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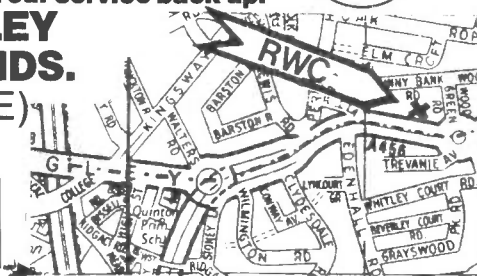


RWC SPECIAL OFFERS



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M5 JUNCT 3



RAY G4 KZH

PHIL G4 OHK

THESE PRODUCTS ARE EXCLUSIVE TO RWC

10 Mtr MOD BOARD - Remember who did it first!

This is a complete modification board designed to fit all CB radios that incorporate the SANYO LC7137 series of synthesizer chip, the unit comprises of a small pcb with six microchips and fits almost all current legal (CB 27/81) radios, the unit is supplied with full fitting instructions and can be fitted easily by most enthusiasts, with the current upsurge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10mtr amateur band.

PRICE £22.50 + £1.00 post and packing

Works excellent in Cybernet, Binatone Lowe TX40G etc. * Check if your radio has the Sanyo chip fitted. We will fit unit for you **£40.00** inclusive. P&P.



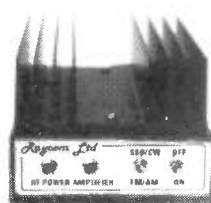
KIT OF PARTS AVAILABLE £17.50 + £1 p&p

* Only available from RWC see R&EW March 1985 for full circuit description etc.

RAYCOM MODULAR RF AMPLIFIERS

A complete range of linear and fm amplifiers for use with both VHF and UHF hand portables and multimode portables such as the YAESU FT290R and FT790R. Power output from 15W to 45W depending on model, (eight are available). All units feature Mitsubishi or Toshiba power modules as used in the majority of mobile and base radio transceivers. Two versions are also available for business radio applications.

PRICE from £39.50 for the 15W vhf model + £2.00 post



UHF UNITS (430-440MHz)

| ORDER CODE | PRICE |
|-----------------------|---------------|
| 25W FM/CW U25F | £79.50 |
| 15W FM/CW/SSB/AM U15L | £69.50 |
| 15W FM/CW U15F | £59.50 |

(FULL RANGE OF POWER MODULES IN STOCK)

VHF UNITS (144-149MHz)

| ORDER CODE | PRICE |
|----------------------|---------------|
| 45 FM/CW V45F | £62.50 |
| 35 FM/CW/SSB/AM V35L | £59.50 |
| 25 FM/CW V25F | £48.50 |
| 15 FM/CW/SSB/AM V15L | £49.50 |
| 15 FM/CW V15F | £39.50 |

A.R.M. MULTI P6 ANTENNA

This is one of the most exciting new products to be launched by RWC and is the result of many months of development by Antenna Research Manufacture based in Devon.

The antenna has been designed to meet the growing popularity in multimode portable and mobile operation and is capable of being used on both vhf and uhf in both horizontal and vertical polarization modes, both portable and mobile. The antenna has the facility of being used as both omni-directional or directional modes as well as having capability of DF function. No ground-plane or radials are required and the antenna can therefore be used in a variety of applications on frequencies between 140-450 mhz. ★ See review in March Amateur Radio.

Further details are available upon application

PRICE £41.75 complete inc post Colinear element £4.75



LOWE TX40G on 10 METRES - Exclusive offer

RWC are pleased to offer this very fine radio modified on 10 metres complete with repeater shift built-in. The unit has all of the features remaining except the high/low switch now controls the offset.

This high quality Japanese made unit has RF gain control, RT, P.A. facility, and has a very sensitive receiver, along with >4W RF output power, and typical deviation of 4Khz.

The unit comes complete with mobile mount, and is guaranteed for six months. This unit has the RWC mod board unit fitted and represents excellent value for money as this radio still sells for £33.00 on 27mhz. Was £79.00 originally

PRICE £52.50 + £2.50 carriage (price subject to increase when existing stocks are sold) - Hurry unrepeatabe offer!

RWC also stock a comprehensive range of matching linears and antennas specifically designated for 10mtr operation.

COMING VERY SOON . . .

RWC WAVEMETER, RWC PHASING HARNESS, RWC DUAL BAND BASE ANTENNA (VHF-UHF)

ANNOUNCING THE SUPER YAESU FT757GX

Following the release of the RWC 10mtr MOD BOARD for the SANYO LC7136/7 series of cb synthesizer chip, and its successful launch onto the UK amateur radio market, the RWC design team are now ready to announce their latest innovation.

This new product is aimed at the world market and is a modification for the popular YAESU FT757GX.

After over six months of development by our design team led by G3SBI, with G8FBX and G4KZH, and successful field trials, the modification has been perfected to enable installation by the end user.

The modification serves two major purposes:

- (1) To improve VFO tuning and eliminate "VCO GLITCH"
- (2) To decrease tuning speed from 10khz per dial revolution to 5khz per dial revolution (selectable on the 500khz step switch).

BRIEF DESCRIPTION

The unit comprises of a small pcb designed to fit onto the existing microprocessor (Q67) and has two microchips and some small components and only eight connections, three of which are connected to three of the micro pins direct. The other five wires easily connect to existing terminals on the main pcb, and also the display board. The modification can easily be installed by experienced constructors and will be available from selected dealers who will be able to offer a fitting service.

Each mod board will be supplied complete and tested (as per the RWC 10mtr. mod board) no kits of parts will be available. Registered design pending.

PRICES

UK price is £29.50 for the built and tested pcb with complete fitting instructions and £39.50 plus carriage for a unit factory fitted and tested. User warranty will not be affected on units supplied by RWC. All prices include value added tax at the current 15%. Export enquiries are welcomed. (Instant fitting service available, please telephone)

All the above products have been designed and built in the UK and are exclusively available from:

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CONTENTS

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Publisher

Peter Williams

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Alan Golbourn

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Safety in the shack

Some of the constructional projects featured refer to additions or modifications to equipment; please note that such alterations may prevent the item from being used in its intended role, and also that its guarantee may be invalidated.

When building any constructional project, bear in mind that sometimes high voltages are involved. Avoid even the slightest risk - safety in the shack please, at all times.

Whilst every care is taken when accepting advertisements we cannot accept responsibility for unsatisfactory transactions. We will, however, thoroughly investigate any complaints.

The views expressed by contributors are not necessarily those of the publishers.

Every care is taken to ensure that the contents of this magazine are accurate, we assume no responsibility for any effect from errors or omissions.

Cover Photographs

Top - The PM2718X advanced multimeter from Philips (p4)

Bottom - Microlink, the modular interface from Biodata (p9)

SPECIAL FEATURES

16 Spectrum Watch

Nigel Cawthorne with news of DBS developments in China and plans for long distance transmissions via undersea cables

20 Power Supplies

Roger Alban continues his series on PSU design with a look at pass transistors

27 Video Monitor Conversion

Alan Warne converts an ordinary domestic TV set into a video monitor in the first instalment of this two-part article

31 Satpack

A sophisticated package of information, data and programs for the BBC Microcomputer, described by Terry Weatherley

33 To Heard and Back

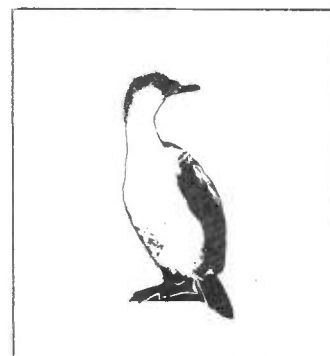
Jim Smith P29JS gives an account of the DXpedition to this remote island in the Indian Ocean

39 Data File

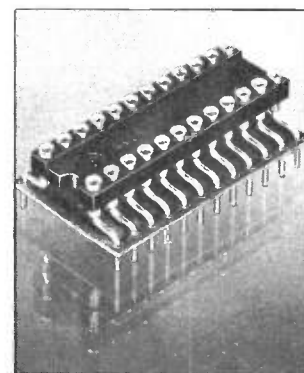
In the second part of his mini-series on 555 timer ICs, Ray Marston looks at a variety of astable circuits

47 Medium Wave DXing

Sunspots and QSL cards are two of the subjects explained by Steve Whitt this month



Heard bird - page 33



Socket to 'em - page 9

REGULARS

4 Product News

13 News Desk

23 Amateur Radio World

44 DX-TV Reception Reports

48 ATV on the Air

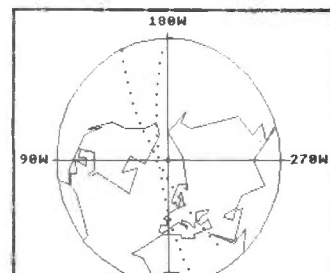
52 Latest Literature

54 QSO

57 Short Wave News

61 Free Classified Ads

64 Small Ads



Satpack pic - page 31

READER SERVICE

29 Subscription Order Form

55 Newsagents Order Form

60 Back Issues Order Form

63 Free Classified Ad Order Form

66 Advertising Index

66 Advertising Rates and Information

NEXT MONTH

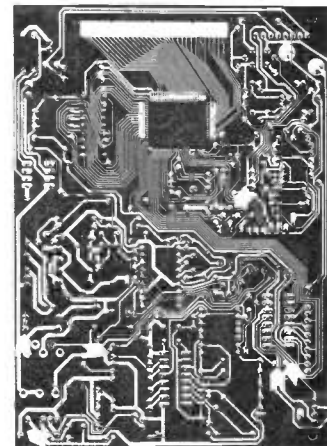
53 What's in Store for You

Next Issue

Cover date September 1985 on sale Thursday, 8 August

Publication Date

Second Thursday of the month preceding cover date



Folled again - page 14

PRODUCT NEWS

Featured on these pages are details of the latest products in communications, electronics and computers. Manufacturers, distributors and dealers are invited to supply information on new products for inclusion in Product News.

Readers, don't forget to mention **Radio & Electronics World** when making enquiries



ADVANCED MULTIMETERS

Philips Test and Measurement is adding two new digital multimeters to its Series 18 models.

The new DMMs, PM2618X and PM2718X, feature all the characteristics of the PM2518X, the first in the series, and more besides.

The PM2618X, for example, adds a 200KHz counter and electronic calibration to the original specification. It also offers two unique features: a 0.3 per cent analogue bargraph display for peaks, trends and adjustments and a 10MHz logic viewing function for digital trouble-shooting. The price is £195 excl VAT.

The top Series 18 model, PM2718X, has all the features of the PM2518X and PM2618X plus a laboratory standard 0.05 per cent dc accuracy combined with ac TRMS measurements of frequencies to 100KHz. Other characteristics of this DMM, which is priced at £225, include min/max readings for signal monitoring and auto data hold for easy readout.

The first DMM in the series, PM2518X, has measuring

capabilities which include 0.1 per cent dc accuracy, ac rms measurements to above 20KHz, relative reference and direct dB measurements. It is available for £145.

Philips Series 18 instruments are the first compact battery powered portable meters to offer automatic calibration testing via the IEEE 488 bus. The optional PM 9181 bus control unit plugs into the side of all meters and enables remote servicing and calibration of the Series 18.

All three models, for which there is an extensive range of accessories, offer exceptional performance in volts/amps/resistance measurement, including 100 μ V to 1000V – dc and ac rms, 10 μ A to 20A – dc and ac rms, 100 megohms measuring range, continuity tone and diode testing, and Pt 100 thermocouple temperature measurements.

*Philips Test & Measuring Instruments,
Pye Unicam Ltd,
York Street,
Cambridge CB1 2PX.
Tel: (0223) 358866.*

CLAMP-ON AMMETERS

New from House of Instruments is the HEME 1000/100 Series of clamp-on ammeters, which utilise the Hall effect to measure from dc to 1KHz and up to 1000A peak.

Lightweight and easily portable, the ammeters have a +1% accuracy, a true rms capability, and protection against the influence of external RF fields.

The instruments can cope with the complexity of ac superimposed on dc currents and are only minimally affected by external magnetic fields and conductor position. They are tested for use on bare conductors up to 650V ac rms or 900V dc to earth.

The 3½-digit liquid-crystal display has autoranging, automatic mode, and low-battery warning features. A hold facility retains the reading for approximately 10 seconds and can be used to

take readings in awkward locations. A surge reading display shows the maximum value of true rms current experienced during the test period, thus enabling easy setting of overload trip relays or other protective equipments.

A plug-in connection enables the Series 1000/100 to be connected to an oscilloscope, for the display of complex current waveforms, or a chart recorder, for monitoring rms current.

Also available is the HEME 1000/A model which has been specially developed to measure the average current, something which welding engineers and technicians often find more useful than true rms.

*House of Instruments,
Raynham Road,
Bishops Stortford,
Herts CM23 5PF.
Tel: (0279) 55155.*

COUNTER-TIMER

A 100MHz universal counter-timer has been added to the range of test instruments manufactured by Black Star Limited.

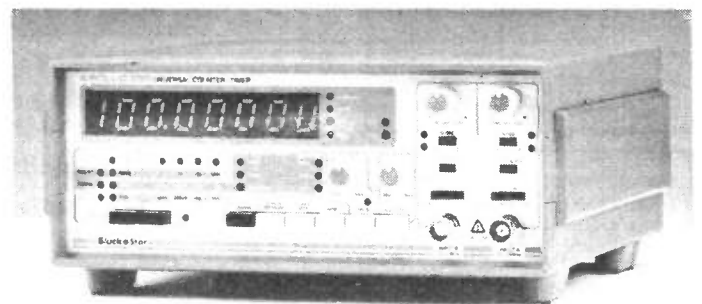
The model Apollo 100 is a compact mains operated unit with an 8-digit LED display for the measurement of frequency, period and period average, frequency ratio and time interval. Stop-watch, rpm and totalise modes are also provided.

Full signal conditioning controls are provided on both inputs, including attenuation, edge selectors, trigger level and low-pass filter. Other controls include single measure, start/stop, reset, display

hold and trigger hold-off.

A 10MHz timebase from a crystal-controlled oscillator provides a typical temperature stability of ± 2.5 ppm (10°C to 40°C), or an optional TCXO will improve the temperature stability to typically ± 0.5 ppm (0°C to 40°C). A rear panel BNC socket allows access to the internal 10MHz oscillator or use of an external reference source. The price is £285.00.

*Black Star Limited,
4 Stephenson Road,
St Ives,
Huntingdon,
Cambs PE17 4WJ.
Tel: (0480) 62440.*



WATTMETER

Available from Anglia Microwaves Ltd, the portable RW501 wattmeter and reflectometer measures up to 300W of direct power and up to 100W of reflected power in a 50 ohm coaxial cable with an accuracy of 5%. Mismatching and SWRs are quickly established.

It is designed for simple and efficient checking of transmitters and line-antenna assemblies working between 65 and 1300MHz. The wide frequency range and power capability are achieved without the need for plug-in units, which introduce errors due to insertion wear.

Ruggedly built and lightweight, the RW501 fits into a convenient carrying case and has its own internal batteries. It features a large display for precise reading, particularly at low settings, and is competitively priced.

*Anglia Microwaves Ltd,
Radford Business Centre,
Radford Way,
Billericay,
Essex CM12 0BZ.
Tel: (02774) 58955.*

MINIATURE MULTIMETER

A miniature, lightweight multimeter, ergonomically designed for simple operating – the Pantec ZIP – has been announced by Electronic and Computer Workshop Ltd (ECW).

Fully autoranging, the ZIP has a 3½-digit LCD to display ac/dc voltages of up to 500 volts and resistances of up to two megohms. In addition, the display gives automatic indication of units and other symbols including function, polarity, decimal point and over-range. A simple continuity test is included.

The ZIP has its electronics, display and selection switches built into one probe. The other probe can be fitted with a crocodile clip, allowing one-handed operation. A display hold function is provided.

*Electronic & Computer
Workshop,
171 Broomfield Road,
Chelmsford,
Essex CM1 1RY.
Tel: (0245) 262149.*

ELECTRONICS PACKAGE

The highly successful *Introducing Microelectronics* package produced for the educational market by Educational Electronics Limited is now available to a broader market, being offered complete with components, circuit board and 136-page course booklet – all necessary to conduct a wide variety of investigations.

The course booklet, written by a leading authority on microelectronics, assumes no previous knowledge of the subject. It provides a self-study guide to basic digital electronics and computer building blocks.

The basic circuit board is cleverly designed to incorporate a range of features and

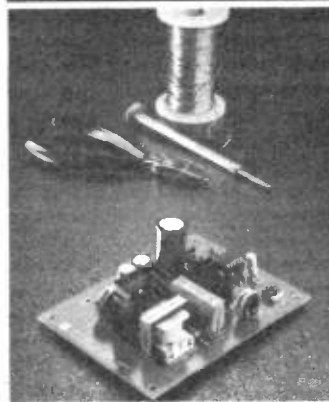
enables the user to make rapid progress. It contains 4 IC socket pads, LED display diodes, a pulser button and a pulse 'clock'. Bit patterns can be set up using the integral bit set switches and the edge connector port can be utilised for further experiments

using a microcomputer. The intro package is available at £59.50 inclusive of VAT, postage and packing.

*Educational Electronics Ltd,
28 Lake Street,
Leighton Buzzard,
Beds LU7 8RX.*



PSU DESIGN KIT



A new kit of components from Dage for a switching power supply introduces designers to advanced high-frequency switching techniques and runs at 150KHz for reduced size, weight and cost, plus improved performance such as better input noise rejection and transient response. The power supply is based around Siliconix's PWM125 controller and uses it in a buck-derived circuit such as is commonly used in offline applications.

The kit includes the PCB, controller IC, MosFETs and all the passive components necessary to build the supply. The new PWM125 controller offers improved performance over the well-known SG2525A and 2527A devices, working to higher frequencies (up to 500KHz), reducing output crossover current, and reducing transients.

Although the controller is

FIBRE-OPTICS MONITOR

Ellmax Electronics have just launched the Fibre-Optics Monitor, a new concept in fibre-optics equipment. The monitor comprises fully portable transmitter and receiver units, plus accessories and carrying case, and it functions as both test and audio transmission equipment. Connector options include the popular SMA and Stratos optical connectors and the equipment operates with all types of multimode fibres, including 50µm core graded index fibre.

The numerous applications of the monitor include: optical cable/fibre continuity testing; detecting the presence of infra-red radiation; voice communications (especially during cable jointing operations); accurate fibre attenuation measurements (including long-term monitoring); and training in fibre-optics and telecommunications. In testing for optical continuity, the monitor operates in an analogous way to the well-known 'buzzer' equipment for



electrical continuity testing. Analogue audio signals may be transmitted over optical fibres, and also a short distance over free space, with the monitor units. The receiver contains a loudspeaker for directly listening to the received signal, and a microphone for connecting to the transmitter is included as an accessory.

*Ellmax Electronics Ltd,
Unit 29,
Leyton Business Centre,
Etloe Road, Leyton,
London E10 7BT.
Tel: (01) 539 0136.*

switched in this circuit at a frequency of 150KHz, it provides designers with a flexible set of features to implement a range of applications: it can be used over a 100Hz to 500KHz range, provides a separate oscillator sync terminal, has adjustable deadtime control, internal

soft-start, input undervoltage lock-out, latching PWM to prevent multiple pulses, and works over 8 to 35V.

*Dage (GB) Ltd,
Eurosem Division,
Rabans Lane, Aylesbury,
Bucks HP19 3RG.
Tel: (0296) 33200.*

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D8085AH-2 £12.00. D8086 £20.00. Z80A £2.99.

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Anderson Jacobson AJ510 VIDEO DISPLAY TERMINAL



Made by one of the USA's largest peripheral manufacturers the AJ510 Professional VDU terminal has too many features to include in space available - just a few are: internal Z80 cpu control, very readable 15" non glare green screen, 24 lines by 80 characters, 128 ASCII character set with lower case and graphics, standard RS232 interface, Cursor addressing, numeric key pad etc. Supplied in good TESTED second hand condition with full manual **£225.00 + carr £10.00. Data sheet on request.**

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BUDGET RANGE VIDEO MONITORS

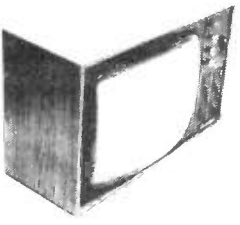
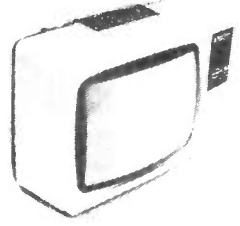
At a price YOU can afford, our range of EX EQUIPMENT video monitors defy competition!! All are for 240v working with standard composite video input. Units are pre tested and set for up to 80 col use on BBC micro. Even where MINOR screen burns MAY exist - normal data displays are unaffected

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'SYSTEM ALPHA' 14" Multi Input Monitor.

Made in the UK by the famous REDIFFUSION Co. for their own professional computer system this monitor has all the features to suit your immediate and future monitor requirements. Two types of video input, RGB and PAL Composite Video, allow direct connection to most makes of micro computers and VCR's. An internal speaker and audio amplifier may be connected to your system's output or direct to a VCR machine, giving superior colour and sound quality. Many other features include PIL tube, Matching BBC case colour, Major controls on front panel, Separate Contrast and Brightness - even in RGB mode, Two types of audio input, Separate Colour and audio controls for Composite Video input, BNC plug for composite input, 15 way 'D' plug for RGB input, modular construction etc. etc.

This must be ONE OF THE YEAR'S BEST BUYS!!!

Supplied BRAND NEW and BOXED, complete with DATA and 90 day guarantee. SUPPLIED BELOW ACTUAL COST - ONLY £149.00 + Carr.

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Little or hardly used manufacturer's surplus enables us to offer this special converted DECCA RGB Colour Video TV Monitor at a super low price of only **£99.00**, a price for a colour monitor as yet unheard of!! Our own interface, safety modification and special 16" high definition PIL tube, combine with the tried and tested DECCA 80/100 series chassis to give 80 column definition and picture quality found only on monitors costing 3 TIMES OUR PRICE. In fact, WE GUARANTEE you will be delighted with this product, the quality for the price has to be seen to be believed. Supplied complete and ready to plug direct to a BBC MICRO computer or any other system with a TTL RGB output. Other features include internal audio amp and speaker, Modular construction, auto degaussing 34 H x 24 D, 90 day guarantee. Supplied in EXCELLENT condition, **ONLY £99.00 + Carr.** Also available UN-MODIFIED but complete with MOD DATA. Only £75.00. Carriage and Insurance on monitors £10.00

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DATL 2B see SPECIAL OFFER centre of this ad
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DACOM DSL2123 Multi Standard Modem. switchable CCITT or USA BELL 103 standard. V21 300-300, V23 75-1200, V23 1200-75 or 1200-1200 half duplex.
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SPECIAL 300 BAUD MODEM OFFER

Another GIGANTIC purchase of these EX BRITISH TELECOM, BRAND NEW or little used 2B data modems allows US to make the FINAL REDUCTION, and for YOU to join the exciting world of data communications at an UNHEARD OF PRICE OF ONLY **£29.95**. Made to the highest POST OFFICE APPROVED spec at a cost of hundreds of pounds each, the 2B has all the standard requirements for data base, business or hobby communications. All this and more!!

- 300 baud full duplex
- Full remote control
- CCITT tone standards
- Supplied with full data
- Modular construction
- Direct isolated connection
- CALL, ANSWER and AUTO modes
- Standard RS232C serial interface
- Built in test switching
- 240v Mains operation
- 1 year full guarantee
- Just 2 wires to comms. line

NOW ONLY £29.95

Order now - while stocks last. Carriage and Ins. £10.00

SAVE £250 SUPER PRINTER SCOOP BRAND NEW CENTRONICS 739-2



The "Do Everything Printer" at a price that will NEVER be repeated. Standard CENTRONICS parallel interface for direct connection to BBC, ORIC, DRAGON etc. Superb print quality with full pin addressable graphics and 4 type fonts plus HIGH DEFINITION internal PROPORTIONAL SPACED MODE for WORD PROCESSOR applications. 80-132 columns, single sheet, sprocket or roll paper handling plus much more. Available ONLY from DISPLAY ELECTRONICS at the ridiculous price of **ONLY £199.00 + VAT** Complete with full manual etc. Limited quantity - Hurry while stocks last.
Options: Interface cable (specify) for BBC, ORIC, DRAGON or CENTRONICS 36 way pig £12.50 Spare ribbon £3.50 each BBC graphics screen dump utility program £8.60 Carriage and Ins. £10.00 + VAT

HUNDREDS OF PRINTERS EX STOCK FROM £49.00. Call Sales Office for Details.

1 only large CALCOMP 1036 AO 3 pen drum plotter and offline 915 magtape controller. Good working order. **ADD VAT TO ALL PRICES £2500.00.**

EX STOCK DEC CORNER

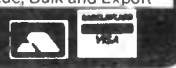
- PDP 1140 System comprising of CPU, 124k memory + MMU 16 line RS232C interface, RP02 40 MB hard disk drive, TU10 9 track 800 BPI Mag tape drive, dual rack system, VT52 VDU etc. etc. Tested and running **£3750.00**
- BA11-MB 3.5" Box, PSU, LTC **£385.00**
DH11-AD 16 x RS232C DMA interface **£2100.00**
DLV11-J4 x EIA interface **£310.00**
DLV11E Serial. Modem support **£200.00**
DUP11 Sych. Serial data i/o **£650.00**
DQ200 Dialog - multi RK controller **£495.00**
DZ11-B 8 line RS232C mux board **£650.00**
KDF11-B M8189 PDP 1123+ **£1100.00**
LA36 Decwriter EIA or 20 ma loop **£270.00**
LA34-AL LA34 tractor feed **£85.00**
MS11-JP Unibus 32 kb Ram **£80.00**
MS11-LB Unibus 128 kb Ram **£450.00**
MS11-LD Unibus 256 kb Ram **£850.00**
MSC4804 Qbus (Equip MSV11-L) 256 kb **£499.00**
PDP11/05 Cpu, Ram, i/o, etc **£450.00**
PDP11/40 Cpu, 124k MMU **£1850.00**
RT11 ver. 3B documentation kit **£70.00**
RK05-J 2.5 Mb disk drives **£650.00**
KLBJA PDP 8 async i/o **£175.00**
MIBE PDP 8 Bootstrap option **£75.00**
VT50 VDU and Keyboard - current loop **£175.00**
VT52 VDU with RS232C interface **£250.00**

1000's of EX STOCK spares for DEC PDP8, PDP8A, PDP11 systems & peripherals. Call for details. All types of Computer equipment and spares wanted for PROMPT CASH PAYMENT.

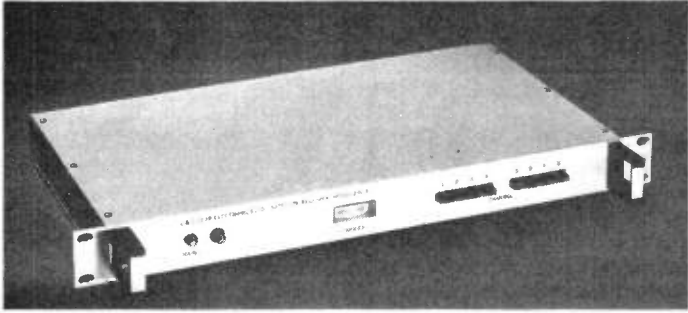
DISPLAY ELECTRONICS

All prices quoted are for U.K. Mainland, paid cash with order in Pounds Sterling PLUS VAT. Minimum order value **£2.00**. Minimum Credit Card order **£10.00**. Minimum BONA FIDE account orders from Government Depts., Schools, Universities and established companies **£20.00**. Where post and packing not indicated please ADD £1.00 + VAT. Warehouse open Mon-Fri 9.30-5.30, Sat 10.30-5.30. We reserve the right to change prices and specifications without notice. Trade, Bulk and Export

32 Biggin Way, Upper Norwood, London SE19 3XF
Telephone 01-679 4414 Telex 894502 Data 01-679 1888



PRODUCT NEWS



TVRO TERMINALS

L & S Bear Electronics Ltd offer a range of receiver units for ECS and Intelsat type terminals. These comprise a dish and feed assembly, a downconverter and a receiver unit. This can be either fixed frequency, ie single channel selection, multichannel outputs, or tunable. Channels are selected by a push-button assembly.

Outputs from the receivers include composite video, audio, and UHF channel 36. The basic receiver can thus be used to feed a suitable

domestic television receiver.

L & S Bear Electronics Ltd is a West Country based company specialising in the design and construction of television receive only terminals (TVRO) for the 4 and 11GHz frequency bands. The company also provide a specialist design/consultancy service for general microwave systems work.

*L & S Bear Electronics Ltd,
Unit E, Yeo Lane,
Colley Lane, Bridgwater,
Somerset.
Tel: (0278) 421719.*

LINEAR AMPLIFIERS

BNOS Electronics Ltd have announced the introduction of two 50W models to their wide range of 2 metre amateur band linear amplifiers.

The LP models are 50W rms output units and are available in 3W or 10W input versions. They incorporate BNOS's well-known switchable low-noise preamplifier and have the usual PTT or VOX switching.

The BNC sockets give the unit compatibility with the latest generation of 3W transceivers and the standard mobile mount gives it the versatility for shack or car use.

The LP144-3-50 and LP144-10-50 retail for £108 each, including VAT.

*BNOS Electronics Ltd,
Bigods Hall,
Great Dunmow,
Essex CM6 3BE.
Tel: (0371) 4077.*

AMTOR SYSTEM

The G3WHO/G3LIV Amtor system provides reliable AmTOR operation for a minimum outlay. ARQ and FEC modes are fully supported and ARQ listen is provided for monitoring. The program is on EPROM and runs on typing ★AMTOR. It comes ready-programmed with your call-sign and selcall.

It operates with split screen in a similar way to the G3WHO RTTY program and many of the features are the same. The same 6 x 254 character and scratchpad memories are available. An on-screen real-time clock is provided which can be sent at any time. Call-sign capture and CW ident are also provided and printers are fully supported.

One requirement of any Amtor system is an accurate 1KHz timing reference. This is provided by an external board which interfaces with the computer via the user port. This can be built into your existing TU or 'piggy backed' into the ribbon cable between the TU and computer using an IDC header socket. Unfortunately, the BBC computer's internal clock is not accurate enough on its own and experience has shown that software-only programs for other computers can run into problems with loss of phase during QSO, which is irritating for everyone.

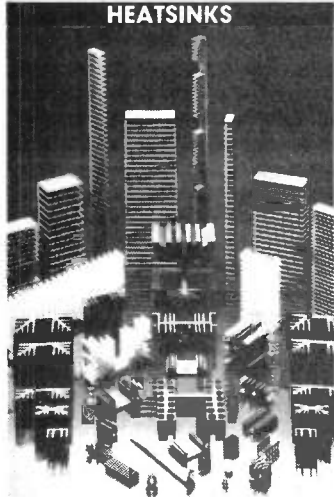
Prices are as follows: software on EPROM, £27.00; built and aligned clock/PTT board, £28.00; boxed unit with switch and LEDs to match G3LIV TU and with IDC connector to piggy-back into ribbon cable, £43.00.

Full details of these and other products available from G3WHO and G3LIV are available from the following addresses.

Software is available from:
*P J Harris G3WHO,
10 Appleby Close,
Great Aine,
Alcester,
Warwickshire B49 6HJ.
Tel: (078981) 377.*

Hardware is available from:
*J Melvin G3LIV,
2 Salters Court,
Gosforth, Newcastle,
Tyne and Wear.
Tel: (0632) 843028.*

HEATSINKS



Semicomps, the Keighley-based electronics component distributor, now offers a wide range of heatsinks to support its established comprehensive range of semiconductor products.

The range includes heatsinks for transistors and IC packages plus a wide range of extruded section designs with thermal resistances from 13.9K/W to 0.3K/W.

The range for transistors covers slotted, ribbed and finned designs accommodating SOT-32, TOP-66 and TO220 cases in upright and flat mounting positions. Notable

is the finned design, which has integral tin plated lugs that permit the heatsink to be fixed to the PCB during the soldering operation.

Heatsinks for ICs are available in sizes for 14, 16, 18, 24, 28, 36 and 40 pin packages. They are simply and quickly mounted on the IC by means of a spring clip, which locates in a central groove in the heatsink to provide a secure attachment giving good thermal contact and optimum thermal resistance. They are equally suitable for solder mounted or plug-in packages.

Of special interest within the range of extruded designs are two extrusions suitable for plastic power transistors - one for TO-220 and TOP-66 cases and one for TOP-3 cases. These heatsinks offer a protective method of installing plastic power transistors directly onto the PCB with minimum space requirements and extremely high cooling performance. In addition, they can be mounted after automatic soldering of the semiconductor devices.

*Semicomps Ltd,
Halifax Road, Keighley,
West Yorkshire,
BD21 5HR.
Tel: (0535) 67921.*

STATIC-SAFE BAGS

Anti-Static Technology Limited, the Avon based specialists in anti-static products and materials, have introduced a new range of see-through conductive protector bags for printed circuit boards.

Designated AST6002, the new range has been specifically developed to enable visual inspection of a bag's contents, so reducing handling requirements, while at the same time maintaining the highest possible levels of conductivity and anti-static protection.

AST6002 bags are made from a polyester material coated with layers of aluminium and protective anti-static varnish, and offer the same standards of protection as traditional black carbon loaded bags. The coating process is achieved in such a way that the metallised and varnished layers maintain their integrity during handling and do not crack or stretch.

*Anti-Static Technology Ltd,
18 Worle Industrial Centre,
Weston-super-Mare,
Avon BS22 0BX.
Tel: (0934) 518777.*

MICROLINK

Microlink, the modular interface from Biodata, has been enhanced to provide a comprehensive hardware and software solution in data acquisition and control.

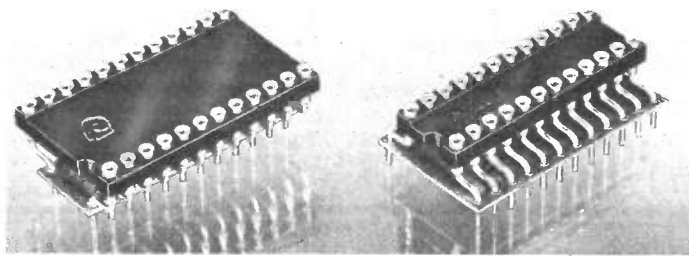
With the addition of 15 new modules, Microlink offers a choice of more than 40 modules, including analogue and digital inputs/outputs, transducer inputs, timers and counters. The new modules include programmable gain amplifiers, transient capture devices, pH and RTD inputs, frequency and event counters, and alarms.

With the availability of new software for use with the HP150 and BBC computers, Microlink hardware can now

be used with most popular micros – including IBM PC, Apricot, HP80 series, HP9816, Sirius and Apple. Sample programs are provided in BASIC for each of these computers.

A new range of applications programs called Microlink Scientific Software has been launched. The first two packages are for data logging and for waveform capture, using the IBM PC or the Apricot. Through the extensive use of menus, the programs are easy to use and they do not require programming experience.

*Biodata Ltd,
10 Stocks Street,
Manchester M8 8QG.
Tel: (061) 834 6688.*



ADAPTOR SOCKETS

A new family of adaptor sockets designed to allow devices with 0.3 inch centres to be mounted on a board drilled for 0.6 inch centres or vice versa has recently been introduced by Aries Electronics.

Available in 6 through to 48-pin DIL sizes, these adaptor sockets provide the flexibility to allow PC boards to accept a wider variety of devices. The sockets use collet contacts

with gold plated beryllium copper contacts within a brass socket body which is available gold or tin plated.

The collet contacts accept round leads from 0.015 to 0.020 inches in diameter and they use a platform material which is rated to UL94V-O specifications.

*Aries Electronics (Europe),
127 Oatlands Drive,
Weybridge, Surrey KT13 9LB.
Tel: (0932) 57377.*

RTTY/CW/ASCII PACKAGE

ICS Electronics Limited have announced a new low cost 'package deal' to permit the newcomer to enter data communications with professionally designed hardware and software at minimal cost.

For £109 including VAT (plus £2.50 p&p) the user receives: an RM-1 multimode terminal unit; a cable to connect it to his computer; and a full split screen software package on tape. All interface connectors to allow connection to the transceiver are provided. This package is available for Commodore 64, VIC-20 and BBC model B

computers only.

Should the user wish to upgrade in future, the RM-1 may be used with ICS's MBATOR multimode Amtor software. Alternatively, the existing software may be retained and the RM-1 replaced by any one of ICS's range of high quality terminal units with additional filtering. They range in price from £189 to £1,576 and all are plug compatible with each other.

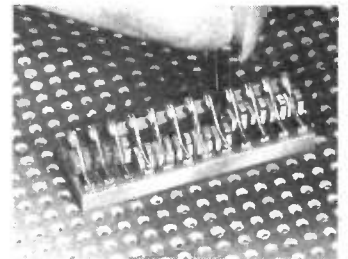
*ICS Electronics Ltd,
PO Box 2, Arundel,
West Sussex BN18 0NX.
Tel: (024 365) 590.*

SWITCH PROGRAMMERS

A new series of low cost switchable programmers which serve as alternatives for DIL switches have just been introduced by Aries Electronics.

