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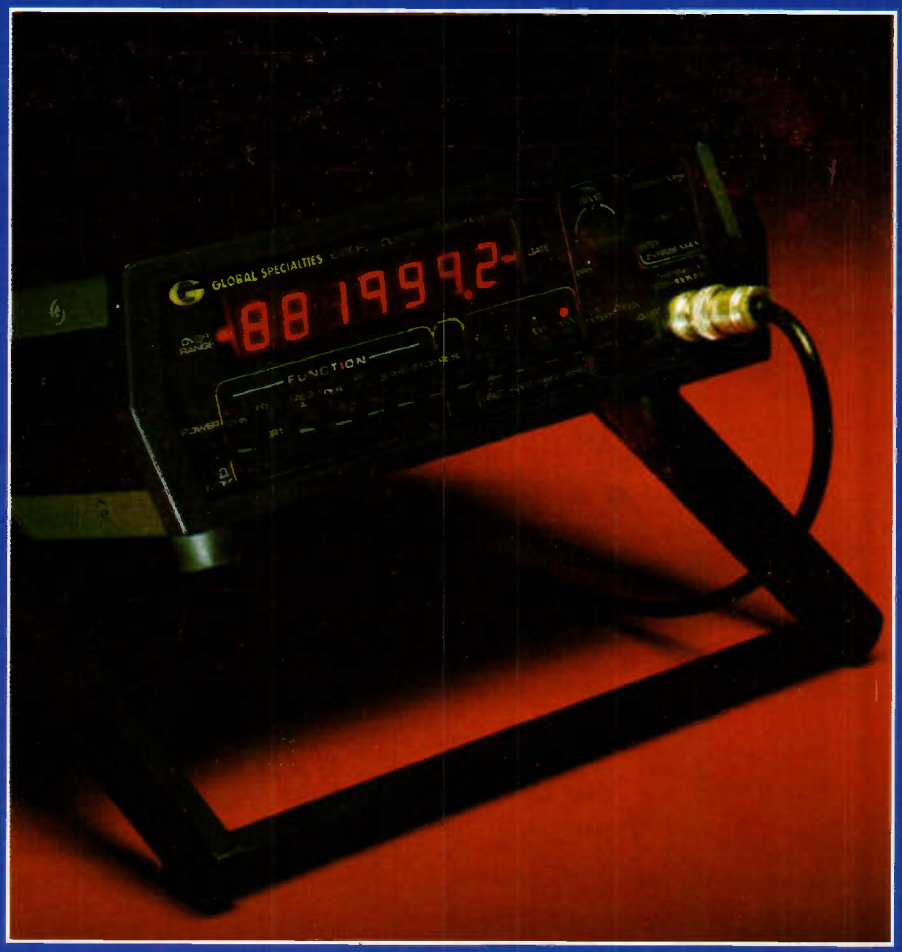

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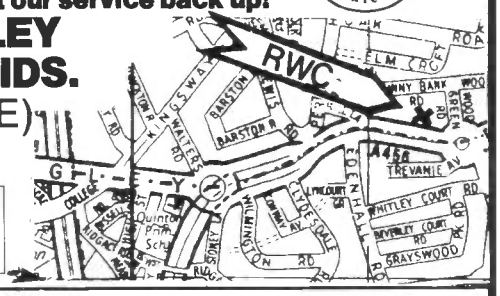

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VISA

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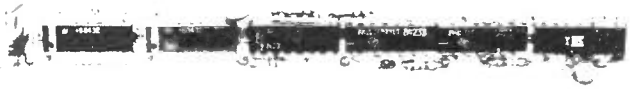
RAY G4 KZH G6 KZH G1 KZH

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 sythesizer 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	£62.30
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 polorization 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 hs RF gain control, RIT, 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 unrepeatable 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 sythesizer 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 mofication 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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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.

Cover Photographs
Top – One of the Sovereign 6003/T series of counter-timers from Global Specialties(p5)
Bottom – Dual axis rotation system, the DR10, from Dynetic Systems (p9)

SPECIAL FEATURES

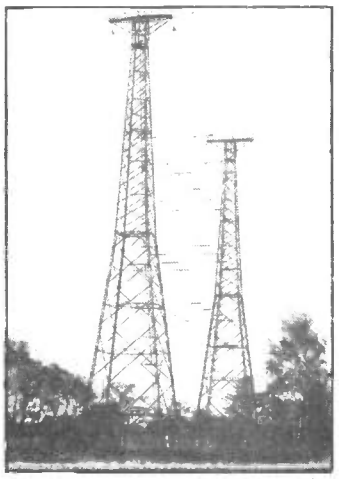
REGULARS

READER SERVICE

NEXT MONTH

☐ **Next Issue**
Cover date October 1985 on sale Thursday, 12 September

☐ **Publication Date**
Second Thursday of the month preceding cover date



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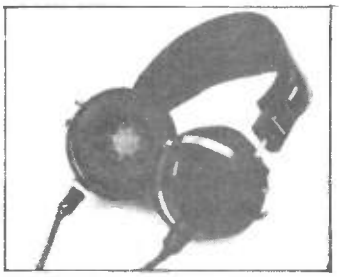

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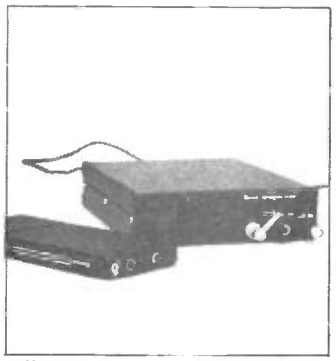

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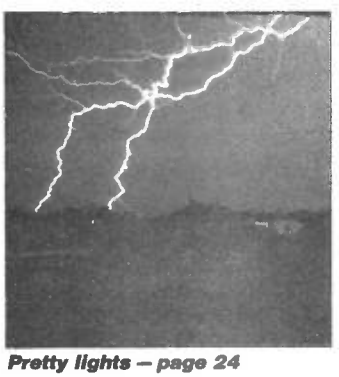


Pretty lights – page 24

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

MILLIVOLTMETER

For both laboratories and production test purposes, the measurement of insertion loss or gain of components and assemblies is made simpler using Boonton's dual-channel option for its advanced 9200A millivoltmeter. The second-channel option duplicates the instrument's front panel input on the back panel, and using a second sensor allows the instrument to display directly channel 1, channel 2 and channel 1-2 differential voltages.

When measuring the insertion loss or gain of a component powered from an RF source, one probe can be connected to the input using a power splitter. The other probe measures the output voltage. The insertion loss/gain figure is then read directly from the 9200A's display in dB.

Quite apart from the improvement in operational convenience of taking the measurements simultaneously instead of taking two readings, Euro Electronics Ltd claim that the differential measurement gives more accurate results. Since the voltage probes differ only slightly in their high frequency response, the differential measurement approach reduces measurement errors of separately levelled measurements.

The actual measurement accuracy depends on three main factors: the basic instrument uncertainty, the probe performance and the temperature effect. For example, the basic uncertainty of the 9200A from 3 to 3000mV is given as one per cent of reading ± one count.

Using an optional 50 ohm terminated sensor (model 952009), frequency response of the 9200A extends to 2.5GHz, and since the probe measures voltage across a 50 ohm resistor, power levels can be read using the instrument's dBm mode.

Data for all probes and sensors is stored in a non-volatile memory. This includes both sensitivity and range linearisation requirements. Replacement probe information can be entered into the memory by the user by operating an internal switch. No further calibration is required.

Euro Electronics Ltd,
Lancaster Gate House,
319 Pinner Road, Harrow,
Middlesex HA1 4HF.
Tel: (01) 863 0811.

15MHz OSCILLOSCOPE

Electronic Brokers offer from stock the new Philips PM3206, a low cost 15MHz oscilloscope. The instrument features a 5mV sensitivity across the full 15MHz bandwidth. Sensitivity is the same for both X and Y channels, with X-deflection input to the A-input, thus providing identical loading for each input signal.

Automatic triggering ensures that a stable trace is locked onto the screen and also enables adjustment of the trigger level between the peaks of the signal. TV triggering is a standard feature for TV and video service engineers.

Other features include trigger selection from either channel A or channel B and externally, and also an external Z-modulation facility, which by blanking parts of the display at predefined time intervals allows the user to put a third parameter on the screen. This latter feature is especially useful in the X-Y mode when neither variable is a time measurement.

The PM3206's 8 x 10cm screen has an internal graticule to eliminate parallax errors, with 0%, 10%, 90% and 100% indications.

With an accuracy of ±5%, the oscilloscope has a 23 nanosecond (nS) rise time, an input impedance of 1MΩ/35pF, and a maximum input voltage of 400V dc or ac peak.

The oscilloscope costs £286 and meets CSA, IEC and VDE safety requirements.

Electronic Brokers Ltd,
140-146 Camden Street,
London NW1 9PB.
Tel: (01) 267 7070.

MEASUREMENT INTERFACE

A new Z80-based scientific measurement interface has been announced by IMS Electronics of Littlehampton, Sussex. The CM1600 has sixteen input/output channels and a computer interface (IEEE-488 or RS232C).

The I/O channels are arranged in four banks of four, each bank in fact being a module. Modules may be selected from the following types: analogue input, thermocouple input, analogue output and mains relay. The CM1600 therefore combines most of the flexibility of a rack system with the convenience of a bench-top instrument. Analogue conversions are carried out to 16-bit resolution.

The price including any four modules and either computer interface is £795. Optional extras include a dot matrix panel printer and a 32K RAM extension to assist in high speed data acquisition.

COUNTER-TIMER SERIES

Now available from GSC is the Sovereign 6003/T series of counter-timers, which provide a wide choice of measurement modes at a low cost.

Designed for almost any application, the 6003/T has five universal measuring modes including frequency, frequency ratio, period, multiple period and totalising. In all modes, results are displayed with a 7-digit light-emitting diode (LED) display with automatic decimal point positioning and a display 'latch' register to ensure the read-out is flicker-free.

Other features include an ac coupled input, an input impedance which is 1MΩ in parallel with 25pF, and the facility to switch the input attenuator for a 1 or 20 attenuation factor. In addition, the trigger level can be continuously varied from – 1V to +1V, and a low-pass filter with an upper frequency of 1kHz is built in to avoid trigger failure at low frequency signal with high noise or radio frequency.

Supplied in a rugged, compact metal case to prevent physical damage and provide effective EMI shielding, the 6003 series is easily portable, weighing only 2.2kg. Options include a binary-coded decimal (BCD) output, and 1GHz and 1.2GHz prescalers.

Global Specialties Corporation, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ. Tel: (0799) 21682.

INTERFACE TEST EQUIPMENT

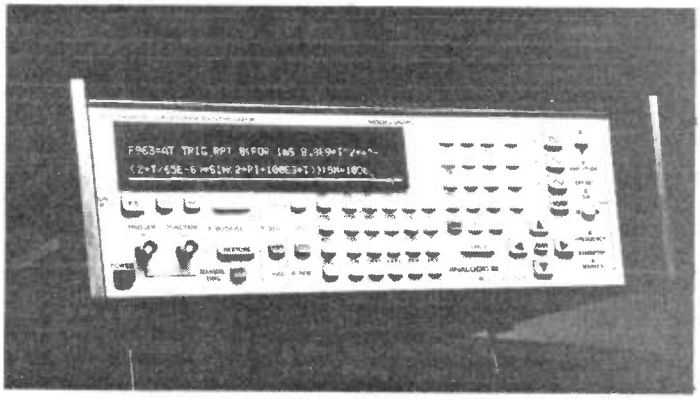
An advanced serial interface tester is now available from Modular Technology, part of Zygal Dynamics plc.

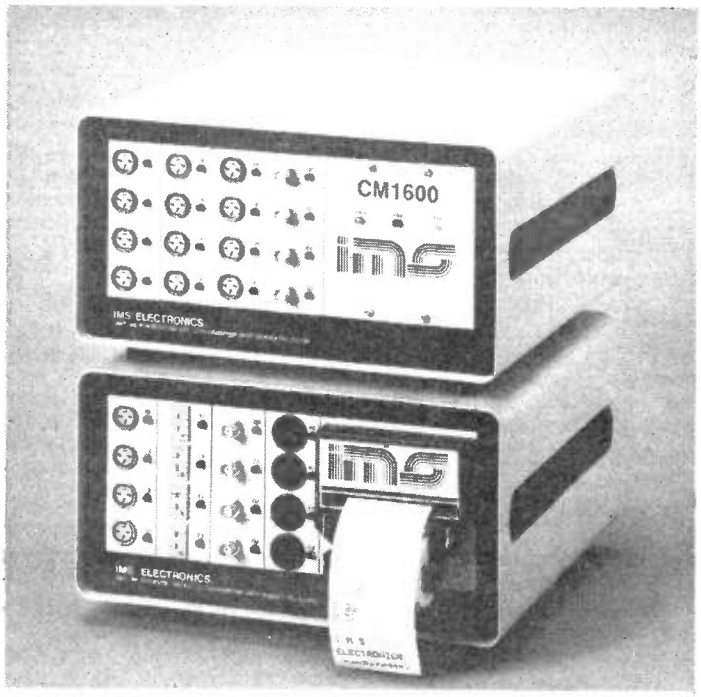
Called the Interfaker III, the equipment will be of particular interest to engineers requiring precise diagnostic and trouble-shooting test equipment for CCITT V24/V28 or EIA RS232C datacom interfaces.

The Interfaker III will not 'electrically load' any lines being monitored or tested. In this way, the equipment does not introduce any extraneous electrical load into the circuit under test.

In practice, the Interfaker III is normally used to test and check conditions and connections between a computer and a modem or terminal.

Modular Technology, Zygal House, Telford Road, Bicester, Oxford OX6 0XB. Tel: (0869) 253361.





IMS Electronics, Unit R6, Riverside Industrial Estate, Littlehampton, West Sussex BN17 5DF. Tel: (0903) 723492.

WAVEFORM SYNTHESISER

Analogic has announced a polynomial waveform synthesiser that allows the user to 'draw' the output waveform required.

The new model 2020 instrument offers 12-bit precision and half-cycle periods from 40 nanoseconds to 379 days. A range from 10nS to two years at 8-bit resolution is available as an option.

Standard waveforms available include triangle, ramp and sawtooth, in addition to white noise. There are ten built-in four-pole linear filters with centre frequencies between 20kHz and 20MHz.

User-defined waveforms can be input via the front panel or the IEEE-488 interface, as polynomials of the form $y = F(t)$. The 'Etch-A-Sketch' facility can be used either to create new waveforms or edit existing ones. In this mode the output waveform is displayed on an external oscilloscope, together with a cursor, allowing the user to redefine the waveform amplitude at any point.

Waveforms can be stored under user-defined filenames as a series of keystrokes, entered via the front panel or the IEEE-488 bus. The keystroke memory is 36,000 (optionally 100,000) keystrokes, a typical waveform being defined by ten keystrokes.

The output can be active (up to ±10V) or inactive. It is short circuit proof and protected up to 150V ac or 210V dc. The double-buffered IEEE-488 interface allows downloading at up to approximately 2Kbytes per second, or up to 200Kbytes per second with high-speed DMA.

A variant, the model 2000, configured especially as a pattern generator for automatic test systems, is expected to be launched shortly.

Analogic Ltd, The Centre, 68 High Street, Weybridge KT13 8BN. Tel: (0932) 56011.

Thanet E

ICOM ICOM

IC-735, The Complete HF Radio

This new HF transceiver from ICOM is compact enough to make mobile or portable use a possibility. The IC-735 covers all Amateur frequencies from 1.8MHz to 30MHz including the three new bands 10, 18 and 24MHz. Modes include SSB, CW, AM and FM, all circuits are solid-state and output is approximately 100 watts.

Tuning ranges from 100kHz to 30MHz, made continuous by using a high-side IF and a CPU control system. RTTY operation is also possible. Dynamic range is 105dB with a 70.451 MHz first IF circuit. The direct feed mixer rejects spurious response and gives higher sensitivity and wider dynamic range. Pass-band tuning and a sharp IF notch filter provide clear reception even under duress. Preamp is 10dB and attenuator 20dB.

The new IC-735 from ICOM is easy to operate and versatile, it has various scanning functions, comprehensive LCD and 12 memories. Computer remote control is possible via the RS-232C jack.

Options include: the AT-150 automatic antenna tuner and shown here the PS-55 AC power supply and SM-8 desk mic.

Please contact Thanet Electronics or your local ICOM dealer for even more information on this latest HF transceiver – the IC-735.

IC-290D/290E Mobile

290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically. Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz.

The squelch on SSB silently scans for signals, while 2 VFO's with equalising capability mark your signal frequency with the touch of a button. Other features include: RIT, 1 KHz or 100Hz tuning/CW sidetone, AGC slow or fast in SSB and CW, Noise blanker to suppress pulse type noises on SSB/CW.

You can scan the whole band between VFO's/scan memories and VFO's. Adjustable scan rate 144 to 146 MHz, remote tuning with IC-HM10 and HM11 microphones. Digital frequency display, Hi/Low power switch. Optional Nicad battery system allows retention of memory.

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ectronics

ICOM ICOM

IC-02E, IC-04E Handheld

The direct entry microprocessor controlled IC-02E is a 2 meter handheld, features include: scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority.

The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions.

HS-10 Headset also available, with earphone and boom microphone, which operates with either of the following:- HS 10-SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10-SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay. The IC-2E and 4E continue to be available.

Authorised Icom dealers in the UK

Alexian Electronics Ltd. Edinburgh. 031-554 2591.
Alyntronics. Newcastle. 0632-761002.
Amateur Radio Exchange, London (Ealing). 01-992 5765.
Amcomm. London (S. Harrow). 01-422 9585.
Arrow Electronics Ltd., Chelmsford Essex. 0245-381673 26.
Beamrite. Cardiff. 0222-486884.
Booth Holding (Bath) Ltd., Bristol. 02217-2402.
Bredhurst Electronics Ltd., W. Sussex. 0444-400786.
Dressler (UK) Ltd., London (Leyton). 01-558 0854.
D.W. Electronics. Widnes Cheshire. 051-420 2559.
Hobbytronics. Knutsford Cheshire. 0565-4040 Until 10pm daily.
Photo Acoustics Ltd., Buckinghamshire. 0908-610625.
Radcomm Electronics. Co. Cork. Ireland. 01035321-632725.
Radio Shack Ltd., London NW6. 01-624 7174.
Scotcomms. Edinburgh. 031-657 2430.
Tyrone Amateur Electronics. Co. Tyrone. N. Ireland. 0662-2043.
Reg Ward & Co. Ltd., S.W. England. 0297-34918.
Waters & Stanton Electronics. Hockley Essex. 0702-206835.

Listed here are authorised dealers who can demonstrate ICOM equipment all year round. This list covers most areas of the U.K., but if you have difficulty finding a dealer near you, contact Thanet Electronics and we will be able to help you.

IC-27E Mobile

You can get what you want just by picking up the telephone. Our mail-order dept. offers you: free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility and a 24 hour answering service.

Please note that we have a retail branch at 95, Mortimer Street, Herne Bay, Kent. Tel: 369464. Give it a visit, BCNU.

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H x 144mm W x 177mm D. It has all the features that you probably require included in this microprocessor controlled unit. In addition, if you feel lonely and can't find anybody on the band, just press "speech" and the optional built in speech synthesizer will tell you the frequency you are tuned to. This is a boon to the blind operator or to those that tuck their rigs out of sight.

Brief features:- 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer.
Just ask for a leaflet and we'll be glad to send you one.

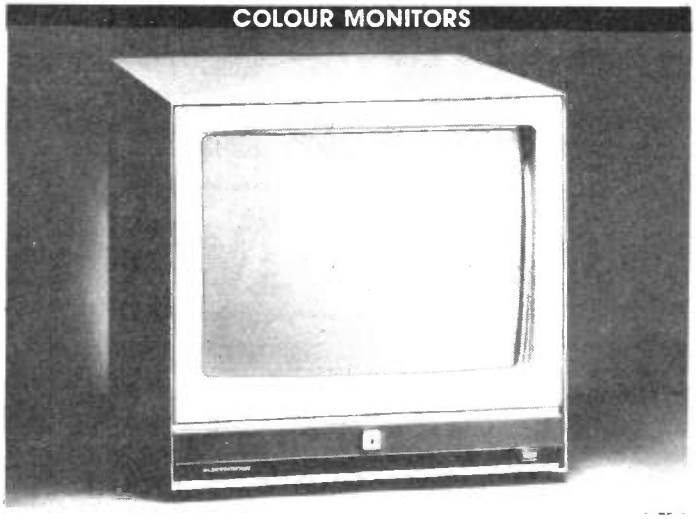
STOP PRESS» Contact us regarding 50MHz equipment for new issued!

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet Electronics

Dept AR, Herne Bay, Kent
Tel: (0227) 363859

PRODUCT NEWS

COLOUR MONITORS



Electrohome have just announced two new colour display monitors – the 48.26cm (19 inch) ECD 1904X and the 63.5cm (25 inch) ECD 2504X. They are ruggedly constructed and are designed to meet a mean time between failure (MTBF) rate of 20,000 hours. Major applications are in public information display systems, business graphics, education and with desktop computers.

Both monitors feature the latest in advanced circuitry and have 560 x 240 pixel resolution. The user controls, which include horizontal phase control, are front mounted and located behind a lockable door.

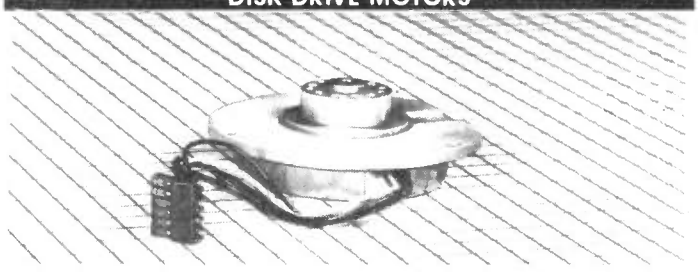
A plug-in module is available which accepts a choice of IBM PC, RGC RS170, or PAC RGB RS170 switchable inputs, allowing the user to configure the monitor to meet a wide range of system requirements.

The monitors have a horizontal frequency of 15.75kHz, (20kHz with factory modification), 8MHz bandwidth and a retrace time of 13μS maximum. The linearity is 8% (nominal).

The ECD 1904X and 2504X are housed in attractively styled all metal enclosures.

Electrohome Ltd,
7 Civic Way,
Ellesmere Port, South Wirral,
Cheshire L65 0AX.
Tel: (051) 3561365.

DISK DRIVE MOTORS



A new range of brushless dc motors designed specifically to suit the stringent demands of modern computer disk drives have recently been announced by Papst Motors Limited.

All five motors in the range utilise the latest Papst 12 volt four pole electronically commutated dc external rotor motor and are designed to meet the ever increasing demand for compactness, essential for modern day storage products which have a high packing density in a small package size.

The 44.04 measures only 22mm in overall height and is designed to drive two 3.5in hard disks. It has an average starting torque of 3.18oz inches with a starting current of 1.8 amps. This motor produces a high precision electronic pulse which can be used to check on the rotor position when searching for sectors of hard disks.

The 54.04 and 53.06 are of similar size and are both designed to drive single 5.25in disks. The 54.04 has an average starting torque of 4.8oz inches at 2.8 amps compared with 3.39oz inches of the 53.06 which has a lower starting current and power consumption.

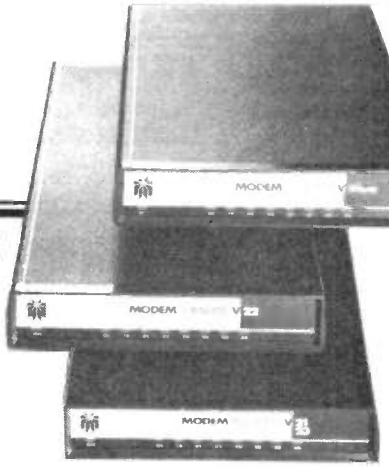
The 46.04 and the 45.04 both measure less than 33mm in total height and are designed to drive two 5.25in disks. The 46.04 has a starting torque of 2.9oz inches with a current of 1.4 amps, whilst the 45.04 is an upgraded version with a starting torque of 4.1oz inches and a starting current of 2 amps.

All the products in this new range are fitted with precision ball bearings with an anticipated operating life in excess of 20,000 hours at the maximum operating temperature of 55°C.

Although initially designed for Winchester drive applications, other uses are being found for this family of motors such as optical reflecting systems for laser instrumentation where the high speed accuracy is a very necessary requirement.

Papst Motors Ltd,
East Portway, Andover,
Hampshire SP10 3RT.
Tel: (0264) 53655.

NEW MODEM RANGE



The new WS3000 professional modem range from Miracle Technology (UK) Ltd offers the facility of full upgradeability from V21/23 use to 1200 or 2400 full duplex.

The base model, WS3000 V2123, offers fully intelligent Hayes compatible autodial, autoanswer data communications at 300, 600, 1200/75 and 75/1200 baud for £295.00. The price includes a built-in Centronics printer port, 64 number internal phone directory and speed buffered RS232 port.

The WS3000 V22 is an upgrade of the V2123, adding the V22 1200 baud full duplex standard. All the features of the V2123 are retained, giving a modem with low and medium-speed use, plus Viewtext for Prestel, for £495.00.

The WS3000 V22bis adds the 2400 baud full duplex CCITT V22bis standard, whilst again retaining all the lower standards including V22 for £650.00.

The new range makes it possible to buy one modem type for low, medium or high-speed use, from one company. All are operated and presented in the same way – if you can use one you can use them all.

Miracle Technology (UK) Ltd,
St Peter's Street,
Ipswich IP1 1XB.
Tel: (0473) 50304.

INTERFERENCE PROTECTION

Spikebloc is a new mains protector that prevents electromagnetic and radio-frequency interference causing expensive damage to sensitive electronic equipment.

Available from Rendar, Spikebloc combines RFI filtering with high-current surge protection and can absorb induced lightning surges up to 2,500A. Used for EMC applications Spikebloc stops interference from pulse circuit equipment affecting displays and microprocessor-based units.

Equipment, particularly if microprocessor-based, is susceptible to interference from other machinery, environmental hazards such as lightning, and 'noisy' power supplies.

Fitted to sensitive electronic equipment, Spikebloc filters spikes and RF interference from power lines, allowing 'clean' power to be supplied in an electrically noisy environment. Fitted to electrically noisy devices, Spikebloc prevents noise from being output to power lines.

Rendar Ltd,
Durban Road, South Bersted,
Bognor Regis,
West Sussex PO22 9RL.
Tel: (0243) 825811

NEW FIBRE-OPTICS

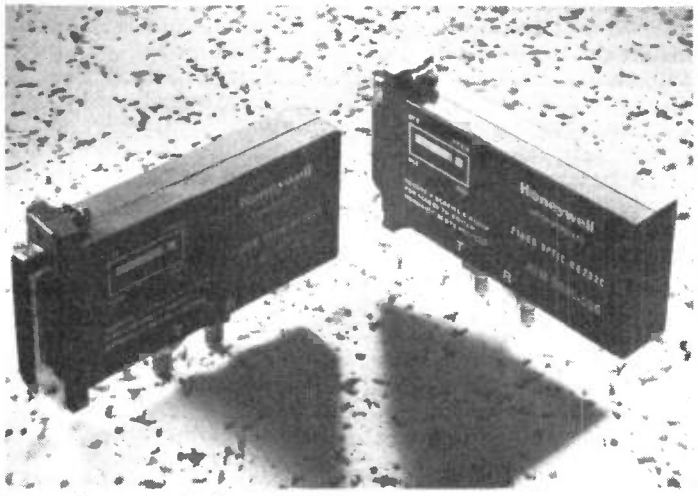
The Fibre Optics Division of Norbain Electro-Optics Limited has launched a new fibre-optic RS232C data link for use in applications where computer terminals are remotely located up to one kilometre away and where electrical noise and interference causes problems with cable routing.

Manufactured by Honeywell and designated the HFM5000 Series, the new fibre-optic links, which can be plugged directly into 25-pin connectors on computers, provide good EMI/RFI resistance and data transmission security. Additional features include reduced error rate, the elimination of ground loops over long distances and plug compatibility with most 4 and 9 pin hard wire RS232C extension cables.

Supporting full duplex asynchronous data rates from dc to 56Kb/S, the modules are capable of operation from −20°C to +85°C with less than ±4μS pulsewidth distortion over the temperature range.

Additional advantages of the new fibre-optic links are the ability to significantly reduce the susceptibility to RF radiation and the incorporation of a DCE/DTE switch providing the user with one module type for both DTE and DCE equipment.

Norbain Electro-Optics Ltd,
Norbain House,
Boulton Road,
Reading,
Berks RG2 0LT.
Tel: (0734) 864411.



RTTY FOR THE AMSTRAD

A 100% machine code program to enable the Amstrad CPC464 microcomputer to receive and transmit RTTY (radio-teletype) messages when used in conjunction with a suitable terminal unit and radio receiver or transceiver has been introduced by PNP Communications.

The program incorporates split screen operation. The top 14 lines by 72 characters are used to display the received text. The next four lines by 72 characters display the current state of the transmitted text and the bottom three lines by 72 characters display the last 288 characters of the 1024 character type-ahead buffer. The remaining screen area is used to display the current status of the program (ie Tx/Rx switching, baud rate, etc).

User selectable baud rates of 45.45, 50, 60 and 75 are selected from the keyboard and may be changed at any time. No external UART or baud rate clock is required.

Ten user-programmable memories are provided, each of 512 characters. These may be programmed using the simple editor and saved on cassette or disc for future use.

Standard pre-programmed messages such as 'CQ CQ CQ de . . .', 'RYRYRYRYRYRY', 'THE QUICK BROWN FOX- . . .'etc are incorporated. The CQ facility uses the programmed-in callsign and this option is available from switch-on.

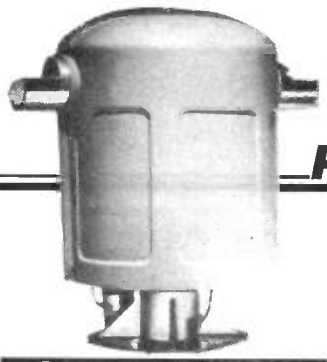
An AFSK Morse callsign ident is provided to comply with the requirements of some licensing authorities.

If the length of the transmitted line is likely to exceed 72 characters, automatic carriage return/line feed is available. The program 'looks ahead' and will avoid (as far as possible) splitting words at the end of a line.

There is a software switchable USOS (un-shift on space) facility on receive. A 'figures shift' character is always sent after any space in a group of figures.

The remaining unused memory, after the program and memory space, is used to store all QSO transactions. This area may be reviewed at a later date and any part selected for printing to provide 'hard-copy'.

PNP Communications,
62 Lawes Avenue,
Newhaven,
East Sussex BN9 9SB.
Tel: (0273) 514465.



POSITIONING SYSTEM

Dynetic Systems Corporation has announced the availability of their new industrial model DR10 dual axis rotation system, which may be of interest to our American readers. Available for prompt delivery, the DR10 system provides both azimuth and elevation motion for camera lighting, microwave or antenna equipment loads (balanced) of 50 pounds or less (see the cover pic).

The DR10 has undergone extensive testing in sub-zero conditions and in other hostile environments, with very good performance. Although aimed at light to medium duty systems, the rotator uses precision industrial grade gear motors manufactured by Dynetic Systems, which output 2000 inch pounds of rated torque.

Dynetic Systems ensures each user the best available performance and convenience with the DR10 by featuring a dual scale control meter and a self contained ac power supply in the control unit, and a top mount rotor which is serviceable without removing the equipment.

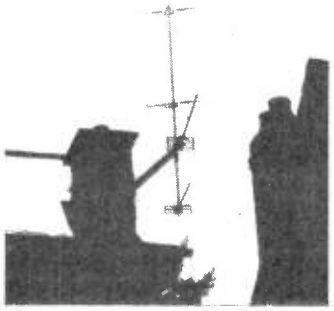
Dynetic Systems,
19128 Industrial Blvd,
Elk River,
Minnesota 55330, USA.

NAVY SPECIAL

Glenstar first introduced its 'Navy Special' range of mobile antennas last summer and the company have reported a very good response.

Now Glenstar have developed a compact system of home base station antennas which simply slip on to the top of a 1¼ inch OD alloy mast. These antennas are based on the well-tried Navy Special mobile resonators. They can be stacked in a relatively small space on the same pole to form an effective miniature multi-band antenna system.

They are ideal for amateurs with limited space, and Glenstar envisage a slim vertical pole rising from the cabbage patch adorned at the top with a pair of Navy Special dipoles, one for 20 metres and one for 40 metres, both fed with a single 50 ohm coaxial cable and using a small tuner FC707 or similar.

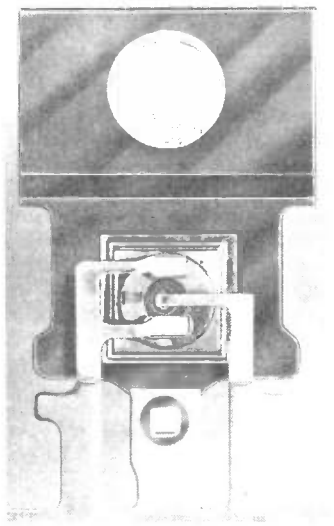


This would make the 10, 12, 15, 17, 20, 30 and 40m bands available.

Glenstar,
Newtown Road,
Henley-on-Thames,
Oxon RG9 1HQ.

PRODUCT NEWS

GTO THYRISTORS



Motorola has added a new series of medium-current gate turn-off thyristors (GTO) aimed at the switching power supply and motor drive markets. The GTO family combines the turn-on/turn-off features of a bipolar power transistor with the high-current/high-voltage characteristics of the conventional SCR.

The GTO family is rated at 18 amps and has blocking voltage ratings from 1000 to 1400 volts. It has faster switching times than conventional SCRs, with a typical turn-on delay time of 0.6μS. It requires only a 300mA trigger current, has high surge current capabilities up to 200 amps, and low forward conduction losses at relatively high anode currents.

Compared with transistors, these asymmetric three-terminal devices can minimise drive losses because they require only a momentary pulse to turn on, unlike power transistors which need a constant drive source. They differ from standard SCRs in that the new devices can also be turned off, with a minimal reverse pulse on the gate.

Motorola Semiconductor Products Inc, PO Box 20912, Phoenix, Arizona 85036, USA.

CRYSTAL DEVICES

IQD Ltd have announced two additions to their range of quartz crystal devices.

The CX1 type micro-miniature quartz crystals from ETA Quarz, Switzerland are made to the same specifications as the Statek range. ETA Quarz is the crystal division of ASUAG Components, former proprietors of the Statek Corporation.

IQPXO programmable miniature quartz oscillators, which correspond with the Statek PXO range, are also available.

IQD Ltd, North Street, Crewkerne, Somerset TA18 7AR. Tel: (0460) 74433.

FOUR-PIN MOS DEVICES

Siliconix has announced the second product range group in its new FETlington series, the family of low-cost Mospower products designed to replace Darlington configurations with one compact device. These new FETDIP packages, auto-insertable 4-pin DIPs, are JEDEC registered as 2N7004, 2N7005 and 2N7006 with respective breakdown voltages of 100 volts, 200 volts and 350 volts. These devices offer on-resistance ($R_{ds(on)}$) ratings of 0.6 ohms, 1.5 ohms and 5.0 ohms respectively. These low-profile power packages have current ratings as high as 8.0 peak amperes with a steady-state dissipation capability of one watt. By using the adjacent circuit board copper conductor area as heatsinking, the continuous power dissipation capability can be enhanced to nearly 2 watts.

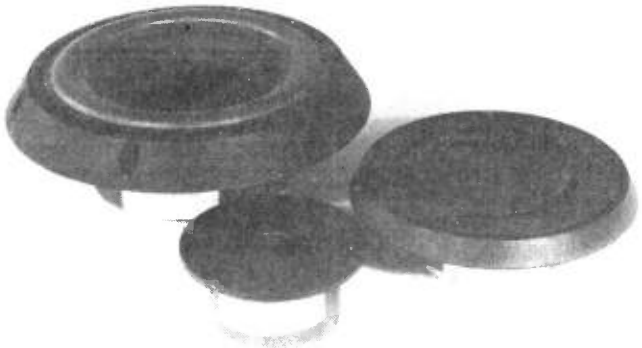
While delivering over 30 watts peak power rating, this compact, low-profile device occupies only 0.060 square inches of board space. Environmental testing – including HTRB, pressure pot, temperature cycling and thermal shock – has shown these devices to be superior to many other plastic packages.

These Mospower products are built with the Siliconix Duramos process, which provides a tested gate-to-source breakdown voltage above 40 watts.

Applications for the 2N7004, 2N7005 and 2N7006 include switching power supplies, motor drives, pulse forming networks, lamp drivers, and relay and solenoid drivers.

Siliconix Ltd, Morriston, Swansea SA6 6NE. Tel: (0792) 74681.

LOUDSPEAKER UNITS



Scanspeak of Denmark have appointed Wilmslow Audio Ltd as exclusive UK distributors of Scanspeak loudspeaker drive units.

The bass and midrange units in the new range have several interesting and exclusive features. Scanspeak Symmetric Drive ensures that forward and backward cone excursion is identical, thus eliminating one obvious source of distortion, and also the voice coils are wound with hexagonal section wire (manufactured under a Scanspeak patented process). The hexagonal wound coil is claimed to handle much more power than conventional voice coils even at very high temperatures.

Three speaker designs are offered for the home constructor, all of which have the Scanspeak Flow Resistance type of loading. Kits are available which include cabinets in flatpack form.

Full details are contained in the *Scanspeak Handbook* which is available free of charge on receipt of a 12in x 9in SAE.

Wilmslow Audio Ltd, 35-39 Church Street, Wilmslow, Cheshire SK9 1AS.

PHASE-CONTROL PSUs

Available exclusively in the UK from House of Instruments is the Trio PD series of regulated dc power supplies. Three models are available: the PD35-20, the PD18-30 and the PD18-20.

The instruments utilise a phase-control technique to provide a transient response of typically 100μs, as well as excellent regulation and a current output of up to 20 or 30A, model dependent. Use of a choke input circuit provides low input current, low line noise, and ensures high efficiency. The phase-control technique together with a filtering circuit give a regulation of 0.005% ±1mV with respect to a ±10% change in input.

Model dependent, the PD series has an output voltage of 0-18V or 0-35V, which is set using a smooth 10-turn potentiometer which offers high setting regulation.

Remote sensing has been added to the PD series to enable compensation for the voltage drop occurring in the wiring between the power supply and the load. Both output voltage and current may be changed using an external dc voltage or resistance.

Other features include a protective circuit which shuts down power to protect the load from overvoltage, as well as the facility to preset and check set values when using voltage and current limiting.

The PD series can be connected in either series or parallel with one of the power supplies being used for all control functions in a master/slave arrangement.

