ELECTRONICS Australia

with CB and HIFI NEWS

JUNE, 1978
AUST $1.25*
NZ $1.25

NEW SOUND EFFECTS GENERATOR

COMPUTER CONTROL FOR MODEL TRAINS

WINDPOWER: WORTHWHILE FOR AUSTRALIA?

Sony Racks Up 'Studio' Sound

If you've yearned to escape from those wooden "living-room" stereos, and go all the way with the professionals, meet Sony's all-new, rack mounted "studio" look.

From our fantastic new F series of systems, the superbly matched F-11. Truly professional in both looks and sound. More than just a matched system this rig is totally integrated. And that means more than just "look-a-likes". Components are factory planned to work perfectly together.

The PS-11 turntable. A direct drive auto-return, auto-cut model with reject. The PS-11 boasts Sony's proven magnedisc servo control system and Sony's new linear torque BSL (brushless and slotless) motor to reduce wow and flutter to less than 0.03%WRMS.

The TA-11 amplifier delivers 25 + 25 crisp, clean watts RMS, (20 to 20,000 Hz with THD of 0.02%) with loudness and muting switches and with line/mic mixing you can be part of your music.

And the new ST-11 AM/FM Stereo tuner features: FM front end (RF stage) with FET, PLL and IC in the multiplex stage and 4 element uni-phase filters in the IF stage. That adds up to high sensitivity (1.8 uV) and low distortion.

The new SS-L1 speaker system, designed to give you everything the F-11 components can produce. And if you've read this far you'll know that's plenty. With a 20 cm Carbocon woofer and a 6.5 cm tweeter combined with Sony's newly designed passive radiator. For clear and mellow, bass enhanced sound.

The F-11 components are designed to look their best mounted in the new "studio" look rack. To complete that professional look why not add a Sony front loading cassette deck.

Yes, Sony racks up a system for true Hi-Fi buffs. The F-11.

SONY®

Research makes the difference.

GAC.S.9650

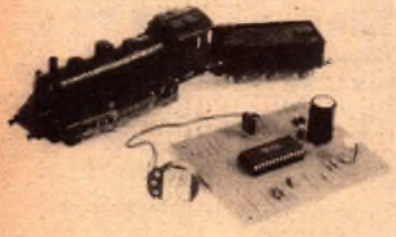
ELECTRONICS Australia

Australia's largest selling electronics & hi-fi magazine

On sale the first Monday of each month

VOL. 40 No. 3 JUNE, 1978

Designed in our laboratory, this new audio oscillator is simple to construct, has both sine and square wave ouputs, and covers frequencies from 15Hz to 150kHz in four ranges. Full details on p43.



This simple circuit can be used to create steam train sound effects for your model railroad; or, by making some simple modifications, the sound of a propeller driven airplane, an electronic siren, or even a phasor gun. Turn to p38 for the details.

Grand Instrument Contest No. 2: you could win a Trio DM-800 Dip Meter in this month's easy-to-enter contest. See p111.

On the cover

Developed at Britain's Harwell Laboratories, this new image processing system is being used to interpret data from remote sensing devices on board Earth orbiting satellites. For further details turn to our colour insert facing p24. (Photo courtesy British Information Service.)

FEATURES

HIFI NEWS AND REVIEWS

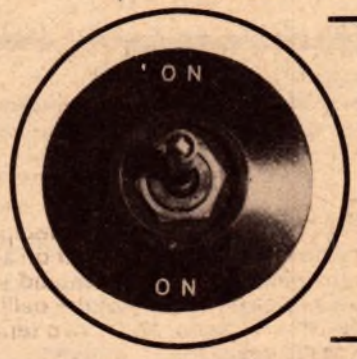
PROJECTS AND CIRCUITS

AMATEUR RADIO, CB SCENE, DX

COLUMNS

DEPARTMENTS

SWITCH ON



TO THE BIGGEST ELECTRONICS SHOW EVER SEEN IN AUSTRALIA

3rd CONSUMER ELECTRONICS SHOW
July 13 to 16. This year at the Sydney Showgrounds.

MANUFACTURERS & COMMEMORATIVE HALLS RAS, SHOWGROUNDS.

SEE IT FIRST AT CES '78
Everything electronic. Stereo equipment, CB radios, calculators, headphones, tuners, turntables, amplifiers, speaker systems, tape decks and recorders, closed circuit TV, microwave ovens, electronic watches, clocks and games, cross-overs, equalizers and new releases you may never have even thought about!

CES '78 WILL MAKE TWICE AS MUCH NOISE AS LAST YEAR!
The response by manufacturers has been so great this year that we needed as much space as we could get. More space than any hotel could offer! This July, then, as the major electronics show of the year, the 3rd Consumer Electronics Show moves into the RAS Showgrounds to occupy more than 80,000 square feet of display area. The advances in technology in the past 12 months have been staggering. It's no wonder that manufacturers have really come out in force to show off their best!

SOUND OUT WHAT'S AVAILABLE
Kriesler, Philips, Pioneer, Pye, Sanyo, Sony, Yamaha . . . those are just a few of the leading manufacturers demonstrating **new releases** at the Show.
See Philips' new 'Sound Project', new front loading cassette, and many other new releases! See Pye's new 'Diotran' range of audio equipment. See Sony's exciting new turntables and cassette deck. All the great names in sound gear from Asia, Europe, U.S.A., the U.K., Scandinavia and Australia will be on hand, all at the same time under one roof!
With so much space, it's easy to walk through the CES exhibit halls at the Sydney Showgrounds and meet the manufacturers. Ask questions, compare performance, judge the values and make up your own mind – who's the best at CES '78!

CES '78 WILL SWITCH IT ALL ON FOR YOU
Thursday and Friday, July 13 and 14 from 1 pm to 10 pm.
Saturday and Sunday, July 15 and 16 from 1 pm to 6 pm.

Really worth listening to!

RP326

ANOTHER RIDDELL EXHIBITION

Editorial Viewpoint

"Cool it" or else . . . .

The past 18 months has seen a rising tide of lawlessness in the radio spectrum in Australia. Undoubtedly, the problem has its roots in the assimilation of CB style radio but it is simplistic to blame CB radio, per se, for what has occurred. One could write a book about the way in which successive Australian Governments have fumbled what should have been handled with care and forethought.

There's an old saying which suggests that "while the cat's away, the mice will play". How sadly true that is. Right now, the administrative "cat" may not be away, but it's emaciated, neglected, bemused and powerless. And the "mice" have never been more numerous — or more undisciplined!

Disregard of regulations and bad behaviour on air is serious enough but we now face the reality of intimidation, destruction and violence by dissident groups.

In our last issue, we carried the story of the deliberate wrecking of the amateur Moonbounce equipment at Dapto, NSW. Two separate visits by vandals wrote off eight years of dedicated work.

More recently, the Canberra 144MHz amateur band repeater was "knocked off" within days of an on-air confrontation in that city. Other equipment in the same enclosure was not touched.

Again, there has been talk in the media about citizens buying and planting bugging devices to frustrate neighbouring CBers, and of CB "vigilantes" raiding the homes and cars of other CBers who were operating outside the regulations. Mostly, it has been in low enough key for the cartoon in our May issue to be "funny" — but no longer!

In the week before we went to press someone planted a high power "beeper" on commercial land in Sydney's outer western suburbs, so adjusted as to cause interference on the 27MHz CB band.

As it happened, it was close to the home of an amateur and the word was passed around that he was the culprit. The result was a weekend of ugly confrontation between the unfortunate amateur (and his neighbours), fellow amateurs, mobile CBers, self-styled "anarchists" and the police. There followed abusive phone calls, intimidation, damage to property and talk of physical violence. Fortunately, the more moderate elements managed to "cool it" before the situation got completely out of hand.

One would hope that this most unpleasant event will emphasise to the Government the need to establish and uphold the law and, to other involved parties, the need to respect it. And perhaps one should add: the need for amateurs, CBers and citizens to quit the abuse and the name calling and to respect each others' established legal rights.

If this doesn't follow and trouble continues to foment, it may well force the Government into a "get tough" attitude — with amateurs, CBers and tomorrow's communicators all being the losers.

— Neville Williams

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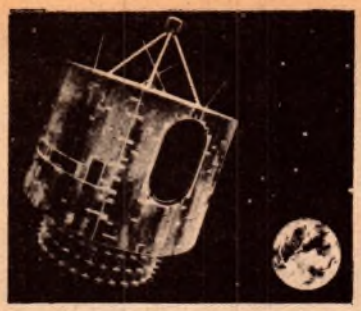


News Highlights

Optical fibre pioneer visits Australia

One of the world's leading authorities on optical fibre communications visited Australia recently to deliver a series of lectures to Defence Department and Telecom engineers at seminars in Sydney, Melbourne and Canberra.

He is Dr Charles Kao, Chief Scientist with ITT electro-optical products division in Virginia, USA.

Dr Kao, who was brought to Australia by STC Pty Ltd, is the man who pioneered the optical glass fibre communications field and who first recognised its potential as a wide-band communications medium. He has been working in the field since 1963, and currently holds 26 patents with 12 pending.

Optical fibre communication is a technique whereby data is converted into pulses of laser light, which are then fed through a hair-thin glass fibre. An optical detector at the receiving end of the fibre "reads" the signal and feeds it to ancillary equipment for conversion back into the desired format.

Optical fibres will probably revolutionise world communications within the next decade. They offer several main advantages including freedom from electrical interference, enhanced security, and greatly reduced bulk and weight when compared to conventional communications cables of the same capacity.

For example, by grouping 10 fibres together, 100,000 telephone calls can be carried in a cable only 10mm in diameter. By comparison, a conventional cable capable of carrying the same number of calls would be 50mm in diameter.

One of the most significant impacts of optical fibres will be the huge weight savings in ships and aircraft. However they are likely to affect every facet of communications, including cable TV systems, telephone networks, computer networks and other data communications systems.

Dr Kao's most cogent remarks are reserved for the social implications of fibre optics. He believes that they have the potential to change society by increasing the individual's capacity to communicate and to retrieve data. Optical fibre communications would also make many journeys unnecessary.

ITT's Dr Charles Kao — optical fibre communications pioneer.

Japan threatens US semiconductor industry, says NS president

A warning that the US semiconductor industry will be destroyed within ten years unless the Federal Government institutes and enforces free-trade rules for Japanese-made products was issued recently by Charles E. Sporck, president of National Semiconductor Corporation, the industry's third largest producer.

Speaking before the Los Angeles Society of Securities Analysts, Mr Sporck expressed concern that monopolistic Japanese companies, will be as successful in dominating the semiconductor industry as they have been in many other industries.

"Successful domination of markets by Japanese companies has weakened or destroyed the corresponding industry in the US," he said. He cited such examples as steel, motorcycles, CB radio, hi-fi electronics, TV receivers, sewing machines, calculators and various passive electronic components. The tactic most often used, he observed, is "predatory pricing".

In addition, the Japanese semiconductor industry enjoys several business advantages that are denied the US industry, according to Sporck. These advantages include:

- 12 per cent import tariff in Japan vs a 6 per cent import tariff in the US.
- Japanese firms have easy access to the US market because well-developed and non-captive marketing organizations already exist in that country. On the other hand, US access to the Japanese market is restricted because marketing organisations in Japan are limited.
- In Japan, semiconductor industry business and technological developments are coordinated by the Japanese government to minimize duplication. In the US, no such coordination exists.
- Large subsidies are provided to semiconductor companies for development work consistent with Japanese government policy. No such subsidies are available in the US.

Mr Sporck said that Japan should lower its tariff on semiconductor imports to the same level as that imposed by the US, and should equalise its trade rules. He further advocated that the capital gains tax in the US be liberalised to provide incentives for companies to invest in innovative technologies.

Alternative energy research . . .

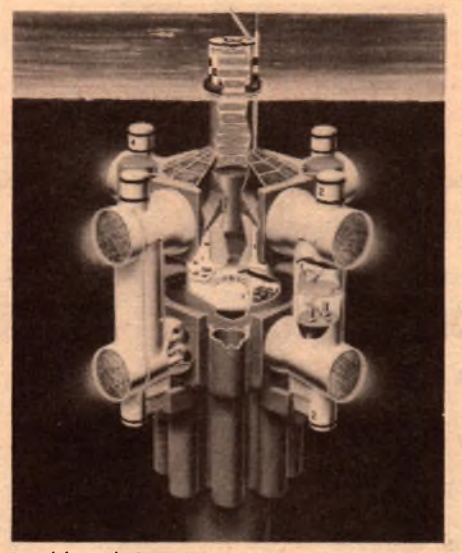
Ocean power contract to Westinghouse

Westinghouse Electric Corporation has received a $US2.9 million contract from the US Department of Energy to design a system for generating electricity on floating power plants using the temperature differences between warm surface water and colder, deeper water in the oceans.

Under the terms of the contract Westinghouse will prepare preliminary designs for a commercial scale ocean thermal energy conversion (OTEC) power system and design a pilot plant. The exact size of each will be determined during the design effort, although the pilot plant will probably be designed to generate 12,500 kilowatts while the commercial system could consist of several modules generating about 50,000 kilowatts each.

Another American company studying the engineering and economic aspects of OTEC is Lockheed Missiles and Space Company, which has been working under a government contract since mid-1974.

The OTEC system involves pumping huge amounts of warm surface water through heat exchangers, where the water's heat evaporates ammonia. The ammonia vapour then turns a turbine-generator to generate electricity. Cold water is then pumped up from a depth of 1,000 metres to cool the vapour and condense it back into a liquid so that the cycle can be repeated.



Lockheed OTEC power concept.

The electricity generated by the floating plants would be transmitted by submarine cable to mainland power networks.

OTEC is considered a form of solar energy since it taps heat collected from the Sun by the world's oceans. It has an important advantage over other solar energy processes, however, in that it works after the Sun goes down. 24-hour operation is possible because ocean surface temperatures drop only slightly at night.

Methane jet fuel

Lockheed-California Company has received a contract from NASA to study liquid methane fuel systems for aircraft capable of carrying 400 passengers 10,000km at a cruise speed of about 1,030km/h.

The study will include a comparison of the economics and performance characteristics of liquid methane, liquid hydrogen and synthetic Jet-A-Fuel. All three can be produced from coal and are considered alternate fuel candidates for subsonic aircraft in the 1990s.

1kW solar cell array

A one kilowatt array of photovoltaic cells that converts solar energy directly into electrical energy has been built as part of a solar energy research program by Varian Associates, USA. Headed by scientists Larry James, Ron Moon and Hugh VanderPlas, the program has demonstrated efficiencies of up to 23.3 per cent for the conversion process using gallium arsenide cells.

New contracts awarded to the company by the US Department of Energy call for further efficiency improvement and construction of an experimental solar conversion, 50 kilowatt power plant. The plant, to be ready by early 1980, will be built in conjunction with Pacific Gas and Electric Company at its San Ramon substation across the bay from San Francisco.

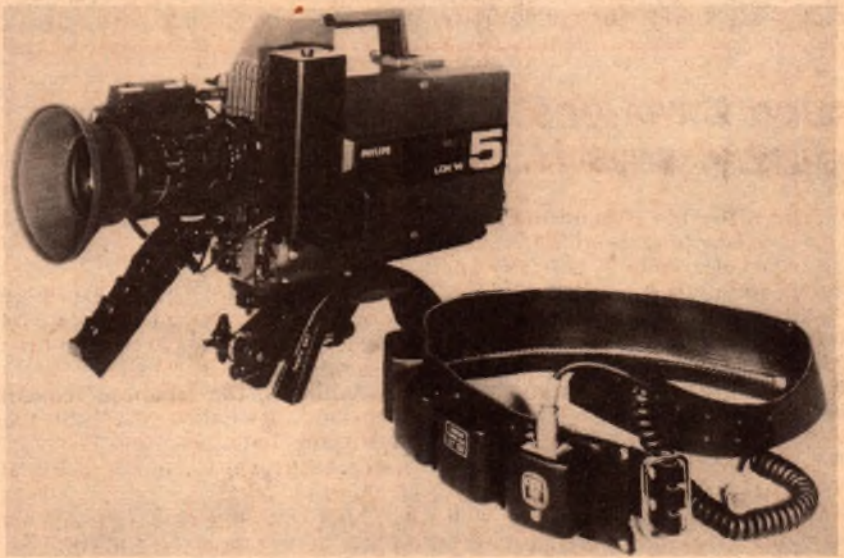
New process converts methanol into petrol

Research over the last two or three years has indicated that methanol (methyl alcohol) may provide a partial solution to the world's looming fuel crisis — not so much as an alternative to petrol (with which it compares poorly in properties and performance) but as a feedstock for making petrol.

Hopes in this area have now risen due to a research breakthrough by Mobil Oil Corporation in the US. Mobil research scientists have discovered a catalyst which, in conjunction with established oil refining processes, will convert methanol into high-grade petrol. The Mobil team is now working in partnership with the US Department of Energy on the design of a pilot plant to evaluate the potential of the discovery.

The Mobil process may prove attractive to Australia, initially at least, if natural gas is selected as the methanol source material. Australia is reasonably well endowed with natural gas reserves, and the prospects for finding more are regarded as good.

New colour camera for ENG



Described as the "Rolls Royce of ENG cameras", the LDK 14 ENG/EFP camera has recently been released in Australia by Philips, along with the lower cost Video 80 ENG camera. Both cameras incorporate a number of automatic features and produce broadcast quality results.

CLOCK MODULES:

12.7mm High Digits

The MA-1002 Clock-on-a-chip from National Semiconductor. It's top value – dollars cheaper than most other sources. Huge digits, ideal for building into equipment. All you need to make it work is a transformer!

Did someone mention a transformer? We've got the MA1002 module in a special kit consisting of the transformer, setting and on/off switches plus data – all ready to hook together to go! You can make this clock up in just a few minutes (like about 30!)Kit: Cat K-3434 ... $19.75

$12.50 Cat X-1052 SAVE $1.00

DON'T PAY $11.95

3 POSITION ANTENNA LAYOVER

Someone is joking: we've seen these advertised for $11.95 elsewhere – and we're sure they're not as good as ours at just $6.95! Ours have a removable stud to allow either end to be used as a male or female connector. Ours have a push button to prevent wind or bumps letting it down. Don't let a carpark or tree eat yours! Use a layover. Cat D-4506

$6.95

IN A RUT? BUILD YOURSELF AN ELECTRONIC KIT.

Here is a listing of all the printed circuit boards currently stocked. Boards from both major magazines – to help you build the project you want. Don't forget, we've also got the components, just in case you didn't realise ...

ELECTRONICS AUSTRALIA PROJECTS				
H-8215	75cd7	Capacitor Discharge Ignition	7/75	$2.00
H-8275	75l11	Playmaster speaker protector	11/75	$1.75
H-8300	76a3	2 watt audio amplifier	3/76	$1.75
H-8302	76sa4	Playmaster 25/25 & 40/40 (inc. f'glass board & printed overlay)	4/76	$5.25
H-8314	76r4	Reverberation unit	4/76	$2.00
H-8315	76lm5	LED level meter	5/76	$2.00
H-8316	76s7	650MHz counter prescaler	7/76	$2.50
H-8318	76pc9	Musicolor Mk 3	9/76	$4.50
H-8322	77f1	Digital frequency counter (special fibreglass board)	1/77	$4.75
H-8324	77up5	Miniscamp computer	6/77	$8.50
H-8325	77dlt7	PCB& front panel logic trainer	7/77	$9.75
H-8326	77up6	Miniscamp memory	6/77	$3.75
H-8330	77b7	Radar burglar alarm	7/77	$2.00
H-8331	77cc4	Cassette interface	3/77	$3.75
H-8332	78c2	Stereo cassette deck	2/78	$3.75
H-8336		VDU – double sided f'glass	2/78	$32.50
H-8337	76/m5	VDU video modulator	4/78	$1.20
H-8338	78ut4	VDU ASCII encoder	4/78	$4.50
H-8339	78b2	RCL Bridge	3/78	$4.75
H-8340	78ek3	Electronic Morse keyer	3/78	$3.75
H-8341	78up5	2650 Mini computer	5/78	$5.00
H-8342	78ps5	Powermate	5/78	$2.00
ELECTRONICS TODAY PROJECTS				
H-8524	ETI111	IC Power Supply	11/72	$2.00
H-8548	ETI313	Car alarm Now $1.00	11/74	~~$1.75~~
H-8552	ETI413	100 watt guitar amplifier	12/72	$2.50
H-8554	ETI419	100 watt pre-amplifier	9/73	$1.75
H-8560	ETI429	LM380 amplifier	12/74	$2.75
H-8578	ETI701	TV Masthead amplifier	12/74	$1.50
H-8582	ETI704	Crosshatch/Dot generator	8/75	$2.00
H-8591	ETI480	50/100 watt amplifier (f'glass)	12/76	$2.50
H-8803	ETI445	Stereo preamplifier	7/76	$1.75
H-8804	ETI802	Mini organ	8/76	$5.60
H-8606	ETI480PS	Power supply for ETI480 50W x 2 or 100W x 1	5/77	$2.25
H-8608	ETI583	Gas Alarm	8/77	$1.75
H-8610	ETI585R	Ultrasonic switch – receiver	9/77	$1.75
H-8611	ETI585T	Ultrasonic switch – transmitter	"	$1.50

SERVICING?

Whether you're servicing for a living or just a hobby, Dick can make life easy for you. His range of service aids suits the professional and hobbyist alike. Try some of them – you'll be back for more!

ELECTROLUBE PRECLENE Highly recommended for cleaning tuners, switches, pots, etc. 340g pressure can. Cat N-1040 .. .. .$3.90

DICK SMITH FREON TF Cleaner, degreaser, moisture removing spray. Non toxic, non explosive, non flammable. Cat N-1051 .. $2.75

ACRYLIC CLEAR SPRAY For protection of screened or lettered panels, also outside weatherproofing for aerials, etc. Cat N-1011 . $2.25

CRC 2-26 Moisture removing spray that leaves a fine film of silicone for continuing protection. Ideal for ignitions! Cat N-1060 .. . $4.75

FREEZ-IT REFRIGERANT Intermittent jarrer! Cools components to –50°C instantly 350g can. Cat N-1056 .. ..$3.00

ELECTROLUBE PCL-2 Printed circuit lacquer can be soldered through, but protects copper and solder against corrosion. Cat N-1045 $4.60

MATTE BLACK PAINT Ideal for touching up scuff marks, etc – or for giving a project a real professional finish. Cat N-1070 . .. .. $2.20

INSTANT COLD GALVANISE Zinc enriched hard coating to stop rust. Many protective uses. 400g. Cat N-1063 .. .. $5.00

ELECTROLUBE 2X LUBE PEN Handy pocket size spray lubricant. Hard to lose this one – really handy. Cat N-1047 .. .. $2.40

CB OUTPUT TRANSISTORS ARE ALL 6's & 7's!

YEP! 2SC1306's and 7's – have you got your spares?

2SC1306(2SC2166) Cat Z-2501 .. .. $4.50

2SC1307(2SC1969) Cat Z-2502 .. .. $6.50

WATCH THIS SPACE

AND FIND OUT WHAT YOU MISSED!

Each month, our stores and mail order dept. feature an outstanding BELOW COST special. All you have to do is go into any of our stores or buy from mail orders to find out what it is.

LAST MONTH:

A 'SCOPE' SUPERSPEED IRON FOR $10.25 – NORMALLY $16.50

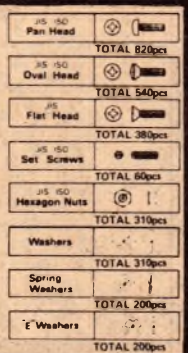
SAVING $6.25

WHAT'S THIS MONTH'S SPECIAL? CALL IN AND FIND OUT YOURSELF!

The ELBEX time-saver pack will save you money! It contains a huge selection – 2820 pieces – of ISO standard nuts, bolts and washers to help YOU with that tricky service job. This pack is incredible value – the contents are less than 2.5c each PLUS you get the pack! No serviceman can afford NOT to have one of these outstanding packs!

$69.00 less than 2.5c each!

Cat T-5650



SERVICEMEN AND OTHERS IN BUSINESS:

You owe it to yourself to read the very important message to you on page 57 of this magazine.

CAR CORNER

In most cars, electrical noise is a real problem. Now you can do something positive to rid your car of this pest: Dick's new noise filter components.

Noise Filter Kit

For the real tough jobs. Heavy duty, with instructions. All cars, etc.

Cat A-7950

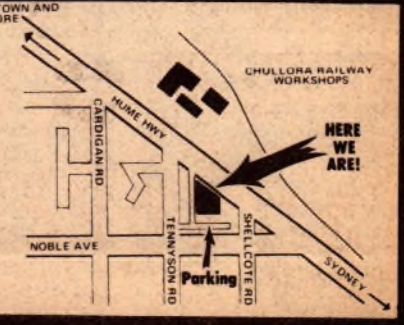
$22.50

Also available: Those nearly impossible to get co-ax filter capacitors. 0.5uF, 100 volt, 60 amp. Cat A-7928 **$3.75**

WE'VE MOVED!

OUR BANKSTOWN STORE IS NOW IN CHULLORA...

Call in today and meet the new manager, Doug Ellis, and his friendly staff. There's parking at the rear of the store, too.



UPGRADE NOW STEREO NEW MODEL!

Now with fader control. It's new – and it's a beauty! Great sound for your car with stereo cassette, mono/stereo fm and broadcast band unit. In dash mounting for top security, four speaker facility available (speakers not supplied). Take the drudgery out of driving – with sound from Dick

AM–FM–CASSETTE

$149.00 Cat. A-6480

PROJECT ELECTRONIC KITS

THE IDEAL INTRODUCTION TO ELECTRONICS

Yes! Find out about the exciting world of electronics with one of these simple kits. Easy to build, and battery operated so they are completely SAFE! All the details are in the 'Project Electronics' book (see below).

Continuity tester	Cat K 2041	$3.00
Heads and tails	Cat K 2043	$3.50
Two-tone doorbell	Cat K 2044	$4.00
500 second timer	Cat K 2045	$4.50
Morse practise set	Cat K 2047	$3.50
Buzz board game	Cat K 2048	$3.90
Basic audio amplifier	Cat K 2061	$5.50
Simple AM tuner	Cat K 2062	$6.50
Electronic bongos	Cat K 2063	$5.00
Electronic Siren	Cat K 2065	$5.50
Temperature alarm	Cat K 2066	$4.90
Singing moisture meter	Cat K 2067	$4.90
LED dice	Cat K 2068	$5.90
Two octave organ	Cat K 2072	$8.50
Battery Saver	Cat K 2511	$3.90

PROJECT ELECTRONICS HANDBOOK

This book contains all the information you need to build the above projects, plus tips and guides to construction, etc. It's a valuable reference of handy circuits (25 in all) plus the data. 82 pages, fits your magazine binders, too. Cat B-3652

$4.75

A CALCULATOR IN A WALLET?

It's got to be the best value going! It's a liquid crystal calculator, with memory, supplied in a wallet, with battery – and it's only $24.50! The batteries really last – up to 2000 hours – and the whole thing is so thin you can wear it. You'll be able to calculate ad infinitum.

Cat. Q-3020

$24.50

HOME BURGLAR ALARM KIT

Protect your home and property! Complete kit for your security. Easy to install, easy to use, and could save you a lot of heartache. If you can use a screwdriver and read this copy, you can install the alarm. It's that simple!

$49.50 Cat L-5105

NOW! 8 page installation booklet – FREE with this alarm system. Written for Dick by an expert, tells you all you need to know. Available separate to system: Cat B 6000 .. .. .. $1.50

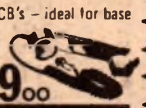
EAR & MIC SETS

$27.50

don't pay $79

Comfortable, easy to use, fits most CB's – the brilliant Dick Smith headset mic. Safer CBing, at less than half the price of other units on the market (as far as we know!) Cat C-1120

Telephone handset for CB's – ideal for base stations and private operation. Fits most CB sets. Cat D-9007



$29.00

INTERCOMS

2 STATION

$14.00

Cat. F-1020

Communicate! You'll do it better with an intercom from Dick Smith! This is ideal from the home (kitchen to garage, etc) or shops, service stations, etc etc. You get a master and slave unit, with connecting lead and battery. Either unit can call the other. Outstanding value.

4 STATION

$29.50

Cat. F-1040

For the large house, factory, shop, etc – a four station system. 1 master unit and 3 slaves (any can call master & vice versa). Quality unit features 'hands free' operation for speed and efficiency at slaves. Complete privacy assured.

KITSBITS

PROJECT AND KIT BUILDERS: THIS IS YOUR LIFE!

If you enjoy building electronic project kits, come to Dick Smith. Dick picks the best of the magazine projects and turns them into famous Dickits. Complete to the last detail, most with detailed instructions, parts as per magazine articles (or the closest possible electrical equivalent if some parts are hard to get) – you can rely on your Dickit.

AUDIO OSCILLATOR (See June EA) A great new kit, easy to build. Very handy piece of test gear to have around, too.
Cat K-3469 .. .. $25.00

ELECTRONIC MORSE CODE KEYER (See March '78 EA). Complete kit, supplied with paddle, un-drilled case and plain painted panels.
Kit of parts: Cat K-3470 .. .. $37.50
Paddle only – Cat D-7103 .. $17.50. PCB only – Cat H-8340 .. $3.75. 9 volt battery Cat S-3200 $2.00

R-C-L BRIDGE (See March '78 EA) Complete kit, supplied with printed, but un-punched panel.
Cat K-3468 .. .. $34.50
PCB only: Cat H-8339 .. .. $4.75

VK POWERMATE (See May '78 EA). Short form kit includes all electronic components but not metalwork, mains wiring or terminals.
Short form kit: Cat K-3449 .. .. $32.00
PCB only: Cat H-8342 .. .. $2.00. Special 5600uF/40V electrolytic capacitors: Cat R-4570 .. .. .. $3.90
Power transformer: Cat M-2000 .. .. $17.32

Special kits for the following projects are not made up, but parts are normally available for these and most other magazine projects, unless special components are required. Ask at our stores for full details.

White & Pink Noise Generator (see April '78 EA).
Photo Time (See April '78 EA)
LED Chaser (See April '78 EA)

WIN A TRIP FOR TWO TO TOKYO

FLYING QANTAS
AUSTRALIA'S AIRLINE TO THE WORLD

Every purchaser of Yaesu equipment from Dick Smith or participating dealers receives an entry form in the fabulous 'Win a trip for two to Tokyo' contest, flying Qantas and staying in a luxury hotel. Full details wherever Yaesu/Dick Smith products are sold.

REMEMBER – THE CONTEST CLOSES IN JULY – AND YOU NEED TO THINK ABOUT YOUR ENTRY. SO DON'T DELAY!

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*Many lines available from the Dick Smith Electronics Centres at

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GCG Communications	385 Mulgrave Rd, Cairns QLD. Ph 54 1035
The Elect. Hobby Centre	1168 Gold Coast Hwy, Palm Beach QLD. Ph 34 1248
Premier Sound	239 Musgrave St, Rockhampton QLD. Ph 27 4004
Sumner Electronics	97 Mitchell St, Bendigo VIC. Ph 43 1977
Aero Electronics	123A Bathurst St, Hobart TAS. Ph 34 8232
Tasmanian Hi Fi	87A Brisbane St, Launceston TAS. Ph 31 5815
Devon Electronics	45 Ashburner St, Devonport TAS. Ph 24 4216
A.E. Cooling	Eliz. Town Centre, Peoples St Bldg, Elizabeth SA. Ph 255 9196
Hutchesson's Communic	5 Elizabeth St, Mt Gambier SA. Ph 25 6404
Altronics	105 Stirling St, Perth WA. Ph 328 1599
BP Electronics	11 Duke St, Albany WA. Ph 41 2681

NEWS HIGHLIGHTS

Australian 'Interscan' landing system chosen by world aviation body

The Australian originated "Interscan" microwave landing system has been chosen as the new standard for world airports by the International Civil Aviation Organisation (ICAO).

The new system, to be progressively introduced in place of existing aircraft landing systems, will mean big money for Australian companies because of Australian patent rights on the antenna design.

Interscan was originated by CSIRO and Department of Transport scientists in Australia, and subsequently adopted and further developed by companies in the United States where it is known as the Time-Reference-Scanning-Beam system (TRSB). In all, the Australian Government is said to have backed the Australian research effort to the tune of $5 million.

Original contracts for the Interscan system were let to AWA and Hawker De Haviland Australia who built and installed test equipment at Tullamarine Airport in 1973, and subsequently at Sydney Airport. An American company, Wilcox Electric Inc, has already held talks with AWA and Hawker De Havilland, and is hoping for a partnership role with the Australian companies.

Briefly, the Interscan system works by transmitting microwave beams from the runway over an approach area shaped much like a pie wedge. The two beams — one moving side to side, the other up and down — locate a plane's position in this area by measuring time intervals as the beams intercept the aircraft.

The transmitting antennas are completely electronic in operation, and have no moving parts.

The concept will allow air traffic control authorities greater flexibility in choosing aircraft approach and landing paths in all weather conditions, and provide more scope for noise abatement over sensitive areas of population.

BUSINESS BRIEFS:

Overseas Agency for Electronic Products

A new agency is to be set up in London later this year with the express purpose of obtaining electronic components for manufacturers and wholesalers in Australia. The function of the agency will be primarily to obtain small quantities of parts and to fulfil single orders. Enquiries to World Procurement Service, PO Box 3, Avondale Heights, Vic. 3034.

Audio Equipment Contract to AWA

One of the most advanced audio recording systems in Australia is being supplied by AWA as part of a $2 million rebuild of EMI Australia's Sydney recording studios. The equipment will be used to produce records and tapes by Australian artists, and includes two Studer TLS 2000 tape lock synchronising systems and four Studer A80/VU-16/2 16-track professional tape recorders.

Electronics Store for Wollongong . . .

A new electronics shop, called Madjenk Lighting and Electronics, has opened at Shop 5, 246 Princes Hwy, Dapto, Wollongong. The shop sells a range of electronic components, electrical accessories and microprocessors, and provides a hire service for all types of lighting for entertainment purposes. Shop proprietoress is Rhonda Jenkins.

. . . And for Northern Melbourne

Rod Irving Electronics is now operating an electronics store in the northern suburbs of Melbourne to cater for kit and project builders. The new store is situated at 499 High St, Northcote. A mail order service is available.

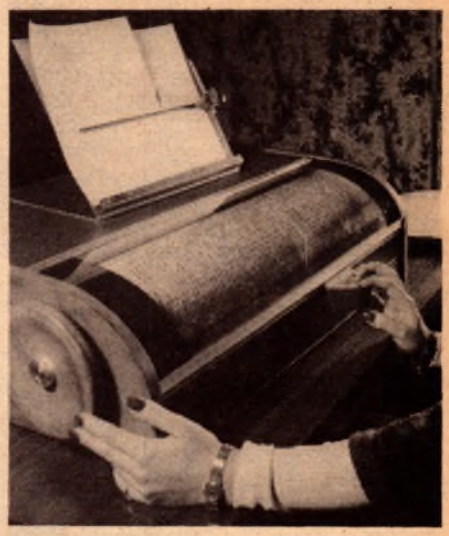
Philips Awarded $3 Million Contract

A $3.1 million contract has been awarded to Philips-TMC by the Metropolitan Fire Brigades Board, Melbourne, for a new computer-assisted fire command and control system. The system will involve 49 fire stations, 6,500 alarm interface units installed on private premises, and a central control system incorporating two Interdata 732 computers. Microprocessor systems in each fire station will supervise alarms in the station's own area.

Wrong Price for NEC TK-80 System

On page 75 of the May issue of EA, the price of the NEC TX-80 microprocessor evaluation kit was incorrectly stated as $215.00 plus sales tax. We have been advised by Tecnico Electronics that this should have read $315.00 plus sales tax.

Encoder for Chinese characters



This ideographic encoder, devised by a British University team, could revolutionise the translation and printing of the Chinese language and enable — for the first time — Chinese characters to be transmitted directly by telegraphic equipment.

The method the team has devised is to put over 4,000 of the most common Chinese characters on a grid, around a drum. As the drum is rotated a cursor is moved horizontally to pinpoint a required character. Photocells read off the code for the drum and cursor position and a stream of binary digits is fed into the computer. From this data, a receiving decoder can generate printed copy, or "paint" on a visual display unit perfectly formed Chinese characters.

This new system, in fact, enables any picture language to be handled — even ancient Egyptian hieroglyphics — by simply adapting its characters to the drum system.

"Buy Australian" says ATDA

The Australian Telecommunications Development Association has applauded the recently announced "Buy Australian" policy directive issued by the Australian Government.

The "Buy Australian" guidelines state that wherever possible Government Departments must buy Australian made equipment and goods and if they have to buy from overseas then they will have to justify this purchase before a committee.

To get approval to import they will have to present a case based on other than economic grounds. ATDA will be looking to a speedy implementation of these guidelines and has suggested that the Department of Administrative Services accept responsibility to ensure the spirit and letter of the directive is enforced.

Tape magazine service for the blind

A new tape magazine service for blind people is to be provided by the Royal Blind Society of NSW.

The monthly 90 minute cassette, compiled and recorded for the Royal Blind Society by journalist-broadcaster Max Taylor, will contain material selected from magazines and newspapers, providing a wide range of background information usually unavailable to people with visual impairments.

Further details may be obtained by writing to the Royal Blind Society, PO Box 176, Burwood, NSW 2134.

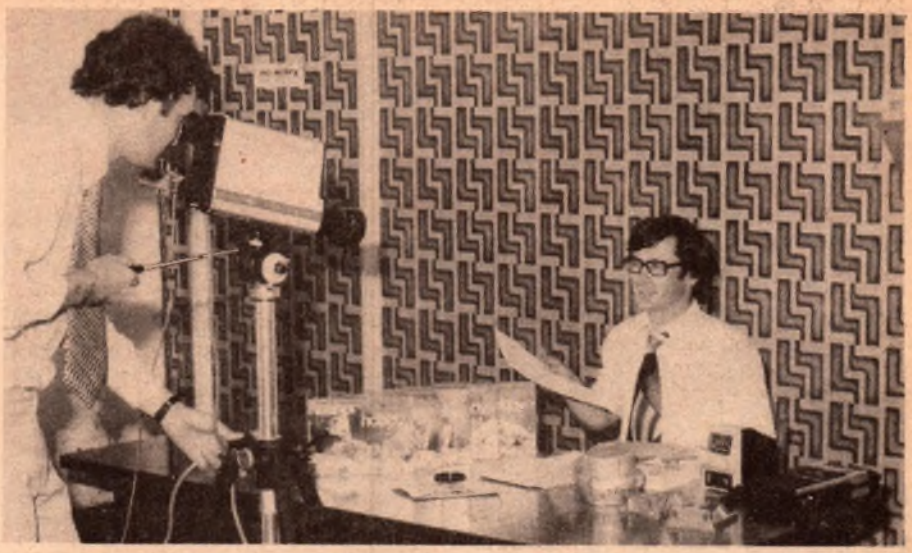
Courses in film and television

The Australian Film and Television School has advised that it is now calling for applications for its fulltime program commencing in 1979. Courses offered are:

- a three-year course on all aspects of film and television production; and
- a one-year screenwriting course.

Candidates for the three-year course must specify their order of preference for one of the following: camera, sound, editing or production. Further information is available from the Recruitment Officer, Australian Film and Television School, PO Box 126, North Ryde, 2113.

Keeping in touch at DSE



Now that Dick Smith's electronic "empire" has grown to eight stores in four states, Dick has had to install a closed circuit colour videotape system to keep in touch with them.

Every week Dick records a 30-minute sales talk in which he introduces new products and demonstrates their selling features, gives news of company developments and shows new advertising campaigns. Duplicate cassettes are dubbed immediately and despatched to Dick Smith branches. There they are shown to staff at weekly sales meetings.

The system cost $24,000 but, according to Dick, will save a fortune in air fares and time compared with the alternative of travelling to all eight branches and doing the same presentations in person.

Dick also intends to use the system for in-store demonstrations of electronic construction techniques, such as soldering and PC board making.

Windmill power for Australia: Pt 1

The potential exists for wind-powered generators to supply a significant percentage of Australia's electricity requirements by the year 2000. But how many windmills would we need, how big would they have to be, and where should they be sited?

by JOHN ANDREWS

"Large scale commercially viable wind systems capable of making a significant contribution to electric power generation are unlikely to be available before the last decade of this century. . . . the development of large scale windpower generation systems does not appear at this stage to merit a special research and development effort."

Senate Standing Committee of National Resources.
Report on Solar Energy, 1977

Wind power and other fringe types of energy are unlikely to play a significant part in the Victorian energy scene."

Vic. Government Green Paper on Energy, March 1977

Struggling uphill against these icy blasts, there is no doubt that it will be a long tough battle to convince State and Federal Governments that energy from the winds could make a major contribution to Australia's energy needs well before the year 2000. The dismissal of wind power as a "fringe-type" of energy belies a ubiquitous official attitude: that wind power is uneconomic, impractical, suited only for wild schemes of well-meaning, but essentially misdirected, technological Don Quixotes.

But who are the real Don Quixotes in this debate? Those who advocate escalating use of fossil fuels, and inevitably nuclear power for Australia, to meet continued growth in energy consumption? Or the growing body of responsible scientists and citizens in Australia and overseas who see wind power as having an important contribution to make in supplying energy to a sustainable economy characterised by a constant level of energy consumption?

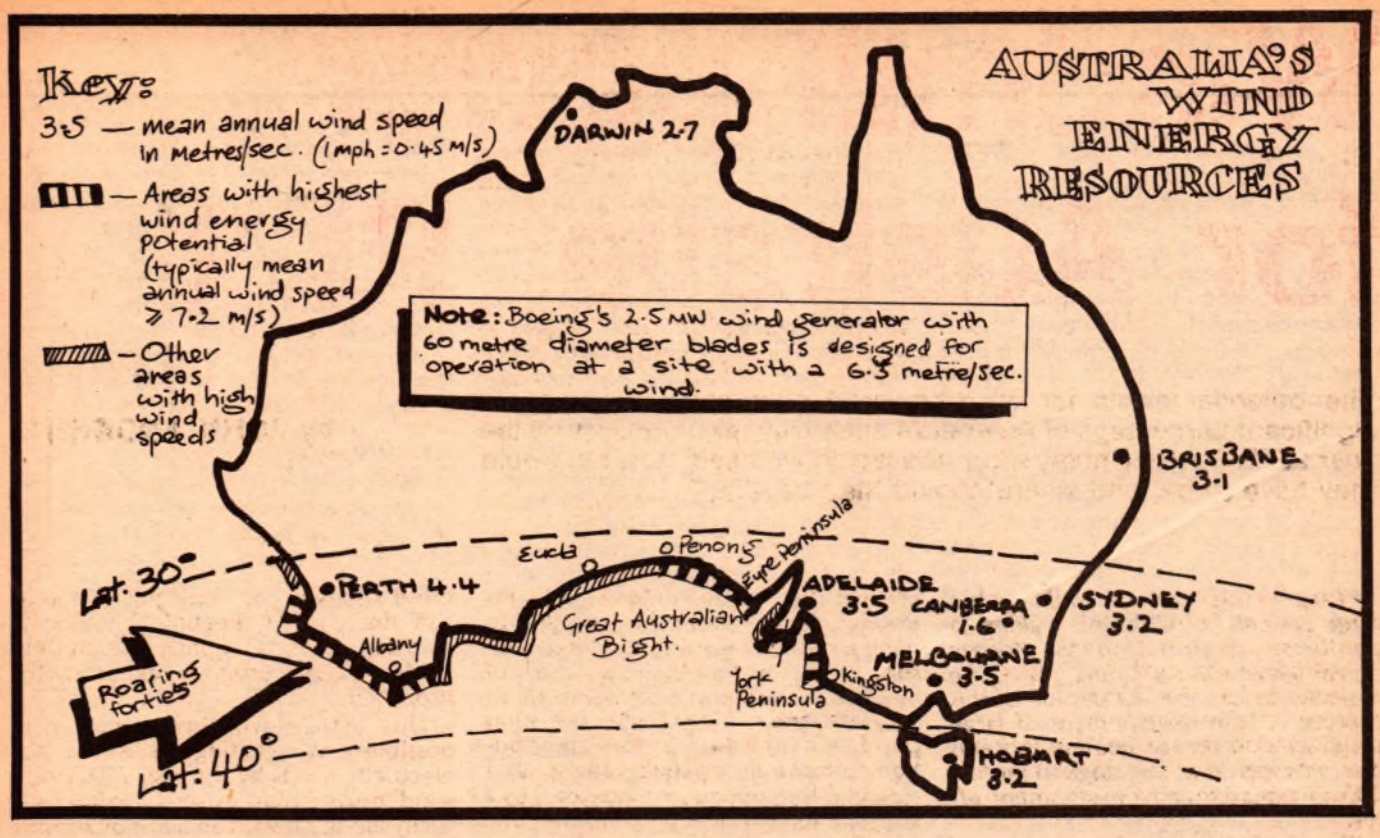
Official Australian pessimism for wind power contrasts starkly with overseas enthusiasm. For example:

- NASA estimate that it is technologically and economically feasible to build 350,000 1.5MW (megawatt) wind plants to supply half the US electricity demand by 1985.
- A Danish wind expert, Brent Sorensen, has proposed that wind power coupled with solar collectors could provide all of Denmark's energy needs by the year 2050.
- The Swedish Government has decided to invest $A4.5 million over the next three years in analysing wind-energy potential. 95 per cent of this will go into grid-attached systems using hydropower as a pumped-storage facility.
- Martin Ryle, writing in May of this year in the highly respected international scientific journal, "Nature", estimates that wind electricity could substitute for energy now obtained from North Sea oil and gas in the UK as those reserves are depleted, at about half the cost of meeting this supply shortfall from a rapidly expanding nuclear-power program as presently proposed.

This article will investigate the possibility of meeting all Australia's electricity needs by the year 2000 from wind power plus existing hydroelectricity alone, or with an additional contribution from solar cells. A particular aim of the analysis is to estimate the number and size of wind generators that would be required, and consider where they might be sited. Any usage of wind energy for purposes other than electricity generation would require additional wind generators to those mentioned in this article.

As a reference case, let us consider a wind power system to provide electricity in Australia with settlement patterns (i.e. the vast majority living in urban areas) and total population maintained as at present. But we will assume that, by using electricity sparingly and only for the purposes for which this high grade form of energy is necessarily required, total annual electricity consumption could be reduced to half its present level.

There is, I think, a lingering belief in some people in the alternative technology movement that, with reduced demand, city people could get their electricity from small locally built,



controlled and sited wind generators — one per house, one per block, or even one per skyscraper. However desirable this may be politically, there are unfortunately cogent technical factors militating against this form of deployment of wind devices.

In most large cities in Australia, each house would need at least a 7 metre diameter wind generator to get anywhere near the half present demand target proposed. If almost every house had such a machine (not to mention factories and commercial buildings), the turbulence created by one prop would interfere with the next and so on. There would be safety risks with whirling blades on top of 20 metre high towers; trees and tall buildings would shield many propellers; and the visual impact of so many wind generators so close together would be considerable.

Why not then use large "community" wind generators, say a 2MW model with 60 metre or greater diameter propellers, each supplying all or part of a suburb? The problem is again the number required to meet half today's electricity demand. In Sydney or Melbourne, several thousand of these large wind plants would be required in each city, each one about the size of a jumbo jet turned on edge. There would be safety problems, enormous visual impact, and the windplants would operate at low efficiency because buildings and trees lower the average wind speeds in urban areas.

Although siting large wind generators remote from the main centres of population they supply incurs energy losses in distributing the electricity generated, another factor will usually more than compensate for these losses. This factor is the much higher mean wind speeds that exist in favorable sites — coastal, off-shore, or inland mountain ranges — compared with urban areas, and hence the considerably higher energy density in the winds at these locations. The energy in wind is proportional to the cube of its velocity, so a wind generator at a good site, say on the SA coast bordering the Great Australian Bight, where the mean annual wind speed is 9 metres per sec. (32kmh), would generate approximately eight times more energy per year than it would in say urban Adelaide with a 4.5 metres per sec. (m/s hereafter) average wind speed.

One of Australia's foremost wind-energy pioneers, L. F. Mullett, wrote in a paper on wind potential in SA published in 1957: "a hill 200ft high in open country is a potential site for a commercial wind power installation; but flat country sites should not be selected more than a few miles from the ocean coastline . . . a good wind site will not be found near vegetation stronger than coarse grass". But by "good site" Mullett meant an annual mean wind speed of 8.5m/s or greater, which are indeed limited usually to near the coast. Present research in the USA is aimed at designing windmills for economical operation at sites with mean wind speeds of 6.3m/s (23kmh), which greatly expands their possible areas of application. In particular it opens up inland areas of Australia for wind-energy collection.

Currently there are two main options for distributing wind energy from wind generators to point of use. At least in the short term the most likely solution is to feed wind-generated electricity into the high-voltage grid system via a DC to AC inverter. Electrical power could probably be usefully transmitted over distances of several hundred kilometres in this manner.

Coupling wind generators at different locations into a grid system has the additional benefit of smoothing out the net input into the grid, since a lull in the wind at one location may be compensated for by high winds at another. However, Sorensen concludes for the USA: "The reduction in fluctuation of power output seems to be less than 10 per cent for windmills located at a distance up to 300km from each other since wind regions change slowly". Insufficient wind data exists in Australia for us to know whether the same applies here or not.

The second possibility for distributing wind energy is to use the electricity generated to electrolyse water (sea water if near the coast, brackish water if inland) and produce hydrogen, which could then be piped or otherwise transported to the point of use. Hydrogen can be reconverted cleanly to electricity by burning or combining with oxygen in fuel cells. Its use as a storage medium for wind energy is discussed later. Professor J. O'M. Bockris of the Institute of Solar and Electrochemical Energy Conversion at Flinders University of SA argues that wind-produced hydrogen could be transferred economically to sites of

high energy use up to 6000km distant from a wind belt".

There seems to be a consensus among authorities that basic strength-of-material limitations place an upper bound of 5MW for a single wind generator, while the largest at present being designed is Boeing's 2.5MW wind-electric plant with blades 90 metres in diameter. In the calculations which follow I shall assume 2MW wind plants are used, which means a blade diameter of 60m for 6.3m/s sites.

At such sites it appears quite practical to design wind generators with a 30 per cent load factor, i.e., the actual electricity produced over a year is 30 per cent of the quantity that would be generated if the machine operated at peak load all the time. The load factor thus takes into account the variability of the wind. Assuming then a 30 per cent load factor, we can calculate that the total electricity generated by a 2MW wind plant is approximately 5.25GWh per year (1 GWh = 1 Gigawatt hour = 10^6 units of electricity) — about enough to supply a town of population 2000, at half today's electricity demand.

In the early period of a wind power program, when a small number of wind generators at various locations would be coupled into existing grid systems, no additional storage of wind energy would be needed, since fluctuations in supply from the wind plants could be accommodated by varying the output from the rest of the generators feeding into the grid (fossil fuel and hydro stations in Australia). In this mode wind plants would serve as fossil fuel savers. However, the maximum contribution of wind power to total electricity supply would be limited to 10 per cent, otherwise the grid system would become too unstable.

If wind power is going to provide a major portion of electricity supply, clearly storage is necessary. The principal methods proposed are hydrogen, pumped-water storage, flywheels and lead acid batteries. The first two are the most promising at present, and will be considered here.

In pumped-water storage, whenever electricity from wind plant fed into the grid leads to an excess of supply over demand, the surplus electricity is used to pump water from the low to the high dam of a hydroelectric scheme. When the wind drops, water in the upper dam can be run back to the lower dam through turbines to produce electricity and hence supplement supply. Neglecting transmission losses, electricity can be stored in this way and be reconverted back to electricity with an overall efficiency of about 70 per cent. Pumped storage has been in use for many years in several countries to store the surplus night-time output of conventional base-load power stations; some schemes cleverly have a single machine which doubles up as pump and turbine. Sweden plans to use pumped storage for its wind power system.

However the potential for using pumped storage for wind power in Australia does not appear very great. The Snowy Mountains hydroelectric scheme already has one pumped storage unit, Tumut 3, but its maximum energy storage capacity is only 10GWh, enough to satify half Victoria's present electricity demand for only 10 hours. Existing conventional hydroelectric capacity could be used to partially meet demand during periods of no wind, though even at half demand substantial storage of wind energy in some other manner would be required (see later figures for hydro capacity). There is limited scope for further pumped storage and hydro projects, and there would be strong environmental objections to using these potential sites. Suitable mountainous areas are also located many hundreds of kilometres from population centres and wind belts, so transmission losses would be high.