Available with one to twelve programmable positions, these simple DIL programmers provide a gas-tight electrical connection between a tapered fork mating pin and the beryllium-copper spring contacts, which assures long life and reliable operation.

Programming is simple. The contacts are normally closed (ON) and each switch can be opened (OFF) merely by moving a slider bar using any pointed object such as a pencil, paper clip, etc. Alternatively, Aries can provide a low cost tool for programming.



The design of the programmer uses an open frame construction to overcome the problems of flux contamination common with most types of DIL switch. The body is glass-filled thermoplastic rated to UL94V0, and all metal parts are 100% tin plated.

*Aries Electronics (Europe),
Alfred House,
127 Oatlands Drive,
Weybridge, Surrey KT13 9LB.
Tel: (0932) 57377.*

PGA SOCKET

A growing market demand for increasingly complex semiconductors has meant a requirement for compatible pin grid array sockets.

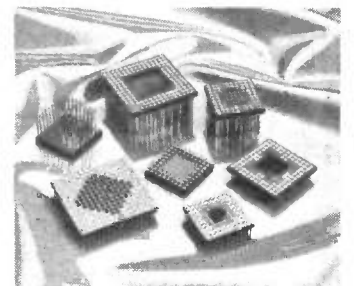
Now i Microbusiness of Newbury offers users of gate arrays, programmable logic arrays and uncommitted logic arrays Preci-Dip's wide range of high-quality, low insertion force pin grid array sockets.

Configurations range from 25 (5 x 5) to 324 (18 x 18) pins, with customised pin arrangements and window versions available as standard items. There is a further choice of wire wrap or solder pins in two lengths to suit multi-layer boards.

Preci-Dip PGA sockets have been approved for use in

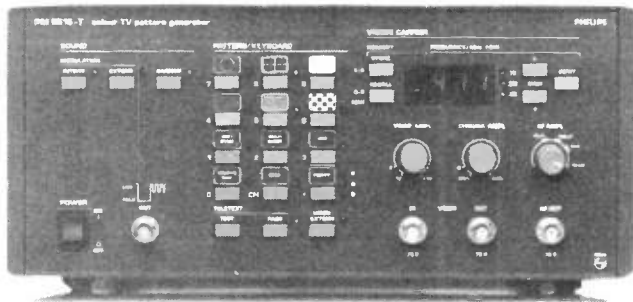
conjunction with Motorola's 68000 series and are also fully compatible with arrays from Intel, National Semiconductor, Weitek, Hitachi, Fujitsu and AMD.

*i Microbusiness Ltd,
Speenham House,
London Road, Newbury,
Berkshire RG13 1LA.
Tel: (0635) 42808.*



PRODUCT NEWS

TEST PATTERN GENERATORS



A range of microprocessor-controlled colour pattern generators, each offering a choice of more than 70 different test pattern combinations with accurate electronic numerical RF frequency selection, has been introduced by Philips Test and Measurement.

They were first shown at the 14th International Television Symposium and Technical Exhibition which was held in Montreux, Switzerland in June this year.

The instruments, PM5515, PM5516 and PM5518, are fully

adaptable to local television standards (PAL, NTSC and SECAM) and the choice of models allows exact matching to video testing needs.

They provide full RF coverage encompassing IF and VHF bands I and III, the S-band cable channels S1 to S10 and S11 to S20, and UHF bands IV and V. Special versions are available for testing Teletext/Antiope and PAL stereo FM equipped televisions. An RGB option is available for all models.

The three PM5515 series instruments can operate on

CCIR and RTMA TV systems, according to both PAL and NTSC chroma standards. The PM5516 generators are designed for use in countries where the SECAM TV system is used, while the PM5518 provides a complete choice of PAL, NTSC and SECAM. In

the multistandard PM5515 and PM5518 models, selection of TV standard is by simple rear panel switching.

*Pye Unicam Ltd,
York Street,
Cambridge CB1 2PX.
Tel: (0223) 358866.*

BUBBLE MEMORIES

Intel's BPK72A 1Mbit magnetic bubble memory kit is now available from MEDL Distribution.

Completely assembled and tested as an open PCB plug-in sub-system, the BPK72A measures only 4in by 4in yet offers 1Mbit of non-volatile memory and is complete with all the necessary support devices. Designed as an evaluation tool, the kit includes full applications information on interfacing with 8080/85/86/88/186 and other popular MPUs.

Average random access time is 48mS with a maximum data transfer rate of 100Kbits/sec. Data retention during

power down is intrinsic to the magnetic bubble technology, and data integrity is assured by built-in read/write error detection/correction facilities.

Dual rail operation requires +5V and +12V supplies at up to 1.92W and 4.80W respectively.

Three temperature options are available to suit spans of 0-70°C, 10-55°C and -20 to 85°C.

*Marconi Distribution,
Unit C, Wessex Road
Industrial Estate,
Bourne End,
Bucks SL8 5DT.
Tel: (06285) 29351.*

C. M. HOWES COMMUNICATIONS

FUN TO BUILD KITS BY MAIL ORDER

139 Highview,
Vigo, Meopham,
Kent DA13 0UT
Tel: Fairseat (0732) 823129

FANFARE FOR NEW GOODIES!

DcRx40 DIRECT CONVERSION RECEIVER kit £14.80. Assembled PCB £19.90
CTX40 LOW POWER CW TRANSMITTER kit £12.95. Assembled PCB £18.95
CVF40 EXTERNAL VFO for DcRx and CTX40 kit £9.30. Assembled PCB £14.90

We are pleased to announce that we now have 40 metre band versions of our popular DcRx receiver, CVF external VFO and CTX transmitter. The 80M versions of these products have proved to be very popular indeed, so we have decided to add 40M versions to our product range. 40 metres is a great band for QRP (low power) CW working – a little goes a long way! Just listen to the huge signals surrounding the band under night time conditions, you can be many, many dBs weaker and still be S9! Fortunately, you can still find a space for CW working without too much trouble. We supply a crystal for the QRP calling frequency (7030kHz) with the CTX40 kit, but you can add the CVF40 VFO to give full band coverage if you wish. The CTX40 has adjustable output power, up to about 3W RF. All the kits will work from a 12 to 14V DC supply. You can use our new 40M kits on their own, or combine them to form a super little transceiver. They all have the usual HOWES features of course – easy to build – good quality parts – clear instructions.

Drop us a line enclosing an SAE for more details about any kit.
Delivery is normally within 7 days.

PLEASE ADD 60p P&P to your total order value

73 from Dave, G4KQH



BAKERS DOZEN PARCELS

All the parcels listed below are brand new components. Price per parcel is £1.00, but if you order 12 you get one extra free.

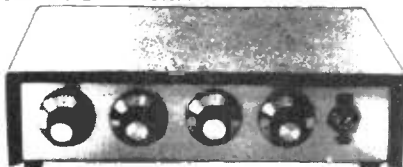
- 1 - 5 13 amp ring main junction boxes
- 2 - 5 13 amp ring main spur boxes
- 3 - 25 13 amp fuses for ring mains
- 4 - 5 surface mounting switches suitable insulated for mains voltage
- 5 - 3 flush electrical switches intermediate type, will also replace 1 or 2 way switches
- 6 - 5 in flex line switches
- 7 - 4 in flex line switches with neons
- 8 - 2 80 watt brass cased elements
- 9 - 2 mains transformers with 6v 1a secondaries
- 10 - 2 mains transformers with 12v 1/2a secondaries
- 11 - 1 extension speaker cabinet for 6 1/2" speaker
- 12 - 5 octal bases for relays or valves
- 13 - 12 glass reed switches
- 14 - 4 OCP 70 photo transistors
- 15 - 25 assorted germanium transistors OC45 etc
- 16 - 4 tape heads, 2 reed, 2 erase
- 17 - 2 ultra sonic transmitters and 2 ditto receivers
- 18 - 2 15000 mfd computer grade electrolytics
- 19 - 2 light dependent resistors similar ORP12
- 20 - 5 diff micro switches
- 21 - 2 mains interference suppressors
- 22 - 2 25 watt crossover units
- 23 - 1 40 watt 3 way crossover unit
- 24 - 250 various screws and self tappers
- 25 - 1 of each water switches - 6p 2 way; 4p 3 way; 2p 6 way; 1p 12 way
- 26 - 2 tape deck counters
- 27 - 1 6 digit counter 12v
- 28 - 1 6 digit counter mains voltage
- 29 - 1 BOAC in flight stereo unit (second hand)
- 30 - 2 Nicad battery chargers
- 31 - 1 key switch with key
- 32 - 2 humidity switches
- 33 - 2 aerosol cans of ICI Dry Lubricant
- 34 - 96 x 1 metre lengths colour-coded connecting wires
- 35 - 2 battery operated motor motors
- 36 - 4 air spaced 2 gang tuning condensers
- 37 - 2 solid dielectric 2 gang tuning condensers
- 38 - 10 compression trimmers
- 39 - Long and Medium wave tuner kit
- 40 - 4 x 465 KC IF transformers
- 41 - 8 Rocker Switches 10 amp Mains SPST
- 42 - 6 Rocker Switches 10 amp Mains SPDT
- 43 - 5 Rocker Switches 10 amp SPDT Centre Off
- 44 - 4 Rocker Switches 10 amp DPDT
- 45 - 1 24 hour time switch mains operated - (s.h.)
- 46 - 1 6 hour clockwork timeswitch
- 47 - 2 lever switches 4 pole changeover up and ditto down
- 48 - 2 6v operated reed switch relays
- 49 - 10 neon valves - make good night lights
- 50 - 2 x 12v DC or 24V AC 4C0 relays
- 51 - 1 x 12v 2C 0 very sensitive relay
- 52 - 1 x 12v 4C 0 relay
- 53 - 2 mains operated relays 3 x 8 amp changeovers (secondhand)
- 54 - 10 rows of 32 gold plated IC sockets (total 320 sockets)
- 55 - 1 locking mechanism with 2 keys
- 56 - Miniature Unselector with Circuit for electric jigsaw puzzle
- 57 - 5 Dolls' House switches
- 58 - 2 telephone hand sets incorporating ear piece and mike (p)
- 59 - 2 flat solenoids - ideal to make current transformer etc
- 60 - 5 ferrite rods 4" x 5/16" diameter aeriols
- 61 - 4 ferrite slab aeriols with L & M wave coils
- 62 - 4 200 earpieces
- 63 - 1 Mullard Thyristor trigger and modules
- 64 - 10 assorted knobs 1/4 spindles
- 65 - 5 different thermostats, mainly bi-metal
- 66 - Magnetic brake - stops rotation instantly
- 67 - Low pressure 3 level switch
- 68 - Heavy duty 4 pole contactor - 24v coil
- 69 - 2 25 watt pots 8 ohm
- 70 - 2 25 watt pots 1000 ohm
- 71 - 5 wire wound pots - 18, 33, 50, and 100 ohm
- 72 - 1 1250 watt dimmer Ultra Ref SE20
- 73 - 4 3 watt wire wound pots 50 ohm
- 74 - 50 1/3 watt carbon film resistors food spread 10 values
- 75 - 20 2 watt carbon resistors 10 values
- 76 - 30 1 watt carbon resistors 15 diff values
- 77 - 1 time reminder adjustable 1-60 mins
- 78 - 5 5 amp stud rectifiers 400V
- 79 - 4 2a bridge rectifiers 400V
- 80 - 2 10a bridge rectifiers 30V
- 81 - 2 30a panel mounting slydlok fuses
- 82 - 4 porcelain fuse holders and fuses
- 83 - 1 fluorescent choke - your choice - 15, 20, 30, 40 or 65 watt
- 84 - 10 1 mains voltage suppressor condensers
- 85 - 1 mains shaded pole motor 3/4" stack
- 86 - 2 5" ali fan blades fit 1/4" shaft
- 87 - 2 3" plastic fan blades fit 1/4" shaft
- 88 - Mains motor suitable for above blades
- 89 - 1 mains motor with gear box 1 rev per 24 hours
- 90 - 1 mains motor with gear box 1 rev per 12 hours
- 91 - 2 mains motor with gear box 16 rpm
- 92 - 4 fluorescent starters suit 4 - 80 w tubes
- 93 - 4 11 pin moulded bases for relays
- 94 - 5 87G valve bases
- 95 - 4 skirted 89A valve bases
- 96 - 1 thermostat for fridge
- 97 - 1 infra red fire element 1000 watts
- 98 - 1 motorised stud switch (SH)
- 99 - 5 assorted ferrite shapes
- 100 - 3 ferrite magnets
- 101 - 1 2 1/2 hours delay switch
- 102 - 1 9v mains power supply unit
- 103 - 1 6v mains power supply unit
- 104 - 1 4 1/2v mains power supply unit
- 105 - 1 5 pin flex plug and panel socket
- 106 - 1 12v vibrating reed beepers
- 107 - 5" speaker size radio cabinet with handle
- 108 - 5 different multi way push switches
- 109 - 10 1/2" spindle type volume controls
- 110 - 10 slider type volume controls
- 111 - 2 musical boxes (less keys)
- 112 - 1 heating pad 200 watts
- 113 - 1 fm front end with tuning condenser
- 114 - 1 w amplifier Mullard 1172

With most items quantity buyers get good discounts and save on postage costs.

EX-G.P.O. TELEPHONES

- Black heavy type £5.50
- Lightweight 746 type £7.50
- Ex-G.P.O. plug £1.00
- Ex-G.P.O. socket £1.00

SOUND TO LIGHT UNIT



Complete kit of parts for a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by 1/4" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form.

CAR STARTER/CHARGER KIT Flat Battery! Don't worry you will start your car in a few minutes with this unit - 250 watt transformer 20 amp rectifiers, case and all parts with data £16.50 or without case £15.00, post paid.

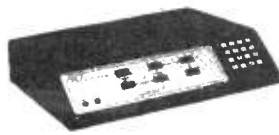
4/5A BATTERY CHARGER Transformer and rectifier £3.95 & £1 post, 3 kits £12.

WALL MOUNTING ROOM THERMOSTAT By Danfoss has a really pretty two tone grey case with circular white scale and dial. Setting temperature from 0 - 30c - 13 amp 250v contacts. Price £4.60 - 10 for £40.

BLEEPERS 6 or 12v battery or transformer operated, ideal for using in alarm circuits but particularly suitable for car and motor cycle alarms. These give a loud shrill note. Price 69p. 1000 for £345. Jap made.

PRESTEL UNITS

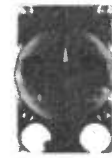
These are brand new and we understand tested, came with manufacturer's guarantee now void as the manufacturer no longer trades. These originally sold for over £150. We offer them complete, except for 7 plug in i.c.'s and price is only £14.95 (less than the value of the modem included).



STABILISED POWER SUPPLY (Mains Input) By LAMDA (USA) - Ideal for computer add-ons, d.c. output. Regulated for line volts and load current. Voltage regulation .1% with input variations up to 20% - load regulation 1% from no load to full load - or full load to no load. Complete in heavy duty case - Models available: 5v - 9A £23. 12v - 1.5A £13.25. 15v - 1.2A £13.25. 24v - 2A £23.

25A ELECTRICAL PROGRAMMER

Learn in your sleep. Have radio playing and kettle boiling as you wake - switch on lights to ward off intruders - have a warm house to come home to. You can do all these and more. By a famous maker with 25 amp on/off switch. Independent 60 minute memory jogger. A beautiful unit at £2.50.



THIS MONTH'S SNIP

TOP OF THE POPS LIGHTING

if you use our disco switch ONLY £6.90

These have 12 x 10 amp changeover switches each rated at 10 amps so a whole street could easily be lit with one. Switches adjustable and could be set to give a running light, random flashes, etc. etc. 230 volts main operation. Brand new, made by Honeywell. Offered at approximately one third of cost.

COMPUTER DESKS

Again available Computer desks - size approx 4' x 2' x 2'6" high formica covered, cost over £100 each. Our price only from £3.50 - you must collect - hundreds supplied to schools.



50 THINGS YOU CAN MAKE

Things you can make include Multi range meter, Low ohms tester, A.C. amps meter, Alarm clock, Soldering iron minder, Two way telephone, Memory jogger, Live line tester, Continuity checker, etc. etc., and you will still have hundreds of parts for future projects. Our 10Kg parcel contains not less than 1,000 items - panel meters, timers, thermal trips, relays, switches, motors, drills, taps, and dies, tools, thermostats, coils, condensers, resistors, neons, earphone/microphones, nicad charger, power unit, 90% are unused components.

YOURS FOR ONLY £11.50 plus £3.00 post.

REVERSIBLE MOTOR WITH CONTROL GEAR Made by the famous Framco Company this is a very robust motor size approximately 7 1/2" long, 3 1/2" dia. 3/8" shaft Tremendously powerful motor, almost impossible to stop. Ideal for operating stage curtains, sliding doors, ventilators etc., even garage doors if adequately counter-balanced. We offer the motor complete with control gear as follows:

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|------------------------------------|--------------------------------|
| 1 Framco motor with gear box | 1 push to start switch |
| 1 manual reversing & on/off switch | 2 limit stop switches |
| £19.50 plus postage £2.50 | 1 circuit diag. of connections |

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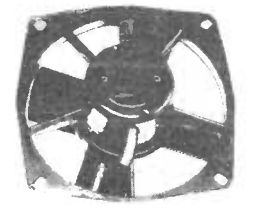
MAIL ORDER TERMS: Cash, P.O. or cheque with order. Orders under £20 add £1 service charge. Monthly account orders accepted from schools and public companies. Access & B/card orders accepted day or night. Haywards Heath (0444) 454563. Bulk orders: phone for quote. Shop open 9.00 - 5.30, Mon to Fri, not Saturday.



VENNER TIME SWITCH Mains operated with 20 amp switch, one on and one off per 24 hrs. repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95, without case, metal case £2.95, adaptor kit to convert this into a normal 24hr. time switch but with the added advantage of up to 12 on/off per 24 hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

EXTRACTOR FANS - MAINS OPERATED

- Woods extractor.
- 5" - £5.75, Post £1.25.
- 6" - £6.95, Post £1.25
- 5" Planair extractor £6.50, Post £1.25.
- 4" x 4" Muffin 115v. £4.50, 230v. £b.75, Post 75p.



All the above ex-computer, those below are unused.

- 4" x 4" £8.50 Post 75p
- 9" American made £11.50, Post £2.00.
- Tangential Blower 10x3 air outlet, dual speed £4.60, Post £1.50.

TANGENTIAL BLOW HEATER by British Solartron, as used in best blow heaters. 3Kw £6.95 complete with 'cold' 'half' and 'full' heat switch, safety cut out and connection diagram.

Please add post £1.50 for 1 or 3 for £2

Still available: £4.95 + £1.50 post. or have 3 for £16 p 2.5 Kw KIT



ROCKER SWITCHES Standard size fit 11.5 x 28 mm cut out. Single pole on/off - 15p each 1000 for £75. Single pole changeover 20p each - 1000 for £100. Single pole changeover with centre off - 25p each - 1000 for £125. Single pole on/off with neon - 36p - 1000 for £180.

ROCKER SWITCH DP/DT 15 amp 250 volts suitable for motor reversing etc. - 46p - 100 for £34.50, 1000 for £230.

MICRO SWITCHES V3 type all 250 10 amp SpST 20p 1000 - £100 Spdt 30p 1000 - £150, very low tongue Spdt 40p 1000 for £200.

The AMSTRAD Stereo Tuner. This ready assembled unit is the ideal tuner for a music centre or an amplifier, it can also be quickly made into a personal stereo radio - easy to carry about and which will give you superb reception.

Other uses are as a "get you to sleep radio", you could even take it with you to use in the lounge when the rest of the family want to view programmes in which you are not interested. You can listen to some music instead.

Some of the features are: long wave band 115 - 170 KHz, medium wave band 525 - 1650 KHz, FM band 87 - 108 MHz, mono, stereo & AFC switchable, fully assembled and fully aligned. Full wiring up data showing you how to connect to amplifier or headphones and details of suitable FM aerial (note ferrite rod aerial is included for medium and long wave bands). All made up on very compact board

Offered at a fraction of its cost. only £6.00 + £1.50 post + insurance

MINIATURE WAFER SWITCHES

- 2 pole, 2 way - 4 pole, 2 way - 3 pole, 3 way - 4 pole, 3 way - 2 pole, 4 way - 3 pole, 4 way - 2 pole, 6 way - 1 pole, 12 way.

All at 25p each or 10 for £2.00

12 volt MOTOR BY SMITHS Made for use in cars, etc. these are very powerful and easily reversible. Size 3 1/2" long by 3" dia. They have a good length of 1/4" spindle - Price £3.45. Ditto, but double ended £4.25.



MAINS MOTORS We have very large stocks of motors from 2 watts to 1/4 hp. Most at a price well below cost, let us know your requirements.

IONISER KIT Refresh your home, office, shop, work room, etc. with a negative ION generator. Makes you feel better and work harder - a complete mains operated kit, case included. £11.95 plus £2.00 post.

OTHER POPULAR PROJECTS

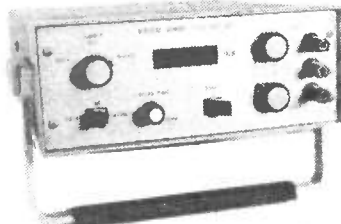
- H C Bridge Kit £9.95
- 3 Channel Sound to Light - with fully prepared metal case £14.95
- Big Ear, listen through walls £9.50
- Silent sentinel Ultra Sonic Transmitter and receiver £9.50
- Car Light 'left on' alarm £3.50
- Secret switch - fools friends and enemies alike £1.95
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- 2 Short & Medium wave Crystal Radio £3.99
- 3v to 16v Mains Power Supply Kit £1.95
- Radio stethoscope - fault finding aid £4.80
- Mug stop - emits piercing squawk £2.50
- Morse Trainer - complete with key £2.99
- Drill control kit £3.95
- Interrupted beam kit £2.50
- Transmitter surveillance kit £2.30
- Radio Mike £6.90
- F M receiver kit - for surveillance or normal F M £3.50
- Insulation Tester - electronic megger £7.95
- Battery shaver or fluorescent from 12v £6.90
- Matchbox Radio - receives Medium Wave £2.95
- 40 watt amp - hifi 20Hz - 20KHz £9.50
- 115 Watt Amplifier 5Hz 25KHz £13.50
- Power supply for 115 watt amps £8.50

HART

This month we feature some fantastic bargains. Our standard range of professional quality kits and cassette decks is still expanding, along with new lines in Video heads and power supplies. Our FREE list gives details of these and many other lines.

ALL BARGAIN ITEMS INCLUDE VAT & POST.

EX PO DIGITAL TIMER TRT 340



Mains/12v DC powered precision timer with full 4-digit display. 3 ranges up to 9999 mS. Sharp LED display holds until reset or cancels after user variable display time. Timing start and stop independently controllable by any of 4 types of input. Display test button on rear. Complete unit is housed in an elegant case with carrying handle/stand. These cost the PO many hundreds of pounds, our price to you only £29.78

LIQUID CRYSTAL DISPLAY WATCH MODULE

With LCD display, 2 pieces of Polarisating material, backlight diffuser, micro lamp, precision crystal, trimmer, battery contacts and open microcircuit. Untested 5 for £1

PLESSEY MAINS INTERFERENCE SUPPRESSORS

Filter unit for mains borne interference. Max current 1.5A. Our Price, brand new only £2.27
Same Item, Store soiled only £1.61

10W POWER AMPLIFIER MODULE

Mullard LP1173 Amplifier module. Needs 24V DC Supply to gives 10 watts into 4 ohm speaker. Size 112 x 70 x 29mm. Complete with heat sink. Only £2.40 complete with Data.

ALPS FF317U FM FRONT END

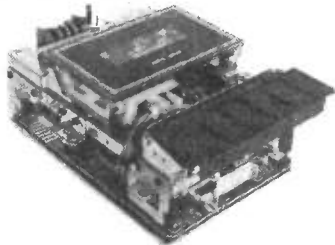
Beautiful, precision made High Quality variable capacitor tuned FM Front End with Dual-gate MosFet. Covers full FM range of 87 to 109 MHz. 12v supply. ONLY £5.15 Circuit if required 35p

CAR RADIO FM IF AND STEREO DECODER

Miniature PCB with 10.7MHz ceramic filters, 2-transformer ratio detector, AX1010 noise suppression IC and TCA4500A advanced stereo decoder IC. Only needs front end to make FM tuner or car radio. Complete with circuit. Incredible value at Only £1.99

TOP LOADING STEREO CASSETTE MODULES

Limited quantity of brand new stereo cassette units, as used in hi-fi music centres etc. All have auto stop.



Deck type 858B. 12v DC motor. 3-digit counter. £29.32
Deck type 811C. As above but with Dolby noise reduction. Fully wired with twin VU meter, level controls, pilot lights and DIN socket. £44.73
Deck type 828A. Deck mechanism only as used in both above, produced by one of Japan's top manufacturers. Fitted high quality stereo R/P head and Ferrite erase. 12v DC electronically governed motor. £11.27
Cassette Door to fit any above £4.02
Deck type 111D. Complete module with record and play electronics. 3-digit counter. AC drive motor and cassette door. £21.73

COMPLETE STEREO TUNER MODULE

3 Band LW/MW/FM Stereo Tuner fully assembled on PCB 165 x 85mm. Supplied with Ferrite Rod Aerial, stereo LED and band switch fully wired. 12v DC Supply. TU560 - Tuner Price Only £7.99
Drive accessories with 2 knobs, tuning drum, window and scale. £2.99
Special price for both items bought together £9.70

PANEL METERS

Special front design that can be mounted on, or behind a front plate. Front 60mm x 45mm. Two types, FSD 50v DC & 1A DC ideal for power supply. Both the same price £6.21 each.

CLOCK/TIMER/FREQUENCY/METER PARTS

Special offer of the fabulous MSM524 clock, timer and frequency meter chip. MSL2318 prescaler chip and 6L709 5-Digit fluorescent display. These are the 3 primary components for a complete timing and frequency display system covering the long, medium, short and FM wavebands. Total cost of these parts is normally over £25. OUR SPECIAL OFFER PRICE ONLY £13.68
INF230 Data on MSM524 and MSL2318 70p
INF260 Application Circuit 20p
Crystal 3276.8 KHz £2.18

VIDEO HEADS

Heads to suit all VHS, BETA and PHILIPS video cassette recorders. Do not take chances with 'near equivalents' there are nine different VHS heads and seven BETAMAX. Write or ring with the make and model number of your recorder for quotation. Prices start at £47.25 for VHS and £57.75 for Beta. Plus Vat

HIGH QUALITY REPLACEMENT CASSETTE HEADS



Do your tapes lack treble? A worn head could be the problem. Fitting one of our replacement heads could restore performance to better than new! Standard mountings make fitting easy and our TC1 Test Cassette helps you set the azimuth spot-on. We are the actual importers which means you get the benefit of lower prices for prime parts. Compare us with other suppliers and see! The following is a list of our most popular heads, all are suitable for use on Dolby machines and are ex-stock.

HC20 Permalloy Stereo Head. This is the standard head fitted as original equipment on most decks £5.11
HM90 High Beta Permalloy Head. A hard-wearing, higher performance head with metal capability £8.06
HS16 Sandust Alloy Super Head. The best head we can find. Longer life than Permalloy, higher output than Ferrite, fantastic frequency response £9.91
HQ551 4-Track Head for auto-reverse or quadrophonic use. Full specification record and playback head. £9.73
Please consult our list for technical data on these and other Special Purpose Heads.
MA481 Latest version Double Mono (2/2) Record/Play head. Replaces R484 £8.90
SM166 Standard Mounting 2/2 Erase head. Compatible with above or HQ551 4 Track head. £5.90
HS24 Standard Erase Head. Semi double gap, high efficiency £1.50
HS61 Metal Tape Erase Head. Full double gap £4.90

HART TRIPLE-PURPOSE TEST CASSETTE TC1

One inexpensive test cassette enables you to set up VU level, head azimuth and tape speed. Invaluable when fitting new heads. Only £4.66 plus VAT and 50p postage.

Tape Head Demagnetiser. Handy size mains operated unit prevents build up of residual head magnetisation causing noise on playback £4.54
Curved Pole Type for inaccessible heads £4.85

Send for your free copy of our LISTS. Overseas please send 2 IRCs to cover surface Post or 5 IRCs for Airmail. Please add part cost of post, packing and insurance as follows:

INLAND Orders up to £10 - 50p
Orders £10 to £49 - £1
Orders over £50 - £1.50
OVERSEAS Please send sufficient to cover Surface or Air Post as required

HART

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OFFER Brand new Eddystone Model 1590 (all solid state) general coverage receiver complete with full workshop manual one years works guarantee £790.00.

OTHER RECEIVERS FOR SALE include the following RACAL RA17 FROM £175, RA17/L FROM £195, RA117/E £250. EDDYSTONE MODELS 830/9 @ £155, 730/6 @ £145, 770U @ £115. Also a selection of Vintage Communication Receivers HRO's, AR88's, S27, 358X, S504 etc; LISTS OF OTHER RECEIVERS AND ITEMS ETC: AVAILABLE

SPECIAL OFFER

Hard to find bayonet fixing 6.3 volt Panel light bulbs suitable for most vintage American radios and postwar Eddystone's etc. Pack of 10 only £1.00 pp paid

PRINTED CIRCUIT BOARD Double sided fibre glass, good for VHF-UHF, only £1.50 per sq ft, cut to size required, minimum order £5.00 pp paid. Also single side Paxalin 50p per sq ft. Large stocks of assorted vintage components (1920's - 60's) to clear Callers only

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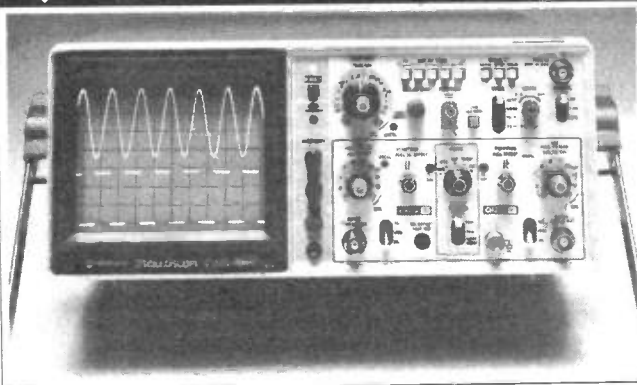
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| V-209 | 20MHz Mini-Portable | V-1070 | 100MHz Four Channel |
| V-422 | 40MHz Dual Trace | V-1100 | 100MHz DMM/Counter |
| V-423 | 40MHz Sweep Delay | V-134 | 10MHz Tube Storage |
| V-509 | 50MHz Mini-Portable | VC-6015 | 10MHz Digital Storage |
| | | VC-6041 | 40MHz Digital Storage |

Prices start at just over £300 plus vat and that includes a full 2 year warranty. We hold the range in stock for immediate delivery.

For colour brochure giving specifications and prices ring (0480) 63570 Thurlby-Reltech, 46 High Street, Solihull, W. Midlands, B91 3TB.

NEWS DESK

Classical recording

Quad Electroacoustics Ltd have supplied forty ESL-63 loudspeakers to Philips in Holland for use on all their classical recording work.

All Philips recordings are made on location, so Quad have developed a special robust version of the 63 to cope with the rigours of the road. The professional version was shown for the first time at the AES Convention in Hamburg and a number of other recording companies, conscious of the extra demands placed upon recording quality by compact disc, have ESL-63s under consideration.

ESL-63s are already used by TV broadcasters in France. All three of the RTF channels, Antenne 2, TF1 and FR3 use Quad ESL-63s to monitor the quality of the sound transmissions.

For further information contact: *Quad Electroacoustics Ltd, Huntingdon, Cambs PE18 7DB. Tel: (0480) 52561.*

SatStream Europe

SatStream Europe, a new business communications service to the Continent using small-dish aerials located on or near customers' premises, has been launched by British Telecom International (BTI).

The commercial start of SatStream Europe, which follows a series of customer trials, was announced by Mr Mike Ford, BTI's Chief Executive for international business services.

For the initial SatStream services BTI has installed small-dish earth terminals, with antennas between 3.7 and 5.5 metres in diameter (12 to 18ft), in the centre of London.

The SatStream North America service currently uses a terminal at West Ealing, London, with a 5.5m antenna designed by British Telecom to give improved performance (see last month's cover pic). The European service employs another dish of the same advanced design mounted on the roof of a British Telecom building in



Southwark. Later this year the North American service will be supplemented by a 13m antenna at the London Teleport, BTI's main earth station in the capital.

SatStream Europe will be provided through Eutelsat 1—the European communications satellite owned and operated by Eutelsat, the European consortium of more than 20 telecommunications authorities.

MultiStream launch

An £8 million improvement to British Telecom's public data network, bringing information technology services within local-call reach of 90 per cent of the nation's businesses, went commercial on 22 May.

The new service, known as MultiStream, provides widespread local access to Packet SwitchStream (PSS), British Telecom's public data network.

PSS is the launch pad for information technology in the United Kingdom. It already supports four public and three private electronic mail services, including the market leader Telecom Gold, and

it provides access to a wide variety of business information stored on computers, both nationally and internationally. In addition, credit card validation is also provided on PSS, with more than 2,500 terminals already linked to the service.

There are two MultiStream services, code-named EPAD and VPAD.

MultiStream EPAD provides error-correction on the dial-up data link between the customer's terminal and the connection into the PSS network. Because the main PSS network already provides error correction as an intrinsic part of its operation, use of EPAD ensures end-to-end error-free transmission of data, from customer terminal to destination computer.

MultiStream VPAD provides users with data presentation in videotex format, to meet a growing demand for videotex support on PSS. It enables operators of private viewdata systems to offer their services nationwide through PSS, giving their customers immediate reliable access.

MultiStream users are given a secret password for maximum security. Customers may change this as frequently as they wish.

MultiStream prices comprise a quarterly password fee of £25, a data volume charge of 25p per kilosegment and a duration charge of 25p an hour.

F-16/TERPROM flight trials

British Aerospace's TERPROM (Terrain Profile Matching) Navigation System has recently successfully completed flight trials on a General Dynamics F-16 aircraft in the USA. Further F-16 trials are to take place later this year. Flight trials are also to be undertaken on a Panavia Tornado IDS in the early summer, operating from British Aerospace's Warton Aerodrome, under Ministry of Defence funding.

TERPROM is a highly accurate navigation system designed for all types of aircraft but particularly suited

to military strike aircraft. The TERPROM system works by matching the profile of the terrain overflown, as measured by a radar altimeter, with that predicted using a digital map carried in its computer memory. The system, by reference to its stored digital map of the terrain ahead, enables the aircraft to be flown either manually or on autopilot at a predetermined height above the ground, without terrain-following radar. The system is inherently covert and resistant to jamming and can operate in all weathers, day or night, without any constraints on the aircraft's flight path.

The TERPROM kit was loaned to General Dynamics in January 1985, and was integrated using the Avionics Equipment Bay test rig and then fitted to the aircraft.

All the pilots in subsequent trials reported that they were impressed with the accuracy and repeatability of TERPROM and there have been no system malfunctions. A second series of trials has been agreed between General Dynamics and British Aerospace to take place before the end of the summer.

For further information contact: *British Aerospace Dynamics Group, Bracknell Division, Downshire Way, Bracknell, Berkshire.*

Slomo aggro

Following the recent launch of their two new joystick interfaces incorporating the Slomo facility, Nidd Valley Micro Products have had a number of enquiries about the comparison between their Spectrum Pacesetter and DKTronic's Games Player, and the possible infringement by DKTronics of their pending patent.

Nidd Valley intends to publish the UK patent application for their slow motion concept this autumn, which should, if successful, ensure that peripherals with a slow motion feature will be available only from Nidd Valley or from approved licensed manufacturers.

Silver printing technique

The use of a new technique of screen-printing silver ink onto PCBs has enabled GSPK (Circuits) Ltd of Knaresborough, North Yorkshire to produce a compact high density board for a new British-made OCR (optical character reader) device at a considerable cost saving.

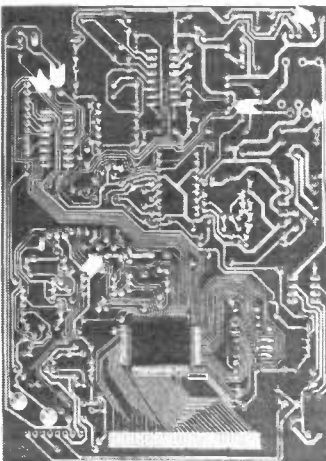
The PCB was designed by Aim Cambridge Ltd. It carries the circuitry and components for Oberon International's new text reader, the 'Omni-Reader'.

GSPK say that their new silver printing process gives the PCB multilevel capabilities at less than the cost of multilayer configuration, and also reduces the complexity of the board.