House of Instruments, Raynham Road, Bishop's Stortford, Herts CM23 5PF.

NEWS DESK

Spreading the word

As even those of aetheist tendencies will have noticed, American evangelist Billy Graham recently chose to bless our shores with his presence. For the irreligious amongst us, perhaps the most interesting aspect of his visit was the technology involved in the project.

Billy Graham was speaking at a football ground in Sheffield, although by virtue of a satellite link-up could be seen and heard at 48 other sites across the British Isles. British Telecom, in association with Megasat Ltd and Multipoint Communications, set up the necessary transmit and receive units, which apparently formed the largest outside broadcast network ever set up in the UK.

The uplink was in the 14GHz band to the European Communications Satellite (Eutelsat Flight 2) in geosynchronous orbit above West Africa. Downlink was on 11GHz to 1.8m dishes at the various receive stations.

Of particular interest is the antenna used for the uplink. This was a 4.5m wide elliptical dish made by GEC McMichael Ltd, mounted on a trailer. The design was produced by GEC McMichael in order to combine efficiency and ease of transport with the increasingly stringent performance requirements becoming necessary (it's getting a bit crowded up there amongst the satellites!).

One of the transportable satellite earth terminals from GEC McMichael

These dishes are produced in a range of sizes, from a few metres in width for satellite news gathering (SNG, see *News Desk* December '84) to 5.6m for TV broadcast links.

Whatever you may think of the subject covered in this particular use of BT's hi-tech, this event serves as a very good indicator of the increasing use of commercial satellite communications. DBS may be a lame duck at the moment, but there's still money in some quarters of the satellite industry!

Cellular radio war

The propaganda war between BT and Racal in their struggle to grab the larger share of the cellular radio market continues at its frenzied pace. News has reached us of the 10,000th Cellnet subscriber, an event caterer called Savoir Fare. The system was installed in June.

This latest news item is no doubt intended to convince us of the glowingly healthy state of the cellular system, but perhaps all the hype conceals a few cracks. Apparently, for all the full colour double page ads in the Sunday supplements, the new customers are not exactly flocking in, hence the overtime being put in by the PR departments of Vodafone and Cellnet. Market resistance is greater than originally predicted.

The PR people at the two companies have been doing an impressive job. For instance, how much has been reported about the technical problems involved in setting up these two entirely new networks? The only hint of any hiccoughs has been the tit for tat claim and counter-claim of one's superiority over another (eg Cellnet saying Racal's aerial system will not cover the cells efficiently enough, and Racal claiming faulty switching of the Cellnet set-up). Each company denies the claims of the other (of course!).

Cellular radio has great potential, and despite the misconceptions of many is far more than another fairly limited and expensive radiophone system, but the day of the carphone being as commonplace as the car cassette player is some time away yet.

Eureka! Well, maybe...

At a recent meeting in Paris to discuss European co-operation in President Mitterrand's 'Eureka' project, the French leader announced an £83M French credit for development of projects in 1986. Attending the meeting were representatives of the EEC countries plus Austria, Norway, Sweden and Switzerland.

The aim of Eureka is to present a serious European challenge to the American and Japanese grip on the high technology market. This will be achieved by firms collaborating in the fields of microelectronics, computing, robotics, telecommunications, etc.

At the time of writing no firm decisions had become apparent, although the British opinion seems to be that the emphasis should be on exploiting available technology rather than investing in pure research and development. Eureka should aim at identifying and exploiting suitable market sectors, with investment and development depending entirely upon the areas deemed desirable.

While it certainly makes sense to try and build a firm commercial base for Eureka, the approach suggested by British representatives does seem to be a little short-sighted. Surely it makes sense to devote money to R&D, which after all will provide a healthy industry in the future?

One thing is certain: after the development of suitable projects during 1986, using President Mitterrand's proposed £83M, considerably more money will be needed. I wonder just how much will be forthcoming from the British government, whose present stance (not to mention its track record in European financial affairs) indicates a certain reluctance to spend money? It would be tragic if Eureka fails to realise its impressive potential merely because of disagreement over its financing.

Tatung expands

Early in July a new factory was opened in Telford, Shropshire, for the manufacture of colour TVs, computers, monitors and specialist circuit boards. This now forms the UK base of the Tatung company, who were previously based at Bridgnorth, twelve miles from Telford. Tatung had been at Bridgnorth since 1981, at which time they took over Decca Radio and Television Ltd.

The new production line is geared for utmost efficiency, with on-site facilities for photographic work and etching of PCBs, as well as for the production of automatic test equipment to be used in-

house.

The potential for expansion at the new site allows Tatung to investigate the possibility of launching new products in the home entertainment and computing markets (current production of the Einstein computer is running at a rate of 60,000 a year).

Berlin fair

Some interesting developments have been promised for the International Audio and Video Fair (Berlin, 30 August – 8 September). One such development is a new service being offered by ARD and ZDF, the German broadcasters. Called VPS (Video Programme System), the service involves the transmission of a signal at the start and finish of TV programmes which will allow preprogrammed video recorders to switch on and off with the beginning and end of the programme of interest.

Also on show will be video recorders compatible with cable transmissions, and VCRs capable of handling any transmission standard (PAL, SECAM or NTSC) and every type of domestic power supply.

There will, of course, be companies showing off their prowess in the new 8mm video format. It will be interesting to see if the quality of vision and sound available is good enough to carve a market for this latest venture in video technology (we hope to cover 8mm video in more detail very shortly).

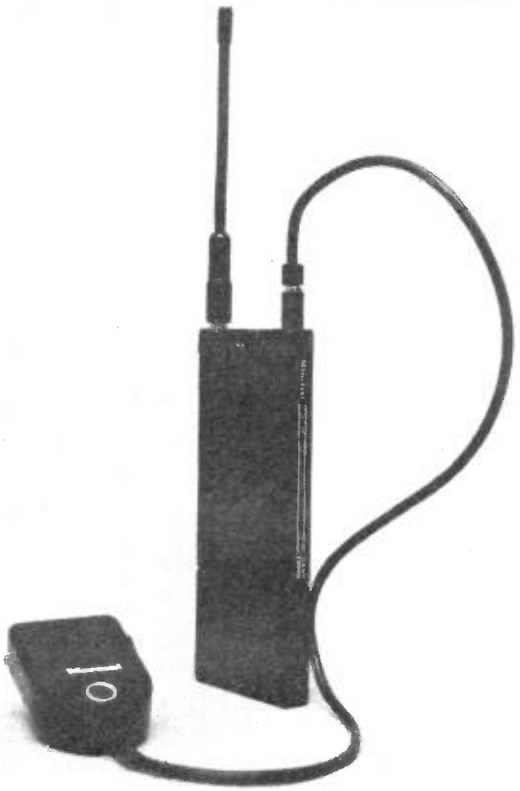
£4m export contract

Marconi Secure Radio Systems has been awarded a £4M contract to supply its Minstrel radio system to a Middle Eastern customer.

The order, which consists of many hundreds of hand-held radios, associated vehicle-appliqué units, control and remote talk-through facilities, will give the customer a flexible communications system with the added advantage of integral high grade digital speech encryption. The entire system has to be supplied before the end of 1985.

The heart of the Minstrel radio system is the hand-held radio. By using large scale integrated circuitry and careful packaging a compact radio has been designed giving integral high-grade digital encryption, a frequency range from 68 to 470MHz and power outputs of 0.5 or 1.5 watts. Ten preset channels can be selected to operate in either single or two frequency simplex modes.

Incorporation of the hand-held radios into vehicle appliqué or desk-top units enhances power output to 20 watts, and with the addition of 40 watt base station and talk-through facilities a total communications system is achieved. The system is easily tailorable to suit any customer requirement.



The Secure Systems Division has also been awarded a £2M contract by the Ministry of Defence to supply a high technology hybrid device for use within a wide range of modern communications equipments. This contract follows completion of a development contract placed by the Ministry of Defence two years ago.

The developed hybrid relies heavily upon the use of silicon-on-sapphire (SOS) large scale integrated circuits (LSIs). This SOS LSI technology was developed for use initially within the Scimitar family of frequency hopping secure combat net radios. It has proved successful in reducing the size, cost and power consumption of the radios but at the same time increasing their capability and performance. The SOS technique produces an LSI which is nuclear hardened and is thus able to withstand damaging electromagnetic pulse which would render conventional equipments useless.

Digital headphones

Mitsubishi Electric Corporation has made prototype headphones that convert digital electric signals directly into analogue acoustic output audible to the human ear. The newly developed headphones perform the dual function of digital-to-analogue (D/A) converter and electroacoustic transducer, thus being able to do away with the electromagnets used in conventional headphones and speakers.

As pulse code modulation (PCM) tape recorders and compact disc players gain popularity, audio equipment today is increasingly digitalised, resulting in significantly reduced deterioration of sound quality in transmission. When digital signals are received at headphones or speakers, the incoming bits have to be converted into analogue signals with a D/A transducer before being converted into sounds by an electroacoustic transducer.

The direct conversion from digital electric signals to acoustic output was made possible by the adoption of the piezoelectric transducer composed of a piezoelectric polymer element and an acoustic system which functions as a desampling acoustic filter for the 8-bit PCM signals.

Piezoelectric material converts the electrical potential difference into mechanical stress and vice versa.

Technical Surplus

A new shop, Technical Surplus, has opened in Birmingham, selling a wide range of technical surplus equipment such as radio, electronics, CB and military bits and pieces – all most useful for the constructor.

The new shop is open from 9.00am to 5.00pm, Monday to Saturday, and is situated at: *576 Hagley Road West, Quinton, Birmingham.*

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ARP34	1.25
ARP35	2.00
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AZ11	4.50
BL63	2.00
BS450	67.00
BS810	55.00
BS814	55.00
CIK	19.00
C3JA	39.50
C6A	9.00
C1112G	70.00
C1108	65.00
C1134	32.00
C1148A	115.00
C1149/1	195.00
C1150/1	135.00
C1534	32.00
CCA	2.60
CC3L	0.90
CL33	2.00
CV Nos Prices on request	
D63	1.20
DA41	22.50
DA42	17.50
DA90	4.50
DA100	125.00
DAF91	0.45
DAF91	0.70
DAF96	1.00
DC70	1.75
DC90	1.20
DCX4-1000	12.00
DCX4-5000	25.00
DET16	28.50
DET18	28.50
DET23	35.00
DET24	39.00
DET25	22.00
DF91	0.70
DF92	0.50
DF96	0.55
DF97	1.00
DH63	1.20
DH77	0.90
DH79	0.56
DH149	2.00
DK91	0.90
DK92	1.20
DL35	2.50
DL63	1.00
DL70	2.50
DL73	2.50
DL91	1.50
DL92	0.95
DL93	1.10
DL94	2.50
DL96	2.50
DLS10	13.50
DLS16	10.00
DM70	1.95
DM160	2.75
DY51	1.50
DY86/87	0.65
DY802	0.72
E80CF	11.00
E80F	18.50
E81CC	3.15
E81L	12.00
E82CC	3.50
E83CC	3.50
E83F	5.50
E86C	9.50
E88C	7.95
E88CC	3.50
E88CC Siemens Special	5.95
E90CC	7.95
E90F	7.95
E91H	4.50
E92CC	3.95
E99F	6.99
E130L	19.95
E180CC	9.50
E182CC	9.00
E180F	5.50
E186F	5.50
E188CC	7.50
E280F	19.50
E283CC	10.00
E288CC	13.50
E55L	42.00
E810F	25.00
E1148	1.00
E1524	6.95
EA50	1.00
EA76	1.95
EA79	1.95
EAA91	0.60
EABC80	0.70
EAC91	2.50
EAF42	1.20
EAF801	2.00
EB34	1.50
EB41	3.95
EB91	0.85
EBC33	2.50

EBC41	1.95
EBC81	1.50
EBC90	0.90
EBC91	0.90
EB91	0.50
EBF80	0.65
EBF83	0.65
EBF85	0.95
EBF89	0.70
EBF93	0.95
EBL1	2.50
EBL21	2.00
EC52	0.75
EC70	1.75
EC80	9.50
EC81	7.95
EC86	1.00
EC88	1.00
EC90	1.10
EC91	6.50
EC92	1.95
EC93	1.50
EC95	7.00
EC97	1.10
EC8010	12.00
ECC32	3.50
ECC33	3.50
ECC35	3.50
ECC81	1.15
ECC81 Special quality	1.95
ECC82	0.65
ECC82 Mullard	1.50
ECC82 Philips	1.95
ECC83	0.65
ECC83 Brimar	1.35
ECC83 Philips	1.95
ECC84	0.50
ECC85	0.50
ECC86	2.75
ECC88	0.95
ECC91	2.00
ECC180	0.72
ECC189	1.95
ECC801S	3.50
ECC803S	3.50
ECC804	0.60
ECC2000	12.00
ECF80	1.15
ECF82	1.15
ECF86	2.25
ECF200	1.85
ECF202	1.85
ECF801	0.85
ECF804	6.00
ECF805	2.50
ECF806	10.25
ECH3	2.50
ECH4	3.00
ECH35	3.50
ECH42	1.00
ECH81	0.65
ECH83	0.78
ECH84	0.69
ECH2000	1.50
ECL80	0.60
ECL82	0.65
ECL81	0.55
ECL83	2.50
ECL84	0.74
ECL85	0.69
ECL86	0.80
ECL805	0.69
EF22	2.50
EF37A	2.00
EF39	1.10
EF41	3.50
EF42	3.50
EF50	2.50
EF55	4.95
EF70	1.20
EF71	1.50
EF72	1.20
EF73	1.00
EF80	0.55
EF83	3.95
EF85	0.50
EF86	2.25
EF86 Special quality	3.15
EF89	1.50
EF91	1.95
EF92	2.15
EF93	0.95
EF94	0.95
EF95	1.50
EF97	0.90
EF98	0.90
EF183	0.65
EF184	0.65
EF730	1.80
EF731	3.50
EF732	3.50
EF800	11.00
EF805S	13.50
EF812	0.65
EFL200	1.50
EH90	0.72
EK90	0.72
EL32	0.95
EL33	4.00
EL34	2.25
EL34 Mullard/Phillips	4.50
EL36	1.95
EL37	9.00
EL38	4.75
EL41	3.50
EL42	2.00
EL81	6.95
EL82	0.58
EL83	5.95
EL84	0.75
EL85	4.50
EL86	0.85
EL90	1.75
EL91	6.00
EL95	1.75
EL153	12.15

EL183E	3.50
EL183P	3.50
EL360	6.75
EL500	1.40
EL504	1.40
EL509	5.25
EL519	6.95
EL802	3.65
EL821	6.50
EL822	12.95
EM1	9.00
EM4	9.00
EM80	0.70
EM81	0.70
EM84	1.65
EM85	3.95
EM87	2.50
EN32	15.50
EN91	1.50
EN92	4.50
ESU150	14.95
ESU872	25.00
EY51	0.80
EY81	2.35
EY83	1.50
EY84	5.95
EY86/87	0.50
EY88	0.55
EY91	6.50
EY500A	1.50
EY802	0.70
EZ35	0.75
EZ40	2.75
EZ41	2.15
EZ80	0.75
EZ81	0.75
EZ90	1.50
F6064	2.95
FW4/800	2.95
G55/1K	9.00
G180/2M	6.95
G232 Mullard	3.95
G240/2D	9.00
GC10B	17.50
GC10D	17.50
GC10/4B	17.50
GC10/4E	17.50
GC12/4B	17.50
GD86W	5.00
GDT120M	5.00
GN4	5.00
GN10	18.00
GR10G	4.00
GS10C	16.50
GS10H	12.00
GS12D	12.00
GT1C	14.00
GT1C S/S	13.00
GTE175M	8.00
GTR150W	1.00
GU20	35.00
GXU1	13.50
GXU3	24.00
GXU50SS	14.50
GY501	1.20
GY802	1.00
GZ30	1.00
GZ31	1.00
GZ32	1.00
GZ33	4.60
GZ34	2.15
GZ37	4.50
HAA91	1.00
HABC80	0.90
HBC90	0.75
HBC91	0.80
HF93	0.75
HF94	1.50
HK90	1.06
HL2K	4.95
HL23DD	4.00
HL90	0.70
HL92	1.50
H133/DD	3.50
HR2	4.00
HY90	1.00
HVR2	3.00
K3118	86.00
KR6/3	45.00
KT8C	7.00
KT33C	3.50
KT36	2.00
KT44	4.00
KT45	4.00
KT61	4.00
KT63	2.00
KT66/CV1075 special yellow ssss pot	19.50
KT66 USA	9.95
KT66 GEC	14.95
KT77 Gold Lion	10.95
KT81	7.00
KT88 USA	10.95
KT88 Gold Lion	18.95
KTW61	2.50
KTW62	2.50
KTW63	2.00
KTZ63	2.50
L63	1.50
L102/2K	6.95
L120/2K	12.00
LB7-20	95.00
LS9B	5.95
M502A	50.00
M537A	50.00
M5143	155.00
M8079	6.00
M8082	7.50
M8083	3.25
M8091	7.50
M8096	3.00
M8098	5.50
M8099	5.00
M8100	5.50
M8136	7.00
M8137	5.50

M8161	6.50
M8162	5.50
M8163	5.50
M8190	4.50
M8195	6.50
M8196	5.50
M8204	5.50
M8223	4.50
M8224	2.00
M8225	3.50
ME1401	29.50
ME1402	29.50
ME1501	14.00
MH4	3.50
MHLD6	4.00
ML4	4.50
MS4B	5.50
MU14	3.50
N37	12.50
N78	9.85
OA2	0.85
OA2WA	1.50
OA3	2.50
OB2	0.85
OB2WA	1.25
OC2	2.50
OC3	1.50
OD3	1.70
OM4	1.00
OM5B	3.00
OM6	1.75
ORP43	2.50
ORP50	3.95
ORP93	12.00
P61	2.50
P41	2.50
PABC80	0.50
PC86	0.75
PC88	0.75
PC92	3.50
PC97	1.10
PC800	1.10
PC900	1.25
PCC84	0.40
PCC85	0.54
PCC88	0.70
PCC89	0.70
PCC189	0.70
PCC805	0.70
PCC806	0.80
PCE82	0.80
PCF80	0.65
PCF82	0.50
PCF84	0.65
PCF86	1.20
PCF87	0.40
PCF200	1.80
PCF201	1.80
PCF800	0.40
PCF801	1.35
PCF802	0.60
PCF805	1.25
PCF806	1.00
PCF808	1.25
PCH200	1.50
PCL82	0.85
PCL83	2.50
PCL84	0.75
PCL85	0.80
PCL86	0.85
PCL800	0.80
PCL805	0.90
PD500	3.50
PD510	3.65
PEN25	2.00
PEN40DD	2.50
PEN45	3.00
PEN45DD	3.00
PEN46	2.00
PEO5-25	39.50
PEO5-40N	42.50
PFL200	0.95
PL21	2.50
PL36	0.95
PL38	1.50
PL81	0.72
PL81A	0.72
PL82	0.60
PL83	0.52
PL84	0.75
PL88	1.00
PL95	1.75
PL302	1.00
PL345	12.50
PL500	0.95
PL500	1.10
PL504	1.15
PL508	1.75
PL509	4.85
PL519	4.95
PL802	5.95
PL802T	3.50
PL820	2.95
PL5557	29.50
PL5727	2.50
PY32	0.50
PY33	0.50
PY81	0.70
PY82	0.70
PY83	0.70
PY88	0.66
PY500A	1.95
PY800	0.79
PY801	0.79
QB3-300	54.95
QB5-1750	139.50
QBL5-3500	495.00
QEO3-10	4.95
QE08-200	£145.00
QF40	65.00
QP25	1.00
QQEO3-12	7.95
QQEO3-20	35.00
QQVO2-6	19.50
QQVO3-10 Mullard	15.00
QQV03-10	5.50

QQVO2-6	19.50
QQVO3-10 Mul-	
QQVO3-20A	25.00
QQVO3-20B	32.00
QQVO6-40A	27.50
QQVO7-50	63.50
QQZO3-20	42.50
QS75/20	1.50
QS75/40	3.00
QS92/1D	5.00
QS95/10	4.85
QS108/45	4.00
QS150/15	6.95
QS150/30	1.15
QS150/45	7.00
QS1200	3.95
QS1202	3.95
QS1203	4.15
QS1205	3.95
QS1206	3.95
QS1206	1.05
QS1207	0.90
QS1208	0.90
QS1209	3.15
QS1210	1.50
QS1211	1.50
QS1212	3.20
QS1213	5.00
QS1215	2.10
QS1218	5.00
QU37	9.50
QU37	11.50
QVO3-12	4.95
QVO5-25	1.75
QVO6-20	29.50
QV2-250C	45.00
QVO8-100	145.00
QY3-125	65.00
QY4-250	70.00
QY4-400	75.00
R10	4.00
R16	12.00
R17	1.50
R18	2.50
R19	2.50
R20	1.20
R1169	55.00
RG1-125	4.95
RG1-240A	14.50
RG3-250A	3.50
RG3-1250A	35.00
RK2K25	62.50
RK-20A	12.00
RL16	1.50
RPL16	12.00
RPY13	2.50
RPY43	2.50
RPY82	2.50
RR3-250	15.00
RR3-1250	35.00
RS613	45.00
RS685	54.95
RS688	52.15
S6F17	5.95
S8F33	29.95
S11E12	38.00
S30/2K	12.00
S104/1K	10.00
S109/1K	15.00
S130	5.95
S130/P	5.95
SC1/800	5.00
SC1/1100	5.00
SC1/1200	5.00
SC1/1300	5.00
SC1/2000	9.00
SD6000M	45.00
SP4B	4.95
SP41	5.00
SP42	3.00
SS501	35.00
ST11	1.50
STV280/40	11.95
STV280/80	19.95
SU42	4.95
TB2.5/300	85.00
TB2-300	45.00
TB3/2000	395.00
TBL-2-300	275.00
TBL2-500	395.00
TD1-100A	25.00
TD03-10F	35.00
TD3-12	4.00
TP25	1.50
TSP4	7.00
TT11	1.50
TT15	34.95
TT21	45.00
TT22	45.00
TT100	57.00
TTR-31MR	65.00
TY2-125A	85.00
TY4-400	85.00
TY8-600W	365.00
TYS2/250	375.00
UL41	4.50
U18-20	2.75
U19	11.95
U24	2.00
U25	0.90
U26	0.90
U37	9.00
U41	5.95

U50	2.00
U82	3.00
U191	0.70
U192	1.00
U193	0.65
U251	1.00
U801	0.75
UABC80	0.65
UAF42	1.00
UBF80	0.50
UBC41	2.95
UBC81	1.50
UBF89	0.60
UBL21	1.75
UC92	1.20
UCC84	0.70
UCC85	0.60
UCF80	1.00
UCH21	1.20
UCH41	2.50
UCH42	2.50
UCH81	0.65
UCL82	1.75
UF85	1.20
UF41	1.15
UF42	1.15
UF80	0.80
UF89	2.50
UL44	3.50
UL84	0.85
UU5	3.50
UU7	8.00
UU8	9.00
UY41	3.50
UY85	0.70
V235A/1K	250.00
V240C/2K	225.00
V241C/1K	195.00
V246A/2K	315.00
V339	3.50
VLS631	10.95
VP133	2.00
VR75/30	3.00
VR101	2.00
VR105/30	1.50
VR150/30	1.15
VT52	2.50
VU29	4.50
VU39	1.50
W77	5.00
W729	1.00
W739	1.50
X24	1.00
X66/X65	4.95
X76M	1.95
XC24	1.50
XC25	0.50
XFW47	1.50
XFW50	1.50
XG5-500	22.50
XL1-5V	1.50
XL628FT	7.50
XNP12	2.50
XR1-1600A	49.50
XR1-3200A	79.50
XR1-6400A	99.50
Y65	6.95
Y503	25.00
Y602	12.00
Y4070	130.00
YD1100	75.00
YJ1060	265.00
YL1000	9.50
YL1020	29.00
YL1030	59.50
YL1060	95.00
YL1070	195.00
YL1071	195.00
YL1290	59.50
Z77	1.20
Z303C	9.00
Z359	9.00
Z505S	15.00
Z520M	4.00
Z521M	8.00
Z700U	3.00
Z749	0.50
Z759	19.95
Z800U	3.00
Z803U	18.95
Z900T	9.50
ZA1000	12.50
ZA1001	1.50
ZA1002	1.50
ZC1040	8.00
ZM1005	8.00
ZM1020	8.95
ZM1021	8.00
ZM1023	7.95
ZM1041	14.00
ZM1082	9.00
ZM1084	10.00
ZM1177	9.00
ZM1202	55.00
ZM1263	4.00
ZM1612	3.00
1A3	4.50
1AC6	1.20
1B3GT	1.95
1B22	10.00
1B24	14.95
1B35A	29.50
1BC2A	2.50
1C1	2.50
1C5GT	2.50
1D5	2.50
1FD1	2.50
1G3GT	2.50
1K3GT	2.50
1N1	4.50
1N2	4.50
1P28	25.00
1N5GT	2.50
1P28	25.00
1S2	0.55
1S5	0.70
1T4	0.70
1U5	1.00
1X2B	1.40
1Z2	8.95

2B22	69.50
QQVO3-10 Mullard	15.00
QQV03-10	5.50
2C21	1.00
2C39A	32.50
2C39BA	39.50
2C40	37.00
2C42	29.50
2C51	0.75
2C53	32.00
2CY5	1.50
2B7	1.50
2D21	1.50
2D21W	2.50
2E26	7.95
2J42	93.00
2K25	24.95
2K25 Ray	75.00
2K26	95.00
3A108A	9.00
3A/107B	12.00
3A/109B	11.00
3A/110B	12.00
3A/141K	11.50
3A/147J	7.50
3A/167M	10.00
3A2	3.95
3A3A	3.95
3A4	1.10
3AL5	0.95
3AT2	3.35
3AU6	0.65
3B2	3.00
3B4	7.00
3B7	4.50
3B24	10.00
3B26	24.00
3B28	12.00
3BZ6	1.50
3C4	1.00
3C45	24.00
3CB6	1.50
3CN3A	2.50
3CS6	0.95
3CY5	1.50
3CX3	2.50
3D6	4.50
3D21A	29.50
3D22	19.50
3E22	49.50
3EH7	1.95
3EJ7	1.95
3W4GT	2.50
4B32	35.00
4B551B	115.00
4BQ7A	1.75
4BZ6	1.95
4-65A	59.00
4-250A	65.00
4C27	25.00
4C28	25.00
4CB6	1.95
4CX250B	49.00
4CX250BM	75.00
4CX250K EIMAC	95.00
4CX350A	95.00
4D26	75.00
4GS7	2.25
4GV7	2.25
4JC6A	2.95
4J52	75.00
4KT6	1.50
4X150A	35.00
5A/102D	9.50
5A152M	9.00
5A163K	10.00
5A170K	6.25
5A-206K	10.00
5A-180M	9.00
4AM8	4.15
5AM8	2.15
5AN8	1.20
5AR4	2.00
5AU4	1.50
5B8	2.50
5B.110M	10.00
5B-254M	14.50
5B-255M	19.50
5B255M	19.50
5B/256M	9.00
5B-257M	9.00
5B-258M	14.50
5C22	125.00
5J180E	2695.00
5R4GB	3.50
5R4GY	3.50
5T4	5.95
5U4G	2.50
5U4GB	2.50
5V4G	1.25
5Y3GT	1.95
5Z4GT	0.85
6/30L2	0.70
6A/203K	9.00
6A7	4.95
6A8G	1.50
6AC7	2.00
6AF4A	2.50
6AF9	4.15
6AG5	1.50
6AG7	1.95
6AH6	2.50

6AJ4	2.00
6AJ7	2.00
6AK5	1.50
6AK6	2.50
6AL5	0.60
6AM4	3.25
6AM5	6.00
6AM6	1.50
6AN5	2.65
6AN8A	2.65
6AQ5	1.75
6AQ8	0.85
6AR5	5.95
6AR8	3.95
6AS5	1.50
6AS6	2.50
6AS7G	4.50
6AT6	0.75
6AT8	1.75
6AU4	2.00
6AU6	0.95
6AV6	0.75
6AW8A	2.50
6AZ8	5.95
6B7	2.80
6B8G	1.50
6BA6	0.95
6BA7	4.50
6BA8A	3.50
6BC8	1.00
6BD4	1.50
6BD6	2.50
6BE6	0.72
6BG6G	3.00
6BH6	1.95
6BH8	1.50
6BJ6	1.20
6BK4	4.00
6BK7A	1.95
6BL8	1.15
6BM8	0.58
6BN4	1.65
6BN6	1.65
6BN7	4.50
6BN8	3.95
6BQ5	0.75
6BQ7A	0.72
6BL7GTA	3.95
6BL8	1.15
6BR5	0.70
6BR7	4.95
6BR8	2.15
6BR8A	2.15
6BS7	5.50
6BW4	1.50
6BW6	5.35
6BW7	1.50
6BW8	4.00
6BX6	0.48
6BX7GT	3.50
6BZ6	2.50
6BZ7	2.95
6C4	1.10
6C5	1.95
6C6	2.50
6C8G	1.50
6C11	2.50
6C18	2.50
6CA4	4.95
6CA7	3.50
6CB5	3.95
6CB6	1.95
6CD6GA	4.50
6CF6	1.50
6CG7	2.25
6CH6	6.95
6CL3	3.95
6CL6	3.25
6CL8A	2.00
6CM5	1.50
6CM7	2.95
6CS6	0.75
6CS7	0.95
6CW4	6.50
6CY5	1.00
6CY7	2.95
6D6	2.50
6DC6	2.95
6DJ8	0.95
6DK6	1.15
6DQ5	5.95
6DQ6B	2.50
6DW4	2.15
6EA4	4.95
6EA7	2.50
6EA8	2.50
6EB8	1.75
6EM5	2.50
6EM7	2.50
6EU7	£1.95
6EU8	1.75
6EV7	2.95
6EW7	4.50
6EW6	1.50
6F1	2.00
6F5	4.95
6F7	5.50
6F6G	2.00
6F12	1.50
6F13	3.00
6F14	1.00
6F17	2.75
6F21	2.50
6F23	0.50
6F24	1.25
6F25	1.25

6F28	1.25
6F32	1.25
6F33	17.00
6FG5	1.95
6FH8	12.50
6G6G	5.50
6GH8A	0.80
6GK5	1.50
6GK6	1.95
6GM6	0.95
6GS7	2.15
6GV7	2.50
6GW6	2.50
6GW8	0.80
6H1	9.50
6H3N	1.10
6H6	1.95
6H6GT	1.95
6HB7	0.95
6HF8	2.50
6HS6	4.95
6HS8	1.95
6HZ6	2.65
6J4	2.15
6J4WA	3.15
6J5	2.50
6J6	2.05
6JB6A	3.95
6JE6C	4.95
6JM6	3.95
6JS6C	4.95
6JU8	2.50
6J7	2.50
6K7G	2.00
6K8Y/G	3.00
6KD6	5.50
6KM8	2.50
6KT8	2.95
6KZ8	1.95
6L1	2.50
6L19	3.95
6L6GC	2.95
6L6GC(GE)	4.50
6L6GT	1.95
6LD20	1.15
6LF6	7.50
6LJ8	2.50
6LQ6	4.95
6L15	3.15
6MJ6	4.95
6N7	2.50
6N7GT	2.50
6P15	1.50
6P25	4.00
6P26	4.00
6P28	2.00
6Q7	1.20
6Q7GT	1.20
6R7G	3.15
6S4A	1.50
6SA7GT	1.35
6SC7	1.50
6SG7	2.50
6SH7	1.35
6SJ7GT	1.35
6SK7	1.35
6SK7GT	1.35
6SL7GT	0.85
6SN7GT	1.35
6SQ7	1.35
6SS7	1.95
6U4GT	1.75
6U8	1.15
6U8A	1.50
6V6GT	1.50
6X2N	1.00
6X4	1.50
6X5GT	1.00
6X5GTY	1.00
6X8A	2.25
7A6	4.50
7A7	2.00
7AD7	1.75
7AU7	1.50
7B6	3.50
7B7	2.50
7C6	2.50
7E7	2.50
7J7	5.50
7V7	4.15
7Y4	2.50
8B10	2.50
8BQ5	1.95
8D8	2.50
8EQ7	1.95
8298A	8.50
85A8	1.50
10D2	1.25
10DE7	2.50
10F1	0.75
10GK6	1.95
10P14	2.50
10P18	0.70
10LD12	0.65
11E3	55.00
12A6	3.95
12AD6	1.50
12AG8	1.50
12AL5	1.00
12AT6	0.95
12AT7	1.15
12AT7WA	2.50
12AU6	1.95
12AU7	0.65
12AV6	1.95

12AX4GT	1.00
12AX7	0.65
12AX7WA	2.50
12AY7	3.95
12AZ7A	1.95
12B4A	4.50
12BA6	1.50
12BE6	1.95
12BH7A	2.50
12BL6	1.75
12BY7A	2.75
12CA5	1.95
12CX6	1.20
12DQ6B	3.50
12DW4A	3.50
12DW7	2.50
12E1	17.95
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13D7	2.50
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6080	8.50
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6887	9.50
6080	8.50
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6096	5.50
6132	10.00
6136	2.50
6146B	9.95
6157	2.50
6201	6.45
6211	2.50
6267	2.25
6350	3.50
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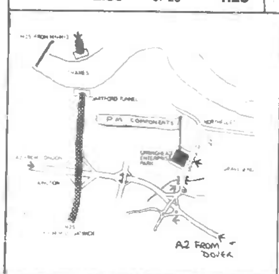

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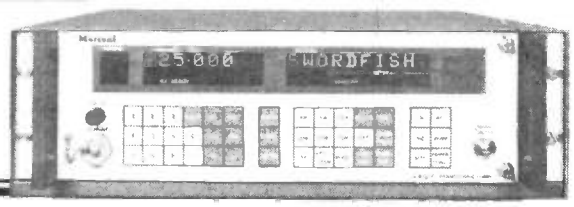


NIGEL CAWTHORNE G3TXF

The DTI announcement that 50-50.5MHz will be set aside for the radio amateur service is good news indeed. However, the new radio amateur allocation was only part of the wide ranging June announcement concerning the future of Bands I and III.

The close down of VHF transmitters in the UK at the beginning of 1985 meant that two large chunks of spectrum would eventually be available for users other than TV broadcasters. TV broadcasters had dominated Band I (41-68MHz) since the opening of post-war 405-line transmissions. In 1955 ITV transmissions started in Band III (174-214MHz). Until recently these frequencies have been the exclusive domain of broadcasters.

Band I (41-68MHz)

As well as the new amateur allocation, the DTI have also announced that the band 49.82-49.90MHz will be used for low power devices such as toys and telemetry equipment. An undefined 500kHz slice of Band I will be allocated to on-site paging services.

Broadcasters will be getting a 4MHz wide piece of Band I as well as two other allocations of 0.35MHz each for use with broadcast ancillary services such as programme links, talk-back and radio microphones. If the frequencies finally allocated to broadcasters are those proposed in a joint RRD/BBC/IBA study published in July 1984, then the broadcast ancillary allocations will be two 0.35MHz bands spaced 5MHz apart somewhere in the range of 50.5 to 58MHz, as well as the 60-64MHz band for use with radio microphones.

The DTI announcement says that only a limited number of frequencies in Band I will be allocated at the moment, while other claims are being considered.

Band III

Services have been announced for the middle of the three Band III sub-bands (mobile transmit: 192.5-199.5MHz and base transmit:200.5-207.5MHz). These include both a national mobile radio service as well as five trunked networks in the London area. Invitations have been issued for companies to apply for licences.

Without specifying exact frequencies, the DTI announcement also included office cordless PBXs which will be allocated five blocks of 1MHz each. Similarly, broadcasters' radio microphones will be getting six blocks of 0.7MHz each in Band III.

Wide-area paging

As part of the same package of anouncements, the DTI have said that new national wide-area paging services should be introduced at 153MHz and at 454MHz. In the interests of competition BT will not be allowed to apply for these new wide-area paging licences.

New equipments from Marconi

Marconi is launching two new major professional communications products. The first, a naval marine transceiver called Swordfish, covers VHF and UHF frequencies in three ranges and is designed to meet the communications requirements of smaller naval and paramilitary vessels.

Swordfish covers 30MHz to 400MHz in the ranges 30-88MHz, 108-175MHz and 225-400MHz and has an output power of 100W on FM/SSB and 90W on AM. The equipment has a number of optional modules, including continuous watchkeeping facilities for the distress frequencies at 121.5MHz and 243MHz. By using independent RF circuitry within the transceiver, automatic and continuous monitoring of distress frequencies is possible no matter what the operating frequency.

In a typical naval operational environment several of these Swordfish units would be working independently through a coupler into the same antenna. In order to do this without interference from one equipment to another, the transmitter noise output at frequencies other than the working frequency has to be very low. Marconi claims that the transmitter output at just 1MHz away from the 100W carrier is 160dB down on the main carrier.

Continuing the tradition

Marconi has been a traditional supplier of both land-based and ship-borne HF and V/UHF equipments for both civil and military applications around the world ever since the earliest days of wireless. The addition of this new V/UHF naval communications transceiver completes an already very full range of products.

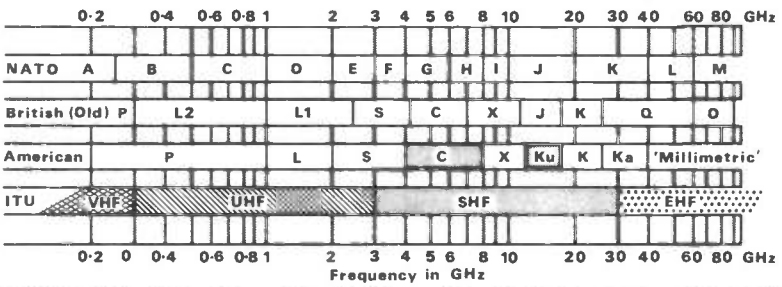
Marconi is also introducing a new HF receiver for use in fixed stations. Designated the H.2542, this 15kHz to 30MHz receiver is a further development of a family of HF equipments which were originally launched in the mid-70s, under the general name MFT (Marconi Fast Tune). The original family of equipments consisted of a self-tuning 1kW HF transmitter (H.1040), a self-tuning 10kW HF transmitter (H.1140) and a corresponding drive unit (H.1540). The family was completed by the H.2540 receiver.

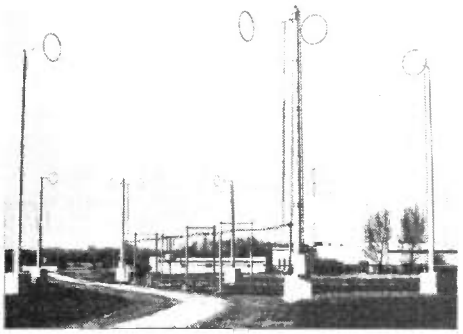
When it was first introduced, MFT was one of the fastest self-tuning ranges of HF transmitters available. Typical tune times from any frequency to any other in the range 2-30MHz are less than two seconds.