The conversion of wind electricity to hydrogen via water electrolysis and back to electricity in fuel cells looks more promising than pumped storage for the Australian situation. Bockris, one of the strongest Australian advocates of the so-called hydrogen economy, holds that the efficiency of converting electrical energy to the chemical energy of hydrogen could be improved to 85 per cent, while fuel cells with hydrogen input could generate electricity with an efficiency of 65 per cent (the best so far achieved is 50 per cent).

In the absence of precise data on matching between wind speeds and electricity demand I will assume all the electricity generated from wind plants is stored as hydrogen and then converted back to electricity before use. This will give an overestimate of the number of wind plants required.

On assuming Bockris's optimistic conversion efficiencies, the 5.25GWh/year of electricity produced by one 2MW plant would give 5.25 x 0.85 x 0.65 = 2.9GWh/year at the point of use.

Before calculating the number of wind generators needed to meet our target year-2000 demand, we must consider the renewable energy supply available in existing hydroelectric schemes, especially from the Snowy Mountains and Tasmania.

Since Tasmania already supplies very nearly 100 per cent of her total electricity demand from hydro plants, we need only deal with the mainland situation. Currently, the total mainland electricity production is approximately 73,500GWh/year, so our goal is to supply half that, ie, 36,730GWh/year.

The contribution from existing mainland hydro schemes (mainly the Snowy) is 7,350GWh/year; hence if we assume it would be possible to use this hydroelectricity in an optimum complementary manner to wind-generated electricity, the remaining demand to be met from wind power is 29,400GWh/year.

With 2.9GWh/year produced by one 2MW wind generator, the total needed to supply half our present electricity demand for all mainland Australia is 29,400/2.9 = 10,000 wind plants. This figure compares with the 10,000 windmills dotted around Britain at the turn of the eighteenth century and the 100,000 that were still operating in Denmark in the early 1900s. But the latter were about ten times smaller than 2MW machines.

Apart from Mullett's wind analysis for SA, reliable data suitable for pinpointing sites for these 10,000 wind plants is unavailable. It is therefore impossible to say at this stage definitely whether enough locations could be found. But with wind generators capable of operating in a 6.3m/s mean wind speed, (allowing inland sites to be used) and a very windy coastline stretching thousands of kilometres from Geraldton in WA round to Kingston, south of Adelaide, it would seem probable that there would not be a shortage of physically suitable sites.

Wind plants with 60m diameter propellers can be placed as close as 600m without interfering with each other through air turbulence. Whether an array (2 or 3 deep) of such plants along a particular coastline, or offshore, is acceptable environmentally is a question that would no doubt stimulate heated debate.

NASA's contention that 350,000 1.5MW machines could be built in the US by 1985 suggests that, given the political will and sufficient financial encouragement, there would be no technological reason why Australian industry could not produce 10,000 2MW units by the year 2000. The job-creating potential of this new industry would be considerable. The most technically similar existing Australian industry is aircraft production.

While wind power offers one of the highest efficiency ways of getting electricity from a renewable source of energy, other ways exist of converting sunlight to electricity, the use of which would reduce the total wind capacity needed.

Solar cells in particular offer an attractive decentralised means of

supplementing electricity generated from remote wind plants, and their cost is falling rapidly. A rough calculation for Melbourne shows that 10 square metres of solar cells on a house roof could collect over a year 30 per cent of today's average annual household electricity consumption. The latter includes electricity for an all electric water heater and if solar collectors were used for water heating, 10m² of solar cells could provide 50 per cent of the household's yearly demand.

Factory roofs obviously provide much greater areas than houses for solar cells. Outputs from these could supplement wind electric inputs to industry. Yet even with extensive installation of solar cells, wind power would still probably supply the greatest proportion in meeting the half-current-demand target set.

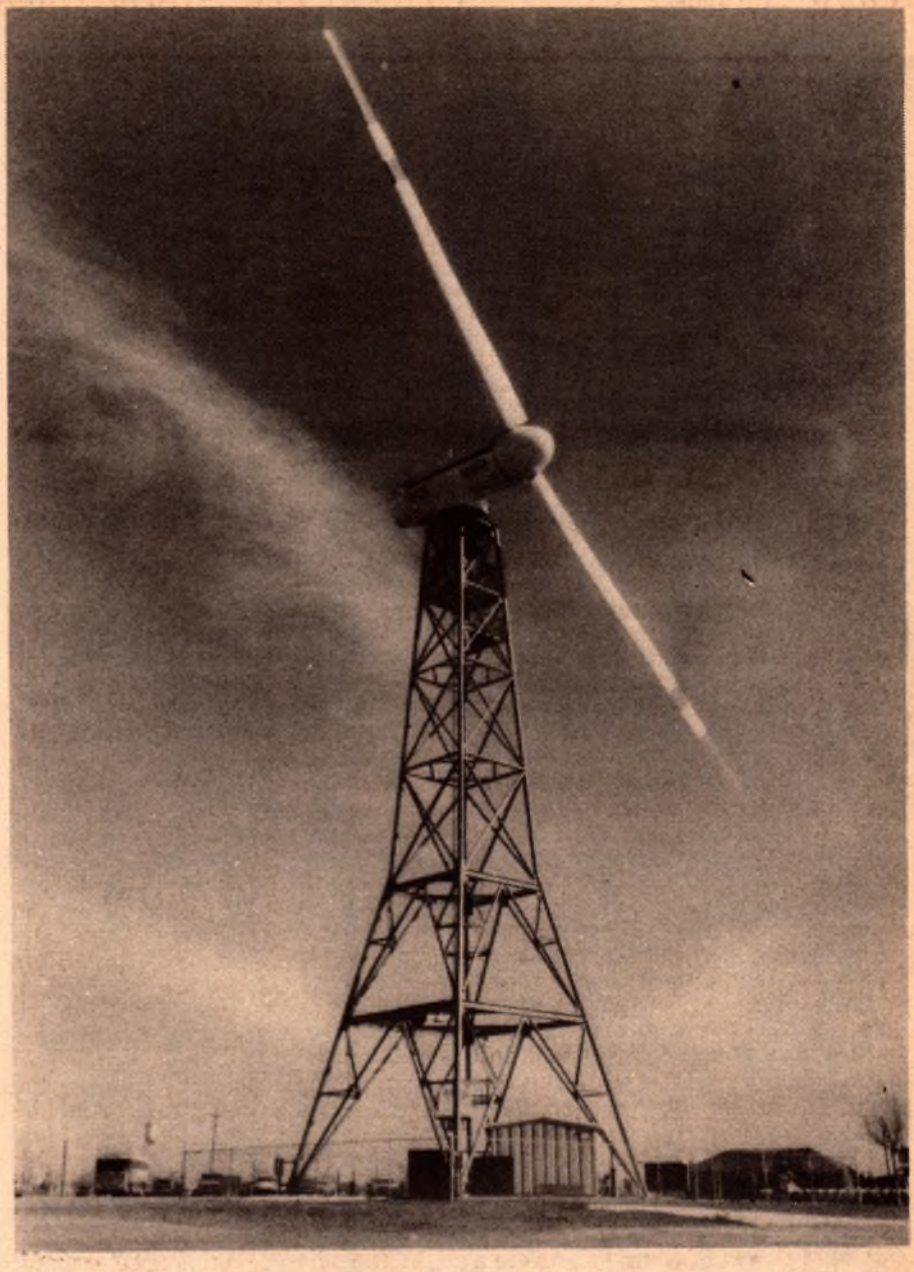
Mullett concluded in 1957 from his wind study of SA for the Electricity Trust of South Australia that economic quantities of wind for large scale exploitation existed on high country in the southern regions of Australia, provided wind generators could be built for the costs he assumed. None were ever built in Australia. Here and overseas interest in wind power wained as news spread around the world of stupendous oil discoveries in the Persian Gulf.

Almost two decades later, Donald Atkinson of Flinders University, a latter-day colleague of Mullett (who is now retired), used the old wind pioneer's data and some of his ideas in a proposal to the Ranger Inquiry for large-scale wind generation in South Australia. Suggesting the use of large lead-acid batteries for storage, Atkinson arrived at the rough estimate of $250-400 per installed kW of wind capacity, including storage. Such figures would make wind power economic today in Australia compared to coal-fired power stations, the present cost of which is about $400-500 per installed kW.

Bockris has done a detailed costing of a complete wind-based hydrogen scheme, involving 5MW wind generators floating off-shore and undersea storage of hydrogen. His figure is $450-900 (1975 prices) per kW, which includes the cost of water electrolysis, storage, distribution of hydrogen over a distance of 1600 km from point of production and its reconversion by fuel cells to electricity. He estimates the cost/kWh of electricity at point of use would be 0.79 cents, lower even than off-peak electricity rates today (1.31 cents/kWh in Victoria).

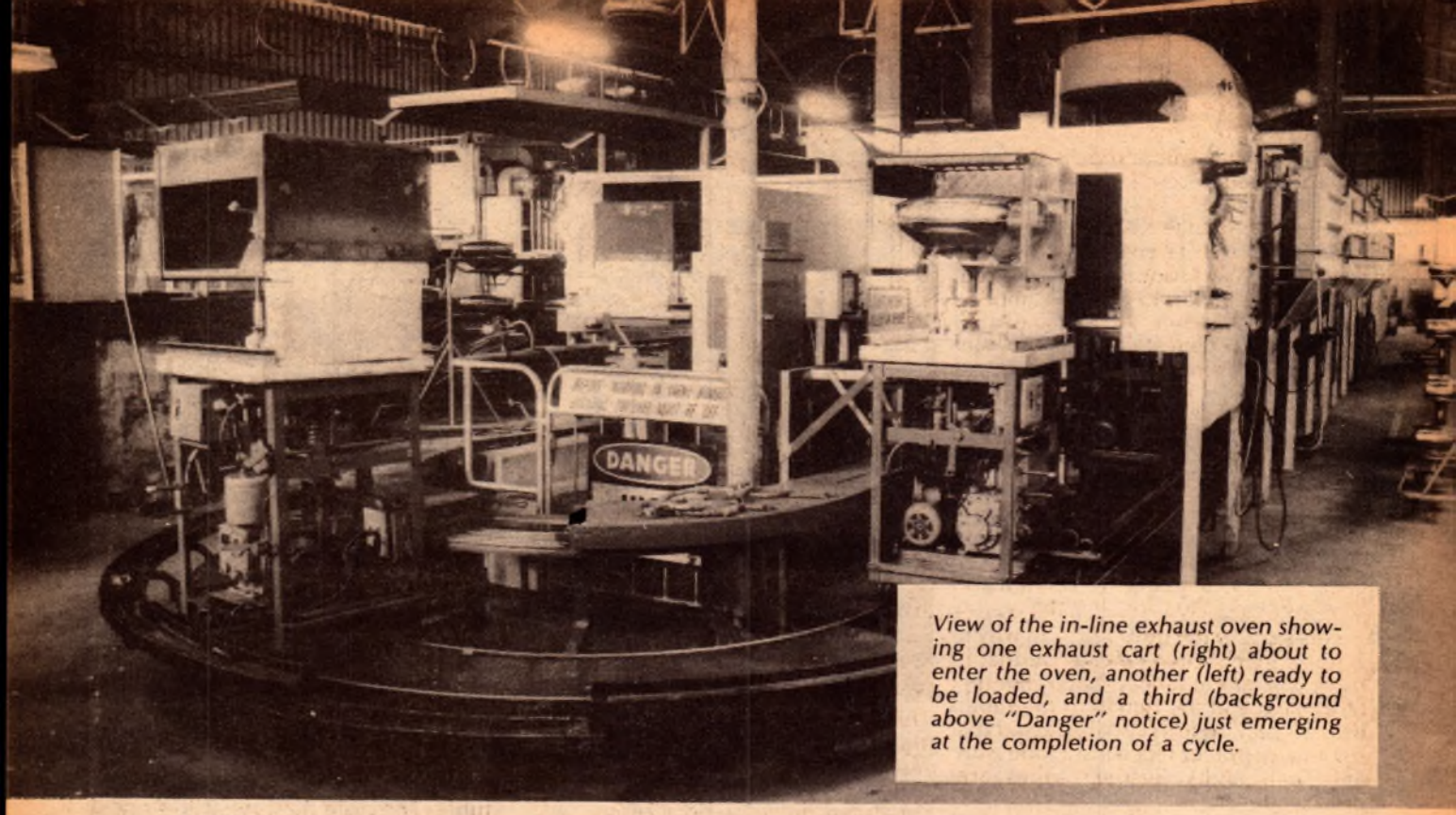
Sorensen has done a detailed comparison of the economics of wind power with other sources such as nuclear. His figures, perhaps some of the most reliable so far, are $US400/installed kW and 1.3 cents/kWh for 1MW wind units without storage, and $US600/installed kW and 1.7 cents/kWh for the same units with storage (1975 prices). He quotes $US720/installed kW and 1.4 cents/kWh for light water nuclear reactors. Sorensen's conclusion is that wind power is likely to be economic today when coupled to a grid system and used as fossil-fuel or nuclear-fuel savers (ie. when no separate storage is needed).

In considering the economics of wind power it is essential to keep in mind the particular energy priorities of the country or area under examination. For example Martin Ryle has shown very convincingly in "Nature" that over the next 10-15 years wind-generated electricity offers a far more economical and practical means of replacing energy now obtained from oil and natural gas in the UK, than does nuclear power. Comparing wind and nuclear power on the basis of provision in both cases of 150-hour storage facilities for low-grade heat at the point of use to reduce peak loadings, Ryle estimates the costs as $US500/installed kW for 1MW wind generators, and $US1250/installed kW for nuclear power stations when costs of fuel reprocessing and waste-storage are included.



Wind in action — this wind turbine generator, equipped with two 18-metre aluminium blades built by Lockheed, supplies the small town of Clayton, New Mexico, with up to 15 per cent of its electrical power. The generator sits atop a 30-metre tower and is capable of producing 200kW of electricity.

Reprinted from "Chain Reaction" Vol. 3 No. 3 1978, quarterly publication of Friends of the Earth, Australia.



View of the in-line exhaust oven showing one exhaust cart (right) about to enter the oven, another (left) ready to be loaded, and a third (background above "Danger" notice) just emerging at the completion of a cycle.

Australian firm rebuilds colour picture tubes

What happens to old colour tubes when they wear out? After only three years of colour TV it may seem premature to raise this point but, in fact, a small percentage are already being replaced and this trickle will become a stream in a few years' time. At least one Australian company is already re-building these tubes and preparing for the future.

by PHILIP WATSON

The idea of rebuilding colour tubes may come as a surprise to many; it certainly did to the author. Rebuilding monochrome tubes was one thing, since they are relatively simple devices, but a colour tube is something else again. How is it possible to fit new hardware with the necessary accuracy? How good is a rebuilt tube? What is the life expectancy of the screen, which cannot be replaced? And how much cheaper is a rebuilt tube?

These, and similar questions, prompted the writer to approach the company concerned, Thomas Electronics, in the Sydney suburb of Riverwood, to arrange a visit to their factory and to try to get some answers.

The managing director of Thomas Electronics is Mr William Hutchinson, who helped found the company in 1956, as a wholly owned subsidiary of Thomas Electronics Inc. of the USA. In 1961 the local directors purchased the Australian subsidiary from the American company and in 1963 EMI Australia acquired a fifty per cent iterest, which it still holds.

At its peak the company was producing 145,000 monochrome tubes a year and employed 145 people, many of them skilled workers. With the advent of colour it was obvious that the demand for monochrome tubes would run down and, at one stage, the number of employees dropped to 22.

Since the company commenced rebuilding colour tubes, even though in small quantities, its payroll is climbing again. It now has over 30 employees and the number is expected to grow steadily as the demand for replacement tubes increases.

Even at this stage they are equipped to rebuild some 47 types of colour tubes being used in Australia. While not representing the full range, it does cover the most popular types. Of those not yet on their list, some hold too small a share of the market to justify tooling costs. Others must be rejected because replacement parts are not available from the original makers.

Mr Hutchinson was not only happy to answer my questions but also took time out to conduct me over the factory and explain the various steps in detail. We spent a couple of hours in the factory alone, which gives some idea of the complexity of the operation.

From the time a faulty tube is booked into the factory, until it leaves the factory in rebuilt form, the emphasis is on quality control, with at least the same

standards being applied as would be appropriate for a new tube.

When a faulty colour tube is received it is subjected to a series of tests to establish whether it is suitable for rebuilding. The first test is a visual one for scratches or bruises on the glass which, if serious, may disqualify it. (Bruised glass is glass which has been bumped, causing crazing on the surface and deep cracks beneath it. These can seriously weaken it.)

Next comes a high voltage spark test to determine whether the tube is still under vacumm since; if not under vacuum, it is unsuitable for rebuilding. There are several reasons for this. One is that the presence of air and moisture in the tube can damage the screen. Again, since the tube cannot be energised, the screen and shadow mask cannot be checked for defects.

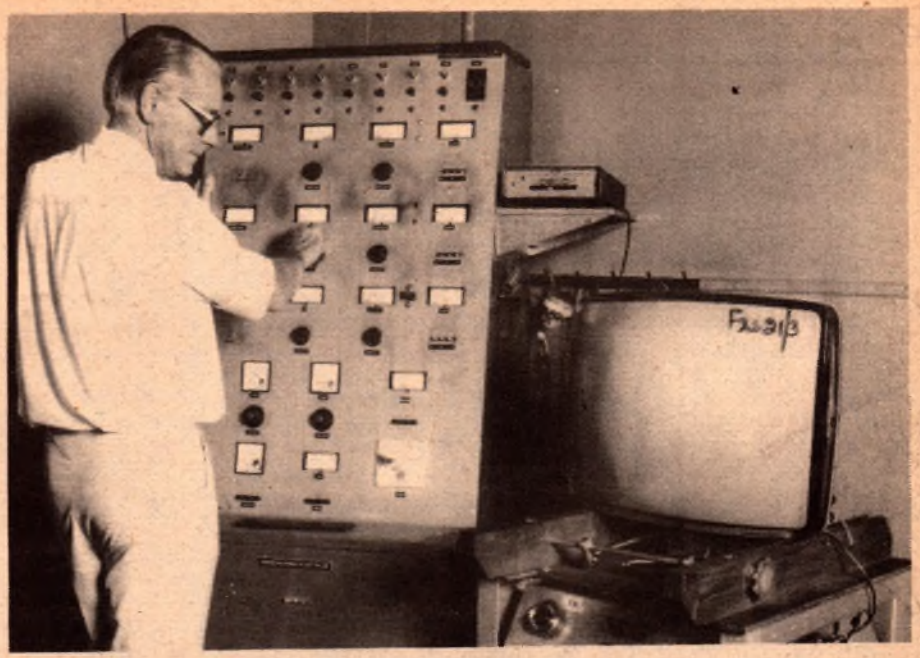
There is also the question as to why it is not under vacuum. It may be that it has a leak at the junction between the face panel and the funnel of the tube: the "frit seal" as it is called. To avoid the risk of a customer receiving a tube with any such faults, suspect tubes are destroyed.

If the tube is under vaccuum it is connected to a universal test jig which energises the gun and puts a raster on the screen, which is then checked for burns, discolouration, or blocked apertures. The last named is a blockage in one or more of the holes in the shadow mask, each blocked hole blacking out its three associated colour dots.

A certain number of such blockages are tolerated even in a new tube, depending on the part of the screen involved. "New tube" specifications are applied to all tubes selected for rebuilding. Assuming it passes all tests, a tube is ready for the rebuilding process proper.

This starts with the tube being "let down to air", ie, let down to atmospheric pressure. This is done by what, to the layman, looks like a rather drastic procedure; a small hole, about 1/32in. diameter, is drilled in the neck of the tube, using a high speed tungsten bit. Immediately the hole is drilled it is coupled to a source of dry nitrogen which fills the tube over a period of about five minutes. The nitrogen prevents the ingress of moisture and protects the internal metalwork against oxidation. The hole is then sealed, the tube possibly going into store at this stage.

The next step is to remove the external metal hardware, such as the tension band and associated mounting lugs. Some bands are simply wrapped around the tube, tensioned, and crimped. Others are prefabricated to the correct size and are fitted by heating until they expand sufficiently to slip over the glass. As they cool they apply the correct tension automatically. Another type of tube, called a "shell bonded" tube, has this hardware

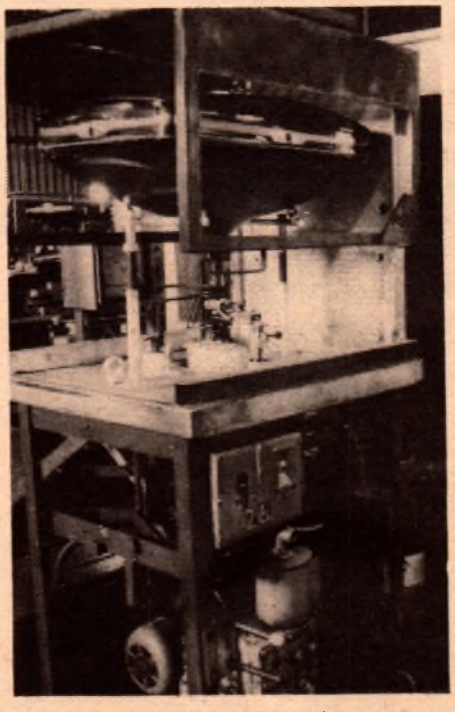


This jig can check the cut-off voltage for each gun, the emission of each cathode, and produce an enlarged cathode image for a visual check. It also generates a raster and patterns for purity, convergence, and other visual checks.

cemented on with epoxy resins.

The shrunk-on bands are removed by simply heating the metal again until it can be tapped off with a hammer — a rather disconcerting operation to watch until one remembers that the tube is no longer under vacuum. In the case of the shell-bonded tubes the resin bond is destroyed, the shell removed, and surplus resin or other material cleaned off the glass.

The tube is then taken to a wash unit, a large stainless steel tank containing a rotating table with jigs to hold the



Loaded exhaust cart, ready to enter oven at right. Note the RF heating coil around the neck of the tube.

tubes. The main purpose of this operation is to remove the outside conductive coating (aquadag), using caustic soda and other chemicals. This coating would probably be damaged anyway, during subsequent handling, as well as being something of a nuisance, so it is best removed at this point and reapplied later.

The next operation is to remove the old gun. The tube is set up in a re-neck lathe, being held in place with a vacuum chuck against the tube face. The lower portion of the neck containing the gun is cut off and a new neck fitted.

The new neck is held in the tailstock of the lathe, mated with the cut end of the old neck, and the two welded together by rotating the assembly while gas flames are applied to the junction. The neck is then sealed to exclude any foreign matter.

Now comes the really tricky part; to fit a new gun in precisely the same position, and having precisely the same orientation, as the original gun. Unless this is done within acceptable tolerances both the convergence and colour purity of the tube will suffer.

Prior to the actual fitting, the tube is given a vibration treatment. It is held face up and vibrated for about four minutes with an air-driven vibrator unit. The purpose of this is to shake loose any residual foreign particles which have attached themeselves to the shadow mask or the walls of the envelope. These settle on the sealing plug at the end of the neck and are removed with it prior to fitting the gun.

The new gun is fitted using essentially the same techniques as used to make a new tube. All colour tubes are fitted with three precision reference flats on the outer edge of the face plate; two on

the long side and one on the short side.

The tube is supported face up in a jig in which reference pins are mated with these reference flats. By this means the tube is accurately orientated with respect to the other portion of the jig, which supports the gun assembly.

The gun assembly consists of the gun structure proper, a button base with the base pins, and an exhaust tube emerging from the centre of the base. The gun holder is a sliding support which raises the gun assembly into the neck of the tube to a precise height. It also controls the orientation of the gun, relative to the screen and shadow mask.

The height of the gun in the tube has to be maintained within 0.25mm and the orientation within 0.5°. Axial alignment is maintained by the original neck of the tube, which is left long enough to enclose the new gun.

Thus positioned, the base button of the new gun is welded to the tube neck by a complex system of gas flames. The usual method is to rotate the jig and tube while stationary gas flames are applied to the neck. However, Thomas have developed and are using an alternative method: holding the tube stationary while the gas flames rotate. This arrangement is a little slower, but maintains a higher order of precision.

Discussion of this process, and the tolerances involved, raised the inevitable question: just how good is a rebuilt tube in this respect? Mr Hutchinson was quite emphatic that the tubes which they rebuild are at least as accurately aligned as a new tube — and in many cases better.

He quoted, as one example, a particular tube which, when new, normally requires the addition of small permanent magnets cemented to the tube funnel to obtain acceptable purity. As rebuilt by Thomas, these tubes very seldom require any magnets for the same performance.

Another natural question at this point concerns the guns, particularly their origin. In the case of monochrome tubes, guns have been manufactured on the premises in a large, controlled environment area.

However, it is not practical to manufacture the colour guns locally, and these are imported from various overseas sources — generally the same sources as those from which the original tube manufacturer purchased his guns!

The only part added locally is the getter wand, which is welded to the gun just prior to use. Getters deteriorate if exposed to the atmosphere for more than a few hours and they are supplied in sealed containers packed with silica-gel.

Having fitted the gun, the next step is to exhaust the tube and seal it off. This is a long and involved procedure, requiring a lot of complex equipment. In fact, it would seem that this is one of the most difficult parts of picture tube production, whether new or rebuilt.

The main problem is to remove all the "occluded" gas, retained in or on solid material inside the tube. While always a problem, it is aggravated in a colour tube. Apart from the shadow mask itself, Mr Hutchinson pointed out that more modern tubes now have internal magnetic shields and black matrix coatings on the screen, both adding significantly to the materials which can harbour gas.

The only practical way to extract such gas is to heat the tube and its internal hardware to the highest permissible temperature during the exhausting process. Because the operation takes several hours, a lot of equipment is necessary to handle a reasonable number of tubes per day.

The equipment is known as an in-line exhaust oven, but might be better described as a tunnel with a railway track running through it. On this track are a number of exhaust carts — 80 were in use for monochrome tube production in the Thomas plant — which are propelled slowly through the tunnel by a chain.

A tube is "let down" by drilling a hole with a tungsten drill. Dry nitrogen is then introduced to protect the screen.

Each cart carries a complete exhaust system, consisting of a mechanical exhaust pump in conjunction with an oil diffusion pump. It also carries a jig to support the tube in a base down position, an RF heater coil around the neck of the tube, plus provision for connecting power to the heater pins, and controlling this power. Each cart is fitted with a hood over the tube to provide more even distribution of heat.

In use the jig lowers the tube so that the glass tube protruding from the base engages what is called an "O" ring gripper assembly, which connects the tube to the vacuum pump system.

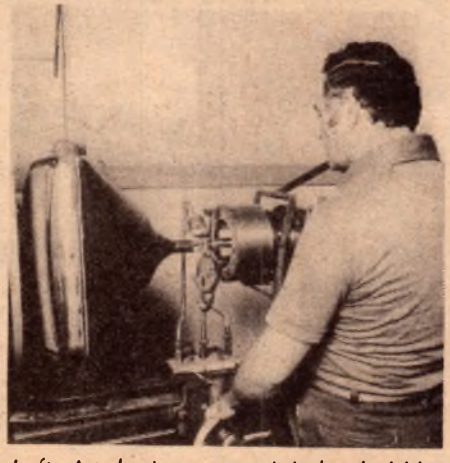
The oven is electrically heated on a graduated basis so that the tube is slowly raised to a peak temperature of 400°C at the centre of the picture tube face.

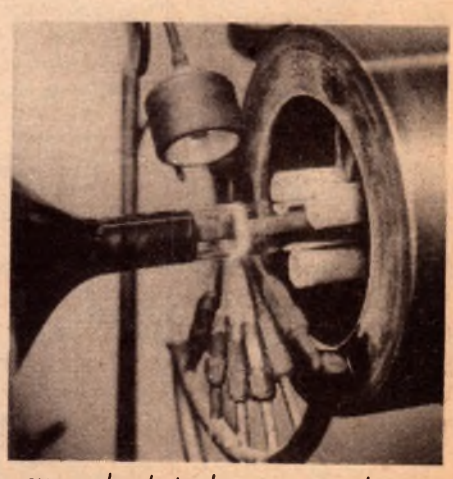
From this point the temperature is gradually reduced until, when the tube leaves the oven, it is down to 120°C. The whole operation takes about four hours.

At appropriate times during this process, other operations are performed. One is to energise the RF heater coil, which heats the gun to a dull red. This helps to outgas the metal and assists in converting the cathode material to an active form.

At the same time a series of voltages are applied to the heater to perform the major conversion function. The cathode material is predominantly barium carbonate, but containing strontium carbonate and calcium carbonate. It is converted to barium oxide and free barium diffused throughout the oxide coating.

The exhaust cycle is terminated at a suitable point in the cooling cycle as the tube approaches the end of the oven. There is a heating element around the small glass tube emerging





Left: A tube in a re-neck lathe, held by a vacuum chuck. Right: Close-up showing a new neck in the tailstock being joined to the old tube. Note the band of red hot glass above the gas burners, which are fed and timed automatically.

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from the tube base and this is energised. The glass tube melts and collapses inwards under atmospheric pressure, thus sealing the tube.

The picture tube is removed from the jig and transported by conveyor belt to the next station. Here the getter is flashed, using an RF heating coil, to absorb any remaining gas.

As the tube leaves the exhaust cart its vacuum would be in the region of 5 x 10^{-6}mm of mercury (mm Hg). After getter flash it would be into the 10^{-7} region and after a few hours of use would go even higher, probably approaching the 10^{-8} region.

The reason for this last improvement is that the electron beam excites the molecules of gas in the screen, which are released and absorbed by the still active getter.

After getter flash, the tube is given a high voltage spark treatment. All the base pins are grounded and an EHT voltage is applied to the final anode at various levels up to 60kV. This results in a certain amount of sparking within the tube as minute foreign particles are destroyed. The device is commonly called a "spot knocker".

The next step is an ageing process. This occupies about 50 minutes, during which time a series of voltages are applied to the heater, G1 and G2. The heater, in particular, is treated quite harshly. For a 6.3V heater there is a "hot shot" test consisting of between 10 and 12 volts (depending on the type of cathode) applied for one minute. This is followed by a "run out" voltage test of between 9 and 9.5 volts applied for 30 minutes.

The tube is now given a series of leakage tests. About 200V is applied between heater and cathode, 450V between G1 and all other elements, and 1000V between G2 and all other elements. This is followed by the application of a high voltage (around 29kV) to the final anode and 6KV to the focus electrode.

Performance parameters are tested next. The cut-off voltage of each gun is checked, followed by an emission test for each gun. The tube is then degaussed, and put through a normal purity and convergence adjustment sequence. Particular attention is paid to the white field uniformity and dynamic convergence performance. There is also a beam landing check, using a 40 power microscope.

This is followed by an inspection for blemishes due to blocked apertures &c. As mentioned earlier, new tube specifications are applied to the rebuilt tubes.

The specifications are, in fact, quite complex but, as an example, they provide for one high contrast blemish, up to .05in. (1.27mm) within the "A" zone: an area 11in. x 8in. (280mm x 203mm) in the centre of a 26in. (64cm) screen, 9in. x 7in. (228mm x 178mm) for a 22in. (53cm) screen, and so on proportionally.

Assuming the screen passes the visual checks, the cathode surfaces of all three guns are examined. This is done by applying appropriate potentials to the various gun electrodes so that an enlarged image of the cathode surface appears on the screen. The cathode is examined for unactivated areas which, if present, could shorten cathode life.

If it passes this test it is given a gas ratio check to ensure that the vacuum is being maintained. After this test, the tube is held for a minimum period of 24 hours before further tests and processes are performed. After this period it is given another gas ratio check.

This completes the testing for the time being, the next step being to fit new metal hardware systems, each requiring different jigs and fitting techniques. The face of the tube is then hand polished.

Only one process now remains to complete the tube; to re-apply the aquadag coating removed at the beginning of the process. Before this is done, however, two more tests are applied.

One is another visual check for screen blemishes, such as might be caused by particles of foreign matter which have appeared in spite of previous precautions. The other is a further emission check for all three guns.

The tube is then spray masked, loaded onto rotating tables, and a new aquadag coating sprayed on. It then passes through a drying tunnel and is labelled with the type number &c.

Finally the tube is boxed but, even here, precautions are taken to ensure reliable service. The tubes are packed with the anode button up, as they are normally fitted to a set. This puts the getter wand at the bottom, where it is least likely to shed foreign particles or, if it does, where these are least likely to cause trouble.

Fitting a new gun. The tube is held in a precision jig while rotating gas flames weld the gun to the neck.

The rebuilt tube is given the same warranty as a new tube: namely, one year. In practice, it is generally considered that any tube which lasts for six months is unlikely to suffer from mechanical failure, and will simply wear out. For monochrome tubes 10 years would be a typical forecast, while colour tubes, due to the heavier beam current and generally more arduous operating conditions, should last from five to seven years.

A natural question which arises in regard to the rebuilt tubes concerns the life of the screen: the one part that is not replaced. According to Mr Hutchinson, overseas statistics indicate that this suffers very little wear.

The screen in a new picture tube will suffer a very slight drop in output during the first 100 hours of life, after which it stabilises. Experience to date suggests that the light output may drop by about 10% over 10 years of typical use. In fact, very few people keep the same set for this length of time.

How does the cost of a rebuilt tube compare with that of a similar new tube? Exact prices vary, but a reasonably accurate general comparison puts the rebuilt tube at about half the price of a new tube. This is on an exchange basis and assumes that the old tube is suitable for rebuilding.

How well has the Australian trade — and public — accepted the idea of a rebuilt tube? Extremely well, according to Mr Hutchinson. Almost invariably, the trade recommends rebuilt tubes to their customers, by reason of the substantial saving in cost and, almost invariably, this advice is taken.

In fact, it is not unusual to find that, if the required rebuilt tube is not immediately available, the customer will elect to wait a few weeks until one is available, rather than buy a new tube.

Which is a nice note on which to finish. Both the technical and commercial aspects of the whole process proved most intriguing. Nobody could fail to be fascinated by the varied complex processes involved in picture tube produce, or to be impressed by the stringent quality control which the makers regard as essential.

On top of that, at a time when so many Australian electronic firms have been forced to the wall by overseas competition, it is most encouraging to find firms like Thomas who have been able to hang on and prepare themselves for a comeback. The fact that they appear to have won the confidence of the trade is particularly significant, because such confidence has to be earned.

Forum

Conducted by Neville Williams

A SORRY TALE OF ONE INVENTOR

Having carried two lengthy articles recently about patents and the role of patent attorneys, we are not about to devote yet more space to what is essentially a rather prosaic subject. However, it has thrown up other quite different problems which face inventors and their would-be sponsors — what happens beyond the patent stage.

Let me begin by saying that the situation on which the following remarks are based is not a hypothetical one, which could develop sometime, somewhere. It involves real people whom I know or know of, and who have been involved in negotiations quite recently. There I must draw the line, however, because I am under obligation not to mention names or identify the invention in any way.

It is sufficient to say that the inventor involved in the particular situation has an engineering background, plus a mix of ambition, curiosity, initiative and a tendency to question the sacred precepts of his profession — very much the formula for an innovator, rather than a 9-to-5 conformist engineer.

Some years ago, he came up with a way-out idea and a theory which, while revolutionary, seemed to have considerable potential. He set about producing a prototype and demonstrated, to his own satisfaction, that it was indeed workable.

However, his prototype was crude and, clearly, a lot of time, effort and money would be needed to develop and upgrade it. Being short of the last-named commodity, he took out the necessary patents and set out in search of financial backing.

Unfortunately, the story, at this point, falls into an all-too-familiar pattern and I digress from the particular to the general:

Inventors, typically, are highly enthusiastic about their respective brainchildren and intent on presenting them in their very best light. They tend to minimise possible problems and see only the time when their creations will have found universal acceptance. Their names will have gone down in history and their sponsors will have been repaid manyfold for their generosity!

But sponsors are typically much more pragmatic. They insist on interjecting with "yes, but. . . ." and interposing nagging questions about immediate and long-term costs, the possibility of failure, alternative options, competition and so on.

To an inventor, the would-be sponsor looks like an unimaginative cretin, shepherding money that he probably didn't earn anyway, and denying the community the chance of sharing in something they rightly ought to have!

But to the "cretin", the inventor is a typical "crackpot" enthusiast who has an interesting idea but is so blind to the attendant problems as to be a thoroughly impractical partner.

So they go their separate ways and, after a few such experiences, the inventor becomes discouraged and perchance convinced that he is being deliberately frustrated by vested interests, lurking somewhere in the background.

"Vested interest" is the oldest story in the book and, while there may be some cases where it operates, I would judge them to be very much in the minority. By far the most common pattern is for inventors to over-sell their idea, to resent criticism and to dismiss rather than examine the hazards, thereby effectively destroying their own credibility. Combine that with notable caution on the part of potential backers and a breakdown in negotiations is not only possible but probable!

"Charles? Oh, he's down in the basement as usual, working on that stupid closed circuit television idea!" (from Radio-Electronics).

For many hopefuls, the story ends right there.

In the case which I set out to relate, the particular inventor went through all this but was challenged rather than discouraged by lack of support. He dug his heels in, kept working on a shoestring budget and carried the development of his idea to a stage just short of marketing. What he needed then was backing to set up a full-scale commercial operation.

Accordingly, he approached a potential backer, who expressed interest and sent along a couple of qualified experts to evaluate the proposition.

There the trouble started all over again: phase two!

The experts were reasonably impressed but felt that the prototype needed to be critically and independently scrutinised in terms of basic theory, engineering approach and as a proposition for full scale production. As part of this, the prototype should be tested in, and exposed to, the possible rigours of on-site usage, to show up any weaknesses.

They suggested that its place in the market had to be examined and defined and special attention paid to the "human engineering" side — how it might be used, or abused, or misunderstood by the target users.

Unfortunately, earlier experience had made the owner of the invention defensive to the point of being totally uncooperative.

He was an engineer himself, and had spent years studying and developing the project. Why should his work need to be questioned and examined so critically by outsiders? But, if it had to be done, it would be done on the spot under his personal surveillance.

The same applied to the proposed on-site tests. They could be simulated in his workshop and under his supervision.

As for design and marketing, he'd been planning this for years. What the public needed and wanted was beyond argument!

And so it came to a classic impasse.

The inventor believed — and presumably still believes — that his project is virtually complete and that he, personally, has all the skills necessary to guide it on to the market. His share of the sales revenue should be proportioned accordingly: the "lion's share".

But the experts said that, in all conscience, they could not advise their principal to put up the very large

amount of money involved unless the project was thoroughly tested and proven beforehand. And that meant bringing independent judgement and expertise to bear on everything from basic theory to marketing strategy.

Because the inventor won't wear this, their advice to their principal has had to be "back off". This, in the full knowledge that there are other prospective backers.

Let me hasten to add that the experts involved have no vested interest in the matter whatever, and what was told me was related in sorrow rather than anger.

One of them outlined to me the nature of his reservations and the steps that would be necessary to clear them. They sounded logical enough to me.

His observations, paraphrased from memory, may provide food for thought to any inventors who may find themselves in a parallel situation:

"Unless he changes his attitude, the story is going to be repeated until he runs out of potential backers.

"By insisting on doing everything his way, he could lose the lot and end up with nothing.

"If that happens, he may well be seen as yet another (Australian) martyr to vested interests!"

"Is this an unusual story?" I asked.

"Unfortunately no, and that's why I wouldn't mind you telling it, provided you don't identify the project or the people.

"Inventors should patent their ideas and they should certainly reap a reward if those ideas are put to use. But inventors often fail to realise that the successful launching of an idea or a product involves skills which they may lack — and those skills also have to be rewarded.

"In short, an inventor's prime expectation should be to negotiate terms which will ensure a proportionate reward for his idea and the work he has put into it.

"At that point, he may be well advised to back off and enjoy the rewards or royalties and let the production and marketing specialists take over."

Well there it is: something different to chew on!

FIRES IN TV RECEIVERS

By way of a welcome change from inventors and their problems, a letter from A. W. in Casuarina in the Northern Territory draws our attention to a reference which he noticed in a several weeks old copy of a local paper, apparently the N. T. News.

From the reference, it would appear that Darwin's Chief Fire Officer, Mr Holtham had implied that TV and radio sets were a potential cause of house and caravan fires in a climate as hot as Darwin. He was particularly concerned about sets which had not been tropicalised and others in which circuit boards tended to overheat. When sets are not in use, they should be turned

FORUM — Continued

off and the plug removed from the power point.

A letter to the editor from one "Doubting Thomas" sought to question the Fire Officer's opinion, wanting to know how many fires had been caused positively by TV or radio receivers, and whether he could name receivers on the market which did or did not exhibit the particular problems. Further, whether any competent Darwin dealers or servicemen were prepared to back up Mr Hotham's ideas.

Our correspondent's opinion is clear enough when he remarks: "Some enterprising tech. (which I am not) could make a mint with a can of CRC!"

I would welcome comment from people on the spot, but there seem to be three things mixed up in Mr Hotham's suggestions.

To me, "tropicalisation" would signify measures that I imagine would now be routine, to inhibit the ingress of moisture and the growth of fungus on wiring and components. Is some radio and TV equipment still prone to this in areas like Darwin?

Heating is really another matter but I would be surprised if any components could normally reach a temperature sufficient to start a fire. For sure, Darwin is hot, but is it any hotter than peak summer temperature further south?

As for withdrawing the power plug, the only likely safety factor would be in those few receivers where operating the ordinary receiver "off" switch leaves some circuitry alive, ready for instant picture.

To change the subject yet again, one of the most remembered of the topics discussed in these columns in recent times appears to be that of noise pollution, particularly as evidenced by the use of excessive sound levels in places of public entertainment. The number of times people comment on the discussion seemingly indicates the reality of it to the average citizen.

With that in mind, we reproduce below a brief article which was submitted along with one of the letters mentioned in the February issue, from D.C. of Beacon Hill, NSW. You may find it of interest:

Don't let this happen to you!

LOUD MUSIC: I am sure those who go to rock concerts, or anywhere there is loud music, do so primarily to have a good time. But have you considered what loud music does to you?

NOISE LEVEL: An average rock concert will reach a noise level of 110 decibels. A decibel is the term by which we measure loudness. Every increase of 10 decibels means that the sound is twice as loud. (The mathematicians among you will realize that the decibel scale behaves logarithmically.) Thus a sound of 100 decibels is twice as loud as a sound of 90 decibels. &c.

FOUR TIMES LOUDER: A loud shout, from a third of a metre, will reach a noise level of 90 decibels. That means an average rock concert will be four times louder than a loud shout. Can you cope with it?

TEMPORARY DEAFNESS: Everyone undergoes what is called a temporary threshold shift after listening to loud music. In other words you cannot hear as well for two to three hours after listening to loud music (longer in certain cases). However, your hearing normally recovers after this time. The problem is that, if you continue to subject yourself to excessive levels of rock music each week you greatly increase the risk of incomplete recovery and therefore permanent damage to your hearing.

HOW YOU HEAR: In the cochlea of your inner ear there are approximately 24,000 tiny fibres which variously vibrate, when they feel a particular pitch, and pass the message to the brain. As you get older, these hairs gradually lose their sensitivity and you begin to lose your ability to hear as many sounds as you could when you were younger. Generally the hairs which pick up the high pitched sounds are the ones which lose sensitivity first.

WHY THE LOSS IN SENSITIVITY?: It was once thought that the hairs lost their sensitivity quite naturally as one grew older. However, a Dr Samuel Rosen of Columbia University, New York City, discovered an African tribe in which the average 75 year old man could hear as well as an average 25 year old Australian or American.

NEAR PERFECT HEARING: What is different about the African tribe in comparison with people in Australia or the United States is that they live in a quiet environment (no heavy traffic, no planes, rock concerts, jackhammers, etc.). It should be noted that the Mabaans,the tribe studied by Doctor Rosen, do not have loud dancing ceremonies which are characteristic of some other African tribes. When Doctor Rosen examined members of the Mabaan tribe he also found that they had an ample blood supply to the ear. In Australia, as we grow older, blood supply is often retarded and, as one result, the hairs by which we hear no longer function properly.

WHOLE BODY AFFECTED: Did you know that loud sounds affect not just your hearing but your whole body? For example your heart increases, the pupils in your eyes dilate, some of your blood vessels get smaller, your adrenalin activity increases and the cholesterol content in your body rises. (Cholesterol is a fatty substance which can clog blood vessels.) So not only does loud music contribute to hearing loss it affects the health of your entire body.

REFERENCES

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Welch, B. L. & A. S. Physiological Effects of Noise Plenum Press. New York. 1970

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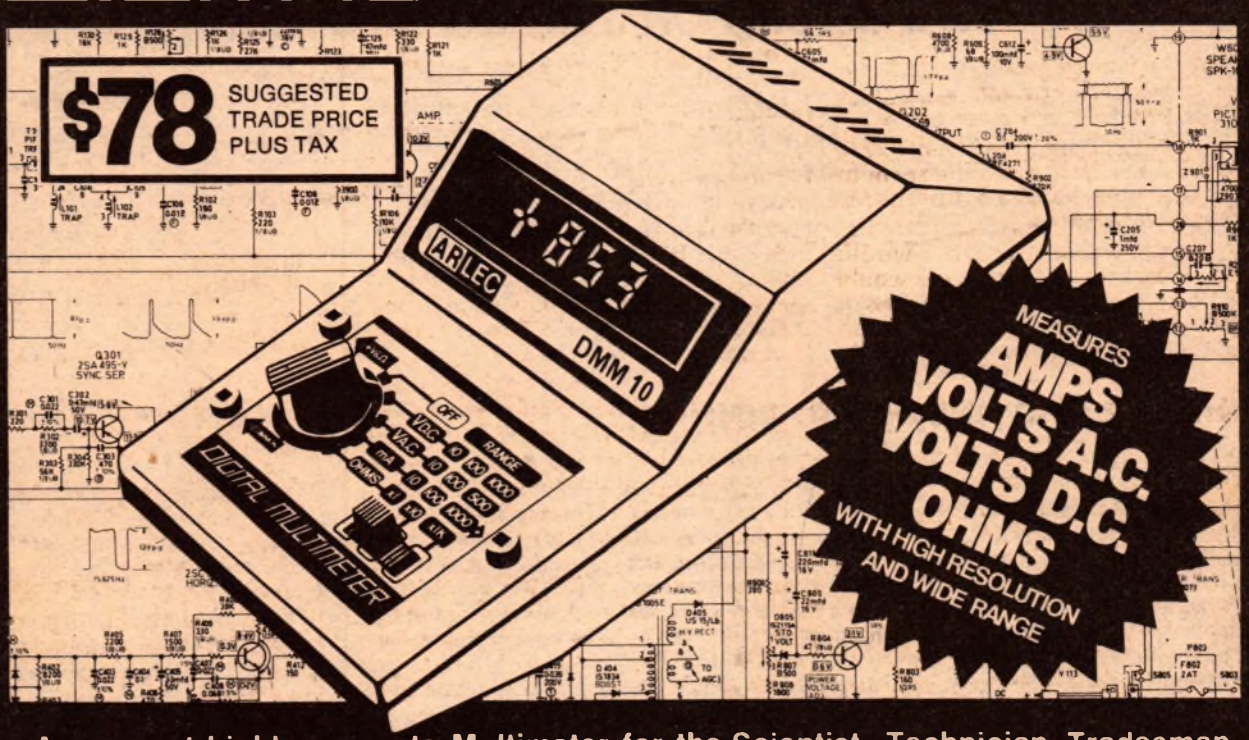

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Hi Fi News

THE FUTURE FOR 4-CHANNEL RECORDS & RADIO
PART TWO: THE CASE FOR THE SQ SYSTEM

Behind the scenes, at an industry level, quite intensive debate is going on aimed at determining, once and for all, a universal standard for "surround" sound. The decision will affect not only recordings, but stereo broadcasting practice. This article advances the claims of one of the two main contenders — the CBS/Sony "SQ" system.

by BENJAMIN B. BAUER*

No less than a dozen different quadraphonic schemes surfaced during recent years — some intended for records, others for broadcasting, and still others for both purposes.

In this latter category is the SQ (stereo-quadraphonic) system adopted by CBS and EMI among other record labels, and used for quadraphonic broadcasting by hundreds of radio stations in the US and other countries. It is one of a number of systems that are competing to become the standard accepted by the United States Federal Communications Commission (FCC), the government agency which has jurisdiction over broadcasting rules in the US.

Confronted with a divergence of opinions about the merits of different quadraphonic schemes, the FCC ordered its own laboratory to evaluate the quality of reproduction obtained with the various systems. After a series of comprehensive listening tests extending over nearly a year, the FCC laboratory issued its report (No. 2710-1) in August 1977. The US weekly "Television Digest" headlined the story "SQ shines in FCC FM Quad Study".

A comparative test conducted by any system's sponsor tends to be supportive of his own interests. And this is why the FCC tests are so important. The FCC laboratory has no vested interests. It is chartered to ensure the "public interest, convenience and necessity" of programmes transmitted over the US airwaves. Thus, its motivation is only to determine the facts in an objective and unbiased manner.

The FCC used the following procedure in comparing five systems: for the idealised "discrete" (4-4-4) system, a 12.7mm, 38cm/s, four-channel tape recorder was chosen on which a master tape containing five diverse musical selections was played. Another tape with localisation signals was also provided.

The four matrix systems were a "4-3-4" from RCA and three "4-2-4" matrix-with-logic systems, H from the BBC, SQ from CBS and QS from Sansui. Each matrix system comprised an encoder and a decoder.

For quadraphonic preference tests, the encoders received inputs from the master tape and fed the encoded outputs directly to the decoders. The decoded signals, as well as the original master tape signals, were compared in a pairwise manner with each other on a random A-B basis.

Listeners were seated in a swivel chair between four loudspeakers and provided with a box with two push-buttons labelled "A" and "B". Each could switch between any two systems presented anonymously until he was able to establish and make note of a preference. Then he went on to hear the next pair of signals.

Some 40 men and women participated in these tests — music students, high-fidelity enthusiasts, engineers and just ordinary music lovers — a cross-section of a typically knowledgeable, interested audience. The tests required each subject to audit and vote on upwards of 150 paired comparisons. To avoid fatigue, the test for each auditor was divided into four half hour sessions extending over two days.

The results of the tests were as follows. Coming within two percentage points (48:52) of the idealised system as represented by the master tape, SQ won easily over the other matrix systems: by 58:42 per cent preference votes over H, 61:39 per cent over 4-3-4, and 77:23 per cent over QS.

The FCC was very concerned with systems compatibility, ie how satisfactorily the various quadraphonic programmes "fold" into stereo and mono sound.

The following procedure was used: to produce stereo pairs, the left channels as well as the right channels of the four-channel master tape were connected together while, with the matrix systems, the stereo outputs were taken directly from the encoders. The five sets of stereo signals led to the switching system whereby they could be applied to the front loudspeakers pairwise, via the A-B box.

Mono preference tests were performed in a similar manner using a summation of the stereophonic signals applied to one of the front loudspeakers. The listeners were asked to express not only preference between A and B, but also the degree of preference.

In the stereo and mono experiments, the SQ system led all others. The FCC report does not provide a single rating number. One way, however, of obtaining an estimate of preference is by distributing the "equal" votes evenly between the system pairs. When this is done, it it seen that the preference for SQ over the other matrix systems, as well

Continued on page 25

*Benjamin B. Bauer is managing director of CBS Technology Centre, Stamford, Connecticut. The article is reproduced by arrangement with "New Scientist", London.

Satellites keep track of Earth resources

This "photograph", taken by an orbiting satellite 804km high, shows the centre of Reading, a small town in southern England. The image is made up from over seven hundred million tiny digital "picture elements" which have been pieced together by a new image processing system developed at Britain's Harwell Laboratories.

The new image processing system is the main theme of this month's front cover. Designated HIPS (for Harwell Image Processing System), it was developed to process the vast amount of information received in digital form from Earth orbiting satellites.

The system is now being used to solve pattern recognition problems to help scientists gain more information from remote sensing devices employed on the satellites. Typical remote sensing devices include cameras, infra-red scanners, and radar.

Actually, a mini-computer forms the heart of the HIPS system. It controls all of the data processing, communicates with the operator, and organises the transfer of data to and from the input and output devices. These include magnetic tape and disc units, a keyboard/printer, and a digital colour monitor for displaying the resultant images. The latter can be seen quite clearly in our front cover photograph.

In addition, the computer is linked to a "flying spot" scanner that can convert images on photographic film into a digital pulse train. The computer can then store this image for subsequent retrieval, or for further processing.