The new silver screen-printing process is conventional THP technology through the initial stages, up to and including the first coating of solder resist, which is applied over bare copper. A second coating is then applied using a different screen. The silver is then screen-printed, followed by an encapsulating layer of solder resist.

The feasibility of the technique owes much to the fact that GSPK have been pioneers of selective solder coating. The solder levelling process is standard on all through-hole plated boards produced by the company. It substantially reduces the incidence of defects and cuts production costs significantly.

GSPK have also produced a high density PCB for future use in British Telecom payphones developed and supplied by Rathdown



ACE undergoing tests at the Marconi factory, Chelmsford

Telecom Australia

Telecom Australia has signed a contract worth A\$12.2m with Marconi Communication Systems Ltd, of Chelmsford, UK in conjunction with GEC Australia for the supply of digital cross connection systems.

The order is for the supply of Time Division Cross Con-

nect (TDCC) equipment, which is a variant of the Marconi Automatic Cross Connect Equipment (ACE) currently supplied to British Telecom.

Both of these systems will be used in the respective country's digital data networks to automate the routing, monitoring and pro-

visioning of digital data services. The system utilises the latest state-of-the-art digital switching techniques under the control of centralised management systems to provide digital leased line networks.

Marconi and GEC will supply switches and sophisticated computer management systems over the next five years to Telecom Australia, which will eliminate the need for manual cross connection systems.

Phased introduction to local manufacture will take place over a period of five years and both Marconi and GEC will be involved in the design of the new production facilities for Australia.

The equipment embodies all current needs for cross connecting at customer data rates, and all anticipated needs for the growing market for sophisticated networks that Telecom Australia customers are demanding.

Industries.

With design spacing between quad-pack solder lands down to 150 microns, GSPK could not screen-print the circuitry in the conventional way. The PCB was imaged using dry film photo-resist to achieve the required close registration and fine definition. The density of this design demands that the board be electrically tested for opens and shorts before despatch, and the 0.8mm pitch of the quad-pack lands was a major obstacle to be overcome in the manufacture of the dedicated test jig.

The payphone is a self-contained table-top device that can be connected to any exchange line, offering a low-cost alternative to traditional and much more expensive systems. A microprocessor controls all the functions.

Reduced workforce

National Semiconductor Corporation (NYSE, NSM) plans to reduce its workforce in the US and Europe by approximately 1,300 employees this year. The company has also announced cancellation of a proposed semiconductor wafer fabrication facility near Portland,

Oregon. The moves reflect the fact that the market for semiconductors has not shown significant improvement since the downturn began a year ago.

The company had previously tried to avoid the layoffs through shut-downs, a wage freeze and reductions in capital expenditures, hoping that these measures would defer this action long enough for a general economic improvement in the semiconductor industry.

However, despite these setbacks the company remains committed to the research and development centre it opened in Beaverton, USA, in July 1984.

National Semiconductor's Scottish branch in Greenoch will also suffer from the downturn in the industry. The workforce will be reduced by approximately 450.

Specific growth plans at the Greenoch plant, however, remain unchanged and hopes for the continued slow expansion of the semiconductor industry are intact.

MSC electronics project

The Manpower Services Commission, through its Open Tech Unit, recently

signed a contract with The Institution of Electrical and Electronics Incorporated Engineers (IEEIE) to produce open learning material aimed at supporting and updating technician engineers and technicians in industry. The MSC will fund £1/2M of development work in the first two years, and the project will benefit from substantial contribution of support and expertise by major electronics companies.

Learning material produced will assume a good standard of professional education, and will attempt to find the right balance between career enhancement and advanced application techniques. The first five modules are expected to become available in March 1986, with the emphasis on electronic structures, systems and testing.

A broadly based steering committee reflecting experience in the profession and in training has been formed, with Dr John Brown CBE, President of the Institution, in the chair. Mr G T Richardson, a former officer of the Royal Navy Weapons Engineering Branch, has been appointed to manage the project.

ELMASET INSTRUMENT CASE

300x133x217mm deep £10.00 ea (£1.50)

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SE9302 100V 10A DARL SIM TIP121 2/£1.00
2N3055 Ex eqpt tested 4/£1.00
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2N3773 NPN 25A 160V £1.80 10/£16.00

DISPLAYS

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Futaba 8 digit calculator, fluorescent display 9CT-01-3L £1.50
LCD Clock display 0.7" digits £3.00
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1.25" Panel Fuseholders 5/£1.00
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MAINS ROCKER SWITCHES 6A SPST 5/£1
4700µF 63V ITT 10A RIPPLE £1.00
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MAINS TRANSIENT SUPPRESSORS 245v 3/£1.00
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SPECTRUM WATCH

NIGEL CAWTHORNE G3TXF

As well as hosting the annual television programme makers' 'Golden Rose of Montreux' competition, the Swiss lakeside town of Montreux also holds a major biennial international television symposium and technical equipment exhibition. The two events, the TV programme festival and the technical exhibition, were originally held together, but since they appeal to different audiences the two are now held as separate events.

This year's Montreux TV symposium and exhibition, held in early June, brought together over 200 TV equipment exhibitors from 16 countries. A total of 67 technical papers were presented which covered topics ranging from the 'Impact of Microelectronics in Broadcasting' to the latest developments in satellite TV and high definition TV.

On the transmission side of broadcasting there were about a dozen manufacturers of broadcast transmitters present. The vast majority of exhibits were concerned with programme production, where digital techniques are playing an ever increasing role.

The French programme company SFP showed a four minute TV clip which was the world's first demonstration of TV material in which the production and post-production were done entirely by digital means. The transition of television from analogue to digital is continuing on a 'piecemeal' basis. SFP's clip demonstrated how digital techniques are making further inroads into areas of TV such as production and post-production, that have traditionally been the exclusive domain of analogue techniques.

DBS in China

The President of the China Broadcast Satellite Corporation (CBSC), Mr Hsu Chung-ming, outlined at a meeting on DBS at Montreux the necessity of establishing a direct broadcasting satellite system as the key to the realisation of national TV and radio coverage for the whole of China.

The CBSC sees the introduction of a satellite broadcast service as the only means to cover China's vast territory of 9.6 million square kilometres with high quality TV and radio programmes. China's current TV transmission network consists of 455 TV main transmitter stations and over 9,000 TV repeaters with powers below 1KW. This network with its

associated microwave links covers 64.7% of the 1 billion population of China.

China's plan is to provide satellite reception of TV programmes primarily for community reception, with partial individual reception in the more developed regions and some sparsely populated villages. In towns, the programmes received from the satellite will be re-transmitted through local terrestrial repeaters.

China has already made some important technical operating decisions for its new satellite TV services. In ITU Region 3 there are three bands available for satellite broadcasting services: 620-790MHz, 2500-2690MHz and the Ku Band 11.7-12.2GHz with 12.5-12.75 for community reception only. The CBSC decided that the first two frequency bands would not provide sufficient bandwidth for China's provincial services and so has opted for the Ku Band.

In a first phase, CBSC plans to operate with one TV programme and four sound radio channels, one of which will be in stereo. Programmes will originate in Beijing. In a later phase it is planned to introduce multibeam transmissions from the satellite to allow regional coverage.

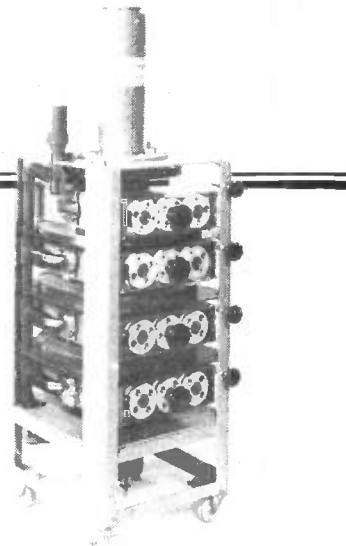
Development of a national TV channel is seen as a major part of the education programme for China. According to Mr Chung-ming, the China Central Radio and TV University (the Chinese Open University) enrolled over 1 million new students in 1984!

Undersea cables

Although topics mentioned in *Spectrum Watch* are usually concerned with some part or other of the radio frequency spectrum in the 'ether', there are currently some interesting developments in the undersea cable business.

Early long distance undersea cables worked, and often failed, on the principle of slamming several KV of dc across the cable at one side of the ocean and hoping that there was just enough juice left at the far end to activate a telegraph tapper! Undersea cabling has progressed from those early days of dc, through coaxial cables, and now to fibre-optics.

Due to become operational in 1988, the latest transatlantic cable, TAT-8, will carry 296Mbit/S, which with digital multiplication techniques can handle 38,000 telephone channels. This is to be the world's first transoceanic fibre-optic cable.



A klystron for use in a high power UHF TV transmitter

The project is costing around \$335 million and is being paid for by AT&T, the US telephone giant (37%), British Telecom (15%), and 27 other owners, including the French PTT and German Bundespost. Capacity will eventually be shared out in relation to the amount that each has invested in the construction.

The previous transatlantic cable, TAT-7, came into service in 1983 with what seems by comparison a modest capacity of 4,000 circuits. TAT-8 will be used for both public switched circuits and leased lines.

Cable laying

The 6,657Km of cable will be laid in three sections, starting on the East Coast of the US and landing on the French coast in Brittany and in the UK in Cornwall. AT&T will lay the first and longest section (5,800Km) across the Atlantic to some point at sea west of Europe. An undersea function box will split the main transatlantic cable into two. A second cable will run the 520Km from the junction box to Widemouth in Cornwall and the third will cover the 310Km section to Penmarche on the Brittany coast.

Coaxial undersea cables require regenerators about every 5Km, whereas the fibre-optic cables used for TAT-8 will require regenerators at only 30-55Km intervals.

Transatlantic cables with even bigger capacities than TAT-8 are already being planned. A private cable venture run by a consortium called 'Submarine Lightwave' is planning a fibre-optic cable (TAV-1, TransAtlantic Video) that would carry 250,000 telephone calls or 144 TV channels. This mammoth capacity project is still only in the discussion stages.

Further plans

Cable and Wireless are also planning, as a joint project with Tel-Optik of the USA, a major private venture transatlantic optical fibre cable. Referred to as 'Market Link', the C&W/Tel-Optik project will consist of two separate cables. The northern cable (PTAT-1) is planned to be operational by June 1989 and the southern cable (PTAT-2) by June 1992.

Moscow moves in

In much the same way as radio amateurs gained three new HF bands at the 1979 WARC, SW broadcasters also gained new spectrum as a result of the conference. A new broadcast band, 13600-13800KHz, situated just below the amateur 20m band, gave SW broadcasters a useful new slice of spectrum. Although this new band is not due to come into operation for some years, there are already several international broadcasters transmitting in the allocation. The foremost of these is Radio Moscow, which has been observed on the following frequencies (KHz): 13625, 13635, 13660, 13680, 13705, 13740, 13755.

Tel Aviv has a potent signal on 13720KHz and several other countries including Radio Korea (13665KHz) and Iran (13745KHz) have also been reported. Radio Iraq can regularly be heard in Arabic on 13700KHz.

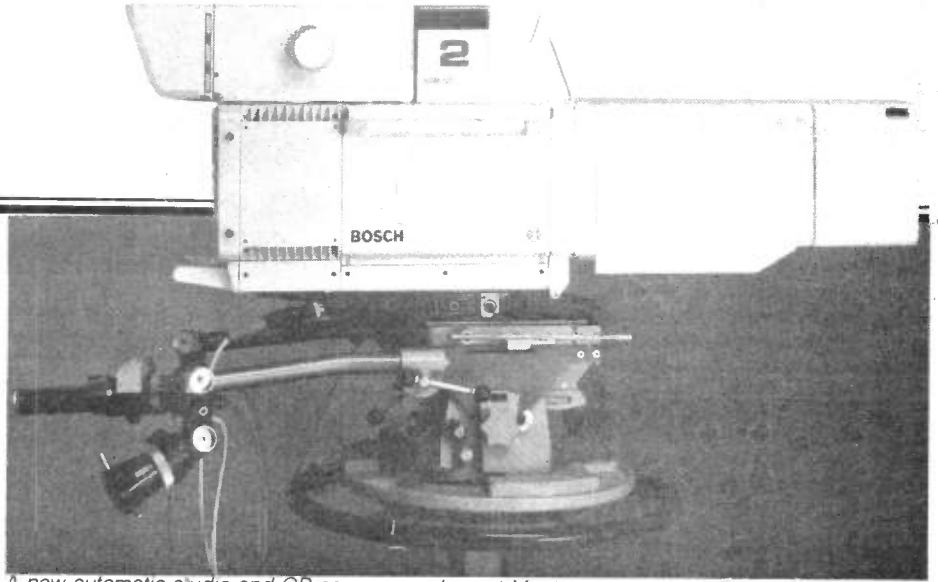
Cellular reserves

The present allocations of cellular radio frequencies in the UK and the US both have reserve capacity. In the UK there is a slice of reserve spectrum at the high end of both the mobile transmit (890-915MHz) and the base transmit (935-960MHz) bands. These segments may eventually be used for the much talked about pan-European network digital cellular network.

In the US there are 6MHz wide segments at the high end of the cellular bands which are also designated as cellular reserve frequencies. However, after only two years of cellular operations in the city of Chicago, Ameritech have filed a petition with the FCC for the allocation of this additional cellular spectrum. With 15,000 cellular radio subscribers in Chicago at the end of 1984 and with an expected 60,000 for 1990, Ameritech claims that even with cell splitting they would not be able to cope with such an expansion without access to the additional spectrum.

The request by Ameritech for further frequency allocations for cellular radio at this relatively early stage in the life of cellular in the US (the Chicago area system came on air on 13 October 1983) is seen by some as being motivated more by commercial reasons than technical. Despite the argument that cellular makes efficient use of the operation spectrum, in practice it is probably cheaper for an operator to expand subscriber capacity by adding new unused frequencies to an existing system rather than installing the additional equipment necessary for cell splitting.

In the US, as in most countries, there is a lot of pressure on spectrum allocation from different interests (broadcasting, mobile radio, military etc) and it is unlikely that the FCC will release the cellular reserve frequencies for use by cellular operators before cellular radio



A new automatic studio and OB camera on show at Montreux

is proven to be the great success that its advocates make it out to be.

Frequency hopping

Until recently, radio communication whether at HF or VHF has always been thought of as taking place on 'a frequency'. With the advent of frequency hopping techniques this is no longer true. Spurred on by the need to keep one jump ahead of the enemy, who is always out to intercept transmissions, military communicators are trying out new frequency hopping techniques.

In a frequency hopping radio net where there are a number of stations needing to be in communication with each other, all stations change their transmit and receive frequencies in synchronism many times a second. The whole net only alights on one particular frequency for a very short while before 'hopping off' to another frequency. The use of a given frequency may be only for a few milliseconds. Because the frequency change is almost instantaneous, operators using the net hear messages in the normal way.

The problems

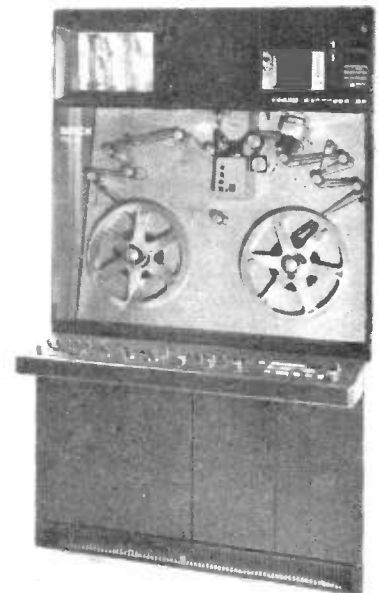
For the enemy interceptor, frequency hopping presents two major problems. The first is finding the sequence of frequency changes so that he can follow with his own receiving equipment. Without knowing the specific frequency codes that may prove impossible. Secondly, the enemy observer usually wants to know where signals are coming from. Direction finding equipment would normally be used, but with frequency hopping DFing presents major difficulties. A given station does not stay on one frequency long enough for the DF equipment to be able to take a bearing. Another problem is that if there are several stations within range, the DF equipment will find it impossible to tell one station from another.

A variant of frequency hopping, but at a much slower rate, is the 'adaptive' HF communication link. HF communications have always had the difficulty of having to be within an ever varying range of frequencies to cover a particular distance. If the frequency is too high, there may be no propagation because the

frequency is above the maximum usable frequency (MUF) for that particular path. Conversely, if the frequency is too low there may also be no workable path because of ionospheric absorption. And even if a good frequency is found that will propagate the signals over the wanted path, that frequency and frequencies close to it may be already occupied with other signals.

Naval ship-to-shore communications still use HF, even though military satellites are available. Navies like to have available the independence of HF communications. Modern 'adaptive' communications involve the use of a technique which regularly scans a number of frequencies in order to assess which is the best one for the particular path. The transmitters and receivers will be made to change automatically from one frequency to another in order to be on what has been measured to be the optimum frequency for the path. The users of the radio link are unaware that frequencies are being changed. The use of broadband transmitter amplifiers and powerful computer systems makes frequency adaptive communications an attractive proposition.

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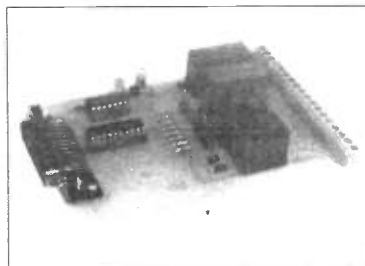
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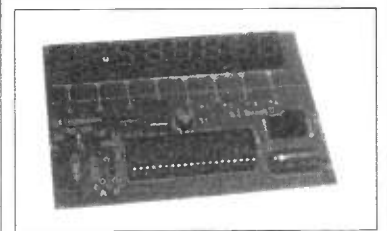


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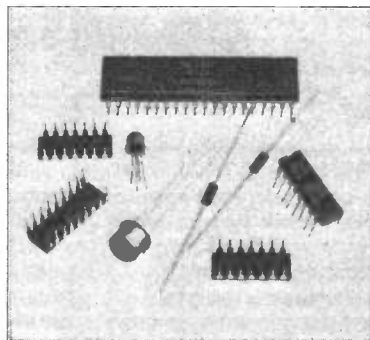


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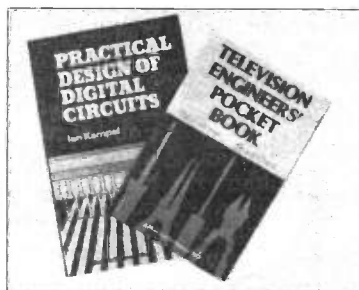
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| TDA1062 | RF oscillator and mixer system for 1-200MHz | 61-01062 | 1.95 |
| TDA1083 | Portable radio AM FM audio in one IC | 61-01083 | 1.95 |
| HA1388 | 18W PA from 14V | 61-01388 | 4.10 |
| MC1496P | Double balanced mixer/modulator | 61-01496 | 1.25 |
| TDA2002 | 8W into 2 ohms power amp | 61-02002 | 1.25 |
| ULN2283 | 1W max 3-12V power amp | 61-02283 | 1.00 |
| CA3089 | FM IF amp, detector, mute, AFC, AGC system | 61-03089 | 3.88 |
| CA3130E | BIMOS op amp | 61-31300 | 0.80 |
| CA3140E | BIMOS version of 741 | 61-31400 | 0.46 |
| MC3359 | Low current dual conversion NBFM IF and det | 61-03859 | 2.95 |
| LM3900 | Quad norton amp | 61-39000 | 1.20 |
| LM3909N | 8-pin DIL LED flasher | 61-39090 | 1.15 |
| KB4412 | Two balanced mixers IF amp with AGC for AM SSB | 61-04412 | 2.73 |
| ICM7555 | Low power CMOS version of 555 timer | 61-75550 | 1.24 |
| LM1225 | Low noise FMIF | 61-11225 | 1.45 |
| HA12017 | 83dB S/N phono preamp 0.001% THD | 61-12017 | 0.80 |
| MC14412 | 300 baud MODEM controller (Euro-US specs) | 61-14412 | 6.85 |

Selected Lines

| | | | |
|------------------------------------|-------------------|----------|-------|
| PB2720 | 80dB Piezo Buzzer | 43-27201 | 0.55 |
| 10M15A | 10.7 Filter | 20-10152 | 2.10 |
| 10M08AA | 10.695 Filter | 20-11152 | 3.49 |
| FC177 | LCD Freq. Meter | 39-17700 | 25.46 |
| CM161 | Min LCD Clock | 40-80161 | 12.20 |
| BBC to Centronics Cable | | 03-10019 | 7.25 |
| Dragon to Centronics Connect Cable | | 03-10017 | 7.25 |
| C12 Computer Cassette Tape | | 21-00012 | 0.55 |
| 8 x 0.3" IC socket | | 28-00800 | 0.12 |
| 14 x 0.3" IC socket | | 28-14000 | 0.13 |
| 16 x 0.3" IC socket | | 28-16000 | 0.13 |
| 6V KUIT-A Relay | | 46-80000 | 0.62 |
| 9V KUIT-A Relay | | 46-80001 | 0.62 |
| 12V KUIT-A Relay | | 46-80002 | 0.62 |
| CX120P | COAX Relay | 46-90120 | 11.96 |
| CX520D | COAX Relay | 46-90520 | 32.00 |
| CX540D | COAX Relay (BNC) | 46-90540 | 32.00 |

Books

| | | |
|---|----------|-------|
| Beginners Guide to Amateur Radio | 02-11262 | 4.50 |
| Beginners Guide to Electronics | 02-04134 | 4.50 |
| Active Filter Cookbook | 02-21168 | 12.70 |
| CMOS Cookbook | 02-21398 | 12.95 |
| TTL Cookbook | 02-10358 | 11.00 |
| Design of Op-amp Circuits with experiments | 02-21537 | 9.30 |
| Practical Design of Digital Circuits | 02-11831 | 10.45 |
| Electronic Projects for Home Security | 02-05351 | 3.80 |
| Electronic Telephone Projects | 02-21618 | 7.60 |
| 55 Timer Applications Sourcebook | 02-21538 | 6.40 |
| Electronics Pocket Book | 02-21309 | 7.50 |
| More Electronic Projects in the Home | 02-21307 | 3.80 |
| The Radio Amateurs Question and Answer Reference Manual | 02-02157 | 5.95 |
| Basic Programming on the BBC Microcomputer | 02-06640 | 5.95 |
| Using Microprocessors and Microcomputers: The 6800 Family | 02-98728 | 11.05 |
| Z-80 Microcomputer Design Projects | 02-21682 | 12.70 |
| Z8000 Microprocessor: A Design Handbook | 02-37345 | 16.10 |
| Simple Amateur Band Aerials - BP125 | 02-00161 | 1.95 |
| Simple Indoor & Window Aerials - BP136 | 02-00166 | 1.75 |
| Simple Tropical and MW Band Aerials | 02-00170 | 1.75 |
| How to get your Electronic Projects Working | 02-00179 | 1.95 |



| | | |
|--|----------|-------|
| 68000: Principles and Programming | 02-21853 | 12.70 |
| 8085A Cookbook | 02-21697 | 13.55 |
| Handbook of Electronic Tables Formulas | 02-21532 | 11.00 |
| Television Eng. Pocket Book 7th Ed. | 02-21313 | 8.95 |
| Popular Electronic Circuits | 02-00175 | 1.95 |
| Semiconductor Data Book 11th Edition | 02-04797 | 9.00 |

Perhaps the most popular and readily available transistor that is used as the pass transistor in power supplies is the 2N3055. These can be obtained at rallies for as little as 25p each and have a maximum current rating of 15 amps. In practice 10 amps is about the limit for a 2N3055 because of limitations of heat-sinking (more on this later). From experimentation I have found that it is best to thoroughly underrate devices in a power unit in order to protect the individual components of the supply against the 'human' tendency of accidentally short-circuiting the output terminals of the supply. For this reason I have decided on an arbitrary maximum current of 5 amps for the 2N3055.

Increasing current

It is possible to increase the current capability of the power supply by paralleling two or more 2N3055 transistors. This now presents a small problem. From earlier discussions we learned that the current gain for 2N3055 transistors varies from between 20 up to a maximum of 70, quite a large variation in current gains for individual 2N3055 transistors. This will cause transistors connected in parallel to draw uneven current, which in turn will result in individual pass transistors dissipating different amounts of heat, not a very satisfactory condition.

The problem can be solved by individually testing and selecting pass transistors with the same current gain; a rather tedious task. The real solution to the problem is to encourage current sharing by connecting a resistor in series with each transistor emitter. The main disadvantage of this circuit is that it is not possible to compensate for the voltage drop across the emitter resistor, and regulation suffers as a consequence.

Figure 16 shows a typical circuit using a pass transistor in parallel. A typical voltage drop across the load-sharing resistors would be between 0.5V and 1V under full load conditions. Let us assume that the load-sharing resistors have been designed to drop 0.5V under full load condition. If the current gain of the two

CONSTRUCTING POWER SUPPLIES

Roger Alban GW3SPA continues his series describing the design and construction of PSUs

pass transistors is different, then initially unequal load currents will flow through each pass transistor and its associated emitter load resistor.

The pass transistor taking the greatest current will have a larger voltage drop across its associated load-sharing resistor than the other. Consequently, the larger voltage drop across the load-sharing resistor will bias back the transistor to reduce the emitter current, while the other pass transistor, which was taking less load current, will have a smaller voltage developed across its load-sharing resistor and therefore the pass transistor will be forward biased to increase its emitter current. Equilibrium is reached when the transistors are sharing the load current equally.

From this explanation you will under-

stand the importance of ensuring that the load-sharing resistors have equal values. The circuit depicted in Figure 16 uses a BFY50 as a drive transistor to ensure that the L723 voltage regulator current output is kept below the maximum prescribed value.

Maximum load

If the power supply is designed to carry a maximum load current of, say, 10 amps, then each pass transistor will carry an emitter current of 5 amps. The value of the load-sharing resistor to drop 0.5 volts on maximum load will be 0.5 divided by 5, which is equal to 0.1 ohms.

Assuming the worst possible current gain for the 2N3055 pass transistors, the base current of each transistor will be 5 amps divided by 20, which is equal to 250mA. Therefore the emitter current of the BFY50 drive transistor will be $2 \times 250\text{mA}$, which is 500mA. The current gain of the BFY50 is 30. Therefore the base current will be 500 divided by 30, or approximately 17mA, well within the safety limits of the output current for the voltage regulator IC.

Another important consideration to bear in mind is the power dissipation of each individual component. The load-sharing resistors will dissipate heat within the power supply cabinet and could result in unnecessary overheating of the power supply if the cabinet is not properly ventilated. From the above example the power dissipated by each load-sharing resistor will be $5\text{A} \times 0.5\text{V} = 2.5\text{W}$. For the home constructor the resistor can be wound on the old type of half-watt solid carbon rod resistors; that is if you have any of them in your junk box!

The heat dissipated by the pass

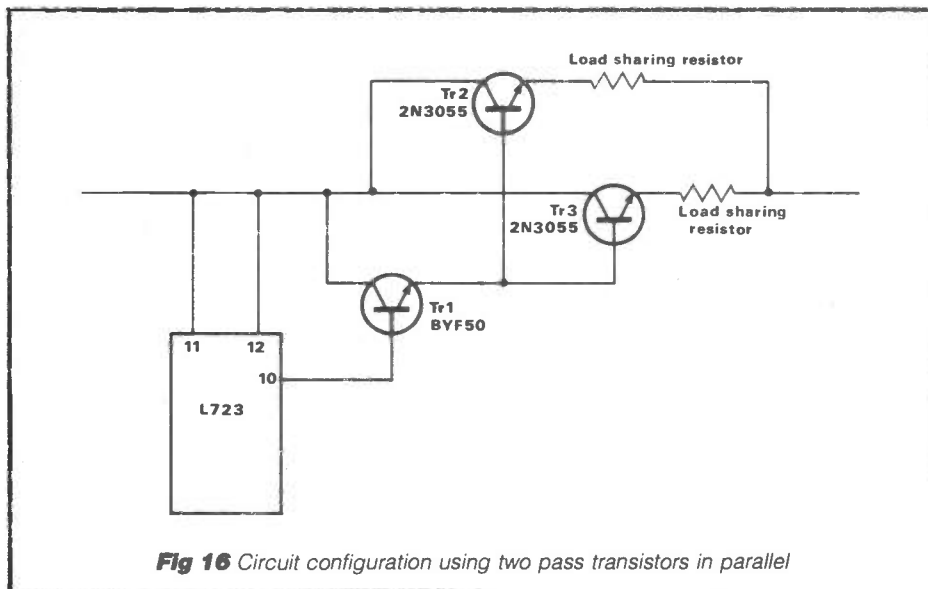


Fig 16 Circuit configuration using two pass transistors in parallel

transistors will depend not only on the load current they are carrying but on the difference in voltage between the regulated output voltage and unregulated voltage that appears across the reservoir capacitor. From the previous example let's assume that the power supply has been designed to provide an output terminal voltage of 13.8 volts under full load condition. Figure 17 illustrates the possible voltage distribution with an unregulated supply of, say, 30V. From practical experience and a rule of thumb, assume that 0.6V is dropped across the emitter/base junctions of the pass transistors and the driver transistor. For the power supply to provide a terminal voltage of 13.8V, 14.5V will need to be dropped between pin 11 and pin 10. Should we provide a heatsink for the voltage regulating transistor?

Output current

From the previous example the output current of the L723 under full load condition is 17mA and the voltage drop across it is 14.5V. Therefore the power dissipated in the integrated circuit will be $14.5 \times 17\text{mA} = 247\text{mW}$, not quite a quarter of a watt.

The driver transistor will have $14.5\text{V} + 0.6\text{V} = 15.1\text{V}$ dropped between emitter and collector. From the previous example the emitter current is 250mA under full load condition. The power dissipated in the driver transistor will be $15.1 \times 250\text{mA} = 3.8\text{W}$, which exceeds the maximum power rating of 800mW for the BFY50. Therefore it would be advisable to change the drive transistor for a 2N3055 and ensure that the heat is dissipated to the outside world by a heatsink.

The heat dissipated by each pass transistor will be:

$$\begin{aligned} (30\text{V} - 13.3\text{V}) \times 5\text{A} \\ = 16.7 \times 5 \\ = 83.5\text{W} \end{aligned}$$

Therefore it is essential that the pass transistors should be mounted on a suitable heatsink to dissipate the unwanted heat to the atmosphere.

The unnecessary power which is being lost in the form of heat from the power supply can be reduced by choosing a suitable value for the unregulated voltage. For example, suppose that the unregulated voltage was reduced to, say, 20V. Then only 4.5V would be dropped across the voltage regulator and 5.1V dropped between emitter and collector of the drive transistor. The power dissipated by the drive transistor will be $4.5 \times 17\text{mA}$, which equals 76.5mW. Therefore there would be no need to change the BFY50.

The power dissipated across each pass transistor will now be $6.7\text{V} \times 5\text{A} = 33.5\text{W}$, so there is still a need for a heatsink for the pass transistors, but the overall power dissipation in the form of

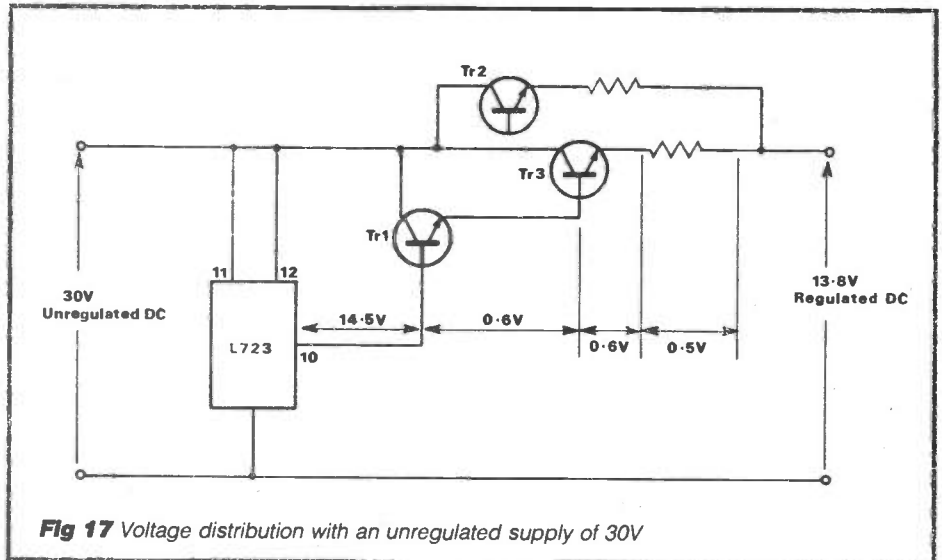


Fig 17 Voltage distribution with an unregulated supply of 30V

unwanted heat has been substantially reduced. However, there exists a danger in reducing the magnitude of the unregulated voltage: the output voltage regulation could suffer due to the lack of voltage difference available to the voltage regulating IC because of the differences in unregulated voltage between no load and full load.

Reducing power dissipation

The problem of regulation of the output voltage when the magnitude of the unregulated voltage is reduced can be overcome by using the circuit configuration illustrated in Figure 18. From the previous two examples, reducing the unregulated voltage by 10V has resulted in the pass transistors' heat dissipation being reduced from 83.5W to 33.5W for each transistor, a substantial reduction. The voltage difference available to the voltage regulating integrated circuit can be maintained if it is supplied from a separate rectifier and reservoir capacitor combination.

In the example shown in Figure 18, the

pass transistors are fed from a 17V unregulated supply. The power dissipated in each pass transistor under full load will be $(17 - 13.3) \times 5 = 18.5\text{W}$. The power dissipated in the drive transistor will be $(1.5\text{V} + 0.6\text{V}) \times 250\text{mA} = 525\text{mW}$, well within the maximum power dissipation of the BFY50. At the same time the voltage across the voltage regulator integrated circuit is 9.5V, leaving plenty of spare voltage for providing regulation.

This circuit configuration has substantially reduced the unwanted heat dissipation of the power supply, and consequently smaller and cheaper heat-sinks can be employed. The main disadvantage of using this circuit is that either a mains transformer with an additional secondary winding will have to be used, or if no such transformer is available it will require the addition of another transformer within the power supply cabinet, space permitting.

Next month the theme of power dissipation will be continued and the basic principles behind heatsinking discussed.

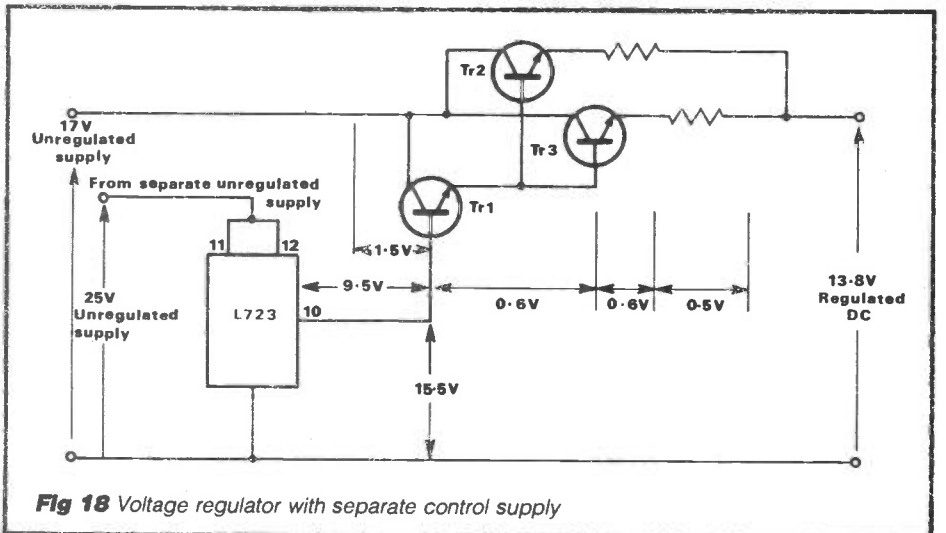


Fig 18 Voltage regulator with separate control supply

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| Z80ACTC | £1.99 | 8271 | £52.50 |

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| 2764-30 | £3.00 | 27128-30 | £5.50 |

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| 74LS00 | £0.20 | 74LS163 | £0.70 |
| 74LS04 | £0.20 | 74LS244 | £0.70 |
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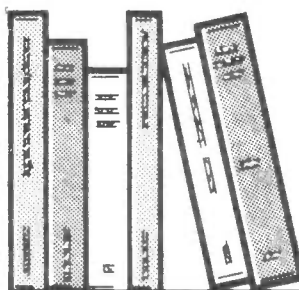
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RSGB BOOKS

AMATEUR RADIO

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1985 EDITION



The latest version of this best-seller from the RSGB. An up-to-date and comprehensive guide to all UK and Eire call signs – and all in one book. There are more than 53,000 call signs listed in this expanded edition, and more efficient production techniques have allowed us to keep the cover price to a very acceptable level. The Call Book includes lists of RSGB affiliated societies, groups, and special call signs, plus the latest RSGB repeaters list. Most addresses given are the locations of the stations, thereby giving the VHF/UHF enthusiast an easy reference for beam directions. The Call Book first appeared at the NEC Exhibition, and is now readily available and is priced at £6.92 inc.

