distance sensor will provide pulses beyond 50km/h we suggest that either the leads from the coil be transposed or the 0.1μF capacitor at the base of Q6 be reduced to 0.001μF. The new Moray sensors have been calibrated using a different method and the number written on the sensor should now be multiplied by 32.97.

It is quite normal for IC1 to run hot and since it is rated for operation at 70°C we would expect the MPU to be satisfactory even in high ambient temperatures. The momentary flash when all the display segments and LEDs light is normal and occurs when the MPU is receiving the power on reset. The fact that the 0 and 8 LEDs hardly glow is not important since they function when the computer is operating normally.

The 8 and 9 LEDs light when the AV button is pressed on the litres and km functions since on pressing the AV button, RANGE is assumed. In fact there are no litres AV or km AV functions available. The litres and km functions refer to a tally of litres used and kilometres travelled. Of course the AV functions are available for km/h and l/100km functions and the 8 LED does not light. Further information about the functions available can be obtained from the article in the July 1982 issue.

When entering the litres REM, the number entered will be added to the number originally displayed. Further information on entering data to the litres REM function is available on page 64 of the September 1982 issue.

The final comments are all related to a common problem, that of incorrect resetting due to a slow starting crystal. We recommend connecting a 10MΩ resistor across the crystal and increasing the 0.1μF capacitor at pin 9 of IC5c until reliable resetting occurs. A value not larger than 0.47μF should be suitable.

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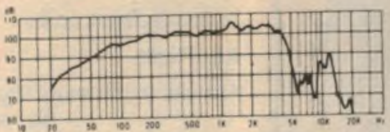

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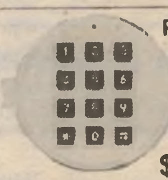

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