The picture of Reading (shown above) covers an area of 226 sq kilometres and is shown using only information contained in the near infra-red part of the spectrum. If you look closely at the bottom of the picture, you will notice a thin line running from east to west. This is the M4 motorway and is clearly visible to the 804 km high satellite despite the fact that it is only 90 metres wide at its widest point.

Various colours were chosen by the scientists to represent different Earth surface textures. In this particular example black was chosen to represent water, blue for high density urban areas (at centre of picture), and red and magenta for other urban areas.

Various rural areas are revealed in green, yellow, white and cyan.

One recent application of the computer has been to interpret pictures received from the Landsat series of satellites. These American launched satellites "photograph" every part of the Earth's surface once every 18 days. The images — each covers 298 sq kilometres — are recorded in only 25 seconds, effectively instantaneously in relation to any changes taking place.

One field where data from such photographs will be valuable is in agriculture, where the satellite can monitor crop development. With this information, farming tasks can be planned ahead and carried out at optimum points in the growth cycle.

The system will also allow more accurate national and global forecasts to be made of crop yields, and could even allow detection of illegal drug crops such as marihuana.

Please turn page

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We all have our favourite programmes which we would love to see again and again. With the Philips Television Cassette Recorder it's now possible. Simply press a button and the machine will record your favourite programme directly as you watch it.

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You know how it happens. You want to watch a programme on one channel and somebody else in the family has picked out a show on another. But with the Philips Television Cassette Recorder, a peaceful solution is at hand. You simply turn your TV to one channel, then select the other channel on the Recorder and set it to record. So as your family enjoys their programme, yours is being recorded simultaneously on cassette — even though it's on a different channel.

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Another fantastic feature of the Philips Television Cassette Recorder is that it can be pre-set up to 3 days in advance, to record any programme at any given time. So, if you're out for the evening or away at the weekend, you don't have to miss out on your favourite show. It's just a matter of selecting the right channel and setting the timer on the Recorder to the commencement time of the programme.

Some technical information.
The Philips Television Cassette Recorder allows you to record from any Australian television channel — UHF or VHF. And it's equipped with automatic fine tuning. Like audio tapes, the video tape cassettes that the recorder uses may be erased and re-recorded time and time again.

Conversely, if you wish to retain the taped programme, you can replay your Philips videotape cassettes up to 500 times. As an optional extra, there are also video cameras available for connection to the Television Cassette Recorder. Ideal for making your own home movies.

For free brochure on the Philips 367 1083 (E) Television Cassette Recorder or name of nearest retailer, write to:
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as over the master tape, in the stereo mode is approximately 60:40 per cent. In the mono mode SQ is preferred to 4-4-4, 4-3-4 and H by 55:45 per cent and is ahead of QS by approximately 70:30 per cent of the votes cast.

According to the FCC tests, CBS can say that SQ is virtually indistinguishable from "discrete" in quadraphonic reproduction, and is preferred over the other matrix systems. As for stereo and mono listeners, SQ wins over the other systems by a significant margin.

The SQ stereo disc has been designed so that pressings from the extreme left signals modulate the left (or inner) groove-wall, and the extreme right signals modulate the right (or outer) groove-wall. The centre signals result in a simultaneous modulation of both groove walls, equally and in phase, resulting in lateral modulation. In reproduction from this disc, the loci of the stylus motion naturally follow the groove profiles, resulting in the replication of the modulating signals.

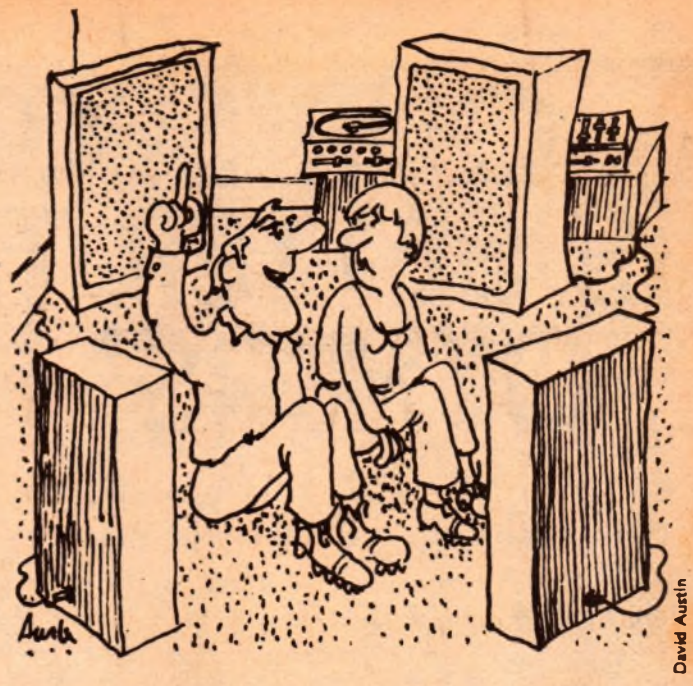
Channel independence, or "separation", so essential to good stereo, depends on the precise orthogonality between the left and right modulations. A further requirement is a precise electrical coincidence, or in-phase relationship, between the left and right channels for the lateral modulation of the centre signal. With good channel separation and the proper in-phase relationships, the stereo signals are sharply and tightly formed at or between the loudspeakers.

To retain the advantages of the stereo disc for the SQ record, we assign unaltered the stereo disc modulations to the front quadraphonic channels, which, in the main, represent the front stage of the concert hall.

The side and back channels are formed by superimposing new modulations upon stereo's regular ones. This superimposition is achieved through the action of the matrix encoder. The variable which differentiates the side and the back channels in SQ from the front ones is the electrical phase dimension. This means that complex coefficients must be used in the matrix, resulting in elliptical or circular stylus loci.

While the centre-back location is irrelevant in most musical performances, some programme producers insist on being able to use it. The reproduction of the centre-back soloists had always posed a problem with matrix quadraphony. However, CBS solved it by splitting the centre-back signals into octave bands and applying these alternately in suitable proportions to the left-back and right-back encoder inputs with the aid of a circuit named the "London box", which helps to fuse the resulting signals into a somewhat spread, but centre, image.

Played in the stereo mode, the SQ record behaves as any stereo disc. The front-stage signals are identical to those of stereo. The phase-shifted images corresponding to side and back sounds or to the ambience are somewhat spread in space and shifted towards the leading loudspeakers.



Notice how you can hear the CBS salesman circling round the room?

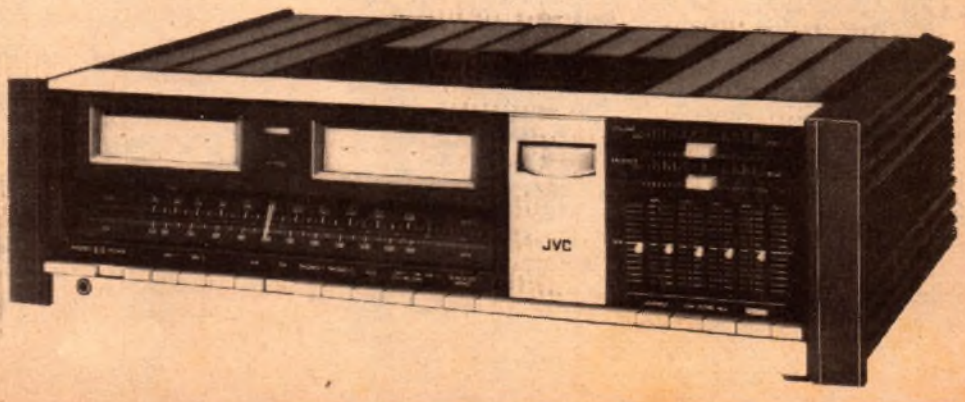
When relayed through an SQ decoder, the front-stage sounds are displayed unaltered over the front loudspeakers as with the conventional stereo disc, retaining their full separation and phase integrity, while the in-quadrature back signals are reproduced, also fully separated over the back loudspeakers.

The only loss of separation is between the front and the back signals. But then it becomes rather simple to provide an effective logic circuit to augment this front-back separation. The performance of the modern SQ decoder in this mode may be judged by the FCC tests; within 48:52 per cent vote, compared with a four-channel master tape.

The SQ recording code, it has already been stated, is characterised by the preservation of established high-fidelity stereo criteria; ie total front-channel separation and the in-phase relationship of the centre-front signals. For quadraphony, we add to this the imperative of equilevel transmission of the four corner signals in the monophonic mode. These are obviously the necessary criteria for stereophonic and monophonic fidelity and compatibility. The developers of other matrices, however, have been quite

New JVC receivers have built-in graphic eqalisers

Three new AM/FM stereo receivers announced by JVC incorporate what is virtually a graphic equaliser in lieu of the usual tone controls — a "first" on the Australian market. Frequency segments centre on 40, 250, 1000, 5000 and 15,000Hz. Illustrated on the right is the JRS600 MkII; others are the JR-S400 and the JRS300. Altogether, JVC is currently releasing 58 new audio products, including amplifiers, tuners, turntables, speaker systems, cassette systems, headphones, microphones, &c.



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CLP.2

3-HOUR COLOUR VIDEO CASSETTE

A compact, lightweight 3-hour video cassette recorder has been introduced by Akai Electric Co, Ltd of Japan. Identified as VHS-format VS-9300, it uses only 35 watts of power for normal operation, weighs 13.9kg and measures 453mm(W) x 147mm(H) x 314mm(D).

Economical half-inch tapes in 1, 2 and 3-hour lengths will be available soon, and recorder models will be available for NTSC, PAL and SECAM standards. It connects to a normal TV set via the antenna terminals.

Having its own in-built TV tuner, the VS-9300 can record the program being viewed or any other available program. It can also be used with a video camera for on the spot recordings.

Incorporated in the front panel of the VS-9300 is a digital timer, adjustable in minutes, which makes it possible to set the recorder as much as 24 hours in advance of a given program. The recorder switches on and then switches itself off again after the designated period.

Also on the front panel are eight push-buttons for the electronic tuner, a three digit counter with memory to locate designated parts of the tape, and a tracking knob to correct any picture distortion during replay.

There are switches to select recording sources and viewing modes, a microphone jack and the usual array of tape transport facilities.

An interesting feature is an in-built thermostatic system which is intended to combat low temperature conditions leading possible to condensation on the tape and the mechanism.

HI FI NEWS Continued: The future for 4-channel records, &c

unconcerned about these criteria.

In its latest "CCIR" version, Sansui's QS has 7.7dB front-channel separation and a 20° centre-front phase error. In mono mode it causes the side-back channel signals to be attenuated by 7dB. These characteristics may have contributed heavily to its last-place ranking in the FCC preference tests.

The H matrix has a slightly higher (8.8dB) front-channel separation than the Sansui system, a 48° centre-front phase error (now reduced to 30°), and a 3.6dB relative loss of back-channel signals in the mono mode. While the H matrix has the claimed advantage of transmitting the centre-back signal satisfactorily in mono mode without the need for an attachment (such as the SQ "London box"), the phase relationship of the centre-back signals is 90° in stereo, causing them to spread and shift towards the leading loudspeaker with a resulting dis-symmetry of the stereo image.

Since the centre-back location is by and large irrelevant in musical performances, this claimed advantage of H is quite immaterial. The 48° phase error for centre-front signal was not, however, causing it to spread and shift and resulted in somewhat fuzzy and dis-symmetrical solo sounds.

The developers of H matrix initially claimed that it would not require logic for satisfactory quadraphonic performance, perhaps as a result of the BBC laboratory's practice of fixing the listeners head in a restraining headrest during the tests. Head motions of course play a vital role in directional perception. Subsequently, the BBC researchers reckoned that this artifact was not representative of home listening conditions, and proceeded to equip the H matrix with a logic system. Thus, the raison d'etre for the H matrix disappeared.

Because considerable publicity has been accorded recently to the 45J matrix sponsored by the UK's National Research Development Corporation, it is proper to review the facts known about this effort.

For years the spokesmen for NRDC have maintained that the Ambisonics matrix system would best all systems, but they have held the technical information about it close to the vest. The first concrete data about Ambisonics appears to have surfaced in "New Scientist" (vol 69, p 222) where Adrian Hope reported that public demonstrations of Ambisonics had been "short of disastrous".

Hope also made reference to the NRDC British Patent BP1 369 813. CBS obtained a copy of this patent, assuming that here, at last, reliable information about Ambisonics would be given. We discovered to our chagrin that the system described in the patent is not, by the usual standards, stereo-compatible — since each of the two transmission channels between the signal transmitter and "receiver", or decoders, carries equal "omnidirectional" and "azimuth" signals which differ only in phase.

Furthermore, the performance diagrams in the patent lead the reader to believe that the decoded signals have 9dB of adjacent-channel separation, while analysis shows that, in truth, the separation is only 3dB.

We understand that experiments now in hand are directed to a new, different NRDC "45J" system using three broadcast channels which form a 4-2½-4 type operation. Further, H and 45J, according to BBC, are similar in design, and we have recently heard that a compromise has been reached between BBC and NRDC. Apparently, both matrices are currently back on the drawing board.

Since the introduction of SQ six years ago, CBS has seen new matrix proposals popping up like toadstools after rain to the tune of great promise of performance proffered wit academic finality, only to find that they fell short of th promise because certain basic hi-fi principles wer neglected by their proponents.

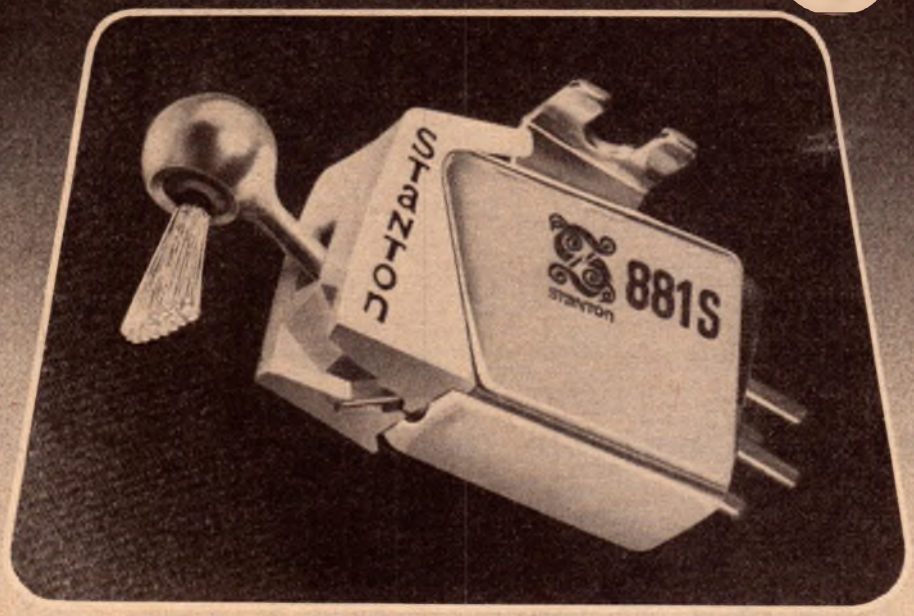
We have watched with dismay the confusion among equipment manufacturers, retailers and the public, resulting from constant contradictory claims of the various matrices and so-called "discrete" systems' proponents. But we could do nothing because no matter what we said it was "our word against theirs".

CBS believes that the FCC report changed all that. Adherence to principle proved to be a realistic guideline. Because of it, the catalogue of SQ records built up during the past six years already exists in the compatible monophonic/stereophonic/quadraphonic SQ mode.

To start such an investment anew, for a still different quadraphonic system, especially one inferior to SQ, would simply be madness. And, since recording and broadcasting go hand-in-hand, CBS anticipates that SQ will be accepted as a universal quadraphonic standard.

Next month: The British alternative

The world's best cartridge?



Stanton 881-S

"Quite simply, it rendered the best tracking performance we have seen to date. Sound quality of the Stanton 881-S is neutral. It does not sound spectacular — one forgets about the cartridge when it is playing. When you come right down to the nitty-gritty, there can be no better comment than that."

"Electronics Australia", January, 1978.

"There is more detail at all frequencies, and stereo images have exceptional stability, even in complex, high level passages. There is also less tendency to become fatiguing, with an absence of the 'grittiness' that afflicts more modest cartridges to a greater or lesser extent". **"Hi-Fi Buyer's Guide", September, 1977.**

"This is not a cartridge for the showman; it is a cartridge for the music lover, for the purist."

"Stereo Magazine", Winter 1978.

"This is one of the most neutral and uncoloured cartridges we have listened to. It sounds as flat as its frequency response curve implies and has an impressive freedom from audible tracking distortions of any kind. It provided a revelation when listening to some of our older, well-worn discs, providing a freshness in their sound that we had not suspected was there."

"Popular Electronics", December, 1977.

"In general, the sound of the Stanton 881-S is completely neutral. It injects no coloration, emphasis, or de-emphasis into any part of the frequency spectrum, and it has a notable freedom from audible tracking distortions of any kind. Since it is so easy to forget that there is a cartridge in the reproducing chain, this is the kind of cartridge we prefer to use when listening to records for musical enjoyment, rather than as a means to uncover flaws in cartridge performance."

"Stereo Review", November, 1977.

"Records heard via the Stanton sound bright, clear, and detailed with an especially smooth high end. Sharp, quick transients, such as those found on direct-cut discs from Telarc, Sheffield, and Umbrella are taken in stride and reproduced with a stunning sense of presence. The stereo image is vivid, plausible, and stable. In the short time that we have known the pickup it has become one of our favourites."

"High Fidelity", October, 1977.

And remember, you can't get the best out of your Stanton Cartridge unless you use a genuine Stanton Stylus.

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LER 206

HiFi — Audio shows in four cities

Three-day Australian HiFi shows, devoted specifically to audio equipment, will be held in four capital cities: Sydney (June 30-July 2); Brisbane (August 4-6); Melbourne (September 1-3); Adelaide (September 8-10). The emphasis will be on top-line equipment, with full demonstration facilities.

Question: What's better than a grand piano? Answer: One that can play itself — with the aid of a Pianocorder!

The respective venues will be: Sydney (Chevron Hotel); Brisbane (Parkroyal Motor Inn); Melbourne (Southern Cross Hotel); Adelaide (Hotel Australia). The shows will be open in each city on the Friday (12 noon-10pm); Saturday (10am-10pm); Sunday (10am-6pm). This should give audiophiles the opportunity to visit the shows as many times as they wish.

A major attraction at each venue will be Superscope (Australasia) Pty Ltd demonstrating for the first time the "Pianocorder" Reproducing System — hailed in America as "the world's first recording and reproducing piano completely controlled by computer programmed cassette tape".

Heart of the Pianocorder Reproducing System is an electronically-controlled keyboard mechanism that can be built into a standard piano. Playback performance is controlled by a computer-programmed cassette tape that commands which keys to play and how fast and hard they should be struck. Logic circuitry in the cassette recorder transfers the programmed information to a bank of solenoids that control the piano keys and pedals, closely simulating a human performance.

Superscope state that there are about 30 million pianos in homes around the world, most of them bought originally for learning purposes, and most of them under-utilised. Provision of a "Pianocorder" unit would allow many more people to gain enjoyment from the instruments.

Superscope, as an introductory offer, will be giving free to every purchaser 100 pre-programmed cassettes, worth $795. The cassettes contain performances by Paderewski, Rachmaninoff, Saint-Saens, Gershwin, Grieg, Debussy, Waller, Morton, Joplin, Shearing and others.

Approximately 80 brands from around the world will be seen and heard at the Audio Shows including Hitachi, TEAC, Celestion, Marantz, Beyer, Altec-Lansing, dbx, Armstrong, Optonica, BIC, AMW, Linn-Sondek, Gale, Onkyo, Ferrograph, Electro-Voice, Dindy, Bose, Nexus, JR, Aztec, EEI, Tandberg, Sonab, Naim, Lux, Amcron, Sugden, Chartwell, Rappaport, plus many others.

The latest Beyer microphones should make an impression on home recordists, professional recordists and performers. They have been available overseas for some time, but have only recently become available in Australia.

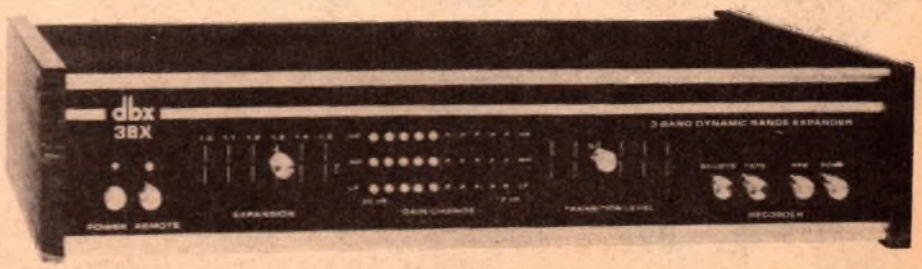
Of more broad appeal will be the range of Beyer headphones, which enjoy an enviable reputation for both quality and durability an innovation on show will be a large scale infra-red transmitter, capable of covering practically any room or hall. The quality is said to be good enough for use in studios and the whole system is remarkably noise free.

Sharp will, of course, be displaying its controversial microprocessor controlled cassette deck No. RT3838H, along with the full range of Optonica hifi equipment. Included will be the ST1515H budget tuner that clearly outperforms its price!

Marantz will be at the Shows, eager to demonstrate the new "DC" series of amplifiers. All the series have THD specifications of 0.05%.

In addition, three new turntables will be on show — the 6110, 6170 and 6350Q. The first is a low-priced belt-drive model, while the last two utilise direct-drive.

Following the acquisition by International Dynamics of the distribution rights for Epicure products, two of the latest speakers from this company will be on display at the 1978 Australian Hi-Fi Audio Shows: the EPI Model 120 and the Epicure Model 400 Plus. The Epicure philosophy is that no speaker should have more than two drive units — a tweeter and a midrange/woofer — because any advantage is cancelled by



From Auriema: The 3BX from dbx — a dynamic range expander with separate channels for low, mid and high frequencies. It connects into the tape loop of a normal hifi amplifier or receiver.

COMING SOON!
THE
AUSTRALIAN HI-FI

1978 AUDIO SHOWS

SYDNEY: Chevron Hotel, 30th June, 1st & 2nd July
BRISBANE: Parkroyal Motor Inn, 4th, 5th & 6th August
MELBOURNE: Southern Cross Hotel, 1st, 2nd & 3rd Sept.
ADELAIDE: Hotel Australia, 8th, 9th & 10th September

OPENING HOURS (ALL VENUES)
FRIDAY: 12 Noon to 10 p.m.
SATURDAY: 10 a.m. to 10 p.m.
SUNDAY: 10 a.m. to 6 p.m.

ADMISSION FREE!!

HIFI NEWS — Cont.

the added phasing problems.

Rotel's latest (and best) cassette deck, the RD30F will be making its first appearance in the Shows. As is usual with Rotel, superfluous frills have been eliminated to allow more money to be allocated to the transport and basic electronic circuits.

Speaking of Rotel, their new RZ-8 mixer provides echo and rhythm effects as well as mixing facilities for vocal, guitar, disc and tape sources. Pre-cueing is possible without affecting the program being played.

Altec's impressive range of loudspeakers, including the Santana II, Stonehenge II, Fifteen, Seventeen and Three, will be set up so that showgoers may audition them in the demonstration rooms. If audiophiles like high efficiency sound and/or are looking for speakers which are capable of soaking up power and dispersing a staggering amount of sound, then they should be sure to head for the Altec display.

Visitors should also take time out to look over the complete range of dbx "dynamic range expanders" on the Auriema stand, from the smallest domestic model to the full studio system.

Keep your eye open also for the Nexus Loudspeaker Protector.

Tandberg equipment is possibly better known in Europe than it is in Australia, although it has many adherents in this country. There will be a comprehensive line-up of current models from Tandberg, including the TCR-222, a three-motor cassette deck, with in-built 12 watts RMS amplifier and the TCD-330. The 330, apart from its sleek, sophisticated (and convenient) styling, features electronic logic circuit operation, three heads, three motors, azimuth alignment control and automatic tensioning.

Electro-Voice is now on the Australian scene with a vengeance, promoting a line of speakers that are based on a theory proposed by Australian engineer A. N. Thiele. The entire "Interface" range, so-called, will be demonstrated at the shows.

Concept Audio Pty Ltd, will be showing several new products, including NEAL cassette decks, Ferrograph tape recorders, Armstrong's 600 series (amplifiers, tuners and receivers), plus the superb REGA turntables. They will also be displaying accessories such as the PIXALL record cleaner, the full range of Empire cartridges and, from Onlife Research Inc. in Japan, the Dynavector moving-coil cartridges. From the Dynavector company comes the model DV505 bi-axis, inertia controlled, dynamically balanced tonearm.

Getting back to loudspeakers, the extremes are represented by an Australian-made system created by Chadwick Audio Furnishings, and a revolutionary no-cone, no-enclosure, omnidirectional unit designed by Professor Jose Bertagni of Bertagni Electroacoustic Systems.

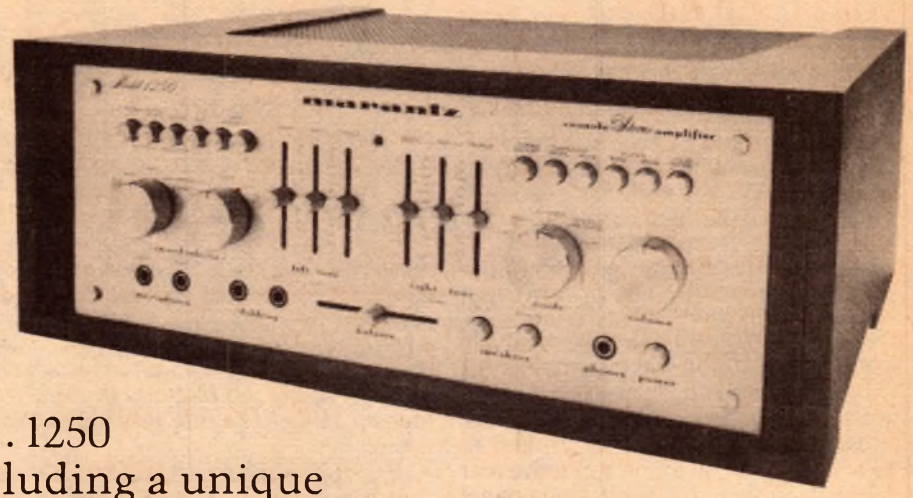
"Geostatic" speakers are rectangular sheets of special polymer "board" which are about 9.5cm thick. The sheets are surrounded by an aluminium frame and covered by a black foam grille at the back and front and look like electrostatic speakers. In actual fact, the drive units are dynamic in nature, but here the similarity to the standard dynamic cone speaker ends.

In the wake of the news that A.B.E. Audio Video have taken over the Australian distribution of Akai products, A.B.E. advise that they will have a brand new range of Akai products at this year's Australian Hi-Fi Audio Shows. Two new cassette decks will be on display, the GXC-709D and GXC-725D. Both decks feature the Akai ADR system, which is claimed to reduce inter-modulation distortion; in both decks the heads are designed so that the azimuth never needs realignment. The GXC-725 deck has three heads. The new range of Akai receivers will also be at the Shows.

From Sharp comes this Optonica ST-1515H tuner for AM and FM-stereo broadcasts. It features a 220mm dial and a large flywheel knob for easy tuning, plus separate signal and tuning meters. Muting and blend switches minimise incidental background noise, while a phase-locked loop system is provided for stereo decoding. Performance specifications are excellent.

"On the rare occasions when we come across a product as outstanding as the Marantz... 1250 (Integrated Stereo Amplifier), we make an extra effort... to find a weak spot. Try as we might, we could not fault the amplifier. No test, either by measurement or by use, revealed any respect in which it fell short of its potential... we couldn't find any limitations."

"Best buy."



"As well as being the most powerful integrated amplifier to bear the Marantz name, the... 1250 has the distinction of including a unique tape recording capability unlike any other we have seen... it is possible to record a program from one source on one recorder, another program from a different source on (a) second machine and still listen to a third program through the speakers!... We suspect that the true appeal of the... 1250 will be to the advanced tape recordist, who will appreciate its remarkable... flexibility."

"The operating controls have a smoothness and positive 'feel' that are consistent with the image of quality associated with a top-end amplifier from one of the most highly respected names in the industry. There are no unwanted noises, switching transients, or the like when anything is pushed or turned... for all practical purposes it is a noise-free amplifier."

"... (considering that) most integrated amplifiers whose electrical performance compares with that of the... 1250 not only lack its complete operating flexibility but are more expensive, (then) it... appears that the... 1250 is something of a 'best buy' for those in the market for a powerful state-of-the-art amplifier... distinctly different from its competition."

—Hirsch-Houck Laboratories, quoted in *Stereo Review*, January, 1977.

marantz.®

WE SOUND BETTER

The Marantz 1250 Integrated Amp delivers a massive 125 Watts of power, minimum RMS at 8 Ohms, 20-20,000 Hz, with no more than 0.1% Total Harmonic Distortion. In Laboratory tests, however, Hirsch-Houck found that "... at rated output ... THD was essentially less than 0.04% from 20 to 20,000 Hz (approaching 0.01% over much of that range). This distortion did not change significantly at lower power levels." ©1977 Marantz Co., Inc., 20525 Nordhoff St., Chatsworth, CA 91311. Prices and models subject to change without notice.

Richard Allan 'Maramba' loudspeakers

The Richard Allan 'Maramba' loudspeaker system is a two-way system with a passive radiator augmenting the response below 120Hz. Frequency response is rated at +3dB over the range 80Hz to 20kHz and power handling capacity is quoted as 30 watts peak programme.

After looking at a photograph of the Richard Allan Maramba system, one may not realise that it is a quite compact system. The enclosure is relatively tall and narrow, with a volume of 39.5 litres. Enclosure dimensions are a modest 250 x 600 x 220mm (W x H x D).

Teak or walnut veneer is applied to four sides of the enclosure plus the rear panel. The acoustic foam front panel can be supplied in Brown or Charcoal colour. Mass of the system is specified as 9.5kg.

The foam front panel is easily peeled off to reveal the driver units. We have reservations about the foam fronts used on many loudspeaker systems. They certainly merge easily into the average decor but they afford only minimal protection to the drivers. What a young toddler could do to a system with foam front does not make for pleasant cogitation.

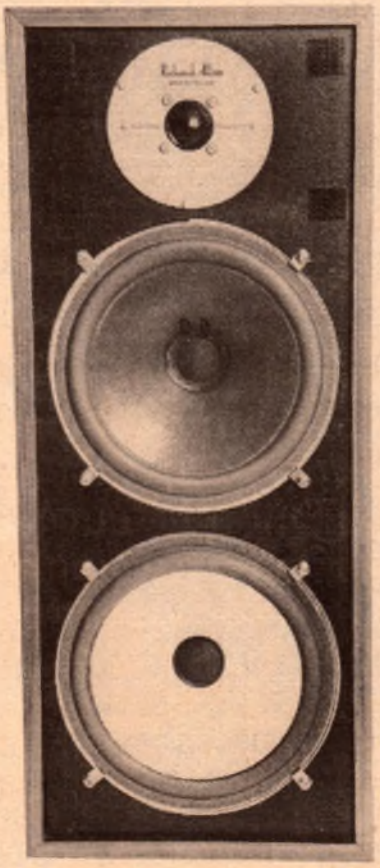
We were unable to remove the drivers from the cabinet, without resorting to butchery, so we cannot comment on details of the driver construction or crossover network. However, at one stage we investigated a serious leak in one enclosure's rear connector panel, so we can state that the enclosures are filled with an acoustic damping material.

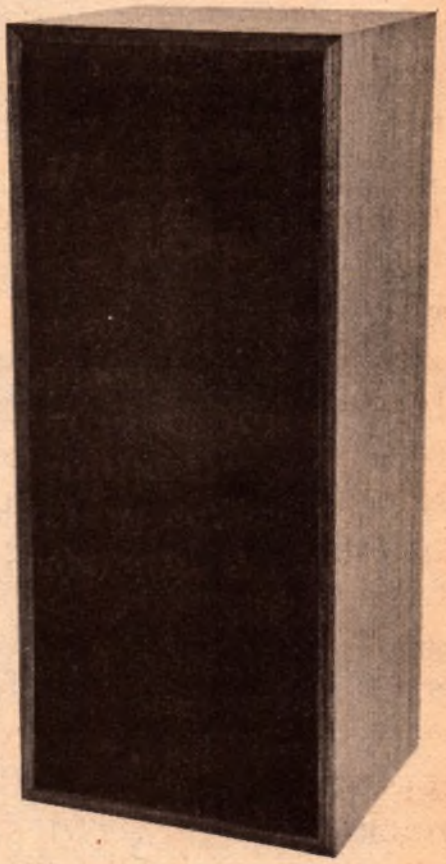
The woofer is a nominal 200mm diameter unit with a polyurethane roll surround and an effective cone diameter of 150mm. Free-air cone resonance is quoted as 28Hz. The passive radiator has the same overall dimensions and roll surround but a cone made of what appears to be polystyrene foam. Crossover from the woofer to the 25mm soft dome tweeter is at 6kHz.

The connector panel referred to earlier is recessed and has a two-pin DIN socket parallelled by a pair of jack sockets. Jack plugs are supplied.

Impedance measurement of the system reveals the main bass resonance at 100Hz. Minimum impedance modulus is seven ohms, occuring between 7 and 8kHz. As such, the Maramba is unlikely to cause embarrassment to the amplifier.

While efficiency of the system is typical of today's loudspeakers, power handling seems quite modest at a rated 30w peak programme. Indeed, we inadvertently damaged one of the bass drivers when testing the systems for rattles, using moderately loud bass tones. Possibly, the unit was inherently faulty but the end result appeared to be loose turns on the voice coil.





Frequency response of the system appears quite smooth over the whole range from 80Hz up the limits of audibility. Below 100Hz, the response tapers at a rate of 6dB per octave. In practice, the bass response appears adequate on popular music but organ and orchestral works can show up the diminishing response below 70Hz.

Discretion must be exercised in applying even modest bass boost, otherwise the system begins to take on a "one note bass" characteristic.

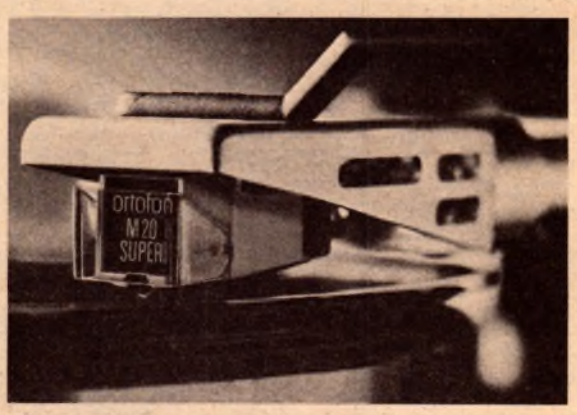
Performance in the treble register was more satisfying. However, by comparison with several of our "yardstick" loudspeakers the treble rendition on most music seemed "less open" and more "restrained". These admittedly vague and subjective terms should not be thought of as outright criticism but rather as differences which may or may not be preferred.

If you have an amplifier or receiver with power rating up to 30 watts per channel and a preference for light orchestral music, the Richard Allan Maramba system could be the one for you. If you like Wagner operas or Jefferson Airplane at ear-splitting levels then see a psychologist or consider another loudspeaker system!

Enquiries regarding price and other information on Richard Allan loudspeakers may be obtained from the Australian distributors, Radio Parts Group, 562 Spencer Street, West Melbourne or 1103 Dandenong Road, East Malvern, Victoria. (L.D.S.)

WHAT GOES IN MUST COME OUT.

Ortofon professional cutter head type DSS 732 in action.



Latest from Ortofon is the M 20 Super—a unique magnetic stereo cartridge, based on our exclusive world-patented Variable Magnetic Shunt (VMS) principle.

When it comes to perfection in recorded sound the principle is as simple as this:

What goes in must come out.

Which means that the response from the groove of your favourite record should be as close as possible to the sound of the original master tape.

With this in mind, we at Ortofon concentrate our activities in two areas only: the production of sophisticated cutting equipment for making master records—and the manufacture of the finest pick-up cartridges to play the discs which they produce.

Most of the major record companies use Ortofon cutters. And because it is only natural that the manufacturer who knows most about making the records should also know most about playing them, our cartridges for many years have been the choice of professionals and discerning music lovers throughout the world.

Ortofon do not make turntables, amplifiers or loudspeakers. We put all our experience into developing advanced products to cover the two most critical sectors in sound reproduction: the cutting and the playback of records.

For us accuracy in sound is more than just a slogan.

It's our reason for being in business.

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accuracy in sound

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JVC SEA-20 Graphic Equaliser

Used in conjunction with a room analyser or similar measurement system, a graphic equaliser can provide notable improvements in sound reproduction. For those with access to such facilities, consider the JVC SEA-20 graphic equaliser reviewed here.

The SEA-20G splits the audio spectrum into seven bands with centre-frequencies of 60Hz, 150Hz, 400Hz, 1kHz, 2.4kHz, 6kHz and 15kHz. Each band can be boosted or cut relative to the others by a slider control. The controls have detent positions which enable the response to be varied in approximate 2dB steps over a range of +12dB.

Normally, a graphic equaliser such as this is connected to the "tape monitor" terminals of a stereo amplifier. If the system comprises a cassette or tape deck, this is connected to "tape monitor" terminals on the equaliser. The equaliser has unity gain so that it can be switched in or out of a system with no change in overall system gain, provided all controls are centred.

As well as the tape monitor terminals mentioned above the SEA-20 has a duplicate set of four terminals which enable enhanced cassette or tape recordings to be obtained with the equaliser controls.

Dimensions of the SEA-20 are 390 x 103 x 267mm (W x H x D) including knobs, rear terminals and feet. Mass is 3.4kg.

Styling and presentation of the unit leave little to be desired. Perhaps the slider knobs are a little tiny and they lack indexing marks so that it is difficult tc determine their exact setting by sight. The power switch is up for off which may upset those who think the opposite is correct.

Inside, the circuitry is accommodate on five PC boards. This seems a little extravagant when the job could have been done with a minimum of two.

We are not entirely happy with the power connection and earthing arrangement in the SEA-20. The mains cord is a two-core flex with moulded two-pin plug similar to that used with shavers and similar double-insulated appliances. However, the mains wiring in the unit is not double-insulated and earthing of the chassis is via the signal cable shields to the main amplifier.

On test, however, the JVC SEA-20 performed very well. All specifications were confirmed: Signal-to-noise ratio with respect to a signal level of 500mV RMS was 100dB unweighted. With the same reference level, separation between channels was 79dB at 100Hz, 62dB at 1kHz and 36dB at 20kHz. Frequency response was 6Hz to 40 kHz at the -1dB points.

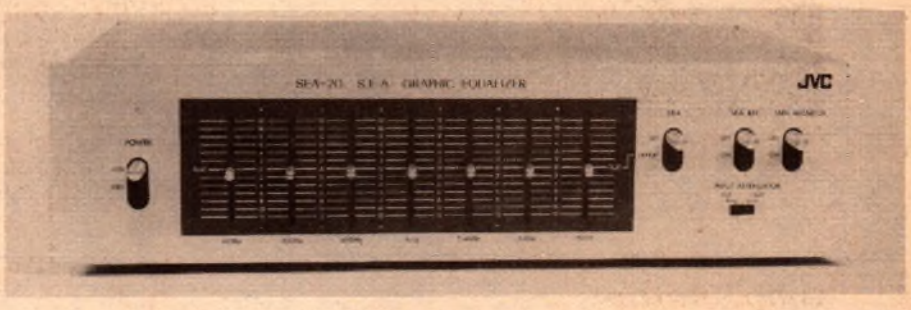
All the above measurements were taken with controls centred and relevant inputs terminated with 4.7k resistors.

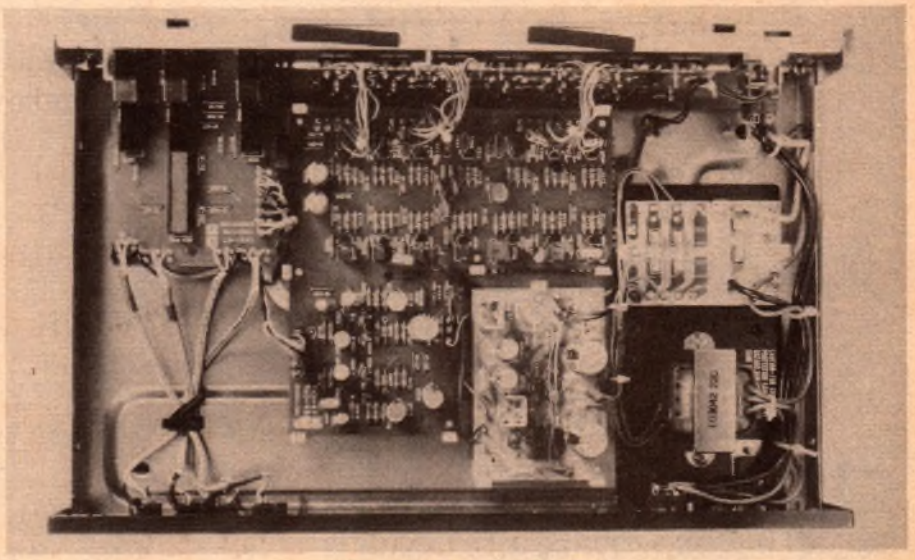
Harmonic distortion was very low. With all controls centred and a signal level of 500mV, distortion was around. .004 per cent over the range 10Hz to 20kHz. This is approaching the measurement limits of our Sound Technology 1700B Analyser. Even for odd and extreme settings and close to maximum output levels the distortion was quite low. The highest measurement was 0.2 per cent. Normally, we would expect distortion to be no higher than 0.02 per cent.

We found no sign of instability at any control setting, using square wave input signals. In short, the SEA-20 causes negligible deterioration of signal quality while its control facilities offer considerable scope for improvements in sound quality.

While we are impressed with the SEA-20, this does not extend to the owner's manual. This does little to enlighten the user as to how to get the best from his system. Instead, it rambles on about how the various band controls can be used to boost certain instruments. In truth, a room analyser must be used, as discussed in the "Hifi News" pages in February 1978 issue of this magazine. As a less precise method, the "Stereo Review" SR12 test disc which has a series of warble tones, might be used to obtain useful results. This was reviewed in the "Lighter Side" pages in our March 1978 issue. Any other approaches could more easily lead to confusion and dissatisfaction.

Recommended retail price of the SEA-20 is $169. Further information can be obtained from retailers or from the Australian distributors, Hagemeyer (Australasia) B.V., 59 Anzac Parade, Kensington, NSW (L.D.S.)





Project for a wet weekend?

A SIMPLE CRYSTAL CHECKER

The crystal oscillator/checker described here can be built up in a few hours of work and with not too much expenditure. Intended for the "ham" shack or the enthusiast's test bench, it is one of those items which, every now and again, can generously repay the effort involved in building it.

by IAN POGSON

In the days of "home brew" amateur equipment, and particularly in the era of post-war surplus crystals, no "shack" was complete without some kind of a crystal tester, used to verify the fundamental frequency of "rocks" and their degree of activity — if any! And, of course, if an amateur had ideas of regrinding crystals, a bench checker was indispensible.

In those days crystal checkers invariably used thermionic valves but, by the time a power supply was included, together with the kind of meter then available, and a possible L/C tuning circuit, it added up to a fair amount of bulk.

Nowadays, needs and ideas have changed and one could hardly justify that much bulk for what is essentially a very simple piece of gear. But, fortunately, available bits and pieces have also changed and one can now make up a basic crystal oscillator/checker from a handful of unpretentious components including, perhaps, a few from the oddment box.

In building up the prototype pictured, we had four possible uses in mind:

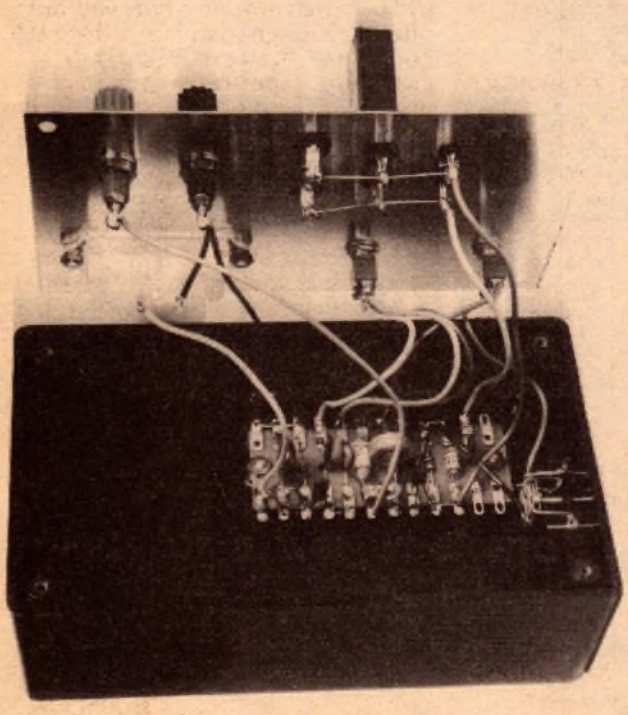
- To sort through oddment crystals which most long-term amateurs seem to have collected. Some crystals work, some don't. Some have their frequencies clearly marked; some are receiver types, offset from the marked frequency, and others carry only long-since-forgotten military channel numbers.
- To check on modern crystals, which are beginning to accumulate from CB and other similar activities.
- To use with suitable crystals to provide marker or calibration frequencies for tuneable recievers.
- To provide steady signals for checking tuneable receivers or transceivers for frequency drift.

In fact, we had intended to build up a crystal checker for some time for just these purposes — without having quite got around to it! What fanned the spark was a two-page article by Fred Brown W6HPH, in the February '78 issue of "QST" entitled "A Universal Crystal Oscillator". Very appropriately, it was presented as "a weekend project".

Essentially, it uses the time-honoured Pierce circuit, requiring no supplementary L/C circuit, but built around a FET — a field effect transistor. According to Fred Brown his original unit operated with every crystal that he could lay his hands on, ranging from the lowest at 50kHz to the highest fundamental mode available at 25MHz.

What better commendation?

In place of the 2N4220 J-Fet originally specified, we have suggested a 2N5485, or similar. Sockets to accomodate all likely crystals are connected in parallel, and wired in the drain-to-gate circuit,



ABOVE:

The prototype crystal checker would not look out of place in any amateur "shack". How you build it up is not critical, however, and the logical course would be to use the "bits" on hand.

AT LEFT:

There is plenty of room inside the box to accommodate a 9-volt battery, if desired, but many may prefer to operate the checker from a bench supply. The usual 13.8V would seem to be ideal.

along with the appropriate isolating capacitors and the gate "leak" resistor.

The original circuit called for two chokes in the drain supply lead, a 2.5mH RF choke and one of 150mH wound on a miniature toroid. This looked like a potential problem in an otherwise simple design as, indeed, would have been an equivalent inductor in a potcore.

Fortunately, it transpired that a 1.8k resistor could be substituted for the larger choke with only one obvious penalty — more resistance in the drain circuit. While this may inhibit the oscillator somewhat with a sluggish crystal and a low supply voltage (say 9V or less) it was certainly no liability when the unit was connected up to a bench supply in the 12V to 15V range.

To make the Pierce circuit more compatible with medium frequency and low frequency crystals, it is desirable to provide a means to increase the amount of capacitance between the drain and source or "earth". While this can be effected with two separate toggle switches, as in the QST design, a rather neater scheme is to use a 3-position toggle wired so that, in its neutral position, it discards the additional capacitors, leaving only the capacitive output coupling network between drain and source.

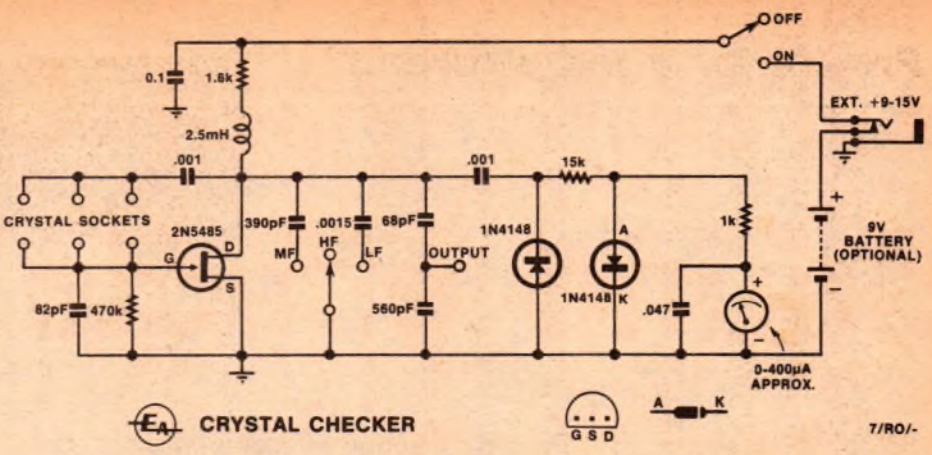
In the process, we have increased slightly a couple of the capacitor values, again aimed at prompting ready oscillation with old and perhaps sluggish crystals. The added capacitance may decrease very slightly the apparent crystal frequency but this will be of no consequence for most purposes.

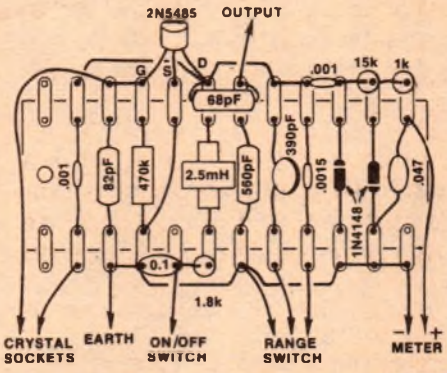
When the system is oscillating, the RF is rectified by the 1N4148 diode and the resulting DC is applied to the metering circuit; the component values are chosen to suit the particular movement specified.

A shunt diode across part of the metering circuit allows the meter to come up to about full scale but prevents it from being heavily overloaded. The effective compression at the top of the scale prevents it from showing up differences in high orders of "activity", but it is nevertheless a convenient arrangement, readily distinguished active from inactive crystals, without the need for a meter sensitivity pot.

Other sensitive meter movements could doubtless be pressed into service, given some fiddling with the resistor values. We did not try to explore all the possible options, reckoning that the average amateur would be able to make adequate arrangements to suit the bits he happened to have on hand.

The output terminals shown on the circuit would facilitate connection to a digital frequency meter, if available, while a wire connected to the active terminal could be used to carry the signal into a receiver or transceiver. In fact, you can expect a fair amount of





Above is the complete circuit of the new crystal checker and, at left, the layout of components on a piece of tagboard. Another private weekend exercise might be to layout and produce from it your own printed circuit board, using techniques described in our December issue, last.

PARTS LIST

OSCILLATOR
- *1 Zippy box 150mm x 90mm x 50mm*
- *1 Miniature edge meter, approx. 400uA FSD, scale 0-10*
- *1 Crystal socket to suit old style ¾in. spacing holders*
- *1 Crystal socket to suit FT243 holders*
- *1 Crystal socket to suit HC6/U holders*
- *1 Crystal socket to suit HC25/U holders (not used on prototype)*
- *2 Banana socket terminals (1-red, 1-black)*
- *1 Miniature toggle switch SPDT*
- *1 Miniature toggle switch SPDT centre off*
- *1 DC input panel socket 2.5mm*
- *1 Miniature tap strip 12prs tags*
- *1 Transistor 2N485 or similar*
- *2 Diodes 1N4148 or similar*
- *1 2.5mH RF choke*

RESISTORS (½W)
- *1 1k*
- *1 1.8k*
- *1 15k*
- *1 470k*

CAPACITORS
- *1 68pF polystyrene*
- *1 82pF polystyrene*
- *1 390pF poystyrene or ceramic*
- *1 560pF polystyrene*
- *2 .001uF greencap*
- *1 .0015uF greencap*
- *1 .047uF greencap*
- *10.1uF greencap*

MISCELLANEOUS
Hookup wire, solder, screws, nuts.

natural radiation from the unit at both the fundamental and the low order harmonics such that, with a sensitive receiver, no direct connection should be necessary.

As mentioned earlier, no provision has been made for an in-built power supply. The checker could be operated from a 9V battery or a modern plug-pack power supply, with ample output from most crystals. In fact, it will still work with many crystals down to 6V. However, it likes more volts rather than less volts and something in the range 12V to 15V is to be preferred.

So much for the circuitry.