COMING SOON! Amateur Radio Software

Written especially for the RSGB, this extremely useful new book will have immediate appeal to all amateurs who want to make use of their home computers. There are many programs, listings and full instructions on how to make the best of both worlds. Author Dr John Morris CM4ANB says there is hardly an activity in amateur radio where a computer cannot be used. Many subjects covered include vhf contests, scoring, component values, propagation predictions, where to point your antenna for moonbounce or satellite working, cw, and much more besides! How to write your own programs, and use the software to its best advantage is what this book is all about.

OTHER RSGB PUBLICATIONS

| | |
|--|---------------|
| NEW! Amateur radio operating manual..... | £6.15 |
| NEW! Radio data reference book..... | £7.98 |
| Radio Amateurs' Examination Manual | £3.84 |
| 1985 World Radio TV Handbook..... | £19.81 |
| VHF/UHF Manual | £10.58 |
| A Guide to Amateur Radio | £3.91 |
| Morse Code for Radio Amateurs..... | £1.64 |
| How to pass the RAE | £3.42 |
| Test Equipment for the Radio Amateur | £6.41 |

The RSGB is the national society representing all UK radio amateurs. Membership is open to all interested in the hobby, including listeners. The Society publishes a range of books, log books and maps for the radio amateur. A large selection of other radio and electronics books are also stocked, a full list is available on request. Contact the membership services section for more information about amateur radio, the RSGB and its publications. All publications sold by the RSGB are available at discounted prices to members.



RSGB Publications
Cranborne Road, Potters Bar,
Hertfordshire EN6 3JW

AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

The British Amateur Radio Teleprinter Group (BARTG) celebrated its silver jubilee last year. The events staged for this commemoration were of particular significance to your scribe, as he was the founder member of this group.

Very briefly, the events which led up to radio teleprinting being introduced to the amateur radio scene in this country were as follows. In the February, March and April 1950 issues of *Radio Constructor* Jim Hepburn VE7KX wrote a series of three articles dealing with amateur radio teleprinting. These three articles, together with one or two letters on the subject which appeared about the same time in other amateur radio journals, stimulated enough interest amongst one or two amateurs, including the writer, to see what could be done to get something going in the way of RTTY activity in this country. What subsequently occurred is outlined in an article which appeared in the BARTG journal, *Datacom*, for spring 1984 entitled *The Founding of BARTG*. It became one of the writer's most interesting projects in a long amateur radio career.

One of the events created to celebrate BARTG's silver jubilee was a competition for a QSL card for BARTG members. The competition was won by Mark Goodfellow G4KUQ and the cards are now coming off the press and are available to BARTG members. We reproduce the call sign of BARTG's president, 'Smudge' Lundegard G3GJW, and we are sure readers will agree that this card is a really interesting one, illustrating as it does the development of RTTY from the days of the noisy, dirty, type 3 GPO tape machines with which RTTY in this country started to the computerised systems of the present day. Readers interested in joining BARTG should write to the Membership Secretary: Pat Beedie GW6MOJ, 'Ffynnonlas', Salem, Llandeilo, Dyfed, Wales.

Ionospheric total absorption

Those readers who use 80 metres on a Sunday morning for one of the many nets at that time must have wondered what had gone wrong on Sunday 21 April, when the band was absolutely dead - dead, that is, except for the usual inter-G QSOs. Practically nothing could be heard of G stations, though a few distant Continental stations were audible. It was

another of the 'fade-out' type conditions associated with solar minimum at this stage of the solar cycle.

Widespread auroral displays were observed in northern latitudes during the night of the 16th and 17th and six separate geomagnetic events were recorded during the night of the 21st and 22nd. Periods of total ionospheric absorption and sporadic-E blanketing were observed during this period. Early morning F2 critical frequencies at the Appleton Radio Observatory fell to 1.7MHz compared with an average of 2.5MHz. VHF stations in Leningrad were worked. Signals from Scandinavia were strong in London, particularly from the Finnish station OH1AWW. The cause of the disturbance is not certain, but evidence suggests it was due to disintegrating solar filaments.

Teach-in for radio amateurs

The Norfolk Amateur Radio Club has come up with a good idea to try and improve operating standards on the amateur bands. The club is 'appalled at some of the things we hear on the air from newly licensed operators these days, so we thought a series of talks and demonstrations would be the best way of putting over the message without upsetting anybody'.

They will be covering such matters as the correct procedures for the exchange of messages between licensed amateurs; the finer legal points of one's licence; apparent ambiguities in the regulations, and the art of operating without antagonising other people! They'll also be dealing with such matters as the correct way of using one's gear, what the knobs on the front panel are for, what goes on behind them and other such technical matters, including what happens when a transmitter is used without being loaded into a correctly matched antenna! It seems a very good idea. Other clubs please copy!

Operation Raleigh

I mentioned some months ago this venture for giving young people an opportunity of doing some real exploration and scientific investigation. The organisers of 'Operation Raleigh' are now looking for a limited number of amateur radio operators to provide back-up ship to shore communication with the

field parties.

It is expected that one operator will be needed for each three month leg of the journey. As these are staff appointments there is no upper age limit but a minimum level of physical fitness will be required. The cost will be approximately £1,500 per person. If you are interested write to: Captain J Masters, c/o Operation Raleigh, PO Box 370, St Katherine's Dock, London E1 9LB.

Morse popular

The writer is an ardent CW enthusiast. He learnt to send and read it properly when in the RNWAR, a civilian Royal Naval Wireless Reserve which was started just before WWII. Someone obviously knew what was coming!

Once the skill is acquired there is much pleasure to be gained in using it - provided the other fellow also sends it properly! There has always been a section of would-be radio amateurs who clamour for its abolition. At one point their voices seemed so loud that it appeared they were a majority group. But it seems this is not so.

In his editorial in the May issue of *Radio Communications*, David Evans G3OUF gives some illuminating facts of recent indications that CW is in fact blooming. An analysis of 750 RSGB user reports, a survey recently carried out by the RSGB, showed that exactly two-thirds of class A licensees reported that they used CW on a regular basis - a far higher proportion than had been expected. Then he mentions that four hundred requests for the RSGB Morseman Project have been received, again well ahead of expectations.

Finally, nearly six thousand 'Notices of Variation' giving permission for class B licensees to use CW have been issued, again more than anticipated. So it seems



G3GJW

BARTG 107 Ingemar Lundegard - "Smudge"

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|----------|------|-----|------|------|-----|-----|
| | | | | | | |

QTH: Saxby, Boisson Lane, West Kingsdown, Sevenoaks, Kent, TN15 6BL, England.

AMATEUR RADIO WORLD

that CW is going strong and the manufacturers of amateur radio gear had better not omit CW facilities from their products just yet at any rate, which we sometimes hear rumours about.

Dallas and Oscar 10

Your scribe must confess to being a 'Dallas' fan, and a 'Dynasty' one too, though that is only to see Joan Collins! Recently the author had a QSO with KT5U, who gave his QTH as Dallas. As a change to signing off with '73', 'Gud DX' or the currently used 'Take care', he sent 'Regards to JR'. Surprise, surprise when Rusty KT5U came back with 'Well, I might just do that! I can see the ranch where they film those scenes from my shack window and the cast often patronise the 'local'!

Your scribe was therefore particularly gratified to receive in due course KT5U's QSL card with the message added: 'Many thanks for a very enjoyable QSO. Glad to talk to another fan of JR. He passes along his regards to you - hi!' Incidentally the QSO was entirely on CW. It's easier, quicker and more reliable that way!

VHF Convention

From the RSGB's VHF/UHF Newsletter, we learn that approximately 2,700

people attended the VHF Convention at Sandown Park, with profits approaching the £3,000 mark.

Proposed dates for next year's VHF Convention are either Saturday 8 March or Sunday 16 March. With the RSGB National Convention being held around the beginning of April, it was felt that a two-week gap between Sandown and the NEC was not acceptable. It has therefore been necessary to arrange the VHF Convention to occur in early March 1986. It could be argued that the convention should be arranged for later in the year but unfortunately flat racing and other exhibitions at Sandown Park preclude this.

Telecom Gold

The RSGB has been considering subscribing in the near future to Telecom Gold, British Telecom's electronic mail network. This is a system which uses computer technology to send text via ordinary telephone lines to a BT computer which stores the message. This can then be accessed and read by authorised users with microcomputers. In some respects it is like an intelligent telex system, but operating twenty-four times as fast.


One possibility under consideration is

to use a Telecom Gold mailbox to circulate the weekly GB2RS script to readers. The main advantage would be a reliable distribution system independent of the vagaries of the postal service. There would also be savings in postage and packing as some 165 scripts are posted each week.

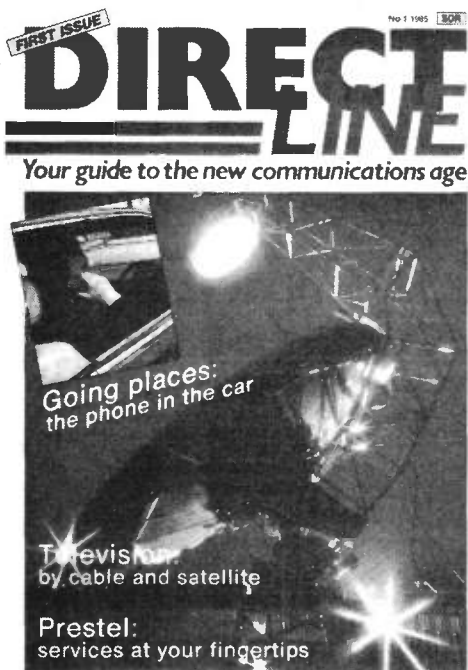
Such a scheme would, of course, necessitate the recipient having access to a microcomputer, modem and telephone. The software requirements are very similar to those needed to receive Prestel/Micronet and would probably be provided by the RSGB to suit the common micros. It would typically take about four to five minutes to send a GB2RS script.

The RSGB has sent out a questionnaire to members to get some idea of the feasibility of introducing such a scheme.

VHF/UHF power amplifiers

Geoff Brown GJ4ICD has recently compiled a booklet on QRO amplifier design which gives information on where to obtain those difficult to find components for building high-powered RF amplifiers. Further information on the booklet is available from Geoff at: 'Lemnos', Longueville Road, St Saviour, Jersey. Tel: (0534) 77067. 

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META

A · S · S · E · M · B · L · E · R

META is both an Editor and a very special Assembler. Most of META resides on a 16K EPROM, but the tables defining the language the Assembler is to translate Assembler for ANY instruction set — you specify which you want to use in your source code.

The large box on the right details all the instruction sets that have been coded for META right now: all these are supplied free with META. The other 4 instruction sets will be supplied as soon as they are written and tested as A FREE UPGRADE. We're on Freepost, so you won't even have to pay postage.

META contains a fully integrated Editor. This follows Wordwise as closely as possible in its philosophy (ie cursor keys used to move text — quickly — up and down about central editing line etc), and includes Global/Selective Search/Replace, Markers (copy, save, delete, find marked text), load text to cursor, character count and heaps of other features.

If an error is detected during assembly, the Editor is right there: on the bad line with a plain English error message describing the fault.

Complex expressions are allowed by the Assembler, including brackets to 8 levels (!). All calculations are to 32 bits.

Macros and IF/ELSE/ENDIF Conditional Assembly are fully supported, and both are nestable. Macros may also pass parameters, and contain local labels. There's also a range of EQU pseudo-ops for data setup, all of which may have a list of arguments separated by a comma. Disc datafiles can also be inserted into the object code. A complex integrated Macro Library system is also included — you can invoke a routine and pass parameters by just giving its name.

Source code is Assembled in two fast passes (we don't use the groaning slow BPUT & BGET as do some ... inferior Assemblers. Instead portions of the source code are effectively *LOADED in at top speed.) The resultant object code may be sent to disc files, sideways RAM, the user or printer port (full details and examples in manual), or down the RS423.

Remember that all instructions sets supported by META have access to all the above features (Macros, the Library etc)

META comes complete with a comprehensive manual and function key strip. 16K of source code for a 6502 BBC game is included free and the META system disc, which demonstrates many of the features of this assembler. (as well as being a neat game!)

- Comes in a 16K EPROM and 40tk disc for the BBC
- Complete Wordwise style integrated editor with special debugging aids
- Assembles for 7 different MPU families right now — FREE updates take this up to 11
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| BC157/8/9 | -10p | BC327,337,337L | -12p | BSX19 | -12p |
| BC547/8/9 | -8p | BD135,136 | -25p | BSX20 | -15p |
| BC557/8/9 | -8p | BD137,138,139 | -25p | 2N2925 | -7p |
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| 470/16, 470/25 - 11p, 470/35 - 12p, 470/40 - 15p, 1000/16 | 15p |
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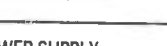
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Alan Warne G4EZO describes the conversion of the Ferguson TX90 for use as a video monitor in this first instalment of a two-part article.



The following article describes a conversion to allow a domestic television to be used as a video monitor or as a normal off-air receiver at the push of a button.

Television receivers which can be used as monitors, having facilities for video and sound input and output, are few and far between and are normally expensive to buy. It was therefore considered reasonable to convert a reliable, inexpensive receiver for this purpose.

The receiver

One of the more popular televisions found in the high street dealers and discount stores which is British made and reliable is the Ferguson Model 37140, which retails at between £159 and £169. It has a screen size of 14 inches and has an option for battery operation. The type of chassis used is the TX90.

Consideration should first be given to why we need to use a monitor rather than a normal television. Any source of video information, wherever it is generated, eg a computer, video recorder, camera, etc, must supply the television with three types of essential information: the vision signal, a synchronising signal, and, if applicable, colour information. When gathered in this format they are called a composite signal.

A video monitor will accept a composite signal without any further additions, but a standard television requires a UHF (ultra high frequency) signal. To meet this requirement the composite signal must be superimposed onto a radio frequency carrier, and must therefore be passed through a modulator. Most modulators that are fitted in peripheral equipment operate on channel 36 or 37 in

the UHF band. These channels are not allocated to broadcasting organisations and are reserved for home entertainment equipment.

When a television receives this signal at the aerial socket it must be demodulated and returned to a composite signal before colour decoding can take place. This process involves many stages of mixing and amplification, which can cause a degrading of picture quality, patterning and drifting off tune.

Figure 1 shows a block diagram of the signal path through the television. If a composite signal is fed into the receiver after the demodulator as shown, the signal processing stages at the front-end are bypassed and there is no need for the modulator at the signal source. Patterning and drifting are then eliminated and picture display quality is greatly improved.

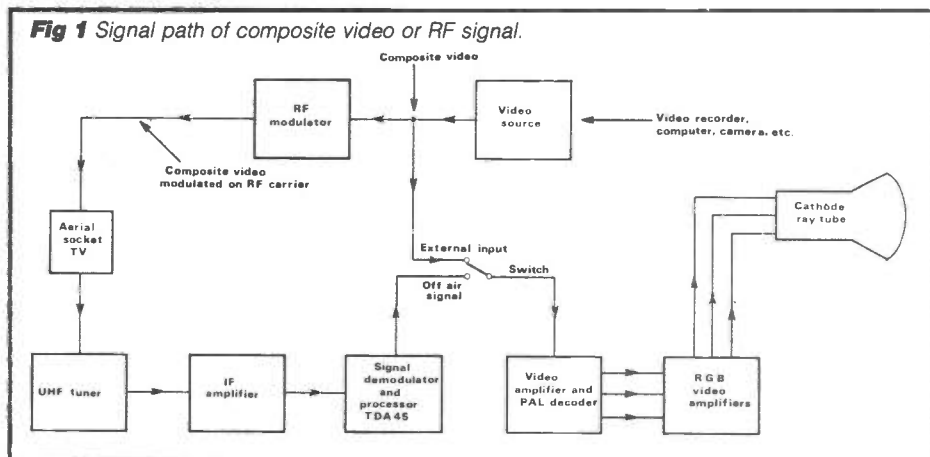
Circuit operation

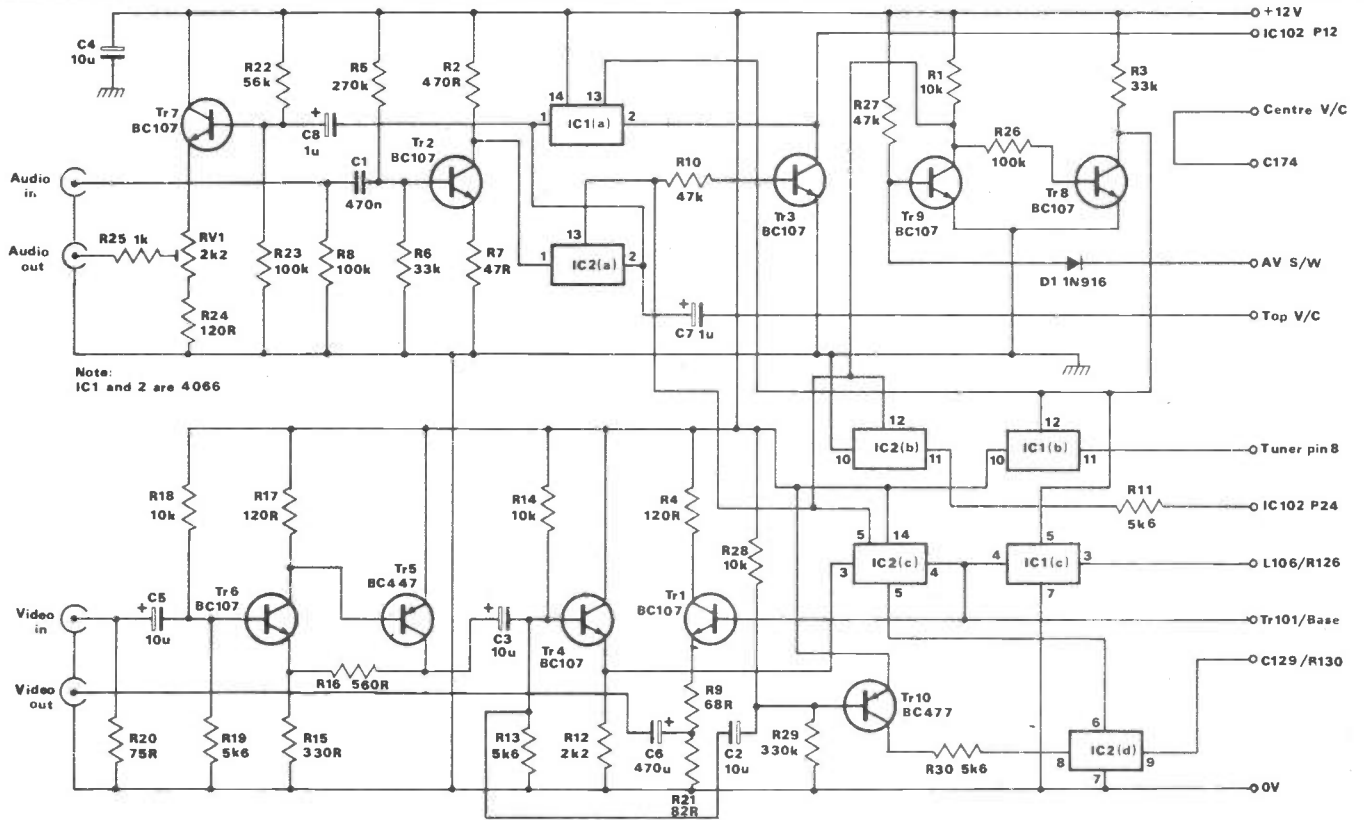
It is standard practice to provide video and sound input and output sockets on a

monitor, and the interface described will give these facilities. Button 8 on the channel selector switch is used to change over from normal television to monitor. In this mode off-air signals are disabled and external video and sound signals are sourced from the input sockets. The signal selected is also made available at the video and sound output sockets for distribution to line, eg for recording or connecting to further monitors.

Sound and vision

In the TX90, sound and vision signals are derived from the small signal combination IC type TDA4500. Video signals are then connected to the luma/chroma processing IC UPC1365 and sound is fed to the audio amplifier (see Figure 2). The path of the video and sound signals must be broken to allow external inputs when in monitor mode. This is achieved by CMOS switching, which offers low insertion loss and simple changeover control.





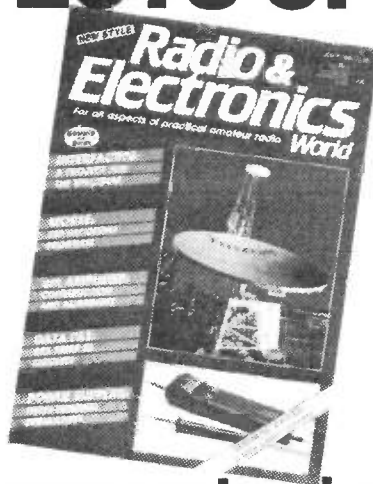
The circuit diagram of the interface

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| Receiver 6 Channel Adaptor | 70MC06R | 25.95 | 18.80 |
| Synthesiser (2 PCB's) | 70SY25B | 91.60 | 65.35 |
| Synthesiser Transmit Amp | A-X3U-06F | 36.40 | 24.30 |
| Synthesiser Modulator | MOD 1 | 9.10 | 5.75 |
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| 500mW to 3W (Straight amp, no changeover) | 70LIN3/LT | 31.40 | 23.40 |
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| Receiver Converter (Ch 36 Output) | TVUP2 | 28.75 | 23.95 |
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| TV Modulator (For Transmission) | TVM1 | 10.35 | 6.05 |
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| 2M Transceiver Kits and Accessories | | | |
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HEARD ISLAND

Story of a DXpedition

To the DXer there can be no doubt that Heard Island was very high on their 'wanted lists' - the lack of amateur radio activity in any rare DX country for more than a few years always increases the demand.

On looking at a map of the southern Indian Ocean, Heard Island seems very isolated. Dominated by a 3000 metre volcano peak, *Big Ben*, it is indeed remote, and can only be reached from Australia by a long sea voyage through what many regard as the stormiest seas of the world, 'the roaring forties'.

In 1980 when I was in Papua New Guinea as P29JS, I tried to join the Australian National Mapping Expedition to Heard Island. This expedition was going to carry out a new survey of the island and surrounding area to update Australian records. In addition, since Heard Island was now unoccupied it was necessary to 'show the flag' and confirm Australia's claim to this area.

If at first . . .

I was unsuccessful in obtaining a berth on the *Cape Pilar* for its journey to Heard Island, but as a result of my attempts I really began to look at Heard Island and think of how it might be activated. It seemed to me that it would take six good operators and a 10-12 day stay to clear the demand for this rare DXCC country, and that was how HIDXA started. This took a very narrow outlook with Heard Island as its only goal, and was even further limited by having only amateur radio as the reason for the long and difficult journey there and back.

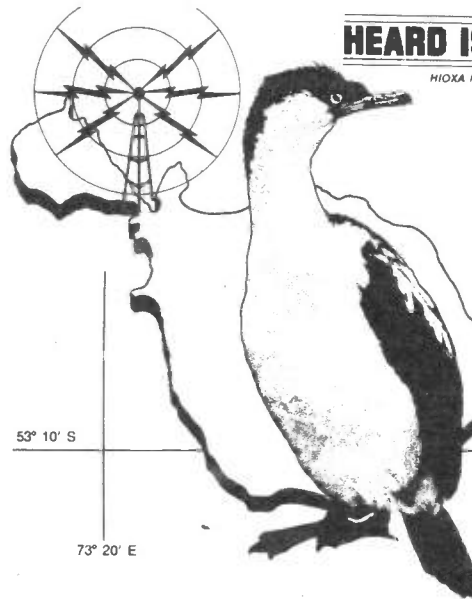
Still, that was the beginning, and letters, telephone calls and finally a visit to Canberra gave HIDXA 'permission in principle' to carry out an amateur radio DXpedition to Heard Island. In addition, the DOC issued me with a licence (VK0JS) to be used on the island.

On reflection, the Australian authorities were very kind and helpful - maybe not all government departments are the same - and HIDXA had every possible assistance from the departments concerned.

Initially it was thought that finances would not be too much of a problem. Many international amateurs needed Heard Island and it was felt that help would be given if asked. All the main amateur radio outlets were informed and even amateurs in the USSR became aware of our intentions.

However, financial considerations did become more of a reality and it finally took three attempts to get to Heard Island. Third time lucky is a common saying internationally, but this third time also had some *unlucky* implications, as many of you will know.

On 4 September 1982 HIDXA entered into a contract agreement with the Thorbryn Towing and Salvage Co, owners of the *Cheyne II*, and this vessel was



HEARD ISLAND DX ASSOCIATION

HIDXA PO BOX 90 NORFOLK ISLAND SOUTH PACIFIC 2899

VK0JS

Zone 39
An Amateur Radio
and
Scientific Expedition
to

HEARD ISLAND

Jim Smith P29JS recounts the saga of his little jaunt in 1983 to the back of beyond

secured for the HIDXA expedition to and from Heard Island. The departure date was set for the first few days of January 1983 and we were confident that the expeditioners would be on Heard around 17/18 January, leaving Heard Island around the end of January to be back home mid-February.

Everything possible was done to see that all was in order, and the contract cost HIDXA over \$1000 in solicitors' fees, with an independent survey carried out on the vessel and its capabilities. In chartering the *Cheyne II*, HIDXA wide-

ned its base considerably, since the vessel had berths for 18 expeditioners in addition to the crew. The range of interests grew and became bigger than the original amateur radio concept.

Amateur control

However, it must be remembered that all expedition organisation and planning was controlled by amateur radio. Time was not on the side of HIDXA, since the *Cheyne II* was not settled until September, allowing barely four months to get all in order. There followed weeks of

PERSONNEL

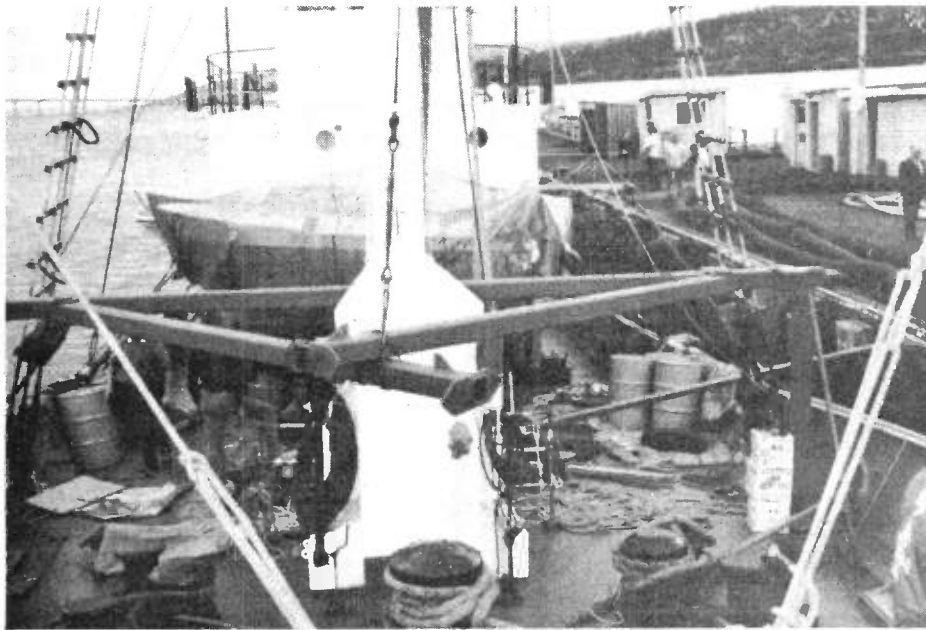
Amateur radio and organisation

| | | |
|----------------------|---|--------|
| James B Smith | Leader and organiser | VK9NS |
| Kirsti Jenkins Smith | Co-organiser | VK9NL |
| Sjoerd Jongens | Co-organiser | VK7ZSJ |
| Robert P Walsh | Operator | WA8MOA |
| Walter Flor | Operator | OE1LO |
| Walter Marshall | withdrew at Albany due to time factors and his work in Saudi Arabia | W7SE |

Scientists

| | |
|--------------------|--------------------|
| Prof H Heatwole | Zoologist |
| Dr Robert T Jones | Veterinary surgeon |
| Dr Jeremy MB Smith | Botanist |
| Dominique Ward | Zoologist |
| Claire Speedie | Ornithologist |
| Alison Greene* | Geologist |

*Alison joined us with three hours notice. VK6MK kindly housed her monster motor bike in his garage. She was holidaying in Albany at the time!



Shipshape? Well, almost . . .

continual telephone calls, letters and so on, and by mid-November most things had been dealt with.

Applications from people to join the expedition had been processed and the expedition team more or less finalised. The multi-page proposal to the Australian authorities had been submitted. Very quickly HIDXA received permission for the amateur radio part of the expedition, with a promise that the scientific area was being dealt with. The authorities were concerned that no damage was done to the environment of Heard Island since due to its position it is unique. There are no introduced species for example, due to its remoteness. It is rarely visited, and only now is the animal population recovering from the ravages of the early sealing days.

The first step

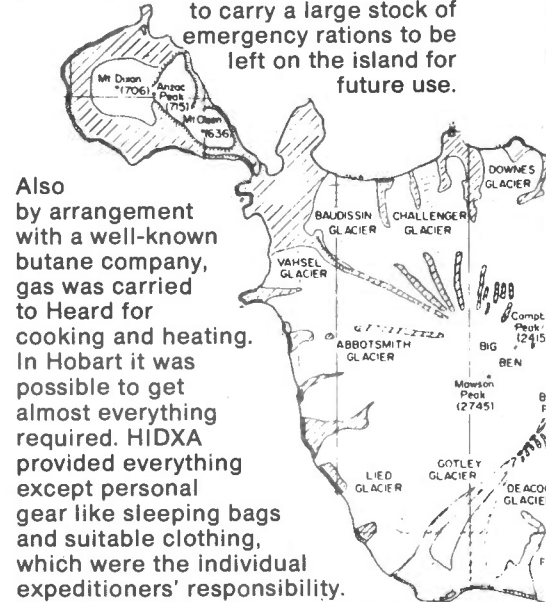
In November 1982 I left Norfolk Island to be in Hobart to get all organised before our departure. One thing after another required attention and the logistics became very formidable. HIDXA put 17 expeditioners on this remote sub-Antarctic island and all areas of food, power, shelter, first aid, amateur radio etc had to be dealt with. Each expeditioner paid \$3,000 as his or her share in charter costs, though this did not include fuel. As a result of this policy we had a very self-motivated group. One has to be very confident to pay that sort of money for such a difficult and arduous expedition. This stood us in good stead later, as we were all able to function together despite hardship and a real element of danger.

Menus had been prepared by Kirsti and myself on Norfolk Island. In Hobart these were being organised in real terms: tins, jars, packets etc. Our target was food for

28 people (including the crew of the *Cheyne II*) for 8 weeks and as events were to show the expedition needed every bit of it.

Fortunately with the *Cheyne II* there were no restrictions on size and weight and gradually things were being collected for loading on the vessel. Unfortunately we had not realised the implications of the yearly Sydney-Hobart yacht race. It became harder and harder to get material on the boat, and many heavy items had to be man-handled quite a long way since great areas of the dock were gradually taken over for the final days of the race. Many business people in Hobart assisted with food donations etc.

Finally things began to take shape and the list of names was more or less complete. Further permission was received from Canberra for the scientific part of the expedition to go ahead. It should also be mentioned that the Antarctic Division, Hobart were very helpful and loaned tents and many items of equipment for possible use on Heard Island. In addition HIDXA agreed to carry a large stock of emergency rations to be left on the island for future use.



Also by arrangement with a well-known butane company, gas was carried to Heard for cooking and heating. In Hobart it was possible to get almost everything required. HIDXA provided everything except personal gear like sleeping bags and suitable clothing, which were the individual expeditioners' responsibility. So an expedition to one of the most remote spots of the world was gradually taking shape and falling into place. By this time the group consisted of radio amateurs, scientists, mountaineers (attempting Big Ben) and a film crew to record our efforts. On picking up the Austrian mountaineering group, I could hardly believe my eyes. The sheer volume of equipment was staggering,

EXPEDITION EQUIPMENT

- 4 Icom 701s – with battery back up, complete with mikes, keys etc.
- 1 Icom 720 – satellite communications, slow-scan and RTTY.
- 1 Icom 740 – complete with built-in keyer and power supply.
- 1 TS830 – complete with remote VFO etc.
- 1 FT901ZM – complete with mike etc.

VHF and six metre equipment – handhelds for local communication with field workers and mountaineers.

Keyers, power supplies, spare connectors etc.

Distribution boards and power cables, pickets, wire, ground rods etc.

Antennae

- 1 TH3MKIII with rotator and indicator.
- 2 TH3JRs, complete with coaxial cable.
- 1 3-element 10 metre beam.
- 1 3-element 15 metre beam.
- 3 18AVQ multiband verticals, complete with radial system etc.
- Dipoles for various bands.
- Backup wire and connectors, coaxial cable etc.

4 petrol generators.

1200 litres of fuel in 200 litre drums: these were floated ashore from the *Cheyne II* and towed by the dinghy.

In short a hundred and one things needed to keep the stations on the air.



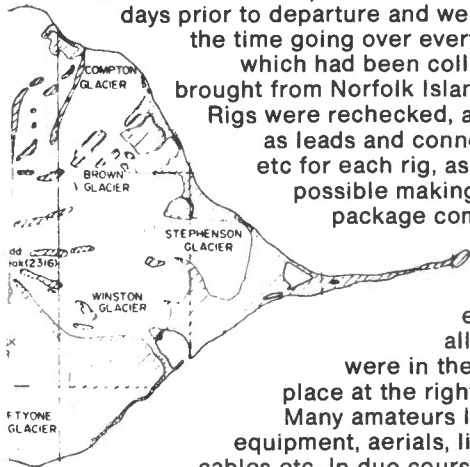
and in fact they came almost as a self-contained unit so they had also worked hard on their logistic requirements.

Food for thought

The amateur radio part was slightly easier to organise, as this is the bread and butter of the DXpeditioner. I find it reasonably easy to think of what is required, and the amateur radio package went together slowly but surely.

I am indebted to several members of the WIA for their help and support, and also to Walt Marshall W7SE (who unfortunately had to leave us at Albany due to time factors). He arrived several days prior to departure and we spent the time going over everything which had been collected, brought from Norfolk Island etc.

Rigs were rechecked, as well as leads and connectors etc for each rig, as far as possible making each package complete

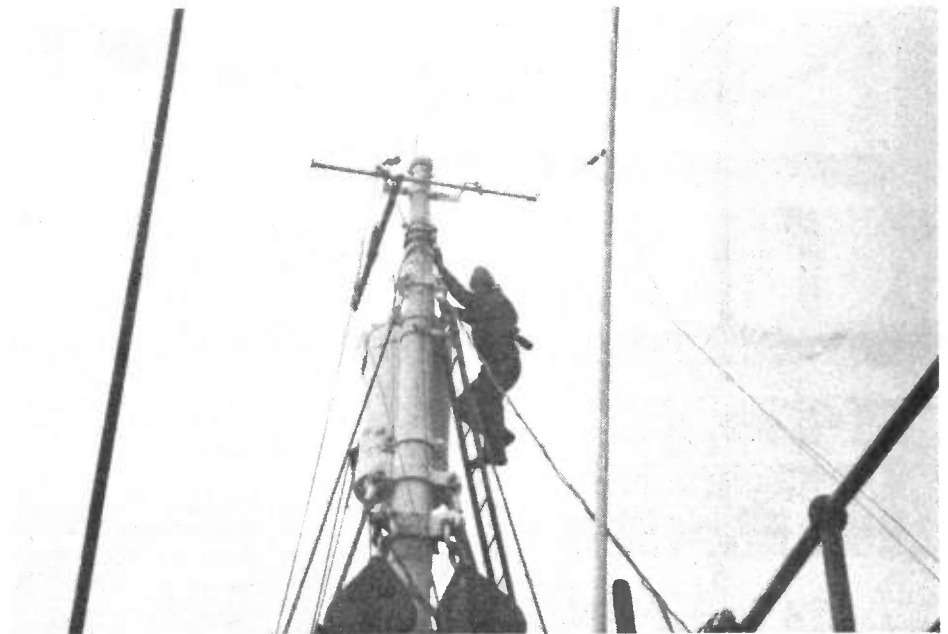


to ensure all items were in the same place at the right time.

Many amateurs loaned equipment, aeriels, linears, cables etc. In due course they will be recognised for their contribution to the expedition.

All antennae were pre-assembled to the maximum length possible to minimise the effort required on Heard Island. All had coaxial cable available and all verticals had pre-cut radials etc. This attention to detail resulted in very few problems. One regret was that Walt could not share the results of our efforts

All stowed and ready to go



Very keen, these mountaineer chappies!

during those sunny days in Hobart. For beam support I used 2 inch aluminium scaffold poles as this tubing is virtually unbendable.