In the ten years since the launch of MFT there have been major developments in some of the components and circuits that are used in the construction of these professional communication equipments. This has led to the development of improved generations of the original HF equipments. The launching of the H.2542 receiver is just one of those continuing developments. The Marconi self-tuning HF equipments are now designated MFT2.

The H.2542 receiver has a 1Hz read-out facility and can be used on HF modes such as CW, AM, FSK, SSB and ISB. Independent Sideband (ISB) is a development of SSB, where instead of there being just one sideband and a suppressed carrier as with SSB, there are two independent sidebands on the same suppressed carrier, each carrying a different voice channel. Successful operation of ISB systems requires excellent filter and unwanted sideband suppression performance in the equipments used.

Satellite TV has inherited the 'letter' frequency band indicators from radar engineering. The diagram shows the various lettering used, plus ITU definitions of VHF, UHF and SHF





The ORF's quadrant antennas at Moosbrunn for high angle European coverage

Austria on the short waves

The SW services of the Austrian broadcasting organisation (ORF) have recently completed a major modernisation of the transmitter facilities. A new Telefunken 300/500kW automatic short wave transmitter has been put alongside the ageing 100kW transmitters which have been in service for over 20 years.

Although having adequate power output is an important part of being competitive on the SW bands, it is probably more important to have the best possible antenna arrays for the required service areas.

The upgrading of the ORF SW services included the addition of three new antennas. The ORF installed a quadrant array for the broadcast bands in the 5/6MHz and 7/9MHz ranges for improved European service coverage. These relatively short range antennas were supplied by the Swiss firm of Brown-Boveri (BBC).

Array for 11-21MHz

BBC also supplied a fixed double curtain array for broadcast bands in the range 11-21MHz, which allows the ORF to transmit programmes simultaneously in two directions on different bands for international coverage.

The centre fire directions for the bi-directional curtain are 85° and 265°. The 85° beam carries signals to Australia and New Zealand. The reverse direction of 265° carries signals to the northern parts of South America. But by slewing the 265° beam by 30° up to 295°, coverage of the east coast of the USA can be obtained. The east-facing curtain is rated at 100kW, whereas the westerly curtain can handle 300kW. Slewing the main transmission direction has the effect of slightly reducing the forward gain as well as broadening out the shape of the beam.

At the ORF installation, the forward gain on the main 265° direction at 21MHz is 21.7dB over a dipole. The result of slewing the main beam by 30° to get North American coverage is a loss of just 0.5dB, bringing the forward gain down to 20.2dB. After slewing, the main beam (3dB power points) has broadened from 20° to 22°. By slewing the main beam at 265° up by just 10° to 275°, the ORF is able to cover the Caribbean area from the same fixed curtain array.

Slewing is a technique used in fixed broadcast antenna arrays whereby the direction of the main beam is altered slightly by altering the relative phase at which the two halves of the antenna are fed. This means that, as in the ORF's case, a fixed directional antenna installation can be used to cover a number of different target areas in the same general direction.

Slewing has its limitations. Trying to slew the main beam of a fixed curtain array too far may reduce the side-lobe performance to a point where there is significant transmitted power in unwanted directions. Although slewing of a well-planned fixed curtain can significantly increase the useful target areas covered, it does not offer the all-round flexibility of a fully rotatable high-gain curtain array.

Rotatable curtains!

The third new antenna at the ORF's Moosbrunn SW station is a massive 320 tonne and 73 metres high fully rotatable double curtain array. Supplied by AEG-Telefunken in co-operation with the Austrian electronics firm Kapsch, this monster antenna gives the Austrian SW broadcasting service a new dimension in flexibility of service and coverage.

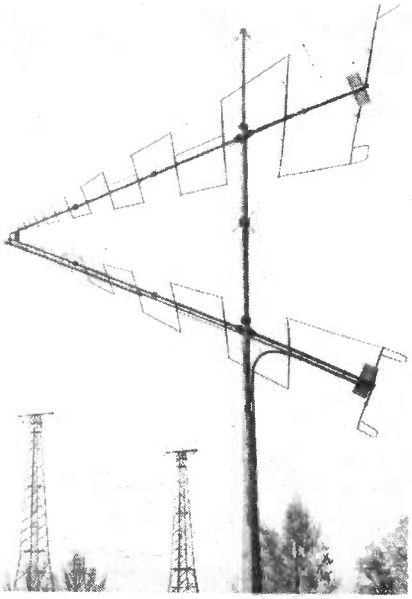
High-gain curtain antennas are usually hung between two fixed towers. By using a passive reflector and a double curtain array, two directional main beams giving coverage at 180° to each other can be obtained. Although slewing does add some directional flexibility, fixed curtain arrays are generally designed for given coverage areas.

However, by building the curtain array on to a rotating trolley arrangement, the broadcaster benefits from both the advantages of the higher forward gains as well as the directional flexibility of a fully rotatable array. But the resulting antenna is a monster!

Vital statistics

With an 85 metre circular track diameter and two 73 metre towers to support the curtains, the whole antenna at Moosbrunn can be rotated up to ±200° from a central position. The array takes just eight minutes to turn through a full 360°. In practice, up to 20 preset positions are programmed into the control system so that the antenna will rotate in accordance with the requirements of the transmission schedule. The array is fully steerable both from a control hut by the antenna as well as directly from the main transmitting control room.

The lower frequency range 6-9MHz array on one side of the antenna is made up of six horizontal dipoles on two vertical stacks of three. On the other side of the passive reflector there are the 16 folded dipole elements in four vertical stacks of four which make up the 11-21MHz array.



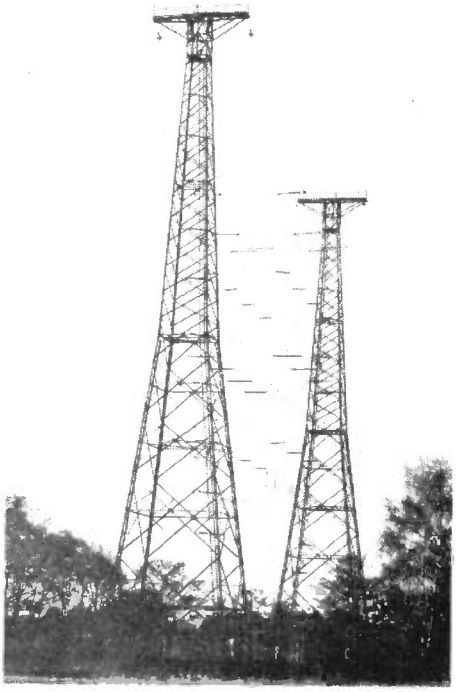
The ORF's rotatable log periodic antenna

Typical forward gains over a reference dipole are around 17dB for the 6-9MHz array and 18-21dB for the 11-21MHz array. The half-power beamwidth of the arrays narrows as the operating frequency increases. At the highest frequency in the 21MHz (13m) broadcast band, the beamwidth is down to 19°. The mechanical accuracy with which the array can be positioned is ±2°.

Transmitters

As part of the same upgrading programme the ORF short wave service brought into operation an AEG-Telefunken S4005 transmitter using pulse-width modulation. With the combination of the increased transmitter power and the greater flexibility offered by the enlarged antenna farm, the ORF expect that Austria's voice will now be more audible on the SW bands and that it will be able to keep its head above the noise and interference from competing broadcasters.

The fixed double curtain array



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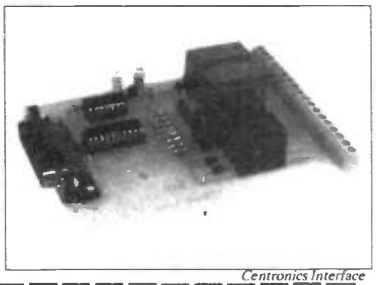

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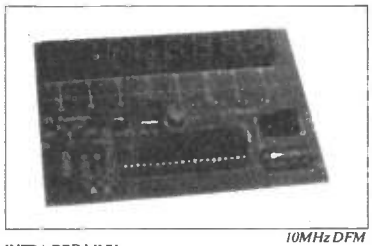

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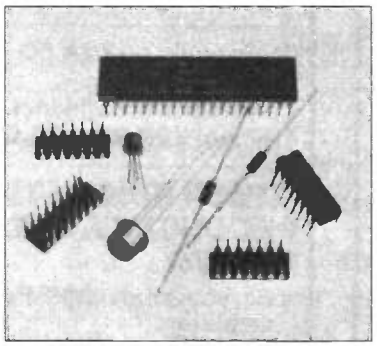

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CA3089	FM IF amp, detector, mute, AFC, AGC system	61-03089	3.88
CA3130E	BIMOS op amp	61-31300	0.80
CA3140E	BIMOS version of 741	61-31400	0.46
MC3359	Low current dual conversion NBFM IF and det	61-03859	2.95
LM3900	Quad norton amp	61-39000	1.20
LM3909N	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
HA11225	Low noise FM IF	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

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CX520D	COAX Relay	46-90520	32.00
CX540D	COAX Relay (BNC)	46-90540	32.00

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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
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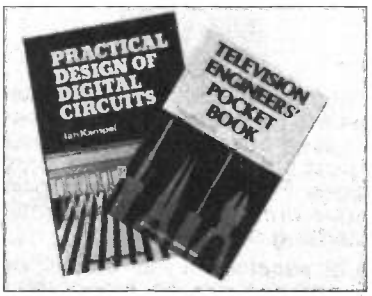
Simple Indoor & Window Aerials - BP136	02-00166	1.75
Simple Tropical and MW Band Aerials	02-00170	1.75
How to get your Electronic Projects Working	02-00179	1.95



68000: Principles and Programming	02-21853	12.70
8085A Cookbook	02-21697	13.55
Handbook of Electronic Tables Formulas	02-21532	11.00
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PIN RF Swtich	PSI 144	7.90	5.60
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1.5W to 10W (No Changover)	144FM10A	29.90	22.20
1.5W to 10W (Auto-Changeover)	144FM10B	42.40	31.50
2M Linears			
1.5W to 10W (SSB/FM) (Auto Changover)	144LIN10B	42.70	32.75
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CONSTRUCTING POWER SUPPLIES

ROGER ALBAN GW3SPA CONTINUES HIS SERIES BY DETAILING THE INTRICACIES OF HEATSINKING

One subject often neglected when building a power supply is a thorough understanding of the size and type of heatsink that should be used. The unwanted power absorbed by a transistor must be dissipated in the form of heat to the surrounding air.

The transistor manufacturer specifies the maximum junction temperature which is permissible, and the designer must take appropriate care to ensure that this temperature is not exceeded. For example, for the popular 2N3055 transistor the data sheet specifies that the maximum junction temperature T_j (Max) must not exceed 200°C. How do we design a heatsink that will ensure that this condition is achieved?

First we must understand the basic principles of thermal conductivity and thermal resistance. Heat developed in the transistor semiconducting material has to be transferred first of all to the metal case, and then from the case to the heatsink. The job of the heatsink is to efficiently radiate the heat to the surrounding air, in the same way that a domestic central heating radiator transfers heat into the surrounding air within a room. The rate of heat transfer is determined by the thermal resistance of the material.

The source of heat

This resistance to heat flow can be compared with a dc circuit and the resistance of current flow within the circuit. *Figure 19* illustrates the equivalent 'circuit' of thermal resistance that will be found in a typical transistor/heatsink arrangement. At the left of the diagram we have the source of the heat, the transistor junction. The thermal resistance between the transistor junction and its case (R1) is specified by the transistor manufacturer. The unit of thermal resistance can be defined as degrees Celsius temperature rise per watt dissipated, just as Ohm's law of resistance can be defined as volts dropped per amp. For example, according to the manufacturer's specification the junction to case thermal resistance for a 2N3055 is 1.5°C/W.

The thermal resistance R2 between transistor case and heatsink will depend on the type of transistor case being used and the method of mechanical fixing to the heatsink. The greater the surface area of contact between the transistor and heatsink, the lower the thermal resistance will be. Therefore it is important to ensure that the surface of the heatsink with which the transistor case mates is as smooth and flat as practicable.

A thin layer of heat-transfer silicone grease should be coated onto both mating surfaces before a mica washer is fitted between them to ensure a good thermal conductivity as well as good electrical insulation. A word of caution: if you use silicone grease, remember to wash your hands thoroughly afterwards. If it is absorbed by the human body, it will not be broken down and will accumulate. For this reason alone, many companies have stopped using silicone grease and have found alternative substances such as a white zinc oxide compound. Unfortunately even this compound contains a small amount of silicon, so it is important to take care and wash your hands after using it.

The third thermal resistance encountered, R3, is the resistance to heat transfer in the material of the heatsink. For example, copper is a very good metal for heat transfer. The majority of heatsinks that will be found on the trade stalls at a mobile rally will be constructed from aluminium, a somewhat cheaper metal.

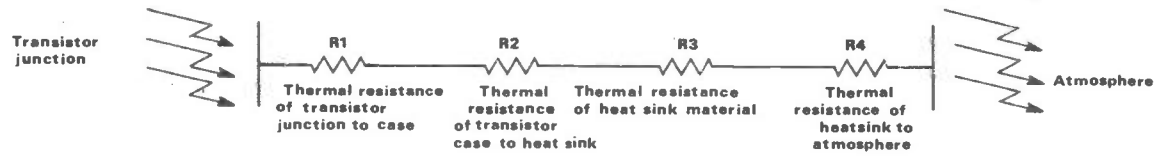
The fourth thermal resistance, R4, is also associated with the heatsink. This is the ability of the heatsink to radiate heat to the surrounding room. This will depend upon its surface area and the coating on it. For example, a heatsink which is painted matt black will radiate heat more efficiently than a heatsink which has a polished metal surface. The rate of heat transfer will also depend upon the difference in temperature between the heatsink and the surrounding air: a heatsink which is at the same temperature as the surrounding air will not dissipate any heat.

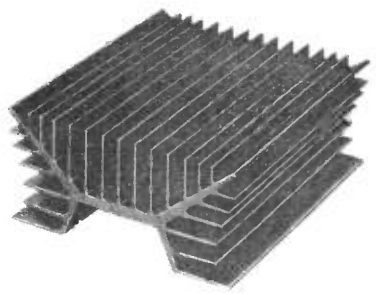
Thermal resistance value

The heatsink manufacturer will quote a given thermal resistance in degrees C per watt. *Figure 20* illustrates a number of popular shapes of heatsink that are readily available, giving also their thermal resistance value. It should be noted that heatsinks that can be purchased from trade stalls at mobile rallies, although corresponding to a recognisable shape, are not necessarily of the length shown in *Figure 20* and a calculation will have to be made on the total surface area according to the length of heatsink purchased.

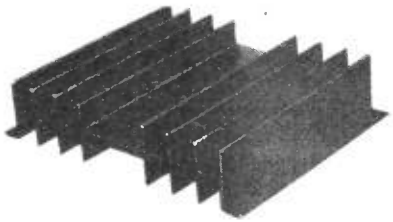
To summarise, the total thermal resistance $R_T = R1 + R2 + R3 + R4$. For the 2N3055 transistor R1 = 1.5°C, R2 = 0.5°C (provided that a mica insulating washer is used together with silicone grease or its substitute), and R3 and R4 are

Fig 19 *Resistance to heatflow between transistor junction and atmosphere*

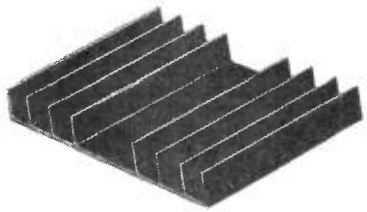




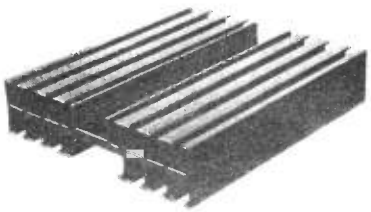
0.23° C/W



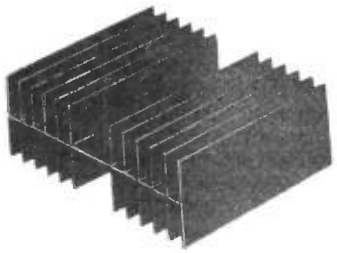
2.1° C/W



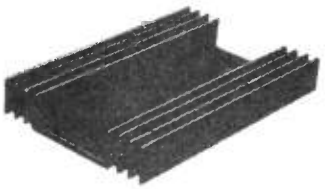
3.0° C/W



1.1° C/W



0.65° C/W



4.0° C/W

Fig 20 *Typical heatsink shapes (note that thermal resistance will vary with size). Pics by kind permission of RS Components*

combined and specified by the heatsink manufacturer.

To calculate the heat that can be dissipated by the transistor and heatsink we need to know the temperature difference between transistor junction and room temperature. This is equivalent to voltage in a dc circuit. The junction temperature is specified by the manufacturer of the transistor. In the case of the 2N3055 it is quoted as 200°C. As a rule of thumb the air temperature at its worst case, for example inside a shack with the linear running, can be considered to be as high as 25°C. Therefore the power dissipated will be:

$$W = \frac{\text{Temperature difference}}{\text{Total thermal resistance}}$$

$$= \frac{T_j\ (\text{Max.}) - 25}{R1 + R2 + R3 + R4}$$

For example, let's take a heatsink with a thermal resistance of 2.1°C/W. The power dissipated, W, for a 2N3055 will be:

$$\frac{200 - 25}{1.5 + 0.5 + 2.1} = 42.5\text{W}$$

This heatsink would be suitable for each pass transistor in the example given when the unregulated voltage is 20V and each pass transistor is dissipating 33.5W.

If a large heatsink is used, such as a heatsink with a thermal resistance of 1.1°C/W then the maximum power that can be dissipated will be:

$$\frac{200 - 25}{1.5 + 0.5 + 1.1} = 56.5\text{W}$$

This large heatsink would be inadequate to dissipate the heat of each pass transistor used in the previous example when the unregulated voltage is 30V. It can be seen, therefore, that it is important to ensure that the secondary voltage of the transformer is custom-designed to meet the requirements of the power supply and to reduce not only the power dissipated but also the cost of the components comprising the power supply.

What happens if two transistors are connected to the same heatsink and are sharing the load current? *Figure 21* shows the equivalent circuit. The two similar pass transistors share the load current equally, and therefore the heat dissipated by each transistor will be half the power dissipated by a single pass transistor. Therefore, with two pass transistors dissipating the heat equally the equivalent circuit can be regarded as having a single transistor generating the source of the heat.

However, the advantage of using two transistors can be seen from the equivalent circuit. The overall thermal resistance of transistor junction to case and the thermal resistance of transistor case to heatsink (R1 and R2) are halved, reducing the overall thermal resistance. If the overall thermal resistance is reduced it should be possible to increase the heat radiated by the heatsink.

Consider the previous examples relating to a 2N3055 pass transistor mounted on two different heatsinks. If two 2N3055 transistors are mounted on a heatsink with a thermal resistance of 2.1°C/W, the power dissipated will be:

$$\frac{200 - 25}{(1.5 + 0.5) \times 0.5 + 2.1} = 56.5\text{W}$$

Therefore, by mounting two similar transistors on the same heatsink we have increased the power radiated by the heatsink from the previous value of 42.5 watts to 56.5 watts, an impressive improvement. It may be cheaper to employ an additional pass transistor like the 2N3055 costing only 25p, rather than increase the size of the heatsink.

In practice it is advisable to de-rate the maximum power dissipated by a heatsink by approximately 10%. There are pass transistors available which are capable of handling larger emitter currents than the 2N3055, but with the limitations of providing suitable heatsinks it seems sensible to stick with the 2N3055.

The heat dissipated by a heatsink can be increased by blowing air past it with a fan. This effectively reduces the thermal resistance of the heatsink to atmosphere, R4, but its actual value will be determined by the volume of air moving past the heatsink in a given time. Also bear in mind that a transistor with a junction temperature approaching 200°C will raise the heatsink to a temperature in excess of 100°C.

Metering

Having got this far in designing and building a power supply it is worth considering the provision of meters to read the load current, and if the power supply has been designed to provide a variable regulated output voltage, then metering of the terminal voltage

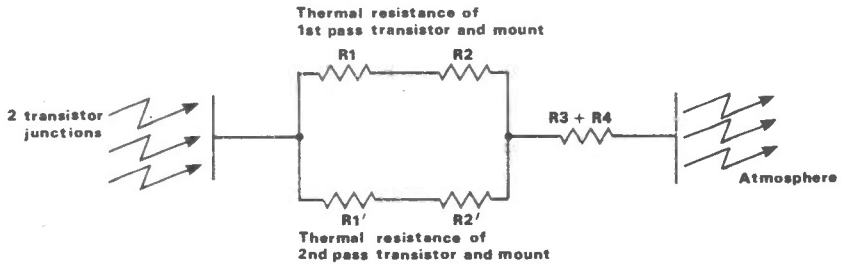


Fig 21 *Resistance to heat flow between 2 similar transistors mounted on same heatsink and atmosphere*

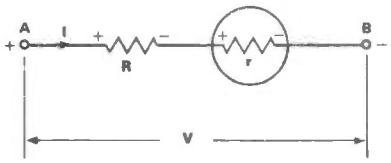


Fig 22 *Ammeter with multiplier used as a voltmeter*

becomes essential. If you examine your junk box you may find an assortment of meters of different sizes and shapes. If not, there are plenty to be found on the trade stalls of your local mobile rally.

An ammeter may be used as a voltmeter by connecting a resistor in series with the instrument. The value of resistance will limit the magnitude of current flowing through the instrument and hence controls the range of the voltmeter.

Figure 22 shows the resistor in series with the instrument. The voltage to be measured is presented across the terminals A and B, and the current required to operate the instrument passes through both the instrument and series resistance, referred to as the multiplier. The maximum value of the current will move the meter needle clockwise until it reads a maximum value on the meter scale. This is called full scale deflection, abbreviated to fsd.

The maximum voltage across the terminals AB will be equal to the voltage drop across the multiplier and meter resistance, ie $E = I \times (R+r)$. If the values of r and I are known, the value of R can be determined for the value of E to give fsd of the meter. From manipulating the above formula the value of the multiplier is given by $R = (E \div I) - r$.

In my junk box I found a meter which has a full scale reading of 100μA and an internal resistance of 30kΩ. The value of the internal resistance was printed on the bottom right-hand side of the scale plate of the meter. It was my intention to convert the meter to read a maximum of 30 volts. Applying the formula:

$$R = (30 \div 100\mu A) - 30k$$
$$= 300k - 30k$$
$$= 270k$$

Next month: more metering minutiae!

AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

One does not often meet radio amateurs who have had personal experience of lightning strikes, but all the same the possibility of such an event, particularly at this time of the year, does seem to lurk in the minds of many amateurs (especially those who have large well exposed aerial systems). Portable installations and repeaters which are usually located on high, open sites are of course at high risk.

The incidence of thunderstorms varies widely over this country. A good map showing such incidence is to be found on page 1042 in the December 1982 issue of *Radio Communications,* from which it appears that the northern and central parts of Scotland have the lowest – under three days a year upon which thunderstorms appeared – and that part of East Anglia in which your scribe lives (around Lowestoft) the highest – 18 to 21 days.

Thunderstorms in this country fall into two basic categories, which are produced in quite different ways. Both are produced by very turbulent air, which collects electrical charges from frictional contacts within the air itself and particularly with any water vapour it may contain. These charges distribute themselves throughout the storm centre so that the top of the storm becomes positively charged with respect to its base.

The first of the two types of thunderstorm comes from a frontal storm, due to cooler air on a cold front driving warm surface air upward. This is quite a violent process, often giving the meteorological phenomenon known as a 'line squall' – well-known to yachtsmen. This can produce a severe but short-lived electrical storm.

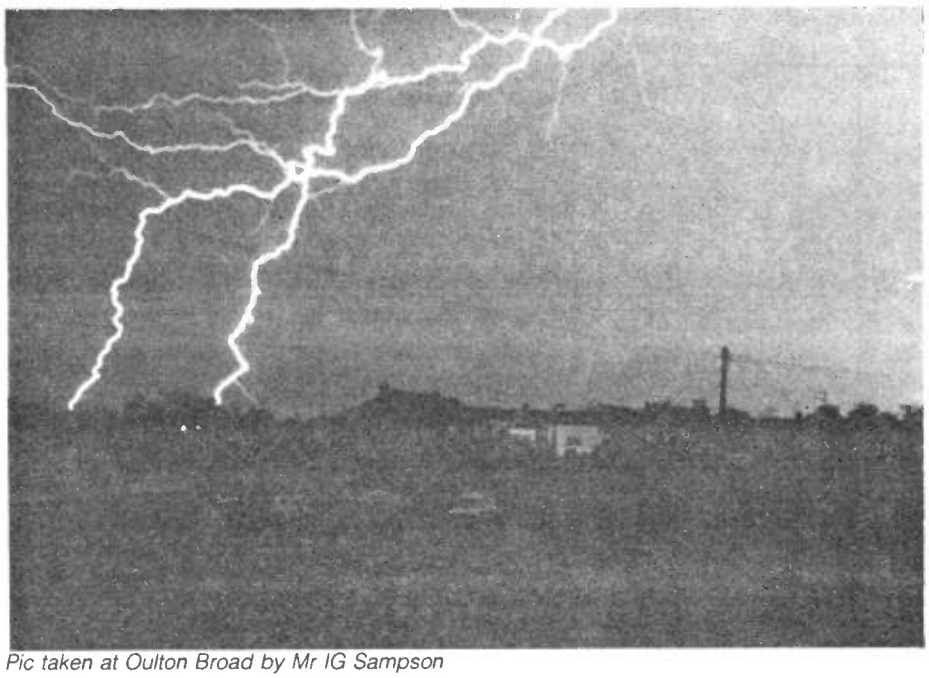
The more familiar thunderstorm is the one which appears late on a summer's afternoon and seems to hang around for hours, thunder rumbling away on and off in the distance. These summer thunderstorms are again due to rising warm air, but this time not assisted by the approach of cooler air.

These storms are caused by summer heat over warm, moist ground creating thermals. They rise many thousands of feet and lift great quantities of water with them in the form of water vapour. This condenses as it rises and cools into massive clouds – thunder-clouds, or more scientifically cumulo-nimbus clouds. There is not the wind around as there is with the first type of thunderstorm, so that the thermal columns become concentrated and these storms tend to hang around for longer than the first type.

It is not easy to quantify the components of a lightning strike but some figures have been produced based on fairly scientific measurement and observation. The average peak current for a cloud to ground strike is said to be about 25kA, although some strikes are thought to peak at over 270kA!

Quite apart from thunderstorms there is always a space charge between the ground and the atmosphere, with the ground being negatively charged with respect to the air above it. On a warm summer day this charge is around 100 volts per metre.

When one comes to consider possible protection against lightning a number of alternatives are available. G R Jessop's article referred to above deals with this topic extensively by describing numerous protective devices. Another approach is suggested in an excellent article by A Martindale G3MYA in the January 1984 issue of *Radio Communications.* This article is a most informative one, to which the writer is indebted for much of the information here. G3MYA suggests installing a single metal mast to stand in the middle of one's property, about 15 feet higher than any other part of one's aerials. The base of this mast must be connected to a good ground earth system. This should provide a cone of protection for all equipment within a radius of 60 feet or so. As G3MYA points out, this mast has the added advantage that it can also be used as an antenna for low angle radiation on the HF bands!



Pic taken at Oulton Broad by Mr IG Sampson

Oscar 10 news schedule

The data for the above is as follows:

In August, there will be no transmission. In September there will be no transmissions on the 1st and the 8th. On the 15th, the figures are 0030GMT, 8 degrees elevation and 233 degrees azimuth. On the 22nd they are 1730, 27 and 152. There will be no transmission on September 29th.

The absence of broadcasts in August and in the beginning of September is due to several factors. First of all the apogee of the satellite's orbit will have moved well into the southern hemisphere, thus reducing the access times in the UK. Then from about August 5th to September 2nd, the satellite will be eclipsed as it passes through the Earth's shadow.

This will result in low battery voltages, so extended use of the satellite such as occurs during a news bulletin transmission is not advisable. And then again the satellite's attitude will have to be adjusted so that the solar panels can be orientated to get maximum illumination. This will result in the aerials pointing in an unfavourable direction, so that during this period signals from Oscar 10 are likely to be very poor.

Conditions on Oscar 10 have been pretty poor of late due to the above factors, which has brought the satellite 'gang' back onto the Russian satellites. Conditions for these have been particularly good with the result that activity on them has picked up substantially. There have been plenty of stations to work at very good signal strengths.

By the time you read this there may be a new Russian satellite in orbit. This will be of the ISKRA type, ie a small low orbit satellite to be launched by hand from a Salyut manned spacecraft. Rumours are high at the time of writing that such a satellite is due to be launched 'shortly'. It is thought that it may have a 10/15 metre transponder aboard. At the time of the launch of the last ISKRA satellite the Russians announced that they proposed launching a series of such satellites.

Oscar 10 has had its apogee over the southern hemisphere for some time now, giving very short periods of workability in this part of the world, and usually at very unsocial hours. Its operating schedule has been adjusted throughout the past month, so that the least possible strain was put on the satellite during its eclipse period. One danger was that of the batteries actually freezing up during the long eclipse period. Oscar 10 was two years old on 16 June last.

RS8 has been showing 'end of life' symptoms. It has not been responding to commands correctly and there have been intermittent function failures and periods of anomalous telemetry. RS8 was launched on 17 December 1981, along with RS3, 4, 5, 6 and 7. RS5 and 7 are the only ones of this launch now functioning.

The solar cycle

Despite some recent increase in solar activity it should not be thought that the sunspot minimum has been passed and that improved conditions will henceforth be on the 'up-and-up'! A stage in the sunspot cycle has now been reached when old cycle spots which appear at low solar latitudes and new cycle spots which appear at higher solar latitudes can exist together. Even so, there will continue to be periods when no sunspots at all will be apparent.

The official forecast of sunspot numbers for the next six months suggests a continuing decline, with a figure as low as only six predicted for October. Many professional experts are predicting a lengthy period still to come at very low levels of activity. They are expecting the next cycle to be of a lower level of activity than average, so HF band conditions during the whole of the next sunspot cycle may be very disappointing indeed. So it looks as though the 'DX chasers' will have to rely on satellites!

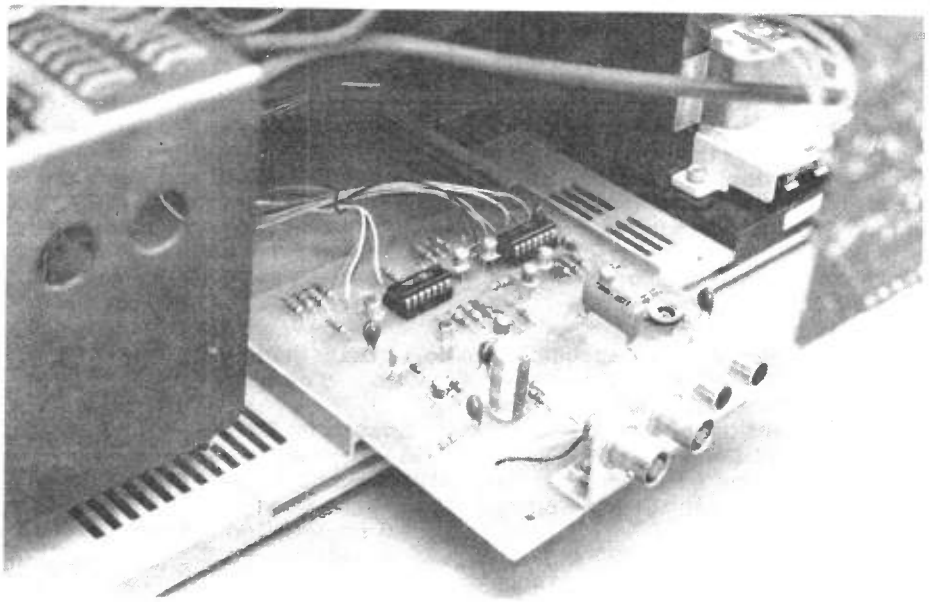
Americans on 24MHz

USA amateurs were authorised to use 24MHz from June last. This should help to increase activity on this band, which British amateurs have been permitted to use since October 1982.

BARTG news bulletins

BARTG wishes to remind RTTY enthusiasts that news bulletins take place on Sunday mornings on 80, 20 and 2 metres, using their callsign GB2ATG. Details of these transmissions can be had from John GW6MOK, BARTG, PO Box 3, Llandeilo SA19 6EY who can also be phoned on: (0558) 822286.

VIDEO MONITOR CONVERSION



IN THE FINAL PART OF HIS ARTICLE ALAN WARNE G4EZO DESCRIBES THE ACTUAL CONSTRUCTION OF THIS PROJECT FOR THE FERGUSON TX90

When mounting components on the printed circuit board, take care to observe the polarity of the electrolytic capacitors and the diode. Fit wire links where indicated and fit two IC sockets. Construct the aluminium bracket as per *Figure 4* and fit two BNC sockets for video in/out and two phono sockets for audio in/out. This bracket is fitted to the PCB using three M3 nuts and bolts. Other types of sockets may be fitted depending on requirements.

Connections to the main board of the television are located along the rear edge of the interface board. Twelve single cables, preferably of different colours for ease of identification, should be fitted using multistrand 16/0.2mm or similar. They should initially be cut to about 24 inches long and trimmed accordingly when connected to the main board. It is advisable to tie the cables together into a neat wiring loom.

To fit the interface, first release the main printed board from the receiver by undoing the self-tapping screw holding the control panel to the cabinet front. The board will then slide back and can be worked on. Two different types of printed board have been used during production of the TX90. The modification can be fitted to either version; however, connection details are not the same for each type. This means that the board must be identified correctly from the outset.

The original board is coded PC1130 and the number is printed on the copper side of the main board. If the receiver is of more recent manufacture it will be fitted with board type PC1140. Carry out the simple modifications by following the appropriate instructions relating to your main board.

PC1130 conversion

1. Interchange C129 68n with R130 820R (hole spacing is the same). This modification undates the sync circuit in line with the PC1140.
2. Cut the track to pin 8 of the tuner, *Figure 5* (breaks the dc supply).
3. Remove C174 470n (located near the rear edge of the PCB).
4. Remove the wire link marked LK142 (located below IC103).
5. Remove the wire link marked LK102 (located above the volume control).
6. Remove R114 10K and replace with a wire link (located behind the volume control).
7. Cut the copper track around the top and middle connections of the volume control to isolate the connections, *Figure 6*.

PC1140 conversion

1. Remove the wire link marked LK110 (top of board above tuner).
2. Remove the wire link marked LK133 (below tuner).
3. Remove C174 470n (located in the audio stage, near the rear edge of the

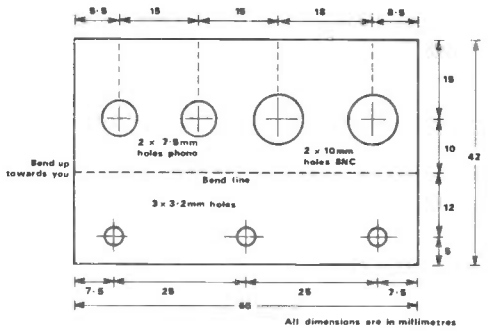


Fig 4 *Details of mounting bracket for in/out sockets*

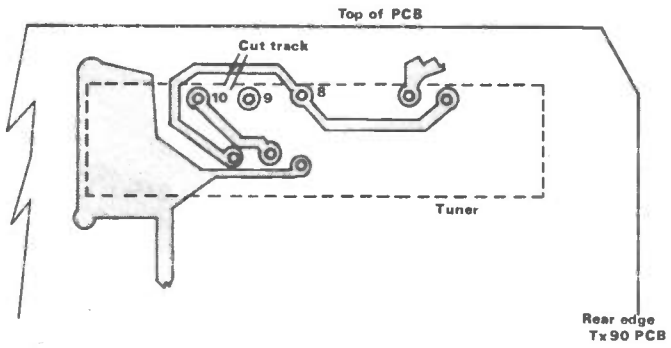


Fig 5 *Tuner modification PC1130 PCB*

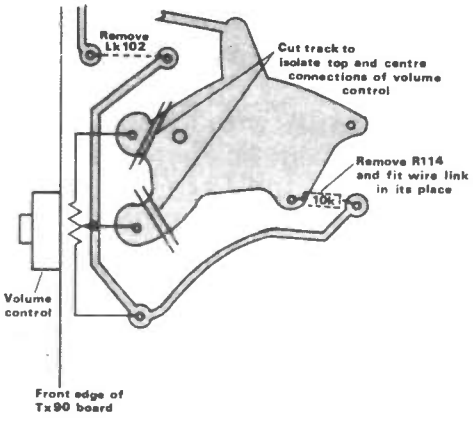


Fig 6 *Volume control mod PC1130 (print side)*

PCB).

4. Remove R158 270R (below IC103).
5. Remove R114 10K (located behind the volume control).

Note: R31 470R should be fitted in line with the cable marked L106/R126. The preferred way is to mount the resistor vertically into the interface board using the hole marked L106/R126 then solder the interconnecting lead to the top of it.

Now slide the new interface board into the ready-made plastic guides in the centre of the cabinet base. Route the wiring loom from this board along the cabinet base and then upwards to the top of the main receiver PCB, and come over the top near the volume control onto the copper track side, fanning out the leads to the appropriate connection points shown in *Figure 7.*

The photograph of the TX90 PCB shows the method involved, but has been exaggerated to easily identify the connections. Keeping the wiring loom close to the front of the cabinet will prevent any stray pick-up from the line output transformer.

Refit the main board into the cabinet, making sure the wiring loom sits neatly above the volume control. Drill two holes of 3.2mm diameter in the cabinet base which line up with the two 3mm holes on the front edge of the interface board. Fit 3mm nuts and bolts to secure the board.

In order to test the unit, switch on the receiver, select a normal TV channel and check that the volume control operates normally. Select button 8 and apply a video and sound signal to the input sockets. Connect another monitor or an oscilloscope to the video and sound output sockets and make sure that external inputs are routed to the output sockets when in monitor mode. When switching over to normal TV these signals should now appear at the output sockets. RV1 should be set for the audio line level required, and is normally set about half-way. Cut a hole in the receiver rear to line up with the sockets, and the modification is complete.

Conclusion

The prototype monitor has operated reliably for over six months, and has been used with the BBC and Commodore 64 computers. It has also been used for amateur television to record off-air signals and to display camera outputs, giving good results.

It should be noted that this conversion cannot be used with TX90 televisions using remote control.