The layout and presentation is quite different from the "QST" project, involving parts and methods which are appropriate to this country. The "Zippy" box used ensures a neat end-result, offering enough room inside for a self-contained battery supply. As in miniature tape recorders, &c, the power plug and socket used offers the option of either an internal or external supply.

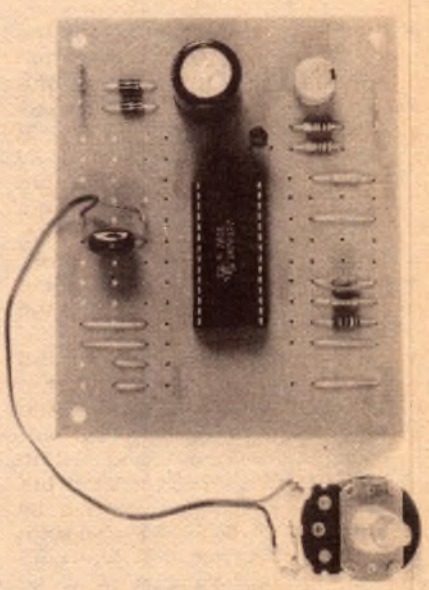
Having completed the unit, we did what Fred Brown apparently did, trying our stock of oddment crystals. The limits of those available were 100kHz to 14MHz but there was no reason to believe that Fred Brown's experience would not have been duplicated, had we had a wider range to choose from. We did, however, come across two or three "duds", which isn't surprising after thirty or forty years in a military or private "junk box"!

One final point: Some of the wartime crystals were used in equipment where they oscillated at their third, fifth or seventh overtone and were marked with that frequency. If plugged into a Pierce circuit, they will oscillate at their fundamental frequency — an approximate third, fifth, or seventh of the marked overtone. Only rarely will they turn out to be an exact fraction, a typical discrepancy being about 0.1%.

Create your own sound effects

by GREG SWAIN

Would you like to create steam train sound effects for your model railroad? Or how about an electronic siren, or the sound of a propeller driven airplane, or even a phaser gun? In this article, we give you some simple sound effects circuits based on the recently released SN76477 from Texas Instruments.



Creating your own sound effects is easy with this general purpose board.

Actually, I'm not too sure what a phasor gun is supposed to sound like. However, the noise generated by the space war/phasor gun sound synthesiser circuit which we built up from TI's application notes is certainly quite weird. Listening to it, one can readily imagine an outer space battle between starships using esoteric weapons.

By varying a single control pot, various "Space War" sound effects can be generated. Wind the pot right down, and the output sounds just like an electronic siren.

But it's with the model train enthusiasts that we're betting this project will really hit the spot. The simple circuit shown can realistically simulate the "chuffing" sound of a steam train or, by varying the control pot, the sound of a propeller driven aircraft. Best of all it should only cost a few dollars to build.

All the circuits described are based on the Texas Instruments SN76477 complex sound generator chip. This is a 28-pin bipolar I²L device which provides noise, tone and low frequency based complex sounds. The device is programmed to produce specific sound effects by means of external components, either resistors, capacitors or direct links to a +5V rail or to earth.

A wide variety of sounds can thus be generated by the SN76477 simply by varying the external component connections to the device. With this in mind, we have taken a somewhat unusual approach with this particular project.

What we have done is to produce a general purpose printed circuit board (code number 78n6, 104 x 84mm) which will accommodate the SN76477 device and its associated audio amplifier and power supply. Then, by adding appropriate components to the board, readers may build whichever sound synthesiser suits their requirements.

The circuit which we have chosen to feature is the steam train/propeller plane sound synthesiser. However, by referring to the accompanying table, readers can just as easily construct the siren/space war sound synthesiser or the gunshot/explosion synthesiser — all on the same pcb!

More about building these circuits later on.

Perhaps the main advantage of the general purpose board is that it will also allow readers to experiment with the chip to create their own special sound effects. You could for example, use the circuits given as a starting point and by adding components or varying component values, synthesise new sounds.

In order to provide a guide to those readers who do wish to experiment further, it may be as well at this point to take a look at the internal circuitry of the SN76477 device. A brief guide on how each of the various chip functions can be controlled or disabled will also be provided.

Fig. 1 shows the block diagram of the SN76477. As you can see, its essential components include a super low frequency (SLF) oscillator, a voltage control oscillator (VCO), a noise oscillator (actually a clock), a noise generator and noise filter, a mixer, and an envelope generator and modulator circuit. Also contained within the chip are various logic circuits for envelope selection from the mixer (envelope logic) and for short duration sounds.

The SLF is normally operated at a frequency somewhere between 0.1 and 30Hz. The actual frequency is determined by the SLF control resistor on pin

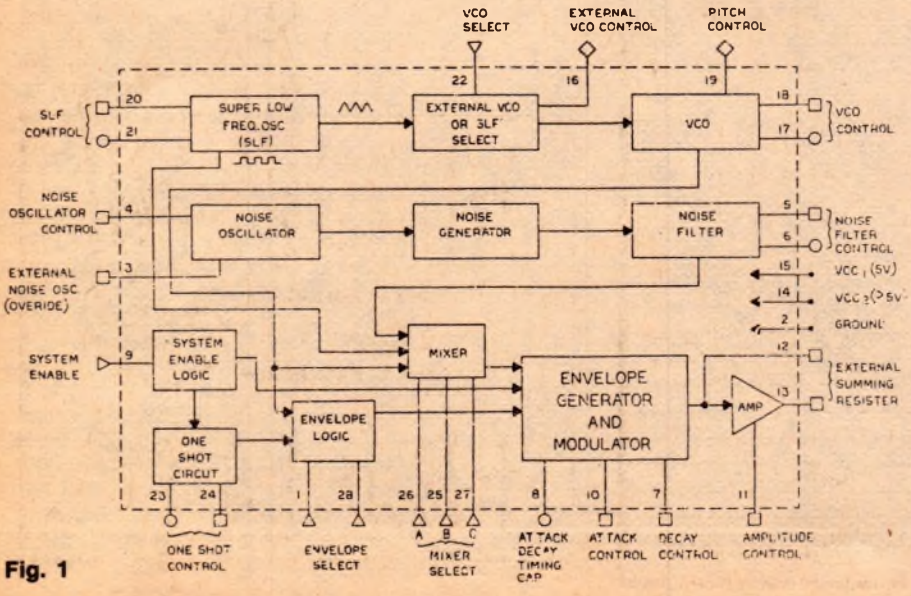


Fig. 1

20 of the device and the capacitor on pin 21. Increasing either of these components decreases the SLF frequency.

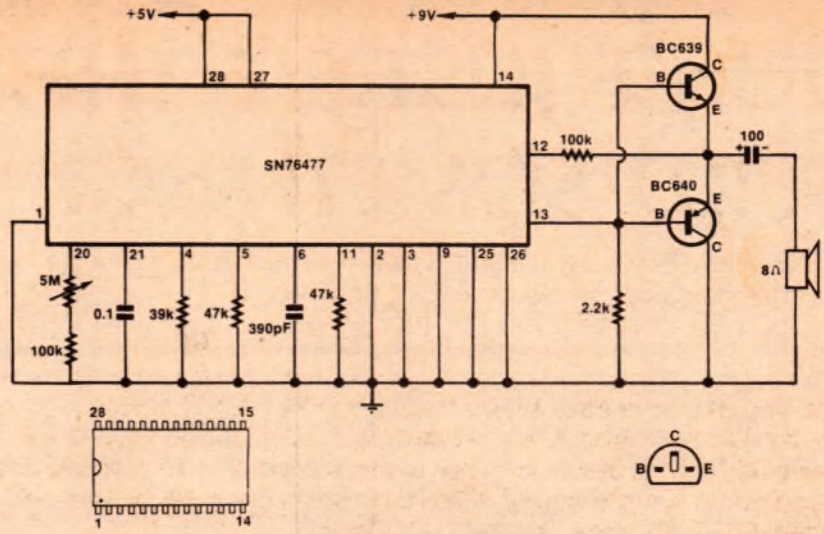
The SLF feeds a 50 per cent duty cycle square wave to the mixer, and a triangle wave to the external VCO/SLF select logic. This triangular waveform is fed straight through to control the VCO when pin 22 is high (taken to +5V). Alternatively, the VCO can be controlled by an external oscillator connected to pin 16. The higher the voltage, the lower the frequency of the VCO.

The range of the VCO, that is the maximum frequency to the minimum frequency (corresponding to the minimum control voltage and the maximum control voltage respectively), is internally set at approximately 10:1. By adjusting the VCO control resistor (pin 18) and capacitor (pin 17), the minimum VCO frequency can be determined according to the following equation: VCO frequency (Hz) = 0.64/RC, where R is the resistance in ohms, and C is the capacitance in farads.

(Note: the above equation can also be used to set the SLF frequency.)

A pitch control (pin 19) can be used to vary the duty cycle of the VCO output to produce different "tones". If no adjustment is desired, then a 50 per cent duty cycle can be obtained by leaving pin 19 high (+5V). Output from the VCO is fed to both the mixer and the envelope select logic.

The block labelled noise oscillator is actually an on-chip clock which controls the rate of the noise generator. The latter generates noise in the form of a long pseudo-random binary sequence which is filtered to reduce high frequency content, and then fed to the mixer.



TRAIN/PROPELLER PLANE SOUND SYNTHESISER

2/MS/-

Use the circuit above to create sound effects for your model railroad.

Pins 5 and 6 are the noise filter control inputs. Increasing the RC time constant on these pins reduces the high frequency content of the noise waveform.

It should be noted that the noise oscillator requires a 39k resistor to ground at pin 4. This value should not be adjusted unless, of course, the noise generator circuitry is not required, in which case it may be deleted. Pin 3 is an automatic override of pin 4 for connection of an external clock.

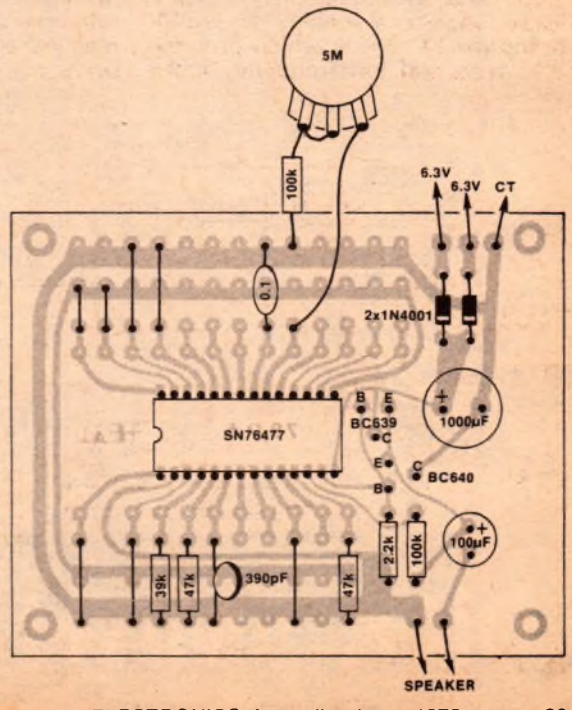
The mixer logic selects one, or a combination of, the inputs from the SLF, VCO and noise filter, and feeds the resultant waveform to the envelope generator and modulator. Mixing takes place according to the following truth table:

Pin 27	Pin 25	Pin 26	Output
0	0	0	VCO
0	0	1	SLF
0	1	0	Noise
0	1	1	VCO/Noise
1	0	0	SLF/Noise
1	0	1	SLF/VCO/Noise
1	1	0	SLF/VCO
1	1	1	Inhibit

where 0 denotes connection to earth and 1 denotes connection to +5V.

PIN	GUNSHOT/EXPLOSION	SIREN/SPACE WAR
1	+5V	+5V
3	earth	—
4	39k to earth	—
5	330k/68k to earth	—
6	390pF to earth	—
7	680k to earth	—
8	0.68uF to earth	—
9	22k to +5V, momentary contact switch to earth	earth
10	3.3k to earth	—
11	47k to earth	150k to earth
16	—	—
17	—	0.22uF to earth
18	—	3.9k to earth
19	—	+5V
20	—	200k pot to earth
21	—	1uF to earth
22	—	+5V
23	0.01uF to earth	—
24	330k to earth	—
25	+5V	earth
26	earth	earth
27	earth	earth
28	earth	earth

Follow the wiring diagram below when wiring up the steam train/prop plane sound circuit.



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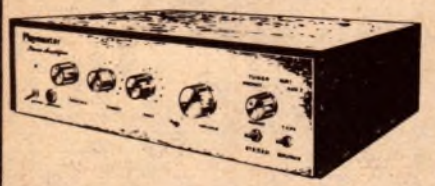

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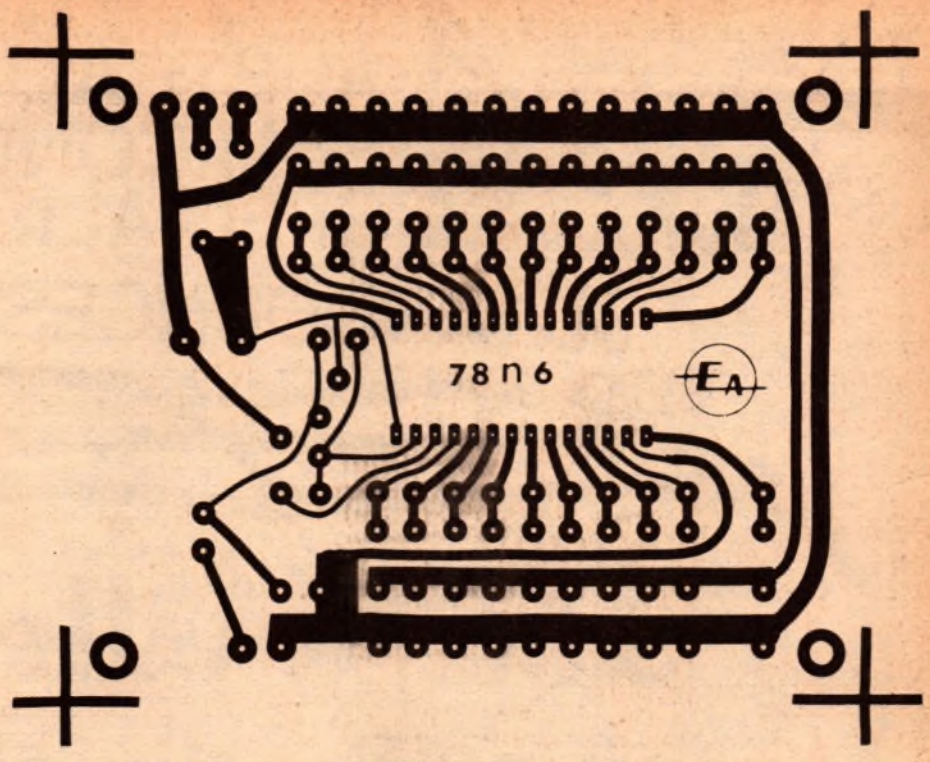


Here is an actual size reproduction of the PCB pattern.

The system enable logic provides an enable/inhibit function for the chip output. When pin 9 is low, the output is enabled; when pin 9 is high, the output is inhibited.

Pin 9 also controls the one-shot logic for momentary sounds, such as gunshots and explosions. The one-shot logic is triggered by the trailing edge of a pulse, that is when pin 9 is taken from a high to a low logic level. This may be accomplished by means of a momentary contact switch, or by a square wave input at pin 9.

The duration of the one-shot is determined by the RC time constant at pins 23 and 24. The maximum duration that can be achieved is around two seconds.

About the only parts of the circuit that we haven't considered so far are the envelope select logic, the attack and decay control logic, and the on-chip amplifier. We will now consider each of these in turn.

Pins 1 and 28 control the envelope select logic, which determines the envelope for the output from the mixer, according to the following table:

Pin 1	Pin 28	Output
0	0	VCO
0	1	Mixer only
1	0	One-shot
1	1	VCO with one-shot

Attack and decay of the one-shot envelope is determined by the attack control resistor (pin 10), the decay control resistor (pin 7), and the attack/decay timing capacitor (pin 8). The attack time in seconds is simply the RC time constant of the attack control resistor and the attack/decay timing capacitor.

Similarly, the decay time is the RC time constant of the decay control resistor and the attack/decay timing capacitor.

The on-chip amplifier is designed to interface with additional amplifier stages. It requires an external summing resistor (10k) from pin 12 to pin 13, and is designed to provide a low impedance output. The gain of the amplifier may be varied by a resistor on pin 11.

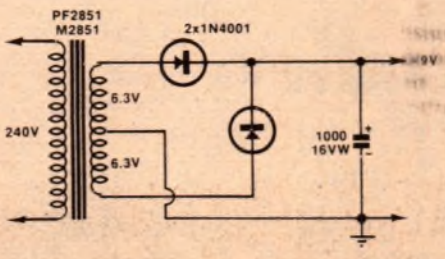
Power supply requirements for the SN76477 are straightforward. The device is designed to accept a 9VDC supply (either battery or mains derived) to pin 14, and to regulate this down to 5V to supply the various on-chip functions. This regulated voltage also appears on pin 15 of the device. Pin 2 is the supply earth.

So much then for the internal workings of the SN76477 sound generator IC. Let's now turn our attention to building some simple circuits, and the way in which we have implemented the general purpose pc board.

As may be seen, the pattern has been designed so that the IC occupies a central position on the board. Running down either side of the IC are the +5V and earth rails, the latter the one nearest to the edge of the board. Solder pads are provided at regular intervals, so that chip programming is simply a matter of inserting the appropriate components between the IC pins and the +5V or earth rails to achieve the desired sound.

Note that we have made use of the regulated +5V appearing at pin 15 of the IC to provide the +5V rail.

We have also made provision on the board for a simple audio amplifier and for the power supply components. The audio amplifier is one suggested in TI's application notes and contains just two transistors (a BC639 and a BC640), employed here as a complementary pair. This arrangement should provide sufficient power output for most purposes.



This simple circuit can be used to power the sound synthesiser.

However, there is nothing to stop you from feeding the chip output into a more powerful amplifier system if you so wish. Just connect a 10k resistor between pins 12 and 13 as described previously, and feed the IC output from pin 13 directly into your amplifier. Input signal levels into the amplifier can be adjusted by the gain resistor on pin 11.

Another option is to use a 9V battery in place of our mains power supply. This should preferably be bypassed with a 100uF electrolytic capacitor, which can be soldered onto the board in place of the 1000uF unit used in the mains supply.

Very few additional components are required to program the chip to build the steam train/propeller plane sound synthesiser — just four resistors, two capacitors, a pot and a few wire links in fact. The way in which we wired up the board is shown in the component overlay diagram.

What if you want to build the siren/spacer war sound synthesiser, or the gunshot/explosion synthesiser? For both cases, just refer to the accompanying table and program the IC accordingly.

One final note, and that concerns availability of the SN76477 IC. The device used in this project was an advance sample supplied through Texas Instruments' local office and, at the time of writting, not generally available in Australia. However, TI has assured us that sufficient stocks will be imported and made available to dealers by the time this article appears in print.

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by DAVID EDWARDS

One of the most useful pieces of equipment on an experimenter's bench, apart from the ubiquitous multimeter, is usually some form of audio oscillator. In the past, we have presented a number of designs for such instruments, including designs both simple and complicated.

The unit described in this article is fairly simple, but still designed for serious work. Performance wise, it is quite respectable, with a nominal maximum output of 1V variable down to zero with a potentiometer and a preset divider. It has quite low distortion figures. As you can see in the accompanying graph, between 20Hz and 20kHz distortion is less than 0.1 per cent, with a minimum distortion centred about 1kHz of about 0.04 per cent. Yet at the same time it is low in cost.

Only four low cost transistors are required for the basic oscillator, along with a thermistor (negative temperature coefficient resistor). A 555 timer is used as a Schmitt trigger to provide a square wave output. The unit has been purposely designed to run from a 9V supply rail, allowing the use of a single 9v battery, or one of the now commonly available "plugpack" power supplies.

Use of a plugpack, rather than an in-built mains supply, is not only cheaper but avoids the problems of magnetic induction from the transformer field into sensitive portions of the circuit. In addition, a single plugpack can be used to power several units (not at the same time of course), leading to a further reduction in cost.

The new instrument has been designed as a companion for the RLC Bridge described in the March 1978 issue. As you can see in the photographs, the unit is mounted in a plastic "zippy" box, with a black front panel having white lettering.

Turning now to Fig. 1, we can discuss the operation of the basic Wein bridge oscillator circuit. A frequency selective network is used to apply positive feedback to a high gain amplifier. This nerwork is formed by R1, C1, R2 and C2.

At a particular frequency, this network has a "pseudo-resonance", where a signal applied to R1 at the output of the amplifier is transmitted back to the amplifier input without any phaseshift, and with a minimum of attenuation. In fact, if R1 is made equal to R2, and if C1 is made equal to C2, this frequency is given by the reciprocal of 2piR1C1, and the feedback transmission loss falls to a minimum of 3.0.

For a feedback amplifier to produce sustained and steady oscillations, there must be positive feedback with zero phase shift at a particular frequency, while at the same time the overall loop gain must be unity. We can achieve these conditions in the present case by applying negative feedback to give the amplifier a gain of 3.0.

This is the purpose of the network formed by R3 and the thermistor. The thermisor serves a second purpose in this case though, and that is to stabilise the amplitude of the oscillations. If the thermistor was replaced by a fixed resistor equal in value to 2R3, the circuit would oscillate, but the oscillations would continue to increase in amplitude until clipping occurred.

This is obviously undesirable. The thermistor acts to prevent this however, because as the output signal rises the power dissipated in the thermistor increases, and its temperature increases. This causes the resistance of the thermistor to reduce, (it has a negative temperature coefficient), so that the the amount of negative feedback is in-

Use this photograph of the completed unit as your guide in the choice of knobs. Make a pointer for the frequency dial with a piece of perspex or clear plastic.

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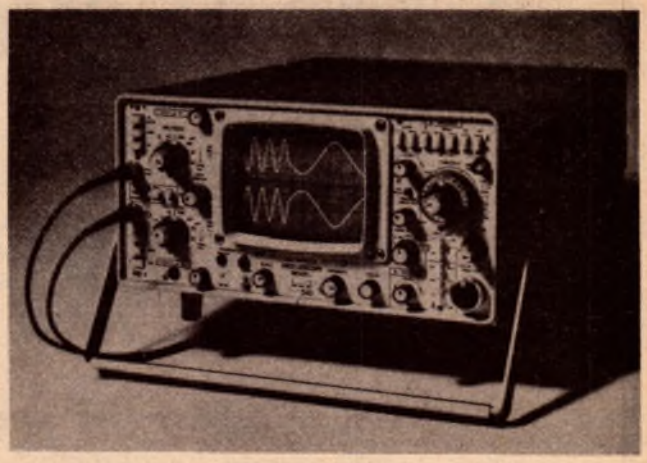

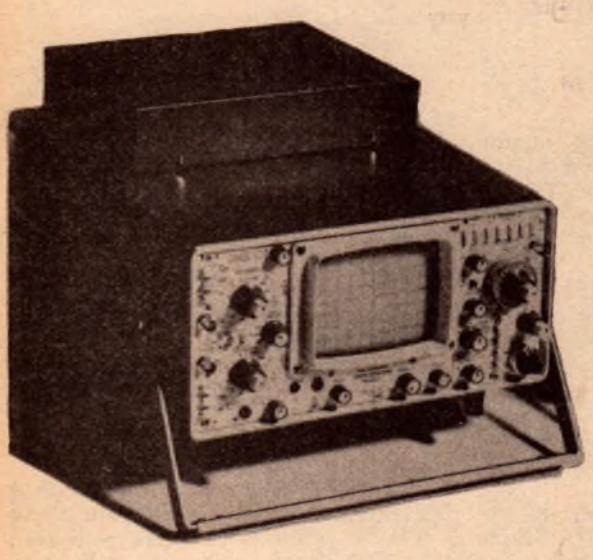

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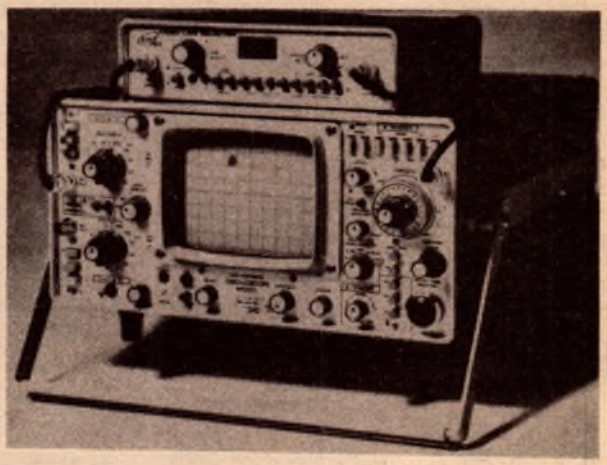

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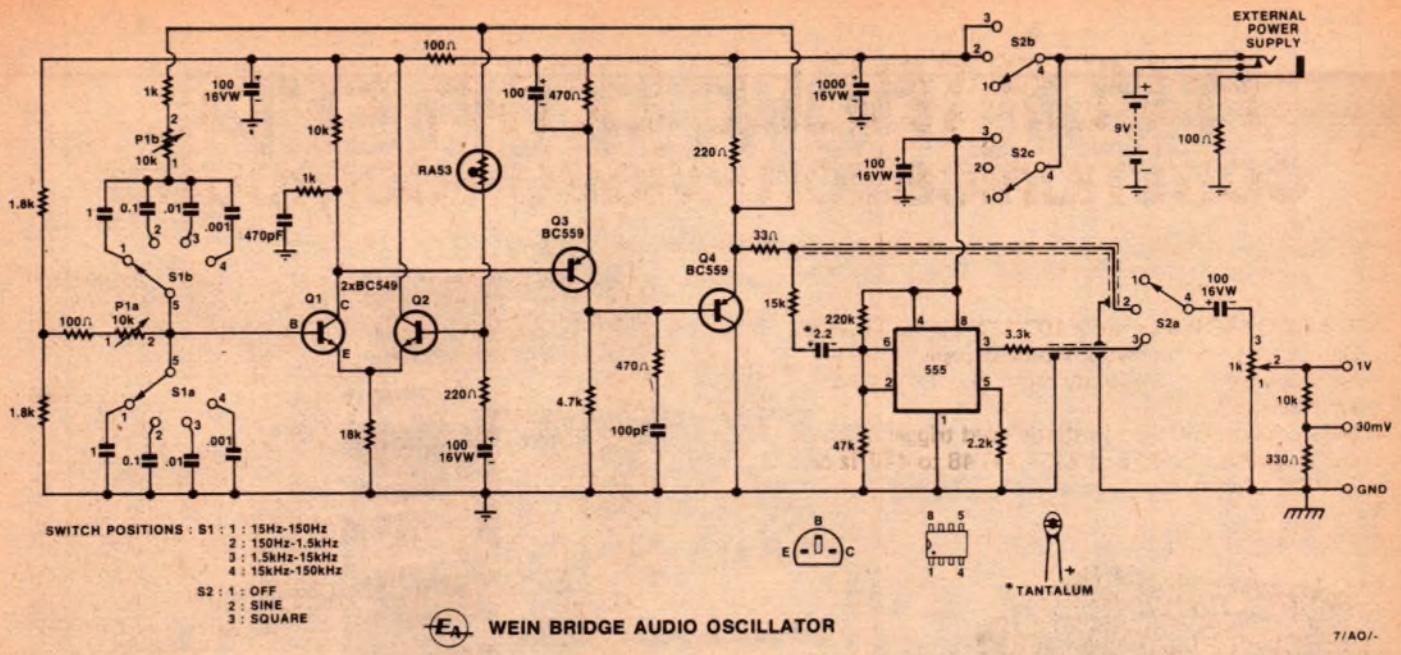


creased, and hence the gain is reduced.

The thermistor also ensures reliable starting of the oscillator, because when there is no oscillation, there is minimal power dissipation in the thermistor, so that the gain of the amplifier is quite high. As the signal level then increases, the thermistor acts to stabilise the amplitude. With the thermistor specified, and the value of R3 used, the final output amplitude is just a little over 1VRMS.

Turning now to the main circuit diagram, we can discuss the circuit in more detail. TR1 and TR2 form a differential pair, with the output taken from the collector of TR1. TR3 amplifies this signal further, while TR4 buffers the signal at the collector of TR3. Positive feedback is applied from the emitter of TR4 to the base of TR1 via the Wein network, while negative feedback is applied to the base of TR2 via the thermistor.

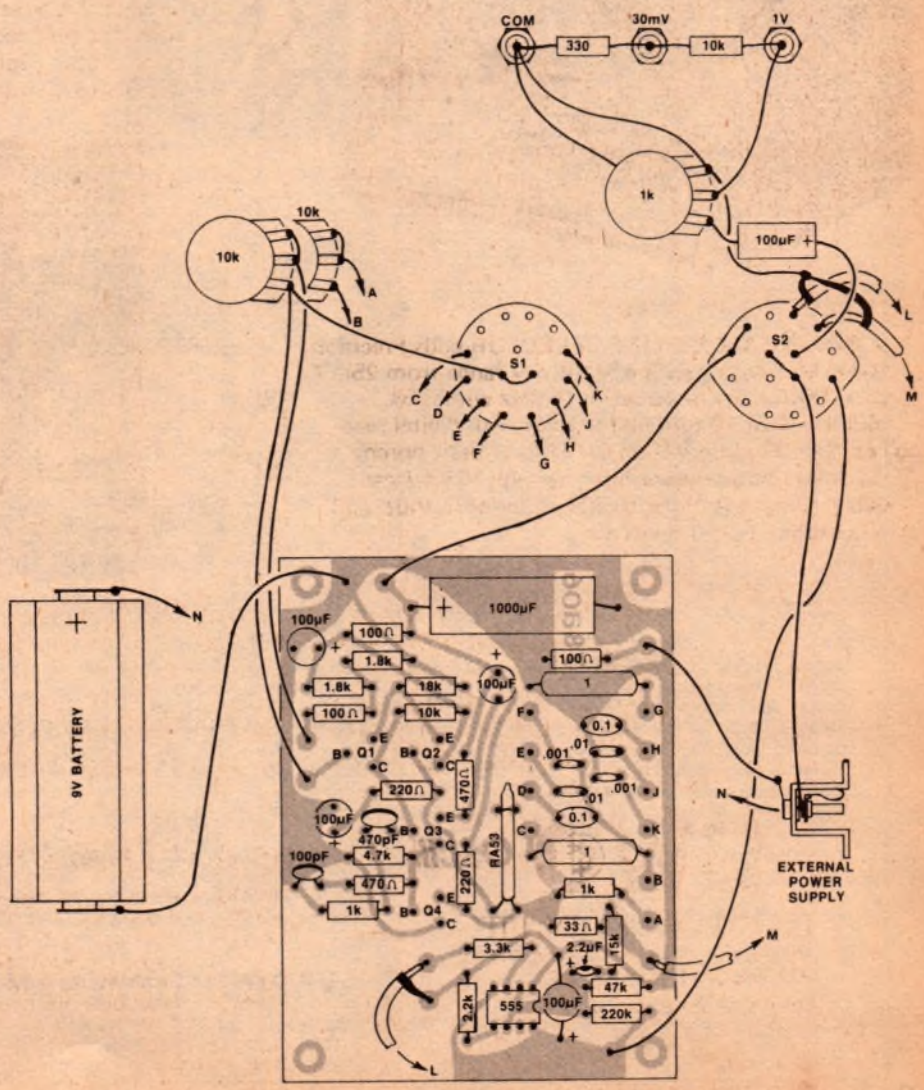
The base of TR1 is held at half the supply voltage by the two 1.8k resistors, and since 100 per cent dc feedback is applied via the thermistor, this fixes the output DC voltage at half the supply rail also. Switch S1 is used to select one of four pairs of capacitors, to give the four frequency ranges provided, while ganged potentiometer P1 provides the frequency selection within each range.

1k stopper resistors are included in series with the two sections of P1 so that overlapping of the ranges is obtained by about five per cent. The stopper in series with P1a is formed by the series parallel combination of the 100 ohm and 1.8k resistors.

High frequency stability of the amplifier is ensured by the use of RC step circuits connected to the collectors of TR1 and TR3. The bias supply and the collectors of TR1 and TR2 are isolated from the main supply line by a

ABOVE: This is the circuit diagram of the oscillator, which uses only four transistors and one 555 timer.

BELOW: Use this diagram as a guide when assembling the PCB, and when completing the wiring.



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BX-505

Fast-response, 24μA movement — fuse & diode protected with high resolution factor. (0.4μA/scale division)
Revised scale marking — intermediate readings readily determined.

U-60D

44μA movement — quality performance, diode protected.
Temperature measurement of −30°C to +150°C with extra scale.

CAM-250D

Clamp meter
Economical and multi-function. Single motion core arm.
Compact yet provides 4 ranges on ACA and 2 ranges on ACV.

PDM-500/C

Performs as low resistance ohmmeter besides insulation tester.
Measurement, scale calibration and battery check are all operated by pushbutton switches.
Has constant voltage impressed irrespective of the value of resistance checked.

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(N-501)
● ±DCV 0-60m 0-0.3-1.2-3-12-30 0-120-300-1.2k-30k (w/HV probe) ● ±DCA 0-2μ 0-0.03-0.3-1.2-3-12-30m 0-0.12-0.3-1.2-12A ● ACV 0-3-12-30-120-300-1.2k ±2.5% Freq. 20Hz to 50kHz ● ACA 0-1.2-12 ● Ω ×1-×10-×100-×1k-×10k-×100k (max. 200M) Batt. 1.5V ×1 & 9V ×1 ● dB −20 to +63

(AX-303TR)
● ±DCV 0-0.3-3-12-30-120-300-1200 ● ACV 0-6-30-120-300-1200 ● ±DCV 0-60μ 3m-30m-0.3-12 ● Ω ×1-×10-×1k-×10k (max. 20M)

(U-60D)
● DCV 0-0.1-0.5-2.5-10-50-250-1k-25k (w/HV probe) ● DCA 0-50μ 2.5-50-500m ● ACV 0-2.5-10-50-250-1k ● Ω ×1-×10-×100-×1k (max. 5M)

(BX-505)
● ±DCV 0-0.12-3-12-30-120-300-1200-30k (w/HV probe) ● ±DCA 0-30μ 3m-30m-0.3-12 ● ACV 0-6-30-120-300-1200 ● ACA 0-12 ● Ω ×1-×10-×1k-×10k (max. 20M)

(CAM-250D)
● ACA 6-30-60-300 ● ACV 300-600 ● kΩ 0-50k ● Batt. 1.5V×1

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sanwa

PARTS LIST

SEMICONDUCTORS
2 BC549 or similar NPN transistors
2 BC559 or similar PNP transistors
1 555 timer IC

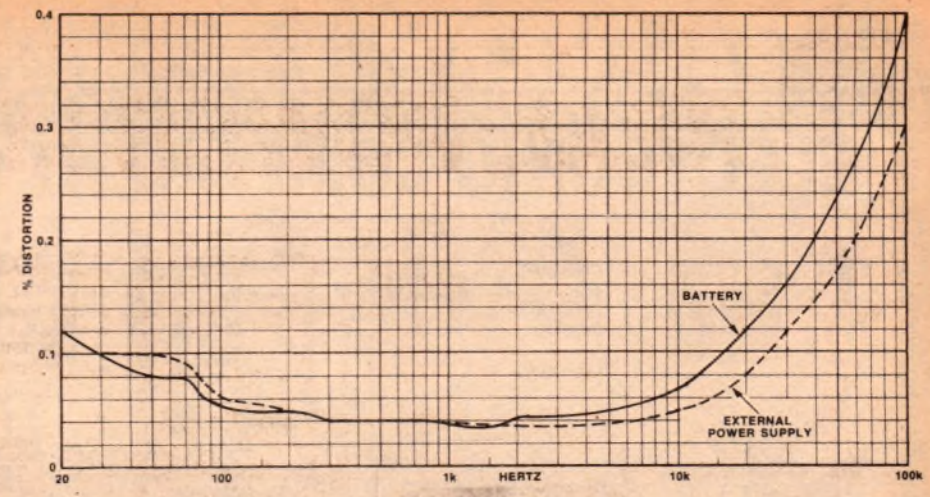
CAPACITORS
1 1000uF 16VW axial lead electrolytic
5 100uF 16VW radial lead electrolytics
1 2.2uF tantalum
2 1uF polyester
2 0.1uF polyester
2 0.01uF polyester
2 0.001uF polyester
1 470pF polystyrene or ceramic
1 100pF polystyrene or ceramic

RESISTORS (all ¼W unless noted)
1 22k, 1 47k, 1 18k, 1 15k, 2 10k, 1 4.7k, 1 3.3k, 1 2.2k, 2 1.8k, 3 1k, 1 470 ohm, 1 330 ohm, 2 220ohm, 3 100 ohm, 1 33 ohm
1 dual 10k linear potentiometer
1 1k linear potentiometer
1 RA 53 thermistor

MISCELLANEOUS
1 2 pole 4 position rotary switch
1 3 pole 3 position rotary switch
1 case, 197 x 60 x 112mm
4 knobs
3 terminals, 2 red, 1 black.
4 rubber feet
1 Eveready 2362 or similar battery and suitable connecting clips
1 front panel (see text)
1 A&R PS309 or similar 9V plugpack
1 2.1mm DC input jack socket and metric screws to suit

1 printed circuit board, coded 78ao6, 101 x 76mm
Rainbow cable, shielded cable, printed circuit board pins, machine screws and nuts, scrap aluminium, perspex, solder

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with higher ratings may generally be used provided they are physically compatible.



ABOVE: Graph showing how the distortion of the prototype varies with the oscillator frequency.

BELOW: The internal layout of the prototype can be seen in this picture. Note the battery clamp.

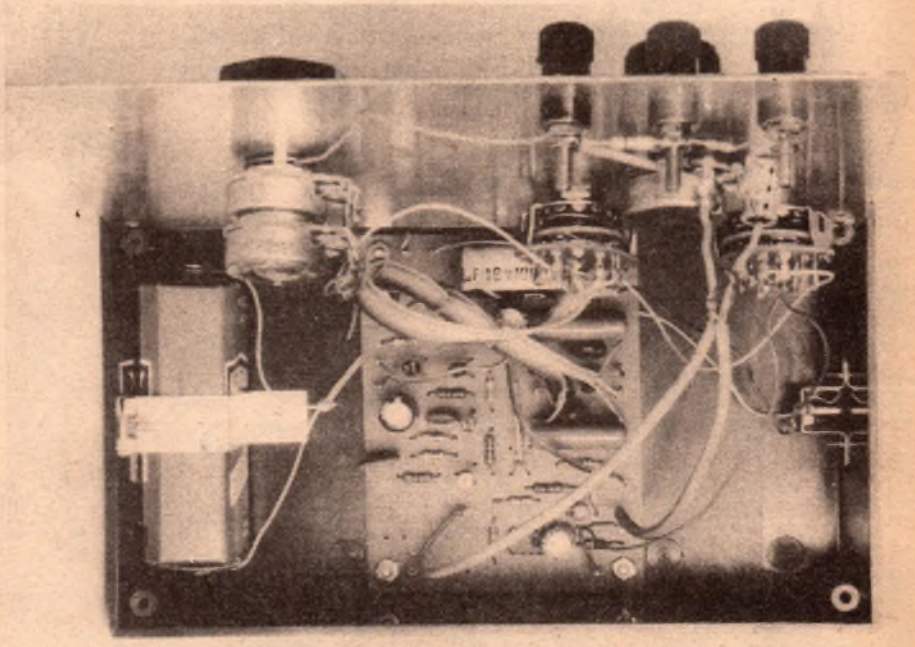
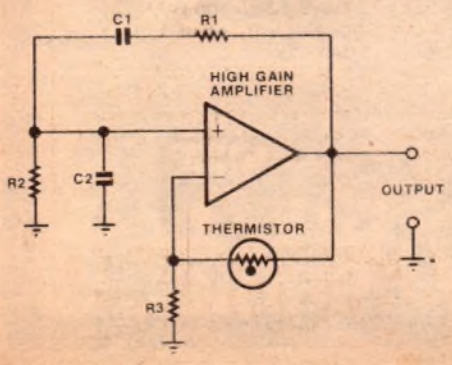


Fig. 1: This circuit shows the basic principles of the oscillator, whose frequency is determined by the RC network.



100uF/100 ohm RC combination.

Switch S2c is used to apply power to the 555 only in the square wave position, so that "glitches" do not appear on the sine wave output. This also has the advantage of reducing the current consumption in the sine wave mode.

The 555 is used as a Schmitt trigger by applying the sinewave signal to the two trigger inputs. This signal is AC coupled, and two inputs are biased at approximately 1.5V by the 220k and 47k resistors. The 2.2k resistor connected to pin five is used to lower the input thresholds to 2V and 1V, so that an approximately even duty cycle square wave is obtained.

Switch S2a is used to select either the sine or square wave signal, with the latter being attenuated to a 1V RMS level by the 3.3k resistor in series with pin 3. A coupling capacitor is provided, with a 1k potentiometer used as an output level control. To faciliate the generation of millivolt-level signals, a fixed divider is provided across the output terminals, to give a nominal signal of 30 mV maximum.

Filtering of the supply line is provided by a 1000uF capacitor. A 100uF capacitor is used to remove glitches from the supply line to the 555, and a 100 ohm resistor inserted in the negative lead of the plugpack input reduces the effects of mains ripple to insignificant levels.

Construction of the unit is quite simple, and should be within the capabilities of even inexperienced constructors. Most of the components are mounted on a single printed circuit board, measuring 101 x 76 mm, and coded 78ao6.

Commenced construction by fitting all the hardware to the case. The front panel of the prototype was made from photosensitive aluminium, but we hope that commercial panels will be

available in due course. The battery is clamped to one end of the case with a small piece of scrap aluminium, while the PCB is simply screwed to the bottom of the case using additional nuts as spacers.

Use the combined overlay diagram and wiring diagram to aid in placements of the components. Remember to ensure that the electrolytic capacitors and transistors are oriented correctly. The output coupling capacitor and attenuator resistors are wired between the front panel components as shown.

Use shielded cable as shown to connect the sine and square wave signals to the function switch (S2). The shield of the cable carrying the square wave signal is used to make the earth connection to the COM terminal. Remember to earth the front panel itself to this point also.

Use rainbow cable for the remaining connections to the front panel, and to the power input socket and the battery terminals. Keep these leads as far as possible away from the output terminals.

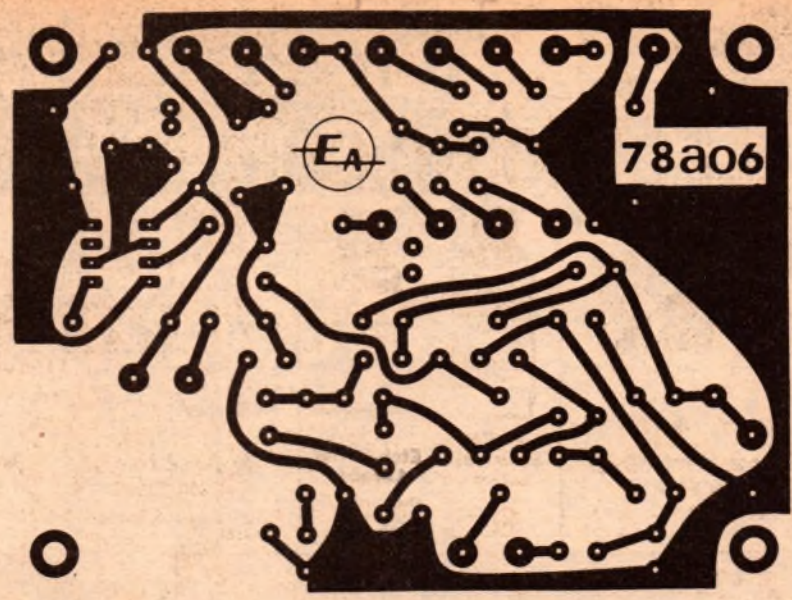
Once construction is complete, operation can be checked using some sort of audio level indicator. A CRO is ideal, with an audio millivoltmeter the next best thing. If necessary, an audio amplifier can be pressed into service, so that you can listen to the output.

Check operation over all frequencies, and in both sine and square wave positions. Do not forget to check for correct operation using both the internal battery and the external plugpack.

Calibration of the completed unit is quite simple. If you have access to a frequency meter, simply set the dial at the correct point while the oscillator is producing about a 3kHz tone.

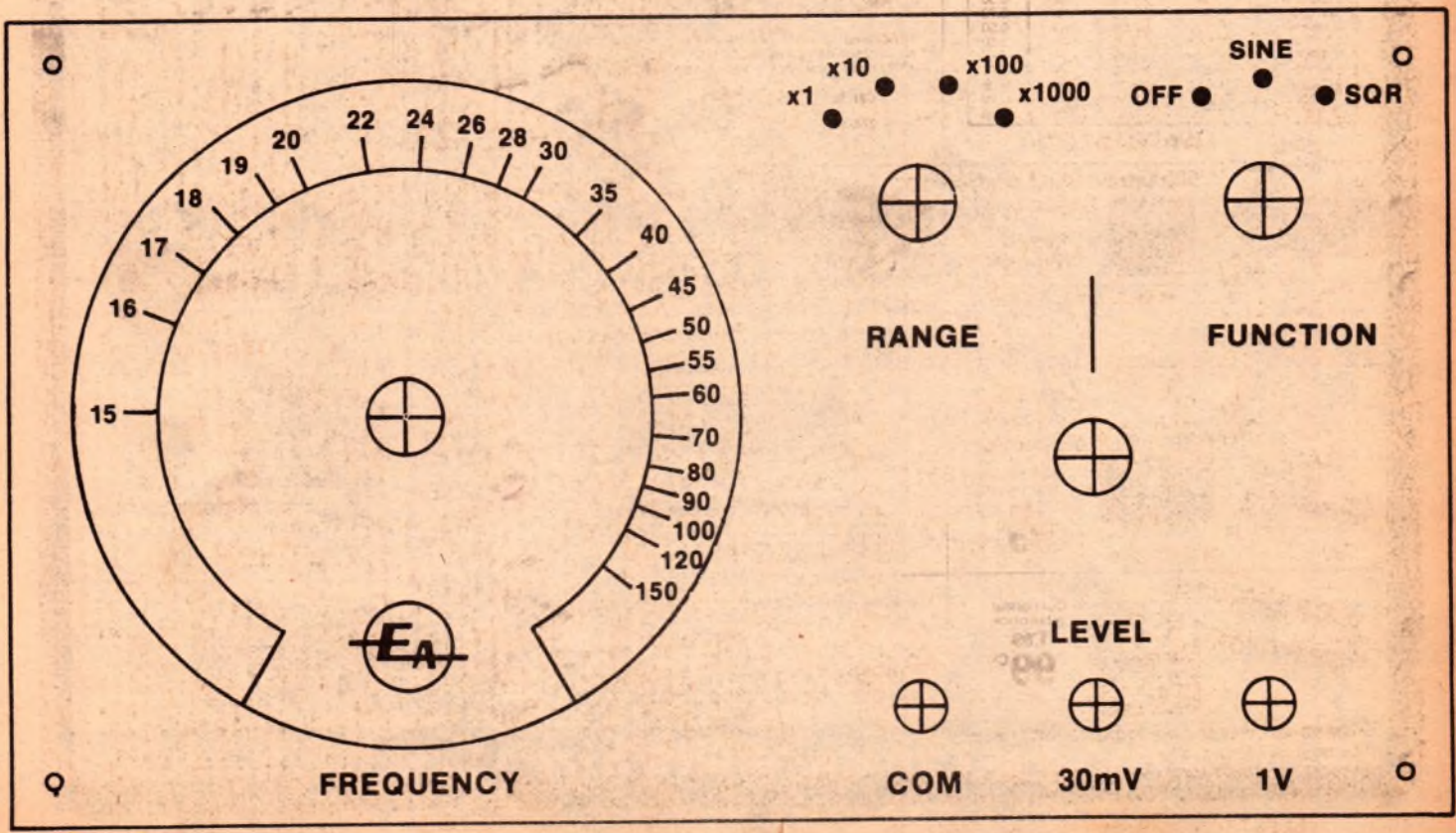
You can then check accuracy on the remaining ranges, padding the appropriate capacitors if necessary. The actual scale calibrations were determined experimentally, and were made using a potentiometer supplied by Dick Smith Electronics, marked "JP-7G" and "B10k". For maximum calibration accuracy, readers should endeavour to use the same type of pot.

On an instrument of this type, however, accuracy of calibration is not essential, and any 10k dual ganged linear pot should give accepable performance.



If you make your own printed circuit boards, then this full sized reproduction can be used as a drawing guide.

This full sized reproduction of the front panel can be used directly, or copied.



Extra channels for the ICOM IC22S

One of the useful features of the ICOM IC22S two-metre transceiver — presumably one which the makers did not foresee — is the fact that the channel selection system can be extended to an external unit so that it is no longer limited to the 22 positions on the front panel. In this and a subsequent article we will discuss some of the ideas already suggested, and their implementation.

by PHILIP WATSON

The channel selection system in the IC22S is a novel one. The front panel switch no longer selects crystals, as it did in the earlier models, but selects groups of diodes fitted to a matrix board, one group for each channel.

The matrix board provides eight possible diode positions for each channel, each position representing a column in a binary numbering system. For example, the first diode represents 1, the second 2, then 4, 8, 16, 32, 64, and 128.

For any particular frequency the diodes are fitted to various positions (or columns) so as to add up to a certain number ("N"). This number is derived from a formula supplied with the set:

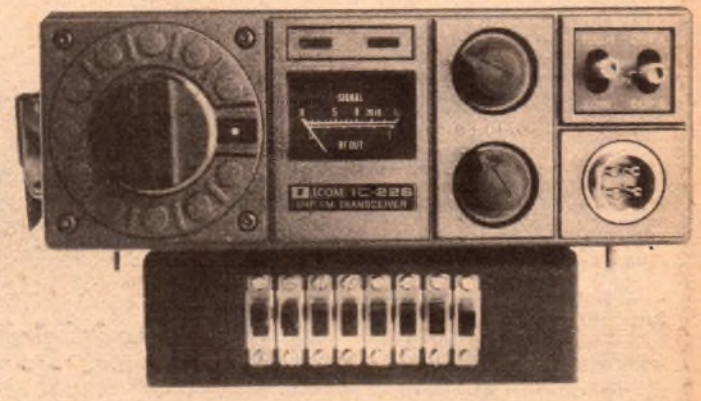
$$N = \frac{\text{Desired frequency} - 144.4}{0.025}$$

If we feed (say) 147.4MHz into this formula we get an "N" figure of 120, and this is made up by fitting diodes to positions 64, 32, 16 and 8. For 146MHz "N" is 64, which can be provided by a single diode.

It did not take amateurs long to wake up to the fact that the eight matrix board connections could be brought out of the set and, using various simple switching systems, used to extend the number of channels to the limits imposed by the set itself. A common lead (actually a 9V rail) is the only other connection needed.

To make this idea even more attractive, there is a 9-pin socket on the back of the set, which is almost redundant. Something of a carryover from earlier models, it uses two pins to bring out a connection to the discriminator, to facilitate "tweaking" the receiver crystals. This connection is still provided, but most users are happy to discard it.

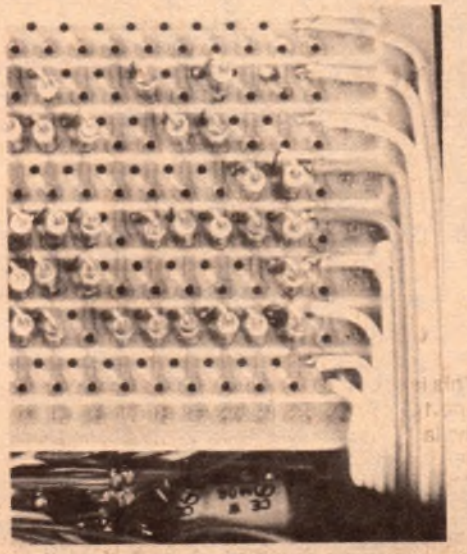
Another point is that, although the switch is numbered 1 to 22, it has 23 positions and similarly, there are 23 positions on the matrix board. For some strange reason, neither has been connected.



The switch assembly mounted underneath the transceiver. Although the simple panel shown may be adequate in some cases, a small metal or plastic box would make a more robust arrangement.

The natural reaction is to wire in the 23rd position, then use this for the external switching system, leaving the other 22 positions wired for the most popular channels.