Generating problems

Generators were a problem, the aim being to put a minimum of two rigs on the air. We did not want to lose both stations if a generator failed, so I opted for individual generators so that each station was independent of the other. This arrangement worked out well and four petrol 2.0KVA generators were put on Heard Island. A great deal of thanks is due to Bob Walsh, as his untiring efforts with the generators kept us going – despite problems.

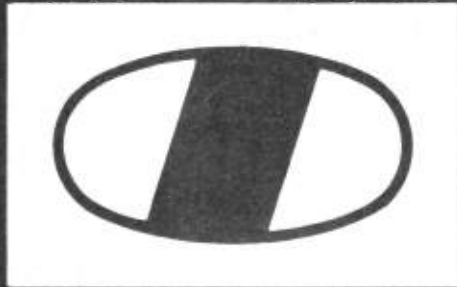
In addition we had battery backup power and this also allowed us to keep operating during refuelling etc. The generators required attention every couple of hours but it was felt better to stop and check them every now and again than run them into the ground. We were utterly dependent on those four generators from an a radio point of view.

We left Hobart more or less on schedule with a 15 or 16 day sea voyage ahead of us, but as we cleared the southern Tasman coast we hit gale conditions. Force 8/9 winds had the *Cheyne's* in very rough conditions with seas of 20/30 foot waves. The skipper decided to turn back for safe anchorage and we ended up back in Hobart itself.

A few days later we were on our way again and under a new captain, Laurin MacEwan. It was decided to steam the northerly route for a few days to allow the skipper to become acquainted with the *Cheyne's II*. After three days he abandoned the charter, saying that the vessel was using fuel at an alarming rate and did not have the range to get to Heard Island and return. After a telephone discussion with the owner, it was agreed that the *Cheyne's II* would go to Albany (Western Australia) and recommence the charter from there. The vessel was refuelled at Albany and eventually the expedition was on its way, very much behind schedule. However, the distance to Heard and back had been reduced and the rest should have been 'plain steaming'!

To be continued . . .

What perils await Jim Smith and his intrepid band? Find out in next month's concluding episode. Don't miss it!



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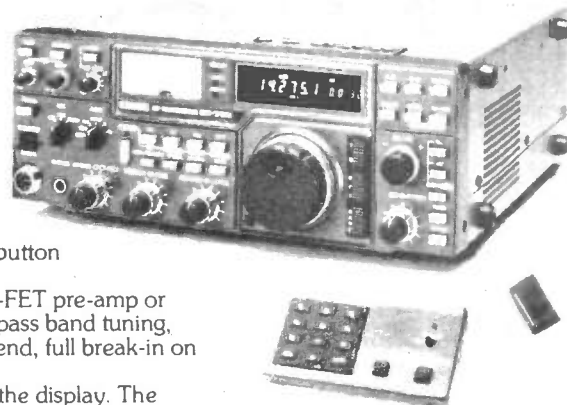


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Standard features include: a speech processor, switchable choice of J-FET pre-amp or 20dB pin diode attenuator and two VFO's, marker, 4 variable tuning rates, pass band tuning, notch, variable noise blanker, monitor switch, direct feed mixer in the front end, full break-in on CW and AMTOR compatibility.

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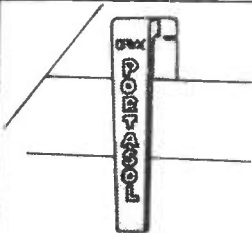


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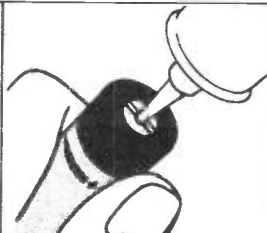
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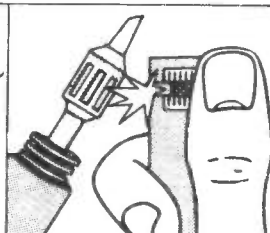
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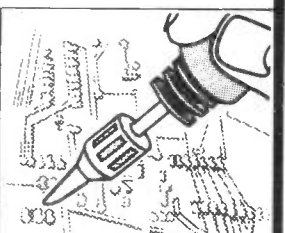
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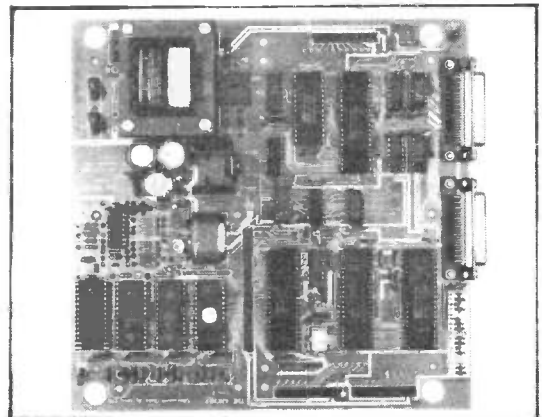
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DATA FILE...

Ray Marston looks at a variety of astable circuits in this second part of his 555 timer IC mini-series.

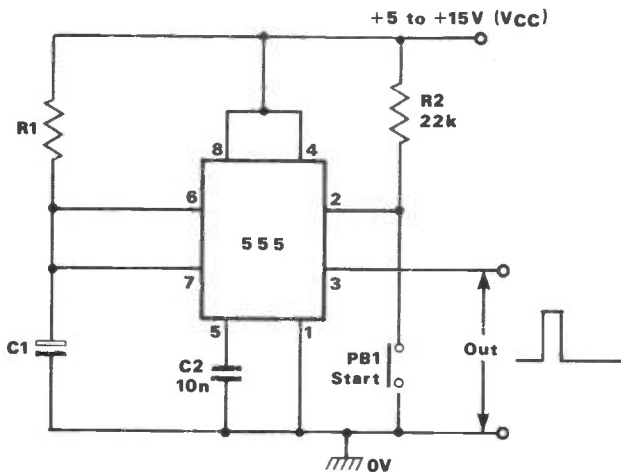


Fig 1 Basic monostable circuit

In last month's edition of *Data File* we gave an introduction to the basic characteristics of the 555 'timer' IC, and showed ways of using it in practical monostable pulse generator and timer applications. In this edition of 'The File' we show how to use the device in practical astable multivibrator or 'squarewave generator' applications.

Astable operation

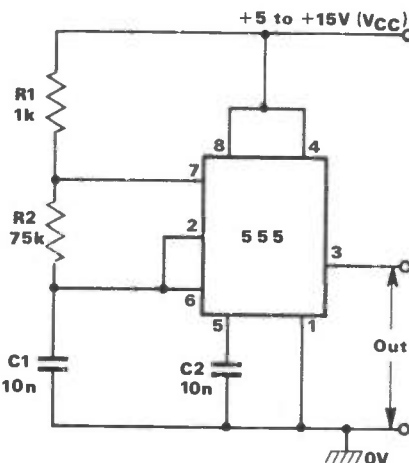
Figure 1 shows, for comparison, the basic 555 monostable multivibrator circuit that was discussed last month, and Figure 2 shows how to connect the same IC in the astable or squarewave generator mode. Let's compare the operation of these two circuits.

In the monostable circuit of Figure 1, the basic action is such that output pin 3, 'discharge' pin 7 and 'threshold' pin 6 are normally (when the circuit is in the quiescent state) pulled low by the internal circuitry of the IC. A monostable timing period can be initiated by briefly pulling pin 2 low via PB1, and this action causes output pin 3 to flip high, while pin 7 is released and is free to follow the C1 voltage, which then starts to rise exponentially via R1 and the supply-line voltage.

Eventually the pin 7 voltage rises to $\frac{2}{3}V_{CC}$, and at this point the circuit action terminates, with pins 3, 6 and 7 being pulled abruptly to zero by the internal circuitry of the IC.

Look now at the Figure 2 astable circuit. Note in this case that 'trigger' pin 2 is shorted to the pin 6 'threshold' terminal, and that timing resistor R2 is wired between pin 6 and 'discharge' pin 7. This circuit operates as follows.

When power is first applied to the circuit, C1 starts to charge exponentially



$$\begin{aligned} \text{If } R2 \gg R1: \\ t1 &= 0.7 \cdot C1 \cdot R2 \\ t2 &= 0.7 \cdot C1 \cdot R1 \\ T &= 1.4 \cdot C1 \cdot R2 \\ f &= \frac{0.72}{C1 \cdot R2} \end{aligned}$$

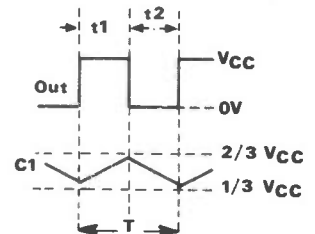


Fig 2 Basic 1KHz astable multivibrator

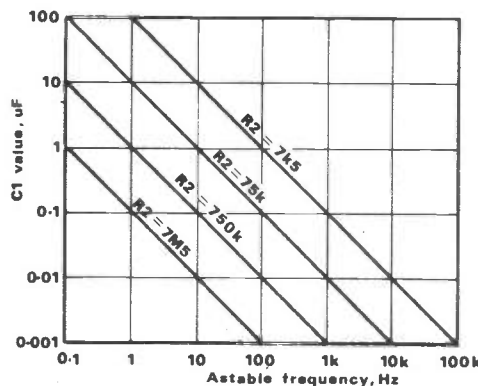


Fig 3 Relationship between C1, R1 and frequency when R2 is large relative to R1

R2, until eventually the C1 voltage falls to $\frac{1}{3}V_{CC}$, and 'trigger' pin 2 is activated.

At this point a new monostable timing sequence is initiated, and C1 starts to recharge towards $\frac{2}{3}V_{CC}$ via R1 and R2. The whole sequence then repeats *ad infinitum*, with C1 alternately charging towards $\frac{2}{3}V_{CC}$ via R1-R2 and discharging towards $\frac{1}{3}V_{CC}$ via R2 only.

Note in the above circuit that if R2 is very large relative to R1, the operating frequency of the circuit is determined essentially by the R2 and C1 values, and that a virtually symmetrical squarewave output waveform is developed on pin 3. In addition, a near-linear 'triangle' waveform is generated across C1.

Figure 3 shows the approximate relationship between frequency and the C1-R2 values under the above condition. In practice, the R1 and R2 values of the circuit can be varied from 1K0 up to tens of megohms: note, however, that R1 can have a significant effect on the total current consumption of the circuit, since pin 7 of the IC is virtually grounded during half of the timing sequence. Also note that the duty cycle or mark/space ratio of the circuit can be preset at a non-symmetrical value if required, by suitable choice of the R1 and R2 values.

The basic circuit of Figure 2 can be usefully modified in a number of ways. Figure 4, for example, shows how it can be made into a variable frequency squarewave generator by simply replacing R2 with a fixed and a variable resistor in series. With the component values shown, the frequency can be varied over the approximate range of 650Hz to 7.2KHz via RV1. If required, the frequency span can be further increased by switch-selecting alternative values of C1.

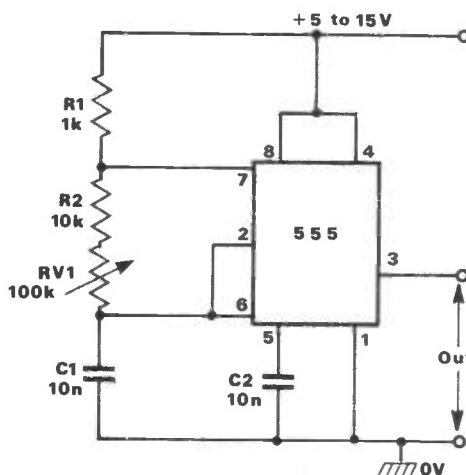


Fig 4 Variable frequency squarewave generator

(in the normal monostable fashion) via the series R1-R2 combination, until eventually the C1 voltage rises to $\frac{2}{3}V_{CC}$. At this point the basic monostable action terminates and 'discharge' pin 7 switches to the low state. C1 then starts to discharge exponentially into pin 7 via

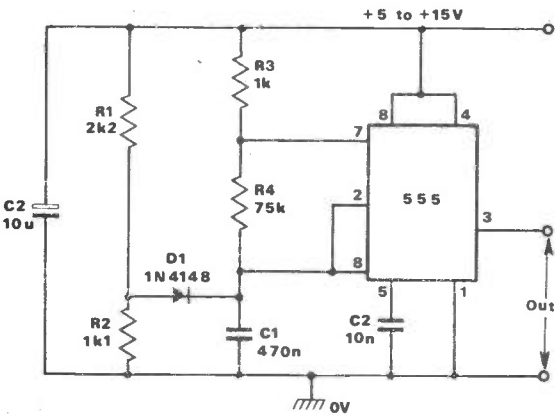


Fig 7 'Precision' low frequency (approximately 20Hz) astable

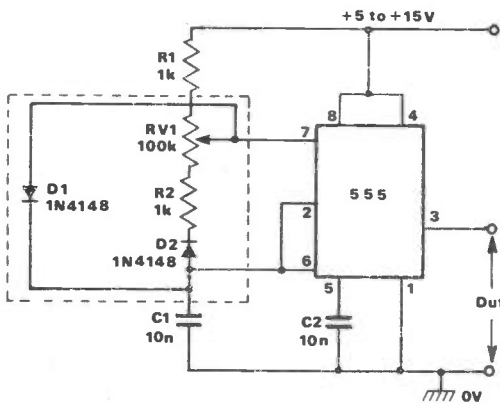


Fig 5 Astable with mark and space periods independently variable from 7μs to 750μs, showing alternative positions for RV1

Mark/space control

The basic Figure 2 circuit can be made to generate a fixed frequency output waveform of any desired mark/space ratio by suitable selection of the R1 and R2 values. In each operating cycle, C1 alternately charges via R1-R2 and discharges via R2 only. Thus if R1 and R2 have equal values the circuit will generate a 2:1 M/S ratio, and so on.

The mark and space periods can be independently controlled by using the circuit of Figure 5, in which C1 alternately charges via R1-D1 and discharges via RV2-D2 and R2. R2 protects the IC against damage in the event of RV2 being reduced to zero ohms.

In the Figure 5 circuit the mark and space periods can be independently varied over a range of approximately 100:1, enabling the M/S ratio to be varied from 100:1 to 1:100. Note that the frequency varies as the M/S ratio is altered.

Figure 6 shows alternative ways of connecting the 555 astable so that the mark/space ratio can be varied without altering the operating frequency. In these circuits the mark period automatically increases as the space period decreases, and vice versa, so that the total period of each operating cycle is constant. In such circuits, the feature of interest is the 'duty cycle' or value of the 'on' period relative to the total period of each operating cycle, and in Figure 6 the duty cycle is variable from 1% to 99% via RV1.

In the Figure 6a circuit, C1 alternately charges via R1-D1 and the upper half of RV1, and discharges via D2-R2 and the lower half of RV1. In Figure 6b, C1 alternately charges via R1-D1 and the right-hand half of RV1, and discharges via D2-R2 and the left-hand half of RV1. Both circuits operate at a nominal frequency of about 1.2KHz with the C1 value shown.

'Precision' astable

In the description of basic astable operation given earlier, it was pointed out that in the initial half-cycle of

operation timing capacitor C1 charges from zero volts to $\frac{2}{3}V_{CC}$, but in all subsequent half-cycles it either discharges from $\frac{2}{3}V_{CC}$ to $\frac{1}{3}V_{CC}$ or charges from $\frac{1}{3}V_{CC}$ to $\frac{2}{3}V_{CC}$. Consequently the initial half-cycle of astable operation has a far longer period than all subsequent half-cycles.

In applications in which a low frequency clock signal is needed, this large period discrepancy can cause practical problems. Fortunately, however, this problem can be overcome by adding an external voltage divider and diode to bias C1 to slightly below $\frac{1}{3}V_{CC}$ (rather than zero volts) at the moment of switch-on, as shown in Figure 7. Here, R1 rapidly charges C1 to $\frac{1}{3}V_{CC}$ via D1 at the moment of switch-on, and all C1 charge is subsequently controlled by R3 and/or R4 only.

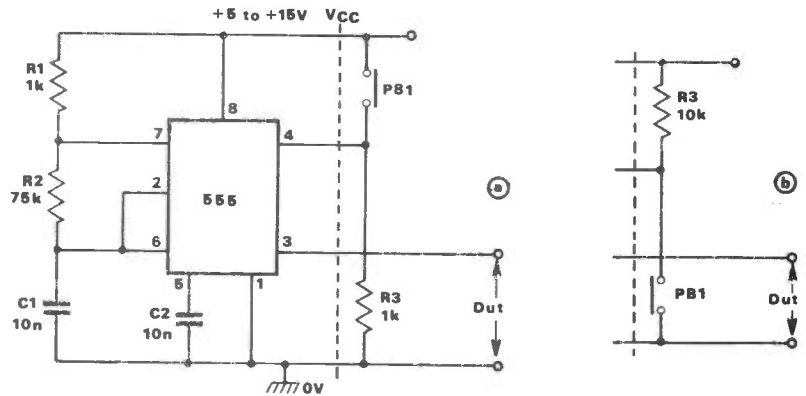
Astable gating

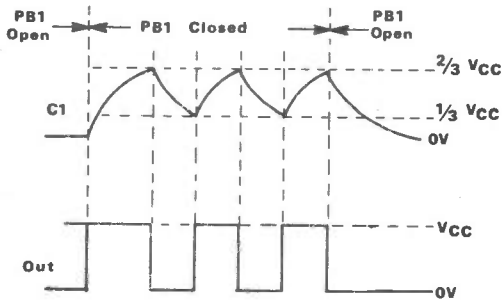
The 555 astable can be gated 'on' and 'off', via either an electro-mechanical switch or an electronic signal, in a variety of ways. The most popular way of gating the device is via the pin 4 'reset' terminal, and Figure 8 shows alternative ways of gating the IC via this terminal and a push-button switch.

The characteristics of the pin 4 'reset' terminal are such that if the terminal is biased above a value of about 0.7 volts the astable is enabled, but if the terminal is biased below 0.7 volts by a current greater than 0.1mA (by taking the terminal to ground via a resistance less than 7KΩ, for example) the astable is disabled and its output is biased low. Thus the Figure 8a circuit is normally gated off by R3, but can be turned on by closing PB1 (thus biasing pin 4 high), while the Figure 8b astable is normally on but can be gated off by closing PB1 (thus shorting pin 4 to ground). These two circuits can also be gated by applying suitable electronic signals directly to pin 4.

Note in Figure 8 that the precise circuit waveforms of C1 and the output terminal are shown for Figure 8a, and that the duration of the first half-cycle of operation is considerably longer than the

Fig 8 Gated 1KHz astable with a) press to turn on, and b) press to turn off operation





Waveforms for Figure 8a

succeeding half-cycles. Also note that when the astable is first gated off, the C1 voltage takes a substantial time to decay to zero; the pin 3 output terminal is zero under the 'off' condition. The Figure 8b circuit has similar waveform characteristics.

Alternatively . . .

Figure 9 shows an alternative method of gating the 555 astable. Here, Tr1 is normally biased on via R1 and thus acts like a closed switch which (via R2) pulls the C1-R4 junction to near zero volts and thus prevents the astable from operating. When switch PB1 is closed, Tr1 is biased off and the astable is then free to operate in the normal way. Note in this circuit that when the astable is gated on, the first half-cycle is again considerably longer than the succeeding half-cycles, and that the C1 voltage falls rapidly to near zero at gate-off. Also note that the pin 3 output is high in the 'off' state.

Figure 9b shows how the above circuit can be modified to give 'press-to-turn-off' operation by simply replacing Tr1 with a push-button switch. Note that an electronic (digital) signal can be used to gate this circuit by connecting a diode as indicated and eliminating PB1. In this case the circuit will gate off when the input signal voltage is reduced below $\frac{1}{3}V_{CC}$.

Finally, to complete this look at 'gating' techniques, Figure 10 shows how the Figure 9 circuit can be modified so that the duration of the first half-cycle is almost equal to that of all succeeding half-cycles, thus giving 'precision' operation.

In this circuit, when PB1 is open Tr1 is saturated, so potential divider R2-R3 pulls the R5-C1 junction to slightly below $\frac{1}{3}V_{CC}$ via D1, thus gating the astable off. When PB1 is closed, Tr1 turns off and D1 is reverse biased via R2, and the astable is thus free to operate in the normal way. Note that when PB1 is first closed C1 starts to charge from an initial value of almost $\frac{1}{3}V_{CC}$, rather than from zero volts, and the duration of the initial half-cycle is thus similar to that of all succeeding half-cycles.

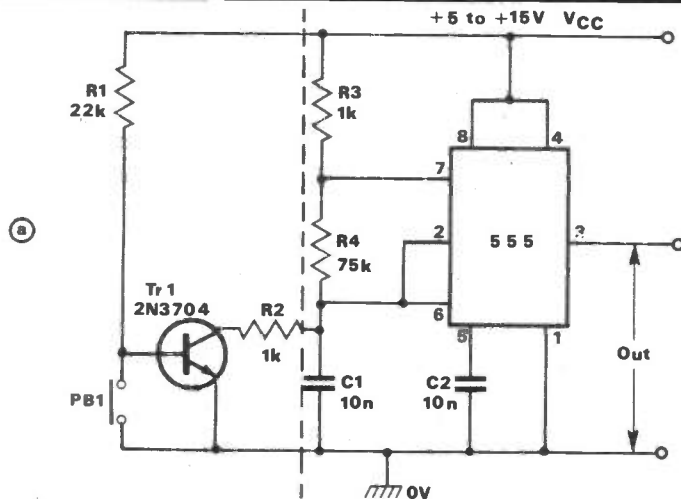
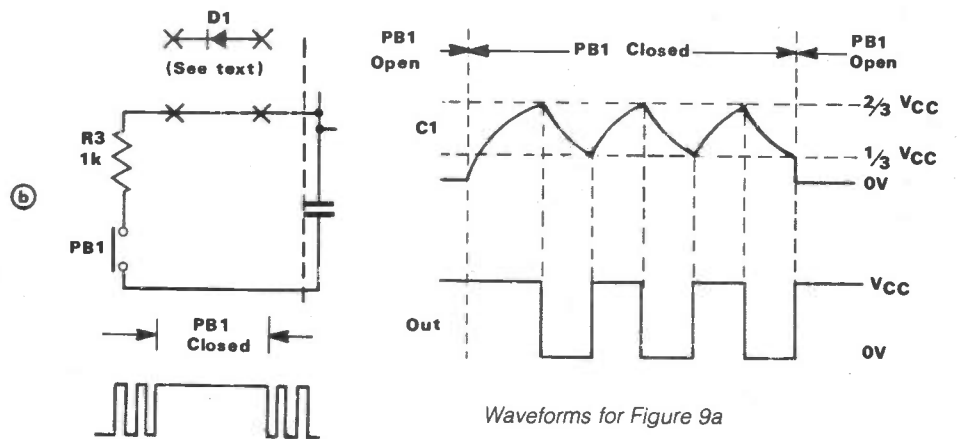


Fig 9a Alternative gated 1KHz astable with press to turn on operation



Waveforms for Figure 9a

Fig 9b Modification for press to turn off

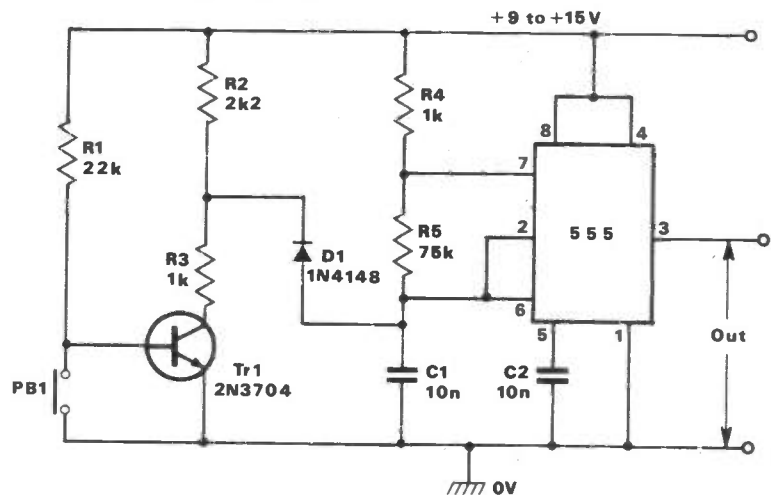
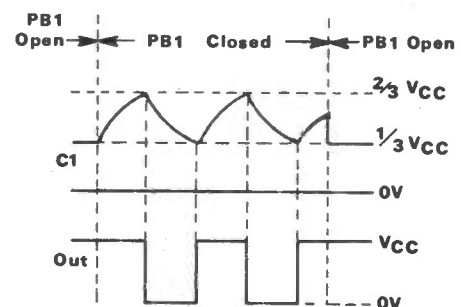


Fig 10 'Precision' version of the Figure 9 circuit



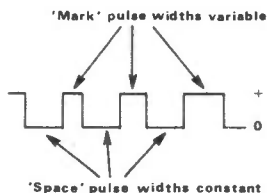
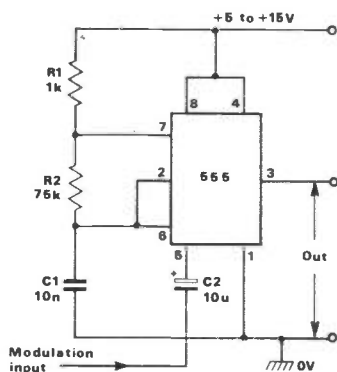


Fig 11 Method of applying ac coupled FM or PPM to the 555

FM and PPM

All the 555 astable circuits that we have looked at can be subjected to frequency modulation (FM) or pulse-position modulation (PPM) by simply feeding a suitable modulation signal to pin 5, which is connected to part of the internal potential divider chain of the IC. This modulation signal can take the form of an ac signal that is fed to pin 5 via a blocking capacitor, as in the case of *Figure 11*, or as a dc signal that is fed directly to pin 5, as in the case of *Figure 12*.

The action of the 555 IC is such that the voltage on pin 5 influences the width of the 'mark' pulses in each timing cycle, but has almost no influence on the width of the 'space' pulses. Thus, since the pin 5 signal influences the position of each 'mark' pulse in each timing cycle, this terminal provides pulse-position modulation (PPM), and, since the signal influences the total period of each cycle

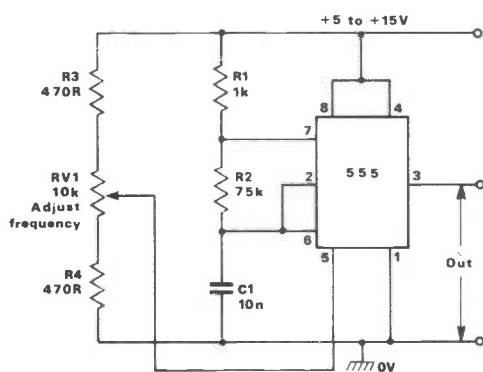


Fig 12 Method of applying dc coupled FM or PPM to the 555

(and thus the frequency of the output signal), the terminal also provides frequency modulation (FM). These facilities are useful in special waveform generator applications.

Alarms and sirens

One of the most popular applications of the 555 astable circuit is as a waveform generator in loudspeaker-driving 'alarm' and 'siren' sound generator circuits.

Figure 13 shows the connections for making an 800Hz monotone alarm-call generator. This circuit can be used with any supply in range 5 to 15 volts, and with any speaker impedance. Note, however, that R_x must be wired in series with speakers having impedances less than 75R, and must be chosen to give a total series impedance of 75R, to keep the peak speaker currents to within the 200mA driving constraints of the 555 IC. The available alarm output power of the circuit depends on the speaker impedance and supply voltage used, but may be as great as 750mW when a 75R speaker is used with a 15 volt supply.

Figure 14 shows how the output power level of the above circuit can be boosted

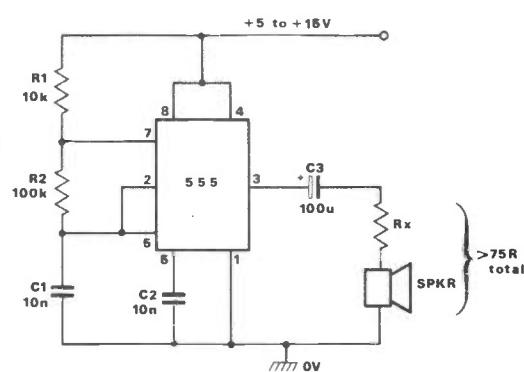


Fig 13 Low power (750mW max) 800Hz monotone alarm-call generator

to several watts via buffer transistor Tr1. Note that the consequent high output currents of the speaker may apply significant ripple voltage to the power supply line, and D1 and C3 are used to protect the 555 IC from the effects of this ripple. D2 and D3 are used to clamp the inductive switching spikes of the speaker and thus protect Tr1 against damage.

Figure 15 shows how a pair of 555 astables can be used to make a pulsed-tone 800Hz alarm-call generator. Here, IC1 is wired as an 800Hz alarm generator, and IC2 is wired as a 1Hz astable which gates IC1 on and off via D1 once every second, thus causing a pulsed-tone output signal to be generated.

For some interesting alarm-call applications of the 555 IC the reader is referred to the October 1984 edition of *Data File*, in which circuits generating 'British police', 'American police' and 'red alert' (à la Star Trek) alarm tones were featured.

Next month

In the next *Data File* we will look at some miscellaneous applications.

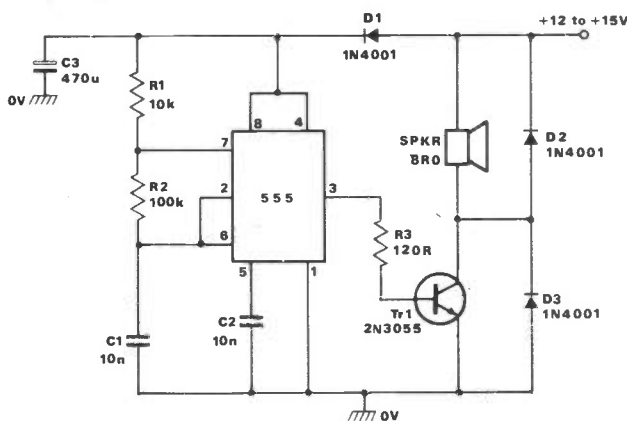


Fig 14 Medium power 800Hz alarm-call generator

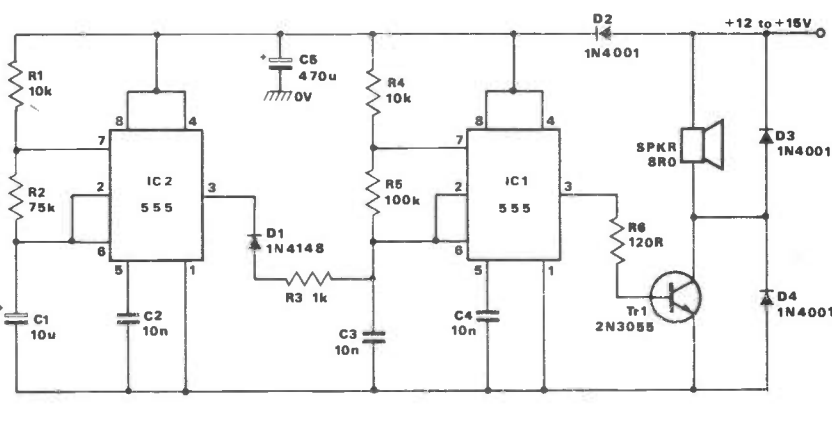


Fig 15 Pulsed-tone 800Hz alarm-call generator

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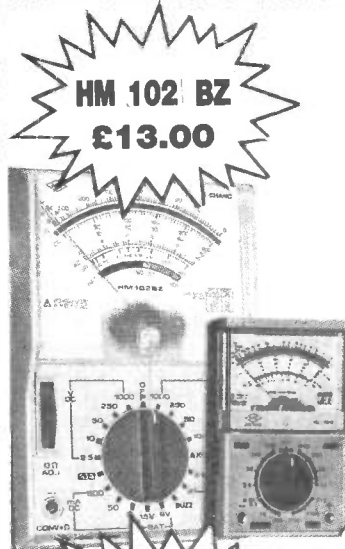
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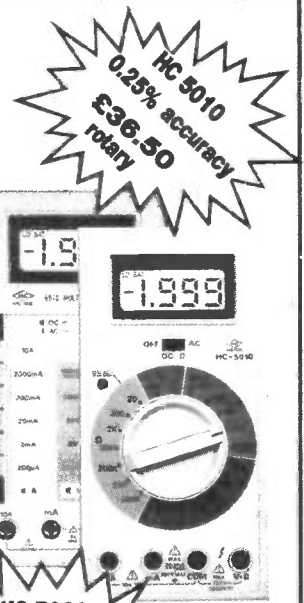
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DX-TV

RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

With the onset of the 1985 sporadic-E season, April showed an improvement in long-distance TV reception conditions. Sporadic-E activity occurred on more than one occasion during the month and even tropospheric reception from France, West Germany, Belgium and the Netherlands was a reality towards the end. There was also an instance of possible reception from Africa on channel E3 by one enthusiast. More about this in the reception reports section later.

DX log for April

The following log shows reception conditions noted by the authors in Derby:

4/4/85: SR-1 (Sweden) on channel E2 with the PM5534 test card carrying the usual 'TV1 SVERIGE' identification; BR-1 (Bayerischer Rundfunk from West Germany) showing the FuBK test card with 'GRUNTEN' transmitter location information.

9/4/85: SRG-1 (German language service in Switzerland) on channel E2 from the transmitter at Bantiger radiating the FuBK test card and the inscription '+PTT SRG1'; SR-1 on E2 with the PM5534 test card.

15/4/85: CST (Czechoslovakia) on channel R1 with the 'RS-KH' electronic test pattern.

16/4/85: CST on R1 and R2 with the EZO-type test card; ORF (Austria) on channel E2a using the PM5544 test card and 'ORF FS1' identification; Switzerland on E2 with the '+PTT SRG1' FuBK test card.

17/4/85: TVE (Spain) on channel E2 with colour bars. The signal was noted at 1239.

18/4/85: TVE on E2 with the GTE colour test card and 'tve tve' identification.

19/4/85: CST with the 'RS-KH' test card on channels R1 and R2; TVE on E2 radiating a colour-bar pattern.

24/4/85: CST on R1 and R2 with the EZO-type pattern; TVE on E2 with the colour test card.

25/4/85: CST with the 'RS-KH' pattern on channel R1.

27/4/85: Unidentified signal via sporadic-E which consisted of a football match at 1532 on channel E2.

29/4/85: BR-1 on channel E2 radiating the 'GRUNTEN' FuBK test card; SR-1 on E3 with the 'TV1 SVERIGE' PM5534 test card; TVE with a colour-bar pattern on E3. This included transmitter identification but

the signal was unfortunately too noisy for positive identification; CST on R1 with the 'RS-KH' test card; an unidentified pattern was noted via sporadic-E from the south. The signal consisted of a pulse and bar pattern with a greyscale towards the right-hand side of the picture.

30/4/85: Czechoslovakia using the EZO-type pattern; TVP (Poland) on channel R1 with their unique version of the PM5544 test card; SSR-1 (French language service in Switzerland) on channel E4 with the FuBK test card carrying the identification '+PTT SSR1'. Reception was from the transmitter at La Dôle.

Reception reports

Simon Hamer of New Radnor in Powys has been quite active during April. On the 1st and 5th he noted the Telefunken test card from Austria on channel E2a. The identification was 'ORF FS1'. Also on the 5th, signals from Poland were seen on channel R1 with the PM5544 test pattern. This particular test card, which has a darker background than a standard PM5544, was also spotted on channel R2.

Sweden made an appearance on the 8th with programmes and the clock caption. Reception was on channel E2. Simon points out that Sweden's familiar 'SR' identification has been changed to 'SVT'. For the time being we'll refer to Sweden as 'SR/SVT', as most enthusiasts know the TV service by its original identification.

There was some activity on the 14th at Simon's location with programmes from RAI in Italy on channel 1A. Shortly after that DX-TV conditions declined somewhat until the 23rd. He then resolved SR/SVT on E2 with programmes and the French 'Canal Plus' service on channels 5 and 6. Signals were apparently of 'excellent quality'. On the 30th the PM5534 test card appeared from Sweden on E2 carrying the inscription 'TV1 SVERIGE'.

Moving briefly into May, May Day itself brought in Russian programmes from TSS which included scenes from the traditional big parade in Red Square. Reception was on channels R1 and R2. According to Simon a cheerful (!) Russian general was interviewed with several smiling onlookers standing in the background. Signals from ORF-Austria on channel E2a were also noted on May 1st.

Kevin Jackson of Leeds has now equipped himself with a 3-element wideband Band III array and finds it has improved his daily reception of Canal Plus on channel F5. The array is mounted in his living room since he lives in a multi-storey block of flats. Larger aerials can't be used for obvious reasons, but it certainly makes you wonder what he might receive if he could cram a few extra elements in!