A service manual for the television may be purchased from *Thorn EMI, Ferguson Service Division, Lea Valley Trading Estate, Angel Road, London N18.* REW

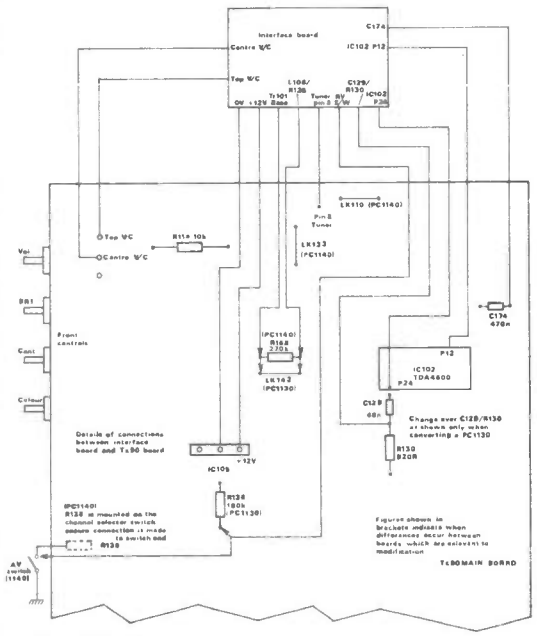


Fig 7 *TX90 main board*

COMPONENTS

Resistors (all ¼W carbon)

RV1 skeleton preset	2K2 (RS part no 184-984)
R7	47R
R9	68R
R20	75R
R21	82R
R4, R17, R24	120R
R15	330R
R2, R31	470R
R16	560R
R25	1K
R12	2K2
R11, R13, R19, R30	5K6
R1, R14, R18, R28	10K
R3, R6	33K
R10, R27	47K
R22	56K
R8, R23, R26	100K
R5	270K
R29	330K

Capacitors

C1	0.47μF provision made on PCB for vertical or horizontal mounting
C7, C8	1 μF 16V tantalum bead
C2, C3, C4, C5	10μF 16V tantalum bead
C6	470μF 16V working (RS part no 104 499)

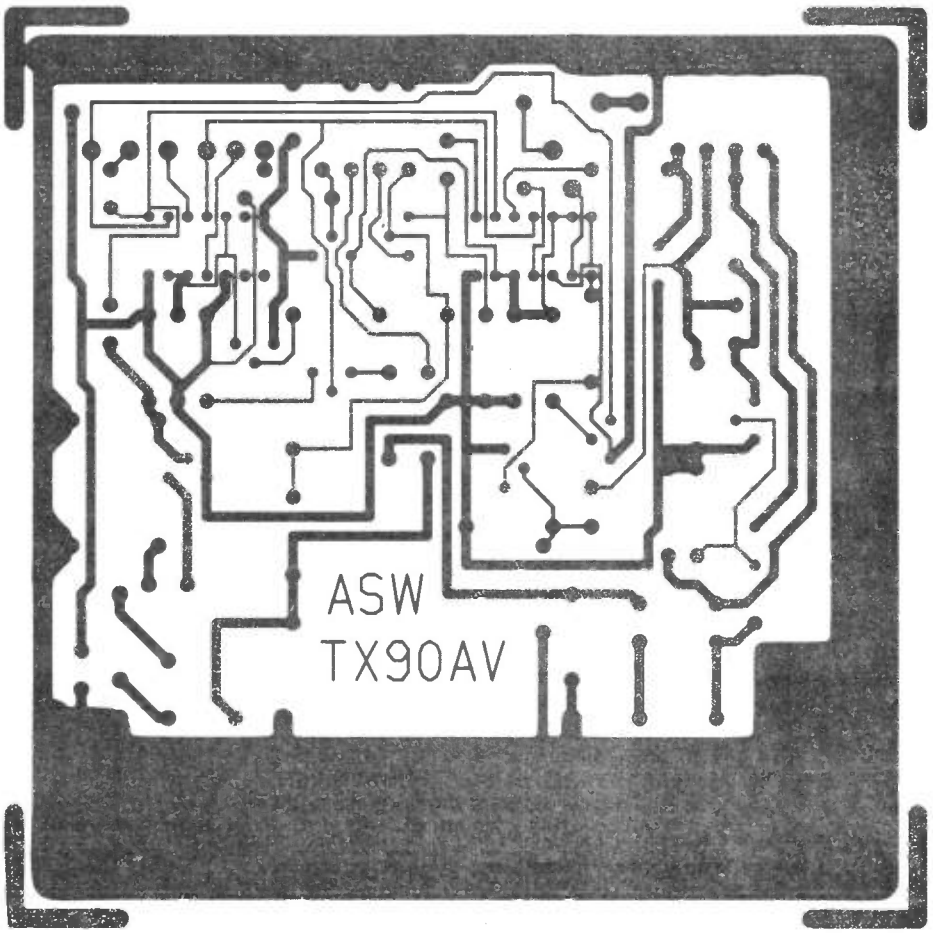
Semiconductors

Tr1,2,3,4,6,7,8,9	BC107 or BC108
Tr5,10	BC477 or BC478
D1	1N4148 or 1N916
IC1,IC2	MC14066 or 4066 CMOS switch

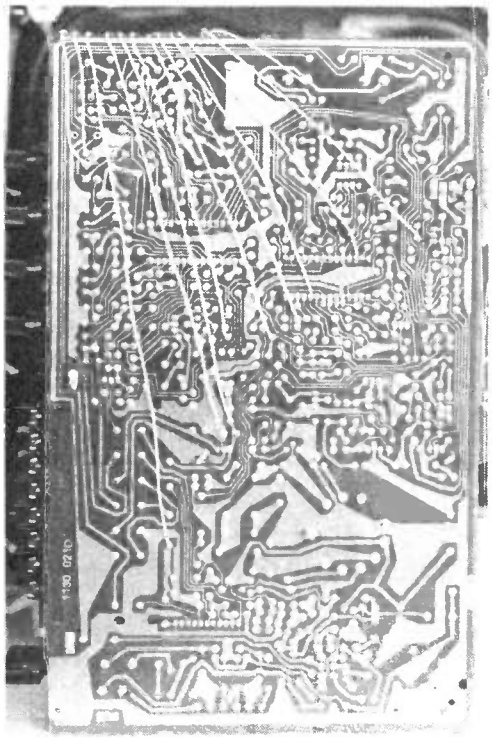
Miscellaneous

1 Printed circuit board
2 14-pin IC holders
2 BNC sockets
2 Phono sockets
1 Aluminium bracket for phono and BNC sockets
5 3mm nuts
3 3mm screws, 6mm long
2 3mm screws, 12mm long

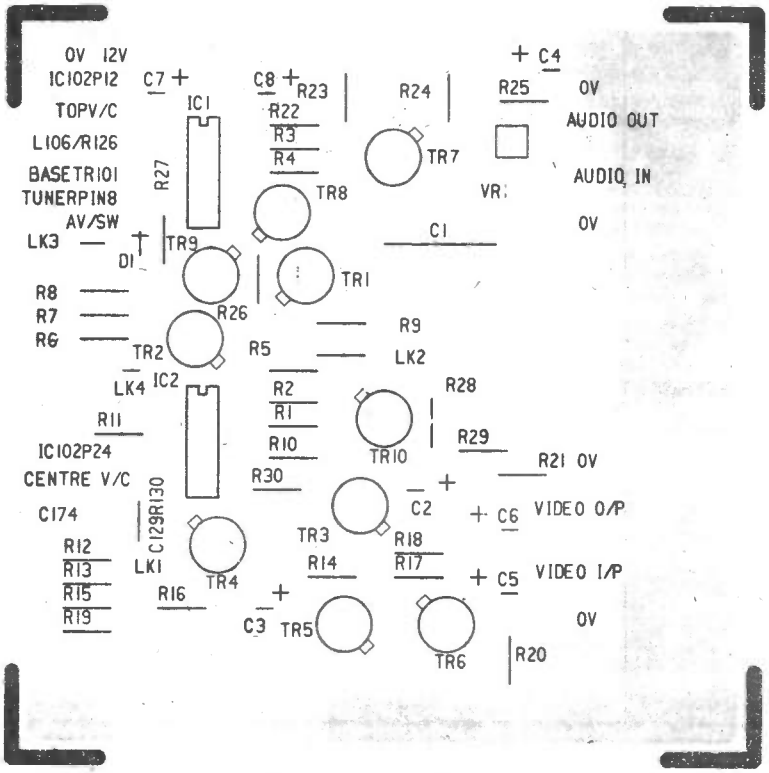
A printed circuit board is available at £6.00, including postage and packing, or the complete kit of parts at £25.00, including postage and packing. Cheques should be made payable to A S Warne and sent to 113 Queens Road, Vicars Cross, Chester, Cheshire CH3 5HF



PCB foil pattern



Details of wiring to TX90 main board



Component overlay

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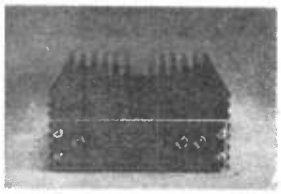
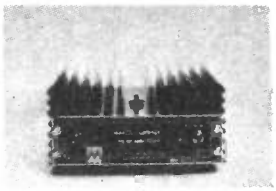
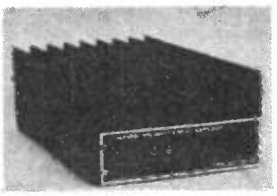


MML144/30-LS



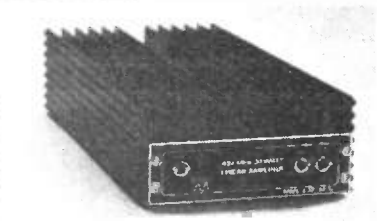
MML144/50-S

MML144/100-LS

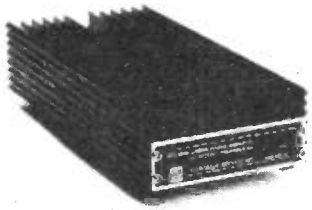


MML144/200-S

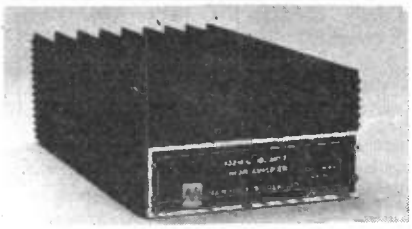
PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	Pre Amplifier GAIN	Pre Amplifier NF	POWER REQUIREMENTS	RF * VOX	PRICE INC VAT
MML144/30-LS	**1 or 3W**	30W	SSB, FM, AM, CW,	12dB	<1.8dB	13.8V @ 4A	V	£82.90 (p&p £3.50)
MML144/50-S	10W	50W				13.8V @ 6A	V	£92.00 (p&p £3.50)
MML144/100-S	10W	100W				13.8V @ 12A	V	£149.95 (p&p £4.00)
MML144/100-HS	25W	100W				13.8V @ 12A	V	£149.95 (p&p £4.00)
MML144/100-LS	**1or 3W**	100W				13.8V @ 14A	V	£169.95 (p&p £4.00)
MML144/200-S	**3, 10 or 25W**	200W				13.8V @ 30A	V	£299.00 (p&p £5.25)



MML432/30-L



MML432/50



MML432/100

PRODUCT	INPUT POWER	OUTPUT POWER	MODES OF OPERATION	PRE AMPLIFIER GAIN	PRE AMPLIFIER NF	POWER REQUIREMENTS	RF* VOX	PRICE Inc VAT
MML432/30-L	1 or 3W	30W	SSB, FM, ATV, CW,	12dB	2dB	13.8V @ 6A	V	£145.00 (p&p £4.00)
MML432/50	10W	50W		12dB	2dB	13.8V @ 8A	V	£129.95 (p&p £4.00)
MML432/100	10W	100W		—	—	13.8V @ 20A	V	£299.00 (p&p £5.25)

*THE RF VOX CAN BE OVERRIDDEN AND HARDWIRED.

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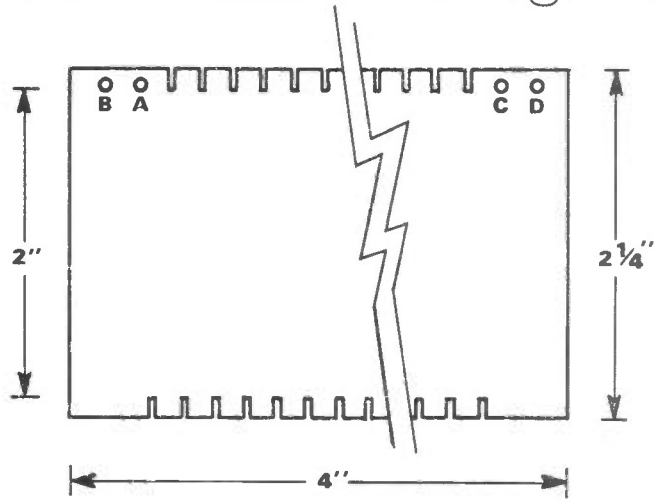

Fig 1 *Layout of the perspex*

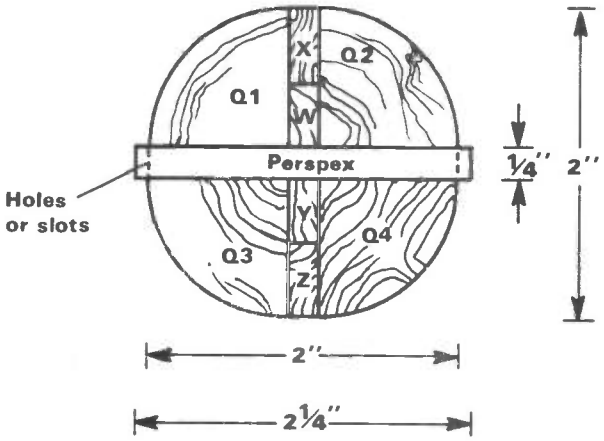

Fig 2 *Arrangement of the temporary former*

At one time it was possible to purchase coil stock in various diameters and turns per inch for use in ATUs, pi-net circuits, etc. Unfortunately this is no longer the case. However, it is comparatively simple for one to make an air spaced coil. As it is easier to describe the construction of a particular coil, this article will show how to construct a 2 inch diameter coil with 15 turns at 5 turns per inch, and then describe how the parameters can be changed. The wire used is 16swg, which will give a rigid coil and yet not be too thick or difficult to wind.

Facts and figures

The length of the winding will be 3 inches, allowing ½in at each end for terminations and mounting. Obtain a ¼in thick piece of perspex 4in long and 2.25in wide. Draw two lines, one ⅞in in from each edge, ie 2in apart. Along one line mark one point ¼in in from one end and a second point ¼in from the first one, as shown by 'A' and 'B' in *Figure 1*. Then mark out a further 15 points at 0.2in centres, the last one being shown as 'C', then a final point 'D' ¼in from 'C'. This last point should be ¼in in from the end.

Along the second line mark off 15 points at 0.2in centres commencing 0.6in from one end. The last point should be 0.6in from the other end. These points should all be opposite the centres of the spaces between the points marked on the first edge.

As it is sometimes difficult to make marks on perspex, an alternative is to draw it out on a piece of paper (tenth-inch graph paper is ideal), temporarily stick it on the perspex, and using a sharp pointed instrument mark the perspex through the paper.

Drill 5/64in holes through each of the marked points. Using an Abra tension file in a hacksaw frame, cut slots from the edge of the perspex into the holes, with the exception of the first two and the last two along the first edge, ie points 'A', 'B', 'C', and 'D' in *Figure 1*. The perspex is now ready.

Obtain four pieces of 25mm nominal (22mm actual) quadrant fillet at least the length of the perspex, and also four pieces of 6mm thick timber of a height such that two pieces on top of each other are the same height as the quadrant fillet, ie 22mm. Arrange them on the perspex as shown in *Figure 2*. They can be kept in position by one or two pieces of masking tape. If the perspex is not quite ¼in thick, then pack it up with cardboard.

As this is a 2 inch diameter coil, allow 6.5 inches of 16swg wire per turn and a couple of feet for terminations, etc. In this case it would require about 12 feet.

The wire must be straightened. One method is to clamp one end in a vice or otherwise fix it to some immovable object. Then sandwich the wire between two pieces of hardwood, and holding them together as tightly as possible (horizontally) walk away from the fixed end keeping a strain on the wire. Repeat the process with the hardwood held vertically. This should remove all kinks and twists in the wire.

The wind up

To wind the coil refer to *Figure 1*. Leave one end of the wire still clamped or fixed. Push the free end of the wire through hole 'A' and then back through hole 'B', leaving enough for terminations. Keep the wire under tension by pulling against the fixed end. Turn the former with the fillets on it and walk towards the fixed end, guiding the wire into the slots and making sure it goes all the way in, not forgetting to remove any masking tape used as the wire reaches it. Finally, feed the wire through hole 'C' and back again through hole 'D'.

For removing the temporary former refer to *Figure 2*. First of all push the piece marked 'W' out through the end. Then ease down piece 'X' clear of the wire and push it out through the end. The two pieces of quadrant fillet marked 'Q1' and 'Q2' should now be loose enough to push out without disturbing the wire, together with any packing. Then deal with 'Y', 'Z', 'Q3' and 'Q4' in a similar manner, and in that order.

Finally, fill all the slots with glue such as UHU, Evo-Stick, Bostic 1, etc and leave to dry for 24 hours. The result will be a rigid firm coil which will withstand fairly rough treatment.

Variations

For coils of different diameters the quadrant fillet can be changed. However, a 2 inch diameter coil is a useful size and the fillets can be used time and again.

When the turns per inch required are 4, 5, 8 or 10, an ordinary ruler can be used to mark out the points. Since metrification and the disappearance of the Armstrong scale, 6 turns per inch can present a problem. However, if the points are marked out at 4mm spacing, this will give 6.35 turns per inch which makes little difference. Indeed, a coil of 19 turns only showed an error of 4½%. Of course one could reduce it by ½ a turn, but bearing in mind normal circuit tolerances it does not seem worthwhile. But do remember that the points along one edge must be opposite the spaces between the points along the other edge.

To be continued . . .

As suggested at the beginning of this brief article, coils wound using this technique can be used in ATUs. The author has constructed just such a unit, details of which will be featured in a forthcoming issue of ***R&EW.*** Watch this space!

DATA FILE . . .

Ray Marston presents a miscellany of astable circuits in this penultimate part of his 555 mini-series

In the last two editions of *Data File* we have explained the basic operating principles of the ubiquitous 555 timer IC, and have taken an in-depth look at ways of using the device in monostable pulse generator and astable squarewave generator applications. In the present edition of 'The File' we present a further variety of useful astable circuits. We start off, however, by showing how the IC can be used in the 'Schmitt Trigger' mode.

Schmitt triggers

The 555 timer IC can be made to function as a useful Schmitt trigger by simply wiring its pin 2 and pin 6 'comparator' terminals together, as shown in *Figure 1*, and applying the external input signal directly to these two points.

These two comparators are internally biased via a built-in potential divider, which biases the inverting terminal of the upper comparator at $\frac{2}{3}V_{CC}$ and the non-inverting terminal of the lower comparator at $\frac{1}{3}V_{CC}$; the comparator outputs drive the 'R' and 'S' terminals respectively of the output-driving R-S flip-flop. Consequently, the action of the *Figure 1* circuit is as follows.

When the input terminal voltage rises above a value of $\frac{2}{3}V_{CC}$ the IC output switches to the low state, and then remains in that state until the input voltage falls below $\frac{1}{3}V_{CC}$, at which point the output switches high and then remains in that state until the input rises above $\frac{2}{3}V_{CC}$ again. The difference between these two trigger levels is called the 'hysteresis' value of the circuit and has a value of $\frac{1}{3}V_{CC}$ in this case. This large hysteresis value makes the circuit useful in noise/ripple-rejecting signal-conditioning applications as indicated in the diagram.

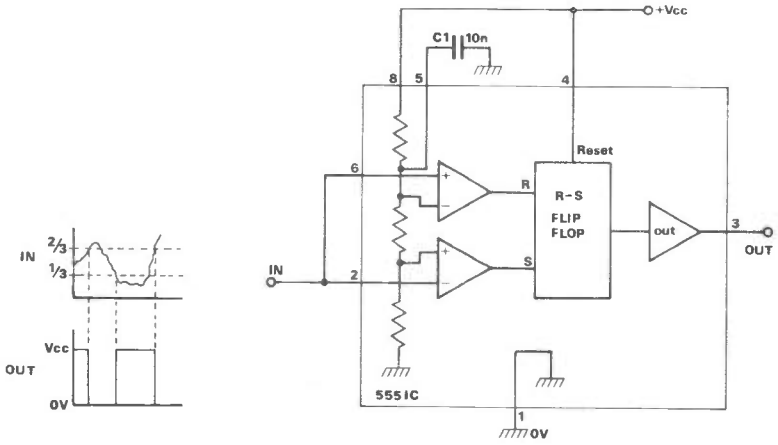

Fig 1 *Simple Schmitt trigger*

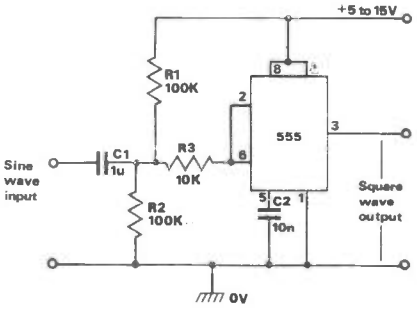

Fig 2 *555 Schmitt sine/square converter*

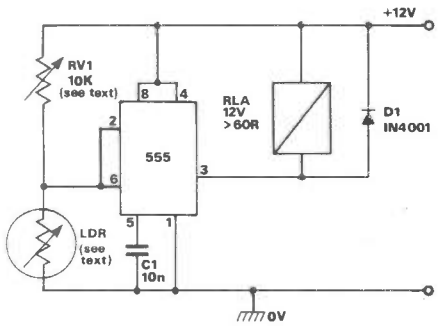

Fig 3 *Dark-activated relay switch*

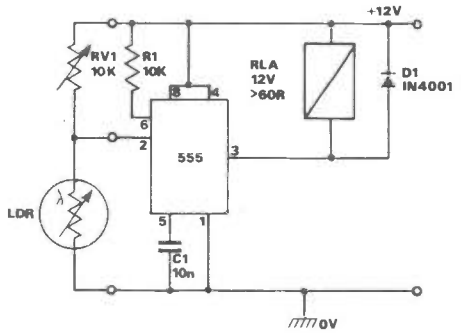

Fig 4 *Minimum backlash relay switch*

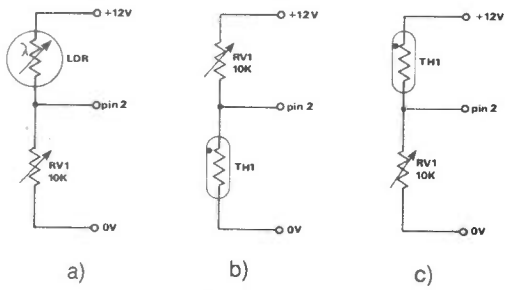

Fig 5 *Alternative inputs for a) light, b) under-temperature and c) over-temperature activation*

Sine/square converter

Figure 2 shows how the above circuit can be modified for use as a high performance sine/square converter that can be used at input frequencies up to a maximum of about 150kHz. Here, potential divider R1-R2 biases the pin 2 and pin 6 input terminals of the IC at a quiescent value of $\frac{1}{2}V_{CC}$ (ie, midway between the upper and lower trigger values), and the sinewave input signal is superimposed on this point via C1. Squarewave output signals are taken from pin 3 of the IC. Resistor R3 is wired in series with the input signal to ensure that it is not adversely influenced by the switching actions of the 555 IC.

Figure 3 shows how the basic Schmitt circuit can be adapted to a dark-activated relay-driving application by wiring light-dependent potential divider RV1-LDR to the input terminal of the IC. The RV1 and LDR values are approximately equal at the median switching light level. Note that the inherently high degree of input backlash or hysteresis of the Schmitt is likely to make this particular circuit useful in only very specialised light sensing applications.

More use?

A far more useful relay-driving dark-activated switching circuit is shown in *Figure 4*. This circuit acts as a fast comparator rather than a true Schmitt trigger: it has the input (pin 6) of its upper internal comparator tied permanently high via R1, while the output of the light sensing RV1-LDR potential divider is applied to the input (pin 2) of the lower comparator. The LDR can be any cadmium sulphide photocell that presents a resistance in the range 470R to 10k at the required turn-on light level.

Note that the above circuit can be made to function as a light (rather than dark) activated switch by simply transposing the RV1 and LDR positions, as shown in *Figure 5a*. Alternatively, the circuit can be made to function as a temperature-activated switch by using a negative temperature coefficient thermistor in place of the LDR, as shown in *Figures 5b* and *5c*. This thermistor must present a resistance in the range 470R to 10k at the required turn-on temperature.

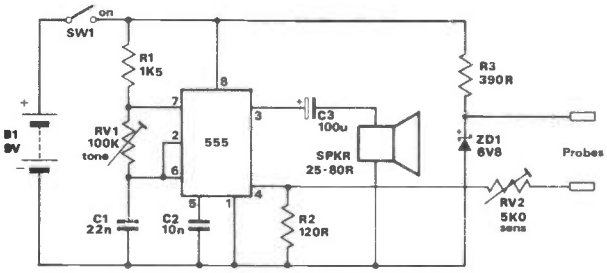

Fig 8 *Continuity tester*

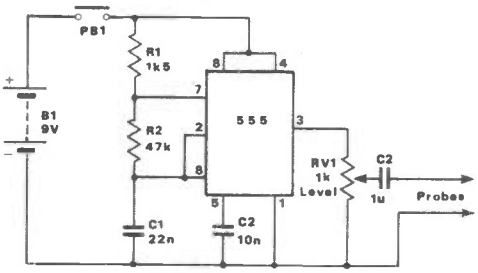

Fig 9 *Signal generator*

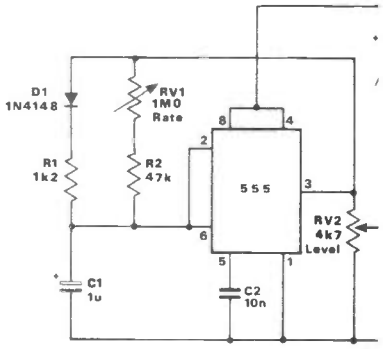

Fig 10 *Metronome*

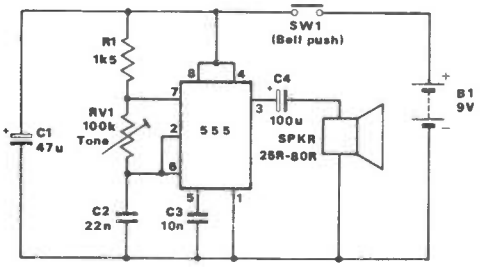

Fig 7 *Electronic door buzzer*

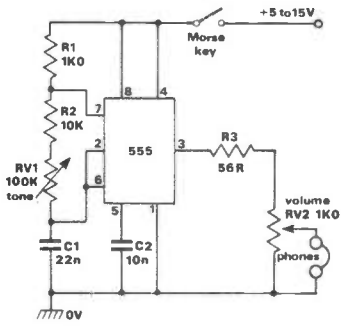

Fig 6 *Morse practice oscillator*

Astable gadgets

The 555 astable multivibrator has three outstanding advantages over other types of astable circuit. First, it has excellent frequency stability with variations in supply voltage and temperature. Next, its frequency can be varied over a wide range via a single resistive control. Finally, its output has a low impedance and can source or sink currents up to 200mA.

These features make the device exceptionally versatile, and it can be used in a vast range of practical applications of interest to both the amateur and professional user. *Figures 6* to *10* show examples of typical 555 astable 'gadgets'.

Figure 6 shows how the 555 timer IC can be used as a Morse code practice oscillator. The circuit acts as a normal astable with frequency variable over the range 300Hz to 3kHz via tone control RV1. The 'phone volume is variable via RV2, and the 'phones can have any impedance from a few ohms up to megohms. The circuit draws zero quiescent current, since the normally-open Morse key is used to connect the circuit to the positive supply rail, which can have any value in the range 5 to 15 volts.

Figure 7 shows how the 555 can be used as a simple electronic 'door buzzer'. The bell-push switch (SW1) connects the 555 astable to the 9 volt supply battery, and the output of the IC is coupled to a small speaker (25R to 80R) via C4. C1 produces a low supply-line impedance, ensuring adequate output drive current to the speaker when SW1 is closed. The circuit generates a monotone 'buzzer' signal.

Figure 8 shows how the 555 astable can be used as a continuity tester which generates an audible tone only if the resistance between the test probes is less than a few ohms. Circuit operation relies on the fact that the astable will operate only if pin 4 is biased positive to 600mV (approximately) or greater. In the diagram, this pin is normally pulled to ground via R2, so the astable is inoperative.

To enable the *Figure 8* astable to operate the two probes must be closed together, connecting R2 to the output of the R3-ZD1 voltage reference generator via RV2. In use RV2 is carefully adjusted so that astable operation is barely obtained under this condition. Consequently if the inter-probe resistance exceeds a few ohms when a continuity test is being made, the astable will not operate. Note that the circuit consumes several mA of current whenever SW1 is closed, even if the probes are open circuit.

Figure 9 shows how the 555 astable can be used as a signal injector that is useful for testing both AF and RF circuits. The astable operates at a basic frequency of a few hundred Hz when PB1 is closed; the square output waveform is very rich in harmonics, however, and these can be detected at frequencies up to tens of MHz on a radio receiver. The signal injection level is variable via RV1.

Figure 10 shows how the 555 can be used to make a metronome in which the 'tick' rate is variable over the range 30 to 120 beats per minute via RV1, and the 'tick' volume is variable via RV2.

This circuit is a modified version of the standard astable, in which the main timing network is driven from the output (pin 3) of the IC. When the output switches high, C1 charges rapidly via D1-R1, to generate a 'tick' pulse with a duration of only a few milliseconds. When the output switches low again C1 discharges via the RV1-R2 series combination, producing an 'off' period of up to two seconds (= 30 beats per minute). The output pulses are fed to a small speaker via volume control RV2 and buffer transistor Tr1.

LED flashers and alarms

Figures 11 and *12* show how the 555 astable can be used in LED flasher applications, in which the LEDs have equal on and off switching times. With the component values shown, each circuit operates at a rate of approximately one flash per second.

The *Figure 11* circuit has a 'double-ended' output: either a single LED, or a number of LEDs connected in series, can be wired between the IC output (pin 3) and ground and between the output and the positive rail.An LED typically 'drops' about 2 volts when on, so several LEDs can be series connected in a circuit that is powered from a 15 volt supply. Resistors R3 and R4 determine the 'on' current of the LEDs.

In this circuit all 'upper' LEDs are on when the 'lower' LEDs are off, and vice versa.

Figure 12 shows how the basic *Figure 11* circuit can be modified to give automatic dark-activated operation, so that the flasher activates automatically at night. In this circuit R4-R5-LDR-RV1 are used as a semi-precision light-sensitive Wheatstone bridge which is used to activate the 555 astable via balance detector Tr1 and the pin 4 'reset' of the IC. The circuit operates as follows.

In *Figure 12* the astable is normally disabled via R6, which pulls the pin 4 reset terminal of the IC to near-zero volts; the astable becomes active only when pin 4 is pulled to a positive voltage greater than 600mV or so, and this can be achieved only by turning on bridge

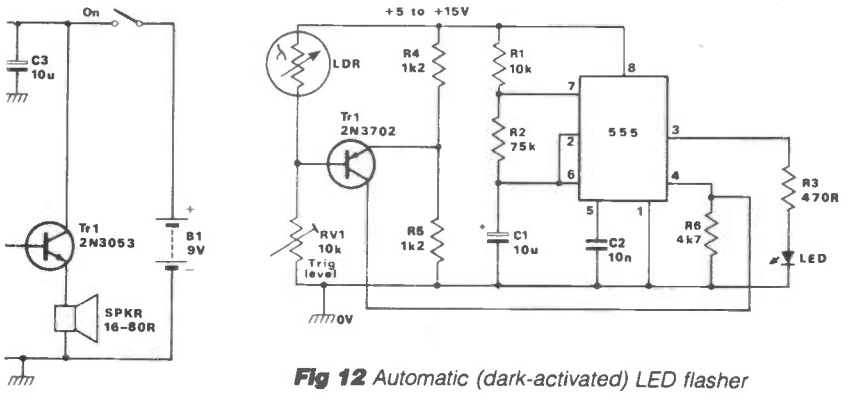

Fig 12 *Automatic (dark-activated) LED flasher*

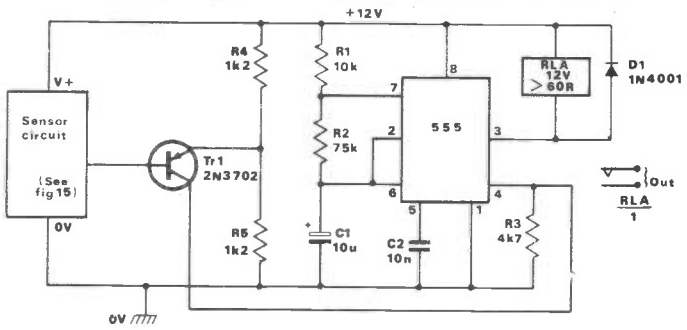

Fig 13 *Heat or light-activated relay pulser circuit*

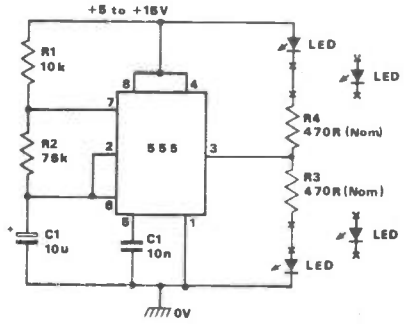

Fig 11 *LED flasher with double-ended output*

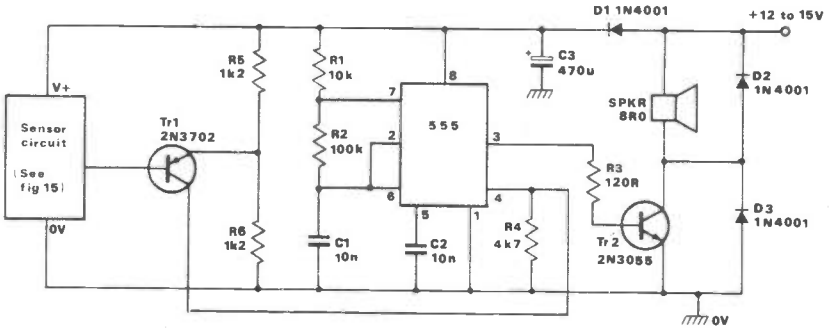

Fig 14 *Heat or light-activated medium power monotone alarm*

balance detector Tr1. R4-R5 form one arm of the bridge, and apply a fixed half-supply voltage to the emitter of Tr1, and LDR-RV1 form the other arm, which applies a light-dependent voltage to Tr1 base.

Under bright conditions the LDR presents a low resistance; consequently the base-emitter junction of Tr1 is reverse biased and the astable is inoperative. Under dark conditions, on the other hand, the LDR resistance is high, so Tr1 and the astable are biased on. In practice RV1 is simply adjusted so that the astable activates at the required 'dark' level: the LDR should have a resistance in the range 470R to 10k under this condition.

The basic 'precision gating' technique described above can be used to gate a variety of 555 astable circuits to make various useful audible alarms and relay pulsers etc. By transposing the LDR and RV1 positions or replacing the LDR with a negative temperature coefficient thermistor, these circuits can be triggered by increases or decreases beyond preset values in either light or temperature levels. *Figures 13* to *15* show practical examples of such circuits.

The *Figure 13* circuit is that of an 'automatic' (heat or light-activated) relay pulser. The circuit is powered from a 12 volt supply, and can be used with any 12 volt relay with a coil resistance greater than about 60 ohms. When activated, the circuit pulses the relay on and off approximately once per second: the relay contacts can be used to activate virtually any type of electrically-powered device (lights, sirens, horns etc).

The *Figure 14* circuit is that of a heat or light-activated monotone alarm-call generator. When activated, this circuit generates an alarm tone of about 800Hz at a power level of several watts in an 8R0 speaker via buffer transistor Tr2. Note that the consequent high output currents of the speaker may apply significant ripple voltage to the power supply line, and that D1 and C3 are used to protect the electronic circuitry from the effects of this ripple. D2 and D3 are used to clamp the inductive switching spikes of the speaker and thus protect Tr2 against damage.

Figure 15 shows the alternative sensor circuitry that can be used to automatically activate either of the *Figure 13* or *Figure 14* circuits. If light-sensitive activation is required, the sensor must be a cadmium sulphide photocell. If the circuit is required to activate when the light level falls to a preset value ('dark' activation), the circuit of *Figure 15a* must be used; if the circuit is required to activate when the light intensity rises to a preset value ('light' activation), use the circuit of *Figure 15b*.

If temperature-sensitive activation is wanted, a negative temperature coefficient thermistor must be used as the sensor element. For under-temperature operation, use the circuit of *Figure 15c;* for over-temperature operation, use the *Figure 15d* circuit. Whatever type of operation is required (optical or thermal), the sensing element must have a resistance in the range 470R to 10k at the desired 'trigger' level.

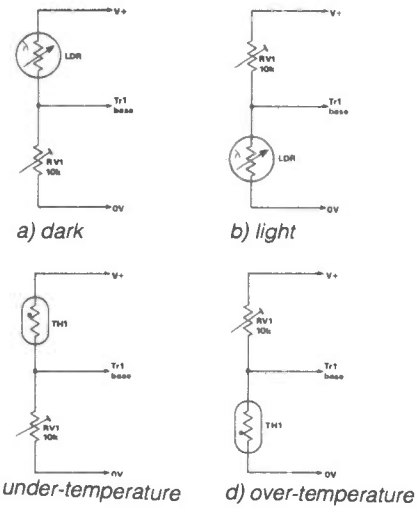

Fig 15 *Alternative sensor circuits*

Long-period timers

In an earlier part of this '555 applications' mini-series it was shown that a single 555 IC can be used to make an excellent manually-triggered relay-driving 'timer' when connected in the monostable or pulse-generator mode. In practice, however, such circuits cannot be used to generate accurate timing periods in excess of a few minutes, since they would require the use of large values of electrolytic timing capacitor: conventional electrolytic capacitors have very wide tolerance values (typically −50% to +100%), and suffer from large and unpredictable leakage currents, and hence cannot be used to generate accurate timing periods.