Once the matrix board connections are brought out, a number of options are available as to the best way to perform the switching, eg:



Close-up of the cable connections to position 23 on the matrix board. See also the accompanying circuit diagram.

(a) Eight diodes selected by eight switches (toggle, slide, etc);

(b) Eight diodes and a three-section BCD thumbwheel switch;

(c) Eight diodes and a DIL socket into which can be fitted preprogrammed plugs and/or a DIL eight position switch;

(d) A second matrix board (possibly fabricated from two pieces of Veroboard), a multi-position switch, and a group of diodes for each position.

None of these ideas is necessarily original or the only ones possible, and several articles have been published on the subject. ("73" October 1977 and January 1978.) The main purpose of this article is to deal with the mechanical aspects of the ideas, particularly in regard to locally available hardware.

Regardless of which scheme is ultimately selected, the first thing to do is to modify the set. Those who hesitate at this point may be reassured that the job can be done simply and neatly, and involves nothing that would prejudice the set's resale value. If necessary the modifications could be removed without trace.

Disconnect all external cables from the set (microphone, power cord etc) and remove the top and bottom covers. Unsolder the speaker leads at the speaker to allow the bottom cover to

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be put to one side.

Select a piece of 10 conductor rainbow cable about 23cm long; preferably the narrow variety, about 12mm wide. Since only nine conductors are needed, peel one off but do not discard it. Removing it will save space and prevent confusion, and it is an ideal type of wire to complete the connection between switch position 23 and position 23 on the matrix board.

Unless you have a double jointed soldering iron, access to switch position 23 is difficult without removing the front panel. Remove the four countersunk screws, two top and two bottom, which hold the panel to the body. The volume and squelch knobs pull off, and the channel selector knob has a grub screw which fits an Allen Key. (The second smallest in the writer's kit.)

The panel is still anchored by wires but can be moved to one side. The panel meter can be lifted out of the panel. Having connected the wire to the switch contact the writer was able to coax the wire into the existing cable, using a pair of tweezers to pull it through each tie point. This makes a very neat job. At the matrix board solder the other end of the wire to the vacant number 23 pad, which is quite obvious.

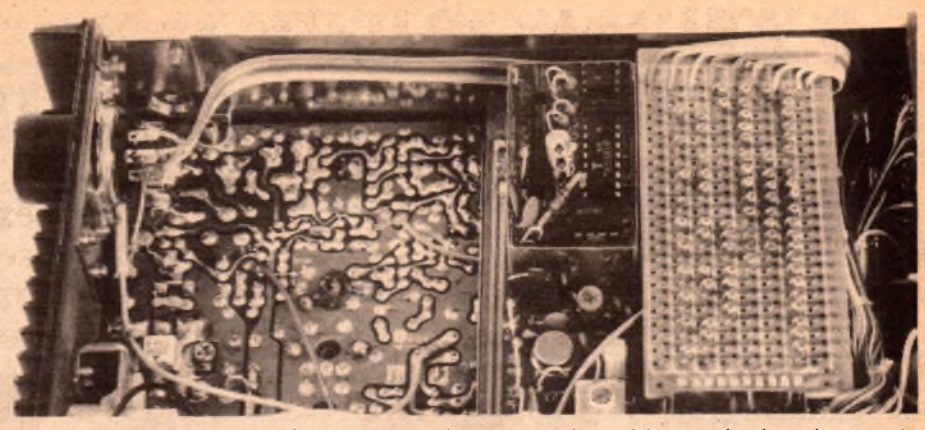
Next wire the length of rainbow cable to the matrix board. Eight of the wires connect to the eight pads of the 23rd position which normally connect to cathode (bar) side of the diodes. The ninth one connects to any one of the anode (arrow) pads, which are slightly offset towards the end of the board. We used the one on the "D7" strip.

Fan the wires out as shown in the photograph and direct the cable towards the front of the unit. Subsequently it is turned under the board towards the rear. This retains the ability to lift the matrix board and turn it over for modification or maintenance.

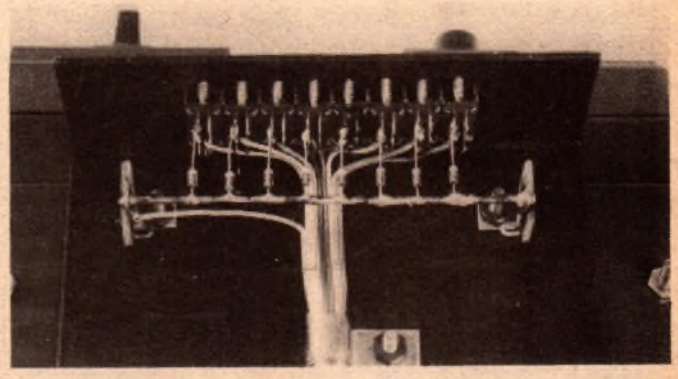
Wiring the rainbow cable to the nine pin socket is easier if the socket is removed. Assess the length of cable needed and trim it accordingly before removing the socket. Then undo the three screws, one at the side and two at the rear (behind the spec. plate) and lift out the complete socket assembly.

Disconnect the two leads to the socket and remove the small capacitor bridging them. The active (hookup wire) lead can be rolled up and taped out of the way. Connect the nine wires to the socket, in logical order, and fit the socket back in place. The whole unit can now be reassembled and no more work need be done on it. Note the colour code before replacing the cover.

Of the options listed (a) is undoubtedly the simplest and cheapest. Assuming that a table of frequencies versus switch positions is available, it is quite simple to select a particular frequency, either on one's own initiative, or as suggested by another operator.



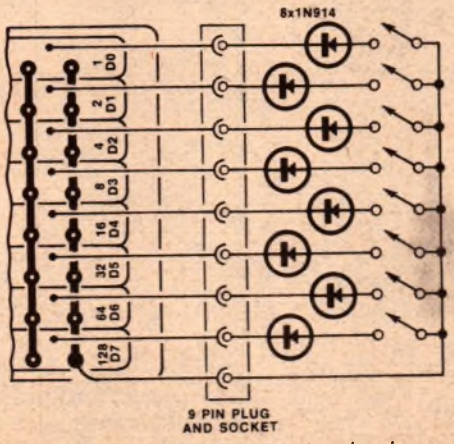
General view of the modifications to the IC22S. The cable attached to the matrix board is dressed towards the front of the set, then turns under and runs along the edge of the chassis to the 9-pin socket at the rear.



Underside view of the switch bracket, showing cables and diodes. The screws securing the two terminal boards also fix the unit to the transceiver's mounting bracket.

It is far less satisfactory if one has ideas about scanning the band in a search for activity. Even using the table, such an operation would be tedious to the point of impracticability. Also, it is not easy to recall the frequency to which the switches are set by looking at them, and too tedious to back-track through the table.

Provided these limitations are appreciated, the scheme is a perfectly practical one. But, because of them, it seems worthwhile to consider the cheapest practical switches, otherwise the cost of eight toggle switches may approach that of three thumbwheel switches and this scheme (b) at least minimises these restrictions.



The connections are so simple that a circuit is hardly needed, but the matrix board details may be helpful.

(We considered the use of a DIL switch but considered that its small size was a disadvantage in this application. For anything but occasional resetting it is far too "fiddly" for the average user.)

We made up a simple version of (a) based on subminiature slide switches (DPDT) which sell for around 35c each, according to how many you buy, and where. (It is often as cheap to buy 10 as to buy eight.)

These switches are intended to mount behind a rectangular cut-out in the panel, but cutting such holes with a neat finish is difficult for the home constructor. An alternative is to cut one large rectangular hole to take the eight switches side by side, mounted from the front.

A minor problem with these switches is to find suitable mounting screws. They are fitted with tapped holes, but the thread is foreign and screws are not readily available. In any case the front mounting alters the requirement. We used some small self tapping screws (No. 3), enlarging the holes slightly with a 3/32in drill, which also served to drill the pilot holes. (A slightly smaller hole, as from a number 42 or 43 drill might be better.) Also, to permit the switches to sit flat on the panel, we filed the extrusions from the rear of mounting lugs.

The outboard unit was built on a simple angle bracket bent up from a scrap of aluminium. It measures 110mm x 65mm x 35mm and bolts to the set's mobile mounting bracket which, in

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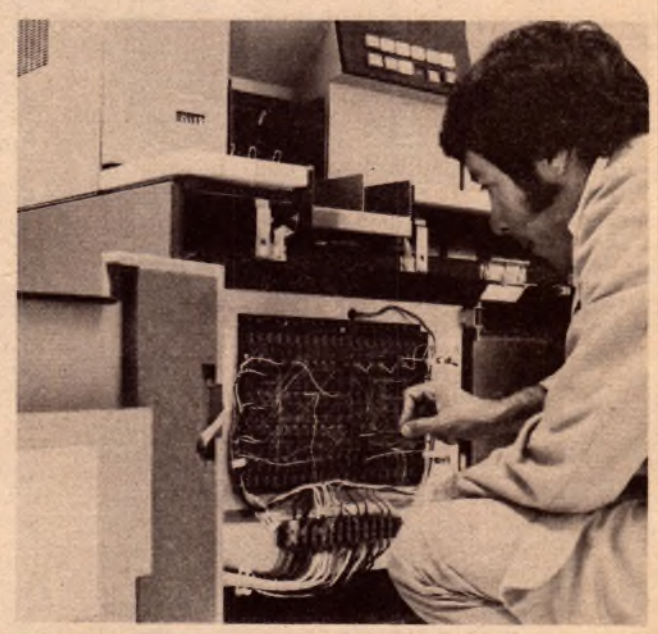

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ICOM IC22S — Cont.

turn, is bolted to the bottom cover of the set. This latter arrangement makes fitting the set to the car a simpler operation.

Having done it this way, the writer would recommend a better approach for the reader. A box, rather than a bracket, is neater and provides better protection for the wiring and components. It can be mounted in the same way. A good choice appears to be one of the small plastic "Jiffy" boxes, such as the UB4 which measures 100mm x 53mm x 41mm.

The idea of mounting the switch unit on the set is, of course, only one approach, aimed mainly at mobile operation. For fixed station operation the unit may be mounted in any convenient position, some distance away if necessary.

To avoid the tedium of calculating "N" each time a new channel is suggested, we have reproduced a table giving the binary combinations for all channels, 25kHz apart, between 144.4MHz and 147.975MHz. This information may be used either to fit diodes to the internal board, or to set the external switches.

Note that, although the table implies operation down to 144.425MHz, this figure is unlikely to be reached. In fact, the makers guarantee operation only between 146 and 148MHz. The writer's set goes down to 144.7, which appears to be typical. On this basis the system provides for about 130 channels.

In our next article we will describe the use of thumbwheel switches and perhaps discuss some of the other options.

ICOM IC22S CHANNEL PROGRAMMING CHART

MHz	OCTAL	BINARY	MHz	OCTAL	BINARY	MHz	OCTAL	BINARY
144.400	0	00000000	145.600	60	00110000	146.800	140	01100000
144.425	1	00000001	145.625	61	00110001	146.825	141	01100001
144.450	2	00000010	145.650	62	00110010	146.850	142	01100010
144.475	3	00000011	145.675	63	00110011	146.875	143	01100011
144.500	4	00000100	145.700	64	00110100	146.900	144	01100100
144.525	5	00000101	145.725	65	00110101	146.925	145	01100101
144.550	6	00000110	145.750	66	00110110	146.950	146	01100110
144.575	7	00000111	145.775	67	00110111	146.975	147	01100111
144.600	10	00001000	145.800	70	00111000	147.000	150	01101000
144.625	11	00001001	145.825	71	00111001	147.025	151	01101001
144.650	12	00001010	145.850	72	00111010	147.050	152	01101010
144.675	13	00001011	145.875	73	00111011	147.075	153	01101011
144.700	14	00001100	145.900	74	00111100	147.100	154	01101100
144.725	15	00001101	145.925	75	00111101	147.125	155	01101101
144.750	16	00001110	145.950	76	00111110	147.150	156	01101110
144.775	17	00001111	145.975	77	00111111	147.175	157	01101111
144.800	20	00010000	146.000	100	01000000	147.200	160	01110000
144.825	21	00010001	146.025	101	01000001	147.225	161	01110001
144.850	22	00010010	146.050	102	01000010	147.250	162	01110010
144.875	23	00010011	146.075	103	01000011	147.275	163	01110011
144.900	24	00010100	146.100	104	01000100	147.300	164	01110100
144.925	25	00010101	146.125	105	01000101	147.325	165	01110101
144.950	26	00010110	146.150	106	01000110	147.350	166	01110110
144.975	27	00010111	146.175	107	01000111	147.375	167	01110111
145.000	30	00011000	146.200	110	01001000	147.400	170	01111000
145.025	31	00011001	146.225	111	01001001	147.425	171	01111001
145.050	32	00011010	146.250	112	01001010	147.450	172	01111010
145.075	33	00011011	146.275	113	01001011	147.475	173	01111011
145.100	34	00011100	146.300	114	01001100	147.500	174	01111100
145.125	35	00011101	146.325	115	01001101	147.525	175	01111101
145.150	36	00011110	146.350	116	01001110	147.550	176	01111110
145.175	37	00011111	146.375	117	01001111	147.575	177	01111111
145.200	40	00100000	146.400	120	01010000	147.600	200	10000000
145.225	41	00100001	146.425	121	01010001	147.625	201	10000001
145.250	42	00100010	146.450	122	01010010	147.650	202	10000010
145.275	43	00100011	146.475	123	01010011	147.675	203	10000011
145.300	44	00100100	146.500	124	01010100	147.700	204	10000100
145.325	45	00100101	146.525	125	01010101	147.725	205	10000101
145.350	46	00100110	146.550	126	01010110	147.750	206	10000110
145.375	47	00100111	146.575	127	01010111	147.775	207	10000111
145.400	50	00101000	146.600	130	01011000	147.800	210	10001000
145.425	51	00101001	146.625	131	01011001	147.825	211	10001001
145.450	52	00101010	146.650	132	01011010	147.850	212	10001010
145.475	53	00101011	146.675	133	01011011	147.875	213	10001011
145.500	54	00101100	146.700	134	01011100	147.900	214	10001100
145.525	55	00101101	146.725	135	01011101	147.925	215	10001101
145.550	56	00101110	146.750	136	01011110	147.950	216	10001110
145.575	57	00101111	146.775	137	01011111	147.975	217	10001111

This chart should prove useful to all IC22S users, whether they add external switching systems or not. The binary column gives the combinations of diodes required for the matrix board, or the combination of external switches when these are used. The octal column is for the system to be described in the next article. (Computer program by John Wightman, VK2YBY.)

The Serviceman

Lightning — what can we do about it?

Misfortune, it seems, is always just around the corner. Following my recent story about a customer whose colour TV set was stolen I heard from a friend whose colour set — and a lot of other things — had been struck by lightning.

There is an old saying that lightning never strikes twice in the same place — to which one cynic was moved to reply that this was only because, after the lightning strikes the first time, the same place isn't there any more!

Be that as it may, lightning strikes are no joke. Maybe we tend to lump them in with music hall gags about trips to the dentists, slipping on a banana skin, and mothers-in-law, but the truth is that they can be very frightening things in reality. Why, then, do we treat them so casually?

Even as a child I tended to be somewhat blase — or perhaps fatalistic — about storms. I reckoned there was nothing you could do to stop them, and very little to avoid them, so you might as well accept them.

Granted, I didn't go flying kites in them, like Ben Franklin, but I did enjoy them. I would stand at the window and watch the rain pelt down — hoping it would turn to hail — listen to the rolls and cracks of thunder and, above all, keep an eager lookout for a bolt of lightning snaking down from the clouds to demolish some unfortunate tree or flagpole.

Not so my grandmother, who had her own way of dealing with thunderstorms. At the first faint roll of thunder she would embark on a ritual of closing doors to eliminate draughts, and covering mirrors. Then she would find the darkest corner of the darkest room in the house, settle herself in a chair, and throw her black apron over her head.

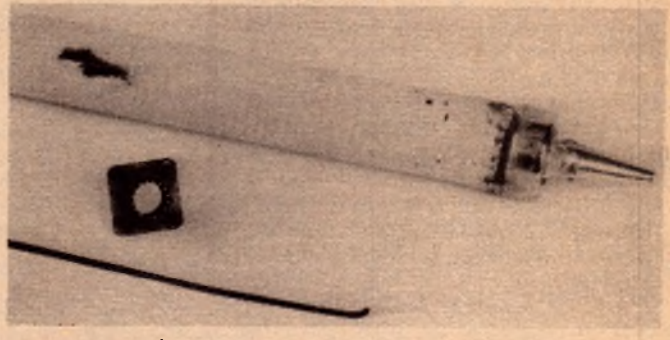
I never could work it all out. From other sources I eventually learned that draughts were supposed to encourage fire balls (if such things actually exist), while mirrors were supposed to attract lightning. I could never work out that last bit either. One theory suggested that it was the metal backing that created the risk, while another claimed that it was the optical reflection. Neither impressed me very much.

As for the apron over the head, well that can only be described as an ostrich-like reaction; as long as she couldn't see the lightning she could pretend it didn't exist.

Which is a good trick if you can make it work.

All of this brings me to the current story. I was prompted to tell it because I'm afraid we all tend to be much too blase about this subject, fondly believing that it always happens to the other bloke.

No, it didn't happen to me, and it did happen to another bloke. But when the "other bloke" is someone one has known for years and, in addition, can produce the physical evidence of what was destroyed, the whole thing suddenly becomes very real.



Three sections of the amateur aerial damaged by the lightning strike; the loading coil (note the black scar), all that was left of the S0239 socket, and the steel rod where it had melted.

Like myself, my friend has been "in radio" for most of his life. Professionally, he is now high up in one of our large TV retail outlets. And for relaxation he turns to amateur radio; a clear indication that it is "in the blood".

The storm struck the southern suburbs of Sydney at about 3.30 in the afternoon, and was a particularly violent one. At about 4 o'clock my friend received a distraught phone call from his wife, describing a most frightening experience.

In simple terms she explained that the house had been struck by lightning, with the immediate result that it had neither power nor telephone. She had to drive to the nearest public telephone to make the call.

Later, she described the experience in greater detail. The house is fitted with some large windows, covered by aluminium fly screens. She described the fly screens as ". . . seeming to light up", though whether this did, in fact, happen, or whether it was simply an optical effect due to the extreme brightness of the flash, is difficult to say.

Another disturbing experience was that she felt that her hair was standing on end and, when she looked at the family cat, she discovered that its fur was, in fact, doing just that. She described it as looking exactly like some of the humourous cartoons of cats which we all tend to accept as artistic licence.

Again, there is no way of knowing the true cause of this. One suggestion is that it was due to a powerful electrostatic charge in the immediate vicinity of the flash. Alternatively, it could have been a simple nervous reaction; a perfectly understandable one in the circumstances and one which could just as easily affect poor old puss as it did my friend's wife.

Not that my friend stopped to worry about such details at that time; he simply jumped in his car and headed for home. Quite apart from the fact that his wife was obviously upset, there were the practical considerations of organising for power to be restored and assessing other possible damage.

Among other things, he was concerned for the fate of $1000 worth of amateur radio transceiver, connected to a commercial vertical aerial on the roof of the house.

As he stepped from his car outside his home it seemed that his worst fears would be realised; about 30cm was mis-

sing from the top of the aerial. With that kind of energy playing around, he dared not think what might have happened to the transceiver.

Happily, a quick visit to the shack revealed no signs of damage although, at that stage, he had no power with which to test anything. He was relieved to note, however, that the power plug to the transceiver had been left out of the power point.

Thus partly reassured, he turned to the more immediate domestic needs. One obvious result of the strike was a large black patch on the kitchen wall immediately above one of the stove switches.

He checked the fuses first and found that all but one, that for the hot water system was blown although, as he put it, "vapourised" would have been a better word.

He replaced the light fuses and the lights came good. Thus encouraged, he replaced the power fuses and this circuit also held up. With power restored he checked the refrigerator and freezer and found both intact, but a second refrigerator had not been so lucky. It was working but when he opened the freezer compartment he was confronted with a charred mass, which had been the air circulating fan.

Next he tackled the stove switch. Apparently an active and neutral wire had been touching, separated only by the asbestos insulation. They were now welded together, the probable result of the lightning surge having broken down the insulation, leaving the 240V to finish the job.

Temporary repairs put the stove back in working order, in time for the evening meal. The only other fault with the stove was the failure of an indicating lamp for one of the hotplates.

He was also able to confirm that the amateur transceiver had not suffered any damage, but the aerial was another matter. It wasn't delivering any worthwhile signals, although the reason would have to wait until he could get up on the roof at the weekend.

In the meantime another casualty had been discovered. The TV set would no longer work on channel 2. The set uses a varactor type tuner, and it transpired that one of the ICs in the tuner had packed up. His firm's own workshop put that right.

There was more to come. The booster element in the hot water tank had failed. This was rather strange, since the fuse was still intact. It is difficult to be sure why this happened, without knowing whether the booster element was actually in operation at the time or not. If it was it seems likely,that the element was about to fail anyway and the surge on the line was the last straw, the element failing before the fuse could go. Significantly, it was later discovered that the council's tone sensing off-peak switch had also failed.

THE SERVICEMAN

The phone had suffered a burnt out printed board and, subsequently, the P&T technicians discovered that the cable buried in the street outside had also been damaged. (Phones belonging to two neighbours had also failed, while another neighbour had suffered a stove failure.)

So the final list was the amateur aerial, the TV tuner, the stove switch, the refrigerator, the hot water element, the off-peak tone sensor, the phone, and the fuses.

My friend was also advised, by an electrical engineer, to have his house wiring tested for both insulation and leakage and earth wire conduction. He subsequently engaged an electrician who checked and passed all circuits.

At the weekend he climbed on to the roof and tackled the aerial. It is a Hi-Gain model 18AVT/WB five band trapped vertical. It consists of a moulded base on which is supported a 30mm diameter tube, about 2m long, on top of which is a 28MHz trap coil. This is followed by two more trap coils, 21MHz and 14MHz, separated by short lengths of tube, then a longer section (about 1.5m) which, with a set of radials, resonates at 7MHz.

Above this again is a 3.5MHz loading coil (30mm x 33cm) and a stainless steel rod about 3mm diameter and about 1m long. Overall, the aerial is about 6.5m high.

Inside the moulded base is a small RF choke, connected between the aerial and the metal bracket on which the structure is mounted. It is intended that this be earthed and, in fact, my friend has gone to a good deal of trouble to provide a heavy duty earth wire to the nearest water pipe. The base is terminated in an S0239 UHF socket, which mates with the popular PL259 UHF plug.

The purpose of the choke is to provide a DC path to earth, while isolating the aerial from earth at RF. This, in turn, is to prevent the accumulation of static charges on the aerial, which can damage delicate front-end devices and also generate noise.

One cause of the poor performance was quickly obvious. As he disconnected the plug from the S0239 socket, the inside of the latter came away as a heap of black powder, while further investigation revealed that the RF choke was a mass of charred insulation.

None of the traps had suffered, but the 3.5MHz loading coil had a black scar on the outer plastic covering, through which could be seen blackened insulation on the winding. And, as already mentioned, about 30cm of the stainless steel rod above was missing. (This has not been found, in spite of a

careful search of the gutters and surrounding garden.)

My friend replaced the damaged socket, and was able to wind a new RF choke. The loading coil was a write-off, and was replaced, but a new rod was fashioned from a car radio aerial.

Naturally, the cost of all the repairs added up to a tidy sum; one which would have made a nasty dent in the bank account had my friend had to meet it all. Fortunately, most of the items were covered by insurance, including the refrigerator, the hot water element, and the cost of having the electrical system tested.

The amateur aerial was not covered, and there is some doubt as to whether the transceiver would have been covered, had it been damaged. This point is being investigated and, if necessary, an additional policy will be taken out to cover it.

This would seem to be the first lesson to be learned from this story; the need to ensure that insurance policies carry the necessary "storm and tempest" clauses to cover such an eventuality, and that they cover any unusual devices or appliances, such as amateur transceivers.

One of the puzzling aspects of this incident is the wide variety of items damaged by what appeared, superficially, to be a single stroke of lightning; the one that struck the amateur aerial.

In fact, such a suggestion is hard to accept, but the alternative would be to assume that there were four separate and virtually simultaneous strikes; one to the amateur aerial, one to the TV aerial, one to the power mains, and one to the buried telephone cables.

In support of this is the now generally accepted theory that lightning strikes are multiple affairs; a series of rapid pulses rather than a relatively long single pulse. However, I have always assumed that this happened at the same strike point.

On the other hand, what we call fork lightning does appear to be several simultaneous strikes in the same area. Granted, they may not be truly simultaneous, but the difference would be academic.

Also, we may be able to rule out the TV aerial being struck. This incident may have amounted to no more than a substantial static charge on the aerial, sufficient to damage an IC, particularly as these devices are rather sensitive.

Which leaves us with the idea of a triple strike. But even if we accept this, I must confess to being puzzled by the fact that the buried telephone lines were struck. I have always tended to believe that buried cables were virtually immune to lightning strikes, so how did this happen?

Did the strike occur some distance away, where the cable was exposed? If so it might well have found the weakest spot in the insulation, while damaging the instrument at the same time. Or could it have been caused by a massive electrostatic charge around the building? (remember poor old puss, with its hair on end.)

Quite frankly, I don't know the answers and I doubt whether answers would be possible at this late stage. In fact, the problem with all lightning strikes is that, because they are unpredictable, and extremely rapid, very little useful data can be obtained from them.

A question of more immediate importance is what one can, or should, do to protect valuable equipment, particularly radio and TV sets, from this awesome force.

In the early days of radio the fear of lightning striking the aerial was considerable, and many people would not buy the new fangled devices for this reason. To counter this, various schemes and devices were recommended to the prospective customer on the basis that they would not only protect the set but turn the aerial into a lightning conductor providing additional protection for the building.

The most popular arrangement was a knife switch (SPDT) which was used to connect the aerial to either the radio or the earth. The switch was supposed to be left in this latter position whenever the radio was not being used. As a further precaution the switch was often fitted with a spark gap, but these were usually so crude as to be virtually useless.

The switch idea was sound enough in theory, but failed in practice simply because people forgot to use it. This, coupled with the waning popularity of outdoor radio aerials, led to its eventual demise. The problem was raised again with the advent of TV and, to a lesser extent, amateur and other communication systems.

But the trend these days is to make aerials capable of being earthed in the DC sense, thereby providing continuous automatic protection. The TV aerial is a classic example, since it can be mounted on an earthed metal mast. The only snag is that one sees very few earthed TV masts!

The amateur aerial in this story is another example; the makers had obviously gone to a lot of trouble to provide a DC path without impairing the RF performance. The fact that my friend had provided an earth wire may well have saved not only his transceiver, but perhaps the building as well. In which case the damaged aerial was a small price to pay.

All of which adds up to a rather sobering story; one which, hopefully, may shatter our complacency. It is easy to laugh at our grandparents and their quaint ideas but, while they did the wrong things, at least they did them for the right reason. Now that we know the right things to do, let us not ignore the reason for doing them.

Microprocessor control of model trains

This article should be of interest to both model railroaders and microprocessor enthusiasts. In it, details are given of how a SC/MP processor can be used to control a model train layout which includes two locos, as well as signals and points.

by STEPHEN DART*

The object of the system is to control a small demonstration layout, illustrated diagramatically in Fig. 1. Two trains travel in opposite directions around the track taking turns at using the main loop.

One signal is placed at either end of the passing track, and two more halfway round the main loop. The turnouts for the passing loop are controlled by solenoid type point motors. Insulating gaps are inserted into the tracks at the points shown.

The insulating gaps divide the track into six separate sections, and each of these sections is connected to a detector circuit which can tell the computer whether or not a loco is on the section of track.

The program takes the layout through a set sequence of conditions that can be repeated (i.e. it ends where it started). The program can be altered to run different sequences, including timing movements.

The program simply steps through a data sequence. First a pointer to the data sequence is initialised (my sequence started at X'0080), and then the state advance sub program is called.

The sub program sets up a pointer to the X'0500's for I/O purposes. The first byte in the data sequence is obtained and written to the signals. The second byte in the data sequence is obtained and written to the throttle.

If the third byte is zero, the end of the sequence has been reached and control returns to the main program. If the byte is positive, control jumps to a double delay. If neither of the above conditions has been met, the sub program continually reads the six detectors until the byte matches the input.

When a match has been obtained, the program jumps to obtain the next byte for the signal.

At the end of the sequence, when a zero is found in byte three, control returns to the main program, which reinitialises the appropriate pointers and repeats the sequence.

Generation of a data sequence is summarised in Fig. 2. Byte 1 contains the data for the signals, each signal requiring two bits of information, coded as shown in the table. Only the four least significant bits of byte 2 are used.

These four bits of information allow the train to be parked, braked, and accelerated in one of two directions.

Byte 3 is made zero at the end of the sequence. If a delay is required, byte 3 is made positive (bit 7 = 0). Two delay instructions are then generated, before a new group of instructions are fetched.

If byte 3 is negative, (bit 7 = 1), it is compared with the status word generated by the six track detectors, Only when a match is achieved is the next group of instructions fetched and executed.

The first byte of the data sequence is X'F7 which sets signals 1, 3 and 4 to red and signal 2 to green. The second byte of the data sequence is X'03 indicating an acceleration in reverse.

The third byte of the data sequence is X'EF, which corresponds to a delay. The remainder of the sequence can be analysed in a similar manner.

I very quickly became bored with this first sequence. I have plans for further sequences:

1. Operate both trains in the same direction, allowing the faster one to run continuously while the slower loops once at a time. This simulates express/local operation.
2. Dance sequence for demonstration

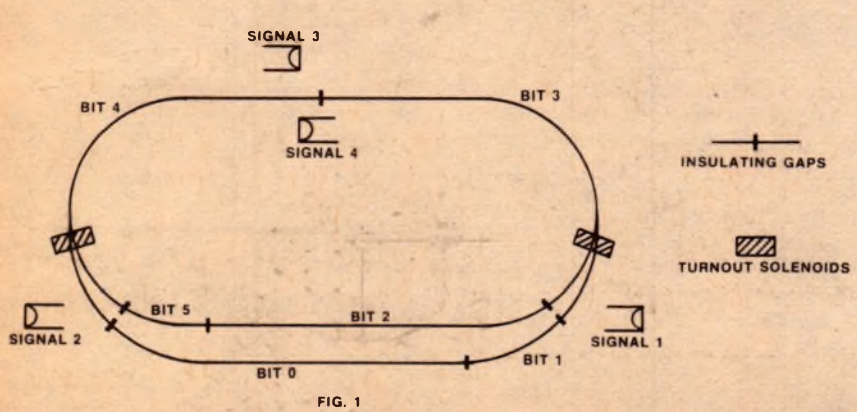


FIG. 1

This is the layout used for the prototype system. A figure of eight loop could be added to promote visual interest.

*5/84 Grosvenor Street, East St. Kilda, Vic. 3183.

purposes utilising mostly time delay instructions

The hardware required to implement the signal, turnout and train control was all assembled from low cost readily available components, as detailed below.

The basic data to be utilised by the computer has to be acquired from the layout itself. Many methods for finding the location of a locomotive are known to model railroaders. Most would be familiar with twin-transistor (TWIN-T) current flow detection, as shown in Fig. 3.

When there is no engine present the capacitor charges through the 3.3k resistor and the output is pulled to the positive rail (rise time 1/10 sec.). If an engine is present, current flows through the diodes and transistors. One of the transistors will be forward biased causing the capacitor to discharge and the output to go to the low state.

The current required to operate a model train (0.1 to 1 amp) forces the use of diodes to bypass the bulk of the current. The diodes and transistors I used seem to be well matched for this purpose, giving positive detection even when very small currents are applied.

The voltage that moves the model is usually full wave rectified DC. During the part of the cycle when the AC wave crosses zero, the output would rise to the high state. A small 4.7uf capacitor is used to smooth this "noise" that would otherwise create havoc with any logic attached.

The 15k resistor was an implementation modification to the circuit. The output from the transistors during conduction is around +0.5V. While +0.5V would register as a low state, —0.5V caused the processor to halt unex-

The circuitry shown below is used to control the speed and direction of the train, and provides a parking facility as well.

```
CALL ROUTINE (HELD IN R.O.M. IN DEDICATED SYSTEM)

0000 08          NOP
0001 C4 00  START LDI  X'00
0003 37           XPAH 3
0004 C4 1F        LDI  X'1F
0006 33           XPAL 3       P3 POINTS TO PROGRAM
0007 C4 00  AGAIN LDI  X'00
0009 36           XPAH 2
000A C4 80        LDI  X'80
000C 32           XPAL 2       P2 POINTS TO DATA LIST
000D 3F           XPPC 3       CALL PROGRAM
000E 90 F7        JMP  AGAIN   REPEAT SEQUENCE

PROGRAM FOR FOLLOWING DATA SEQUENCE

0020 C4 05  ENTRY LDI  X'05
0022 35           XPAH 1
0023 C4 00        LDI  X'00
0025 31           XPAL 1       P1 POINTS TO PERIPHERAL ADDRESS
0026 C6 01  LOOP  LD   @1(2)
0028 C9 03        ST   3(1)    WRITE TO SIGNALS
002A C6 01        LD   @1(2)   GET THROTTLE DATA
002C C9 02        ST   2(1)    WRITE TO THROTTLE
002E C2 00        LD   0(2)    GET STATUS DATA
0030 98 14        JZ   RETURN  IF ZERO END OF SEQUENCE
0032 94 0A        JP   DELAY   IF POSITIVE  JUMP TO DELAY
0034 C2 00  NOMAT LD   0(2)    GET STATUS DATA
0036 E1 01        XOR  1(1)    XOR WITH READ OF STATUS
0038 9C FA        JNZ  NOMAT   IF NO MATCH TRY AGAIN
003A C6 01        LD   @1(2)   ADVANCE POINTER
003C 90 E8        JMP  LOOP    JUMP TO NEXT SET OF COMMANDS
003E 8F FF  DELAY DLY  255     DELAY
0040 8F FF        DLY  255     DELAY
0042 C6 01        LD   @1(2)   ADVANCE POINTER
0044 90 E0        JMP  LOOP    JUMP TO NEXT SET OF COMMANDS
0046 3F     RETURN XPPC 3      RETURN TO CALLING ROUTINE
0047 90 D7        JMP  ENTRY   JUMP TO NEXT SET OF COMMANDS

DATA SEQUENCE FOR MY PARTICULAR LAYOUT

0080 F7 03 EF
0083 EF 03 F7
0086 FF 03 FB
0089 FF 05 DF
008C FD 09 0F
008F FD 08 FD
0092 FD 02 F7
0095 BF 02 EF
0098 FF 02 FE
009B FF 04 FD
009E FF 08 00
```

The author's program and data sequence is reproduced above. Only 90 bytes of memory space is required.

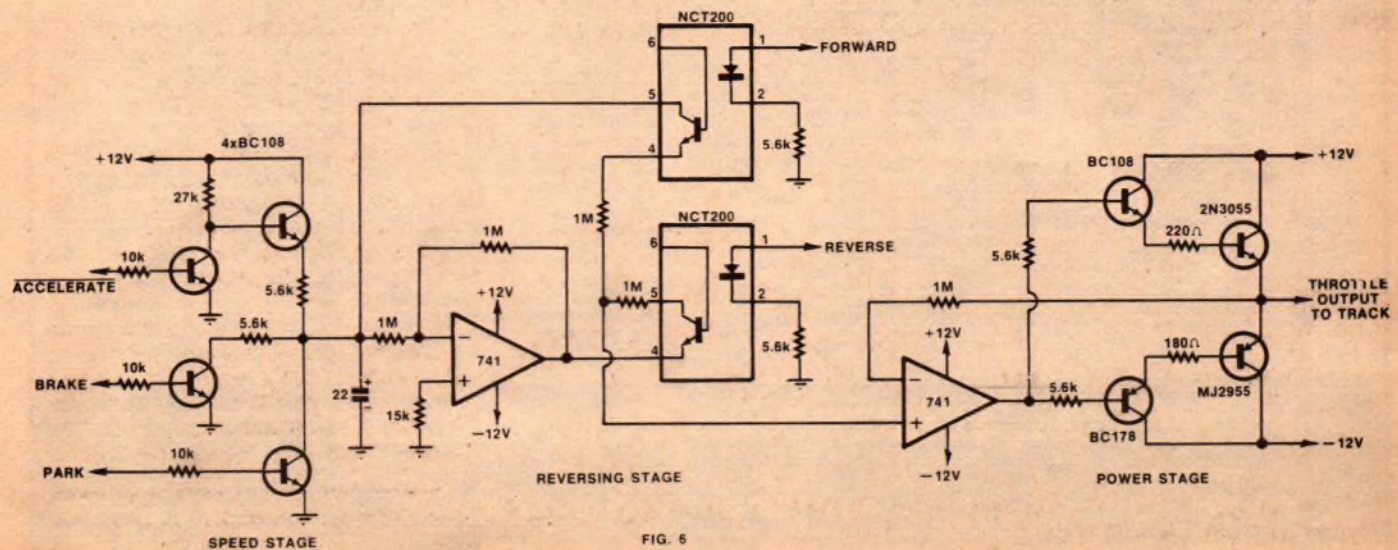
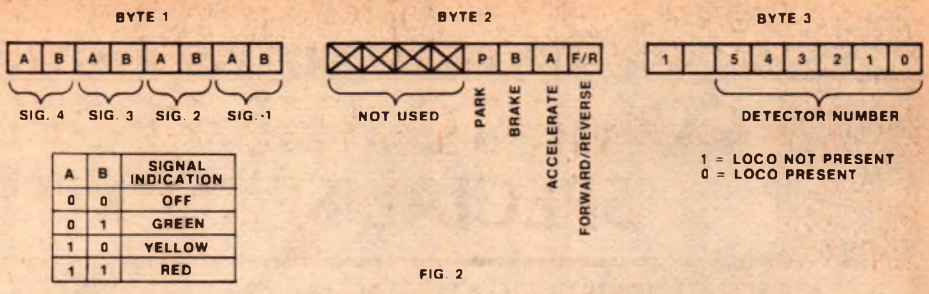


FIG. 6

Model trains

These diagrams illustrate various segments of the train control system. Power supply and mechanical construction details have not been specified, as these will no doubt vary from layout to layout.



A	B	SIGNAL INDICATION
0	0	OFF
0	1	GREEN
1	0	YELLOW
1	1	RED

FIG. 2

pectedly. The resistor was employed to limit the pull-down current. No further problems have been experienced.

Signal decoding requires only three, two input nand gates. The circuit is as shown in Fig. 4, which also includes the lamp drivers. The lamps were 12V grain-of-wheat incandescent bulbs.

The easiest way to operate a solenoid point motor is to discharge a large capacitor across the coil. The following scheme utilises a relay to alternatively charge one capacitor while the other discharges through the solenoid. Refer to Fig. 5 for the circuit diagram.

The 4.7uf capacitor stops the relay from shuddering at 50Hz, which it otherwise does when operated by rectified AC. The diode-resistor combination allows the large capacitors to charge to a full 12 volts without excessive loading on the supply.

The remainder of the diodes are present to combat back emf from the various coils.

The throttle (see Fig. 6) is divided into three sections: speed, direction and power. Speed is controlled by the charge on a capacitor which can be increased or decreased to simulate acceleration and braking. A third control is used as a parking brake; while engaged, the locomotive cannot move.

The reversing stage uses one op-amp and two opto-couplers. The op-amp provides the negative of the speed voltage and the opto-couplers select either the positive or negative voltage. The power stage was mounted on a heat sink.

The address decoding circuitry shown in Fig. 7 includes the RDS and WDS control lines as inputs so that the decoded address line is pulsed at the right instant. On this model, only three peripherals were required, but this simple scheme can be expanded to allow for six. The devices all reside in the 500s. 501 is the detector, 502 the throttle, and 503 the signals.

The address decoding was mounted on Veroboard. The route select control line was connected to the reverse bit of the throttle port (I ran out of 74C175's). All the logic operated from the computer's 5 volt supply. The earth of the chassis was attached to the earth of the trains' power pack which supplied +12 and —12 for the electro-mechanics and signals.

Further construction details are left to individual constructors, as they will no doubt vary fom one layout to another.

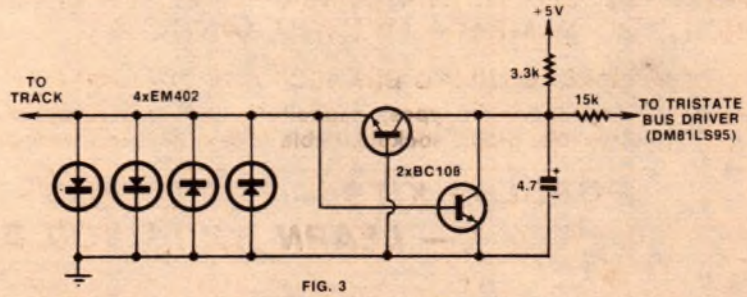


FIG. 3

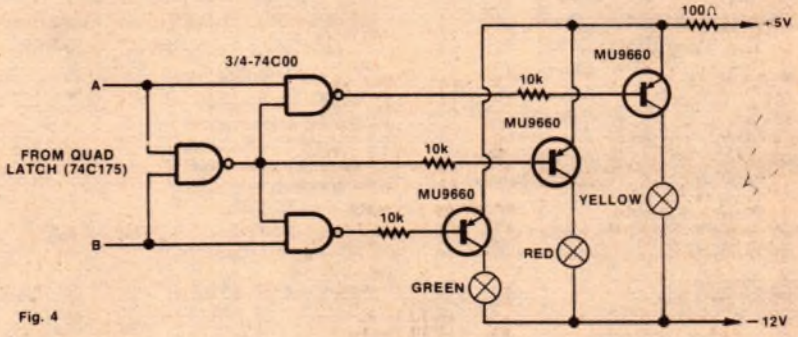


Fig. 4

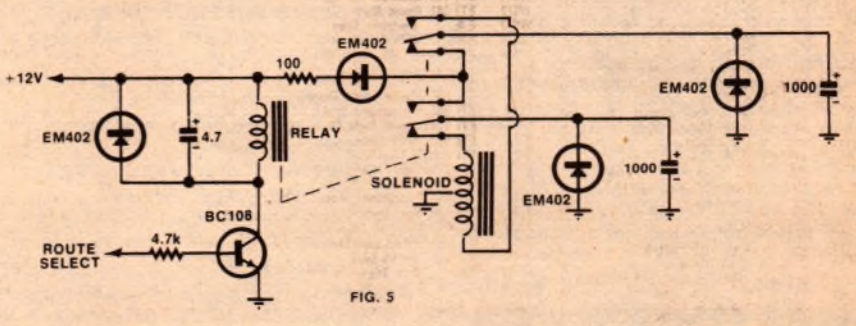


FIG. 5

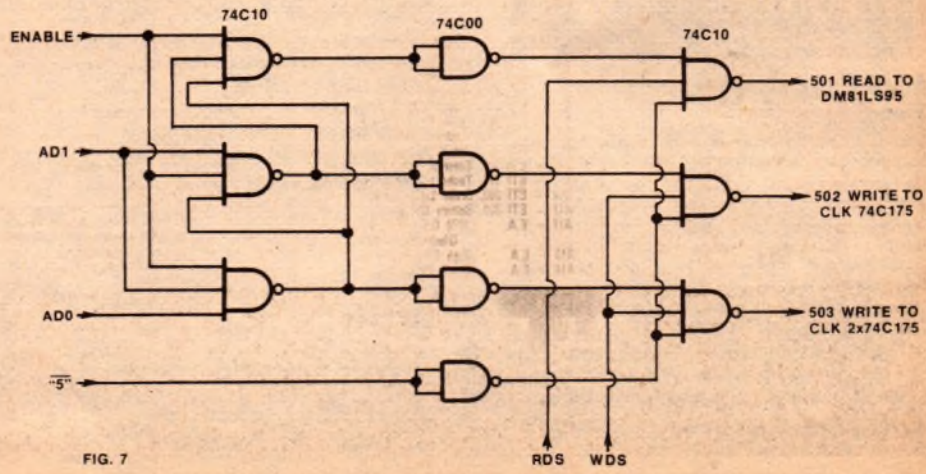


FIG. 7

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5. *Boolean Algebra.*
6. *Flip-Flops and Registers: latches, D & JK flip-flops, storage registers, applications.*
7. *Sequential Logic Circuits: binary, BCD, modulo N, up/down counters, dividers, shift registers.*
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220 Park St., South Melb. 3205. Phone: 699-4999

Circuit & Design Ideas

Conducted by Ian Pogson

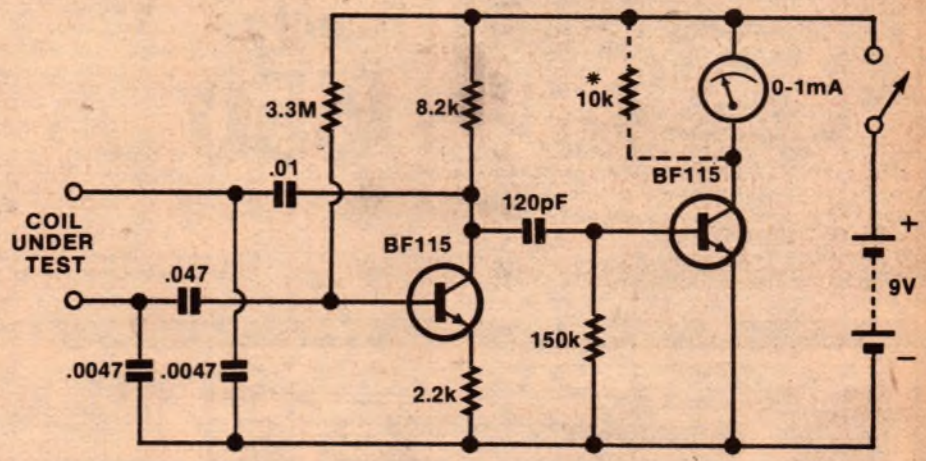
Interesting circuit ideas and design notes selected from technical literature, reader contributions and staff jottings. As they have not necessarily been tested in our laboratory, responsibility cannot be accepted. Your contributions are welcome, and will be paid for if used.

Shorted turns tester fitted to multimeter

This shorted turns tester has been in use by me for many years now. I have built it into my multimeter and it has proved to be very handy for service work.

Unlike the shorted turns tester as described in Electronics Australia for July, 1972, this tester does not require a reference coil. My tester will test all coils with ferrite cores, as well as open coils. Yoke windings, line oscillator coils, width coils, etc., may be tested satisfactorily.

The amount of meter deflection is dependent upon the type and brand of coil being tested. On some coils, such as line oscillator coils, the meter may deflect hard full scale. On the other hand, EHT coils may not deflect the meter very far. Even the slightest amount of meter deflection indicates a good coil. However, a coil with shorted turns will not give any meter deflection at all. With a little experience in its use, it becomes quite easy to use.



*MAY BE NEEDED DEPENDING ON METER USED

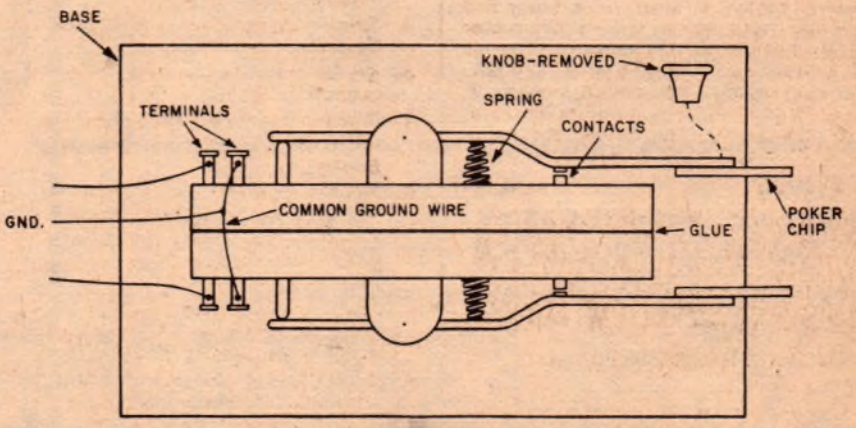
The circuit can be built on a small piece of Veroboard, particularly if small components are used. The meter may be any suitable type with a sensitivity up to 1mA, together with the appropriate shunting resistor across it, as shown dotted on the circuit. The .01uF capacitor is open to experiment and may be made as high as 0.22uF to give a good overall deflection on the meter. I tried BC108 transistors at first but these appeared not to be satisfactory. The BF115s do the job very well.

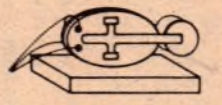
(By Mr R. W. Schilling, 14 Drayton Street, Nanango, Qld 4315.)

A poor man's paddle for an electronic keyer

If you want to duplicate my simple design, here are the necessities: Two hand keys, preferably identical to each other, some strong cement that will hold the keys together, a base to mount the keys on (metal, wood, etc.) and a little time to assemble the unit.

First remove the knobs from the keys. If the bases of the hand keys are rough, sand them down lightly so that the glue will have more surface area to adhere to. Take a small amount of glue and spread it on the base of one of the keys. Then take the other key and press the two bases together so that the levers are facing in the same direction. After the glue has set, apply a small amount of glue to the material you are using for a base. (I used an old metal ashtray turned upside down.) Then press the keyer assembly to the base and hold until the glue has set.





Now all you need is a common ground line. Attach a wire from a terminal on one key to a terminal on the other. The last step is attaching the paddle to the keyer. Just hook the ground wire from the keyer to the common wire that goes between the keys. Then attach the remaining wires (one for each dot and dash contact) to the remaining terminals. The way in which these are connected will determine which side of the paddle will produce dots, and which dashes. If the bare paddles are too small for your fingers, glue two poker chips, or some other suitable pieces, on the paddle tips.

(By Howard Goldstein, WB2IWX, in "QST".)

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See the review in MAY 1978 E.A.

CAT. D-2850

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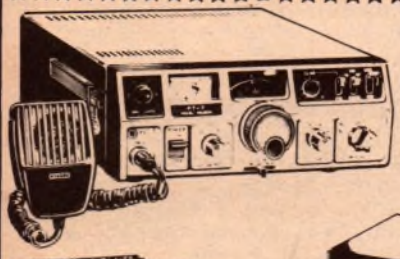

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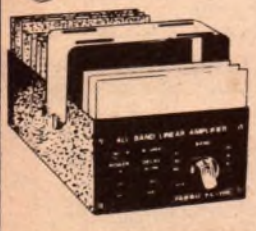

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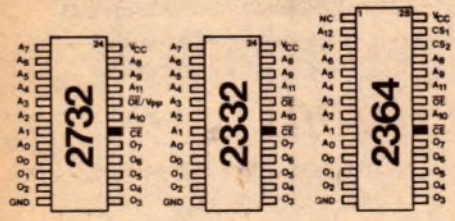
Microcomputer News & Products

32k & 64k ROMs

Intel Corporation has announced its release of 32k and 64k bit mask programmed ROMs, with a matching pin-compatible 32k bit EPROM coming shortly. The devices form part of a new range of edge-enabled, high density, single 5V supply ROMs specifically designed to meet the needs of microcomputer program storage.

The mask-programmed devices have type numbers 2332 and 2364 respectively, and are organised as 4096 x 8 and 8192 x 8 to provide optimum matching



for byte-organised systems. They provide 300 ns maximum access time and are directly TTL compatible on all inputs and outputs.

They also feature a separate output enabling function to eliminate bus contention problems.

Pin compatible with the 2332 will be the new 32k bit EPROM, the 2732, again organised as 8192 x 8 bits.

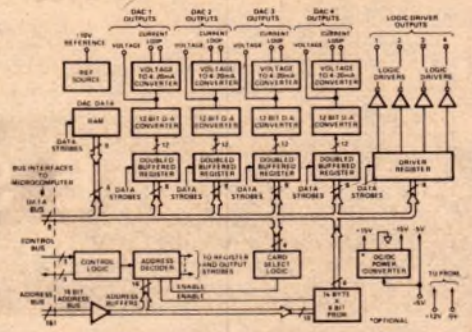
Edge enabling is used to provide faster access time and lower power consumption than fully static operation. Typical currents from the single 5V supply are 20mA when active and 9mA during standby.

Further information on the new devices is available from AJF Systems & Components, 29 Devlin Street, Ryde, NSW.

Analog interface

Analog Devices, Inc. has produced a new analog output interface subsystem specifically designed to form part of a microcomputer using the Intel SBC-80 board. Called the RTI-1201, the subsystem provides four 12-bit digital-to-analog output channels with either voltage or current output, and four digital output channels with 300mA, 30V drive capability.