Kevin noted a lift in tropospheric conditions on April 3rd when programmes from French, Belgian and Dutch TV stations were received on the following channels: tf1 (France) on E27, BRT (Belgium, Flemish language) on E43 and E46, RTBF (French language service in Belgium) on E8 and NOS-2 (Netherlands) on channel E39. The period between the 18th and 22nd was even better with additional signals from West Germany including NDR-1 (Norddeutscher Rundfunk) on E43, NDR-3 on E40 and E43, ZDF (West Germany's 2nd network) on E37 and E35, plus WDR-3 (Westdeutscher Rundfunk) on E48. Belgian signals were typically BRT on E10, E43, E46 and E49, with RTBF on E8, E57 and E63. French stations were located throughout the UHF band on the 22nd with Antenne 2 (A2) on E21, E39 and E48, tf1 on E42 and FR-3 on E24, E45 and E60.

A rather impressive sporadic-E opening was noted during the afternoon of April 29th. The Yugoslavian PM5534 test card was logged at 1445 on channel E3. The test card carried the identification 'JRT BGRD 1'. Over on channel E4 at 1454 a news programme was seen which originated from the Yugoslavian transmitter at Psunj.

Just before despatching his reception report, Kevin observed an increase in meteor-shower DX activity on the 30th. There were many pings and bursts although the only transmission to be positively identified came from TVE in Spain.

Another DX-TV log from the Leeds area has come via Kevin and covers reception noted by Mark Dent. Apparently reception from RTE in Eire on channel H is a daily occurrence for Mark, who uses a 3-element wideband Band III aerial feeding a D-100 DX-TV converter and a monochrome portable. Signals from the Continent appeared on the 22nd with RTBF programmes from the Wavre transmitter on E8, BRT on E10 (also from the Wavre outlet), E43 and E46 together with Canal Plus signals on F5.

Incidentally, it seems that elaborate aerials aren't really necessary in Leeds. An interesting experiment was conducted on the 22nd. Using nothing more than a pair of 4 inch map dividers pushed into the aerial socket of Kevin's D-100 converter he was able to lock the picture from Canal Plus!

What do you do when stropky neighbours object to your hobby? That's what

several DX-TV enthusiasts have asked recently. Many amateur radio operators have encountered this problem over the years and, of course, they always attract the blame when their neighbour's TV set goes on the blink. And if you go to the trouble and expense of fitting filtering to their poorly designed set, what happens? The TV picture will never be the same again!

One of our regular readers is the latest casualty and he doesn't possess transmitting equipment of any description. Both his neighbours object to his hobby of DX-TV despite the use of loft aerials. To make matters worse one of his friendly neighbours has only just moved in and his new pride and joy (a Philips colour TV with 'Supersound') radiates and splatters on most of the DX channels, causing patterning and negative images. So much for modern technology which is 'simply years ahead'. Any suggestions on how to woo neighbours into not becoming downright pests would be welcome. Advice on a post card please via the Editor!

Meanwhile, Chris Howles of Lichfield has been experiencing similar problems, but fortunately he has been able to see quite a lot of Band I DX recently. During April he noted a steady signal on channel E3 which exhibited ghosting and smearing effects at times. At first he thought it was RTBF from the Liège transmitter in Belgium because there was a slight tropospheric lift at the time. However, RTBF or BRT normally also appear on channels E8 and E10 during enhanced conditions but there was no sign of either service. The signal was noted during the late afternoon but unfortunately a more accurate record of the actual date has gone astray. Since Chris uses a fixed Band I beam in the loft he was unable to rotate it in order to check on the general direction of the signal. Optimistically it may have originated from an African country such as Ghana or Nigeria. Experience over the years has shown that reception often occurs before the start of the main sporadic-E season.

During the tropospheric opening on



A simple test pattern radiated in Denmark by Kobenhavns Kristne Radio/TV

April 22nd, Chris was pleased to receive West Germany on channel E9. The Westdeutches Fernsehen outlet at Langenberg was noted radiating the FuBK test pattern complete with the identification 'WDR1 LA9'. French signals were seen too in Band III and at UHF. A transmission which he hopes may have been RTL-Luxembourg was logged on channel E27.

Fred Pilkington of Newmarket in Suffolk has forwarded a video tape of Middle East TV test cards and captions recorded in Kuwait. The tape is extremely interesting and we hope to feature some of the transmissions from this region in the near future. A strange phenomena exists in this part of the world. Due to the general pattern of weather, tropospheric ducting is commonplace and in several Middle East countries viewers are able to regularly tune in to broadcasts which originate several hundred miles away. Most of the TV services in this area fully realise that they have an enlarged audience and they turn this to their political advantage with carefully scheduled programmes during trop conditions.

Many stations in the Middle East operate in Band III and on UHF but in recent years there has been an increase in the use of Band I channels. The most likely transmissions to be received in the UK via multi-hop sporadic-E would be from the following countries: Jordan (channel E3), Lebanon (E2 and E4), Syria (E3 and E4), Egypt (E2 and E4), Iran (E2), Dubai (E2) and Saudi Arabia (from Dhahran on E3).

Iran on channel E2 and Aramco TV on E3 from Saudi Arabia appeared in the UK last year via multi-hop sporadic-E propagation. Unfortunately, such reception is extremely rare. Jordan on E3 is, however, comparatively frequent, especially when an intense opening to the south-east is in progress. So, next time JRT is in from Yugoslavia make a note of the picture floating over it. It could well be DX from the Middle East!

It makes you laugh...

Want to hear a joke? Well, it seems that the world-famous BBC test card 'F' has a lot to answer for. Regular trade test transmissions were discontinued by the BBC in May 1983. Since then, sample pages from the teletext service 'Ceefax' have been laboriously radiated between breaks in scheduled programmes.

We can only assume that Ceefax began to rule the airwaves (a) to increase the Ceefax Empire at Television Centre, (b) to make the lives of those working in the BBC Presentation Department simpler and (c) to irritate and annoy field TV service technicians who are now expected to install and align receivers using nothing more than boring teletext pages.

When we questioned the BBC as to why

they have spent a lot of time and effort designing a fully digital version of test card F only to scrap it in favour of Ceefax, we were fascinated by their reply. Now comes the funny bit. Mr Charles Hope of the Engineering Information Department (this particular department is normally noted for its well-reasoned and sensible deliberations, but on this occasion there must have been an aberration) informed us that: 'The test card of course should never be used for adjustments to television sets. Obviously it is of use to the aerial trade if we carry a signal on our transmitters so that they can optimise an aerial for reception on all four channels. What that signal actually is is not that important'.

Now for Mr Hope's 'pièce de résistance': 'Television dealers who leave receivers switched on in the showrooms do not particularly appreciate the constant transmission of the test card since it can lead to damaged CRTs.'

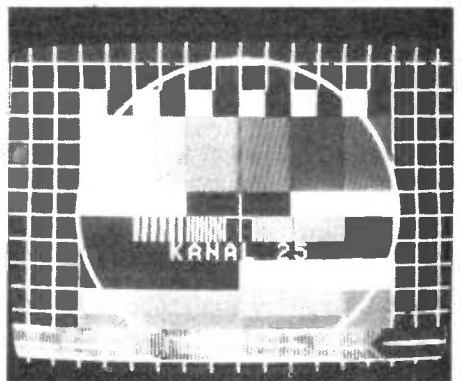
So with the dire warning that your TV set could have a permanent copy of test card F emblazoned across the tube if bought prior to May 1983, you'd better check your telly straightaway. But worse is to come. According to Mr Hope's stunning theory, sets bought after that date will have the word 'Ceefax' neatly etched onto the screen in the top left-hand corner!!

Czech translation

In the May issue of *R&EW* we posed the problem of translating the following phrase: 'Dalsi vyssi kanály jsou cleneny s odstupem 8MHz az do kanálu c 81'. The information was originally received by Kevin Jackson of Leeds from the Czech TV service in Prague. Fortunately Mr J Prokopius of Crowthorne in Berkshire read our DX-TV column and has sent the following translation: 'The other higher channels are separated with a gap of 8MHz up to channel C'. So now we know, thanks to Mr Prokopius.

Danish TV update

In the March issue we gave details about the new television services in Denmark. The information was supplied



FuBK test card from Kanal 25 in Denmark (photos courtesy of Michael Summers Larsen)

DX-TV RECEPTION REPORTS

by Michael Summers Larsen of Taastrup near Copenhagen, and he has since written with further details. He has also sent photographs of the latest Danish test cards; these are featured this month.

In Copenhagen the station originally known as 'Kanal Plus' has changed its name to 'Weekend-TV'. An agreement has been reached with 'Kanal 2' so that this station will broadcast for the first four days of the week. Weekend-TV, as its name suggests, will be aired on Fridays, public holidays and at weekends.

Kanal 2 transmissions have been scrambled since last March. It costs about £80 to receive the station, which at the present time has only approximately 4 to 5 hours of programming per day. A special decoder is required to receive Kanal 2 transmissions. These are manufactured by the Finnish company, Salora. Michael, who reads *R&EW*, would like to know whether anyone knows of a cheaper method of receiving the service. If you think you can help Michael then please send any information via *R&EW*.

The state-owned television service in Denmark (known as 'Danmarks Radio') is planning to install a UHF transmitter in Copenhagen. This will improve reception in the eastern half of Sjælland. During the summer months local reception is frequently affected by sporadic-E conditions. This is fine for Danish DX-TV enthusiasts but the rest of the population don't take too kindly to having their VHF signals ruined by reception from Italy or Spain!

It hasn't yet been decided whether Danmarks Radio (DR) should have a second TV service. The cost is rather prohibitive and it has been estimated that 16 UHF transmitters will be required to cover the whole of Denmark. However, initially only four would be necessary to provide a service for about 60% of the potential audience.

At present there are three regional TV services operating in the Jylland (or Jutland) area. These are HDH-tv on channel E52 from Horsens, Kanal ATV on channel E54 located at Aarhus, and Naer-tv from Aalborg on E54. In the Fyn

region there are the following services: TV-Odense and Kanal Fyn sharing channel E53; TV-Svendborg which broadcasts on channel E52.

Far away to the east of Denmark in the Baltic Sea is the island of Bornholm. It has its own regional TV service known simply as TV-Bornholm. This operates on channel E59. Because of its geographical location (between Sweden and Poland) it is an ideal source from which to obtain TV output from the Polish TV service, TVP. Danmarks Radio often features transmissions from Poland in their news bulletins. It is thought that Polish programmes are fed into the Eurovision network via the regional TV service on Bornholm. Although only a small installation, it is a vital link between the Eastern bloc and Western Europe.

Our thanks to Michael for sending the above information. Incidentally, if there are regular readers of *R&EW* overseas (and we know there are!) then we would be pleased to hear from you with details about your local or national TV service. If you can send photographs of test cards or identification captions then so much the better.

Nice to see you

By all accounts the recent annual rally organised by the British Amateur Television Club (BATC) was a resounding success. The authors of this column were there but we didn't have time to look around the show! We were kept flat-out demonstrating DX-TV reception, but nevertheless we had the opportunity to meet a number of regular contributors to this column, so we can now put faces to the names.

Thanks to all those who passed on favourable comments about our regular DX-TV spot.

Moroccan test card Identification

Last year several DX-TV enthusiasts received the PM5534 test card from the Moroccan channel E4 transmitter at Laayoune. It carried the identification 'RTM' (Radiodiffusion-Télévision Marocaine) as well as Arabic script. The same

dual identification has also been noted during reception via satellite. However, an enthusiast living in southern Spain has reported that the test card carries only Arabic inscriptions.

It is thought that the PM5534 test card carries Arabic identification when radiated via terrestrial transmitters, whereas the satellite transmissions carry both forms of identification. The theory is that the Laayoune outlet, situated in the far south of the country, takes its feed from the satellite. If anyone can shed further light on the subject, please write in.

Service Information

Ire: The RTE-2 network is now radiated from the following transmitters:

Cahirciveen Ch J 1KW ERP
Letterkenny Ch J 2KW ERP
Kippure/Dublin Ch J 1KW ERP
Three Rocks Ch 33 25KW ERP

The following transmitters have increased their ERPs from 100KW:

Mullaghanish/Cork RTE-1 Ch D 220KW
Mt Leinster/Kilkenny RTE-1 Ch F 220KW
Truskmore/Sligo RTE-2 Ch G 280KW
Mullaghanish/Cork RTE-2 Ch G 220KW
Truskmore/Sligo RTE-1 Ch I 280KW
Mt Leinster/Kilkenny RTE-2 Ch I 220KW

Macao: Teledifusora de Macau (TDM) has commenced broadcasting with five hours of programmes each day. Films from China, England and the Portuguese TV service (RTP) are regularly shown.

A second TV network (in the Cantonese language) is already being planned.

Cyprus: A new transmitter has come into service on channel E38. The 7KW outlet at Limassol radiates the 1st network of the Cyprus Broadcasting Corporation.

Greece: There are three new UHF transmitters radiating programmes from EPT-1 as follows: Tholopotamos-Hios on channel E22 with 30KW; Lithotopos-Serrai on E22 with 3KW; Mesta-Hios on E24 with 2.2KW ERP.

Our thanks to Gösta van der Linden (Rotterdam, Netherlands) and Alexander Wiese (Munich, West Germany) for supplying this month's service information.

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MEDIUM WAVE



DXING

by Steve Whitt

Welcome to the August column, especially to those dedicated readers who have taken their receivers away on holiday with them. Maybe you've only got room for a small portable in your luggage, but if you do hear anything interesting in this way do let me know.

For those not disappearing to exotic locations, now is the time to start to overhaul your receiving set-up; perhaps your receiver needs realignment or your outdoor aerials could do with some maintenance. It is all the more important to have your gear in tip-top condition this coming winter since we are slowly approaching the minimum of the current sunspot cycle, and potentially there should be some very good DX around.

Sunspot cycle 21

Sunspots are localised disturbances visible on the surface of the sun which were first noticed by the ancient Chinese, though they were 'rediscovered' by Galileo when he invented the telescope. Since the 18th century detailed records of these disturbances have been kept by astronomers, but it was not until a few decades ago that a link was established between the number of sunspots present and radio propagation.

Over many years it has been noticed that the sunspot count varies cyclically with a period of approximately eleven years. Not every cycle is identical, but on

average the sunspot count ranges from 0 at sunspot minimum to about 200 at sunspot maximum. We are currently in cycle 21, the maximum of which occurred in December 1979; the present sunspot activity is very low and the minimum could be reached in the next twelve to eighteen months.

The sunspot count has proven to be a good indicator of overall solar activity and is thus a good indicator of the effect this activity will have upon radio propagation here on Earth. The sunspot count is the most reliable index of the ionosphere's refractive efficiency, ie its capability for reflecting radio waves earthwards.

Whilst the sunspot minimum is often viewed as a rather lean period for the short wave broadcaster and listener, since the maximum usable frequency for long distance transmission tends to decrease, it is this portion of the sunspot cycle during which the best MW DX is possible. For instance, during previous sunspot minima reception of stations on the west coast of North America was a possibility.

Starting point

This month we will take a quick look at the world of QSL cards and how they relate to the MW DXer. Essentially the QSL card is a confirmation that a listener has heard a particular radio station, and is normally obtained by sending a station

a reception report giving details of reception conditions and of the programme material heard as proof of reception.

Historically, the QSL card originated in the days when stations relied on reports from listeners to determine their coverage area. Nowadays, however, many stations use reports from professional monitoring stations and have more accurate coverage predictions available, and consequently the QSL card survives largely as a service from the station's point of view and as an element of the DX hobby from the listener's point of view.

Additionally there is a significant difference in QSL policy between the international short wave broadcaster, which issues QSLs to maintain contact with and gauge the size of its audience, and the local medium wave station being heard outside its usual coverage area. At best, the latter will treat a far off reception report with curiosity and will send out a QSL as a public relations exercise. At worst, to a station operating with few staff and a limited budget, reception reports from DXers can be a downright nuisance. It is therefore vital that MW DXers follow some simple guidelines when sending reception reports to stations.


Firstly I would suggest that a personal letter to the engineer or manager together with a detailed report of reception conditions and adequate programme details to prove that you did hear the station are the basic requirements.

Additionally make a polite request – not a demand – for a QSL card or letter confirming reception, and remembering that most MW stations are local affairs run on limited budgets it is wise to write to them in their own language (or that used in the programme) and to enclose return postage in the form of an International Reply Coupon (IRC) or mint stamps.

Remember that if you follow these tips, not only should you receive more QSL cards, but you will help maintain good relations between stations and the DX fraternity in general.

To conclude this section here are a few more MW listening tips; again all are in English and readily heard using elementary equipment (times are GMT/UTC and valid till October).

846KHz RAI Rome, Italy 2303-2306
918KHz R Ljubljana, Yugoslavia
2335-2340 (Mon-Fri)
963KHz R Finland 2100-2125
1386KHz R Moscow, USSR 2100-2400
1557KHz R Mediterranean, Malta
2230-2315

Lastly, a brief reminder that any and all suggestions and contributions for this column would be more than welcome. 73s till September. 

DX FILE

As mentioned last month, the summer months can provide some interesting listening; admittedly there can be high levels of radio noise but on quiet days one can hear stations that may be inaudible at other times of the year. For

example, summer is a good time for Afro-DX since Europe is operating summer time; this opens up an extra one hour window to Africa after the Europeans sign off at around 2200GMT. My log reveals the following:

- 765 ORTS Senegal, vernacular + Afro mx @ 2325 19 May
- 891 RTA Algiers, play in AA massive signal @ 2330 21 May
- 1100 R Globo Sao Paulo Brazil, PP @ 0047 1 June
- 1220 R Globo Rio de Janeiro Brazil, regular as early as 2224 19 May
- 1402 Libya, Koran in AA heard during holy month of Ramadan @ 2330
- 1404 Conakry Guinea, FF and vernacular + Afro mx regular 2230-2330
- 1481 United Arab Emirates, talk in AA @ 0003 25 May
- 1512 Saudi Arabia, Koran in AA good signal @ 2300 20 May

Key: AA=Arabic, FF=French, PP=Portuguese, mx=music

ATV ON THE AIR

Presented by
Andy Emmerson G8PTH

As the more astute of you know, this column exists in a sort of timewarp. Apart from the fact that I still live in the black and white era, this column is written about two months before you read it, so what seems super-topical when I feverishly write it can be old hat by the time you read it! So if I say the rally season has just started you should read 'is now well under way'.

Anyway, it seems to be a good year for video cameras at the rallies I have attended so far – perhaps the traders see us ATVers as a good sales market. With this surfeit of surplus riches I thought it might be a good idea to run down the finer points of buying a second-hand camera. What to look for, traps for the unwary and how much to pay...

Decisions, decisions ...

If you're like me you go to rallies not intending to spend a lot of money, but all the same you don't feel the trip was worthwhile if you don't buy *something*. A bargain camera is difficult to resist, even if you already have one or more – it would be useful for mounting on a wall bracket looking down on the shack, or for captions, or for setting aside for portable operation...

Monochrome cameras are more common than colour ones and I would tend to steer clear of buying a colour camera at a rally. You're really on your own if the colour camera turns out a lemon: for a start it may be difficult to get back to the seller. Many colour cameras are poor bargains anyway, since they will almost certainly need a kilowatt of light for indoor use and have poor resolution. If a tube turns out to be burnt you can reckon on an expensive replacement. Often the lens is not interchangeable and may have only a 2:1 zoom range. Its CCU may be missing and there's no way to 'try before you buy'. Expect to pay £100 to £200 for a second-hand colour camera.

Black and white cameras are a safer bet. For a start the price range is usually £20 to £60, which is less to lose. Also they are much easier to get going even if there turns out to be a fault, and replacement vidicons should cost no more than a fiver or a tenner.

The mono cameras on the market generally fall into three types. Firstly, there are recent surveillance jobs with $\frac{3}{8}$ in vidicons, which tend to be pricey (£40-£50) and very good in terms of

picture resolution and sensitivity – a 100W light-bulb will give a picture with good contrast. For around £25-£30 you can find an older, larger surveillance camera with a 1in tube. Many of these are good, too. Finally there are the smaller studio cameras, usually with external sync options and often with a viewfinder. These give excellent pictures but can cost up to or just over £100.

Points to watch

When choosing a camera check its external condition. If it looks well looked after it probably is. Try to get a good lens with it; buying a lens separately can cost almost as much as the camera!

Look for a racking knob, usually a knob on the rear panel labelled mechanical focus. Without this you will have to open up the camera each time you change the lens.

Avoid cameras with infra-red or ultra low-light tubes (unless you have a special need for them) – the replacement tubes are expensive and they go mad in normal daylight. Cameras with lots of switches and sockets on the rear panel are usually de luxe models and worth seeking out for this reason alone.

Some cameras, too, are designed to run off batteries, or at least have a 12 volt option. If you are intending to use the camera as a portable this should be borne in mind. Sony hand-held cameras and the Philips mini-compact camera will work off 12 volts, though some Sonys need special pulses.

The switches may include the following. V/RF (or V/HF): this selects video or low-band VHF from the output connector. Int/Ext: this refers to internal or external syncs – in the 'Ext' position you can genlock the camera to a central sync pulse generator, which is important if you have a multi-camera studio. Hi/Lo: this refers to sensitivity and indicates that the camera will work in low-light conditions. V/VS (or Sync off/on): cameras so fitted can produce non-composite video, which is necessary for some effects generators. Normally you have sync on, ie VS or video and sync.

Lenses are pretty straightforward. Check that they have not been 'bounced' and that the moving parts operate freely. An F rating of significantly more than 2 is not much good for TV work, and F1.9 or F1.4 will let much more light into the vidicon. Beware of the cheaper lenses

with no iris: a good lens should have both focussing and iris rings, the exception being the fixed focus wide angle jobs. Good names include Dallmeyer and Taylor Hobson (UK), Angenieux and Berthiot (France), Schneider (Germany) and Cosmocar and Tamron (Japan).

Grubby

A grubby lens can be cleaned with lighter fuel and paper tissue – and a bit of care! Lenses designed for $\frac{3}{8}$ in tube cameras will give an incomplete image on a 1in camera – there will be shading around the edge of the picture. They are usually marked f=16mm, whereas lenses for 1in tubes have f=25mm (or more) on them.

Vidicons look robust but benefit from care. In particular avoid holding them face down (loose particles may drop and damage the target) and keep them away from bright lights, even when not powered, as they can be 'burned'. When you get home and try out your new acquisition the picture may well be blemished: small spots are there for good, but bright patches (common on surveillance cameras, having been burned in by lights in shops) can sometimes be 'washed' out. Remove the lens and point the camera at a brightly and evenly illuminated wall or card for a period of several hours – with luck this may do the trick.

New, commercial grade vidicons cost several tens of pounds, but acceptable used examples are commonly sold for £5 at rallies. Alternatively BATC members can get hold of slightly spotted new tubes at reasonable prices from club sales.

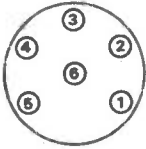
What if it doesn't work?

A non-working camera is frustrating, though fortunately most cameras work in more or less the same way. Unfortunately, not all manufacturers and distributors keep old manuals for sale: Sony are good in this respect but others are not. The book *Closed Circuit TV for Technicians* by K J Bohlmann (Norman Price Publishers Ltd) is a good standby, and Mullard publish an educational pamphlet on simple closed circuit TV cameras.

Here are some common faults with their cures in brackets: no picture (tube has shifted, leaving no target connection); poor picture geometry (adjust focus magnets on tube, replace capacitors in deflection circuits); poor focus (rack tube forwards and backwards); picture displaced (adjust internal width and height presets); picture distorted (adjust internal linearity controls); picture ringing or smeary (adjust internal peaking capacitors). When opening up the camera beware of high voltages, which may take a minute or two to discharge.

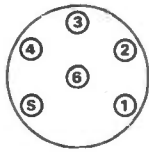
Most cameras have three external

PANASONIC



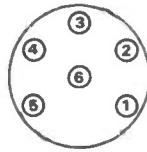
- 1 Video out
- 2,4 Ground
- 3 Field drive
- 5 Line drive

HITACHI HV-16K



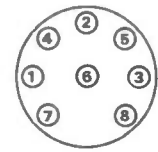
- 1 Video out
- 2 Field drive
- 3,6 Ground
- 5 Line drive

SHIBADEN HV-155



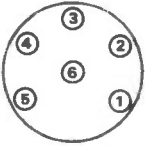
- 1 Line drive
- 2 Field drive
- 3 Mixed blanking (but not required)
- 4 Combined syncs (but not required)
- 5 Ground
- 6 Video out

IKEGAMI CTC-5000



- 1 Line drive
- 2 Tally light
- 3 Intercom
- 4 Field drive
- 5 Ground for intercom
- 6 Video out
- 7 Video in
- 8 Ground

SONY



- 1 Video out
- 2 Field drive
- 3,6 Ground
- 5 Line drive

controls, the adjustment of which is fairly critical. These will be marked target, beam and electrical focus and should be adjusted as follows. Using a video monitor of known picture quality (obvious but essential!) perform these operations. Rotate target control a quarter turn clockwise or so. Rotate beam control until a picture appears, then continue in same direction until all highlights (over-bright whites) subside. Adjust electrical focus for sharpest picture. Readjust target for best position with usable picture – the lowest target position will give the least lag or comet-tailing. Adjust lens focus for best picture.

More twiddling

Setting up zoom lenses used to fox me, and this is how I do it now. Set aperture wide open and focus on an object 50 feet away. Adjust lens focus for best TV picture, then rack scan coils (or lens mount) for optimum picture. The actual distance of the object in focus should correspond with the distance marking engraved on the lens ring. Check that the lens tracks in focus over the whole zoom range.

Cameras accepting external drive pulses usually accept any voltage pulse between 2 and 4 volts: often the pulse line is terminated in 75 ohms internally,

so TTL or other high impedance pulses will not do. The 74128 line driver chip will work, however, if you have a sync source at TTL level. Older British-made cameras require line and field drives, plus mixed blanking and combined syncs. Japanese cameras, however, need just line and field trigger signals; the accompanying chart shows pin connections on cameras commonly found.

That's it; good luck with your purchases and if you have any queries send them with an SAE to me care of Sovereign House. If I can I'll try to answer them. All news on ATV subjects is welcome too!

New Forth Microcard system

The Essex Forth Microcard measures only 10cm x 8cm but it is equipped to take on ambitious control tasks using the powerful FORTH Programming Language.

You can use the Essex Forthwriter disk to turn a BBC iG computer into a flexible workstation during program development but from then on the Microcard stands on its own.

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| A1714 | 24.80 | EL13E | 1.95 | ERC41 | 1.95 | M8161 | 6.90 | QQV02-6 | 19.90 | U50 | 2.00 | 2B32 | 69.90 | BAJ7 | 2.00 | 6F28 | 1.25 | 150B2 | 1.00 |
| A1986 | 11.80 | EL13P | 3.50 | ERC81 | 1.50 | M8162 | 5.90 | QQV03-10 Multi-lard | 18.00 | U91 | 3.70 | QV03-10 Multi-lard | 18.00 | BAJ7 | 2.00 | 6F32 | 1.25 | 150C2 | 0.65 |
| A2087 | 14.95 | EL180 | 3.95 | ERC90 | 0.90 | M8163 | 6.90 | QQV03-20A | 23.00 | U92 | 1.00 | QV03-10 Multi-lard | 18.00 | BAK6 | 1.80 | 6F33 | 1.70 | 150C4 | 1.45 |
| A2324 | 8.90 | EL500 | 1.40 | EG91 | 0.95 | M8193 | 6.90 | QQV03-20B | 23.00 | U93 | 0.95 | QV03-10 Multi-lard | 18.00 | BAK6 | 1.80 | 6F34 | 1.70 | 150C6 | 1.45 |
| A2395 | 8.90 | EL509 | 1.40 | EG91 | 0.95 | M8195 | 6.90 | QQV06-47.90 | 27.90 | U80 | 0.75 | QV03-20A | 23.00 | BAJ7 | 2.00 | 6F35 | 1.70 | 150C7 | 1.45 |
| A2596 | 37.90 | EL519 | 6.95 | EF80 | 0.65 | M8204 | 6.90 | QQV07-50 | 47.90 | UABCR0 | 1.00 | QV06-47.90 | 27.90 | SAM5 | 3.25 | 6G8A | 0.90 | 150C8 | 1.45 |
| A2799 | 17.90 | EL529 | 3.95 | EF83 | 0.65 | M8205 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8B | 0.90 | 150C9 | 1.45 |
| A2900 | 11.80 | EL529 | 3.95 | EF83 | 0.65 | M8206 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8C | 0.90 | 150C10 | 1.45 |
| A3042 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8224 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8D | 0.90 | 150C11 | 1.45 |
| A3291 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8225 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8E | 0.90 | 150C12 | 1.45 |
| A3302 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8226 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8F | 0.90 | 150C13 | 1.45 |
| A3303 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8227 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8G | 0.90 | 150C14 | 1.45 |
| A3304 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8228 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8H | 0.90 | 150C15 | 1.45 |
| A3305 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8229 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8I | 0.90 | 150C16 | 1.45 |
| A3306 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8230 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8J | 0.90 | 150C17 | 1.45 |
| A3307 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8231 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8K | 0.90 | 150C18 | 1.45 |
| A3308 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8232 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8L | 0.90 | 150C19 | 1.45 |
| A3309 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8233 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8M | 0.90 | 150C20 | 1.45 |
| A3310 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8234 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8N | 0.90 | 150C21 | 1.45 |
| A3311 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8235 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8O | 0.90 | 150C22 | 1.45 |
| A3312 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8236 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8P | 0.90 | 150C23 | 1.45 |
| A3313 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8237 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8Q | 0.90 | 150C24 | 1.45 |
| A3314 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8238 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8R | 0.90 | 150C25 | 1.45 |
| A3315 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8239 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8S | 0.90 | 150C26 | 1.45 |
| A3316 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8240 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8T | 0.90 | 150C27 | 1.45 |
| A3317 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8241 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8U | 0.90 | 150C28 | 1.45 |
| A3318 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8242 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8V | 0.90 | 150C29 | 1.45 |
| A3319 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8243 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8W | 0.90 | 150C30 | 1.45 |
| A3320 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8244 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8X | 0.90 | 150C31 | 1.45 |
| A3321 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8245 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8Y | 0.90 | 150C32 | 1.45 |
| A3322 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8246 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G8Z | 0.90 | 150C33 | 1.45 |
| A3323 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8247 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9A | 0.90 | 150C34 | 1.45 |
| A3324 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8248 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9B | 0.90 | 150C35 | 1.45 |
| A3325 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8249 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9C | 0.90 | 150C36 | 1.45 |
| A3326 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8250 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9D | 0.90 | 150C37 | 1.45 |
| A3327 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8251 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9E | 0.90 | 150C38 | 1.45 |
| A3328 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8252 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9F | 0.90 | 150C39 | 1.45 |
| A3329 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8253 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9G | 0.90 | 150C40 | 1.45 |
| A3330 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8254 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9H | 0.90 | 150C41 | 1.45 |
| A3331 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8255 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9I | 0.90 | 150C42 | 1.45 |
| A3332 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8256 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9J | 0.90 | 150C43 | 1.45 |
| A3333 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8257 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9K | 0.90 | 150C44 | 1.45 |
| A3334 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8258 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9L | 0.90 | 150C45 | 1.45 |
| A3335 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8259 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9M | 0.90 | 150C46 | 1.45 |
| A3336 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8260 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9N | 0.90 | 150C47 | 1.45 |
| A3337 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8261 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9O | 0.90 | 150C48 | 1.45 |
| A3338 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8262 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9P | 0.90 | 150C49 | 1.45 |
| A3339 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8263 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9Q | 0.90 | 150C50 | 1.45 |
| A3340 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8264 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9R | 0.90 | 150C51 | 1.45 |
| A3341 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8265 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9S | 0.90 | 150C52 | 1.45 |
| A3342 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8266 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9T | 0.90 | 150C53 | 1.45 |
| A3343 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8267 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9U | 0.90 | 150C54 | 1.45 |
| A3344 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8268 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9V | 0.90 | 150C55 | 1.45 |
| A3345 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8269 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9W | 0.90 | 150C56 | 1.45 |
| A3346 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8270 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9X | 0.90 | 150C57 | 1.45 |
| A3347 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8271 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9Y | 0.90 | 150C58 | 1.45 |
| A3348 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8272 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G9Z | 0.90 | 150C59 | 1.45 |
| A3349 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8273 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G0A | 0.90 | 150C60 | 1.45 |
| A3350 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8274 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G0B | 0.90 | 150C61 | 1.45 |
| A3351 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8275 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G0C | 0.90 | 150C62 | 1.45 |
| A3352 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8276 | 6.90 | QV07-50 | 47.90 | UABCR0 | 1.00 | QV07-50 | 47.90 | SAM5 | 3.25 | 6G0D | 0.90 | 150C63 | 1.45 |
| A3353 | 24.00 | EL130 | 2.95 | EF89 | 0.70 | M8277 | 6.90 | QV07-50 | 47.90 | | | | | | | | | | |

LATEST LITERATURE

Clubs, manufacturers, publishers and agents are invited to send details of new books, catalogues, data sheets, etc for inclusion on this page

PROJECTS FOR THE CAR AND GARAGE

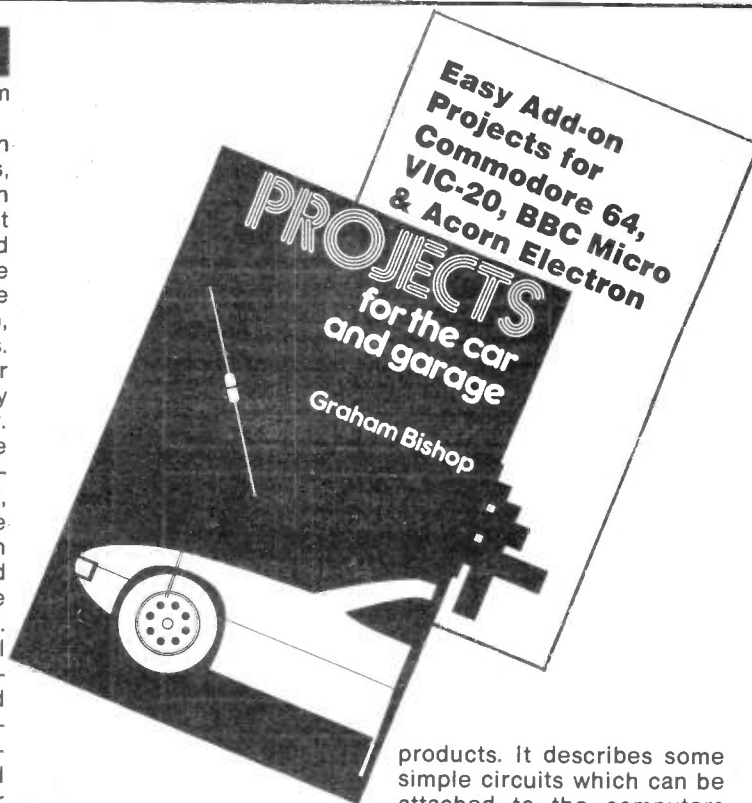
Revised Edition, by Graham Bishop

This is part of the Macmillan Electronic Projects Series, and was first published in 1980. It is aimed essentially at the relatively inexperienced constructor, although the projects are useful to anyone (anyone, that is, with a car!), and is split into five sections. These cover ignition, car theft, lighting and accessory circuits and garage/test gear.

As a book aimed at the beginner this volume succeeds where many fall short, having a text which covers the essential information with commendable clarity and illustrations which are nothing short of excellent. The nuts and bolts of actual construction are comprehensive and unambiguous, and the appendices include up-to-date parts lists, semiconductor specifications and resistor/capacitor colour coding (it is a book for the beginner, after all).

Of course the book does have shortcomings. It is a little disappointing, for instance, in that the chapter on car theft circuits covers a mere four pages (it is possible to be a little too elementary!). There are also areas of the text which could be more comprehensive, bearing in mind the intended readership of this book: an example is the mention of stereo systems when dealing with audio boosters. It is stated that the circuits described can also be used for stereo operation, but the information given is hardly adequate for a beginner to divine the essentials of such set-ups. It was clearly decided that such depth of treatment was beyond the scope of this volume, so the curious reader will need to purchase *Audio Circuits and Projects*, another book in the series!

While on the subject of



stereo, the coverage of stereo radio and the problems involved with the reception of FM stereo in cars, while brief, is interesting, as is the description of pseudo-stereo systems. These should whet the appetite of any novice reading the book.

Projects for the Car and Garage provides a good basic guide for comparative newcomers to electronic constructing, as well as giving some valuable circuits for the more experienced, and must therefore be said to have succeeded in its aim.

Macmillan Education Ltd,
£4.95. ISBN 0 333 37220 4

EASY ADD-ON PROJECTS FOR THE CBM 64, VIC-20, BBC MICRO & ACORN ELECTRON

By Owen Bishop

This is another book from Babani, and follows the familiar format of this publisher's

be used with the various computers, and is interesting as it allows up to eighteen projects to be connected to the computer at once. This allows, for example, all of the weather station projects to be in operation simultaneously.