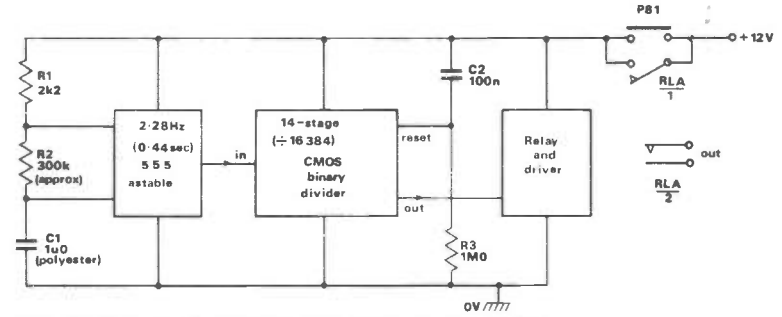

Fig 16 *Method of obtaining a 60 minute timing period*

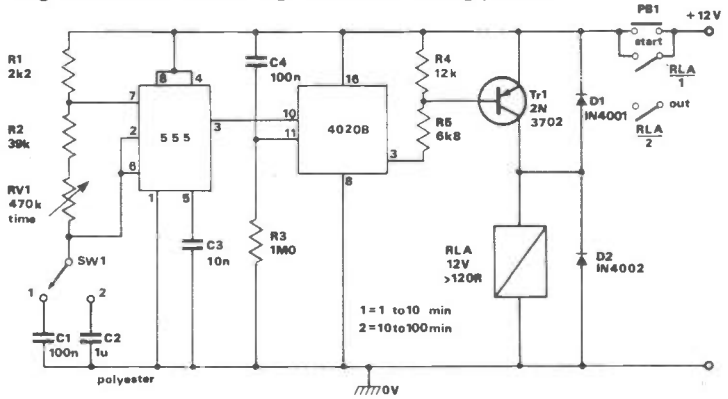

Fig 17 *Two-range (1-10 and 10-100 minute) relay-output timer*

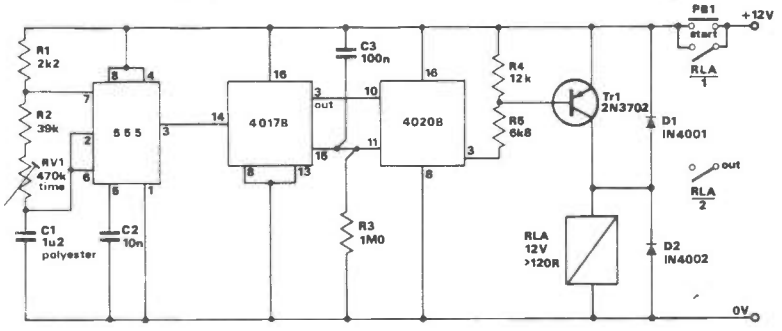

Fig 18 *Extra long period (100 minutes - 20 hours) relay-output timer*

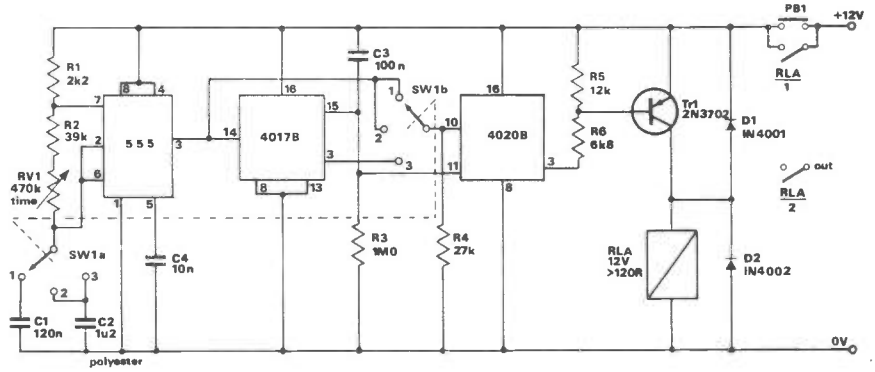

Fig 19 *Wide-range timer covering 1 minute to 20 hours*

Thus when very long timing periods are required from the 555 IC, the device must be used with a non-electrolytic timing capacitor. *Figure 16* shows, in block diagram form, how this can be achieved, to make a 60 minute relay-driving timer. In this case the 555 is wired in the astable mode, and has its output connected to the relay driver via a 14-stage binary divider IC which gives an overall division ratio of 16,384.

The action of this IC is such that if its output is set to zero at the start of an input count, the output will switch high on the arrival of the 8192nd input pulse and will remain high until the arrival of the 16,382nd pulse, at which point the output will switch low again, completing the operating sequence. Consequently, the *Figure 16* circuit operates as follows.

The timing sequence is initiated by briefly closing push-button switch PB1: this action connects the supply to the circuit and simultaneously activates the astable and sets the counter to 'zero count' (via C2-R3), thereby driving the counter output low and turning the relay on. As the relay turns on contacts RLA/1 close and bypass PB1, maintaining the supply connection once PB1 is released. This state is maintained until the 8192nd astable pulse arrives at the input of the counter, at which point the counter output switches high and turns the relay off. As the relay turns off, contacts RLA/1 open, thereby disconnecting the supply from the circuit and completing the operating cycle.

Note in this circuit that the astable is required to operate with a cycling period that is $\frac{1}{8192}$nd of that of the required 'timing' period, ie, 0.44 seconds in this particular case, and that this can be achieved by using a 1μ0 polyester timing capacitor in conjunction with a timing resistor of about 300k.

Practical timer

Figure 17 shows how the above technique can be used to make a practical relay-output timer circuit which spans the range 1 minute to 100 minutes in two overlapping decade ranges. This circuit is powered from a 12 volt supply, and the relay can be any type that has two or more sets of change-over contacts and which has a coil resistance of 120R or greater.

Figure 18 shows how the available time delay of the above circuit can be further increased by simply connecting an additional divider stage between the 555 astable output and the input of the relay-driving output stage. In this particular case a 'divide-by-ten' 4017B CMOS IC is connected between the output of the 555 and the input of the 4020B to give an effective overall division ratio of 81,920, thus making delays in the range 100 minutes to 20 hours available from this single-range timer. Note that both of the divider ICs are automatically reset (via C3-R3) at the moment of switch-on (PB1 closure).

Finally, to complete this edition of *Data File*, *Figure 19* shows how the above circuit can be modified to make a wide range general purpose timer that spans 1 minute to 20 hours in three decade-related ranges. Note here that the 'divide-by-ten' stage is switched into action on the very long period '3' range only.

Next month

In next month's edition of *Data File* we will conclude this 555-applications mini-series by looking at a miscellaneous collection of astable and monostable circuits, and by giving a brief introduction to the '7555' CMOS version of the device.

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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 Uniselector with circuit for electric jigsaw puzzle
57 – 5 Dolls' House switches
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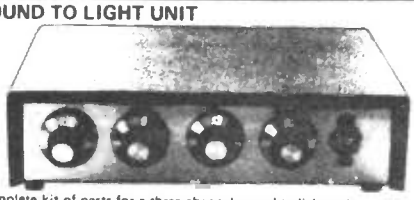
Ex-G.P.O. socket	£1.00

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 ¼" 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.

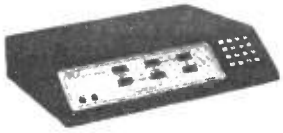
CAR STARTER/CHARGER KIT Flat Battery! Don't worry you will start your car in a few minutes with this unit – 250 watt transformer 20 amp rectifiers, case and all parts with data £16.50 or without case £15.00. post paid.

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 – 30 c – 13 amp 250v contacts. Price £4.60. – 10 for £40.

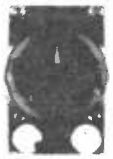
BLEEPERS 6 or 12v battery or transformer operated, ideal for using in alarm circuits but particularly suitable for can and motor cycle alarms. These give a loud shrill note. Price 69p. 1000 for £345. Jap made.

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 £9.50 – 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 componants.
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 7½" long, 3½" 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:
1 Framco motor with gear box
1 manual reversing & on/off switch
1 push to start switch
2 limit stop switches
1 circuit diag. of connections
£19.50 plus postage £2.50

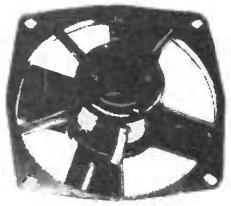
J. BULL (Electrical) Ltd.
(Dept. RE), 34 · 36 AMERICA LANE,
HAYWARDS HEATH, SUSSEX RH16 3QU. Established 30 YEARS

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.

Ex-Electricity Board. Guaranteed 12 months.

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/offs 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" Plannair extractor
£6.50. Post £1.25.
4"x4" Muffin 115v.
£4.50. 230v
£5.75. 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 3½" long by 3" dia. They have a good length of ¼" spindle – **Price £3.45.**
Ditto, but double ended £4.25.

MAINS MOTORS
We have very large stocks of motors from 2 watts to ¼ 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

R 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
3 – 30v Variable Power Supply	£13.80
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 squark	£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

COMPUTER WAREHOUSE

1000's OF BARGAINS FOR CALLERS

THE 'ALADDIN'S' CAVE OF COMPUTER AND ELECTRONIC EQUIPMENT

RECHARGEABLE BATTERIES

Dry Fit Maintenance FREE by Sonnenschein.
A300 07191315 12v 3 AH same as **RS 591-770 NEW £13.95**. **A300 07191202** 6-0-6 1.8 AH same as **RS 591-382 EX EQUIP £4.99**. Miniature PCB mount 3.6v 100 Mah as **RS 591-477 NEW £1.00**. **SAFT VR2C** 1.2v "C" size **NICADS** in 18 cell ex equipment pack. Good condition – easily split to single cells **£10.50** + pp £1.90

HOT LINE DATA BASE

DISTEL©

THE **ORIGINAL FREE OF CHARGE** dial up data base 1000's of stock items and one off bargains.
ON LINE NOW – 300 baud, full duplex CCITT tones, 8 bit word, no parity

01-679 1888

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.

EX-STOCK INTEGRATED CIRCUITS

2732 ex equip **£3.25**. **27128** – 250ns **NEW £12.00**. **6116**-200 **£4.50**, **6116**-250 **£3.95**, **6264LP**-150 **£22.00**, 4164-200 **£3.50**, 4864-150 **£4.00**, 4116-300, **£1.20**, 2114 **£1.75**, 6800 **£2.50**, 6821 **£1.00**, 68A09 **£8.00**, 68B09 **£10.00**, 68B09E **£14.50**, D8085AH-2 **£12.00**, 08086 **£20.00**, Z80A **£2.99**.

MAINS FILTERS

Cure those unnerving hang ups and data glitches caused by mains interference

5D5A As recommended by **ZX81** news letter matchbox size up to 1000 watt load **£5.95**

L2127 compact completely cased unit with 3 pin fitted socket. Up to 750 watts **£9.99**

COOLING FANS

Keep your hot parts COOL and RELIABLE with our range of **BRAND NEW** professional cooling fans.
ETRI 99XU01 Dim. 92 x 92 x 25 mm. Miniature 240 v equipment fan complete with finger guard. **£9.95**.
GOULD JB-3AR Dim. 3" x 3" x 2.5" compact very quiet running 240 v operation. **NEW £8.95**
BUHLER 69.11.22. 8-16 v DC micro miniature reversible fan. Uses a brushless servo motor for extremely high air flow, almost silent running and guaranteed 10,000 hr life. Measures only 62 x 62 x 22 mm. Current cost £32.00. **OUR PRICE ONLY £12.95 complete with data.**
MUFFIN-CENTAUR standard 4" x 4" x 1.25" fan supplied tested EX EQUIPMENT 240 v at £6.25 or 110 v at £4.95 or BRAND NEW 240 v at £10.50. 1000's of other fans Ex Stock. Call for Details. Post & Packing on all fans £1.60

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.

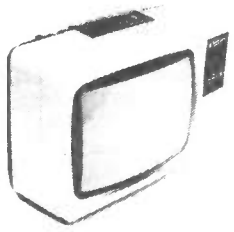
1000's SOLD TO DATE

12" KGM 320-321, high bandwidth input, will display up to 132 columns x 25 lines. Housed in attractive fully enclosed brushed alloy case. **B/W only *£32.95***

24" KGM large screen black & white monitor fully enclosed in light alloy case. Ideal schools, shops, clubs etc. ***ONLY £55.00*** Carriage £10.00

A Major company's over production problems, and a special **BULK PURCHASE** enable **TWO** outstanding offers.

COLOUR MONITOR SPECIALS

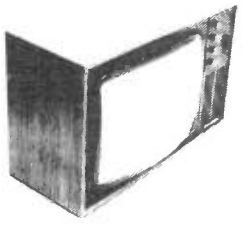


'SYSTEM ALPHA' 14" Multi Input Monitor.

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.



DECCA RGB 80-100 Monitor.

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 directo 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

DATA MODEMS

Join the communications revolution with our super range of **DATA MODEMS** with prices and types to suit all applications and budgets!!
Most modems are **EX BRITISH TELECOM** and are made to the highest standard for continuous use and reliability RS232 interfaces are standard to all our modems, so will connect to ANY micro etc. with an RS232 serial interface.

DATEL 2B see **SPECIAL OFFER** centre of this ad.
MODEM 13A, 300 baud. Compact unit only 2" high and same size as telephone base. Standard CCITT tones, CALL mode only. Tested with data. ***ONLY £45.00 + PP £0.50.***
MODEM 20-1, 75-1200 baud. Compact unit for use as subscriber end to PRESTEL, MICRONET or TELECOM GOLD. Tested with data. ***£39.95 + PP £6.50.***
MODEM 20-2, same as 20-1 but 1200-75 baud ***£99.00.***
TRANSDATA 307A, 300 baud acoustic coupler. Brand new with RS232 interface. **ONLY £49.95**
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.
Auto answer via MODEM or CPU. CALL or ANSWER modes plus LED status indication. Dim 2.5" x 8.5" x 9". **BRAND NEW fully guaranteed *ONLY £268.00 + PP £4.50.***
DATEL 2412 Made by SE LABS for BT this two part unit is for synchronous data links at 1200 or 2400 baud using 2780/3780 protocol. Many features include Auto answer, 2 or 4 wire working etc. etc. **COST OVER £800. *OUR PRICE £185.00.***
DATEL 4800, RACAL MPS4800 high speed good condition ***£285.00 CARR £10.00***

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

NOW ONLY £29.95

- CALL, ANSWER and AUTO modes
- Standard RS232 serial interface
- Built in test switching
- 240v Mains operation
- 1 year full guarantee
- Just 2 wires to comms. line

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.

ONLY £199

Options. Interface cable (specify) for BBC, ORIC, DRAGON or CENTRONICS 36 way plg £12.50. Spare ribbon £3.50 each. BBC graphics screen dump utility program £8.50. 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. **£2500.00.**

ADD VAT TO ALL PRICES

EX STOCK

DEC CORNER

PDP 11 4D System comprising of CPU, 124K memory + MMU 16 line RS232 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 RS232 DMA interface	£2100.00
DLV11-J 4 x EIA interface	£310.00
DLVII-E Serial. Modem support	£200.00
DUP11 Sych. Serial data i/o	£650.00
DQ200 Dilog – multi RK controller	***£495.00***
DZ11-B 8 line RS232 mux board	£650.00
KDF11-B M8189 PDP 1123+	£1100.00
LA36 Decwriter EIA or 20 ma loop	£270.00
LAX34-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 (Equiv 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
RKD5-J 2.5 Mb disk drives	£650.00
KL8JA PDP 8 async i/o	£175.00
MI8E PDP 8 Bootstrap option	£75.00
VT50 VDU and Keyboard – current loop	£175.00
VT52 VDU with RS232 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

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SUPER DEAL? NO — SUPER STEAL!!

The FABULOUS 25CPS TEC Starwriter

BRAND NEW AT ONLY £499 + VAT

Made to the very highest spec the **TEC Starwriter FP1500-25** features a heavy duty die cast chassis and DIABLO type print mechanism giving superb registration and print quality. Microprocessor electronics offer full DIABLO/QUME command compatability and full control via CPM Wordstar etc. Many other features include bi directional printing, switchable 10 or 12 pitch, full width 381 mm paper handling with upto 163 characters per line, friction feed rollers for single sheet or continuous paper, internal buffer, standard RS232 serial interface with handshake. Supplied absolutly **BRAND NEW** with 90 day guarantee and **FREE** daisy wheel and dust cover. Order **NOW** or contact sales office for more information. Optional extras: RS232 data cable **£10.00**. Tech manual **£7.50**. Tractor feed **£140.00**. Spare daisy wheel **£3.00**. Carriage & Ins. (UK Mainland) **£10.00**.

PROFESSIONAL KEYBOARD OFFER

An advantageous purchase of brand new surplus allows a great **QWERTY**, full travel, chassis keyboard offer at fractions of their original costs.

ALPHAMERIC 7204/60 full **ASCII** 60 key, upper, lower + control key, parallel TTL output plus strobe. Dim 12" x 6" +5 & –12 DC. ***£39.50.***

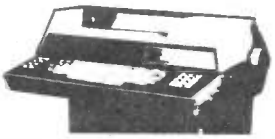
DEC LA34 Uncoded keyboard with 67 quality, **GOLD**, normally open switches on standard X, Y matrix. Complete with 3 LED indicators & i/o cable – ideal micro conversions etc. pcb DIM 15" x 4.5" ***£24.95*** Carriage on keyboards £3.00.

66% DISCOUNT ELECTRONIC COMPONENTS EQUIPMENT

Due to our massive bulk purchasing programme which enables us to bring you the best possible bargains, we have thousands of I.C.'s, Transistors, Relays, Cap.s, P.C.B.'s, Sub-assemblies, Switches, etc. etc. surplus to our requirements. Because we don't have sufficient stocks of any one item to include in our ads. we are packing all these items into the *"BARGAIN PARCEL OF A LIFETIME"*. Thousands of components at giveaway prices! Guaranteed to be worth at least *3 times* what you pay. Unbeatable value!! Sold by weight.

2.5kls *£4.25* + pp £1.25 **5kls *£5.90*** + £1.80
10kls *£10.25* + pp £2.25 **20 kls *£17.50*** + £4.75

GE MODEL 30



A large purchase of these stand alone terminal units offers an EXTREMELY LOW PRICE for a professional printer for direct connection to your micro. The printer has a standard RS232 serial interface with switchable rates of 110, 200 and 300 baud. Upper and lower case characters are printed by a matrix head with character widths up to 132 columns. Unit accepts standard fan fold sprocket fed paper from 4" to 9.5". Many other features such as numeric keypad, electronic keyboard, auto motor on/off and FREE floor stand. Supplied in good S/H working condition – complete with manual ***ONLY £95.00***
CARRIAGE & INS. £10.00

EXTEL PRINTERS

EX NEWS SERVICE compact, quality built 50 column matrix printer, type AE11. Unit operates on 5 BIT BAUDOT code from current loop, RS232 or TTL serial interfaces. May be connected direct to micro, or comms receiver via simple filter network to enable printing of most world wide NEWS, TELEX and RTTY services. Supplied in tested second hand condition with 50 and 75 baud xtals, data sheet and large paper roll. ***ONLY £49.95.***
Dimensions 15" D x 5" H x 10" W
CARR £6.00 Spare paper rolls £4.50 each

GE TERMIPRINTER

A massive purchase of these desk top printer-terminals enables us to offer you these quality 30 cps printers at a **SUPER LOW PRICE** against their original cost of over £1000. Unit comprises of full QWERTY, electronic keyboard and pnnter mech with print face similar to correspondence quality typewriter. Variable forms tractor unit enables full width – up to 13.5" 120 column paper, upper – lower case, standard RS232 serial interface, internal vertical and horizontal tab settings, standard ribbon adjustable baud rates, quiet operation plus many other features. Supplied complete with manual. Guaranteed working ***£130.00*** or untested ***£85.00***, optional floor stand £12.50 Carr & Ins £10.00.

TELETYPE ASR33, I/O TERMINALS

FROM £195 + CAR. + VAT

Fully fledged industry standard ASR33 data terminal. Many features including ASCII keyboard and printer for data I/O auto data detect circuitry. RS232 serial interface. 110 baud, 8 bit paper tape punch and reader for off line data preparation and ridiculously cheap and reliable data storage. Supplied in good condition and in working order
Options: Floor stand ***£12.50*** + VAT
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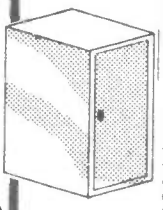

LARGE 19" equipment cabinet. Totally enclosed with locking front and rear doors. An internal sub fram 63" high is pre drilled for standard 19" equipment etc. Other features include internal 12" cooling fan, two-tone blue and grey finish with alloy trims. Mounted on 4 heavy duty castors, mains panel etc. And at a current cost from **IMHOFS** of over **£500** A snip at **ONLY £125**. Supplied in **NEW** or little used condition. Carriage £22.00. Ext. Dim 72.5"h x 23.5"w x 26"d

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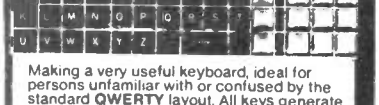

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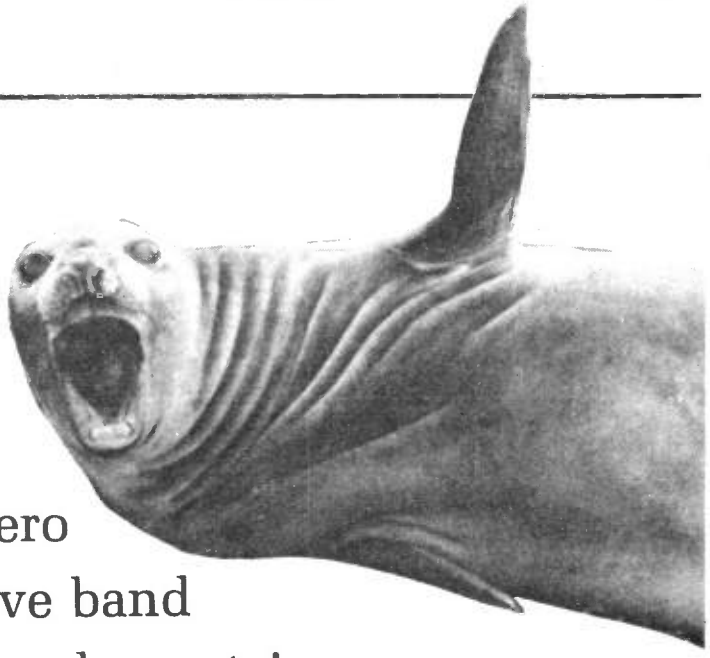
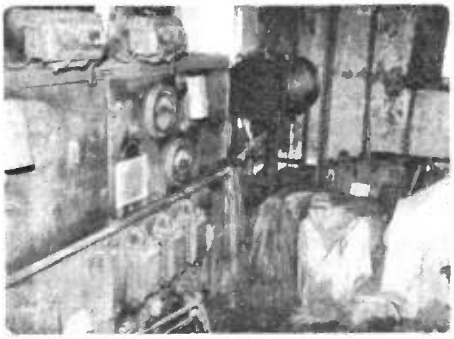
HEARD ISLAND



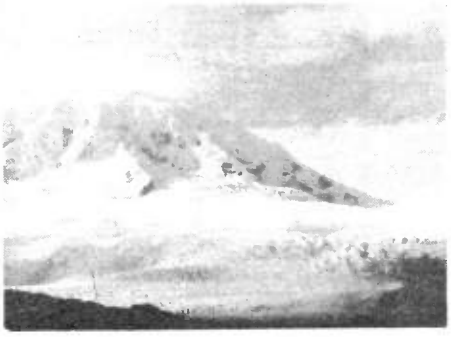
PART TWO: In which our hero Jim Smith P29JS and his brave band do battle with fate and the elements!

As the *Cheynes II* made her way south-west the weather got colder and rougher, the 'roaring forties' living up to their reputation. The vessel was a good sea boat and by this time we were all hardy seamen anyway. The exception was Bob Walsh, who was determined to be seasick all the way to Heard and back. He had a terrible time and seasickness is a very unhappy situation. The *Cheynes II* was built for these sort of seas and with just the right length the bows never went under and the propeller never came out of the water.

First impressions



The old ANARE station



One day the sun shone . . . Big Ben

Water, water everywhere . . .

Three days out of Kerguelen the skipper informed me that the vessel was short of water; in fact there were only four more days steaming in the ship. A detour would have to be made to Kerguelen to take on water. We would use valuable fuel to make this detour, but the ship could not do without water.

The stay on Kerguelen was very pleasant and for our part it was nice to get on dry land and walk around again. The French made us very welcome and we all had a very pleasant meal and a great time. Kerguelen treated us to another episode as the *Cheynes II* dragged anchor and went aground – fortunately it was only temporary. Then, with water aboard, the *Cheynes II* was on her way again with Heard Island only a day and a half away.

Heard but not seen

Heard Island was on the ship's radar for hours before we were finally standing off the island waiting for dawn and our landing in the Atlas Cove area. Several meetings and discussions had been held about this moment. Everyone was well briefed in what he had to do. First priority would be to get all equipment ashore and get ourselves secure for the night, and if possible get one amateur radio station on the air.

Dawn finally came and after a 4am breakfast a start was made to getting ashore. The dawn was misty but the sea calm as we made our way into Atlas Cove and dropped anchor. A great deal of unwrapping of dinghies and opening of the hold etc kept us all busy. By 7am our first dinghy was in the water and the other followed soon after. However, the first boat was in trouble – the outboard engine would not start! To avoid wasting time it was towed behind the other and a fair amount of gear was transferred to shore in this manner.

Heard Island looked bleak, felt cold and very damp, and generally lived up to its reputation. The organisation and planning paid off and by noon all were ashore with most of the equipment, and there were no further problems. The weather remained calm and the sea in a moderate condition.

The mountaineers were very helpful and with their muscle and stamina they contributed a great deal to getting all those heavy items up from the hold. With all ashore at Heard Island the mountaineers went back to the *Cheynes II* and a decision was made to drop them off at Mechanics Bay, a spot up the coast which would knock two days off their route to the top of Big Ben from the Atlas Cove area. This decision was meant to be helpful and was taken by the skipper, but it went against my basic principle of all being in the relative safety of the Atlas Cove area. We were to pay for this later, on departure from Heard Island under severe weather conditions.

The rest of the afternoon was spent shuttling everything from the beach up to the various locations. There are some metal buildings on Heard built during a joint expedition in 1970. Two were shared

Home, sweet home!

Amateur radio station

The power house

between the scientists and film crew and the other, about 400 metres away, was used by the amateurs. These buildings are very bleak – really only metal shells – but they did afford some protection from the biting wind and the cold rain and drizzle. Our building had no door, the hinges having long since rusted through.

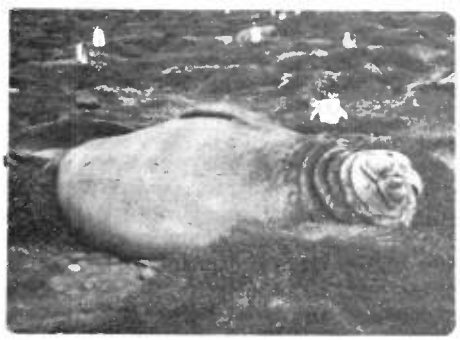
So it was in these conditions that we had to get organised and try to get as comfortable as possible. All attempts were made to get a station on the air and we were reasonably successful in that first night. In the process we lost the 'Minooka' special antenna, which collapsed in wet and windy conditions before it was fully assembled. An 18AVQ was finally erected and the first VK0JS station was on the air.

Holding up the antennae was a problem as the top soil was not at all what we thought and was only an inch or so of top sand with hard rock underneath. Large areas of Azerelia clumps were used, and by double or triple staking all antennae remained in position despite the stormy conditions.

Band conditions were terrible and it was with great effort that the score of radio contacts gradually crept upwards. Any band open was always used but it was not very often that we managed to get two or more stations on the air – it was very frustrating.

A total of 150 contacts on 10 metres is an example of propagation from Heard Island. However, some 14,000 contacts with 138 countries was the final score, a lot less than expected but nothing could be done about that. Several notable firsts were made: first YL operation (Kirsti VK0NL), first RTTY, first slow-scan, first satellite QSO, etc. We were also on six metres, but nothing to report here.

Daily skeds with the mountaineers kept us informed of their progress and gradually the scientists got through their work programme. The weather remained fairly warm and reasonably pleasant, but the operating was not the easiest: it seemed impossible to keep warm, as the nights were very long and cold. A real challenge to be sure.



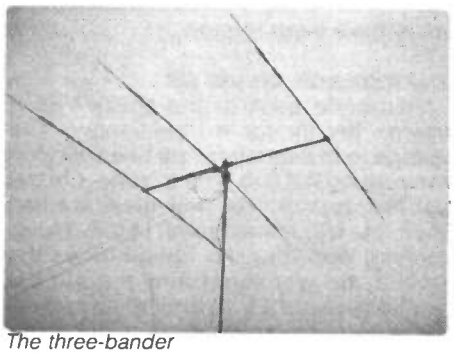
Cheshire cat impression from a local

Endless CQs

I think it is fair to say that we were easy to work, or perhaps more correctly we were always there for you to try, using the same frequencies each time. Endless CQs ensured that we opened the bands and we didn't leave them until they were closed. The pile-ups were very big with a lot of QRM on our channel: you know, the usual 'policeman', what is your call etc. This seems to be normal these days and a great pity, especially under the sort of conditions we had.

Up to the last couple of days the weather had been reasonably kind, but Heard Island decided to remind us all that its reputation was for real. The mountaineers got within six hours of the top of Big Ben. They sat in soaking clothes and wet tents waiting for the cold freeze that would allow them to reach the top. The days ran down towards departure, although it was always part of the agreement that we could stay a couple of days longer (subject to paying, of course). However, the attempt was finally beaten by the weather.

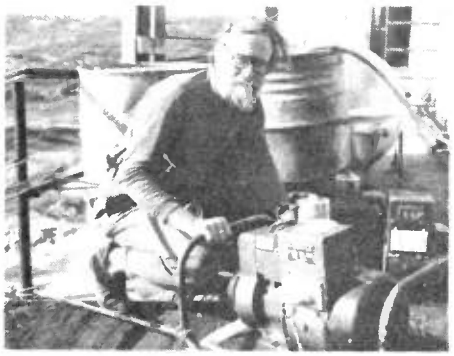
Gradually, unwanted items were carried down to the beach and stockpiled for our departure time, anything to take some of the strain away from the reloading of everything onto the *Cheynes II*. The barometer headed down to 950mB in a very short time and then Heard Island was hit by a major storm. There was no question of getting on board the vessel, as in fact she was also in some trouble and getting up steam to keep under way for the storm.



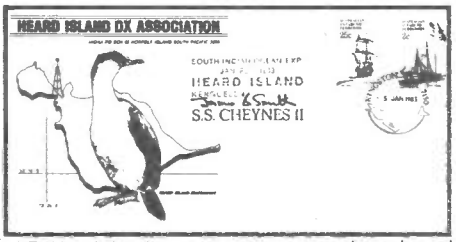
The three-bander

A kitchen, believe it or not

Coffee break



Emergency power for the freezer



HIDXA philateic covers were produced and made available at A$5 each to help recover some of the expense of the expedition

Saxon Onward arrives to help

Stores had to be moved back from the water's edge as the severe gale force winds were driving the sea up the beach of Atlas Cove way over the normal water line. Kirsti was blown off her feet and I started to chase a bag of gear careering across the sand. The black volcanic sand was being driven everywhere and was very painful as it stung every exposed part of the body. Finally everything was moved back and as things happened we had one more night on the island – but it could have been longer.

Last moments on the air

Meanwhile back in the shack VK0JS was on the air for a little longer. The change in the weather had been sudden and violent. We had time to reflect in the last few days on just how lucky we had been as we investigated Atlas Cove. Looking over the old buildings of the ANARE, we wondered how the old expeditioneers of '47, '48 and '50 had fared.

We had gone on little field trips ourselves when the bands were quiet, looking over the old sealing areas used before the days of ANARE, and realised that their days must have been incredibly harsh. Yet Heard Island is unique, Big Ben dominating Atlas Cove and like Mount Fuji always presenting a different face when the cloud cover allows a glimpse – those early morning sights of the mountain, enormous and beautiful!

Next morning with the storm abated somewhat a start was made to getting back on the *Cheynes II*. Most of the morning was spent dismantling antennae and so on, all helping get things down to the beach and gradually on board ship. This journey back to the ship was one of the scariest times as the swell was enormous.

Once back on *Cheynes II* the trip seemed virtually over, but you may remember that our mountaineers were still in the Mechanics Bay area and they had to be collected before we left. As we rounded the point with our dinghy in tow, the line broke, the boat was swamped, and it headed for the bottom of the ocean. All attempts to retrieve it failed and help from another ship was required to get our mountaineers off the island.

The *Cheynes II* was short of fuel and water. Arrangements had been made with the owner to rendezvous and take on fuel and water about 600 miles south of Albany. After two days of steaming the skipper shut down the engine and we started to sail. I use the word lightly, but that is exactly how we travelled 855 nautical miles in 368 hours and at an average speed of about 2.32 knots. It was frustration at its worst, since it was impossible to tell whether we were moving or not.

A hitch-hiker

Only after a period of a few hours and a check of our position with the satellite navigator could we tell if we had moved and in what direction. There was little or no wake, and even an albatross gave up and waited in the water until we drifted past before taking off again to land ahead of us, and repeat the process. At one point we were going so slowly that a penguin walked aboard. Our penguin experts did some studies, weighed it, and then sent it back on its way.

The most frightening experience for me was to be woken at about 3am with the *Cheynes II* 'gybing'. That is to say that since the vessel was fixed-rigged a sudden change in the wind direction meant that the vessel had to follow (a yacht gets round this by swinging the boom). So the boat became its own boom and turned in its own length at a very alarming angle. I was convinced that this was it and that we were heading for the bottom of the ocean.

This early awakening remains vivid in my mind and I don't think I would like the moment repeated.

Up periscope!

Finally we got up steam again to meet our projected rendezvous and it was good to be moving. The Southern Ocean is not the place to be on a dead ship and I suppose we were lucky that we did not have a major storm. The *Cheynes II* is a terrific sea boat as I have said, very safe and low in the water (built in 1947 for a Norwegian whaling company), but sometimes we thought we were on a submarine.

The rendezvous was a tremendous let down with the owner coming with a tow line instead of fuel and water. So it was back to slow plodding hours as we made our way towards Albany. The weather got warmer and spirits began to soar and we were all looking forward to getting back. The journey back finally took 27 days and was a real marathon.

Then it was back in Albany with a great deal of work to be done unloading and arranging for all our borrowed items to be returned. Since we had started at Hobart it meant a lot of extra expense to get items shipped across Australia to their eventual destination. Once again the mountaineers came to my rescue and I am grateful to Bruno, Leopold, Walter and Werner for their assistance in clearing the *Cheynes II*. It was a gruelling couple of days and finally Kirsti and I split resources and she returned to Hobart to tidy up there. I returned to Norfolk Island and the mountain of mail and not a few problems after being away for almost four months.

And finally

For myself I would like to thank those who helped and waited. It was a long wait but then Heard Island is not the easiest of places to get to. Financial considerations have always been the problem and it was not until we secured the means of transport that we could really feel that we were on our way. Once there it was certainly worth it!

HIDXA ACHIEVEMENTS

(a) The association replaced the automatic weather station for the Antarctic Division and returned the old unit for inspection and evaluation.
(b) The automatic weather station used by the Glaciology Section, Antarctic Division was recovered and returned to Australia.
(c) Weather observations every four hours each day for the Department of Meteorology, Melbourne were transmitted to the Australian mainland.
(d) Took bird sightings each hour of daylight and logged types and numbers etc.
(e) Air samples were taken for CSIRO Canberra etc.

ATV ON THE AIR

Presented by Andy Emmerson G8PTH

Another three months past and loads of letters, for which I thank you. No major openings though (as far as I'm aware), so it's all down to the normal type of ATV activity, ie patient experimentation and local contacts – and what's wrong with that?! Anyway, down to business: let's pull some letters out of the file, starting with 70 centimetres.

Les Gibson G3RCX, who hails from Thorpe Bay, near Southend in Essex, writes that he is at last on the air. Video QSOs include Robin G4DVJ, Jim G6CVB and others. Les has a Microwave Modules transmitter and wants to get up to 50 or 100 watts. What, he asks, is the best compromise between watts out and power supply amps in? Would a 100W solid state PA offer much advantage over a 50W one? My answer to question one is £££ and to question two a resounding *no*– the extra power will barely add one P point to your report!

Experience sadly relates that solid state PAs are a disappointment for many people: they tend to require expensive power supplies, and then their owners do not monitor the output signal with a 'scope. The net result is a signal composed of all video and no syncs. Furthermore these PAs are not linear when run flat out, so you *must* reckon on derating them by at least a third to pass video linearly.

The best bet by far is to look for a secondhand EDL-432P (£50-75) or some similar device using a 2C39 valve: this will be guaranteed linear and will pass a full bandwidth TV signal. With a nice built-in high voltage power supply, it won't require a second mortgage for a 20 amp 12V PSU, either.

An eyewig writes

Monday night is ATV night in the Edinburgh and Fife area, writes Alastair Downs GM6NEI. He says that he has a half watt/half not transmitter – sounds fun! Moving down to Bristol, ATV is on the list of sideshows for the celebrations marking the 150th anniversary of the founding of God's Wonderful Railway. By the time you read this GB2GWR should have transmitted colour pix from Temple Meads station, helped by Matthew G6OCV, Phil G6SPA and Peter G8WAX.

'I am Mervyn the eyewig', writes the now licensed G1MDD from Upton Bishop near Ross-on-Wye. Mervyn visited Dave ZL1LH in New Zealand and came away with a set of PCBs for SSTV as well as seeing his collection of old radios and gramaphones. Back home Mervyn has devised an interesting gadget in his shack. This uses a convex shop security mirror, about two feet in diameter, placed at one end of the shack. He is able to point the camera at it and with the aid of zoom give an excellent view of the proceedings, without a wide angle lens and with everything in focus.

From Albany, Auckland M J Sheffield ZL1ABS writes of his first two-way contact with Wayne ZL1TVW. He also operated in the NX VHF-UHF contest with Ian ZL1TOQ under the call ZL1TVW: in this contest there is a 100km minimum contact rule, which made things more difficult and restricted them to one hookup. MJ hopes to recruit more members to ATV – well done!

Jeff G8PX writes again from Oxford and informs us that G3UMF, G8PQG and he are on the air with TV most weekends. G6AQC is QRT pending aerial repairs and G0AFY, G1AAU and G6YTW have receive converters. G8SIN is also assembling a station, so there is enough activity for a local ATV group thinks Jeff.

Continental DX via GB3VR

On the next band up activity through GB3TV is on the increase, and Dave G4FRE claims to have heard 'that 23cm thing from Dunstable' at Felixstowe. Indeed, rumour has it that both TV and VR were visible simultaneously one night in London, so perhaps there was a lift after all.