Each of the digital-to-analog conversion channels may be used as either a 12-bit channel requiring two bytes of input data, or as an 8-bit channel requiring a single byte. Each channel has its own latch registers, while there is a separate parallel RAM to allow the processor to "read back" the data currently in the DAC registers.



Analog Devices will shortly be marketing similar units for Texas Instruments and Motorola systems.

Further information is available from the Australian agents, who are Parameters Pty Ltd, 68 Alexander St, Crows Nest, NSW 2065.

Octal CMOS latches

National Semiconductor has developed CMOS versions of the 20-pin octal microprocessor interfacing devices now becoming industry standard. The CMOS devices incorporate a new feature: the ability to drive highly capacitive loads, and to drive a standard TTL load.

The MM74C373 is an 8-bit latch, while the MM74C374 is an 8-bit positive edge-triggered latch.

Both devices will operate from supply voltages between 3 and 15 volts, and have a low Tristate off current of about 5 nanoamps. Typical output source current capability is 20mA.

The improved output capability is due to the use of an NPN emitter follower in the output stage, along with a P-Channel FET.

DSE also has OP-80A

Dick Smith Electronics has advised that they also have stocks of the Oliver OP-80A photoelectric reader kit for punched paper tape, as reviewed in our May issue. From DSE the cost of the kit is $95, including sales tax.

Computer clubs

Currently we know of six organised computer hobby clubs or groups, as listed below. Details of other clubs will be published if we are advised of their formation or existence.

CANBERRA. The Microprocessor Special Interest Group (MICSIG), which although affiliated with the Canberra branch of the Australian Computer Society also welcomes non-ACS members, both hobbyist and professional. Meetings are held at 7.30pm on the second Tuesday of the month in Building 9 at the Canberra College of Advanced Education. Further information from the Convenor, Peter Harris, PO Box 118, Mawson, ACT 2607.

SYDNEY: The Microcomputer Enthusiasts Group (MEGs). Meetings are held at 8pm on the first and third Monday of each month at the WIA centre, 14 Atcheson Street, Crows Nest. Mail address P.O Box 3, St Leonards 2065.

MELBOURNE: The Microcomputer Club of Melbourne (MICOM). Meetings are held at 2pm on the third Saturday of each month at the Model Railways Hall, Glen Iris (opposite railway station). Contact is Roger Edgecome on (03) 836 1077 (bus hours).

HOBART: The Tasmanian Amateur Computer Society (TACS). Meetings are held at 7.30pm on the first and third Tuesdays of the month in the Computer Studies area of the Rosny Matriculation College, Hobart. Further details from the secretary, Clive Myers, on Hobart 65 2252.

NEWCASTLE: Newcastle Microcomputer Club. Meetings are held at 7pm on the second and fourth Mondays of the month in room G03 of the Engineering building at the University of Newcastle, Shortland. Further information from Brian Hill, 5 Kalinda Street, Blacksmiths, NSW 2281, or telephone 71 1088.

NEW ENGLAND: The New England Computer Club. Membership is by no means limited to students, and enquiries are invited. Enquiries C/- The Union, University of New England, Armidale, NSW 2351.

Available in kit form, we review the . . .

Heath H8 home computer system

The Heath H8 Digital computer system has now been released in Australia. Based on the 8080A CPU central processing unit, it has provision for 64k of memory. A companion video terminal is also available, along with an audio cassette recorder, the complete system forming a self-contained home computer station.

by DAVID EDWARDS

Comprehensive software routines are available for the H8 system, including a BASIC interpreter, a console debugger (BUG-8), a text editor (TED-8), and an assembly language (HASL-8). We will leave the discussion of these till later in the article, and concentrate first on the system hardware.

The H8 computer unit measures 406 x 445 x 165mm, and weights 9.5kg. As will be apparent from the photographs, it has a sloping front and is fitted with an eight digit LED display and a 16-key keyboard. Four status LEDs are included on the left-hand side of the display. The power switch is fitted to the rear panel, however, and is rather inconvenient to operate as a result.

Internally, there is a mother board, a front panel board, and provision for seven memory or I/O boards, plus one bus expansion board. The unit supplied for review was fitted with three 8k RAM boards and one serial I/O board, as well as the CPU and PAM-8 monitor board.

The unit is normally supplied with only 4k of RAM, and without the serial I/O board. Normally, it comes in full kit form, and is assembled by the user.

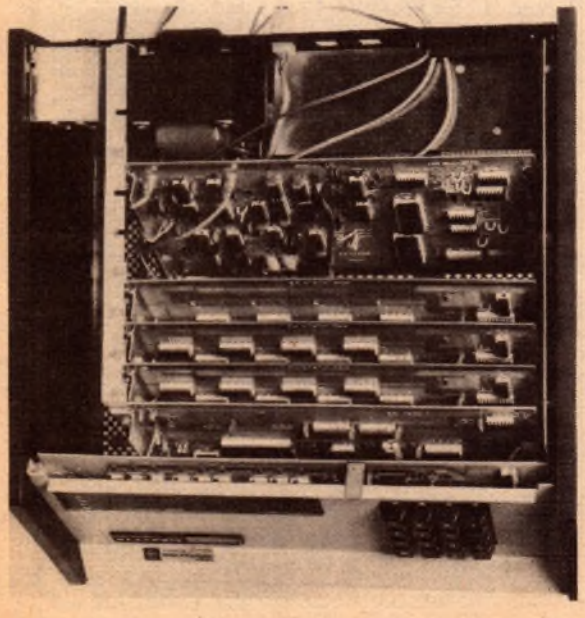
The panel monitor, PAM-8, resides in a 1k ROM, and has the following features:

- Memory contents display and alteration;
- Register contents display and alteration;
- Program execution control (both breakpoint and single instruction operation);
- Self-contained bootstraps for program loading and dumping;
- Port input and output routines.

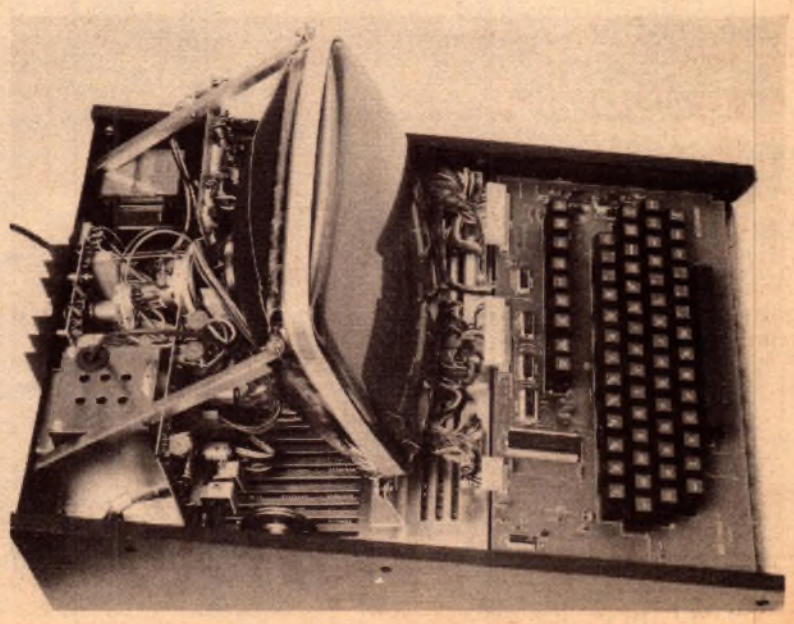
Instruction codes are entered via the keyboard and displayed via the displays in octal notation, with 16 bit numbers being treated in offset octal notation (i.e. 11111111 11111111 is coded as 377 377 and not 177777). Codes are entered as three consecutive octal digits, without the use of any terminating key.

As a result, all leading zeros must be entered. A cancel key is provided to enable erroneous keystrokes to be re-

The mother board is at the bottom of the case, and is fitted with PCB sockets.



Internally, the VDU is dominated by the cathode ray tube and the keyboard assembly.



The complete home computer station is shown above, including the data storage system (the cassette recorder).

entered, an audible indication being provided for each keystroke. The decimal points of the displays are used to indicate the display mode (memory address, memory alter, register display and alter).

The load and dump routines are intended for use with an audio cassette recorder, or with a paper tape punch and reader. Programs can be loaded and dumped with a single keystroke. A tape transport control facility is provided, along with error checking routines.

The cassette recorder provided is a self-contained 110V unit, which is powered from a convenience socket on the rear of the computer chassis. Three cables are provided to interconnect it with the H8 unit.

The H8 can be used as a stand-alone computer, with data and programs entered via the keyboard, and results and outputs displayed on the LED displays. It uses the 8080A CPU chip, and can therefore be used with a large range of 8080 compatible software. The reference manual supplied with the system includes a listing of the instruction set, as well as a section on basic computer fundamentals.

The companion H9 Video Terminal has 305mm (dia.) cathode-ray tube, a 67 key ASCII keyboard, and can communicate through a standard 20mA, EIA or TTL serial interface, or through a parallel I/O interface. Overall dimensions are 397 x 527 x 318mm, and the weight is 14.5kg.

The baud rate is user selectable to one of the following values: 110, 300, 600, 1200, 2400, 4800 or 9600. Characters are displayed using a 5 x 7 dot matrix, allowable characters being upper case alphabetic, numerals and punctuation.

A total of 960 characters can be displayed, the normal mode being 12 lines of 80 characters. A plot mode is also available, which has 48 lines of 20 characters. Other features include automatic scrolling, cursor controls, erase to end of page, short form (four 12 line columns of 20 characters), automatic line carry-over, built in audible bell, transmit page.

The operation manual supplied with the unit contains full details of the various options and controls, including detailed instructions for any alterations that may be required.

Four software routines are supplied with the H8 system. The first of these is the BUG-8 Console Debugger, which is designed to allow machine language programs to be entered and debugged from the video terminal unit.

BUG-8 contains facilities to perform the following major functions:

- Display and alter the contents of a selected memory location;
- Display and alter the contents of any 8080 register;
- Insert and execute breakpoints;
- Execute programs;
- Execute programs one step at a time;
- Load and dump programs to and from tape storage.

Memory locations and memory and register contents can be displayed as either bytes or words, and in octal, decimal or ASCII format. No provision is made for hexadecimal format.

A text editing program called TED-8 is provided, and is intended mainly for producing a source code for processing by the assembler program. However, it can also be used to produce error-free text, such as would be required for reports, letters and manuscripts.

The next software package provided is the Heath Assembly Language, HASL-8. This program assembles a source program composed, using the companion editor program, into a binary program (the object code) for use by the CPU and a symbolic listing for use by the programmer.

Two passes are required through the assembler, the symbolic listing being produced on the second pass, along with a list of any errors present. As well as recognising the standard 8080 opcodes, the assembler also recognises a number of pseudo opcodes, which are used to direct the operation of the assembler and to generate constants in the object code.

The final software package, and perhaps the most interesting, is the conversational programming language, BASIC. Two versions of this are available, Benton Harbour BASIC and Extended Benton Harbour BASIC.

Extended BASIC provides for string manipulation, as well as more advanced functions, but is otherwise similar to the unextended BASIC. Standard commands provided include CLEAR, FOR and NEXT, GOSUB and RETURN, IF THEN, IF GOTO, GOTO, LET, LIST, ON GOSUB, ON GOTO, PRINT, READ, DATA, REM, STEP, INPUT and STOP.

A process called command completion is used with these commands. Once sufficient letters of a command have been typed so that the command is defined uniquely, the program takes over and fills in the remaining letters. This saves the programmer time, but does not save program storage space.

The more normal system is to just to allow commands to be abbreviated, thus reducing program length. Integer and floating point numbers can be handled, with a range from 10^{38} to 10^{37}. The resolution is 6.9 digits.

Variables are named by a single letter, or a single letter followed by a single number. Subscripted variables are allowed, as well as string variables.

Two commands, LOAD and DUMP, are provided for loading and dumping programs via cassettes or paper tapes. Programs can be given names, and the load routine will test each program on the tape till a match with the specified name is found, and then automatically load it. A VERIFY command is also provided, to enable tapes to be checked.

The documentation supplied with the units is quite comprehensive, but presumes a deal of knowledge on the part of the user. A newcomer would find it quite difficult to know just what the various software programs are used for, and would probably also have difficulty in actually using some of it.

Further details regarding price and availability are available from the Warburton Franki agent in your capital city.

Practice makes perfect.

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Slew Rate	13 V/us	7 V/us	9 V/us
Noise (f=1 KHz)	22 nV/$\sqrt{Hz}$	50 nV/$\sqrt{Hz}$	40 nV/$\sqrt{Hz}$
V_{os} (drift)	8 uV/°C	10 uV/°C	50 uV/°C
Handling/ Ruggedness	Good	Good	Poor
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Using Mini Scamp to find intermittents

Having built our Mini Scamp microcomputer and become familiar with its operation, this contributor decided to use it to help find intermittent faults in electronic equipment. In this article he describes the simple hardware interfacing used, and also gives the program he developed.

by JOHN BARRY*

I have developed a simple way of using the Mini Scamp microcomputer to help track down intermittent faults in electronic circuits. Mini Scamp is used to monitor the voltages at two points in the circuit, and give an indication of any change. It also records the values before and after the change.

I initially developed this idea while trying to repair an early model Playmaster Twin 25 amplifier, which I had built for a friend and which would fail every few days at odd times. By leaving the Mini Scamp unit connected to two points in the amplifier overnight I was able to trace the problem to one of the driver transistors (BC639) which was running fairly hot. I have subsequently used the unit to trace several other intermittent faults (I work as an Electronics Technician) and have found it saves a lot of time as it can be left unattended until the fault shows up.

As you can see from the block diagram, the external interfacing circuitry turns Mini Scamp into a simple analog-to-digital converter system with input multiplexing. The analog-to-digital conversion is performed by comparing the selected input voltage with the output of an integrator fed with a fixed input voltage, and initially reset before conversion begins. While the integrator output ramp is lower than the unknown input, Mini Scamp is used to develop a count. Then when the ramp equals the input voltage, the LM307 comparator signals this to Mini Scamp by taking the SC/MP sense-A input high. The count is then stopped, with a value which is proportional to the input voltage.

The count rate is selected so that a 2-volt input range corresponds to 200 counts. However the input signal is offset by +1 volt, so that signals of either input polarity can be handled. Thus counts from 0 to 100 correspond to inputs from −1 to 0V, while those from 100 to 200 correspond to inputs from 0 to +1V.

After a count is performed, 100 counts are subtracted from the result and if the resultant number is positive then this is taken to be a positive voltage and this number is treated as the reading (thus positive inputs result in bit 8 being zero). If after subtracting 100 counts the result is negative (bit 8 is 1) then it is a negative result (in 2's complement form). This result is converted by subtracting 1 count and then complementing the count giving a result which corresponds to the displacement below zero. The sign bit (bit 8) is set to indicate a negative result.

The three flag outputs from the SC/MP processor chip are used to zero the integrator before a count and to select the input to be read. I used reed relays to perform this switching as they were on hand, but it would possibly be easier to use CMOS switches. Also the number of input channels could be increased by decoding the flag inputs, but I found two inputs quite useful for fault finding.

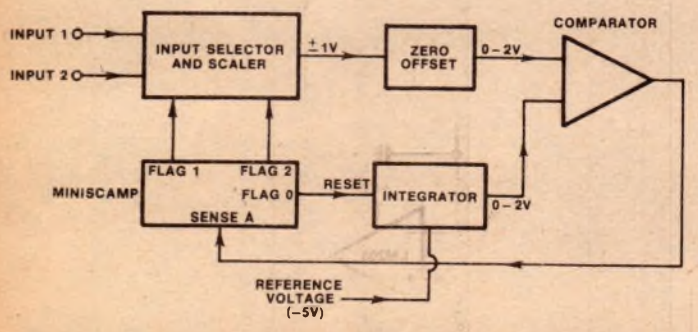
Ordinary variable resistors were used to scale the inputs to suitable values and these were calibrated using a multimeter when the unit was set up. I used +30 volt scales, as these are fairly common maximum values with solid-state equipment.

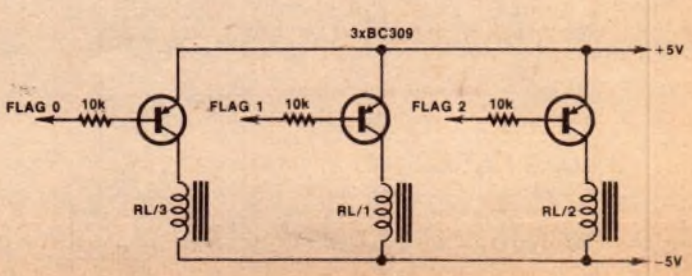
When the program is run the unit reads channel 1 and displays it on the LEDs and then halts. If this result is unsuitable the reset button allows a repeat reading. If the reading is suitable the deposit button is pressed and the unit repeats the process with channel 2. These two readings are stored for later comparison in the stack.

When the deposit button is pressed after the channel 2 reading the unit then reads both channels again and "exclusive ORs" the results with the original readings.

I discarded the three least significant digits (bits) from these results, to allow slight variations due to supply voltage changes etc. The amount of variation detected may be altered by varying the bits discarded.

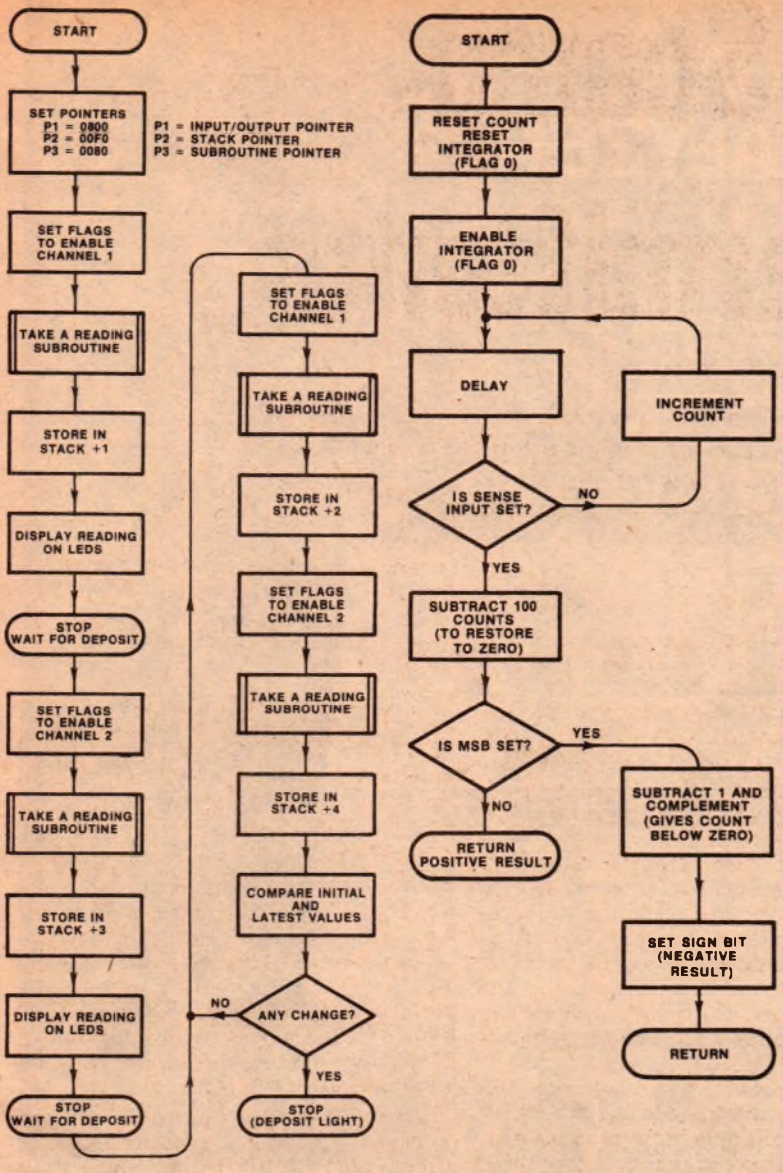
If the readings are the same, the process is repeated continously. When a variation is detected, the program stops and the deposit light comes on as an indicator. The readings may then be examined by directly examining the





Shown above is the block diagram of the author's intermittent detection system using Mini Scamp. At right are the control relay driver cricuits.

*82 Liverpool Street, Liverpool NSW.




```
0000 08       NOP
0001 C4 08    LDI
0003 35       XPAH P1
0004 C4 00    LDI
0006 31       XPAL P1
0007 C4 00    LDI
0009 36       XPAH P2
000A C4 F0    LDI
000C 32       XPAL P2
000D C4 00    LDI
000F 37       XPAH P3
0010 C4 80    LDI
0012 33       XPAL P3
0013 06       CSA
0014 D4 FD    ANI
0016 DC 04    ORI
0018 07       CAS
0019 3F       XPPC P3
001A CA 01    ST P2+1
001C C9 02    ST P1+2
001E C1 01    LD P1+1
0020 06       CSA
0021 D4 F8    ANI
0023 DC 02    ORI
0025 07       CAS
0026 C4 80    LDI
0028 33       XPAL P3
0029 3F       XPPC P3
002A CA 03    ST P2+3
002C C9 02    ST P1+2
002E C1 01    LD P1+1
0030 06    $1 CSA
0031 D4 F0    ANI
0033 DC 04    ORI
0035 07       CAS
0036 C4 80    LDI
0038 33       XPAL P3
0039 3F       XPPC P3
003A CA 02    ST P2+2
003C 06       CSA
003D D4 F8    ANI
003F DC 02    ORI
0041 07       CAS
0042 C4 80    LDI
0044 33       XPAL P3
0045 3F       XPPC P3
0046 CA 04    ST P2+4
0048 C2 02    LD P2+2
004A E2 01    XOR 02+1
004C D4 F8    ANI
004E 9C 08    JNZ
0050 C2 04    LD P2+4
0052 E2 03    XOR P2+3
0054 D4 F8    ANI
0056 98 08    JZ
0058 C1 01 $4 LD P1+1

(SUBROUTINE TO TAKE A READING)

0080 08       NOP
0081 C4 00    LDI
0083 CA 00    ST P2
0085 06       CSA
0086 D4 FE    ANI
0088 07       CAS
0089 8F FF    DLY
008B 06       CSA
008C DC 01    ORI
008E 07       CAS
008F C4 0C $1 LDI
00C1 8F 00    DLY
00C3 06       CSA
00C4 D4 10    ANI
00C6 9C 04    JNZ
00C8 AA 00    ILD P2
00CA 90 F3    JMP
00CC 06    $2 CSA
00CD DC 80    ORI
00CF 07       CAS
00D0 C2 00    LD P2
00D2 FC 64    CAI
00D4 CA 00    ST P2
00D6 D4 80    ANI
00D8 9C 03    JNZ
00DA C2 00    LD P2
00DC 3F       XPPC P3
00DD C2 00 $3 LD P2
00DF F4 FF    ADD
00E1 CA 00    ST P2
00E3 06       CSA
00E4 D4 7F    ANI
00E6 07       CAS
00E7 C4 00    LDI
00E9 FA 00    CAD
00EB DC 80    OR
00ED 3F       XPPC P3
```

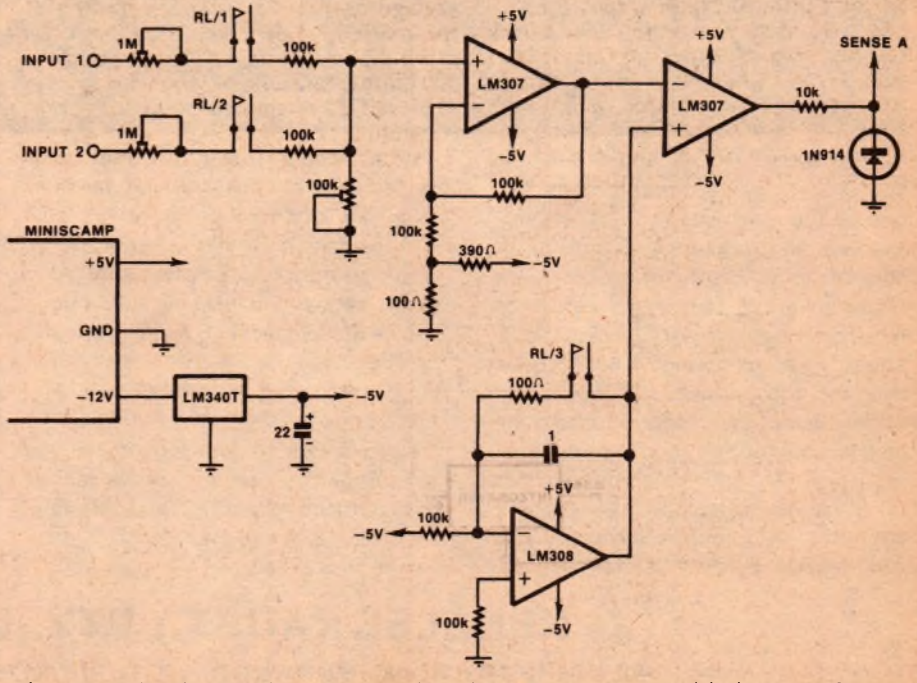
The flow charts for the author's program are shown at upper left, with the "take a reading" subroutine shown separated from the rest of the program for clarity. The full listing is shown above, with the subroutine again separated for clarity.

contents of the appropriate memory locations:
00F1 for the initial channel 1 reading
00F2 for the final channel 1 reading
00F3 for the initial channel 2 reading
00F4 for the final channel 2 reading

The output readings are of course in binary and must be converted to decimal and suitably scaled. I am at present working on a decimal readout using seven segment displays as I have also found the unit can be used simply as a digital voltmeter by inserting a loop in the program after the initial reading.

The interfacing circuitry was built on a piece of Vero-board and plugs into the back of the Mini Scamp via a 25 way cannon connector. A —5 volt rail was obtained from the —12V available in Mini Scamp using a LM320T fixed regulator.

Editor's Note: It may be desirable to add a bell, buzzer or other audible alarm to Mini Scamp for this application, so that it can attract one's attention more effectively. This could be done via a relay and driver connected to the collector of the DRQ control transistor.



The circuit for the simple analog-to-digital converter system added to Mini Scamp, and controlled by it via the relays RL1, 2 and 3.

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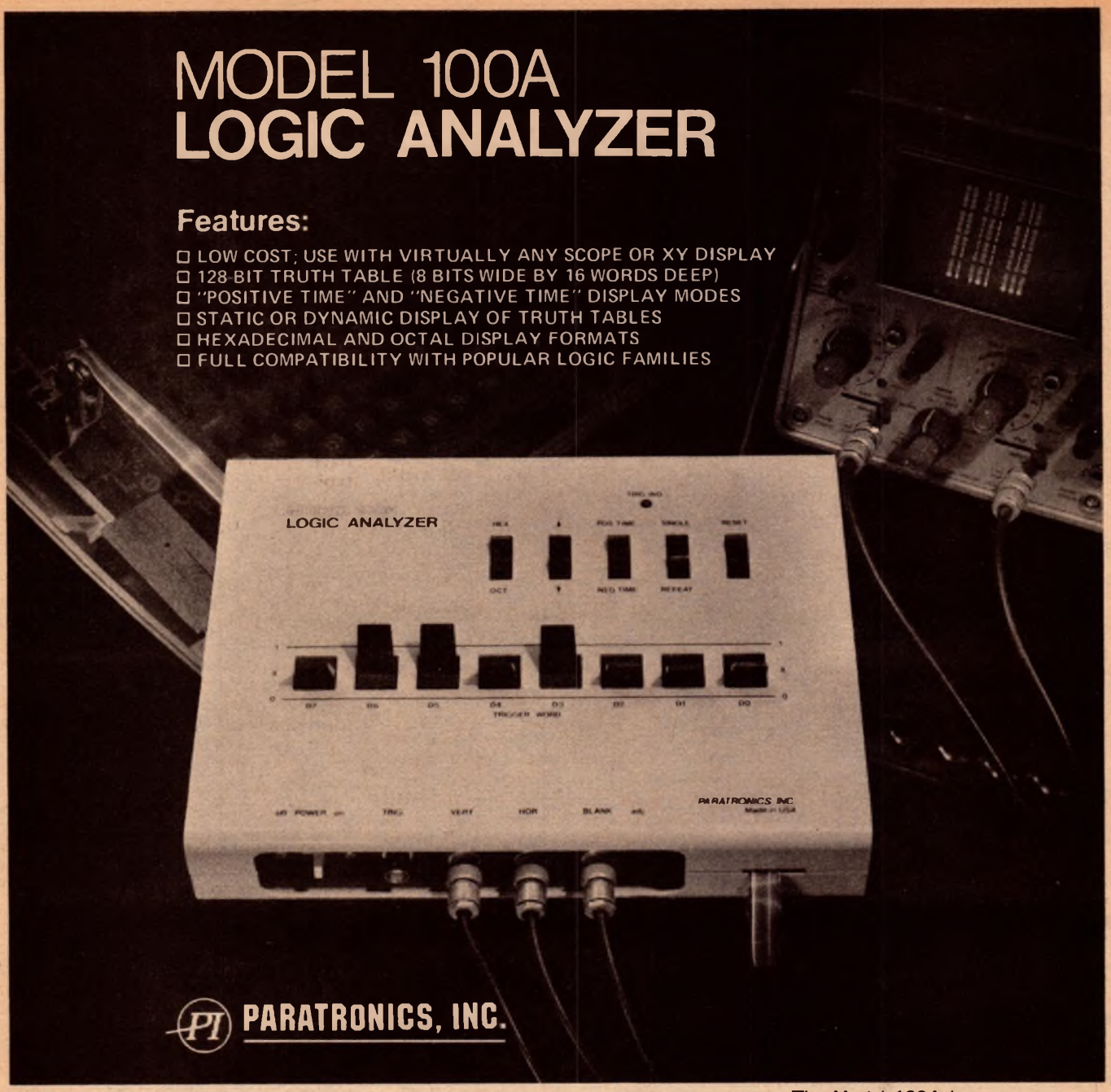
- ☐ HEXADECIMAL AND OCTAL DISPLAY FORMATS
- ☐ FULL COMPATIBILITY WITH POPULAR LOGIC FAMILIES



PARATRONICS, INC.

The Model 100A Logic Analyzer converts an ordinary oscilloscope into one of the most useful digital testing, analysis, and development tools available. It is ideal for applications requiring an in-depth exploration of hardware and software performance. Use it to trace computer program flow, examine the contents of ROMs and other memories, check counter and register operations, and monitor I/O sequences. An input data rate in excess of 8 Megabytes/second assures compatibility with most microprocessors and general purpose digital systems.

The Model 100A provides data domain analysis features not possible using an oscilloscope alone. It will capture data before or after a trigger word, and display the associated truth tables statically or dynamically in your choice of hexadecimal or octal formats.

The low cost of the Model 100A permits engineering companies, educational institutions, and hobbyists to take advantage of data domain analysis to support a variety of advanced development, training, and trouble-shooting applications.

The Model 100A is easy to operate and will interface directly with most common logic families including TTL, Schottky, CMOS, MOS, and DTL. Connection to the system-under-test is accomplished using a color-coded flat ribbon cable terminated in gold-plated "universal" pin connectors.

A 100-page owner's manual provides extensive information on theory of operation as well as educational, production testing, field service, and general digital applications. The analysis procedures for seven popular microprocessors are also included.

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New type of test instrument comes as a kit:

Logic analyser shows truth table

A new breed of test instrument is emerging to cope with the complexities of modern digital systems: the logic analyser. Many of these are themselves quite complex and expensive, but the Paratronics Model 100A should be within the reach of most organisations developing or servicing digital systems. It comes as an assemble-it-yourself kit, and uses a standard oscilloscope for the display.

by JAMIESON ROWE

Not very long ago, the best way to examine the operation of almost any electronic circuit was to use an oscilloscope. This still applies in many circuits, but in a growing number of circuits using microprocessors and other complex digital sub-systems, the oscilloscope by itself is not very helpful.

There can be a variety of reasons for this. Often it is because we are interested not so much in waveforms, but in bit patterns. Not only that, but we may need to hunt for a particular bit pattern, and then look at the patterns which occur a certain number of clock pulses either after or before that key pattern, in order to analyse the sequence of events.

You really need to be able to store the bit patterns examined, too, because very often the sequence of patterns is not repeated. And since the patterns may be anything from 4 to 32 bits wide, you can need quite a lot of independent channels.

Although some of these requirements can be provided by expensive storage oscilloscopes with many Y-input channels and an elaborate delayed sweep system, even these don't allow triggering on specific patterns or examination of events BEFORE the trigger. The usual non-storage 'scope is even less helpful.

To remedy these problems, a new breed of test instrument is currently being evolved: the logic analyser.

Actually there are a number of different types of logic analyser, but they tend to have some common features. One is that they generally have rather more input channels than a typical 'scope: from 8 to 24, or even 32. They also provide a facility for triggering from a specified bit pattern, and storing a number of patterns either before or after that key pattern.

Some analysers display the stored information as a series of waveforms (either real or synthesised), rather like a 'scope with a very large number of channels. These are generally known as time-domain analysers.

Others display the information in the form of a truth table, showing only the binary values of the bits in each pattern. These are generally known as data-domain analysers.

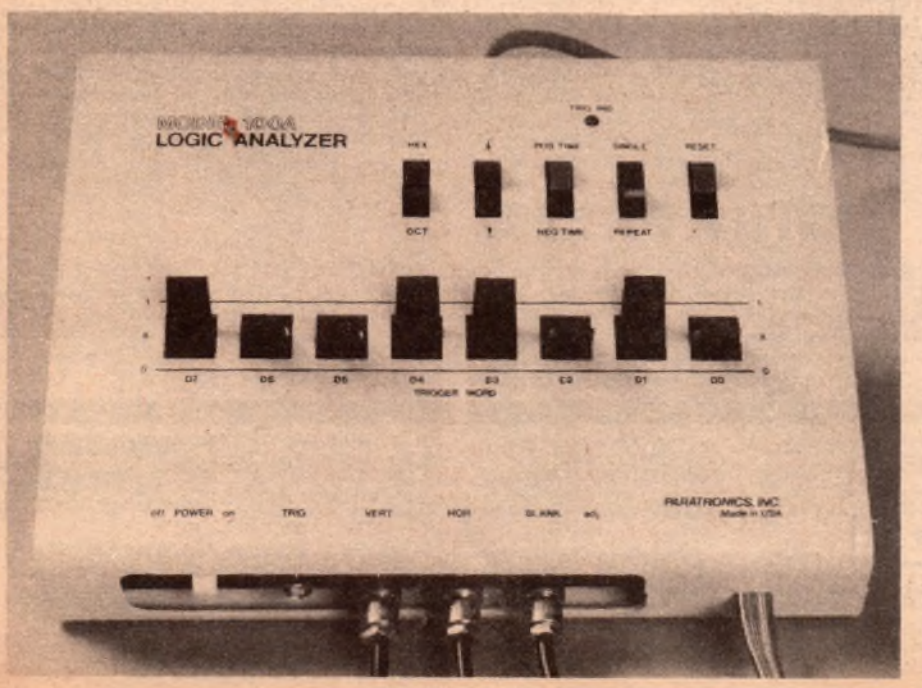
Some of the more elaborate analysers offer a choice of either type of display, on an inbuilt cathode ray tube or LED matrix. An instrument of this type can cost many thousands of dollars, far beyond the reach of many people involved in the development or service of digital equipment.

In terms of cost, the Paratronics Model 100A logic analyser is well down the scale. This is particularly so if you buy it in kit form, when it costs only $229 plus tax. Despite this, it provides most of the basic facilities needed for testing the operation of digital systems, including those based on microprocessors.

As you can see from the photographs, the 100A is a compact instrument designed to use a standard 'scope for display. The 'scope must be able to provide X-Y display, as the 100A is basically a data domain analyser. It should also have provision for intensity or "Z-axis" modulation, to enable the 100A to intensify the trigger word and improve display contrast.

In itself the 100A is an 8-channel analyser, although an expander unit is available to convert it into a 25-channel unit. This will be decribed in a following article.

In operation the eight data inputs of



Our sample of the Paratronics model 100A logic analyser, assembled from a kit. It worked from switch-on.

INTRODUCING MULTI-P 2650

The easily affordable expandable multi-purpose home computer. Based on the new 2650 Mini Computer described in E.A. May, 1978, the MULTI-P 2650 is the first Australian designed home computer available ASSEMBLED AND TESTED ready for use. All you have to do is connect a T.V. set and any low cost cassette recorder and the system is ready for use. Using the resident "PIPBUG" minitor you can enter your own programs in machine language or better still, you can select programmed tapes from the large 2650 program library and load programs of your choice. The MULTI-P is supplied with the invaluable 2650 programming course and a test cassette which contains sample computer games for you to play.

Technically speaking the MULTI-P 2650 is manufactured and serviced locally by Applied Technology Pty. Ltd and is based on the popular Signetics 2650 microprocessor. The main CPU board is as described in E.A. May, 1978 and utilises the latest 4K RAM chips. The basic version of MULTI-P 2650 is supplied with 1K RAM and provision has been made to add a further 3K by plug ging more RAMs into the sockets provided and is housed in a specifically designed case providing room for further expansion to be described in E.A. in the near future. The VDU has also been described in E.A. Feb., 1978 and produces an easily readable 32 character by 16 line display. The input to the computer is via the full function keyboard which also controls the cassette interface and the reset functions. The power supply is designed around a special transformer which can apply 10A at 5V, 1A at +12V, 1Aat −12V to provide for any future expansion.

The MULTI-P 2650 is supplied with complete technical documentation including detailed assembly language programming/technical manual, sample programs to run and the 2650 programming course.

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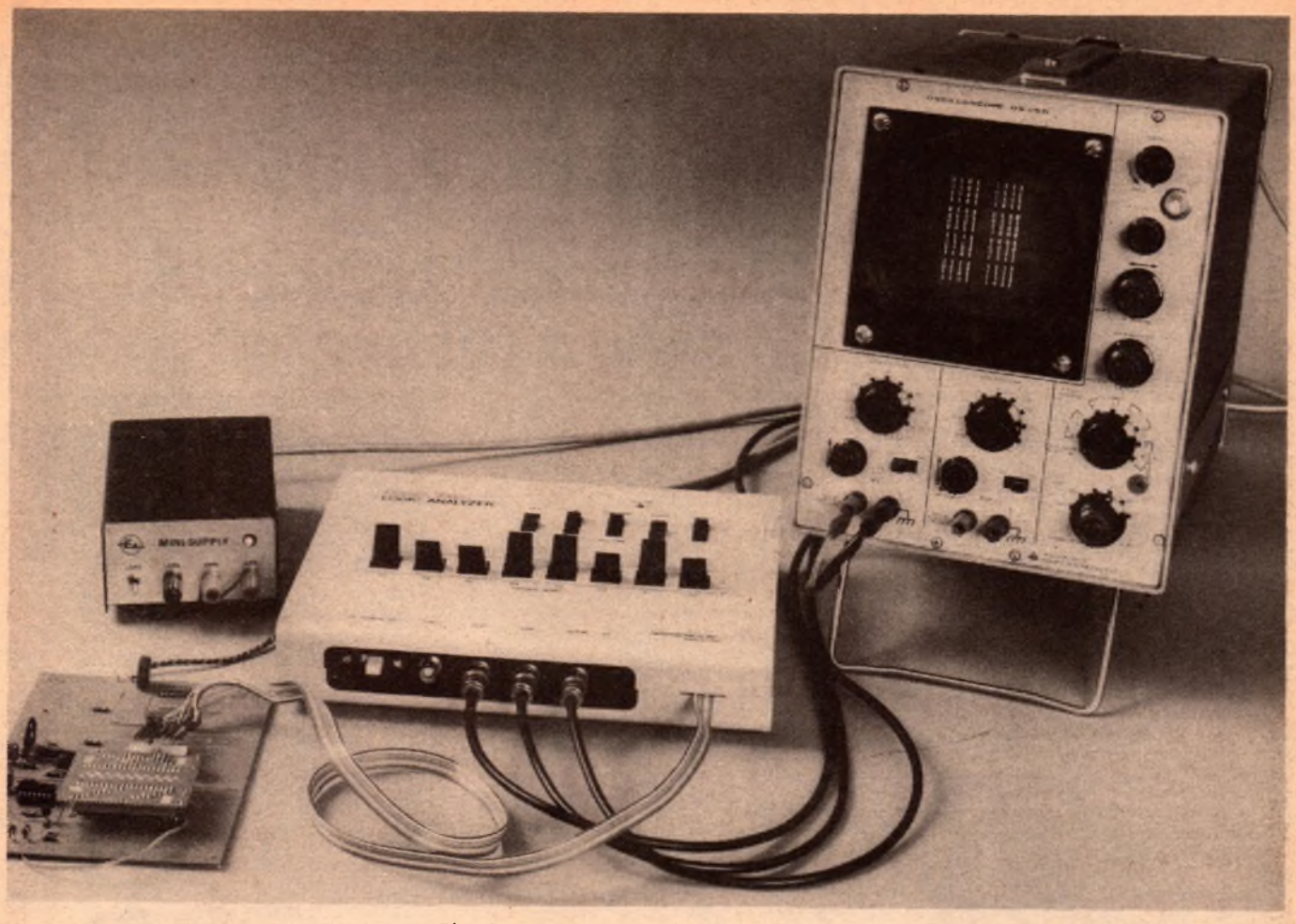


The Paratronics 100A logic analyser in use, looking at the operation of a small microcomputer system. Note the truth table on the scope screen.

the 100A are connected to the part of the digital system to be examined, such as the data bus lines of a microcomputer system. Then a ninth input line is connected to a suitable word strobe signal, such as the system clock or a memory read or write control line.

A front panel switch on the 100A allows selection of the effective edge of the strobe signal — ie, whether strobing takes place on the negative-going or positive-going transitions.

The desired trigger word pattern is specified by means of 8 three-position tab switches, visible in the centre of the front panel. Each switch may be set for binary 1, 0 or "X" (meaning "don't care").

The 100A then produces on the screen of the 'scope a truth table showing 16 8-bit words, with the trigger word intensified for rapid identification. The remaining 15 words will be either those before the trigger word or those after, determined by the position of another 100A front-panel switch marked "positive time/negative time". Thus you can see either the events leading up to the trigger word, or those following it.

A further front-panel switch is used to determine whether the bits in the truth table are grouped in fours, for convenient hexadecimal interpretation, or in a 2-3-3 pattern for octal interpretation. Another switch allows selection of either "single shot" mode, or a repetitive mode. There is also a "reset" switch, for re-arming the trigger circuitry in single shot mode.

Although it is mainly designed for use in this fashion as a data domain analyser, the 100A also provides a trigger output which makes available a pulse whenever the desired trigger word is detected. This may be used to trigger a 'scope in normal time display mode, for time domain and waveform analysis.

As mentioned earlier, the 100A is available as an assemble-it-yourself kit. This was the form in which we received the sample unit, sent for review by Paratronics agents Kenelec Australia.

When opened from its box, the kit checked out as complete. Items like connecting cables are not included, but the kit does include a well-written handbook covering kit assembly and checkout, and describing the basic operation of logic analysers in general.

Following the manual slavishly, and with no attempt to cut corners, I assembled the kit in about four hours. It went together very smoothly, and on completion worked well.

To try it out I hooked it up to a small microcomputer based on the Signetics 2650 microprocessor. After a few minutes it was easy to see the advantages of this type of instrument over a normal 'scope, in the analysis of system operation.

It is simplicity itself to track down a desired word pattern, and examine the words either preceding or following it. Not only that, but you can use the trigger output to trigger the 'scope reliably on any desired word, to search for troublesome "glitches" and subtle timing errors. In short, a pleasure to use.

Summarising, I found the Paratronics 100A analyser to be a very well designed instrument, and good value for money. It should be of considerable interest to anyone involved in developing or servicing digital systems, particularly those with microprocessors.

For further information on the 100A, readers are referred to Kenelec Australia Pty Ltd at 142 Highbury Road, Burwood, Victoria 3125 or at 14 Valetta Building, Campbell Street, Artarmon, NSW 2064.

In a following issue I hope to describe a companion instrument to the 100A analyser, the Model 10 Trigger Expander unit.

At last, reliable, convenient CB communication.

The Philips 40 channel FM 320 UHF. It's what CB radio is coming to.

This ultra-high frequency unit is made here by Philips – Australia's largest manufacturer of two-way radio equipment. With its arrival, CB radio in Australia reaches maturity. Why? Because current CB legislation provides for the allocation of 18 channels for AM/SSB use. Philips FM 320 UHF, with 40 channels, more than doubles this availability.

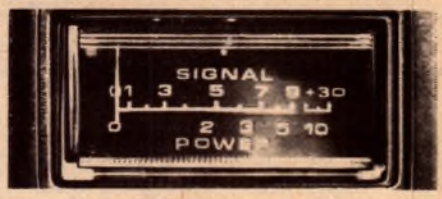
But that's not all. Because UHF operates on FM, interference such as static, vehicle ignitions, industrial activity and electrical storms will have little effect on reception. Every CBer knows that such interference plays havoc with 27 megahertz equipment, while these rigs provide television interference of their own.

Again, UHF does not generate any television interference as it operates on FM.

In city areas, Philips FM 320 UHF takes the uncertainty out of CB communication. High-rise buildings, bridges and other structures won't affect reception clarity or constancy. In effect, the UHF signal passes through the concrete canyons, instead of bouncing around them.

In conditions of heavy air traffic, Philips FM 320 UHF will capture the strongest signal on a given channel and temporarily silence any other which would otherwise cause interference. On the open road, mobile operators won't be interrupted by foreign "skipping" signals.

The Philips FM 320 UHF features Phase loop synthesiser and 5 watt RF output. A 40 channel L.E.D. readout selector can be push-button operated one channel at a time, or continuously until the desired channel is selected. Built-in remote control change on the microphone allows safe mobile operation. Channel changes are accompanied by an audible "click". Many more exciting features are built-in, like automatic call channel reset.



You can choose from a 15 cm quarter-wave tuned high gain type aerial, or perhaps the most universal aerial, the co-axial dipole. Its independence of a ground plane allows positioning almost anywhere on a vehicle.

That's the Philips FM 320 UHF– Australian built and backed by Philips. It turns CB radio into a reliable, convenient communication facility.

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The Australian CB SCENE

CAN PHILIPS CRACK THE BRITISH CB MARKET?

Despite mounting pressure from private citizens, and more recently from the electronics industry itself, the British Home Office is maintaining its "thumbs down" attitude to CB in Britain. Curiously, events in Australia may help change their attitude.

by NEVILLE WILLIAMS

A working party on citizens band radio, set up in Britain about a year ago by the Electronics Engineering Association, has recommended that any such service should operate within the frequency range of 60MHz to 500MHz. The purpose of recommending this frequency range is to avoid some of the worst aspects of CB radio on 27MHz as it is presently operating in the USA and about 15 other countries.

It would seem that there is a further incentive, in that a non-27MHz service would offer a better prospect for British manufacturers to supply their own market, as well as perhaps leading to other parallel markets in Europe.

The working party recommended that transceivers should be kept within the price reach of a large number of people — say £150 as an upper limit, with licence fees in the range £5 to £10. On this basis, the industry could look to somewhere between two million and 10 million potential customers, ranging from private citizens to small businesses.

In fact, the whole tone of the report indicates that the EEA is now positively in favour of setting up some form of CB service.

It is envisaged that all transceivers marketed for the proposed CB service would be type approved to definite Home Office standards. Further, in line with the views of the Citizens Band Association, each and every transceiver would have an in-built coding system which would distinguish it from all others, each time it was used to originate a transmission.

Power output would be limited to 100mW erp for hand-held units and 1W erp for vehicular and fixed installations. This should be sufficient to provide communication over 2 to 3km., seen as the major need, with 8km. as the maximum distance.

The report envisages the provision of 40 channels with about 12.5kHz separation, although there may be a case, at the outset, to release only 10 of the channels in the centre of the block, presumably to keep transmissions well inside the band limits during the initial period of operation.

The working party report stresses that the CB service as envisaged should not be relied upon for emergency, security or business communication, being intended as a non-critical convenience.

While the EEA report is seen as an encouragement to CB protagonists in Britain, it would appear that the Home Office still shows zero enthusiasm for the scheme. They claim that they are already short of frequencies for existing services and, even if space was created for CB, it would bring with it a heritage of interference problems.

E.A. Editor-in-Chief, Neville Williams (left) chats with Mr Tony Staley, Minister for Post and Telecommunications, outside the Philips-TMC factory at Clayton. On the right is Philips Chairman Mr Hermann Huyer. Asked what would happen to CB in 1982, Mr Staley replied: "That's something we have to talk bout . "

Here, in Australia, the arguments all have a familiar ring!

But also, right here in Australia, Philips-TMC have just released a CB transceiver which could slot neatly into the British situation.

Using frequency modulation and operating on 40 channels in the region of 470MHz, their Australian designed FM-320 transceiver should provide reliable short-range communications, as required, without skip effect and all its attendant problems.

Nor should a UHF transceiver give trouble with interference into hifi or other electronic equipment, as happens at 27MHz.

The power level and price level of the FM-320 is somewhat above the limits envisaged by the EEA working party, but a ready-made answer in the form of a tried and proven UHF transceiver may change that.

While the FM-320 has been designed in Clayton, Victoria, for Australian conditions, it should be readily adaptable to the needs of other countries. Certainly, the design could be taken up by Philips in Eindhoven or by any one of Philips national subsidiaries and put into production, with relatively little extra effort.

Already, Austria has opted for CB in the UHF spectrum and it is logical that other countries will look in the same direction.

A couple of weeks back, we asked a question of Philips-TMC engineers at Clayton:

"Have you any clues as to what the British Government might be thinking about UHF in the light of your new transceiver?"

The silence that followed was so utterly discreet that I was left to draw my own conclusions.

After all, if your company had just got through spending a million dollars on a CB development project, wouldn't you be keen to convince the British Home Office that you were on to a good thing?

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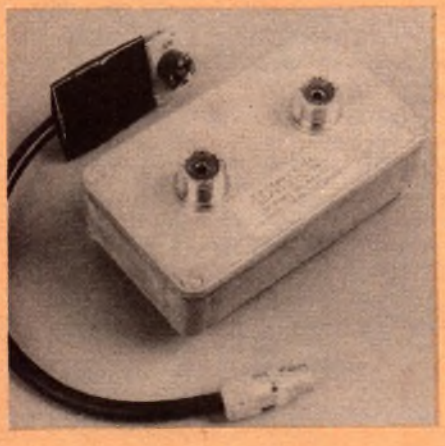
The Australian
CB SCENE

FILTERS, POWER UNITS, MIC., &c.

NEW LINE OF FILTERS: The Australian Transistor Company of Melbourne have recently released a new line of antenna filters designed to combat interference from CB transceivers into neighbouring television receivers, particularly when the latter are tuned to TV channel 0.

The unit in a diecast box, as pictured, is a low-pass filter intended for connection between a 27MHz transceiver and the transmitting antenna. According to figures supplied by the manufacturer, attenuation at 27.5MHz is virtually zero, while the SWR is 1.2, being still less than 1.5 at 30MHz. Since the unit also has a power rating of 200 watts, it would be equally suitable for use by radio amateurs operating on the 10-metre amateur band and below. Attenuation is given as 3dB at 37.7MHz, rolling sharply to 53dB at 45.4MHz. It is 60dB around 50MHz and 70dB at 82MHz.

No less interesting is the second filter pictured, which is a high-pass type intended to fit to TV receivers in series with the 75-ohm coaxial antenna lead and the mating antenna socket. In fact, the new ATC filter would appear to have this important market virtually to itself. Manufacturer's figures indicate that the attenuation is 30dB at 5MHz, peaking to 40dB at 27MHz. Above that, it diminishes to 3dB at 40MHz and is virtually zero over the remainder of the involved spectrum from 50 to 500MHz.



In fact, we had the opportunity of installing this filter to a receiver suffering from CB interference and it proved completely effective.

A third filter, to be added to the ATC range, is also a high-pass unit for TV receivers, but designed to operate in a 300-ohm antenna line. These are fairly commonplace on the Australian market, being imported from overseas, and it will be interesting to see how the performance figures of the local product compares.

The filters pictured were supplied to us by ATC distributors: Watkin Wynne Pty Ltd, 32 Falcon St, Crows Nest, 2065. Tel 02 43 2107, or 02 43 1912.

☆ ☆ ☆

MODULAR POWER SUPPLIES: Statwright Pty Ltd is not a company to do things by halves, if one is to judge by the eighteen different modular power supplies which they are currently listing. They range in voltage from 5V to 48V and in current ratings from 0.5A to 5A. Still other supplies are in the design stage.