This book follows the established pattern of its predecessors from Babani in its straightforward representation of the basics of the subject and its clear, if unexciting, format. Although certainly not comprehensive, you could easily make a worse choice than this for a basic guide.

Bernard Babani (publishing)
Ltd, £2.95. ISBN 0 85934 109 7

Radio books

A catalogue is now available from Interbooks, listing their range of radio-related books. Interbooks is a new company formed by Interproduct Limited to deal solely with the importation and marketing of books for the amateur radio operator and short wave listener, and to supply them to the trade.

The books come from Europe and the USA and many titles are now available. The company has the sole importation rights for Michiel Schaay's books, which include *Shortwave Facsimile Frequency Guide*, *Maritime Radio Handbook* and *Embassy Radio Communications Workbook*. They are also marketing Joerg Klinenfuss's *Guide to Utility Stations 1985* and his other publications.

New titles are being added all the time, so anybody who would like a copy of their new free catalogue should contact Interbooks.

Interbooks,
Lynton,
Stanley,
Perthshire,
Scotland PH1 4QQ.
Tel: (073882) 575.

products. It describes some simple circuits which can be attached to the computers listed in the title, whose common factor is that they all use the 6502 as the CPU, and the designs are applicable to all of these computers.

The devices covered range from a pulse detector, useful for testing the other interfaces, through to various other gadgets such as a picture digitiser, a model controller and a light pen. There are seventeen projects in all. The last six of these together form a weather station, with rain detector, anemometer, barometer etc.

The emphasis with all the devices is upon simplicity, and each description covers the method of operation, construction and rudimentary programming. In many cases, given the elementary nature of the projects, the description is as interesting for the possible applications it suggests as for the unit described.

The first appendix describes a decoder unit to

LATEST LITERATURE

Black Star Ltd

A colour leaflet is available from Black Star with technical specifications of a new range of British made passive probes and BNC cable assemblies.

The passive probes feature a new compact body style, bandwidth up to 300MHz and detachable earth lead.

BNC cable assemblies are available in varying lengths up to 2m and are terminated with BNC plugs, 4mm plugs or crocodile clips.

*Black Star Ltd,
4 Stephenson Road,
St Ives,
Huntingdon,
Cambs PE17 4WJ.
Tel: (0480) 62440.*

Soldermatic Equipment

Soldermatic Equipment have just released a new 6-page full colour catalogue covering their range of wave soldering machines, accessories and materials. The new

Catalogues

publication features the latest design specifications of the 220, 305 and new 380mm bench-top machines for 1985, and the optional base/cup-board units and feed conveyors.

Also included are the latest details of the Dynamic Solder Pot, with pumped solder wave, showing a new rectangular nozzle which is now available as an alternative to the standard circular one.

Copies of the catalogue are available free on request.

*Soldermatic Equipment,
97-99 Gloucester Road,
Croydon,
Surrey CR0 2DN.
Tel: (01) 689 0574.*

STC Electronic Services

Now available from STC Electronic Services is the 1985 edition of the *Cable and*

Wire Book.

Featuring full technical information on the company's comprehensive range of electronic cable and wire, this 65-page catalogue also includes details of a wide selection of wiring accessories.

The Broadcast Cable section has been newly introduced whilst UL, CSA Approved Equipment Wire and Belden Cable sections have been sizeably extended.

A *Wire Selector Guide* is provided together with a succinct glossary, indices for national and international specifications, Electric Cable Maker Confederation and Belden part numbers, and essential product safety information.

*Cable and Wire Group,
STC Electronic Services,
Edinburgh Way,
Harlow,*

*Essex CM20 2DE.
Tel: (0279) 26777.*

Papst Motors Ltd

A comprehensive guide detailing the theory and practical measurement of acoustic noise, particularly in relation to cooling equipment, has been produced by Papst Motors Limited.

It has been compiled by Papst's technical staff at Andover and is based on their experience gained through testing fans and customers' equipment in the anechoic chamber recently installed there. This leaflet will prove particularly interesting to all engineers involved in the design and manufacture of modern electronic equipment where low operational noise level is a major design criterion.

*Papst Motors Ltd,
East Portway,
Andover,
Hampshire SP10 3RT.*

NEXT ISSUE

Radio & Electronics

For all aspects of practical amateur radio **World**

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W G Borland outlines how to wind your own coils for ATUs, pi-net circuits, etc

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On these pages we present details of interesting contacts from clubs and individuals. We would be happy to receive any similar items from readers

RAE course

For more than twenty years The Nautical College in Lancashire has annually enrolled adult education evening courses leading to the Radio Amateurs' Examination. Morse practice is also available for both the beginner and the experienced operator.

In recent years attendance has increased, and it is apparent that there is an upsurge in the popularity of this fascinating hobby within the north-west area. This year it is intended to offer additional courses on specialist areas of the hobby including topics related to AMSAT, UoSAT, RTTY and similar subjects.

The RAE course is of twenty-five weeks' duration and is scheduled for Thursday evenings, 7.00pm - 9.00pm,

commencing 26 September, 1985. Enrolment is on 17 September, 7.00 until 9.00pm. Postal enrolments will be accepted directly at the college.

Further information can be obtained by contacting the course tutor: *Mr N Watson, The Nautical College, Broadwater, Fleetwood, Lancs FY7 8JZ. Tel: (03917) 79123.*

RAE and chips

In addition to the numerous RAE courses available, there are also various related evening classes on offer at certain institutions. One such is the microelectronics course at Hendon College in North London. Aimed essentially at beginners, this course covers microelectronic systems, microprocessors, digital sig-

nals and hardware, software and firmware. Machine level programming is included, with practical work using a Z80.

The college also offers an RAE course, tutored by Tony Essex. Both commence in September. Further information can be obtained from the Head of Technology, Chris Holford, on (01) 202 3811.

Hobby electronics

Wigan College of Technology will be running three courses of possible relevance to our readers, commencing in September.

Hobby electronics, the Morse code and RAE courses will be available, and those interested should contact: *Roy Hesford G4UAE, Wigan College of Technology, Parson's Walk, Wigan WN1 1RR. Tel: (0942) 494911.*

Grampian VHF repeater

The mode of operation of the Grampian Repeater Group's VHF repeater at Durris, about 15 miles south-west of Aberdeen, was modified over the weekend of 25/26 May.

The repeater now has restricted talk-through time during the morning and evening rush-hour periods from 7.30 to 9.00 in the morning and 4.30 to 6.00 in the evening. During these periods the time allowed is 1½ minutes, followed by 10 seconds of beeps and close-down. At all other times there is 5½ minutes of talk-through time allowed before time-out is indicated.

During the restricted talk-through periods, the indication at the end of each transmission is a series of five dits; at all other times the

invitation to transmit is a Morse 'K'. The delay from the drop of carrier to the invitation has also been extended to permit more easy break-in for anyone joining the net.

All users are asked to wait for the invitation to transmit before continuing with the net to avoid timing out, and also to allow anyone who wants to join in to do so.

Repeater news

The Cambridgeshire Repeater Group has sent us the latest issue of its newsletter, which includes all the usual news of existing repeaters plus details of GB3PV, the proposed 23cm FM TV repeater.

The latest repeater is intended to serve the Cambridge area on channel RMT-2, input 1249.0MHz, output 1318.5MHz. It will initially have a power of 10W ERP, increasing to 25W ERP and possibly 1KW ERP eventually, subject to licensing authority approval.

The newsletter also includes articles on a RTTY tone decoder, wide bandwidth aerials for 23/24cm and the curiously entitled *Thoughts of the hot curry lover.*

Further information is available from: *Chris Lorek G4HCL (Editor), 11 Bevills Close, Doddington, March, Cambs PE15 0TT.*

Picnic

A picnic for all the family will be combined with some /P (mobile) operating by the Maidenhead and District ARC on 1 August. So, if you fancy an entertaining day out, contact John Hicks G8RYW (Secretary), QTHr, or telephone Maidenhead 28463.



The Society takes pleasure in certifying that A.N.Other operating G9ZZZ has this day submitted evidence of having worked or heard the requisite number of RNARS special and member stations during its 25th Anniversary Year. This certificate is issued in recognition of this achievement.

Royal Naval ARS award

To celebrate its silver jubilee, the Royal Naval Amateur Radio Society (RNARS) is sponsoring a Silver Jubilee Award.

The award is available to all radio amateurs and short wave listeners who satisfy the following conditions: 1) amateurs in the UK and Eire should work/hear 5 RNARS special stations and 25 members; 2) those in Europe should work/hear 5 RNARS special stations and 15 members; 3) DX

countries should work/hear 2 RNARS special stations and 5 members; 4) amateurs on VHF only should work/hear 2 RNARS special stations and 10 members.

Contacts must have been made between 1 January and 31 December 1985.

Log data plus an award fee of £1.00 (UK and Eire) or £1.50 (abroad) should be sent to:

D F J Walmsley G3HZL, 3 Meon Court, 609 London Road, Isleworth, Middlesex TW7 4EW.

Hamfest '85

Organised by the Lincoln Short Wave Club, the Lincoln Hamfest '85 will take place on 8 September at the Exhibition Centre and in a marquee on the Lincolnshire Showground (4 miles north of Lincoln City on the A15).

The day will begin at 10.30am and end at 5.30pm. Talk-in by Raynet will be on 144MHz (S22) and 432MHz (SU8). There will be more trade stands than in previous years, CW tests, many attractions for junior ops (such as a licensed bar!) and ample coach and car parking.

Contact G4STO, QThr, or write c/o City Engineers Club, Central depot, Water Side South, Lincoln.

Red Rose Rally clash

The West Manchester Radio Club (G4MWC, G6FSA) is holding its annual Red Rose Summer Rally on Sunday 18 August.

The venue is the Haydock Park Racecourse, near Wigan, which is close to the M6, M62, M61 and M56, making it easily accessible from all parts of the country.

For further information contact: *J E Cooke, 106 Wirral Drive, Winstanley, Wigan WN3 6LD.*

Meanwhile the Cambridge Amateur Radio Rally, which was also originally planned for 18 August, has been postponed to 1 September.

Further details can be obtained from: *D Cooper G6MIF, 7 St James Terrace, Buxton, Derbyshire SK17 6HS.*

RAIBC news

The Radio Amateur Invalid and Blind Club, which is a self-help organisation aimed at encouraging the handicapped to take up amateur radio, has experienced substantial changes to its committee recently.

The most important change was brought about following the resignation of Mrs Frances Woolley as secretary. After more than twenty-two years she felt it was time to relinquish the post in favour of a younger person.

The highlight of Frances' period as secretary came in May this year, when she was awarded the British Empire Medal at a ceremony at the County Hall in London. She was given the medal for her 'outstanding' efforts in encouraging the growth of amateur radio amongst handicapped people and for her 'contribution to the pleasure and communication of so many of the less fortunate...'

Mrs C M Clark G1GQJ was elected as the new secretary, and all future correspondence should be addressed to her at: *9 Conigre, Chinnor, Oxford OX9 4JY.*

Vintage wireless clubs?

The Vintage Wireless Company has commented on the need for a national, or even international, vintage radio/audio society to cater for enthusiasts interested in valve equipment. The problem is, however, finding somebody with the time, dedication and organisational abilities to run it.

As mentioned in the com-

NOTES FROM THE PAST

Some interesting comments from the 1950's ...

In October 1954 The Daily Telegraph reported that tests with a transmitter powered by a battery of 16 photo-electric cells exposed to daylight had been successfully carried out. The transmitter operated on the 160 metre amateur band, and CW signals were received at distances of up to 30 miles. The apparatus was built by Mr J M Osborne G3HMO, of Buckingham.

The successful experiments by British amateurs using a sun-powered transmitter, reported in our October issue, has occasioned rather less excitement than one might have supposed. Is it that we have become so accustomed to scientific progress that nothing can astonish us, or did the original demonstration at the Murray Hill Bell Laboratories, New Jersey, in April last take the edge off the news?

I rather think it must be the former – even space travel is taken for granted nowadays – and in any case the Bell experiments were not widely reported in the British press.

Solar batteries

At the Bell Telephone Laboratory demonstrations silicon solar batteries were used to power transmitters, line repeaters and a toy Ferris Wheel. Surprisingly enough only a very small percentage of amateurs I have spoken to knew anything about it!

The idea of using power from the sun is far from new, but we are only now gradually learning how to convert it into energy or to store it. While what has already been done is, in itself, a great achievement, the amount of power harnessed is only a tiny fraction of that available. It is the fact that we are beginning to break through the fringe of the problem that is eventful. All scientific progress has grown from puny beginnings – often with false steps and by roundabout paths. A visit to any science museum reveals the fumbings of pioneers, who with the right ideas prove their theories with what subsequently looks to be the crudest means. Much of the early electrical experimental gear appears laughable to us nowadays, but we have only moved further along from the point where inspired genius guided us, and whatever progress we make comes only after climbing upon the backs of the great men of the past. So, in the harnessing of solar energy, history repeats itself.

2m AMPLIFIER KIT

Martelec Ltd now produce a kit for this project, featured in *R&EW* June & July 1985.

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Martelec Ltd, 43 Queen's Rd, Farnborough, Hampshire GU14 6JP. Tel: (0252) 515666

pany's Antique Wireless Newsheet (no. 104), in societies such as this 'it is always the few who do all the work—you have to be a master organiser to get the mass membership involved'!

The newsheet also points out that a regular and informative magazine should be the core of a society like this, and if anybody is prepared to undertake the task of editor the Vintage Wireless Co Ltd is prepared to assist in any way possible.

Interested parties should contact the company at: *Tudor House, Cossham St, Mangotsfield, Bristol.*

Sexists' corner

Hot off the press (positively sizzling, actually) from deepest Shropshire has come the newsletter of the Telford and District Amateur Radio Society. The Editor of this amusing little publication, Tom Crosbie G6PZZ, is obviously a man who likes to provoke a reaction from his readers; this latest issue carries what can only be described as a risqué picture on page three (Miss Raquel Vodaphone, would you believe...).

I won't comment on the sexist nature of such pics (mind you, it's a pity the

quality of reproduction isn't better), but the next page three special might well be one of Tom being strung up by the irate female club members.

I hope he avoids the flak that will undoubtedly fly his way, since the newsletter makes very enjoyable reading, Tom being something of a wit (substitute your own description here!).

Anyone interested in joining the fun can find the society meeting every Wednesday evening at: *Dawley Bank Community Centre, Bank Road, Dawley, Telford, Shropshire.*

Bristol events

Satellites are the subject of a lecture which has been arranged by the RSGB City of Bristol Group on 29 July. Ron Broadbent will be talking about the AMSAT-UK organisation and Oscar 10.

Another lecture will be given on 30 September by Glen Ross G8MWR on the Microwave Society.

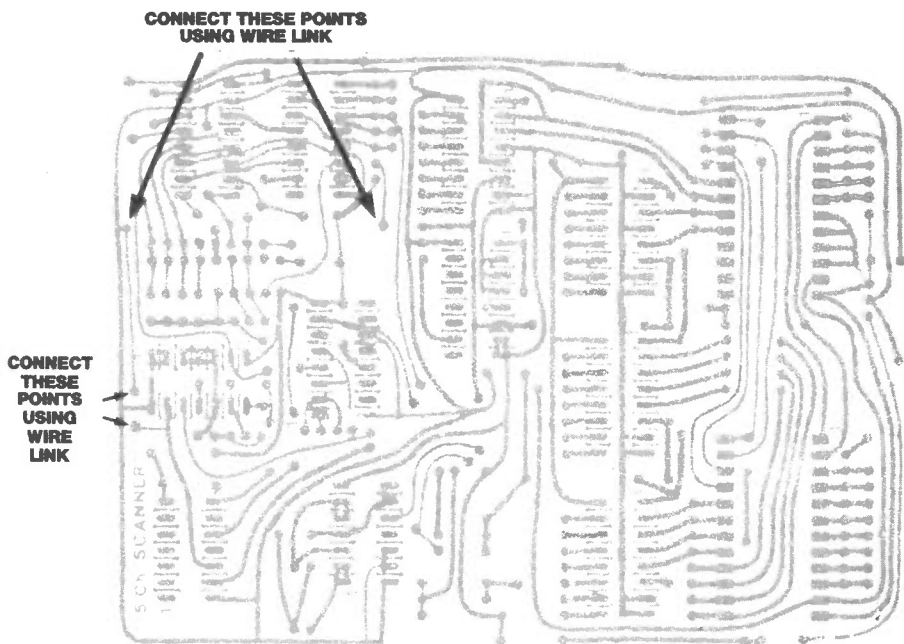
Both events will take place at the Queen's Building, University of Bristol, and further details can be obtained from: *Colin Hollister G4SQQ (Honorary Secretary), 34 Battersby Way, Henbury, Bristol BS10 7SU.*

ERRATA . . .

5 Station scanner

It would appear that a few gremlins crept into this article, which appeared in the September '84 issue of *R&EW*. These are listed below:

1. *Figure 3*: A link has been omitted between PL9 pin 6 and IC7 pin 12. This can be corrected by fitting two links to the PCB as shown.
2. *Figure 2*: IC3 pins 2 and 4 are not shown connected to 0 volts, although they are so connected on the PCB.
3. In the text, page 63 line 46 reading 'R8 and R9 are the current limiting resistors' should read R12 and R13.
4. In the parts list on page 67 the value given for R1 should be 220K, and that for R8 should be 8×47K SIL.
5. The resistor in series with the manual LED in *Figure 3* should be shown as R12, not R11.
6. *Figure 2*: IC12 shows pins 7 to 10 connected to +6 volts, whereas they are connected to 0V on the PCB. These four connections are unused inputs of a CMOS store and must be tied to 0V or 6V. Either is OK.



NOTE: diagram not shown full size

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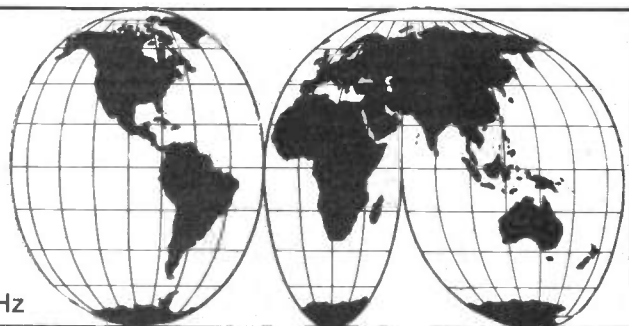
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SHORT WAVE NEWS FOR DX LISTENERS

By Frank A Baldwin

All times in GMT, **bold** figures indicate the frequency in KHz



Continuing our review of some of the more powerful African stations to be heard on the 60 metre band likely to be logged by the interested SWL, we commence this month with the 100KW Radio Diffusion Nationale Tchadienne, Chad which operates on **4904** in French, Arabic, Sara and some other local languages from 1730 to 2100 (Saturday until 2200).

Evening schedules

It should be noted that in conformity with the previous instalment, only the evening schedules are mentioned here, this often being the best time for UK reception.

On **4910** is the Zambian station ZBS Lusaka. At 50KW, it is on the air from 1530 to 2105 (Friday and Saturday until 2205). This is the Home Service in English and local vernaculars.

The Voice of Kenya in Nairobi may be heard on **4915** operating from 1330 to 2010 (Saturday until 2110). This is the National Service in Swahili, the power being 100KW.

Radio Nacional, Bata in Equatorial Guinea has a 100KW transmitter that operates on **4925** but often vacates this channel for the alternative **5004** frequency - to no known pattern I might add. The programme language is mainly Spanish but with some local vernaculars, the evening schedule being from 1600 to 2135, the closing time varying to 2200.

The Educational Service of Radio Nigeria is on **4932** at 50KW, the schedule being from 0430 through to 2130 but with the sign-off sometimes varying to 2300. The programme languages are English, Hausa, Ibo, Yoruba and some local vernaculars.

Radio Diffusion Nationale in Garoua, Cameroon can be tuned in on **5010**, at which point on the dial it operates its evening schedule from 1645 to 2200. At 100KW, it

features an English programme timed from 1830 to 1900. Transmissions are in French, English and vernaculars.

Radio Uganda, Soroti is on the air with the National Programme in English, Swahili, French and some local vernaculars from 1300 (Saturday from 1400, Sunday from 1430) until 2100 with a power of 250KW on a variable **5027**. These are transmissions in the Blue Network.

Bangui in the Central African Republic radiates on a variable **5035** (from **5032** to **5035**) at 100KW. This one is not so easy to receive by virtue of the co-channel Alma Ata, USSR station. The most favourable time for reception of Bangui, judging from my experience, is at the opening time of 0430 or soon after.

The last of the high powered African stations to be reviewed here is Togblekope in Togo. This one operates on **5047** with a power of 100KW from 1700 to 2400 and it features a newscast in English at 2000.

Lower powered Africans

Having logged some of the more powerful African transmitters, the reader may now be prepared to try for some of the lower powered stations on the 60 metre band. In terms of ease of logging, these rate from the not-so-difficult to the downright sometimes-possible in the Dark Continent reception stakes.

ELWA (Eternal Love Winning Africa) in Monrovia, Liberia is on **4760** with a power of 10KW from 1725 to 2302 (Sunday until 2247). This is the Home Service which is in English except for a vernacular presentation timed from 1730 to 1900.

On **4780** can often be heard signals from Radio Djibouti working to the schedule 0900 to 1900 in Somali, Afar and Arabic. The power is 20KW but expect opposition from the 50KW USSR transmitter in

Petrozavodsk co-channel throughout the Radio Djibouti schedule. Despite this snag, however, R Djibouti is frequently logged by DXers based here in the UK.

AROUND THE DIAL

In which the times and frequencies are presented for the information of readers interested in tuning over the short wave broadcast bands.

AFRICA

Benin

Cotonou on **4870** at 1856, African drums and tribal chants - the sound of Africa at its best - absolutely unmistakable! This was a transmission in the Home Service which is on the air from 0400 (Saturday from 0545, Sunday from 0600) to 0800 (Saturday until 1100, Sunday until 2300) and from 1300 to 2300 in French and local vernaculars. There is an English newscast from 2000 to 2015 and the power is 30KW.

Botswana

Gaborone on **4820** at 0410, YLs with hymns during a religious service in Swahili. This 50KW transmitter is scheduled from 0400 to 0630 and from 1420 (Monday to Wednesday inclusive from 1500) to 2100.

Burkina Faso

Ouagadougou on **4815** at 1836, OM with a song in one of the sixteen local languages featured in programmes of the National Service, French being the mainstay. The schedule is from 0530 (Thursday from 0800, Saturday and Sunday from 0700) to 0900 (Saturday and Sunday until 0800) and from 1600 to 2400. The power is 20KW. Burkina Faso was formerly called Upper Volta.

Cameroon

Radio Douala on **4850** at 2106, OM with a newscast in English, mostly about a local conflagration and the resul-

ting deaths. R Youande operates from 0400 to 0700 and from 1630 to 2400 with the National Service in French and English. There are English newscasts at 0530, 0600 (Sunday only), 1830 and 2100. The power is 100KW.

Gabon

Africa No 1, Moyabi on a measured **4810.4** at 1833, OM announcements in French amid a programme of pop records. This one radiates in French to Central Africa from 0500 to 0800 and from 1700 to 2300. The power is 250KW.

Morocco

RTM (Radiodiffusion Television Marocaine) Rabat on **15335** at 1510, OM with a newscast in Arabic in a relay of the domestic Network A for the Middle East, West Africa, Europe, South Morocco and Mauritania, scheduled daily from 1000 to 0100.

Nigeria

Lagos on **7255** at 0550, OM with a local pop song in the English transmission for West Africa, timed from 0500 to 0600.

Senegal

Dakar on a measured **4892.2** at 1900, OM with the station identification in French and a vernacular followed by a talk in French. R Diffusion is on the air from 0600 to 0800 and from 1800 to 0100, the power being 100KW and the nominal frequency **4890**.

South Africa

Johannesburg on **4880** at 1905, OM with a talk in the Afrikaans Home Service, scheduled from 0347 (Saturday from 0427, Sunday from 0447) to 0550 and from 1520 to 2200 with a power of 100KW.

Swaziland

TWR (Trans World Radio) Mpingela on **4760** at 0320, OM with a talk, YLs with hymns during a religious programme in the Shona transmission for

SHORT WAVE NEWS

Zimbabwe, timed from 0300 to 0345. The address of the Zimbabwe office was given as POB 152 Harare. OM with the station identification and schedule, chimes and off at 0344.

THE AMERICAS

Brazil

Radio Nacional da Amazonia, Manaus on **4845** at 0154, OM with a ballad in Portuguese. RN da Amazonia is on the air from 0900 to 0200 with a power of 250KW.

Radio Difusora Acreana, Rio Branco on **4880** at 0310, OM with announcements in Portuguese, promos, OM song in local pop style. The schedule is from 0900 to 0530 and this one has been reported as being on **4880** and **4885** alternately in undetermined periods. The power is 5KW.

Colombia

La Voz de Cinaruco, Arauca on **4865** at 0332, OM with the station identification as part of the Caracol network then into a programme of local pops, all in Spanish.

LV de Cinaruco is scheduled from 0900 to 0400 (Sundays until 0200) but sometimes, just to fool us all, it works around the clock. The power is 1KW.

Cuba

Radio Moscow Relay, Havana on **4765** at 0240, YL with a song in Russian complete with piano backing. The Mayak (Lighthouse) programme is relayed around the clock for the benefit of Russians in the general area.

Ecuador

Radio Popular, Cuenca on **4800** at 0248, OM with a pop song in Spanish, YLs with another pop song. OM with the station identification at 0300. This 5KW transmitter is on the air from 1000 to 0700 but has been reported closing on occasion at 0515. To further confuse the DXer, it does occasionally work to a 24 hour schedule.

Surinam

Radio Apintie, Paramaribo, on **5005** at 0222, classical piano music, OM announcements in Dutch. Off the air for some time due to transmitter breakdown, R Apintie is now

back on the air. Reportedly closing at 0400, the power is just 350 watts.

Venezuela

La Vox de Carabobo, Valencia on **4780** at 0159, OMs with a duet in Spanish with guitar backing, OM with announcements, promos (promotions) interspersed with various jingles then OM with station identification.

LV de Carabobo is on the air from 0900 (Sunday from 1000) to 0400 with a power of 1KW.

Ecos del Torbes, San Cristobal on **4980** at 0329, YL and OM with a duet in Spanish followed by OM with announcements and promos, the station identification being at 0330. This station operates from 0900 (Sunday from 1000) to 0400, this schedule including a CID (Cuba Independiente Democratica) transmission under the Radio Antonio Maceo banner from Tuesday to Saturday inclusive from 0105 to 0135. The power is 10KW.

ASIA

China

Xinjiang PBS, Urumqi on **4970** at 2050, OM with the Russian programme timed from 1900 to 1955 and from 2000 to 2055, this being a relay of the Radio Beijing Foreign Service.

Xinjiang PBS on this channel is operative with the Home Service from 0000 to 0230 and from 1200 to 1720, which includes a relay of R Beijing in Kazakh from 0100 to 0125. The power is 15/50KW.

Radio Beijing on **9290** at 1420, YL with a song, YL with a talk in the Thai programme for Thailand, timed from 1330 to 1430.

India

AIR Delhi on **17387** at 1020, OM and YL with a duet in Hindi and some local-style music during the English presentation to North-East Asia and Australasia, scheduled from 1000 to 1100. Also logged in parallel on **17875**.

Iran

Tehran on **9022** at 1945, OM with a newscast during the English transmission for Europe, the Far East, North Africa and North America, scheduled from 1930 to 2030.

Israel

Jerusalem on **17630** at 1025, OM with a talk in the Hebrew Domestic Service radiated on this frequency from 0515 to 1105.

Pakistan

Karachi on **17660** at 1355, OM with a talk in the Urdu programme directed to the Persian Gulf and the Middle East from 1330 to 1600.

Turkey

Turkiye Polis Radyosu (Turkey Police Radio) Ankara on **6340** at 1531, Turkish music and announcements then YL with songs. The schedule of this 1KW transmitter is from 0600 to 1000 and from 1100 to 1700 daily.

Turkish State Meteorological Service on **6900** at 1539, OM and YL with a duet in Turkish. This station features weather reports in Turkish on the hour, the schedule being from 0400 to 0600, from 0700 to 0840 and from 1100 to 1555. The power is 2.5KW.

EUROPE

Austria

Vienna on **11935** at 1350, OM with listeners' letters and requests during the English programme for Europe, North Africa and North America, timed from 1330 to 1400.

Czechoslovakia

Prague on **5930** at 2025, YL with the station identification and announcements at the end of the English transmission for Europe, timed from 2000 to 2030, this being followed by the Portuguese programme for Europe scheduled from 2030 to 2100.

Netherlands

Hilversum on **17605** at 1514, OM and YL with the English programme directed to South Asia and the Far East from 1430 to 1525. It was all about short wave receivers, a very interesting review of those currently available on the market.

CLANDESTINE

Voice of the Resistance of the Black Cockerel (A Voz da Resistencia do Galo Negro) on **4950** at 1855, OM with a song in Portuguese complete with xylophone-type instrumental backing, OM

announcements, YLs with chants and OM in a vernacular. This clandestine is controlled by the Unita movement and is hostile to the Angolan government. It is scheduled from 1730 to 1930 on Tuesday, Thursday and Sunday, the following days having a repeat of the broadcast from 0430 to 0630. This channel also carries programmes from another clandestine, A Voz de Verdade (The Voice of Truth) in Portuguese from 2000 to 2045 daily. It is hostile to the Angolan government and to Cuban presence in Angola. A Voz de Verdade also operates in Portuguese from 0330 to 0415 on **5015** daily. To log the reported transmission, a 1.4KHz bandwidth was necessary.

DOTS AND DASHES

A few sessions on Top Band (1.8 to 2.0MHz) resulted in the logging of signals from, among others, EA6CJ, I1ONZ, K1ST, K2HJP, LA6QBA/P, LU9EIE, LZ1KDP, OE5SE, RB5ZAT, RT5UB, SM6DGA, W1RR, W8AH, YU2TW, ZC4GG and 4X4NJ.

Forty metres (7.0 to 7.1MHz) produced, from amid the QRM, CO7HC, HK1FCG, KP4FI, LU1NBY, PY5BAB, PZ1DC, TI2PL, UH8EAA, UM8MIG, W8ANZ/4, YB4UL, YV5AAM and 9Y4GR, the YB (Indonesia) being the best DX on forty for many a long year.

NOW LOG THIS

La Cruz del Sur, La Paz, Bolivia on a measured **4876.1** at 0150, OM with a shouted political speech in Spanish complete with a voice-over translation in a local vernacular (Quechua or Aymara) with many mentions of Bolivia (pronounced Bolevya). This 10KW transmitter closes at 0300 and is listed on **4875** but varies to the frequency shown above.

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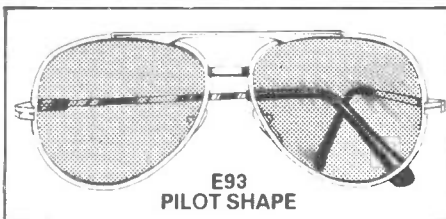
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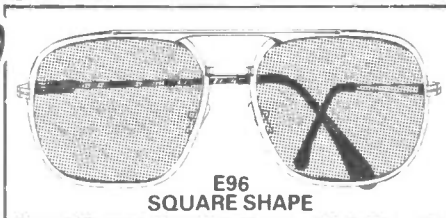
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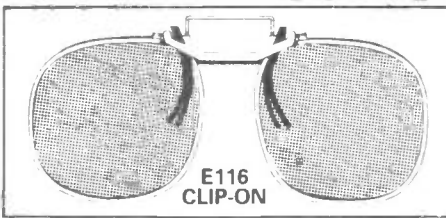
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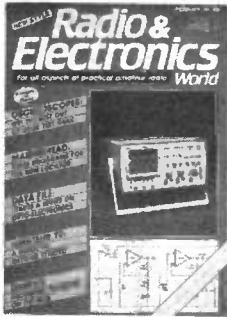
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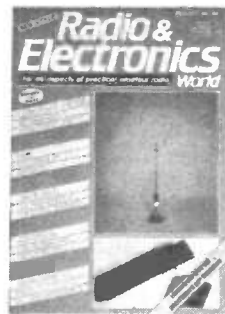
DECEMBER 1984

Features — Cable TV goes on the air; Simple speech processor, a simple device to increase e stations 'talk power'; Uosat-2 telemetry, decoding satellite signals using this BBC Micro program; Tatung Einstein review; Testingt! Testingt! oscilloscopes; ATV — getting started; Data File, LED circuits and opto electronic principles; Morse test, self study course; Computing Maidenhead, three programs relating to the Universal (Maidenhead) Locator; QSO, club and event news; ATV on the Air, with news from the air waves.



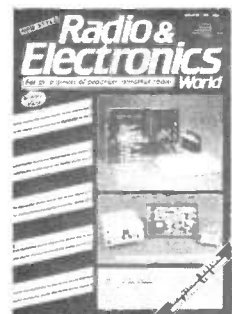
JANUARY 1985

Features — Canal Plus, Europe's first VHF/UHF pay-TV service; Phased Vertical Arrays, a computer program for the design and modelling of antenna systems; Russian Satellites, the first part of a series looking at the equipment used to decode signals from the navigation satellites; RF small signal amplifiers, some of the obstacles encountered when constructing radio frequency devices; Principles of Z80 Morse Decoding; Data File, a look at LED sequencer and analogue-value indicator circuits.



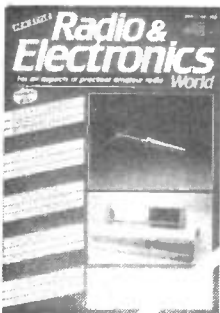
FEBRUARY 1985

Features — Airborne TV, some fascinating experiments involving TV transmissions from an aircraft in flight; Direct Broadcast by Satellite, the systems of TV reception via satellite; Touch-sensitive joystick, zapping Klingons is made quicker and easier with this project; The Horseshoe Nail Syndrome, Brian Dale questions the policies of major manufacturers with regard to chip production; Long Waves Live on!, Nigel Cawthorne on long wave broadcasting; Low-pass Filter, clean up your signals with this relatively cheap high power project; Russian Satellites — Part two, the receive section; Data File, more opto-electronics from Ray Marston.



MARCH 1985

Features — Spectrum Watch, a survey of the latest developments in the radio spectrum; Russian Satellites, part three outlines the computing of the received data; Variable Frequency Ramp Generator, a circuit for testing bandpass filters; Electronic Lock, a cheap and versatile project; Data File, seven-segment display driving; Computing, inductance and capacitance values for circuit tracking; Frequency Translation, a follow-up project to November's CB conversion article.



APRIL 1985

Features — RSGB Convention preview; Spectrum Watch, progress with cellular radio, and French private TV; Synchronous Rectifiers, examining these and phase-sensitive devices; Amtext on HF, an experiment with Packet Radio; Weather Satellite Pictures, a ROM for the Beeb; Up in the Air, a cheap aid for VHF antenna experimenting; Data File, photo-diodes and LDRs; 934MHz — Dead or Alive, a look at civilised CB.



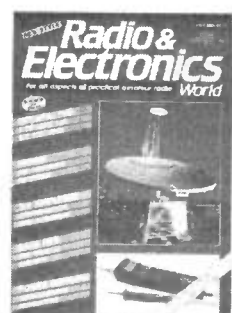
MAY 1985

Features — Spectrum Watch, news of European DBS and the MW broadcast band; RS232C Replacement, outlining a possible new standard for serial interfacing; Modifying the FRG-7, by adding a narrow-band filter and compensating for temperature variation; Power Supplies, Roger Alban on the design and construction of PSUs; UoSAT Programs, processing signals from Oscar 9 and 11; TV Reception, Ivor Nathan combines low-level signals; Data File, opto-coupler devices; 24cm TV Converter, Andy Emmerson builds and tests a budget-priced kit.



JUNE 1985

Features — Spectrum Watch, Nigel Cawthorne on mobile radio communications; Computing; Intermodulation, a computer program for sorting out your spurious signals; Power Supplies, reservoir capacitors and Zener diodes; Data File, control techniques are discussed in the concluding part of Ray Marston's mini-series on opto-electronics; Two metre amplifier, designing an FM amplifier for 144 to 146MHz; Cirkwik review, Terry Weatherley looks at this disc-based design aid for the BBC Micro; Medium Wave DXing, Steve Whitt describes this fascinating area of radio listening.



JULY 1985

Features — Spectrum Watch - USAI, the differences between Europe and the USA in their use of the radio spectrum; Power Supplies, three terminal regulators; Two Metre Amplifier, part 2 of David Silvester's construction project; Data File, the practical applications of the 555 timer IC; A Versatile Spectrum Interface, a simple circuit to resolve problems of interfacing the Sinclair Spectrum; Morse Decoding, a program using Z80 Mode 2 interrupts.