Mentioning GB3VR reminds me that Roy G4WTV claims the first foreign TV contact through a repeater. No prizes for guessing the repeater, nor for that matter the call of the contact (yes, F1EDM...). Date not recorded but early 1985.

On 2 March Nick G4WHO (Wimborne) had a full duplex vision QSO with Garry G4CRJ (High Wycombe). Nick sent 10 watts of 70cm vision to an 18 element Parabeam plus 50mW audio on SU8 into a Slim Jim. Garry had just half a watt of sound and vision on 23cm, but this was sufficient for P4 pictures (perhaps there was a lift then). Nick has a good location and finds he can regularly work Garry on 24cm: he can also see Mike G8LES from his new Hampshire eyrie under flat conditions, a distance of 60 miles.

In Bristol Shaun G8VPG has been

An informative caption from PE1AGA. Why not send your photos?

John 'QRO' G8MNY from South London. Photos by Ryn Muntjewerff

working Chris 'Ancient Modulation' G8GLQ over a 13km obstructed path: Chris was slope detecting. GB3UT is in this part of the world and I am informed that the aerials, receiver and video processing are now complete and the rest is progressing nicely.

In Kent several of the east Kent gang have built GaAsFET preamps and seem well satisfied. Ron G6GHP finds the performance of the BATC FM demodulator can be improved with a preamp. He uses the 26dB gain two-stage tunable one published in Roger Bunney's DX-TV paperback (G3YQC has found that the Wood & Douglas IF board also benefits from an IF preamp).

Latest Kent viewer is Roy G6OKB at Minster-in-Thanet, reports Ron. Ron has also had a P3 report from John G3OGX over the water in Essex: he was able to give John a P2 for his 100mW! Current roster down there is G4AYT (200mW, 1250MHz), G6XYY (1.25W, 1255MHz), G6GHP (6W, 1245MHz) all FM into 20-turn helical antennas.

Duplex in the West Midlands

In Atherstone (Warwickshire) John G6EHJ has a 500ft asl site from which he gets a P5 FM picture over the 20 miles to G3DFL. Transmitter is a Fortop (2 watts) and antenna is JVL ('very narrow beamwidth'). Geoff transmits back from Smethwick on 70cm, giving full duplex QSOs.

Some lonely lads in Norfolk are looking for 24cm TV contacts outside their locality: they are Laurence G6DPL and Malcolm G8ZLT, both in King's Lynn. In Oxford G8PX has built a 24cm TV transmitter and is currently browbeating Alan G3UMF to get on 24cm.

Final microwave letter is from Peter G3PYB in Thorner, Yorks. From his home about 4 miles south of Wetherby he has established a path to Peter G4RNA at Bradfield near Sheffield. The 50km path is not optical but even with modest antennas (15/15 J-Beam and narrowband Tonna) the pictures are promising. Radar is no problem says 'PYB, but 'RNA's 1200 elevated site (1200ft) does give him trouble at times. Power at the PYB end is 20W on 1280MHz with a W&D receive system and often a sub-1dB NF GaAsFET preamp. Intercarrier sound is planned as well as wide deviation audio on the vision frequency, when TV is not in use, for duplex working.

G4RNA has 40 to 50W output and plans to mount the PA at masthead, which should help. Aerials are long helical and a 4ft grid dish. They have both relayed from 24cm to 70cm, without too many problems. 'PYB has a high-ERP 10GHz Tx and a suitable Rx system (FM of course): he hopes to go out portable with a 4ft dish, assuming he can find some contacts, but there is considerable interest in 10GHz in Yorkshire and Lincolnshire.

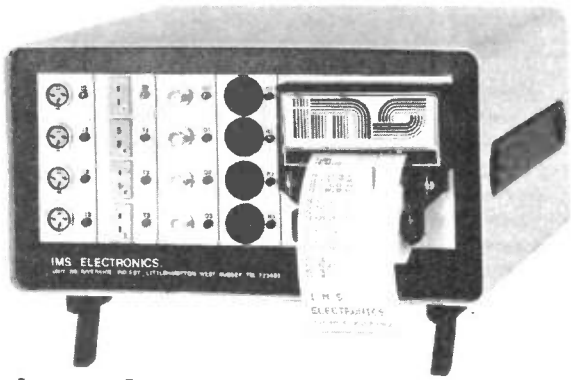
SSTV news – not much!

SSTV now. Chris Lewis G6ACL writes from Loughborough in Leicestershire that he has been experimenting with the Scarab Systems SSTV program for the Sinclair Spectrum. This, he finds, will resolve a 32 second frame. The program will scroll down the page and when full will start at the top again. When this occurs Chris stops the tape and prints the first screen, then runs the prerecorded tape and allows the program to fill another screen and output to the Spectrum printer.

Chris sent a print to prove it, though it is not really suitable for reproduction here. He says the program tracks the slower scan frequencies perfectly and recommends it highly. Chris also reminds us that 144.500 is the SSTV calling frequency and not the RTTY or ATV talkback channel, nor the Worked All England Squares Contest channel, nor 'See you one meg down [from S20]'.

The CM1600 Measurement and Control Interface

from IMS Electronics



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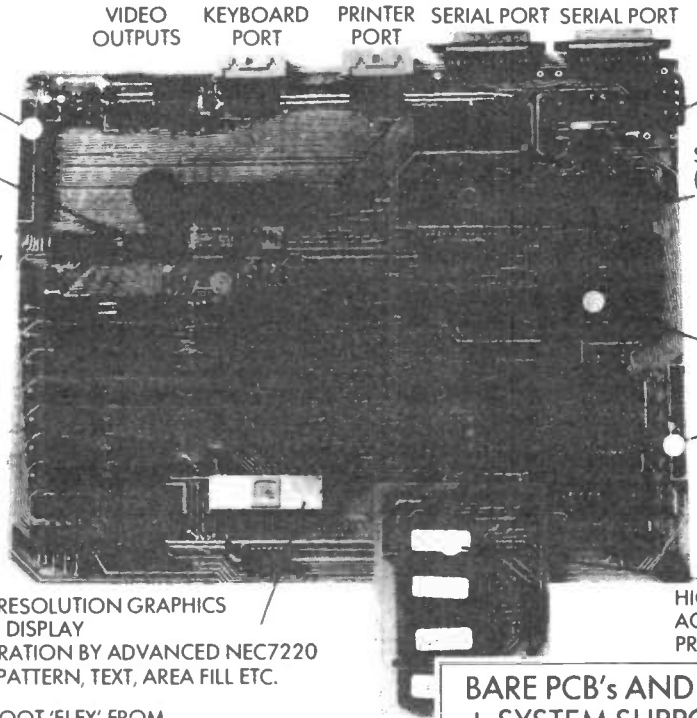

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MEDIUM WAVE DXING

by Steve Whitt

It is a sad fact that time is a limited commodity as far as the DXer is concerned – particularly for those who have to fit a full time job around their DX activities! There are a number of ways of using the available time to the best advantage which basically come down to knowing when to listen for a particular station or for a specific area of the world. To make this decision one needs to know station broadcasting hours, sunset and sunrise times at the distant station and seasonal time zone variations.

Firstly, as I have mentioned in this column before, the best source of information about broadcasting hours is probably the *World Radio TV Handbook*. As an example, it reveals that in order to DX the Caribbean one should listen before 0400hrs GMT since many stations in this region sign off around this time.

Secondly, it is essential for the MW-DXer to understand the significance of sunset and sunrise times in order to choose the best listening times. At night MW radio signals propagate over great distances via the 'skywave', which is a radio wave that has been reflected back to the earth from the ionosphere; during the hours of daylight the properties of the ionosphere change so that MW signals are absorbed rather than reflected. For skywave propagation to occur it is essential that the Great Circle path between transmitter and receiver is in darkness; it is for this reason that the DXer can often hear American stations after midnight GMT.

The table shows the sunset times for various locations across the Atlantic and these indicate the earliest time that stations in the target area are likely to be heard. Equally, DX is unlikely to be heard after sunrise at the receiver site, therefore the table also includes the sunrise time for London. Exact times are only given for the beginning of the month, but times for intermediate dates can be interpolated with reasonable accuracy.

Moving onto the last point, at the moment the whole of Europe is operating summer time, which is GMT+1 in Britain and Eire and GMT+2 on the Continent. The change back from summer time is not yet co-ordinated and Continental time reverts to GMT+1 on 29 September whilst Britain and Eire change back to GMT on 27 October. Since African countries do not operate summer time, there is a good DX window during the summer from about 2200hrs, when many European stations close down, until 2400hrs when many African stations sign off. In fact September is often very good for Afro-DX, and stations worth looking for include ORTS Dakar, Senegal on 765kHz, Ouagadougou, Burkina Faso (formerly Upper Volta) on 747kHz and RDN Conakry, Guinea on 1404kHz. Additionally the month of October is convenient for pre-dawn DX to the Americas since Continental stations will be signing on at about the same time as British stations, rather than an hour earlier as is normal.

Starting point

Whilst on the subject of timekeeping there are two related items that can be very useful to the DXer and are highly recommended for the novice.

Firstly, I would recommend that every MW-DXer keep some sort of logbook, preferably a book set aside specially for this purpose, in which all relevant information about stations can be noted as they are heard. One can then pick out the important information that needs to be included in a reception report to a station. Furthermore you now have a useful record of your DX activities that can be referred to at a later date.

Secondly, I would suggest that every DXer should have a cassette recorder permanently linked to their main receiver (remember it doesn't need to be hi-fi); a tape recording of a weak signal is invaluable when it comes to extracting station IDs and other information.

A further benefit is obtained by combining an electronic time-switch with the cassette recorder,thus allowing stations to be recorded at times that would normally be considered inconvenient for listening. Some time-switches are available with digital clock read-outs and facilities for several on/off times accurate to the nearest minute, and although these may cost in the region of £20 they soon become invaluable.

For the last few months I have included some listening tips for the newcomer to the MW band, which have mainly been European English language programmes. This month's listening tips bring the total to 22, but if you missed the previous issues of *Radio & Electronics World* there is no need to worry, since all the information (and much more) is available in a publication called *European English Language Broadcasts on MW,* which can be obtained from the Medium Wave Circle for 50p including postage. Send your money to Harold Emblem, 6 Pratt Lane, Mirfield, W Yorks WF14 9LX. Once again all times given are GMT/UTC and are valid till October.

792kHz VOA Kavalla, Greece 0400-0430
1233kHz Trans World R, Cyprus 2115-2130 (not easy)
1359kHz R Berlin Int, GDR 2115-2200

Sunset time at transmitter site	Time (GMT/UTC)		
	1 Sept	1 Oct	1 Nov
St Johns, Newfoundland	2210	2111	2016
Caracas, Venezuela	2237	2219	2205
New York, USA	2327	2231	2154
Quito, Ecuador	2317	2307	2301
Havana, Cuba	2347	2318	2253
Chicago, USA	0026	2332	2248
Seattle, USA	0250	0150	0055
Sunrise at London	0513	0600	0651

DX FILE

This month we start with a very interesting report submitted by A Walmsley of Blackpool, who has been using a Realistic DX400 receiver to good effect. With just a 7 metre loft aerial he logged the following stations at the end of May:

590 VOCM St Johns NF @ 0014
1010 WINS New York NY @ 0314
1050 CHUM Toronto ON @ 0240
1050 WHN New York NY @ 0115
1140 CBI Sydney NS @ 0309
1210 WCAU Philadelphia PA @ 0152
1320 CFGM Richmond Hill ON @ 0300
1390 WCSC Charleston SC @ 0203 (just 5kW)
1500 WTOP Washington DC @ 0325
1510 WMRE Boston MA @ 0110

In addition I have noticed that R Globo, Rio de Janeiro, Brazil (1220kHz) has been regular most nights during the summer from 2315hrs onwards. This station is very easy to recognise by its regular IDs and dramatic news at 2400hrs.

DX-TV

RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

The long-awaited 1985 sporadic-E season finally arrived bang on cue. The first opening occurred on May 1st with a typical May Day parade from Soviet TV on channel R1. Sporadic-E activity was in evidence practically every day through May with the 24th and 25th being, without doubt, the best days. Signals arrived from all over Europe. At times the whole of Band I was sheer chaos with every channel crammed with DX.

There were a few minor tropospheric lifts in Band III and on UHF during the month. The main countries to be received were Belgium, France and the Netherlands. As far as we are aware there weren't any signals of too much significance noted via the trops.

Sporadic-E round-up

Experienced DXers were pleased to find a few exotic signals infiltrating their aerial systems. Ray Davies, situated on the Norfolk coast, watched the PM5534 from EPT (Greece) on channel E3 during the morning of May 3rd. On the 24th Simon Hamer at his location near Presteigne in Powys saw an Arabic caption on E3 at 1840. This was presumably JTV from the Suweilih transmitter in Jordan.

Most newcomers to the hobby were more than delighted to sample bullfighting from Spain, wildlife and botany from Norway and military parades from Russia. This was especially the case after a long inactive winter with virtually no DX reception.

Most DX-TV enthusiasts have found reception much easier throughout Bands I and III since the closure of the 405-line services. There have been a few instances where 6m activity has continued to ruin reception on channel R1, even after 0830. Fortunately, interference from 6m amateurs hasn't spoilt the stronger DX-TV signals too much.

DX logs for May

This month we are featuring two logs. The first comes from William Maries of Studley in Warwickshire. William uses a rotatable wideband dipole which feeds a standard UHF portable via an upconverter. Although his equipment is fairly basic, his log speaks for itself:

19/5/85: NOS-1 from the Netherlands on test and received on channel E4 via tropospheric propagation using a multi-element UHF aerial; TVE (Spain) via sporadic-E with a sports programme and the American TV series M★A★S★H.

24/5/85: NRK (Norway) with a news programme; TVP (Poland) on programmes; RAI (Italy) with programme schedules; JRT (Yugoslavia) showing commercials featuring the well-known 'EPP' caption between each advert; SR/SVT (Sweden) with programmes including a cartoon; TSS (Russia) with news or current affairs programmes. All reception via sporadic-E. An unidentified chequered test pattern was also noted but there are no details concerning the channel.

25/5/85: TVE with the results of the Spanish national lottery; TSS with a news bulletin; SR/SVT on test; MTV (Hungary) with programmes going on to their news programme called 'TV Hirado'; JRT with the news from TV Zagreb; ORF (Austria) with their news programme; RAI with general programmes featuring identification in the corner of the screen. The 'RAI' ident appears on all programmes to help prevent piracy by Italian private TV stations, of which there are literally hundreds. All reception noted was via sporadic-E.

26/5/85: MTV with programmes.

27/5/85: CST (Czechoslovakia) on test with the EZO-type electronic test card; RAI with a quiz programme; unidentified programmes noted, including an announcer wearing medals.

28/5/85: SR/SVT radiating the test card and noted on channels E2, E3 and E4; NRK with the PM5534 test card and a variety of transmitter identifications including Steigen (channel E2), Hemnes (E3), Gulen (E2), Greipstad (E2) changing to 'NORGE NRK' ident, Bagn (E3), Melhus (E2) and Kongsberg on channel E4; TVE showing the GTE colour test card; RAI with a news programme; CST radiating the 'RS-KH' test card followed by the FuBK pattern. All reception via Sp-E.

29/5/85: TVE on test with the colour test card followed by regional transmissions. TVE was noted for most of the day on channels E2, E3 and E4; RTP (Portugal) with a news bulletin followed by the FuBK test card then educational programmes. Transmissions were noted on channel E2 via sporadic-E.

30/5/85: TVE received on E4 with programmes via sporadic-E.

31/5/85: NOS-1 radiating the PM5544 test card in the morning and reappearing at various times during the day. Reception was from the channel E4 outlet at Lopik during enhanced tropospheric conditions; RTBF-1 (French-language service from Belgium) with the PM5544 test card during the early morning period and received in Band III on channel E8; Canal Plus (France) with programmes; TVE on E2, E3 and E4, chiefly with the GTE colour test card but regional test cards were also seen including Madrid on E4 and La Muela on E3. Reception was in PAL colour via sporadic-E. Transmissions from TVE-2 were also logged on channel E2; RTP on E2 and E3 with a news magazine programme, the test card and educational programmes; TSS with a news or current affairs programme. Channel details are not known.

Our other featured log has been sent in by Mark Dent of Leeds. Judging by Mark's reception, his location appears to be ideal for DX-TV. All times noted are GMT.

1/5/85: Swiss FuBK test card with the identification '+PTT SRG1' at 1140 on channel E2; programme from West Germany on E2 at 1142; '+PTT SRG1' FuBK test card on E3 with a caption on E2 reading 'DRS'; RAI on IA; MTV with a multiburst test pattern on R1 and the Hungarian clock caption at 1300.

2/5/85: RAI on channel IA at 1342 with the PM5544 test card, received via meteor shower.

6/5/85: Italian PM5544 test card with the identification 'RAI 1'; Swiss test card on channel E2; SR/SVT on E2 with the 'TV1 SVERIGE' PM5534; CST on R2 with the EZO-type test card carrying the identification 'RS-KH'; Bayerischer Rundfunk from West Germany radiating the FuBK test card and 'GRÜNTEN' identification on E2; RTVE from Spain on E3 transmitting the GTE colour test card with 'tve tve1' identification; JRT with programmes on E3 and E4.

7/5/85: RAI on channel IÁ with the 'RAI 1' PM5544 test card; West German 'GRÜNTEN' FuBK pattern on E2; RTVE colour bars at 1004 on E2; RTP (Portugal) on E3.

8/5/85: TSS with a programme on R1 celebrating VE Day, also on channel R2.

12/5/85: NOS-1 on E39 via trop; MTV R2 with programmes, also on R1; CST programmes on R2 at 1502; JRT at 1505 with programmes on channel E3.

13/5/85: BRT (Belgium) on E43 and E46 via enhanced tropospheric conditions.

15/5/85: RTVE E2 radiating the 'tve tve1' colour test card at 1008; TSS R1; CST on R1 with the 'RS-KH' test card; West German teletext pages on E2 at 1113; RAI on IA with the 'RAI 1' PM5544 test card at 1129; MTV multiburst on R1 followed by the 'MTV-1 BUDAPEST' PM5544; TSS clock caption on channel R2 at 1700 showing GMT +4 hours.

18/5/85: NOS-2 on E32; BRT E43 and E46;

TDF (France) on E39 from the 2nd network, 'Antenne 2' via trop; RTVE on E2 with the GTE test card carrying the identification 'tve tve2' at 1243.

24/5/85: Swiss FuBK on E2 at 0937; MTV with programmes on R1; RAI 'Televideo' teletext pages; JRT E3 on programmes, also on channel E4; 'RAI 1' PM5544 on channel IB; low-frequency test pattern at 1042 from RTP on channel E3; RTVE colour-bar pattern carrying the regional identification 'RTVE LA MUELA 3'. The GTE colour test card was noted on E4 with the ident 'TVE BARCELONA' at 1118. On channel E3 the regional 'TVE GAMONITEIRO 3' colour-bar pattern was noted. A little later at 1149 a new pattern was received on E3 with the identification 'VALENCIA'; JRT E3 with the 'JRT BGRD' PM5544 test card; an unidentified chessboard pattern was seen just HF of channel IA at 1213. This was probably the Italian pirate station, NCT; West German 'GRÜNTEN' FuBK test card on E2; ORF (Austria) on E4 transmitting the old monoscopic Telefunken TO5 test card with the identification 'ORF FS1'. This was also seen on channel E2a; CST R2 radiating the PM5544 which carried the identification 'SR1-TV BRATISLAVA' at 1259. The familiar 'RS-KH' electronic test pattern was logged on R1 from CST at 1313; TSS with programmes on R1 and R2.

25/5/85: Some early morning reception with programmes from TSS on R1 at 0517 and the 'RS-KH' test card from Czechoslovakia on R1 at 0543. The TVP PM5544 from Poland was noted on R1 at 0606. An FuBK test card with the identification 'JRT ZGRB 1' appeared at 0633 on E4 and, to complete the breakfast-time round up, a chessboard pattern just HF of channel IA was seen at 0640. Reception was probably from NCT. Other signals logged during the day include: MTV on R1 and R2; RTVE with the 'tve tve' colour test card on E2, E3 and E4; the Portuguese FuBK test card on E3 with 'RTP 1' ident; TVP on R1 with a news programme identified by the letters 'dt'; ORF on E2a with a caption reading 'Österreichischer Heute' (Austria Today); an ident caption from Czechoslovakia on R2 from Bratislava at 1705; programmes from Hungary on channels R1 and R2; an identification caption 'NOCOJ TV 1' at 1724 on E3 from JRT in Yugoslavia.

27/5/85: Colour test card from the Spanish 2nd network with the identification 'tve tve2' on channel E2; TSS programmes on R1; the FuBK test card from Portugal on channel E3 carrying the ident 'RTP-PORTO'.

28/5/85: NRK (Norway) on E2 with the PM5534 at 0746 with the transmitter ident 'NORGE STEIGEN'; SR/SVT Sweden on E2 with the 'TV1 SVERIGE' PM5534; the FuBK test card from Finland was logged at 1003 which included the inscription 'YLE TV1'. Other countries received during the day included Spain, Portugal, Italy, Hungary and Czechoslovakia.

29/5/85: Several transmissions from Spain were received including a colour-bar pattern on E4 with the ident 'SANTIAGO 4'. The 'RTP 1' FuBK test card was logged on channels E2 and E3 from Portugal.

30/5/85: Unidentified PM5544 test card at 1046 on channel IB/IA. This was possibly RTE (Eire) via trop. Other signals noted via enhanced trop conditions included BRT on E43 and E46, TDF Antenne-2 on E39, Canal Plus (France) on F5, ZDF (West Germany) E35 and E37, WDR-1 (Westdeutscher Rundfunk in West Germany) on E46, NDR-3 (Norddeutscher Rundfunk) on channels E40 and E43.

31/5/85: Reception via tropospheric propagation continued with the following stations: TDF Canal Plus on F5; RTBF (Belgium) on E8 and E61; NOS-1 E6 and E7; NDR-1 on E41, NDR-3 E43, WDR-1 E32, ZDF E24, E35, E37, E39; DDR:F2 (East Germany) received on channel E34 from the transmitter at Brocken.

Our thanks to William and Mark for sending in their very impressive DX-TV logs.

News programme broadcast by the French 1st network, TF-1

Anglia TV on E10 mystery

At least three reports claim that Anglia Television programmes have been resolved on channel E10 in the Nottinghamshire/Lincolnshire area. Signal strength has been fair and this encouraged two DXers in Nottingham to attempt to locate the source of transmissions. The IBA were initially consulted but they apparently had no knowledge relating to these transmissions or of harmonic radiation from a UHF outlet.

The source has been traced to the City of Lincoln and it appears that a pirate transmitter is in operation. A blank raster is radiated after the normal Anglia TV stations have completely switched off after close down.

Signals have been received over a period of five days followed by three days of total inactivity. We have no idea what the motive is behind these strange transmissions since a receiver with 625-line VHF facilities would be required in order to resolve the programmes. One theory is that the pirate station is using Band III to escape attention and subsequent detection by the DTI. Several years ago there were complaints when the Belmont transmitter stopped radiating Anglia TV. Yorkshire TV programmes appeared in their place, much to the dismay of the farming community throughout Lincolnshire. They were disgruntled because the detailed weather forecasts had been replaced by superficial 30-second spots. Could this be the UK's first illegal relay station? Any information on this subject would be most welcome.

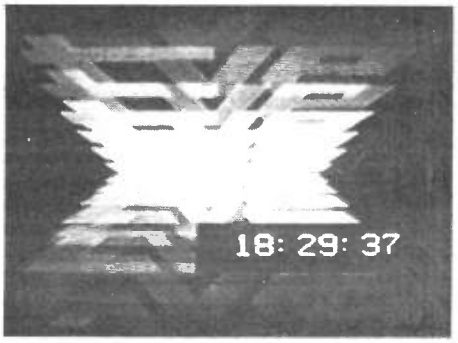
Reception reports

Chris Howles (Lichfield) reports a successful season so far. On May 19th at 1640BST a programme appeared featuring an African minister on channel E2. Reception lasted for approximately five minutes. A short while later, RAI was resolved on channel IA with a football match. Spain was also noted with yet another screening of M★A★S★H on channel E2. The NCT chessboard was in evidence on the 24th just after 0800BST. This was swamped at times by the RAI test card on IA.

Chris was surprised to find the Finnish FuBK test card on channel E3 at 1005 on the 28th. The identification was 'YLE TV1'. This was eventually followed by Sweden using the 'TV1 SVERIGE' PM5534 pattern. Signals from Norwegian transmitters were also observed. The 'NORGE STEIGEN' PM5534 was present on E2 with sound and colour, while on E3 the test card carried the 'NORGE HEMNES' identification.

The 25th was an eventful day for Chris with reception on channel R3 in Band II. The programme consisted of male dancers wearing evening suits. The time of reception was 1312BST. This was probably TSS (Russia). A different network on channel R1 was noted simultaneously with a current affairs programme called 'HOBOCTN'.

David Wright (St Neots, Cambridgeshire) has written with a description of his DX-TV equipment. It consists of a 14-inch Shibaden monochrome portable set with sound systems B and G (5.5MHz). For colour reception he uses an elderly Luxor set which has a multiband tuner fitted. A 3-element



Spanish clock caption received by Jurgen Klassen via Sp-E on E2 in West Berlin

wideband Yagi is employed for Band I DX reception, complete with a tunable amplifier.

For tropospheric reception in Band III, David uses a 10-element Yagi array while for UHF he has installed a Wolsey Colour King. This covers the entire UHF spectrum.

David noted the May Day parade on channel R1 on the 1st together with the chessboard pattern from NCT in Italy via sporadic-E. A colour-bar pattern on R1 was eventually identified as TSS but a chessboard pattern noted on the same channel still remains a mystery. On the 14th at 0955BST a pulse and bar pattern appeared on channel E2. We feel that this was RTP from Portugal since this pattern has been used in the past and has often been received on channel E3.

Kevin Jackson and Mark Dent (both of Leeds) have sent very impressive logs for May. Kevin was busy turning the dials as early as 0526 on the 25th. He was rewarded with various transmissions from Russia. An interesting catch was a TSS caption with the inscription 'EESTI TELEVISIOON'. Reception was timed at 0551 on channel R2. Note the use of the Roman rather than the usual Russian Cyrillic alphabet.

The NCT chessboard was logged by Kevin just HF of channel IA. At 0829 on the 25th a programme with Greek subtitling was resolved on E3. Unfortunately for Kevin it may not be as exotic as it first appears. JRT (Yugoslavia) have been known to show such material. Other reports tend to indicate that EPT (Greece) radiates the PM5534 test card during the morning.

Lightning scatter DX

During thundery weather on the 14th Kevin monitored channels E43 and E46. He was rewarded with short-duration signals from BRT-Belgium (from the Egem transmitter) and West Germany (from the NDR-3 outlet on channel E46). We have personally witnessed lightning scatter DX in Band III but have never experienced it at UHF. It's worth trying, providing the storm isn't too close!

Tony Privett (Basingstoke) has recently made improvements to his rotatable aerial system. He offset the alignment to enable the arrays to be rotated through to the south-west without them stopping at the due-south position. It is advisable to do this for DX-TV work since there is nothing more frustrating than having to waste time rotating the arrays through north before they are pointing south-west.

Most European services have found their way to Tony's location during the month. He too experienced the spectacular openings of the 24th and 25th when the muf rose high enough to permit reception of channels R3 and IC in Band II. Channel IC is used exclusively by RAI in Italy and RTS in Albania. The reception on E3 of a fairly weak PM5534 test card on the 24th remains a mystery. Tony wonders if this could have been EPT-Greece since there was identification in the top black rectangle only. The EPT test card certainly fits the bill, so perhaps it was indeed reception from the low-power Greek E3 transmitter.

John Bray (St Neots) achieved good results with SECAM colour signals from TSS, TVP and CST on the 24th and 25th using his multi-standard Luxor SX9 receiver. A mystery in the form of a PM5544 test card cropped up on channel R1 on the 17th. As most DXers will be aware, TVP is the only service to regularly use this pattern without identification. The TVP version has a darker background than a standard PM5544 but John's didn't. Has anyone else seen this?

John reports that the Dutch service (NOS) has again changed its opening caption. It is easily recognised because it carries the word 'NEDERLAND' at the top and a large '1' down the right-hand side. The colour bars to the left of centre, which are normally horizontal, have been seen in a vertical position. However, since John's letter arrived we have noticed that the bars are horizontal once again. Perhaps NOS weren't satisfied with the updated version!

Harold Brodribb (St Leonards-on-Sea) has been active monitoring the Eastern European OIRT FM band during openings to the south-east. On the 25th at least 21 such stations were heard between 66.4MHz and 73.1MHz during the afternoon. Earlier in the day various Italian private radio links were monitored carrying pop music programmes on frequencies such as 51.8MHz, 52.9MHz, 54.5MHz, 55.9MHz and 55.25MHz, the latter coinciding with the vision frequency of channel E3.

Bob Brooks (South Wirral) has been up and about DXing very early most mornings. Of particular interest was a West German FuBK test card on channel E4 from Norddeutscher Rundfunk with 'NDR-1' identification. Tuning in on the 25th, a chessboard pattern was seen on E2 at 0745 with simultaneous reception of RAI-Italy on channel IA with the 'RAI 1' PM5544. On two occasions, Bob has seen on channel R1 a globe with lines of latitude and longitude enclosed within a rectangle. So far this has remained unidentified.

Robin Williams (Shipston-on-Stour, Warwickshire) received a number of countries on the 25th including Sweden on E2 with the PM5534 test card, TSS on R1 and R2, TVE-1 on E2 and E4 together with MTV-1 (Hungary), CST and JRT. He also logged a football match on channel E4 from the West German TV service, ARD.

Ray Davies (Happisburgh, Norfolk) was pleasantly surprised to discover that he could receive the Band II channel R3 on his Grundig colour TV. Signals have been fairly good on this channel despite the use of an aerial which is cut to a lower frequency (channel E4). Perhaps a multi-element Band II array will soon grace the Happisburgh skyline!

Apparently in East Anglia on June 1st between 1000 and 1030, Iran was seen on channel E2 using the FuBK test card with a digital clock displaying GMT+4½ hours. Ray was alerted but he couldn't find any trace of this extremely rare visitor.

Clive Athowe (Blofield near Norwich) reports excellent colour signals from TVR in Rumania on the 15th. A football match was being aired at the time over the channel R2 transmitter located at Bucuresti.

Italian pirate

One test card which has kept quite a few DXers guessing (including many experienced enthusiasts) during May has been a chessboard pattern around channel IA and E3. It was actually slightly HF of IA and was frequently received throughout the month (a glance at the reception reports confirms this). The chessboard was often accompanied by reception from RAI in Italy.

This pattern was subsequently identified by Harold Brodribb as originating from the Italian pirate TV station known as NCT. Nord Center Television operates via a low-power transmitter from Udine which is close to the border with Yugoslavia. The station has been well received during past sporadic-E seasons, but beware – NCT have a habit of occasionally shifting their frequency. It seems to vary anywhere between IA and E3. Throughout their relatively short history, NCT have used a variety of captions and test patterns. The chessboard includes identification in the bottom right-hand corner.

Another chessboard pattern has been sighted on E2/R1 but so far nobody has been able to identify it. So far this season we have not yet received this pattern here in Derby.

Service information

West Germany: Two new transmitters have come into service radiating programmes from Bayerischer Rundfunk. Burgwindheim is served by a 60W outlet on channel E36 while a 20W transmitter on E43 covers Brughaslach and the Rimbach region.

France: There is a new transmitter at Mende on channel 68. The ERP is 3kW.

Finland: The following outlets have recently opened: Muonio on channel E43 with 1kW ERP (YLE-1 programmes) and E49 (YLE-2); Rovaniemi on E9 with 1kW for YLE-1 (vertically polarised) and E49 for the YLE-2 network.

This month's service information was kindly supplied by Gösta van der Linden (Netherlands) and Alexander Wiese (West Germany).

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RELAYS 240v AC coil PCB mounting 2 pole changeover £1 3 pole c/o **£1.00**
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37-way £2; 50-way £3.50; covers 50p ea

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8K	4556 SGS	30p
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10K	TL084	45p
5K	CA3140E	38p
500	LM1808N	30p
1K3	UA3086PC	30p
100	74LS374	40p
1K	74S240	25p
70K	**BC337 5K+**	**£38/1000**
15K	**BC213L 5K+**	**£39/1000**
15K	**2N3904 5K+**	**£40/1000**
3K	**4070**	**£15/100**

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1K 1K15 1K2 1K3 1K5 1K8 2K4 2K7 3K3 10K
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OPI2252 Opto isolator **50p**
Photo diode 50p ..... 6/**£2.00**
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RPY58A LDR 50p ORP12 LDR **85p**
LEDs RED 3mm or 5mm 12/£1 ..... 100/**£6.00**
GREEN or YELLOW 3 or 5mm 10/£1 ..... 100/**£6.50**
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1S3740 Germanium ..... 100/**£2.00**
1N4004 or SD4 1A 300v ..... 100/**£3.00**
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BA157 1A 400V Fast recovery ..... 100/**£2.50**
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100N 250V radial 10mm 100/£3 .....
1u5 P/carb 15mm rad ..... 100/**£7.00** (£1)
2u2 160v rad 22mm ..... 100/**£10.00** (£1.50)
470n 250v AC X rated rad ..... 4/**£1.00**
33n/47n 250v AC X rated rad 15mm ..... 10/**£1.00**
10n 250v AC X rated rad 10mm ..... 10/**£1.00**
100n 600V SPRAGUE axial 10/£1 ..... 100/**£6.00** (£1)

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R53 THERMISTOR **£2.00**

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2u2 20V 8/£1 ..... 100/**£8.00**

MONOLOTHIC CERAMIC CAPS
10N 50v 100/£6 10N 50V ..... 100/**£3.00**
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LATEST LITERATURE

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

TECHNICAL WRITING & PUBLICATION TECHNIQUES

This handbook, published in May, has been produced by the Institute of Scientific and Technical Communicators with the aim of improving the presentation of textbooks and manuals dealing with complex subjects. The book is a collaborative effort produced by a team of eight experienced authors and illustrators, and covers the subject of technical writing from the fundamentals of actually choosing appropriate words, through presentation, illustrations and editing (very useful this!) to an outline of printing techniques.

It is pleasing to see that the authors have followed their own advice, and have produced a clear and well illustrated volume which points out some quite appalling errors commonly made in this field. My only reservation is whether the people at whom this book is aimed will actually follow the advice given; some of the staff who work on technical publications seem to have a remarkable ability to make the reader think he is looking at a foreign language.

Technical Writing & Publication Techniques will obviously have limited appeal amongst readers of ***R&EW,*** but for those whose work entails communicating complex technical ideas in writing this should be required reading. The potential increase in efficiency should make the expense more than worthwhile.

William Heinemann Ltd, £14.95. ISBN 0 434 90354 X

AMSTRAD CPC664 COMPUTING

By Ian Sinclair

This is another of the well-produced computing books from Collins, which in addition to outlining the programming of this machine also covers its disc system in detail and the CP/M operating system.

The book begins with a guide to plugging everything in, and an outline of how discs are used for storage is included. The subsequent description of programming is written with the inexperienced programmer in mind, dealing with the various aspects (including windows, graphics and sound) in a clear, step by step manner. The last chapter forms a useful beginner's guide to the use of a printer, with descriptions of Epson, Juki and CGP-115 machines.

Although this book is a good introduction to computing with the CPC664, there are one or two things which strike me as a little unsettling. The claim on the rear cover that this machine is the first complete home computer with a built-in disc drive seems a little dubious (surely that honour goes to the Tatung Einstein?), but can easily be dismissed as publisher's hype.

Somewhat less easy to understand is the statement that the manual supplied with the computer is excellent ('one of the best'). If this is the case, what need have we of Ian Sinclair's book? While I would agree that an elementary guide to computing with a particular machine is necessary (since most manuals assume a certain grasp of programming), there is a lot to be said for including such a guide with the computer (as some companies actually do already). The point also arises that much of the information in this book will be duplicating instructions supplied by the manufacturer (setting up, etc). If computers were supplied with proper instructions, books like this should be unnecessary (that's not to deny a need for advanced programming guides, of course).

Such criticisms apply to all such books, and are not aimed specifically at this one. Ian Sinclair's book is a rather good example of its type, bearing in mind that the author is obviously an Amstrad fan (and therefore maybe a little short-sighted concerning its faults), and that this is not intended as a comprehensive programming course. If you've bought the computer you will have a bit more money to spare than if you'd chosen another comparable package, so you might as well buy this book!

Collins Professional and Technical Books, £9.95. ISBN 0 00 383184 1

THE RADIO DIRECTORY THE TV DIRECTORY

These two handbooks, both A4 size soft cover volumes, are published twice-yearly by Professional Books of Abingdon, and these latest editions (summer 1985) have been available since June and April respectively.

The directories provide extensive listings of the broadcasters in this country. *The Radio Directory* covers all the divisions of the BBC, and ILR, unlicensed, student and hospital stations, as well as European stations which transmit English language programmes. Details are included of times, frequencies and addresses, with programme content also included in many cases.

The list of radio stations is followed by a list of companies associated with radio (ie, those that provide services or equipment).

The TV Directory is of the same format, with a list of TV broadcasting concerns (including cable, teletext and electronic media, hotel networks, representatives of overseas stations, etc) preceding a list of companies providing equipment and services.

Each directory is available for a yearly subscription of £15 (single copies are £8). The next issues of each are due in October (TV) and December (radio).

Professional Books, ISBN 0 86205 100 2 (TV), 0 86205 117 7 (radio).

CABLE TELEVISION

By Jeff Maynard

This book is intended to provide an introduction to the relatively new subject (in the UK at least) of cable TV, outlining the technical aspects of operating a cable system, the possibilities opened up by new technology, and the economic and social aspects of cable.

Beginning with a description of the development of cable in the USA, the book continues with an outline of the elements of TV broadcasting before dealing with the details of cable technology. The possible network layouts are described, along with the practical problems encountered, then the electronics involved in cable transmission (including, of course, optical fibre). Having dealt with the more basic areas the author moves on to the exciting possibilities of interactive services (eg, data transmission, telebanking, video conferencing).

The treatment throughout is excellent. The text is very clear, while still including a fair amount of technical information for those who want more than a casual read. The coverage is comprehensive, with the author displaying an appreciation of the problems involved in UK cable TV beyond just the technical hurdles, and as a general introduction to the subject this volume certainly achieves its aim (in case you hadn't noticed, I like this book!)

Collins Professional and Technical Books, £12.95. ISBN 0 00 383016 0

CATALOGUES

INSPEC

A revised and extended edition of the *INSPEC List of Journals and Other Serial Sources* has just been published.