The unit illustrated is the 313B, intended primarily for use by amateurs and CBers, being rated at 13.8V and 3A. The manufacturers claim that it is short-circuit proof and fully overload protected. Recommended retail price of the 313B is given as $48.90 including sales tax.

We did not try deliberately to abuse the unit submitted for our inspection but simply connected it up to a typical CB SSB transceiver and a Yaesu Musen 227-R 2-metre amateur rig, as would a typical customer. There was no sign of hum or noise or any description, no sign of overheating or instability due to RF penetration, and the voltage stayed spot on 13.8, irrespective of the mode. Operation had to be rated as completely satisfactory.

The 313B modular power supply is available through most CB specialist shops or direct from Statwright Pty Ltd, 97 Hunter St Hornsby, or through P.O. Box 149 Hornsby NSW 2077. Tel. 02 476 6555.

☆ ☆ ☆

"HANDS OFF" QSO's: Unless you've been born with three hands, it is difficult to steer the car, change gears and conduct a QSO on normal CB equipment at the one time. The basic need diminishes to two hands if the CB transceiver is fitted with microphone

The Australian CB SCENE

headset currently available from Dick Smith Electronics. The headset combines a well padded earphone, a microphone on a short boom and a press-to-talk switch which can be taped to a convenient position on the car's steering wheel.

The headphone lead terminates in a 3.5mm plug intended to fit the transceiver's extension speaker outlet, while the microphone cable can be wired to suit the normal microphone socket. In the home, of course, the unit will permit the CBer to carry right on, without interrupting other activities in the home.

Right: Power Mic VM2

Priced at $27.50, the new headset (cat. no C. 1120 is available from all Dick Smith stores and dealers.

☆ ☆ ☆

POWER MICROPHONE, MODEL VM2: Released through Vicom International, the VM2 microphone can replace virtually any push-to-talk microphone used with CB transceivers, designed for impedance values in the range 250 to 600 ohms. A built-in preamplifier ensures that there will always be adequate gain, the actual output being controlled by a flush knob in the base structure.

Intended for convenient base station use, the neck of the microphone is adjustable, while a touch bar on the front of the base provides the push-to-talk facility. A lock switch is included to permit continuous carrier on. The microphone uses a good quality dynamic element and the output lead will accommodate 3- to 6-pin connectors as fitted to typical CB transceivers.

The VM2 microphone is available from the Australian distributors, Vicom International Pty Ltd, 139 Auburn Rd, Auburn, Vic 3123, and from their authorized dealers.

☆ ☆ ☆

ARCHER .64 WAVE ANTENNA: Described by Tandy Electronics as "the ultimate in an omni-directional CB antenna", the Archer .64 is intended for base station use. The 5-section vertical radiator is over 22ft long and, with four 9ft radials, it is claimed to have a 4.5dB gain, with the lowest radiation angle of any comparable omni-direction antenna. Radiation polarity is, of course, vertical.

According to Tandy, special attention has been paid in the design to the moisture-proofing of the loading coils to ensure trouble-free service. The Archer .64 antenna retails as $79.65 and is available through all Tandy stores.

The Australian
CB SCENE

Questions and answers:

Q: A clause in the document CB-14 governing the operation of CB base stations requires that they shall not communicate over distances greater than 32 kilometres. Taken at its face value, we would all need an area map with 32km circle superimposed. Is the regulation for real?

A: It is not for us to interpret or administer the law and, superficially, what is written is written! However, we did take this up, quite early, with the representative of the Postal and Telecommunications Department and received an explanation that was at the one time strange and logical!

The spokesman said that the real object of the regulation was not to create circles on maps, about which his department and CBers would thereafter be doomed to argue. In any case, radio signals cannot be confined by regulation. Even if an operator is talking to someone only blocks away, his signal may be heard hundreds of miles away, due to propagation conditions.

The regulation, he said, was not unique to CB but was a carryover from thinking which applied to any mobile radio service. By nominating a radius for the service, and assuming a certain field strength at the fringe, it is possible to calculate and specify such things as transmitter power and the nature of the base antenna.

The latter is important because a well-heeled base station operator, unless restrained, might erect a complicated rotating beam on top of a tower and dominate whatever channel he chose to use by the sheer strength of the signal resulting from antenna gain.

Permission to erect a higher gain antenna can be refused simply on the basis that it will provide a normal range in excess of the 32 kilometre limit.

The object of the regulations, the spokesman stressed, was to allow the channels to be shared, on a local basis, by as many people as possible — not to facilitate a few powerful DX transmissions! There was also the problem of interference into TV sets and other equipment, which tends to increase with increasing field strength.

The problem is not critical with mobile installations, because there are physical limits to the kind of antenna which can be installed on a road vehicle. If mobile operators manage to talk interstate from a quarter-wave or a loaded whip, good luck to them; they can thank the propagation conditions!

Having said all that, the fact remains that the regulation exists and could presumably be enforced if the department so chose. From observation, however, it would seem that they are much less concerned with the simple matter of distance than they are problems and breaches which positively disadvantage other services and members of the public.

Q: Virtually all CB transceivers and ancilliary equipment is rated for operation at 13.8V. Why this figure instead of the logical 12V? Does it mean that it is normal to over-run CB equipment?

A: Most CB transceivers are type approved on the basis that they deliver no more than 4W to the antenna on AM and 12W PEP on SSB. If they were designed to do this with a "logical" 12V supply, they would deliver increased power — and become illegal — the moment they were operated in a car with the generator charging. To counter the problem, it has become conventional to adjust and rate transceivers so that they deliver the approved output power with a supply rail of 13.8V (or thereabouts) as the figure most likely to occur in a moving vehicle. It follows that mains power supplies should also be designed to deliver this figure, so that the transmitter will give its full rated power.

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by Pierce Healy, VK2APQ

Wireless Institute Civil Emergency Net in action

Communication links provided by members of the NSW Wireless Institute Civil Emergency Net provide real assistance to authorities during floods and as a safety measure during sporting events.

Very heavy rains along the New South Wales Coast during March 1978, caused serious threats to property and life, and placed a heavy load on the State Emergency Services.

WICEN members were alerted in a number of areas and assisted by providing communication links to the SES Headquarters in Sydney.

Unfortunately damage to property and livestock losses were high, but WICEN activity helped to alleviate the distress of those living in the affected areas.

WICEN operations were initiated on the Central Coast in the Gosford/Wyong area at the request of the local SES controller over the weekend 18th and 19th March, 1978. Two and six metre links were used, including the Gosford Radio Club repeater, VK2RAG, which operated on emergency battery supply when power failed in the Somersby area.

Ray Wells, VK2ZSX, WICEN coordinator, was assisted by a number of local amateurs. Some of the call signs recorded were; VK2ZCZ, VK2BJC, VK2ZVV, VK2ASA and VK2YER.

In the Sydney area, WICEN was activated at 1.00pm on Wednesday, 22nd March, 1978, to provide communications links into the Windsor/Richmond and Wiseman's Ferry areas.

WICEN committee members were sent into both areas to supervise setting up the networks. Links were established via the channel 8 repeater back to SES state headquarters in Sydney until 6.00pm that evening.

A new group of WICEN members were sent to Wiseman's Ferry early on the 23rd with a request from SES headquartes to establish a relay from the area. Wiseman's Ferry is situated in a deep river valley and virtually out of radio contact with other flood areas in the same river system.

Links back to Sydney SES headquarters were set up via the channel 8 repeater from a convenient hilltop overlooking the Wiseman's Ferry valley. A two to 10 metre relay system was used to link this point with novice operators in valley, using 10 metre hand held and portable units.

Allan Nutley, VK2BNA, who was manning this relay point, also set up a crude, but effective, manned repeater within the two metre band. Signals from the valley were sent to the relay site on 145.32MHz and from this site to Dural on 146.4MHz, the channel 8 input frequency. This put operators in the valley in direct touch with SES headquarters in Sydney.

Only a limited volume of flood traffic was handled, but numerous requests of a third-party nature such as meteorlogical forecasts, messages to relatives from persons isolated by road etc, were handled.

Apart from the service to the community, the benefit from the activation was the experience gained which will prove invaluable in future emergencies.

The mobility of WICEN was also demonstrated, as well as the ease with which amateur operators can communicate over difficult paths. Many complimentary remarks were made about WICEN by the authorities concerned.

It is possible that, had WICEN been activated earlier, all flood boats on the river would have been equipped with two metre equipment — but it was, too late on Wednesday to alter established procedure. (SES/police complained that they lost touch with their boats at the first bend of the river).

An interesting sidelight is that the Radio Branch authorised the use of an amateur 146MHz FM transceiver from a private helicopter, unattended by a licensed operator, and using the helicopter registration letters VH-THK. This was done to enable the pilot to keep direct radio contact with SES control at Wiseman's Ferry though channel 8 repeater, VK2RWI, while taking food supplies to isolated areas.

In helicopter loading terms it seems that one licensed radio operator is equal to 100 loaves of bread!

WICEN committee members involved were Ray Gill, VK2BRF, Allan Nuttley, VK2BNA, and Mike Richter, VK2BMM. They were assisted by many others including A. Blake, VK2ALF, Ed Hulme, VK2EN, members of the Hornsby District Radio Club Barry White, VK2AAB, Kevin & Stuart White and Gareth Davey, VK2ANF, who organised the 10 to two metre relay.

WICEN exercises of a different nature were held over the Easter 1978 weekend in the western districts of NSW. Several members supported the Bathurst SES in providing a communications safety net at various locations around the Mount Panorama race track during the motor cycle races on the 25th/26th March. The SES operators used their UHF system and the WICEN operators used hand held 2 metre units. Call signs were: — VK2's ZNW, ZIC, ZNP, ZRJ and TK.

Over the same weekend a group of amateurs from Parkes provided communications for a car rally held in the Pakes, Condoblin area. Much of the operating was done at night and under difficult conditions on the 80 metre band. At times CW was the only mode useable.

The Canberra WIA VKI division WICEN group had a particularly active year in 1977, although no real emergencies arose. However, the WICEN net frequencies were monitored during cyclone Verne on 31st January — 1st

Radio clubs and other organisations, as well as individual amateur operators, are cordially invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits. All material should be sent to Pierce Healy at 69 Taylor Street, Bankstown 2200.

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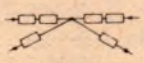

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MC10 ptt hand mic	$16.00
AT200 matching antenna tuner	$169.00
SP820 matching speaker for TS820s	$58.00

YAESU

FT101E transceiver, 160 thru 10m	$899.00
FL2100B HF linear amplifier	$578.00
FRG7 Communications Receiver	$349.00
FT7 HF mobile transceiver	$569.00
FT901DM HF transceiver	$1'75.00
YO301 Monitorscope	$349.00

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IC502 6m ssb portable	$219.00
IC215 2m fm portable	$219.00
BC20 nicad pack with Charger	$57.00
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IC5OL 6m linear, 10w out	$98.00
IC2OL 2m linear, 10w out	$98.00
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IC245 2m fm digital mobile	$450.00
IC211 2m all mode transceiver	$750.00
IC22S 2m fm mobile	$299.00

90-DAY WARRANTY ON ALL NEW PRODUCTS

SPECIAL

VOX-3 VOX attachment for TS700A transceiver	$20.00

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MC330 audio mic compressor	$71
RF440 rf processor, ac/dc	$119
RF550 rf processor with crystal filter	$159

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4 position quality coax switch

- frequency range up to 500MHz
- high isolation, unused outlets grounded
- insertion loss better than 0.2dB
- impedance 50 ohms
- contact resistance 20m ohm
- commercial quality

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Price: $49.90

WARNING: The law requires that a licence be held for all transmitting equipment.

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AMATEUR RADIO

February, 1978.

Several exercises were conducted, the major one being participation in the Natural Disasters Organisation exercise "Backup 77", when 14 operators participated to maintain a nationwide HF SSB net and HF RTTY net for planned 16 hours.

Here is the text of a letter from the Director General NDO, Major-General Alan Stretton, AO, CBE, to Rex Roseblade, VK1QJ, WIA Federal WICEN Co-ordinator, following that exercise:

"Thank you for your letter advising the results of the WICEN exercise which was based on the scenario of our exercise Backup 77. The radio teletype capability is a major step forward and should significantly enhance the usefulness of WICEN in a major disaster.

"I would like to thank you for your participation in Backup 77 and can report that the simulated WICEN input was most useful. I would hope that we can make similar arrangements for next year's exercise, possibly with a greater variety of messages representing information passed on behalf of other agencies, as well as direct information received from WICEN operators.

"My communications officer should be available to attend your exercise debriefing meeting provided the date does not conflict with any other meetings he may be required to attend.

"Thank you again for your interest and co-operation."

Other exercises were conducted in conjunction with the ACT Emergency Service annual exercise: November, 1977; National Capital Junior Tennis championships, December, 1977; and Australia Day celebrations, January, 1978. Two emergency communications courses were also run by the WICEN group, each followed by a short training exercise.

WICEN officials in the ACT are: Rex Roseblade, VK1QJ; Ron Nash, VK1RN; Peter Cohn, VK1ZPC, and Ray Roche VK1ZJR.

Further information from Rex Roseblade, VK1QJ WIA WICEN Co-ordinator, 44 Savige Street, Campbell ACT, 2601.

WICEN has several such groups in Australia providing a community service with trained and technically qualified operators providing communications facilities in the case of civil emergencies. Also WICEN exercises tied to community social and sporting events mean that amateurs can give service to the community whilst exercising for possible future emergency operations. There is also pleasure and satisfaction gained by those participating in WICEN activities.

IARU NEWS

The next International Amateur Radio Union Region III Association conference will be held in Bangkok from Friday 6th October to Tuesday 10th October, 1978. The host society will be the Radio Amateur Society of Thailand under the leadership of president Kainchai Chotikul, HS1WR and secretary Edward Rose, HS1ALF.

The WIA will be represented by the federal president, David Wardlaw, VK3ADW. David Rankin, 9H1RH/VK3QV is secretary of the Region Association and the directors are — Masami Saito, JH3PJE; Michael Owen, VK3KI, Tom Clarkson, ZL2AZ; and Ton Lian Huat, 9V10D.

Two new members of the IARU Region III Association are the Papua New Guinea Amateur Radio Society and the Korean Amateur Radio Society Inc. The president of PNGARS is Jim Smith, P29JS and of KARL Mrs Young-Hee Suh, MH1YL.

A new member of IARU is the Royal Omani Amateur Radio Society making the total membership 98. Amateur Radio Indonesia has applied for membership.

IARU Region I has three new members, Botswana Amateur Radio Society, the Amateur Radio Association of Bahrain and the Sierra Leone Amateur Radio Society, making that region's membership 46. Three additional societies, the Tukiye Radyo Amatorleri Amiyeti, the Royal Jordanian Radio Amateur Society and the Royal Omani Amateur Radio Society are expected to join Region I shortly.

The next IARU Region II conference is due to be held in Panama City from 3rd to 8th September, 1978 and a Region I conference was held recently in Hungary. All regional conferences are trienial. (Information supplied by WIA federal office.)

WIA NEWS

Following lengthy negotiations between the Radio Branch of the P&T Department and the WIA, the Department has confirmed that the syllabus prepared by WIA federal education officer, Graeme Scott, VK3ZR, and his assistants, would serve admirably as a study guide for novice licence examinations and would be endorsed for that purpose. It also confirmed that the WIA novice exam questions would be included in the bank of departmental novice exam questions. Once this bank had been established there seems no reason why they should not be published by the WIA to assist students.

The letter also stated, "A joint WIA/Department committee will be established to discuss the activities and administration of the amateur radio service in order to resolve any difference of opinion which may arise from time to time". The suggestion was made that the committee should meet at an early date to examine the issues raised in the submission to the department of 8th August, 1977 (this was published in the Sept. 1977 issue of the WIA magazine, "Amateur Radio").

As these notes were being prepared the 1978 WIA federal convention was about to commence in Melbourne. A wide range of agenda items was to be considered.

NOVICE LICENCE CLASSES

The Department of Technical and Further Education will hold classes for the novice licence in Brisbane commencing June, 1978. They will cover theory, Morse code and regulations. The course will run over 21 weeks with two weekend practical exercises and one weekend trial examination. The fee is $24, plus materials $16. The aim is to prepare students for the November, 1978 exam.

The Department has agreed to lower the minimum age to 15 years and will admit senior high school students as long as there is room in the classes. Six classes with a limit of 25 students each are planned at the following TAFE centres in Brisbane. Classes are held between 7.00pm and 9.00pm.

Tuesday — South Brisbane Technical College
Tuesday — Mansfield
Wednesday — McDowall
Wednesday — Sailisbury
Thursday — McDowall
Thursday — Salisbury

Enquiries may be made by telephoning the Technical and Further Education office Brisbane (07) 224 7848. Technical enquiries may be made to the course co-ordinator Ann Davis on telephone (07) 351 3812.

Radio clubs in the Brisbane area conducting novice licence classes are:

REDCLIFFE RADIO CLUB — meetings Monday night, Education Centre, Henzell Street, Redcliffe. Contact Dave Richards (07) 284 6098.

IRSWICH RADIO CLUB — meeting Friday night at clubhouse, Deebing Street, Denmark Hill. Contact Llew Ashdown, (07) 288 3316.

BRISBANE AMATEUR RADIO CLUB — meetings Friday night. Contact Doug Hunter, (07) 48 7725.

WINDSOR AMATEUR RADIO CLUB — meetings Thursday night at Wavell Heights, Contact Geoff Adcock, (07) 59 7732.

TEN METRES

Advice has been received from the Upper Hutt Branch 63 (Inc) of the New Zealand Association of Radio Transmitters that a 10 metre beacon, ZL2MHF, on Mount Climie, is now operating on 28.23MHz.

In order that 10 metre band propagation may be studied it would be appreciated if signal reports are forwarded either via the QSL bureau or direct to the Secretary, NZART Branch 63, PO Box 40212, Upper Hutt, New Zealand.

The ten metre band (28.00MHz — 29.70MHz) propagation conditions in

AMATEUR RADIO

recent months has been excellent. This has given an incentive to Australian novice licencees to work the world. As a natural outcome interest in the TEN-TEN International Net has become a major activity, the reward being a certificate from a chapter of this international net.

One of the more recent chapters formed is the "Down Under ZL1 Chapter".

Details of that chapter, The "New Orleans Chapter", and the "Central Florida Cyprus Chapter" will be included in these notes as space permits.

DX AWARD

The Frazer Valley DX Club, VE7DXC, issues an award to amateurs in any part of the world who make contact with the required number of club members. At present there are 47 members.

The award is issued for contacts made subsequent to 1st May, 1978. QSL cards are not required with application, just a certified list of stations giving date; GMT, frequency, mode.

All amateur bands may be used for SSB; CW; SSTV; RTTY; or through OSCAR translator. Repeater contacts are not eligible.

Contacts — USA and Canadian stations to work 15 members; the rest of the world — 5 members.

Cost of the award — 5 IRC's or US$1.00.

Applications to — FVDXC Awards, Box 3112, Langley, B.C. Canada V3A 4R3.

RTTY NEWS

Paragraphs 61 and 112 of the "Handbook for Operators of Radio Stations in the Amateur Service" which relate to radioteletype (RTTY) have been amended to read as follows:

Para. 61: Automatic telegraph systems:

The transmission of radiotelegraph signals by an amateur station shall be in accordance with the following special conditions:

(a) The emission shall be:
F1 — frequency shift not more than 850Hz, A2 or F2 — occupied bandwidth to be confined within the limits + or — 3kHz.

(b) The code used shall be:
(i) five unit (start-stop) teleprinter code corresponding to the international telegraphic alphabet No 2: or
(ii) seven unit (start-stop) data transmission code corresponding to the international alphabet No 5 (US ASCII or ANSCII) including the original ASCII and the Australian standard AS XI for information exchange.
(iii) any other internationally recognised code.

AMATEUR RADIO

Para. 112
(a) the operator of an amateur station shall transmit the call sign of the station being worked and the call sign of the station he is operating at the beginning and end of each transmission and not less frequently than once in any ten minutes during the session.
(b) stations transmitting the modes associated with automatic telegraph systems (F1, A2 or F2) and F4 emissions shall, in addition to identification on the mode in use as specified above, employ either:
(i) the international Morse code; or
(ii) telephony
for identification at the end of each transmission.

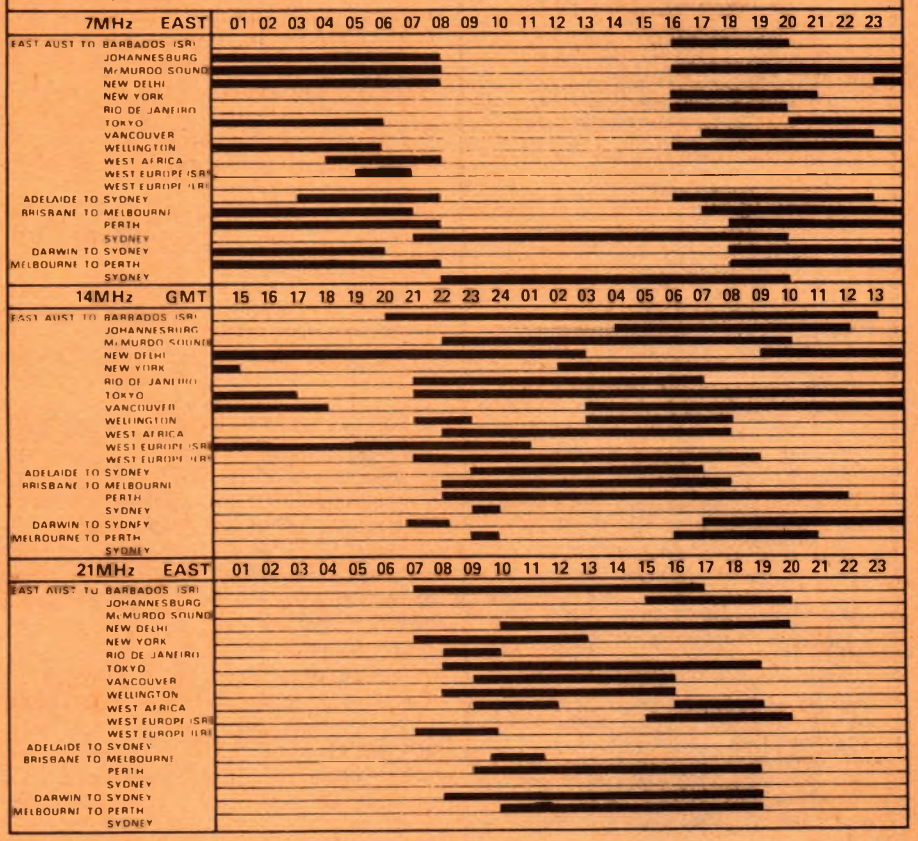
The New South Wales RTTY group provides a WIA news broadcast each Sunday morning at 0030GMT on 7045kHz and 14.090MHz. The speed is 45 Baud and the shift 170Hz.

An SSB net co-ordinated by Lindsay Douglass, VK2ON is conducted each Monday night at 8.00pm on 3605kHz, also on Saturday afternoon at 2.00pm on 7045kHz. The net will be the forum for RTTY technical discussion and to assist in solving problems that RTTY operators may have.

The VK/ZL/Oceania DX Contest to be held October, 1978 will include an RTTY section. This is the first time RTTY has been included in this popular worldwide contest and will be held on the weekend October 7th & 8th. Rules have been received and will be published in a future issue.

IONOSPHERIC PREDICTIONS FOR JUNE

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Department of Science. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). Black bands indicate periods when circuit is open. 6.78



CLUB DIRECTORY

The following club details have recently come to hand.

Club name: Killarney Heights Novice Radio Group.
Club call sign: VK2BKX.
Meeting place: Alternate members homes when convenient to members.
Day and time: 2nd and 4th Friday each month commencing at 8.00pm.
Affiliation: WIA Youth Radio Service, NSW division.
Contact: Secretary — Mark Vowels, 6 Nulgarra Street, Frenchs Forest, NSW 2086. Telephone 451 3963.

Club name: The Gippsland Gate Radio Club;
Call sign: VK3BJA;
Meeting place: The Oakwood Park scout hall, Heyington Cr & Titcher Rd corner, Dandenong;
Day and time: The second and fourth friday of each month;
Affiliation: Member of "VICAR" (Victorian Inter-club Committee of Amateur Radio;
Net frequency: VHF Ch. 50 (146.500MHz);
Sundays, 7.30pm HF 3.560MHz ± QRM, Sundays 8.00pm 28.4MHz ± QRM, Sundays 12 noon;
Amateur training: Classes held at the meeting place each Monday night at 7.30pm;
Contact: Lionel Curling, VK3NM, phone 88-3710.

Club name: North West Amateur Radio Group.
Club call sign: Repeater VK2RAB.
Meeting place: Arranged to suit members.
Day and Time: In a different host town or city every four months.
Affiliation: To be determined at meeting in Moree during May, 1978.
Net frequency: 3574kHz Monday evenings at 8.30pm.
Contact: Secretary Kerry Adams, VK2BXT, PO Box 511 Moree, NSW 2400. Telephone (067) 52 2233 (day), (067) 52 2548 (night).

VHF REPEATER NOTES

Repeater information of installations sponsored by the NWARG:— Area — Gunnedah; Channel 5. This repeater has been operational for some months and is located at Porcupine Reserve, Gunnedah.

Under construction: Moree/Inverell area; Channel 7. An application for a licence has been made to the P&T Dept.

Proposed: Glen Innes/Armidale area; channel 1 or 3, both provisional. Surveys are being conducted in the Glen Innes area to locate a suitable site.

The Blue Mountains Radio Club repeater, on channel 9, has been installed at its permanent site at Medlow Bath after several weeks test at a Springwood site. Results have been very encouraging, in spite of the fact that the transmitter is operating on low power at present. Plans to increase the power are under way. ●

An Amateur Radio Community Service Announcement!

How to recognise the export quality set you should be getting for your money!

Are you concerned about warranty, after sales service, and spare parts availability for your purchase of amateur radio equipment? Would you pay for a transceiver and be happy to accept it without an English language instruction manual, made for operation only on 220V A.C. instead of the more usual Australian line voltage of 230-240V (250V in W.A.), equipped with a non-Australian standard (illegal) two core A.C. power cable, possibly less some features that may be considered normal or necessary by a conscientious factory authorised importer?

O.K., we believe we know the answers to these questions, but how can you identify the equipment?

First of all, check that your chosen dealer is a factory authorised agent or that he is an agent approved distributor. Is he prepared to spend a reasonable amount of time showing you the set, providing a genuine warranty, etc. or does he push a sealed carton under your nose with the suggestion that, e.g., "You are getting it cheap enough what more do you expect?"

Do ensure that your purchase of an A.C. operated transceiver is fitted with an Australian approved 3 core A.C. power cable and 3 pin plug. Look for the official approval numbers stamped on the cable and plug. Does it include an English language instruction manual? Amateur transceivers produced by the Yaesu Musen Co. Ltd. of Japan for authorised sale in Australia include the characteristic export blue and white covered English language manual, usually printed on glossy paper — not a black and white covered manual or a photo copy.

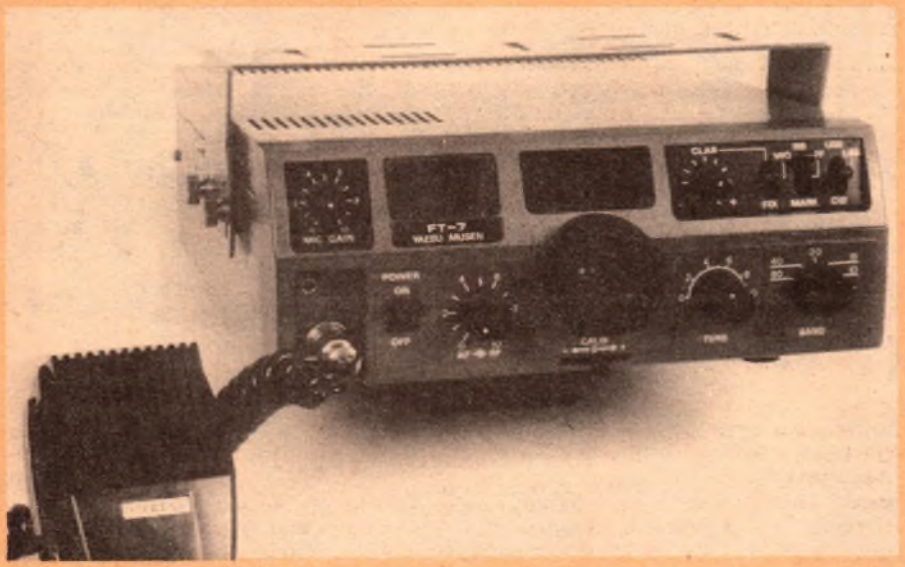
Check that the equipment is fitted with a 234V primary power transformer and carries the Yaesu factory 234V sticker, and that the serial number has not been removed or obliterated. As an example an authorised dealer imported FT-101E should include speech processor, cooling fan, crystals for all amateur bands 160M-10M with full coverage on all ranges, microphone, A.C. and D.C. power cables, accessory connectors, etc.

An FT-301S should have crystals installed for 80M-10M (28.5-29 MHz on 10M), reject control, connectors, microphone, VOX, crystal marker calibrator, etc.

In other words make sure that the set that you are purchasing is an Australian Standard export quality set and not an unauthorised imported ("bootlegged") job!

This space was donated in the interests of better amateur radio by Bail Electronic Services of Box Hill North, Melbourne, Australian Yaesu agent since 1963.

YAESU MUSEN FT-7 MOBILE HF TRANSCEIVER



Superseding the earlier FT-75 and FT-75B transceivers, the Yaesu-Musen FT-7 pictured above has been especially designed for the amateur who is keen on mobile operation, using the HF bands. However, backed up by a 5-6amp, 13.8V power supply, it can also give a very good account of itself in the "shack", in between times.

With its hand microphone and a cradle intended for under-dash mounting, the FT-7 is reminiscent of VHF amateur and CB transceivers, but is larger, heavier, more ambitious technically — and more expensive!

The dimensions are 230mm (W) x 80mm (H) x 290mm (D) and the weight is quoted as 5kg. While obviously more bulky than the usual CB mobile transceiver, it should still be a practical proposition for the average family car. In fact, judged on the basis of an all-band amateur HF transceiver, it is a remarkably compact piece of equipment!

Actual frequency coverage is 3.5 — 4.0MHz, 7.0 — 7.5MHz, 14.0 — 14.5MHz, 21.0 — 21.5MHz and 28.5 — 29.0MHz. The limited coverage within the last named band is an obvious compromise that the designers have had to settle for but it is pointed out that the VFO coverage can be shifted to other half-megacycle segments by installing other available crystals.

A common slow-speed vernier dial with concentric scales serves both the transmit and receive functions so that, having tuned a calling station accurately, the transmitter will come up on the same frequency.

To read off the frequency, the operator must memorise the start of the particular band, eg 20m (or 14.00MHz).

Above: The FT-7 transceiver has a potential for both mobile and fixed service.
Right: A set of loaded whips plus "mast", also available from Bail Electronic Services.

The scale visible immediately above the large tuning knob carries 100KHz divisions, while the scale rotating immediately above that again is marked in 1kHz divisions. One may thus read off the frequency (say) 20m or 14.0MHz (from the selector switch) plus 200kHz (from the lower scale) plus 56kHz (from the upper scale); ie 14.256MHz.

Associated with the tuning facilities is an in-built channel marker, invoked by a panel switch nd providing a check on each100kHz setting of the dial. A slider type control under the dial allows it to be set precisely to the calibration.

Another tuning facility, also invoked by a switch, is a "clarifier" or fine tune on the receiver only, allowing the operator to cope with an off-frequency incoming signal, without disturbing his own transmitter setting.

The desired band is selected by a switch marked 10-15-20-40-80, while a single "tune" control serves to peak the output circuitry into the antenna, on the assumption that the latter will be substantially resonant at the operating frequency, and at a nominal 50 ohms. Other switching allows the selection of USB, LSB or CW, noise blanking on receive, and the possible use of external VFO or crystal control.

Other controls include an off-on paddle switch, concentric RF and AF controls on receive, and a Mic Gain on transmit. The latter appears to be delightfully non-critical in its setting in that, providing it is turned up far enough to activate the automatic level control, modulation more or less looks after itself.

Other features not mentioned so far include semi break-in with sidetone, a receiver with MOSFET front end, and a matching AC power supply, available as an extra. Power supply requirements are 13.5V at a nominal 3A, with an RF power input of 20W. Unwanted sideband and carrier suppression is rated at better than 50dB; stability is better than 300Hz from a cold start and better than 100Hz over 30 minutes after warm-up. Audio power out is 3W.

"Fired up" in the "shack", the FT-7 gave a very good account of itself, with excellent characteristics on "receive" and enthusiastic comments about the stability and quality of the transmission. It would appear to be an excellent proposition for the amateur who wants a versatile HF rig for home, holiday and mobile.

By way of special interest, the distributors supplied a set of interchangeable loaded whips from Yaesu, one for each band, plus a common "mast" which a natural quarter-wave on 144Mhz. These must have a potential, not only for mobile working, but for use in a situation where a normal antenna cannot be set up.

For further information: Bail Electronic Services, 60 Shannon St, Box Hill Nth 3129. Telephone 03 89 2213. (WNW)

AMATEUR RADIO

DRAKE TRANSCEIVER IS VERSATILE

Elmeasco Instruments Pty Ltd have released advance details of the latest transceiver from the R.L. Drake Company, U.S.A. This is the Drake TR-7 transceiver which, with a number of options, makes up to a very versatile unit. While aimed mainly at the amateur market, the options make it suitable for commercial applications, such as marine, embassy, government, military, etc.

The TR-7 is a basic transceiver intended primarily for amateur use. It covers the amateur bands from 1.5MHz to 29MHz in six segments (1.5-2.0; 3.5-4.0; 7.0-7.5; 14.0-14.5; 21.0-21.5; 28.5-29.0), on both transmit and receive, plus receive only 2.5-3.0MHz and 5.0-5.5MHz. Tuning is by means of the analog dial only. (No digital readout.)

An option called "Aux-7" adds any eight selected 500kHz channels between 0 and 30MHz on receive, and between 1.5 and 30MHz on transmit.

A second option; "DR-7 digital read-out general coverage board", adds the digital read-out facility, plus continuous receiver coverage from 1.5 to 30MHz. The Aux-7 option can be used with the DR-7 option if desired.

Other options are a series of receiving selectivity filters which can be installed and selected individually from press-buttons on the front panel. The standard filter is 2.3kHz and the options are; 300Hz (CW), 500Hz (CW), 1.8kHz (narrow SSB or RTTY), and 6kHz (AM).

Receiver sensitivity is given as; less than 0.5uV for 10dB S+N/N (CW), and less than 2.0uV for AM at 30 per cent modulation with the same S/N ratio.

Modes of operation are given as; SSB (USB-LSB), CW, RTTY, and AM)with reduced carrier — A3H).

The transmitter is rated at 250W PEP for SSB, 250W for CW and 80W (carrier), plus upper sideband, for AM.

Further details may be obtained form Elmeasco Instruments Pty Ltd, 15 Macdonald St, Mortlake, NSW 2137.

Daiwa SWR and power meter from ICOM

Vicom has released a new SWR/POWER meter produced by the well known Daiwa company, designed for professional and amateur use. It is designated as the SWX777.

It has a power rating of up to 1kW and a frequency range of 1.8 to 30MHz. It is not frequency conscious and, therefore, there are no conversion charts needed for power level readings. Two ranges are provided; 200W and 1000W and LED indicators show which has been selected.

The SWR measuring system uses a novel approach, in that both forward and reflected power are measured simultaneously, using twin meter pointers. The SWR is read at the point where they cross.

The claimed accuracy of the instrument is 7 per cent of full scale. Size of the unit is 192mm (W) x 120mm (H) x 133mm (D).

Further enquiries should be directed to Vicom International Pty Ltd, 139 Auburn Rd, Auburn, Victoria, 3123.

SHORTWAVE SCENE

by Arthur Cushen, MBE

Deutsche Welle Celebrates Twenty-Five Years

The Voice of Germany has celebrated 25 years of International Broadcasting and is one station that has made a tremendous progress with its relay stations. These are now located in many strategic parts of the world.

"This is Radio Deutsche Welle broadcasting from Cologne to the Far East on 11795kHz in the 25 metre band." With this announcement the overseas service of the Federal Republic of Germany began transmitting regular programs at 1030GMT on May 3, 1953.

Response to the first few broadcasts came quickly and produced a surprise — one third of the listener-s letters received were written in a foreign language. The Deutsche Welle reacted quickly. Barely twelve months later it launched a foreign language news program in English, French, Spanish and Portuguese. The foreign language programs were systematically expanded and the technical facilities built up step by step.

Today — 25 years later — the Deutsche Welle has drawn considerably nearer the goal it is legally committed to pursue: every day it broadcasts 93 programs in 34 languages, and endeavours to convey an impression of life in Germany to listeners overseas.

The facilities of Deutsche Welle over the past 25 years have dramatically increased, and the station now has a series of relay bases around the world. The main transmitter sites in Germany are at Julich (which consists of nine transmitters of 100kW) and Wertachtal (which has eight transmitters of 500kW).

In Portugal there are two transmitters of 250kW. On Malta there are three transmitters of 250kW for short-wave and one transmitter of 600kW for medium-wave transmissions. In Africa the transmitters at Kigali are two of 250kW while on Antigua, in the Caribbean, there are six transmitters of 250kW which are used jointly by Deutsche Welle and the BBC. Further facilities on Montserrat are being used, and the present coverage for Asia is to be filled in with a new relay station in Sri Lanka.

Deutsche Welle has two transmissions in English for Australia and these are 0930-1030GMT on 9650, 11850 and 15275, 17715, 17780, 17800 and 21540kHz. The morning service from Cologne is broadcast 2100-2200GMT on 7130 and 9765kHz. Programs in German for Australia from Deutsche Welle are broadcast 0600-0950GMT on 6085, 6145, 7285, 9690, 9735, 11795, 17845 and 21560kHz. The morning program 2300-2315 is on 6065, 7235, 9630 and 11905kHz.

The mailing address for reports to Deutsche Welle is PO Box 100444, Cologne, Germany.

CHANGES AT KTWR

Station KTWR at Agana Guam continues to search for new frequencies as the Trans World Radio station becomes established as a new gospel voice in the Asian area. Recently KTWR has been using 15425kHz 1100-1130GMT in English and 1130-1300GMT in Mandarin. This transmission is also carried on 11850kHz.

KTWR is keen to receive reception reports from listeners, giving a comparison of the two frequencies in use. In the past few weeks the station has been using several 19-metre band channels in an attempt to find a good frequency, 15115, 15135, 15145, 15155 and 15195kHz have all been used.

KTWR is a member of the Trans World Radio group, with its main station at Monte Carlo. The actual beginning took place in Tangiers under the call sign WTAN, and in 1956 they were using just 10kW.

Trans World Radio now has stations in Swaziland, Sri Lanka, Bonaire, Cyprus and Guam, and broadcats in more than 50 languages. Its transmitters have a combined output power of over 5,000,-000 watts.

RADIO YUGOSLAVIA

Earlier this year, the short-wave broadcasts from Yugoslavia were taken over by a new organisation, known as "Radio Yugoslavia," from the former "Radio Belgrade." Plans have been announced for an expansion of short-wave services which will eventually result in worldwide coverage.

The address of the service is now Radio Yugoslavia, PO Box 880, 11000 Belgrade, Yugoslavia.

According to a verification letter, Radio Yugoslavia broadcasts in English 1530-1600GMT on 11735, 15240 and 9620kHz. Further English broadcasts are 1830-1900, 2000-2030 and 2200-2215GMT on 6100, 7240 and 9620kHz.

VOA USES 11 METRES

Proof of the increased sunspot count, which enables broadcasters to move to higher frequencies, is now obvious with the use of the 11-metre band by Israel and the Voice Of America. The 11-metre band covers 25,600-26,100kHz and, according to the Voice of America, a transmitter at Greenville South Carolina is using 26040kHz 1600-2000GMT. The power on this frequency is 50kW according to Robert Jones of Sydney, who is a VOA Technical Monitor. The last use of this band by VOA was in May 1974.

Though the frequency range at the moment only extends to 26,100kHz, there have been experimental transmissions on even higher frequencies in this band during the early days of high frequency broadcasting. One of these stations operated on the highest frequency so far used by an international broadcater, and this was experimental station W4XA Nashville, Tennessee which operated on 26150kHz with the power of 1,000 watts. This experimental station relayed the medium-wave broadcasts of WSM.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, NZ. All times are GMT. Add 8 hours for WAST, 10 hours for EAST and 12 hours for NZT.

SHORTWAVE SCENE

LATIN AMERICAN SIGNALS

This month, signals from Latin America during our afternoons are at their best and reception is possible in the 49, 60 and 90-metre bands. As well, reception around 1000GMT continues to be favourable and signals in the 31 and 49-metre bands are being heard, while the lower frequencies are also active.

An interesting signal from Peru on 6175kHz is Radio Tawantinsuyo, Cuzco, Peru which has been heard around 1018GMT. Jack Buckley of Sydney has heard this signal with typical Peruvian music and Spanish announcements. Signals from Argentina on 6180kHz have also been noted at 0915GMT, and at 0930GMT the station slogan "Radio Mendoza" was given.

BRAZILIAN SIGNALS

At the present time, signals from Brazil in the 31-metre band are being widely reported by readers in Australia and New Zealand. Reception is around 0900GMT and stations are heard with their early morning broadcasts. All announcements are in Portuguese, though English and American popular music is often heard.

Radio Excelsior at Sao Paulo on 9585kHz has been heard with this type of program up to 1000GMT when full station announcements have been broadcast. Interference is confined after this hour to two strong signals on 9580kHz, when Radio Korea and the Voice of America both commence broadcasting.

Other strong signals have been noted from Aparecida on 9635kHz and Radio Bandeirrantes on 9645kHz. Harry Weatherley of Melbourne also reports good signals on 9675kHz from Radio Diario da Manha.

LUXEMBOURG USING 15350kHz

Radio Luxembourg has for many years been operating on two shortwave frequencies: 6090 and 15350kHz. The former channel is frequently heard around dawn and dusk but suffers interference from the Sydney ABC station VLI6.

Reception on 15350kHz has been difficult for several years, as this area is one in which there is severe jamming. However, the frequency of late has been received clear of this interference and a broadcast in Arabic from VOA Greenville is noted up to 2200GMT. After this transmitter leaves the air, it has been possible to hear Radio Luxembourg at fair strength. The broadcast consists of news in French at 2200 followed by popular music with both French and English announcements.

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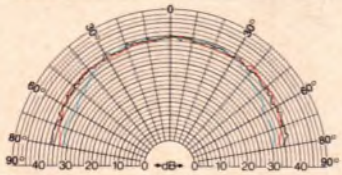

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SHORTWAVE SCENE

FREQUENCY CHANGES

Recent frequency changes have been observed in April with adjustments to avoid interference being the main cause of the new channels being heard. This survey gives the details on these changes.

AUSTRIA: Vienna, broadcasting to Australia and New Zealand, now uses 9605kHz 0700-0900GMT with English at 0830GMT. The frequency replaces 9765kHz and, as we suggested to Vienna, with 9605kHz being dropped by Radio Sweden, this frequency could well provide good reception in this area. Another frequency noted is 17815kHz 0600-0700GMT.

ANTIGUA: The BBC relay base on Antigua is providing secondary coverage of the World Service to Australia on 6195kHz 0900-0915GMT. The frequency of 11775kHz is used 1200-1300 Monday to Saturday and 1300-1330GMT daily. Antigua is also using 15420kHz 2000-2115GMT for a transmission to this area.

BELGIUM: Brussels is using 15205kHz in place of 15210kHz at 0630GMT. According to John Mainland of Wellington NZ, the move has been made to avoid interference from Cairo. The broadcast is in French and heard from 0630GMT. The service in Dutch has been noted on 15190kHz at the same time.

BULGARIA: Radio Sofia is using 9765kHz with an English broadcast directed to North America and commencing at 0430GMT.

ISRAEL: Tel Aviv has a broadcast in English 0500-0515GMT which is heard on 9835kHz and another new frequency 11955kHz. The latter channel replaces 11960kHz.

INDIA: All India Radio Delhi is using the additional frequency of 9535kHz for a morning transmission to Australia of 2045GMT. The broadcast is also heard on 9525kHz and 11740kHz.

LEBANON: Beirut has been noted on 15440kHz with English at 1830GMT beamed to Europe and later at 0100GMT in Spanish for South America. The broadcast in English 0230-0300GMT is on the new frequency of 11825kHz and this transmission suffers some interference from Tahiti.

SAUDI ARABIA: Broadcasts in Arabic on the out-of-band channel of 6265kHz have been noted at 1715GMT with reported close-down at 2030GMT. Bryan Clark of Wellington NZ advises that 17755kHz is now being used by Saudi Arabia with a program in Arabic at 0630GMT.

ROUMANIA: Radio Bucharest is being received on 17785kHz with English 0645-0715GMT for the Far East. After 0715GMT, the transmission continues in Roumanian. Reception on 11940kHz of this English broadcast is also well received.

USA: KGEI San Francisco, with Japanese at 0800 and Russian at 0900GMT, is using the new frequency of 9750kHz in place of 5980kHz for its gospel programs to the Far East.

VATICAN: The Vatican radio is using 6210kHz in place of 6190kHz for the Four Voices" program at 0700GMT. This multi-language service includes English, French, Italian and German and features news for tourists about Rome and notices concerning functions at the Vatican.

URUGUAY: Montevideo has been heard on 9515kHz with its new international service at 0320GMT. At this time, a short news bulletin in English was broadcast. This SODRE transmission has also been noted on 15273KHz by Paul Ormandy, Oamaru NZ.

LISTENING BRIEFS
EUROPE

BELGIUM: The Belgium Radio advise of a frequency change for their English transmission which is valid up to September. The transmission to North America 0015-0100GMT is now broadcast on 6080 and 9685kHz. The Belgium DX Corner program is now broadcast on these frequencies on the second and fourthSunday of the month. English to Africa is broadcast 1715-1800GMT on 11940 and 15250kHz.

ICELAND: The daily broadcast from Reykjavik is 1200-1300GMT on 12175kHz. The transmitting site is in the south-east part of the island and the program is intended for Icelandic seamen. The station extends its schedule for certain events. According to Finland DX Club, reports are welcomed and verified with a card.

ASIA

NEPAL: Katmandu is now using a new 100kW transmitter, which was officially opened recently. This new transmitter broadcasts on 5005kHz. The broadcast in English on this frequency is 1440-1520GMT and, as well, is on 3425kHz. News in English is heard at 1450 according to the BBC Monitoring Service.

PAKISTAN: Radio Pakistan continues to broadcast a news bulletin in English from 0930-0935GMT during its 0830-1045GMT South Asia service which is transmitted on 11885 and 15520kHz.

KOREA: Radio Korea at Seoul has been heard on the out-of-band frequency of 7550kHz with a service to the Middle East. A transmission in Korean is noted to 1900GMT when a time signal is broadcast and the program continues in Arabic. Seoul has also been observed on 9580kHz at 1000GMT with English news and this is also broadcast on 9525kHz.

CLANDESTINE: One of our readers, Alan Lowing of Campbelltown NSW, reports reception of the Voice of Malayan Revolution. This transmitter is located in Southern China and broadcasts towards Malayasia and Singapore. The station was heard on 15950kHz, with a transmission in English at 1005GMT.

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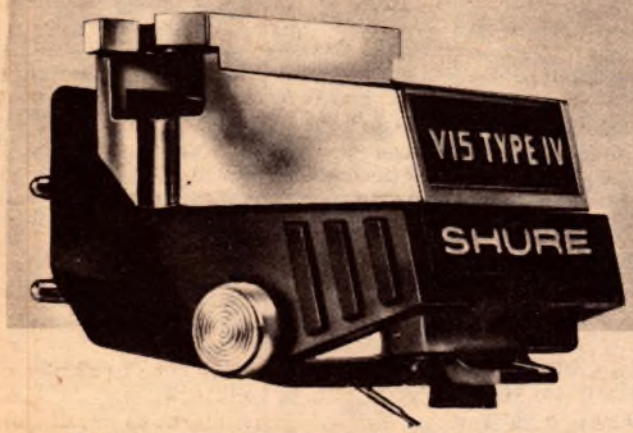

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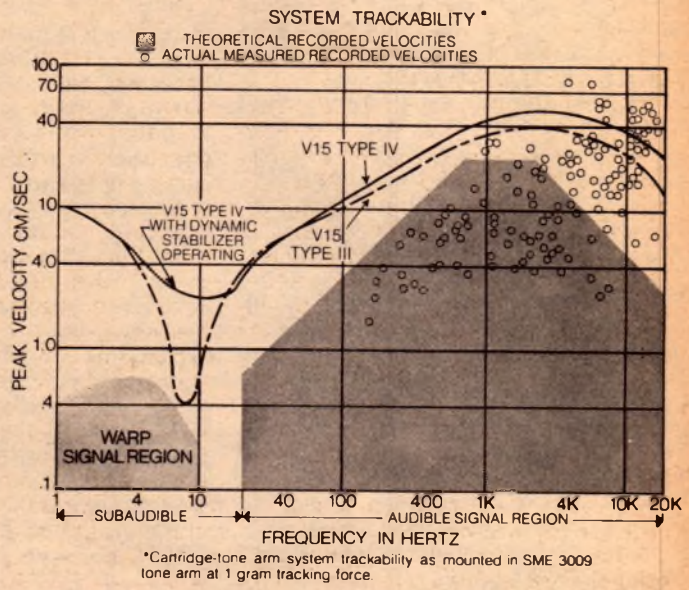

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Classical Recordings

Reviewed by Julian Russell

Beethoven — Symphony No. 3: "amazingly instructive"

BEETHOVEN — Symphony No. 3 in E Flat (Eroica) transcribed for piano solo by Franz Liszt and played by Roger Woodward. RCA Red Seal Stereo Disc VRL1 7151.

Liszt seems to crop up in every column I write recently. This is not surprising when the many different facets of his life and work are remembered. Apart from being the greatest piano virtuoso of his time — giving recitals all over Europe when transport was slower than slow — he still found time to be a great innovator, not only for that instrument but also for the orchestra. He was a fine conductor, generous to all who sought his advice or financial help and apparently irresistible to women.

Indeed it is freely thought that he sought ordination — if that is the word — as an abbe in the Roman Catholic Church so that no desperate female admirer could lure him into marriage.

Among his many compositions are a splendid collection of transcriptions for piano of songs, orchestral works, and instrumental solos. The transcriptions are amazingly true to their originals, but in his Fantasias he took one or two tunes, or even scraps of tunes, from a popular piece and on them built an entirely new composition. Perhaps the best known of these is the great Rigoletto Fantasia.

But this transcription of the Eroica belongs to the first category mentioned here — a faithful transferrence of a piece of music from one medium to another. It is so faithful that in Woodward's great performance you will probably sometimes hear details that you might miss in listening to the original orchestral version, however well played.

Liszt made no effort to imitate an orchestra on a piano. Rather, he treated the symphony as a piano sonata — a giant one unmistakeably Beethovenian which still preserves all the characteristics of the original. And this is the way Woodward presents it. I even dare to say that you might learn from Woodward even more about the work than you would from hearing repeated orchestral performances under a fine conductor.

That the orchestral colorations are absent doesn't seem to matter so well as the spirit of the work is retained. Everything, except for a few thunderous climaxes, is scaled down to what might best be described as chamber music level, but strangely without sacrifice of its natural grandeur. And some of the part writing is presented with a clarity seldom or never heard in orchestral performances.

Indeed, many concertgoers and record buyers who consider they know every note of the Eroica will be astonished at the revelations they will hear in this Beethoven-Liszt-Woodward collaboration. I include Woodward deliberately for that is what his contribution means to me. Woodward's great technique can always be taken for granted, however waywardly he sometimes uses it. He studies every work minutely in preparation and then offers his idea of how it should go, and however perverse it may sometimes sound to you, you can take it or leave it.

I'm sure Woodward would remain unworried and convinced he was right in any circumstances. But, allied to this technique he displays here, he shows a depth of perception of the music that should surprise — and delight — many. True here and there is a moment that strikes the ear strangely — as it might in many of Woodward's performances, however fine.