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■ Yaesu FRG7700M, mint condition with manual. £235 including carriage. Tel: (0783) 367589

■ Quantity of electronic supplies, including wire wrap tool £35. Digital multimeter £80. Logic probe £15. Power supplies, RAMs, technical books, manuals. Tel: Maidenhead 28020

■ NEC CQ110E multimode. HF Tx/Rx. £250. AR88D vgc. £55. Hammarlund HQ170, ham Rx. £120. FDK 2m multimode. £120. Rebuilt R1155B with all DF intact. £65. BC221 wavemeter with charts. £25. Creed 75 teleprinter. £25. Q-max GDO. £25. NAD 7020 tuner amp. £80. Lafayette HE30 Rx. £25. All complete with manuals and circuits. D Evans, 70 Kingsway, West Wickham, Kent BR4 9JG. Tel: (01) 462 4614

■ Cumana CSX200 80 track disc drive, little used, handbook, cables and disc for BBC Micro. £120. 2m 7 element crossed yagi, unused condition. £25. 2m 5/5 skeleton slot fed yagi, weathered but good working order. £20. 2m-70cm PA and tripler, 3W in 6+ watts out, 12V dc supply. £15. 2-10m converter. £15. Peter Swallow G8EZE (QTHR). Tel: (0752) 46489

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■ Signal generators and other test gear to be cleared out, including: Advance H1 and J2 AF signal generators, Heathkit AW1V AF wattmeter, Radiometer SMG1 stereo generator, Kingshill NS155 5V PSU, decibel meters No 15 AEF-R58, all items appear to be working. Inspection and collection by buyer preferred. Reasonable offers for the lot or for individual items. D Russell, 9 South Beach Road, Ardrossan, Ayrshire KA22 8AX. Tel: (0294) 64144

■ Pye pocketphones Tx/Rx. £15 per pair, including postage. Circuits and mods 75p per copy. Bird thru-line power meter module 100-250MHz, 50 watt. £25 ono. Pye Bantams with batteries and 2 chargers, offers. Pye PF9 pocketphones, £18 per pair. Rank Mitre VHF FM 4 channel handsets, charger, ni-cads, offers. Pye W30 Tx/Rx, AM, 30 watts, offers. Wanted: info on German radio, radar, WWII search receivers etc. Tel: (0501) 51453

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■ Collectors' item. Offers for 'Television Today' (1936), complete 16 parts. 'Radio Constructor' 1961-1980, complete. £30. 'Practical Wireless' 1962-1980, complete. £30. 'Practical Electronics 1965 (No 1) -

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■ Commodore computer enthusiast offers for sale or exchange for amateur band Tx/Rx base station equipment, WHY, two Commodore Pet computers, model 2001, 8K memory, integral 9in screen and cassette unit, minimum value £85 each. One Commodore Pet as above, upgraded to 4000 series, with 32K memory, green screen, sound output speaker/earphones, reset switches, minimum value £185, including detachable full size keyboard, many programs. Commodore 4040 twin disk drive, minimum value £375. All machines in good working order and complete with manuals. Tel: (062 982) 3207, evenings.

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■ PYE Cambridge AM10D (converted to FM) 2 metre transceiver. 13.8V operation for mobile or base use. Six channels, ideal for newcomer or as additional mobile unit. Complete with copy of official service manual, £45 ono. Buyer collects. T B Myies, 14 All Saints Rise, All Saints Road, Tunbridge Wells, Kent TN4 9PW. Tel: (0892) 23419

■ Sale or exchange. Frequency counter. Black Star Meteor 1000. 2Hz to 1.2GHz in box, as new. 5 months old, with service manual, handbook, mains adaptor, and lead. £180 ono. Wanted: 2m Tx/Rx, FT290 or similar. John Solman, G1LUG. Tel: Coventry 450476, after 6pm

■ Odd numbers of back issues. Various different electronic magazines. SAE list. Various valve data

books, old technical books etc. SAE list. Marconi model T69 DA valve wireless. Good working order with circuit. £13.95, plus £4.50 towards postage. Sinclair Interface 2 for use with ZX Spectrum. Original in box, unused. Use with joysticks and ROM cartridges. £4.95, plus £1.00 towards postage. Service sheets, manuals for most equipment, SAE 'wants'. Mr Small, 8 Cherry Tree Road, Chinnor, Oxon OX9 4QY

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■ Clearing out lots of new and used gear, including transformers, speakers, large electrolytics, Gunn diode, tuning caps etc. SAE for list. S Williams, 55 Fairfield, Hebden Bridge, West Yorkshire HX7 6JD

■ Icom IC-251E with muTek front end. Used very little. A super DX rig for 2m. Also have an Icom IC-R70 with FM board fitted. Has never been used. Both rigs in superb condition with boxes, manuals etc. Will sell for £450 each or £850 for both. Ian G6NKB QTHR. Tel: (0509) 502989 after 6pm

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■ Icom IC2E 2m FM hand-held, Tx/Rx mint cond, comp with charger, spare NiCad pack, orig packing, hardly used. £120. Tel: Bromsgrove 75799, evenings. (021) 477 6744 daytime

■ IC271E new, £575 or take FT290R in part exchange or mint LS102 26 to 30MHz. Yaesu dummy load wattmeter, damaged meter, otherwise perfect £35. Cost £99. FDK 700AX 144 to 148, with sat band, 5KHz, 10KHz, 100KHz steps, £145 postage extra. Mr Waters, 42 Tregundy Rd, Perranporth, Cornwall TR6 0EF

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■ Eddystone 770R VHF receiver, £90. Teletype ASR33, £60. Creed teleprinter with reader, £25. B40CHF receiver, £55. Domestic radios from about 1934, WW2 radio equipment and many other items of later equipment, components, etc. Please send SAE for list to: L Ellison, 17A Main Road, Willows Riverside Park, Maidenhead Road, Windsor, Berks. Tel: Windsor 52300

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■ Icom IC260E transceiver, with manual, circuit diagrams, multi-mode, good condition, £160 ono. Matthew Cornwall, 99 Bridge Road, Uxbridge, Middlesex. Tel: (0895) 54965

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■ Yaesu FT227R 2m FM rig 10W, mobile mount, good condition, £125. Europa transverter 2m spare PA valve, all leads for Yaesu equipment okay, £40. Creed 75 plus terminal unit CU89, £20. 5A variac, £15. Collins UHF Rx, £85. Marconi sig gen 20-80MHz, £12. AM/FM good for CB heavy. Tel: (0532) 677101

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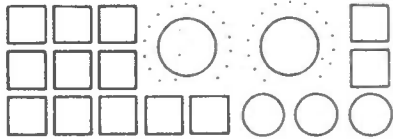
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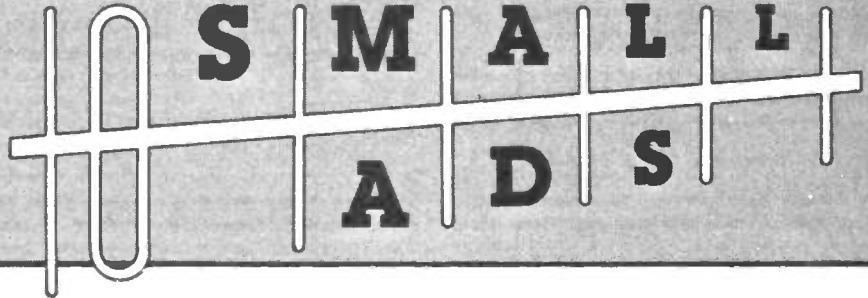
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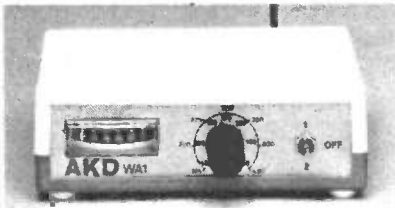
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|-------------------------|--------|-----------------------|-------|
| Armon Elec | 43 | Hart Elec..... | 12 |
| Blackstar | 46 | High-Tec..... | 22 |
| J Bull | 11 | C M Howes | 10 |
| Centre Elec..... | 12 | Keytronics..... | 15 |
| Cirkit | 18, 19 | Number 1 Systems..... | 56 |
| P M Component | 50, 51 | Reltech | 12 |
| Crash Barriers..... | 25 | Riscomp..... | 25 |
| Digitask | 43 | RSGB..... | 22 |
| Display Elec..... | 67 | Sendz | 68 |
| E Cornwall..... | 67 | Sherwood Data | 38 |
| Edwardschild..... | 12 | C R Supply..... | 25 |
| Essex Elec Centre | 49 | Thanet..... | 36 |
| Grandata | 26 | Wood & Douglas..... | 30 |
| Greenwood Elec..... | 38 | R Withers..... | 2, 30 |



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| <p>SERIES RATES Series rates also apply when larger or additional space to that initially booked is taken. An ad of at least the minimum space must appear in consecutive issues to qualify for series rates. Previous copy will automatically be repeated if no further copy is received. A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received. Display Ad and Small Ad series rate contracts are not interchangeable.</p> | <p>If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.</p> <p>COPY Except for County Guides copy may be changed monthly. No additional charges for typesetting or illustrations (except for colour separations). For illustrations just send photograph or artwork. Colour Ad rates do not include the cost of separations.</p> | <p>Printed — web-offset. PAYMENT Above rates exclude VAT. All single insertion ads are accepted on a pre-payment basis only, unless an account is held. Accounts will be opened for series rate advertisers subject to satisfactory credit references. Accounts are strictly net and must be settled by publication date.</p> <p>FOR FURTHER INFORMATION CONTACT Radio & Electronics World, Sovereign House, Brentwood, Essex CM14 4SE. (0277) 219876</p> <p>Overseas payments by International Money Order. Commission to approved advertising agencies is 10%.</p> <p>CONDITIONS 10% discount if advertising in both Radio & Electronics World and Amateur Radio. A voucher copy will be sent to Display and Colour advertisers only. Ads accepted subject to our standard conditions, available on request.</p> |

EAST CORNWALL COMPONENTS

| TRANSISTORS | | DIODES | | Type | | Price (£) | | Type | | Price (£) | | Type | | Price (£) | | Type | | Price (£) | |
|-------------|------|---------|------|-------------|------|-----------|------|-------|------|------------|------|-----------|------|-----------|------|------------------------------|------|-----------|------|
| AC126 | 0.35 | BC108 | 0.10 | BC302 | 0.32 | BD244A | 0.65 | BF258 | 0.30 | BT101/300 | 1.15 | BYX36/150 | 0.22 | TIP32 | 0.40 | REGULATORS | | | |
| AC127 | 0.30 | AB or C | 0.12 | BC303 | 0.32 | BD375 | 0.32 | BF259 | 0.32 | BT101/500 | 1.25 | BYX36/600 | 0.28 | TIP32C | 0.60 | Type | Type | Type | Type |
| AC128 | 0.14 | BC110 | 0.12 | BC307 | 0.10 | BD410 | 0.78 | BF262 | 0.30 | BT102/300 | 1.35 | BYX48/300 | 0.72 | TIP33A | 0.80 | 78L05 | 0.30 | DY802 | 0.85 |
| AC128K | 0.34 | BC114 | 0.12 | BC308A | 0.10 | BD434 | 0.10 | BF263 | 0.30 | BT102/500 | 1.65 | BYX48/600 | 0.47 | TIP34A | 0.72 | 78L08 | 0.30 | ECC81 | 0.88 |
| AC132 | 0.58 | BC115 | 0.12 | BC323 | 0.99 | BD436 | 0.68 | BF270 | 0.30 | BT106 | 1.80 | BYX55/350 | 0.29 | TIP41C | 0.80 | 78L12 | 0.30 | ECC82 | 0.88 |
| AC141 | 0.28 | BC116 | 0.12 | BC327 | 0.14 | BD437 | 0.78 | BF271 | 0.30 | BT108 | 1.30 | BYX55/600 | 0.33 | TIP42C | 0.72 | 78L15 | 0.30 | ECC83 | 0.75 |
| AC141K | 0.28 | BC117 | 0.22 | BC328 | 0.14 | BD438 | 0.75 | BF273 | 0.18 | BT109 | 1.18 | BYX71/600 | 1.18 | TIP47 | 0.60 | 78M05 | 0.50 | ECC84 | 0.65 |
| AC141K | 0.40 | BC118 | 0.27 | BC337 | 0.12 | BD439 | 0.68 | BF274 | 0.32 | BT116 | 1.28 | BYZ12 | 0.42 | TIP110 | 0.88 | 78M08 | 0.50 | ECC85 | 0.60 |
| AC178K | 0.48 | BC120 | 0.10 | BC350 | 0.12 | BD450 | 0.58 | BF323 | 0.92 | BT119 | 3.62 | CO16D | 0.60 | TIP295S | 0.60 | 78M12 | 0.50 | ECC88 | 0.98 |
| AC142K | 0.48 | BC125 | 0.10 | BC350 | 0.14 | BD508 | 0.53 | BF336 | 0.28 | BT120 | 3.90 | E1222 | 0.40 | TIP305S | 0.60 | 78M15 | 0.50 | ECC90 | 0.98 |
| AC151 | 0.48 | BC140 | 0.28 | BC440 | 0.30 | BD509 | 0.48 | BF337 | 0.28 | BT121 | 3.02 | E5024 | 0.30 | TIS43 | 0.60 | 78M24 | 0.50 | ECC92 | 0.75 |
| AC152 | 0.48 | BC141 | 0.42 | BC441 | 0.32 | BD510 | 0.48 | BF338 | 0.28 | BT138/600 | 1.30 | GET872 | 0.48 | TIS88 | 0.48 | 7805 | 0.58 | ECC94 | 0.75 |
| AC176 | 0.28 | BC142 | 0.22 | BC461 | 0.32 | BD517 | 0.58 | BF355 | 0.58 | BT151/560R | 0.42 | ITT44 | 0.04 | TIS90 | 0.28 | 7808 | 0.58 | ECC96 | 0.75 |
| AC178K | 0.48 | BC143 | 0.30 | BC547 | 0.12 | BD520 | 0.88 | BF363 | 0.82 | BT151/300R | 1.18 | ITT2002 | 0.11 | TIS91 | 0.28 | 7812 | 0.58 | ECC98 | 0.88 |
| AC187 | 0.48 | BC147 | 0.08 | BC548 | 0.12 | BD589 | 1.25 | BF367 | 0.24 | BTY79/400R | 2.40 | MIE0402 | 0.20 | ZTX108 | 0.07 | 7815 | 0.58 | EF80 | 1.05 |
| AC187K | 0.48 | A or B | 0.10 | BC549 | 0.12 | BD707 | 0.58 | BF371 | 0.27 | BU100A | 2.30 | MJ0402 | 2.90 | ZTX109 | 0.12 | 7818 | 0.58 | EF81 | 1.05 |
| AC188 | 0.44 | BC148 | 0.08 | BC550 | 0.16 | BDX18 | 2.35 | BF422 | 0.38 | BU104 | 2.00 | MEU21 | 0.50 | ZTX212 | 0.28 | 7818 | 0.58 | EF183 | 0.75 |
| AC188K | 0.50 | A or B | 0.10 | BC550C | 0.16 | BDX32 | 2.10 | BF450 | 0.38 | BU105 | 2.00 | MJ400 | 1.25 | IN4001 | 0.08 | 7824 | 0.58 | EF184 | 0.75 |
| ACY40 | 0.88 | BC149 | 0.09 | BC557 | 0.12 | BF115 | 0.32 | BF457 | 0.33 | BU105/02 | 1.98 | MJ295S | 0.90 | IN4003 | 0.06 | 7905 | 0.68 | EH90 | 0.54 |
| AD142 | 1.10 | BC157 | 0.10 | BC558 | 0.12 | BF119 | 0.54 | BF458 | 0.38 | BU108 | 1.80 | MJ3000 | 1.98 | IN4004 | 0.06 | 7912 | 0.68 | EL34 | 2.50 |
| AD143 | 1.10 | BC158 | 0.10 | BCX34 | 0.27 | BF119 | 0.82 | BF459 | 0.44 | BU124 | 1.78 | MJE240 | 0.80 | IN4006 | 0.06 | 7915 | 0.68 | EL84 | 0.68 |
| AD149 | 0.98 | BC159 | 0.10 | BCY70 | 0.16 | BF120 | 0.16 | BF459 | 0.22 | BU126 | 1.28 | MJE340 | 0.54 | IN4007 | 0.07 | 7918 | 0.68 | EL85 | 0.68 |
| AD161 | 0.48 | BC160 | 0.30 | BCY71 | 0.17 | BF123 | 0.30 | BF459 | 0.22 | BU133 | 1.80 | MJE170 | 0.88 | IN4148 | 0.05 | 7924 | 0.68 | EM87 | 2.55 |
| AD162 | 0.48 | BC161 | 0.30 | BCY72 | 0.18 | BF125 | 0.42 | BF459 | 0.22 | BU204 | 1.38 | MJE250 | 0.48 | IN5400 | 0.12 | CA3085 | 0.95 | EY86/87 | 0.67 |
| AD161/AD162 | 0.98 | BC168B | 0.12 | BCZ10 | 1.88 | BF127 | 0.38 | BF459 | 0.30 | BU205 | 1.30 | MJE295S | 0.99 | IN5402 | 0.10 | 723C | 0.95 | EY900A | 1.85 |
| AF106 | 0.48 | BC169C | 0.10 | BDZ11 | 1.48 | BF152 | 0.18 | BF459 | 0.32 | BU206 | 1.70 | MJL305T | 0.70 | IN5405 | 0.16 | LM317K | 3.50 | PCC84 | 0.85 |
| AF114 | 2.10 | BC170 | 0.10 | BDZ14P | 0.90 | BF154 | 0.28 | BF459 | 0.32 | BU208A | 1.63 | 0A90 | 0.10 | IN5408 | 0.18 | LM317T | 0.90 | PCC85 | 0.85 |
| AF115 | 2.10 | BC170B | 0.10 | BC130Y | 0.88 | BF157 | 0.40 | BF459 | 0.34 | BU208B | 1.63 | 0A90 | 0.10 | IN5408 | 0.18 | LM317T | 0.90 | PCC89 | 0.74 |
| AF116 | 2.10 | BC171 | 0.10 | BD131 | 0.34 | BF158 | 0.22 | BF459 | 1.72 | BU208/02 | 2.05 | 0A90 | 0.08 | IS920 | 0.08 | | | PCC189 | 0.85 |
| AF117 | 2.10 | BC171 | 0.10 | BD132 | 0.34 | BF159 | 0.22 | BF459 | 1.72 | BU208/02 | 2.05 | 0A90 | 0.08 | IS920 | 0.08 | | | PCC189 | 0.85 |
| AF118 | 0.88 | A or B | 0.08 | BD131/BD132 | 0.98 | BF160 | 0.23 | BF459 | 0.36 | BU407 | 1.68 | 0A95 | 0.18 | 2N706A | 0.33 | | | PCF86 | 1.25 |
| AF121 | 0.88 | A or B | 0.08 | BD135 | 0.52 | BF167 | 0.30 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AF124 | 0.48 | A or B | 0.12 | BD136 | 0.32 | BF172 | 0.30 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AF125 | 0.48 | BC177 | 0.20 | BD137 | 0.36 | BF177 | 0.42 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AF127 | 0.48 | BC178A | 0.22 | BD138 | 0.38 | BF178 | 0.42 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AF139 | 0.68 | BC182 | 0.08 | BD139 | 0.38 | BF179 | 0.42 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AF178 | 0.68 | A or C | 0.08 | BD140 | 0.38 | BF180 | 0.32 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AF239 | 0.68 | BC182L | 0.08 | BD144 | 1.60 | BF181 | 0.35 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AF279S | 0.72 | A or C | 0.08 | BD145 | 1.82 | BF182 | 0.32 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AL100 | 2.50 | BC183 | 0.09 | BD150A | 0.51 | BF183 | 0.32 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AL102 | 5.90 | A or C | 0.10 | BD159 | 0.88 | BF184 | 0.32 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AL113 | 2.20 | BC183L | 0.08 | BD160 | 1.85 | BF185 | 0.32 | BF459 | 0.78 | BU407D | 1.90 | 0A200 | 0.08 | 2N2904 | 0.28 | | | PCF200 | 1.85 |
| AS90 | 1.78 | A or C | 0.12 | BD165 | 0.48 | BF194 | 0.08 | BF459 | 0.21 | BY135 | 0.25 | 0C45 | 0.58 | 2N3904 | 0.18 | Setting Brightness | PL33 | 1.50 | |
| AU110 | 1.40 | BC185 | 0.10 | BD175 | 0.58 | BF195 | 0.10 | BF459 | 0.21 | BY164 | 0.44 | 0C71 | 0.50 | 2N3906 | 0.18 | Control | PL36 | 1.48 | |
| AY102 | 4.32 | A or C | 0.10 | BD182 | 1.00 | BF196 | 0.10 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | Wake to Mute | PL81 | 0.58 | |
| BA102 | 0.34 | BC207 | 0.18 | BD183 | 1.10 | BF197 | 0.10 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | £2.50 ea + addtl postage 50p | PL82 | 0.75 | |
| BA110 | 0.67 | BC208 | 0.18 | BD184 | 1.20 | BF198 | 0.14 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL83 | 0.68 | |
| BA121 | 0.40 | BC212 | 0.10 | BD201 | 0.72 | BF199 | 0.16 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL84 | 0.75 | |
| BA129 | 0.38 | A or C | 0.09 | BD202 | 0.87 | BF200 | 0.48 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL85 | 2.00 | |
| BA148 | 0.18 | A or C | 0.10 | BD204 | 0.90 | BF201 | 0.48 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL86 | 1.20 | |
| BA154 | 0.08 | A or C | 0.10 | BD222 | 0.80 | BF224 | 0.20 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL87 | 1.20 | |
| BA155 | 0.10 | BC213 | 0.09 | BD225 | 0.88 | BF224J | 0.16 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL88 | 0.75 | |
| BA156 | 0.08 | A or B | 0.10 | BD232 | 0.48 | BF240 | 0.20 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL89 | 0.75 | |
| BA157 | 0.28 | BC213L | 0.10 | BD233 | 0.80 | BF241 | 0.28 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL90 | 2.00 | |
| BA164 | 0.16 | A or B | 0.10 | BD234 | 0.82 | BF244 | 0.28 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL91 | 1.20 | |
| BB104S | 0.14 | BC236 | 0.12 | BD236 | 0.82 | BF244C | 0.28 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL92 | 1.20 | |
| BB105S | 0.48 | BC239 | 0.14 | BD237 | 0.88 | BF245A | 0.28 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL93 | 1.20 | |
| BB110S | 0.42 | BC251 | 0.12 | BD238 | 0.58 | BF254 | 0.18 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL94 | 1.20 | |
| BC107 | 0.10 | A or C | 0.14 | BD241 | 0.80 | BF256 | 0.40 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL95 | 1.20 | |
| A or B | 0.12 | BC301 | 0.30 | BD243A | 0.80 | BF257 | 0.32 | BF459 | 0.21 | BY232 | 0.68 | 0C72 | 0.50 | 2N4524 | 0.10 | | PL96 | 1.20 | |

| | | | |
|----------|-------|---------------------------|-------|
| SAAS500A | £1.80 | R275-TIP41c | 40p |
| SAAS502A | £3.00 | R3129-TIP47 | 40p |
| SAAS503 | £3.00 | S2008b | 40p |
| SAAS504 | £3.50 | | |
| SAAS504A | £4.40 | 2SC940 | £1.00 |
| SAAS505 | £3.80 | BU 105/04 | 80p |
| SAF1032p | £2.80 | BU 108 | £1.00 |
| SAF1039 | £2.00 | BU 124 | 80p |
| SA5680 | £1.00 | BU 126 | 80p |
| SA5670 | £1.00 | BU 128 | 80p |
| SL901B | £4.80 | BU 204 | 70p |
| TA7122 | £1.18 | BU 205 | £1.00 |
| TAA320A | £1.80 | BU 206 | £1.00 |
| TAA470 | £1.80 | BU 207 | £1.00 |
| TAA570 | £1.80 | BU 208 | 80p |
| TAA611B | £1.80 | BU 208 on heatsink | 70p |
| TAA621 | £2.00 | BU 208D | 80p |
| TAA681 | £1.80 | BU 222 | £1.00 |
| TAA711 | £1.80 | BU 226 | £1.00 |
| TA7120P | £1.80 | BU 407 | 80p |
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| TA7807AF | £1.80 | BU 508A | £1.20 |
| TA7809P | £1.80 | BU 526 | 75p |
| TBA120A | £1.00 | BU 807 | £1.00 |
| TBA120AS | £1.00 | BU 824 | £1.00 |
| TBA120S | £1.00 | BU939/94 | 80p |
| TBA120SB | £1.00 | BUY 71 | £1.00 |
| TBA120SC | £1.00 | TIC 106A | 40p |
| TBA120SD | £1.00 | TIC 116m | 40p |
| TBA120SE | £1.00 | TIC 116m/Y 1003 | 38p |
| TBA120SF | £1.00 | TIC 126N | 40p |
| TBA120SG | £1.00 | TIC 206C | 30p |
| TBA120SH | £1.00 | TIC 225S | 40p |
| TBA120SI | £1.00 | TIC 226E | 40p |
| TBA120SJ | £1.00 | TIC 226m | 40p |
| TBA120SK | £1.00 | TIC 236m | 40p |
| TBA120SL | £1.00 | TIC 236m/106D (T092 case) | 40p |
| TBA120SM | £1.00 | 2A/40V | 10p |
| TBA120SN | £1.00 | TIP 29 | 20p |
| TBA120SO | £1.00 | TIP 30 | 38p |
| TBA120SP | £1.00 | TIP 30A | 38p |
| TBA120SQ | £1.00 | TIP 30B | 40p |
| TBA120SR | £1.00 | TIP 30C | 48p |
| TBA120SS | £1.00 | TIP 31 | 30p |
| TBA120ST | £1.00 | TIP 32 | 25p |
| TBA120SU | £1.00 | TIP 33B | 50p |
| TBA120SV | £1.00 | TIP 33C | 70p |
| TBA120SW | £1.00 | TIP 34A | 50p |
| TBA120SX | £1.00 | TIP 34B | 50p |
| TBA120SY | £1.00 | TIP 34C | 50p |
| TBA120SZ | £1.00 | TIP 35B | 50p |
| TBA120TA | £1.00 | TIP 35C | 50p |
| TBA120TB | £1.00 | TIP 35D | 80p |
| TBA120TC | £1.00 | TIP 36 | 30p |
| TBA120TD | £1.00 | TIP 37 | 30p |
| TBA120TE | £1.00 | TIP 41B | 70p |
| TBA120TF | £1.00 | TIP 41D | 70p |
| TBA120TG | £1.00 | TIP 42/BRC 6109 | 30p |
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| TBA120TI | £1.00 | TIP 49 | 30p |
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| TBA120TK | £1.00 | TIP 102 | 30p |
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| TBA120TM | £1.00 | TIP 115 | 50p |
| TBA120TN | £1.00 | TIP 117 | 60p |
| TBA120TO | £1.00 | TIP 120 | 30p |
| TBA120TP | £1.00 | TIP 125 | 35p |
| TBA120TQ | £1.00 | TIP 130 | 30p |
| TBA120TR | £1.00 | TIP 131 | 25p |
| TBA120TS | £1.00 | TIP 136 | 30p |
| TBA120TT | £1.00 | TIP 140 | 30p |
| TBA120TU | £1.00 | TIP 140 | 30p |
| TBA120TV | £1.00 | TIP 140 | 30p |
| TBA120TW | £1.00 | TIP 295S | 50p |
| TBA120TX | £1.00 | T6032 | 30p |
| TBA120TY | £1.00 | T6036 | 30p |
| TBA120TZ | £1.00 | T6040 | 40p |
| TBA120TA | £1.00 | T6047 | 40p |
| TBA120TB | £1.00 | T6049 | 40p |
| TBA120TC | £1.00 | T6051 | 40p |
| TBA120TD | £1.00 | T6052 | 40p |
| TBA120TE | £1.00 | T9004 | 40p |
| TBA120TF | £1.00 | T9005 | 40p |
| TBA120TG | £1.00 | ZTX 102c | 10p |
| TBA120TH | £1.00 | ZTX 107 | 10p |
| TBA120TI | £1.00 | ZTX 108c | 10p |
| TBA120TJ | £1.00 | ZTX 109c | 5p |
| TBA120TK | £1.00 | ZYX 213 | 5p |
| TBA120TL | £1.00 | ZFR79 | 15p |
| TBA120TM | £1.00 | ZFR81 | 15p |
| TBA120TN | £1.00 | ZFR87 | 10p |
| TBA120TO | £1.00 | ZFR90 | 25p |
| TBA120TP | £1.00 | ZFR92 | 7p |
| TBA120TQ | £1.00 | ZFR93 | 10p |
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| TBA120TS | £1.00 | ZFR95 | 10p |
| TBA120TT | £1.00 | ZFR96 | 10p |
| TBA120TU | £1.00 | ZFR97 | 10p |
| TBA120TV | £1.00 | ZFR98 | 10p |
| TBA120TW | £1.00 | ZFR99 | 10p |
| TBA120TX | £1.00 | ZFR100 | 10p |
| TBA120TY | £1.00 | ZFR101 | 10p |
| TBA120TZ | £1.00 | ZFR102 | 10p |
| TBA120TA | £1.00 | ZFR103 | 10p |
| TBA120TB | £1.00 | ZFR104 | 10p |
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| TBA120TE | £1.00 | ZFR107 | 10p |
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| TBA120TH | £1.00 | ZFR110 | 10p |
| TBA120TI | £1.00 | ZFR111 | 10p |
| TBA120TJ | £1.00 | ZFR112 | 10p |
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| TBA120TL | £1.00 | ZFR114 | 10p |
| TBA120TM | £1.00 | ZFR115 | 10p |
| TBA120TN | £1.00 | ZFR116 | 10p |
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| TBA120TP | £1.00 | ZFR118 | 10p |
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| TBA120TS | £1.00 | ZFR121 | 10p |
| TBA120TT | £1.00 | ZFR122 | 10p |
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| TBA120TZ | £1.00 | ZFR128 | 10p |
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| TBA120TD | £1.00 | ZFR132 | 10p |
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| TBA120TG | £1.00 | ZFR135 | 10p |
| TBA120TH | £1.00 | ZFR136 | 10p |
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| TBA120TJ | £1.00 | ZFR138 | 10p |
| TBA120TK | £1.00 | ZFR139 | 10p |
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| TBA120TN | £1.00 | ZFR142 | 10p |
| TBA120TO | £1.00 | ZFR143 | 10p |
| TBA120TP | £1.00 | ZFR144 | 10p |
| TBA120TQ | £1.00 | ZFR145 | 10p |
| TBA120TR | £1.00 | ZFR146 | 10p |
| TBA120TS | £1.00 | ZFR147 | 10p |
| TBA120TT | £1.00 | ZFR148 | 10p |
| TBA120TU | £1.00 | ZFR149 | 10p |
| TBA120TV | £1.00 | ZFR150 | 10p |
| TBA120TW | £1.00 | ZFR151 | 10p |
| TBA120TX | £1.00 | ZFR152 | 10p |
| TBA120TY | £1.00 | ZFR153 | 10p |
| TBA120TZ | £1.00 | ZFR154 | 10p |
| TBA120TA | £1.00 | ZFR155 | 10p |
| TBA120TB | £1.00 | ZFR156 | 10p |
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| TBA120TD | £1.00 | ZFR158 | 10p |
| TBA120TE | £1.00 | ZFR159 | 10p |
| TBA120TF | £1.00 | ZFR160 | 10p |
| TBA120TG | £1.00 | ZFR161 | 10p |
| TBA120TH | £1.00 | ZFR162 | 10p |
| TBA120TI | £1.00 | ZFR163 | 10p |
| TBA120TJ | £1.00 | ZFR164 | 10p |
| TBA120TK | £1.00 | ZFR165 | 10p |
| TBA120TL | £1.00 | ZFR166 | 10p |
| TBA120TM | £1.00 | ZFR167 | 10p |
| TBA120TN | £1.00 | ZFR168 | 10p |
| TBA120TO | £1.00 | ZFR169 | 10p |
| TBA120TP | £1.00 | ZFR170 | 10p |
| TBA120TQ | £1.00 | ZFR171 | 10p |
| TBA120TR | £1.00 | ZFR172 | 10p |
| TBA120TS | £1.00 | ZFR173 | 10p |
| TBA120TT | £1.00 | ZFR174 | 10p |
| TBA120TU | £1.00 | ZFR175 | 10p |
| TBA120TV | £1.00 | ZFR176 | 10p |
| TBA120TW | £1.00 | ZFR177 | 10p |
| TBA120TX | £1.00 | ZFR178 | 10p |
| TBA120TY | £1.00 | ZFR179 | 10p |
| TBA120TZ | £1.00 | ZFR180 | 10p |
| TBA120TA | £1.00 | ZFR181 | 10p |
| TBA120TB | £1.00 | ZFR182 | 10p |
| TBA120TC | £1.00 | ZFR183 | 10p |
| TBA120TD | £1.00 | ZFR184 | 10p |
| TBA120TE | £1.00 | ZFR185 | 10p |
| TBA120TF | £1.00 | ZFR186 | 10p |
| TBA120TG | £1.00 | ZFR187 | 10p |
| TBA120TH | £1.00 | ZFR188 | 10p |
| TBA120TI | £1.00 | ZFR189 | 10p |
| TBA120TJ | £1.00 | ZFR190 | 10p |
| TBA120TK | £1.00 | ZFR191 | 10p |
| TBA120TL | £1.00 | ZFR192 | 10p |
| TBA120TM | £1.00 | ZFR193 | 10p |
| TBA120TN | £1.00 | ZFR194 | 10p |
| TBA120TO | £1.00 | ZFR195 | 10p |
| TBA120TP | £1.00 | ZFR196 | 10p |
| TBA120TQ | £1.00 | ZFR197 | 10p |
| TBA120TR | £1.00 | ZFR198 | 10p |
| TBA120TS | £1.00 | ZFR199 | 10p |
| TBA120TT | £1.00 | ZFR200 | 10p |
| TBA120TU | £1.00 | ZFR201 | 10p |
| TBA120TV | £1.00 | ZFR202 | 10p |
| TBA120TW | £1.00 | ZFR203 | 10p |
| TBA120TX | £1.00 | ZFR204 | 10p |
| TBA120TY | £1.00 | ZFR205 | 10p |
| TBA120TZ | £1.00 | ZFR206 | 10p |
| TBA120TA | £1.00 | ZFR207 | 10p |
| TBA120TB | £1.00 | ZFR208 | 10p |
| TBA120TC | £1.00 | ZFR209 | 10p |
| TBA120TD | £1.00 | ZFR210 | 10p |
| TBA120TE | £1.00 | ZFR211 | 10p |
| TBA120TF | £1.00 | ZFR212 | 10p |
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| TBA120TH | £1.00 | ZFR214 | 10p |
| TBA120TI | £1.00 | ZFR215 | 10p |
| TBA120TJ | £1.00 | ZFR216 | 10p |
| TBA120TK | £1.00 | ZFR217 | 10p |
| TBA120TL | £1.00 | ZFR218 | 10p |
| TBA120TM | £1.00 | ZFR219 | 10p |
| TBA120TN | £1.00 | ZFR220 | 10p |
| TBA120TO | £1.00 | ZFR221 | 10p |
| TBA120TP | £1.00 | ZFR222 | 10p |
| TBA120TQ | £1.00 | ZFR223 | 10p |
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| TBA120TH | £1.00 | ZFR240 | 10p |
| TBA120TI | £1.00 | ZFR241 | 10p |
| TBA120TJ | £1.00 | ZFR242 | 10p |
| TBA120TK | £1.00 | ZFR243 | 10p |
| TBA120TL | £1.00 | ZFR244 | 10p |
| TBA120TM | £1.00 | ZFR245 | 10p |
| TBA120TN | £1.00 | ZFR246 | 10p |
| TBA120TO | £1.00 | ZFR247 | 10p |
| TBA120TP | £1.00 | ZFR248 | 10p |
| TBA120TQ | £1.00 | ZFR249 | 10p |
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| TBA120TH | £1.00 | ZFR266 | 10p |
| TBA120TI | £1.00 | ZFR267 | 10p |
| TBA120TJ | £1.00 | ZFR268 | 10p |
| TBA120TK | £1.00 | ZFR269 | 10p |
| TBA120TL | £1.00 | ZFR270 | 10p |
| TBA120TM | £1.00 | ZFR271 | 10p |
| TBA120TN | £1.00 | ZFR272 | 10p |
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| TBA120TZ | £1.00 | ZFR284 | 10p |
| TBA120TA | £1.00 | ZFR285 | 10p |
| TBA120TB | £1.00 | ZFR286 | 10p |
| TBA120TC | £1.00 | ZFR287 | 10p |
| TBA120TD | £1.00 | ZFR288 | 10p |
| TBA120TE | £1.00 | ZFR289 | 10p |
| TBA120TF | £1.00 | | |