The latest version contains full details of over 3,700 publications regularly received and scanned by INSPEC for its range of information services. For each publication the list now gives the full and abbreviated title, frequency of issue, the publisher's name and address, CODEN and ISSN, and the first (and last) issue covered by INSPEC. In addition, where appropriate, the British Library Lending Division shelf number is given. Details are also included for publications which are no longer published or which, for any other reason, are no longer covered by INSPEC.

A comprehensive set of indexes, by abbreviated title, by CODEN, by ISSN, and by country of publication, contributes to making this a useful aid for users of the INSPEC Database.

INSPEC Marketing Department,
The Institution of Electrical Engineers,
Station House,
Nightingale Road,
Hitchin,
Herts SG5 1RJ.
Tel: (0462) 53331.

Cossor Electronics Ltd

Cossor Electronics' latest full colour brochure deals with the company's capabilities in optical technology, both in manufacturing and in continuing research and development.

Their involvement with fibre-optics, which began in 1978, has matured into a comprehensive technical, manufacturing and commercial infrastracture. The brochure illustrates how Cossor is increasingly incorporating fibre-optic technology into their traditional equipments and systems and using it to enhance on-site communications.

Listed are Cossor's current interests in the field, a description of their manufacturing facilities and some of their products, and their further research and development in optical signal processing.

The publication is illustrated with full colour pictures and graphs of the company's products and laboratories.

Copies of the brochure are available from the Publicity Department.

Cossor Electronics Ltd,
The Pinnacles,
Harlow,
Essex CM19 5BB.

Weir

Weir Electronics Ltd has published a comprehensive technical data sheet covering the recently introduced SMS300 series of high-efficiency power supply units.

These are single-output switched-mode units capable of delivering 300 watts output with forced-air cooling or 200 watts with simple convection cooling. Four models are available, with output voltages of 5, 12, 24 and 50 volts respectively. Special features include Weir's current sensing monitor which permits parallel operation of several similar power supply units.

The data sheet is a four-page A4 size leaflet printed in two colours throughout, with a full-colour photograph of the power supply on the front page. It includes a technical description with complete performance specification, and dimensioned outline drawings giving the positions of all fixings and connections.

The leaflet is freely available on request.

Weir Electronics Ltd,
Durban Road,
Bognor Regis,
Sussex PO22 9RW.
Tel: (0243) 865991.

Greenweld

The Greenweld 1985 Catalogue Update has just been published, featuring an extensive range of components for both the home constructor and the small manufacturer.

The catalogue also includes a 'Bargain List' and £1 worth of discount vouchers. It costs 70p + 30p p&p.

Greenweld Electronic Components,
443 Millbrook Road,
Southampton SO1 0HX.
Tel: (0703) 772501.

Quiller

A catalogue featuring the Breter range of control switches is now available from Quiller Components.

The 32-page, full-colour catalogue gives concise details of technical specifications and operational performance, as well as part numbers.

Italian manufacturer Breter's control switches are used to control low voltage ac or dc electrical circuits. Attractive in design, the switches are available with round or square bezels, and offer considerable time savings in mounting operations; contact blocks and power supplies have a snap-on fixing system and can be wired separately from the body.

The major design features and use of quality materials ensure that the reliability and safety of all Breter control switches complies with IEC, CEE el, BSI and VDE standards.

Copies of the catalogue are available free on request.

Quiller Components Ltd,
85 Stanley Road,
Bournemouth BH1 4SD.
Tel: (0202) 303424.

NTIS

Some 1,200 new processes, inventions, equipment, software and techniques developed on US Federal R and D programmes are described in the 1984 *Federal Technology Catalog,* PB85-106987, from the National Technical Information Service (NTIS).

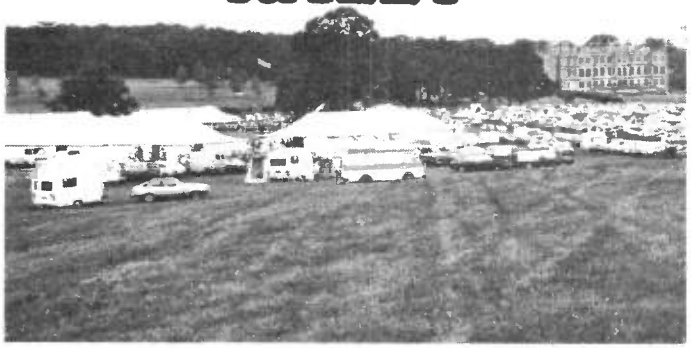
With contributions from many organisations, including NASA, the catalogue describes practical technology selected for commercial potential. The fields of computer technology, energy, electrotechnology, engineering, life sciences, machinery, tools, manufacturing, materials, physical sciences, testing and instrumentation are summarised in 24 broad disciplines. Sources of additional information are given for each summary and a thorough subject index is also included.

Of value to all those with commercial interests in technology, this easy to use, comprehensive publication is available from the UK distributor for NTIS, Microinfo Ltd, priced at £52.90.

Microinfo,
PO Box 3,
Newman Lane, Alton,
Hampshire GU34 2PG.

LONGLEAT RALLY

We visited this year's Longleat rally and found a lot more than just lions . . .



This year's Longleat rally, organised by the RSGB Bristol Group, took place in near-perfect conditions (ie, I didn't get rained on!) at the end of June.

This is quite a large affair, with half a dozen or so large marquees erected on a field close to the famous Longleat House. There was the usual periphery of such an event, with a beer tent (naturally), fish and chips, hot dogs etc, as well as more uncommon attractions (several monkey bikes (small motor bikes!) in an enclosure for the kids among us). Some of the trade stands were selling an unexpected range of goods, too, with teddy bears, glove puppets and sweets all available.

Bargain hunters

Real junk

The impression in the trade tents was one of a lot of small stallholders, and there was a lot of junk on offer (and I mean *real* junk, not the useful variety). The number of 'big names' attending was somewhat smaller than I had expected, and some of those who did attend seemed to be dealing more in components and accessories than in the more capital intensive items. This no doubt reflects a general lack of money available (and a tail-off of the money from the influx of CBers into amateur radio).

There were a fair few clubs present, with such organisations as BARTG, the Microwave Society, the RAIBC (complete with their new secretary), the RAF and Royal Naval amateur radio societies, etc.

There was a very good bring-and-buy section, and the same tent housed the registration stand for Morse tests (the test itself, of course, was conducted elsewhere under somewhat quieter conditions!). Such testing at shows and rallies seems to be increasingly popular, and is a very good idea. However, judging by some of the people attending Longleat there are those who regard amateur radio as glorified CB and who will never pass, or even think of attempting, the Morse test. At one point I saw a class B operator conversing at length with a friend using a handheld and a lightweight headset (presumably a recent acquisition). His friend was a matter of a few feet away! Such instances were not uncommon, and while it is useful to be able to test a new piece of equipment, or to contact someone at an unknown location at such a rally, some of the behaviour witnessed at Longleat (and, indeed, elsewhere) stretched my credulity to previously untried limits. No wonder there is such a clamour for a novice licence, or even for dispensing with the Morse test altogether.

Bad manners

As an aside, I was also quite appalled by some of the bad manners in evidence at times. I'd have thought that such a gathering of like-minded people, all of them presumably in a good mood on such a pleasant day out, would generate a feeling of camaraderie and fellowship. Not so! While I encountered a number of people of unsurpassed civility and good humour, who I would be pleased to call 'friend', the proportion of inconsiderate, unfeeling and downright rude ops quite took me aback.

I hope this little tirade hasn't put you off! The event was most enjoyable, and is well worth sparing a thought for if you've not attended before. Just don't leave your manners at home!

The new secretary of RAIBC, Cathy G1CQJ with husband Brian

The bring-and-buy tent

Morris Weinstock passes his Morse test!

Morse accessories, for those interested!

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

Morse decoding blues

A letter recently received details a problem of relevance to any Spectrum owners who try to adapt Dr Kiam-Laine's Z80 Morse decoding program (see the July edition) to this machine. Roy Fox G4PRX has discovered that the Sinclair wonderbox doesn't like certain aspects of the program:

'I have modified the program to run on a Spectrum at start address 7000h due to the computer's operating system being located in ROM at the lower addresses. Unfortunately I have not been able to get the program running properly and usually the program either crashes or resets as if "NEW" was entered'.

Roy points out that Toni Baker's book *Mastering Machine Code on your ZX Spectrum* contains a warning concerning the IM instruction (which sets the interrupt mode): ' *DANGER!!!* Under no circumstances use this instruction'.

We seem to have a problem here! Has anyone else experienced this little hitch, and more importantly has anyone solved it?

BARTG contest news

During the Spring HF Bands Contest, organised by the British Amateur Radio Teleprinter Group, 118 logs were received in all, which was slightly up on last year.

However, no contacts were made with Africa so no claims for the WAC (Worked All Continents) award can be processed. Some logs arrived after the contest's closing date and were therefore classed as check logs.

South America was apparently well-represented this year, although many stations commented on the absence of signals from Asia.

Details of the 1985 Autumn VHF/UHF RTTY contest have also reached us. The contest will begin at 1800GMT on Saturday 12 October and continue until 1100GMT on Sunday 13 October. Bands used will be 144MHz and 432MHz, but contacts via a repeater or satellite will not be valid.

Certificates will be awarded to the top scorers and runners up in each section for each band. Each band is regarded as a separate contest so single band entries will count.

Full details of the contest rules are available from the BARTG Contest Manager: *Peter Adams G6LZB, 464 Whippendell Road, Watford, Herts WD1 7PT.*

Brazilian contest

The Electril Antenna factory in Sao Paulo, Brazil is sponsoring a contest to celebrate its silver jubilee.

The contest will take place on the 2, 10, 15, 20, 40 and 80m bands using CW and phone modes, from 0000UTC on 9 November through to 2400UTC on 10 November this year.

Operators are divided into two categories. For Category I (single operators) a total of 12 hours rest period has to be clearly indicated in the log (it can be subdivided). Category II consists of multiple operators, ie clubs and associations, and there is no rest period.

The call for CW operators is 'CQ test 25' and for phone is 'CQ 25 years contest'. Contestants are required to exchange RS/RST reports once they have a contact.

Each confirmed QSO counts for one point. There are no multipliers, but different band contacts with the same station count separately.

Logs should include details of the station worked, RST sent and received, QTR and UTC, band, mode and general remarks. Completed logs should be sent to PO Box 22, Labre, Sao Paulo Section, SP-Brazil 01000 before 31 January 1986.

Electril products will be awarded to the winners.

Electronics show

The 22nd Leeds Electronics Show is to be held from 24-26 September at the University of Leeds.

An important series of Electronics Updates has been introduced for the event. Topics to be covered include: modern measurement techniques, electronic computer aided design and power semiconductor devices.

An attraction for all major industry companies is the heavy involvement of the 2,000 graduate engineers of Leeds University.

For further information please contact Terry Jefford on Saffron Walden (0799) 26699.

QTI-TNA

Since the conception in 1980 of QTI-TNA, the talking newspaper for blind radio amateurs, the UK membership has grown to around 140 with 40 more overseas members. Before this, visually handicapped amateurs and SWLs had little or no access to the kind of written information which sighted amateurs had available. QTI is now a registered charity (no. 326454).

QTI takes the form of readings from the various radio magazines available (including our sister magazine, *Amateur Radio*), the main

COURSE GUIDE

Course title	Enrolment date	Additional information
RAE	9/10 Sept	Derby CFE. Weekly 2 hr session for 30 wks. Tutor = G4MLL. College also runs an Advanced RAE course. Tel: Derby 73012
RAE + CW courses	10 Sept	Bradford and Ilkley Community College, Gt Horton Rd, W Yorks BD7 1AY
Construction for the Radio Amateur	10 Sept	As above
RAE + CW practice	17 Sept	The Nautical College, Fleetwood, Lancs. Thursday evenings for 25 wks. Tel: (03917) 79123
Micro electronics + RAE course	Sept	Hendon College, N London. Head of Technology = Chris Holford. Tel: (01) 202 3811
RAE + CW courses	Sept	Wigan College of Technology. Tel: (0942) 494911
Hobby Electronics	Sept	As above
RAE	9/10 Sept	De Havilland College, Borehamwood, Herts. Every Tuesday. Tutor = G L Benbow G3HB (Editor of *How to Pass the Radio Amateurs' Examination*). Tel: 953 6024. The college also runs this course on Thursdays at its Applecraft Centre in Welwyn Garden City. Tel: WGC 26318
RAE + CW courses	16/17/19 Sept	Reddish Vale Evening Centre, Stockport, Cheshire. The RAE course is on Monday evenings and the CW course on Thursday evenings. Tel: (061) 477 3544
RAE	9/10/11 Sept	Paddington College, London. Tutors = G4KKM and G6MFR. Use of Electrical Engineering Dept's facilities to conduct practical experiments. College operates club station, G4UWU. Special rates for students, pensioners, unemployed. Pass rate nearly 90%

emphasis being on new and interesting equipment and electronic design ideas.

A voluntary annual subscription of £3.50 is charged, but members with financial difficulties will remain on the association's mailing list.

Finance is always a problem for charitable magazines such as this, so all donations would be welcome. Practical help is also important – readings can be made in your own home and sent to the organisation.

Further information is available from: *QTI-TNA, 2 Cartmel Walk, North Anston, Sheffield S31 7TU. Tel: (0909) 566301.*

SARCON '85

The 1985 Scottish Amateur Radio Convention (SARCON '85) is to be held at the Dundee College of Education on 21 September.

The college is situated three miles from the city centre and has over 12,000 square metres of outdoor and 600 metres of indoor exhibition space.

There is ample car parking space and the entire building has been designed to cater for access for the disabled.

Further information is available from: *R M Grant, 31 Stormont Park, Scone, Perth PH2 6SD.*

New computer club

A new amateur radio and computer club (AMRAC) has recently been formed in South Hampshire. The club aims to promote the use of computers in amateur radio and to encourage the use of digital communication techniques.

The members are active on the data frequency 144.675MHz using ASCII and both the AX25 and Cambridge Packet systems.

Meetings are held every fourth Friday at 8pm in the Crown public house in Bishop's Waltham. The next meetings are scheduled for 6 September and 4 October.

Further details are available from: *The Secretary, Trevor Tugwell, 50 Mayridge, Fareham, Hants. Tel: (0485) 81032.*

Mobile rally

The Harlow and District Amateur Radio Society has sent details of its annual mobile rally.

The event takes place on 22 September at the Harlow Sports Centre, Hammarskjold Road, Harlow. There is ample free parking, and refreshments and a licensed bar will be on site along with a book stall and bring-and-buy stall.

The event opens at 10.30am and talk-in will be on S22.

For further details phone (0279) 725876 or (0279) 22365 (daytime).

New clubrooms

The members of the West of Scotland Amateur Radio Society have been very busy converting a former curtain factory in the centre of Glasgow into new clubrooms.

The curtain goes up on this project *(groan! – Ed)* on 20 September at 8pm when the new club will be formally opened by the President of the RSGB, Mrs Joan Heathershaw G4CHH.

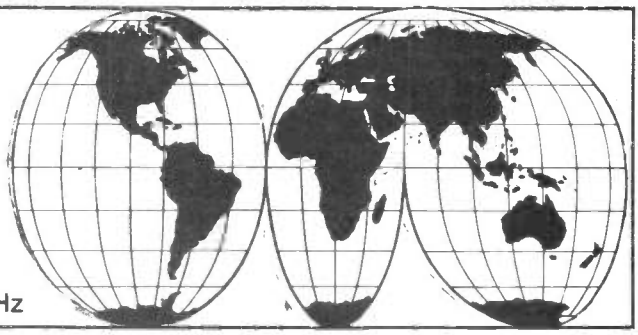
The new clubrooms have a sizeable meeting hall, a shack equipped for HF and VHF operation, a lounge, kitchen and cloakrooms and a room for Morse classes and construction work.

The club meets at 7.30 every Friday evening and has a fortnightly lecture programme starting in September.

Further information can be obtained from: *Ian McGarvie GM4JDU, 3 Kelso Avenue, Paisley PA2 9JE. Tel: (050) 581 2708.*

Why not write and tell us what events your club has planned?

SHORT WAVE NEWS FOR DX LISTENERS



By Frank A Baldwin

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

Reviewing some of the 60 metre band African stations exhibiting comparatively low powers, a continuation is made by commencing with details of a Kenyan transmitter not so often reported in the SWL press.

The Voice of Kenya, Nairobi on **4804** has a power of 5kW and works to the afternoon/evening schedule 1300 (Saturday and Sunday from 1330) to 2010 (Saturday until 2110). This is the General Service, reception being easily confirmed by the beginner DXer due to the fact that all transmissions are in English.

A 20kW transmitter is that of Ouagadougou in Burkina Faso (formerly Upper Volta) on **4815.** This one operates in French and no fewer than sixteen national languages from 1600 to 2400. The writer once noted Ouagadougou listed in an SWL publication simply as 'you know where' – not being in the least surprised, I knew exactly to which place he was alluding!

Radio Mozambique, Maputo may be found between the frequency limits **4860** to **4867.** Nominally on **4865,** it operates in Portuguese and local vernaculars from 1500 to 2215 with a power of 25kW. It should be noted here that as in the two previous issues of this excellent journal, *(Frank is obviously a man of discernment – Ed.)* only the late part of the schedules are listed, this being often the most favourable time for reception here in the UK of African signals.

Cotonou in Benin radiates the Home Service in French and vernaculars. The schedule is from 1300 to 2300 with a power of 30kW on **4870,** there being a newscast in English from 2000 to 2015, this being the prime time for UK based DXers to listen for this station.

Tuning to **4910** may result in the reception of signals from Conakry in Guinea. The main language is French, some local vernaculars also being used. The schedule is from 1230 to 0100, the power being 18kW. An English programme is featured, being timed from 1830 to 1930. The difficulty here is that the co-channel 50kW Zambian in Lusaka is on the air until 2105 (Friday and Saturday until 2205) in English and vernaculars. One should therefore have a try after the latter transmitter has signed off.

On **4940** Abidjan, Ivory Coast operates the Home Service in French from 0600 through to 2400 (from 1600 to 1845 in vernaculars) with a power of 25kW. Difficulty here however will be encountered with the signals emanating from the 50kW USSR transmitter in Kiev, a co-channel occupant. With good conditions prevailing for African signals, it is sometimes possible to log Abidjan.

The Channel 1 service in English and vernaculars radiated by Lagos in Nigeria may be found on **4990** where it operates from 1700 to 2310 with a power of 20kW. Often heard by the writer and other DXers, this one is well worth logging – especially if one can manage to tape the interval signal of an African talking drum. Once heard never forgotten!

The elusive and rarely reported Niamey in Niger is on **5020** with a power of 30 or 100kW working from 1700 (Saturday and Sunday from 1630) to 2200 (Saturday until 2300) with the Home Service 2 programmes in French, English and vernaculars. This is Network 2, the English newscast being at 1715 on Sunday only.

Parakou in Benin radiates the Regional Service in French and local languages from 1700 to 2300 with a power of 20kW on **5025.** It is regularly reported in the SWL press.

Omdurman in the Sudan is on **5039** with a power of 20kW radiating the Home and Foreign Service to Ethiopia and Somalia from 0400 through to 2200. This one was recently logged by the writer soon after it had signed on, another prime time for logging the Africans.

Radio Tanzania, Dar-es-Salaam on **5050** broadcasts the Commercial Service in Swahili from 1300 to 2015 with a power of 10kW. It is a transmitter that is frequently logged here in the UK, being heard when signing off several times of late.

That concludes our review of some African stations on the 60 metre band most likely to be heard here in the UK. Next month some of the 90 metre band Africans will be featured.

AROUND THE DIAL

From the novice SWL to the old-time DXer there is hopefully something of interest in this section. Some of the schedules may have changed by the time this appears in print, but most of the times quoted and other details will be correct.

AFRICA

Ascension Island

BBC Relay on **15400** at 1520, OM with a talk in English about tropical diseases during a World Service programme to southern Africa, timed from 0615 to 1130 and from 1445 to 2030.

Chad

Radiodiffusion Nationale Tchadienne, N'djamena on **4904** at 1906, OM with a talk in French. This 100kW transmitter is on the air from 0455 to 0730 (Sunday until 0700) and from 1555 (Sunday from 1455) to 2100 (Saturday until 2200).

Egypt

Cairo on **21465** at 1312, OM with a talk in the Indonesian programme with several mentions of Jayapura. This transmission is scheduled from 1215 to 1345 and is directed to South-East Asia.

Libya

Tripoli on **15415** at 1405, OMs with a song, YL with announcements in the Arabic Domestic Service which may be heard on this channel from 1100 to 1645.

Mauritania

Nouakchott on **4845** at 1846, OM with a talk in a local vernacular. The schedule is from 0600 (Sunday from 0830) to 0830 and from 1800 to 2400 (Sunday from 1700 to 2400). The power is 100kW.

Nigeria

Lagos on **15120** at 0600, OM with the station identification at the end of the English transmission to North Africa and Europe, timed from 0500 to 0600. This was followed by the interval signal of rapid beating drums, then OM with a programme in French to the same target areas and timed from 0600 to 0700.

South Africa

RSA Johannesburg on **21535** at 1429, OM with a talk in English all about the South African economy. This English transmission to Africa, Europe and the Middle East is radiated from 1300 to 1600 daily.

Uganda

Kampala on **5026** at 1918, OM with a newscast of world events. This was an English programme in the National Service which uses the English, Swahili and French languages. This 250kW transmitter is scheduled from 0300 to 0545 (Saturday to 1345, Sunday to 1415), from 0600 to 1130 and from 1300 (Saturday from 1400, Sunday from 1430) to 2100.

THE AMERICAS

Brazil

Radio Anhanguera, Goiania on **4915** at 0309, OM with announcements in Portuguese, a few promos then the

station identification at 0314 after YL with a pop song. This Brazilian now operates around the clock and has a power of 10kW.

Radio Clube do Para, Belém on **5045** at 0301, OM with the station identification, frequency and sign off without the National Anthem. RC do Para is scheduled from 0700 to 0300, the power being 10kW.

Colombia

Ecos del Combeima, Ibague on **4785** at 0255, OM with a pop song in Spanish, OM with the station identification and QTH (location) at 0257. With a power of 5kW, this one is scheduled around the clock.

Ecuador

Emisora Gran Colombia, Quito on **4911** at 0156, OM with announcements in Spanish, promos (promotions), YL with a pop song then OM with the station identification at 0200. Em Gran Colombia transmits from 1100 to 0500, sometimes varying to closing at 0400, but at other times works to a 24 hour schedule. To further confuse DXers it can vary in frequency to **4910.** The power is 10kW.

Peru

Radio Atlantida, Iquitos on a measured **4790.4** at 0250, OMs with a discussion in Spanish about Ecuador with mentions of Guayaquil and Santo Domingo. At 5kW this Peruvian operates from 0900 (Sunday from 1000) to 0500 (Sunday until 0400 but sometimes 0600). The frequency can vary from the nominal **4790** to **4791** on occasions.

Venezuela

Radio Barquisimeto on **4990** at 0153, OM with a folk ballad in Spanish, the transmission being spoilt by some interference from Yerevan in the USSR. R Barquisimeto is on the air from 1000 to 0400 with a power of 15kW.

ASIA

Bangladesh

Dhaka on **17670** at 0800, YL with the station identification and time check as '1400 hours Bangladesh time, this is the Voice of Islam'. OM with announcements, a recitation from the Holy Quran at the commencement of the English transmission for Western Europe timed from 0800 to 0830.

China

Radio Beijing on **9945** at 1520, YL with a talk in the Vietnamese programme, scheduled from 1100 to 1600 on this channel.

Radio Beijing on **11330** at 1513, OM and YL with Chinese theatre drama complete with gongs and percussion sound effects in a Domestic 1st Programme presentation. The Domestic Service is on this frequency from 2230 to 1730.

Iraq

Baghdad on **9610** at 2043, OM with a newscast followed by some Arabic music in the English programme for Europe, timed from 2030 to 2130.

Baghdad on **13700** at 2036. OMs with a drama in Arabic in a relay of the Voice of the Masses service, scheduled on this channel from 1400 to 2200.

Kuwait

Radio Kuwait on **9840** at 1530, recitations from the Holy Quran in the Domestic/External Service which is on this channel from 0225 to 0015.

Saudi Arabia

Riyadh on **21495** at 0936, recitations from the Holy Quran in the Arabic Service scheduled from 0700 to 1000 on this frequency and in parallel on **21730.**

Syria

Damascus on **12085** at 1040, YL with songs in Arabic in a relay of the Domestic Service which may be logged on this channel from 0800 to 1500.

Turkey

Ankara on **15220** at 2016, YL with the station identification during the Turkish programme for Turks abroad, scheduled on this frequency from 0355 through to 2200.

United Arab Emirates

Dubai on **17775** at 1340, OM with the station identification and the news in an English programme for Europe and North Africa, scheduled from 1330 to 1400. Also logged in parallel on **21695.**

USSR

Yerevan, Armenian SSR on **4810** at 0100, organ music interval signal then YL with the Moscow identification followed by OM with the news in Russian. This 50kW regional transmitter relays Moscow 1 from 0100 to 1300 and Yerevan 2 from 1300 to 2000.

SOUTH-EAST ASIA

Australia

Melbourne on **7205** at 1619, OM with a talk in English about short wave listening in the English Service to the Pacific Islands and Papua New Guinea on this channel from 1430 to 1730.

Vietnam

Hanoi on **10010** at 1525, YL with announcements during the Chinese programme to the Far East, scheduled from 1500 to 1530.

EUROPE

Albania

Tirana on **14320** (much to the annoyance of radio amateurs no doubt) at 1414, OM with a talk in the Standard Chinese programme for China, timed from 1300 to 1400.

Austria

Vienna on **15410** at 0544, OM with a talk in the German programme for Europe, North Africa and the Middle East, scheduled from 0500 to 0600.

Finland

Helsinki on **6120** at 0552, OM with a talk in Finnish in a Domestic General Programme relay to Europe, timed from 0345 to 1300 and from 1500 to 1600 on this frequency.

Greece

Thessalonika on **11615** at 1404, OM with a talk in Greek during a short wave relay of this regional station, timed from 1000 (Sunday from 0600) to 1730 and from 1800 to 2215 (Sunday one hour earlier).

CLANDESTINE

Voice of Democratic Kampuchea on **11675** at 1350, OM song, YL with announcements then OM and YL with a battle song in Cambodian. Abruptly off at 1357 then Radio Beijing chimes with the East is Red tuning signal and then this also abruptly off! This clandestine is on the air in Cambodian from 1300 to 1400 and is located in China – obviously!

NOW LOG THIS

Radio Nueva America, La Paz, Bolivia on **4797** at 0301, OM with the station identification and location in Spanish complete with a slight echo effect. This 1kW transmitter operates from 1000 to 1310 (sometimes to 1830) and from 2200 (sometimes from 2000) to 0400, Sunday from 1030 to 2245 (sometimes 2300).

NOW HEAR THIS

Radio Tropical, Tarapoto, Peru on a measured **4934.6** at 0336, OM promos in Spanish, OM with news items separated by a single chime at 0345. OM with station identification at 0401 followed by an orchestral/choral version of the National Anthem and off at 0404.

DOTS AND DASHES

As a change of occupation, a few sessions on the CW portions of the 40 and 160 metre bands brought forth the following. On 160 metres (Top Band) DL3XK, EI9Q, GD0/DL4VB, IK1DQK, LZ2KCS, OH1XX, OK3CZA, RT5UO, SM6EHY, UA2FF, UB5AB, UP1BZR, UQ2PQ, UT5AB, YU1ELM and Y37XJ. On 40 metres HI8DDC, HK4FLT, LU1MRA, PY2PKS, PZ2AC.

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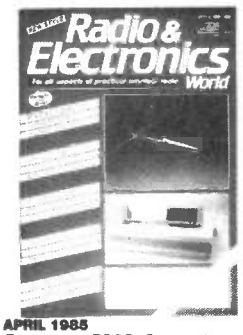
JANUARY 1985
Features — Canal Plus, Europe's first VHF/UHF pay-TV service; Phased Vertical Arrays, a computer program for the design and modelling of antenna systems; Russian Satellites, the first part of a series looking at the equipment used to decode signals from the navigation satellites; RF small 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.

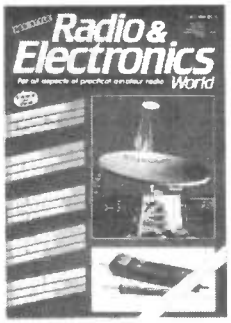
MARCH 1985
Features – Spectrum Watch, a survey of the latest developments in the radio spectrum; Russian Satellites, part three outlines the computing of the received data; Variable Frequency Ramp Generator, a circuit for testing bandpass filters; Electronic Lock, a cheap and versatile project; Data 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, photodiodes 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 - USA!, 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.

AUGUST 1985
Features – Spectrum Watch, DBS developments in China and undersea cables; Power Supplies, this month a look at pass transistors; Video Monitor Conversion, conversion of an ordinary TV set into a video monitor (part one); Satpack, a package of information, data and programs for BBC microcomputer; To Heard and Back, part one of a DXpedition to a remote island in the Indian Ocean; Data File, part two of series on the 555 timer IC.

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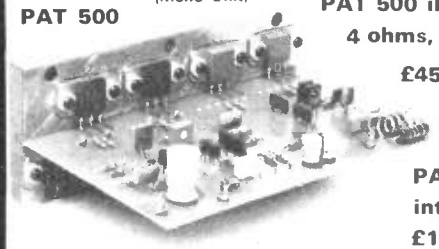

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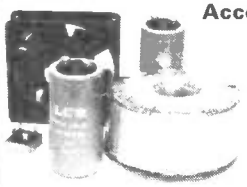

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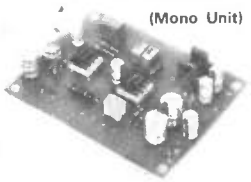

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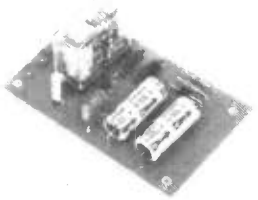

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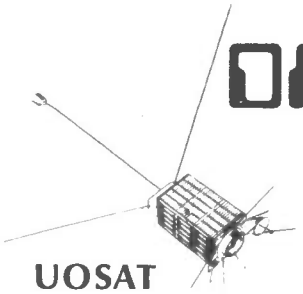

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■ SB102 transceiver, ham bands, 180W PEP SSB/CW. Inc P/supply, spkr, mic, handbooks, clean working condition, £150. SX62AU, was 'Hallicrafters' top Rx for gen-coverage, 500KHz to 108MHz ideal for BC band listener, powerful Rx and good order, £70. CTE 100W, 240V, 26-30MHz linear, £35. SX71, 500KHz-55MHz gen-cov Rx by Hallicrafters, bandspread on ham bands, ok on SSB. Good clean Rx, £75. SX24 'Defiant' again by Hallicrafters, 500KHz-32MHz, no mods, immaculate original order, stored for 20 years, new mains lead put on, and works like new, 2 owners since 1939, a good collectors Rx, £65. BC348M, 240V, again in immaculate condition 1 mod, Dial-lite switch, instead of rotary control. Unmarked F/panel, you will have a job finding a cleaner model, £60. Belcom LS102L 26-30MHz SSB/FM/CW/AM. FB on SSB but suffers bleedover on FM (CB). Good clean Tx/Rx, in box £170. BC906 freq meter, £8, in wooden case. WW2 mine detector, working and complete, £15. Boonton Rx meter, 250/A, USA. H/Book £20. All gear ono. Tel: (0908) 314095

■ Zetagi BV131 linear amp. Converted 10 metre and 15 metre amateur bands. Also works on 11 metre band. 100W AM/FM 200W SSB. Very good condition £80 or nearest offer. Tel: any time after 4.30pm and ask for Paul on Congleton 275158

■ Fortop 23cm Rx TVR130. Also video modulator Fortop TVD100, both for £100, brand new. Jaybeam 23cm corner reflector antennas. New, two for £20 each. Pye 17inch b/w TV monitor, £20. Ikegma 9inch b/w TV monitor, £20. Toyo T435 2m/70cm I/L wattmeter, brand new, £25. Collect or carr extra. W Burton, 149 Longfellow Rd, Coventry. Tel: (0203) 455021

■ Siemens console radio, six short waves, medium, long and VHF. Rosewood cabinet, good selectivity, very wide tuning dial and five speakers. Perfect working order. Ideal for the beginner in DXing on all bands. £45.00. Common core basic electricity course, five books, and BIET electrical mathematics course, twenty one lessons, £12.00 the lot. Can deliver. Mr Lewin, 345 Tom's Lane, Bedmond, Watford, Herts WD5 0RA

■ Radio books old and new. Also books on traction engines, diecast toys and tropical fish. SAE to Marris, 35 Kingswood House, Harnham Road, Slough, Berks SL2 1DA

■ Vintage wireless set. Osram Music Maker. 1928 model. Complete with valves. Circuit diagram available. Good condition. Matching speaker unit included. £40. Please tel: Reading 883799

■ Clearing shack, Eddystone S640 receiver, 1.6MHz/33MHz usual features £30. Heathkit GR54 receiver AM/LSB, USB/CW. 1.5MHz/30MHz Morse key connections £38. Wayne-Kerr frequency calibrator CT42, 3 plug in xtals £18. Wayne-Kerr component bridge B121. Resistance, capacity, inductance, £15. Newnes Radio/Television 1946-61, 1966-73, + old blueprints, 14 vols. £20. New regulated PSU, 13.8V 3.5 amps £11. 9.5mm prewar films 1,300ft including George VI Coronation, C Chaplin 400ft, S Pollard, Mickey Mouse, tennis £25. PSU 12V-16V dc 2.5A autocut-out (for models) £4.50. Philips 30kV probe, as new £4.50. Grundig 8 channel radio control transmitter, receiver and filters- 8 various Servos £20. Pye Cambridge AM 10 DV Tx, 170.025, Rx, 165.825, £10. CB radio Midland 2001 £10. CB antenna Thunderpole 2 new boxed £16. Eumig S 8 10D 15 watt sound film projector 8mm dual standard with case, sound on sound, auto-dub etc. Used only 5 times, plus Chinon sound film camera (reflex) auto/manual zoom lens F1,9-25mm, mike and earphone used for 2 x films only, with case, cost £315 sell £130 the lot. Minolta 50mm lens (Rokkor 1.2) auto SRT 100 plus case plus 80/200mm telephoto lens with case, auto 24 flash and super wide semi-fish eye lens, new, in case £110. Halinamat 300 watt semi-automatic slide projector hardly used since new, F1.28/100mm lens inc slide cassette £12. Uher tape recorder, mint, metal body, desk top portable with spare tapes £16: Ferrograph tape machine, Wright and Weare mechanism as was used by BBC, 3 heads (one stereo) dubbing in, fade in/out etc, meter fitted, hardback manual. First £35. New contact printer £3.50, tape recorder, as new, spare tapes £9. Various cassette player/recorders £7-£12. Car stereo radio/cassette player, speakers £16. 2 car stereo cassette players, speakers, £10 each. Stereo cassette 2nd speaker, unhinges from body, plays and records, mains/battery £12. Stereo cartridge as above £9: Vega long, medium and 6 short wave receiver. Battery/mains £14. Portable record player professional Thorens deck, removable 3-way speaker in lid, superb £15. All the items are ono you collect or post extra. G1IPC J D Methuen, 42 Alpha Road, Crawley, Sussex RH117AZ Tel: (0293) 27187

■ Creed 444 teleprinter with integral tape punch and reader. Complete with BARTG terminal unit. £65. Buyer collects. John Rowles. Tel: (0480) 66908 (St Ives, Cambs)

■ JVC CD 4 four channel compact disc demodulator, offers or exchange anything radio/electronic. Paul O'Flanagan, Flat 3, 29 Prideaux Road, Stockwell, S London SW9 9LQ. Tel:(01) 733 0665

■ FT102 with FM board fitted. Used in Rx mode only. RF amp needs attention. Exchange for general coverage valve receiver with cash adjustment or £400 cash. David Jones, 24 Cowell Road, Garwant, Dyfed. Tel: (0269) 84 2953

■ Kyokuto 10 watt FM mobile 144-149 must sell £99. Ferguson b & w portable 12V/240V vgc £29. 70cm multibeam £10. Approx 200 valves some old TV radio transmitting VHF/UHF HF, some new, offers TV tubes. Offers VHS video recorder, good condition remote £169. Dave Hoddesdon. Tel: (0992) 440587 after 6pm.

■ KW EzeeMatch ATU £35. LAR HF omni match ATU all bands incl WARC £60. SEM Ezitune ant tuning bridge £25. Half size G5RV £7.50. Mains PSU 12 volt 5 amp metered £15. All items brand new. John Randall G3OAZ, 243 Paddock Road, Basingstoke, Hants. Tel: 465126

■ Trio TS780 dual bander 144/432 multimode base station. As new, boxed with SP70 speaker. Cost new £1000+. £750 ono Icom IC701 HF transceiver, 100W digital all bands with matching PSU, remote keyboard, etc. As new, £495 complete. Tempo 2002 2kW 144MHz linear unused £785. Tel: (01) 9984936 after 7.30pm

■ Two Creed Envoy teleprinters. One including work desk. Offers invited. Tel: (570) 4077, ask for Shomit

■ Portable computer, Tandy model 100, 24K RAM, CW, case, manuals, printer cable, ac adaptor plus built in software WP Telcom for communication. Also C/W acoustic coupler for data transfer along telephone lines ie Telecom Gold perfect condition, £450 the lot. Also for sale thermal printer, ideal for Tandy, CoCo and Dragon. Will work with Spectrum thru RS232C £40. Tel: (0742) 471160, after 7.00pm

■ Pye Cambridge AM10B 6 channel mid band £2. Microphone control box and cables £1. Loudspeaker £1. Creed 6S6M auto Tx £3. Creed 7TR punch £3. New boxed valves EF91, EF92, ECC81, 6BH6, 5U4G, 5Z4G, £1 each. 6BR7 £2. 5B254M £10 pair. Tel: Hitchin 811591, after 6pm

■ Eumig dual projector 8mm standard and 8mm super. Mirage 8mm super camera as new in leather case. One splicing or jointing machine. Films yes. One AVO signal generator portable No 2 ZD03771 complete in case. Must be collected. Would exchange for a good 70cm transceiver. RD Hargreaves, 58 Horsewell Lane, Wigston Magna, Leicester LE8 2HQ Tel: (0533) 889903

■ Trio TR2500 2 Ni-cads plus car plus adaptor plus carry case, belt clip, sp/mic, spare case and top piece. Swap for Yaesu FT-290R with Nicads or sell £200 ono. Tel: (0742) 471160 after 7.00pm.