Some listeners, for instance, will be bound to disapprove of his slow tempo in the Scherzo. But he never tampers with the music's form. This is a record worthy not only of a long posterity, but an amazingly instructive one too to all musicians, no matter how well informed they may think they are on all aspects of the Eroica. The sound is fine except for a very rare tape hiss, easily ignored.

Mozart: "a fine performance"

MOZART — Serenade No. 4 in D Major, K.203. Serenade No. 5 in D Major, K.204. Marches in D Major, K.237 and K.235. Pinchas Zukerman (violin) plays the solo parts and conducts the English Chamber Orchestra. CBS Stereo Disc, S2BR 220350.

Violinist-conductor Pinchas Zukerman has here the services of the English Chamber Orchestra which he consistently uses stylishly, though he sometimes contrasts it to his own solo work.

Make no mistake though, this is a fine performance, admirably recorded. My opening remark was prompted by the fact that though Zukerman proves himself a conductor of talent enough to augur well for further activities in this field, he is also a virtuoso violinist and, as if born of habit, this occasionally creeps through in his solo contributions. Not often, mind you, but still often enough to remind the listener of his outstanding skill in this field.

Here and there is a tendency to romanticise passages and even once a whole movement — the first of the Concertante — and again, here and there, an irresistible urge to display his great gifts of brilliance.

But elsewhere, merits so heavily outweigh these momentary inconsistencies of style that they may well be overlooked by all but the most hypercritical listeners. Indeed, so much did I enjoy the Serenade (No. 4) as a whole that I myself feel churlish at mentioning its trivial blemishes. And these small blemishes might seem all the less important to those who want to have their universally admired soloist in full bloom, so to speak.

At a guess, the proportions for or against could well be even. So don't dismiss it on my account. The odds are even that you could belong to the above mentioned other team of admirers.

The playing of the English Chamber Orchestra is always right up to its famous high standard and the engineering first rate.

The Fifth Serenade is the other major work in this two-disc set. The Fifth was recorded a few months after the Fourth and to me it sounds as if Zukerman benefited by listening to the earlier

Classical Record Reviews . . .

one. In the Fifth, he and the orchestra, which Zukerman again conducts while playing the concerto-like solo part, are in accord with the whole.

Gone are all Zukerman's temptations to self-indulgence in the solo part. Even the cadenzas are delivered with a minimum of show and in perfect proportion to the whole conception. His performance could not be more modest and remain as completely satisfying as it does here. And when he is not playing himself he sees to it that his orchestra has every opportunity — especially the first desk players — to display its renowned skill. Indeed, all told, I cannot recall having heard a more alluring performance by any other combination, past or present.

Two splendidly played Marches, both in D Major, K.237 and K.235 make a generous fill. Before closing I might mention that the cover decoration is in the form of a bright painting, much in the Richardson manner. The more you examine it the more really comic details you will find.

☆ ☆ ☆

BERLIOZ — Summer Night. Song Cycle sung by Yvonne Minton and Stuart Burroughs, with Pierre Boulez conducting the BBC Symphony Orchestra. CBS Stereo Disc 235864.

Berlioz wrote these enchanting songs as a suite for solo voice with piano accompaniment. The voice could be either mezzo-soprano or tenor. And nowadays that is the way they are usually heard in the concert hall though with an orchestral accompaniment scored by Berlioz himself with his usual brilliance.

But while orchestrating the piano accompaniment some years after the composition of the songs, he started changing some of the key signatures around so that the various compasses suited other than the original tenor-mezzo versions. I can find no explanation for this except that perhaps Berlioz had some special singer, or singers, in mind whose voices were better suited to the new keys. Also there is good reason for speculating that Boulez, when studying the songs for recording, realised that he would himself choose which type of voice should sing a particular song since all are very different in mood, some requiring a light voice, others a more emotion-charged one.

I can't say that I am always in total agreement with Boulez' various choices, and Minton often towers above the light and sometimes unsteady tenor Stuart Burroughs. Minton's voice has a warmth and emotional range that is missing in Burroughs'. But what else could be done, seeing that Boulez retains Berlioz' revised key signatures? I am not a mathematician, so I am unable to say how many permutations six separate items can provide. And no doubt there will be many who will agree with Boulez' choice.

As to Boulez' account of the accompaniments, he sometimes over-expresses some of the composer's intentions. However this response of mine may be due to my always intense enjoyment of the version sung by Janet Baker and accompanied by Barbirolli with the New Philharmonia Orchestra recorded back at the beginning of 1969.

I was, on the other hand, entirely captured by both Minton's and Boulez' account of the Death of Cleopatra, a piece rarely heard because its unusual structure and content make it difficult to include in any ordinary concert program. Despite the difficulty of a completely satisfactory collaboration, Minton and Boulez achieve it here with brilliant success. It should make a valuable addition to the library of any Berlioz enthusiast who perhaps may be surprised to recognise little bits from elsewhere in the composer's oeuvre, especially Benvenuto Cellini.

BARTOK — Music for Strings, Percussion and Celeste. Dance Suite. Played by Antal Dorati conducting the Philharmonia Hungarica Orchestra. Two Images played by the Frankfurt Radio Symphony Orchestra conducted by Eliahu Inbal. Philips Stereo Cassette 7300 453.

Although we have, in this cassette, a good Hungarian conductor conducting an Hungarian Orchestra in Hungarian music, I must confess that the first movement of this eloquent piece just failed to grip me as it usually does. It sounded a trifle too colourless. But I found the second much more vital and sprightly.

I admit the first movement is marked andante tranquillo but I thought Dorati a little too tranquil. In the second movement the very difficult syncopations are exemplary in their unanimity.

I liked the third movement best of all. It is a typical Bartok nocturnal slow movement, full of tiny insect sounds and almost every other kind of natural sound that can be heard by a keen ear on a still night.

I found it difficult to work out why I wasn't carried away by the spirited finale. It has so many good points and the playing is always note perfect. I could not detect a single fumbled entry. Was it a bad day for me — or Dorati? I'll give him the benefit of the doubt because he does all the right things.

In the Dance Suite, Dorati uses the same orchestra but with additions to bring it up to symphonic size. Here is playing that delighted me not only in the great variety of its beautifully sustained dance rhythms, but also in the subtle modifications of the oft-returning ritornello Bartok uses to bind the suite together. A really exciting performance.

On the same cassette, the Frankfurt Radio Symphony Orchestra under Eliahu Inbal plays Two Images — Im Fill Vloom and Village Dance. The first is a nature study, though not in Bartok's usual nocturnal style. Nevertheless, it shows the same wonderful ear for natural sounds and their effect on his ultra sensitive hearing.

Inbal wins a passionate response from his orchestra that is not entirely characteristic of Bartok's music, but then I would hesitate to call the music characteristic Bartok. It is a an early work, composed when he was immersed in the music of Debussy and has more than a hint of Delius.

The Village Dance is true to title in Bartok's already inimitable style. I must confess that the middle section doesn't sound very much exhilarating.

☆ ☆ ☆

MUSSORGSKY — Pictures at an Exhibition. Prelude to Khovantchina. New Philharmonia Orchestra conducted by Charles Mackerras. Vanguard Stereo Disc 71188.

I found the sound a little hard on his disc, perhaps because my pressing is a stereo version of a work recorded quadraphonically. But it is always beautifully clear and balanced with outstanding delicacy, even if it sounds contradictory in the most heavily scored sections. In the quieter items — the Old Castle, for instance — where the sharpness of the acoustic is toned down, the superb quality of the New Philharmonia Orchestra's playing can be better enjoyed.

I did notice something odd about the veiled quality of the tuba's playing in Bydlo (Polish Ox Cart). It sounds a bit like a dinosaur calling its young. But Mackerras gets a fine effect by his insistence on the side drum roll at the climax. Following this you have the delicious refinement of the Chicken Ballet.

Another exciting piece is the disciplined bustle of the Limoges Market Place. In this item, where the tempo broadens before the sinister introduction to the Catacombs, there was a good deal of reverberation on my set. But the noble strains of the Great Gate of Kieff bring it all to an exhilarating ending.

The fill is a sound performance of the same composer's Prelude to his opera Khovantchina, which landscapes a dawn over Moscow. Mackerras does all the right things though the whole effect was spoilt a little for me by the wiry quality of the upper strings.

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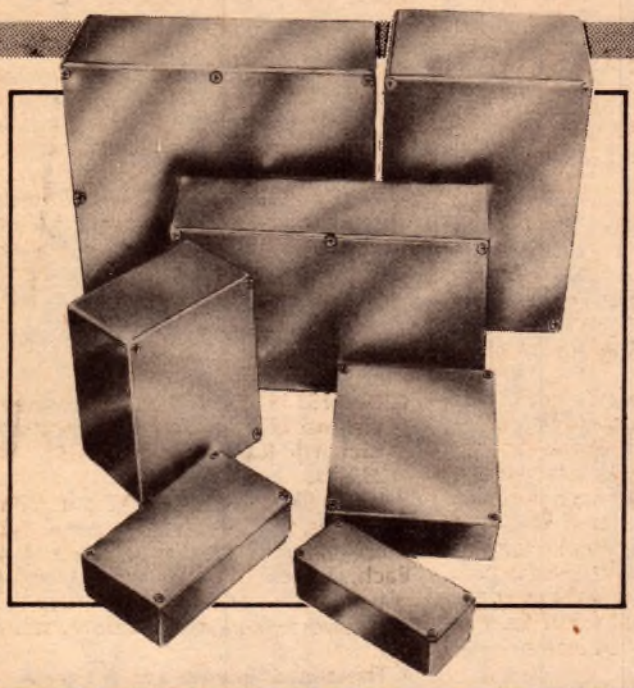

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Lighter Side

Reviews of other recordings

Devotional Records

IT'S ALL RIGHT NOW. Jessy Dixon. Stereo, Light LS-5719. (From Sacred Productions Aust., 181 Clarence St, Sydney and other capitals).

To put you in the picture, Jessy Dixon is a young male negro vocalist who says in his jacket notes that he has been singing Gospel for quite a while but it didn't mean all that much to him until five years ago, when he became a committed Christian.

Backed here by the Jessy Dixon Singers, and elsewhere by the Christ Memorial Choir, the Thompson Community Singers and other named vocalists, he presents a program of ten numbers:

I Expect To See Him — He'll Be Right There — Father Me — I'm Satisfied — Hold On — It's All Right Now — Come To Me — Lord, You've Been So Good To Me — Born Again — He Has Done Great Things.

While certain of the tracks are fairly subdued, the performance as a whole must be labelled rock Gospel — a tag that will repel some and attract others. But, if you are in the latter group, the performance is good and so also is the quality of the recording itself. More than that, if you belong to a group looking for new material, a note on the cover indicates that a companion music book has also been published by "Light" Records. (W.N.W.)

☆ ☆ ☆

THE WORLD'S BEST LOVED HYMNS, Vol. II. Maurice McKenzie, organ. Stereo, Image (Astor) ILP-4923. Also on Musicassette 4ILP-4923.

The basis for the title of this album, which is one of a series, was a "favourite hymn" survey conducted in 1971 by the "Belfast Telegraph" newspaper. Eighteen of the one hundred hymns which emerged as the most favoured are played here by Maurice McKenzie on the Conn electronic organ.

As a method of indicating the nature of the hymns, I list each alternate title: Love Divine — Guide Me O Thou Great Jehovah — Rock Of Ages — Abide With Me — Eternal Father, Strong To Save — When The Roll Is Called Up Yonder — Will Your Anchor Hold — And Can It Be — O For A Thousand Tongues To Sing — Now The Day Is Over (plus, of course, the nine others in between).

Fairly obviously, Maurice McKenzie has had to face the problem of playing two verses each of 18 all-too-familiar tunes. Had he decided to arrange, ornament and "perform" each one, he could easily have alienated the very people who cherish the simple, familiar melodies. As it is, he has chosen to play them in a very subdued fashion, more or less as you'd hear them in any number of modest churches and chapels.

If your prime interest is in organ music, you won't like the end result, especially for the none too subtle use of vibrato and Leslie. But, if you just like simple old-time hymns, chapel style, then Maurice McKenzie may have planned it just for you. (W.N.W.)

Instrumental, Vocal and Humour

GREAT COMPOSERS. Cyril Richard tells their stories and introduces the instruments of the orchestra. Stereo, Image (Astor) ILP-4924.

In six simple tales, addressed to young children, Cyril Richard tells the story of as many great composers: Bach, Mozart, Haydn, Brahms, Schumann, Beethoven. He tells of their childhood, briefly sketches their career and introduces snippets of their music, almost as background sound to the tale.

On side 2, attention is turned to the orchestra. He introduces clarinet, piano, harpsichord, French horn, cello oboe and violin — not in any formal way but as a kindergarten game: walk when you hear this one . . . stand still when you recognise that one. And move your hands to the music.

The sleeve is endorsed "Music appreciation for children, highly recommended". While not boasting the insight of a kindergarten teacher, I don't think I'd be inclinded to quarrel with that claim. If you have children in the target age group, it may be well worth your while to sample the two sides. At least, it would be a change from "I'd like a Toohey's" (W.N.W.)

☆ ☆ ☆

GREATEST HITS OF 1720. Philharmonia Virtuosi of New York, conducted by Richard Kapp. Stereo, CBS SBR 235871.

If you like music of the 17th and 18th centuries, this disc should appeal. With a collection of light little pieces from Bach, Corelli, Handel and Albinoni, played on a variety of instruments, it makes very pleasant and relaxed listening.

The pieces played are a Canon by Pachelbel, a Gigue by Corelli, the Rondeau from Mouret's First Symphonic Suite, an Adagio by Albinoni, the Sarabande from Handel's Suite No. 11 for Harpsichord (which is the theme from the film "Barry Lyndon"), Campra's Triumphal March from "Tancrede," and four items by J. S. Bach: Air for the G. String, A Minuet from Anna Magdalena's Notebook, Largo from the F-minor Harpsichord Concerto, and Adagio from the Conerto for Violin and Oboe.

The playing is of a high standard, and the recording is fine. (J.R.)

☆ ☆ ☆

ONE DOZEN ROSES. The Mom and Dads. GNP Crescendo stereo L 36430. Distributed by Festival Records Pty Ltd.

"The Mom and Dads" could not in any way be confused with the "Mommas and Poppas". The former group is an old-time dance band which will prove enjoyable if you are a ballroom dance fan but makes monotonous listening if you are not. Record quality is passable.

As might be gathered from the album title there are one dozen tracks, each with a rose theme: One Dozen Roses — Bouquet Of Roses — The One Rose — Sweet Gypsy Rose — Ramblin' Rose — Red Roses For A Blue Lady — Room Full Of Roses — Paper Roses — My Wild Irish Rose — Yellow Rose Of Texas — Moonlight And Roses — Painted Tainted Rose. (L.D.S.)

Reviews in this section are by Neville Williams (W.N.W.), Jamieson Rowe (J.R.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), David Edwards(D.W.E.), Greg Swain (G.S.), and Danny Hooper (D.H.).

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CLASSIC RADIO

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LIGHTER SIDE — Cont.

NO REGRETS. Barry Crocker. Stereo, Astor ALPS 1055. (Also on cassette 4ALPS 1055.)

Perhaps without thinking, I picked up this album expecting it to be another from Barry Crocker, the singer with a big voice, a big orchestra and songs beloved by traditional baritones. But it isn't that kind of album at all; its a much lighter sound, with backing by a rhythm/rock group and modern songs, many of which were composed by Barry Crocker himself.

The title is "No Regrets" but the almost universal theme seems to be unrequited love: Love Is — Throw A Little Bit Of Love My Way — Moonbeams — Lady Of The Night — Sweet Alabis — I'd Rather Leave While I'm In Love — On And On — No Regrets — If I'd Only Known — Be Good To You — The Grass Was Always Greener.

Recorded in Hollywood and Los Angeles, the quality is quite okay but it would be wise to check a couple of tracks to see whether Barry Crocker's style here is in line with your expectations. (W.N.W.)

☆ ☆ ☆

BURL IVES. MCA COPS 7991 Astor release.

Burl Ives fans will appreciate the twenty well-known tracks on this "Country Gold" release from Astor, with titles like: Call Me Mr In Between — Royal Telephone — I Walk The Line — The Almighty Dollar Bill — The Blizzard — Forty Hour Week — Green Green Grass Of Home — Pearly Shells — This Is All I Ask — My Gal Sal — Mary Ann Regrets — Funny Way Of Laughin'.

No recording dates are listed, so most of the tracks could be re-releases, but this does not reduce the pleasure of hearing a master of the folk-country idiom again. The quality is good throughout. (N.J.M.)

☆ ☆ ☆

JEANETTE MacDONALD and NELSON EDDY — Legendary Performers. RCA Victor CPL1 2468.

This one seems certain to be a big hit with movie buffs, as well as with those who still have fond memories of the romantic duo as part of their own youth. RCA have brought together just about all of their famous songs, and although they are not taken from the original sound tracks, many were recorded at much the same time. Of the 15 tracks, 8 were recorded in 1935-36.

There's Indian Love Call and Rose-Marie from "Rose-Marie", Italian Street Song, I'm Falling In Love With Someone, Ah! Sweet Mystery Of Life and Tramp, Tramp, Tramp Along the Highway from "Naughty Marietta", Sweetheart Waltz from "Sweethearts", Will You Remember? from "Maytime", Wanting You from "New Moon", and also Rosalie, Giannina Mia, Stouthearted Men, Beyond the Blue Horizon, Song of Love and I'll See You Again.

The recording quality is quite good, although some of the earlier masters are a little edgy and obviously narrower in bandwidth. Naturally enough Jeanette and Nelson sound rather more mature in the later recordings, too, as these were made in 1957-58 — twenty-three years after the first recordings!

As a tribute to one of the most famous and well-loved singing and movie twosomes, it's a collector's item. And even in these cynical seventies it's still surprisingly enjoyable as well. (J.R.)

☆ ☆ ☆

THE FLORAL DANCE. The Brighouse and Rastrick Band. Stereo, 45rpm. M7 MST223.

The name may look like a put-on but it's apparently a real band, somewhere in Britain. "The Floral Dance" is on side 1 and "Bachelor Girls" on side 2. Why it should have come my way I'm not sure,

FASCINATIN' RHYTHM. Yehudi Menuhin & Stephane Grapelli. Quadraphonic, World Record Club WRC-R.03271.

I well remember the fascination when I heard Yehudi Menuhin and Stephane Grapelli playing together for the first time — violin "giants" in the respective world of classics and jazz, and yet teaming together so naturally.

This album comes as a sequel to their earlier and very successful "Jealousy: Music of the Thirties" and features the music of George Gershwin, Jerome Kern and Cole Porter — or what's left after the duo have finished doing their own thing with it:

Just One Of Those Things — Soon — Sumertime — Nice Work If You Can Get It — Johnny Aime — Looking At You — Embraceable You — Fascinating Rhythm — Liza — Why Do I Love You — Menuet pour Menuhin — S'-Wonderful — I Get A Kick Out Of You — All The Things You Are — I Got Rhythm.

If you count up those titles, you will find a total of 15 tracks, a generous helping indeed. It's not very demanding material as far as the recording is

concerned, and the sound is as clean as you would expect, whether you play it in quadraphonic or normal 2-channel stereo.

If you don't already have "Jealousy ...", treat yourself to this one. (W.N.W.)

THE LIGHTER SIDE — Continued

but I can report that it's a brief but happy sound, with a bass beat that comes through fine on a couple of decent speakers. (W.N.W.)

☆ ☆ ☆ ☆

RONNIE MILSAP LIVE. Ronnie Milsap. Recorded live at the Grand Ole Opry House, Nashville , Tennessee. RCA Victor APL1-2043.

Ronnie Milsap has made quite a name for himself of late in the country music world, with a string of hits to his credit. The record starts off with an introduction by Ralph Emery, but from then on it's all pure Milsap, with tracks like "Pure Love", "That Girl Who Waits On Tables", "Kaw-liga" and "(I'd Be) A Legend In My Time".

Technically, the record is A1, with a very clean sound and minimal background noise. It will obviously appeal to C and W fans, and Ronnie Milsap fans in particular. (D.W.E.)

☆ ☆ ☆

MUSIC HALL TO VARIETY. Vol. 1. World Record Club Retrospect series WRC-3168.

What nostalgia I admit to stretches back to the early days of radio and covers a few of the items on this disc like "Motoring" (Harry Tate & Company), "Don't Have Any More, Missus Moore" (Lily Morris), "The Laughing Policeman" (Charles Penrose) and "Fourth Form At St Michaels" (Will Hay).

But there are many other tracks here, with their roots in the music hall, of which I have only the vaguest memory: Little Betty Bouncer (Flotsam & Jestam) — Here Am I, Broken-hearted (Layton & Johnson) — Don't Do That To The Poor Puss Cat (Leslie Sarony) — plus another half dozen on side 2.

How you react to the album would largely depend on whether your memories pre-date mine. If they do, you'll say "ah yes" to a greater number of tracks, of which there are 13, all told.

Selected and re-recorded from the EMI archives, some of the older ones sound every bit their age but, after all, that's the way they've always sounded.

You'll have to make up your own mind on this one. It wouldn't be everybody's choice. (W.N.W.)

☆ ☆ ☆

EVERGREEN. Roger Williams. MCA 2279. Astor release.

This is one record that I have no hesitation recommending. It features ten well-known tracks, many of them movie themes and all played by piano virtuoso Roger Williams.

Included are such favourites as "Evergreen" (from the movie "A Star Is Born"), "Theme from Airport 77", and "When I Need You", the latter recently made popular by vocalist David Soul. Be sure to listen to the third track on side 1, "Cast Your Fate to the Wind" — it contains some rather way-out synthesiser sounds.

The other six tracks are Theme from New York, New York — What Are You Doing The Rest Of Your Life — Me — Grieg's You Know What By Roger You Know Who — Love Song — Main Theme From King Kong.

As is usual with this label, the recording quality is excellent. (G.S.)

☆ ☆ ☆

BILITIS, I NEED A MAN. Music by Francis Lea. Stereo, 7-inch 45 rpm. M7 Records MS-237.

Produced last year in France, this is a melodic morsel, particularly "Bilitis", from the sound track of David

CLASSICAL GUITAR. Liona Boyd. Image (Astor) ILP-769. Also on musicassette 4ILP-769.

You don't need to be a devotee of the classical guitar to enjoy this album by the outstanding Canadian woman guitarist Liona Boyd. In fact, if you have passed over the instrument before, she may well induce you to listen more closely!

Precise, yet sensitive and involved with her music and her audience, Liona Boyd plays the following numbers, some of them transcribed, and all covered by the jacket notes:

El Colibri (Sagreras) — Campanas de Alba (Sainz de la Maza) — Rumores de la Caleta (Albinez) — Zambra Granadina (Albinez) — Sounds of Bells (Guimaraes) — Cancion Triste (Calleja) — Prelude in A Minor, Presto in A Minor (Bach) — Gavotte I and II (Bach) — Sonata in A Minor (Scarlatti) — Sonata in A Major (Scarlatti) — La Fille aux Cheveux de Lin (Debussy) — Le Muletier des Andes (Tomasi).

Listening to her performance, it is easy to appreciate why Liona Boyd, an attractive blue-eyed blond, has won the hearts of audiences and critics around the world. And the quality of the recording is excellent.

One you should buy for your collection. (W.N.W.)

Hamilton's film by that name. Electronically sourced, the sound is very clean, very atmospheric. "I Need A Man", which carries an "A" side sticker, opens with a more conventional soft rock sound but "Bilitis" is the one that I liked best. (W.N.W.)

☆ ☆ ☆

COMMITMENT. Jim Hall. A & M Records Inc. Festival Records release L 36420.

Perhaps the best way to describe the rather run-of-the-mill music on this album is to call it a "soft" jazz session. Featured are such instruments as piano, bass, flugelhorn, drums and guitar. There is some vocal backing on one track on side 2.

Personally, I didn't find the style to my taste and I suspect that many readers will react the same way. My advice: listen before you buy. On the positive side, recording quality is well up to standard.

Track titles are Walk Soft — One Morning in May — Lament for a Fallen Matador — Down the Line — When I Fall in Love — My One and Only Love — Bermuda Bye Bye — Indian Summer. (G.S.)

☆ ☆ ☆

FLOATERS. Floaters. ABC Records AB 1030. RCA Release.

This all-male member group gained high recognition with the release of their last single "Float On". An eleven minute version of this single is the opening track on the album. "Float On" reached No. 1 in England, No. 2 in America and reached the top five in Australia.

This album, unlike the single, has had little success, even though most of the eight tracks are very good. The closing track "I Am So Glad I Took My Time" is a ballad but the remaining seven songs are all characterised by a definite soul beat.

The theme of the entire album is based on love, so all of you lovers may find this a suitable record to purchase! (D.H.)

☆ ☆ ☆

AJA. Steely Dan. ABC Records AB 1006. RCA release.

Steely Dan is Walter Becker and Donald Fagen. All of the seven tracks on the album were composed lyrically and musically by Steely Dan. Each song is a unique musical venture, not like the one before or the one to follow.

The songs vary greatly from ballads, example "Deacon Blues" to funky numbers, example "Black Cow" and the album even contains a rhythm and blues poem. "Home At Last" is this song, which enhances the poetic technique of a definite rhyme scheme.

However, the most renowned songs on "AJA" are "Josie" and "Peg" (the single released from the album). A listen to "AJA", if not a purchase, is a must! (D.H.)

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DICK SMITH ELECTRONICS

Letters to the editor

Hands off China!

I was disgusted to read in your Serviceman column (April 1978) the petty criticism by innuendo of the People's Republic of China.

This sort of meddling in international politics by a magazine which is supposed to be of an electronics nature is to be condemned.

If the case is one of neglect by an electronic manufacturer of their warranties there are plenty of examples in our own back yard which in some cases are a lot worse than the one mentioned in the letter.

So instead of using your pages to promote international tension and division why not promote goodwill and understanding between all peoples of the world no matter what type of political system they live under.

Lindsay Shepherd,
Emerald, Qld.

COMMENT: You appear not to have noticed the readiness of the Serviceman to criticise our own industry, where warranted. The October 1977 issue provides a recent example. Where comparable administrative bungles come to our notice, we see no reason to suppress them because they happen to have occurred in another country, irrespective of their political system.

Grouch from NZ

I am a CB radio operator in New Zealand and would like to work my counterparts in Australia but due to an outlandish international regulation this cannot be done, even though the opportunity presents itself nearly every day.

Lately I have copied Australian, USA, Canadian, Japan, New Hebrides, and Continental CB stations at nothing below strength 5, and up to +10.

We in New Zealand are under the impression that CB in Australia is on the 37MHz band. If this is so why are so many Australian stations using the 26MHz band, especially 26.500MHz which is the NZ calling channel.

At times I have been talking to another station located no three miles from me and been "flattened" by Australians so badly that I have had to give the contact away.

We have recently had the case of Australian stations pirating NZ call signs and using them while working back into NZ. It is because of this foolish behaviour that the radio authorities have come down hard in NZ (and possibly soon in Australia) on international CB. Over here, the 26MHz band is more or less policed by the CBers themselves and we jump on children and trouble makers using the band.

Kiwi CBer (North Island).

Can anyone help?

My elderly father has a speech defect (neuromuscular inco-ordination of the oesophagus), caused by osteo arthritis and spondylitis — meaning that he can only speak in a whisper, making communication very difficult for him.

Extensive enquiries through various hospitals and speech therapy organisations for some sort of small external battery operated microphone/amplifier have been to no avail, although if there was no speech at all he could helped with an electrolarynx implant. Because he can be heard over the telephone, I believe that help from an electronic device is feasible.

Any help you could supply such as a circuit diagram, known whereabouts of a commercial unit, or any advice would be greatly appreciated.

W. Bulloch,
4 Aster Ave, Miranda 2228.

COMMENT: Anyone who can help should write direct to Mr Bulloch at the address given.

Old time receiver

I am trying to restore a 1930 radio, an AWA Radiolo Forty-Five (Model C73, power unit D21). At present the set works but with distorted output. I would like to return it to original condition and maintain it that way for as long as possible and I am seeking a few components that most present-day suppliers have never even seen: UX280 (or 80) rectifier; UY224 first and second RF amp and detector; UX245 (or 45) AF amplifier. Also an AWA wirewound potentiometer and an appropriate magnetic speaker.

If anyone could help me with any of these parts or with information, particularly with regard to preferred speaker impedance, I would be most grateful.

Brian Weavers,
8 Ashburton Rd,
Glen Iris 3146.

New Products

Portable 15MHz dual-trace oscilloscope

Parameters has announced the availability of a completely new portable dual trace oscilloscope from Trio. Weighing in at just 6.5kg, the CS1352 adopts very similar styling to the already popular mains operated range of Trio scopes and packs an impression set of specifications into relatively compact dimensions.

Full 15MHz, 3dB bandwidth is offered on both channels, together with a sensitivity of 2mV/division and a triggered sweep system.

According to Bruce McCarthy of Parameters, the CS1352 has been specifically developed for field use in TV and computer service situations where freedom from a mains supply is an important consideration. The scope has a three-way supply system — AC mains (recharging), 12V DC, or internal rechargeable cells giving over two hours continuous operation.

Performance compares very favourably with the already well established CS1560A mains operated 15MHz scope. Screen size is 75mm, with an extremely stable display achieved by the use of DC-to-DC converters in the power supplies. These ensure constant deflection sensitivity and sweep rates over extended periods of time.

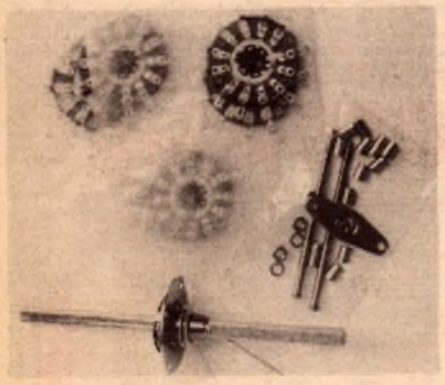
Trio Export Marketing Manager, Mr Saito, demonstrates the features of the CS1352 CRO to EA Editor, Jim Rowe.

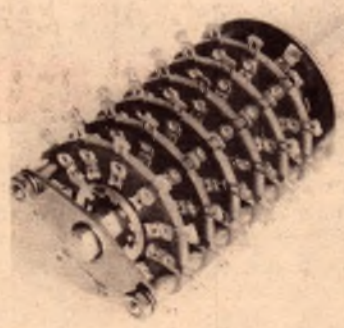
Lissajous figures can be displayed at full sensitivity, together with add and subtract signals on both channels. A trace rotation feature enables accurate alignment of traces with the graticule.

Nineteen sweep rates are offered from 0.5us to 0.5s/division. For TV signal observation there are TV-V and TV-H sweep rates. A x5 magnifier allows sweep rates as fast as 0.1ms/division for high frequency measurements.

For further information contact Parameters Pty Ltd, 68 Alexander St, Crows Nest, NSW 2065.

Multi-position switch kit from Davred





For those experimenters and home constructors who need multi-position switches, often with odd contact arrangements, a switch kit currently being offered by Davred Electronics Pty Ltd should have a particular appeal. The kit consists of six only 1x12 switch wafers, shaft and clicker plate assembly, plus screws, nut spacers and other hardware. The clicker plate, as supplied, is stopped at six positions, but is designed to be modified, in single steps, up to 12 positions. It also appears that, with a little ingenuity, it could be modified for less than six positions. Price of the kit is $5.95.

12-terminal rotary switch for appliances

A unique 12 terminal, programmable rotary switch has been introduced by Melbourne based Swann Electronics Pty Ltd. The switch is manufactured in Australia for local and overseas appliance manufacturers, and is designated "90 series".

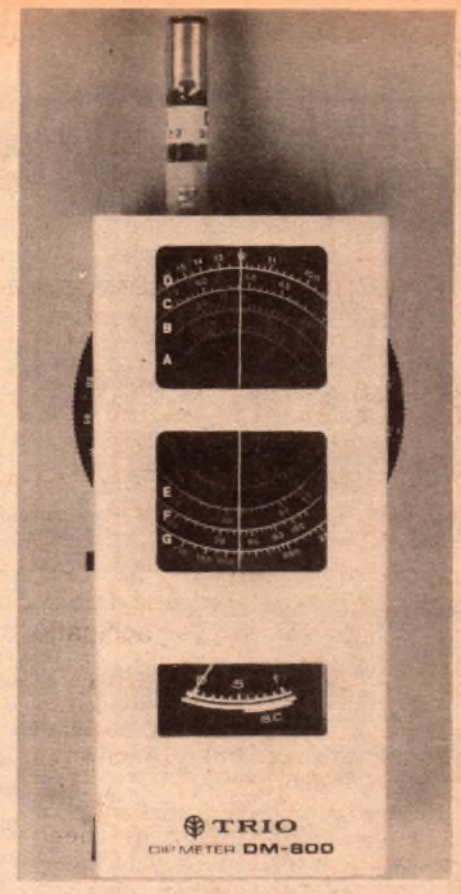
Major cost savings in circuitry can be achieved by the variety of configurations available in volume production to individual manufacturers' specifications. The unit is rated at 15A 240V AC, and internal bridging is available to provide additional flexibility in circuit design.

Depending on specification, the switch can be barrel or flange mounted, or supplied with a threaded shank for panel mounting.

Further information is available from Swann Electronics Pty Ltd, Cnr Forster and Hardner Rods, Mt. Waverley, Victoria 3149.

Trio DM-800 Dip Meter

A dip meter is a handy gadget for any electronics enthusiast, particularly those involved in radio communications. Here we review the Trio DM-800 Dip Meter, and give you an opportunity to win the unit pictured.



Perhaps we should explain first what dip meter does, since there will be many readers who are unfamiliar with this item of test equipment!

Basically, such an instrument consists of a tuneable RF oscillator, an external tuning coil, a detector circuit, and a signal strength meter which measures the output from the oscillator. In theory, and in practice, the circuit is really very simple.

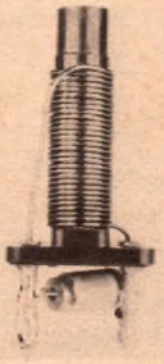
But despite this basic simplicity, a dip meter is a multipurpose measuring instrument with a variety of uses. It may be used to determine the resonant frequency of tuned circuits and antennas; as a simple signal generator for aligning radio receivers; as an absorption frequency meter; as a field strength meter; for checking crystals; and for determining the values of unknown capacitors and inductors.

The most basic measurement involves measuring the resonant frequency of a tuned circuit made up of a coil and a capacitor. This is done by placing the dip meter coil close to the tuned circuit and adjusting the oscillator frequency until a dip is noted on the signal strength meter.

This dip in signal strength occurs at the resonant frequency of the tuned circuit and is due to energy being coupled into the tuned circuit from the dip meter oscillator.

The Trio DM-800 has only recently been made available on the Australian market. It is an attractive unit featuring a frequency range from 700kHz to 250MHz in 7 bands, a built-in modulator, battery operation, and provision for an earphone to enable the user to monitor modulation.

You could win a Trio DM-800 Dip Meter simply by nominating the resonance of the tuned circuit pictured at right. Full details are set out in the coupon below. (No slug in coil).



The unit can be easily held in one hand and has overall dimensions of 70 x 155 x 45mm (W x H X D). Frequency calibrations on the large circular dial are colour coded to aid band identification.

Supplied with the DM-800 are seven plug-in coils, one for each frequency band. These plug into a socket located at the top of the unit. Each coil, by the way, is marked with the relevant frequency band and an identification letter, and is colour coded to match the dial calibration colours.

A neat touch is the coil compartment (at the base of the instrument) which houses those coils not in use.

The built-in modulator allows the DM-800 to be used as a signal generator for aligning an AM receiver. In practice, the user sets the function switch to "MOD" and couples the output of the dip meter into the antenna circuit of the receiver. Modulation frequency is 1kHz.

Alignment of SSB and CW receivers is carried out by leaving the function switch in the "OSC" position (no modulation).

Crystals may also be checked on the DM-800, and two sockets are provided for this purpose. One socket (the coil socket) accepts FT-243 and HC-6U crystals while the other accepts HC-25U crystals. In addition, the DM-800 can be used as a marker generator by plugging a suitable marker crystal into the unit, eg. 1MHz, 3.5MHz, etc.

Other applications are set out in the small operating manual supplied with the unit. Price is $109 plus sales tax.

For further information on the DM-800 contact Parameters Pty Ltd, 68 Alexander St, Crows Nest, NSW 2065. (G.S.)

PARAMETERS/ELECTRONICS AUSTRALIA

GRAND INSTRUMENT CONTEST no 2

Win the Trio DM800 Dip Meter reviewed above . . .

The reviewer close wound 30 turns of 22B&S on a 7mm former. The coil was connected in parallel with a 680 pf polystyrene capacitor. Simply estimate the frequency at which the circuit dipped to the nearest 50 kHz.

Seal an envelope, write the frequency and your name and address on the back of it and send to:

PARAMETERS/E.A. GRAND INSTRUMENT CONTEST NO. 2.
P.O. Box 163, Beaconsfield, 2014.

All entries must be in by Monday July 3rd, and the winner will be the first correct entry picked from the barrel.

Permit Number No. TC860A issued under the Lotteries & Art Unions Act

you could win . . .

New products . . .

New range of hobby kits

Dick Smith Electronics have recently introduced a new range of hobby kits. These are the Fishertechnik precision scientific constructional kits, which use moulded plastic parts as the basis for mechanical and electrical models.

The basic kit available is the Hobby 1, which provides base plates, building blocks, axles, wheels, tyres, cranks, gears, couplings, cams and joints. This can be expanded with Hobby 2, which provides a motor, as well as many gears and pinions.

Hobby 3 provides parts required for switching and control applications, and includes switches, lamps, electromagnets, and relays. Hobby 4, the set shown in the photographs, is the electronic section of the units. It provides an operational amplifier, as well as an electronically controlled relay.

Optical units, such as lenses, lamps and mirrors are also provided, along with the necessary mechanical support units. This allows many aspects of photo-electronics to be investigated. Two further kits are also available, which allow large static devices (cranes, buildings, etc) and landscapes to be assembled.

A matching power supply is also available, as well as further manuals which complement and improve on the basic information supplied with each kit. Further information on the kits is available from Dick Smith Electronics Pty Ltd, 24 Carlotta Street, Artarmon, NSW 2064. (D.W.E.).

Moderately priced X-Y display

At a moderate price, the new Tektronix 624 Display Monitor offers a brightness of 130cd/m³ for easy viewing in ambient room light.

The 624 is well suited to applications in medical diagnostic equipment, electronic instrumentation, mechanical measurements, and military/aerospace systems. A specific example of medical application is the A-scan display in an ultrasound system. Electronic instrumentation applications include displays for spectrum analyzers and logic analyzers.

For further information contact Tektronix Australia Pty Ltd, 80 Waterloo Rd, North Ryde, NSW 2113.

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QUESTIONS & ANSWERS ON RADIO AND TELEVISION, H. W. Hellyer
Starting with the fundamentals of electricity and sound and radio waves, this manual takes the reader step-by-step in question and answer form to a thorough grasp of the principles of radio and television reception and transmission, with emphasis on the techniques and operations employed in day-to-day practical work.

This new edition has been extensively revised and includes new illustration and new section on the use of transistors.

ELECTRONIC COMPONENTS, M. A. Colwell
Fully illustrated guide to modern electronic components, what they are and what they do. Invaluable to students, technicians and hobbyists and newcomers to electronics.

ELECTRONIC DIAGRAMS, M. A. Colwell
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PRACTICAL ELECTRONIC PROJECT BUILDING, M. A. Colwell
A practical aid to building circuits with help in avoiding common faults and in trouble-shooting.

SIMPLE CIRCUIT BUILDING, M. A. Colwell
Learn about electronic circuits from basics to complex systems without the conventional theoretical approach usually found elsewhere.

PRINTED CIRCUIT ASSEMBLY, M. A. Colwell & M. J. Hughes
Fully illustrated elementary guide to the design and manufacture of printed circuit boards and assembly of components. Extremely useful to students, technicians, hobbyists and artists preparing artwork.

PROJECT PLANNING AND BUILDING, M. A. Colwell
How to convert an idea or a given circuit into a practical model; full of practical information.

110 INTEGRATED CIRCUIT PROJECTS FOR THE HOME CONSTRUCTOR, R. M. Marston
A completely rewritten edition containing a practical introduction to five specific i.c.s. The projects range from simple low-level amplifiers to precision measuring and indicating instruments, and include a host of unusual gadgets. All i.c.s. are internationally available and all circuits have been fully evaluated by the author. The book should be of equal interest to the amateur, the student and the professional engineer.

110 SEMICONDUCTOR PROJECTS FOR THE HOME CONSTRUCTOR, R. M. Marston
This book presents information on established and new semiconductor devices by way of circuit design rather than by long winded theory. All circuits have full component values and are accompanied by brief but explicit descriptions of their operation.

RADIO CIRCUITS EXPLAINED, G. J. King
Circuits used in modern radio receivers are examined in detail ranging from the simple transistor radio to the specialised hi-fi receiver. The book will provide a clear understanding of principles and operation and design parameters of contemporary sets. Invaluable to radio and audio service technicians, to the student and to anyone interested in radio.

BASIC CARRIER TELEPHONY – Revised 3rd Edition, D. Talley
A basic course in the principles and applications of carrier telephony and its place in the over-all communications picture. Abundantly illustrated, with questions and problems throughout, and requiring a minimum of mathematics, this revised edition will be most useful to personnel throughout the communications and electronics fields.

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Books & Literature

Electrical and electronic theory

THE GENERAL THEORY OF ALTERNATING CURRENT MACHINES, by B. Adkins and R. G. Harley. Hard covers, 279 pages 240mm x 160mm. Published 1975 by Chapman and Hall, London. Price in Australia $33.00.

According to the preface, this book represents an extension and an updating of the earlier "The General Theory of Electrical Machines" by B. Adkins, published in 1957. As such, it is well outside and beyond the present scope of this magazine but, having received a review copy, we reproduce a few sentences from the jacket notes, as a guide to readers whose interests may lie in that direction:

The initial chapters introduce idealised, primitive and DC machines, while the remaining chapters discuss AC machines alone. Chapter 5 deals specifically with problems and methods of solution and computation, and is followed by four chapters devoted to synchronous machines, their operation, faults and associated problems. The last three chapters cover such subjects as the effects of saturation, eddy currents, induction motor problems, the application of theory to the less common types of machines, operation methods and the per-unit system. The book is suitable for senior and post-graduate students.

Our copy came from Methuen of Australia, 301 Kent St, Sydney 2000. (W.N.W.)

☆ ☆ ☆

ELECTRONICS FOR ELECTRICAL TRADES second edition by James F. Lowe. Hard covers, 246 pages 242mm x 184mm, illustrated by diagrams and pictures. Published 1977 by the McGraw-Hill Book Co., Sydney. Price in Australia $8.95.

The Author of this text is head Teacher of Electrical Trades at the Newcastle (NSW) Technical College and, not surprisingly, has designed (and now redesigned) the book primarily with the needs of students in mind.

As indicated by the title, the book is not intended to be a detailed text on electronics, but rather to give an insight into the subject to students in electrical trade courses. The reader is therefore introduced to terms and concepts sufficient to have some appreciation on the new science which is overlapping into his traditional field.

The ten sections in the book, each sub-divided to facilitate reference and study, cover: diodes, transistors, protection and control devices, logic, thyristors, electron tubes and opto-electronics. There are six appendices provided for supplementary study, a general index and answers to the revision questions which follow each section.

Rearranged and up-dated from the earlier edition, the book should not only meet its initial requirement but should also provide helpful practicing electrical tradesmen anxious to catch up with emerging technology.

Our review copy came from McGraw-Hill Book Co. Aust. Pty Ltd, 4 Barcoo St, Roseville East, NSW 2069. Tel. (02) 406 4288. (W.N.W.)

☆ ☆ ☆

RADIO CIRCUITS EXPLAINED. Gordon J. King. Published 1977 by Newnes Technical Books. Hard covers, 145 pages, 240mm x 158mm, illustrated by diagrams and pictures. Price in Australia $12.50.

This would appear to be the 14th book by Gordon J. King, whose name is followed on the flyleaf by the longest

C. & K. COMPONENTS INC. of USA have released a small booklet entitled "all you should know about thumbwheels . . . and never asked".

The 6-page publication explains basic fundamentals associated with thumbwheel switches. The approach is light and makes for entertaining reading.

For your free copy, contact C. & K. in Sydney or interstate agents. The Sydney C. & K. Electronics (Aust.) Pty Ltd, Office 2, 6 McFarlane St, Merrylands, NSW 2160. Alternatively: PO Box 101, Merrylands 2160. Telephone 02 682 3144.

list of technical affiliations that I can ever remember seeing!

The jacket notes point out that, while there is any number of books on the subject of television receivers, there are very few to do with current radio receiver design. This is the position that Gordon King has set out to rectify, with chapters on the following:

Block and flow diagrams — RF amplifiers & mixers — Frequency changers & oscillators — IF amplifiers — Detectors — AF amplifiers — AF power amplifiers — Power supplies — Stereo encoding & decoding.

Taking in relatively simple receivers through to the more elaborate stereo-hifi variety, he discusses the basic design principles involved in each section. The text is basically descriptive and could be read to advantage by anyone with a foundational knowledge of electronics, who wants to up-date in terms of current technology.

While obviously intended for use by students, it could also prove very useful to the many TV servicemen who may be looking to expand their activities back into the radio field — an ironic but nevertheless realistic twist.

Our copy came from Butterworths, 586 Pacific Highway, Chatswood 2067. Tel. (02) 412 3444. (W.N.W.)

☆ ☆ ☆

110 INTEGRATED CIRCUIT PROJECTS For the Home Constructor. Second edition, 1978. Stiff paper cover 133mm x 215mm, illustrated by circuits. Published by Newnes Butterworths London. Price in Australia $7.00.

According to the information on the flyleaf, the first edition dated 1971, was reprinted in 1973 and 1976. This new 1978 edition has been completely rewritten and should presumably also enjoy success.

It is divided into five main sections covering: Type 741 Op-Amp Projects — Type 555 Timer Applications — XR-2206 Waveform Generator Circuits — LM-380 2-watt amplifier Circuits — Type 723 Voltage Regulator Circuits. At the back is a brief appendix showing device outlines and pins, and a general index.

The book presents circuits only, plus a brief explanation, the actual construction would be largely up to the individual. The projects vary in complexity from individual circuit functions to complete simple gadgets. It is pointed out that the material in two of the chapters covering the 555 and 741 have been published previously in magazines such as "Radio-Electronics" and "Electronics Today International".

I see two distinct uses for the book: one as a source of ideas for things to build, and the other as text which could help the reader understand what is being done with popular, mass produced integrated circuits.

Our copy came from Butterworths, 586 Pacific Highway, Chatswood, NSW 2067. Tel. (02) 412 3444. (W.N.W.)

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COMMERCIAL ANTENNA: I would be grateful for your advice and opinion. In a recent US catalogue there is the enclosed advertisement for the "Select-a-Tenna". Could you tell me:

(1) How does the device work?

(2) Do you think it is worthwhile, or just a gimmick?

(The advertisement portrays a pocket radio sitting alongside a much larger circular device with what appears to be a tuning knob on the front. The accompanying blurb describes the device, along with other glowing adjectives, as "possibly the greatest radio invention in years".)

● Putting aside the natural exuberance of the makers it is probably fair to say that the device will almost certainly provide some benefit. The simple fact is that pocket sets of the kind portrayed use such ineffective aerials that almost anything will improve them — including adding a simple external aerial, where there is provision to do so. Not only would this be a lot cheaper (the device costs $25) but, in some respects, it could be better.

The device is almost certainly a tuned loop aerial, which is inductively coupled to the set's own ferrite rod aerial. (Our office cynic described it as the aerial the set maker would have liked to have fitted but dared not, because no one would then buy the set!)

But, seriously, it would have some advantages. Because it is tuned it would add some preselection to the set, even though this may offer little advantage in practice. It would also retain, and perhaps enhance, the directional properties of the set's own aerial, which can be an advantage where weak distant stations tend to be drowned by powerful local signals on adjacent frequencies.

We described a verion of such a device in the now defunct "Modern World" for July 1971.

VIDEO DATA TERMINAL: Currently I am in the process of completing your Video Data Terminal from the March 1977 issue, and have struck a couple of snags. The first one relates to the connection of the terminal to the TV set. What kind of coaxial cable should be used, for both the video and RF outputs? Do you need a balun if a television receiver is being used?

Secondly, what is the best way of making connections to the keyboard socket on the display module? How was this done on the prototype? (M. T., Hawthorn, Vic.)

● We are a little confused as to which terminal you are referring to, M. T., as neither of our designs was presented in the March 1977 issue. Our first design was present in January and February 1977, while the second appeared in the February and April 1978 issues. However, we may still be able to answer your questions.

Use 75 ohm coaxial cable for connections to either a monitor or a normal TV set. A balun is required only if the TV set does not have a 75 ohm input, and in this case will have to be from 75 ohms unbalanced to 300 ohm balanced.

A DIL plug is the best method of making connections to a DIL socket. These should be available from your normal component source. An alternative method is to remove the socket and solder directly to the printed board.

If you are unable to complete an "Electronics Australia" project because you missed out on your regular issue, we can usually provide emergency assistance on the following basis:

PHOTOSTAT COPIES: $2 per project, or $2 per part where a project spreads over multiple issues. Requests can be handled more speedily if projects are positively identified, and if not accompanied by technical queries.

METALWORK DYELINES: Available for most projects at $2 each, showing dimensions, holes, cutouts, etc., but no wiring details.

PRINTED BOARD PATTERNS: Dyeline transparencies, actual size but of limited contrast: $2. Specify positive or negative. We do not sell PC boards.

REPLIES BY POST: Limited to advice concerning projects published within the past two years. Charge $2. We cannot provide lengthy answers, undertake special research or discuss design changes.

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OTHER QUERIES: Technical queries outside the scope of "Replies by Post" may be submitted without fee, for reply in the magazine, at the discretion of the Editor.

COMMERCIAL, SURPLUS EQUIPMENT: No information can be supplied.

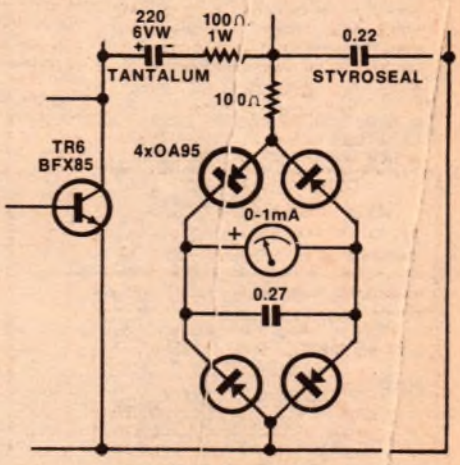
COMPONENTS: We do not deal in electronic components. Prices, specifications, etc., should be sought from advertisers or agents.

REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Beaconsfield, 2014.

NOTES & ERRATA

INDUCTANCE METER (March 1978, File No. 7/B/14). Two of the diodes in the metering circuit bridge rectifier were shown with incorrect polarity in the circuit diagram on page 73. The four diodes should be wired as shown in the accompanying diagram.



ELECTRONIC KEYER (March 1978, File No. 3/MS/75.) The printed board wiring diagram (p59) shows one of the supply rail decoupling capacitors (upper right) as .047uF. This should be 0.1uF, to agree with the circuit and parts list.

INDEX TO VOLUME 38 (March, 1977): File No. 1/SE/38, 3-41L Speaker System, June, 1976 should read File No. 1/SE/45. File No. 2/CC/16, ASCII-Baudot Translator, October, 1976, should read File No. 2/CC/15. File No. 2/CC/17, A "baby" System using the Signetics 2650 Micro-processor, March, 1977, should read File No. 2/CC/18. File No. 3/AU/17, A Hazard Flasher for your Car, March, 1977, should read File No. 3/AU/18.

INDEX TO VOLUME 39 (March 1978): File No. 2/PS/41, Dual Regulated Supply, (Mini-Supply) June, 1977, should read File No. 2/PS/40. File No. 7/M/54, Building a Digital Multimeter, January, 1978, should have no File No.

MINISCAMP PART 4. (July 1977, File No. 8/M/17. Also chapter 15 of "Getting Into Microprocessors".) In Fig. 4, the address decoding shown is incorrect. To achieve an address of 5111 HEX, the 74C10 gate should be connected to AD0 and AD4, not AD0 and AD3.

MINISCAMP REACTION PROGRAM (May 1978, File No. 8/M/29). There is an error in the HEX listing of the program. Location 0005 should be changed from 2F to 31.

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ADVERTISING INDEX

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