■ Racal RA17 general coverage receiver, good condition, £145 ono. Tel: Birmingham (021) 328 3293

■ Spectrum + with microdrive. 3 months old with guarantee and 3 years insurance. Kempston joystick, plenty of books and software inc RTTY on both tape and microdrive. Also CW terminal on tape. No interface needed, just 2 leads for RTTY or CW Tx. Exchange 2 metre portable multi-mode (FT290 or similar) or cash £200. No offers. Tel: Len G6ZSG (021) 453 9762, anytime

■ Hewlett Packard transistors, low noise (2.8dB), 4GHz type HXTR6101 (2N6617), ideal for satellite Rx, QTY limited, £35 – each. Taylor. Tel (01) 969 3192 eves

■ Scarab systems terminal unit, MPTU-1, £38.00. No offers. Prefer buyer to inspect and collect, or £1.50 postage.SAE for reply appreciated. Maurice G6IMV, 18 Mossvale Grove, Washwood Heath, Birmingham B8 3QJ

■ HF Tx FLDX 500, 240W 80-10 mtrs, £90 ono. Burndept B473 hand-held on 2 mtrs. Fitted Rx R5, S17, S22. No Tx xtals with CCT, batteries £50 ono. Roller coaster coil £3. Datong speech processor with nicads £25. RA17 Rx with CCT £120. 70cms Westminster transistorised, 4 ch fitted 15W PA all leads etc £50. Swap any above for 70/2MHz SSB gear, WHY all collect or post extra. Ben G4BXD Tel: (021) 525 9772

■ Modem 1200/75 full duplex, 1200/1200 half duplex, (direct connect type) plus ROM for Prestel. Unwanted prize, hence as new condition. £45. Also RH Electronics lightpen for BBC micro £25. Tel: Dave (061) 430 2060, after 6pm

■ Exchange Grundig Yacht Boy 700 receiver, digital, analogue, clock, SSB, wide, narrow, 5kHz filter, immaculate for Telereader CWR610E decoder unit, must be in first class condition. Borthwick, 92 Linglie Road, Selkirk, Selkirkshire

■ Trio 9R-59D communications receiver and matching SP5 DS speaker. Good order £60. GEC base station transceiver. 10 channel 158-2 MHz and some hand sets same frequency. Offers. G W Reed 96 Wootton Road, King's Lynn, Norfolk PE30 4BT

■ JIL SX400 VHF/UHF scanning receiver, 25-520MHz no gaps, AM FM with facility for computer interface, excellent receiver, bargain at £400.00 ovno. Boxed with manual, only a few months old. Reason for sale owner changing to HF bands. K L Phillips, 3 Linden Court, Frithville Gardens, London W12 7JJ. Tel: (01) 743 0811

■ Tau SPC3000 HF ATU brand new, unused in original carton with handbook, slow motion tuning with power and SWR meters, will handle 1kW output, selling up, will accept £200.00 ono. Buyer collect or postage extra. Tel: (051) 644 9122 after 8pm Merseyside area.

■ Potted bridge rectifiers ITT 70USD 13003MDH, 25p each. Reed switches, 6p each. Weller TCPI with PUID £8.50. Red point powersinks 94x55x14 (18) 30p each. Binocular microscope head Reiche, offers. Stereoramic bench magnifier. New lens and spare fluorescent tube £30. Jacobs drill chucks ¼, 5/16, ⅜, £3 each. Agfa Gevaert 10½in spools. Cine centres new (4) 75p. Each KT66 GEC new £8. Various chrome instrument case handles. SAE for list. Evenings or write to: Mr F Joyce, 110 Charteris Road, Kilburn, London NW6 7EX

■ ASR33 ASCII printer and keyboard with full set of service manuals. Offers invited. Tel: Tony Leeming (0608) 811102

WANTED

■ 144MHz wavemeter 144MHz multimode base station, portable or mobile at 70cm considered, 144MHz 100 or 150 watt linear amplifier, BBC Micro and modem printer disc driver. G1IPC. Tel: (0293) 27187

■ FT290R/FT790B or any separate 2m/70cm rigs. Tel: (01) 9984936, after 7.30pm

■ RTTY CW to TV converter, also 70cm mobile trcvr. Tel: (0452) 423908 (Gloucester)

■ Power transformer for Solatron CD1014.2 or a transformer with 6.3V, 120V, 165V secondaries. A circuit diagram would also be appreciated. Can refund all postage photocopy costs. Large air spaced HV capacitors also required for ATU. Stephen Thomas, 14 Brown Street, Shotts ML7 SNL. Tel: Shotts 23725

■ RTTY/CW CWR670 receive only or similar, £200 offered or WHY. Mr Lear, Flat 86, Block 205, Wensley Road, Reading, Berks.

■ Yaesu FRG7700 or FRG7000. Must be in first class order and reasonably priced. Collection can be arranged. G W Reed, 96 Wootton Road, Kings Lynn, Norfolk PE30 4BT. Tel: (0553) 763428

■ Old 120 volt high tension eliminator. Also 6 volt Mullard P5MX general purpose valve. Bell mouth and swan neck for Gecophone horn speaker. E Lane, 115 Wooton Road, King's Lynn, Norfolk PE30 4DJ

■ Valves: 'R' type to KT88, any quantity, output triodes especially wanted. All valve wireless, communications, audio equipment and crystal sets. Early quality hi-fi amplifiers using large output valves, tuners, turntables, speakers, pick-ups and heads, pre-1950 radiograms etc. Compact, transportable, military receivers, transmitters, American midget radio-sets, Ekco, Philco, Philips etc, bakelite radios and speakers. Anything valve and interesting considered. Please write: John Baker, 57 Birkenhead Street, London WC1 8BB. Tel: (01) 833 3008

■ VFO suitable for Trio 2200GX- 7200G- 7200GII believe serial no VFO 30 but will consider any suitable VFO. Will consider transceiver and VFO if necessary. Also wanted VFO suitable for Trio 7010 SSB CW. Tel: Allan (0782) 612868

■ Information wanted for Sphynx SSB transmitter, photocopies of handbook, circuit diagrams etc. Also wanted, manual for MS5U signal generator and info for converting Pye pocket-phones to 70cm. Paul O'Flanagan, Flat 3, 29 Prideaux Road, Stockwell, London SW9 9LQ. Tel: (01) 733 0665

■ 2m handheld or mobile rig in exchange for Sanyo Beta video 9300 heads. Ideal for DX TV. Covers bands one, three and UHF. Also wanted AM/FM/USB/LSB/+legal FM CB rig in exch for 3 inch portable TV+ radio. Covers DX/TV Chns bands one, three + UHF. Radio covers AM+FM or exchange both for 64K Commodore + Dataset or gen coverage receiver WHY? Graham, 9 Burngreave Road, Sheffield. Tel: (0742) 700074 anytime

■ General coverage receiver in any reasonable condition. Straight swap Sanyo Beta video recorder. Requires some attention. William McGuigan, 34 Newbattle Ave, Calderbank, Airdrie, Lanarkshire ML6 9TS. Tel: Airdrie 53366

■ Datong converter UC1 or PC1. Tony Leeming. Tel: (0608) 811102

■ Pan adaptor Eddystone EP15 or EP20. Please ring or write with details; G8CGW, 92 Hinckley Road, Barwell, Leicester. Tel: (0455) 47040 after 7.00pm.

■ Nato 2000, Belcom 26-29MHz and FT707 in perfect condition. Tel: (0283) 221870.

■ HRO senior receiver wanted. Coils not essential, would buy, but prefer local exchange for Codar AT5 15W AM/CW transmitter, complete with mains PSU, circuit and instruction, mike etc in good clean condition and working. Harry G4FEQ. Tel: Castleford (0977) 552862.

■ FRG7700 or Trio R1000 or Trio R600 or any good comm Rx in exchange for Amstrad CPC464 colour computer, six months old, plus software + books. Mr J Durham, Dunedin, The Green, Hatfield Peverel, Chelmsford, Essex CM3 2JQ.

■ 16mm Bell Howell (GSAP) gun camera ex-USN or air force 24Vdc working, mag load, black diecast construction with or without lens. Any condition. Also K9 16mm coaxial load 16mm cine camera military type. Tel: (0225) 706795 (Bath).

■ Icom IC402 portable 70cms SSB transceiver, any condition considered. Also leather case or any accessories for Icom IC2025. Chris Kelland G6LRY QTHr. Tel: Wantage (023 57) 2205 evenings.

■ One PR40 Codar preselector. Battery operated nine volts dc from £5-£8 and one digital amateur bands receiver from £40-£50. Must have all bands working. Not a valve receiver. Tel: Wood. Clochen 378.

■ My Texas TI99/A computer is in dire need of an interface and software to enable it to receive and transmit RTTY. Can anyone advise me of a source of supply? Also still wanted – video tapes for my Shibaden recorder and a WW2 American aircraft transmitter type BC375 or BC191 – surely the Yanks didn't take them all back to USA? Write or phone Nev Kirk, G3JDK, 54 Allendale Road, Rotherham, Yorks S65 3BY. Tel: Wickersley 541606.

■ Yaesu FRG7700 or FRG7000. Must be in first class order. Also FRT7700 or similar. Collection can be arranged. G W Reed, 96 Wootton Road, King's Lynn, Norfolk PE30 4BT. Tel: (0553) 763428.

■ 120 volt high tension eliminator required for old Mullard radio. Also P5MX 6 volt general purpose valve for same. Bell mouth and swan neck for Gecophone horn speaker. E Lane, 115 Wootton Road, King's Lynn, Norfolk PE30 4DJ.

■ Yaesu FV50B VFO, also xtals for Yaesu FL50B Tx and external speaker. Please state price and condition. G R Woodley, 16 Albert Street, St Barnabas, Oxford OX2 6AY.

FREE CLASSIFIED AD ORDER FORM

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USE BLOCK CAPITALS (One word per box)
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Name/Address Postcode/Telephone							

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PL1 RTTY mod/demod	£14. 50k	£18.50a
MF1 Morse demod	£12. 50k	£18. 50a
FP1 Power supply/amp	£11. 50k	£14. 50a

a = assembled PCB, k = kit of parts.

Software available for: Dragon VIC20, CBM 64, BBC, Amstrad CPC464, Acorn ATOM. Please add VAT at the current rate.

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This method of advertising is available in multiples of a single column centimetres — (minimum 2cms). Copy can be changed every month.

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per single column centimetre:
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COPY enclosed.....☐ to follow.....☐

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CHARGE TO MY ACCOUNT.....☐

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C P I

Radio & Electronics World
For all aspects of practical amateur radio

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	⅛page	£91.00	£86.00	£82.00	£73.00
128 x 90 or 61 x 186	¼ page	£160.00	£150.00	£145.00	£125.00
128 x 186 or 263 x 90	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£560.00	£530.00	£475.00
263 x 394	double page	£1140.00	£1070.00	£1020.00	£910.00

COLOUR AD RATES

colour rates exclude cost of separations

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	½ page	£420.00	£395.00	£375.00	£335.00
297 x 210	1 page	£810.00	£760.00	£730.00	£650.00

SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area = 307 x 220]
Facing Matter: 15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono proof ad	mono no proof and small ad	mono artwork	on sale thurs
Oct 85	15 Aug 85	21 Aug 85	23 Aug 85	12 Sep 85
Nov 85	12 Sep 85	18 Sep 85	20 Sep 85	10 Oct 85
Dec 85	17 Oct 85	23 Oct 85	25 Oct 85	14 Nov 85
Jan 86	14 Nov 85	20 Nov 85	22 Nov 85	12 Dec 85

CONDITIONS & INFORMATION

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.

If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.

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.

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.

FOR FURTHER INFORMATION CONTACT
Radio & Electronics World, Sovereign House, Brentwood, Essex CM14 4SE.
(0277) 219876

Overseas payments by International Money Order.
Commission to approved advertising agencies is 10%.

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.

ADVERTISERS INDEX

EAST CORNWALL COMPONENTS

RESISTORS — CARBON FILM 5%

1/4W 1RO to 10M (E12 Range)	**2p each. 15p/10. 75p/100**
1/2W 2R2 to 10M (E24 Range)	**2p each. 15p/10. 75p/100**
1W 10R to 2M2 (E12 Range)	**7p each. 65p/10. 6.00/100**
2W 10R to 2M2 (E6 Range)	**8p each. 70p/10. 6.00/100**

RESISTOR KITS — each value individually packed

1/4W pack 10 each value E12 — 10R to 1M 610 pieces	**5.00**
1/4W pack 5 each value E12 — 10R to 1M 305 pieces	**3.00**
1/2W pack 10 each value E12 — 2R2 to 2M2 730 pieces	**6.00**
1/2W pack 5 each value E12 — 2R2 to 1M 365 pieces	**3.00**
1W pack 5 each value E12 — 2R2 to 1M 353 pieces	**15.00**
2W pack 5 each value E6 — 10R to 2M2 317 pieces	**18.00**

RESISTORS — WIREWOUND Generally 5%

2-5W 0-22 to 270R Available in preferred values	**0.20**
4W 1Ro to 10K. Available in preferred values	**0.21**
7W 0.47R to 22K. Available in preferred values	**0.25**
11W 1R0 to 22K. Available in preferred values	**0.29**
17W 1R0 to 22K. Available in preferred values	**0.37**

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Plastic Co-ax Plug	**0.14**
Single Junction Socket	**0.80**
Plastic Phono	**0.10**
FM Plugs	**0.20**
PL259	**0.38**
Reducer	**0.15**
2.5mm Plug Metal	**0.15**
2.5mm Plug Metal	**0.16**
2.5mm Chassis Socket	**0.10**
3.5mm Chassis Socket	**0.10**
2 pin 1/4in Mono Chassis Socket	**0.14**
4 pin 1/4in Mono Chassis Socket	**0.20**
6 pin 1/4in Mono Chassis Socket	**0.30**
4mm Banana Plug	**0.15**
4mm Banana Socket	**0.15**
PP3 Battery Connectors	**0.05**
PP9 Battery Connectors	**0.16**

FUSEHOLDERS

20mm Panel Mounting	**0.28**
20mm Chassis Mounting	**0.05**
1/4in Panel Mounting	**0.35**
1/4in Chassis Mounting	**0.342**
Carline 1 1/4in Mounting	**0.10**

COPPER WIRE

Tinned & Enamelled · 2oz Reels.
14 to 38 swg **£1.00 per Reel**

Soldering Section

XS25 Watt Iron Kit/complete with stand & plug attached	**7.20**
CS 18 Watt as above	**7.00**
ANTEX 15W IRON	**5.00**
ANTEX 18W IRON	**5.00**
ANTEX 25W IRON	**5.20**
ANTEX ELEMENTS	**2.00**
ANTEX BITS	**0.95**
ANTEX STANDS	**1.90**
SOLDERSUCKER	**4.50**
500gm SOLDER	**6.80**
SOLDA MOP	**0.70**
ANTEX SOLDERING STATION complete with Iron — 30W or 40W	**40.95**
Spare nozzles for Soldersucker	**0.45**

NI-CAD

Universal Ni-Cad charger, charges PP3, AA, C.D
Price **£6.00**

RECHARGEABLE BATTERIES

AA HP7	**0.65**	10/**0.76 each.**
C HP11	**1.75**	10/**1.65 each.**
D HP2	**2.05**	10/**1.95 each.**
PP3	**3.80**	10/**3.70 each.**

ZENER DIODES

400mW Plastic 3V-75V **8p each 10/75p**
1.3W Plastic 3V-200V **15p each 10/£1.40**
1.5W Flange 4.7-47V **£1.26 each**
2.5W Plastic 75-75V **64p each**
20W Stud 75-75v **£1.35 each**

ZENNER PACK

400mW-5 each value -55 off **£3.50 per kit**

CERAMIC CAPACITORS

ALL 50V. 1pf to 10pf **4p each**
100 for £2.75

CERAMIC KIT - 5 off each value - 25 values - total 125 Caps for **£3.50**

VIDEO PROJECTION UNIT

Brand new, complete & working but no instruation manual.
Supplied complete with Projector, Tuner & Screen.
Price: Normally over £2,500
Our Price: **£1,200**

PLASTIC BOXES

3x2x1"	**0.35**
3x2 1/2x2"	**0.55**
4x3x1 1/2"	**0.70**
4 1/2x4x1 1/2"	**0.83**
6x4x2 1/2"	**1.15**
8 1/2x5x3 1/4"	**2.15**

TELEPHONE SPECIAL

BT Approved Telephone Plug + 3m Lead	**1.25**
BT Approved Master Socket Inc. Wiring Instrns	**2.85**
BT Approved Secondary Socket	**1.95**
BT 4-Core Cable 1M.	**.15**
100 M.	**12.00**

BT Telephones now available.

SERVICE AIDS

ALL SERVISOL PRODUCTS

Switch Cleaner	**0.95**
Circuit Freezer	**1.14**
Foam Cleanser	**0.96**
Aero Klene	**0.90**
Silicone Grease (Aerosol)	**1.84**
Silicone Grease Tbe	**1.60**
Antistat Spray	**0.98**
Plastic Seal	**1.08**
Excel Polish	**0.92**
Fire Extin 640g	**2.86**
Video Head Cleaner	**0.86**
Super 40 Moisture	**1.48**
Repel & Lub	**1.62**
Solder Mop Std	**0.72**
L/g	**0.72**
Addtl P & Don Aerosols	**30p ea**

VEROBOARD

0,1in Clad,

2 1/2 x 3 3/4"	**85p**
2 1/2 x 5"	**1.00**
3 3/4 x 3 3/4"	**1.05**
3 1/2 x 17"	**3.25**
3 3/4 x 17"	**4.10**
4 3/4 x 17 3/4"	**4.95**

0,1in PLAIN.

3 3/4 x 5"	**95p**
3 3/4 x 17"	**2.70**
DIP Board	**3.85**
Vero Strip	**1.25**
Pkt. ef 100 pins	**50p**
Spot face cutter	**1.48**
Pin insert tool	**1.83**
Vero Wiring Peg + spool	**4.50**

INTEGRATED CIRCUITS (£) EACH

Type	£	Type	£	Type	£	Type	£	Type	£
AN240P	3.42	TA7108P	3.20	TBA970	4.05	4000	0.24	4503	0.40
AN214Q	3.88	TA7120P	2.20	TBA990	1.88	4001	0.24	4507	0.48
AN715Q	2.90	TA7129AP	3.65	TCA160C	3.90	4002	0.25	4508	1.30
CA3065	1.75	TA7130P	1.65	TCA270S	4.00	4007	0.25	4510	0.65
CA4031P	2.88	TA7172	1.80	TCA270SA	4.02	4011	0.24	4511	0.55
CA4102	3.30	TA7193	5.50	TCA800	7.50	4012	0.24	4512	0.55
CA4250	3.50	TA7172P	1.80	TCA940	1.90	4013	0.65	4514	1.15
CA4400	2.96	TA7176	2.50	TDA440	3.80	4014	0.60	4515	1.15
CA4422	3.07	TA7202P	4.18	TDA1002	1.90	4015	0.60	4516	0.65
LC7120	5.33	TA7204P	1.86	TDA1003A	5.50	4016	0.40	4517	2.70
LC7130	5.26	TA7205AP	1.50	TDA1004	3.75	4017	0.60	4518	0.48
LC7137	5.16	TA7208P	3.25	TDA1006A	2.40	4018	0.60	4020	0.53
LM380N	1.65	TA7210P	.60	TDA1035S	4.50	4020	0.65	4521	1.15
LM1303N	2.82	TA7222P	2.12	TDA1044	4.30	4021	0.68	4522	1.25
HA1151P	3.12	TA7223P	3.68	TDA1170S	3.00	4022	0.96	4526	0.60
MC1307P	1.85	TA7227P	5.60	TDA1190	3.50	4023	0.36	4527	0.65
MC1310P	1.85	TA7310P	1.80	TDA1200	2.95	4024	0.60	4528	0.68
MC1312P	2.25	TA7609P	4.28	TDA1270Q	3.70	4025	0.24	4531	1.30
MC1327P	1.75	TA7611AP	2.88	TDA1327A	1.66	4027	0.46	4532	0.65
MC1330P	0.83	TAA263	2.45	TDA1352A/B	1.58	4028	0.46	4536	2.65
MC13449P	1.65	TAA310A	2.68	TDA1412	1.20	4029	0.75	4538	0.60
MC1350P	1.20	TAA550	0.60	TDA2002	2.80	4030	0.36	4539	0.90
MC1351P	2.50	TAA570	1.99	TDA2020	4.60	4031	1.30	4541	0.90
MC1352P	1.60	TAA611A12	3.60	TDA2030	2.78	4033	1.25	4543	1.25
MC1357P	.88	TAA611B12	2.85	TDA2140	5.90	4034	1.46	4549	4.00
MC1358P	1.30	TAA630S	3.90	TDA2521	4.10	4035	0.70	4553	2.46
MC1496L	1.15	TAA661B	1.70	TDA2523	3.50	4036A	2.75	4554	1.92
ML231B	2.10	TAA700	2.80	TDA2530	2.70	4038	0.75	4555	0.35
ML232B	2.10	TAA840	3.38	TDA2540	3.80	4039A	2.80	4556	0.65
ML237B	2.30	TAD100	2.80	TDA2541	3.80	4040	0.60		
NE555	0.35	TBA120A	1.00	TDA2560	3.50	4068	0.24		
C-mos 555	0.88	AS,S,SA,SB	1.30	TDA2571A	5.75	4069	0.24		
NE556	0.80	Q,T,U,UQ	1.32	TDA2581	3.20	4070	0.25		
SAA1024	5.35	TBA120B	1.30	TDA2590	3.20	4071	0.24		
SAA1025	8.40	TBA231	1.45	TDA2591	2.98	4072	0.25		
SAS560A	2.50	TBA281	2.65	TDA2593	2.95	4073	0.25		
SAS560S	1.85	TBA395	1.20	TDA2610	3.20	4075	0.25		
SAS570S	1.85	TBA480Q	1.60	TDA2611A	1.94	4076	0.68		
SAS580	2.85	TBA400	2.30	TDA2640	2.90	4077	0.25		
SAS590	2.82	TBA510	2.60	TDA2680	3.40	4078	0.25		
SC9503P	1.10	TBA510Q	2.60	TDA2690	3.50	4081	0.25		
SL432A	4.00	TBA520/Q	1.60	TDA3950/A/B	2.60	4082	0.25		
SL901B	5.20	TBA530/Q	1.30	UPC554C	1.32	4085	0.58		
SL917B	6.25	TBA540/Q	1.40	UPC557H	0.90	4086	0.68		
SL1327Q	1.10	TBA550/Q	1.52	UPC566H	2.95	4089	1.25		
SN76003N	2.44	TBA560C	1.70	UPC575C2	3.20	4093	0.37		
SN76013N	1.90	TBA560CQ	1.80	UPC1018C	1.10	4094	0.95		
SN76023ND	2.90	TBA570	1.50	UPC1025H	2.90	4095	0.95		
SN76033N	2.45	TBA651	2.80	UPC1032H	0.90	4096	0.99		
SN76110N	1.12	TBA673	2.40	UPC1156H	4.20	4097	2.65		
SN76115N	2.00	TBA700	2.85	UPC1158H	0.76	4098	0.80		
SN76131N	1.65	TBA750	2.80	UPC1163H	0.98	4099	1.05		
SN76226DN	1.80	TBA800	1.60	UPC1181H	1.60	4161	0.96		
SN76227N	1.10	TBA810P	1.10	UPC1185H2	3.75	4162	0.96		
SN76530P	1.40	TBA810S	1.20	UPC1212C	1.30	4163	0.96		
SN76533N	1.80	TBA820	1.60	UPC1230H	3.90	4174	0.96		
SN76650N	1.05	TBA890	3.88	UPC1350C	4.25	4175	1.00		
SN76660N	0.75	TBA920/Q	3.00	UPC1367C	3.40	4194	0.99		
SN76666N	0.80	TBA950/2A	3.05	UPC1378H	4.40	4501	0.38		
STK015	6.60			UPC2002H	2.80	4502	0.38		

D C MOTORS (Min)

6-12V **0.75**

IC SOCKETS DIl to DIl

8	pin	**0.08**
14	pin	**0.10**
16	pin	**0.11**
18	pin	**0.14**
22	pin	**0.21**
24	pin	**0.25**
28	pin	**0.30**
40	pin	**0.34**

BRIDGES

1 1/2A 50V	**0.27**
200V	**0.32**
600V	**0.50**
3A 100V	**0.52**
600V	**0.67**
6A 100V	**0.66**
600V	**0.80**
10A 50V	**2.20**
400V	**2.50**
25A 50V	**2.05**
400V	**3.20**

SANYO ELIPTICAL LOUDSPEAKER
Eliptical Loudspeaker 5"x3" 4ohm 1.5W
PRICE ONLY 90p

SANYO 3" ROUND LOUDSPEAKER
3" Round Loudspeaker 8ohm 0.6W 1W maximum
PRICE ONLY 75p

SANYO DYNAMIC MICROPHONE
C/W 1 metre of cable and plug, ON-OFF switch and stand. 1MP 500ohm MODEL NoHM23
PRICE ONLY £1.25

SANYO DYNAMIC MICROPHONE
C/W 1 metre of cable and plug, ON-OFF switch and stand. 1MP 500ohm MODEL NoHM95
PRICE ONLY £1.50

MIN 'D' CONNECTORS

		9way	15way	25way	37way
PLUS	**Solder**	.52	.65	.88	1.45
	Lug	.89	1.34	1.98	3.48
	R Angle	.78	.98	1.33	2.48
SOCKETS	**Solder**	1.18	1.78	2.70	4.15
	Lug	.95	.95	.98	1.00
COVERS	**R Angle**				

POTENTIOMETERS

Carbon Track Rotary 0.25W Log & Lin values. All 1/4in Spindle, 20ml body dia, Shaft 2" long

4K7-2M2 Single Gang Log	.30	10/**3.00**
1K — 2M2 Single Gang Lin	.32	10/**3.00**
5K — 2M2 Single Gang DP Switch Log	.75	10/**7.00**
5K — 2M2 Double Gang Log & Lin	.86	10/**8.25**

VALVES

Type	Price (£)
DY802	0.86
DY86/87	0.75
ECC81	1.27
ECC82	0.65
ECC83	0.75
ECC84	0.90
ECC85	0.90
ECC88	0.95
ECF80	0.90
ECH81	0.75
ECH84	0.75
ECL82	0.75
ECL86	0.96
EF80	0.65
EF86	1.65
EF183	0.75
EF184	0.75
EH90	0.54
EL34	2.50
EL84	0.69
EL509	5.50
EM87	2.55
EY86/87	0.67
EY500A	1.65
PCC84	0.50
PCC85	0.65
PCC89	0.74
PCC189	0.85
PCF80	0.75
PCF86	1.25
PCF200	1.56
PCF801	1.46
PCF802	0.85
PCF806	1.20
PCL82	0.90
PCL83	2.50
PCL84	0.90
PCL86	0.58
PCL805/85	1.35
PD500	3.75
PFL200	1.35
PL33	1.50
PL36	1.45
PL81	0.85
PL82	0.75
PL83	0.65
PL84	0.75
PL95	2.00
PL504	1.20
PL508	2.40
PL509/519	7.50
PY88	1.80
PY500A	2.40
U26	1.90
UCH81	0.30
UCL82	1.70
6J5GT	1.78
6SJ7	2.20
30FL12	1.60
6JB6A	4.00

TRANSISTORS DIODES

Type	Price (£)	Type	Price (£)	Type	Price (£)
AC126	0.36	BC108	0.10	BC302	0.32
AC127	0.30	A B or C	0.12	BC303	0.32
AC128	0.30	BC113	0.14	BC307	0.10
AC128K	0.34	BC114	0.12	BC308A	0.10
AC132	0.85	BC115	0.12	BC323	0.99
AC141	0.26	BC116	0.15	BC327	0.14
AC141	0.26	BC117	0.22	BC328	0.14
AC141K	0.40	BC118	0.17	BC337	0.12
AC142	0.26	BC119	0.30	BC338	0.12
AC142K	0.48	BC125	0.12	BC350	0.14
AC151	0.45	BC140	0.28	BC440	0.30
AC152	0.48	BC141	0.42	BC441	0.32
AC176	0.28	BC142	0.30	BC461	0.32
AC176K	0.48	BC143	0.30	BC547	0.12
AC187	0.42	BC147	0.08	BC548	0.12
AC187K	0.48	A or B	0.10	BC549	0.12
AC188	0.44	BC148	0.08	BC550	0.18
AC188K	0.50	A or B	0.10	BC550C	0.18
ACY40	0.88	BC149	0.09	BC557	0.12
AD142	1.10	BC157	0.10	BC558	0.12
AD143	1.10	BC158	0.10	BCX34	0.27
AD149	0.96	BC159	0.10	BCY70	0.15
AD161	0.42	BC160	0.30	BCY71	0.17
AD162	0.42	BC161	0.30	BCY72	0.18
AD161/AD162	0.96	BC168B	0.12	BCZ10	1.68
AF106	0.48	BC169C	0.10	BCZ11	1.45
AF114	2.10	BC170	0.14	BD124P	0.80
AF115	2.10	BC170B	0.12	BC130Y	0.68
AF116	2.10	BC171	0.10	BD131	0.34
AF117	2.10	BC171	0.10	BD132	0.34
AF118	0.85	A or B	0.08	BD131/BD132	0.96
AF121	0.62	BC172	0.08	BD135	0.32
AF124	0.48	A or B	0.12	BD136	0.36
AF125	0.48	BC177	0.20	BD137	0.36
AF127	0.48	BC178A	0.22	BD138	0.36
AF139	0.68	BC182	0.08	BD139	0.38
AF178	0.68	A B or C	0.09	BD140	0.38
AF239	0.68	BC182L	0.09	BD144	160
AF279S	0.72	A B or C	0.09	BD145	1.82
AL100	2.60	BC183	0.09	BD150A	0.81
AL102	5.90	A B or C	0.10	BD159	0.65
AL113	2.20	BC183L	0.06	BD160	1.65
ASY80	1.75	A B or C	0.12	BD165	0.46
AU110	1.40	BC184	0.10	BD175	0.60
AY102	4.32	A B or C	0.10	BD182	1.00
BA102	0.34	BC207	0.15	BD183	1.10
BA110	0.67	BC208	0.15	BD184	1.20
BA121	0.40	BC212	0.09	BD201	0.72
BA129	0.35	A B or C	0.10	BD202	0.87
BA148	0.16	BC212L	0.08	BD204	0.80
BA154	0.06	A B or C	0.10	BD222	0.80
BA155	0.10	BC213	0.09	BD225	0.86
BA156	0.06	A or B	0.10	BD232	0.45
BA157	0.28	BC213L	0.10	BD233	0.60
BA164	0.14	A or B	0.10	BD234	0.62
BB104B	0.52	BC237	0.11	BD235	0.53
BB105B	0.30	BC236	0.12	BD236	0.63
BB105G	0.48	BC239	0.14	BD237	0.66
BB110B	0.42	BC251	0.12	BD238	0.56
BC107	0.10	A B or C	0.14	BD241	0.60
A or B	0.12	BC301	0.30	BD243A	0.80

Type	Price (£)	Type	Price (£)	Type	Price (£)
BD244A	0.65	BF258	0.30	BT101/300	1.15
BD375	0.32	BF259	0.32	BT101/500	1.25
BD410	0.76	BF262	0.30	BT102/300	1.35
BD434	0.68	BF263	0.30	BT102/500	1.65
BD436	0.68	BF270	0.30	BT106	1.60
BD437	0.75	BF271	0.26	BT108	1.30
BD438	0.75	BF273	0.18	BT109	1.18
BD439	0.68	BF274	0.32	BT116	1.25
BD507	0.46	BF323	0.92	BT119	3.62
BD508	0.53	BF336	0.26	BT120	3.60
BD509	0.54	BF337	0.26	BT121	3.02
BD510	0.46	BF338	0.26	BT138/600	1.30
BD517	0.56	BF355	0.42	BT151/560R	0.90
BD520	0.66	BF363	0.82	BT151/300R	1.15
BD699	1.25	BF367	0.24	BTY79/400R	2.80
BD707	0.88	BF371	0.27	BU100A	2.30
BDX18	2.35	BF422	0.35	BU104	2.00
BDX32	2.10	BF450	0.35	BU105	1.20
BF115	0.32	BF457	0.33	BU105/02	1.56
BF117	0.54	BF458	0.36	BU108	1.80
BF119	0.82	BF459	0.44	BU124	1.75
BF120	0.36	BFR39	0.22	BU126	1.25
BF123	0.40	BFR40	0.22	BU133	1.80
BF125	0.42	BFR41	0.22	BU204	1.35
BF127	0.38	BFR51	0.30	BU205	1.30
BF152	0.16	BFR61	0.32	BU206	1.70
BF154	0.23	BFR62	0.28	BU208	1.55
BF157	0.40	BFR88	0.34	BU208A	1.63
BF158	0.22	BFR90	1.72	BU208/02	2.05
BF159	0.24	BFT41	0.36	BU326S	1.75
BFR160	0.23	BFT43	0.36	BU407	1.65
BF167	0.30	BFW10	0.79	BU407D	1.80
BF173	0.25	BFW44	0.76	BUX80	3.70
BF177	0.42	BFX29	0.28	BUY20	1.75
BF178	0.30	BFX30	0.30	BUY69A	2.60
BF179	0.32	BFX80	3.56	BUY69B	1.96
BF180	0.35	BFX84	0.24	DBY101	0.46
BF161	0.35	BFZ85	0.26	BY118	1.10
BF162	0.32	BFX86	0.26	BY122	0.68
BF183	0.32	BFX87	0.26	BY126	0.12
BF184	0.32	BFX89	0.65	BY127	0.10
BF185	0.32	BFY50	0.21	BY133	0.16
BF194	0.06	BFY51	0.21	BY135	0.25
BF195	0.10	BFY52	0.21	BY164	44
BF196	0.10	BFY57	0.40	BY179	0.66
BF197	0.10	BFY90	0.90	BY182	0.87
BF198	0.14	BFY90S	1.34	BY184	0.40
BF199	0.16	BR100	0.20	BY187	0.72
BF200	0.48	BR101	0.44	BY189	4.75
BF222	0.48	BR103	0.56	BY198	0.44
BF224	0.20	BRC443	1.78	BY199	0.47
BF224J	0.16	BRY39	0.35	BY206	0.24
BF240	0.20	BRY56	0.42	BY207	0.24
BF241	0.26	BRY61	0.86	BY210/400	0.25
BF244	0.26	BSS17	0.56	BY210/600	0.26
BF244A	0.28	BSS27	0.92	BY210/800	0.30
BF244C	0.24	BSX19	0.34	BY223	1.20
BF245A	0.26	BSX20	0.34	BY227	0.26
BF254	0.15	BSX59	0.62	BY229	0.30
BF256	0.40	BSX76	0.29	BY238	0.68
BF257	0.32	BT100A/02	0.94	BYX10	0.24

Type	Price (£)	Type	Price (£)
BYX36/150	0.22	TIP32	0.40
BYX36/600	0.28	TIP32C	0.60
BYX48/300	0.72	TIP33A	0.63
BYX49/300	0.47	TIP34A	0.72
BYX55/350	0.29	TIP41C	0.46
BYX55/600	0.33	TIP42A	0.52
BYX71/600	1.18	TIP47	0.60
BYZ12	0.42	TIP110	0.88
C106D	0.80	TIP2955	0.60
E1222	0.40	TIP3055	0.60
E5024	0.30	TIS43	0.88
GET872	0.46	TIS88	0.40
ITT44	0.04	TIS90	0.25
ITT2002	0.11	TIS91	0.28
ME0402	0.20	ZTX108	0.12
ME0404/2	0.24	ZTX109	0.12
MEU21	0.60	ZTX212	0.28
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MJ2955	0.90	IN4003	0.05
MJ3000	1.96	IN4004	0.06
MJE240	0.60	IN4006	0.07
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MJE370	0.88	IN4148	0.05
MJE520	0.48	IN5400	0.12
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OA47	0.10	IN5408	0.20
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OA91	0.09	2N697	0.55
OA95	0.18	2N706A	0.33
OA200	0.05	2N2904	0.28
OA202	0.15	2N2906	0.24
OC25	2.10	2N2926G	0.10
OC26	1.70	2N3053	0.40
OC28	1.50	2N3054	0.56
OC29	2.47	2N3055	0.46
OC35	1.75	2N3702	0.10
OC36	1.75	2N3704	0.10
OC42	0.72	2N3708	0.10
OC42K	1.40	2N3772	1.90
OC44	0.72	2N3773	2.70
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OC71	0.50	2N3906	0.16
OC72	0.52	2N5294	0.48
OC81	0.68	2N6107	0.71
OC200	2.46	2N6126	0.65
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Can of handy oil 'mobile' 40p
Flat Red LED 12p
500gm 60/40 solder reel £7.00
Clearweld glue pack 30p
Dual v/u meter – 20 - + 10db £1.00
K30 thermistor 23226296009 75p
GEC Mains Power Supply R.E.G. £3.00
1Kg reel of solder £8.00

Plastic Boxes 4¾x4x1x¾ 50p
100 Fuses £2.00
100 W/W Res £1.50
BF 199 20 for £1.00
10x20 Turn 100k pots. Rank Thorn 9 volt power supply regulated £3.00
BF 470 20 for £2.00
20 Slider Knobs 70p
6 Mixed UHF Aerial Isolating Sockets, some with long leads. Fit ITT, GEC, Philips, Pye £1.00

Mixed Packs
TO66, 12 Power Trans RCA 16182 NPN Replacement for BD124 and Mounting Kits £1.00
50 Mixed AC series Transistor £4.50
15 Panel mount rocket switch 250V/10A £1.50
25 Panel Mount Bulbs & Neons £1.50
10A £1.50
Mixed ribbon cables £1.00
25 LEB red/yellow/green £1.50
201/C Holders £1.20
20 Large LED Red £1.00
20 Small LED Red £1.00
10x20 Turn 100K Pots £1.00
100 Transistor £2.50
20 Convergence Pots 80p
100 Sticks £1.00
10 Thermistors 50p
20 Slider Pots £1.00
30 Presets 50p
15 VDR + thermistors, degaussing. HT. etc £1.00
40 glass reed switch £1.00
10 press to make switch 70p
40 Pots £1.50
10 Gun Switches 50p
5 Tube Bases £1.00
1,000 Diodes, Condensers, Resistors on Bandolier £2.00
Lucky Dip 600 gram £1.00
Jungle Bag 5kg £3.00
20 Knobs £1.00
40 Pots, ¼"+6mm spindles for audio/TV £3.00
20mm Fuse Holders Chassis Mount 20 for £1.00
IN4001/6 100 mixed £2.50
EHT Diodes, small 20 for £1.00
20 Mixed Switches £1.00
ITT M5 Microphone 50p
400V/4A Triac 10 for £1.50

SENDZ COMPONENTS

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